AIR QUALITY IMPACT ASSESSMENT

REVISED BORG MANUFACTURING TIMBER PANELS PROCESSING FACILITY EXPANSION

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Air Quality Impact Assessment
Revised Borg Panels Timber Panels Processing Facility Expansion

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TABLE OF CONTENTS

LIST OF APPENDICES

LIST OF TABLES

LIST OF FIGURES

1 INTRODUCTION

Todoroski Air Sciences has prepared this air quality impact assessment report for Borg Manufacturing Pty Ltd (hereafter referred to as the Proponent). It provides an assessment of the potential air quality impacts associated with the existing operations and proposed expansion of the Borg Timber Panels Processing Facility at Oberon, New South Wales (NSW) (hereafter referred to as the Project).

The existing Project comprises the medium-density fibreboard (MDF) plant and multi-daylight (MDL) plant.

The proposed expansion of the Project would include modifications to the existing MDF plant and installation of a new particle board (PB) plant.

To assess the potential air quality impacts associated with the Project, this report incorporates the following aspects:

- An outline of the local setting and background to the Project;
- A review of the existing meteorological and air quality environment;
- A description of the dispersion modelling approach used to assess potential air quality impacts;
- An outline of the estimated potential air emissions associated with the existing and proposed expansion of the Project; and,
- Presentation of the predicted results and a discussion of the potential air quality impacts.

This assessment report differs from a similar report dated 21 October 2016 by the inclusion of the MDL plant and some additional fugitive sources.

2 LOCAL SETTING

The Project is situated in an industrial area directly to the north of the township of Oberon, located approximately 39 kilometres (km) southeast of Bathurst and approximately 36km southwest of Lithgow. The surrounding land use in the wider area is characterised as predominantly agricultural land, with the residential areas of Oberon to the south of the industrial precinct in which the Project is located. **Figure 2-1** presents the location of the Project in relation to the potentially most affected sensitive receptors of relevance to this assessment. Also shown in the figure are the other facilities in the industrial precinct. These facilities are similar in nature to the Project and include Woodchem, Carter Holt Harvey (CHH), Structaflor and Highland Pine Products (HPP).

Figure 2-2 presents a pseudo three-dimensional (3D) visualisation of the topography in the general vicinity of the Project area. The Project is located at a high altitude with dipping complex terrain sloping down to the nearby creeks and up to some receptor locations. The terrain features of the surrounding area would have an effect on the local wind distribution patterns and flows.

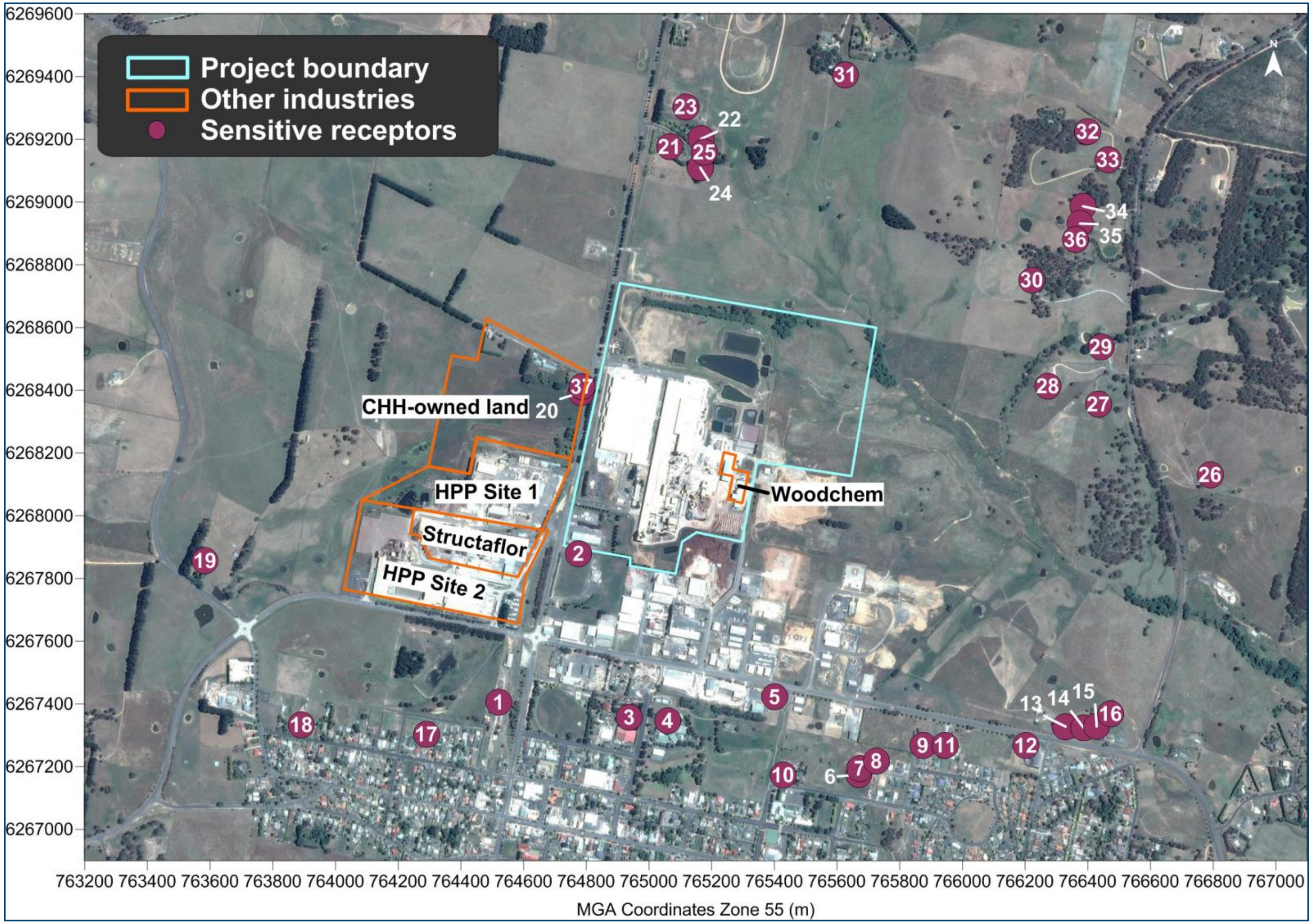

Figure 2-1: Project location

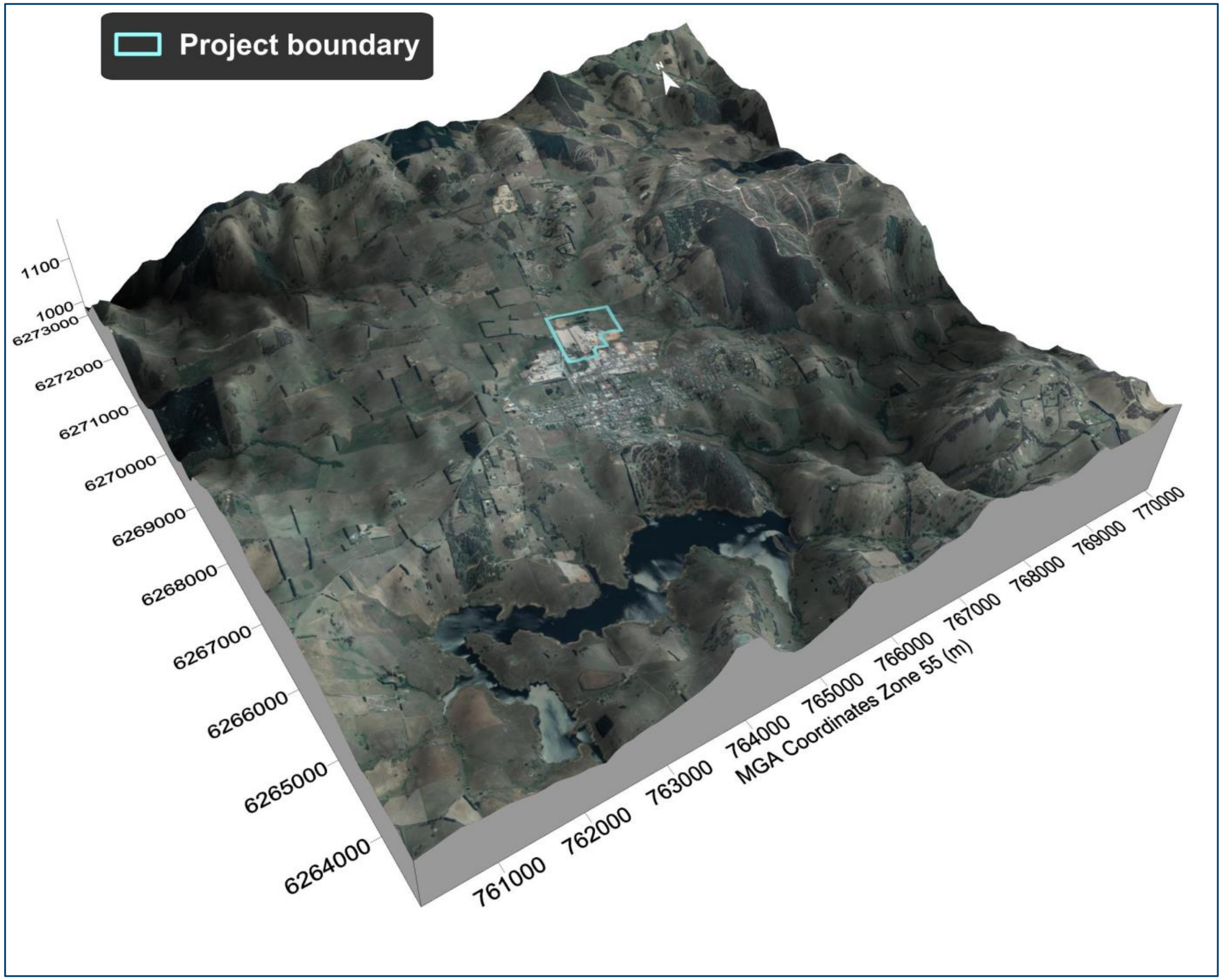

Figure 2-2: Representative view of the topography surrounding the Project location

3 PROJECT BACKGROUND

The existing plant at the Project processes wood to produce MDF. The proposed expansion would allow the facility to produce another product (Particleboard) using similar processes to those existing. The processes include chipping the fresh and waste wood materials received on-site, flaking the chips from fresh wood materials, drying the chipped and flaked materials, sorting and cleaning the dried chips, gluing the dry chips together with the addition of resins and other additives, forming and pressing the glued wood particles into mats, trimming, cooling and stacking the pressed MDF and PB, and sanding of the final product.

4 AIR QUALITY ASSESSMENT CRITERIA

4.1 Preamble

Air quality criteria are benchmarks set to protect the general health and amenity of the community in relation to air quality. The sections below identify the potential air emissions generated by the Project and the applicable air quality criteria.

4.2 Particulate matter

Particulate matter consists of dust particles of varying size and composition. Air quality goals refer to measures of the total mass of all particles suspended in air defined as the Total Suspended Particulate matter (TSP). The upper size range for TSP is nominally taken to be 30 micrometres (μm) as in practice particles larger than 30 to 50μm will settle out of the atmosphere too quickly to be regarded as air pollutants.

Two sub-classes of TSP are also included in the air quality goals, namely PM_{10}, particulate matter with equivalent aerodynamic diameters of 10μm or less, and $PM_{2.5}$, particulate matter with equivalent aerodynamic diameters of 2.5μm or less.

Particulate matter, typically in the upper size range, that settles from the atmosphere and deposit on surfaces is characterised as deposited dust. The deposition of dust on surfaces is considered a nuisance and can adversely affect the amenity of an area by soiling property in the vicinity.

4.2.1 New South Wales Environment Protection Authority impact assessment criteria

Table 4-1 summarises the air quality goals that are relevant to this study as outlined in the NSW EPA document *Approved Methods for the Modelling and Assessment of Air Pollutants in NSW* (Approved Methods) (**NSW DEC, 2005**).

The air quality goals for total impacts relate to the total dust burden in the air and not just the dust from the Project. Consideration of background dust levels needs to be made when using these goals to assess potential impacts.

Table 4-1: NSW EPA air quality impact assessment criteria

Pollutant	Averaging period	Impact	Criteria
TSP	Annual	Total	90µg/m³
PM_{10}	Annual	Total	30µg/m³
	24 hour	Total	50µg/m³
Deposited dust	Annual	Incremental	2g/m²/month
		Total	4g/m²/month

Source: **NSW DEC, 2005**
µg/m³ = micrograms per cubic metre
g/m²/month = grams per square metre per month

4.2.2 National Environment Protection (Ambient Air Quality) Measure

The National Environment Protection Council (NEPC) Act 1994 and subsequent amendments define the National Environment Protection Measures (NEPMs) as instruments for setting environmental objectives in Australia.

The Ambient Air Quality NEPM specifies national ambient air quality standards and goals for air pollutants including PM_{10} and $PM_{2.5}$. The standard for PM_{10} and $PM_{2.5}$ is outlined in **Table 4-2**. The Ambient Air Quality NEPM allows for exceedance above the 24-hour average criterion in exceptional events such as bush fires and regional dust storms.

Table 4-2: Standard for PM_{10} and $PM_{2.5}$ concentrations (µg/m³)

Pollutant	Averaging period	Maximum concentration
PM_{10}	24 hour	50
	Annual	25
$PM_{2.5}$	24 hour	25
	Annual	8

Source: **NEPC, 2016**

As with each of the NEPM goals, these apply to the average, or general exposure of a population, rather than to "hot spot" locations or to individual industry projects.

4.3 Other pollutants

Other main air pollutants emitted due to the operation of the Project include formaldehyde and nitrogen dioxide (NO_2). **Table 4-3** outlines the applicable air quality assessment criteria, as outlined in the document *Approved Methods for the Modelling and Assessment of Air Pollutants in NSW* (Approved Methods) (**NSW DEC, 2005**), for the other main air pollutants that are considered in this assessment.

With the exception of formaldehyde, all the other air pollutants are assessed against their applicable criteria using the maximum predicted concentrations at the sensitive receptors. For formaldehyde, the 99.9th percentile predicted concentrations are assessed against the criteria at or beyond the Project boundary.

Table 4-3: Applicable air quality impact assessment criteria for formaldehyde (µg/m³)

Pollutant	Averaging period	Criterion
NO_2	1-hour	246
	Annual	62
Formaldehyde	1-hour	21.8 (20*)

*The applicable criterion for formaldehyde is presented as 20µg/m³ at 25°C in the Approved Methods (**NSW DEC, 2005**). To be consistent with the other pollutant criteria (and hence the modelling results), the table above presents the criterion at 0°C which is 21.8µg/m³.

4.3.1 World Health Organisation Guidelines

Table 4-4 presents the formaldehyde guideline recommended by the World Health Organisation (WHO) to prevent sensory irritation in the general public. The WHO Guideline is based on current knowledge of health impacts and is generally less stringent than the NSW EPA Criterion.

Table 4-4: Applicable air quality guideline for formaldehyde (µg/m³)

Pollutant	Averaging period	Guideline
Formaldehyde	30-minute	100

Source: **WHO, 2010**

4.3.2 Protection of the Environment Operations (Clean Air) Regulation 2010

The Protection of the Environment Operations (Clean Air) Regulation 2010 (**POEO, 2010**) outlines standards of concentrations for air emissions emitted from various plant. The emission limits applicable to the Project are summarised in **Table 4-5**.

Table 4-5: Standards of concentration for scheduled premises

Pollutant	Standard of concentration (mg/m³)	
	Existing sources	Proposed sources (Group 6)
TSP	250	50
NO_x, as NO_2 equivalent	2,500	350

Source: **POEO, 2010**

4.3.3 NSW EPA Licence Limit

The Proponent's environmental licence number 3035 contains emission limits for several of the existing emissions points on the Premises. The emission limits relevant to this assessment are summarised in **Table 4-6**.

Table 4-6: NSW EPA environmental licence limits

Source	TSP emission limit (mg/m³)	Formaldehyde emission limit (mg/m³)
EPA 11	200	5
EPA 17	200	5

Source: NSW EPA Licence 3035 (2016)

5 EXISTING ENVIRONMENT

This section describes the existing environment including the climate and ambient air quality in the general area surrounding the Project.

5.1 Ambient air quality

The main sources of air pollutants in the area surrounding the Project include emissions from local anthropogenic activities such as various commercial or industrial activities, motor vehicle exhaust and domestic wood heaters.

Ambient air quality monitoring data for the Project site are not available. Therefore the available data from the nearest air quality monitors operated by the NSW Office of Environment and Heritage (OEH) were used to quantify the existing background level for assessed pollutants at the Project site.

The NSW OEH air quality monitors at Bathurst and Oakdale (see **Figure 5-1**) are located approximately 42km to 71km from the site. Whilst not ideal, the data from these monitors have been used to quantify the existing ambient levels of air pollutants in this study.

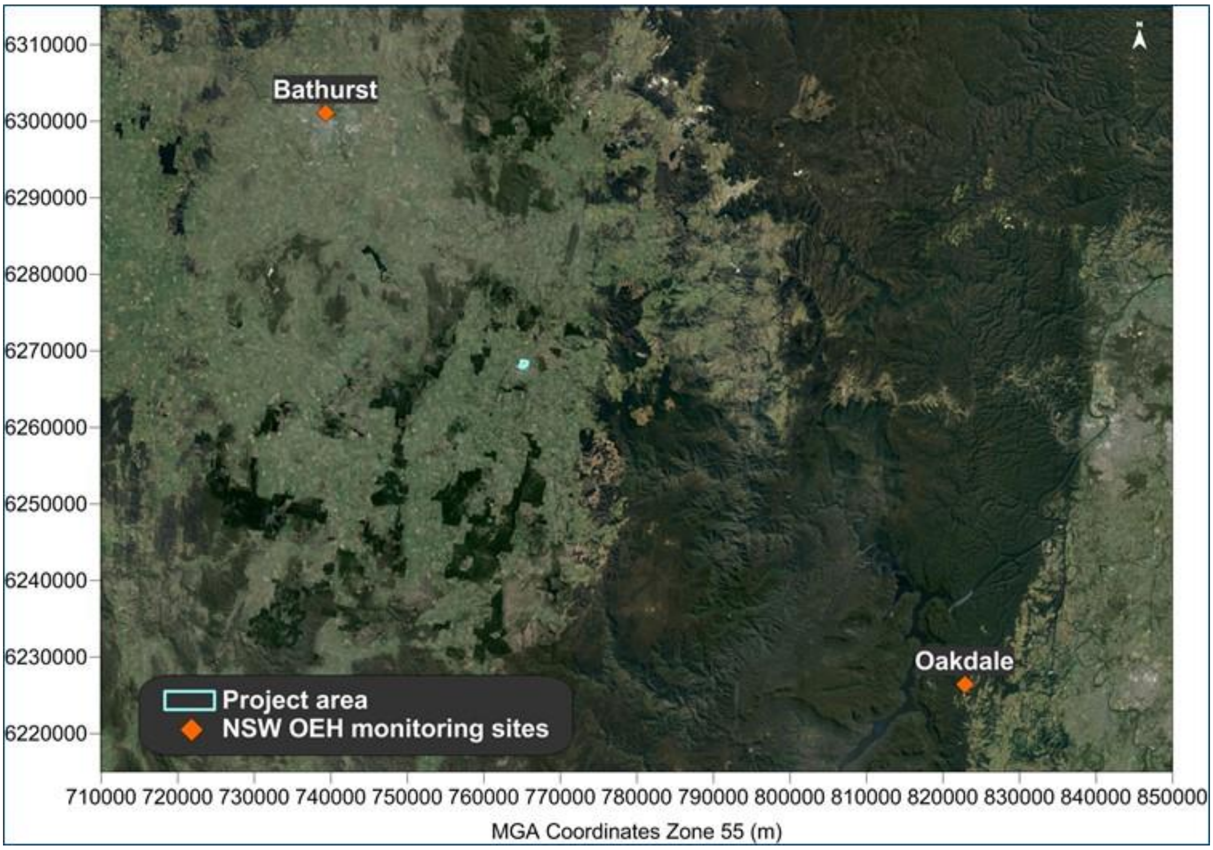

Figure 5-1: NSW EPA monitoring sites

5.1.1 PM_{10} monitoring

A summary of the available data from the NSW OEH monitoring stations is presented in **Table 5-1**. Recorded 24-hour average PM_{10} concentrations are presented in **Figure 5-2**.

A review of **Table 5-1** indicates that the annual average PM_{10} concentrations for each monitoring station were below the relevant criterion of 30µg/m^3. The maximum 24-hour average PM_{10} concentrations recorded at these stations were found to exceed the relevant criterion of 50µg/m^3 at times during the review period (see **Figure 5-2**).

Table 5-1: Summary of PM_{10} levels from NSW OEH TEOM monitoring (µg/m^3)

Station ID	Annual average					Maximum 24-hour average				
	2011	2012	2013	2014	2015	2011	2012	2013	2014	2015
Bathurst	11.0	13.4	15.1	14.6	13.4	24.3	55.5	145.0	42.8	94.6
Oakdale	10.7	11.7	13.6	13.1	11.4	54.7	38.9	99.0	56.3	61.7

The Ambient Air Quality NEPM standard for 24-hour average PM_{10} is a level of 50µg/m^3 with an allowance for extraordinary events such as bushfires and dust storms which may produce dust levels above the standard (refer to **Section 3.2.2**).

It can be seen from **Figure 5-2** that PM_{10} concentrations are nominally highest in the spring and summer months with the warmer weather raising the potential for drier ground elevating the occurrence of windblown dust, bushfires and increased pollen levels.

The PM_{10} monitoring data at Bathurst are measured on the same side of the dividing range as the Project site, and are more likely to experience similar levels of pollen and natural dust etc. The data also show some of the highest maximum dust levels. Therefore the Bathurst data are considered to be representative background data and were used in this assessment.

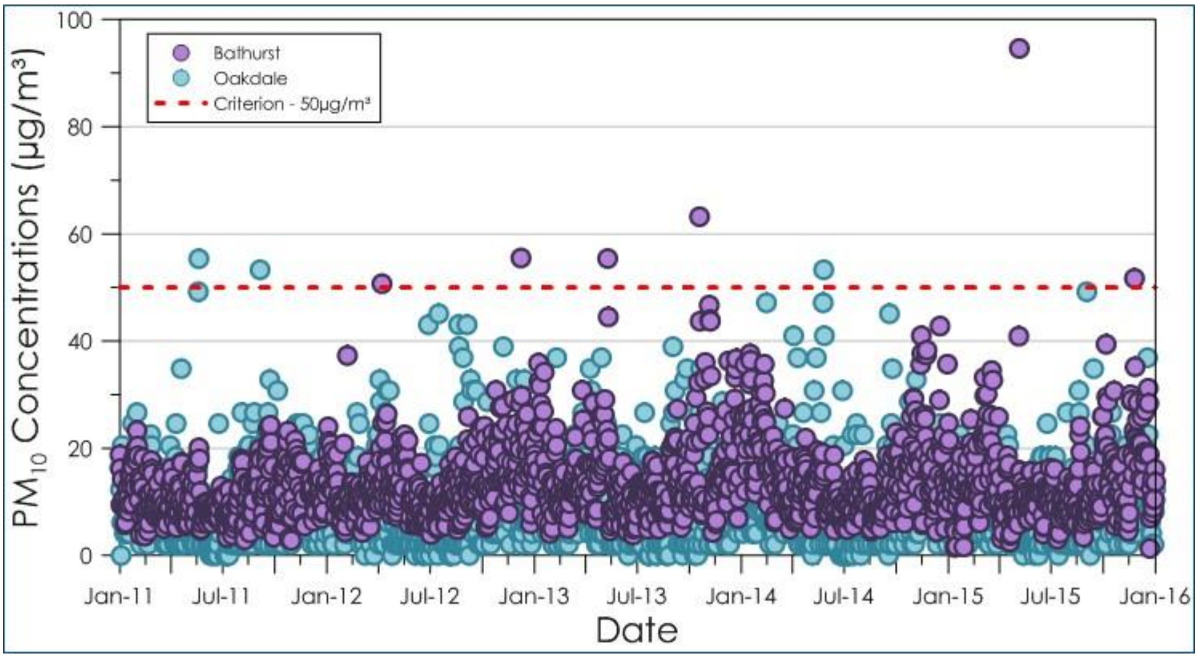

Figure 5-2: 24-hour average PM_{10} concentrations (clipped at 100µg/m^3; highest level at 145µg/m^3)

5.1.2 NO_2 monitoring

Table 5-2 presents a summary of the NO_2 monitoring data recorded at Oakdale from 2011 to 2015.

Table 5-2: Summary of NO_2 levels from NSW OEH monitoring sites (µg/m³)

Station ID	2011	2012	2013	2014	2015
	Annual Average				
Oakdale	4.1	4.1	4.1	4.1	4.1
	Maximum 1-hour average				
Oakdale	55.4	45.1	39.0	53.3	49.2

Figure 5-3 presents the maximum daily 1-hour average NO_2 concentrations recorded at the NSW EPA Oakdale monitoring site from 2011 to 2015. The data indicate that there were no exceedances of the NSW EPA 1-hour average goal of 246µg/m^3 during this period.

The data also indicate that levels of NO_2 are relatively low compared to the criterion level.

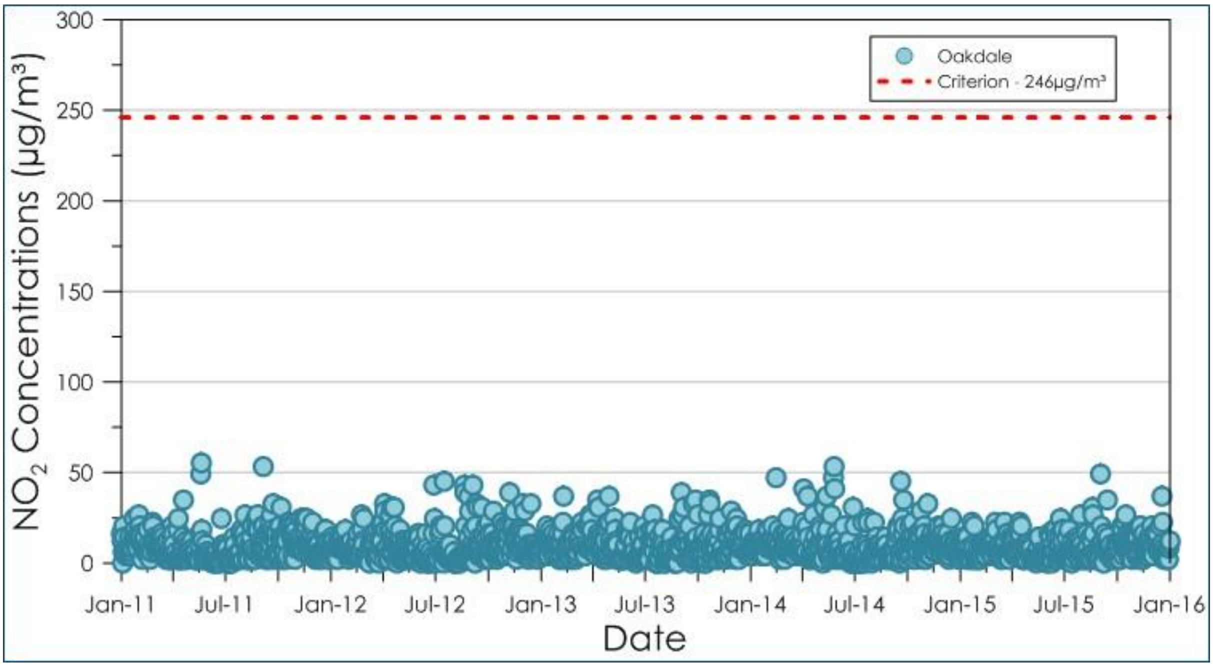

Figure 5-3: Maximum daily 1 hour average NO_2 concentrations

5.1.3 Summary of background concentrations used in the Level 1 assessment

A summary of background concentrations used in the Level 1 cumulative assessment (i.e. maximum prediction added with maximum background concentration) is presented in **Table 5-3**. The (maximum) background concentrations occur in the chosen meteorological modelling year (2014).

Table 5-3: Background concentrations used in the Level 1 assessment

Pollutant	Averaging period	Background concentrations	Monitoring station
PM_{10}	24-hour	42.8	Bathurst
	Annual average	14.6	Bathurst
NO_2	1-hour	53.3	Oakdale
	Annual average	4.1	Oakdale

5.2 Local climate

Long-term climatic data from the closest Bureau of Meteorology (BoM) weather station at Bathurst Airport Automatic Weather Station (AWS) (Site No. 063291) were analysed to characterise the local climate in the proximity of the Project. The Bathurst Airport AWS is located approximately 36km south-southeast of the Project. The next closest weather station at Mt Boyce is approximately 39km away and is located in a more hilly and steep terrain.

Table 5-4 and **Figure 5-4** present a summary of data from the Bathurst Airport AWS collected over a 19 to 25-year period for the various meteorological parameters.

The data indicate that January is the hottest month with a mean maximum temperature of 28.5 degrees Celsius (ºC) and July is the coldest month with a mean minimum temperature of 0.8ºC.

Rainfall exhibits seasonal variation with a higher amount of rainfall occurring in the warmer months. The annual average rainfall is 610.3 millimetres (mm) over 71.1 days. The data indicate that December is the wettest month with an average rainfall of 74.9mm over 7.1 days and May is the driest month with an average rainfall of 33.8mm over 4.7 days.

Relative humidity exhibits seasonal variability which generally increases in the first half of the year and decreases thereafter. Mean 9am relative humidity ranges from 66% in December to 91% in June. Mean 3pm relative humidity levels range from 40% in January and December to 64% in June.

The spread between the mean 9am and 3pm wind speeds does not vary greatly across the year. Mean 9am wind speeds range from 8.1 kilometres per hour (km/h) in May to 12.5km/h in September and October. Mean 3pm wind speeds range from 15.9km/h in May to 21.0km/h in September.

Table 5-4: Monthly climate statistics summary – Bathurst Airport AWS

Parameter	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Ann.
Temperature													
Mean max. temperature (ºC)	28.5	27.3	24.7	20.7	16.3	12.6	11.9	13.8	17.1	20.4	23.7	26.5	20.3
Mean min. temperature (ºC)	13.6	13.5	10.5	6.4	3.1	2.0	0.8	1.2	3.6	6.1	9.4	11.5	6.8
Rainfall													
Rainfall (mm)	60.6	60.3	54.7	34.3	33.8	41.3	45.2	38.5	45.4	52.9	64.0	74.9	610.3
Mean No. of rain days (≥1mm)	5.9	5.9	5.2	4.0	4.7	6.6	6.7	6.1	5.1	6.4	7.4	7.1	71.1
9am conditions													
Mean temperature (ºC)	19.4	18.2	15.3	12.4	8.0	5.2	4.4	6.0	9.9	13.5	15.6	18.1	12.2
Mean relative humidity (%)	67	75	78	78	88	91	90	84	77	69	71	66	78
Mean wind speed (km/h)	10.7	10.1	9.0	8.6	8.1	8.8	9.1	10.9	12.5	12.5	11.8	10.8	10.2
3pm conditions													
Mean temperature (ºC)	26.8	25.6	23.4	19.5	15.2	11.5	10.8	12.5	15.6	18.7	21.6	24.7	18.8
Mean relative humidity (%)	40	46	44	44	54	64	62	53	50	47	47	40	49
Mean wind speed (km/h)	18.6	17.7	17.3	16.6	15.9	16.6	17.3	20.1	21.0	19.9	19.4	19.5	18.3

Source: **Bureau of Meteorology, 2016 (24 August 2016)**

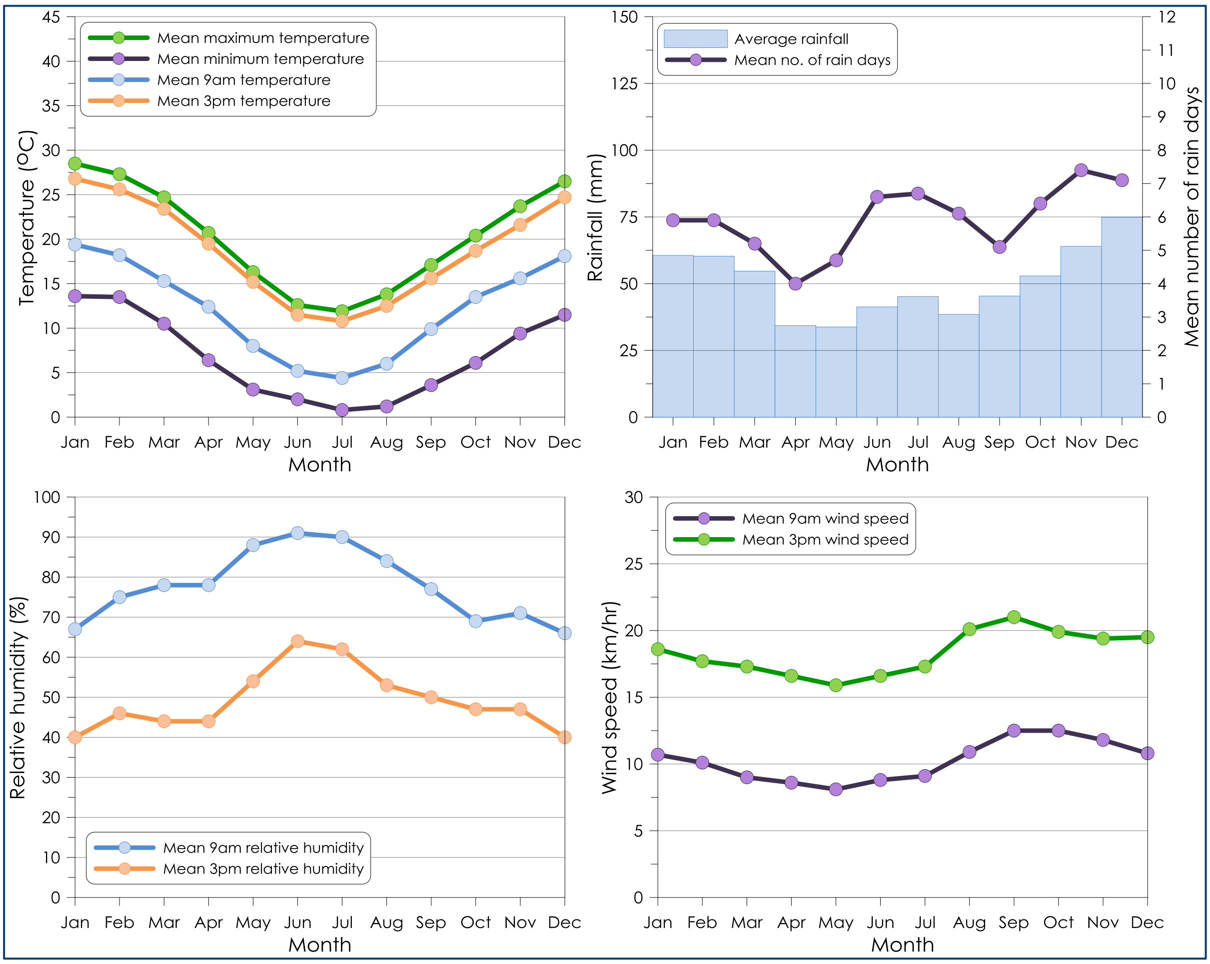

Figure 5-4: Monthly climate statistics summary – Bathurst Airport AWS

5.3 Local meteorological conditions

Annual and seasonal windroses for the Bathurst Airport AWS during the 2014 calendar period are presented in **Figure 5-5**.

Winds are generally observed to be relatively evenly spread across all directions on an annual average basis, but with a somewhat more frequent occurrence of winds originating from the west-southwest, the north, east-northeast and southwest.

In summer, winds are typically from the east-northeast and east. During autumn, winds are typically lighter than the rest of the year, with dominant winds from the east-northeast and north. During winter, there are fewer winds from the northeast quadrant, and a dominance of winds from the west-southwest. The spring distribution is similar to annual but with a higher proportion of winds from the west-southwest and southwest and a lesser proportion of winds from the eastern quadrants.

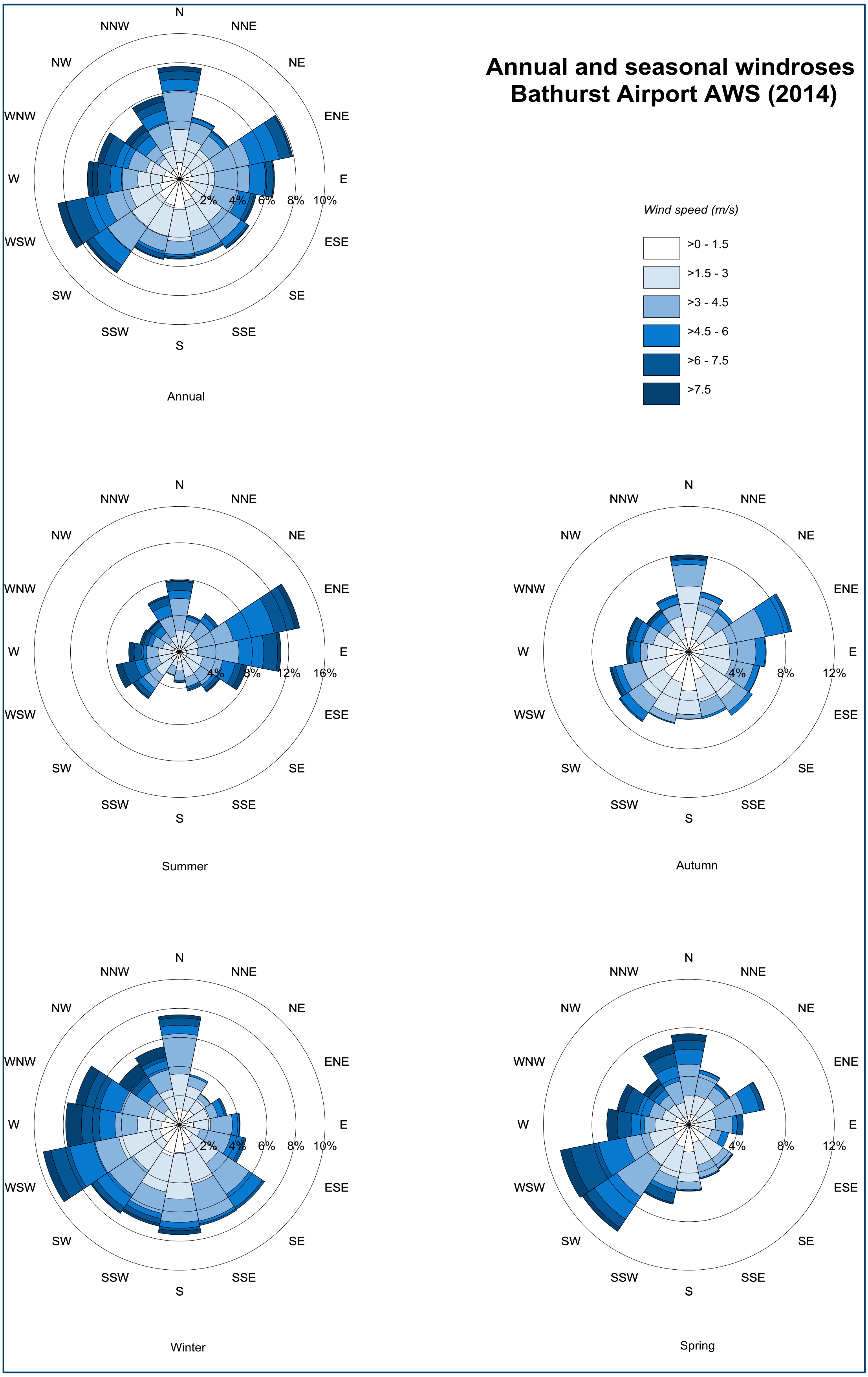

Figure 5-5: Annual and seasonal windroses for Bathurst Airport AWS

5.3.1 Selection of meteorological year for modelling

The 2014 calendar year was selected as the meteorological year for the dispersion modelling based on an analysis of data trends in the meteorological data records. **Figure 5-6** and **Figure 5-7** graph the meteorological analysis conducted using data from the Bathurst Airport. Among the data for each of the different calendar years (2012 to 2015) analysed, the calendar years 2013 and 2014 were the most similar to the recorded trends in the meteorology.

Examination of the recorded dust data found that the maximum 24-hour average PM_{10} recorded during 2014 is the closest to the average maximum 24-hour average PM_{10} in the data set, and also the annual average PM_{10} levels in 2014 were closest to the recorded annual average of all of the data. Thus, the year 2014 was chosen in preference to 2013 for use in the modelling.

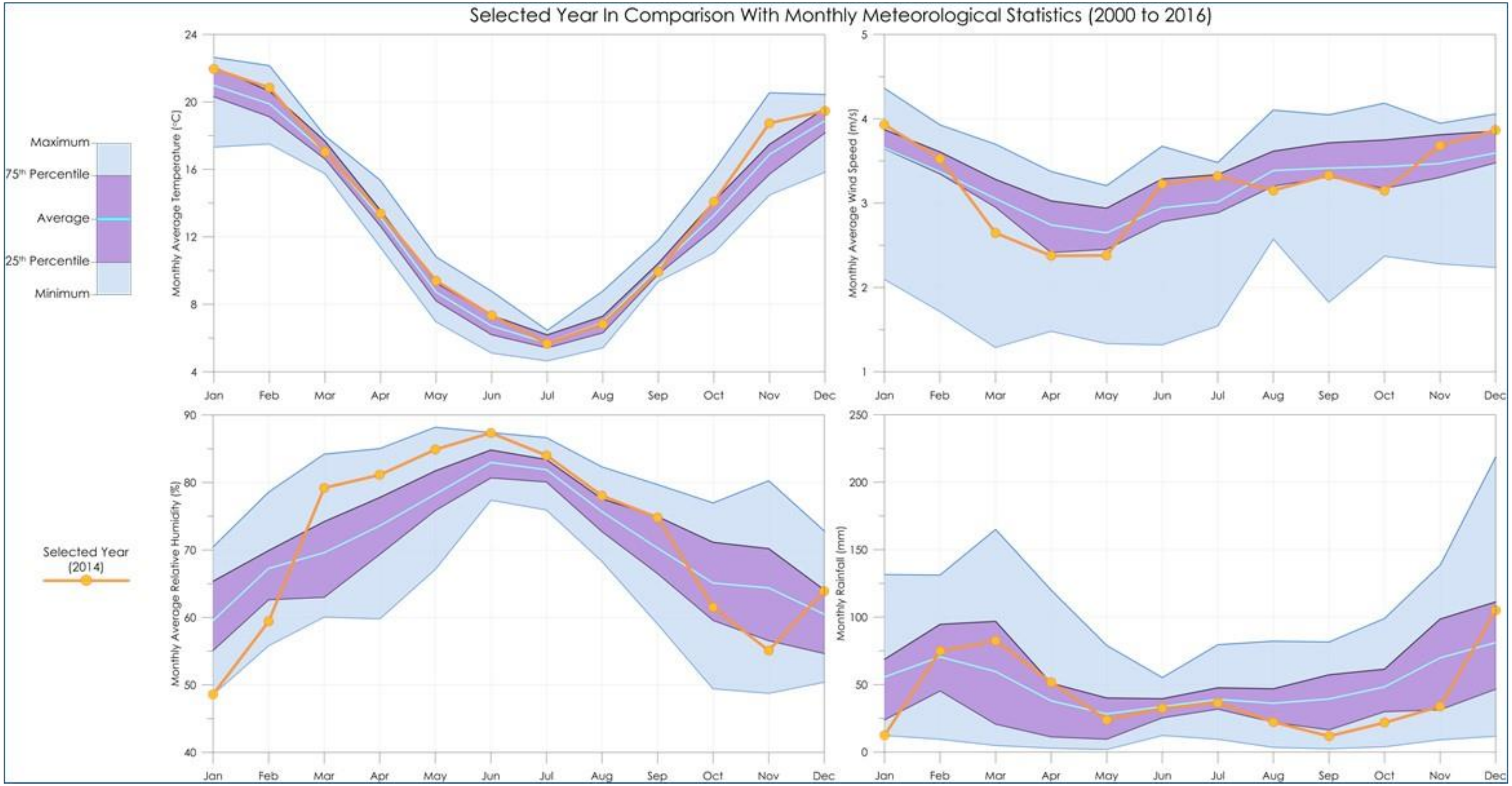

Figure 5-6: Statistical analysis of temperature, wind speed, relative humidity and rainfall data at Bathurst Airport

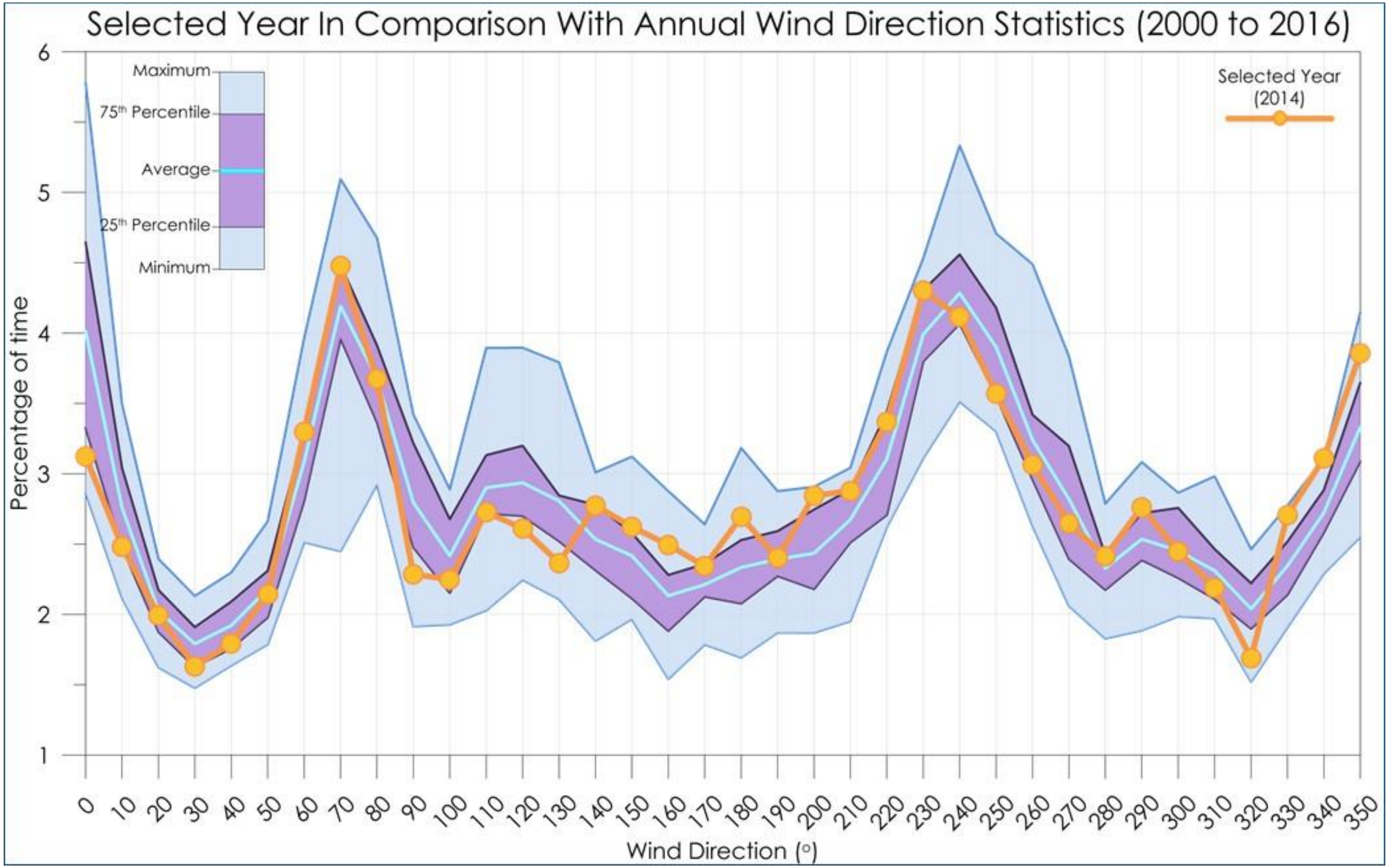

Figure 5-7: Statistical analysis of wind direction data - Bathurst Airport

6 DISPERSION MODELLING APPROACH

6.1 Introduction

The following sections are included to provide the reader with an understanding of the model and modelling approach.

For this assessment the CALPUFF modelling suite is applied to dispersion modelling. The CALPUFF model is an advanced "puff" model that can deal with the effects of complex local terrain on the dispersion meteorology over the entire modelling domain in a three dimensional, sub-hourly varying time step. CALPUFF is an air dispersion model approved by NSW EPA for use in air quality impact assessments. The model setup used is in general accordance with 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 of Air Pollutants in NSW, Australia'* (**TRC Environmental Corporation**, **2011**).

6.2 Modelling methodology

Modelling was undertaken using a combination of The Air Pollution Model (TAPM) and the CALPUFF Modelling System. The CALPUFF Modelling System includes three main components: CALMET, CALPUFF and CALPOST and a large set of pre-processing programs designed to interface the model to standard, routinely available meteorological and geophysical datasets.

TAPM is a prognostic air model used to simulate the upper air data for CALMET input. The meteorological component of TAPM is an incompressible, non-hydrostatic, primitive equation model with a terrain-following vertical coordinate for 3D simulations. The model predicts the flows important to local scale air pollution, such as sea breezes and terrain induced flows, against a background of larger scale meteorology provided by synoptic analysis.

CALMET is a meteorological model that uses the geophysical information and observed/simulated surface and upper air data as inputs and develops wind and temperature fields on a 3D gridded modelling domain.

CALPUFF is a transport and dispersion model that advects "puffs" of material emitted from modelled sources, simulating dispersion processes along the way. It typically uses the 3D meteorological field generated by CALMET.

CALPOST is a post processor used to process the output of the CALPUFF model and produce tabulations that summarise the results of the simulation.

6.2.1 Meteorological modelling

TAPM was applied to the available data to generate a 3D upper air data file for use in CALMET. The centre of analysis for TAPM was 33.69deg south and 149.86deg east (765100mE, 6268100mS). The simulation involved an outer grid of 30km, with three nested grids of 10km, 3km and 1km with 35 vertical grid levels.

CALMET modelling used a nested approach where the 3D wind field from the coarser grid outer domain is used as the initial guess (or starting) field for the finer grid inner domain. This approach has several advantages over modelling a single domain. Observed surface wind field data from the near field as well as from far field monitoring sites can be included in the model to generate a more representative 3D wind field for the modelled area. Off domain terrain features for the finer grid domain can be allowed to take effect within the finer domain, as would occur in reality. Also, the coarse scale wind flow fields give a better set of starting conditions with which to operate the finer grid run.

The CALMET initial domain was run on a 50 x 50km area with a 1km grid resolution and refined for a second domain on a 30 x 30km area with a 0.6km grid resolution and further refined for a final domain on a 10 x 10km area with a 0.1km grid resolution. **Table 6-1** outlines the parameter inputs to the model.

Table 6-1: Surface observation stations

Weather stations	Parameters						
	WS	WD	CH	CC	T	RH	SLP
Bathurst AWS (BoM) (Station No. 63291)	✓	✓	✓	✓	✓	✓	✓
Mt Boyce AWS (BoM) (Station No. 63292)	✓	✓	✓	✓	✓	✓	

WS = wind speed, WD = wind direction, CH = cloud height, CC = cloud cover, T = temperature, RH = relative humidity, SLP = station level pressure

Local land use and detailed topographical information was included in the simulation to produce realistic fine scale flow fields (such as terrain forced flows) in surrounding areas as shown in **Figure 6-1**.

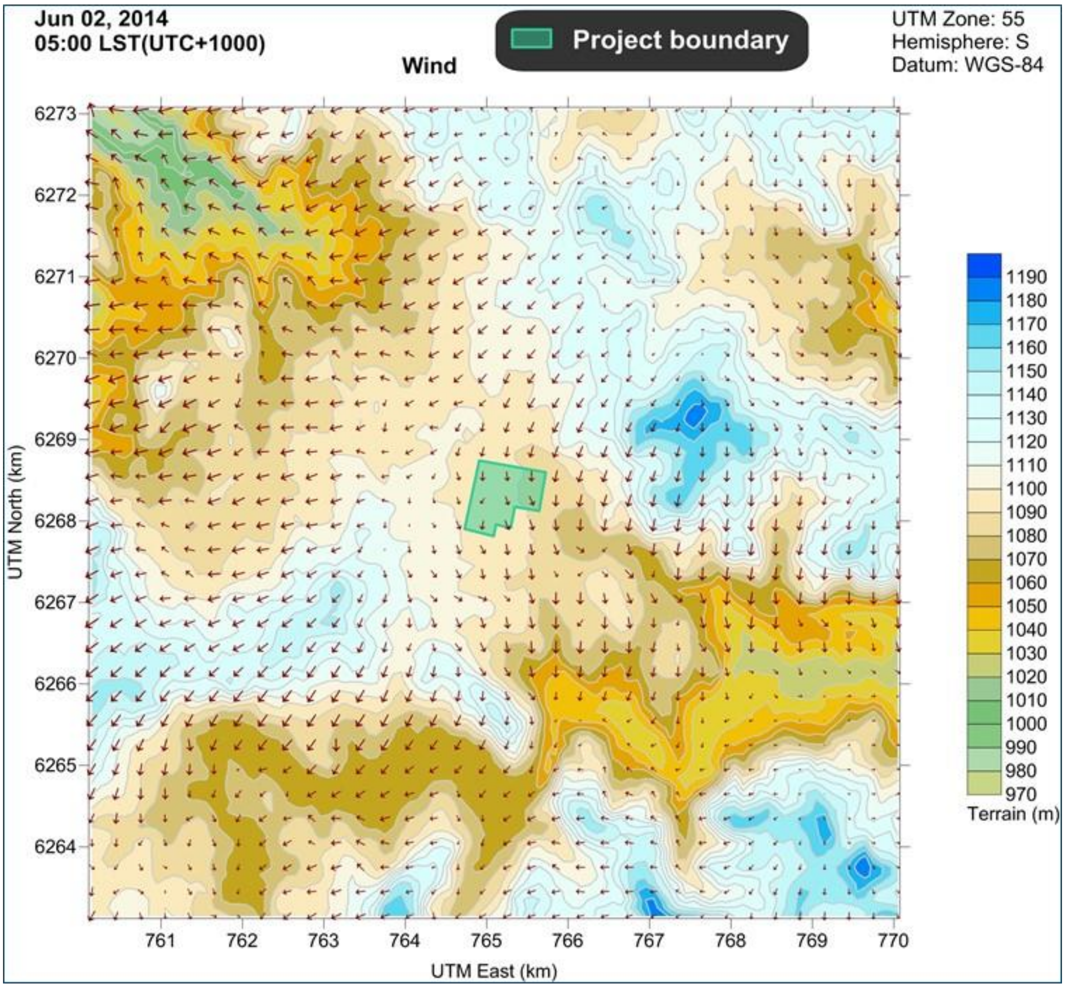

Figure 6-1: Example of the wind field for one of the 8,760 hours of the year that are modelled

CALMET generated meteorological data were extracted from a point within the CALMET domain and are graphically represented in **Figure 6-2** and **Figure 6-3**.

Figure 6-2 presents the annual and seasonal windroses from the CALMET data. The figure shows that winds are generally light from all directions with the exception of winds from the western quadrants which reflects the expected wind distribution patterns of the area based on expected terrain effects on the prevailing winds and katabatic flows. Apart from winter, light winds from the north dominate the distribution. On an annual basis, winds are varied with a high proportion of light winds from the south and relatively stronger winds from the west.

During summer, winds are typically from the northeast quadrant. The autumn distribution is varied and the westerly winds are relatively less strong compared to those of other seasons. Winds from the west-northwest are frequent. The winter distribution is characterised by relatively strong winds from the west and light winds from the south. The spring distribution is characterised by winds typically from the western quadrants, with winds from the west-southwest dominating the distribution after the light northern winds.

Figure 6-3 includes graphs of the temperature, wind speed, mixing height and stability classification over the modelling period and show sensible trends considered to be representative of the area.

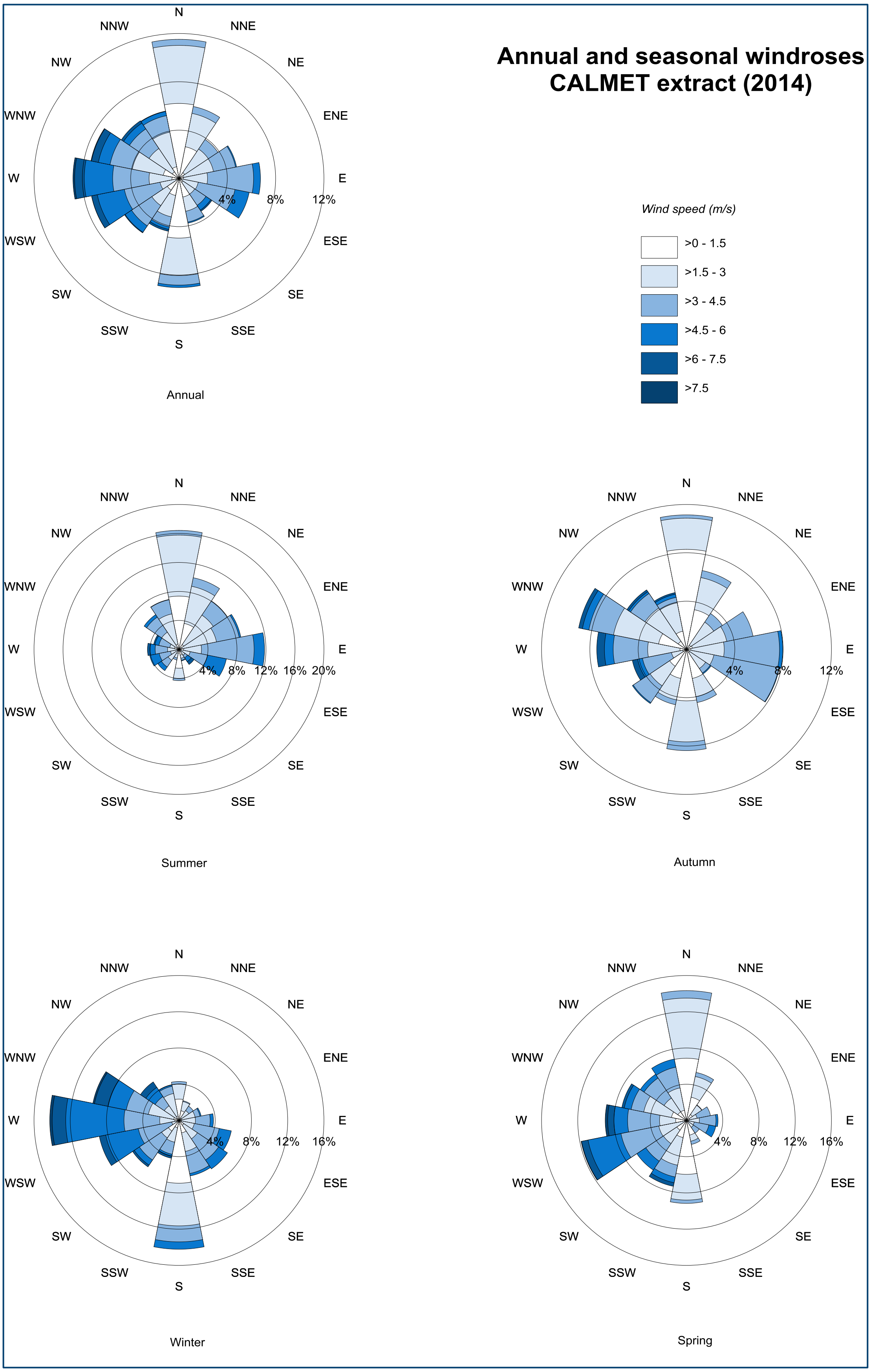

Figure 6-2: Windroses from CALMET extract at 10m height (Cell Ref 5050)

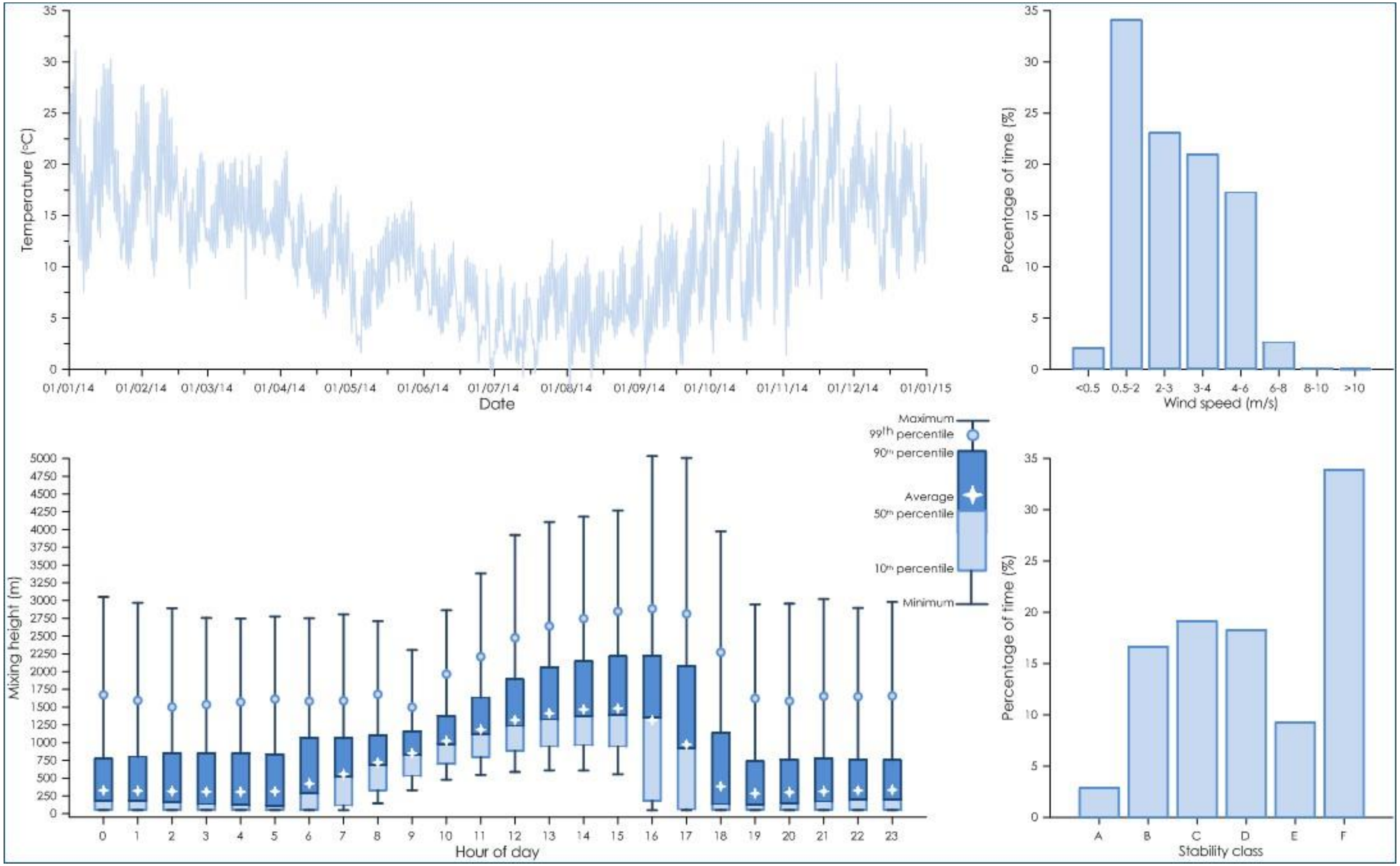

Figure 6-3: Meteorological analyses of CALMET extract (Cell Ref 5050)

6.2.2 Dispersion modelling

CALPUFF modelling was used to predict the potential air impacts in the wider area associated with the existing and proposed operations of the Project.

The key air emissions from the Project arise from the main processes as enumerated in **Section 3**. The main existing emissions to atmosphere are from the stacks of the existing MDF and MDL plants as shown in **Figure 6-4**. The main emissions to be released to atmosphere from the proposed expansion are from the existing stacks of the MDF and MDL plants, a proposed additional stack servicing the MDF plant, and proposed stacks for the PB plant as shown in **Figure 6-5**.

Fugitive emissions from the press lines are also considered. These sources are shown in purple shading in the **Figure 6-4** and **Figure 6-5**. Some of the existing MDF plant stack emissions and emissions from other new sources would be diverted into the existing heat plant (for destruction) and to the proposed additional stack.

Other emission sources from the nearby industries are also included in the model as point sources. The model includes consideration of potential "building" wake effects on air dispersion that arise due to the effects of winds passing over the buildings within the Project and nearby industrial sites. The Project and other industrial sources are summarised with their likely emission parameters in **Section 6.3**.

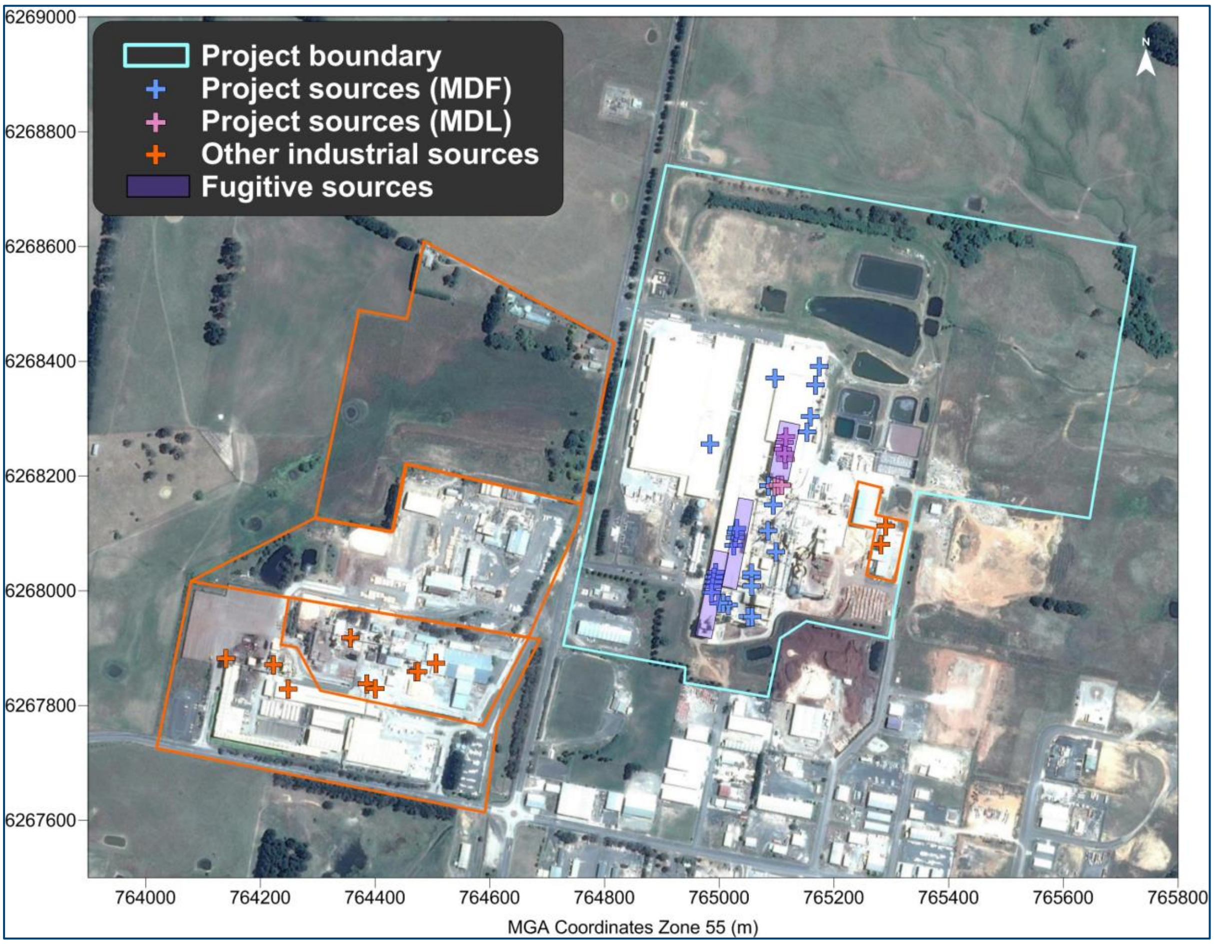

Figure 6-4: Location of existing sources modelled

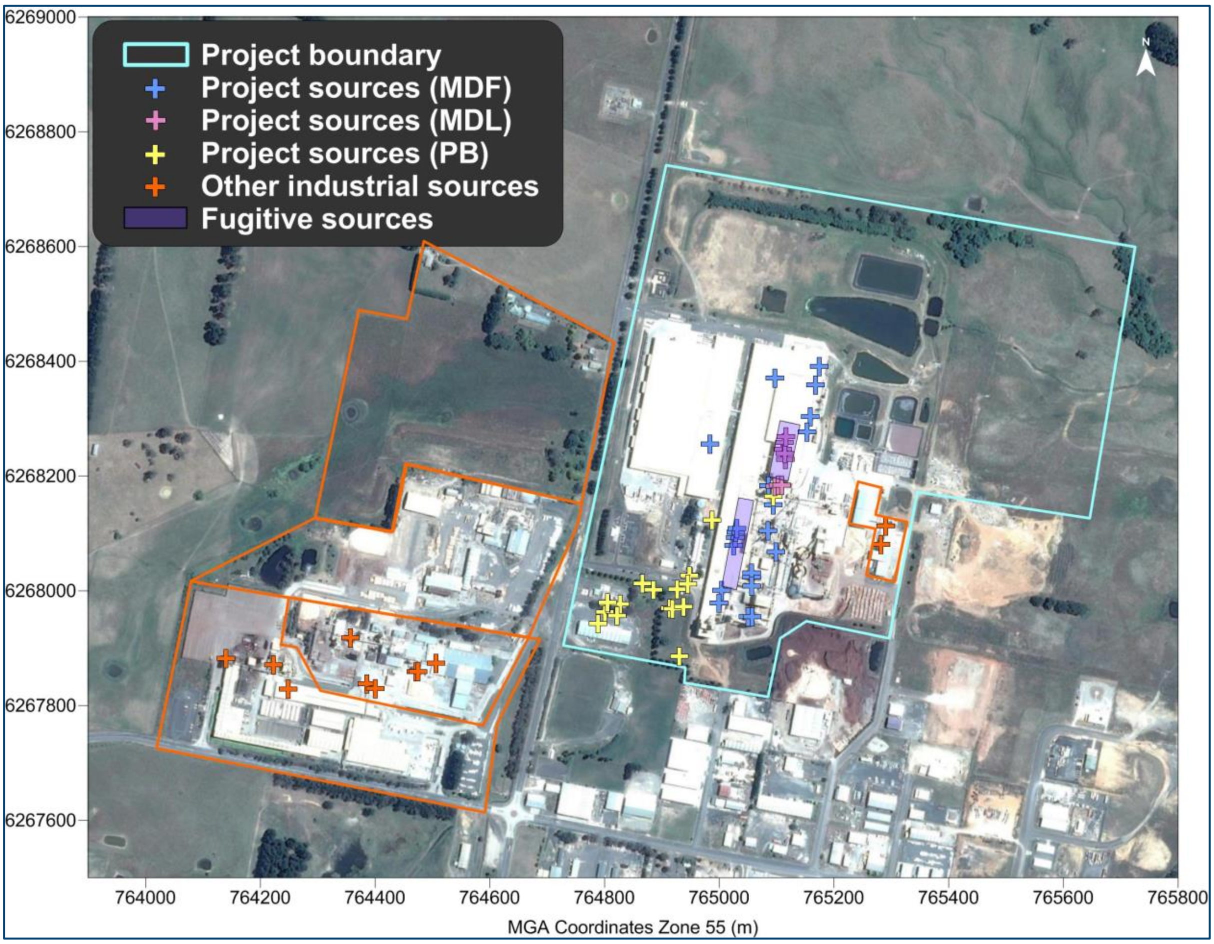

Figure 6-5: Location of proposed sources modelled

6.3 Emission estimation

Dispersion modelling parameters for the existing MDF and MDL plants, proposed PB and modified MDF plant, and other existing industries are presented in **Table 6-2** to **Table 6-6**, respectively.

Table 6-7 presents the emission concentrations of the proposed Project sources (i.e. proposed modified MDF plant, proposed PB plant) for comparison with the applicable POEO (Clean Air) Regulation and licence limits. As shown, all the sources comply with the POEO limits.

It is important to note that the Project would modify emission point EPA 11 (a heat plant) to include additional emissions from other sources. Accordingly the TSP emission was modelled at a concentration of 215.6mg/m^3 to take into account the proposed changes to the plant design.[1]

Thus, the table shows that there is potential for the proposed emissions from emission point EPA 11 (a heat plant) to exceed the existing licence limits, but not the Regulation limits. An amendment of the licence limit for TSP for EPA 11 may be necessary due to its proposed modification (i.e. diversion of other emissions into EPA 11).

The emission parameters of the existing sources including parts of the modified MDF plant were taken directly from the historical stack testing results. For conservatism, the average plus standard deviation of the historical stack testing results were modelled. Formaldehyde emissions which were considered to be erroneous were omitted from the analysis of the historical stack testing results. The formaldehyde emissions omitted include the following:

- Emission results from tests conducted on April 2013 and February 2015 which were generally significantly higher than the rest of the stack testing data across all stacks sampled. For EPA12 Conti 1 Press Vents, where results for both test times were present, only one was omitted which was the February 2015 results.
- Emission results from testing conducted on September 2016 for the EPA 23 Paper treater duct was considered an outlier as it was much higher than any other data recorded.

Where the emission sources will be modified, the emissions were calculated using the values from the stack testing results by taking into account the modifications that are proposed, as follows:

- EPA 4 (DC1 Baghouse) and EPA 5 (DC2 Baghouse) emissions would be diverted to the New Combined Stack, together with 60% of the emissions from the new Conti 2 Scrubber;
- EPA 12 (b), diversion of this press roof vent to the inlet air of Conti 1 Heat plant (EPA 17).
- EPA 23 (Paper Treater) emissions and 40% of the emissions from the Conti 2 Scrubber would be diverted to EPA 11 (Conti 2 Heat Plant). Another paper treater, whose emissions are assumed

[1] The historical stack testing data of EPA 11 shows up to 140mg/m^3 of TSP emissions which is below the licence limit of 200 mg/m^3. The destruction of the TSP from other sources that would be diverted into the heat plant serviced by emission point EPA 11 has not been taken into account, and thus in reality, the TSP emissions from EPA 11 would be lower than modelled due to combustion in the heat plant.

to be the same as the existing paper treater (EPA 23), would be installed and its emissions would also go to the EPA 11.

Where stack testing results are not available, assumptions were made to calculate for the emissions, as follows:

- 45mg/Nm^3 of formaldehyde going into the Conti 2 Scrubber based on the plant manufacturer's specification (of 35 to 50mg/Nm^3);
- A formaldehyde destruction efficiency of 30% in the Conti 2 Scrubber based on the plant manufacturer's guarantee of 30 to 40%;
- A formaldehyde destruction efficiency of 99% in the Conti 1 Heat Plant based on actual Destruction Efficiency Testing (**Stephenson, 2016a**); and,
- As PM_{10} emission data are not available for all sources, it was assumed that the measured TSP emitted is comprised entirely of PM_{10}.

Fugitive emissions from the press vents were also modelled and assumed to be 20% of the total emissions from the press vents, and that 80% of the total emissions are what is measured in the stacks.

The emission parameters for the proposed PB plant were based on a previous assessment conducted by **Stephenson (2016b)** and confirmed by the Proponent. Similar to the MDF emissions, the following assumptions were made:

- 35mg/Nm^3 of formaldehyde going into the scrubber based on the plant manufacturer's specification (of 30 to 40mg/Nm^3);
- A formaldehyde destruction efficiency of 30% in the scrubber based on the plant manufacturer's specification (of 30 to 40%); and,
- The manufacturer's specification for TSP emission levels was assumed to represent PM_{10} emissions in the model.

The emissions from the Woodchem facility were derived from the historical stack testing results.

The emission parameters for other industries in the area were supplied by the Proponent from previous stack testing reports and website data.

6.3.1 NO_2 assessment

The NO_X emissions from plant at the site would contain some fraction of harmful NO_2. To understand this some investigation of the likely range of NO fractions in the NO_X emissions was conducted.

Collated NO_2/NO_X percentage emissions data from forest product industry boilers, fired on various combinations of wood, coal, bark, waste oil and non-condensable gases ranges from 2.5 to 13.4% (**NCASI, 2015**). The NO_2/NO_x percentage of emissions from natural gas-fired heaters was found to be approximately 11% (**Hunton & Williams, 2011**), and the NO_2/NO_x percentage would typically be up to 23% for a natural gas-fired boiler (**ECT, 2013**).

Some fraction of the NO_X emitted from the Project would also undergo chemical change to form additional NO_2 by the time the emissions reach receptors. On the basis that the plant NO_X emissions would typically comprise 2.5 to 23% NO_2, and to account for any potential change in the emissions once released, it was assumed that 40% of all of the emitted NO_X would be in the form of NO_2 at the sensitive receptors. Considering the relatively short-distance between the sources and the receptors there would be little time for NO_X reactions to occur, and given also the generally cooler climate and overall relatively low fraction of NO_2 in the emissions from the main sources, the assumed 40% conversion of NO_X to NO_2 would be a conservative approach to estimating the potential NO_2 effects of the Project at the most affected receptors.

Note also that all NO_X emissions, including those from nearby industries, are considered in the cumulative assessment.

Table 6-2: Emission inventory of the existing MDF stacks

Source ID	Description	Easting (m)	Northing (m)	Stack height (m)	Discharge Temperature (°C)	Stack Diameter (m)	Exit Velocity (m/s)	TSP (g/s)	PM_{10} (g/s)	Formaldehyde (g/s)	NO_x (g/s)
EPA4	Bag filter forming line	765016	6267975	8.00	40	1.04	10.4	0.054	0.049	0.021	-
EPA5	Bag filter air grader	765007	6267979	6.00	30	1.56	12.1	0.068	0.056	0.034	-
EPA7	Conti 2 Stage 1 Dryer Cyclone #1 (west)	765050	6267955	44.40	51	2.48	13.8	0.94	0.94	0.43	-
EPA8	Conti 2 Stage 1 Dryer Cyclone #2 (east)	765057	6267955	44.40	51	2.48	14.2	0.88	0.88	0.19	-
EPA9	Conti 1 Dryer Cyclone #1 (south)	765056	6268024	30.50	53	2.23	12.3	0.66	0.56	0.20	4.6
EPA10	Conti 1 Dryer Cyclone #1 (north)	765056	6268031	30.50	55	2.23	12.6	0.69	0.58	0.34	4.6
EPA11	Conti 2 Heat Plant	765099	6268068	22.00	305	1.50	8.7	0.78	0.61	0.020	3.0
EPA12a	Conti 1 Press Vents	765025	6268079	11.95	39	1.14	6.7	0.026	0.025	0.015	0.036
EPA12b	Conti 1 Press Vents	765028	6268093	11.95	42	1.14	9.7	0.098	0.087	0.066	0.066
EPA12c	Conti 1 Press Vents	765028	6268093	11.95	39	1.14	7.5	0.055	0.055	0.037	0.033
EPA12d	Conti 1 Press Vents	765029	6268102	11.95	38	1.17	7.7	0.060	0.043	0.039	0.042
EPA12e	Conti 1 Press Vents	765031	6268109	11.95	33	1.19	8.0	0.055	0.055	0.0069	0.030
EPA17	Conti 1 Heat Plant	765085	6268105	30.50	234	1.20	11.7	1.2	0.93	0.0057	6.0
A3-1	A3 Baghouse	765174	6268391	4.00	27	0.80	30.1	0.069	0.069	-	-
A3-2	A3 Baghouse	765168	6268359	4.00	27	0.80	30.1	0.069	0.069	-	-
A2-1	A2 Baghouse	765159	6268304	4.00	27	0.80	24.4	0.056	0.056	-	-
A2-2	A2 Baghouse	765153	6268277	4.00	27	0.80	24.4	0.056	0.056	-	-
EPA6	DC3 Baghouse	764999	6267979	6.00	33	1.18	10.1	0.070	0.052	-	-
EPA3	Moulding Oven Exhaust	764984	6268256	15.00	93	0.55	7.8	0.0074	0.0074	-	0.0068
EPA1	DC4 Baghouse	765094	6268150	6.00	30	1.93	16.0	0.18	0.034	-	-
-	Hot oil heater	765097	6268371	15.00	250	0.40	8.5	-	-	-	0.083
EPA13a	Conti 2 Press Vents	764994	6268032	12.00	40	1.24	6.4	0.035	0.033	0.010	0.024
EPA13b	Conti 2 Press Vents	764991	6268024	12.00	40	1.24	6.5	0.031	0.031	0.0069	0.032
EPA13c	Conti 2 Press Vents	764990	6268016	12.00	35	1.24	6.2	0.043	0.038	0.027	0.029
EPA13d	Conti 2 Press Vents	764988	6268007	12.00	35	1.24	6.3	0.067	0.055	0.055	0.051
EPA13e	Conti 2 Press Vents	764986	6267997	12.00	35	1.24	9.2	0.23	0.22	0.22	0.065
EPA2	DC7 Baghouse	765086	6268183	8.00	26	0.76	18.0	0.020	0.020	-	-
-	Conti Fibre Transport Cyclone	765056	6268008	25.00	27	1.70	3.6	0.050	0.048	0.0025	-

Table 6-3: Emission inventory of the existing MDL stacks

Source ID	Description	Easting (m)	Northing (m)	Stack height (m)	Discharge Temperature (°C)	Stack Diameter (m)	Exit Velocity (m/s)	TSP (g/s)	PM_{10} (g/s)	Formaldehyde (g/s)	NO_X (g/s)
EPA18a	Existing Press Vents	765111	6268247	16.00	26	1.24	9.1	0.064	0.064	0.041	-
EPA18b	Existing Press Vents	765113	6268259	16.00	26	1.24	5.5	0.037	0.037	0.045	-
EPA18c	Existing Press Vents	765115	6268229	16.00	26	1.24	8.4	0.057	0.057	0.058	-
EPA18d	Existing Press Vents	765114	6268239	16.00	25	1.24	7.9	0.030	0.030	0.020	-
EPA18e	Existing Press Vents	765116	6268269	17.00	25	1.24	8.4	0.045	0.045	0.013	-
EPA19	Point 3 Dryer Stack	765097	6268182	35.00	53	1.62	24.9	3.22	0.39	0.0081	2.2
-	Old Jeldwen Point 20	765102	6268184	12.00	23	0.98	10.5	0.062	0.062	0.0050	-
-	Old Jeldwen Point 21	765102	6268184	12.00	25	0.73	12.0	0.033	0.033	0.0066	-
-	Old Jeldwen Point 22	765109	6268184	5.00	20	1.02	23.0	0.092	0.092	0.0078	-

Table 6-4: Emission inventory of the proposed changes to the MDF plant

Source ID	Description	Easting (m)	Northing (m)	Stack height (m)	Discharge Temperature (°C)	Stack Diameter (m)	Exit Velocity (m/s)	TSP (g/s)	PM_{10} (g/s)	Formaldehyde (g/s)	NO_X (g/s)
EPA7	Conti 2 Stage 1 Dryer Cyclone #1 (west)	765050	6267955	44.40	51	2.48	13.8	0.94	0.94	0.43	0.92
EPA8	Conti 2 Stage 1 Dryer Cyclone #2 (east)	765057	6267955	44.40	51	2.48	14.2	0.88	0.88	0.19	0.95
EPA9	Conti 1 Dryer Cyclone #1 (south)	765056	6268024	30.50	53	2.23	12.3	0.66	0.56	0.20	4.6
EPA10	Conti 1 Dryer Cyclone #1 (north)	765056	6268031	30.50	55	2.23	12.6	0.69	0.58	0.34	4.6
EPA11	Conti 2 Heat Plant	765099	6268068	22.00	305	1.50	8.7	1.3	0.026	0.0080	0.12
EPA12a	Conti 1 Press Vents	765025	6268079	11.95	38	1.14	6.7	0.026	0.025	0.015	0.036
EPA12c	Conti 1 Press Vents	765028	6268093	11.95	39	1.14	7.5	0.055	0.055	0.037	0.033
EPA12d	Conti 1 Press Vents	765029	6268102	11.95	38	1.17	7.7	0.060	0.043	0.039	0.042
EPA12e	Conti 1 Press Vents	765031	6268109	11.95	33	1.19	8.0	0.055	0.055	0.0069	0.030
EPA17	Conti 1 Heat Plant	765085	6268105	30.50	234	1.20	11.7	1.2	1.0	0.0064	6.1
-	New Combined Stack	765004	6268001	40.00	35	1.90	20.0	0.84	0.82	0.56	2.8
A3-1	A3 Baghouse	765174	6268391	4.00	27	0.80	30.1	0.069	0.069	-	-
A3-2	A3 Baghouse	765168	6268359	4.00	27	0.80	30.1	0.069	0.069	-	-
A2-1	A2 Baghouse	765159	6268304	4.00	27	0.80	24.4	0.056	0.056	-	-
A2-2	A2 Baghouse	765153	6268277	4.00	27	0.80	24.4	0.056	0.056	-	-
EPA6	DC3 Baghouse	764999	6267979	6.00	33	1.18	10.1	0.070	0.052	-	-
EPA3	Moulding Oven Exhaust	764984	6268256	15.00	93	0.55	7.8	0.0074	0.0074	-	0.0068
EPA1	DC4 Baghouse	765094	6268150	6.00	30	1.93	16.0	0.18	0.034	-	-
-	Hot oil heater	765097	6268371	15.00	250	0.40	8.5	-	-	-	0.083
EPA2	DC7 Baghouse	765086	6268183	8.00	26	0.76	18.0	0.020	0.020	-	-
-	Conti Fibre Transport Cyclone	765056	6268008	25.00	27	1.70	3.6	0.050	0.048	0.0025	-

Table 6-5: Emission inventory of the proposed PB plant

Source ID	Description	Easting (m)	Northing (m)	Stack height (m)	Discharge Temperature (°C)	Stack Diameter (m)	Exit Velocity (m/s)	TSP (g/s)	PM_{10} (g/s)	Formaldehyde (g/s)	NO_x (g/s)
E1	Fines Blower	764801	6267963	20.00	12	0.26	20.0	0.0053	0.0053	-	-
E2	Hammermill Particles	764806	6267977	40.00	12	0.22	20.0	0.0038	0.0038	-	-
E3	Chipper Cyclofilter	764930	6267886	10.00	12	0.66	20.0	0.035	0.035	-	-
E4	Hammermill Cyclofilter	764827	6267977	19.00	12	0.97	15.0	0.056	0.056	-	-
E5	Flakers Baghouse	764822	6267957	19.00	12	1.10	15.0	0.072	0.072	-	-
E7	Baghouse	764885	6268002	30.00	12	0.25	15.0	0.0038	0.0038	-	-
E8	Air Grader Baghouse	764927	6268003	15.00	45	1.40	10.0	0.076	0.076	-	-
E9	Mill Cyclofilter	764914	6267970	12.00	50	0.72	15.0	0.031	0.031	-	-
E10	Mill Cyclofilter	764918	6267969	12.00	50	0.72	15.0	0.031	0.031	-	-
E12	Forming Line Baghouse including PB scrubber	764950	6268025	40.00	20	1.60	20.0	1.26	0.70	0.69	-
E13	Forming Station Baghouse	764938	6267972	40.00	20	0.96	20.0	0.036	0.036	0.042	-
E14	Reject Mat Dump	764789	6267943	20.00	20	0.69	15.0	0.028	0.028	-	-
E15	Trimming Saws	764948	6268027	15.00	20	0.91	15.0	0.049	0.049	-	-
E16	Dust Transport	764805	6267980	20.00	12	0.25	15.0	0.0038	0.0038	-	-
E18	Cooling Tuners	764987	6268123	20.00	20	1.02	15.0	0.014	0.014	0.063	-
E19	Wet Electrostatic Precipitator	764866	6268013	40.00	67	2.80	17.2	0.63	0.63	0.021	9.7
E20	Hot Oil Heater	764945	6268012	20.00	150	0.80	8.6	-	-	-	0.47
-	Baghouse for particle board sander	765094	6268165	8.00	30	1.80	18.0	0.17	0.054	-	-

Table 6-6: Emission inventory of other key industries near the Project

Source	Easting (m)	Northing (m)	Stack height (m)	Discharge Temperature (°C)	Stack Diameter (m)		Exit Velocity (m/s)	TSP (g/s)	PM_{10} (g/s)	Formaldehyde (g/s)	NO_x (g/s)
Woodchem											
Catalytic oxidizer	765290	6268113	6.00	267	0.45		20.7	0.0072	0.0072	0.0067	0.0070
Batch reactor stack	765282	6268081	12.00	23	0.17		8.9	0.00080	0.00080	0.0027	-
Structaflor											
Roof vent	764506	6267874	12.00	29	1.10		11.0	0.084	0.071	0.082	-
Roof vent	764506	6267874	11.00	24	1.10		7.4	0.067	0.067	0.042	-
Roof vent	764506	6267874	11.00	28	1.10		12.0	0.078	0.053	0.078	-
Core Dryer Stack 125	764357	6267918	30.00	21	1.24		16.0	3.3	3.0	0.0020	1.1
Surface Dryer Stack 105	764357	6267918	30.00	13	0.90		23.0	0.94	0.65	0.0020	1.7
Cyclones	764471	6267859	15.00	29	0.58		6.3	0.033	0.016	0.0025	-
Cyclones	764475	6267859	15.00	29	0.58		5.9	0.032	0.0096	0.0027	-
Highland Pine Products											
S2 Boiler Stack	764223	6267871	35.00	279	2.07		8.3	3.3	2.2	0.0030	1.6
S1 Planer Mill Cyclone	764386	6267838	16.00	17	0.50		5.4	0.0013	0.0027	-	-
S2 Baghouse	764400	6267830	7.00	25	1.82		13.0	0.054	0.047	-	
S2 Chip Bin Cyclone	764140	6267882	18.00	18	0.90		4.2	0.0030	0.0030	-	-
S2 Drying Kiln	764248	6267829	15.00	26	0.45		4.5	-	-	0.00010	-

Table 6-7: Emission concentration of the proposed Project sources

Source ID	Description	Modelled TSP concentration (mg/m³)	TSP POEO limit (mg/m³)	TSP licence limit (mg/m³)	Modelled Formaldehyde concentration (mg/m³)	Formaldehyde licence limit (mg/m³)	Modelled NO_x (as NO_2) concentration (mg/m³)	NO_x (as NO_2) POEO limit (mg/m³)
EPA7	Conti 2 Stage 1 Dryer Cyclone #1 (west)	20.1	250	-	9.3	-	19.7	2,500
EPA8	Conti 2 Stage 1 Dryer Cyclone #2 (east)	18.2	250	-	3.9	-	19.7	2,500
EPA9	Conti 1 Dryer Cyclone #1 (south)	19.6	250	-	6.0	-	136.5	2,500
EPA10	Conti 1 Dryer Cyclone #1 (north)	20.0	250	-	9.8	-	131.5	2,500
EPA11	Conti 2 Heat Plant	**215.6**	250	200	1.3	5	19.7	2,500
EPA12a	Conti 1 Press Vents	4.4	250	-	2.6	-	6.1	2,500

Source ID	Description	Modelled TSP concentration (mg/m³)	TSP POEO limit (mg/m³)	TSP licence limit (mg/m³)	Modelled Formaldehyde concentration (mg/m³)	Formaldehyde licence limit (mg/m³)	Modelled NO_x (as NO_2) concentration (mg/m³)	NO_x (as NO_2) POEO limit (mg/m³)
EPA12c	Conti 1 Press Vents	9.0	250	-	6.2	-	5.6	2,500
EPA12d	Conti 1 Press Vents	8.4	250	-	5.5	-	5.8	2,500
EPA12e	Conti 1 Press Vents	6.8	250	-	0.9	-	3.8	2,500
EPA17	Conti 1 Heat Plant	195.4	250	200	1.1	5	1,012.6	2,500
-	New Combined Stack	21.1	50	-	14	-	70.2	350
A3-1	A3 Baghouse	5.0	250	-	-	-	-	2,500
A3-2	A3 Baghouse	5.0	250	-	-	-	-	2,500
A2-1	A2 Baghouse	5.0	250	-	-	-	-	2,500
A2-2	A2 Baghouse	5.0	250	-	-	-	-	2,500
EPA6	DC3 Baghouse	8.1	250	-	-	-	-	2,500
EPA3	Moulding Oven Exhaust	6.2	250	-	-	-	5.7	2,500
EPA1	DC4 Baghouse	4.8	250	-	-	-	-	2,500
-	Hot oil heater	-	250	-	-	-	150	2,500
EPA2	DC7 Baghouse	3.1	250	-	-	-	-	2,500
-	Conti Fibre Transport Cyclone	7.7	250	-	0.38	-	-	2,500
E1	Fines Blower	3.2	50	-	-	-	-	350
E2	Hammermill Particles	1.4	50	-	-	-	-	350
E3	Chipper Cyclofilter	5.0	50	-	-	-	-	350
E4	Hammermill Cyclofilter	6.3	50	-	-	-	-	350
E5	Flakers	2.0	50	-	-	-	-	350
E7	Baghouse	1.4	50	-	-	-	-	350
E8	Air Grader Baghouse	5.5	50	-	-	-	-	350
E9	Mill Cyclofilter	4.4	50	-	-	-	-	350
E10	Mill Cyclofilter	4.4	50	-	-	-	-	350
E12	Forming Line Baghouse Including new PB scrubber	5.0	50	-	27.93	-	-	350
E13	Forming Station Baghouse	4.3	50	-	5	-	-	350
E14	Reject Mat Dump	5.0	50	-	-	-	-	350
E15	Trimming Saws	8.7	50	-	-	-	-	350
E16	Dust Transport	3.4	50	-	-	-	-	350
E18	Cooling Tuners	1.1	50	-	5	-	-	350
E19	Wet Electrostatic Precipitator	15.0	50	-	0.76	-	233.3	350
E20	Hot Oil Heater	-	50	-	-	-	170.0	350

7 DISPERSION MODELLING RESULTS

7.1 Particulate matter and NO_2

Table 7-1 and **Table 7-2** present a summary of the predicted particulate matter and NO_2 impacts of the Level 1 assessment (adding the maximum predicted level with the maximum measured background level irrespective of when these occur) of the existing and proposed Project, respectively. A Level 1 assessment of the 24-hour average PM_{10} would show unrealistic results and the 24-hour average PM_{10} impacts are assessed separately in more detail (see **Section 7.2**).

The predicted annual average concentrations of PM_{10} and NO_2 and the predicted 1-hour average NO_2 concentrations are below the relevant criterion at all the sensitive receptors at all times.

Table 7-1: Model-predicted impacts of existing Project using maximum incremental and background

Receptor ID	PM_{10} (µg/m³)		TSP (µg/m³)	NO_2 (µg/m³)		PM_{10} (µg/m³)	NO_2 (µg/m³)	
	Project impact					Total impact		
	24-hr ave.	Ann. ave.	Ann. ave.	1-hr ave.	Ann. ave.	Ann. ave.	1-hr ave.	Ann. ave.
	Air quality impact criteria							
	-	-	-	-	-	30	246	62
1	11.8	1.0	1.5	66.4	0.9	17.3	119.8	5.5
2	27.5	3.2	4.6	66.9	2.5	21.7	120.4	7.6
3	19.7	1.6	2.4	79.2	2.1	17.5	132.5	6.6
4	15.8	1.6	2.3	76.6	2.1	17.2	129.9	6.5
5	13.4	1.5	2.3	47.6	1.6	16.9	101.0	6.0
6	8.6	0.9	1.4	35.9	1.0	16.0	89.2	5.2
7	8.9	0.9	1.4	35.9	1.0	16.0	89.3	5.3
8	9.0	0.9	1.4	34.4	1.0	16.0	87.7	5.3
9	7.8	0.8	1.3	41.3	0.9	15.9	102.2	5.1
10	9.4	1.0	1.5	45.5	1.1	16.2	98.8	5.3
11	7.0	0.8	1.2	46.9	0.8	15.8	107.2	5.1
12	5.6	0.6	0.9	50.7	0.7	15.6	109.3	4.9
13	5.9	0.6	0.9	49.1	0.7	15.6	106.5	4.9
14	5.9	0.6	0.9	46.3	0.6	15.6	103.6	4.8
15	5.8	0.6	0.8	44.4	0.6	15.5	101.5	4.8
16	6.1	0.6	0.8	44.5	0.6	15.5	105.0	4.8
17	10.4	0.7	1.1	39.7	0.6	16.4	93.1	5.0
18	10.9	0.5	0.8	35.3	0.4	16.0	88.6	4.8
19	7.0	0.6	0.8	39.1	0.5	16.6	111.6	5.1
20	18.1	2.1	3.0	60.4	1.3	17.9	114.5	5.7
21	9.1	0.4	0.7	54.2	0.3	15.3	107.5	4.5
22	9.3	0.4	0.7	50.8	0.3	15.3	104.9	4.5
23	8.1	0.4	0.6	49.5	0.3	15.2	102.8	4.4
24	10.3	0.5	0.8	52.5	0.4	15.4	106.5	4.5
25	9.9	0.4	0.7	52.5	0.3	15.3	106.6	4.5
26	9.0	0.7	1.0	29.2	0.7	15.6	85.7	4.9
27	8.8	0.8	1.2	34.1	0.9	15.8	90.8	5.1
28	10.6	0.9	1.5	39.2	1.0	15.9	96.3	5.2
29	10.3	0.8	1.2	36.3	0.8	15.8	94.9	5.0
30	13.5	0.8	1.4	34.1	0.8	15.9	89.4	5.1
31	6.7	0.4	0.6	53.7	0.3	15.2	107.1	4.4
32	9.8	0.5	0.9	44.4	0.5	15.5	99.5	4.7
33	10.0	0.6	1.0	39.8	0.5	15.5	96.4	4.7
34	13.6	0.7	1.1	41.6	0.6	15.6	96.8	4.8
35	14.4	0.7	1.1	38.0	0.7	15.7	93.1	4.9
36	14.4	0.7	1.2	36.3	0.7	15.7	92.9	4.9
37	17.0	2.0	2.9	59.9	1.2	17.8	113.9	5.6

Table 7-2: Model-predicted impacts of proposed Project using maximum incremental and background

Receptor ID	PM_{10} (µg/m³)		TSP (µg/m³)	NO_2 (µg/m³)		PM_{10} (µg/m³)	NO_2 (µg/m³)	
	Project impact					Total impact		
	24-hr ave.	Ann. ave.	Ann. ave.	1-hr ave.	Ann. ave.	Ann. ave.	1-hr ave.	Ann. ave.
	Air quality impact criteria							
	-	-	-	-	-	30	246	62
1	13.9	1.2	1.9	89.1	1.3	17.6	142.4	5.9
2	31.7	4.4	6.4	89.9	4.0	23.0	143.4	9.1
3	18.7	1.7	2.9	127.8	2.3	17.5	181.2	6.7
4	15.4	1.6	2.9	119.4	2.1	17.2	172.7	6.5
5	15.2	1.8	2.9	48.7	2.2	17.1	102.0	6.5
6	9.8	1.1	1.7	39.1	1.3	16.1	92.5	5.6
7	10.1	1.1	1.8	38.2	1.4	16.2	91.5	5.6
8	10.0	1.1	1.7	38.8	1.4	16.2	92.1	5.6
9	8.3	1.0	1.6	53.4	1.2	16.0	114.2	5.5
10	10.7	1.1	1.9	51.4	1.4	16.3	104.7	5.7
11	7.4	0.9	1.5	60.7	1.1	16.0	120.9	5.4
12	6.6	0.7	1.2	67.7	0.9	15.7	126.3	5.1
13	6.8	0.7	1.2	65.7	0.9	15.7	123.1	5.1
14	6.6	0.7	1.1	62.5	0.9	15.7	119.7	5.1
15	6.4	0.7	1.1	60.0	0.9	15.7	117.1	5.1
16	7.0	0.7	1.1	56.9	0.9	15.6	117.4	5.1
17	11.8	0.8	1.3	57.3	0.9	16.5	110.7	5.3
18	13.1	0.6	1.0	40.6	0.7	16.1	93.9	5.0
19	9.0	0.7	1.1	41.7	0.8	16.8	115.0	5.3
20	17.1	2.3	3.5	69.8	1.6	18.1	123.8	6.0
21	10.1	0.5	0.8	56.9	0.4	15.3	110.2	4.6
22	10.2	0.5	0.8	57.6	0.4	15.3	110.9	4.6
23	9.0	0.4	0.7	53.7	0.4	15.2	107.0	4.5
24	11.2	0.5	0.9	56.5	0.5	15.4	109.8	4.7
25	10.7	0.5	0.8	58.0	0.5	15.4	111.4	4.6
26	10.6	0.8	1.3	38.6	1.0	15.7	95.1	5.2
27	10.1	0.9	1.5	55.1	1.1	15.9	111.8	5.3
28	12.1	1.1	1.8	52.6	1.3	16.1	110.8	5.5
29	11.6	0.9	1.5	47.3	1.1	15.9	106.3	5.3
30	15.1	1.0	1.7	38.0	1.1	16.0	92.8	5.3
31	8.4	0.4	0.7	58.7	0.4	15.3	112.0	4.6
32	10.8	0.6	1.1	46.8	0.6	15.6	101.8	4.9
33	11.6	0.7	1.2	42.6	0.7	15.6	99.3	4.9
34	15.5	0.8	1.3	43.9	0.8	15.8	99.1	5.1
35	16.1	0.8	1.4	39.2	0.9	15.8	94.3	5.1
36	16.0	0.8	1.5	39.6	0.9	15.9	95.2	5.2
37	16.9	2.2	3.4	68.9	1.5	18.0	122.7	5.9

The predicted dust impacts of the existing and proposed Project are relatively similar. Although there would be a small increase in NO_2 concentrations for the proposed Project, the off-site concentrations remain below acceptable levels.

Figure 7-1 to **Figure 7-10** present the isopleth plots of the model-predicted PM_{10} and NO_2 concentrations due to the Project alone and due to the Project and other industries.

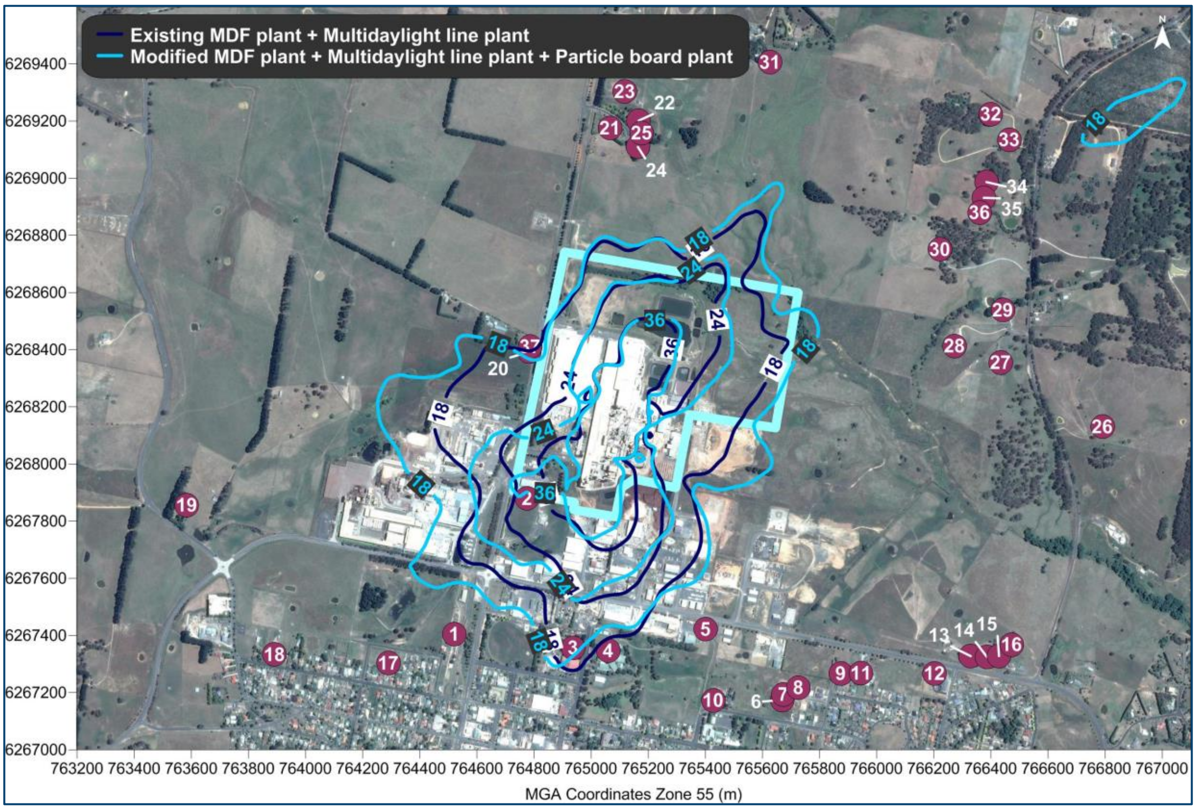

Figure 7-1: Predicted maximum 24-hour average PM_{10} concentration (µg/m³) due to the Project

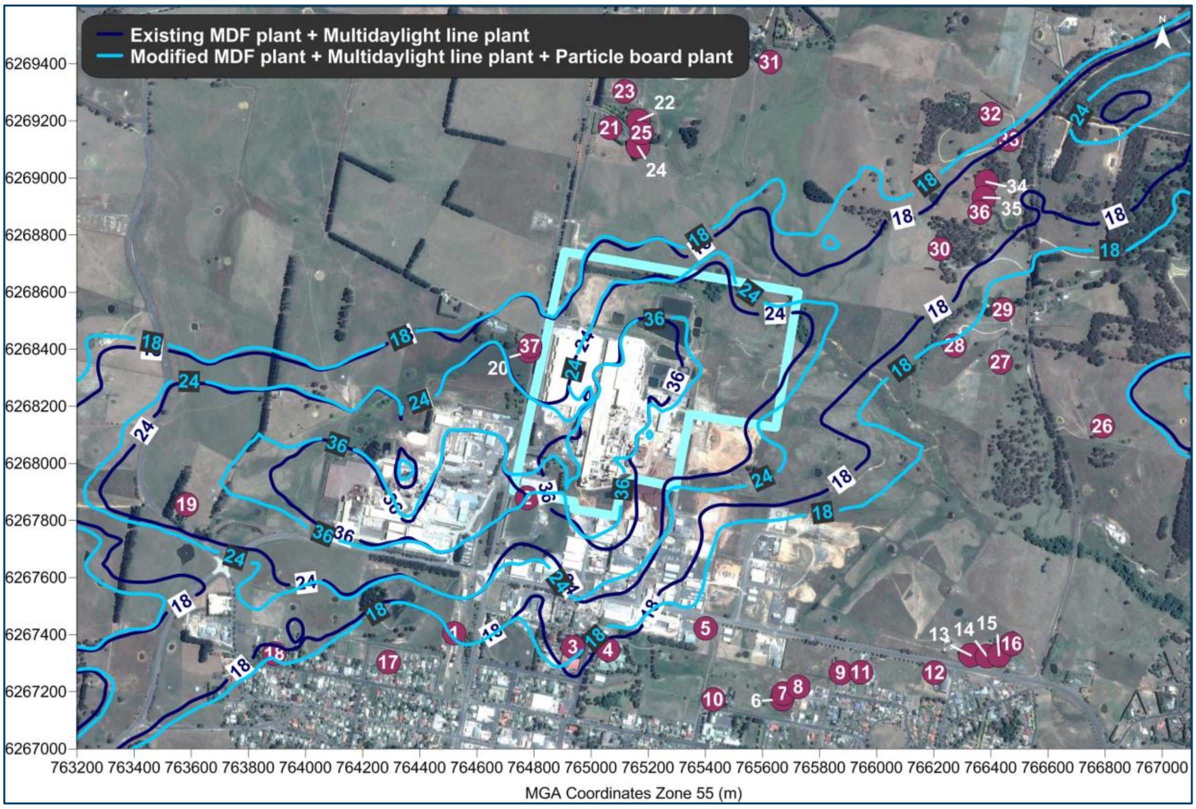

Figure 7-2: Predicted max. 24-hr ave. PM_{10} concentration (µg/m³) due to the Project and other surrounding industries

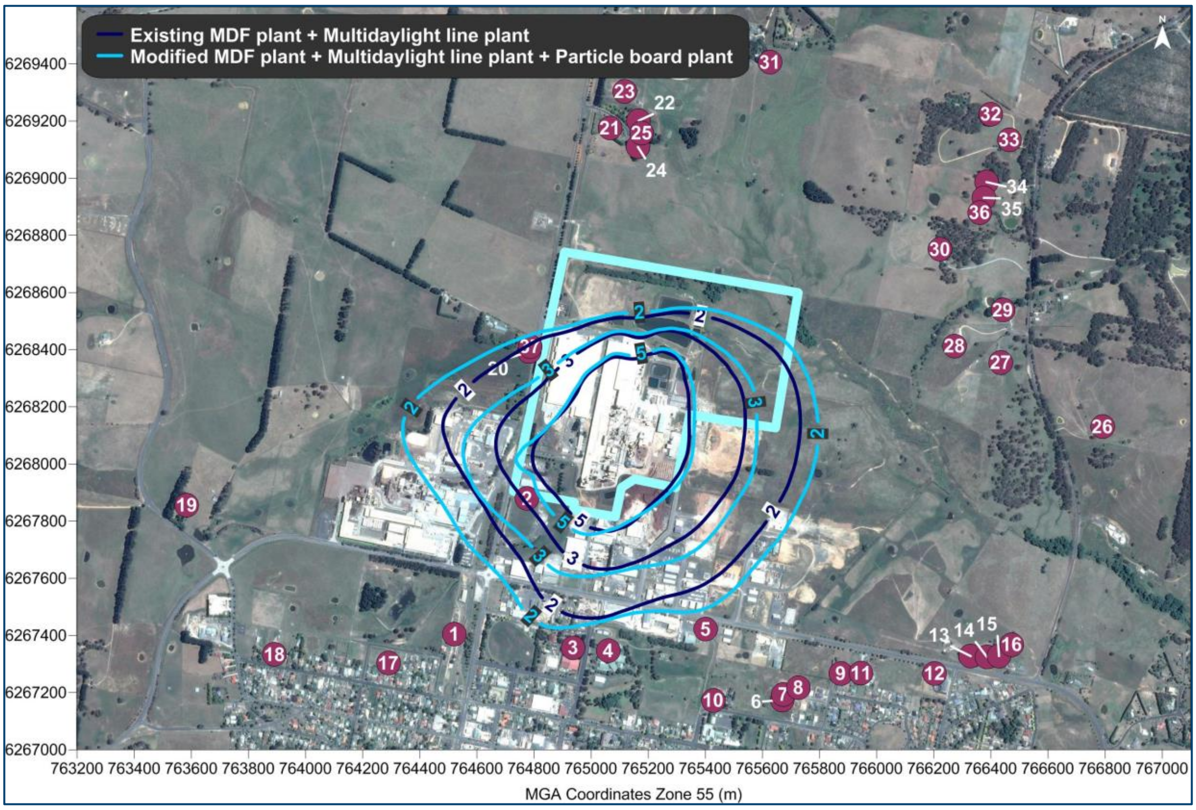

Figure 7-3: Predicted annual average PM_{10} concentration (µg/m³) due to the Project

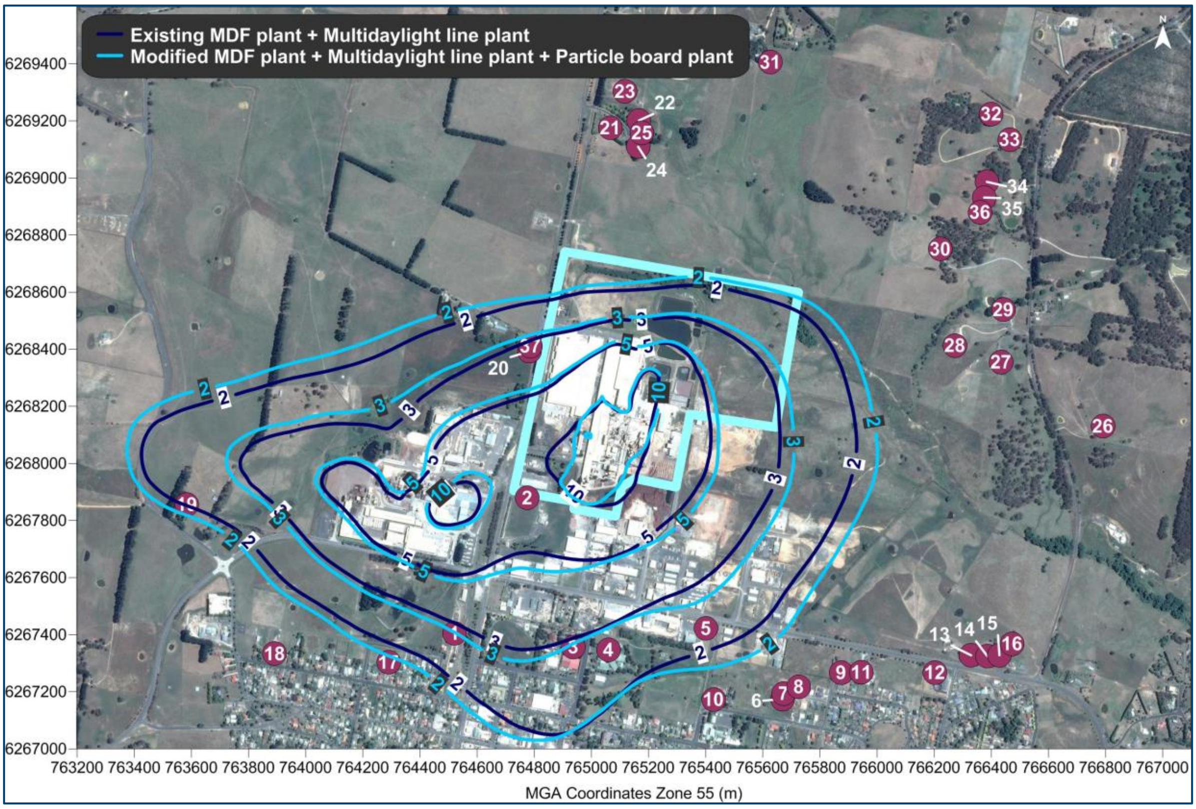

Figure 7-4: Predicted annual average PM_{10} concentration (µg/m³) due to the Project and other surrounding industries

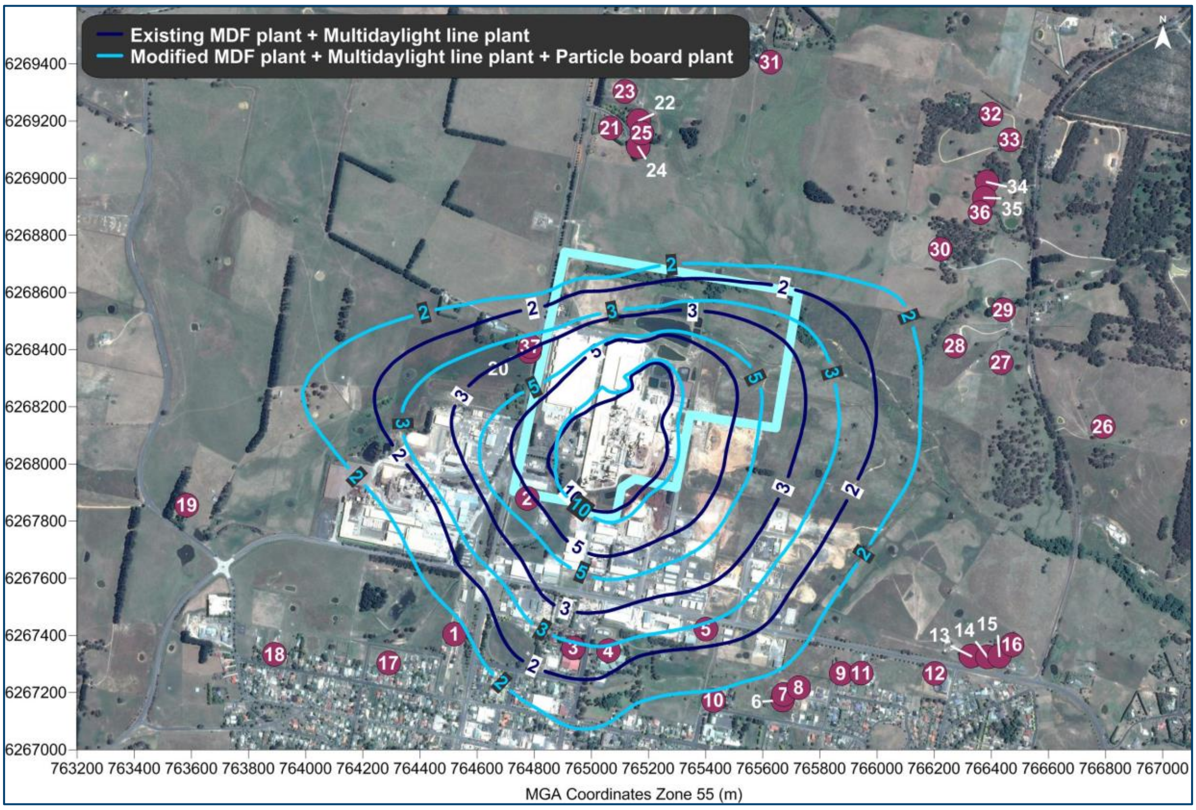

Figure 7-5: Predicted annual average TSP concentration (µg/m³) due to the Project

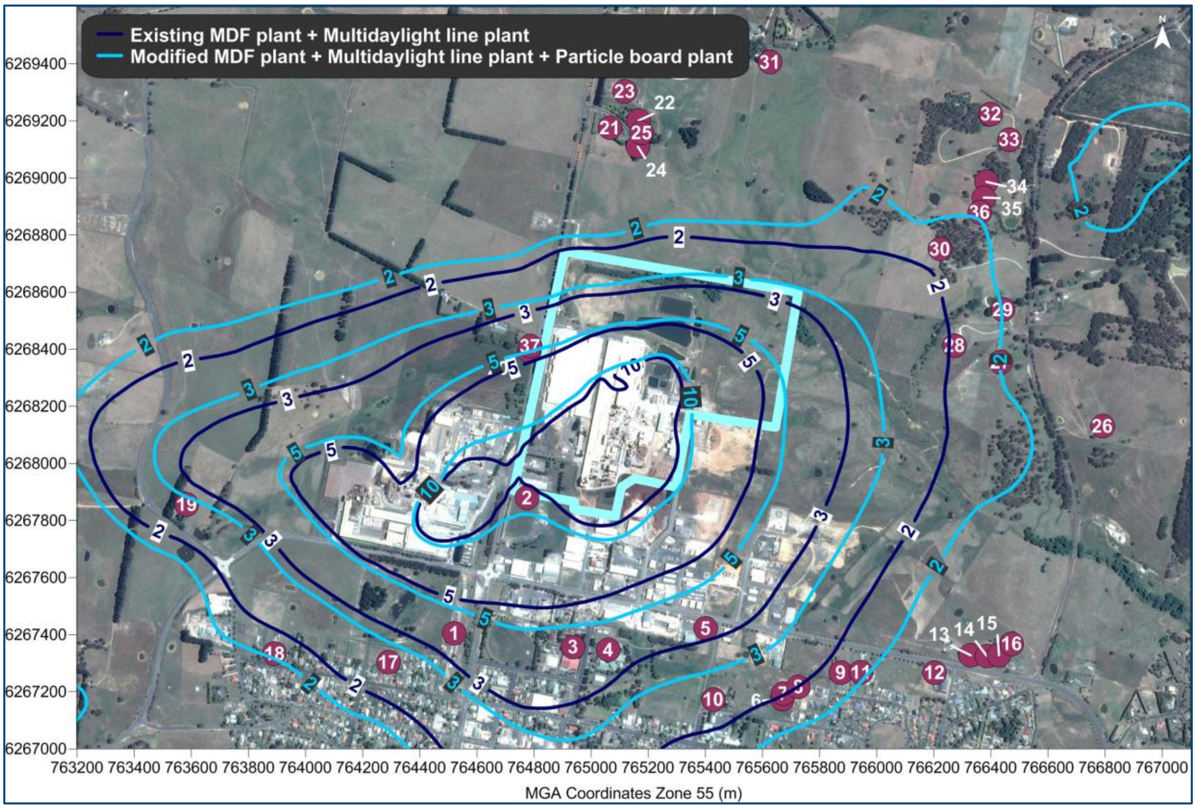

Figure 7-6: Predicted annual average TSP concentration (µg/m³) due to the Project and other surrounding industries

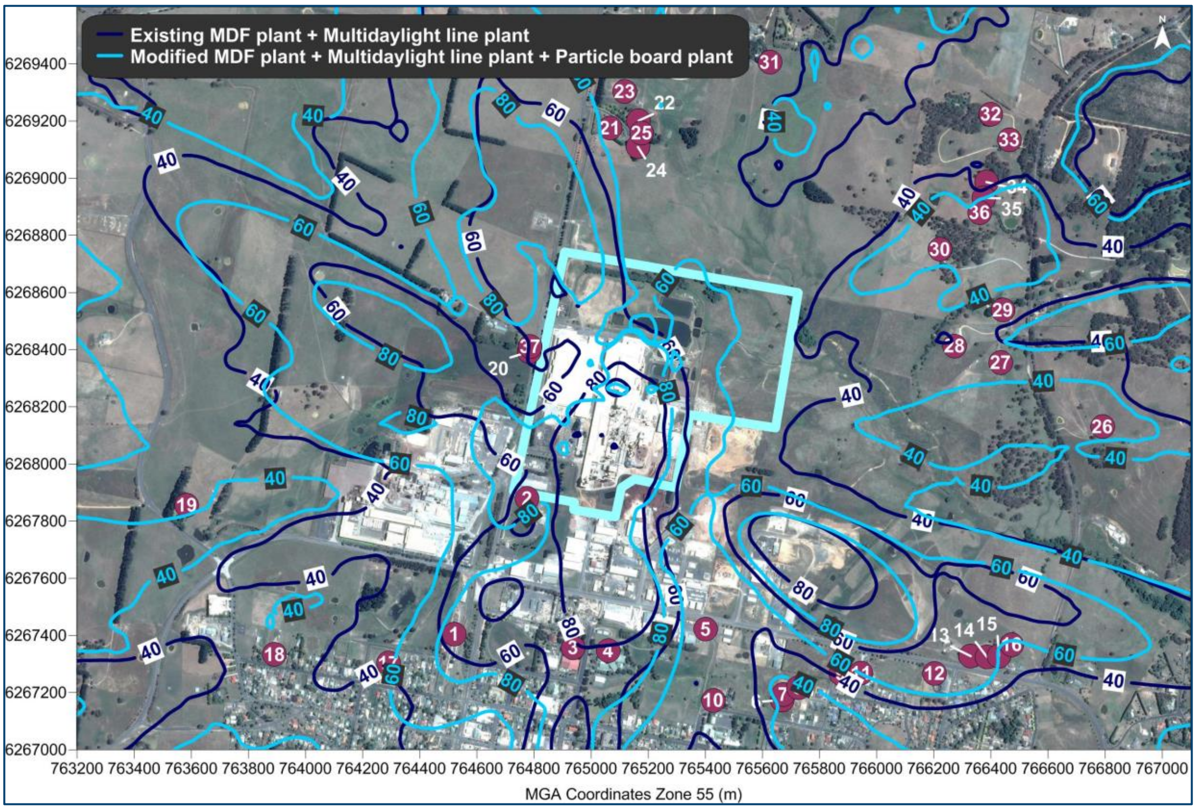

Figure 7-7: Predicted maximum 1-hour average NO_2 concentration (µg/m³) due to the Project

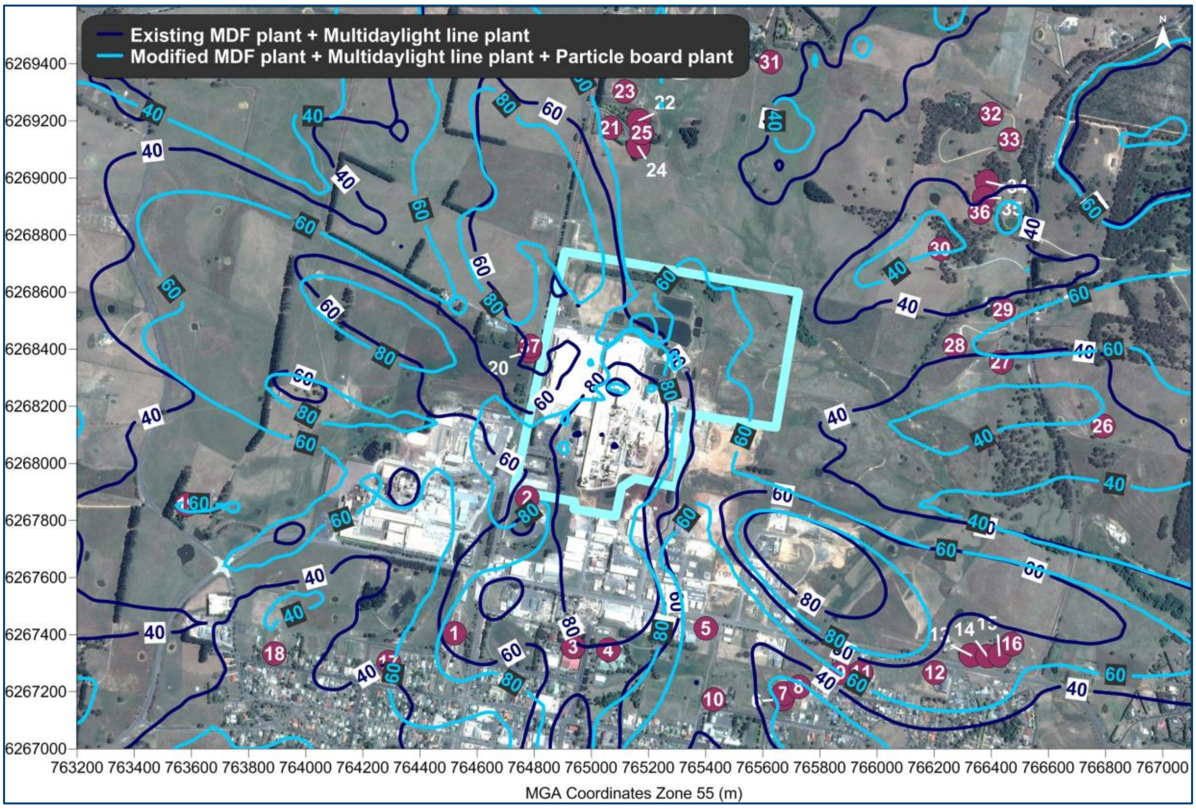

Figure 7-8: Predicted max. 1-hr average NO_2 concentration (µg/m³) due to the Project and other surrounding industries

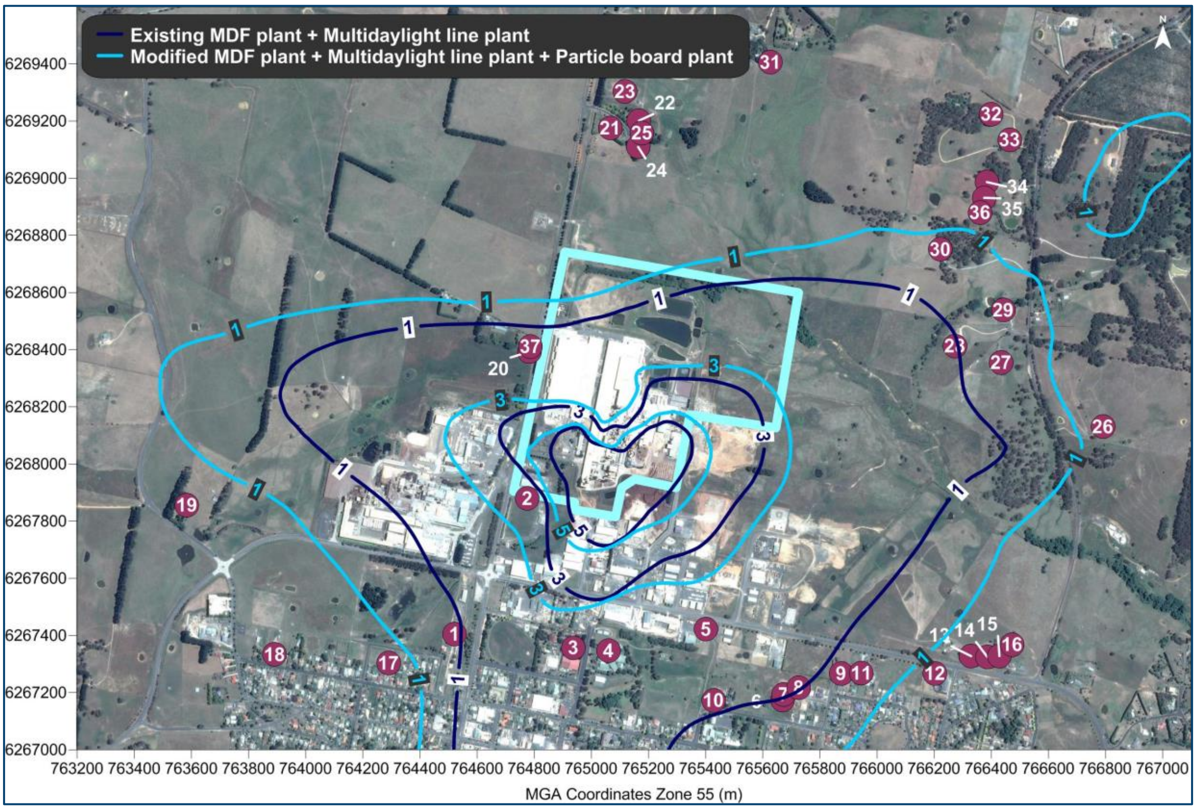

Figure 7-9: Predicted annual average NO_2 concentration (µg/m³) due to the Project

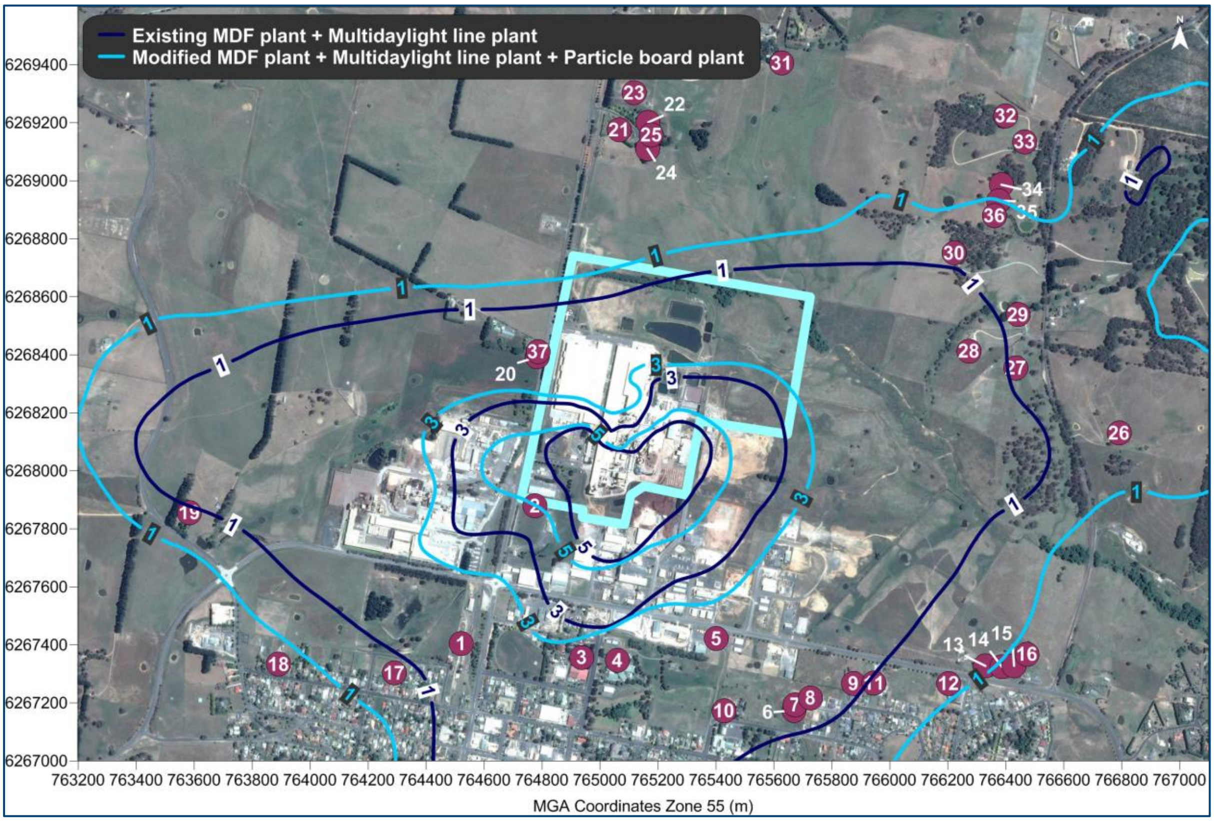

Figure 7-10: Predicted annual average NO_2 concentration (µg/m³) due to the Project and other surrounding industries

7.2 24-hour average PM_{10} impacts

Due to the elevated levels in the monitoring data, the screening Level 1 approach of adding maximum background levels with maximum predicted Project only levels would not be appropriate for assessing the potential 24-hour average PM_{10} impacts on these elevated days.

In such situations, the NSW EPA approach applies a more thorough Level 2 assessment whereby the measured background level on a given day is added contemporaneously with the corresponding Project level predicted using the same day's weather data.

An assessment of cumulative 24-hour average PM_{10} impacts was undertaken in accordance with the methods outlined in Section 11.2 of the *Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales* (**NSW DEC**, **2005**). The "Level 2 assessment - Contemporaneous impact and background approach" was applied to assess potential impacts. This method factors into the assessment the spatial and temporal variation in background levels affected by the weather and existing sources of dust in the area on a given day. However, the approach has limitations in predicting short term impacts. The approach has been applied at the most potentially affected sensitive receptor locations where there may be persons present for 24 hours or longer.

Ambient (background) dust concentration data for January 2014 to December 2014 from the Bathurst monitor have been applied in the Level 2 contemporaneous 24-hour average PM_{10} assessment.

Table 7-3 provides a summary of the findings of the contemporaneous assessment at each key assessment location. Detailed tables of the full assessment results are provided in **Appendix A**.

The results in **Table 7-3** indicate that the existing and proposed Project is unlikely to exceedance the cumulative 24-hour average PM_{10} impacts at any sensitive receptor.

Table 7-3: NSW EPA contemporaneous assessment - maximum number of additional days above 24-hour average PM_{10} criterion depending on background level at monitoring sites

Receptor ID	Maximum number of additional days above 24-hour average PM_{10} criterion	
	Existing	Proposed
5	0	0
20	0	0
24	0	0
28	0	0
30	0	0

7.3 Formaldehyde

Table 7-4 presents the 99.9th percentile 1-hour average formaldehyde concentration at the sensitive receptors due to the operations of the existing plant and the proposed Project. The results show that the Project would meet the EPA criteria at all assessed receptor locations.

Table 7-4: Model-predicted formaldehyde impacts of the existing plant and the proposed Project

Receptor ID	99.9th percentile 1-hour average formaldehyde concentration (µg/m³)			
	Existing plant	Existing plant + other industries	Proposed plant	Proposed plant + other industries
	Air quality impact criteria			
	21.8			
1	13.6	13.7	10.4	10.4
2	27.9	28.0	18.5	18.5
3	11.7	11.8	10.7	10.7
4	10.6	10.6	9.9	9.9
5	8.9	8.9	11.1	11.2
6	5.2	5.2	7.5	7.5
7	5.2	5.2	7.4	7.5
8	5.2	5.3	7.2	7.3
9	5.1	5.3	6.7	6.7
10	7.1	7.2	9.5	9.5
11	5.1	5.3	7.1	7.2
12	5.5	5.5	6.8	6.9
13	5.6	5.7	6.9	7.2
14	5.5	5.5	6.8	7.0
15	5.4	5.5	6.7	7.0
16	5.4	5.8	7.0	7.3
17	10.2	10.6	9.3	9.3
18	9.5	12.1	8.2	10.0
19	7.3	12.0	8.8	10.7
20	16.4	16.4	16.3	16.4
21	9.3	9.3	9.6	9.7
22	8.7	8.7	8.1	8.1
23	8.3	8.3	7.9	8.0
24	9.3	9.4	8.8	8.8
25	8.8	8.8	9.6	8.6
26	6.9	8.0	8.3	8.4
27	6.4	6.9	8.1	7.9
28	6.4	7.5	9.0	8.4
29	6.5	7.9	9.1	8.5
30	8.8	10.0	10.4	10.1
31	8.2	8.4	8.0	7.3
32	8.5	9.4	9.5	9.3
33	8.1	9.6	9.9	9.6
34	8.2	9.2	10.8	10.3
35	8.3	9.9	10.8	10.3
36	8.7	10.0	10.7	10.4
37	16.3	16.4	17.7	15.3

The spatial distribution of the dispersion modelling predictions for the Project alone and for the Project and other surrounding industries are presented as isopleth diagrams showing the 99.9th percentile 1-hour average formaldehyde concentrations in **Figure 7-11** and **Figure 7-12**, respectively. The thicker isopleth lines indicate the predicted concentration of 21.8µg/m³, corresponding to the criterion level.

As shown in the figures, the maximum one hour average impacts from the existing operation may exceed the NSW EPA formaldehyde criterion outside the plant boundary. However, the proposed operation would substantially reduce the extent of the predicted impacts relative to the existing situation such that maximum one hour average formaldehyde concentrations at the EPA impact assessment criterion remain essentially within the plant boundary. This remains the case even when cumulative impacts with the neighbouring activity are considered.

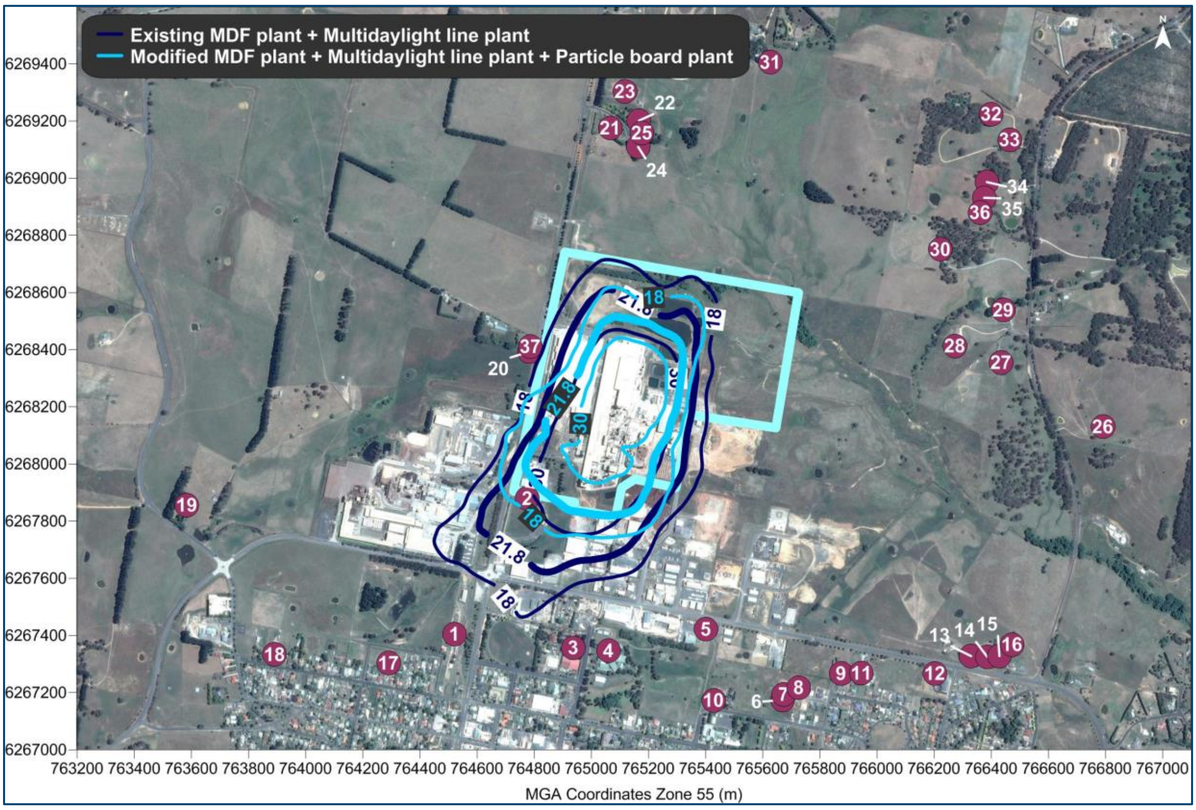

Figure 7-11: Predicted 99.9th percentile 1-hour average formaldehyde concentration (µg/m³) for the Project

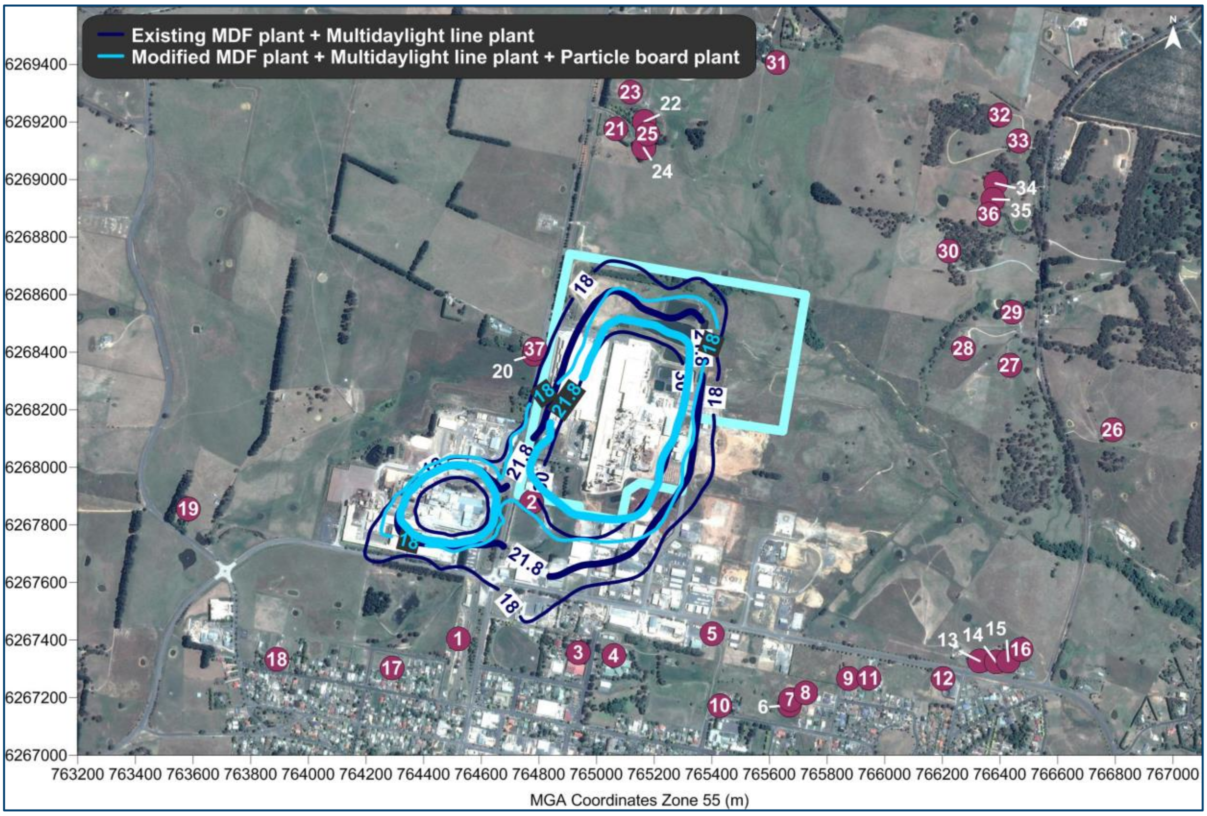

Figure 7-12: Predicted 99.9th percentile 1-hr ave formaldehyde conc (µg/m³) for the Project and surrounding industries

It is noted that the WHO conducted detailed health based studies into the effects of human exposure to formaldehyde in 2010. The WHO criterion is set at 100µg/m³ and is designed to prevent sensory irritation. Potential health impacts occur when exposed to double this level.

Figure 7-13 presents an isopleth plot for the maximum 30-minute average formaldehyde concentration at the WHO guideline of 100µg/m³. The figures show that the predicted formaldehyde concentrations due to the Project, along with those from other nearby industries, would not exceed the WHO limits at any location outside the Project boundary.

Hence no impact in terms of sensory irritation or health impact due to formaldehyde emissions in the locality is predicted to arise off-site.

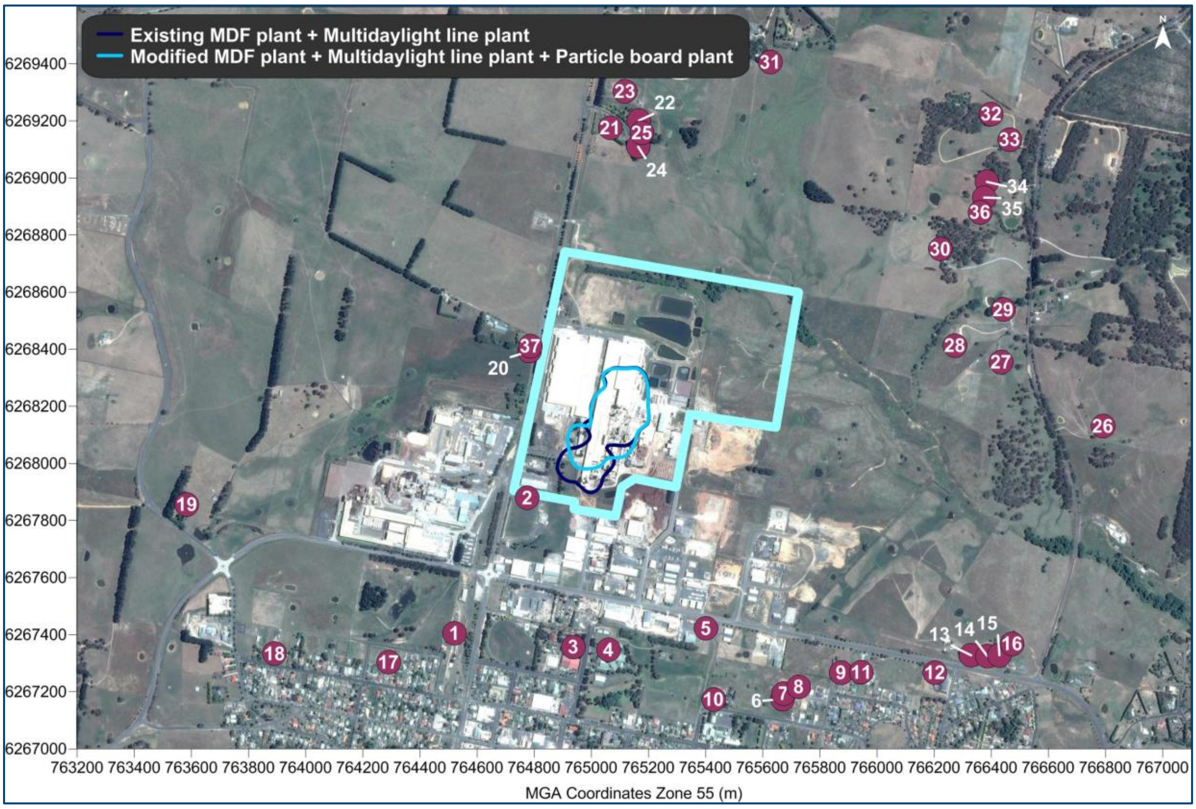

Figure 7-13: Predicted maximum 30-minute average formaldehyde concentration due to the Project and other industries– WHO guideline (100µg/m³)

7.3.1 Sensitivity analysis

A sensitivity analysis was conducted by modelling the emission rates using the average, average plus standard deviation and average minus standard deviation of the historical stack testing results. The modelling results are presented as isopleth plots in **Figure 7-14**. The results show that the predicted formaldehyde concentrations are essentially within the Project boundary, and that there is no predicted level above the EPA criteria on any publically accessible land outside of the Project boundary.

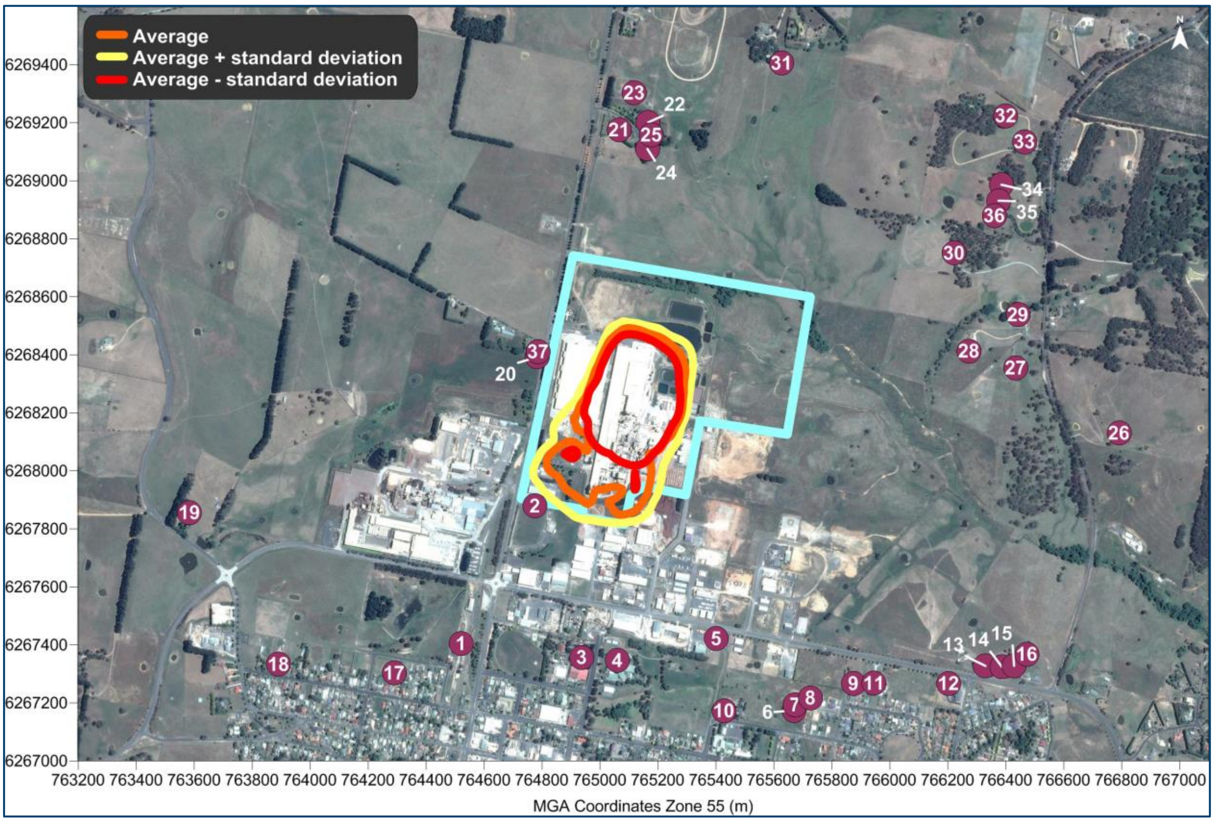

Figure 7-14: Predicted 99.9th percentile 1-hr ave formaldehyde for the Modified MDF Plant and Particle Board Plant – NSW EPA criterion of 21.8µg/m³

Further analysis has been conducted to examine the potential formaldehyde emissions from the Project, as outlined in **Appendix B**.

8 POLLUTION CONTROL

To reduce the potential amount of pollutants emitted by the Project, the Proponent would install and utilise best available technologies on-site. These would include the following:

- Cyclones for process particle capture;
- Wet Electrostatic precipitator (WESP)/scrubber system for the dryer with exhaust gas circulation; and,
- Best available press suction system for the press exhausts.

The recirculation of some of the exhaust gases to heat plant, as part of the existing plant modification, would expose the gases to high temperatures resulting in the oxidation of the contaminants including formaldehyde, thus reducing the quantity of pollutants emitted from the plant.

The WESP and scrubber system would capture small particles and other water-soluble contaminants including formaldehyde. The system would be continually bled and fresh water would be regularly introduced into the system to prevent saturation. This system would thus allow for the effective removal of the contaminants. The scrubber is anticipated to remove up to 70% of the formaldehyde emissions by maintaining good water quality in the system. For conservatism in the assessment, the scrubber has been modelled with only a 30% removal efficiency.

To limit fugitive emissions, a press fume extraction system would be installed on the existing Conti 2 press line to replace the existing roof ventilators, and also on the new PB Plant (instead of roof ventilators). The system would allow the capture of most of the emissions from the press lines and direct these into the scrubber oxidation system for treatment prior to release to the atmosphere via a stack, (instead of the existing release of untreated emissions from the roof-level ventilators and other fugitive sources). The system would thus also improve the air quality inside the press line building for the benefit of the workers.

The Proponent is currently examining the feasibility of capturing formalin (*i.e.* formaldehyde dissolved in water) in a reactive bark filter. This bark would then be used as a fuel in the heat plant resulting in the thermal destruction of formaldehyde. A potential side benefit is an anticipated reduction in NO_X emitted by the furnace due to the cooler flame temperature arising from a portion of the fuel stream being high moisture bark.

8.1 Pollution Reduction Program

The Proponent is committed to reducing its environmental impacts where it is possible (practicable and economically viable) to do so, and plans to conduct a pollution reduction program for the plant. It is suggested that this would be conducted in two parts as follows;

Part 1.

a) A detailed examination of the existing processes to identify the potential for emissions reductions, with a primary focus on formaldehyde;

b) This may include measurement (stack testing) of the existing unmonitored sources, with a focus on formaldehyde.

c) Where practicable and economically feasible measures can be put into place, a description of the measures and a timeframe for their implementation would be provided. This may range from minor changes to parts of the existing plant or pollution control, through to large scale upgrades of existing plant or processes. Any large scale changes may be subject to planning approval timelines.

Part 2. (Post Part 1 or in parallel with Part 1 as timeframes allow).

d) Measurement (stack testing) of the proposed and modified emissions sources would be conducted as part of the commissioning of the proposed Project,

e) Further air quality modelling would be conducted to determine the likely actual effects of the best practice mitigation at c) if any, by utilising the actual stack test results from b), and/or if the results at d), or any other new information about the existing sources (or other PRP related changes to existing other plant which may be identified show greater emissions than assumed.

9 SUMMARY AND CONCLUSIONS

This study has examined the potential air quality impacts which may arise due to the Project.

The study applies generally conservative assumptions and applies stack testing data and manufacturer's specifications supplied by the Proponent to calculate the potential emissions from the Project.

The Project in-stack emission concentrations are all below the POEO limits, and would remain so due to the Project.

The proposed modification to emissions point "EPA 11" would direct additional new emissions sources through this stack, thus the existing EPA licence limit for TSP may need to be amended to reflect the revised stack configuration. It should be noted that the assumed emission values in the modelling have not taken into effect any destruction of the redirected TSP afforded by the furnace, and the actual TSP emissions form this point may be lower than assumed.

The CALPUFF model is used to predict the potential off-site effects which may arise due to emissions from the Project, including other sources and background pollutant levels as applicable.

The results indicate that the Project is unlikely to lead to any exceedance of any criteria at any residential receptor at any time.

The Project would significantly reduce the currently approved off-site formaldehyde levels and would essentially limit the impacts to within the plant boundary and not result in any formaldehyde levels above EPA criteria on any publically accessible land.

Importantly, the predicted formaldehyde concentrations would not exceed the more current, health based WHO formaldehyde guideline to prevent sensory irritation, set at a concentration that is half of that necessary to protect against the onset of any harm to health.

Hence by comparison of the results with the EPA and WHO criteria, it can be concluded that no impact in terms of sensory irritation or health due to formaldehyde is predicted to arise outside of the plant boundary as a result of the Project.

Overall, the study finds that the Project would not lead to any unacceptable or harmful level of air pollutants off-site.

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"Generic Guidance and Optimum Model Setting for the CALPUFF Modelling System", prepared for NSW OEH, March 2011.

WHO (2010)

"WHO guidelines for indoor air quality: selected pollutants", World Health Organization, 2010.

Appendix A

Further detail regarding 24-hour PM_{10} analysis

Contemporaneous assessment per NSW EPA Approved Methods

The analysis below provides a detailed cumulative 24-hour PM_{10} impact assessment per the NSW EPA Approved Methods; refer to the worked example on Page 52 to 54 of the Approved Methods.

The background level is the total ambient measured level at the nearest monitoring station to the sensitive receptor for the said date.

The predicted increment is the change in level predicted to occur at the receptor due to the Project.

The total is the sum of the background level and the predicted level due to the Project.

Each table assesses one receptor individually. The left hand half of the table examines the cumulative impact during the periods of highest background levels and the right hand half of the table examines the cumulative impact during the periods of highest contribution from the Project.

The green shading represents days where the existing background level is below the criterion.

The values in **bold red** are above the criteria.

Table A-1 to **Table A-5** show the predicted maximum PM_{10} cumulative levels for the existing sources at each of the most-affected receptors surrounding the Project.

Table A-6 to **Table A-10** show the predicted maximum PM_{10} cumulative levels for the proposed sources at each of the most-affected receptors surrounding the Project.

Table A-1: Receptor 5 (PM_{10} 24-hr average concentration) (µg/m³) – existing sources

Ranked by Highest to Lowest Background Concentration				Ranked by Highest to Lowest Predicted incremental Concentration			
Date	Measured background level	Predicted increment due to Project	Total cumulative 24-hr average level	Date	Measured background level	Predicted increment due to Project	Total cumulative 24-hr average level
17/12/2014	42.8	0.0	42.8	19/02/2014	12.2	13.4	25.6
14/11/2014	41.0	4.3	45.3	1/12/2014	16.3	13.1	29.4
24/11/2014	38.3	4.1	42.4	9/09/2014	10.1	11.7	21.8
15/11/2014	37.7	0.6	38.3	25/12/2014	10.1	11.1	21.2
16/01/2014	37.6	1.5	39.1	15/03/2014	10.4	10.9	21.3
23/11/2014	37.4	6.3	43.7	27/05/2014	15.7	10.5	26.2
17/01/2014	36.4	0.4	36.8	10/04/2014	14.7	10.3	25.0
10/02/2014	35.7	0.1	35.8	19/06/2014	11.7	9.5	21.2
30/12/2014	35.7	0.0	35.7	20/11/2014	26.2	9.2	35.4
7/01/2014	35.6	0.3	35.9	9/07/2014	11.9	9.2	21.1

Table A-2: Receptor 20 (PM_{10} 24-hr average concentration) (µg/m³) – existing sources

Ranked by Highest to Lowest Background Concentration				Ranked by Highest to Lowest Predicted incremental Concentration			
Date	Measured background level	Predicted increment due to Project	Total cumulative 24-hr average level	Date	Measured background level	Predicted increment due to Project	Total cumulative 24-hr average level
17/12/2014	42.8	1.0	43.8	12/12/2014	10.3	18.1	28.4
14/11/2014	41.0	0.0	41.0	5/09/2014	8.0	17.0	25.0
24/11/2014	38.3	0.1	38.4	9/06/2014	11.6	16.7	28.3
15/11/2014	37.7	0.0	37.7	28/08/2014	8.6	16.1	24.7
16/01/2014	37.6	1.5	39.1	6/06/2014	10.0	15.2	25.2
23/11/2014	37.4	0.7	38.1	7/11/2014	19.8	15.0	34.8
17/01/2014	36.4	0.0	36.4	22/02/2014	19.9	14.6	34.5
10/02/2014	35.7	5.1	40.8	20/08/2014	8.7	14.0	22.7
30/12/2014	35.7	0.0	35.7	27/08/2014	7.3	13.9	21.2
7/01/2014	35.6	4.2	39.8	6/04/2014	6.5	13.6	20.1

Table A-3: Receptor 24 (PM_{10} 24-hr average concentration) (µg/m³) – existing sources

Ranked by Highest to Lowest Background Concentration				Ranked by Highest to Lowest Predicted incremental Concentration			
Date	Measured background level	Predicted increment due to Project	Total cumulative 24-hr average level	Date	Measured background level	Predicted increment due to Project	Total cumulative 24-hr average level
17/12/2014	42.8	0.1	42.9	19/07/2014	10.6	10.3	20.9
14/11/2014	41.0	0.0	41.0	12/04/2014	7.7	10.2	17.9
24/11/2014	38.3	0.0	38.3	4/09/2014	7.9	9.1	17.0
15/11/2014	37.7	0.0	37.7	18/08/2014	4.9	7.4	12.3
16/01/2014	37.6	0.0	37.6	19/08/2014	6.7	6.7	13.4
23/11/2014	37.4	0.6	38.0	29/08/2014	8.2	6.5	14.7
17/01/2014	36.4	0.0	36.4	7/06/2014	9.1	6.3	15.4
10/02/2014	35.7	0.6	36.3	8/06/2014	11.0	5.3	16.3
30/12/2014	35.7	0.4	36.1	17/04/2014	12.3	4.7	17.0
7/01/2014	35.6	0.1	35.7	21/05/2014	17.7	4.6	22.3

Table A-4: Receptor 28 (PM_{10} 24-hr average concentration) (µg/m³) – existing sources

Ranked by Highest to Lowest Background Concentration				Ranked by Highest to Lowest Predicted incremental Concentration			
Date	Measured background level	Predicted increment due to Project	Total cumulative 24-hr average level	Date	Measured background level	Predicted increment due to Project	Total cumulative 24-hr average level
17/12/2014	42.8	3.2	46.0	17/09/2014	9.8	10.6	20.4
14/11/2014	41.0	0.0	41.0	4/05/2014	8.0	9.8	17.8
24/11/2014	38.3	0.9	39.2	6/07/2014	6.3	9.8	16.1
15/11/2014	37.7	3.9	41.6	30/06/2014	5.7	9.5	15.2
16/01/2014	37.6	0.0	37.6	11/07/2014	7.9	7.2	15.1
23/11/2014	37.4	0.9	38.3	12/07/2014	7.5	6.8	14.3
17/01/2014	36.4	0.0	36.4	30/12/2014	35.7	6.8	42.5
10/02/2014	35.7	0.0	35.7	24/05/2014	19.1	6.7	25.8
30/12/2014	35.7	6.8	42.5	17/06/2014	8.6	6.3	14.9
7/01/2014	35.6	0.1	35.7	15/06/2014	7.5	6.2	13.7

Table A-5: Receptor 30 (PM_{10} 24-hr average concentration) (µg/m³) – existing sources

Ranked by Highest to Lowest Background Concentration				Ranked by Highest to Lowest Predicted incremental Concentration			
Date	Measured background level	Predicted increment due to Project	Total cumulative 24-hr average level	Date	Measured background level	Predicted increment due to Project	Total cumulative 24-hr average level
17/12/2014	42.8	5.4	48.2	7/07/2014	4.8	13.5	18.3
14/11/2014	41.0	0.0	41.0	15/06/2014	7.5	13.4	20.9
24/11/2014	38.3	0.7	39.0	18/09/2014	9.2	9.8	19.0
15/11/2014	37.7	0.9	38.6	2/11/2014	9.5	7.3	16.8
16/01/2014	37.6	0.0	37.6	17/11/2014	6.1	7.0	13.1
23/11/2014	37.4	0.4	37.8	11/09/2014	11.0	6.9	17.9
17/01/2014	36.4	0.0	36.4	6/07/2014	6.3	6.4	12.7
10/02/2014	35.7	0.1	35.8	30/06/2014	5.7	6.3	12.0
30/12/2014	35.7	2.1	37.8	5/05/2014	8.0	6.3	14.3
7/01/2014	35.6	0.1	35.7	25/11/2014	16.9	6.1	23.0

Table A-6: Receptor 5 (PM_{10} 24-hr average concentration) (µg/m³) – proposed sources

Ranked by Highest to Lowest Background Concentration				Ranked by Highest to Lowest Predicted incremental Concentration			
Date	Measured background level	Predicted increment due to Project	Total cumulative 24-hr average level	Date	Measured background level	Predicted increment due to Project	Total cumulative 24-hr average level
17/12/2014	42.8	0.0	42.8	19/02/2014	12.2	15.2	27.4
14/11/2014	41.0	5.0	46.0	1/12/2014	16.3	14.0	30.3
24/11/2014	38.3	4.9	43.2	15/03/2014	10.4	12.7	23.1
15/11/2014	37.7	0.8	38.5	25/12/2014	10.1	12.6	22.7
16/01/2014	37.6	1.6	39.2	27/05/2014	15.7	12.2	27.9
23/11/2014	37.4	7.2	44.6	9/09/2014	10.1	11.7	21.8
17/01/2014	36.4	0.4	36.8	20/11/2014	26.2	11.0	37.2
10/02/2014	35.7	0.1	35.8	10/04/2014	14.7	11.0	25.7
30/12/2014	35.7	0.0	35.7	10/05/2014	12.4	10.9	23.3
7/01/2014	35.6	0.3	35.9	19/06/2014	11.7	10.5	22.2

Table A-7: Receptor 20 (PM_{10} 24-hr average concentration) (µg/m³) – proposed sources

Ranked by Highest to Lowest Background Concentration				Ranked by Highest to Lowest Predicted incremental Concentration			
Date	Measured background level	Predicted increment due to Project	Total cumulative 24-hr average level	Date	Measured background level	Predicted increment due to Project	Total cumulative 24-hr average level
17/12/2014	42.8	1.0	43.8	5/09/2014	8.0	17.1	25.1
14/11/2014	41.0	0.0	41.0	7/11/2014	19.8	17.0	36.8
24/11/2014	38.3	0.1	38.4	12/12/2014	10.3	16.1	26.4
15/11/2014	37.7	0.0	37.7	9/06/2014	11.6	16.0	27.6
16/01/2014	37.6	1.5	39.1	6/06/2014	10.0	15.9	25.9
23/11/2014	37.4	0.6	38.0	22/02/2014	19.9	15.7	35.6
17/01/2014	36.4	0.0	36.4	20/08/2014	8.7	15.5	24.2
10/02/2014	35.7	4.5	40.2	30/08/2014	8.3	15.1	23.4
30/12/2014	35.7	0.0	35.7	28/08/2014	8.6	15.1	23.7
7/01/2014	35.6	4.8	40.4	6/04/2014	6.5	14.4	20.9

Table A-8: Receptor 24 (PM_{10} 24-hr average concentration) (µg/m³) – proposed sources

Ranked by Highest to Lowest Background Concentration				Ranked by Highest to Lowest Predicted incremental Concentration			
Date	Measured background level	Predicted increment due to Project	Total cumulative 24-hr average level	Date	Measured background level	Predicted increment due to Project	Total cumulative 24-hr average level
17/12/2014	42.8	0.1	42.9	19/07/2014	10.6	11.2	21.8
14/11/2014	41.0	0.0	41.0	12/04/2014	7.7	10.8	18.5
24/11/2014	38.3	0.0	38.3	4/09/2014	7.9	9.8	17.7
15/11/2014	37.7	0.0	37.7	18/08/2014	4.9	8.8	13.7
16/01/2014	37.6	0.0	37.6	29/08/2014	8.2	7.1	15.3
23/11/2014	37.4	0.6	38.0	7/06/2014	9.1	6.2	15.3
17/01/2014	36.4	0.0	36.4	19/08/2014	6.7	6.2	12.9
10/02/2014	35.7	0.6	36.3	20/09/2014	12.5	5.7	18.2
30/12/2014	35.7	0.5	36.2	8/06/2014	11	5.6	16.6
7/01/2014	35.6	0.1	35.7	17/04/2014	12.3	5.3	17.6

Table A-9: Receptor 28 (PM_{10} 24-hr average concentration) (µg/m³) – proposed sources

Ranked by Highest to Lowest Background Concentration				Ranked by Highest to Lowest Predicted incremental Concentration			
Date	Measured background level	Predicted increment due to Project	Total cumulative 24-hr average level	Date	Measured background level	Predicted increment due to Project	Total cumulative 24-hr average level
17/12/2014	42.8	3.8	46.6	17/09/2014	9.8	12.1	21.9
14/11/2014	41.0	0.0	41.0	4/05/2014	8.0	11.1	19.1
24/11/2014	38.3	1.0	39.3	6/07/2014	6.3	11.1	17.4
15/11/2014	37.7	4.4	42.1	30/06/2014	5.7	10.7	16.4
16/01/2014	37.6	0.0	37.6	11/07/2014	7.9	8.0	15.9
23/11/2014	37.4	1.1	38.5	12/07/2014	7.5	7.7	15.2
17/01/2014	36.4	0.0	36.4	30/12/2014	35.7	7.6	43.3
10/02/2014	35.7	0.1	35.8	24/05/2014	19.1	7.5	26.6
30/12/2014	35.7	7.6	43.3	17/06/2014	8.6	7.1	15.7
7/01/2014	35.6	0.1	35.7	16/10/2014	10.1	6.8	16.9

Table A-10: Receptor 30 (PM_{10} 24-hr average concentration) ($\mu g/m^3$) – proposed sources

Ranked by Highest to Lowest Background Concentration				Ranked by Highest to Lowest Predicted incremental Concentration			
Date	Measured background level	Predicted increment due to Project	Total cumulative 24-hr average level	Date	Measured background level	Predicted increment due to Project	Total cumulative 24-hr average level
17/12/2014	42.8	5.7	48.5	15/06/2014	7.5	15.1	22.6
14/11/2014	41.0	0.0	41.0	7/07/2014	4.8	15.0	19.8
24/11/2014	38.3	0.8	39.1	18/09/2014	9.2	11.8	21.0
15/11/2014	37.7	1.0	38.7	2/11/2014	9.5	8.6	18.1
16/01/2014	37.6	0.0	37.6	11/09/2014	1.01	8.1	19.1
23/11/2014	37.4	0.5	37.9	17/11/2014	6.1	8.0	14.1
17/01/2014	36.4	0.0	36.4	30/06/2014	5.7	7.3	13.0
10/02/2014	35.7	0.1	35.8	6/07/2014	6.3	7.1	13.4
30/12/2014	35.7	2.5	38.2	5/05/2014	8.0	6.9	14.9
7/01/2014	35.6	0.1	35.7	25/11/2014	16.9	6.8	23.7

Appendix B

Further analysis of off-site formaldehyde concentrations

Contribution analysis - formaldehyde

Figure B-1 and **Figure B-2** present isopleth plots for the predicted 99.9th percentile 1-hour average formaldehyde concentration due to the existing and proposed Project, respectively. (The figures show the same data that are shown combined in **Figure 7-11**).

As shown, there would be a substantial decrease in formaldehyde impacts due to the operation of the proposed Project.

It is thus desirable to understand how this comes about and which sources contribute to the off-site formaldehyde concentrations.

Figure B-3 presents an isopleth plot for the predicted 99.9th percentile 1-hour average formaldehyde concentration due to the existing plant and the existing plant with the proposed new PB plant. The results show that the proposed new PB plant makes only a small difference to the current situation in regard to off-site formaldehyde concentrations.

This suggests that the main cause of the predicted formaldehyde impact is the existing plant.

Figure B-4 presents an isopleth plot for the predicted 99.9th percentile 1-hour average formaldehyde concentration due to the operation of the PB plant alone. It is noted that the maximum PB plant contribution does not occur at the same time as the maximum contribution from the existing plant, thus the levels shown in **Figure B-4** cannot be directly added with those shown in say **Figure B-1** or **Figure B-2**.

As part of the proposed Project and installation of the PB plant, the proponent proposes to modify the existing MDF plant to reduce the overall formaldehyde impact. **Figure B-5** presents an isopleth plot for the predicted 99.9th percentile 1-hour average formaldehyde concentration due to the modified MDF plant with the existing MDL plant. The figure shows a substantial improvement of the predicted formaldehyde levels from the existing Project due to the proposed modifications.

This confirms that the maximum off-site impacts are indeed primarily influenced by the existing activities, rather than the proposed new PB line.

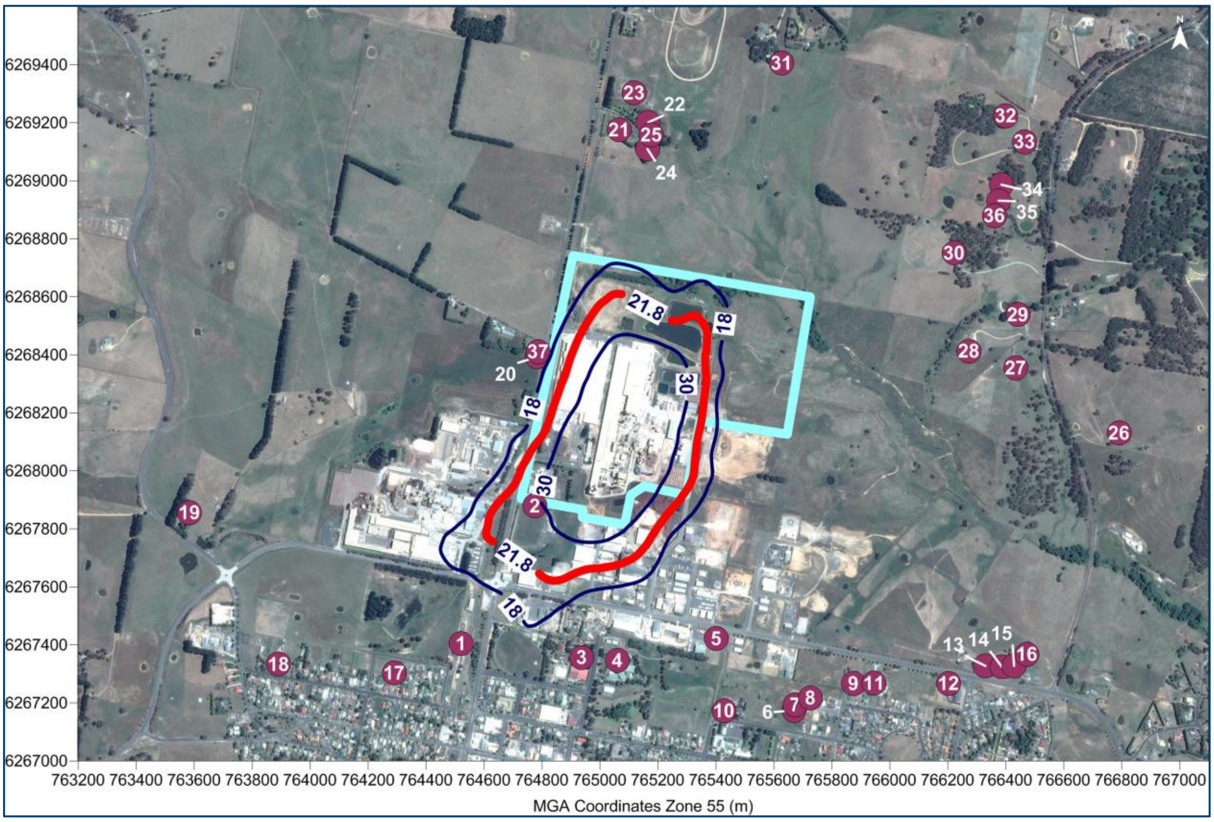

Figure B-1: Predicted 99.9th percentile 1-hour average formaldehyde concentration (µg/m³) for the Project - existing

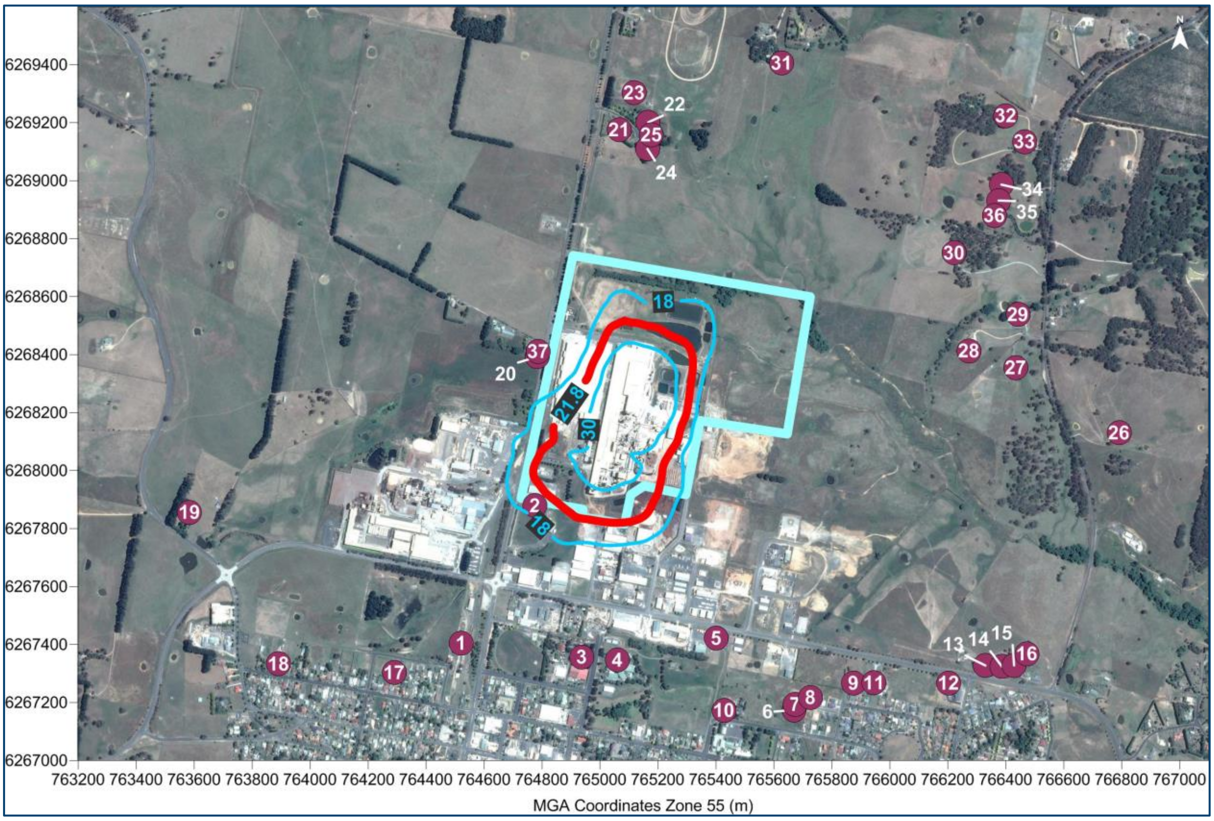

Figure B-2: Predicted 99.9th percentile 1-hour average formaldehyde concentration (µg/m³) for the Project - proposed

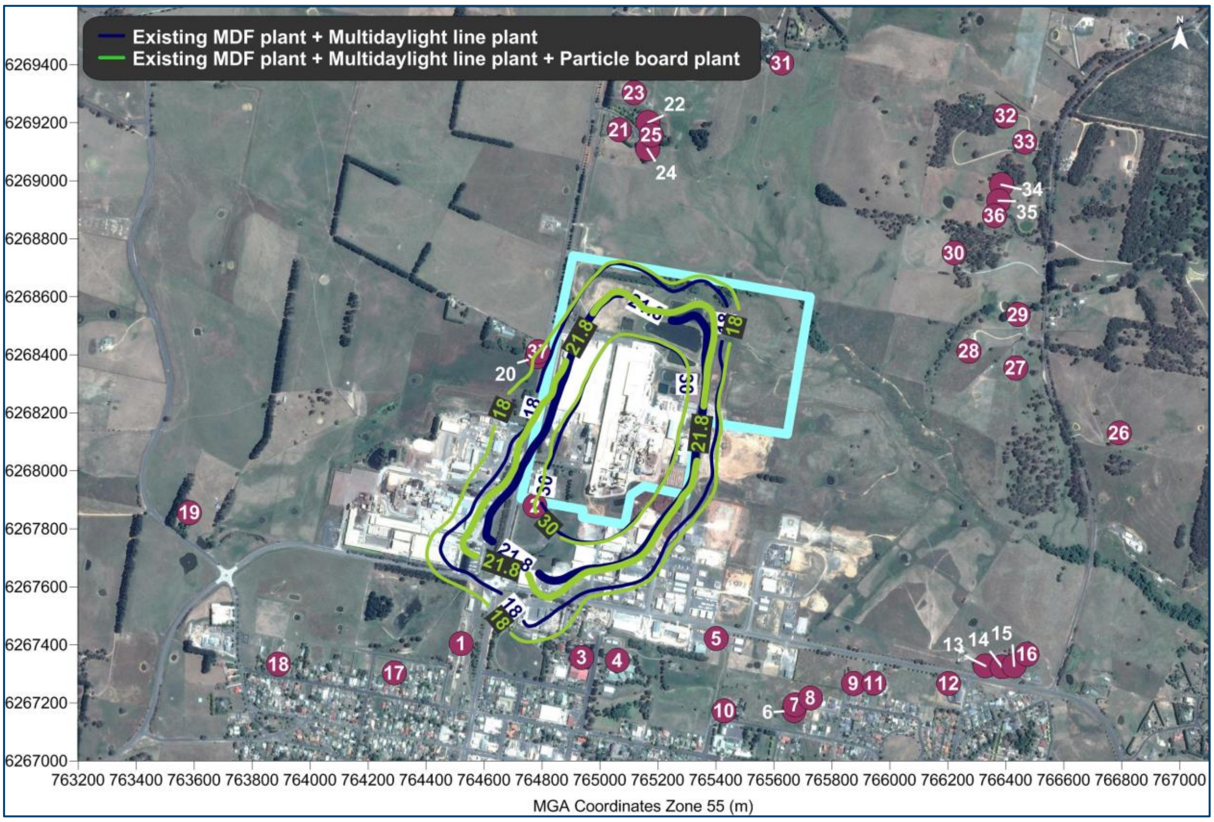

Figure B-3: Predicted 99.9th percentile 1-hour average formaldehyde concentration (µg/m³) for the Project

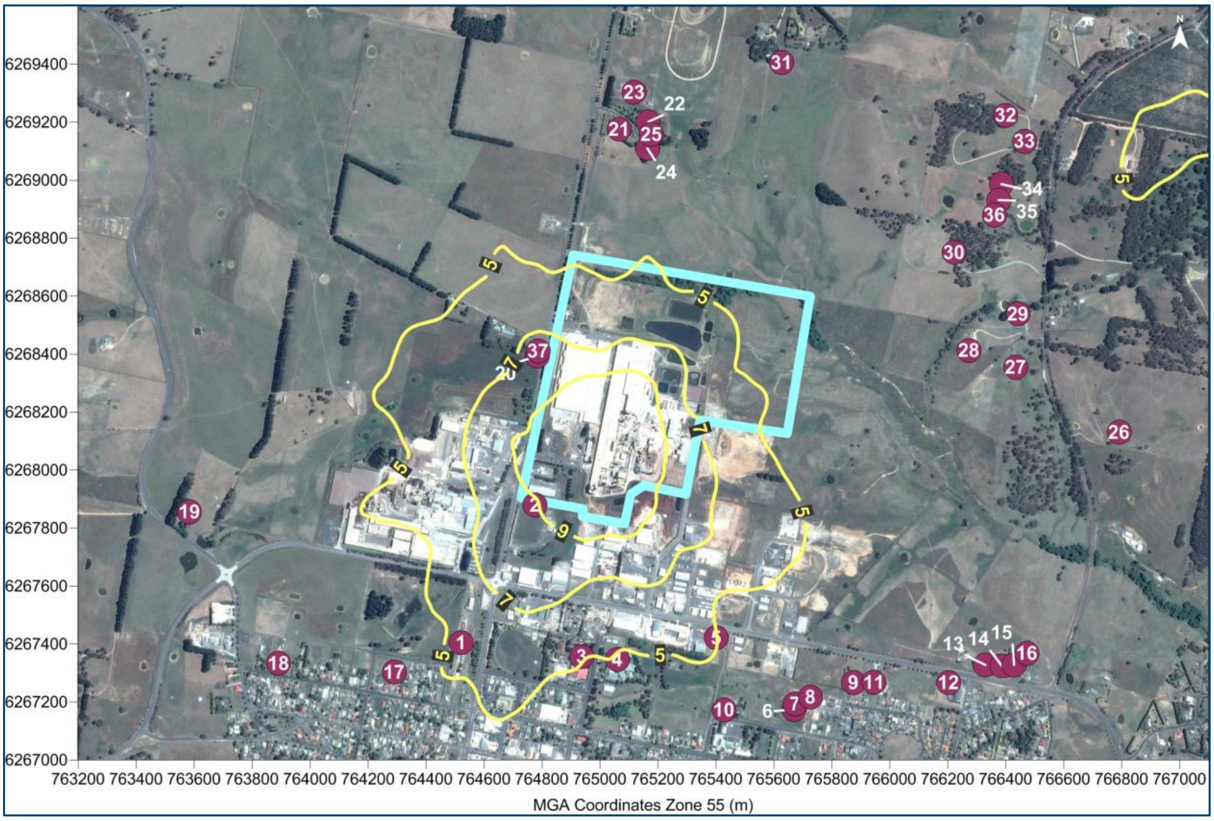

Figure B-4: Predicted 99.9th percentile 1-hour average formaldehyde concentration (µg/m³) for the PB Plant only

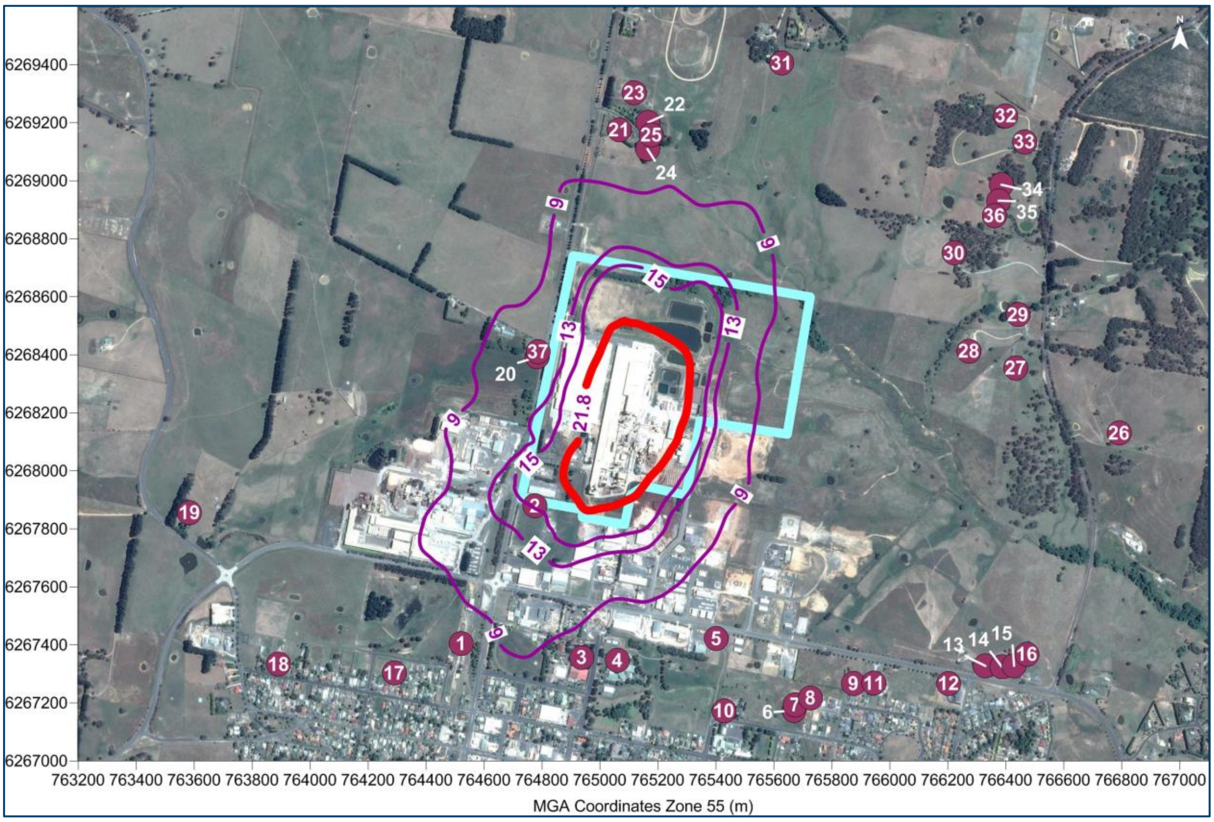

Figure B-5: Predicted 99.9th percentile 1-hr ave formaldehyde (µg/m³) for the Modified MDF Plant and Existing MDL Plant Only