NATIONAL ENVIRONMENT PROTECTION (AMBIENT AIR QUALITY) MEASURE

NEW SOUTH WALES ANNUAL COMPLIANCE REPORT 2008

Prepared 15th September 2009

Department of Environment, Climate Change and Water NSW This page intentionally blank

Document Management

This document contains the 2008 NSW Annual Ambient Air Quality National Environment Protection Measures (AAQ NEPM) compliance report as required under Clause(18) of the Ambient Air Quality NEPM.

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Acronyms, abbreviations and glossary

Following is a list of acronyms, abbreviations and terms used in this report.

AAQ NEPM	Ambient Air Quality – National Environment Protection Measure
ABS	Australian Bureau of Statistics
Ambient air	The external air environment (does not include the air environment inside
	buildings or structures)
AQMP	Air Quality Monitoring Plan
AS	Australian Standards
BAM	Beta Attenuation Monitor
CO	Carbon monoxide
DEC	Department of Environment and Conservation (NSW)
DECC	Department of Environment and Climate Change.
DECCW	Department of Environment, Climate Change and Water (NSW) – formerly
	the DECC.
EPA	Environment Protection Authority (predecessor of the DEC)
FDMS	Filter Dynamics Measurement System (used with TEOM)
FRM	Federal Reference Method (USEPA)
GRUB	Generally Representative Upper Bound
ICP-AES	Inductively Coupled Plasma-Atomic Emission Spectroscopy
Monitoring station	A facility for measuring the concentration of one or more pollutants in the
0	ambient air in a region or sub-region
NEPC	National Environment Protection Council
NEPM	National Environment Protection Measure
NO ₂	Nitrogen dioxide
NO _x	Oxides of nitrogen
03	Ozone
Pb	Lead
PM _{2.5}	Particulate Matter with aerodynamic diameter of 2.5 microns or less
PM_{10}	Particulate Matter with aerodynamic diameter of 10 microns or less
POEO	Protection of the Environment Operations Act (1997) – key piece of
	environmental protection legislation in NSW
ppm	Parts per million by volume – parts of pollutant per million parts of air
PRC	Peer Review Committee
RAAS	Reference Ambient Air Sampler
SO ₂	Sulfur dioxide
TEOM	Tapered Element Oscillating Microbalance
USEPA	United States Environmental Protection Agency
$\mu g/m^3$	microgram (1 millionth of a gram) per cubic metre referenced to a
10	temperature of 0°C and an absolute pressure of 101.325 kilopascals.
VOC	Volatile Organic Compounds – means any compound of carbon, excluding
	carbon monoxide, carbon dioxide, carbonic acid. metallic carbides or
	carbonates and ammonium carbonate. which participates in atmospheric
	photochemical reactions and generally having a vapour pressure greater than
	0.1 mm Hg at normal temperature and pressure

Introduction

The goal of the National Environment Protection Measure for Ambient Air Quality (AAQ NEPM) is to meet the NEPM standards (within the maximum number of allowable exceedences) by 2008.

Air quality is addressed as a priority under the NSW State Plan, released in 2006 and being updated in 2009. The target under the State Plan's cleaner air priority is to meet the national air quality goals as identified in the Ambient Air Quality NEPM.

The NSW 25-year air quality management plan, *Action for Air*, was released in 1998, updated in *Action for Air: 2006 Update* and a further update is due to for completion in 2009.

Action for Air is a whole-of-government strategy covering the range of sources that contribute to air pollution, from planning of cities, roads and public transport, to cleaner vehicles and fuel, and industrial and household emissions.

Action for Air requires a broadly based public forum to be convened every three years to encourage public input on air quality trends and strategies. Planning for the next Clean Air Forum in 2010 is underway. Proceedings of the last forum, held in November 2007 with the theme of 'Clean Air, Cool Climate', can be found at http://www.environment.nsw.gov.au/air/actionforair/caf2007.htm.

Meeting the Ambient Air Quality NEPM goal for ozone is a challenge for the major urban areas of NSW, with Sydney in particular continuing to exceed the ozone standards each year. NSW has set in place and continues to develop new strategies under *Action for Air* to reduce ozone precursor pollutants. The NSW Cleaner Vehicles and Fuels Strategy, released in August 2008, includes actions such as requiring Stage 2 vapour controls at service stations and mandatory limits for petrol volatility in summer. Initiatives to address precursor emissions from smaller, commercial/industrial sources and domestic sources are also in place or being developed, including a draft policy on reducing nitrogen oxide emissions from cogeneration through use of best available technology.

While Sydney generally meets particle standards unless there are bushfires or dust storms, parts of regional NSW face a considerable challenge in meeting the standards. Bushfires, stubble burning, dust storms and woodheaters are the major emission sources in these regional areas.

DECCW and the Department of Primary Industries are working together with local government and local communities to develop coordinated actions to reduce rural particles, with a pilot project to be implemented in Wagga Wagga.

Action for Air also includes strategies for managing particle emissions across mobile, industry and domestic sources. Significant initiatives include: the NSW diesel retrofit program (part of the Cleaner Vehicles and Fuels Strategy); NSW's woodheater emission reduction program; emission limits for industry under the Protection of the Environment (Clean Air) Regulation; national vehicle emission and fuel quality standards; and actions such as the NSW smoky vehicle program under the Diesel National Environment Protection Measure .NSW is also contributing to developing national approaches to reduce particle and ozone precursor emissions from the product and equipment sectors.

Over 2007-2010, the NSW Government's \$5 million Clean Air, Healthy Communities fund is supporting a range of initiatives to reduce emissions of particles and ozone precursors as well as greenhouse gases.

Ambient Air Quality NEPM Monitoring

The *NSW Ambient Air Quality NEPM Monitoring Plan* details the monitoring that NSW performs to assess compliance with the Ambient Air Quality NEPM. The majority of monitoring occurs in the high population regions of Sydney, Newcastle and Wollongong. These regions contain over 60% of the NSW population. Campaign monitoring is also performed at a number of rural population centres.

The network is designed to characterise general air quality and frequently will pick up individual pollutant events. This approach ensures that there is adequate coverage of the populated areas and of the broad differences in pollutant distribution within a region. The choice of stations in each region was made to optimise both population coverage and representation of the occurrences of higher pollutant concentration.

NSW characterises the air quality to which the general population is exposed in a region by monitoring all air pollutants of interest in a network of trend stations. These stations capture the majority of pollution events that occur from time to time, but are supplemented by additional permanent upper bound stations at which selected pollutants only will be monitored to ensure that all major pollutant events are captured and reported.

Campaign monitoring will be undertaken in regional centres. Initial monitoring is occurring at Albury, Wagga Wagga, Bathurst and Tamworth. Data from these stations will be used to validate and review the screening measures applied to the urban centres outside the Sydney-Wollongong-Newcastle regions.

In total, NSW currently monitors the majority of pollutants at eight trend stations (T), selected individual pollutants at four additional permanent upper bound stations or performance stations (P), and selected pollutants on a campaign basis at a further seven stations (C) in Sydney, the Lower Hunter and regional centres.

In addition NSW also maintains a number of air quality monitoring stations that are not designated for NEPM monitoring. Some stations that are designated NEPM stations for particular pollutants are not designated for other pollutants. For instance St Marys is designated as a NEPM station for ozone however nitrogen dioxide and PM_{10} are also measured at this station. Data from stations that are not designated as NEPM stations for a particular pollutant are not presented in this report.

The NSW monitoring network for the Ambient Air Quality NEPM is outlined in table 1. More detailed information on NEPM monitoring in NSW is provided in <u>Appendix A</u>.

New sites and site closures

No new sites were established or closed during 2008.

Station	Station type ⁽¹⁾	Year established	Number of parameters	Ozone	Nitrogen dioxide	PM ₁₀	Carbon monoxide	Sulfur dioxide
Sydney								
Blacktown (6)	Т	1992 – 2004	5	Х	Х	Х	Х	Х
Bringelly	Т	1992	4	Х	Х	Х		Х
Central Coast (2)	С	To be established	4	х	х	Х		Х
Chullora (3)	Т	2003	5	Х	Х	Х	Х	Х
Liverpool	С	1990	4	Х	Х	Х	Х	
Macarthur	Т	2003	5	Х	Х	Х	Х	Х
Oakdale	Р	1996	2	Х		Х		
Prospect (6)	Т	2007	5	Х	Х	Х	Х	Х
Richmond	Т	1992	4	Х	Х	Х		Х
Rozelle	Т	1978	4	Х	Х	Х	Х	
St Marys	Р	1992	1	Х				
Lower Hunter								
Newcastle	Т	1992	5	Х	Х	Х	Х	Х
Maitland (2)	т	To be established	4	х	Х	х		Х
Beresfield (4)	С	1993	1			Х		
Wallsend (4)	С	1992	3	Х	Х			Х
Illawarra								
Albion Park	Р	1978 – 2005	4	Х	Х	Х		Х
Albion Park South	Р	2005	4	Х	Х	Х		Х
Kembla Grange	Р	1994	2	Х		Х		
Warrawong (7)	Р	1993 – 2006	1					Х
Wollongong	Т	1993	5	Х	Х	Х	Х	Х
Regional NSW								
Albury	С	2000	1			Х		
Bathurst ⁽⁸⁾	С	2000	2	Х		Х		
Dubbo ⁽⁵⁾	С	Dependent	1			Х		
Lismore ⁽⁵⁾	С	on campaign	1			Х		
Orange ⁽⁵⁾	С	results	1			Х		
Tamworth	С	2000	1			Х		
Wagga Wagga	С	2001	1			Х		

Table 1: NSW Ambient Air Quality NEPM monitoring network

(1) P denotes performance; T denotes trend; C denotes campaign.

(2) Postponed – under review.

(3) Replaced the Lidcombe trend station.

(4) Data from Beresfield and Wallsend will be reported at least until the Maitland station is established.

(5) Monitoring subject to results from initial campaign monitoring.

(6) Prospect station replaces Blacktown station from 2007.

(7) Warrawong station closed in April 2006.

(8) Bathurst ozone analyzer removed in August 2007 due to the completion of the campaign.

Assessment of compliance with standards and 2008 goal

Air quality is assessed against the Ambient Air Quality (AAQ) NEPM standards and goals as specified in Schedule 2 of the NEPM and reproduced below in Table 2.

The **Standards** against which air quality is assessed are concentrations in parts per million (ppm) or micrograms per cubic metre ($\mu g/m^3$) – (see column 3 of Table 2.)

The **Goal** of the AAQ NEPM is to achieve the Standards as assessed in accordance with the monitoring protocol within 10 years of commencement (i.e. 2008) to the extent specified in Schedule 2 of the NEPM. The extent is expressed as a maximum allowable number of exceedences for each standard (see column 4 in Table 2). These are set to account for unusual meteorological conditions and, in the case of particles, natural events such as dust storms and bushfires, that can't be controlled through normal air quality management programs.

The AAQ NEPM also specifies advisory reporting standards for $PM_{2.5}$ (see Table 2). The goal for $PM_{2.5}$ is to collect sufficient data to facilitate a review of the $PM_{2.5}$ standards, is currently underway.

Pollutant	Averaging period	AAQ NEPM Standard maximum concentration	AAQ NEPM Goal. maximum number of allowable exceedances
Carbon monoxide	8 hour rolling average	9.0 ppm	1 day a year
Nitrogen dioxide	1 hour average	0.12 ppm	1 day a year
Nillogen dioxide	1 year average	0.03 ppm	None
Photochemical	1 hour average	0.10 ppm	1 day a year
ozone	4 hour rolling average	0.08 ppm	1 day a year
	1 hour average	0.20 ppm	1 day a year
Sulfur dioxide	1 day average	0.08 ppm	1 day a year
	1 year average	0.02 ppm	None
Particles as PM ₁₀	1 day average	50 µg/m ³	5 days a year
Lead	1 day average	0.50 µg/m ³	None
Particles as	1 day average	25 µg/m ³	Gather sufficient data nationally to facilitate a review
PM _{2.5} #	1 year average	8 µg/m ³	of Advisory Reporting Standard.

Table 2: NEPM Standards and Goals

[#] - Reporting standard only.

The following tables summarise compliance with the standards and goals of the AAQ NEPM. For each pollutant, the data availability (quarterly and annual), the number of days when standards were exceeded, the annual mean (where an annual standard exists) and an assessment of compliance, are given for each monitoring station within each region.

A station's performance is assessed as **complying with the NEPM (i.e. 'MET')** if the number of exceedences is no more than the number specified in Schedule 2 of the AAQ NEPM and data availability was at least 75% in each quarter of 2008. A region demonstrates compliance with the NEPM when either all stations in the region demonstrate compliance, or when the region meets approved *pollutant screening criteria*.

A station's performance is assessed as **not complying with the NEPM (i.e.'NOT MET')** if there is more than the number of exceedences specified in Schedule 2 of the AAQ NEPM, even if the data availability rates are less than the 75% required.

A station's performance is assessed as **'NOT DEMONSTRATED' (ND)** if it records no exceedences, or exceedences on a number of days less than that allowed, but has data availability rates less than 75% in any quarter. This may be due to instrument failures, temporary closures for upgrading or closures to allow relocation of the station.

These categories (i.e. MET, NOT MET and ND) are used in the tables on the following pages.

Calculation and reporting methods used comply with the requirements detailed in the NEPC Peer Review Committee Technical paper No 8: Annual Reports (NEPC 2002). Previous reports included daily average calculations for PM_{10} , $PM_{2.5}$ and sulfur dioxide using hours 0 to 23 – daily averages are now calculated using hours 1 to 24 as detailed in the NEPM Technical Paper No.5, "Data Collection and Handling".

 PM_{10} TEOM data indicate data which has undergone an internal correction factor for USEPA equivalency but without subsequent treatment or temperature adjustment.

All days where a particular standard for a pollutant has been exceeded are listed. Also listed are the stations that recorded an exceedence of the standard on that day, and for averaging periods less than twenty-four hours, the number of averaging periods in the day that the standard was exceeded.

Where possible, a brief comment is given for particular pollution events. Events that have been clearly influenced by extraordinary natural events, such as bushfires and dust storms, are highlighted. It should be noted that the absence of a comment does not necessarily indicate the absence of such influences, rather that there is no clear information available. In some cases it is likely that there has been some influence, but the extent of this influence cannot be absolutely determined.

Data loss

Detailed below are the reasons why the data availability rates are lower then the Ambient Air Quality NEPM goal for 2008 for the following ambient air pollutants:

- PM₁₀ at Prospect vandalism resulted in 27 days of lost data in March.
- PM₁₀ at Tamworth computer failure resulted in 45 days of lost data in July/August.

Technical issues resulted in data losses for the following pollutants and sites during 2008:

- Carbon monoxide at Chullora.
- Nitrogen dioxide at Rozelle & Wollongong.
- Sulfur dioxide at Bringelly, Chullora, Prospect and Wollongong.

Carbon monoxide

Comment

During 2008, no exceedences of the AAQ NEPM standard for carbon monoxide were recorded in NSW. All monitoring stations complied with the AAQ NEPM 8 hour average goal for carbon monoxide except Chullora where compliance was not demonstrated, due to the reasons outlined in the Data loss section on page 5.

Carbon monoxide levels are well below the AAQ NEPM standard. The highest recorded value in NSW, during 2008, was 2.4ppm at Liverpool. This is only 27% of the standard. Levels in all regions are significantly lower than the NEPM standard.

						AAQ NEPM Standard 9.0 ppm (8-hour average)				
Region/ Performance		Data a (%	vailabilit % of hour	y rates ′s)		Number of exceedences standards a				
Station	Q1	Q2	Q3	Q4	Annual	(days)	standards and goal			
Sydney										
Chullora	99.1	73.8	98.8	99.6	92.8	0	ND			
Liverpool	79.1	94.9	93.1	84.8	88.0	0	Met			
Macarthur	99.0	98.7	97.1	95.2	97.5	0	Met			
Prospect	86.1	90.6	91.9	98.4	91.8	0	Met			
Rozelle	94.9	97.7	98.4	86.8	94.4	0	Met			
Illawarra										
Wollongong	97.4	93.4	98.0	87.4	94.0	0	Met			
Lower Hunter										
Newcastle	97.3	97.3	98.7	91.3	96.1	0	Met			

Table 3: 2008 compliance summary for CO in New South Wales

ND Not demonstrated.

Table 4: Summary for CO - Daily maximum rolling 8-hour average concentrations (2008)

Region/	Data availability	Number of				
monitoring Station	rates (%)	valid days	Highest Value	Highest Date	2 nd Highest Value	2 nd Highest Date
Sydney						
Chullora	92.8	334	1.6	29-Jun 02:00	1.4	14-May 03:00
Liverpool	88.0	307	2.4	26-Jun 02:00	2.2	31-May 02:00
Macarthur	97.5	350	0.9	30-May 00:00	0.9	31-May 01:00
Prospect	91.8	326	1.5	29-Jun 02:00	1.3	28-Jun 00:00
Rozelle	94.4	336	1.5	14-Jul 02:00	1.3	17-Jul 02:00
Illawarra						
Wollongong	94.0	338	1.3	15-Nov 11:00	1.1	14-Oct 18:00
Lower Hunter						
Newcastle	96.1	345	2.0	11-Jun 02:00	1.7	10-Jun 00:00

Nitrogen dioxide

Comment

During 2008, no exceedences of the AAQ NEPM standard for nitrogen dioxide were recorded in NSW. All monitoring stations complied with the AAQ NEPM 1 hour average and 1 year average goals for nitrogen dioxide, except Rozelle and Wollongong where compliance was not demonstrated, due to the reasons outlined in the Data loss section on page 5.

Nitrogen dioxide levels are well below the AAQ NEPM standard. The highest recorded 1 hour value in NSW, during 2008, was 0.057ppm at Prospect. This is only 48% of the standard. The highest recorded annual average in NSW, during 2008, was 0.013ppm at Chullora. This is only 43% of the standard. Levels in all regions are significantly lower than the NEPM standard.

						0.12 ppm (1-hour average) 0.03 ppm (1-year average)				
Region/ Performance monitoring Station		Data a (%	vailabilit ሬ of hour	y rates ·s)		Number of Exceed- ences	Annual mean (ppm)	Perfor again standa go	mance st the rds and oal	
	Q1	Q2	Q3	Q4	Annual	(days)		1-hour	1-year	
Sydney										
Bringelly	88.4	77.7	86.8	93.4	86.6	0	0.005	Met	Met	
Chullora	92.1	89.1	89.7	85.4	89.1	0	0.013	Met	Met	
Liverpool	80.8	86.8	90.3	81.0	84.7	0	0.011	Met	Met	
Macarthur	83.3	86.1	92.3	94.3	89.0	0	0.010	Met	Met	
Prospect	79.0	82.0	94.2	81.6	84.2	0	0.012	Met	Met	
Richmond	87.4	89.6	90.7	84.7	88.1	0	0.005	Met	Met	
Rozelle	69.0	67.2	85.1	94.9	79.0	0	0.011	ND	ND	
Central Coast ⁽¹⁾										
Illawarra										
Albion Park South	76.4	91.6	94.2	93.6	89.0	0	0.004	Met	Met	
Wollongong	84.1	93.1	69.5	86.5	83.3	0	0.009	ND	ND	
Lower Hunter										
Maitland ⁽²⁾										
Newcastle	77.6	81.7	91.0	80.8	82.8	0	0.007	Met	Met	
Wallsend	80.6	89.6	94.6	83.8	87.1	0	0.007	Met	Met	

Table 5: 2008 compliance summary for NO2 in New South Wales

AAQ NEPM standard

ND Not demonstrated.

(1) Station to be established.

(2) Station to be established. Data reported from Wallsend in the interim.

Region/	Data availability	Number of				
monitoring Station	rates (%)	valid days	Highest Value	Highest Date	2 nd Highest Value	2 nd Highest Date
Sydney						
Bringelly	86.6	330	0.033	11-Sep 19:00	0.031	19-Sep 20:00
Chullora	89.1	338	0.044	06-Nov 20:00	0.042	26-Aug 18:00
Liverpool	84.7	319	0.046	06-Nov 20:00	0.042	27-May 18:00
Macarthur	89.0	341	0.044	06-Nov 20:00	0.044	27-Sep 21:00
Prospect	84.2	323	0.057	27-Aug 17:00	0.048	24-Jun 10:00
Richmond	88.1	328	0.027	18-Sep 20:00	0.027	05-Dec 22:00
Rozelle	79.0	303	0.040	25-May 19:00	0.038	27-May 19:00
Illawarra						
Albion Park South	89.0	334	0.042	26-Oct 17:00	0.041	02-Oct 18:00
Wollongong	83.3	316	0.046	02-Oct 20:00	0.041	26-Aug 19:00
Lower Hunter						
Newcastle	82.8	316	0.033	20-Aug 19:00	0.031	13-Aug 20:00
Wallsend	87.1	333	0.031	02-Sep 20:00	0.030	27-May 18:00

Table 6: Summary for NO₂ - Daily maximum 1-hour average concentrations (2008)

Ozone

Comment

During 2008, one (1) Sydney monitoring stations exceeded the AAQ NEPM 1 hour standard for ozone and three (3) Sydney monitoring stations exceeded the AAQ NEPM 4 hour standard for ozone.

There were no exceedences of the AAQ NEPM 1 and 4 hour standard for ozone at Bringelly, Chullora, Macarthur, Oakdale, Richmond, Rozelle, Albion Park South, Kembla Grange, Wollongong, Newcastle and Wallsend. Liverpool and St Marys did not exceed the AAQ NEPM 1 hour standard for ozone, however exceeded the AAQ NEPM 4 hour standard for ozone. Prospect exceeded both the AAQ NEPM 1 hour and 4 hour standard for ozone.

Illawarra and Lower Hunter regions complied with both the AAQ NEPM 1 and 4 hour goals for ozone. The Sydney region complied with only the AAQ NEPM 1 hour goal. Whilst no individual monitoring station, exceeded the 4 hour standard for more then one day, as a region, Sydney, recorded 2 exceedence days, which resulted in the region being in non-compliance.

						0.10 0.08	ppm (1-ł ppm (4-ł	nour ave nour ave	rage) rage)
Region/ Performance monitoring Station		Data a (%	vailabilit ⁄6 of hour	y rates ˈs)		Numl exceed (da	ber of dences lys)	Perfor again standa go	mance st the rds and oal
olution	Q1	Q2	Q3	Q4	Annual	1-hour	4-hour	1-hour	4-hour
Sydney									
Bringelly	92.3	80.4	92.4	94.0	89.8	0	0	Met	Met
Chullora	94.2	91.7	94.8	94.8	93.9	0	0	Met	Met
Liverpool	85.5	88.6	92.9	81.7	87.2	0	1	Met	Met
Macarthur	93.3	95.0	93.4	93.0	93.7	0	0	Met	Met
Oakdale	92.0	92.1	92.7	93.3	92.5	0	0	Met	Met
Prospect	82.1	90.0	94.2	91.9	89.5	1	1	Met	Met
Richmond	91.1	92.9	92.2	86.3	90.6	0	0	Met	Met
Rozelle	92.6	89.1	94.7	94.8	92.8	0	0	Met	Met
St Marys	91.9	94.8	89.5	94.6	92.7	0	1	Met	Met
Central Coast ⁽¹⁾									
Illawarra									
Albion Park South	90.8	84.7	92.1	94.1	90.4	0	0	Met	Met
Kembla Grange	92.1	94.4	92.8	95.2	93.6	0	0	Met	Met
Wollongong	93.7	92.8	95.0	94.4	94.0	0	0	Met	Met
Lower Hunter									
Maitland (2)									
Newcastle	84.8	86.7	94.2	93.7	89.8	0	0	Met	Met
Wallsend	89.1	91.1	92.6	94.7	91.9	0	0	Met	Met

Table 7: 2008 compliance summary for O3 in New South Wales

AAQ NEPM standard

ND Not demonstrated.

Bold font indicates values that exceed the AAQ NEPM standard

(1) Station to be established

(2) Station to be established. Data reported from Wallsend in the interim.

Ozone events in the Sydney region are highly variable in terms of both frequency and severity. This is largely the result of the annual variability of meteorological conditions, which has the greatest effect on measures of frequency but can also have some influence on measures of peak concentrations. In the Sydney region emissions of ozone precursors (NOx and VOCs) are sufficient to generate concentrations of ozone well above the AAQ NEPM standards (DEC 2006).

The highest recorded 1-hour average in NSW, during 2008, was 0.107 ppm recorded at Prospect on the 16^{th} January. This is 107% of the AAQ NEPM 1 hour standard for ozone. In 2008, the lower average summer temperatures (January average was 28.5 °C, which was the coolest January month since 2000) and the high average rainfall (January average was 83.2 mm, which was the wettest January month since 2006 - BOM – Prospect Reservior meteorological site) contributed to the lower number of ozone exceedences.

Region/	Data availability	Number of		Maximu (pr	m values om)	
monitoring Station	rates (%)	valid days	Highest Value	Highest Date	2 nd Highest Value	2 nd Highest Date
Sydney						
Bringelly	89.8	344	0.093	29-Jan 14:00	0.089	12-Jan 13:00
Chullora	93.9	359	0.080	16-Jan 13:00	0.068	19-Oct 15:00
Liverpool	87.2	327	0.098	16-Jan 14:00	0.077	29-Jan 13:00
Macarthur	93.7	360	0.085	30-Jan 14:00	0.084	29-Jan 14:00
Oakdale	92.5	355	0.093	29-Jan 15:00	0.091	14-Nov 16:00
Prospect	89.5	346	0.107	16-Jan 15:00	0.089	29-Jan 14:00
Richmond	90.6	348	0.078	12-Jan 15:00	0.072	15-Mar 17:00
Rozelle	92.8	357	0.056	17-Dec 13:00	0.051	28-Dec 12:00
St Marys	92.7	356	0.096	12-Jan 13:00	0.086	15-Mar 16:00
Illawarra						
Albion Park South	90.4	344	0.062	28-Dec 15:00	0.060	19-Oct 15:00
Kembla Grange	93.6	358	0.072	28-Dec 14:00	0.072	19-Oct 15:00
Wollongong	94.0	360	0.067	19-Oct 15:00	0.066	28-Dec 14:00
Lower Hunter						
Newcastle	89.8	345	0.064	17-Dec 16:00	0.058	06-Nov 14:00
Wallsend	91.9	353	0.057	06-Nov 15:00	0.057	13-Jan 13:00

Table 8: Summary for O₃ - Daily maximum 1-hour average concentrations (2008)

AAQ NEPM Standard - 0.10 ppm (1-hour average)

Bold font indicates values that exceed the AAQ NEPM standard

The highest recorded 4-hour average in NSW, during 2008, was 0.096 ppm recorded at Prospect on the 16th January. This is 120% of the AAQ NEPM 4 hour standard for ozone.

			0	0		· · · · · · · · · · · · · · · · · · ·		
Region/ Performance	Data availability	Number of		Maximum values (ppm)				
monitoring Station	rates (%)	valid days	Highest Value	Highest Date	2 nd Highest Value	2 nd Highest Date		
Sydney								
Bringelly	93.6	344	0.078	29-Jan 15:00	0.075	14-Nov 17:00		
Chullora	98.3	359	0.074	16-Jan 15:00	0.060	13-Jan 14:00		
Liverpool	90.5	325	0.089	16-Jan 15:00	0.067	13-Jan 14:00		
Macarthur	97.9	359	0.070	29-Jan 16:00	0.069	14-Nov 15:00		
Oakdale	96.9	355	0.075	14-Nov 17:00	0.074	29-Jan 18:00		
Prospect	93.2	345	0.096	16-Jan 16:00	0.074	12-Jan 14:00		
Richmond	94.6	348	0.067	12-Jan 16:00	0.062	16-Jan 15:00		
Rozelle	97.0	357	0.048	28-Dec 15:00	0.047	06-Dec 13:00		
St Marys	97.1	358	0.082	12-Jan 15:00	0.075	16-Jan 15:00		
Illawarra								
Albion Park South	94.1	343	0.055	19-Oct 16:00	0.053	06-Nov 16:00		
Kembla Grange	97.5	357	0.066	19-Oct 16:00	0.063	28-Dec 17:00		
Wollongong	97.9	360	0.063	19-Oct 15:00	0.059	28-Dec 16:00		
Lower Hunter								
Newcastle	93.8	345	0.058	17-Dec 18:00	0.053	06-Nov 16:00		
Wallsend	95.7	353	0.054	06-Nov 18:00	0.051	17-Dec 18:00		

Table 9: Summary for O₃ - Daily maximum rolling 4-hour average concentrations (2008)

AAQ NEPM Standard - 0.08 ppm (rolling 4-hour average)

Bold font indicates values that exceed the AAQ NEPM standard

Comment

The 1-hour ozone standard was exceeded at one station in Sydney (Prospect) and this is identified in the table below. There were no exceedences of the 1 hour standard in the Illawarra and Lower Hunter regions.

Table 10: Days when O₃ 1-hour Ambient Air Quality NEPM standard exceeded (2008)

Date	Stations where standard exceeded and hour of exceedence	Comments ^(#)
16-Jan-2008	Prospect (15)	

(#) Events that can be clearly identified as influencing pollution levels

The 4-hour ozone standard was exceeded at three stations in Sydney (St Marys, Liverpool and Prospect) and these are identified in the table below. There were no exceedences in the 4 hour standard in the Illawarra and Lower Hunter regions.

Table	e 11: Days when O ₃ 4-hour Ambient Air Quality NEPM standard exceed	ded (2008)
<u>م</u>	Stations where standard exceeded and hour of exceedence	Comme

Date	Stations where standard exceeded and nour of exceedence	Comments
12-Jan-2008	St Marys (15)	
16-Jan-2008	Liverpool (15), Prospect (15-16)	
10-3411-2000		

(#) Events that can be clearly identified as influencing pollution levels

Action for Air, the NSW Government's Air Quality Management Plan for Sydney, the Lower Hunter and the Illawarra, sets out a program of measures that target ground level ozone in summer. The Plan covers strategies designed to reduce emissions from industry, motor vehicles and domestic/commercial sources. These include the Cleaner Vehicles Action Plan; emission limits and load based licensing for industrial facilities; the Cleaner Industries Program; and the Clean Air Program. A number of other measures are also being pursued as part of the ozone management strategy, including reducing the volatility of petrol in summer and vapour recovery at service stations and bulk terminals.

(#)

Sulfur dioxide

Comment

During 2008, no exceedences of the AAQ NEPM 1 hour average, 24 hour average and 1 year average standard for sulfur dioxide were recorded in NSW. All monitoring stations complied with the AAQ NEPM 1 hour average, 24 hour average and 1 year average goals for sulfur dioxide, except Bringelly, Chullora, Prospect and Wollongong where compliance was not demonstrated, due to the reasons outlined in the Data loss section on page 5.

Table 12: 2008 compliance summary for SO₂ in New South Wales

AAQ NEPM standards 0.20 ppm (1-hour average) 0.08 ppm (24-hour average) 0.02 ppm (1-year average)

								0.02	Phil (1-	year ave	iuge)
Region/ Performance monitoring Station	Data availability rates (% of hours)					Number of exceedences (days)		Annual Mean (ppm)	Pe a sta	erforman gainst th Indards a goal	ce Ie Ind
Station	Q1	Q2	Q3	Q4	Annual	1-hour	24-hour		1-hour	24-hour	1-year
Sydney											
Bringelly	90.9	82.1	94.5	56.1	80.9	0	0	0.000	ND	ND	ND
Chullora	86.5	89.4	61.3	72.7	77.5	0	0	0.001	ND	ND	ND
Macarthur	89.8	90.2	93.9	94.4	92.1	0	0	0.001	Met	Met	Met
Prospect	65.9	86.2	94.1	94.6	85.2	0	0	0.000	ND	ND	ND
Richmond	91.2	93.5	91.5	92.5	92.2	0	0	0.000	Met	Met	Met
Central Coast ⁽¹⁾											
Illawarra											
Albion Park South	91.7	92.1	95.2	93.1	93.0	0	0	0.001	Met	Met	Met
Wollongong	91.9	69.5	76.3	75.6	78.3	0	0	0.000	ND	ND	ND
Lower Hunter											
Maitland (2)											
Newcastle	81.6	83.3	93.5	89.2	86.9	0	0	0.001	Met	Met	Met
Wallsend	90.2	90.9	94.1	90.0	91.3	0	0	0.002	Met	Met	Met

ND Not demonstrated.

(1) Station to be established.

(2) Station to be established. Data reported from Wallsend in the interim.

Sulfur dioxide levels are well below the AAQ NEPM standard. The highest recorded 1 hour value in NSW, for 2008, was 0.044ppm at Wallsend. This is only 22% of the standard. The highest recorded 24 hour average in NSW, for 2008, was 0.008 at Albion Park South and Newcastle. This is only 10% of the standard. The highest recorded annual average in NSW, for 2008, was 0.002 at Wallsend. This is only 10% of the standard. Levels in all regions are significantly lower than the NEPM standard.

Region/ Performance	Data availability	Number of	Maximum values f (ppm)						
monitoring Station	rates (%)	valid days	Highest Value	Highest Date	2 nd Highest Value	2 nd Highest Date			
Sydney									
Bringelly	80.9	307	0.019	26-May 13:00	0.012	30-Aug 12:00			
Chullora	77.5	296	0.021	14-Nov 08:00	0.020	25-Mar 09:00			
Macarthur	92.1	355	0.015	16-Jan 01:00	0.014	26-May 17:00			
Prospect	85.2	329	0.014	18-Nov 08:00	0.011	19-Mar 04:00			
Richmond	92.2	354	0.015	19-Nov 21:00	0.010	10-Jan 08:00			
Illawarra									
Albion Park South	93.0	355	0.028	15-Mar 13:00	0.026	20-Mar 16:00			
Wollongong	78.3	292	0.021	18-Mar 08:00	0.020	23-Sep 11:00			
Lower Hunter									
Newcastle	86.9	330	0.033	15-May 12:00	0.033	18-Dec 09:00			
Wallsend	91.3	349	0.044	11-Oct 12:00	0.037	11-Sep 15:00			

Table 13: Summary for SO₂ - Daily maximum 1-hour average concentrations (2008)

AAQ NEPM Standard - 0.20 ppm (1-hour average)

Region/	Data	Number of	Maximum values						
Performance monitoring Station	rates (%)	valid days	Highest Value	(P Highest Value Highest Date		2 nd Highest Date			
Sydney									
Bringelly	83.8	307	0.003	12-Jan	0.003	26-May			
Chullora	80.9	296	0.005	12-Jan	0.004	26-May			
Macarthur	97.0	355	0.004	26-May	0.003	01-Oct			
Prospect	90.0	329	0.004	08-Oct	0.004	09-Oct			
Richmond	96.7	354	0.003	19-Nov	0.002	22-Dec			
Illawarra									
Albion Park South	97.0	355	0.008	15-Mar	0.008	27-Dec			
Wollongong	79.9	292	0.007	23-Dec	0.004	29-Dec			
Lower Hunter									
Newcastle	90.2	330	0.008	06-May	0.007	01-May			
Wallsend	95.3	349	0.007	04-Mar	0.007	29-Jul			

Table 14: Summary for SO ₂ -	Maximum 24-hour avera	age concentrations (2008)
$1 \text{ abic 14. Summary for } SO_2 =$	Maximum 24-nour avera	ize concenti ations (2000)

Particles as PM₁₀

Comment

During 2008, all regions in NSW, recorded exceedences of the AAQ NEPM 24-hr standard for PM_{10} . Four (4) Sydney monitoring stations, three (3) Illawarra monitoring stations, two (2) lower Hunter monitoring stations and four (4) regional monitoring stations recorded exceedences of the AAQ NEPM 24-hr standard for PM_{10} . The only monitoring stations to record no exceedences were Chullora, Prospect, Richmond and Rozelle.

The Sydney, Illawarra and Lower Hunter regions complied with the AAQ NEPM 24-hr goal for PM_{10} . Albury and Wagga Wagga failed to comply with the AAQ NEPM 24-hr goal for PM_{10} .

At Prospect and Tamworth, compliance was not demonstrated for PM_{10} due to the reasons outlined in the Data loss section on page 5.

						50 µg/m³ (24-	hour average)
Region/ Performance		Data a (?	vailabilit ⁄⁄6 of day	ty rates s)	Number of exceedences	Performance against the	
Station	Q1	Q2	Q3	Q4	Annual	(days)	goal
Sydney							
Bringelly	100.0	90.1	100.0	97.8	97.0	1	Met
Chullora	94.5	95.6	100.0	97.8	97.0	0	Met
Liverpool	96.7	97.8	96.7	80.5	92.9	1	Met
Macarthur	100.0	100.0	97.8	100.0	99.4	1	Met
Oakdale	93.5	98.9	96.8	97.8	96.8	1	Met
Prospect	69.9	90.2	97.8	96.7	88.6	0	ND
Richmond	97.7	100.0	100.0	95.6	98.3	0	Met
Rozelle	100.0	98.9	100.0	87.1	96.5	0	Met
Central Coast ⁽¹⁾							
Illawarra							
Albion Park South	98.9	98.9	100.0	90.3	97.0	1	Met
Kembla Grange	100.0	100.0	100.0	94.6	98.7	4	Met
Wollongong	100.0	98.9	87.1	92.4	94.6	1	Met
Lower Hunter							
Beresfield	93.5	96.8	94.6	96.8	95.4	5	Met
Maitland ⁽²⁾							
Newcastle	100.0	76.3	98.9	97.8	93.2	2	Met
Regional							
Albury	97.7	81.6	97.8	96.7	93.5	8	Not met
Bathurst	97.7	86.0	97.8	97.8	94.8	1	Met
Dubbo ⁽¹⁾							
Lismore ⁽¹⁾							
Orange ⁽¹⁾							
Tamworth	97.7	97.8	49.5	98.9	86.0	3	ND
Wagga Wagga	100.0	92.5	97.8	97.8	97.0	25	Not met

 Table 15: 2008 compliance summary for PM₁₀ in New South Wales
 AAQ NEPM Standard

ND Not demonstrated. **Bold** font indicates values that exceed the AAQ NEPM standard

(1) Station to be established

(2) Station to be established. Data reported from Beresfield in the interim.

The highest PM_{10} level recorded in NSW during 2008, was 294.9µg/m³ during a dust storm, recorded at Wagga Wagga on the 2nd April. This is 589% of the AAQ NEPM 24 hour standard for PM_{10} .

The highest PM_{10} level recorded in the Sydney region during 2008 was $68.2\mu g/m^3$ recorded at Oakdale on the 1st July. The highest PM_{10} level recorded in the Illawarra region during 2008 was $100.8\mu g/m^3$ recorded at Kembla Grange on the 1st July. The highest PM_{10} level recorded in the Lower Hunter region during 2008 was $59.9.0\mu g/m^3$ recorded at Beresfield on the 1st July. On the 1st July there were strong winds (> 90km/hr) recorded throughout NSW which resulted in high levels of dust and fine particles, throughout most of the monitoring regions in NSW (BOM – significant weather summary). The highest PM_{10} level recorded in regional NSW was recorded at Wagga Wagga as detailed above.

Region/	Data availability Number of		Maximum values (ppm)						
Performance monitoring Station	rates (%)	valid days	Highest Value	Highest Date	6th Highest Value	6th Highest Date			
Sydney									
Bringelly	97.0	355	62.7	14-Nov	33.1	29-Jan			
Chullora	97.0	355	44.3	01-Jul	37.9	31-Dec			
Liverpool	92.9	340	53.8	14-Nov	33.8	16-Sep			
Macarthur	99.4	364	65.5	01-Jul	31.1	16-Sep			
Oakdale	96.8	354	68.2	01-Jul	31.7	29-Jan			
Prospect	88.6	324	41.8	06-Dec	35.6	31-Dec			
Richmond	98.3	360	39.0	15-Sep	28.4	08-Jan			
Rozelle	96.5	353	43.1	16-Sep	32.9	25-Feb			
Illawarra									
Albion Park South	97.0	355	96.1	01-Jul	36.5	18-Oct			
Kembla Grange	98.7	361	100.8	01-Jul	46.7	13-Sep			
Wollongong	94.6	346	78.3	01-Jul	37.3	19-Sep			
Lower Hunter									
Beresfield	95.4	349	59.9	01-Jul	45.5	19-Mar			
Newcastle	93.2	341	54.4	01-Jul	41.2	21-Jul			
Regional									
Albury	93.5	342	124.8	02-Apr	56.1	14-Feb			
Bathurst	94.8	347	63.0	15-Sep	35.9	22-Feb			
Tamworth	86.0	315	100.4	16-Sep	40.9	19-Sep			
Wagga Wagga	97.0	355	294.9	02-Apr	64.6	14-Mar			

Table 16: 9	Summary for	PM ₁₀ –	Maximum	24-hour	average	concentrations	(2008)
Table 10.	Summary 101	1 14110 -	Maximum	24-noui	average	concentrations	(2000)

Bold font indicates values that exceed the AAQ NEPM standard

AAQ NEPM Standard – 50 μ g/m³ (24-hour average)

The 24 hour PM_{10} standard was exceeded at four stations in Sydney (Bringelly, Liverpool, Macarthur and Oakdale), three stations in the Illawarra (Albion Park South, Kembla Grange, Wollongong), two stations in the Lower Hunter (Beresfield and Newcastle) and four stations in Regional NSW (Albury, Bathurst, Tamworth and Wagga Wagga). The days on which these excedences occurred are identified in the table below.

Events effecting the PM_{10} values at the regional monitoring stations included dust storms caused by high winds.

The monitoring station at Wagga Wagga had 25 exceedences of the AAQ NEPM 24 hour PM_{10} standard and this was by far the most number of exceedences in NSW. The next was Albury with 8 exceedences.

One exceedence was recorded at Bathurst on the 15th September and this was due to a dust storm at Bathurst.

With the exception of Albury and Wagga Wagga, and considering natural events and climatological effects, PM_{10} levels are generally below the goal set by the NEPM. Nevertheless the Department of Environment, Climate Change and Water continues to work towards reducing emissions of anthropogenically-produced particles. Key strategies in the management of particle emissions are outlined in Action for Air.

Date	Stations where standard exceeded	Comments ^(#)
11-Jan-2008	Wagga Wagga	Dust storm
12-Jan-2008	Wagga Wagga	Dust storm
29-Jan-2008	Wagga Wagga	
14-Feb-2008	Albury	
27-Feb-2008	Wagga Wagga	
06-Mar-2008	Wagga Wagga	
07-Mar-2008	Wagga Wagga	Dust storm
11-Mar-2008	Wagga Wagga	
12-Mar-2008	Wagga Wagga	
14-Mar-2008	Wagga Wagga	
18-Mar-2008	Wagga Wagga	Dust storm
19-Mar-2008	Wagga Wagga	
20-Mar-2008	Albury, Wagga Wagga	Dust storm
02-Apr-2008	Albury, Wagga Wagga	Dust storm
03-Apr-2008	Tamworth	Dust storm
21-Apr-2008	Albury	
24-Apr-2008	Wagga Wagga	Dust storm & smoke plume
25-Apr-2008	Albury, Wagga Wagga	
26-Apr-2008	Albury, Wagga Wagga	
26-Jun-2008	Beresfield, Kembla Grange	Dust & high winds
	Wagga Wagga, Newcastle, Beresfield, Macarthur,	Duct starra & kisk wish
01 101 2008	Oakdale, Wollongong, Albion Park South, Kembla	Dust storm & high winds
11- Jul-2008	Kembla Grange	
21- Jul-2008	Beresfield	Dust storm
01_01_2008	Kembla Grange	Dust stoffi
15-Sep-2008	Bathurst Wagaa Wagaa	Dust storm
16-Sep-2008	Beresfield Tamworth	Dust storm
22-Sep-2008	Albury, Wagga Wagga	Dust storm
02-Oct-2008	Wagga Wagga	Dust stoffi
03-Oct-2008	Wagga Wagga Wagga Wagga	
26-Oct-2008	Wagga Wagga	
30-Oct-2008	Wagga Wagga	
31-Oct-2008	Wagga Wagga Wagga Wagga	
14-Nov-2008	Liverpool Bringelly	Hazard reduction burn
24-Nov-2008	Tamworth	
09-Dec-2008	Wagga Wagga	
11-Dec-2008	Albury	
31-Dec-2008	Newcastle Beresfield	
01 000 2000		

(#) Events that can be clearly identified as influencing pollution levels

Lead

Changes to fuel formulation have brought marked reductions in the levels of lead in the atmosphere. Annual averages throughout New South Wales are now typically less than $0.03\mu g/m^3$ with many 24-hour average samples below the minimum detection limit for lead of $0.007\mu g/m^3$ using ICP-AES (Inductively Coupled Plasma-Atomic Emission Spectroscopy) analysis. Since 2002 the highest annual average recorded in New South Wales was $0.09\mu g/m^3$ at Wallsend during 2003, only 18% of the standard.

With a complete ban on lead in petrol now in force, the primary source of lead in air at the regional scale has been eliminated.

The Department of Environment, Climate Change and Water began phasing out ambient lead monitoring for the AAQ NEPM during 2004. All lead monitoring ceased from 1st January 2005.

A report summarising the case for a cessation of lead monitoring was presented to NEPC.

Statistical summary and trends

The following section provides a basic statistical summary, using percentiles, for each station and for each standard. Percentiles for daily maximum values are presented. As discussed in Appendix C *Data availability* only valid days are used in calculating these statistics.

For stations that have data sets of two years or longer, trend data, in the form of annual maximums, are provided for each standard for each pollutant. Trend data are presented if any monitoring of a particular pollutant occurred at a station in a given year and the annual data availability rate for the pollutant at that station is fifteen percent or greater.

Carbon Monoxide

Statistical summary

Table 18: Statistical summary for CO - Daily maximum rolling 8-hour average concentrations (2008)

Region/ Performance	Data availability	Maximum conc.	kimum Percentiles onc. (ppm)							
monitoring Station	(%)	(ppm)	99 th	98 th	95 th	90 th	75 th	50 th	25 th	
Sydney										
Chullora	92.8	1.6	1.3	1.2	1.0	0.8	0.5	0.3	0.2	
Liverpool	88.0	2.4	2.1	1.9	1.6	1.3	0.8	0.4	0.2	
Macarthur	97.5	0.9	0.6	0.6	0.5	0.4	0.3	0.2	0.1	
Prospect	91.8	1.5	1.3	1.2	1.0	0.8	0.5	0.3	0.1	
Rozelle	94.4	1.5	1.3	1.2	1.1	0.9	0.6	0.3	0.2	
Illawarra										
Wollongong	94.0	1.3	0.9	0.9	0.8	0.7	0.5	0.3	0.2	
Lower Hunter										
Newcastle	96.1	2.0	1.5	1.4	1.2	1.0	0.6	0.4	0.3	

AAQ NEPM Standard - 9.0 ppm (rolling 8-hour average)

Trend analysis

Table 19: Daily maximum rolling 8-hour average concentrations for CO (ppm)

Region/ Performance monitoring Station	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Sydney										
Blacktown/Prospect*	3.5	3.1	2.6	3.0	2.5	1.7			2.0 [*]	1.5
Chullora						3.4	2.8	2.3	1.8	1.6
Liverpool	4.0	4.8	3.5	3.6	5.5	3.0	2.8	2.1	2.1	2.4
Macarthur							1.0	1.8	1.8	0.9
Rozelle	4.0	4.5	3.2	2.8	2.2	2.2	2.1	2.0	1.8	1.5
Illawarra										
Wollongong	2.4	2.4	4.2	2.3	2.1	2.1	2.6	1.5	1.5	1.3
Lower Hunter										
Newcastle	3.3	3.1	4.0	3.2	2.8	2.4	1.9	2.2	1.7	2.0

Year	Data availability	Number of	Maximum value	Percentiles (ppm)									
	rates (%)	(days)	(ppm)	99 th	98 th	95 th	90 th	75 th	50 th	25 th			
1999 ⁽¹⁾	98.2	0	3.5	3.0	2.7	2.1	1.8	1.2	0.6	0.2			
2000 ⁽¹⁾	92.3	0	3.1	2.4	2.3	2.0	1.6	1.0	0.4	0.2			
2001 ⁽¹⁾	95.5	0	2.6	1.9	1.8	1.6	1.3	0.8	0.3	0.2			
2002 ⁽¹⁾	94.5	0	3.0	2.4	2.0	1.8	1.3	0.6	0.3	0.1			
2003 ⁽¹⁾	93.6	0	2.5	1.9	1.6	1.2	0.8	0.4	0.1	0.0			
2004 ⁽¹⁾	40.9	0	1.7	1.5	1.3	1.1	0.8	0.4	0.1	0.0			
2005#	0.0												
2006#	0.0												
2007 ⁽²⁾	78.5	0	2.0	1.5	1.4	1.3	1.0	0.6	0.3	0.2			
2008 ⁽²⁾	91.8	0	1.5	1.3	1.2	1.0	0.8	0.5	0.3	0.1			

 Table 20: Statistical summary for CO - Daily maximum rolling 8-hour average concentrations

 Station: Blacktown⁽¹⁾/Prospect⁽²⁾

Station closed pending relocation.

Table 21: Statistical summary for CO - Daily maximum rolling 8-hour average concentrations

Station: Chullora

Year	Data availability	Number of Exceedences	Maximum value			Pe	rcentil (ppm)	es		
	rates (%)	(days)	(ppm)	99 th	98 th	95 th	90 th	75 th	50 th	25 th
2004	84.8	0	3.4	2.1	1.9	1.6	1.3	0.8	0.5	0.3
2005	97.0	0	2.8	1.9	1.7	1.5	1.2	0.7	0.4	0.3
2006	94.7	0	2.3	1.5	1.4	1.1	1.0	0.6	0.4	0.3
2007	90.7	0	1.8	1.4	1.3	1.1	0.8	0.5	0.3	0.2
2008	92.8	0	1.6	1.3	1.2	1.0	0.8	0.5	0.3	0.2

 Table 22: Statistical summary for CO - Daily maximum rolling 8-hour average concentrations

 Station: Liverpool

Year	Data availability rates	Number of Exceedences	Maximum value	kimum Percentiles alue (ppm)								
	rates (%)	(days)	(ppm)	99 th	98 th	95 th	90 th	75 th	50 th	25 th		
1999	81.6	0	4.0	3.9	3.6	3.1	2.5	1.6	0.8	0.5		
2000	98.0	0	4.8	3.6	3.3	2.8	2.1	1.3	0.9	0.5		
2001	98.1	0	3.5	2.9	2.8	2.6	1.8	1.1	0.7	0.5		
2002	85.6	0	3.6	3.0	2.9	2.4	1.9	1.2	0.7	0.5		
2003	93.4	0	5.5	3.1	2.8	2.2	1.6	1.0	0.6	0.4		
2004	97.3	0	3.0	2.7	2.4	2.1	1.4	0.9	0.5	0.3		
2005	91.9	0	2.8	2.4	2.0	1.7	1.4	0.9	0.5	0.3		
2006	96.4	0	2.1	1.8	1.6	1.5	1.3	0.8	0.5	0.3		
2007	94.7	0	2.1	1.7	1.6	1.3	1.1	0.6	0.4	0.2		
2008	88.0	0	2.4	2.1	1.9	1.6	1.3	0.8	0.4	0.2		

 Table 23: Statistical summary for CO - Daily maximum rolling 8-hour average concentrations

 Station: Macarthur

Year	Data availability	Number of	Maximum			Pe	ercentil (ppm)	es		
rear	rates (%)	(days)	(ppm)	99 th	98 th	95 th	90 th	75 th	50 th	25 th
2005	55.2	0	1.0	0.8	0.7	0.6	0.5	0.4	0.3	0.2
2006	98.2	0	1.8	1.6	1.2	0.5	0.4	0.3	0.2	0.2
2007	94.0	0	1.8	1.5	0.8	0.6	0.5	0.4	0.3	0.2
2008	97.5	0	0.9	0.6	0.6	0.5	0.4	0.3	0.2	0.1

 Table 24: Statistical summary for CO - Daily maximum rolling 8-hour average concentrations

Station:	Rozelle									
Year	Data availability	Number of Exceedences	Maximum value			Pe	ercentil (ppm)	es		
	rates (%)	(days)	(ppm)	99 th	98 th	95 th	90 th	75 th	50 th	25 th
1999	83.3	0	4.0	2.5	2.5	2.0	1.6	1.0	0.6	0.4
2000	90.0	0	4.5	2.4	2.3	1.7	1.3	0.8	0.5	0.4
2001	95.0	0	3.2	2.4	2.1	1.7	1.3	0.7	0.5	0.3
2002	87.5	0	2.8	1.7	1.6	1.3	1.1	0.7	0.5	0.3
2003	93.1	0	2.2	1.5	1.4	1.1	0.9	0.6	0.4	0.3
2004	94.0	0	2.2	1.8	1.7	1.3	1.0	0.7	0.4	0.3
2005	97.3	0	2.1	1.7	1.5	1.2	1.0	0.6	0.4	0.2
2006	96.6	0	2.0	1.4	1.3	1.1	0.9	0.6	0.3	0.3
2007	96.1	0	1.8	1.4	1.1	0.8	0.8	0.5	0.3	0.2
2008	94.4	0	1.5	1.3	1.2	1.1	0.9	0.6	0.3	0.2

Table 25: Statistical summary for CO - Daily maximum rolling 8-hour average concentrations

Station: Wollongong

Year	Data Availability Year rates (days)		Maximum value	Percentiles (ppm)								
	rates (%)	(days)	(ppm)	99 th	98 th	95 th	90 th	75 th	50 th	25 th		
1999	98.2	0	2.4	2.2	2.1	1.6	1.3	0.9	0.6	0.4		
2000	98.7	0	2.4	1.9	1.7	1.4	1.2	0.8	0.5	0.3		
2001	97.6	0	4.2	1.7	1.5	1.1	1.0	0.7	0.5	0.3		
2002	91.2	0	2.3	1.9	1.7	1.5	1.2	0.9	0.5	0.3		
2003	96.4	0	2.1	1.7	1.5	1.3	1.0	0.7	0.5	0.3		
2004	97.3	0	2.1	1.5	1.4	1.2	1.0	0.7	0.5	0.3		
2005	96.8	0	2.6	1.8	1.4	1.2	1.1	0.7	0.5	0.3		
2006	98.6	0	1.5	1.2	1.1	0.9	0.8	0.6	0.4	0.3		
2007	90.7	0	1.5	1.2	1.1	1.0	0.8	0.6	0.4	0.2		
2008	94.0	0	1.3	0.9	0.9	0.8	0.7	0.5	0.3	0.2		

 Table 26: Statistical summary for CO - Daily maximum rolling 8-hour average concentrations

Da Availa Year rat	Data availability	Number of	Maximum value			Pe	ercentil (ppm)	es		
- Oui	rates (%)	(days)	(ppm)	99 th	98 th	95 th	90 th	75 th	50 th	25 th
1999	67.6	0	3.3	2.8	2.5	1.7	1.0	0.3	0.1	0.0
2000	83.1	0	3.1	2.8	2.6	2.0	1.3	0.7	0.4	0.2
2001	96.7	0	4.0	2.6	2.4	1.7	1.4	0.7	0.4	0.3
2002	94.6	0	3.2	2.1	1.9	1.4	1.0	0.6	0.4	0.3
2003	93.0	0	2.8	2.0	1.8	1.5	1.0	0.6	0.3	0.2
2004	97.0	0	2.4	1.7	1.6	1.3	1.1	0.6	0.3	0.2
2005	95.8	0	1.9	1.6	1.4	1.1	0.9	0.4	0.3	0.2
2006	94.7	0	2.2	1.5	1.4	0.9	0.7	0.4	0.3	0.2
2007	43.4	0	1.7	1.6	1.4	1.1	0.8	0.5	0.2	0.2
2008	96.1	0	2.0	1.5	1.4	1.2	1.0	0.6	0.4	0.3

Station: Newcastle

Nitrogen Dioxide

Statistical summary

Table 27: Statistical summary for NO₂ - Daily maximum 1-hour average concentrations (2008)

Region/ Performance	Data availability	Maximum conc.	m Percentiles (ppm)								
monitoring Station	rates (%)	(ppm)	99 th	98 th	95 th	90 th	75 th	50 th	25 th		
Sydney											
Bringelly	86.6	0.033	0.028	0.024	0.021	0.018	0.014	0.011	0.007		
Chullora	89.1	0.044	0.041	0.041	0.037	0.034	0.029	0.024	0.018		
Liverpool	84.7	0.046	0.041	0.038	0.033	0.030	0.027	0.021	0.017		
Macarthur	89.0	0.044	0.041	0.039	0.036	0.032	0.026	0.021	0.016		
Prospect	84.2	0.057	0.039	0.038	0.035	0.033	0.029	0.023	0.016		
Richmond	88.1	0.027	0.024	0.023	0.021	0.019	0.015	0.011	0.008		
Rozelle	79.0	0.040	0.037	0.036	0.033	0.031	0.027	0.022	0.015		
Illawarra											
Albion Park South	89.0	0.042	0.033	0.029	0.025	0.021	0.015	0.010	0.006		
Wollongong	83.3	0.046	0.037	0.036	0.034	0.030	0.026	0.020	0.015		
Lower Hunter											
Newcastle	82.8	0.033	0.030	0.029	0.027	0.026	0.021	0.016	0.010		
Wallsend	87.1	0.031	0.029	0.029	0.026	0.024	0.020	0.015	0.011		

AAQ NEPM Standard - 0.12 ppm (1-hour average)

Trend analysis

							2 U	pp)		
Region/ Performance monitoring Station	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Sydney										
Blacktown/Prospect*	0.058	0.070	0.058	0.057	0.055	0.048			0.049 [*]	0.057 [*]
Bringelly	0.045	0.045	0.048	0.052	0.044	0.041	0.045	0.040	0.044	0.033
Chullora/Lidcombe [*]	0.073 [*]	0.070 [*]	0.071 [*]	0.052 [*]	0.066	0.056	0.064	0.066	0.049	0.044
Liverpool	0.054	0.079	0.067	0.068	0.064	0.060	0.063	0.053	0.053	0.046
Macarthur						0.052	0.081	0.066	0.047	0.044
Richmond	0.044	0.037	0.038	0.048	0.036	0.037	0.036	0.044	0.029	0.027
Rozelle	0.062	0.070	0.066	0.086	0.052	0.064	0.052	0.057	0.050	0.040
Illawarra										
Albion Park / Albion Park South [*]	0.049	0.055	0.051	0.048	0.048	0.044	0.044	0.051 [*]	0.045 [*]	0.042 [*]
Wollongong	0.062	0.065	0.056	0.056	0.049	0.044	0.058	0.050	0.043	0.046
Lower Hunter										
Newcastle	0.049	0.044	0.040	0.047	0.039	0.044	0.041	0.042	0.032	0.033
Wallsend	0.034	0.054	0.044	0.043	0.050	0.041	0.038	0.037	0.035	0.031

Table 28: Maximum 1-hour average concentrations for NO₂ (ppm)

AAQ NEPM Standard - 0.12 ppm (1-hour average)

Bold font indicates values that exceed the AAQ NEPM standard

Region/ Performance monitoring Station	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Sydney										
Blacktown/Prospect*	0.014	0.013	0.013	0.014	0.013	0.013				0.012 [*]
Bringelly	0.007	0.007	0.006	0.009	0.007	0.006	0.006	0.006	0.006	0.005
Chullora/Lidcombe [*]	0.016 [*]	0.015 [*]	0.016 [*]	0.013 [*]	0.016	0.016	0.014	0.014	0.013	0.013
Liverpool	0.014	0.014	0.014	0.015	0.013	0.013	0.013	0.013	0.012	0.011
Macarthur						0.009	0.012	0.011	0.011	0.010
Richmond	0.007	0.006	0.007	0.007	0.007	0.007	0.006	0.006	0.006	0.005
Rozelle	0.015	0.014	0.014	0.015	0.014	0.014	0.013	0.013	0.012	0.011
Illawarra										
Albion Park / Albion Park South [*]	0.004	0.005	0.004	0.004	0.005	0.004	0.013	0.005 [*]	0.004 [*]	0.004 [*]
Wollongong	0.011	0.010	0.010	0.011	0.010	0.009	0.009	0.009	0.009	0.009
Lower Hunter										
Newcastle	0.009	0.009	0.009	0.009	0.008	0.009	0.009	0.008	0.007	0.007
Wallsend	0.009	0.008	0.009	0.009	0.008	0.008	0.008	0.009	0.008	0.007

Table 29: Annual average concentrations for NO₂ (ppm)

AAQ NEPM Standard - 0.03 ppm (Annual average)

Table 30: Statistical summary for NO_2 - Annual daily maximum 1-hour average concentrations Station: Blacktown⁽¹⁾/Prospect⁽²⁾

Data Availability rates	Number of Exceedences	Maximum value	Percentiles (ppm)									
	rates (%)	(days)	(ppm)	99 th	98 th	95 th	90 th	75 th	50 th	25 th		
1999 ⁽¹⁾	90.8	0	0.058	0.048	0.047	0.040	0.035	0.030	0.026	0.021		
2000 ⁽¹⁾	90.3	0	0.070	0.054	0.043	0.039	0.034	0.029	0.024	0.019		
2001 ⁽¹⁾	93.3	0	0.058	0.047	0.045	0.037	0.034	0.030	0.025	0.020		
2002 ⁽¹⁾	92.4	0	0.057	0.050	0.046	0.043	0.037	0.032	0.026	0.020		
2003 ⁽¹⁾	89.8	0	0.055	0.049	0.047	0.038	0.035	0.030	0.025	0.020		
2004 ⁽¹⁾	39.3	0	0.048	0.043	0.043	0.039	0.036	0.030	0.024	0.019		
2005 [#]	0.0											
2006 [#]	0.0											
2007 ⁽²⁾	64.7	0	0.049	0.043	0.040	0.036	0.033	0.029	0.025	0.020		
2008	84.2	0	0.057	0.039	0.038	0.035	0.033	0.029	0.023	0.016		

Station closed pending relocation.

average concentrations

Station:	Bringelly										
Year	Data availability	Number of Exceedences	Maximum value	Percentiles (ppm)							
l oui	rates (%)	(days)	(ppm)	99 th	98 th	95 th	90 th	75 th	50 th	25 th	
1999	90.4	0	0.045	0.037	0.034	0.027	0.025	0.020	0.015	0.011	
2000	93.4	0	0.045	0.033	0.029	0.026	0.022	0.019	0.015	0.011	
2001	94.4	0	0.048	0.033	0.031	0.026	0.023	0.019	0.015	0.011	
2002	93.1	0	0.052	0.041	0.038	0.033	0.029	0.022	0.017	0.012	
2003	87.1	0	0.044	0.031	0.028	0.023	0.021	0.017	0.013	0.010	
2004	91.1	0	0.041	0.031	0.029	0.026	0.022	0.017	0.013	0.010	
2005	91.5	0	0.045	0.033	0.030	0.026	0.022	0.018	0.014	0.009	
2006	92.1	0	0.040	0.035	0.031	0.026	0.023	0.018	0.014	0.010	
2007	92.2	0	0.044	0.032	0.029	0.024	0.021	0.016	0.012	0.009	
2008	86.6	0	0.033	0.028	0.024	0.021	0.018	0.014	0.011	0.007	

 Table 32: Statistical summary for NO2 - Annual daily maximum 1-hour average concentrations

 Station: Lidcombe⁽¹⁾ / Chullora⁽²⁾

Year	Data availability	Number of	Maximum value	Percentiles (ppm)								
- Cai	rates (%)	(days)	(ppm)	99 th	98 th	95 th	90 th	75 th	50 th	25 th		
1999 ⁽¹⁾	88.9	0	0.073	0.051	0.047	0.043	0.039	0.035	0.028	0.021		
2000 ⁽¹⁾	91.7	0	0.070	0.055	0.051	0.042	0.036	0.030	0.025	0.021		
2001 ⁽¹⁾	93.8	0	0.071	0.055	0.050	0.042	0.038	0.033	0.028	0.022		
2002 ⁽¹⁾	30.8	0	0.052	0.044	0.040	0.036	0.032	0.027	0.022	0.018		
2003 ⁽²⁾	76.0	0	0.066	0.054	0.048	0.043	0.038	0.033	0.028	0.022		
2004 ⁽²⁾	84.3	0	0.056	0.051	0.050	0.044	0.041	0.034	0.028	0.023		
2005 ⁽²⁾	92.5	0	0.064	0.047	0.043	0.040	0.037	0.030	0.026	0.021		
2006 ⁽²⁾	91.7	0	0.066	0.053	0.046	0.042	0.037	0.031	0.025	0.019		
2007 ⁽²⁾	90.3	0	0.049	0.047	0.044	0.038	0.035	0.030	0.024	0.018		
2008 ⁽²⁾	89.1	0	0.044	0.041	0.041	0.037	0.034	0.029	0.024	0.018		

 Table 33: Statistical summary for NO2 - Annual daily maximum 1-hour average concentrations

 Station: Liverpool

							_			
Year	Data availability	Number of Exceedences	Maximum value			ercentil (ppm)	entiles pm)			
	rates (%)	(days)	(ppm)	99 th	98 th	95 th	90 th	75 th	50 th	25 th
1999	87.9	0	0.054	0.046	0.044	0.041	0.038	0.032	0.027	0.021
2000	89.2	0	0.079	0.057	0.049	0.042	0.036	0.030	0.025	0.021
2001	94.3	0	0.067	0.051	0.045	0.043	0.037	0.031	0.027	0.021
2002	93.0	0	0.068	0.051	0.047	0.045	0.040	0.033	0.028	0.022
2003	89.2	0	0.064	0.047	0.042	0.038	0.034	0.028	0.024	0.020
2004	93.7	0	0.060	0.050	0.048	0.042	0.036	0.031	0.025	0.021
2005	92.0	0	0.063	0.050	0.044	0.039	0.034	0.029	0.025	0.020
2006	92.7	0	0.053	0.049	0.047	0.041	0.036	0.029	0.024	0.018
2007	90.5	0	0.053	0.044	0.039	0.035	0.032	0.028	0.023	0.018
2008	84.7	0	0.046	0.041	0.038	0.033	0.030	0.027	0.021	0.017

AAQ NEPM Standard - 0.12 ppm (1-hour average)

Bold font indicates values that exceed the AAQ NEPM standard

Table 34: Statistical summary for NO₂ - Annual daily maximum 1-hour average concentrations

Year	Data availability	Number of	Maximum value	Percentiles (ppm)							
- Cai	rates (%)	(days)	(ppm)	99 th	98 th	95 th	90 th	75 th	50 th	25 th	
2004	16.2	0	0.052	0.050	0.045	0.039	0.031	0.024	0.020	0.016	
2005	91.9	0	0.081	0.051	0.048	0.042	0.035	0.030	0.025	0.019	
2006	93.9	0	0.066	0.048	0.047	0.043	0.036	0.030	0.024	0.018	
2007	90.2	0	0.047	0.042	0.040	0.038	0.033	0.029	0.023	0.018	
2008	89.0	0	0.044	0.041	0.039	0.036	0.032	0.026	0.021	0.016	

Station: Macarthur

 Table 35: Statistical summary for NO2 - Annual daily maximum 1-hour average concentrations

 Station: Richmond

Year	Data availability	Number of Exceedences	Maximum value	Percentiles (ppm)							
	rates (%)	(days)	(ppm)	99 th	98 th	95 th	90 th	75 th	50 th	25 th	
1999	89.2	0	0.044	0.032	0.029	0.026	0.024	0.021	0.016	0.011	
2000	93.3	0	0.037	0.027	0.027	0.025	0.023	0.019	0.015	0.011	
2001	92.3	0	0.038	0.031	0.030	0.027	0.025	0.020	0.016	0.011	
2002	92.9	0	0.048	0.037	0.032	0.029	0.027	0.023	0.018	0.012	
2003	93.0	0	0.036	0.031	0.029	0.026	0.024	0.021	0.016	0.012	
2004	88.4	0	0.037	0.034	0.033	0.029	0.027	0.021	0.015	0.012	
2005	90.1	0	0.036	0.031	0.030	0.027	0.025	0.020	0.015	0.011	
2006	91.4	0	0.044	0.035	0.032	0.027	0.024	0.020	0.015	0.011	
2007	89.1	0	0.029	0.027	0.025	0.023	0.021	0.016	0.013	0.009	
2008	88.1	0	0.027	0.024	0.023	0.021	0.019	0.015	0.011	0.008	

Table 36: Statistical summary for NO_2 - Annual daily maximum 1-hour average concentrations

Station: Rozelle

Year	Data availability	Data Number of I availability Exceedences		Percentiles (ppm)							
1	rates (%)	(days)	(ppm)	99 th	98 th	95 th	90 th	75 th	50 th	25 th	
1999	87.4	0	0.062	0.047	0.044	0.041	0.037	0.030	0.025	0.019	
2000	94.3	0	0.070	0.057	0.051	0.044	0.038	0.031	0.025	0.020	
2001	93.2	0	0.066	0.051	0.049	0.040	0.037	0.032	0.026	0.019	
2002	87.1	0	0.086	0.058	0.053	0.045	0.041	0.035	0.027	0.019	
2003	88.6	0	0.052	0.047	0.046	0.041	0.038	0.032	0.026	0.020	
2004	89.2	0	0.064	0.051	0.047	0.042	0.037	0.031	0.025	0.019	
2005	91.2	0	0.052	0.046	0.044	0.040	0.036	0.031	0.024	0.017	
2006	92.9	0	0.057	0.048	0.044	0.038	0.035	0.030	0.025	0.018	
2007	89.2	0	0.050	0.043	0.040	0.037	0.033	0.027	0.023	0.015	
2008	79.0	0	0.040	0.037	0.036	0.033	0.031	0.027	0.022	0.015	

Year	Data availability	Number of	Maximum value	Percentiles (ppm)							
	rates (%)	(days)	(ppm)	99 th	98 th	95 th	90 th	75 th	50 th	25 th	
1999 ⁽¹⁾	90.4	0	0.049	0.042	0.037	0.031	0.025	0.015	0.009	0.005	
2000 ⁽¹⁾	90.3	0	0.055	0.044	0.041	0.031	0.024	0.017	0.010	0.005	
2001 ⁽¹⁾	93.0	0	0.051	0.040	0.035	0.028	0.024	0.017	0.010	0.004	
2002 ⁽¹⁾	57.5	0	0.048	0.035	0.034	0.029	0.024	0.015	0.008	0.005	
2003 ⁽¹⁾	90.0	0	0.048	0.039	0.036	0.030	0.023	0.017	0.011	0.006	
2004 ⁽¹⁾	91.4	0	0.044	0.036	0.034	0.027	0.021	0.016	0.011	0.006	
2005 ⁽¹⁾	4.8	0	0.035	0.034	0.034	0.032	0.024	0.010	0.005	0.004	
2006 ⁽²⁾	78.9	0	0.051	0.039	0.033	0.027	0.022	0.017	0.012	0.007	
2007 ⁽²⁾	93.0	0	0.045	0.033	0.030	0.026	0.021	0.015	0.010	0.006	
2008 ⁽²⁾	89.0	0	0.042	0.033	0.029	0.025	0.021	0.015	0.010	0.006	

Table 37: Statistical summary for NO2 -	Annual daily maximum 1-hour average concentrations
Station: Albion Park ^{(1)/} Albion Park South ⁽²⁾	

Table 38: Statistical summary for NO₂ - Annual daily maximum 1-hour average concentrations

Station: Wollongong

Year	Data availability	Number of Exceedences	Maximum value	Percentiles (ppm)							
	rates (%)	(days)	(ppm)	99 th	98 th	95 th	90 th	75 th	50 th	25 th	
1999	90.8	0	0.062	0.046	0.042	0.037	0.032	0.027	0.022	0.016	
2000	93.0	0	0.065	0.049	0.043	0.034	0.030	0.025	0.021	0.017	
2001	93.6	0	0.056	0.043	0.040	0.037	0.031	0.027	0.022	0.016	
2002	94.2	0	0.056	0.048	0.044	0.039	0.036	0.029	0.023	0.016	
2003	93.3	0	0.049	0.039	0.036	0.035	0.032	0.027	0.022	0.017	
2004	92.2	0	0.044	0.039	0.038	0.033	0.029	0.026	0.021	0.015	
2005	88.6	0	0.058	0.042	0.037	0.032	0.029	0.025	0.020	0.015	
2006	87.8	0	0.050	0.044	0.040	0.035	0.031	0.025	0.020	0.015	
2007	89.6	0	0.043	0.038	0.036	0.032	0.029	0.025	0.020	0.015	
2008	83.3	0	0.046	0.037	0.036	0.034	0.030	0.026	0.020	0.015	

Table 39: Statistical summary for NO₂ - Annual daily maximum 1-hour average concentrations

Station: Newcastle

Year	Data availability	Number of Exceedences	Maximum value			Pe	rcentil (ppm)	es		
1	rates (%)	(days)	(ppm)	99 th	98 th	95 th	90 th	75 th	50 th	25 th
1999	90.2	0	0.049	0.040	0.038	0.034	0.030	0.025	0.020	0.012
2000	90.1	0	0.044	0.038	0.034	0.031	0.028	0.024	0.018	0.011
2001	91.5	0	0.040	0.034	0.032	0.030	0.029	0.026	0.020	0.012
2002	85.9	0	0.047	0.040	0.037	0.034	0.031	0.025	0.019	0.012
2003	95.0	0	0.039	0.035	0.034	0.032	0.029	0.025	0.019	0.011
2004	91.0	0	0.044	0.037	0.035	0.032	0.029	0.025	0.020	0.012
2005	89.7	0	0.041	0.034	0.033	0.031	0.029	0.026	0.019	0.012
2006	89.2	0	0.042	0.034	0.033	0.031	0.029	0.024	0.018	0.010
2007	40.6	0	0.032	0.030	0.029	0.026	0.025	0.021	0.015	0.009
2008	82.8	0	0.033	0.030	0.029	0.027	0.026	0.021	0.016	0.010

Table 40: Statistical summary for NO₂ - Annual daily maximum 1-hour average concentrations

Station: Wallsend											
Year	Data availability rates (%)	Number of Exceedences (days)	Maximum value (ppm)	Percentiles (ppm)							
				99 th	98 th	95 th	90 th	75 th	50 th	25 th	
1999	85.6	0	0.034	0.033	0.030	0.027	0.025	0.021	0.017	0.012	
2000	91.8	0	0.054	0.037	0.033	0.029	0.026	0.022	0.017	0.012	
2001	87.5	0	0.044	0.039	0.036	0.032	0.030	0.024	0.018	0.014	
2002	63.2	0	0.043	0.038	0.034	0.029	0.027	0.024	0.018	0.014	
2003	85.9	0	0.050	0.037	0.034	0.029	0.027	0.022	0.016	0.013	
2004	92.2	0	0.041	0.035	0.033	0.029	0.027	0.023	0.017	0.013	
2005	93.4	0	0.038	0.033	0.032	0.029	0.028	0.023	0.018	0.012	
2006	92.1	0	0.037	0.035	0.034	0.029	0.027	0.023	0.018	0.013	
2007	93.9	0	0.035	0.032	0.031	0.028	0.026	0.022	0.016	0.011	
2008	87.1	0	0.031	0.029	0.029	0.026	0.024	0.020	0.015	0.011	

Ozone

Statistical summary

Due to mathematical rounding of the ozone concentration from parts per hundred million to parts per million there may be some instances in which exceedences are recorded, when the ozone concentration is equal to the AAQ NEPM standard. These instances will be noted in each of the tables in which this occurs.

Region/ Performance	Data availability	Percentiles (ppm)							
monitoring Station	rates (%)	(ppm)	99 th	98 th	95 th	90 th	75 th	50 th	25 th
Sydney									
Bringelly	89.8	0.093	0.083	0.072	0.055	0.051	0.039	0.030	0.026
Chullora	93.9	0.080	0.064	0.058	0.049	0.042	0.033	0.027	0.022
Liverpool	87.2	0.098	0.074	0.067	0.058	0.047	0.033	0.028	0.024
Macarthur	93.7	0.085	0.081	0.072	0.059	0.052	0.037	0.031	0.027
Oakdale	92.5	0.093	0.068	0.064	0.058	0.050	0.039	0.032	0.027
Prospect	89.5	0.107	0.085	0.063	0.052	0.045	0.035	0.027	0.023
Richmond	90.6	0.078	0.066	0.062	0.053	0.045	0.037	0.030	0.026
Rozelle	92.8	0.056	0.050	0.047	0.042	0.038	0.030	0.026	0.022
St Marys	92.7	0.096	0.077	0.060	0.053	0.048	0.038	0.031	0.026
Illawarra									
Albion Park South	90.4	0.062	0.058	0.056	0.048	0.041	0.034	0.030	0.026
Kembla Grange	93.6	0.072	0.063	0.055	0.048	0.042	0.032	0.029	0.025
Wollongong	94.0	0.067	0.062	0.056	0.048	0.043	0.033	0.029	0.025
Lower Hunter									
Newcastle	89.8	0.064	0.054	0.049	0.044	0.039	0.034	0.028	0.024
Wallsend	91.9	0.057	0.054	0.052	0.045	0.040	0.033	0.028	0.024

Table 41: Statistical summary for O₃ - Daily maximum 1-hour average concentrations (2008)

Bold font indicates values that exceed the AAQ NEPM standard

Region/ Performance	Data availability	Maximum conc.	Percentiles (ppm)								
monitoring Station	rates (%)	(ppm)	99 th	98 th	95 th	90 th	75 th	50 th	25 th		
Sydney											
Bringelly	93.6	0.078	0.071	0.062	0.051	0.046	0.036	0.029	0.025		
Chullora	98.3	0.074	0.058	0.050	0.045	0.039	0.031	0.025	0.020		
Liverpool	90.5	0.089	0.064	0.059	0.051	0.042	0.032	0.027	0.022		
Macarthur	97.9	0.070	0.065	0.063	0.054	0.047	0.035	0.030	0.025		
Oakdale	96.9	0.075	0.060	0.055	0.051	0.045	0.037	0.031	0.026		
Prospect	93.2	0.096	0.069	0.058	0.047	0.042	0.033	0.026	0.022		
Richmond	94.6	0.067	0.061	0.055	0.048	0.041	0.034	0.029	0.025		
Rozelle	97.0	0.048	0.046	0.044	0.038	0.034	0.028	0.025	0.020		
St Marys	97.1	0.082	0.069	0.056	0.048	0.044	0.036	0.029	0.025		
Illawarra											
Albion Park South	94.1	0.055	0.053	0.048	0.044	0.039	0.032	0.029	0.024		
Kembla Grange	97.5	0.066	0.054	0.050	0.044	0.039	0.031	0.028	0.023		
Wollongong	97.9	0.063	0.056	0.051	0.043	0.040	0.032	0.027	0.023		
Lower Hunter											
Newcastle	93.8	0.058	0.049	0.046	0.041	0.037	0.032	0.027	0.022		
Wallsend	95.7	0.054	0.048	0.045	0.040	0.037	0.031	0.027	0.022		

Table 42: Statistical summary for O₃ - Daily maximum rolling 4-hour average concentrations (2008)

AAQ NEPM Standard - 0.08 ppm (rolling 4-hour average)

Bold font indicates values that exceed the AAQ NEPM standard
Trend analysis

				0				,		
Region/ Performance monitoring Station	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Sydney										
Blacktown/Prospect*	0.091	0.113	0.153	0.130	0.181	0.123			0.089 [*]	0.107 [*]
Bringelly	0.114	0.130	0.175	0.118	0.155	0.122	0.112	0.119	0.111	0.093
Chullora/Lidombe [*]	0.092 [*]	0.118 [*]	0.156 [*]	0.100 [*]	0.084	0.105	0.086	0.117	0.088	0.080
Liverpool	0.102	0.133	0.141	0.100	0.151	0.113	0.149	0.128	0.116	0.098
Macarthur						0.099	0.142	0.128	0.121	0.085
Oakdale	0.107	0.126	0.135	0.094	0.102	0.124	0.130	0.109	0.142	0.093
Richmond	0.127	0.088	0.117	0.125	0.148	0.096	0.125	0.108	0.134	0.078
Rozelle	0.059	0.080	0.115	0.100	0.083	0.094	0.081	0.093	0.088	0.056
St Marys	0.113	0.158	0.146	0.119	0.093	0.142	0.113	0.124	0.123	0.096
Illawarra										
Albion Park/ Albion Park South [*]	0.090	0.106	0.088	0.094	0.130	0.112	0.073	0.096 [*]	0.092 [*]	0.062 [*]
Kembla Grange	0.101	0.117	0.119	0.099	0.113	0.120	0.091	0.093	0.093	0.072
Wollongong	0.087	0.108	0.116	0.121	0.097	0.103	0.102	0.096	0.077	0.067
Lower Hunter										
Newcastle	0.066	0.071	0.072	0.083	0.079	0.112	0.078	0.068	0.053	0.064
Wallsend	0.069	0.073	0.078	0.081	0.077	0.103	0.094	0.086	0.070	0.057

 Table 43: Maximum 1-hour average concentrations for O₃ (ppm)

AAQ NEPM Standard - 0.10 ppm (1-hour average)

Region/ Performance monitoring Station	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Sydney										
Blacktown/Prospect*	0.077	0.101	0.120	0.107	0.157	0.107			0.085*	0.096*
Bringelly	0.092	0.115	0.128	0.099	0.133	0.110	0.102	0.110	0.095	0.078
Chullora/Lidcombe [*]	0.077 [*]	0.095 [*]	0.137 [*]	0.084 [*]	0.077	0.086	0.080	0.104	0.074	0.074
Liverpool	0.084	0.107	0.120	0.089	0.132	0.092	0.121	0.124	0.094	0.089
Macarthur						0.084	0.126	0.117	0.101	0.070
Oakdale	0.090	0.098	0.105	0.080	0.089	0.099	0.106	0.086	0.116	0.075
Richmond	0.098	0.078	0.111	0.112	0.138	0.088	0.101	0.095	0.121	0.067
Rozelle	0.053	0.073	0.083	0.087	0.070	0.087	0.065	0.082	0.075	0.048
St Marys	0.091	0.136	0.125	0.093	0.091	0.128	0.091	0.109	0.105	0.082
Illawarra										
Albion Park/ Albion Park South [*]	0.081	0.083	0.082	0.083	0.111	0.092	0.063	0.078 [*]	0.080*	0.055 [*]
Kembla Grange	0.081	0.089	0.092	0.083	0.107	0.100	0.084	0.081	0.082	0.066
Wollongong	0.073	0.086	0.091	0.099	0.080	0.090	0.099	0.086	0.073	0.063
Lower Hunter										
Newcastle	0.065	0.065	0.069	0.077	0.061	0.073	0.070	0.064	0.047	0.058
Wallsend	0.059	0.070	0.073	0.074	0.059	0.078	0.074	0.066	0.068	0.054

Table 44: Maximum rolling 4-hour average concentrations for O₃ (ppm)

AAQ NEPM Standard - 0.08 ppm (rolling 4-hour average)

Table 45: Statistical summary for O ₃	Annual daily maximum 1-hour average concentrations
Station: Blacktown ⁽¹⁾ /Prospect ⁽²⁾	

Year	Data availability	Number of	Maximum value	Percentiles (ppm)								
	rates (%)	(days)	(ppm)	99 th	98 th	95 th	90 th	75 th	50 th	25 th		
1999 ⁽¹⁾	95.1	0	0.091	0.079	0.075	0.063	0.050	0.035	0.026	0.020		
2000 ⁽¹⁾	91.5	2	0.113	0.088	0.075	0.061	0.051	0.037	0.028	0.024		
2001 ⁽¹⁾	93.6	5	0.153	0.107	0.088	0.075	0.054	0.040	0.030	0.024		
2002 ⁽¹⁾	91.7	2	0.130	0.093	0.083	0.068	0.059	0.043	0.033	0.026		
2003 ⁽¹⁾	90.3	3	0.181	0.085	0.073	0.061	0.050	0.037	0.029	0.025		
2004 ⁽¹⁾	39.5	2	0.123	0.093	0.089	0.080	0.066	0.050	0.036	0.028		
2005#	0.0											
2006#	0.0											
2007 ⁽²⁾	73.3	0	0.089	0.069	0.065	0.061	0.053	0.040	0.030	0.025		
2008 ⁽²⁾	89.5	1	0.107	0.085	0.063	0.052	0.045	0.035	0.027	0.023		

Station closed pending relocation.

Table 46: Statistical summary for O₃ - Annual daily maximum 1-hour average concentrations

Station: Bringelly

Year	Data availability	Number of Exceedences	Maximum value	Percentiles (ppm)								
	rates (%)	(days)	(ppm)	99 th	98 th	95 th	90 th	75 th	50 th	25 th		
1999	92.1	3	0.114	0.100	0.094	0.073	0.055	0.037	0.029	0.024		
2000	94.9	3	0.130	0.096	0.092	0.070	0.059	0.039	0.032	0.027		
2001	91.5	9	0.175	0.115	0.102	0.074	0.059	0.042	0.033	0.027		
2002	93.0	2	0.118	0.098	0.090	0.074	0.064	0.045	0.034	0.028		
2003	91.3	3	0.155	0.095	0.076	0.065	0.056	0.041	0.032	0.028		
2004	91.1	6	0.122	0.104	0.091	0.074	0.060	0.044	0.033	0.029		
2005	88.4	3	0.112	0.084	0.078	0.065	0.056	0.043	0.034	0.029		
2006	92.1	6	0.119	0.106	0.093	0.070	0.057	0.044	0.033	0.028		
2007	92.1	4	0.111	0.093	0.079	0.069	0.058	0.044	0.033	0.028		
2008	89.8	0	0.093	0.083	0.072	0.055	0.051	0.039	0.030	0.026		

 Table 47: Statistical summary for O3 - Annual daily maximum 1-hour average concentrations

 Station: Lidcombe⁽¹⁾ / Chullora⁽²⁾

Year	Data availability	Number of Exceedences	Maximum value			Pe	rcentil (ppm)	es		
	rates (%)	(days)	(ppm)	99 th	98 th	95 th	90 th	75 th	50 th	25 th
1999 ⁽¹⁾	89.4	0	0.092	0.076	0.065	0.055	0.043	0.031	0.025	0.020
2000 ⁽¹⁾	94.7	1	0.118	0.080	0.071	0.058	0.048	0.033	0.026	0.021
2001 ⁽¹⁾	94.5	4	0.156	0.094	0.085	0.066	0.050	0.035	0.025	0.020
2002 ⁽¹⁾	31.0	0#	0.100	0.078	0.074	0.061	0.046	0.037	0.029	0.021
2003 ⁽²⁾	80.6	0	0.084	0.066	0.063	0.046	0.040	0.034	0.028	0.023
2004 ⁽²⁾	87.2	1	0.105	0.087	0.074	0.061	0.050	0.038	0.030	0.026
2005 ⁽²⁾	92.0	0	0.086	0.069	0.066	0.057	0.048	0.037	0.031	0.025
2006 ⁽²⁾	94.3	1	0.117	0.077	0.072	0.057	0.048	0.037	0.030	0.024
2007 ⁽²⁾	93.0	0	0.088	0.067	0.063	0.054	0.044	0.036	0.029	0.024
2008 ⁽²⁾	93.9	0	0.080	0.064	0.058	0.049	0.042	0.033	0.027	0.022

No exceedences due to mathematical rounding of the maximum value from parts per hundred million to parts per million.

Bold font indicates values that exceed the AAQ NEPM standard AAQ NEPM Standard - 0.10 ppm (1-hour average)

Table 48: Statistical summary for O₃ - Annual daily maximum 1-hour average concentrations

Year	Data availability	Number of	Maximum value	Percentiles (ppm)								
. oai	rates (%)	(days)	(ppm)	99 th	98 th	95 th	90 th	75 th	50 th	25 th		
1999	83.6	1	0.102	0.086	0.077	0.064	0.045	0.032	0.025	0.020		
2000	93.3	2	0.133	0.088	0.079	0.069	0.058	0.035	0.028	0.024		
2001	94.7	5	0.141	0.103	0.089	0.071	0.053	0.039	0.030	0.025		
2002	93.6	1#	0.100	0.087	0.084	0.064	0.054	0.039	0.030	0.025		
2003	93.3	4	0.151	0.087	0.065	0.054	0.045	0.035	0.029	0.024		
2004	92.3	3	0.113	0.096	0.084	0.068	0.054	0.040	0.030	0.026		
2005	88.0	1	0.149	0.082	0.077	0.059	0.052	0.040	0.032	0.027		
2006	91.4	4	0.128	0.092	0.084	0.069	0.054	0.040	0.030	0.025		
2007	90.3	2	0.116	0.086	0.074	0.062	0.052	0.039	0.029	0.025		
2008	87.2	0	0.098	0.074	0.067	0.058	0.047	0.033	0.028	0.024		

Station: Liverpool

Table 49: Statistical summary for O₃ - Annual daily maximum 1-hour average concentrations

Station: Macarthur

Year	Data availability	Number of	Maximum value	Percentiles (ppm)								
	rates (%)	(days)	(ppm)	99 th	98 th	95 th	90 th	75 th	50 th	25 th		
2004	16.2	0	0.099	0.086	0.082	0.070	0.062	0.055	0.038	0.028		
2005	94.7	6	0.142	0.104	0.090	0.073	0.061	0.044	0.033	0.029		
2006	94.3	8	0.128	0.111	0.100	0.073	0.059	0.044	0.032	0.027		
2007	90.6	3	0.121	0.095	0.086	0.070	0.059	0.043	0.032	0.027		
2008	93.7	0	0.085	0.081	0.072	0.059	0.052	0.037	0.031	0.027		

Table 50: Statistical summary for O₃ - Annual daily maximum 1-hour average concentrations

Station: Oakdale

Year	Data availability	Number of Exceedences	Maximum value			Pe	ercentil (ppm)	es		
1	rates (%)	(days)	(ppm)	99 th	98 th	95 th	90 th	75 th	50 th	25 th
1999	89.6	5	0.107	0.104	0.090	0.068	0.055	0.041	0.031	0.027
2000	90.1	4	0.126	0.100	0.086	0.065	0.055	0.039	0.030	0.027
2001	34.8	7	0.135	0.118	0.115	0.089	0.072	0.045	0.032	0.025
2002	18.6	0	0.094	0.088	0.088	0.082	0.077	0.062	0.047	0.037
2003	91.1	1	0.102	0.079	0.073	0.063	0.054	0.041	0.033	0.029
2004	85.6	7	0.124	0.105	0.089	0.072	0.063	0.047	0.035	0.031
2005	91.9	4	0.130	0.097	0.084	0.070	0.058	0.043	0.034	0.030
2006	87.9	1	0.109	0.088	0.081	0.068	0.060	0.048	0.035	0.030
2007	87.6	4	0.142	0.099	0.089	0.070	0.060	0.044	0.034	0.030
2008	92.5	0	0.093	0.068	0.064	0.058	0.050	0.039	0.032	0.027

AAQ NEPM Standard - 0.10 ppm (1-hour average)

Table 51: Statistical summary for O₃ - Annual daily maximum 1-hour average concentrations

Year	Data availability	Number of	Maximum value	Percentiles (ppm)								
- Oui	rates (%)	(days)	(ppm)	99 th	98 th	95 th	90 th	75 th	50 th	25 th		
1999	92.0	1	0.127	0.076	0.074	0.064	0.054	0.040	0.032	0.027		
2000	89.7	0	0.088	0.080	0.071	0.062	0.051	0.039	0.030	0.025		
2001	90.8	5	0.117	0.106	0.095	0.074	0.057	0.042	0.034	0.028		
2002	92.5	2	0.125	0.094	0.084	0.070	0.063	0.045	0.034	0.029		
2003	86.1	2	0.148	0.083	0.078	0.061	0.053	0.039	0.030	0.026		
2004	89.5	0	0.096	0.080	0.075	0.065	0.058	0.045	0.034	0.029		
2005	91.8	2	0.125	0.090	0.081	0.065	0.058	0.046	0.035	0.030		
2006	92.8	2	0.108	0.086	0.077	0.068	0.058	0.046	0.035	0.029		
2007	91.1	1	0.134	0.081	0.073	0.067	0.058	0.046	0.034	0.029		
2008	90.6	0	0.078	0.066	0.062	0.053	0.045	0.037	0.030	0.026		

Station: Richmond

Table 52: Statistical summary for O_3 - Annual daily maximum 1-hour average concentrations

Station: Rozelle

Year	Data availability	Number of Exceedences	Maximum value	Percentiles (ppm)								
	rates (%)	(days)	(ppm)	99 th	98 th	95 th	90 th	75 th	50 th	25 th		
1999	89.9	0	0.059	0.050	0.047	0.038	0.032	0.025	0.020	0.015		
2000	87.8	0	0.080	0.068	0.058	0.048	0.036	0.030	0.026	0.021		
2001	93.4	1	0.115	0.066	0.057	0.047	0.040	0.032	0.026	0.021		
2002	88.1	O [#]	0.100	0.073	0.066	0.053	0.043	0.035	0.028	0.023		
2003	91.2	0	0.083	0.064	0.058	0.045	0.037	0.031	0.027	0.023		
2004	88.9	0	0.094	0.077	0.072	0.056	0.045	0.034	0.027	0.024		
2005	88.9	0	0.081	0.067	0.059	0.051	0.044	0.034	0.029	0.024		
2006	92.2	0	0.093	0.069	0.060	0.051	0.042	0.033	0.027	0.023		
2007	92.0	0	0.088	0.055	0.050	0.046	0.041	0.033	0.028	0.023		
2008	92.8	0	0.056	0.050	0.047	0.042	0.038	0.030	0.026	0.022		

Exceedence due to mathematical rounding of the maximum value from parts per hundred million to parts per million.

Table 53: Statistical summary for O₃ - Annual daily maximum 1-hour average concentrations

Station:	St	Marys
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Year	Data availability	Number of Exceedences	Maximum value	Percentiles (ppm)								
	rates (%)	(days)	(ppm)	99 th	98 th	95 th	90 th	75 th	50 th	25 th		
1999	88.3	2	0.113	0.091	0.083	0.062	0.052	0.034	0.026	0.021		
2000	91.5	3	0.158	0.096	0.086	0.069	0.058	0.041	0.032	0.027		
2001	90.3	6	0.146	0.111	0.099	0.076	0.059	0.042	0.033	0.028		
2002	95.3	1	0.119	0.091	0.082	0.067	0.059	0.046	0.034	0.028		
2003	92.7	0	0.093	0.071	0.066	0.058	0.052	0.037	0.030	0.026		
2004	93.6	3	0.142	0.091	0.082	0.067	0.058	0.044	0.033	0.029		
2005	92.1	2	0.113	0.086	0.076	0.066	0.058	0.042	0.034	0.029		
2006	92.6	3	0.124	0.089	0.076	0.067	0.056	0.043	0.032	0.027		
2007	92.2	3	0.123	0.089	0.076	0.065	0.056	0.044	0.033	0.028		
2008	92.7	0	0.096	0.077	0.060	0.053	0.048	0.038	0.031	0.026		

AAQ NEPM Standard - 0.10 ppm (1-hour average)

Year	Data availability	Number of	Maximum value –	Percentiles (ppm)								
- Cai	rates (%)	(days)	(ppm)	99 th	98 th	95 th	90 th	75 th	50 th	25 th		
1999 ⁽¹⁾	90.4	0	0.090	0.084	0.067	0.051	0.043	0.034	0.029	0.025		
2000 ⁽¹⁾	90.0	1	0.106	0.086	0.079	0.059	0.045	0.035	0.030	0.026		
2001 ⁽¹⁾	93.6	0	0.088	0.074	0.065	0.054	0.044	0.037	0.032	0.027		
2002 ⁽¹⁾	57.6	0	0.094	0.077	0.068	0.048	0.043	0.033	0.027	0.024		
2003 ⁽¹⁾	92.8	4	0.130	0.081	0.063	0.044	0.040	0.034	0.030	0.027		
2004 ⁽¹⁾	93.5	1	0.112	0.080	0.062	0.051	0.044	0.035	0.030	0.027		
2005 ⁽¹⁾	4.8	0	0.067	0.066	0.065	0.062	0.049	0.039	0.030	0.025		
2006 ⁽²⁾	86.2	0	0.096	0.082	0.074	0.054	0.046	0.037	0.031	0.027		
2007 ⁽²⁾	91.4	0	0.092	0.068	0.058	0.050	0.042	0.035	0.031	0.028		
2008 ⁽²⁾	90.4	0	0.062	0.058	0.056	0.048	0.041	0.034	0.030	0.026		

Table 54: Statistical summary for O_3 - Annual daily maximum 1-hour average concentrationStation: Albion Park $^{(1)}$ / Albion Park South $^{(2)}$

Table 55: Statistical summary for O_3 - Annual daily maximum 1-hour average concentrations

Station: Kembla Grange

Year	Data availability	ata Number of ability Exceedences		Percentiles (ppm)								
	rates (%)	(days)	(ppm)	99 th	98 th	95 th	90 th	75 th	50 th	25 th		
1999	91.1	1	0.101	0.079	0.065	0.051	0.042	0.033	0.028	0.024		
2000	93.9	3	0.117	0.087	0.077	0.056	0.045	0.034	0.029	0.025		
2001	82.3	2	0.119	0.085	0.078	0.056	0.046	0.036	0.030	0.025		
2002	91.7	0	0.099	0.084	0.079	0.053	0.044	0.036	0.031	0.026		
2003	93.3	2	0.113	0.092	0.066	0.044	0.038	0.033	0.030	0.026		
2004	91.3	3	0.120	0.077	0.060	0.051	0.043	0.036	0.031	0.027		
2005	92.6	0	0.091	0.071	0.065	0.051	0.044	0.036	0.032	0.027		
2006	94.6	0	0.093	0.067	0.063	0.051	0.045	0.036	0.030	0.027		
2007	94.1	0	0.093	0.066	0.061	0.048	0.043	0.034	0.031	0.027		
2008	93.6	0	0.072	0.063	0.055	0.048	0.042	0.032	0.029	0.025		

Table 56: Statistical summary for O₃ - Annual daily maximum 1-hour average concentrations

Station:	Wollongong
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Year	Data availability	Number of Exceedences	Maximum value	Percentiles (ppm)								
1	rates (%)	(days)	(ppm)	99 th	98 th	95 th	90 th	75 th	50 th	25 th		
1999	87.7	0	0.087	0.067	0.062	0.046	0.041	0.032	0.027	0.021		
2000	94.1	1	0.108	0.083	0.074	0.061	0.046	0.034	0.028	0.024		
2001	94.0	1	0.116	0.074	0.071	0.061	0.050	0.037	0.030	0.025		
2002	90.7	2	0.121	0.084	0.081	0.062	0.048	0.036	0.030	0.024		
2003	92.8	0	0.097	0.080	0.070	0.046	0.040	0.033	0.029	0.025		
2004	92.5	1	0.103	0.082	0.069	0.055	0.043	0.034	0.029	0.026		
2005	92.4	1	0.102	0.071	0.065	0.054	0.046	0.035	0.030	0.026		
2006	94.6	0	0.096	0.072	0.063	0.053	0.046	0.035	0.030	0.026		
2007	90.2	0	0.077	0.066	0.059	0.050	0.042	0.034	0.029	0.025		
2008	94.0	0	0.067	0.062	0.056	0.048	0.043	0.033	0.029	0.025		

AAQ NEPM Standard - 0.10 ppm (1-hour average)

Table 57: Statistical summary for O₃ - Annual daily maximum 1-hour average concentration

Year	Data availability	Number of	Maximum value (ppm)	Percentiles (ppm)								
- Oui	rates (%)	(days)		99 th	98 th	95 th	90 th	75 th	50 th	25 th		
1999	92.0	0	0.066	0.055	0.051	0.046	0.040	0.033	0.027	0.022		
2000	88.4	0	0.071	0.065	0.058	0.048	0.042	0.032	0.027	0.023		
2001	93.3	0	0.072	0.063	0.057	0.047	0.040	0.034	0.029	0.025		
2002	94.0	0	0.083	0.077	0.061	0.054	0.046	0.037	0.030	0.025		
2003	92.4	0	0.079	0.061	0.054	0.045	0.039	0.035	0.030	0.025		
2004	92.3	1	0.112	0.068	0.065	0.052	0.044	0.036	0.030	0.025		
2005	92.4	0	0.078	0.061	0.057	0.049	0.042	0.035	0.030	0.026		
2006	93.7	0	0.068	0.061	0.059	0.047	0.042	0.035	0.030	0.024		
2007	43.9	0	0.053	0.051	0.050	0.046	0.040	0.033	0.028	0.023		
2008	89.8	0	0.064	0.054	0.049	0.044	0.039	0.034	0.028	0.024		

Station: Newcastle

Table 58: Statistical summary for O_3 - Annual daily maximum 1-hour average concentration

Station: Wallsend

Year	Data availability ratos	Number of Exceedences (days)	Maximum value	Percentiles (ppm)								
	rates (%)		(ppm)	99 th	98 th	95 th	90 th	75 th	50 th	25 th		
1999	83.2	0	0.069	0.057	0.054	0.047	0.042	0.033	0.027	0.021		
2000	90.4	0	0.073	0.066	0.060	0.048	0.042	0.032	0.027	0.023		
2001	87.9	0	0.078	0.070	0.063	0.053	0.046	0.036	0.028	0.023		
2002	81.9	0	0.081	0.074	0.069	0.056	0.049	0.038	0.031	0.025		
2003	91.6	0	0.077	0.064	0.060	0.049	0.042	0.034	0.029	0.025		
2004	88.2	1	0.103	0.071	0.065	0.054	0.047	0.037	0.031	0.026		
2005	91.3	0	0.094	0.068	0.063	0.052	0.046	0.037	0.031	0.026		
2006	93.2	0	0.086	0.068	0.061	0.050	0.045	0.036	0.029	0.024		
2007	92.3	0	0.070	0.061	0.054	0.049	0.045	0.035	0.029	0.025		
2008	91.9	0	0.057	0.054	0.052	0.045	0.040	0.033	0.028	0.024		

Table 59: Statistical summary for O₃ - Annual daily maximum 1-hour average concentrations

Station: Bathurst

Year	Data availability	Number of Exceedences	Maximum value		Percentiles (ppm)						
1	rates (%)	(days)	(ppm)	99 th	98 th	95 th	90 th	75 th	50 th	25 th	
2001	50.4	0	0.063	0.052	0.050	0.048	0.045	0.036	0.032	0.027	
2002	34.7	0	0.064	0.063	0.062	0.057	0.052	0.044	0.038	0.032	
2003	76.4	0	0.056	0.051	0.049	0.046	0.042	0.036	0.032	0.029	
2004	89.9	0	0.092	0.067	0.059	0.054	0.050	0.043	0.034	0.029	
2005	90.7	0	0.056	0.054	0.052	0.048	0.044	0.038	0.033	0.030	
2006	94.5	0	0.075	0.066	0.059	0.054	0.048	0.041	0.034	0.029	
2007	54.3	0	0.068	0.065	0.061	0.053	0.050	0.039	0.032	0.029	
2008											

AAQ NEPM Standard - 0.10 ppm (1-hour average)

Table 60: Statistical summary for O ₃ - Daily maximum rolling 4-hour	average concentration
Station: Blacktown ⁽¹⁾ /Prospect ⁽²⁾	

Year	Data availability	Number of Exceedences	Maximum value	Percentiles (ppm)								
	rates (%)	(days)	(ppm)	99 th	98 th	95 th	90 th	75 th	50 th	25 th		
1999 ⁽¹⁾	99.3	0	0.077	0.064	0.061	0.054	0.045	0.031	0.024	0.018		
2000 ⁽¹⁾	95.3	3	0.101	0.078	0.065	0.054	0.045	0.034	0.026	0.021		
2001 ⁽¹⁾	97.7	8	0.120	0.091	0.080	0.065	0.048	0.036	0.029	0.022		
2002 ⁽¹⁾	95.7	6	0.107	0.083	0.077	0.061	0.054	0.040	0.031	0.024		
2003 ⁽¹⁾	94.3	3	0.157	0.078	0.066	0.056	0.045	0.035	0.028	0.023		
2004 ⁽¹⁾	41.3	4	0.107	0.082	0.080	0.070	0.061	0.044	0.033	0.026		
2005#	0.0											
2006#	0.0											
2007 ⁽²⁾	75.1	1	0.085	0.063	0.059	0.054	0.048	0.037	0.028	0.023		
2008 ⁽²⁾	93.2	1	0.096	0.069	0.058	0.047	0.042	0.033	0.026	0.022		

Station closed pending relocation.

Table 61: Statistical summary for O₃ - Daily maximum rolling 4-hour average concentration

Station: Bringelly

Year	Data availability	Number of Exceedences	umber of Maximum ceedences value			Percentiles (ppm)								
	rates (%)	(days)	(ppm)	99 th	98 th	95 th	90 th	75 th	50 th	25 th				
1999	96.0	4	0.092	0.078	0.074	0.061	0.049	0.034	0.028	0.023				
2000	99.3	6	0.115	0.086	0.076	0.063	0.052	0.037	0.030	0.026				
2001	95.4	12	0.128	0.098	0.086	0.069	0.054	0.039	0.032	0.026				
2002	96.8	7	0.099	0.088	0.078	0.066	0.055	0.041	0.033	0.026				
2003	95.3	5	0.133	0.082	0.068	0.057	0.050	0.038	0.031	0.027				
2004	95.1	7	0.110	0.085	0.078	0.064	0.053	0.041	0.032	0.028				
2005	92.4	3	0.102	0.074	0.066	0.059	0.050	0.039	0.033	0.028				
2006	96.2	6	0.110	0.083	0.075	0.062	0.051	0.041	0.031	0.026				
2007	94.8	4	0.095	0.079	0.070	0.058	0.052	0.040	0.031	0.027				
2008	93.6	0	0.078	0.071	0.062	0.051	0.046	0.036	0.029	0.025				

 Table 62: Statistical summary for O_3 - Daily maximum rolling 4-hour average concentration

 Station: Lidcombe⁽¹⁾ / Chullora⁽²⁾

Year	Data availability	Number of Exceedences	Maximum value	Percentiles (ppm)								
	rates (%)	(days)	(ppm)	99 th	98 th	95 th	90 th	75 th	50 th	25 th		
1999 ⁽¹⁾	91.0	0	0.077	0.065	0.056	0.050	0.039	0.029	0.023	0.018		
2000 (1)	98.7	2	0.095	0.074	0.066	0.053	0.043	0.031	0.025	0.019		
2001 (1)	98.5	4	0.137	0.080	0.076	0.057	0.044	0.032	0.024	0.019		
2002 (1)	32.4	1	0.084	0.072	0.063	0.052	0.043	0.035	0.027	0.020		
2003 (2)	84.2	0	0.077	0.057	0.053	0.041	0.037	0.032	0.026	0.021		
2004 (2)	91.2	4	0.086	0.077	0.065	0.054	0.045	0.035	0.029	0.024		
2005 ⁽²⁾	96.2	1#	0.080	0.064	0.059	0.052	0.042	0.034	0.028	0.023		
2006 ⁽²⁾	98.8	2	0.104	0.070	0.063	0.053	0.044	0.034	0.028	0.022		
2007 ⁽²⁾	97.1	0	0.074	0.063	0.056	0.049	0.041	0.033	0.027	0.022		
2008 (2)	98.3	0	0.074	0.058	0.050	0.045	0.039	0.031	0.025	0.020		

Exceedence due to mathematical rounding of the maximum value from parts per hundred million to parts per million.

AAQ NEPM Standard - 0.08 ppm (rolling 4-hour average)

Table 63: Statistical summary for O_3 - Daily maximum rolling 4-hour average concentration

Year	Data availability	Number of Exceedences	Maximum value			Pe	ercentil (ppm)	les		
	rates (%)	(days)	(ppm)	99 th	98 th	95 th	90 th	75 th	50 th	25 th
1999	87.3	1	0.084	0.068	0.065	0.054	0.041	0.030	0.023	0.018
2000	97.5	3	0.107	0.076	0.070	0.059	0.047	0.033	0.027	0.022
2001	99.0	7	0.120	0.093	0.078	0.064	0.048	0.036	0.029	0.023
2002	97.7	5	0.089	0.078	0.068	0.058	0.048	0.035	0.028	0.023
2003	97.1	3	0.132	0.073	0.054	0.048	0.040	0.033	0.028	0.022
2004	96.4	5	0.092	0.080	0.071	0.059	0.048	0.037	0.029	0.024
2005	92.0	2	0.121	0.073	0.067	0.053	0.046	0.036	0.030	0.025
2006	95.2	4	0.124	0.075	0.073	0.062	0.049	0.036	0.028	0.023
2007	92.3	2	0.094	0.072	0.066	0.057	0.047	0.035	0.028	0.023
2008	90.5	1	0.089	0.064	0.059	0.051	0.042	0.032	0.027	0.022

Station: Liverpool

Table 64: Statistical summary for O_3 - Daily maximum rolling 4-hour average concentration

Station: Macarthur

Year	Data availability	Number of Exceedences	Maximum value		Percentiles (ppm)							
	rates (%)	(days)	(ppm)	99 th	98 th	95 th	90 th	75 th	50 th	25 th		
2004	16.9	1	0.084	0.077	0.068	0.059	0.054	0.047	0.037	0.027		
2005	98.9	7	0.126	0.091	0.077	0.061	0.054	0.040	0.032	0.028		
2006	98.5	8	0.117	0.093	0.081	0.066	0.054	0.040	0.030	0.026		
2007	94.1	7	0.101	0.082	0.076	0.063	0.054	0.039	0.030	0.025		
2008	97.9	0	0.070	0.065	0.063	0.054	0.047	0.035	0.030	0.025		

Table 65: Statistical summary for O₃ - Daily maximum rolling 4-hour average concentration

Station: Oakdale

Year	Data availability	Number of Exceedences	Maximum value			Pe	rcentil (ppm)	es		
	rates (%)	(days)	(ppm)	99 th	98 th	95 th	90 th	75 th	50 th	25 th
1999	93.3	6	0.090	0.083	0.075	0.059	0.050	0.038	0.030	0.027
2000	94.0	4	0.098	0.082	0.072	0.055	0.047	0.037	0.029	0.026
2001	36.2	8	0.105	0.096	0.093	0.084	0.057	0.042	0.030	0.025
2002	19.3	1#	0.080	0.079	0.076	0.073	0.068	0.055	0.043	0.035
2003	95.0	3	0.089	0.072	0.064	0.056	0.048	0.039	0.032	0.028
2004	89.2	7	0.099	0.088	0.077	0.064	0.056	0.044	0.034	0.030
2005	95.1	4	0.106	0.079	0.072	0.062	0.052	0.040	0.032	0.029
2006	91.6	1	0.086	0.077	0.070	0.061	0.053	0.044	0.034	0.029
2007	91.0	6	0.116	0.083	0.075	0.063	0.053	0.042	0.033	0.029
2008	96.9	0	0.075	0.060	0.055	0.051	0.045	0.037	0.031	0.026

Exceedence due to mathematical rounding of the maximum value from parts per hundred million to parts per million.

AAQ NEPM Standard - 0.08 ppm (rolling 4-hour average)

Table 66: Statistical summary for O_3 - Daily maximum rolling 4-hour average concentration

Year	Data availability	Number of Exceedences	Maximum value			Pe	ercentil (ppm)	les		
	rates (%)	(days)	(ppm)	99 th	98 th	95 th	90 th	75 th	50 th	25 th
1999	95.9	1	0.098	0.071	0.064	0.053	0.048	0.038	0.031	0.025
2000	93.2	0	0.078	0.065	0.061	0.054	0.046	0.036	0.028	0.024
2001	94.5	6	0.111	0.084	0.074	0.065	0.051	0.039	0.032	0.026
2002	96.3	4	0.112	0.080	0.073	0.062	0.056	0.042	0.032	0.027
2003	89.5	3	0.138	0.076	0.067	0.055	0.048	0.037	0.029	0.025
2004	93.8	1	0.088	0.073	0.067	0.057	0.052	0.042	0.033	0.028
2005	96.3	4	0.101	0.080	0.066	0.059	0.052	0.042	0.033	0.028
2006	97.3	2	0.095	0.075	0.072	0.061	0.052	0.042	0.034	0.027
2007	94.1	3	0.121	0.071	0.067	0.059	0.053	0.042	0.032	0.028
2008	94.6	0	0.067	0.061	0.055	0.048	0.041	0.034	0.029	0.025

Station: Richmond

Table 67: Statistical summary for O_3 - Daily maximum rolling 4-hour average concentration

Station: Rozelle

Year	Data availability	Number of Exceedences	Maximum value	n Percentiles (ppm)								
	rates (%)	(days)	(ppm)	99 th	98 th	95 th	90 th	75 th	50 th	25 th		
1999	92.6	0	0.053	0.043	0.039	0.035	0.029	0.023	0.019	0.014		
2000	91.5	0	0.073	0.058	0.050	0.042	0.034	0.028	0.024	0.019		
2001	97.4	1	0.083	0.055	0.050	0.040	0.036	0.030	0.024	0.020		
2002	92.1	1	0.087	0.061	0.054	0.047	0.040	0.032	0.026	0.021		
2003	95.3	0	0.070	0.057	0.052	0.039	0.034	0.030	0.025	0.021		
2004	92.9	1	0.087	0.071	0.065	0.050	0.041	0.032	0.026	0.022		
2005	92.9	0	0.065	0.058	0.054	0.045	0.039	0.032	0.027	0.023		
2006	96.6	1	0.082	0.062	0.055	0.046	0.037	0.030	0.026	0.021		
2007	93.7	0	0.075	0.049	0.045	0.042	0.037	0.031	0.026	0.021		
2008	97.0	0	0.048	0.046	0.044	0.038	0.034	0.028	0.025	0.020		

Table 68: Statistical summary for O₃ - Daily maximum rolling 4-hour average concentration

Station: St Marys

Year	Data availability	Number of Exceedences	Maximum value		Percentiles (ppm)								
	rates (%)	(days)	(ppm)	99 th	98 th	95 th	90 th	75 th	50 th	25 th			
1999	92.2	3	0.091	0.073	0.065	0.057	0.046	0.031	0.025	0.019			
2000	95.6	5	0.136	0.083	0.076	0.063	0.053	0.038	0.030	0.025			
2001	94.2	11	0.125	0.092	0.085	0.067	0.051	0.040	0.031	0.027			
2002	99.7	7	0.093	0.084	0.070	0.060	0.053	0.042	0.032	0.026			
2003	96.8	2	0.091	0.062	0.059	0.051	0.046	0.035	0.029	0.025			
2004	97.8	4	0.128	0.078	0.067	0.060	0.053	0.041	0.032	0.028			
2005	96.2	3	0.091	0.077	0.067	0.058	0.050	0.040	0.032	0.028			
2006	96.6	4	0.109	0.079	0.067	0.059	0.052	0.041	0.030	0.026			
2007	93.1	4	0.105	0.080	0.069	0.057	0.050	0.039	0.031	0.027			
2008	97.1	1	0.082	0.069	0.056	0.048	0.044	0.036	0.029	0.025			

AAQ NEPM Standard - 0.08 ppm (rolling 4-hour average)

Year	Data availability	Number of	Maximum value			Pe	ercentil (ppm)	es		
	rates (%)	(days)	(ppm)	99 th	98 th	95 th	90 th	75 th	50 th	25 th
1999 ⁽¹⁾	89.4	1	0.081	0.070	0.056	0.045	0.038	0.032	0.028	0.024
2000 ⁽¹⁾	93.7	4	0.083	0.080	0.065	0.051	0.041	0.034	0.028	0.025
2001 ⁽¹⁾	97.7	1	0.082	0.064	0.059	0.049	0.041	0.036	0.031	0.026
2002 ⁽¹⁾	60.0	1	0.083	0.069	0.065	0.043	0.039	0.031	0.026	0.023
2003 ⁽¹⁾	96.8	4	0.111	0.070	0.058	0.040	0.037	0.033	0.029	0.025
2004 ⁽¹⁾	97.5	1	0.092	0.073	0.055	0.046	0.040	0.033	0.029	0.026
2005 ⁽¹⁾	5.0	0	0.063	0.059	0.058	0.054	0.047	0.039	0.029	0.023
2006 ⁽²⁾	90.0	0	0.078	0.070	0.062	0.048	0.042	0.035	0.030	0.026
2007 ⁽²⁾	94.6	1#	0.080	0.060	0.055	0.046	0.039	0.033	0.030	0.026
2008 ⁽²⁾	94.1	0	0.055	0.053	0.048	0.044	0.039	0.032	0.029	0.024

Table 69: Statistical summary for O3 - Daily maximum rolling 4-hour average concentrationStation: Albion Park $^{(1)}$ / Albion Park South $^{(2)}$

Exceedence due to mathematical rounding of the maximum value from parts per hundred million to parts per million.

Table 70: Statistical summary for O₃ - Daily maximum rolling 4-hour average concentration

Station: Kembla Grange

Year	Data availability	Number of Exceedences	Maximum value			Pe	rcentil (ppm)	es		
	rates (%)	(days)	(ppm)	99 th	98 th	95 th	90 th	75 th	50 th	25 th
1999	88.9	1	0.081	0.067	0.056	0.044	0.037	0.031	0.027	0.023
2000	97.9	4	0.089	0.077	0.067	0.050	0.039	0.032	0.028	0.024
2001	85.7	2	0.092	0.071	0.061	0.051	0.042	0.034	0.029	0.024
2002	95.8	1	0.083	0.071	0.070	0.046	0.040	0.034	0.029	0.024
2003	97.4	3	0.107	0.073	0.056	0.041	0.036	0.032	0.028	0.025
2004	95.4	3	0.100	0.067	0.053	0.047	0.040	0.034	0.030	0.026
2005	96.7	1	0.084	0.060	0.059	0.047	0.040	0.035	0.031	0.026
2006	98.9	1	0.081	0.061	0.055	0.046	0.041	0.034	0.029	0.025
2007	97.8	1	0.082	0.061	0.056	0.045	0.040	0.033	0.029	0.025
2008	97.5	0	0.066	0.054	0.050	0.044	0.039	0.031	0.028	0.023

Table 71: Statistical summary for O₃ - Daily maximum rolling 4-hour average concentration

Station: Wollongong

Year	Data availability	Number of Exceedences	Maximum value	Maximum Percentiles value (ppm)								
	rates (%)	(days)	(ppm)	99 th	98 th	95 th	90 th	75 th	50 th	25 th		
1999	85.4	0	0.073	0.058	0.054	0.043	0.037	0.030	0.025	0.019		
2000	98.2	3	0.086	0.076	0.067	0.056	0.040	0.031	0.027	0.023		
2001	98.0	1	0.091	0.068	0.064	0.052	0.044	0.034	0.029	0.024		
2002	94.6	2	0.099	0.076	0.068	0.056	0.043	0.034	0.028	0.023		
2003	96.4	1#	0.080	0.072	0.059	0.042	0.037	0.032	0.028	0.024		
2004	96.3	2	0.090	0.067	0.058	0.050	0.040	0.032	0.028	0.025		
2005	96.2	1	0.099	0.063	0.058	0.048	0.041	0.033	0.029	0.024		
2006	98.6	1	0.086	0.064	0.055	0.047	0.042	0.033	0.028	0.024		
2007	93.2	0	0.073	0.061	0.054	0.045	0.039	0.033	0.028	0.023		
2008	97.9	0	0.063	0.056	0.051	0.043	0.040	0.032	0.027	0.023		

Exceedence due to mathematical rounding of the maximum value from parts per hundred million to parts per million.

AAQ NEPM Standard - 0.08 ppm (rolling 4-hour average)

Table 72: Statistical summary for O₃ - Daily maximum rolling 4-hour average concentrations

Year	Data availability	Number of	Maximum value			Pe	ercentil (ppm)	es		
- Cai	rates (%)	(days)	(ppm)	99 th	98 th	95 th	90 th	75 th	50 th	25 th
1999	96.0	0	0.065	0.050	0.047	0.042	0.037	0.032	0.026	0.021
2000	92.1	0	0.065	0.059	0.051	0.043	0.038	0.030	0.025	0.021
2001	97.4	0	0.069	0.057	0.051	0.042	0.037	0.032	0.027	0.023
2002	98.2	0	0.077	0.063	0.054	0.050	0.041	0.034	0.028	0.023
2003	96.3	0	0.061	0.052	0.049	0.041	0.038	0.033	0.028	0.024
2004	96.4	0	0.073	0.061	0.059	0.048	0.041	0.034	0.028	0.024
2005	96.5	0	0.070	0.052	0.049	0.044	0.039	0.033	0.028	0.024
2006	97.9	0	0.064	0.054	0.052	0.043	0.038	0.033	0.028	0.022
2007	45.6	0	0.047	0.046	0.045	0.041	0.036	0.031	0.026	0.021
2008	93.8	0	0.058	0.049	0.046	0.041	0.037	0.032	0.027	0.022

Station: Newcastle

Table 73: Statistical summary for O_3 - Daily maximum rolling 4-hour average concentration

Station: Wallsend

Year	Data availability	Number of Exceedences	Maximum value			Pe	ercentil (ppm)	es		
i oui	rates (%)	(days)	(ppm)	99 th	98 th	95 th	90 th	75 th	50 th	25 th
1999	86.7	0	0.059	0.050	0.047	0.042	0.038	0.031	0.024	0.020
2000	94.2	0	0.070	0.059	0.056	0.045	0.038	0.030	0.026	0.022
2001	91.7	0	0.073	0.062	0.056	0.048	0.041	0.033	0.027	0.022
2002	85.6	0	0.074	0.067	0.065	0.052	0.043	0.035	0.029	0.023
2003	95.7	0	0.059	0.057	0.054	0.044	0.039	0.032	0.028	0.024
2004	92.0	0	0.078	0.064	0.057	0.049	0.044	0.035	0.029	0.025
2005	95.4	0	0.074	0.061	0.056	0.048	0.041	0.034	0.029	0.025
2006	97.3	0	0.066	0.062	0.056	0.046	0.039	0.033	0.027	0.023
2007	95.1	0	0.068	0.053	0.049	0.044	0.040	0.033	0.028	0.023
2008	95.7	0	0.054	0.048	0.045	0.040	0.037	0.031	0.027	0.022

Table 74: Statistical summary for O₃ - Daily maximum rolling 4-hour average concentration

Station: Bathurst

Year	Data availability	Number of Exceedences	Maximum value			Pe	rcentil (ppm)	es		
'	rates (%)	(days)	(ppm)	99 th	98 th	95 th	90 th	75 th	50 th	25 th
2001	52.3	0	0.060	0.051	0.049	0.046	0.042	0.035	0.030	0.025
2002	36.1	0	0.062	0.058	0.057	0.054	0.049	0.042	0.037	0.030
2003	79.6	0	0.053	0.049	0.047	0.044	0.040	0.036	0.031	0.028
2004	93.7	0	0.067	0.058	0.055	0.050	0.048	0.041	0.033	0.027
2005	94.5	0	0.055	0.052	0.049	0.046	0.041	0.036	0.032	0.029
2006	98.5	0	0.071	0.061	0.056	0.050	0.045	0.040	0.033	0.028
2007	56.7	0	0.066	0.061	0.059	0.050	0.048	0.037	0.031	0.028
2008										

AAQ NEPM Standard - 0.08 ppm (rolling 4-hour average)

Sulfur Dioxide

Statistical summary

Region/ Performance	Data availability	Maximum conc.	Percentiles (ppm)								
monitoring Station	rates (%)	(ppm)	99 th	98 th	95 th	90 th	75 th	50 th	25 th		
Sydney											
Bringelly	80.9	0.019	0.008	0.006	0.005	0.003	0.002	0.001	0.000		
Chullora	77.5	0.021	0.018	0.012	0.007	0.006	0.004	0.002	0.001		
Macarthur	92.1	0.015	0.013	0.009	0.006	0.004	0.003	0.002	0.001		
Prospect	85.2	0.014	0.011	0.010	0.008	0.005	0.003	0.002	0.001		
Richmond	92.2	0.015	0.009	0.007	0.005	0.003	0.001	0.001	0.000		
Illawarra											
Albion Park South	93.0	0.028	0.026	0.022	0.015	0.011	0.005	0.001	0.000		
Wollongong	78.3	0.021	0.019	0.015	0.012	0.009	0.006	0.002	0.001		
Lower Hunter											
Newcastle	86.9	0.033	0.027	0.024	0.019	0.015	0.010	0.005	0.002		
Wallsend	91.3	0.044	0.032	0.026	0.021	0.018	0.011	0.006	0.002		

Table 75: Statistical summary for SO₂ - Daily maximum 1-hour average concentrations (2008)

AAQ NEPM Standard - 0.20 ppm (1-hour average)

Table 76: Statistical summary for SO₂ - Daily 24-hour average concentrations (2008)

Region/ Performance	Data availability	Maximum conc.	n Percentiles (ppm)								
monitoring Station	rates (%)	(ppm)	99 th	98 th	95 th	90 th	75 th	50 th	25 th		
Sydney											
Bringelly	83.8	0.003	0.002	0.002	0.002	0.001	0.001	0.000	0.000		
Chullora	80.9	0.005	0.004	0.003	0.002	0.002	0.001	0.001	0.000		
Macarthur	97.0	0.004	0.003	0.003	0.002	0.002	0.001	0.000	0.000		
Prospect	90.0	0.004	0.003	0.003	0.002	0.001	0.001	0.000	0.000		
Richmond	96.7	0.003	0.002	0.001	0.001	0.001	0.000	0.000	-0.001		
Illawarra											
Albion Park South	97.0	0.008	0.006	0.005	0.004	0.003	0.002	0.000	0.000		
Wollongong	79.9	0.007	0.004	0.003	0.003	0.002	0.001	0.000	-0.001		
Lower Hunter											
Newcastle	90.2	0.008	0.006	0.006	0.004	0.003	0.002	0.001	0.000		
Wallsend	95.3	0.007	0.006	0.006	0.005	0.004	0.002	0.001	0.001		

AAQ NEPM Standard - 0.08 ppm (24-hour average)

SO₂ 24 hour average

NEPM Annual Compliance reports prior to 2008 included 24 hour daily average calculations for SO₂ using hours 0 to 23. Daily averages are now calculated using hours 1 to 24 as detailed in the NEPM Technical Paper No. 5, "Data Collection and Handling". Accordingly, in the following tables, Table 78, Table 90 to Table 99, the calculation of the 24 hour daily averages for 2008, differs in comparison to previous years.

Trend analysis

				0			- •			
Region/ Performance monitoring Station	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Sydney										
Blacktown / Prospect*	0.020	0.015	0.020	0.021	0.016	0.016			0.022*	0.014 [*]
Bringelly	0.012	0.018	0.012	0.010	0.017	0.015	0.009	0.009	0.017	0.019
Chullora							0.015	0.015	0.020	0.021
Macarthur							0.015	0.010	0.015	0.015
Richmond	0.019	0.015	0.012	0.028	0.012	0.021	0.015	0.018	0.024	0.015
Illawarra										
Albion Park / Albion Park South [*]	0.033	0.042	0.034	0.029	0.035	0.034	0.032	0.038 [*]	0.038 [*]	0.028 [*]
Warrawong	0.051	0.110	0.162	0.046	0.063	0.088	0.070	0.022		
Wollongong	0.041	0.031	0.030	0.039	0.031	0.053	0.038	0.035	0.032	0.021
Lower Hunter										
Newcastle							0.037	0.034	0.043	0.033
Wallsend	0.074	0.041	0.049	0.045	0.047	0.067	0.048	0.058	0.039	0.044

Table 77: Maximum 1-hour average concentrations for SO₂ (ppm)

AAQ NEPM Standard - 0.20 ppm (1-hour average)

Table 78: Maximum 24-hour average concentrations for SO₂ (ppm)

Region/ Performance monitoring Station	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Sydney										
Blacktown / Prospect*	0.003	0.004	0.005	0.004	0.004	0.004			0.005	0.004 [*]
Bringelly	0.003	0.004	0.003	0.002	0.002	0.002	0.002	0.002	0.003	0.003
Chullora							0.005	0.004	0.004	0.005
Macarthur							0.003	0.003	0.004	0.004
Richmond	0.003	0.004	0.010	0.004	0.003	0.003	0.003	0.003	0.004	0.003
Illawarra										
Albion Park / Albion Park South [*]	0.009	0.014	0.013	0.009	0.009	0.009	0.011	0.010 [*]	0.013 [*]	0.008 [*]
Warrawong	0.009	0.010	0.013	0.009	0.012	0.012	0.009	0.007		
Wollongong	0.006	0.007	0.007	0.008	0.006	0.015	0.006	0.007	0.008	0.007
Lower Hunter										
Newcastle							0.007	0.009	0.012	0.008
Wallsend	0.014	0.010	0.013	0.011	0.010	0.014	0.007	0.009	0.007	0.007

Region/ Performance monitoring Station	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Sydney										
Blacktown/ Prospect	0.001	0.001	0.001	0.001	0.001	0.001				0.000
Bringelly	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Chullora							0.001	0.001	0.001	0.001
Macarthur							0.001	0.001	0.001	0.001
Richmond	0.001	0.000	0.000	0.001	0.000	0.000	0.000	0.000	0.000	0.000
Illawarra										
Albion Park / Albion Park South [*]	0.001	0.001	0.001	0.001	0.001	0.001	0.007	0.001 [*]	0.001 [*]	0.001 [*]
Warrawong	0.001	0.001	0.002	0.001	0.001	0.001	0.001	0.001		
Wollongong	0.001	0.002	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.000
Lower Hunter										
Newcastle							0.002	0.001	0.001	0.001
Wallsend	0.002	0.002	0.002	0.002	0.002	0.002	0.001	0.001	0.001	0.002

Table 79: Annual average concentrations for SO₂ (ppm)

Data availability for the year is less then 75%.

AAQ NEPM Standard - 0.02 ppm (Annual average)

 Table 80: Statistical summary for SO2 - Annual daily maximum 1-hour average concentrations

 Station: Blacktown⁽¹⁾/Prospect⁽²⁾

Year	Data availability	Number of Exceedences	Maximum value	n Percentiles (ppm)						
	rates (%)	(days)	(ppm)	99 th	98 th	95 th	90 th	75 th	50 th	25 th
1999 ⁽¹⁾	88.8	0	0.020	0.009	0.008	0.007	0.006	0.004	0.003	0.002
2000 ⁽¹⁾	85.9	0	0.015	0.011	0.010	0.008	0.006	0.004	0.003	0.002
2001 ⁽¹⁾	93.9	0	0.020	0.014	0.012	0.008	0.007	0.005	0.003	0.002
2002 ⁽¹⁾	93.2	0	0.021	0.013	0.010	0.008	0.006	0.004	0.003	0.002
2003 ⁽¹⁾	91.3	0	0.016	0.012	0.010	0.007	0.005	0.004	0.003	0.002
2004 ⁽¹⁾	39.1	0	0.016	0.012	0.012	0.010	0.008	0.005	0.004	0.002
2005#	0.0									
2006#	0.0									
2007 ⁽²⁾	67.0	0	0.022	0.016	0.013	0.009	0.006	0.004	0.002	0.001
2008 ⁽²⁾	85.2	0	0.014	0.011	0.010	0.008	0.005	0.003	0.002	0.001

Station closed pending relocation.

Table 81: Statistical summary for SO_2 - Annual daily maximum 1-hour average concentrations

Year	Data availability rates	Number of	Maximum value	Percentiles (ppm)								
- Oui	rates (%)	(days)	(ppm)	99 th	98 th	95 th	90 th	75 th	50 th	25 th		
1999	87.8	0	0.012	0.008	0.007	0.005	0.004	0.003	0.002	0.001		
2000	90.8	0	0.018	0.007	0.006	0.005	0.004	0.003	0.001	0.001		
2001	94.7	0	0.012	0.010	0.008	0.006	0.004	0.003	0.002	0.001		
2002	94.6	0	0.010	0.009	0.008	0.006	0.004	0.002	0.001	0.001		
2003	93.0	0	0.017	0.006	0.006	0.004	0.003	0.002	0.001	0.001		
2004	90.8	0	0.015	0.008	0.007	0.005	0.004	0.002	0.001	0.000		
2005	91.3	0	0.009	0.007	0.006	0.004	0.003	0.002	0.001	0.000		
2006	91.4	0	0.009	0.006	0.005	0.004	0.003	0.002	0.001	0.001		
2007	84.2	0	0.017	0.008	0.007	0.005	0.004	0.002	0.001	0.000		
2008	80.9	0	0.019	0.008	0.006	0.005	0.003	0.002	0.001	0.000		

Station: Bringelly

Table 82: Statistical summary for SO₂ - Annual daily maximum 1-hour average concentrations

Station: Chullora

Year	Data availability rates	Number of	Maximum	Percentiles (ppm)								
Tear	rates (%)	(days)	(ppm)	99 th	98 th	95 th	90 th	75 th	50 th	25 th		
2005	68.8	0	0.015	0.013	0.011	0.009	0.007	0.004	0.002	0.001		
2006	93.9	0	0.015	0.012	0.010	0.009	0.006	0.004	0.003	0.002		
2007	86.7	0	0.020	0.016	0.012	0.009	0.007	0.004	0.002	0.001		
2008	77.5	0	0.021	0.018	0.012	0.007	0.006	0.004	0.002	0.001		

Table 83: Statistical summary for SO₂ - Annual daily maximum 1-hour average concentrations

Station: Macarthur

Year	Data availability rates	Number of Exceedences	Maximum value	Percentiles (ppm)							
	rates (%)	(days)	(ppm)	99 th	98 th	95 th	90 th	75 th	50 th	25 th	
2005	53.1	0	0.015	0.008	0.008	0.006	0.004	0.003	0.002	0.001	
2006	93.2	0	0.010	0.007	0.006	0.005	0.004	0.002	0.001	0.001	
2007	90.9	0	0.015	0.011	0.009	0.007	0.005	0.003	0.002	0.001	
2008	92.1	0	0.015	0.013	0.009	0.006	0.004	0.003	0.002	0.001	

Table 84: Statistical summary for SO₂ - Annual daily maximum 1-hour average concentrations

Year	Data availability	Number of	Maximum value	Percentiles (ppm)								
- Cai	rates (%)	(days)	(ppm)	99 th	98 th	95 th	90 th	75 th	50 th	25 th		
1999	90.3	0	0.019	0.018	0.018	0.007	0.005	0.003	0.002	0.001		
2000	85.6	0	0.015	0.009	0.007	0.006	0.004	0.002	0.001	0.001		
2001	84.7	0	0.012	0.010	0.007	0.005	0.004	0.002	0.001	0.001		
2002	93.3	0	0.028	0.009	0.008	0.006	0.004	0.003	0.001	0.001		
2003	93.0	0	0.012	0.010	0.008	0.006	0.004	0.003	0.001	0.001		
2004	89.7	0	0.021	0.011	0.009	0.007	0.005	0.003	0.002	0.001		
2005	92.8	0	0.015	0.009	0.007	0.006	0.004	0.003	0.001	0.001		
2006	92.0	0	0.018	0.010	0.008	0.006	0.004	0.002	0.001	0.001		
2007	91.0	0	0.024	0.007	0.007	0.005	0.004	0.002	0.001	0.000		
2008	92.2	0	0.015	0.009	0.007	0.005	0.003	0.001	0.001	0.000		

Station:	Richmond
Station.	Mulliona

 Table 85: Statistical summary for SO2 - Annual daily maximum 1-hour average concentrations

 Station: Albion Park ⁽¹⁾/ Albion Park South ⁽²⁾

Year	Data availability	Number of Exceedences	Maximum value	Percentiles (ppm)								
	rates (%)	(days)	(ppm)	99 th	98 th	95 th	90 th	75 th	50 th	25 th		
1999 ⁽¹⁾	90.5	0	0.033	0.025	0.024	0.017	0.013	0.005	0.001	0.000		
2000 ⁽¹⁾	94.2	0	0.042	0.032	0.030	0.024	0.017	0.008	0.001	0.000		
2001 ⁽¹⁾	93.7	0	0.034	0.027	0.024	0.018	0.013	0.008	0.001	0.000		
2002 ⁽¹⁾	57.4	0	0.029	0.027	0.026	0.022	0.016	0.006	0.001	0.000		
2003 ⁽¹⁾	93.7	0	0.035	0.025	0.021	0.015	0.012	0.005	0.001	0.000		
2004 ⁽¹⁾	92.9	0	0.034	0.029	0.026	0.017	0.013	0.006	0.001	0.000		
2005 ⁽¹⁾	4.8	0	0.032	0.031	0.031	0.030	0.028	0.006	0.001	0.000		
2006 ⁽²⁾	86.7	0	0.038	0.027	0.024	0.018	0.011	0.004	0.001	0.000		
2007 ⁽²⁾	83.1	0	0.038	0.032	0.030	0.018	0.013	0.005	0.001	0.000		
2008 ⁽²⁾	93.0	0	0.028	0.026	0.022	0.015	0.011	0.005	0.001	0.000		

 Table 86: Statistical summary for SO2 - Annual daily maximum 1-hour average concentrations

 Station: Warrawong

Year	Data availability	Number of Exceedences	Maximum value							
	rates (%)	(days)	(ppm)	99 th	98 th	95 th	90 th	75 th	50 th	25 th
1999	89.2	0	0.051	0.036	0.027	0.019	0.013	0.006	0.002	0.001
2000	90.8	0	0.110	0.068	0.038	0.026	0.020	0.011	0.003	0.000
2001	93.1	0	0.162	0.065	0.055	0.042	0.027	0.012	0.003	0.000
2002	94.0	0	0.046	0.031	0.028	0.023	0.019	0.011	0.004	0.000
2003	93.7	0	0.063	0.048	0.040	0.020	0.016	0.009	0.002	0.000
2004	91.4	0	0.088	0.037	0.029	0.021	0.014	0.006	0.002	0.000
2005	91.8	0	0.070	0.032	0.025	0.019	0.014	0.007	0.002	0.000
2006	37.9	0	0.022	0.021	0.019	0.014	0.010	0.004	0.001	0.000
2007 #	0.0									
2008 #	0.0									

Station closed in April 2006.

Table 87: Statistical summary for SO₂ - Annual daily maximum 1-hour average concentrations

Year	Data availability	Number of	Maximum value (ppm)	Percentiles (ppm)								
- Cai	rates (%)	(days)		99 th	98 th	95 th	90 th	75 th	50 th	25 th		
1999	91.6	0	0.041	0.018	0.016	0.013	0.011	0.008	0.004	0.002		
2000	94.3	0	0.031	0.025	0.021	0.017	0.014	0.009	0.005	0.003		
2001	92.6	0	0.030	0.027	0.020	0.016	0.013	0.008	0.004	0.002		
2002	91.1	0	0.039	0.030	0.025	0.019	0.015	0.009	0.005	0.002		
2003	93.7	0	0.031	0.025	0.022	0.015	0.013	0.008	0.004	0.002		
2004	92.8	0	0.053	0.022	0.018	0.014	0.011	0.006	0.003	0.001		
2005	93.0	0	0.038	0.022	0.020	0.015	0.011	0.006	0.003	0.001		
2006	94.5	0	0.035	0.019	0.018	0.015	0.012	0.007	0.004	0.001		
2007	78.9	0	0.032	0.022	0.019	0.016	0.011	0.007	0.003	0.001		
2008	78.3	0	0.021	0.019	0.015	0.012	0.009	0.006	0.002	0.001		

Station: Wollongong

Table 88: Statistical summary for SO₂ - Annual daily maximum 1-hour average concentrations

Station: Newcastle

Year	Data availability rates	Number of	Maximum	Percentiles (ppm)								
- Cai	rates (%)	(days)	(ppm)	99 th	98 th	95 th	90 th	75 th	50 th	25 th		
2005	72.6	0	0.037	0.035	0.028	0.019	0.015	0.009	0.005	0.002		
2006	93.3	0	0.034	0.026	0.020	0.017	0.013	0.007	0.004	0.002		
2007	44.5	0	0.043	0.028	0.025	0.021	0.014	0.008	0.005	0.003		
2008	86.9	0	0.033	0.027	0.024	0.019	0.015	0.010	0.005	0.002		

Table 89: Statistical summary for SO₂ - Annual daily maximum 1-hour average concentrations

Station: Wallsend

Year	Data availability	Number of Exceedences	Maximum value	Percentiles (ppm)									
	rates (%)	(days)	(ppm)	99 th	98 th	95 th	90 th	75 th	50 th	25 th			
1999	80.4	0	0.074	0.042	0.041	0.033	0.024	0.014	0.009	0.004			
2000	92.0	0	0.041	0.031	0.030	0.024	0.019	0.012	0.007	0.003			
2001	86.9	0	0.049	0.035	0.030	0.025	0.021	0.013	0.008	0.003			
2002	80.2	0	0.045	0.034	0.028	0.024	0.019	0.012	0.007	0.004			
2003	90.3	0	0.047	0.032	0.028	0.021	0.016	0.011	0.006	0.003			
2004	90.1	0	0.067	0.039	0.032	0.021	0.016	0.010	0.005	0.002			
2005	93.4	0	0.048	0.032	0.026	0.021	0.016	0.009	0.005	0.002			
2006	94.5	0	0.058	0.026	0.024	0.020	0.016	0.010	0.005	0.002			
2007	83.9	0	0.039	0.031	0.027	0.022	0.018	0.010	0.005	0.002			
2008	91.3	0	0.044	0.032	0.026	0.021	0.018	0.011	0.006	0.002			

Table 90: Statistical summary for SO ₂ - 24-hour average concentratio	our average concentrations
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Year	Data availability	Number of	Maximum value	Percentiles (ppm)								
- Cai	rates (%)	(days)	(ppm)	99 th	98 th	95 th	90 th	75 th	50 th	25 th		
1999 ⁽¹⁾	95.3	0	0.003	0.003	0.003	0.002	0.002	0.001	0.001	0.000		
2000 ⁽¹⁾	84.2	0	0.004	0.003	0.003	0.003	0.002	0.001	0.001	0.000		
2001 ⁽¹⁾	98.1	0	0.005	0.004	0.003	0.003	0.002	0.001	0.001	0.001		
2002 ⁽¹⁾	96.4	0	0.004	0.003	0.003	0.002	0.002	0.001	0.001	0.001		
2003 ⁽¹⁾	95.1	0	0.004	0.003	0.003	0.002	0.002	0.001	0.001	0.001		
2004 ⁽¹⁾	40.4	0	0.004	0.004	0.003	0.003	0.002	0.002	0.001	0.001		
2005#	0.0											
2006#	0.0											
2007 ⁽²⁾	67.1	0	0.005	0.003	0.002	0.002	0.002	0.001	0.001	0.000		
2008 ⁽²⁾	90.0	0	0.004	0.003	0.003	0.002	0.001	0.001	0.000	0.000		

Station: Blacktown⁽¹⁾/Prospect⁽²⁾

Station closed pending relocation.

Table 91: Statistical summary for SO₂ - 24-hour average concentrations

Station: Bringelly

Year	Data availability	Number of Exceedences	Maximum value	Percentiles (ppm)								
	rates (%)	(days)	(ppm)	99 th	98 th	95 th	90 th	75 th	50 th	25 th		
1999	94.0	0	0.003	0.002	0.002	0.002	0.002	0.001	0.001	0.000		
2000	94.8	0	0.004	0.002	0.001	0.001	0.001	0.001	0.000	0.000		
2001	98.6	0	0.003	0.002	0.002	0.001	0.001	0.001	0.000	0.000		
2002	99.2	0	0.002	0.002	0.002	0.001	0.001	0.001	0.000	0.000		
2003	97.3	0	0.002	0.002	0.002	0.001	0.001	0.000	0.000	0.000		
2004	94.8	0	0.002	0.002	0.001	0.001	0.001	0.000	0.000	0.000		
2005	95.3	0	0.002	0.002	0.001	0.001	0.001	0.000	0.000	0.000		
2006	95.3	0	0.002	0.002	0.001	0.001	0.001	0.001	0.000	0.000		
2007	86.8	0	0.003	0.002	0.002	0.002	0.001	0.001	0.000	0.000		
2008	83.8	0	0.003	0.002	0.002	0.002	0.001	0.001	0.000	0.000		

Table 92: Statistical summary for SO_2 - 24-hour average concentrations

Station: Chullora

Year	Data availability	Number of Exceedences	Maximum value	Percentiles (ppm)							
	rates (%)	(days)	(ppm)	99 th	98 th	95 th	90 th	75 th	50 th	25 th	
2005	71.8	0	0.005	0.003	0.003	0.003	0.002	0.001	0.001	0.000	
2006	98.4	0	0.004	0.004	0.003	0.003	0.002	0.002	0.001	0.001	
2007	89.3	0	0.004	0.004	0.003	0.002	0.002	0.001	0.001	0.000	
2008	80.9	0	0.005	0.004	0.003	0.002	0.002	0.001	0.001	0.000	

Table 93: Statistical summary for SO_2 - 24-hour average concentrations

Station: Macarthur

Year	Data availability rates	Number of Exceedences	Maximum	Percentiles (ppm)								
- Cui	rates (%)	(days)	(ppm)	99 th	98 th	95 th	90 th	75 th	50 th	25 th		
2005	55.3	0	0.003	0.003	0.002	0.002	0.001	0.001	0.000	0.000		
2006	97.0	0	0.003	0.003	0.002	0.002	0.001	0.001	0.000	0.000		
2007	94.8	0	0.004	0.003	0.003	0.002	0.002	0.001	0.001	0.000		
2008	97.0	0	0.004	0.003	0.003	0.002	0.002	0.001	0.000	0.000		

Table 94: Statistical summary for SO_2 - 24-hour average concentrations

Station: Richmond

Year	Data availability	Number of Exceedences	Maximum value	Percentiles (ppm)								
	rates (%)	(days)	(ppm)	99 th	98 th	95 th	90 th	75 th	50 th	25 th		
1999	95.6	0	0.003	0.002	0.002	0.002	0.001	0.001	0.001	0.000		
2000	89.3	0	0.004	0.002	0.002	0.001	0.001	0.001	0.000	0.000		
2001	88.8	0	0.010	0.002	0.002	0.002	0.001	0.001	0.000	0.000		
2002	97.5	0	0.004	0.002	0.002	0.002	0.001	0.001	0.000	0.000		
2003	97.0	0	0.003	0.002	0.002	0.001	0.001	0.001	0.000	0.000		
2004	92.9	0	0.003	0.002	0.002	0.002	0.001	0.001	0.000	0.000		
2005	96.7	0	0.003	0.002	0.002	0.001	0.001	0.001	0.000	0.000		
2006	95.9	0	0.003	0.002	0.002	0.002	0.001	0.001	0.000	0.000		
2007	94.8	0	0.004	0.002	0.002	0.001	0.001	0.000	0.000	0.000		
2008	96.7	0	0.003	0.002	0.001	0.001	0.001	0.000	0.000	-0.001		

Table 95: Statistical summary for SO₂ - 24-hour average concentrations

Year	Data availability	Number of Exceedences	Maximum value	Percentiles (ppm)								
	rates (%)	(days)	(ppm)	99 th	98 th	95 th	90 th	75 th	50 th	25 th		
1999 ⁽¹⁾	98.6	0	0.009	0.008	0.006	0.004	0.003	0.001	0.000	0.000		
2000 ⁽¹⁾	98.1	0	0.014	0.009	0.008	0.006	0.004	0.002	0.000	0.000		
2001 ⁽¹⁾	98.1	0	0.013	0.008	0.007	0.005	0.003	0.002	0.000	0.000		
2002 ⁽¹⁾	60.0	0	0.009	0.008	0.007	0.006	0.004	0.001	0.000	0.000		
2003 ⁽¹⁾	98.9	0	0.009	0.007	0.005	0.004	0.003	0.001	0.000	0.000		
2004 ⁽¹⁾	97.0	0	0.009	0.007	0.006	0.004	0.003	0.001	0.000	0.000		
2005 ⁽¹⁾	4.9	0	0.011	0.009	0.009	0.007	0.006	0.001	0.000	0.000		
2006 ⁽²⁾	89.3	0	0.010	0.008	0.007	0.004	0.003	0.001	0.000	0.000		
2007 ⁽²⁾	84.1	0	0.013	0.010	0.008	0.004	0.003	0.001	0.000	0.000		
2008 ⁽²⁾	97.0	0	0.008	0.006	0.005	0.004	0.003	0.002	0.000	0.000		

Station: Albion Park⁽¹⁾/ Albion Park South⁽²⁾

Table 96: Statistical summary for SO_2 - 24-hour average concentrations

Year	Data availability	Number of Exceedences	Maximum value	Percentiles (ppm)								
- Oui	rates (%)	(days)	(ppm)	99 th	98 th	95 th	90 th	75 th	50 th	25 th		
1999	95.3	0	0.009	0.007	0.005	0.004	0.003	0.001	0.001	0.000		
2000	93.7	0	0.010	0.007	0.006	0.004	0.003	0.002	0.000	0.000		
2001	97.3	0	0.013	0.010	0.009	0.006	0.005	0.002	0.000	0.000		
2002	98.6	0	0.009	0.006	0.006	0.005	0.003	0.002	0.001	0.000		
2003	98.4	0	0.012	0.009	0.007	0.004	0.003	0.002	0.000	0.000		
2004	95.4	0	0.012	0.006	0.006	0.004	0.003	0.001	0.000	0.000		
2005	96.7	0	0.009	0.007	0.005	0.004	0.003	0.002	0.000	0.000		
2006	39.2	0	0.007	0.006	0.004	0.003	0.002	0.001	0.000	0.000		
2007 #	0.0											
2008 #	0.0											

Station: Warrawong

Station closed in April 2006.

Table 97: Statistical summary for SO₂ - 24-hour average concentrations

Station: Wollongong

Year	Data availability	Number of Exceedences	Maximum value	Percentiles (ppm)							
	rates (%)	(days)	(ppm)	99 th	98 th	95 th	90 th	75 th	50 th	25 th	
1999	98.1	0	0.006	0.005	0.004	0.004	0.003	0.002	0.001	0.001	
2000	99.2	0	0.008	0.006	0.005	0.004	0.003	0.002	0.001	0.001	
2001	95.9	0	0.008	0.006	0.005	0.004	0.003	0.002	0.001	0.000	
2002	95.3	0	0.008	0.006	0.006	0.004	0.003	0.002	0.001	0.000	
2003	98.4	0	0.006	0.005	0.004	0.003	0.003	0.001	0.001	0.000	
2004	97.3	0	0.015	0.006	0.005	0.003	0.002	0.001	0.001	0.000	
2005	97.5	0	0.006	0.005	0.004	0.003	0.002	0.001	0.001	0.000	
2006	98.9	0	0.007	0.005	0.004	0.003	0.002	0.001	0.001	0.000	
2007	79.5	0	0.008	0.006	0.004	0.003	0.002	0.002	0.001	0.000	
2008	79.9	0	0.007	0.004	0.003	0.003	0.002	0.001	0.000	-0.001	

Table 98: Statistical summary for SO_2 - 24-hour average concentrations

Station: Newcastle

Year	Data availability	Number of Exceedences	Maximum value	n Percentiles (ppm)						
	rates (%)	(days)	(ppm)	99 th	98 th	95 th	90 th	75 th	50 th	25 th
2005	75.3	0	0.007	0.006	0.005	0.004	0.003	0.002	0.001	0.000
2006	97.3	0	0.009	0.005	0.004	0.004	0.003	0.002	0.001	0.000
2007	45.8	0	0.012	0.008	0.006	0.004	0.003	0.002	0.001	0.000
2008	90.2	0	0.008	0.006	0.006	0.004	0.003	0.002	0.001	0.000

Table 99: Statistical summary for SO₂ - 24-hour average concentrations

Station: Wallsend

Year	Data availability	Number of Exceedences	Maximum value	Percentiles (ppm)							
	rates (%)	(days)	(ppm)	99 th	98 th	95 th	90 th	75 th	50 th	25 th	
1999	86.0	0	0.014	0.011	0.009	0.007	0.005	0.003	0.002	0.001	
2000	94.5	0	0.010	0.009	0.007	0.006	0.004	0.003	0.002	0.001	
2001	89.6	0	0.013	0.009	0.008	0.006	0.005	0.003	0.002	0.001	
2002	82.2	0	0.012	0.007	0.007	0.005	0.004	0.003	0.002	0.001	
2003	93.7	0	0.011	0.006	0.005	0.004	0.003	0.002	0.001	0.001	
2004	92.9	0	0.014	0.007	0.006	0.004	0.003	0.002	0.001	0.001	
2005	97.5	0	0.007	0.006	0.005	0.004	0.003	0.002	0.001	0.000	
2006	98.9	0	0.009	0.007	0.005	0.004	0.003	0.002	0.001	0.000	
2007	83.6	0	0.007	0.006	0.006	0.004	0.004	0.002	0.001	0.000	
2008	95.3	0	0.007	0.006	0.006	0.005	0.004	0.002	0.001	0.001	

Particles as PM₁₀

Statistical summary

Region/ Performance	Data availability	Maximum conc.	um Percentiles 						
monitoring Station	rates (%)	(ppm)	99 th	98 th	95 th	90 th	75 th	50 th	25 th
Sydney									
Bringelly	97.0	62.7	34.7	32.9	28.6	24.6	19.3	14.3	10.6
Chullora	97.0	44.3	38.5	36.1	33.0	30.2	23.7	18.6	13.9
Liverpool	92.9	53.8	34.7	33.4	30.1	26.6	21.7	16.9	12.2
Macarthur	99.4	65.5	32.6	30.5	27.6	23.3	17.5	13.7	9.9
Oakdale	96.8	68.2	33.8	30.4	27.0	21.3	15.5	10.7	7.2
Prospect	88.6	41.8	38.5	34.6	32.6	27.5	21.0	16.4	12.8
Richmond	98.3	39.0	30.4	28.0	24.9	20.2	16.0	11.9	8.9
Rozelle	96.5	43.1	33.7	32.3	28.7	26.0	20.6	16.7	12.9
Illawarra									
Albion Park South	97.0	96.1	38.7	34.8	29.7	25.2	18.2	13.0	9.4
Kembla Grange	98.7	100.8	48.9	38.4	33.3	30.3	23.3	16.7	11.1
Wollongong	94.6	78.3	39.6	35.8	31.2	28.7	21.5	16.3	12.1
Lower Hunter									
Beresfield	95.4	59.9	52.1	36.9	32.3	27.3	21.5	16.9	13.4
Newcastle	93.2	54.4	43.1	39.2	34.4	31.4	24.8	19.1	15.1
Regional									
Albury	93.5	124.8	59.8	52.7	40.2	30.1	20.8	14.4	9.9
Bathurst	94.8	63.0	40.6	35.7	28.8	24.1	16.9	12.3	8.8
Tamworth	86.0	100.4	45.8	40.2	30.5	23.8	18.7	14.0	10.5
Wagga Wagga	97.0	294.9	68.1	62.7	53.5	45.6	28.5	21.0	14.5

Table 100: Statistical summary for PM₁₀ - 24-hour average concentrations (2008)

 $AAQ NEPM Standard - 50 \ \mu g/m^3 \ (24-hour average)$ Bold font indicates values that exceed the AAQ NEPM standard

PM₁₀ 24 hour average

NEPM Annual Compliance reports prior to 2008 included 24 hour daily average calculations for PM_{10} using hours 0 to 23. Daily averages are now calculated using hours 1 to 24 as detailed in the NEPM Technical Paper No. 5, "Data Collection and Handling". Accordingly, in the following tables from Table 101 to Table 118, the calculation of the 24 hour daily averages for 2008, differs in comparison to previous years.

Trend analysis

				0			10			
Region/ Performance monitoring Station	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Sydney										
Blacktown/Prospect*	37.4	36.2	127.1	122.0	186.8	42.6			46.6 [*]	41.8 [*]
Bringelly	33.9	36.5	99.4	120.2	274.7	60.3	53.9	72.0	50.4	62.7
Chullora/Lidcombe [*]	37.0 [*]	52.5 [*]	65.3 [*]	86.4 [*]	212.8	57.5	49.7	65.1	64.3	44.3
Liverpool	46.0	64.1	61.4	127.6	282.6	60.5	55.1	74.0	51.8	53.8
Macarthur						59.1	54.9	91.1	52.0	65.5
Oakdale						41.3	42.6	57.3	48.2	68.2
Richmond	44.4	43.2	119.9	126.4	194.3	46.2	49.1	60.9	44.2	39.0
Rozelle					36.8	51.4	47.1	52.2	53.0	43.1
Illawarra										
Albion Park / Albion Park South [*]	48.7	62.5	58.7	88.3	281.0	51.5	41.8	60.1 [*]	53.8 [*]	96.1 [*]
Kembla Grange						57.6	59.0	84.3	60.1	100.8
Wollongong	40.2	58.1	68.2	76.7	280.5	48.1	54.8	62.0	58.8	78.3
Lower Hunter										
Beresfield	48.0	53.6	81.0	166.4	88.0	55.7	53.2	51.7	62.0	59.9
Newcastle						46.9	49.9	51.1	58.2	54.4
Regional										
Albury			28.8	81.3	921.4	55.6	55.1	189.2	197.7	124.8
Bathurst		35.2	35.6	258.2	621.7	72.9	44.9	61.3	164.0	63.0
Tamworth		21.1	34.6	189.8	243.3	55.7	88.8	48.0	48.9	100.4
Wagga Wagga			69.8	178.2	837.0	105.9	163.1	172.9	105.3	294.9
					AAQ NI	EPM Stai	ndard – S	$50 \ \mu g/m^3$	(24-hour	· average)

Table 101: Maximum 24-hour average concentrations for PM₁₀ (µg/m³)

Station:	Station: Blacktown ⁽¹⁾ /Prospect ⁽²⁾											
Year	Data availability	Number of Exceedences	Maximum value	Percentiles (ug/m3)								
	rates (%)	(days)	(ug/m3)	99 th	98 th	95 th	90 th	75 th	50 th	25 th		
1999 ⁽¹⁾	92.3	0	37.5	29.3	26.4	24.1	22.1	18.3	14.6	11.3		
2000 ⁽¹⁾	94.8	0	36.2	29.1	27.9	24.2	21.2	18.1	14.4	11.8		
2001 ⁽¹⁾	92.9	3	127.1	43.2	41.7	35.7	32.5	24.8	18.9	13.9		
2002 ⁽¹⁾	93.4	11	122.0	82.4	64.5	42.9	33.6	25.2	18.4	14.6		
2003 ⁽¹⁾	94.8	4	186.8	52.7	41.0	34.3	28.9	21.7	17.0	12.7		
2004 ⁽¹⁾	35.8	0	42.6	41.9	41.5	36.3	33.7	27.6	22.3	17.9		
2005#												
2006#												
2007 ⁽²⁾	82.7	0	46.6	43.6	41.1	33.0	27.7	22.0	16.8	12.3		
2008 ⁽²⁾	88.6	0	41.8	38.5	34.6	32.6	27.5	21.0	16.4	12.8		

Table 102: Statistical summary for PM_{10} - 24-hour average concentrations

Station closed pending relocation.

Table 103: Statistical summary for PM₁₀ - 24-hour average concentrations

Station: Bringelly

Year	Data Number of availability Exceedences		Maximum value	Percentiles (ug/m3)							
	rates (%)	(days)	(ug/m3)	99 th	98 th	95 th	90 th	75 th	50 th	25 th	
1999	85.5	0	33.9	29.3	27.0	24.3	22.2	18.0	14.2	11.0	
2000	88.5	0	36.5	33.0	30.6	26.7	23.1	18.4	14.7	12.1	
2001	96.7	5	99.4	54.7	33.6	27.3	24.4	20.2	16.2	12.6	
2002	97.0	12	120.2	73.6	64.4	40.1	34.5	25.4	18.4	13.6	
2003	97.0	5	274.7	52.1	40.1	33.9	28.8	21.4	16.6	12.1	
2004	93.4	2	60.3	44.3	40.6	34.4	30.4	24.7	19.1	13.2	
2005	91.8	2	53.9	44.3	42.5	35.6	30.3	23.8	18.2	13.8	
2006	88.2	3	72.0	44.9	41.4	32.9	29.5	25.0	18.9	14.7	
2007	99.5	1	50.4	45.6	41.7	33.4	29.6	23.7	16.7	12.0	
2008	97.0	1	62.7	34.7	32.9	28.6	24.6	19.3	14.3	10.6	

Table 104: Statistical summary for PM_{10} - 24-hour average concentrations

Station: Lidcombe⁽¹⁾ / Chullora⁽²⁾

Year	Data availability	Number of Exceedences	Percentiles (ug/m3)							
	rates (%)	(days)	(ug/m3)	99 th	98 th	95 th	90 th	75 th	50 th	25 th
1999 ⁽¹⁾	87.7	0	37.0	31.4	29.6	26.0	23.7	20.0	15.6	11.6
2000 (1)	94.3	1	52.5	38.5	34.1	29.5	25.4	20.2	16.2	12.4
2001 (1)	86.0	1	65.3	39.5	34.5	30.1	27.8	23.1	17.9	14.0
2002 (1)	30.7	3	86.4	62.3	47.2	35.5	29.7	20.8	16.0	13.9
2003 (2)	85.2	10	212.8	59.6	55.3	45.1	35.7	28.5	21.0	16.3
2004 (2)	90.4	2	57.5	48.4	45.6	38.5	33.7	27.4	21.1	16.2
2005 ⁽²⁾	89.0	0	49.7	46.1	42.0	38.0	33.4	27.0	20.3	16.3
2006 ⁽²⁾	97.3	4	65.1	43.5	37.9	34.7	30.9	26.5	21.3	16.5
2007 ⁽²⁾	97.5	2	64.3	39.1	37.2	33.7	29.7	23.2	19.0	13.3
2008 (2)	97.0	0	44.3	38.5	36.1	33.0	30.2	23.7	18.6	13.9

AAQ NEPM Standard – $50 \mu g/m^3$ (24-hour average)

Table 105: Statistical summary for PM_{10} - 24-hour average concentrations

Year	Data availability	Data Number of ailability Exceedences		Percentiles (ug/m3)							
i oai	rates (%)	(days)	(ug/m3)	99 th	98 th	95 th	90 th	75 th	50 th	25 th	
1999	97.3	0	46.0	34.8	32.1	27.9	24.3	20.4	15.9	11.4	
2000	94.3	2	64.1	41.9	36.9	31.1	26.4	20.8	16.6	12.7	
2001	95.3	2	61.4	37.1	34.9	30.2	28.2	22.6	18.2	13.3	
2002	91.0	13	127.6	76.0	68.5	46.1	37.3	27.2	20.2	15.1	
2003	90.1	6	282.6	57.5	43.9	37.0	32.5	25.5	19.6	14.8	
2004	91.8	1	60.5	46.1	44.1	36.2	32.3	27.1	20.6	14.8	
2005	96.4	2	55.1	45.9	43.7	36.2	32.4	26.3	20.0	15.1	
2006	95.9	3	74.0	48.2	40.1	34.6	31.3	26.1	20.6	15.9	
2007	95.6	1	51.8	40.2	38.9	35.2	29.8	23.7	17.7	12.9	
2008	92.9	1	53.8	34.7	33.4	30.1	26.6	21.7	16.9	12.2	

Station: Liverpool

Table 106: Statistical summary for PM_{10} - 24-hour average concentrations

Station: Macarthur

Year	Data availability	Number of Maximum Exceedences value		Percentiles (ug/m3)							
	rates (%)	(days)	(ug/m3)	99 th	98 th	95 th	90 th	75 th	50 th	25 th	
2004	14.8	1	59.1	46.8	44.1	39.8	36.9	30.6	21.6	15.7	
2005	83.8	1	54.9	45.3	42.4	36.0	30.5	24.6	18.2	13.6	
2006	100.0	4	91.1	43.7	34.4	29.8	26.0	22.2	15.7	11.6	
2007	96.4	1	52.0	38.0	35.0	29.6	25.5	19.8	14.8	10.3	
2008	99.4	1	65.5	32.6	30.5	27.6	23.3	17.5	13.7	9.9	

Table 107: Statistical summary for PM_{10} - 24-hour average concentrations

Station: Oakdale

Year	Data availability	ity Exceedences value Percentiles						es)		
	rates (%)	(days)	(ug/m3)	99 th	98 th	95 th	90 th	75 th	50 th	25 th
2004	56.6	0	41.3	30.0	26.4	23.8	19.2	15.7	10.4	6.6
2005	92.9	0	42.6	36.9	32.1	27.3	22.2	16.8	12.3	8.4
2006	96.4	1	57.3	35.7	32.1	28.5	23.7	17.8	12.7	8.7
2007	97.0	0	48.2	35.3	30.8	24.7	22.2	16.3	11.3	7.2
2008	96.8	1	68.2	33.8	30.4	27.0	21.3	15.5	10.7	7.2

AAQ NEPM Standard – $50 \mu g/m^3$ (24-hour average)

Table 108: Statistica	l summary for P	PM ₁₀ - 24-hour avera	age concentrations
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Year	Data availability	Number of	Maximum value	Percentiles (ug/m3)						
i oai	rates (%)	(days)	(ug/m3)	99 th	98 th	95 th	90 th	75 th	50 th	25 th
1999	92.1	0	44.4	27.5	25.0	22.4	19.4	17.0	13.2	9.8
2000	95.4	0	43.2	33.1	30.8	25.4	23.0	17.7	13.9	10.9
2001	87.4	4	119.9	61.3	32.8	27.8	25.4	20.2	16.1	11.8
2002	94.2	17	126.4	102.8	84.2	49.1	34.9	24.5	17.1	12.2
2003	96.7	7	194.3	66.3	46.4	34.8	28.6	21.1	15.7	11.3
2004	96.2	0	46.2	39.9	37.6	33.5	29.7	22.6	17.5	12.2
2005	97.0	0	49.1	41.7	35.0	30.1	25.7	20.2	15.4	11.4
2006	97.0	3	60.9	43.5	37.2	30.8	26.9	21.4	15.9	12.0
2007	98.4	0	44.2	35.0	33.1	27.6	23.7	18.3	13.5	10.0
2008	98.3	0	39.0	30.4	28.0	24.9	20.2	16.0	11.9	8.9

Station: Richmond

Table 109: Statistical summary for PM_{10} - 24-hour average concentrations

Station: Rozelle

Year	Data availability rates	Number of Exceedences	Maximum value	Percentiles (ug/m3)							
	rates (%)	(days)	(ug/m3)	99 th	98 th	95 th	90 th	75 th	50 th	25 th	
2003	10.7	0	36.8	36.6	36.4	33.7	30.7	21.1	18.9	16.0	
2004	92.6	1	51.4	42.1	39.4	33.1	30.2	24.9	19.3	13.9	
2005	95.6	0	47.1	40.4	38.9	34.8	31.0	24.2	18.9	14.8	
2006	94.0	1	52.2	40.6	37.2	33.3	29.4	24.7	19.3	15.4	
2007	97.5	1	53.0	37.6	35.9	30.0	26.9	21.8	17.2	13.0	
2008	96.5	0	43.1	33.7	32.3	28.7	26.0	20.6	16.7	12.9	

Table 110: Statistical summary for PM_{10} - 24-hour average concentrations

Year	Data availability	Number of Exceedences	Maximum value	(ug/m3)							
1	rates (%)	(days)	(ug/m3)	99th	98 th	95 th	90 th	75 th	50 th	25 th	
1999 ⁽¹⁾	98.9	0	48.7	36.8	32.6	25.4	22.1	16.3	11.0	7.8	
2000 ⁽¹⁾	96.4	2	62.5	41.3	35.8	29.4	25.1	18.2	12.9	9.6	
2001 ⁽¹⁾	97.3	1	58.7	41.9	38.0	34.5	28.5	20.6	14.9	9.9	
2002 ⁽¹⁾	59.5	6	88.3	65.1	53.1	40.2	34.6	26.1	16.4	10.9	
2003 ⁽¹⁾	96.2	4	281.0	50.2	38.8	29.9	25.7	19.0	13.7	9.9	
2004 ⁽¹⁾	95.9	1	51.5	42.6	39.6	33.3	29.4	22.2	15.4	10.5	
2005 ⁽¹⁾	3.0	0	41.8	39.8	39.3	37.9	36.9	29.7	22.1	15.6	
2006 ⁽²⁾	85.8	2	60.1	40.2	37.8	35.2	29.6	21.8	15.4	10.6	
2007 ⁽²⁾	88.5	1	53.8	39.4	37.0	32.4	27.8	20.7	13.7	8.6	
2008 ⁽²⁾	97.0	1	96.1	38.7	34.8	29.7	25.2	18.2	13.0	9.4	

Station: Albion Park⁽¹⁾/ Albion Park South⁽²⁾

AAQ NEPM Standard – 50 μ g/m³ (24-hour average)

Table 111: Statistical summary for PM_{10} - 24-hour average concentrations

Year	Data availability	Number of	Maximum	Percentiles (ug/m3)							
- Oui	rates (%)	(days)	(ug/m3)	99 th	98 th	95 th	90 th	75 th	50 th	25 th	
2004	57.4	1	57.6	44.2	42.4	36.1	30.1	21.2	14.8	10.4	
2005	97.8	4	59.0	49.4	45.7	38.6	33.1	23.2	17.2	12.2	
2006	99.2	9	84.3	61.6	52.2	38.5	34.4	25.9	18.8	12.9	
2007	99.5	3	60.1	49.9	45.7	38.4	32.9	24.3	17.6	11.9	
2008	98.7	4	100.8	48.9	38.4	33.3	30.3	23.3	16.7	11.1	

Station: Kembla Grange

Table 112: Statistical summary for PM_{10} - 24-hour average concentrations

Station: Wollongong

Year	Data availability	Number of Maximum Exceedences value			Percentiles (ug/m3)							
	rates (%)	(days)	(ug/m3)	99 th	98 th	95 th	90 th	75 th	50 th	25 th		
1999	96.4	0	40.2	35.4	32.9	28.4	25.4	20.2	15.8	12.4		
2000	93.4	3	58.1	46.1	42.3	34.2	26.9	20.9	15.5	11.6		
2001	97.5	4	68.2	48.0	42.6	36.7	31.3	22.6	16.5	12.2		
2002	94.5	9	76.7	61.9	53.0	43.8	34.1	25.6	18.5	13.7		
2003	97.8	7	280.5	60.4	46.7	34.3	28.6	21.5	16.7	12.4		
2004	97.3	0	48.1	45.4	39.9	36.3	30.4	23.4	17.3	12.2		
2005	97.3	1	54.8	44.0	41.3	35.4	30.0	23.5	16.7	12.7		
2006	96.7	5	62.0	52.1	45.2	36.3	31.9	25.7	18.5	13.0		
2007	95.3	3	58.8	47.6	41.6	37.1	31.9	24.6	18.4	13.0		
2008	94.6	1	78.3	39.6	35.8	31.2	28.7	21.5	16.3	12.1		

Table 113: Statistical summary for PM_{10} - 24-hour average concentrations

Station: Beresfield

Year	Data availability	Number of Maxim Exceedences value				Pe (ercentil (ug/m3	es)		
	rates (%)	(days)	(ug/m3)	99 th	98 th	95 th	90 th	75 th	50 th	25 th
1999	98.4	0	48.0	37.8	33.8	28.7	26.3	21.0	16.0	11.5
2000	90.4	1	53.6	43.1	38.3	33.8	27.1	20.5	16.2	12.8
2001	90.1	3	81.0	47.5	45.6	37.4	31.8	25.8	20.0	15.0
2002	82.5	25	166.4	84.8	70.8	57.1	47.3	33.4	21.5	16.0
2003	91.2	5	88.0	53.5	44.0	34.3	29.1	22.3	17.4	13.2
2004	87.2	1	55.7	47.5	43.1	38.3	33.2	24.7	19.3	13.9
2005	95.9	1	53.2	44.4	39.5	35.9	31.7	24.9	18.4	14.6
2006	96.4	2	51.7	44.8	41.8	37.0	33.5	26.9	19.1	14.7
2007	90.1	5	62.0	53.0	48.6	41.5	31.3	25.2	18.5	13.0
2008	95.4	5	59.9	52.1	36.9	32.3	27.3	21.5	16.9	13.4

AAQ NEPM Standard – 50 μ g/m³ (24-hour average)

Table 114: Statistical summary for PM₁₀ - 24-hour average concentrations

Percentiles (ug/m3)

90th

33.3

31.7

31.2

33.3

31.4

 75^{th}

26.6

26.2

25.7

26.7

24.8

33.9

40.3

34.4

50th

21.9

21.1

20.2

21.4

19.1

 $\mathbf{25}^{\text{th}}$

17.1

16.6

15.8

17.1

15.1

Station.	Thewcastie					
Year	Data availability	Number of	Maximum value			Р
loui	rates (%)	(days)	(ug/m3)	99 th	98 th	95 th
2004	19.4	0	46.9	46.0	44.6	37.3
2005	81.6	0	49.9	40.9	38.9	35.1

1

2

2

Station: Newcastle

97.3

47.1

93.2

Table 115: Statistical summary for PM₁₀ - 24-hour average concentrations

40.8

49.3

43.1

36.7

45.9

39.2

51.1

58.2

54.4

Station: Albury

2006

2007

2008

Year	Data availability	Number of Exceedences	Maximum value	Percentiles (ug/m3)							
	rates (%)	(days)	(ug/m3)	99 th	98 th	95 th	90 th	75 th	50 th	25 th	
2001	31.8	0	28.8	26.1	25.3	21.8	20.2	16.8	12.2	9.4	
2002	86.6	5	81.3	59.0	45.1	38.3	31.5	22.9	16.0	12.8	
2003	80.8	28	921.4	215.0	190.8	91.3	48.4	22.7	13.9	9.7	
2004	76.8	2	55.6	41.9	41.1	36.9	32.5	18.5	13.1	9.9	
2005	90.4	3	55.1	46.6	39.6	35.9	30.9	20.1	14.4	10.8	
2006	87.9	15	189.2	105.3	73.4	47.2	34.4	24.0	17.8	13.1	
2007	91.2	11	197.7	101.0	68.7	43.1	31.0	22.0	15.2	11.2	
2008	93.5	8	124.8	59.8	52.7	40.2	30.1	20.8	14.4	9.9	

Table 116: Statistical summary for PM₁₀ - 24-hour average concentrations

Station: Bathurst

Year	Data availability	Number of Exceedences	Number of Maximum Exceedences value			Percentiles (ug/m3)						
'	rates (%)	(days)	(ug/m3)	99 th	98 th	95 th	90 th	75 th	50 th	25 th		
2000	32.5	0	35.2	33.6	32.4	27.6	22.4	17.7	12.2	8.9		
2001	30.1	0	35.6	35.3	35.0	31.3	27.5	22.7	16.5	12.3		
2002	91.8	15	258.2	83.6	68.8	45.7	35.2	25.0	16.6	12.5		
2003	90.4	12	621.7	103.4	75.0	34.4	26.8	17.0	12.8	8.8		
2004	88.5	4	72.9	49.9	46.1	37.9	33.3	24.2	15.3	9.7		
2005	93.2	0	44.9	38.3	36.6	30.5	25.2	18.3	12.8	8.8		
2006	98.6	2	61.3	45.5	43.8	34.4	28.4	21.9	15.2	11.3		
2007	95.1	2	164.0	45.1	38.8	32.5	26.6	19.2	13.6	9.1		
2008	94.8	1	63.0	40.6	35.7	28.8	24.1	16.9	12.3	8.8		

AAQ NEPM Standard – 50 μ g/m³ (24-hour average)

Year	Data availability	Number of	Maximum value	Percentiles (ug/m3)							
i oui	rates (%)	(days)	(ug/m3)	99 th	98 th	95 th	90 th	75 th	50 th	25 th	
2000	21.0	0	21.1	20.6	20.4	19.0	18.1	15.0	11.5	8.5	
2001	97.3	0	34.6	25.7	24.1	22.6	20.0	16.5	13.0	9.9	
2002	99.2	9	189.8	66.2	51.2	40.9	33.6	23.4	17.4	13.1	
2003	92.9	7	243.3	54.5	48.0	34.3	25.8	19.7	15.0	11.4	
2004	79.5	2	55.7	42.3	40.1	34.6	31.0	24.6	19.5	15.3	
2005	68.2	2	88.8	34.7	33.1	30.1	26.6	20.3	14.7	10.6	
2006	79.2	0	48.0	38.7	32.0	29.2	26.8	21.3	15.1	11.0	
2007	73.7	0	48.9	35.5	34.0	30.0	25.9	19.7	14.4	10.2	
2008	86.0	3	100.4	45.8	40.2	30.5	23.8	18.7	14.0	10.5	

Station: Tamworth

Table 118: Statistical summary for PM₁₀ - 24-hour average concentrations

Station: Wagga Wagga

Year	Data availability	Number of	Maximum value	Percentiles (ug/m3)							
	rates (%)	(days)	(ug/m3)	99 th	98 th	95 th	90 th	75 th	50 th	25 th	
2001	31.2	2	69.8	45.4	37.5	31.9	28.7	22.5	16.7	12.4	
2002	99.2	35	178.2	121.6	94.9	60.6	49.3	33.3	24.6	16.9	
2003	87.4	22	837.0	129.7	91.4	55.5	43.0	29.1	19.0	12.5	
2004	91.0	28	105.9	69.7	68.4	60.0	47.5	32.8	21.3	13.9	
2005	90.7	28	163.1	77.8	67.8	57.0	46.3	30.5	19.8	14.2	
2006	95.6	36	172.9	111.5	83.7	59.6	50.2	36.8	25.1	16.4	
2007	97.5	34	105.3	78.3	72.4	60.3	48.1	32.3	21.5	14.8	
2008	97.0	25	294.9	68.1	62.7	53.5	45.6	28.5	21.0	14.5	

AAQ NEPM Standard – $50 \mu g/m^3$ (24-hour average)

Assessment of progress towards achieving the goal

The NSW Government puts in place air quality management programs and strategies to protect ambient air quality and public health. The Ambient Air Quality NEPM goal is a driver for these strategies and a benchmark against which progress in managing air quality can be assessed.

Framework for Air Quality Management in the Sydney Greater Metropolitan Region

The NSW State Plan released in 2006 includes a priority to improve air quality, with a target of meeting the national goals under the Ambient Air Quality NEPM. Under the State Plan, lead agencies for each priority are required to work with partner agencies to develop and implement plans to deliver on each priority. The Department of Environment, Climate Change and Water (DECCW) is the lead agency on improving air quality. The bringing together of different NSW Government priorities within the State Plan highlights the importance of actions that have multiple benefits, such as actions that reduce both air and greenhouse emissions.

Action for Air, the NSW Government's Air Quality Management Plan for Sydney, the Lower Hunter and the Illawarra, sets out a program of measures that target the pollutants of most concern in the region – ground level ozone in summer and particles. The plan covers strategies designed to reduce emissions from industry, motor vehicles and domestic/commercial sources.

The following outlines the key mechanisms for managing ozone and particles.

Motor Vehicle and Motor Vehicle Fuels

As motor vehicles are the main source of air pollution in Sydney (producing 71% of anthropogenic NOx emissions and 38% of VOCs), the NSW Government has implemented a range of policies to address vehicle emissions.

NSW Cleaner Vehicles and Fuels Strategy: Released in August 2008, the Strategy sets out an expanded list of NSW Government actions for cleaner fuels and a cleaner fleet. The ten initiatives under the Strategy include vapour recovery at service stations and the NSW diesel retrofit program (see below), as well as low volatility summertime petrol; alternative fuels, improved national standards for fuels and motor vehicles; benchmarking the fleet; a heavy vehicle rating scheme, an awareness and behaviour change component, a "FleetWise" partnership and Government leading by example.

Stage 2 vapour recovery (VR2) captures VOC emissions from vehicle petrol tanks during refuelling at petrol bowsers. VR2 will be introduced on a staged basis starting in 2010 with vapour recovery equipment to be installed at the largest service stations in Sydney, Newcastle, Wollongong and the Central Coast by 2014, and at all but the smallest service stations in Sydney by 2017. VR2 is expected to reduce VOC emissions in the Greater Metropolitan Area by 6000 tonnes per year by 2020.

Stage 1 vapour recovery (VR1), which captures VOC emissions from underground storage tanks as they are filled by road tankers, has been in place in most parts of Sydney for some time but will be extended to all parts of Sydney, and the Wollongong, Newcastle and Central Coast metropolitan areas.

Diesel Retrofit Program, established in 2005, has been expanded. The program provides for retrofitting of a total of around 850 existing diesel vehicles with exhaust treatment devices to reduce particle emissions. It involves DECCW, the Roads and Traffic Authority and State Transit Authority and includes a commitment of \$4 million to retrofit older Sydney buses.

Commercial and domestic emissions

The NSW Government has implemented a number of policies focussing on the domestic-commercial sector as a significant contributor to air pollution in NSW.

Woodsmoke Reduction Workshops were run for councils in Sydney and regional NSW during the 2008 winter, as in 2007, as part of the Government's <u>Woodsmoke Reduction Program</u>. The workshops help local council officers manage local woodsmoke issues, such as <u>woodheater</u> installation, enforcement action for excessive woodsmoke, the use of planning instruments to manage the number

of woodheaters in a local government area, and community education programs to foster better woodheater operation. Working with the former <u>Growth Centres Commission</u>, DECCW has investigated measures to manage installation of woodheaters in new land release areas to protect air quality and amenity of nearby residents. As a result, Development Control Plans for the first two precincts in the Growth Centres – Oran Park and Turner Road in western Sydney – prohibit open fireplaces and slow combustion stoves.

NSW is also working with the Commonwealth and other jurisdictions through the Air Quality Working Group of the EPHC on national approaches to reduce particle and ozone precursor emissions from the product and equipment sectors, including from woodheaters, small engines, surface coatings and non-road engines (as used for example in construction and mining). In 2008 NSW led a study of options for reducing emissions from the surface coatings sector.

Industry emissions

The <u>Protection of the Environment Operations (Clean Air) Regulation 2002</u> provides the framework for managing air pollution from major industry.

Tighter industrial emission standards for NO_x , VOCs and particles were introduced when the Regulation was reviewed in 2005, as well as a timetable for the upgrade of old plant and equipment. As the first phase of implementation, a program is underway to introduce more stringent particle emission limits for 130 industrial premises, including some of the oldest and largest industrial facilities in NSW, among them refineries and steel mills.

A pilot program **targeting existing industrial sources of VOC emissions** commenced in 2008. The program implements regulatory and non-regulatory tools to reduce VOC emissions from premises with the greatest potential to contribute to ozone formation in the Sydney and Illawarra. The pilot is scheduled for completion by the end of 2009.

During 2008, DECCW developed an **interim NOX policy for cogeneration in the Sydney and Illawarra** to reduce nitrogen oxide emissions from cogeneration by use of best available technology. The interim policy is available at http://www.environment.nsw.gov.au/resources/air/inp09124.pdf

Regional emissions

Regional particle emissions are a significant contributor to exceedences of the Air NEPM particle goal. There are a number of potential contributors to rural air pollution in NSW including dust storms, agricultural burning, woodsmoke and bushfires. DECCW and the Department of Primary Industries are working together with local government and local communities to develop and deliver coordinated actions addressing the multiple particle sources, with a pilot project to be implemented in Wagga Wagga.

Conclusions

Air quality is addressed as a priority under the NSW State Plan,. The target for improving air quality under the State is to meet the national air quality goals as identified in the Ambient Air Quality NEPM.

Meeting the Ambient Air Quality NEPM goal for ozone is a continuing challenge for the major urban areas of NSW. However, NSW has a broad range of strategies to reduce precursor pollutants in place and being developed under the State Plan and *Action for Air*. These include the introduction of Stage 2 vapour recovery at service stations in Sydney, other initiatives under the NSW Cleaner Vehicles and Fuels Strategy, and actions to manage precursor emissions from smaller, commercial/ industrial sources and domestic sources. A strengthened regulatory framework, which restricts emissions from larger industry through licence limits and load-based fees, will be subject to further regulatory review., Together with national actions to tighten standards and reduce emissions, these actions will help move NSW towards meeting the NEPM goal for ozone in the longer term.

Dust storms contributed to elevated fine particle levels in all regions in NSW, throughout 2008. Even discounting bushfire and dust storm events, meeting the goal of the Ambient Air Quality NEPM for particles, measured as PM₁₀, presents a challenge for areas of regional NSW. NSW is addressing regional particle emissions through coordinated State and local government actions, including a pilot project for Wagga Wagga. In addition to: national vehicle emission and fuel standards and actions under the Diesel NEPM, NSW has a range of programs in place under *Action for Air* to reduce particle emissions. These include the diesel retrofit program, woodsmoke reduction program, the Smoky Vehicle Enforcement program and particle limits for industry under the Protection of the Environment (Clean Air) Regulation. NSW is also working with the Commonwealth and other jurisdictions on national approaches to reduce particle and ozone precursor emissions from the product and equipment sectors.

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Appendix A: Ambient Air Quality NEPM Monitoring in NSW

NSW Air Quality Monitoring Plan (AQMP)

Under the Ambient Air Quality NEPM, jurisdictions were required to prepare a Monitoring Plan to meet the monitoring requirements detailed in the Ambient Air Quality NEPM. The approved NSW Ambient Air Quality NEPM monitoring plan outlines the monitoring network for each of the required pollutants and is available on the Department of Environment, Climate Change and Water website <u>http://www.environment.nsw.gov.au/air/nepm/index.htm</u>

The NSW Ambient Air Quality NEPM Monitoring Plan was approved as consistent with the Ambient Air Quality NEPM by NEPC on 29 June 2001.

Since the submission of the AQMP to NEPC operational constraints have necessitated the closure of a number of air quality monitoring stations that were designated for NEPM reporting. A review of the AQMP is currently occurring.

The Sydney region

The population of the Sydney region requires at least seven monitoring stations according to the formula in clause 14(1) of the Ambient Air Quality NEPM. Monitoring stations have been selected for the region to ensure that there is adequate coverage of the population, and that the network will capture the higher concentrations.

In the Sydney region there are currently six trend stations, two performance stations, and one campaign station. Each sub-region contains two trend stations that characterise general air quality and also frequently record individual pollutant events. This approach ensures that there is adequate coverage of the populated areas and of the broad differences in pollutant distribution within the region. The choice of stations in each region was made to optimise both population coverage and representation of the occurrences of higher pollutant concentration.

Trend stations are located in the northwest at Prospect and Richmond, in the southwest at Bringelly and Macarthur, and in the east at Chullora and Rozelle. These stations provide a good geographic spread throughout the region and capture a range of the high concentration events. However to supplement the trend monitoring network additional stations are needed to capture particular events. High concentrations of ozone are frequently recorded at Oakdale. This station is on the edge of the Sydney basin in a sparsely populated area, however ozone concentrations in this region are an important measure of progress to achieving the goal of the Ambient Air Quality NEPM.

Campaign monitoring will be undertaken in the Central Coast, in the northern part of the Sydney region. The outcome of this monitoring will determine whether there is a need to establish a trend station in this area. Installation of this monitoring station has been delayed and no final installation date has been set.

The trend station at Lidcombe was closed due to construction activity in May 2002. A new station was established nearby at Chullora in December 2002. Trend data are reported for both stations. The trend station at Woolooware and the performance station in the CBD were closed in August 2004.

The monitoring network for the Sydney region is shown in Figure A1 and summarised in Table A1, which lists all stations noting the parameters measured at each.

Station	Station type ⁽¹⁾	Number of parameters	Ozone	Nitrogen dioxide	PM ₁₀	Carbon monoxide	Sulfur dioxide
Bringelly	Т	4	Х	Х	Х		Х
Central Coast ⁽²⁾	С	4	Х	Х	Х		Х
Chullora ⁽³⁾	Т	5	Х	Х	Х	Х	Х
Liverpool (4)	С	4	Х	Х	Х	Х	
Macarthur	Т	5	Х	Х	Х	Х	Х
Oakdale	Р	2	Х		Х		
Prospect	Т	5	Х	Х	Х	Х	Х
Richmond	Т	4	Х	Х	Х		Х
Rozelle	Т	4	Х	Х	Х	Х	
St Marys	Р	1	Х				

Table A1: Sydney region Ambient Air Quality NEPM monitoring network

(1) P denotes performance; T denotes trend; C denotes campaign.

(2) To be established.

(3) Replaced the Lidcombe trend station.

(4) Data from the Liverpool station will be reported at least until the Macarthur station is fully established.



Figure A1: Ambient Air Quality NEPM Monitoring in the Sydney region (AMG co-ordinates) ★ trend station; + performance station; ◆ campaign station; O proposed station;

The Lower Hunter region

The population criterion of section 14(2) of the Ambient Air Quality NEPM requires at least two monitoring sites in the Lower Hunter region. The region contains two major population centres, Newcastle and Maitland. Current monitoring has focussed on Newcastle and its environs. The installation of the planned trend station in the Maitland area has been delayed. Until this site is established, data from the existing stations at Wallsend and Beresfield will be reported. Together these stations characterise the general air quality to which the urban population of the Lower Hunter is exposed.

The monitoring network for the Lower Hunter is shown in Figure A2 and summarised in Table A2, which notes the parameters to be reported from each station.



Figure A2: Ambient Air Quality NEPM Monitoring in the Lower Hunter region ★ trend station; ◆ campaign station; ○ proposed station;

Table A2: Lower	Hunter region	Ambient Air	Ouality NEPM	monitoring network
	munter region	1 Minorene 1 Mi	Quanty 1111	moment mg need of K

Station	Station Type ⁽¹⁾	Number of parameters	Ozone	Nitrogen dioxide	PM 10	Carbon monoxide	Sulfur dioxide
Newcastle	Т	5	Х	Х	Х	Х	Х
Maitland ⁽²⁾	Т	4	Х	Х	Х		Х
Beresfield (3)	С	1			Х		
Wallsend ⁽³⁾	С	3	Х	Х			Х

(1) P denotes performance; T denotes trend, C denotes campaign.

(2) Station to be established.

(3) Data from Beresfield and Wallsend will be reported at least until the Maitland station is established.
The Illawarra region

In the Illawarra, the presence of industrial sources in the region, the occurrence of emissions transport from Sydney, and the complexity of the region together result in a need for a greater monitoring effort than that indicated purely on the basis of population. Accordingly, the general air quality to which the urban population is exposed will be characterised by monitoring all pollutants of interest at the trend station at Wollongong and the performance station at Albion Park. An additional station represents the local conditions at Kembla Grange. The Warrawong station was closed in April 2006.

Ambient Air Quality NEPM screening guidelines allow for carbon monoxide to be monitored at fewer stations. Carbon monoxide is monitored only at the Wollongong trend station.

The monitoring network for the Illawarra Region is shown in Figure A3 and summarised in Table A3, which notes the parameters to be reported from each station.



Figure A3: Ambient Air Quality NEPM Monitoring in the Illawarra region

★ trend station; + performance station;

Table A3: Illawarra	region Ambient	t Air Quality NEPM	monitoring network
	8	~ .	8

Station	Station type ⁽¹⁾	Number of parameters	Ozone	Nitrogen dioxide	PM ₁₀	Carbon monoxide	Sulfur dioxide
Albion Park South	Р	4	Х	Х	Х		Х
Kembla Grange	Р	2	Х		Х		
Warrawong ⁽²⁾	Р	1					Х
Wollongong	Т	5	Х	Х	Х	Х	Х

(1) P denotes performance; T denotes trend; C denotes campaign.

(2) Closed in April 2006.

Other regions

The NSW Ambient Air Quality NEPM Monitoring Plan provides for monitoring at several regional centres of NSW. Ambient Air Quality NEPM screening guidelines allow for carbon monoxide, nitrogen dioxide, ozone, sulfur dioxide and lead not to be monitored at these rural population centres.

Several regional centres are located on the tablelands where smoke from wood fires may be of concern during winter. As there is the potential for exceedences of the Ambient Air Quality NEPM goal for particles, the DECCW has begun campaign monitoring at Albury, Bathurst, Tamworth and Wagga Wagga. On completion of these campaigns the data will be evaluated against the screening procedures. A decision will be made whether it is necessary to establish further campaign stations at Dubbo, Lismore, and Orange as originally proposed.

Station	Station type ⁽¹⁾	Number of parameters	PM ₁₀
Albury	С	1	Х
Bathurst	С	1	Х
Dubbo ⁽²⁾	С	1	Х
Lismore (2)	С	1	Х
Orange (2)	С	1	Х
Tamworth	С	1	Х
Wagga Wagga	С	1	Х

Table A4: Rural NSW Ambient Air Quality NEPM monitoring network

(1) C denotes campaign monitoring.

(2) Monitoring subject to results from initial campaign monitoring.



Figure A4: Ambient Air Quality NEPM Monitoring in rural New South Wales ♦ campaign station; O proposed station;

Station siting and exposure

All stations within the network meet all of the Ambient Air Quality NEPM siting and exposure criteria with the exceptions of Liverpool, Rozelle, Tamworth, and Wagga Wagga.

Station	Siting criteria not met	Comments
Liverpool	Clear sky angle <120°.	Trees have grown since establishment of station.
Rozelle	Clear sky angle <120°. Less than 20m from	Trees have grown since
	trees.	establishment of station.
		Best location in urban area
Tamworth	Less than 20m from trees.	specifically targeted for
		monitoring.
Wada Wada	Less than 20m from trees	Street trees within about 15 m of
wayya wayya		station

Table A5: Stations not complying with all siting and exposure criteria

Population exposure

Under the NSW Ambient Air Quality NEPM Monitoring Plan, monitoring stations have been distributed to provide a reasonable coverage of the population while capturing the spatial variability of pollution events. The monitoring network covers a population of about 4 million in the greater metropolitan area of the Sydney, Lower Hunter and Illawarra regions. The current monitoring in regional NSW covers an additional population of about 140 000. Information about the characteristics of individual monitoring stations and exposed population is given in the NSW Monitoring Plan, available on the DECCW website <u>http://www.environment.nsw.gov.au/air/nepm/index.htm</u>

Station	Exposed population	
Sydney Region		
Bringelly	Trend station in a rural area in the southwest of the Sydney basin.	
Chullora	Trend station in a mixed residential and commercial area. Replaced the Lidcombe trend station, which had operated since 1970.	
Macarthur	Trend station representing residential areas in the southwest of the Sydney basin.	
Oakdale	Rural area on the SW edge of the Sydney basin - upper bound station for ozone.	
Prospect	Trend station in a largely residential area in the northwest sub-region.	
Richmond	Trend station representing the residential area in the north of the Hawkesbury basin.	
Rozelle	Trend station within the Parramatta River valley. Existing long-term station.	
St Marys	Upper bound station for ozone in a residential area.	
Central Coast ⁽¹⁾	Trend station representing residential areas of the Central Coast.	
Lower Hunter		
Beresfield	Campaign station in a semi-rural area used as a proxy for the Maitland station.	
Maitland ⁽²⁾	Trend station representing residential area.	
Newcastle	Trend station within the main population centre.	
Wallsend	Campaign station in a residential area used as a proxy for the yet-to-be-established Maitlar station.	
Illawarra		
Albion Park South	Performance station in a semi-rural area in the south of the region.	
Kembla Grange	Upper bound station in a residential area to the west of Lake Illawarra.	
Warrawong	Upper bound station in an industrial-residential area.	
Wollongong	Trend station in the main population/commercial centre.	
Rural Population c	entres	
Tamworth	Rural township campaign station established 2000.	
Bathurst	Rural township campaign station established 2000.	
Wagga Wagga	Rural township campaign station established 2001.	
Albury	Rural township campaign station established 2000.	
Dubbo ⁽³⁾	Rural township campaign station.	
Orange ⁽³⁾	Rural township campaign station.	
Lismore ⁽³⁾	Rural township campaign station.	

Table A6: Population exposure

(1) Station to be established.

(2) Station to be established. Data reported from Beresfield and Wallsend in the interim.

(3) Future campaign stations are subject to evaluation of initial campaign monitoring.

Pollutant screening criteria

Clause 14(2) of NEPM allows for fewer performance monitoring stations where it can be demonstrated that pollutant levels are reasonably expected to be consistently lower than the NEPM standards. These screening criteria have been used for carbon monoxide, nitrogen dioxide, ozone, sulfur dioxide, and lead, at several regions in NSW. More detailed information regarding screening of pollutants for specific regions is given in the NSW Monitoring Plan, available on the DECCW website *http://www.environment.nsw.gov.au/air/nepm/index.htm*

Monitoring methods

The NSW network is comprised of instruments that are in accordance with the relevant Australian standard. It will be noted that, in the case of PM_{10} , the Tapered Element Oscillating Microbalance (TEOM) method is used for NEPM monitoring and reporting. PM_{10} data from the TEOM are presented as measured and unadjusted.

Pollutant	Standard	Title	Method used
Carbon monoxide	AS3580.7.1-1992	Ambient Air - Determination of Carbon Monoxide - Direct Reading Instrument Method	Gas Filter Correlation / Non Dispersive Infra- Red
Nitrogen dioxide	AS3580.5.1-1993	Ambient Air - Determination of Oxides of Nitrogen - Chemiluminescence Method	Gas Phase Chemi- luminescence
Photochemical oxidant (ozone)	AS3580.6.1-1990	Ambient Air - Determination of Ozone - Direct Reading Instrument Method	Non Dispersive Ultra- violet
Sulfur dioxide	AS3580.4.1-1990	Ambient Air - Determination of Sulfur Dioxide - Direct Reading Instrument Method	Pulsed Fluorescence
Lead	AS2800-1985	Ambient Air - Determination of Particulate Lead-High Volume Sampler - Gravimetric Method	Atomic Absorption
Particles as PM ₁₀	AS 3580.9.8-2001	Determination of Suspended particulate matter - PM ₁₀ continuous direct mass method using a tapered element oscillating microbalance analyser.	Tapered Element Oscillating Microbalance (TEOM)

Table A7: Instruments used in NSW for NEPM monitoring

NATA accreditation

As required under Clause 12 of the Ambient Air Quality NEPM, the DECC is accredited by the National Association of Testing Authorities (NATA) for the measurement of all Ambient Air Quality NEPM parameters. The biennial reassessment of the Air Quality Monitoring Laboratory and associated monitoring stations by NATA was completed in early 2007 and accreditation has been continued.

Appendix B: Fine particles as PM_{2.5}

In May 2003 NEPC announced a variation to the Ambient Air Quality NEPM. The purpose of the Variation was to include in the Ambient Air Quality NEPM, Advisory Reporting Standards (ARS) for particles as $PM_{2.5}$ and protocols for monitoring and reporting $PM_{2.5}$. The standards introduced are $25\mu g/m^3$ for a daily (24-hour) average, and $8\mu g/m^3$ for an annual average.

Below are presented data measuring particles as $PM_{2.5}$ from NSW during 2008. Also included are historical trend data from 1998 onwards (where available).

PM_{2.5} monitoring

The advisory reporting standard requires $PM_{2.5}$ monitoring to be conducted at NEPM performance monitoring stations that have been specified for particles as PM_{10} . At present PM_{10} and $PM_{2.5}$ monitoring is performed concurrently at five of the eighteen stations currently specified as NEPM monitoring stations for PM_{10} - Chullora, Liverpool, Richmond, Beresfield and Wollongong. PM_{10} and $PM_{2.5}$ monitoring is also performed at the Earlwood and Wallsend stations which are not designated as NEPM monitoring stations for PM_{10} .

The DECCW has operated Tapered Element Oscillating Microbalance (TEOM) continuous fine particle monitors sampling $PM_{2.5}$ since 1996. Currently there is no Australian standard method for monitoring $PM_{2.5}$ using TEOM. The advisory reporting standard allows the use of TEOM monitors for $PM_{2.5}$ measurement, although it is stated that values obtained from this method "cannot be used for comparison with the advisory reporting standards until the outcomes of the $PM_{2.5}$ Equivalence Program have been formally included in the Principal Measure." This report only presents data obtained by TEOM monitors. These data are compared to the advisory reporting standard purely for **interest only**.

PM_{2.5} Equivalence Program

In the absence of an Australian Standard method for $PM_{2.5}$ monitoring the variation to the Ambient Air Quality NEPM identifies the need for consistent data collection. The <u>Technical Paper on monitoring</u> <u>of particles for PM2.5</u> provides advice on $PM_{2.5}$ monitoring and proposes an equivalence program to assess the accuracy of and precision of $PM_{2.5}$ measurement methods with regard to the USEPA Federal Reference Method.

The DECCW is contributing to this program by running co-located $PM_{2.5}$ samplers at the Chullora and Richmond monitoring stations. Alongside the PARTISOL and RAAS FRMs these stations operate instruments using a number of measurement techniques such as BAM, TEOM and TEOM/FDMS. Only data from the TEOM monitors are reported here.

The TEOM $PM_{2.5}$ monitors used by the DECCW have been operated along similar lines to the TEOM PM_{10} monitors and in accordance with *AS3580.9.8 (Determination of suspended particulate matter -* PM_{10} continuous direct mass method using a tapered element oscillating microbalance analyser). The internal software of the TEOM is configured to make linear adjustments of mass measurement. For PM_{10} the adjustment is based on empirical results designed to achieve comparable results to the USEPA PM_{10} reference methods. This adjustment is of the form:

Y = A + BxFor $PM_{10} : A = 3.0, B = 1.03$

Historically all TEOM monitors used by the DECCW have used this adjustment, including when the instruments are used for $PM_{2.5}$ measurements. At the commencement of the $PM_{2.5}$ equivalence program the TEOM monitors at Chullora and Richmond were configured such that the coefficients for linear adjustments were A=0 and B=1. TEOM monitors at other stations operate using the PM_{10} coefficients. After the results of the equivalence program are finalised data from all TEOM instruments will be adjusted with the appropriate coefficients.

In this report only data that is scaled (A=3, B=1.03) is presented. Data from the Chullora and Richmond stations will be made available when the results of the Equivalence Program are released.

Station siting, exposure and population exposure

Figure B1 shows the location of the $PM_{2.5}$ monitoring stations in NSW. *Table B2* gives a brief description of the stations where $PM_{2.5}$ monitoring is conducted.

The Beresfield, Chullora, Richmond, Wallsend and Wollongong stations meet all of the Ambient Air Quality NEPM siting and exposure criteria. The Earlwood and Liverpool stations do not meet these criteria. Particulars of non-compliance with siting criteria for each of these stations are given below in *Table B1*.

Information about the characteristics of individual monitoring stations and exposed population are given in the NSW Monitoring Plan, available on the DECCW website <u>http://www.environment.nsw.gov.au/air/nepm/index.htm</u>

Station	Siting criteria not met	Comments			
Earlwood	Clear sky angle <120°. Less than 20m from trees.	Trees have grown since establishment of station.			
Liverpool	Clear sky angle <120°.	Trees have grown since establishment of station.			

Table B1: Stations not complying with all siting and exposure criteria

Station	Exposed population
Sydney Region	
Chullora	Trend station in a mixed residential and commercial area. Replaced the Lidcombe trend station, which had operated since 1970.
Earlwood	Non-NEPM station in a residential area within the Cooks River valley.
Liverpool	Campaign station in an urban area of SW Sydney.
Richmond	Trend station representing the residential area in the north of the Hawkesbury basin.
Lower Hunter	
Beresfield	Performance station in a semi-rural area used as a proxy for the Maitland station.
Wallsend	Non-NEPM (for PM ₁₀) station in a residential area.
Illawarra	
Wollongong	Trend station in the main population/commercial centre.

Table B2: Population exposure



Warrawong monitoring station closed in April 2006.

Data analysis

The variation to the Ambient Air Quality NEPM (2003) states that values obtained using the TEOM method for $PM_{2.5}$ "cannot be used for comparison with the advisory reporting standards until the outcomes of the $PM_{2.5}$ Equivalence Program have been formally included in the Principal Measure."

This report only presents data obtained by TEOM monitors. These data are compared to the advisory reporting standard for $PM_{2.5}$ purely for interest.

					A	dvisory Report 25 μg/m³ (24-ł 8 μg/m³ (Ani	ting Standard nour average) nual average)
Region/ Performance monitoring		Data a (%	vailabilit ⁄₀ of houi	ry rates rs)		Number of Exceed- ences (days)	Annual mean (uq/m ³)
Station	Q1	Q2	Q3	Q4	Annual		
Sydney							
Earlwood	98.9	100.0	98.9	96.7	98.6	0	8.6
Liverpool	96.7	97.8	96.7	79.5	92.7	1	9.6
Illawarra							
Wollongong	97.8	98.9	87.1	92.5	94.1	0	8.7
Lower Hunter							
Beresfield	79.6	100.0	93.5	95.7	92.2	0	9.1
Wallsend	90.2	85.8	83.8	91.4	87.8	1	9.0

Table B3: Summary of PM2.5 concentrations in NSW (2008)

Bold font indicates values that exceed the AAQ NEPM advisory reporting standard

In 2008, all regions in NSW exceeded the AAQ NEPM annual average advisory reporting standard for $PM_{2.5}$. Sydney and the Lower Hunter regions exceeded the AAQ NEPM 24 hour average advisory reporting standard for $PM_{2.5}$. Readings in excess of the 24-hour reporting standard were recorded at Liverpool and Wallsend. All monitoring stations failed to comply with the annual average advisory reporting goal. Liverpool recorded the highest annual average of $9.6\mu g/m^3$.

PM_{2.5} 24 hour average

NEPM Annual Compliance reports prior to 2008 included 24 hour daily average calculations for $PM_{2.5}$ using hours 0 to 23. Daily averages are now calculated using hours 1 to 24 as detailed in the NEPM Technical Paper No. 5, "Data Collection and Handling". Accordingly, in the following tables, Table B4, B6, B7 and B9 to B14, the calculation of the 24 hour daily averages for 2008, differs in comparison to previous years.

Region/ Performance	Data availability	Number of		Maximum values (ppm)		
monitoring Station	rates (%)	valid days	Highest Value	Highest Date	2 nd Highest Value	2 nd Highest Date
Sydney						
Earlwood	98.6	361	21.8	27-May	20.2	13-Jul
Liverpool	92.7	339	36.1	14-Nov	20.7	05-Apr
Illawarra Wollongong	94.1	344	19.2	29-Jan	18.0	02-Oct
Lower Hunter						
Beresfield	92.2	337	20.4	19-Sep	20.1	16-Sep
Wallsend	87.8	321	26.4	20-Sep	23.9	16-Sep

Table B4: Sui	mmary for PM ₂₅ -	- Maximum 24-hour	· average concentrations	(2008)
Tuble D II Sul	11111112.5	in a nour	a, er age concentr ations	(=000)

AAQ NEPM advisory reporting standard – 25 μ g/m³ (24-hour average)

Bold font indicates values that exceed the AAQ NEPM advisory reporting standard

Table B5: Days when PM_{2.5} 24-hour Ambient Air Quality NEPM standard exceeded

Date	Stations where standard exceeded	Comments ^(#)
20-Sep-2008	Wallsend	
14-Nov-2008	Liverpool	Hazard reduction burn

Table B6: Statistical summary for PM_{2.5} - Daily 24-hour average concentrations (2008)

Region/ Performance	Data availability	Maximum conc.							
monitoring Station	rates (%)	(ppm)	99 th	98 th	95 th	90 th	75 th	50 th	25 th
Sydney									
Earlwood	98.6	21.8	18.7	18.0	14.6	12.9	10.4	8.0	6.3
Liverpool	92.7	36.1	19.7	17.9	15.6	13.9	11.6	9.0	7.0
Illawarra									
Wollongong	94.1	19.2	17.7	16.9	14.5	13.1	10.7	8.0	6.2
Lower Hunter									
Beresfield	92.2	20.4	18.2	17.1	15.1	13.0	10.9	8.9	6.7
Wallsend	87.8	26.4	20.5	17.7	15.4	13.4	10.7	8.3	6.5

AAQ NEPM advisory reporting standard - $25 \mu g/m^3$ (24-hour average)

Bold font indicates values that exceed the AAQ NEPM advisory reporting standard

Trend data

Annual averages and annual maximum 24-hour averages for all stations are given below.

Region/ Performance monitoring Station	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Sydney										
Earlwood	27.6	35.4	81.7	56.1	39.4	24.4	31.2	33.1	23.2	21.8
Liverpool	25.4	45.1	118.6	89.2	50.1	41.8	34.9	51.5	27.0	36.1
Illawarra										
Warrawong	19.9	32.6	23.2	89.6	160.3	26.8	27.4	18.6		
Wollongong	19.4	31.1	53.4	93.8	112.5	26.7	25.2	30.7	26.3	19.2
Lower Hunter										
Beresfield	21.4	34.1	66.4	50.4	40.9	31.7	22.1	29.6	26.2	20.4
Wallsend	21.9	61.5	56.4	59.6	34.1	26.9	21.3	30.5	21.9	26.4

Table B7: Maximum 24-hour average concentrations for $PM_{2.5}$ (µg/m³)

AAQ NEPM advisory reporting standard - $25 \mu g/m^3$ (24-hour average)

				8			2.5 (1.8	,		
Region/										
monitoring Station	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Sydney										
Earlwood	10.2	10.3	11.6	12.8	11.0	10.8	10.3	10.1	9.1	8.6
Liverpool	9.6	10.4	11.8	15.2	13.6	12.5	11.6	12.2	10.4	9.6
Illawarra										
Warrawong	8.3	9.1	9.9	12.7	12.0	11.4	10.6	9.2		
Wollongong	8.0	8.3	9.4	11.5	10.5	9.8	9.5	9.5	9.1	8.7
Lower Hunter										
Beresfield	8.8	8.8	12.4	13.6	9.4	11.0	10.0	10.0	9.5	9.1
Wallsend	8.0	8.4	10.2	11.3	9.8	9.9	9.7	9.6	9.0	9.0

Table B8: Annual average concentrations for PM_{2.5} (µg/m³)

 $AAQ NEPM advisory reporting standard - 8\mu g/m^3 (annual average)$ Bold font indicates values that exceed the AAQ NEPM advisory reporting standard

Statistical trends

Table B9: Statistical summary for PM_{2.5} - 24-hour average concentrations

Station: Earlwood

Year	Data availability	Number of	Maximum value	Percentiles (ug/m3)							
	rates (%)	(days)	(ug/m3)	99 th	98 th	95 th	90 th	75 th	50 th	25 th	
1999	93.4	4	27.6	25.2	21.1	18.4	16.2	12.7	9.1	6.9	
2000	84.7	3	35.4	21.6	19.9	18.2	16.8	12.1	9.3	7.2	
2001	93.7	8	81.7	50.2	25.1	20.6	18.1	13.1	9.7	7.6	
2002	98.9	15	56.1	51.1	29.3	23.6	20.7	15.2	10.9	8.1	
2003	98.6	9	39.4	30.5	26.5	19.6	17.3	12.9	9.6	7.5	
2004	96.2	0	24.4	22.2	21.3	18.6	16.5	13.3	10.0	7.5	
2005	98.9	2	31.2	23.6	22.4	17.4	15.6	12.4	9.3	7.5	
2006	98.6	3	33.1	19.6	18.5	16.6	14.9	11.7	9.6	7.5	
2007	96.7	0	23.2	19.7	18.7	15.3	13.8	11.1	8.4	6.3	
2008	98.6	0	21.8	18.7	18.0	14.6	12.9	10.4	8.0	6.3	

Table B10: Statistical summary for $PM_{2.5}$ - 24-hour average concentrations

Station: Liverpool

Year	Data availability rates	Data availability rates	Maximum value	Percentiles (ug/m3)								
	rates (%)	(days)	(ug/m3)	99 th	98 th	95 th	90 th	75 th	50 th	25 th		
1999	98.6	1	25.4	20.1	18.6	17.1	14.8	12.1	9.0	6.8		
2000	97.8	5	45.1	25.3	22.7	17.7	15.3	12.1	9.5	7.4		
2001	97.8	6	118.6	53.1	21.9	19.4	17.1	13.4	10.2	7.6		
2002	96.7	39	89.2	44.4	39.3	29.8	25.3	17.9	12.9	9.4		
2003	65.5	12	50.1	37.3	30.3	24.6	20.6	16.6	12.2	9.6		
2004	85.0	10	41.8	29.2	25.8	20.8	19.3	15.1	11.7	8.5		
2005	91.0	7	34.9	27.5	23.9	20.7	18.3	14.3	10.7	8.1		
2006	98.6	3	51.5	24.1	21.3	19.3	17.4	14.1	11.5	9.0		
2007	95.1	1	27.0	22.2	21.6	18.5	15.6	12.6	9.8	7.4		
2008	92.7	1	36.1	19.7	17.9	15.6	13.9	11.6	9.0	7.0		

 $AAQ NEPM advisory reporting standard - 25 \mu g/m^3 (24-hour average)$ Bold font indicates values that exceed the AAQ NEPM advisory reporting standard

	Data availability	Number of	Maximum value	Percentiles (ug/m3)								
Year	rates (%)	(days)	(ug/m3)	99 th	98 th	95 th	90 th	75 th	50 th	25 th		
1999	97.5	0	19.9	16.2	15.6	14.0	12.6	9.6	7.8	6.2		
2000	97.5	3	32.6	20.6	18.7	15.3	13.3	10.5	8.3	6.7		
2001	94.2	0	23.2	21.5	20.6	17.6	15.1	12.0	8.9	6.7		
2002	96.7	18	89.6	40.3	31.4	24.4	21.1	15.2	10.5	8.0		
2003	98.4	8	160.3	27.3	24.9	20.6	17.6	14.1	10.5	8.1		
2004	94.0	2	26.8	23.6	22.1	20.7	17.9	14.2	10.4	8.0		
2005	94.8	3	27.4	23.3	21.6	19.1	16.5	13.0	9.7	7.5		
2006	40.5	0	18.6	17.8	16.9	15.4	13.7	11.3	9.1	6.4		
2007 #	0.0											
2008												

Table B11: Statistical summary for $PM_{2.5}$ - 24-hour average concentrations

Station: Warrawong

Station closed in April 2006.

Table B12: Statistical summary for $PM_{2.5}$ - 24-hour average concentrations

Station: Wollongong

Year	Data Number of availability Exceedences	Maximum value	Percentiles (ug/m3)								
	rates (%)	(days)	(ug/m3)	99 th	98 th	95 th	90 th	75 th	50 th	25 th	
1999	98.6	0	19.4	16.1	14.9	12.5	11.4	9.3	7.5	6.1	
2000	100.0	1	31.1	18.9	17.2	15.1	12.4	9.6	7.6	6.2	
2001	96.2	2	53.4	20.6	19.3	17.0	14.9	11.0	8.2	6.4	
2002	95.9	18	93.8	40.2	30.1	24.5	18.4	13.5	9.3	7.2	
2003	96.7	7	112.5	32.4	23.6	18.3	15.9	11.9	9.3	7.2	
2004	97.3	2	26.7	21.7	20.6	16.9	15.8	12.2	9.1	6.7	
2005	97.8	1	25.2	21.1	19.3	16.5	15.4	11.2	8.7	6.9	
2006	100.0	2	30.7	19.7	17.7	15.8	14.3	11.6	8.9	6.7	
2007	98.4	1	26.3	22.0	19.7	16.5	14.3	10.8	8.3	6.3	
2008	94.1	0	19.2	17.7	16.9	14.5	13.1	10.7	8.0	6.2	

Table B13: Statistical summary for $PM_{2.5}$ - 24-hour average concentrations

Station: Beresfield

Year	Data availability	Number of Exceedences	Maximum value	Percentiles (ug/m3)							
	rates (%)	(days)	(ug/m3)	99 th	98 th	95 th	90 th	75 th	50 th	25 th	
1999	95.9	0	21.4	17.6	17.0	15.7	13.7	10.8	8.0	6.2	
2000	85.2	2	34.1	22.5	19.7	15.4	13.4	10.1	7.8	6.4	
2001	69.0	9	66.4	33.1	25.5	21.1	18.9	15.0	11.3	8.3	
2002	95.1	26	50.4	45.6	39.8	29.3	21.4	15.8	11.3	8.8	
2003	90.7	5	40.9	27.4	22.4	16.6	14.1	10.8	8.2	6.2	
2004	90.2	1	31.7	23.6	23.0	19.9	16.5	12.9	10.3	7.8	
2005	93.7	0	22.1	20.7	19.5	18.4	15.7	12.0	9.1	7.2	
2006	98.9	2	29.6	19.4	18.3	16.7	14.5	11.7	9.0	7.4	
2007	86.0	1	26.2	20.0	19.1	17.3	14.6	11.5	8.8	6.6	
2008	92.2	0	20.4	18.2	17.1	15.1	13.0	10.9	8.9	6.7	

AAQ NEPM advisory reporting standard - $25 \mu g/m^3$ (24-hour average)

Bold font indicates values that exceed the AAQ NEPM advisory reporting standard

Table B14: Statistical summ	nary for PM _{2.5} ·	- 24-hour average	e concentrations
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Year	Data availability	Data Number of availability Exceedences	Maximum value	Percentiles (ug/m3)							
	rates (%)	(days)	(ug/m3)	99 th	98 th	95 th	90 th	75 th	50 th	25 th	
1999	88.8	0	21.9	15.0	14.0	12.7	11.6	9.5	7.6	5.9	
2000	88.5	1	61.5	17.4	15.7	14.5	13.1	9.8	7.3	6.1	
2001	94.8	7	56.4	30.1	23.8	18.1	15.5	11.6	8.6	7.1	
2002	85.8	13	59.6	37.0	31.5	22.8	17.3	12.9	9.3	7.3	
2003	88.5	3	34.1	24.9	20.8	16.4	14.7	11.7	8.8	7.0	
2004	87.4	1	26.9	20.1	18.3	16.4	14.3	11.6	9.0	7.3	
2005	95.9	0	21.3	19.6	18.8	16.4	14.3	11.5	9.0	7.2	
2006	99.2	2	30.5	18.7	17.5	15.6	13.8	11.2	9.0	7.2	
2007	92.3	0	21.9	18.5	17.8	15.8	13.3	10.6	8.2	6.4	
2008	87.8	1	26.4	20.5	17.7	15.4	13.4	10.7	8.3	6.5	

Station: Wallsend

AAQ NEPM advisory reporting standard - $25 \mu g/m^3$ (24-hour average)

Bold font indicates values that exceed the AAQ NEPM advisory reporting standard

Appendix C: Calculating data availability

Throughout this report data availability rates are presented as either percentages of available data, or as days available. These two rates are calculated using different methods. When presented as a percentage, the value is the number of averaging periods where data is valid, divided by the total number of averaging periods in the year. When presented as number of valid days, this value represents the number of days during the year when at least seventy-five percent of averaging periods during the day are valid.

For example the carbon monoxide standard is based on eight hour rolling averages. A valid hour (the end point of an eight hour average) is the average, over the preceding eight hours, of the valid one-hour averages, when at least six of those hours hold valid data. A valid day has at least eighteen valid hours. If we hypothesize that on each day throughout the year we had *exactly* eighteen valid hours, then annual data availability would be seventy-five percent. The number of valid days would be 365.

For the gaseous pollutants, carbon monoxide, nitrogen dioxide, ozone and sulfur dioxide, the NSW DECCW undertakes daily an automated instrument calibration check. This occurs during the early hours of the morning, and sample data obtained during the calibration check is considered as invalid data. Hence for these pollutants the maximum number of valid one-hour averages in a day is twenty-three. All calculations for data availability given in this report *include* the invalid calibration hour (i.e. calculations assume that there are twenty-four *possible* valid hours in a day). Therefore for these pollutants the maximum that the annual one-hour data availability can be is 95.8 %.

For a pollutant that is reported against more than one standard, data availability rates may not be the same for each standard. For instance when measuring ozone, one hour of each day is lost during instrument calibration checks. This affects the data availability rates when reporting against the one hour standard but does not affect data availability rates when reporting against the four hour standard. The maximum data availability rates are thus 95.8% and 100% respectively.

For compliance reporting on standards with averaging periods less than twenty-four hours, peak daily values are given regardless of the number of valid hours in that day. For reporting of statistics, such as percentiles of daily maxima, on standards with averaging periods less than twenty-four hours, only days that have at least seventy-five percent of valid hours are used.