Design
for a better
future /

DEPARTMENT OF PLANNING,
INDUSTRY AND ENVIRONMENT

MASTER PLAN - AIR QUALITY AND ODOUR ASSESSMENT

PARKES SPECIAL ACTIVATION PRECINCT

JULY 2019

Question today
Imagine tomorrow
Create for the future

Master Plan - Air Quality and Odour Assessment
Parkes Special Activation Precinct

Department of Planning, Industry and Environment

WSP
Level 27, 680 George Street
Sydney NSW 2000
GPO Box 5394
Sydney NSW 2001

Tel: +61 2 9272 5100
Fax: +61 2 9272 5101
wsp.com

REV	DATE	DETAILS
A	03/5/2019	Draft 1
B	03/06/2019	Draft 2
C	05/07/2019	Draft 3
D	29/07/2019	Final

	NAME	DATE	SIGNATURE
Prepared by:	Nicola Enslin	05/07/2019	
Reviewed by:	Letitia Sparrow	05/07/2019	
Approved by:	Emma Dean	29/07/2019	

TABLE OF CONTENTS

ABBREVIATIONS VI

EXECUTIVE SUMMARY VIII

1 INTRODUCTION 1

1.1 BACKGROUND TO PARKES SAP 1

1.2 LOCATION OF PARKES SAP 2

1.3 PURPOSE OF THIS REPORT 4

1.4 OBJECTIVE 4

2 PROJECT BACKGROUND 5

2.1 SCENARIOS 1, 3 AND 6 5

2.2 MASTER PLAN SCENARIO 6

2.3 ANTICIPATED POLLUTANTS OF CONCERN 9

3 LEGISLATIVE CONTEXT 10

3.1 STATE 10

3.2 COMMONWEALTH 11

4 ASSESSMENT CRITERIA 12

4.1 ASSESSMENT CRITERIA 12

5 EXISTING INDUSTRIES 14

5.1 INLAND RAIL, INTERMODAL TERMINAL AND NATIONAL LOGISTICS HUB 16

5.2 PARKES WASTE FACILITY 16

5.3 WESTLIME QUARRY 16

5.4 PARKES SEWAGE TREATMENT PLANT 17

5.5 PET FOOD MANUFACTURING 17

6 EXISTING ENVIRONMENT 18

6.1 SENSITIVE RECEIVERS 18

6.2 TOPOGRAPHY 18

6.3 LOCAL CLIMATE 21

6.4 BACKGROUND AMBIENT AIR QUALITY 26

CONTENTS (Continued)

7 AIR QUALITY EVALUATION 30
7.1 MASTER PLAN SCENARIO 30
7.2 DISPERSION MODELLING 41
8 RESULTS AND DISCUSSION 43
8.1 MASTER PLAN 43
8.2 ASSUMPTIONS AND LIMITATIONS 51
8.3 RECOMMENDATIONS 51
9 CONCLUSION 52
10 REFERENCES 53
11 LIMITATIONS 54
11.1 PERMITTED PURPOSE 54
11.2 QUALIFICATIONS AND ASSUMPTIONS 54
11.3 USE AND RELIANCE 54
11.4 DISCLAIMER 55

LIST OF TABLES

TABLE 2.1 PARKES SAP PLACE TYPES AND TYPICAL LAND USES 5
TABLE 2.2 PROPOSED LAND USES FOR SCENARIOS 1, 3 AND 6 6
TABLE 2.3 ANTICIPATED LAND USE AND POTENTIAL POLLUTANTS OF CONCERN 9
TABLE 4.1 IMPACT ASSESSMENT CRITERIA 12
TABLE 4.2 NSW EPA IMPACT ASSESSMENT CRITERIA FOR COMPLEX MIXTURES OF ODOROUS AIR POLLUTANTS (NOSE RESPONSE TIME AVERAGE, 99^{TH} PERCENTILE) 13
TABLE 6.1 PERCENTAGE DATA RECOVERY FOR BATHURST AAQMS FOR THE PERIOD JANUARY 2014 – DECEMBER 2018 27
TABLE 6.2 MAXIMUM, MINIMUM AND AVERAGE PM_{10} AND $PM_{2.5}$ CONCENTRATIONS RECORDED AT BATHURST FOR THE PERIOD JANUARY 2014 – DECEMBER 2018. VALUES THAT EXCEED THE APPLICABLE STANDARDS ARE HIGHLIGHTED IN BLUE BOLD WITH THE NUMBER OF EXCEEDANCES PROVIDED IN BRACKETS. 29
TABLE 7.1: ESTIMATED ANNUAL DUST EMISSIONS FROM THE PET FOOD MANUFACTURING FACILITY 31
TABLE 7.2 ESTIMATED ODOUR EMISSIONS FROM THE PET FOOD MANUFACTURING FACILITY 31
TABLE 7.3 PREDICTED INCREMENTAL PARTICULATE CONCENTRATIONS FOR SENSITIVE RECEPTORS 32
TABLE 7.4 PREDICTED CUMULATIVE PARTICULATE CONCENTRATIONS FOR SENSITIVE RECEPTORS 32
TABLE 7.5 PREDICTED 99^{TH} PERCENTILE ODOUR CONCENTRATIONS FOR SENSITIVE RECEPTORS 32
TABLE 7.6 SOURCE PARAMETERS AND ODOUR EMISSION RATES FOR THE MOIRA CATTLE FEEDLOT 35
TABLE 7.7 POTENTIAL AIR POLLUTANTS RELEASED FROM INTEGRATED MEAT PROCESSING PLANTS 36
TABLE 7.8 SOURCE PARAMETERS AND EMISSION RATES FOR THE BOURKE ABATTOIR - BOILERS 38
TABLE 7.9 SOURCE PARAMETERS AND EMISSION RATES FOR THE BOURKE ABATTOIR – ODOUR SOURCES 39

LIST OF FIGURES

FIGURE 1.1 THE FIVE CORE COMPONENTS OF A SAP (DPE, 2019) 1
FIGURE 1.2 INDICATIVE LOCATION OF PARKES SAP 3
FIGURE 1.3 ZONING MAP 4
FIGURE 2.1 PARKES SAP – MASTER PLAN SCENARIO 8
FIGURE 5.1 EXISTING INDUSTRIES NEIGHBOURING THE PARKES SAP 15
FIGURE 6.1 TOPOGRAPHY SURROUNDING PARKES SAP 19
FIGURE 6.2 SENSITIVE RECEIVERS SURROUNDING PARKES SAP 20
FIGURE 6.3 ANNUAL WIND ROSE FOR PARKES AIRPORT FOR THE PERIOD JANUARY 2013 – DECEMBER 2018 21
FIGURE 6.4 DIURNAL WIND ROSES FOR PARKES AIRPORT FOR THE PERIOD JANUARY 2013 – DECEMBER 2018 22
FIGURE 6.5 SEASONAL WIND ROSES FOR PARKES AIRPORT FOR THE PERIOD JANUARY 2013 – DECEMBER 2018 23
FIGURE 6.6 TEMPERATURE – PARKES AIRPORT (2013 – 2018) 24
FIGURE 6.7 RAINFALL – PARKES AIRPORT (2013 – 2018) 25
FIGURE 6.8 RELATIVE HUMIDITY – PARKES AIRPORT (2013 – 2018) 26
FIGURE 6.9 AMBIENT 24-HOUR AVERAGE PM_{10} CONCENTRATIONS AT BATHURST FOR THE PERIOD JANUARY 2014 – DECEMBER 2018 28
FIGURE 6.10 AMBIENT 24-HOUR AVERAGE $PM_{2.5}$ CONCENTRATIONS AT BATHURST FOR THE PERIOD JANUARY 2014 – DECEMBER 2018 29
FIGURE 7.1 SENSITIVE RECEPTORS SURROUNDING THE PROPOSED PET FOOD MANUFACTURING FACILITY 30
FIGURE 7.2 SITE LAYOUT OF THE MOIRA CATTLE FEEDLOT 33
FIGURE 7.3 ANNUAL WIND ROSES FOR PARKES AIRPORT AWS AND CALMET/WRF DATA EXTRACTED AT PARKES AIRPORT AWS FOR THE PERIOD JANUARY TO DECEMBER 2018 42
FIGURE 8.1 MASTER PLAN INCREMENTAL 100TH PERCENTILE 24-HOUR AVERAGE PM_{10} CONCENTRATION 45
FIGURE 8.2 MASTER PLAN INCREMENTAL ANNUAL AVERAGE PM_{10} CONCENTRATION 46
FIGURE 8.3 MASTER PLAN INCREMENTAL 100TH PERCENTILE 1-HOUR AVERAGE NO_2 CONCENTRATION 47
FIGURE 8.4 MASTER PLAN INCREMENTAL ANNUAL AVERAGE NO_2 CONCENTRATION 48

LIST OF FIGURES (CONTINUED)

FIGURE 8.5 MASTER PLAN INCREMENTAL 99TH PERCENTILE 1 SECOND AVERAGE ODOUR CONCENTRATION – CONSTANT EMISSIONS.......... 49
FIGURE 8.6 MASTER PLAN INCREMENTAL 99TH PERCENTILE 1 SECOND AVERAGE ODOUR CONCENTRATION – VARIABLE EMISSIONS.......... 50

ABBREVIATIONS

AAQMS	Ambient Air Quality Monitoring Station
AWS	Automatic Weather Station
BoM	Bureau of Meteorology
CH_4	Methane
Cl_2	Chlorine
CO	Carbon monoxide
CO_2	Carbon dioxide
DEM	Digital Elevation Model
DP&E	Department of Environment and Planning
EPA	Environmental Protection Agency
HCl	Hydrogen chloride
HF	Hydrogen fluoride
H_2S	Hydrogen sulphide
IAC	Impact Assessment Criteria
NEPM	National Environment Protection (Ambient Air Quality) Measure
NH_3	Ammonia
NO	Nitric oxide
NO_2	Nitrogen dioxide
NO_x	Nitrogen oxides
NSW	New South Wales
O_3	Ozone
OER	Odour emission rate
OU	Odour unit
Pb	Lead
$PM_{2.5}$	Particulate matter with an aerodynamic diameter of less than 2.5 microns
PM_{10}	Particulate matter with an aerodynamic diameter of less than 10 microns
POEO	Protection of the Environment Operations Act 1997
SAP	Special Activation Precinct
SO_2	Sulphur dioxide
SRTM	Shuttle Radar Topographic Mission

USEPA	United States Environmental Protection Agency
UTM E	Universal Transverse Mercator East
UTM N	Universal Transverse Mercator North
VOCs	Volatile Organic Compounds
WRF	Weather Research and Forecasting Model

EXECUTIVE SUMMARY

The Parkes Special Activation Precinct (the SAP) is a Government initiative, announced by the Deputy Premier, the Hon John Barilaro MP, to create a 20-year vision for job creation and regional development. The Department of Premier and Cabinet and the Department of Planning and Environment are leading the creation of the Parkes SAP.

Parkes is a location of State and regional significance and the SAP is an economic enabler that will address market failures and leverage catalyst opportunities. The SAPs are a place-based approach to 'activate' this strategic location. The Parkes SAP was selected because of the economic opportunities associated with the construction of an Inland Rail from Brisbane to Melbourne and the existing east-west Sydney to Perth/Adelaide Rail corridor which cross at Parkes creating an opportunity for an Inland Port.

WSP was commissioned by the New South Wales Government Department of Planning & Environment (NSW DP&E) to prepare an air quality and odour evaluation which will analyse potential air quality and odour impacts that may arise from future development within the Parkes SAP Master Plan. The objective of this assessment was as follows:

- from an air quality perspective, determine a preferred SAP layout scenario
- provide pollutant isopleths, to assist in defining indicative lot boundaries for different land uses; and
- for the final selected Master Plan, assess the potential air quality and odorous impacts associated with the Intensive Livestock Agriculture land use.

It is noted that this report was prepared noting the following assumptions and limitations detailed in Section 8.2.

The master planning process for the SAP has included a series of workshops to test and refine a long list of seven scenarios to a short list of three scenarios to be tested further and taken through to an enquiry by design workshop to further develop a final Master Plan scenario.

To assist in the assessment of the scenarios, the study area has been broken into nine smaller land parcels (A to I) based on natural/man made boundaries such as major roads, rail lines, travelling stock route, property boundaries and existing uses. This report only considers the final Master Plan scenario with the three short-listed scenarios presented in the *Parkes Special Activation Precinct: Environmental, Heritage and Sustainability Summary Report* (WSP 2019).

To assess the prevailing meteorological conditions in the area, surface meteorological data was obtained from the Parkes Regional Airport AWS for the period January 2013 – December 2018. An analysis of the meteorological conditions indicates that:

- Winds originate predominantly from the northeast with lesser components from the north, north-northeast and east-northeast.
- Diurnal winds show a slight variation, with winds originating predominantly from the northeast and east-northeast during the early morning (00:00 – 06:00). From 06:00 – 12:00, prevailing winds occur from the north, north-northeast and northeast. The afternoon period (12:00 – 18:00) is characterised by winds from the north and southwest with a shift observed in the evening (18:00 – 24:00) to the northeast and south-southwest.
- Seasonal winds show a similar wind field during all seasons with winds originating predominantly from the northeast.

An assessment of the existing air quality situation was undertaken using ambient air quality monitoring data from the nearest AAQMS located at Bathurst. This station is located approximately 132 km east of the Parkes SAP and as such, is not considered to be representative of the air quality situation in the Parkes SAP. Based on an analysis of the available ambient air quality monitoring data from the Bathurst AAQMS:

- Ambient PM_{10} concentrations exceed the NEPM 24-hour average PM_{10} standard in 2015 (two exceedances) and 2018 (eight exceedances). However, annual average PM_{10} concentrations fall below the NEPM annual average PM_{10} standard for all years.

- Ambient $PM_{2.5}$ concentrations exceed the NEPM 24-hour average $PM_{2.5}$ standard in 2018 (two exceedances). However, annual average $PM_{2.5}$ concentrations fall below the NEPM annual average $PM_{2.5}$ standard for all available years.

For the purposes of this study, dispersion modelling simulations using CALPUFF were undertaken for the proposed SAP land uses for the Master Plan:

SCENARIO	DESCRIPTION
Master Plan	Emissions of PM_{10} released from the intensive livestock agricultural land use
	Emissions of NO_2 released from the intensive livestock agricultural land use
	Emissions of odour released from the intensive livestock agricultural land use (constant emissions from the cattle feedlot)
	Emissions of odour released from the intensive livestock agricultural land use (variable emissions from the cattle feedlot)

In addition to the above land uses, it is understood that an energy from waste(s) facility is also proposed within the Parkes SAP. However, emissions from this source are highly variable with the types and concentrations of pollutants in the waste stream dependant on the process type, the waste being burned and combustion conditions. Detailed information on the energy from waste(s) facility proposed in the Parkes SAP is required in order to accurately assess emissions from this source.

To determine topographic, climatic and meteorological conditions, CALPUFF relies on CALMET, a diagnostic 3-dimensional meteorological model. The model contains overwater and overland boundary layer algorithms that allows for the effects on plume transportation, dispersion and deposition to be simulated in CALPUFF.

Surface and upper air observations were generated using CALMET-ready WRF (Weather Research and Forecasting model) data. WRF is a regional mesoscale prognostic model specifically used for creating weather forecasts and climate projections in areas with limited meteorological data.

The results of the modelling simulations for the Master Plan scenario indicates the following:

- Predicted short-term and long-term (annual) PM_{10} and NO_2 concentrations are compliant with their applicable IAC.
- The highest short-term PM_{10} and NO_2 concentrations due to emissions from the boiler are predicted towards the north and northeast. For PM_{10}, the highest concentrations are predicted on-site, within the Parkes SAP boundary while for $NO_{2,}$ the highest concentrations are predicted off-site, approximately 500 m to the northeast of the Parkes SAP boundary.
- Odour concentrations are predicted to exceed the applicable odour assessment criteria ((2 OU for urban areas ≥2000 and 7 OU for single residences) off-site for both emission scenarios. However, with the recommended location of odour generating sources in the south-western parts of the Parkes SAP, the impact of odour on the town of Parkes is minimised with odour concentrations predicted to be compliant with the 2 OU impact assessment criteria (for the variable emissions scenario). To the west and south of the Parkes SAP where there are single residences (and the 7 OU impact assessment criteria applies), residents within 3 km of the Parkes SAP are likely to experience elevated odour concentrations (for the variable emissions scenario).
- Odour concentrations due to emissions from the abattoir and cattle feedlot are predicted to disperse towards the northwest and southeast.

Based on the findings of the Parkes SAP Master Plan scenario, the following recommendations are made:

- Undertake ambient air quality and meteorological monitoring once the Parkes SAP is operational. Pollutants to be monitored should include PM_{10}, $PM_{2.5}$, SO_2 and NO_2 as well as a range of meteorological parameters (wind speed, wind direction, temperature, rainfall, humidity and pressure).
- It is recommended that the most significant polluting industries are located in the southwest corner of the Parkes SAP so as to minimise the potential impact on Parkes to the east.
- It is recommended that while an energy from waste(s) facility would likely be permissible within the SAP, the approval of such a facility should require a development application and associated site specific air quality assessment.
- During discrete (short-term) periods of elevated odour emissions (e.g during wet conditions and katabatic drift associated with the winter months), it is recommended that operators need to undertake due diligence work to identify these periods and implement contingencies and management procedures to address them.

1 INTRODUCTION

1.1 BACKGROUND TO PARKES SAP

The Parkes Special Activation Precinct (SAP) is a joint Government Agency initiative, announced by the Deputy Premier, the Hon John Barilaro MP, to create a 20-year vision for job creation and regional development. The Department of Planning, Industry and Environment are leading the creation of the Parkes SAP.

Parkes is a location of State and regional significance and the SAP is an economic enabler that will address market failures and leverage catalyst opportunities. The SAPs are a place-based approach to 'activate' this strategic location.

The Parkes SAP was selected because of the economic opportunities associated with the construction of an Inland Rail from Brisbane to Melbourne and the existing east-west Sydney to Perth/Adelaide Rail corridor which cross at Parkes creating an opportunity for an Inland Port.

The Parkes SAP will lead to investment in common-use infrastructure, including roads infrastructure, water, electricity, telecommunication, gas systems and services, high speed internet and data connections and facilities, and other possible infrastructure or services.

A SAP contains five core components and this plan (government led studies) will inform fast track planning for the SAP and potential future infrastructure investment and government led development:

Figure 1.1 The five core components of a SAP (DPE, 2019)

1.2 LOCATION OF PARKES SAP

Parkes local government area (LGA) is located approximately 350 kilometres west of Sydney, in the Central West and Orana Region. The main townships and settlements in the LGA include Alectown, Bogan Gate, Cookamidgera, Parkes, Peak Hill, Trundle and Tullamore. Other major centres in the region include Condobolin, Cowra, Dubbo, Forbes and Orange.

The Parkes township has a stable population of approximately 11,500 people (ABS, 2016), with around 5,000 dwellings. An industrial estate (zoned IN1 - General Industrial) is located south of the town, adjoining the Newell Highway. The town is serviced by an existing local centre, mixed use areas that contain both commercial, business and retail use. A new hospital and associated health Precinct is located towards the southern end of the town. The Parkes Regional Airport is located east of town, with the Parkes National Logistics Hub located to the west.

The Central West and Orana Regional Plan 2036 identifies the following key features about Parkes:

- development and settlement is clustered around key corridors, including the twin centres of Parkes and Forbes
- Parkes, along with Dubbo, is a major freight hub particularly in the selling, processing, manufacturing and transporting of livestock and agricultural produce
- TransGrid’s NSW Connection Opportunities identifies Parkes as having capacity for renewable energy generation; and
- existing regional mining operations (North Parkes Mines and Tomingley) near the Parkes township.

The establishment of a Parkes SAP is consistent with Parkes Shire Council’s vision and strategic planning for the locality.

The Parkes SAP is located to the west of the Parkes township (see Figure 1.2). The Parkes SAP is strategically located at the intersection of:

- the Brisbane to Melbourne Inland Rail
- the Sydney to Perth/Adelaide Rail corridor
- is in close proximity to the junction of the Henry Parkes Way and Newell Highway.

The Inland Rail project has received $9.3 billion in funding from the Commonwealth Government to support the upgrade to the freight network from Brisbane the Melbourne. It is projected that the first train will run between the two capital cities in 2025. Parkes is an important connection for the Inland Rail project, as it is the epicentre of inland freight.

Figure 1.2 Indicative location of Parkes SAP

The Parkes SAP area is predominantly occupied by agricultural land, with a solar energy facility located in the north-western corner and an existing quarry operation located in the south-eastern area of the SAP.

The existing primary industries in Parkes are focused around freight and logistics (SCT and Pacific National), agribusiness and mining. Parkes strategic location within Regional NSW provides the opportunity to capitalise on these industries, along with the potential to expand into warehousing, advanced food manufacturing and renewable energy uses.

1.2.1 PLANNING FRAMEWORK

Currently under the *Parkes Local Environmental Plan (LEP) 2012*, the Parkes SAP area is zoned (refer to Figure 1.3):

— RU1 – Primary Production
— SP1 – Special Activities
— SP2 – Infrastructure.

The land zoned SP1 – Special Activities has been identified as the Parkes National Logistics Hub. The Logistics Hub covers approximately 600 hectares. The land includes the Pacific National and SCT Logistics sites among other landholdings. The locality provides the opportunity to create an intermodal site serviced by rail and road connections.

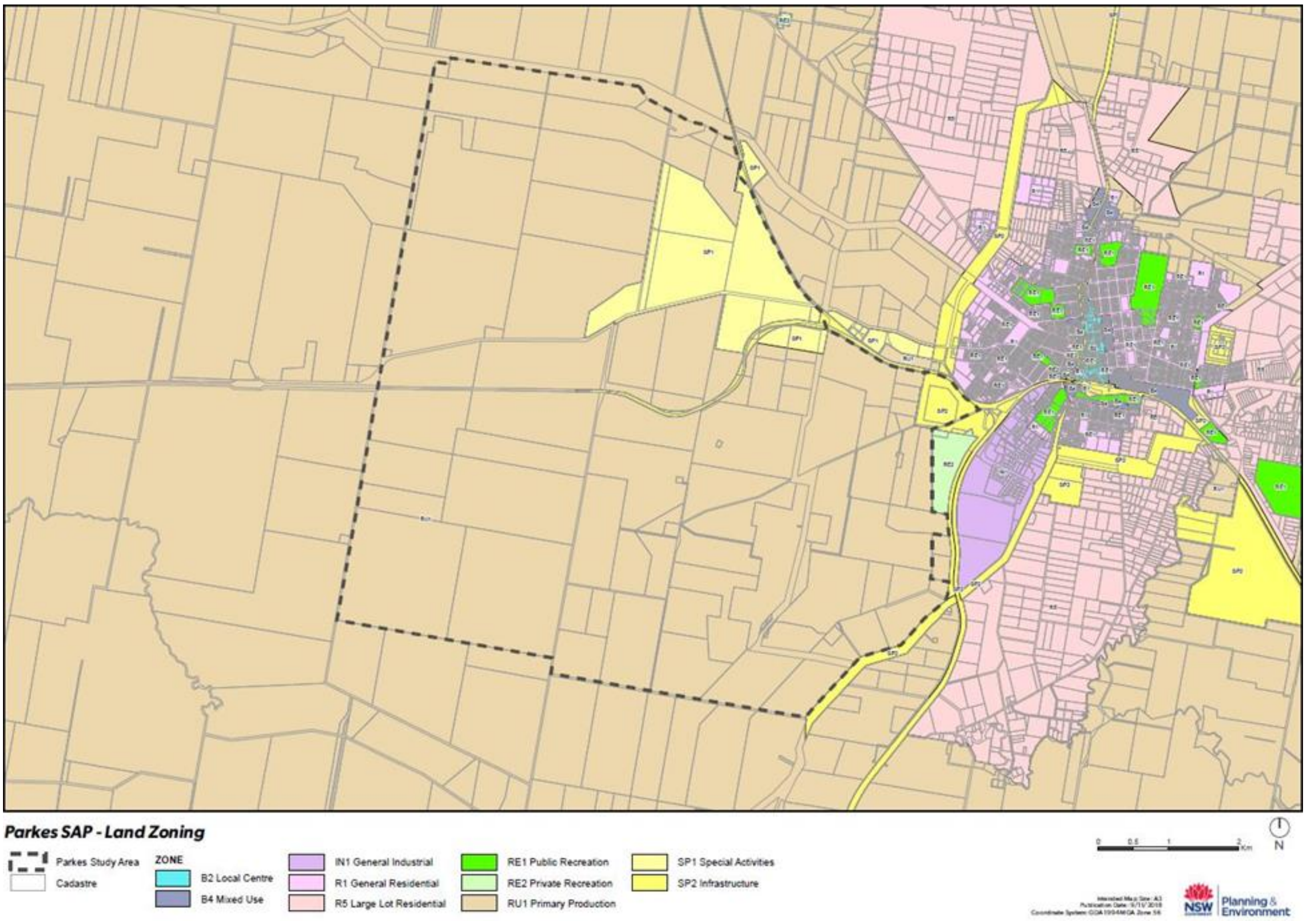

Figure 1.3 Zoning map

1.3 PURPOSE OF THIS REPORT

This report provides a pathway for considering potential air quality challenges into the Parkes SAP Master Plan through the consideration of planning, development and infrastructure opportunities that could be pursued. The purpose of the report is:

- to articulate the legislative requirements for air quality
- to establish the character of the existing local airshed
- to identify the current air emissions sources/industries
- to communicate the ambition for the Parkes SAP, in its response to air quality; and
- for each of the short listed scenarios, provide a preliminary assessment of the key air quality considerations.

1.4 OBJECTIVE

The objective of this assessment was as follows:

- from an air quality perspective, determine a preferred Parkes SAP Master Plan
- provide pollutant isopleths, to assist in defining indicative development boundaries for different land uses; and
- for the final selected Master Plan, assess the potential air quality and odorous impacts associated with the Intensive Livestock Agriculture land use.

2 PROJECT BACKGROUND

The master planning process for the SAP has included a series of workshops to test and refine a long list of seven scenarios to a short list of three scenarios to be tested further and taken through to an enquiry by design workshop to further develop a final Master Plan.

2.1 SCENARIOS 1, 3 AND 6

To assist in the assessment of the short listed scenarios, the study area was broken into nine smaller land parcels (A to I) based on natural/man made boundaries such as major roads, rail lines, travelling stock route, property boundaries and existing uses. Table 2.1 identifies the typical land uses for each of the place types proposed for the SAP.

Table 2.1 Parkes SAP place types and typical land uses

PLACE TYPE	TYPICAL LAND USES
Freight terminals	— rail/road intermodal freight terminals e.g. PN, SCT — rail siding — rail provisioning, maintenance, refuelling, wagon — maintenance — container apron — container storage — container maintenance — grain storage — fuel storage — freight forwarding companies e.g. Linfox, SCT; packing/unpacking and associated office — truck parking
Regional enterprise	— advanced manufacturing e.g. food processing and packaging incl. grains, meat, plant, dairy, pet food — distribution centres e.g. supermarket chain, retailers etc. — warehouse — container maintenance — truck fuelling, maintenance, truck parking, provisioning centre, sales — mining services — hazardous material storage — large format wholesalers (e.g. mining, agricultural) — customs facility — related small enterprise/office
Intensive livestock agriculture	— abattoir and associated holding pens, feedlots, waste treatment, — poultry farm, hatchery — piggery — other intensive livestock growing/processing — mushroom farm — buffer
Energy (solar)	— solar farm — associated infrastructure
Energy & Recycling	— waste-to-energy plant – from small to large — recycling — landfill — buffer

PLACE TYPE	TYPICAL LAND USES
Protected cropping	— commercial greenhouses — hydroponics — aquaculture — other value-add crops — associated solar/energy
Green infrastructure	— protected vegetation — offset planting areas, rehabilitation — stormwater treatment wetlands etc — green/biodiversity corridor
Airport	— international standard airport runway, taxiways, terminal, hangar, operational areas, secure areas

A preliminary assessment of the potential impacts associated with the proposed activities at the Parkes SAP was undertaken for three short listed scenarios (Table 2.2). Detailed information on the three short listed scenarios can be found in the *Parkes Special Activation Precinct: Environmental, Heritage and Sustainability Summary Report* (WSP 2019).

Table 2.2 Proposed land uses for Scenarios 1, 3 and 6

SCENARIO	LAND USES
1	— Waste to Energy and Recycling — Intensive Livestock Agriculture — Regional Enterprise — Freight Terminals
3	— Waste to Energy and Recycling — Intensive Livestock Agriculture — Regional Enterprise — Freight Terminals
6	— Intensive Livestock Agriculture — Regional Enterprise — Freight Terminals

Findings from the three short listed scenarios were used to inform the configuration and layout of the final selected Master Plan with the aim of reducing / minimising any potential air quality impacts due to the proposed activities within the Parkes SAP. For these purposes, the most significant polluting industries (such as the *Intensive Livestock Agriculture* land use) were proposed to be located in the southeast corner of the Parkes SAP so as to minimise the potential impacts on the town of Parkes to the east. An evaluation of the prevailing wind field at Parkes also showed winds to originate predominantly from the northeast and as such, pollutants generated in the Parkes SAP will likely be transported away from the town of Parkes. Moderate to fast winds will also result in the effective dilution and dispersion of pollutants away from the town.

2.2 MASTER PLAN SCENARIO

Through an enquiry by design process the three short listed scenarios were refined to develop the final Master Plan (refer to Figure 2.1). This Master Plan was developed based on the following:

- existing rail infrastructure and industry including the solar farms in the northwest corner and West Lime Quarry
- flood risks and flows
- biodiversity constraints and green corridors

- existing topography and local climate, considering the desktop assessment undertaken for this report (refer to section 6)
- known environmental constraints including noise and air dispersal patterns.

The final Master Plan includes the following SAP sub-precincts:

- *Regional Enterprise* located to the north of the Brolgan Road spine and servicing the freight corridors
- *Intensive Livestock Agriculture* located to the south and southwest of the Parkes SAP which may include industries such as abattoirs, feedlots etc
- *Solar* located in the north-western corner comprising of existing and approved solar developments
- *Resources and Recycling* which includes the existing Parkes Shire Council waste facility, the existing West Lime operations and an area accessible to the freight corridor to the south of Brolgan Road which may include an energy from waste facility
- *Commercial Gateway* in the northeast corner which is located to a number of sensitive receivers; and
- *Mixed Enterprise* which may include land uses such as retail, service station, takeaway food etc.

Based on a review of the short listed scenarios and planning considerations, an energy from waste(s) facility was not included in this Master Plan assessment. Emissions from this source are highly variable with the types and concentrations of pollutants in the waste stream dependant on the process type, the waste being burned and combustion conditions. Detailed information on the energy from waste(s) facility proposed in the Parkes SAP is required in order to accurately assess emissions from this source. Whilst it is likely that an energy from waste(s) facility would be permissible within the SAP, the approval of such a facility would require a development application and associated site specific air quality assessment. For this reason, no additional assessment of this land use was undertaken.

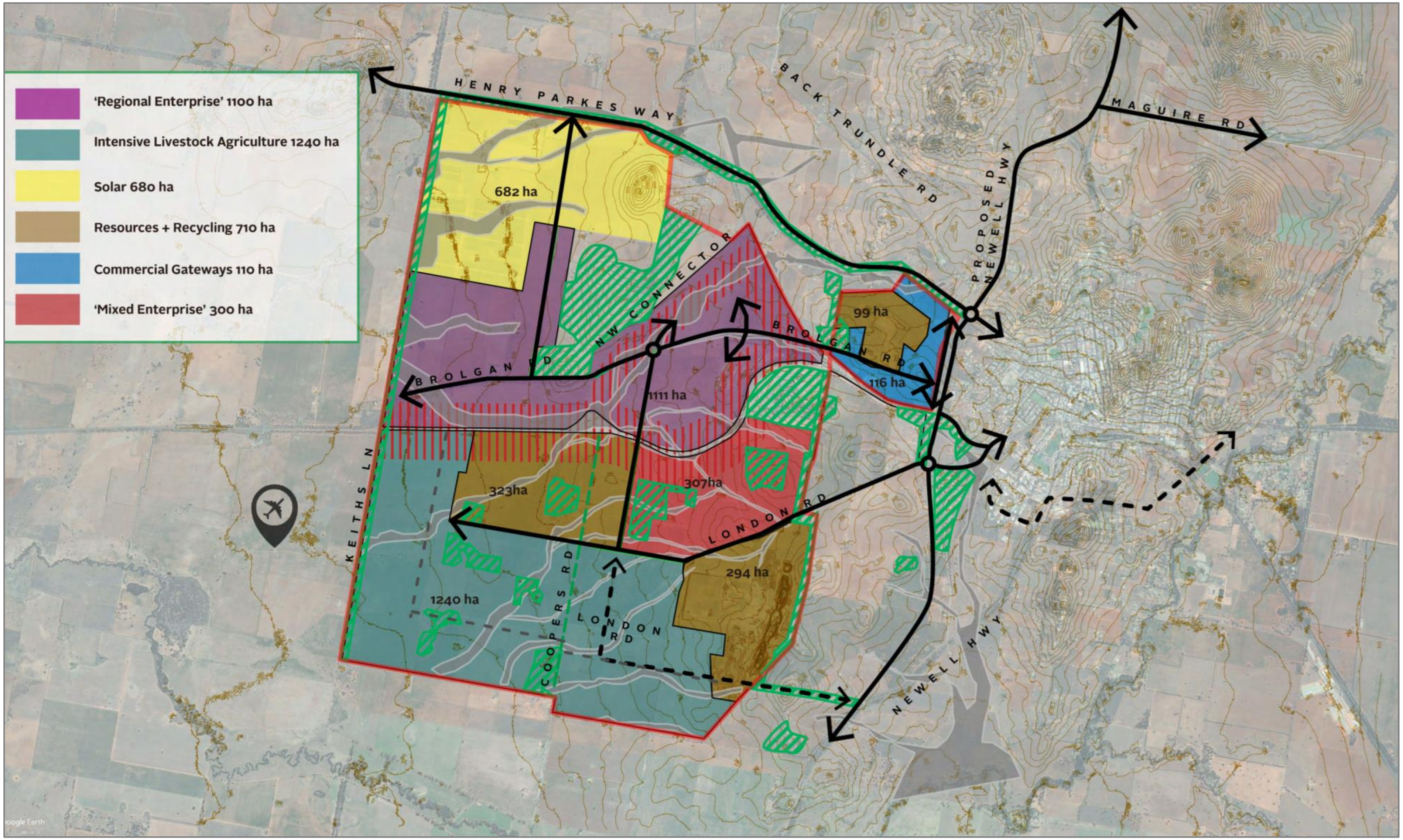

Figure 2.1 Parkes SAP – Master Plan scenario

2.3 ANTICIPATED POLLUTANTS OF CONCERN

Based on the understood potential land uses for each place type, the anticipated pollutants of concern are summarised in Table 2.3.

Table 2.3 Anticipated land use and potential pollutants of concern

PLACE TYPE	ANTICIPATED LAND USE	POTENTIAL POLLUTANTS OF CONCERN
Freight Terminals	Rail and Road freight terminals	Particulates ($PM_{2.5}$ and PM_{10}), nitrogen dioxide (NO_2), sulfur dioxide (SO_2), carbon monoxide (CO), lead (Pb)
	Customs port and warehousing	
Regional/Mixed Enterprise	Advanced manufacturing e.g. food processing and packing including grains, meat, dairy, pet food	Particulates ($PM_{2.5}$ and PM_{10}), nitrogen dioxide (NO_2), sulfur dioxide (SO_2), odour, Volatile Organic Compounds (VOCs)
	Distribution centre	
	Truck Fuelling, maintenance, truck parking	
Intensive Livestock Agriculture	Abattoir and associated holding pens, feedlots and waste treatment	Particulates ($PM_{2.5}$ and PM_{10}), nitrogen dioxide (NO_2), sulfur dioxide (SO_2), Odour, Volatile Organic Compounds (VOCs), dioxins/furans, heavy metals
	Poultry farm, hatchery	
	Piggery	
	Mushroom farm	
Resources & Recycling	Energy from waste plant	Particulates ($PM_{2.5}$ and PM_{10}), nitrogen dioxide (NO_2), sulfur dioxide (SO_2), odour, Volatile Organic Compounds (VOCs), dioxins/furans, heavy metals
	Recycling	

3 LEGISLATIVE CONTEXT

The relevant legislative considerations and advisory documents for the project are detailed below.

3.1 STATE

3.1.1 PROTECTION OF THE ENVIRONMENT OPERATIONS ACT 1997

The *Protection of the Environment Operations Act 1997* (POEO Act) provides the legislative framework for the protection and enhancement of air quality in NSW. Its primary objectives are to reduce risks to harmless levels through pollution prevention, cleaner production, application of waste management hierarchy, continual environmental improvement and environmental monitoring. Sections 124 to 126 and 128 of the POEO Act refer to air pollution related activities.

3.1.2 PROTECTION OF THE ENVIRONMENT OPERATIONS ACT 1997, SCHEDULE 1 – SCHEDULED ACTIVITIES

Parts 1 and 2 of this Schedule list the activities that are scheduled activities for the purposes of this Act.

The POEO Act establishes the NSW environmental regulatory framework and includes a licensing requirement for certain activities. Environment protection licenses are a central means to control the localised, cumulative and acute impacts of pollution in NSW.

The EPA's licensing requirements apply to the whole of NSW and the POEO Act contains a core list of activities that require a licence issued by the EPA. These activities are listed in Schedule 1.

Scheduled activities are divided into:

- premises-based activities (listed in Part 1 of Schedule 1 of the POEO Act)
- activities that are not premises-based (listed in Part 2 of Schedule 1 of the POEO Act).

Under the POEO Act, if work is to be undertaken at a premises for a scheduled activity to be carried out, (referred to as 'scheduled development work') then the person undertaking the work must hold a licence issued by the EPA.

3.1.3 PROTECTION OF THE ENVIRONMENT OPERATIONS (CLEAN AIR) REGULATION 2010

The Protection of Environment Operations (Clean Air) Regulation 2010 contains provisions to regulate emissions from:

- Wood heater (Part 2) – wood smoke is a significant source of particle pollution in parts of NSW
- Fires – (Part 3) – including open burning and bushfires
- Motor vehicles and fuels (Part 4)
- Industry (Part 5).

3.1.4 APPROVED METHODS FOR MODELLING AND ASSESSMENT OF AIR QUALITY IN NSW (2016)

Pursuant to the POEO Act, the Approved Methods for Modelling and Assessment of Air Quality in NSW (Approved Methods) [NSW EPA 2016] prescribes the statutory methods for modelling and assessing air emission sources in NSW.

The Approved Methods lists impact assessment criteria (IAC) for a range of pollutants against which emissions from an activity are required to be assessed. An assessment under these Approved Methods would be undertaken on the proposed future scenarios of the Parkes SAP once prepared.

3.1.5 TECHNICAL NOTES – ASSESSMENT AND MANAGEMENT OF ODOUR FROM STATIONARY SOURCES IN NSW (2006)

The EPA (Previously Department of Environment and Conservation) has developed the *Technical Framework: Assessment and Management of Odour from Stationary Sources in NSW*. This publication offers guidance for industry, consent authorities, environmental regulators and odour specialists on assessing and managing activities that emit odour.

The framework is not a regulatory tool and does not introduce any new environmental requirements. It simply provides up-to-date information to help deal with this difficult issue. It offers:

- a system to help protect the environment and community from odour impacts while promoting fair and equitable outcomes for odour-emitting activities
- a fair and transparent process for assessing odour impacts from new developments
- risk-based approaches and strategies for dealing with ongoing odour impacts from existing activities
- a technical reference document for proponents and regulators.

The framework promotes ongoing environmental improvement and best management practices to prevent or minimise odours. While recognising the changing needs of industry and society, it also promotes sustainable land-use planning and management to avoid odours and associated conflicts.

3.2 COMMONWEALTH

Criteria substances are commonly found in ambient air and regulated under the National Environment Protection (Ambient Air Quality) Measure (Ambient Air Quality NEPM; NEPC 2011).

The Ambient Air Quality NEPM substances are:

- carbon monoxide (CO)
- lead and compounds (Pb)
- nitrogen dioxide (NO_2), which is one component of oxides of nitrogen (NO_x). NO_x includes both NO_2 and nitric oxide (NO)
- ozone (O_3), which is an indicator of photochemical smog. Ozone is a secondary pollutant rather than a direct emission and is formed through atmospheric reactions between volatile organic compounds (VOC) and NO_x in the presence of sunlight
- particulate matter with an aerodynamic equivalent diameter less than 10 micrometres (PM_{10})
- particulate matter with an aerodynamic equivalent diameter less than 2.5 micrometres ($PM_{2.5}$); and
- sulfur dioxide (SO_2).

The Ambient Air Quality NEPM requires jurisdictions to monitor and report on ambient air quality and actions taken to achieve the ambient air quality standards.

4 ASSESSMENT CRITERIA

There are three types of criteria relevant to air emissions associated with the Project. These are:

- *Air Impact Assessment Criteria* – ambient criteria designed for use in air dispersion modelling and air quality impact assessments for new or modified emission sources.
- *Ambient Air Quality Standards* – regional standards against which ambient air quality monitoring results may be assessed.
- *Emission Standards* – which specify maximum allowable in-stack pollutant concentrations as specified for particular industrial activities and plant types.

A combination of emission standards and air Impact Assessment Criteria (IAC) are typically used to evaluate the expected impact of air emissions on local air quality and the effectiveness of plant design and associated emission controls. The wider objective of these criteria is to ensure that the resulting regional ambient air quality meets the relevant ambient air quality standards.

In addition, ambient air quality standards constitute an additional range of criteria which can be used to provide additional context to modelling predictions.

4.1 ASSESSMENT CRITERIA

4.1.1 SO_2, NO_2, O_3, PB, $PM_{2.5}$, PM_{10} AND CO

As detailed within the Approved Methods, the IAC for SO_2, NO_2, O_3, Pb, $PM_{2.5}$, PM_{10} and CO are provided in Table 4.1.

Table 4.1 Impact assessment criteria

POLLUTANTS	AVERAGING PERIOD	CONCENTRATION (µg/m^3)
Sulfur dioxide (SO_2)	10 minutes	712
	1 hour	570
	24 hours	228
	Annual	60
Nitrogen dioxide (NO_2)	1 hour	246
	Annual	62
Photochemical oxidants (as O_3)	1 hour	214
	4 hours	171
Lead (Pb)	Annual	0.5
$PM_{2.5}$	24 hours	25
	Annual	8
PM_{10}	24 hours	50
	Annual	25
Carbon Monoxide (CO)(1)	1 hour	30
	8 hours	10

Notes:

Units expressed in mg/m^3

The IAC apply at the nearest existing or likely future off-site receptor location for the maximum predicted impact. In other words, the incremental impact (predicted impacts from the Parkes SAP investigation area) plus the background concentration.

4.1.2 COMPLEX MIXTURES OF ODOROUS AIR POLLUTANTS

A summary of the impact assessment criteria given for various population densities, as drawn from the Approved Methods, is given in Table 4.2.

Table 4.2 NSW EPA Impact assessment criteria for complex Mixtures of Odorous air pollutants (nose response time average, 99^{th} percentile)

POPULATION OF AFFECTED COMMUNITY	IMPACT ASSESSMENT CRITERIA (OU)
Urban Area (>2,000)	2.0
~500	3.0
~125	4.0
~30	5.0
~10	6.0
Single Residence (<2)	7.0

The Approved Methods states that the impact assessment criteria for complex mixtures of odorous air pollutants must be applied at the nearest existing or likely future off-site sensitive receptor(s).

The incremental impact (predicted impact due to the pollutant source alone) must be reported in units consistent with the impact assessment criteria (OU), as peak concentrations (i.e. approximately 1 second average) and as the:

- 100^{th} percentile of dispersion model predictions for 'Level 1' impact assessments, or
- 99^{th} percentile of dispersion model predictions for 'Level 2' impact assessments (using a minimum of 1-year of site-specific meteorological data).

Given the high density of potential sensitive receptor locations in the immediate vicinity of Parkes, it is expected that an odour impact assessment criterion of 2 OU (expressed as the 99^{th} percentile for a nose-response time-average, i.e. 1-second mean concentration) would appropriately assess the odour performance of the SAP.

4.1.3 AMBIENT AIR QUALITY STANDARDS

The National Environment Protection (Air Toxics) Measure (NEPC, 2004, as amended 2011) provides health investigation levels for a range of substances. These investigation levels represent numerical values that are protective of human health, and against which ambient monitoring data can be compared, for the purposes of establishing whether additional investigation is required.

Whilst not intended directly for use in impact assessment, nor applicable to the Project in a specific regulatory sense, the sources from which the criteria are developed are considered relevant and useful in the context of this assessment. Specifically, these criteria are available as long-term (annual) averages, and hence offer improved compatibility with the assessment of exposure to pollutants with chronic health effects (e.g. benzene).

4.1.4 EMISSION STANDARDS

The Protection of the Environment Operations (Clean Air) Regulation 2010 (NSW, 2010) sets regulatory emission limits for air impurities from stationary plant and equipment which apply throughout New South Wales under the Protection of the Environment Operations Act 1997.

This regulation has historically applied to a wide range of point sources (stacks) at the site, in the form of pollutant concentration limits not to be exceeded.

5 EXISTING INDUSTRIES

A review of EPA environmental protections licences and the National Pollution Inventory (http://www.npi.gov.au/npi-data/search-npi-data) was undertaken to determine industries within or surrounding the SAP that may impact upon the local airshed.

The known or proposed industries located on or surrounding the SAP which have the potential to impact upon the local air shed are detailed below:

- the inland rail, intermodal terminal and national logistics Hub
- Parkes waste facility
- Westlime quarry
- Parkes waste water treatment plant
- pet food manufacturing facility.

The locality of these industries regarding the SAP are illustrated in Figure 5.1.

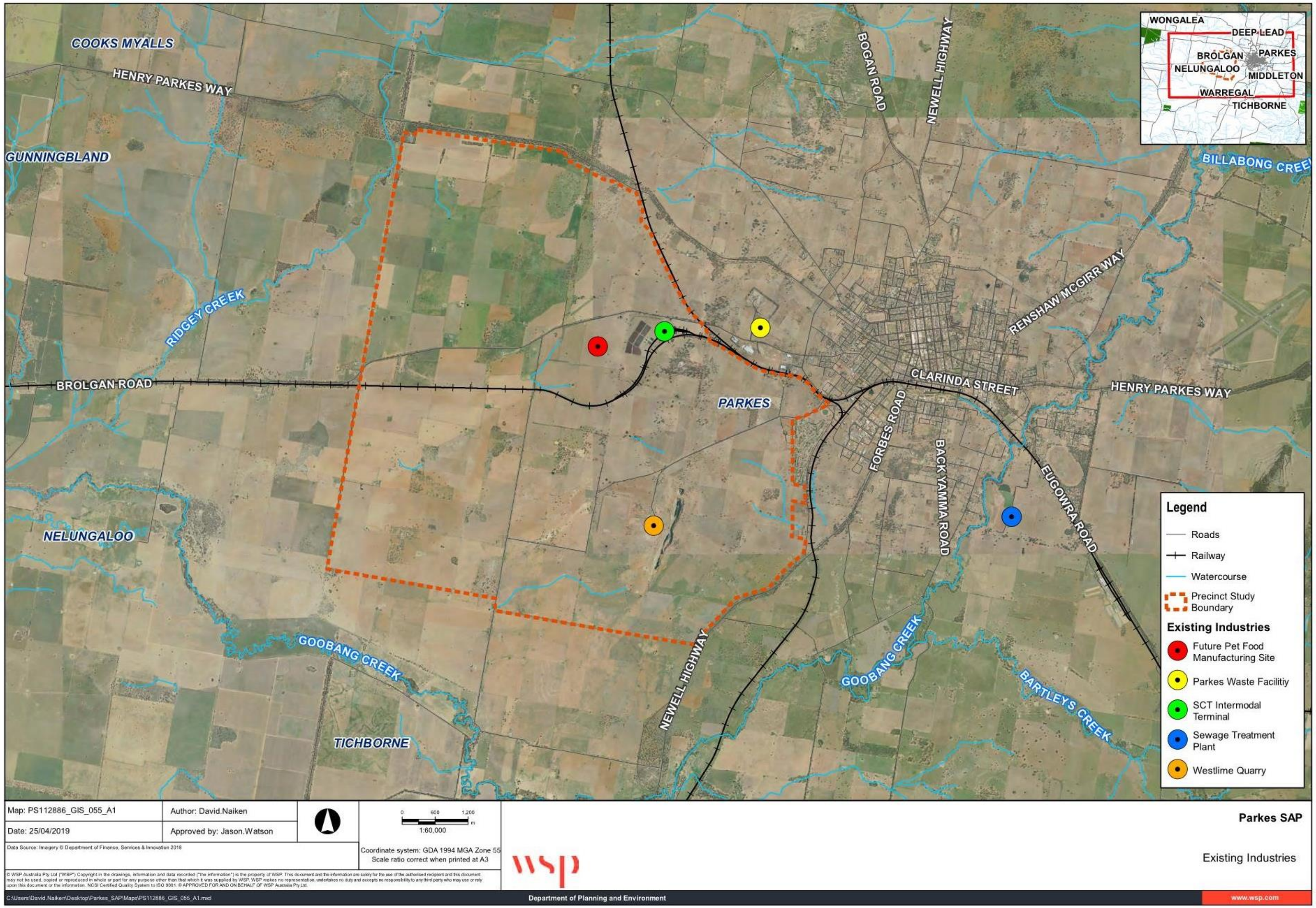

Figure 5.1 Existing industries neighbouring the Parkes SAP

5.1 INLAND RAIL, INTERMODAL TERMINAL AND NATIONAL LOGISTICS HUB

An existing intermodal terminal (SCT Intermodal terminal) on Brolgan Road within the SAP is currently in operation as part of the National Logistic Hub. An intermodal logistic terminal to be operated by Pacific National has been approved and is under construction within the SAP (as of March 2019).

The Parkes to Narromine component of the Inland Rail project (including a siding) is also within the SAP.

The primary pollutants of concern in regards to these activities include:

- NO_x
- CO
- PM_{10} and $PM_{2.5}$
- VOCs
- Carbon dioxide (CO_2)
- SO_2.

There is no know current background air quality data for this land use.

5.2 PARKES WASTE FACILITY

The Parkes waste facility is located approximately 900 m east of the Parkes SAP investigation area. The landfill has progressively been adapted to focus on recycling and resource recovery rather than just waste disposal. It will operate as the central waste landfill and will progressively receive waste from waste transfer stations located throughout the Parkes Shire.

The primary pollutants of concern from this waste facility include:

- Methane (CH_4)
- Nitrogen (N)
- Hydrogen sulphide (H_2S)
- Carbon dioxide (CO_2)
- Ammonia (NH_3)
- Odour.

There is no know current background air quality data for this land use.

Being located within 900 metres of the Parkes SAP investigation area, it is considered that there is potential for air quality impacts upon the SAP.

5.3 WESTLIME QUARRY

Westlime quarry is located in the southeastern section of the Parkes SAP investigation area. The quarry is expected to be in operation for another 15 years and currently operates under NSW Environmental License 11553.

It produces high quality fine lime, agricultural lime, dolomite, construction materials and roadbase.

The primary pollutants of concern from this facility include particulate matter (PM_{10} and $PM_{2.5}$).

There is no known current background air quality data for this land use however the existing development application documents have been requested to confirm this.

There is a risk particulate matter generated during normal site operation may impact above the IAC at or beyond the Westlime site boundary.

5.4 PARKES SEWAGE TREATMENT PLANT

The Parkes Sewage Treatment Plant is located approximately 6 km east of the Parkes SAP investigation area.

The primary pollutants of concern from this facility include:

- CH_4
- H_2S
- Sulfides
- NH_3
- VOCs.

Being located approximately 6 km of the Parkes SAP investigation area it is not considered to impact upon the air quality of the SAP.

5.5 PET FOOD MANUFACTURING

A Pet Food manufacturing facility is currently proposed within the boundary of the SAP. The primary pollutants of concern in regards to this facility may include:

- NO_x
- CO
- PM_{10} and $PM_{2.5}$
- VOCs
- Odour
- SO_2.

Being located within the SAP, this facility has the potential to impact upon background air quality, in particular, upon odour.

6 EXISTING ENVIRONMENT

6.1 SENSITIVE RECEIVERS

The NSW EPA '*Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales (2016)'* describes a sensitive receiver as:

> *'A location where people are likely to work or reside this may include a dwelling, school, hospital, office or public recreational area. An air quality impact assessment should also consider the location of known or likely future sensitive receptors.''*

An aerial view of the Project area, including the location of the nearest external sensitive receivers is provided in Figure 6.2.

6.2 TOPOGRAPHY

The topography are the Parkes SAP investigation area and surrounds are illustrated in Figure 6.1. The SAP investigation area (56.5 km^2) encompasses gentle undulating land, with an elevation ranging from approximately 270 m to 351 m. The investigation area contains south to south westerly aspects across the eastern and southern portions, and westerly to north westerly across the western and northern portions of the project area, respectively. Topographic grades of <2% to 5% are anticipated across the project, with the higher grades situated around slopes and crests associated with the North Parkes Volcanics. The Gooband National Park mountain range is located approximately 24 km east and northeast, and features elevations from 400 m – 700 m.

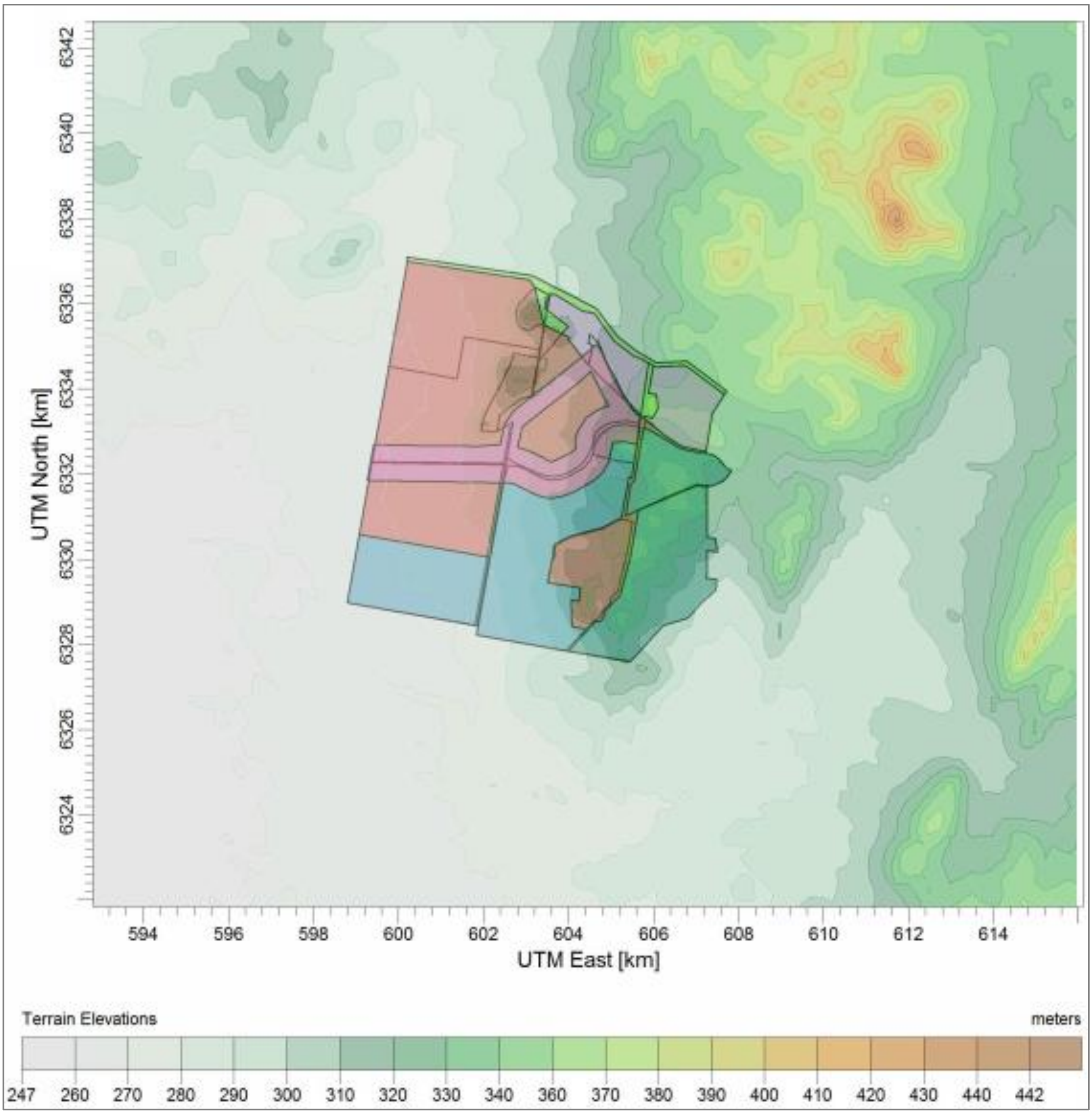

Figure 6.1 Topography surrounding Parkes SAP

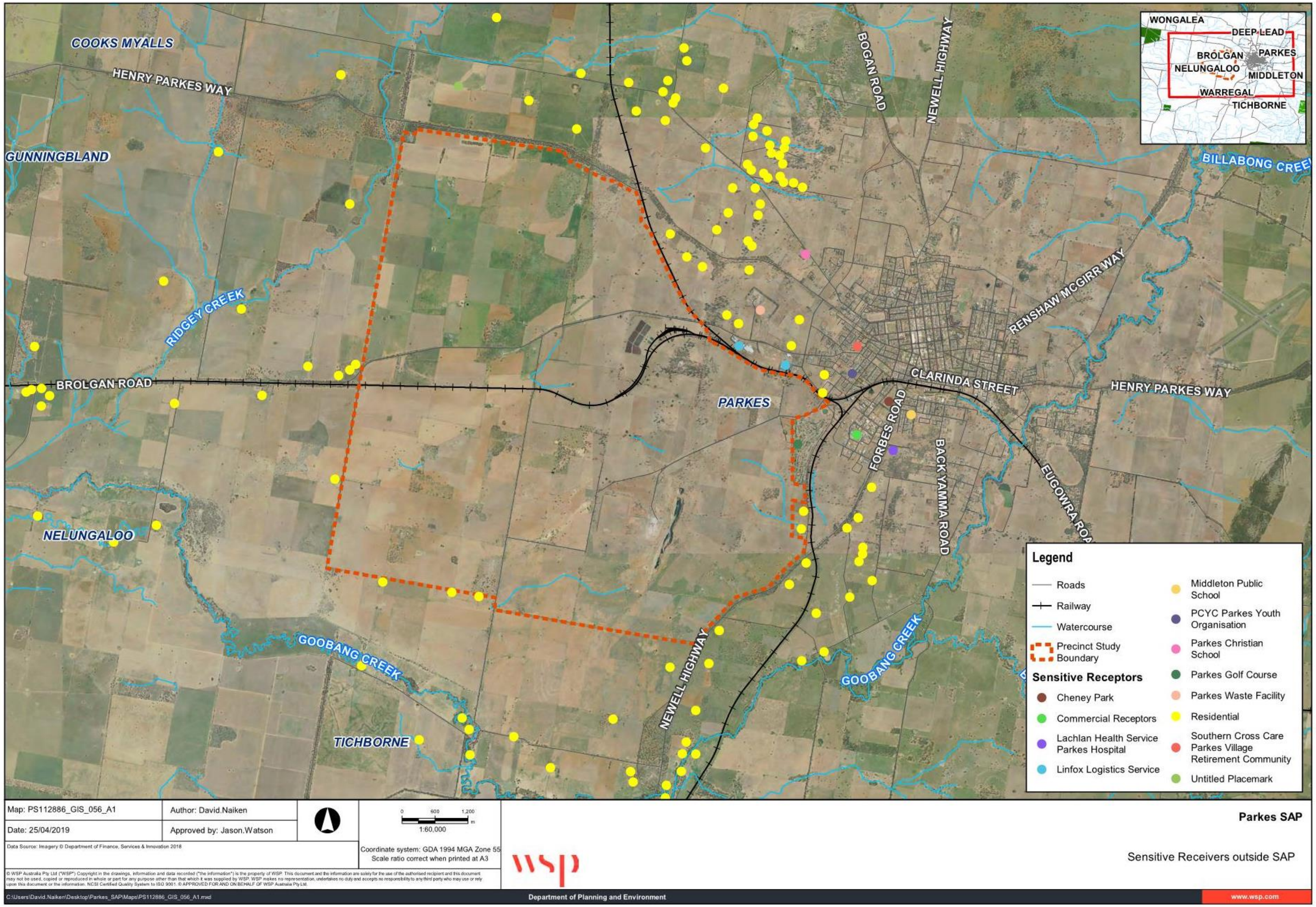

Figure 6.2 Sensitive receivers surrounding Parkes SAP

6.3 LOCAL CLIMATE

Meteorological conditions are important for determining the direction and rate at which emissions from a source would disperse. The key meteorological requirements of air dispersion models are typically hourly records of wind speed, wind direction, temperature, rainfall and relative humidity. The following section discusses meteorological conditions in the vicinity the SAP investigation area.

The Bureau of Meteorology (BoM) collects meteorological data at automatic weather stations (AWS) across Australia and can be used for determining climate statistics over standard periods, such as 30 years, known as climate normals. These can be used to compare with shorter time periods such as one year, that are used for dispersion modelling purposes.

The nearest AWS to the Project area is located in the Parkes Regional Airport (615669 m E, 6333616 m S). The Parkes Airport AWS (Station ID: 065068) is located at an elevation of 322 m, approximately 8 km east of the SAP. Topographically, the AWS is situated on flat plains surrounded by farmland, roughly 14 km south-west of the Goobang National Park mountain ranges.

The following sections provide information based on historical data for Parkes Airport AWS, including wind speed and direction, temperature, rainfall and relative humidity reported as averaged results.

6.3.1 WIND SPEED AND DIRECTION

An annual wind rose plot for the period 1 January 2013 to 31 December 2018 at Parkes Regional Airport AWS is shown in Figure 6.3. Based on the available data, winds originate predominantly from the north-east (13% of the time) with lesser components from the north (9% of the time), north-northeast (10% of the time) and east-northeast (11% of the time). Winds are generally moderate to fast, with the highest wind speeds (>8 m/s) originating from the north. Calm conditions, which were defined as wind speeds less than 0.5 m/s, occur 9% of the time.

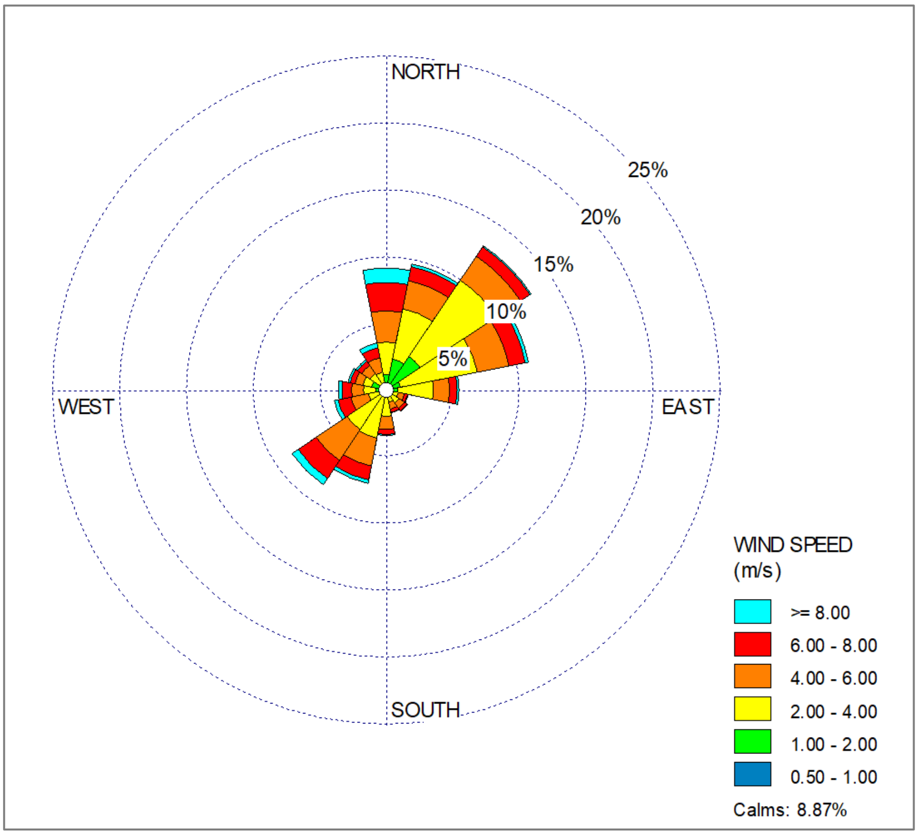

Figure 6.3 Annual wind rose for Parkes Airport for the period January 2013 – December 2018

Diurnal wind variations for the period 1 January 2013 to 31 December 2018 at Parkes Regional Airport AWS are illustrated in Figure 6.4. In the early morning (00:00 – 06:00), winds primarily originate from the northeast and east-northeast, with the highest number of calm periods (13%). From 06:00 – 12:00, prevailing winds occur from the north, north-northeast and northeast with an overall increase in speed observed. The afternoon period (12:00 – 18:00) is characterised by few calm periods (2%) and strong (>8 m/s) winds, predominantly from the north and southwest. In the evening (18:00 – 24:00), winds experience an overall reduction in speed, with the prevailing winds originating from the northeast and south-southwest.

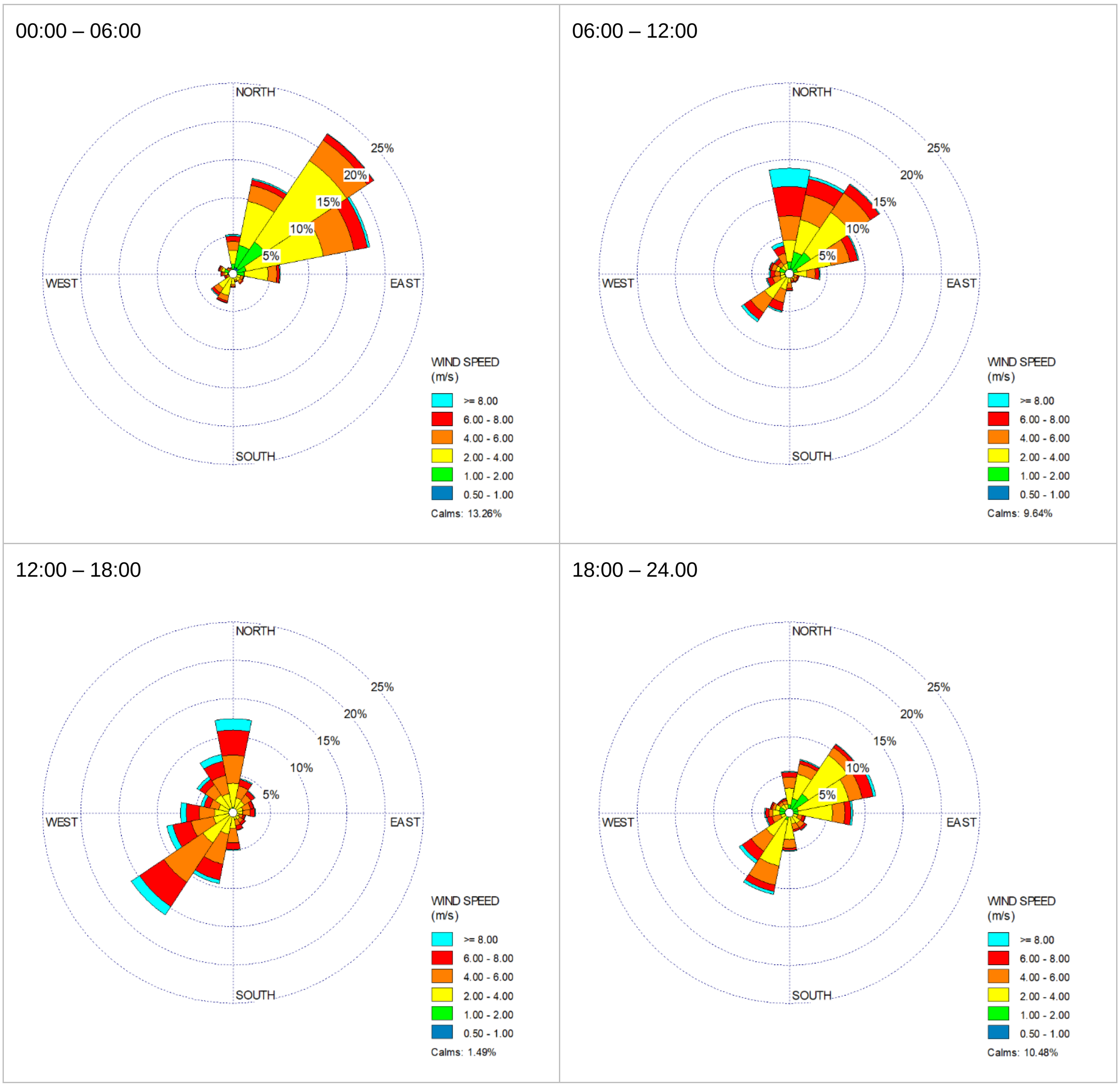

Figure 6.4 Diurnal wind roses for Parkes Airport for the period January 2013 – December 2018

Seasonal wind variations at Parkes Regional Airport AWS for the period 1 January 2013 to 31 December 2018 are illustrated in Figure 6.5. During summer (December, January and February), prevailing winds originate from the northeast and east-northeast, with few calm periods (4%). In autumn (March, April and May), overall wind speed decreases, with the prevailing wind direction originating from the northeast. During winter (June, July and August), overall wind speed further decreases, with the greatest amount of calm periods (14%). Winds originate predominantly from the northeast. During spring (September, October and November), wind speeds increase, with winds remaining from the northeast. A stronger component from the southeast is also observed during this season.

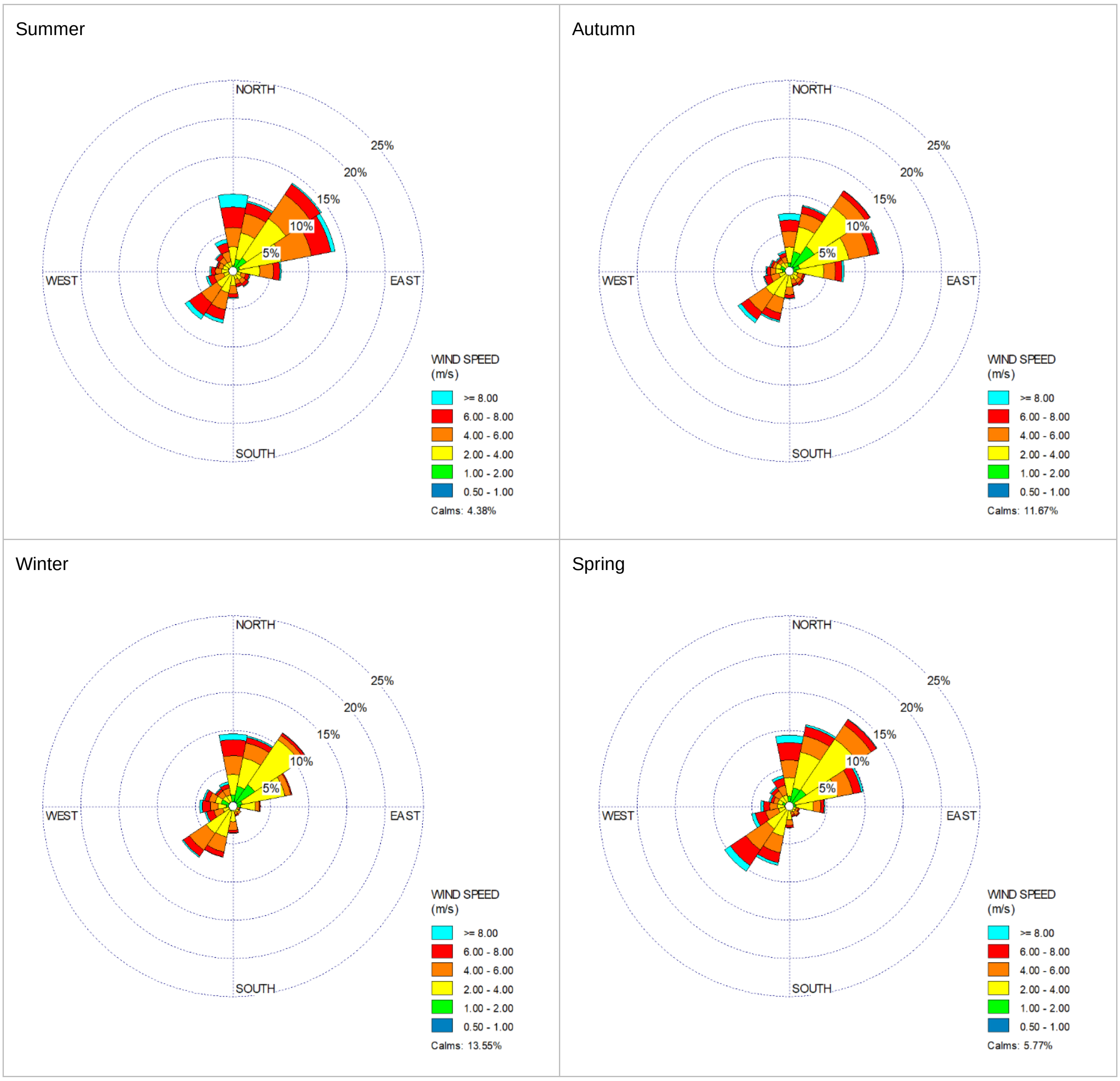

Figure 6.5 Seasonal wind roses for Parkes Airport for the period January 2013 – December 2018

6.3.2 TEMPERATURE

Parkes Airport AWS has warm temperate climate, with significant temperature variations between summer and winter. For the period 2013–2018, the average temperature for the year ranged from 8.1°C (July) to 25.6°C (January). The maximum temperature occurred in February 2018, measuring 45.5°C. Conversely, the minimum temperature occurred in July and August 2018, measuring -5.1°C. Average, maximum and minimum temperature statistics for the 2013 to 2018 at Parkes Airport AWS are summarised in Figure 6.6.

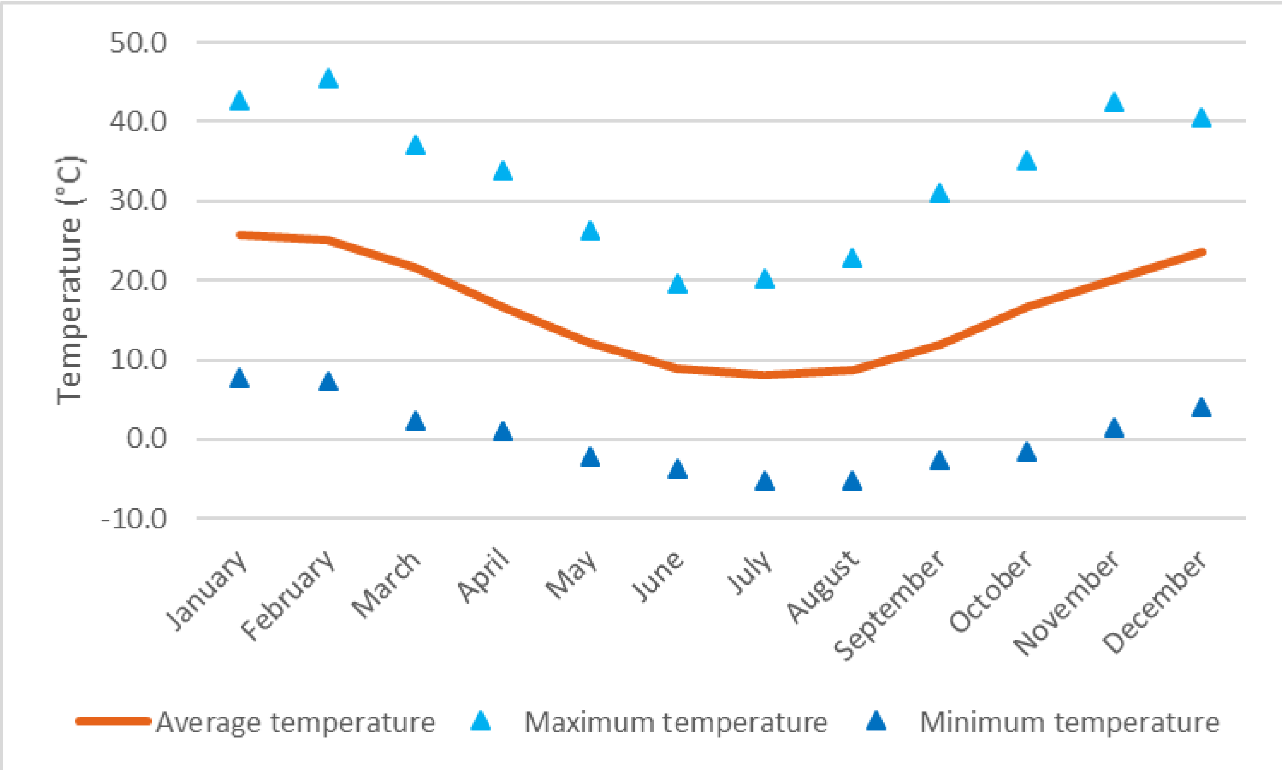

Figure 6.6 Temperature – Parkes Airport (2013 – 2018)

6.3.3 RAINFALL

For the period 2013–2018, Parkes Airport AWS received an average of 585 millimetres (mm) of rainfall per year. The wettest season is Spring, receiving 155 mm of rainfall, while the driest season is Summer, receiving 136 mm of rain. February is the direst month, experiencing the lowest monthly rainfall recorded over the 5 year period (0.2 mm in 2016) and the lowest average rainfall (17.8 mm). March is the wettest month, experiencing the highest monthly amount of rainfall over the 5 year period (195.4 mm in 2017) and the highest average rainfall (77.8 mm). Average, highest and lowest rainfall statistics for the period 2013 to 2018 at Parkes Airport AWS are summarised in Figure 6.7.

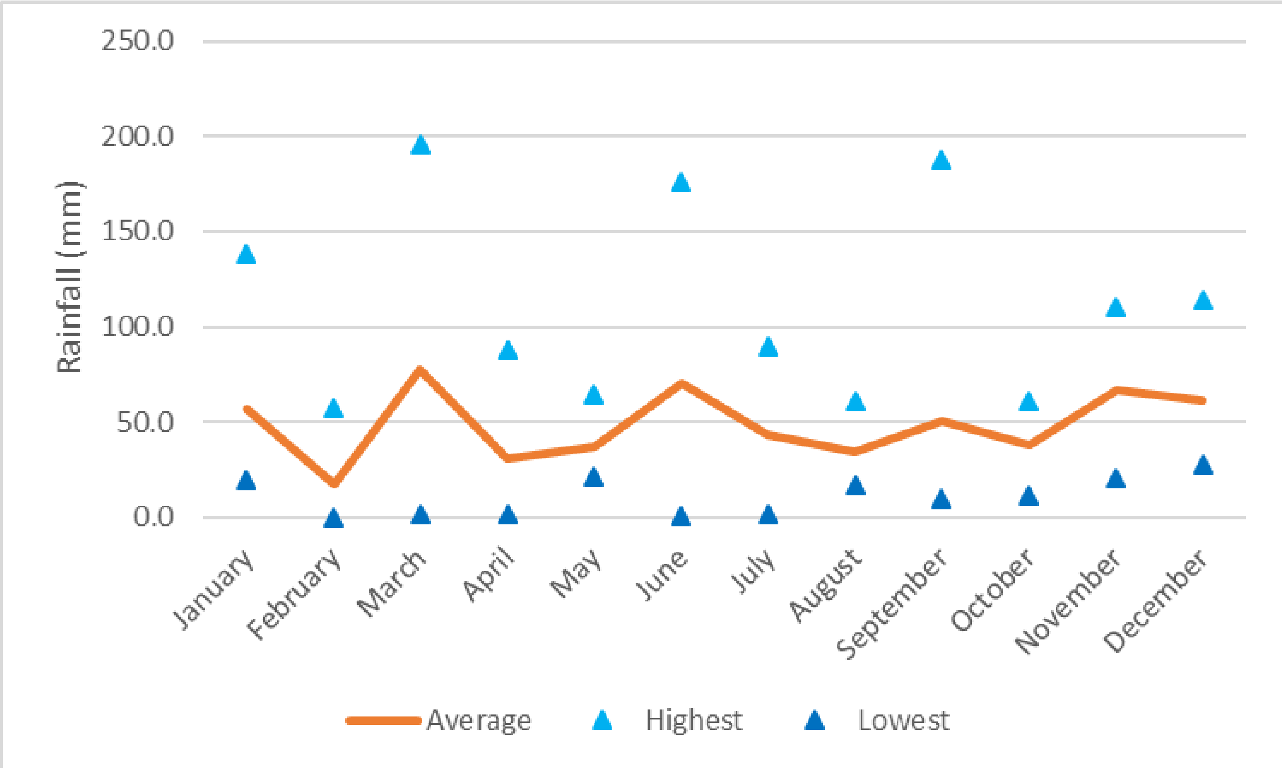

Figure 6.7 Rainfall – Parkes Airport (2013 – 2018)

6.3.4 RELATIVE HUMIDITY

Mean daily 09:00 and 15:00 relative humidity data for Parkes Airport AWS over the period 2013 – 2018 is presented in Figure 6.8.

Parkes Airport AWS displays relative humidity levels that are consistently higher in the morning. Seasonally, relative humidity is highest in winter and lowest in summer. Relative humidity is highest in June and lowest in November.

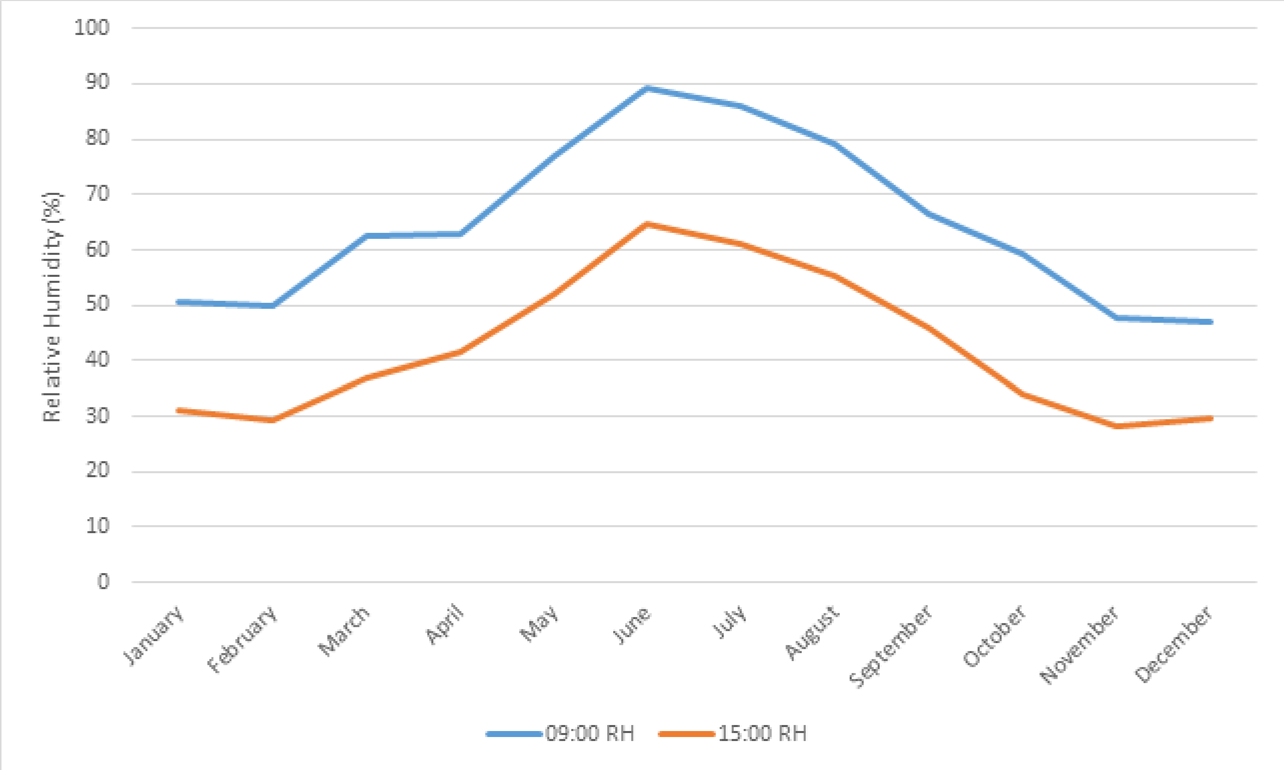

Figure 6.8 Relative Humidity – Parkes Airport (2013 – 2018)

6.4 BACKGROUND AMBIENT AIR QUALITY

The main industrial and non-industrial air emission sources contributing to the local airshed include:

- traffic using the local road network
- freight and logistics operations
- domestic fuel burning (gas, liquid and solid)
- residential activities e.g. lawn mowers and barbecues
- Westlime milling and distribution centre (burning of fuels, heating of feed material, grinding and cooling).

These sources give rise to key pollutants likely to be emitted during construction works including particulate matter of varying size fractions (PM_{10} and $PM_{2.5}$) and emissions from fuel combustion.

6.4.1 EXISTING AVAILABLE BACKGROUND DATA

There is no existing available background data available from the Parkes SAP investigation area or the surrounding area.

6.4.2 BATHURST REGIONAL AMBIENT AIR QUALITY MONITORING

The nearest ambient air quality monitoring station (AAQMS) is located in Bathurst (739077 m E 6301192 m S), approximately 132 km east of the Parkes SAP investigation area, at an elevation of 625 m. In the absence of a closer site, the use of the Bathurst monitoring station has been adopted for consideration within this assessment. However, due to the distance of this station from the Parkes SAP, pollutant concentrations recorded at this station are not considered to be representative of the existing air quality situation at Parkes.

This AAQMS is a performance monitoring station and has been operational since July 2000. The AAQMS represents air quality for a region of ≥42,000 people to which the National Environment Protection (Ambient Air Quality) Measure (NEPM[AAQ]) standards apply.

Ambient PM_{10} and $PM_{2.5}$ concentrations were obtained from the Bathurst AAQMS for the period January 2014 to December 2018 and are presented in the section below.

Percentage data recovery for PM_{10} and $PM_{2.5}$ from the Bathurst AAQMS for the period January 2014 to December 2018 is given in Table 6.1. Data recovery for PM_{10} was above 90% for all years while $PM_{2.5}$ data was not available for 2014 and 2015 with 2016 also reporting low data recovery. As such, $PM_{2.5}$ data presented from this station should be viewed with caution.

Table 6.1 Percentage data recovery for Bathurst AAQMS for the period January 2014 – December 2018

STATION	DATE	DATA RECOVERY (%)	
		PM_{10}	$PM_{2.5}$
Bathurst AAQMS	2014	98.72	0.00
	2015	99.17	0.00
	2016	93.03	63.37
	2017	97.18	93.86
	2018	97.37	93.86

Ambient PM_{10} concentrations measured at Bathurst exceed the NEPM 24-hour average PM_{10} standard in 2015 (two exceedances) and 2018 (eight exceedances) (Figure 6.9 and Table 6.2). Annual average PM_{10} concentrations fall below the NEPM annual average PM_{10} standard for all years.

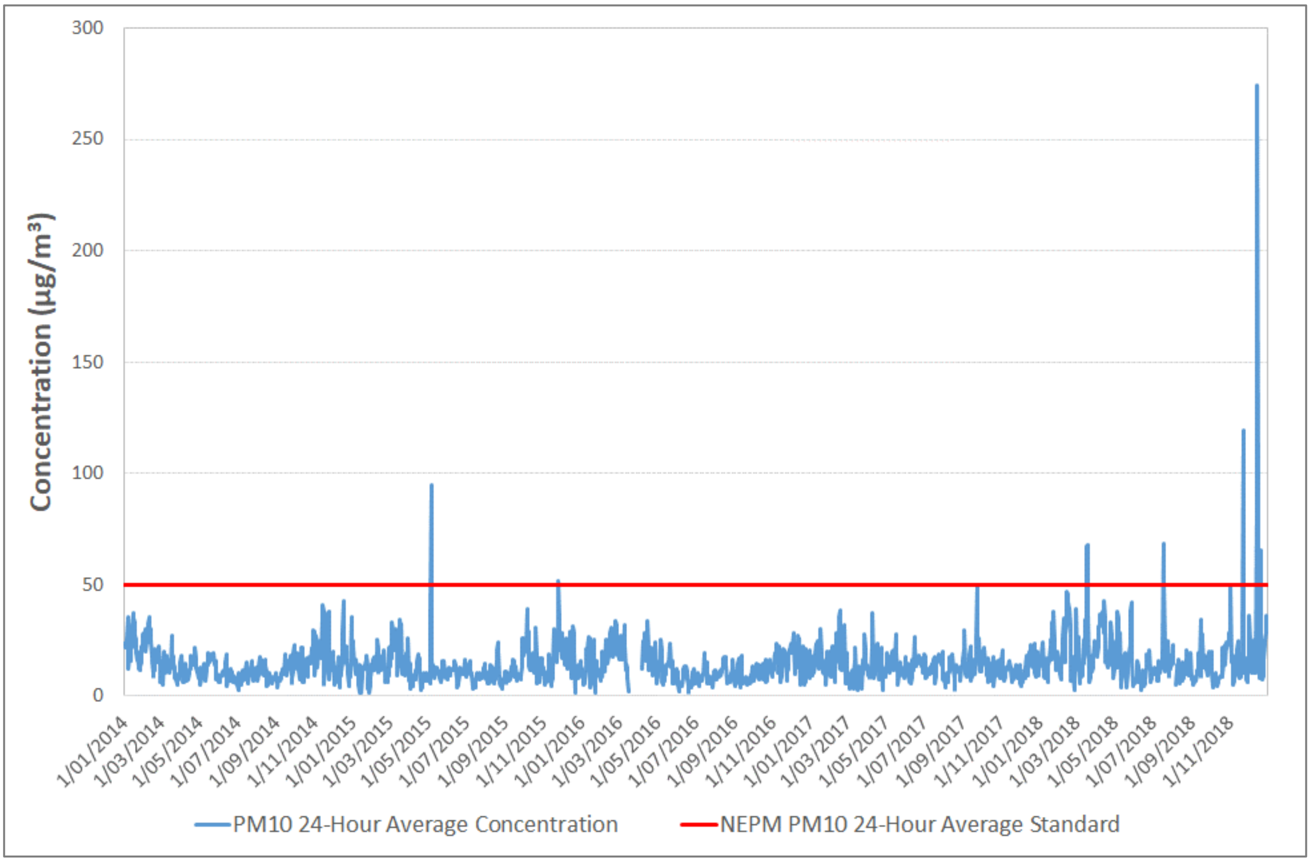

Figure 6.9 Ambient 24-hour average PM_{10} concentrations at Bathurst for the period January 2014 – December 2018

Ambient $PM_{2.5}$ concentrations measured at Bathurst exceed the NEPM 24-hour average $PM_{2.5}$ standard in 2018 (two exceedances) (Figure 6.10 and Table 6.2). Annual average $PM_{2.5}$ concentrations fall below the NEPM annual average $PM_{2.5}$ standard for all available years.

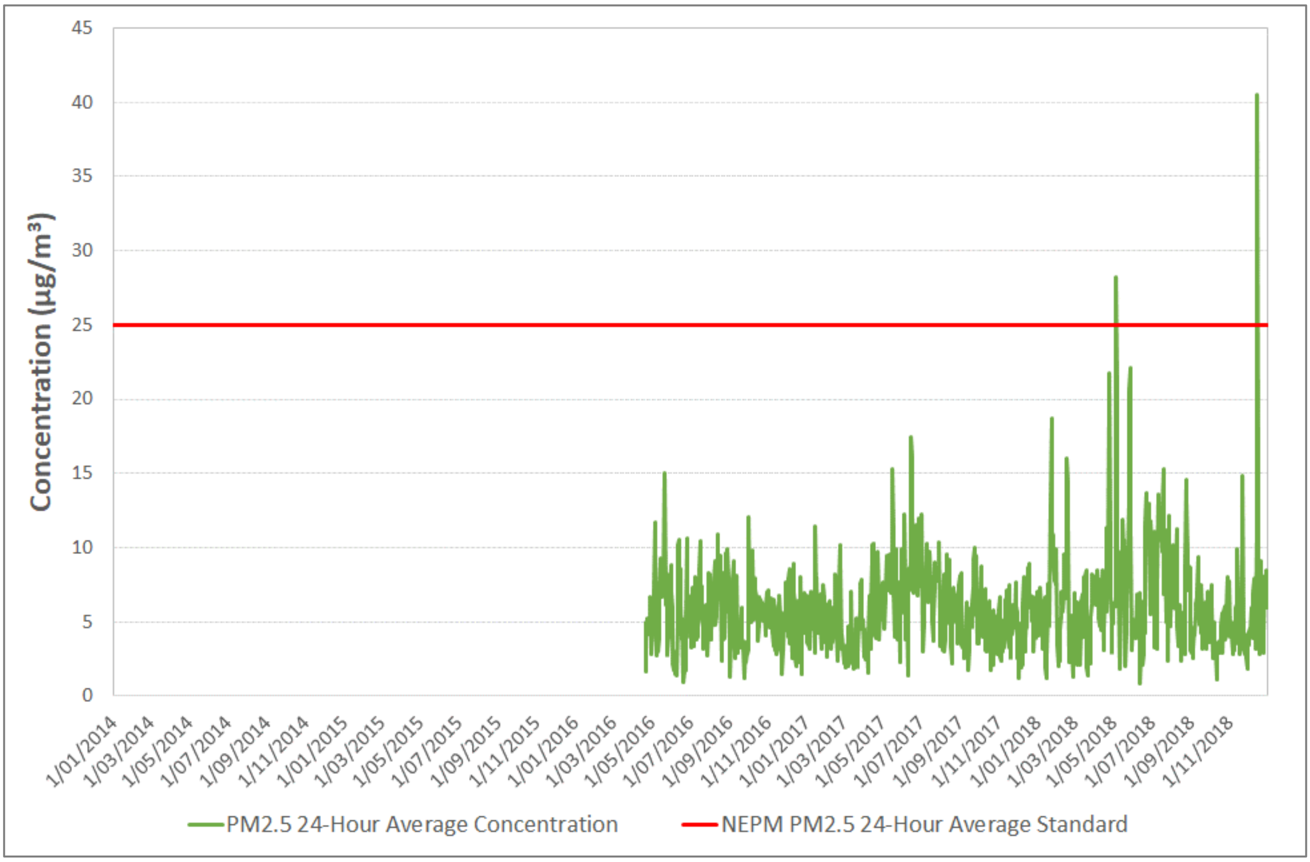

Figure 6.10 Ambient 24-hour average $PM_{2.5}$ concentrations at Bathurst for the period January 2014 – December 2018

Table 6.2 Maximum, minimum and average PM_{10} and $PM_{2.5}$ concentrations recorded at Bathurst for the period January 2014 – December 2018. Values that exceed the applicable standards are highlighted in blue bold with the number of exceedances provided in brackets.

POLLUTANT	DATE	24-HOUR AVERAGE CONCENTRATION (µG/M³)		ANNUAL AVERAGE CONCENTRATION (µG/M³)
		MINIMUM	MAXIMUM	
PM_{10}	2014	2.65	42.76	14.39
	2015	1.35	**94.64 (2)**	13.29
	2016	1.83	34.06	13.16
	2017	2.86	49.90	13.79
	2018	2.71	**274.15 (8)**	18.52
$PM_{2.5}$	2014	N/A	N/A	N/A
	2015	N/A	N/A	N/A
	2016	0.92	15.03	5.51
	2017	1.23	17.48	5.78
	2018	0.80	**40.53 (2)**	6.59

7 AIR QUALITY EVALUATION

7.1 MASTER PLAN SCENARIO

As part of the Master Plan scenario assessment, the potential impact of emissions from a pet food manufacturing facility, an abattoir and a cattle feedlot were evaluated in the Intensive Livestock Agriculture land-use. For this purpose, reference was made to the following air quality assessments:

- Todoroski Air Sciences., 2018: Air Quality Assessment: Pet Food Manufacturing Facility, Parkes, Total Pty Ltd, NSW.
- Holmes Air Sciences., 2005: Air Quality Assessment: Moira Cattle Feedlot, Agricultural Equity Investments Pty Ltd, NSW.
- SLR Consulting Australia., Air Quality Impact Assessment., 2016: Proposed Bourke Small Stock Abattoir, CAPRA Developments Pty Ltd, NSW.

7.1.1 PET FOOD MANUFACTURING FACILITY

The section below has been extracted from the above mentioned report compiled by Todoroski Air Sciences (2018). Further evaluation of the pet food manufacturing facility has not been undertaken for the Master Plan scenario as findings of this assessment are considered to be applicable to the Parkes SAP.

Total Pty Ltd have proposed the development of a 30,000 tonnes per annum pet food manufacturing facility at Parkes, NSW. The proposed project site is situated approximately 5.6 km west of the Parkes City Centre. The nearest residential receptors are located approximately 1.1 km to the northwest of the site (Figure 7.1).

Figure 7.1 Sensitive receptors surrounding the proposed Pet Food Manufacturing Facility

The significant dust generating activities associated with the operation of the facility were identified to be trucks travelling on-site, receiving and cleaning raw ingredients, milling using a hammermill, extrusion, feed shipping and diesel exhaust from trucks and plant. Emissions were estimated using emission factors sourced from the Australian NPI *Emission Estimation Technique Manual for Animal and Bird Feed Manufacture* (NPI, 1999). Estimated dust emissions are provided in Table 7.1.

Table 7.1: Estimated annual dust emissions from the Pet Food Manufacturing Facility

SOURCE	EMISSIONS (kg/YEAR)		
	TSP	PM_{10}	$PM_{2.5}$
Delivering raw material	64	12	3
Receiving raw material	59	39	20
Cleaning raw material (internal vibrating)	42	28	14
Milling (hammermill)	765	510	255
Pelletising (extrusion)	5400	3600	1800
Feed packaging	18	12	6
Dispatch product material	64	12	3
Exhaust emissions	13	13	13
Total Emissions	**6426**	**4227**	**2113**

Odour emissions associated with the facility arise from the extruding process, coating the product, drying in the main production room and packaging of product material. Odour concentrations for each source were obtained from measurements conducted at a pet food manufacturing facility in the United Kingdom (Golder Associates (UK), Ltd, 2018). Odour emissions were calculated based on the approximate room dimensions of each odour source with an assumed air exchange rate of two changes per hour and modelled as volume sources. Estimated odour emissions are provided in Table 7.2.

Table 7.2 Estimated odour emissions from the Pet Food Manufacturing Facility

SOURCE	ODOUR CONCENTRATION (OU)	ODOUR EMISSION RATE (OU/S)
Extruding process	1494	2303
Coating the product	1260	2046
Drying in main production room	888	2362
Packing of product	100	756

Dispersion modelling simulations were undertaken using CALPUFF to predict the potential for off-site dust and odour impacts in the surrounding area due to the operation of the pet food manufacturing facility. Findings of the dispersion modelling indicate that (Table 7.3–Table 7.5):

- incremental and cumulative TSP, PM_{10} and $PM_{2.5}$ concentrations are predicted to fall below their applicable impact assessment criteria at surrounding sensitive receptors
- incremental and cumulative deposited dust levels are also predicted to fall below the applicable impact assessment criteria at surrounding sensitive receptors; and
- odour concentrations fall below the applicable criteria at surrounding sensitive receptors.

As such, it was determined that the facility can operate without exceeding the applicable air quality criteria and that there would not be any impacts upon the surrounding environment due to the operation of the facility.

Table 7.3 Predicted incremental particulate concentrations for sensitive receptors

RECEPTOR	$PM_{2.5}$ (µg/m³)		PM_{10} (µg/m³)		TSP (µg/m³)	DUST DEPOSITION (g/m²/DAY)
	24-HOUR AV	ANNUAL AV	24-HOUR AV	ANNUAL AV	ANNUAL AV	ANNUAL AV
R1	0.8	0.1	1.6	0.1	0.2	0.8
R2	0.3	<0.1	0.6	0.1	0.1	0.3
R3	0.3	<0.1	0.6	0.1	0.1	0.3
R4	0.2	<0.1	0.4	<0.1	<0.1	0.2
R5	0.6	<0.1	1.1	<0.1	<0.1	0.6
R6	0.2	<0.1	0.3	<0.1	<0.1	0.2
R7	0.3	<0.1	0.5	<0.1	<0.1	0.3
IAC	–	–	–	–	–	2

Table 7.4 Predicted cumulative particulate concentrations for sensitive receptors

RECEPTOR	$PM_{2.5}$ (µg/m³)		PM_{10} (µg/m³)		TSP (µg/m³)	DUST DEPOSITION (g/m²/DAY)
	24-HOUR AV	ANNUAL AV	24-HOUR AV	ANNUAL AV	ANNUAL AV	ANNUAL AV
R1	9.0	7.5	25.8	20.7	74.3	3.3
R2	8.5	7.4	24.8	20.7	74.3	3.3
R3	8.5	7.4	24.8	20.7	74.3	3.3
R4	8.4	7.4	24.6	20.6	74.2	3.3
R5	8.8	7.4	25.3	20.6	74.2	3.3
R6	8.4	7.4	24.5	20.6	74.2	3.3
R7	8.5	7.4	24.7	20.6	74.2	3.3
IAC	25	8	50	25	90	4

Table 7.5 Predicted 99th percentile odour concentrations for sensitive receptors

RECEPTOR	PREDICTED OU CONCENTRATION	ODOUR ASSESSMENT CRITERION
R1	<1	2
R2	<1	2
R3	<1	2
R4	<1	2
R5	<1	2
R6	<1	2
R7	<1	2

7.1.2 MOIRA CATTLE FEEDLOT

The section below has been extracted from the report compiled by Holmes Air Sciences (2005). Holmes Air Sciences were appointed to undertake an Air Quality Impact Assessment to assess the potential odour impacts that may arise during the operation of the Moira Cattle Feedlot. Agricultural Equity Investments Pty Ltd has proposed the development of an 80,000 head cattle feedlot at Moira in southern New South Wales.

The feedlot includes the following components (Figure 7.2):

- feedlot pens
- effluent storage and effluent holding
- sedimentation ponds
- a burial pit
- receivals area
- commodities.

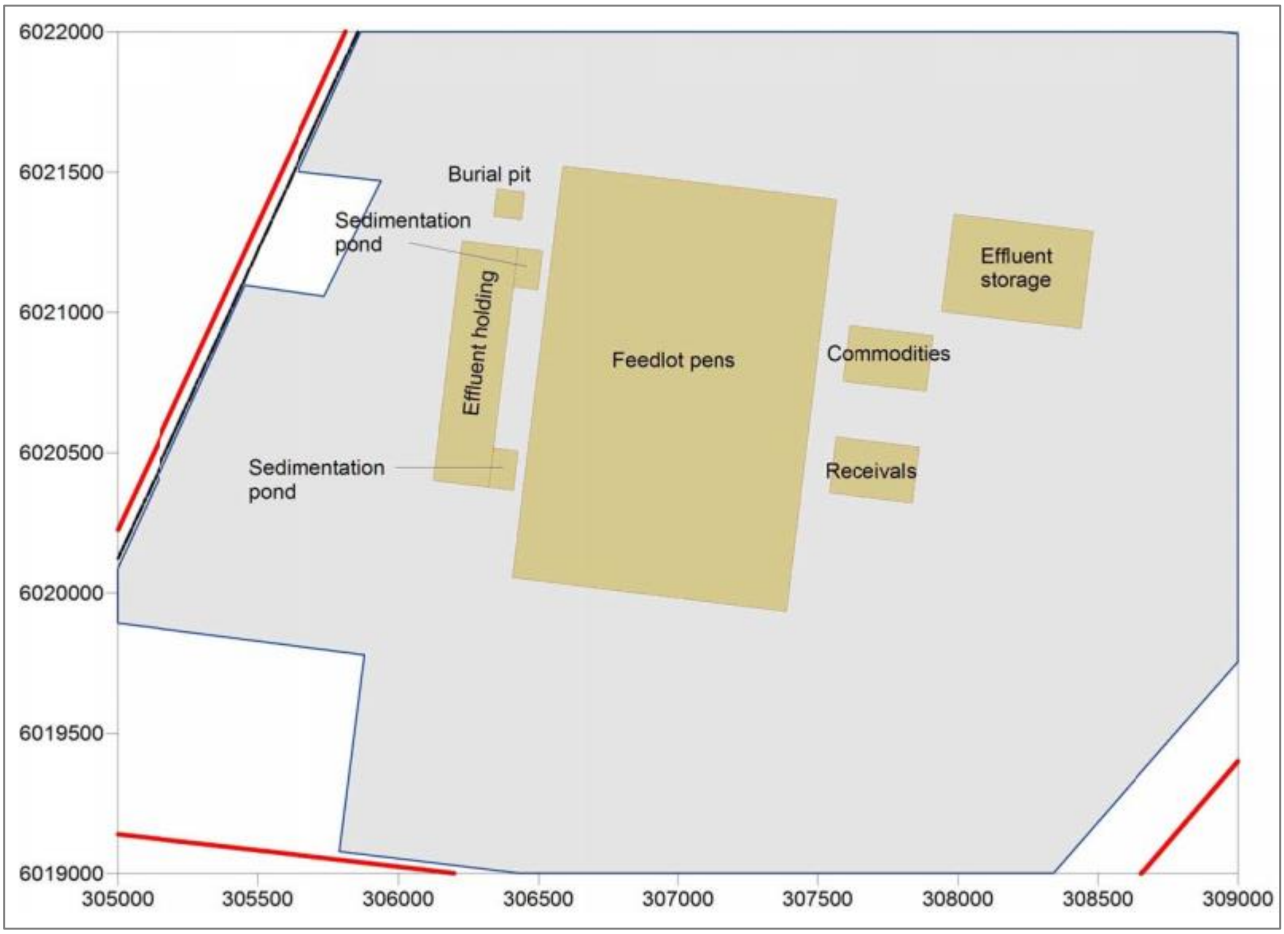

Figure 7.2 Site layout of the Moira Cattle Feedlot

Emissions from cattle feedlots are difficult to assess due to the complexity of interactions between many factors including meteorology, pen management and stocking density. The most significant factor affecting odour emissions from cattle feedlots is the state of the manure pad. Conditions which are conducive to the growth of anaerobic bacteria will give rise to the highest odour emission rates. If the manure pad is deep through infrequent cleaning and there is an episode of high rainfall and warm weather, high odour emission rates are likely to occur (Holmes Air Sciences, 2005).

The source parameters and emission rates obtained from the Moira Cattle Feedlot report and applied in the Master Plan assessment are provided in Table 7.6. Two odour emission scenarios applied in the report were selected for this assessment. The first scenario conservatively assumes that the feedlot pad emits at a constant odour emission rate of 5 $OU/m^3/m^2/s$, consistent with the measurements by back calculation for well run cattle feedlots (Dean and Freeman, 1994). However, it is noted that this approach does not take into account variations in rainfall and feedlot management practices (Holmes Air Sciences, 2005).

The second scenario made use of the Lunney and Smith (1994) emission model. Factors such as stocking density, pen clean-out procedures, daily rainfall and feed were used to estimate the pad moisture content which, in turn, was used as input into the odour emissions model. The model was run with supplied base feedlot data with an assumed maximum manure depth of 50 mm and a pen slope of 3% (Holmes Air Sciences, 2005).

Table 7.6 Source parameters and odour emission rates for the Moira Cattle Feedlot

SOURCE	LENGTH (m)	WIDTH (m)	AREA (m^2)	UTM E (m)	UTM S (m)	RELEASE HEIGHT (m)	SIGMA Z (m)	CONSTANT EMISSION RATE ($OU.m^3/m^2/s$)	VARIABLE EMISSION RATE ($OU.m^3/m^2/s$)
Feedlot Pen Surface	1300	780	1014000	600041	6330529	2	0.47	5	2
Effluent Holding	190	860	163400	599476	6329495	1	0.47	0.38[1]	0.38[1]
Sediment Pond 1	140	90	12600	599693	6329610	0	0.23	0.38[1]	0.38[1]
Sediment Pond 2	90	140	12600	599762	6330186	0	0.23	0.38[1]	0.38[1]
Effluent Storage	350	500	175000	601339	6330445	0	0.47	0.38[1]	0.38[1]
Receivals Area	200	300	60000	600919	6329651	2	0.47	5	2
Burial Pit	95	95	9025	599705	6330535	1	0.23	5	2

Notes:

Using emissions similar to anaerobic ponds (Holmes Air Sciences, 2000)

7.1.3 BOURKE ABATTOIR

The section below has been extracted from the report compiled by SLR Consulting (2016) who were commissioned to perform a Construction and Operational Air Quality Impact Assessment (including odour) for the proposed development of a small stock abattoir. The proposed site is located approximately 14 km to the north of Bourke in the Far West region of NSW. The abattoir is proposed to have the capacity to process up to 6000 head per day, consisting of sheep, lamb and goats.

The operational activities that have the potential to cause emissions to air, and the likely pollutants emitted are outlined in Table 7.7. The key sources of emission during the operational phase include:

- odour generation due to the operational of the wastewater processing system; and
- exhaust emissions from the boilers.

Table 7.7 Potential air pollutants released from Integrated Meat Processing Plants

OPERATION	TYPE OF EMISSION	POLLUTANTS EMITTED	COMMENTS
Abattoir Sources			
Holding pens/ yards	Fugitive	Particulate matter	Holding pens are all hardstand with the stock elevated on the second level to allow easy cleaning of manure. Dust emissions are expected to be minimal following dust management practices.
	Point	Odour	Yards are expected to be a source of odour from the collection of manure. Holding pens will be open on all sides with a roof covering. Male goats in rut that are kept in the yard may emit body odour.
Kill Floor	Fugitive	Odour	Building is under positive pressure. Therefore potential fugitive emissions of odour may be emitted via open doors.
Blood products	Fugitive	Odour	Blood will be segregated, collected and transported off-site for processing.
Skins	Fugitive	Odour	Animal skins will be collected and stored separately in bins located under the kill floor, which will be covered with open sides. The bins will be loaded onto enclosed truck/trailers and transported daily to an existing off-site skins treatment facility for processing.
Paunch	Fugitive	Odour	Paunch will be stored in open bins under the kill floor. It will be mixed with the material from the DAF, put through a belt press to reduce water content and the solid waste sent off site to landfill.

OPERATION	TYPE OF EMISSION	POLLUTANTS EMITTED	COMMENTS
Wastewater Sources			
Rotary Screen	Fugitive	Odour	Wastewater will first be directed to a rotary screen, with 1–2 tonnes of screenings expected to be removed per day.
Screenings bin	Fugitive	Odour	Screenings will be collected into a bin and removed off-site for treatment.
Dissolved Air Flotation (DAF)	Fugitive	Odour	The DAF will have a slight odour of ammonia and sulphide compounds.
4 Anaerobic Treatments Ponds	Fugitive	Odour	If not covered, can emit strong hydrogen sulphide odour, however, some anaerobic systems have crust formation and this can aid in odour reduction.
Ancillary			
Boiler for generation of steam for cleaning	Point	Products of combustion	The boilers will be fuelled by gas. They will generally operate 24 hours a day.

The source parameters and emission rates obtained from the Bourke Small Stock Abattoir report and applied in the Master Plan assessment are provided in Table 7.8 and Table 7.9. The odour emission rates were conservatively selected. In most cases, the maximum available emission rate was selected from a database of literature values for similar sources and operations.

Table 7.8 Source parameters and emission rates for the Bourke Abattoir - Boilers

SOURCE	UTM E (m)	UTM S (m)	RELEASE HEIGHT (m)	STACK DIAMETER (m)	EXHAUST TEMP (k)	EXHAUST FLOW RATE (m^3/s)	EXHAUST VELOCITY (m/s)	NO_X EMISSION RATE (g/s)	PM_{10} EMISSION RATE (g/s)
Boiler(1)	602766	6329701	8	0.4	513	2.89(2)	23	0.315(3)	0.031(4)
Boiler(1)	602766	6329699	8	0.4	513	2.89(2)	23	0.315(3)	0.031(4)

Notes:

(1) Boilers to be fuelled by natural gas hence SO_2 concentrations will be negligible.

(2) Exhaust flow rate has been based on a stack diameter of 0.7 m and a nominal velocity of 15 m/s to give 5.77 m^3/s (East Coast Steam Pty Ltd, 2014). This total gas flow was then split between two stacks (one for each boiler) with a stack diameter of 0.4 m each, to give an exhaust velocity of 23 m/s and a flowrate of 2.89 m^3/s.

(3) NO_x concentration of 50 ppm per boiler was discharged from the low NOx burners.

(4) The PM_{10} emission rate was calculated by multiplying the flow rate (2.89 m^3/s) by the in-stack PM_{10} concentration reported for the Fonterra boilers described in the Fonterra Spretyon Facility assessment (0.0107 g/m^3). This was derived from an emission rate of 0.042 g/s and a flow rate of 3.927 m^3/s (PAEHolmes, 2011).

Table 7.9 Source parameters and emission rates for the Bourke Abattoir – Odour Sources

SOURCE	LENGTH (m)	WIDTH (m)	AREA (m^2)	UTM E (m)	UTM S (m)	RELEASE HEIGHT (m)	SIGMA Y (m)	SIGMA Z (m)	SPECIFIC ODOUR EMISSION RATE ($OU.m^3/m^2/s$)
Primary Holding Pen (manure)(1)	135	60	8100	602783	6329707	2	-	0.47	1.81
Secondary Holding Pen (manure) (2)	60	30	1800	602778	6329836	1	-	0.23	0.35
Primary Holding Pen (goat odour) (3)	135	60	8100	602783	6329707	2	-	0.47	47.0
Secondary Holding Pen (goat odour) (3)	60	30	1800	602778	6329707	1	-	0.23	47.0
Kill Floor(4)	2	2	4	602839	6329696	2	0.47	0.47	0.53
Non-edible(5)	1	1	1	602816	6329696	2	0.23	0.23	15.8
Skins(5)	1	1	1	602805	6329698	1	0.23	0.47	15.8
Paunch(5)	1	1	1	602808	6329690	1	0.23	0.47	15.8
Rotary Screen(6)	1	1	1	602642	6329927	1	0.23	0.47	8.33
Waste from Screen Bin(5)	1	1	1	602642	6329931	1	0.23	0.47	15.8
DAF(7)	-	-	28.27	602645	6329938	2	-	0.47	2.73
Wastewater Treatment Pond 1(8)	100	100	10000	602461	6330127	0	-	0.23	3.38
Wastewater Treatment Pond 2(8)	100	100	10000	602566	6330108	0	-	0.23	3.38
Wastewater Treatment Pond 3(8)	100	100	10000	602547	6330004	0	-	0.23	3.38
Wastewater Treatment Pond 4(8)	100	100	10000	602443	6330024	0	-	0.23	3.38

Notes for Table 7.9 above:

(1) Odour emission rates pertaining specifically to goat manure are not publicly available in Australia. The maximum odour emission rate from 23 separately sourced literature values for holding pens has been used in this assessment. This OER was from soiled holding pens containing sheep. Odour emission rates taken in Australia from sheep manure were deemed to be appropriate.

(2) As the secondary holding pen is only to be used periodically, a continuous emission rate from an unsoiled (clean but used) holding pen for sheep has been used for this assessment.

(3) An odour emission rate of 57 $OU.m^3/m^2/s$ (derived from 42 $OU.m^3/s$/goat with a goat density of 1.12 goats/m^2) was used as a conservative assumption of goat odour.

(4) Kill floor usually is not a major source of odour, a small emission rate has been added for conservatism (Katestone Environmental, 2004).

(5) This OER is the maximum OER available in the literature for fresh side products from the abattoir process (Heggies, 2006).

(6) OER is from a hot screen, which should be conservative (Consulting Environmental Engineers, 2008).

(7) This emission rate is the maximum OER of four emission rates found in the literature for DAFs (Heggies, 2006).

(8) This mean emission rate is the maximum OER of five emission rates found in the literature for anaerobic ponds (The Odour Unit, 2007).

(9) Peak to mean ratios relevant to the type of source modelled were applied to these emission rates, with a varying peak to mean ratio applied to area sources based on the stability class.

7.2 DISPERSION MODELLING

7.2.1 CALPUFF

CALPUFF is a multi-layer, multi-species non-steady-state puff dispersion model, which can simulate the effects of time and space, as well as varying meteorological conditions on pollutant transport, transformation and removal. CALPUFF is an internationally recognised dispersion model recommended for:

- long-range transport distances between 50 and 300 km
- assessment of multiple emission source types (i.e.: point, line, area, volume) and emission sectors (i.e.: industry, traffic, etc.)
- deposition and light extinction for long-range transport
- secondary formation of particulate matter in long-range transport; and
- complex non-steady-state meteorological conditions such as inhomogeneous winds, stagnation conditions and inversion breakup dispersion.

The CALPUFF atmospheric dispersion modelling system includes three main components:

- CALMET: a meteorological model that develops hourly wind and temperature fields on a three-dimensional gridded modelling domain.
- CALPUFF: a transport and dispersion model that advects "puffs" of material emitted from modelled sources, simulating dispersion and transformation processes using the fields generated by CALMET. Temporal and spatial variations in the meteorological fields selected are incorporated in the resulting distribution of puffs throughout a simulation period. Output files contain hourly concentration or deposition fluxes evaluated for selected receptor locations.
- CALPOST: a post run processor for tabulating and summarising the results of the simulation for selected averaging times and locations.

7.2.2 MODELLING SCENARIOS

For the purposes of this study, dispersion modelling simulations were undertaken for the proposed SAP land uses for the following scenarios:

SCENARIO	DESCRIPTION
Master Plan	Emissions of PM_{10} released from the intensive livestock agricultural land use
	Emissions of NO_2 released from the intensive livestock agricultural land use
	Emissions of odour released from the intensive livestock agricultural land use (constant emissions from the cattle feedlot)
	Emissions of odour released from the intensive livestock agricultural land use (variable emissions from the cattle feedlot)

7.2.3 METEOROLOGICAL INPUT

To determine topographic, climatic and meteorological conditions, CALPUFF relies on CALMET, a diagnostic 3- dimensional meteorological model. The model contains overwater and overland boundary layer algorithms that allows for the effects on plume transportation, dispersion and deposition to be simulated in CALPUFF.

Surface and upper air observations were generated using CALMET-ready WRF (Weather Research and Forecasting model) data. WRF is a regional mesoscale prognostic model specifically used for creating weather forecasts and climate projections in areas with limited meteorological data. The prognostic modelling domain used by WRF was site specific, centred upon UTM Zone 55 S: 603595.93 m E and 6331811.86 m S for the period of 1 January to 31 December 2018, featuring 1 km resolution, 50 x 50 km domain size and a vertical level of 35.

The CALMET model setup used is in general accordance with the methods provided in the NSW EPA document *Generic Guidance and Optimum Model Setting for the CALPUFF Modeling System for Inclusion into the 'Approved Methods for the Modeling and Assessments for Air Pollutants in NSW,* Australia'. The CALMET domain was run with a 25 km × 25 km domain size and a 0.25 km grid resolution.

A comparison of the measured and CALMET generated annual wind roses for 2018 at Parkes Airport AWS is presented in Figure 7.3. A good agreement is observed between the measured and modelled data, giving confidence in the use of this data for the assessment.

Parkes Airport AWS 2013–2018 (Measured)	Parkes Airport 2018 (Predicted)

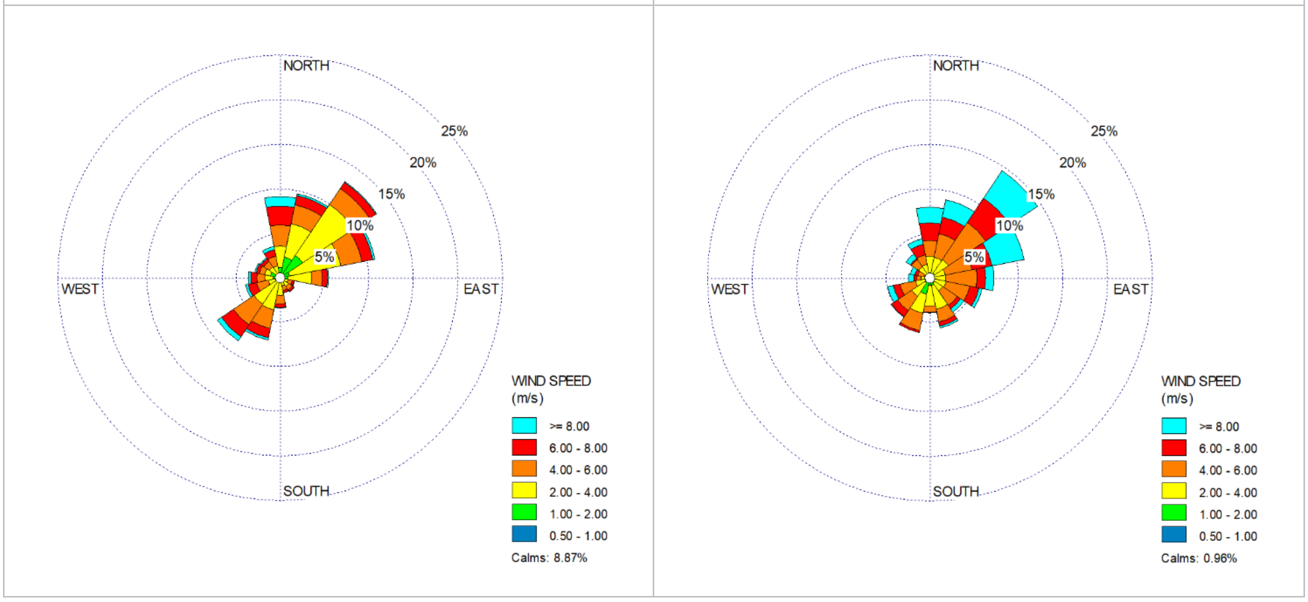

Figure 7.3 Annual wind roses for Parkes Airport AWS and CALMET/WRF data extracted at Parkes Airport AWS for the period January to December 2018

7.2.3.1 MODELLING INPUT

An 8 km by 8 km model domain centred on the site was included in the model. A sampling grid was utilised with a resolution of 400 m x 400 m (Master Plan). Terrain influences dispersion of pollutants, especially during periods of stable conditions. The NASA Shuttle Radar Topographic Mission (STRM) digital elevation model (DEM) (resolution of 30 m x 30 m over a domain of 25 km x 25 km) was extracted and inputted to the model to account for terrain influences on dispersion. For the land use categorization, an AERSURFACE output was created from the Global Land Cover Characterization Global Coverage – Version 2 (1 km x 1 km resolution over a domain of 25 km x 25 km).

7.2.3.2 PEAK TO MEAN RATIOS

For odour modelling in NSW, a peak to mean (P/M ratio) must be applied to odour emission rates to take into account peak odour levels. Whilst CALPUFF is capable of predicting impacts for averaging periods ranging from one-hour to years, the human nose is capable of responding to odours over much shorter periods. In order to allow CALPUFF to predict odour impacts in the range of 1-second, peak to mean ratios are applied. The peak to mean ratios are dependent on the type of odour emission source, the atmospheric stability and distance between the odour source and the sensitive receptor. For the Master Plan, the estimated odour emission rates applied for the Bourke Small Stock Abattoir have accounted for the peak to mean ratios. For area sources, the peak to mean ratio is 2.3 for stability classes A to D, and 2.5 for E and F class stability. For volume sources, the factor is 2.3 and is not dependant on stability. For the emission rates obtained from the Moira Cattle Feedlot, a peak to mean ratio has not been applied to the constant emissions.

8 RESULTS AND DISCUSSION

8.1 MASTER PLAN

8.1.1 PM_{10} CONCENTRATIONS

The results of dispersion modelling for PM_{10} is illustrated in Figure 8.1 to Figure 8.2. The outputs represent the predicted 100th percentile incremental PM_{10} concentrations. The results indicate the following:

- Predicted 24-hour and annual average PM_{10} concentrations fall below their respective PM_{10} IAC of 50 and 25 µg/m^3, respectively.
- Maximum incremental 24-hour and annual average PM_{10} concentrations were 1.50 µg/m^3 and 0.181 µg/m^3, respectively.

8.1.2 NO_2 CONCENTRATIONS

The results of dispersion modelling for NO_2 is illustrated in Figure 8.3 to Figure 8.4. The outputs represent the predicted 100th percentile incremental NO_2 concentrations. The results indicate the following:

- Predicted 1-hour and annual average NO_2 concentrations also fall below their respective NO_2 IAC of 246 and 62 µg/m^3, respectively.
- Maximum incremental 1-hour and annual average NO_2 concentrations were 97.22 µg/m^3 and 1.8 µg/m^3, respectively.

8.1.3 ODOUR CONCENTRATIONS

The results of dispersion modelling for odour is illustrated in Figure 8.5 and Figure 8.6. The results indicate the following:

- Predicted 1-second average odour concentrations exceed the applicable odour assessment criteria (2 OU for urban areas ≥2000 and 7 OU for single residences) off-site for both the constant and variable emissions scenarios. However, with the recommended location of odour generating sources in the south-western parts of the Parkes SAP, the impact of odour on the town of Parkes is minimised with odour concentrations predicted to be compliant with the 2 OU impact assessment criteria (for the variable emissions scenario). To the west and south of the Parkes SAP where there are single residences (and the 7 OU impact assessment criteria applies), residents within 3 km of the Parkes SAP are likely to experience elevated odour concentrations (for the variable emissions scenario).
- For the constant emissions scenario, the highest incremental 99th percentile 1 second odour concentration was 1052 OU (predicted on-site). A highest 99th percentile concentration of 423.97 OU was predicted at the Parkes SAP boundary.
- For the constant emissions scenario, the highest incremental 99th percentile 1 second odour concentration was 621.88 OU (predicted on-site). A highest 99th percentile concentration of 55.05 OU was predicted at the Parkes SAP boundary.

POPULATION OF AFFECTED COMMUNITY	IMPACT ASSESSMENT CRITERIA (OU)
Urban Area (>2,000)	2.0
~500	3.0
~125	4.0
~30	5.0
~10	6.0
Single Residence (<2)	7.0

Based on an evaluation of the dispersion pattern of pollutants from the site, the highest short-term (1-hour and 24-hour) PM_{10} and NO_2 concentrations due to emissions from the boiler are predicted towards the north and northeast. For PM_{10}, the highest concentrations are predicted on-site, within the Parkes SAP boundary while for NO_2, the highest concentrations are predicted off-site, approximately 500 m to the northeast of the Parkes SAP boundary.

For odour, emissions from the abattoir and cattle feedlot are predicted to disperse towards the northwest and southeast. The odour assessment criterion of 2 OU is predicted to be exceeded up to 8 km to the northwest from the Parkes SAP boundary (for the variable emissions scenario). The cattle feedlot pen surface is identified to be the main contributing source to odour. However, it should be noted that results from these dispersion modelling simulations should not be used for compliance purposes but rather provide a general indication of the dispersion pattern of pollutants from proposed activities at the SAP (based on the source parameters and emissions included in this Master Plan assessment).

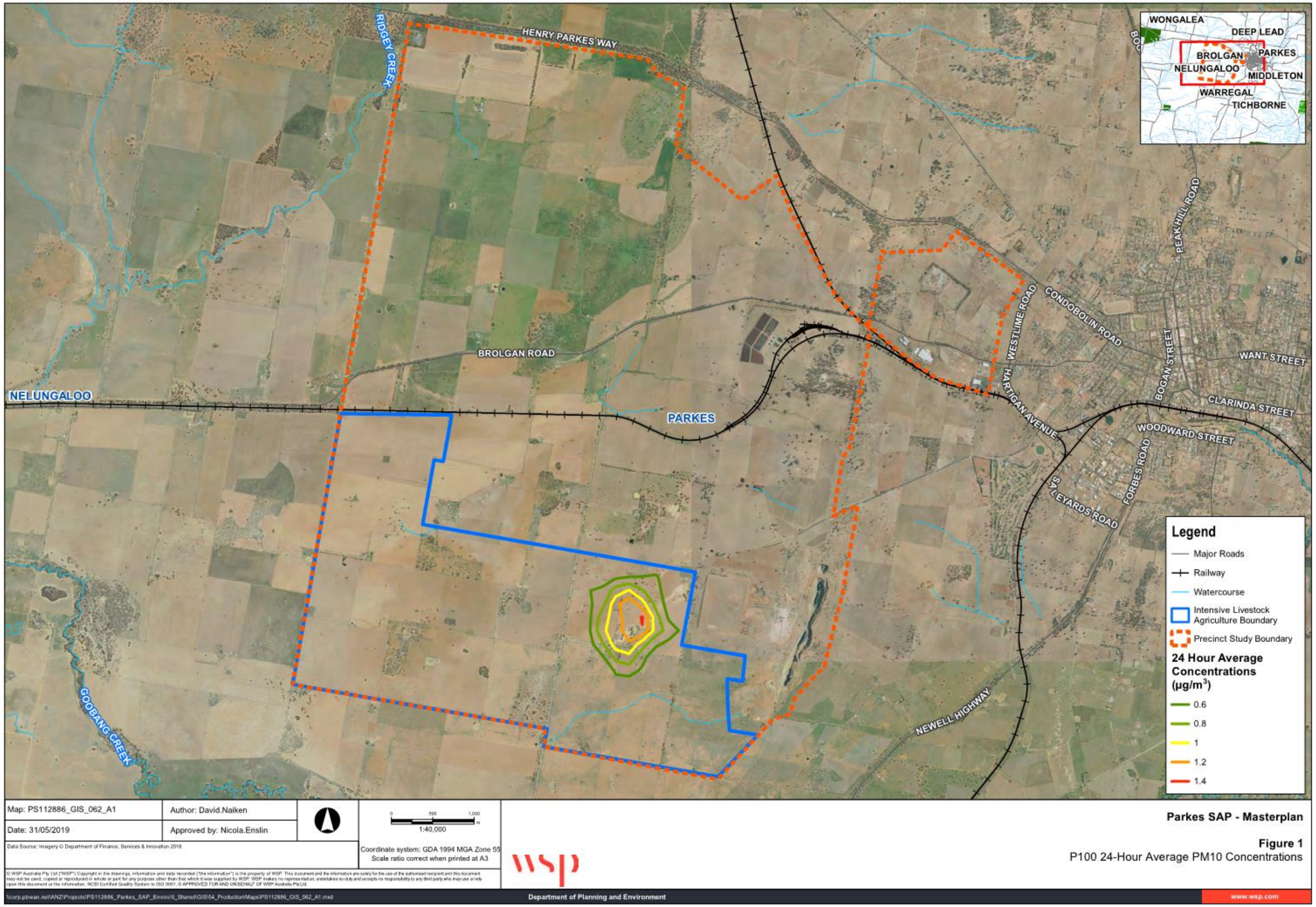

Figure 8.1 Master Plan incremental 100th percentile 24-hour average PM_{10} concentration

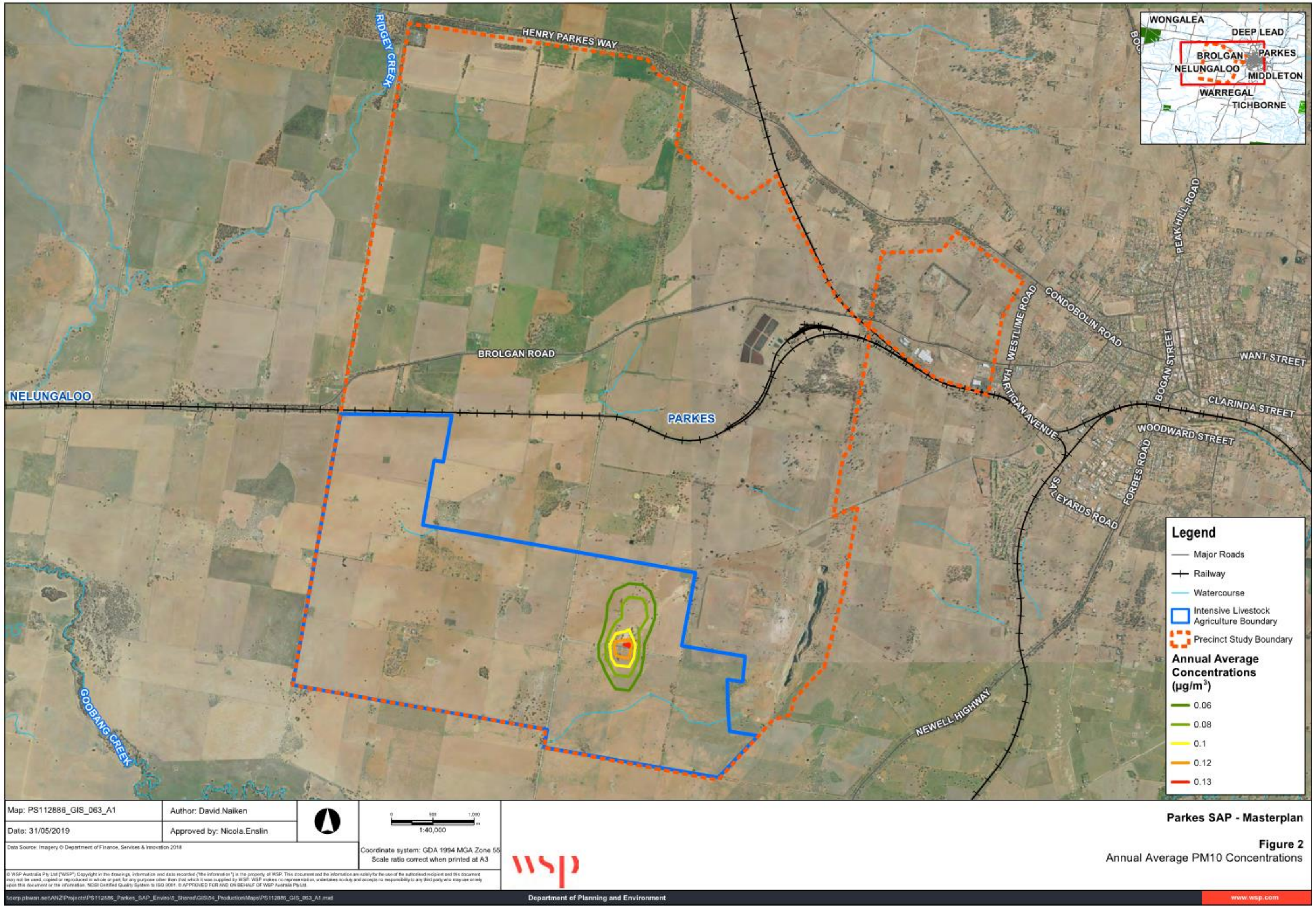

Figure 8.2 Master Plan incremental annual average PM_{10} concentration

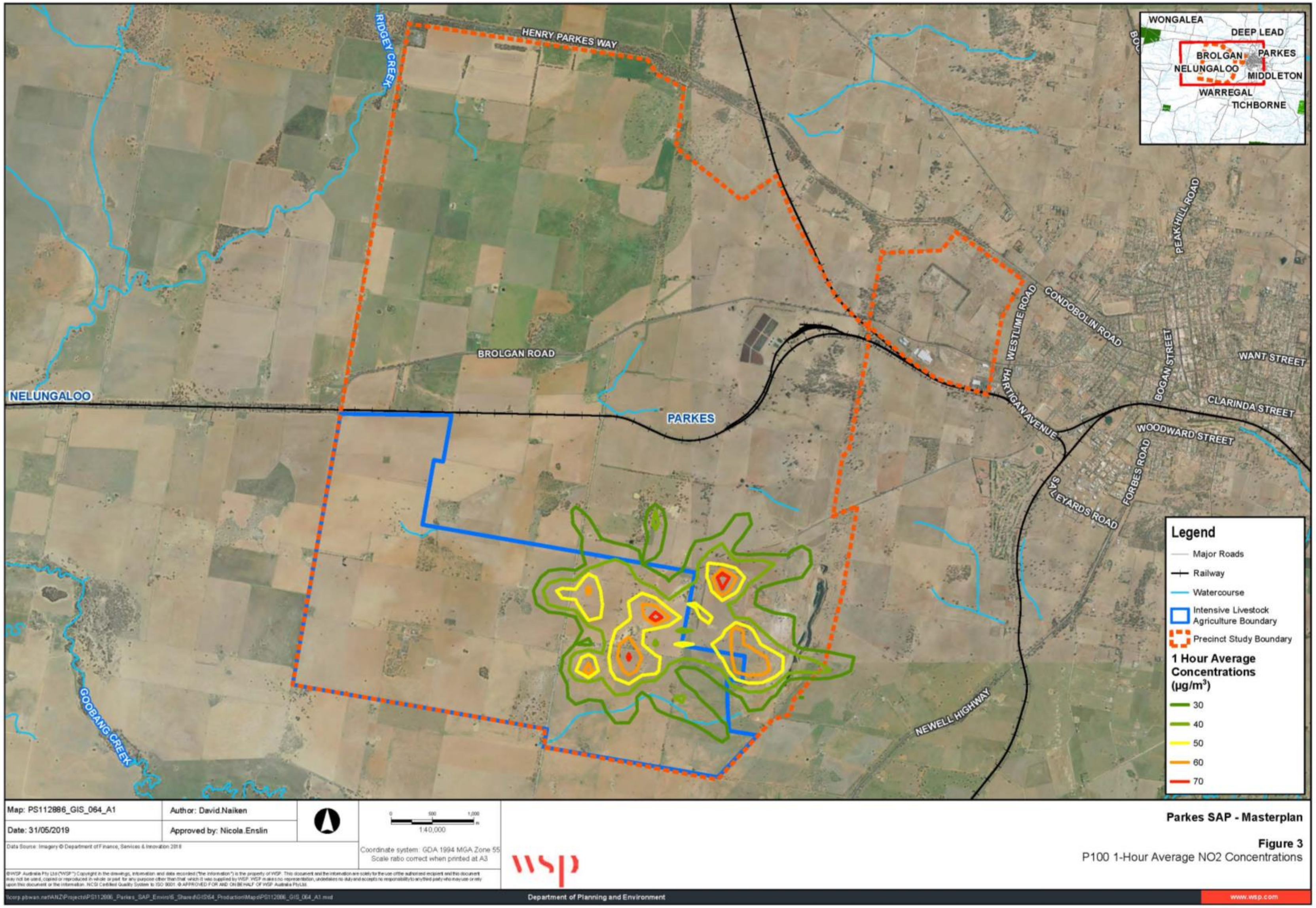

Figure 8.3 Master Plan incremental 100th percentile 1-hour average NO_2 concentration

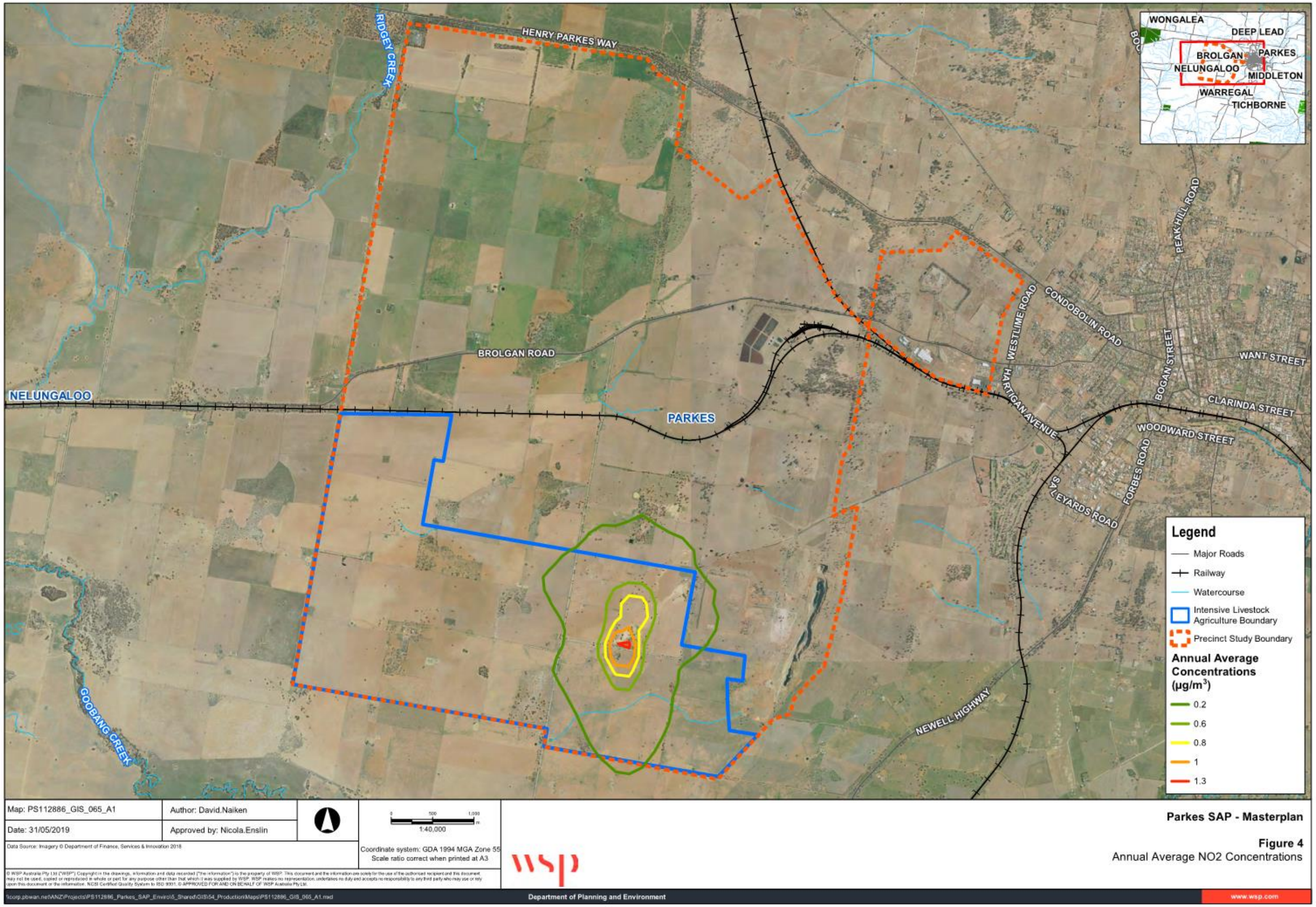

Figure 8.4 Master Plan incremental annual average NO_2 concentration

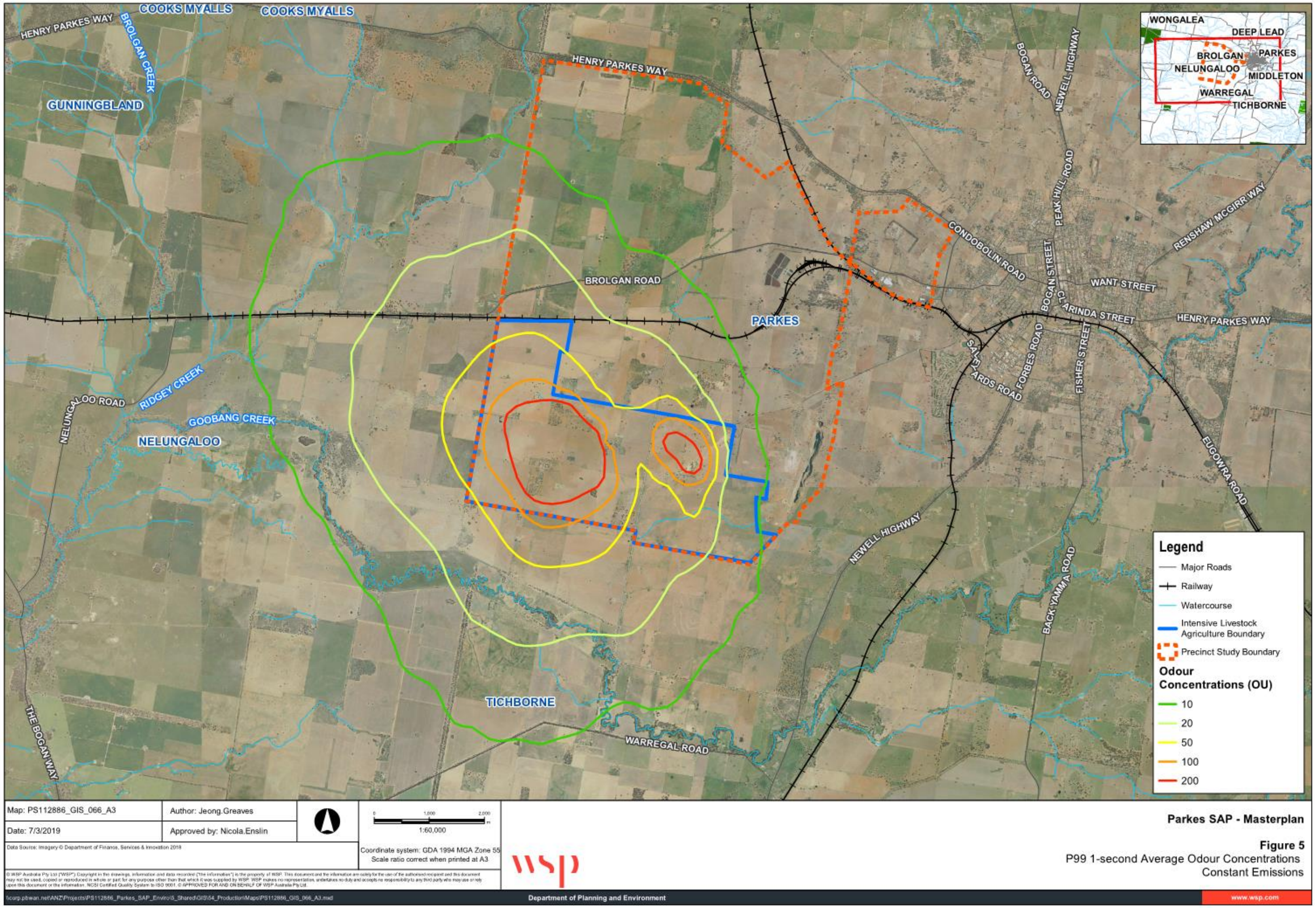

Figure 8.5 Master Plan incremental 99th percentile 1 second average odour concentration – constant emissions

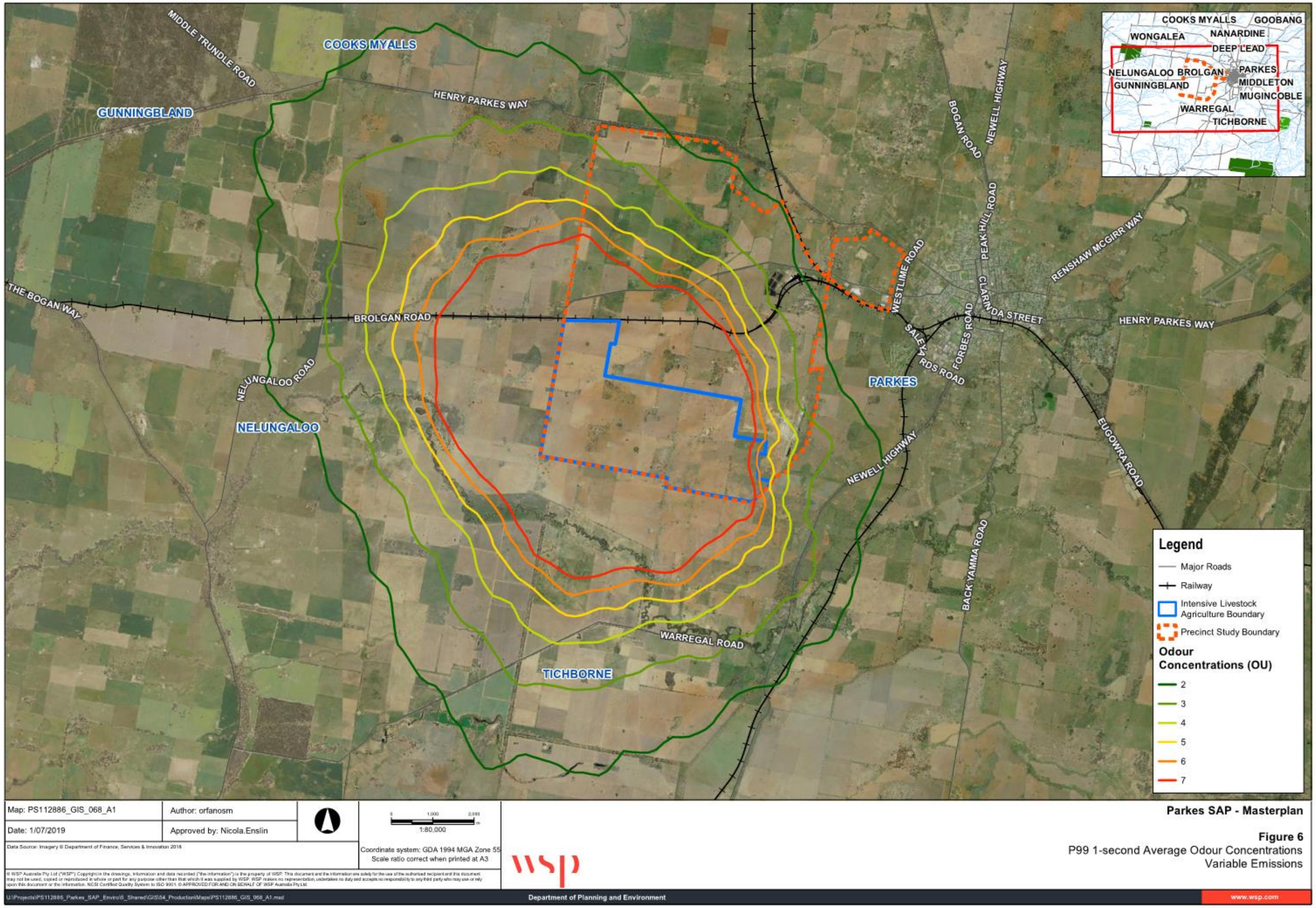

Figure 8.6 Master Plan incremental 99th percentile 1 second average odour concentration – variable emissions

8.2 ASSUMPTIONS AND LIMITATIONS

This report was prepared noting the following assumptions and limitations:

- Modelled Weather Research and Forecasting Model (WRF) meteorological data was obtained from Lakes Environmental for the period 1 January to 31 December 2018.
- No residential receivers are located within the boundaries of the SAP.
- Detailed source parameters and emission rates were not available for the proposed activities within the Parkes SAP. For the purposes of the Master Plan assessment, use was made of existing source inputs and emission rates for the Bourke Abattoir and Moira Cattle Feedlot.
- Particulate emissions from the Bourke Abattoir and Moira Cattle Feedlot was limited to emissions from a natural gas fired boiler at the abattoir. Particulate emission rates for other emission sources were not provided in both studies and as such, additional sources of particulate emissions could not be included in the Master Plan assessment. It is recognised that fugitive particulate emissions would be generated from activities at both the abattoir and cattle feedlot.
- Other pollutants (e.g toxic air pollutants and individual odorous pollutants) could not be assessed due to the complexity in characterising the potential emission sources, pollutants and impacts.
- Operations in the Parkes SAP were assumed to be continuous i.e. 24 hours per day and 365 days per annum.
- Background ambient air quality monitoring data is not available to undertake a cumulative assessment of the Parkes SAP and surrounding land uses. As such only the incremental impacts associated with the proposed activities in the Master Plan have been assessed.
- Background odour concentrations are not available to undertake a cumulative assessment of odour impacts and as such, only the incremental odour impacts associated with the proposed activities in the Master Plan have been evaluated.
- Outputs of the dispersion modelling are not suitable to determine a buffer distances between different land uses. Detailed source parameters and emission rates are required for this purpose.
- This report was not prepared to comply with the *Approved Methods for assessment for modelling and assessment of air quality in NSW* (NSW EPA 2016).

8.3 RECOMMENDATIONS

Based on the findings of the Master Plan assessment, the following recommendations are made:

- Undertake ambient air quality and meteorological monitoring once the Parkes SAP is operational. Pollutants to be monitored should include PM_{10}, $PM_{2.5}$, SO_2 and NO_2 as well as a range of meteorological parameters (wind speed, wind direction, temperature, rainfall, humidity and pressure);
- It is recommended that the most significant polluting industries are located in the southwest corner of the Parkes SAP so as to minimise the potential impact on the Parkes township to the east.
- It is recommended that while an energy from waste(s) facility would likely be permissible within the SAP, the approval of such a facility should require a development application and associated site specific air quality assessment.
- During discrete (short-term) periods of elevated odour emissions (e.g during wet conditions and katabatic drift associated with the winter months), it is recommended that operators need to undertake due diligence work to identify these periods and implement contingencies and management procedures to address them.

9 CONCLUSION

As part of the Parkes SAP Master Plan, an assessment of the potential impact of emissions from a pet food manufacturing facility, abattoir and cattle feedlot was undertaken. In the absence of detailed information for the Parkes SAP Master Plan, source parameters and emission rates from the Bourke Abattoir and Moira Cattle Feedlot were obtained and input into CALPUFF to assess the potential impacts on the surrounding environment.

Based on information presented within this report (and acknowledging the limitations and assumptions) for the air quality assessment for the Parkes SAP Master Plan, the following is noted:

- Predicted short-term and long-term (annual) PM_{10} and NO_2 concentrations are compliant with their applicable IAC.
- The highest short-term PM_{10} and NO_2 concentrations due to emissions from the boiler are predicted towards the north and northeast. For PM_{10}, the highest concentrations are predicted on-site, within the Parkes SAP boundary while for NO_2, the highest concentrations are predicted off-site, approximately 500 m from the Parkes SAP boundary.
- Odour concentrations are predicted to exceed the applicable odour assessment criteria ((2 OU for urban areas ≥2000 and 7 OU for single residences) off-site for both emission scenarios. However, with the recommended location of odour generating sources in the south-western parts of the Parkes SAP, the impact of odour on the town of Parkes is minimised with odour concentrations predicted to be compliant with the 2 OU impact assessment criteria (for the variable emissions scenario). To the west and south of the Parkes SAP where there are single residences (and the 7 OU impact assessment criteria applies), residents within 3 km of the Parkes SAP are likely to experience elevated odour concentrations (for the variable emissions scenario).
- Odour concentrations due to emissions from the abattoir and cattle feedlot are predicted to disperse towards the northwest and southeast.

10 REFERENCES

- Dean, M and Freeman, K (1994) "Agricultural odours". Proceedings of CASANZ 12th International Conference, Perth WA. 23-28 October, 1994.
- DEC, 2006a: Technical Notes: Assessment and Management of Odour from Stationary Sources in NSW, Department of Environment and Climate Change, Sydney, NSW.
- DEC, 2006b: Technical Framework for the Assessment and Management of Odour from Stationary Sources in NSW, Department of Environment and Climate Change, Sydney, NSW.
- Golder Associates (UK) Ltd (2018) “Sudbury Odour Impact Assessment Odour Dispersion Modelling – Proposed Changes”, prepared by Golder Associates (UK) Ltd for Nestle Purina Petcare UK Ltd.
- Holmes Air Sciences., 2005: Air Quality Assessment: Moira Cattle Feedlot, Agricultural Equity Investments Pty Ltd, NSW.
- Katestone Environmental (2004). Utility of odour intensity for the meat processing industry. Prepared for Meat and Livestock Australia.
- NSW EPA, 2016: Approved Methods and Guidance for the Modelling and Assessment of Air Pollutants in NSW, Department of Environment and Conservation, Sydney, NSW.
- Protection of the Environment Operations (Clean Air) Regulation (2010).
- SLR Consulting Australia., Air Quality Impact Assessment., 2016: Proposed Bourke Small Stock Abattoir, CAPRA Developments Pty Ltd, NSW.
- Todoroski Air Sciences., 2018: Air Quality Assessment: Pet Food Manufacturing Facility, Parkes, Total Pty Ltd, NSW.
- WSP (2019) Parkes Special Activation Precinct: Environmental, Heritage and Sustainability Summary Report, Sydney. New South Wales.

11 LIMITATIONS

This Report is provided by WSP Australia Pty Limited (WSP) for Department of Planning and Environment (Client) in response to specific instructions from the Client.

11.1 PERMITTED PURPOSE

This Report is provided by WSP for the purpose described in the Agreement and no responsibility is accepted by WSP for the use of the Report in whole or in part, for any other purpose (Permitted Purpose).

11.2 QUALIFICATIONS AND ASSUMPTIONS

The services undertaken by WSP in preparing this Report were limited to those specifically detailed in the Report and are subject to the scope, qualifications, assumptions and limitations set out in the Report or otherwise communicated to the Client.

Except as otherwise stated in the Report and to the extent that statements, opinions, facts, conclusion and / or recommendations in the Report (Conclusions) are based in whole or in part on information provided by the Client and other parties identified in the report (Information), those Conclusions are based on assumptions by WSP of the reliability, adequacy, accuracy and completeness of the Information and have not been verified. WSP accepts no responsibility for the Information.

WSP has prepared the Report without regard to any special interest of any person other than the Client when undertaking the services described in the Agreement or in preparing the Report.

11.3 USE AND RELIANCE

This Report should be read in its entirety and must not be copied, distributed or referred to in part only. The Report must not be reproduced without the written approval of WSP. WSP will not be responsible for interpretations or conclusions drawn by the reader. This Report (or sections of the Report) should not be used as part of a specification for a project or for incorporation into any other document without the prior agreement of WSP.

WSP is not (and will not be) obliged to provide an update of this Report to include any event, circumstance, revised Information or any matter coming to WSP's attention after the date of this Report. Data reported and Conclusions drawn are based solely on information made available to WSP at the time of preparing the Report. The passage of time; unexpected variations in ground conditions; manifestations of latent conditions; or the impact of future events (including (without limitation) changes in policy, legislation, guidelines, scientific knowledge; and changes in interpretation of policy by statutory authorities); may require further investigation or subsequent re-evaluation of the Conclusions.

This Report can only be relied upon for the Permitted Purpose and may not be relied upon for any other purpose. The Report does not purport to recommend or induce a decision to make (or not make) any purchase, disposal, investment, divestment, financial commitment or otherwise. It is the responsibility of the Client to accept (if the Client so chooses) any Conclusions contained within the Report and implement them in an appropriate, suitable and timely manner.

In the absence of express written consent of WSP, no responsibility is accepted by WSP for the use of the Report in whole or in part by any party other than the Client for any purpose whatsoever. Without the express written consent of WSP, any use which a third party makes of this Report or any reliance on (or decisions to be made) based on this Report is at the sole risk of those third parties without recourse to WSP. Third parties should make their own enquiries and obtain independent advice in relation to any matter dealt with or Conclusions expressed in the Report.

11.4 DISCLAIMER

No warranty, undertaking or guarantee whether expressed or implied, is made with respect to the data reported or the Conclusions drawn. To the fullest extent permitted at law, WSP, its related bodies corporate and its officers, employees and agents assumes no responsibility and will not be liable to any third party for, or in relation to any losses, damages or expenses (including any indirect, consequential or punitive losses or damages or any amounts for loss of profit, loss of revenue, loss of opportunity to earn profit, loss of production, loss of contract, increased operational costs, loss of business opportunity, site depredation costs, business interruption or economic loss) of any kind whatsoever, suffered on incurred by a third party.