32. Air quality

32.1. Introduction

This chapter considers the potential local and regional air quality impacts and the anticipated greenhouse gas emissions associated with the long term development of the proposed airport. It builds on the consideration of potential air quality impacts associated with the Stage 1 development presented in Chapter 12 of Volume 2 and is based upon technical reports in relation to local air quality and greenhouse gas emissions (included as Appendix F1 in Volume 4) and regional air quality (included as Appendix F2 in Volume 4).

The assessment of the air quality impacts of the Stage 1 development presented in Volume 2 includes a detailed description of the existing environment at the airport site, including a description of existing meteorological conditions and ambient air quality in the vicinity of the site.

For the purpose of the assessment, local air quality was defined as being within a five kilometre radius of the airport site and regional air quality refers to the wider Sydney basin. Regional air quality considers the formation of secondary pollutants (such as ozone (O_3) through photochemical reactions from primary emissions from the proposed airport.

32.2. Methodology

The air quality and greenhouse gases assessment includes a review of climatic data obtained from the airport site and an analysis of ambient air quality based on data collected from monitoring stations in the vicinity of the airport site. Air quality impacts associated with the operation of the airport were modelled to assess impacts at representative sensitive receivers located in the vicinity of the airport site. Other air quality parameters that were assessed include odour (from aircraft exhaust and the on-site wastewater treatment plant), regional air quality impacts (ozone) and greenhouse gas emissions. For further detail on the methodology, refer to Chapter 12 in Volume 2 and Appendix F in Volume 4.

32.3. Existing environment

Meteorological conditions such as wind speed and direction, temperature and humidity affect the potential dispersion of air emissions. Climatic data recorded at the airport site across the five year period 2010–2014 indicated:

- average wind speed of 2.6 metres per second, with calm conditions (winds less than 0.5 metres per second) about nine per cent of the time;
- wind direction typically from the south-west, followed by the south-south-west and north;
- annual average temperature of 17 degrees Celsius;
- January as the hottest month, averaging 23 degrees Celsius;
- June/July as the coldest months, averaging 11 and 10 degrees, respectively; and
- average annual relative humidity of 73 per cent.

Ambient air quality was measured at Bringelly, in the vicinity of the airport site. Measurements were undertaken for a number of key parameters including nitrogen dioxide, particulate matter and ozone. Air quality data over the 10 year period 2005–14 indicated:

- nitrogen dioxide (and other nitrogen oxides) levels were well below the relevant criteria;
- particulate matter (PM_{10}) occasionally exceeding the relevant criteria, likely to be associated with bushfire and surrounding population centres; and
- ozone exceeding the relevant criteria on multiple occasions.

More information on ambient air quality in the vicinity of the airport site is provided in Chapter 12 of Volume 2.

32.4. Assessment of impacts during operation

This section describes the results of the emission calculations and air dispersion modelling for the long term operation of the airport.

32.4.1. Emissions

The emissions of criteria pollutants (as defined in Chapter 12) from the long term development are presented in Figure 32-1. Incremental emissions comprise emissions from aircraft, auxiliary power units, ground support equipment, parking facilities, terminal traffic, stationary sources and training fires. Cumulative emissions include background pollutant concentrations, modelled emissions from the airport and other projects in addition to vehicular emissions from external roadways in the study area.

The emissions inventory for the long term development in 2063 is presented by source type in Table 32–1. The anticipated percentage contribution of each source category is shown alongside the emission value. Emissions totals have been provided with and without the cumulative contributions from external roadways within the study area.

Review of the incremental emissions (that is, those emissions from within the airport site only) show that aircraft engines would generally be the most significant source of emissions. Aircraft would generate approximately 56 per cent of carbon monoxide emissions and approximately 91 and 88 per cent respectively of nitrogen oxides and sulfur dioxide emissions on the airport site. Auxiliary power units, ground support equipment, parking facilities and terminal traffic would also be significant emissions sources.

Figure 32-2 shows the proposed airport emissions and emissions from traffic on external roads as a percentage of the total modelled emissions within the study area. The cumulative contributions from traffic on the external roadways account for an estimated 82 per cent of PM_{10}, 75 per cent of $PM_{2.5}$, 69 percent of carbon monoxide and 28 per cent of nitrogen oxides emissions. The relative contribution of nitrogen oxides and volatile organic compounds from airport sources increases significantly in comparison to the Stage 1 development and in comparison to the growth in vehicles on the surrounding road network.

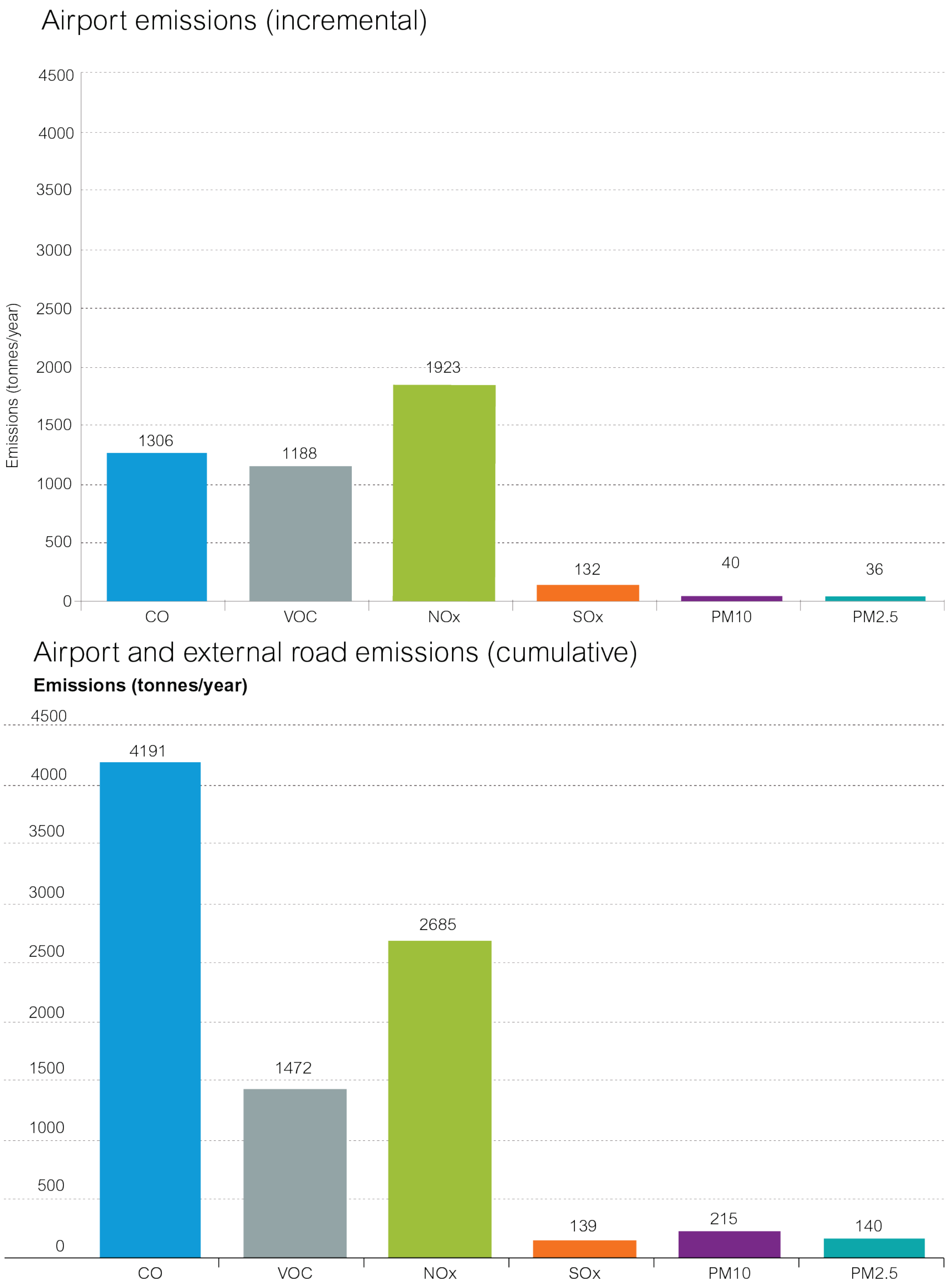
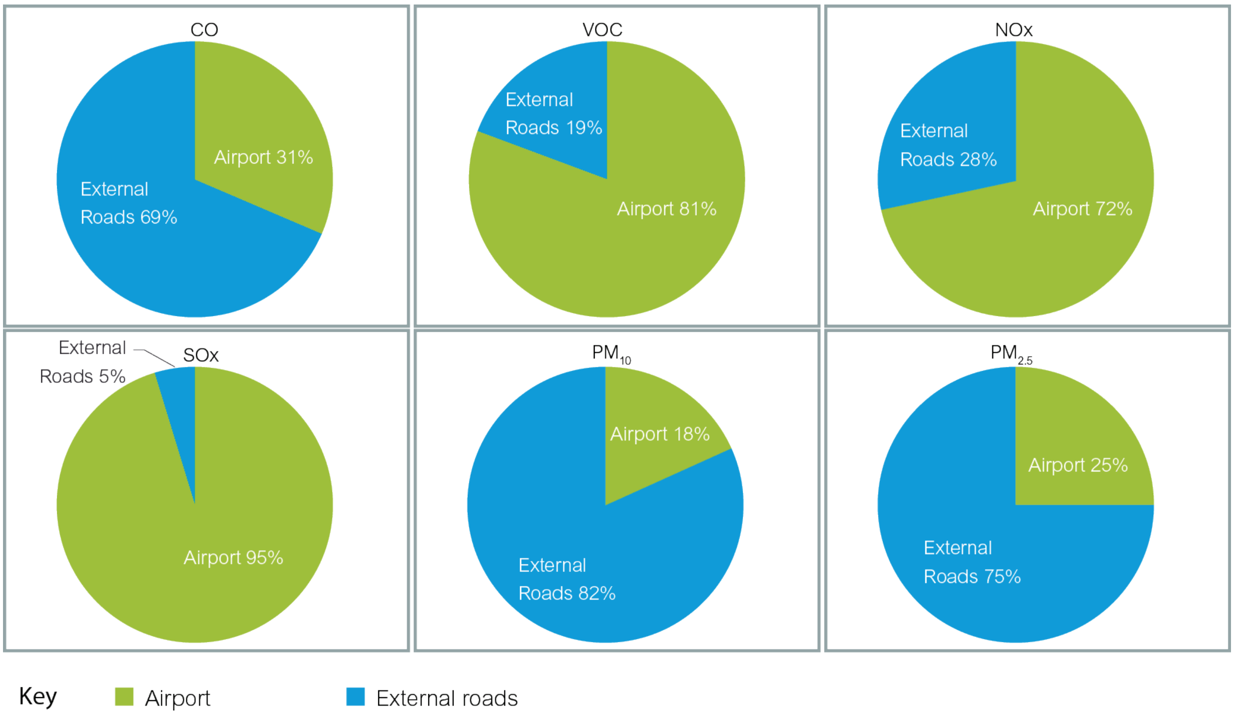


Figure 32-1 – Total estimated emissions for criteria pollutants (long term development)

Table 32–1 – Proposed airport emission inventory for criteria pollutants (long term development)

Category	Emissions (tonnes per year)											
	CO		VOC		NO_x		SO_2		PM_{10}		$PM_{2.5}$	
Aircraft	729	56%	131.9	11%	1,756	91%	116	88%	7.8	20%	7.8	22%
Ground support equipment	159	12%	7.2	1%	15.0	1%	1.7	1%	1.0	3%	1.0	3%
Auxiliary power units	18	1%	1.8	0%	64.4	3%	6.6	5%	3.9	10%	3.9	11%
Parking facilities	127	10%	13.7	1%	5.7	0%	0.1	0%	0.3	1%	0.2	0%
Terminal traffic	182	14%	17.8	2%	38.1	2%	0.3	0%	8.3	21%	4.7	13%
Stationary sources	15.3	1%	507	43%	21.6	1%	6.5	5%	1.6	4%	1.6	4%
Boilers	14.5	1%	1.0	0%	17.8	1%	0.1	0%	1.3	3%	1.3	4%
Engine tests	0.0	0%	1.2	0%	0.0	0%	0.0	0%	0.0	0%	0.0	0%
Fuel tanks	-	-	441	37%	-	-	-	-	-	-	-	-
Generators	0.8	0%	0.2	0%	3.8	0%	0.3	0%	0.3	1%	0.3	1%
Paint and solvent	-	-	63.2	5%	-	-	-	-	-	-	-	-
Training fires	61.1	5%	2.0	0%	0.5	0%	0.1	0%	14.9	38%	14.9	42%
Total incremental (airport only)	**1,306**	**100%**	**1,188**	**100%**	**1,923**	**100%**	**132**	**100%**	**40**	**100%**	**36**	**100%**
External roadways	2885	69%	283	19%	762	28%	6.5	5%	176	82%	105	75%
Airport	1,306	31%	1,188	81%	1,923	72%	132	95%	40	18%	36	25%
Total including external roadways	**3,820**	**100%**	**938**	**100%**	**2,609**	**100%**	**130**	**100%**	**204**	**100%**	**133**	**100%**

Note: CO = Carbon monoxide, VOC = Volatile organic compounds, NO_x = Nitrogen oxides, SO_x = Sulfur oxides, PM_{10} and $PM_{2.5}$ = Particulate matter

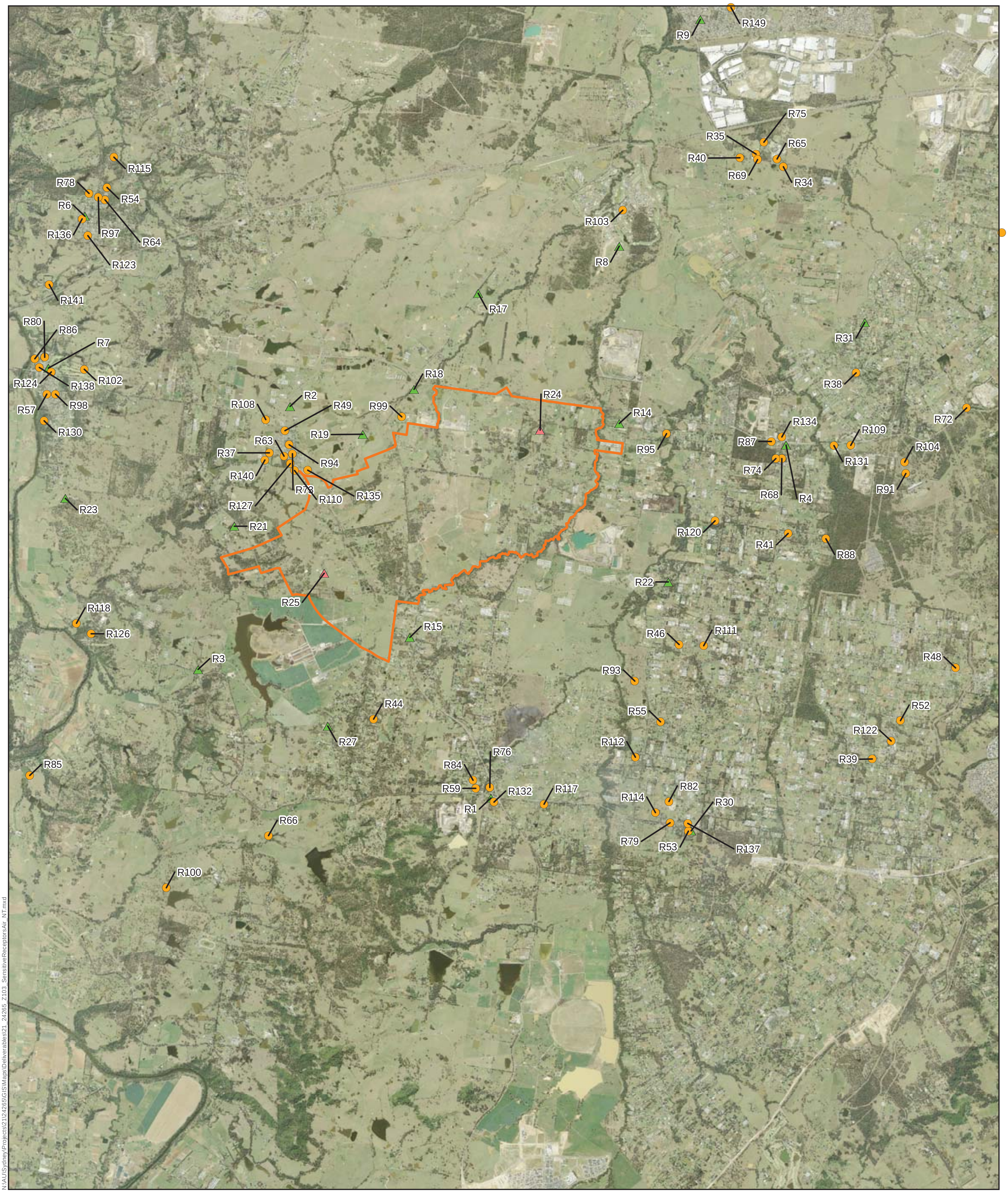


Note: CO = Carbon monoxide, VOC = Volatile organic compounds, NO_x = Nitrogen oxides, SO_x = Sulfur oxides, PM_{10} and $PM_{2.5}$ = Particulate matter

Figure 32-2 – Estimated airport and external roads emissions as a percentage of total modelled for criteria pollutants (long term development)

32.4.2. Dispersion modelling results

Given the uncertainty regarding the future reduction in vehicular and aircraft engine emissions and the anticipated general reduction in background emissions over time, ground level concentration predictions were assessed only for the key criteria pollutants such as nitrogen dioxide and particulate matter (PM_{10} and $PM_{2.5}$) for the long term development. Figure 32-3 shows the location of representative sensitive receptors in the vicinity of the airport site.



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LEGEND

- Airport site
- Community
- Residential
- Airport site

Data Source: Please refer to "Digital Data Sources" on the second page of the EIS

0 0.5 1 2
Kilometres

N

Figure 32-3 - Location of sensitive receptors in the vicinity of the airport site

32.4.2.1. Oxides of nitrogen

The dispersion modelling results for maximum one hour and annual average nitrogen dioxide are presented in Table 32–2. Exceedances of the air quality assessment criteria are shown in bold text. The results of the dispersion modelling show predicted nitrogen dioxide concentrations are expected to be below the air quality assessment criteria at all residential receptors for annual average nitrogen dioxide concentrations when considering the proposed airport in isolation (incremental) and in combination with the external roadways and background sources (cumulative) within the study area.

Exceedances of the one hour average air quality assessment criteria may be experienced at seven of the 20 selected sensitive residential and on-site receptors. These elevated concentrations are predicted to occur for between one and two hours per year. The maximum one hour nitrogen dioxide concentration is predicted to occur at receptor R14, located to the north-west of the airport site.

Table 32–2 – Predicted incremental and cumulative nitrogen dioxide concentrations (long term development)

Receptor	Receptor description	Airport (µg/m^3)			Cumulative (µg/m^3)		
		One hour		Annual	One hour		Annual
Assessment criteria		*320*	*Number of hours > 320*	*62*	*320*	*Number of hours > 320*	*62*
R1	Bringelly	237	0	17	246	0	25
R2	Luddenham	111	0	22	112	0	24
R3	Greendale, Greendale Road	**347**	1	22	**368**	1	24
R4	Kemps Creek	223	0	17	244	0	31
R6	Mulgoa	188	0	18	189	0	19
R7	Wallacia	241	0	17	243	0	18
R8	Twin Creeks, corner of Twin Creek Drive and Humewood Place	155	0	21	164	0	26
R14	Badgerys Creek, Lawson Road,	**517**	1	34	**519**	1	45
R15	Greendale, Mersey Road	**343**	2	31	**349**	2	34
R17	Luddenham Road	310	0	22	313	0	26
R18	Corner of Adams and Elizabeth Drive	229	0	38	229	0	43
R19	Corner of Adams and Anton Road	211	0	47	211	0	50
R21	Corner of Willowdene Avenue and Vicar Park Lane	**408**	1	24	**424**	1	27
R22	Rossmore, Victor Avenue	242	0	18	246	0	23
R23	Wallacia, Greendale Road	**342**	1	15	**347**	1	17
R24	Greendale, Dwyer Road	**335**	1	55	**337**	1	57

Receptor	Receptor description	Airport (µg/m³)			Cumulative (µg/m³)		
		One hour		Annual	One hour		Annual
R25	Rossmore residential	281	0	23	287	0	26
R27	Mt Vernon residential	116	0	14	117	0	16
R30	Bringelly	312	0	14	319	0	36
R31	Luddenham	**345**	1	22	**355**	1	26

32.4.2.2. Particulate matter (PM_{10})

The dispersion modelling results for maximum 24 hour average and annual average PM_{10} are presented in Table 32–3. Exceedances of the air quality assessment criteria are shown in bold text. PM_{10} concentrations are predicted to exceed the 24 hour air quality assessment criteria at one sensitive receptor (R24). This receptor is located within the airport site and represents the air quality conditions that would be likely to be experienced on-site (that is, by both staff and passengers of the proposed airport). For the remaining sensitive receptors, there are no predicted exceedances of the air quality assessment criteria.

There are no exceedances of the annual average air quality assessment criteria at any of the sensitive residential receptors.

Table 32–3 – Predicted incremental and cumulative PM_{10} concentrations (long term development)

Receptor	Receptor description	Airport (µg/m³)		Airport + external roadways (µg/m³)		Cumulative – airport + external roadways + existing background (µg/m³)	
		24 hour	Annual	24 hour	Annual	24 hour	Annual
Assessment criteria		n/a	n/a	n/a	n/a	50	30
R1	Bringelly	3.7	0.1	13.7	1.9	46	19
R2	Luddenham	1.7	0.3	3.6	0.7	43	18
R3	Greendale, Greendale Road	5.7	0.3	7.3	0.6	43	18
R4	Kemps Creek	2.6	0.2	14.7	3.7	48	21
R6	Mulgoa	1.8	0.1	4.5	0.4	43	17
R7	Wallacia	1.3	0.1	2.6	0.4	43	17
R8	Twin Creeks, corner of Twin Creek Drive and Humewood Place	2.2	0.2	4.4	1.2	45	18
R14	Badgerys Creek, Lawson Road	9.6	0.7	15.8	3.1	47	20
R15	Greendale, Mersey Road	6.1	0.5	8.6	1.3	46	18
R17	Luddenham Road	3.4	0.2	6.9	1.2	45	18

Receptor	Receptor description	Airport (µg/m³)		Airport + external roadways (µg/m³)		Cumulative – airport + external roadways + existing background (µg/m³)	
		24 hour	Annual	24 hour	Annual	24 hour	Annual
R18	Corner of Adams and Elizabeth Drive	5.3	0.6	9.4	1.7	46	19
R19	Corner of Adams and Anton Road	5.3	0.8	6.9	1.4	45	18
R21	Corner of Willowdene Avenue and Vicar Park Lane	5.9	0.3	6.9	0.9	44	18
R22	Rossmore, Victor Avenue	4.1	0.2	7.7	1.3	46	18
R23	Wallacia, Greendale Road	2.3	0.1	3.7	0.4	43	17
R24	Greendale, Dwyer Road	31.6	8.9	40.9	11.2	72	28
R25	Rossmore residential	3.6	0.5	5.1	1.2	43	18
R27	Mt Vernon residential	1.4	0.1	2.6	0.4	43	17
R30	Bringelly	1.7	0.1	24.0	5.0	49	22
R31	Luddenham	4.2	0.2	6.5	1.1	44	18

32.4.2.3. Particulate matter ($PM_{2.5}$)

The dispersion modelling results for maximum 24 hour average and annual average $PM_{2.5}$ are presented in Table 32–4. Exceedances of the air quality assessment criteria are shown in bold text. It is predicted that $PM_{2.5}$ concentrations would be above the air quality assessment criteria of 25 µg/m^3 and 8 µg/m^3 for the 24 hour and annual averaging periods at a number of receptors. This is not unexpected for receptor R24, given that it is located within the airport site. The annual criteria are predicted to be exceeded at four other receptors. This is also not unexpected, given that the background contributes almost 90 per cent of the criteria.

The contour plots show that in addition to the proposed airport, the contribution from traffic on external roadways would play a significant role in the ground level concentrations of $PM_{2.5}$ (refer to Appendix F1).

Table 32–4 – Predicted incremental and cumulative $PM_{2.5}$ concentrations (long term development)

Receptor	Receptor description	Airport (µg/m3)		Airport + external roadways (µg/m3)		Cumulative – airport + external roadways + existing background (µg/m3)	
		24 hour	Annual	24 hour	Annual	24 hour	Annual
Assessment criteria		n/a	n/a	n/a	n/a	25	8
R1	Bringelly	2.4	0.1	9.1	1.2	16	8
R2	Luddenham	1.5	0.2	2.4	0.5	14	8
R3	Greendale, Greendale Road	4.3	0.2	5.8	0.4	14	7
R4	Kemps Creek	2.0	0.1	8.4	2.1	18	**9**
R6	Mulgoa	1.6	0.1	3.2	0.3	13	7
R7	Wallacia	1.1	0.1	1.8	0.3	14	7
R8	Twin Creeks, corner of Twin Creek Drive and Humewood Place	1.6	0.2	2.8	0.8	15	8
R14	Badgerys Creek, Lawson Road,	6.8	0.6	11.3	2.1	18	**9**
R15	Greendale, Mersey Road	4.6	0.5	6.6	1.0	16	8
R17	Luddenham Road	2.8	0.2	4.4	0.8	15	8
R18	Corner of Adams and Elizabeth Drive	3.8	0.5	6.6	1.1	16	8
R19	Corner of Adams and Anton Road	4.0	0.6	5.1	1.0	15	8
R21	Corner of Willowdene Avenue and Vicar Park Lane	4.0	0.2	4.7	0.6	14	8
R22	Rossmore, Victor Avenue	2.9	0.2	4.8	0.9	16	8
R23	Wallacia, Greendale Road	1.7	0.1	2.5	0.3	14	7
R24	Greendale, Dwyer Road	18.6	5.3	24.7	6.8	**34**	**14**
R25	Rossmore residential	2.3	0.4	3.3	0.9	14	8
R27	Mt Vernon residential	1.1	0.1	1.6	0.3	13	7
R30	Bringelly	1.2	0.1	15.9	3.4	23	**10**
R31	Luddenham	2.9	0.2	4.5	0.7	14	8

The above assessment of the long term development forecasts emissions approximately 50 years into the future and assumes no improvement in background air quality conditions. Further, the assessment also assumes there is limited improvement in aircraft emissions. On these two points, it can be concluded that the emission estimates are conservative.

32.4.3. Fuel jettisoning

As discussed in Chapter 7 and Chapter 12 in Volume 2, the effects of fuel jettisoning on local air quality would be limited due to the rarity of the activity, the inability of many aircraft to jettison fuel, the rapid vaporisation and wide dispersion of jettisoned fuel, the strict guidelines on fuel jettisoning altitudes and locations and the anticipated reduction in fuel jettisoning events and volumes in the future. For these reasons, fuel jettisoning is not considered likely to have a significant immediate or future impact on local air quality or human health.

32.4.4. Regional air quality (ozone)

Regional air quality considers the formation of secondary pollutants (such as ozone (O_3)) through photochemical reactions from primary emissions of precursor gases including nitrogen oxides, volatile organic compounds and carbon monoxide.

International studies have shown that emissions from airport operations are small in the context of regional emissions inventories (Ratliff et al, 2009). This is supported by data presented in the *Air Emissions Inventory for the Greater Metropolitan Region in New South Wales* (EPA 2012) which shows that emissions from existing airport operations in Sydney are less than three per cent of total emissions for the Sydney region.

Future projected emissions for sources other than the proposed airport (such as commercial, industrial, on-road mobile) are not available for the 2063 scenario, therefore, the long term development scenario becomes a hypothetical scenario of the long term airport development occurring within the context of 2030 base case emissions. Twelve days with high observed ozone (one hour ozone concentrations greater than 70 parts per billion and four hour ozone concentrations greater than 65 parts per billion) were selected for detailed modelling analysis, as described in Chapter 12 of Volume 2. Historical dates in January and February 2009 were selected to represent the meteorological conditions that have historically led to peak ozone formation and which the model has effectively captured for peak ozone formation with the addition of future emissions.

The daily maximum predicted one hour ozone concentrations are presented in Table 32–5. The maximum predicted one hour ozone concentration was unchanged between the 2030 base case and the 2063 airport case for eight of the analysis days. On four days, the peak predicted one hour ozone concentration increased by a maximum of 0.2 parts per billion. Both the 2030 base case and the 2063 airport case were above the NEPM criterion of 100 parts per billion for all but one day of analysis.

Table 32–5 – Maximum daily predicted one hour ozone concentration (parts per billion) – 2063

Date	2030 future base case peak value	2063 airport case peak value	2063 airport case – 2030 future base case largest difference
06/01/2009	149.1	149.2	2.0
07/01/2009	129.8	130.0	12.3
14/01/2009	106.6	106.6	5.6
29/01/2009	124.1	124.1	1.6
30/01/2009	107.4	107.4	2.3
31/01/2009	109.4	109.4	2.2
04/02/2009	103.8	103.8	3.3
05/02/2009	119.6	119.6	1.6
06/02/2009	112.5	112.5	3.3
07/02/2009	133.7	133.7	1.7
08/02/2009	148.6	148.7	2.5
20/02/2009	98.3	98.4	4.5

Larger ozone increases were modelled for the 2063 airport case than for the 2030 airport case. The average of the second to fourth highest increases in daily maximum one hour ozone rose from 1.1 parts per billion for 2030 to 4.5 parts per billion for 2063. This would be significantly above the maximum allowable increment of one part per billion defined in the NSW tiered procedure for ozone assessment. However, it should be noted that the increase is a hypothetical scenario of the long term airport development occurring within the context of 2030 environmental baseline and, therefore, does not reflect a direct comparative increase as the 2063 ozone concentrations are unknown.

The daily maximum predicted four hour ozone concentrations are presented in Table 32–6. The peak predicted four hour ozone concentration would be unchanged in seven of the days analysed and increased in five of the days by a maximum of 0.2 parts per billion. The highest change in daily maximum four hour ozone concentration, from the addition of 2063 airport emissions, was 6.3 parts per billion, while the second highest was 5.8 parts per billion. The average of the second to fourth highest increases in daily maximum four hour ozone is 3.7 parts per billion, which would be significantly above the maximum allowable increment of one part per billion defined in the NSW tiered procedure for ozone assessment.

Table 32–6 – Maximum daily predicted four hour ozone concentration (parts per billion) – 2063

Date	2030 future base case peak value	2063 airport case peak value	2063 airport case – 2030 future base case largest difference
06/01/2009	126.2	126.5	1.9
07/01/2009	115.3	115.6	5.8
14/01/2009	98.7	98.9	1.6
29/01/2009	95.9	95.9	2.2
30/01/2009	78.2	78.2	2.4
31/01/2009	99.9	99.9	2.3
04/02/2009	97.3	97.3	3.0
05/02/2009	108.7	108.7	1.6
06/02/2009	92.4	92.4	1.7
07/02/2009	121.0	121.0	2.4
08/02/2009	129.9	130.0	2.3
20/02/2009	83.9	84.2	6.3

In the 2063 airport case, reductions in daily maximum ozone, due to ozone suppression by nitrogen oxide emissions, would occur in the vicinity of the airport site and on some days extend to the aircraft flight corridor and areas downwind of the airport site. Areas of ozone reduction would be more expansive for the 2063 airport case than for 2030 airport case because nitrogen oxide emissions from the proposed airport would be higher in 2063. Increases in ozone occurring downwind of the airport site would also be larger in 2063 than in 2030.

It is noted that the emissions data provided for airport operations assumes worst case operations, for example by including emissions from on-board auxiliary power units rather than the use of mains powered auxiliary power units at the airport gates. Furthermore, for the long term airport development there was no accounting for future changes in emissions from all other sources (such as commercial, industrial, on-road vehicles), some of which may increase and some of which may decrease. The modelling predictions for the long term development should, therefore, be viewed in this context.

32.5. Greenhouse gas assessment

Greenhouse gas emissions that are forecast to be generated during the operation of the long term development are presented in Table 32–7. As shown in Table 32–7, electricity consumption would account for around 80% of Scope 1 and 2 greenhouse gas emissions during the long term operation of the airport. Electricity is a Scope 2 emission. Scope 1 emissions would account for only 20 per cent of greenhouse gas emissions from the airport site.

It is not commonplace to report Scope 3 emissions because of the potential of double counting greenhouse gas emissions. Nevertheless, as they are considered significant for the proposed airport, the most probable primary contributor (jet fuel), has been quantified in Table 32–7. It must be noted that this quantity involves only those emissions from departing planes during their entire flight (those departing from the proposed airport). This method assumes the arriving planes emissions are accounted for by the preceding airport, and is a common approach taken internationally. This method has been recommended by the Airport Cooperative Research Program (ACRP) (ACRP 2009).

Table 32–7 – Summary of estimated annual Scope 1, 2 and 3 greenhouse gas emissions (long term development)

Scope	Source	Fuel type	Annual quantity	Units	Annual emissions (t CO_2 e)
1	Ground support equipment	Transport diesel oil	6	ML	16,910
		Transport gasoline	13	ML	30,728
1	Auxiliary power unit	Stationary gasoline (jet fuel)	33	ML	88,566
1	Boilers	Stationary natural gas	11,735,513	m^3	23,674
1	Generators	Stationary diesel oil	0.05	ML	143
1	Fire training	Stationary kerosene	0.03	ML	74
1	Wastewater treatment plant	N/A	9,782	ML	6,092
1	Fugitive emissions	Transport gasoline (jet fuel)	8030	ML	846
1	Fugitive emissions	Transport diesel oil	6	ML	0.7
1	Fugitive emissions	Transport gasoline	13	ML	1
2	Electricity	N/A	755,112,000	kWh	649,396
Total Scope 1 and 2					**816,430**
3	In flight aviation fuel	Transport gasoline (jet fuel)	8,030	ML	20,570,033

Note: Fuel Type reflects the categories in DoE (2014b)

Assumptions made within the greenhouse gas calculations are provided within Appendix F1.

Emissions factor was not available for jet fuel, emissions have been assumed to be the same as Avgas.

32.6. Considerations for future development stages

Air quality impacts and greenhouse gas emissions generated during construction and operation of the long term development would generally be managed in accordance with best management practices, similar to those outlined in Chapter 12 of Volume 2. Air quality matters associated with the proposed airport would also be regulated under the Airports (Environment Protection) Regulations.

32.7. Summary of Findings

Operation of the long term development would result in an increase in emissions of nitrogen dioxide, PM_{10}, $PM_{2.5}$, carbon monoxide, sulfur dioxide and air toxics. Given the uncertainty regarding the future reduction in vehicular and aircraft engine emissions and the anticipated general reduction in background emissions over time, ground level concentration predictions were assessed only for the key criteria pollutants (nitrogen dioxide, PM_{10} and $PM_{2.5}$) for the long term development.

The results of the dispersion modelling for nitrogen dioxide are as follows.

- *Annual average*: There would be no exceedances of the annual average air quality assessment criteria at any of the sensitive residential receptors; and
- *One hour average*: There would be seven residential receptors predicted to exceed the one hour air quality assessment criteria. These elevated concentrations are predicted to occur for between one and two hours per year. The maximum one hour nitrogen dioxide concentration is predicted to occur at receptor R14, located to the north-west of the airport site.

The results of the dispersion modelling for PM_{10} are as follows.

- *Annual average:* There would be no exceedances of the annual average air quality assessment criteria at any of the residential receptors; and
- *24 hour average:* There would be one on-site receptor predicted to exceed the 24 hour air quality assessment criteria. For the residential receptors, there would be no predicted exceedances of the air quality assessment criteria.

The results of the dispersion modelling for $PM_{2.5}$ are as follows.

- *Annual average:* The air quality assessment criteria would be predicted to be exceeded at four receptors, including one on-site receptor; and
- *24 hour average:* There would be one on-site receptor predicted to exceed the air quality assessment criteria. For the residential receptors there would be no predicted exceedances of the criteria.

The local effects of fuel jettisoning at or near the airport site would be limited due to the inability of many aircraft to jettison fuel, the quick vaporisation and dispersion of aircraft fuel, the strict guidelines on fuel jettisoning altitudes and locations, and the anticipated reduction in fuel jettisoning events and volumes in the future. For these reasons, fuel jettisoning is not considered likely to have a significant future impact on local air quality or human health.

The maximum predicted one hour and four hour ozone concentrations increased by a maximum of 0.2 parts per billion during the operation of the long term development. Both the predicted base case and the long term development were generally above the NEPM criteria. Larger ozone incremental increases in the surrounding localities were recorded for the long term development, driven primarily by the increase in nitrogen oxides and volatile organic compound emissions sources.

Actual air emissions from the operating long term development may be lower than predicted given the use of mains powered auxiliary power units at the airport gates (instead of on-board auxiliary power units), increased use and optimisation of proposed rail connections (instead of motor vehicles) and progressive improvements in aircraft technology.