

NATIONAL ENVIRONMENT PROTECTION (AMBIENT AIR QUALITY) MEASURE

NEW SOUTH WALES ANNUAL COMPLIANCE REPORT 2006

(Prepared 17th July 2007)

Department of **Environment & Climate Change** NSW



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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 (NSW) – formerly the DEC
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 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
O ₃	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 Environment Protection Agency
µg/m ³	microgram (1 millionth of a gram) per cubic metre referenced to a temperature of 0°C and an absolute pressure of 101.325 kilopascals
VOC	Volatile Organic Compounds – compounds that vaporise, that is become a gas, at normal atmospheric temperatures

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.

This report, required under Clause (18) of the Ambient Air Quality NEPM, demonstrates that in 2006 NSW has met the requirements of the Ambient Air Quality NEPM for most pollutants. Levels of carbon monoxide, nitrogen dioxide, lead and sulfur dioxide continue to be well below the NEPM standards. Levels of ozone exceeded the NEPM standards in the Sydney and Illawarra regions and exceedences of the PM₁₀ standard were recorded in Sydney, the Illawarra, lower Hunter, Albury, Tamworth and Wagga Wagga.

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

The NSW air quality management plan, *Action for Air*, was released in 1998 and updated in [*Action for Air: 2006 Update*](#). *Action for Air* outlines a broad range of strategies used to manage air quality in NSW such as integrating air quality goals and urban transport planning; providing more and better transport choices; making cars, trucks and buses cleaner; promoting cleaner homes and business; and managing the impact of open burning. *Action for Air* is a 25-year plan that is reviewed regularly to assess achievements and the need for adaptation of control strategies. A review of the plan is taking place in 2007, with a public Clean Air Forum in November.

Meeting the Ambient Air Quality NEPM goal for ozone will be a challenge for the major urban areas of NSW given pressures from a growing population, urban expansion and increase in motor vehicle use. However, NSW has a broad range of strategies to reduce precursor pollutants in place and being developed under *Action for Air*. These include the requirement for Stage 1 vapour controls at service stations in Sydney, mandatory limits for petrol volatility in summer and the NSW Cleaner Vehicles Action Plan as well as initiatives to assist local councils to manage precursor emissions from smaller, commercial/industrial sources and domestic sources. A regulatory framework, which restricts emissions from larger industry through licence limits and load-based fees, is in place. The regulations limiting industrial emissions were reviewed and strengthened in 2005. These measures, together with stricter motor vehicle emission standards, tighter fuel regulations, NSW Diesel NEPM programs and new actions brought forward under the NSW State Plan and *Action for Air* Review will help move NSW towards meeting the NEPM goal for ozone in the longer term.

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 NSW. This is the case, not only in Sydney, but also particularly in rural population centres where a combination of topography, climate, agricultural activities and relatively high use of solid fuel heaters, can combine to produce elevated levels of fine particles.

As for ozone, *Action for Air* includes a broad range of strategies for managing particle emissions across mobile, industry and domestic sources and additional actions will be brought forward under the *Action for Air* Review. Some of the more significant initiatives in place are:

- National vehicle emission and fuel quality standards;
- Actions under the Diesel National Environment Protection Measure which requires jurisdictions to assess the impact of emissions from in service diesel vehicles and where necessary to implement programs to reduce them. NSW programs include the Smoky Vehicle Enforcement program;
- Particle emissions limits for industrial combustion processes under the Protection of the Environment (Clean Air) Regulation;
- Environmental Impact Assessment processes for new developments;
- Emission limits for particles from solid fuel heaters.

Findings of a major emissions inventory project for NSW, which is close to final, will inform the *Action for Air* Review and the development of new strategies to address the NEPM goals. The NSW Government's new \$5 million Healthy Air, Healthy Communities fund will provide for a number of new initiatives to improve air quality and at the same time reduce greenhouse gas emissions.

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 at 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 nine trend stations (T), selected individual pollutants at five 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 provincial cities.

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 PM₁₀ 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 [Appendix A](#).

New sites and site closures

After continued vandalism the Albion Park station was closed in January 2005 and relocated to a nearby site in December 2005. The new site, Albion Park South, became fully operational during the first quarter of 2006. Consequently a full year of data is not available from the station.

The Blacktown monitoring station was closed in June 2004 as the land where the station was located was sold for residential development. The location of this monitoring station, directly on the Blacktown Ridge provided valuable data that contributed to a better understanding of air movements between the Hawkesbury basin and the Parramatta River valley. A new station was established at Prospect in early 2007. The station is sited such that the key characteristics of the old Blacktown station should also be evident at the new Prospect station.

The Warrawong station was closed in April 2006.

Table 1: NSW Ambient Air Quality NEPM monitoring network

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

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

(2) Currently closed. To be replaced by a new station nearby at Prospect.

(3) Postponed – under review.

(4) Replaced the Lidcombe trend station.

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

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

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

Assessment of compliance with standards and goal

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

A station is assessed as complying with the Ambient Air Quality NEPM standard if less than the allowed number of exceedences are recorded at the station, and data availability is greater than seventy-five percent both for the year, and for each quarter of the year. A station can demonstrate non-compliance if a greater number of days than allowed exceed the relevant standard, even if that station does not comply with data availability rates. If a station records no exceedences, or exceedences on a number of days less than that allowed, but has not complied with data availability rates, then the station is assessed as compliance not demonstrated.

A region demonstrates compliance when either all stations in the region demonstrate compliance, or when the region meets approved [pollutant screening](#) criteria.

The Ambient Air Quality NEPM states that short-term standards should not be exceeded on more than one day per year for carbon monoxide, nitrogen dioxide, ozone and sulfur dioxide, and on no more than five days per year for particles (PM₁₀). With this form of standard, the non-overlapping second highest daily value (or the sixth for PM₁₀) becomes the value against which compliance is assessed. If this value is greater than the standard then non-compliance is reported.

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

Not including station closures listed earlier, no significant amounts of data were lost during 2006.

During the first quarter of 2006 there was lower data recovery from the new Albion Park South station as the station became fully operational.

Instrument failures led to data availability rates lower than the Ambient Air Quality NEPM goal for the oxides of nitrogen monitor at Wollongong and the PM₁₀ monitor at Tamworth.

Carbon monoxide

During 2006 no exceedences of the carbon monoxide standard were recorded in NSW. Compliance with the Ambient Air Quality NEPM goal was demonstrated in all regions.

Carbon monoxide levels are well below the Ambient Air Quality NEPM standard. The highest recorded value in the state was 2.3ppm at Chullora. This is only 26 per cent of the standard. Levels in all regions are significantly lower than the NEPM standard.

Table 2: 2006 compliance summary for CO in New South Wales

Region/ Performance monitoring Station	Data availability rates (% of hours)					Number of exceedences (days)	Performance against the standards and goal
	Q1	Q2	Q3	Q4	Annual		
Sydney							
Blacktown ⁽¹⁾							
Chullora	89.8	96.2	93.8	98.8	94.7	0	Met
Liverpool	95.3	98.0	94.6	97.6	96.4	0	Met
Macarthur	96.9	99.3	96.9	99.9	98.2	0	Met
Rozelle	91.8	99.0	96.1	99.3	96.6	0	Met
Illawarra							
Wollongong	98.7	98.4	99.0	98.5	98.6	0	Met
Lower Hunter							
Newcastle	98.0	96.3	85.9	98.7	94.7	0	Met

ND Not demonstrated.

(1) Station closed pending relocation.

Table 3: Summary for CO - Daily maximum rolling 8-hour average concentrations (2006)

Region/ Performance monitoring Station	Data availability rates (%)	Number of valid days	Maximum values (ppm)			
			Highest Value	Highest Date	2 nd Highest Value	2 nd Highest Date
Sydney						
Chullora	94.7	342	2.3	29-Jun 03:00	1.8	23-Jun 03:00
Liverpool	96.4	346	2.1	10-Jul 03:00	2.0	30-Jun 03:00
Macarthur	98.2	352	1.8	17-Jul 10:00	1.6	18-Jul 04:00
Rozelle	96.6	347	2.0	29-Jun 03:00	1.7	20-Jun 03:00
Illawarra						
Wollongong	98.6	356	1.5	09-Aug 01:00	1.3	27-Jul 01:00
Lower Hunter						
Newcastle	94.7	338	2.2	15-Jun 02:00	1.9	14-Jun 02:00

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

Nitrogen dioxide

No exceedences of the nitrogen dioxide 1-hour and annual standards were recorded in NSW during 2006. Compliance with the Ambient Air Quality NEPM goal was demonstrated in Sydney and the lower Hunter region. Compliance was not demonstrated in the Illawarra region because the data availability criteria were not met at Albion Park (due to the relocation of this station) and Wollongong (due to instrument fault).

Table 4: 2006 compliance summary for NO₂ in New South Wales

Region/ Performance monitoring Station	Data availability rates (% of hours)					Number of Exceed- ences (days)	AAQ NEPM standard		
							0.12 ppm (1-hour average)		
							0.03 ppm (1-year average)		
	Q1	Q2	Q3	Q4	Annual		Annual mean (ppm)	Performance against the standards and goal	
								1-hour	1-year
Sydney									
Blacktown ⁽¹⁾									
Bringelly	92.3	90.5	93.1	92.3	92.1	0	0.006	Met	Met
Chullora	86.0	92.2	93.7	94.7	91.7	0	0.014	Met	Met
Liverpool	93.6	94.9	88.5	94.0	92.7	0	0.013	Met	Met
Macarthur	91.9	94.9	93.8	95.1	93.9	0	0.011	Met	Met
Richmond	93.1	93.0	87.0	92.6	91.4	0	0.006	Met	Met
Rozelle	90.6	94.3	92.3	94.3	92.9	0	0.013	Met	Met
Central Coast ⁽²⁾									
Illawarra									
Albion Park South	45.2	81.5	93.8	94.6	78.9	0	0.005	ND	ND
Wollongong	68.9	94.2	93.5	94.2	87.8	0	0.009	ND	ND
Lower Hunter									
Newcastle	86.8	87.5	87.1	95.4	89.2	0	0.008	Met	Met
Maitland ⁽³⁾									
Wallsend	87.8	95.5	95.2	90.0	92.1	0	0.009	Met	Met

ND Not demonstrated.

(1) Station closed pending relocation.

(2) Station to be established.

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

Within NSW levels of nitrogen dioxide are well below the NEPM standard. The highest recorded 1-hour average value in the state was 0.066ppm (55 per cent of the standard) at the Chullora and Macarthur stations. The highest annual average of 0.014ppm (47 percent of the standard) was recorded at Chullora.

Table 5: Summary for NO₂ - Daily maximum 1-hour average concentrations (2006)

Region/ Performance monitoring Station	Data availability rates (%)	Number of valid days	Maximum values (ppm)			
			Highest Value	Highest Date	2 nd Highest Value	2 nd Highest Date
Sydney						
Bringelly	92.1	351	0.040	21-Sep 21:00	0.039	12-Apr 19:00
Chullora	91.7	349	0.066	04-Apr 21:00	0.058	05-Apr 00:00
Liverpool	92.7	353	0.053	13-Oct 20:00	0.051	12-Apr 20:00
Macarthur	93.9	356	0.066	12-Apr 20:00	0.060	21-Nov 21:00
Richmond	91.4	348	0.044	04-Apr 21:00	0.038	21-Aug 19:00
Rozelle	92.9	356	0.057	21-Nov 09:00	0.053	12-Apr 09:00
Illawarra						
Albion Park South	78.9	298	0.051	21-Nov 20:00	0.043	13-Oct 19:00
Wollongong	87.8	333	0.050	12-Apr 19:00	0.046	03-Apr 19:00
Lower Hunter						
Newcastle	89.2	337	0.042	29-Sep 19:00	0.041	17-Aug 19:00
Wallsend	92.1	351	0.037	18-Aug 19:00	0.036	21-Aug 20:00

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

Ozone

Both the 1-hour and 4-hour standards for ozone were exceeded in NSW during 2006. The Sydney region did not comply with the Ambient Air Quality NEPM goal. Compliance was demonstrated in the lower Hunter and Bathurst regions. Compliance was not demonstrated in the Illawarra region because the data availability criteria were not met at Albion Park (due to the relocation of this station).

Table 6: 2006 compliance summary for O₃ in New South Wales

						AAQ NEPM standard 0.10 ppm (1-hour average) 0.08 ppm (4-hour average)			
Region/ Performance monitoring Station	Data availability rates (% of hours)					Number of exceedences (days)		Performance against the standards and goal	
	Q1	Q2	Q3	Q4	Annual	1-hour	4-hour	1-hour	4-hour
Sydney									
Blacktown ⁽¹⁾									
Bringelly	93.4	89.5	93.2	92.3	92.1	6	6	Not met	Not met
Chullora	95.1	92.2	94.8	94.9	94.3	1	2	Met	Not met
Liverpool	93.5	91.1	90.2	90.9	91.4	4	4	Not met	Not met
Macarthur	92.4	94.9	94.8	95.1	94.3	8	8	Not met	Not met
Oakdale	95.0	84.6	85.1	87.1	87.9	1	1	Met	Met
Richmond	92.6	93.0	93.1	92.6	92.8	2	2	Not met	Not met
Rozelle	91.5	94.6	88.1	94.7	92.2	0	1	Met	Met
St Marys	91.2	90.3	94.3	94.6	92.6	3	4	Not met	Not met
Central Coast ⁽²⁾									
Illawarra									
Albion Park South	73.1	81.5	95.5	94.6	86.2	0	0	ND	ND
Kembla Grange	92.6	95.4	95.2	95.3	94.6	0	1	Met	Met
Wollongong	94.4	94.2	95.3	94.4	94.6	0	1	Met	Met
Lower Hunter									
Maitland ⁽³⁾									
Newcastle	94.9	91.7	92.8	95.6	93.7	0	0	Met	Met
Wallsend	87.5	95.4	95.2	94.4	93.2	0	0	Met	Met
Regional									
Bathurst	94.4	93.4	94.6	95.7	94.5	0	0	Met	Met

ND Not demonstrated.

Bold font indicates values that exceed the AAQ NEPM standard

(1) Station closed pending relocation.

(2) Station to be established

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

Ozone events in the Sydney and Illawarra regions 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 (NO_x and VOCs) are sufficient to generate concentrations of ozone well above the Ambient Air Quality NEPM standards (DEC 2006).

Both the 1-hour and 4-hour NEPM standards were exceeded in the Sydney region. In the Illawarra only the 4-hour standard was exceeded. There were no exceedences of either standard in Bathurst or the lower Hunter.

The 1-hour standard was exceeded at seven Sydney monitoring stations: Bringelly, Chullora, Liverpool, Macarthur, Oakdale, Richmond and St Marys. Of these, Macarthur recorded the highest number of exceedences with eight days where hourly averages were greater than the standard. Rozelle did not exceed the 1-hour standard. The maximum 1-hour average during the year was 0.128 ppm recorded at Liverpool on the 1st December and at Macarthur on the 11th December.

There were no exceedences of the 1-hour standard recorded in the Illawarra, lower Hunter and Bathurst regions.

Table 7: Summary for O₃ - Daily maximum 1-hour average concentrations (2006)

Region/ Performance monitoring Station	Data availability rates (%)	Number of valid days	Maximum values (ppm)			
			Highest Value	Highest Date	2 nd Highest Value	2 nd Highest Date
Sydney						
Bringelly	92.1	352	0.119	01-Dec 17:00	0.109	02-Feb 14:00
Chullora	94.3	360	0.117	18-Feb 15:00	0.099	01-Dec 16:00
Liverpool	91.4	348	0.128	01-Dec 13:00	0.110	11-Dec 14:00
Macarthur	94.3	359	0.128	11-Dec 14:00	0.127	01-Dec 16:00
Oakdale	87.9	329	0.109	19-Feb 16:00	0.094	17-Feb 18:00
Richmond	92.8	354	0.108	02-Feb 15:00	0.103	23-Jan 16:00
Rozelle	92.2	352	0.093	18-Feb 13:00	0.086	21-Nov 11:00
St Marys	92.6	352	0.124	23-Jan 17:00	0.123	02-Feb 14:00
Illawarra						
Albion Park South	86.2	325	0.096	13-Oct 15:00	0.091	14-Oct 15:00
Kembla Grange	94.6	362	0.093	21-Nov 14:00	0.086	13-Oct 15:00
Wollongong	94.6	360	0.096	21-Nov 13:00	0.087	13-Oct 14:00
Lower Hunter						
Newcastle	93.7	358	0.068	01-Jan 13:00	0.065	03-Jan 15:00
Wallsend	93.2	355	0.086	01-Dec 13:00	0.075	19-Feb 13:00
Regional						
Bathurst	94.5	361	0.075	10-Dec 16:00	0.071	02-Jan 19:00

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

Bold font indicates values that exceed the AAQ NEPM standard

Table 8: Summary for O₃ - Daily maximum rolling 4-hour average concentrations (2006)

Region/ Performance monitoring Station	Data availability rates (%)	Number of valid days	Highest Value	Maximum values (ppm)		
				Highest Date	2 nd Highest Value	2 nd Highest Date
Sydney						
Bringelly	96.2	352	0.110	01-Dec 18:00	0.102	23-Jan 16:00
Chullora	98.8	360	0.104	18-Feb 15:00	0.091	01-Dec 17:00
Liverpool	95.2	348	0.124	01-Dec 16:00	0.100	18-Feb 16:00
Macarthur	98.5	359	0.117	01-Dec 17:00	0.111	11-Dec 15:00
Oakdale	91.6	329	0.086	23-Jan 19:00	0.080	19-Feb 17:00
Richmond	97.3	355	0.095	23-Jan 18:00	0.087	01-Dec 15:00
Rozelle	96.6	352	0.082	18-Feb 15:00	0.076	21-Nov 14:00
St Marys	96.6	352	0.109	23-Jan 17:00	0.093	02-Feb 15:00
Illawarra						
Albion Park South	90.0	325	0.078	13-Oct 16:00	0.075	14-Oct 16:00
Kembla Grange	98.9	362	0.081	21-Nov 16:00	0.071	13-Oct 16:00
Wollongong	98.6	360	0.086	21-Nov 15:00	0.077	13-Oct 16:00
Lower Hunter						
Newcastle	97.9	357	0.064	01-Jan 15:00	0.062	03-Jan 17:00
Wallsend	97.3	355	0.066	03-Jan 16:00	0.066	01-Dec 15:00
Regional						
Bathurst	98.5	361	0.071	10-Dec 16:00	0.066	02-Jan 19:00

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

Bold font indicates values that exceed the AAQ NEPM standard

Table 9: Days when O₃ 1-hour Ambient Air Quality NEPM standard exceeded (2006)

Date	Stations where standard exceeded and hour of exceedence	Comments ^(#)
21-Jan-2006	Macarthur (17)	
22-Jan-2006	Macarthur (13)	
23-Jan-2006	Bringelly (15-16), Liverpool (13), Macarthur (14-16), Richmond (16), St Marys (15, 17)	
27-Jan-2006	Bringelly (15), Macarthur (15)	
02-Feb-2006	Bringelly (14), Richmond (15), St Marys (14)	
17-Feb-2006	Macarthur (16-17)	
18-Feb-2006	Chullora (13-15), Liverpool (13, 15)	
19-Feb-2006	Bringelly (14), Oakdale (16)	
20-Nov-2006	St Marys (12)	Bushfires (Blue Mountains)
21-Nov-2006	Macarthur (12)	
01-Dec-2006	Bringelly (13, 16-18), Liverpool (12-17), Macarthur (13-18)	
11-Dec-2006	Bringelly (15), Liverpool (13-14), Macarthur (13-15)	

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

The 4-hour standard was exceeded at all stations in the Sydney and Illawarra regions except Albion Park South. Six stations in Sydney (Bringelly, Chullora, Liverpool, Macarthur, Richmond and St Marys) exceeded the standard on two or more days. The maximum value recorded in Sydney was 0.124ppm at Liverpool on the 1st December.

In the Illawarra the 4-hour standard was exceeded on the 21st November at Kembla Grange and Wollongong. The maximum 4-hour ozone in the Illawarra was 0.086ppm recorded at Wollongong on this day.

There were no exceedences of the 4-hour standard at Bathurst or in the lower Hunter region.

Table 10: Days when O₃ 4-hour Ambient Air Quality NEPM standard exceeded (2006)

Date	Stations where standard exceeded and hour of exceedence	Comments ^(#)
21-Jan-2006	Macarthur (18-19)	
22-Jan-2006	Bringelly (15), Macarthur (13-16)	
23-Jan-2006	Bringelly (15-18), Liverpool (14-16), Macarthur (15-18), Oakdale (18-19), Richmond (15-19), St Marys (15-19)	
27-Jan-2006	Macarthur (16-17)	
02-Feb-2006	Bringelly (14), St Marys (14-16)	
17-Feb-2006	Macarthur (17-19)	
18-Feb-2006	Chullora (14-18), Liverpool (15-17), Rozelle (15)	
19-Feb-2006	Bringelly (15-16)	
12-Nov-2006	Macarthur (16-17)	
20-Nov-2006	St Marys (14)	Bushfires (Blue Mountains)
21-Nov-2006	Kembla Grange (16), Wollongong (14-16)	
01-Dec-2006	Bringelly (14-20), Chullora (14-18), Liverpool (13-19), Macarthur (14-20), Richmond (14-16), St Marys (14-16)	
11-Dec-2006	Bringelly (15-16), Liverpool (14-16), Macarthur (14-17)	

(#) 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

The 1-hour, 24-hour and annual standards for sulfur dioxide were not exceeded in NSW during 2006. Compliance with the Ambient Air Quality NEPM goal was demonstrated in all regions.

The data availability criteria were not met at Albion Park (due to the relocation of this station) and at Warrawong (due to the closure of the station).

Table 11: 2006 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)

Region/ Performance monitoring Station	Data availability rates (% of hours)					Number of exceedences (days)		Annual Mean (ppm)	Performance against the standards and goal		
	Q1	Q2	Q3	Q4	Annual	1-hour	24-hour		1-hour	24-hour	1-year
Sydney											
Blacktown ⁽¹⁾											
Bringelly	90.6	89.6	93.1	92.3	91.4	0	0	0.000	Met	Met	Met
Chullora	93.9	92.2	94.7	94.8	93.9	0	0	0.001	Met	Met	Met
Macarthur	90.9	94.9	91.7	95.2	93.2	0	0	0.001	Met	Met	Met
Richmond	92.6	92.3	90.4	92.6	92.0	0	0	0.000	Met	Met	Met
Central Coast ⁽²⁾											
Illawarra											
Albion Park South	74.9	81.5	95.4	94.6	86.7	0	0	0.001	ND	ND	ND
Warrawong	91.7	61.4	00.0	00.0	37.9	0	0	0.001	ND	ND	ND
Wollongong	94.5	94.2	95.2	94.1	94.5	0	0	0.001	Met	Met	Met
Lower Hunter											
Maitland ⁽³⁾											
Newcastle	93.4	91.5	93.1	95.4	93.3	0	0	0.001	Met	Met	Met
Wallsend	92.8	95.5	95.3	94.3	94.5	0	0	0.001	Met	Met	Met

ND Not demonstrated.

(1) Station closed pending relocation.

(2) Station to be established.

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

SO₂ levels are significantly below the 1-hour, 24-hour and annual NEPM standards. Wallsend recorded the highest 1-hour value with 0.058 ppm (24 percent of the standard). The highest 24-hour average was recorded at Albion Park, 0.010 ppm (13 percent of the standard). The highest annual average of 0.001 ppm, recorded at a number of stations, is only 5 percent of the standard.

Table 12: Summary for SO₂ - Daily maximum 1-hour average concentrations (2006)

Region/ Performance monitoring Station	Data availability rates (%)	Number of valid days	Maximum values (ppm)			
			Highest Value	Highest Date	2 nd Highest Value	2 nd Highest Date
Sydney						
Bringelly	91.4	348	0.009	23-Jan 09:00	0.008	27-Jan 06:00
Chullora	93.9	359	0.015	15-Sep 14:00	0.015	06-Dec 08:00
Macarthur	93.2	354	0.010	25-Feb 11:00	0.009	27-Jan 06:00
Richmond	92.0	350	0.018	16-Sep 12:00	0.014	12-Mar 21:00
Illawarra						
Albion Park South	86.7	326	0.038	21-Nov 17:00	0.032	11-Dec 12:00
Warrawong	37.9	143	0.022	09-Feb 05:00	0.022	29-Jan 01:00
Wollongong	94.5	361	0.035	05-Jan 05:00	0.025	12-Aug 10:00
Lower Hunter						
Newcastle	93.3	355	0.034	23-Sep 01:00	0.031	05-Jul 17:00
Wallsend	94.5	361	0.058	05-May 11:00	0.039	05-Jul 17:00

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

Table 13: Summary for SO₂ - Maximum 24-hour average concentrations (2006)

Region/ Performance monitoring Station	Data availability rates (%)	Number of valid days	Maximum values (ppm)			
			Highest Value	Highest Date	2 nd Highest Value	2 nd Highest Date
Sydney						
Bringelly	95.3	348	0.002	01-Dec	0.002	23-Jan
Chullora	98.4	359	0.004	01-Dec	0.004	13-Mar
Macarthur	97.0	354	0.003	01-Dec	0.003	27-Jan
Richmond	95.9	350	0.003	12-Mar	0.003	23-Jan
Illawarra						
Albion Park South	89.3	326	0.010	21-Nov	0.009	19-Nov
Warrawong	39.2	143	0.007	29-Jan	0.006	11-Apr
Wollongong	98.9	361	0.007	11-Jan	0.005	10-Sep
Lower Hunter						
Newcastle	97.3	355	0.009	05-Jul	0.005	03-Apr
Wallsend	98.9	361	0.009	05-May	0.009	19-Jul

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

Particles as PM₁₀

All regions in NSW, except Tamworth, recorded exceedences of the 24-hr PM₁₀ standard during 2006.

Compliance was demonstrated in Sydney, the lower Hunter, and Bathurst. Compliance was not demonstrated at Tamworth, as the data availability criteria were not met. The Illawarra, Albury and Wagga Wagga did not comply with the goal. At Wagga Wagga the 24-hour standard was exceeded on 36 days during 2006.

Table 14: 2006 compliance summary for PM₁₀ in New South Wales

Region/ Performance monitoring Station	Data availability rates (% of days)					AAQ NEPM Standard 50 µg/m ³ (24-hour average)	
	Q1	Q2	Q3	Q4	Annual	Number of exceedences (days)	Performance against the standards and goal
Sydney							
Blacktown ⁽¹⁾							
Bringelly	97.8	75.8	85.9	93.5	88.2	3	Met
Chullora	94.4	94.5	100.0	100.0	97.3	4	Met
Liverpool	100.0	85.7	98.9	98.9	95.9	3	Met
Macarthur	100.0	100.0	100.0	100.0	100.0	4	Met
Oakdale	97.8	98.9	93.5	95.7	96.4	1	Met
Richmond	100.0	95.6	97.8	94.6	97.0	3	Met
Rozelle	96.7	92.3	97.8	89.1	94.0	1	Met
Central Coast ⁽²⁾							
Illawarra							
Albion Park South	60.0	82.4	100.0	100.0	85.8	2	ND
Kembla Grange	98.9	97.8	100.0	100.0	99.2	9	Not met
Wollongong	98.9	87.9	100.0	100.0	96.7	5	Met
Lower Hunter							
Beresfield	100.0	89.0	100.0	96.7	96.4	2	Met
Maitland ⁽³⁾							
Newcastle	100.0	91.2	97.8	100.0	97.3	1	Met
Regional							
Albury	84.4	81.3	90.2	95.7	87.9	15	Not met
Bathurst	98.9	96.7	100.0	98.9	98.6	2	Met
Dubbo ⁽²⁾							
Lismore ⁽²⁾							
Orange ⁽²⁾							
Tamworth	56.7	93.4	79.3	87.0	79.2	0	ND
Wagga Wagga	97.8	94.5	97.8	92.4	95.6	36	Not met

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

(1) Station closed pending relocation.

(2) Station to be established

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

The continuing drought conditions experienced across SE Australia during 2006 were a major influence on particle levels in NSW. The Bureau of Meteorology reports that 2006 was the driest year on record for the Murray-Darling basin (BOM 2007).

In Sydney, exceedences of the standard were observed on the 24th September, 1st November, 21st November, 22nd November and the 1st December. The highest PM₁₀ level recorded in Sydney during 2006 was 91.1 µg/m³ recorded at Macarthur on the 24th September.

In the Illawarra region the PM₁₀ standard was exceeded on eleven days, the 13th March, 24th September, 8th October, 13-14th October, 20-22nd November, 1st December, 14th December and the 23rd December. The maximum value for the year was 84.3 µg/m³ at Kembla Grange on the 1st December.

In the lower Hunter region the standard was exceeded at Beresfield on the 13th February when 51.7µg/m³ was recorded and at Beresfield and Newcastle on the 22nd November.

The highest PM₁₀ level recorded in NSW during 2006 was 189.2µg/m³ at Albury on the 12th December. During December 2006 – January 2007 severe bushfires in Gippsland and the Australian Alps adversely impacted on air quality in NSW, particularly in Albury and Wagga Wagga. During December there were 16 days that exceeded the PM₁₀ standard at one or both of these stations.

At Albury, 15 exceedences of the PM₁₀ standard were recorded during 2006. Twelve of these exceedences were due to the severe bushfire conditions at the end of the year. Other exceedences were recorded on the 28th April and 13-14th October.

Elevated PM₁₀ levels occur more frequently at Wagga Wagga than elsewhere in NSW. During 2006 the standard was exceeded on 36 days. On 21 of these days Wagga Wagga was the only station in NSW to report PM₁₀ levels higher than the standard. The maximum PM₁₀ during 2006 was 172.9 µg/m³ on 7th December during the severe Victorian bushfires.

Two exceedences were recorded at Bathurst during 2006, 22nd November and the 1st December. Both exceedences were due bushfires in the Blue Mountains area.

With the exception of Wagga Wagga, and considering severe events and climatological effects, PM₁₀ levels are generally below the goal set by the NEPM. Nevertheless the Department of Environment and Climate Change continues to work towards reducing emissions of anthropogenically-produced particles. Key strategies in the management of particle emissions are outlined in [Action for Air](#).

Table 15: Summary for PM₁₀ – Maximum 24-hour average concentrations (2006)

Region/ Performance monitoring Station	Data availability rates (%)	Number of valid days	Maximum values (ppm)			
			Highest Value	Highest Date	6th Highest Value	6th Highest Date
Sydney						
Bringelly	88.2	322	72.0	22-Nov	43.0	28-Nov
Chullora	97.3	355	65.1	01-Dec	38.7	04-Apr
Liverpool	95.9	350	74.0	01-Dec	43.7	29-Nov
Macarthur	100.0	365	91.1	24-Sep	38.1	20-Nov
Oakdale	96.4	352	57.3	01-Nov	35.1	23-Nov
Richmond	97.0	354	60.9	01-Dec	40.0	29-Nov
Rozelle	94.0	343	52.2	22-Nov	38.1	18-Feb
Illawarra						
Albion Park South	85.8	313	60.1	01-Dec	38.7	24-Sep
Kembla Grange	99.2	362	84.3	01-Dec	57.1	14-Oct
Wollongong	96.7	353	62.0	01-Dec	47.4	14-Oct
Lower Hunter						
Beresfield	96.4	352	51.7	13-Feb	43.5	28-Sep
Newcastle	97.3	355	51.1	22-Nov	39.1	29-Nov
Regional						
Albury	87.9	321	189.2	12-Dec	77.0	13-Oct
Bathurst	98.6	360	61.3	01-Dec	45.3	25-Nov
Tamworth	79.2	289	48.0	31-May	36.4	01-Dec
Wagga Wagga	95.6	349	172.9	07-Dec	95.5	14-Dec

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

Bold font indicates values that exceed the AAQ NEPM standard

Table 16: Days when PM₁₀ 24-hour Ambient Air Quality NEPM standard exceeded

Date	Stations where standard exceeded	Comments ^(#)
01-Jan-2006	Wagga Wagga	Dust storm in Eastern Riverina
13-Feb-2006	Beresfield	
18-Feb-2006	Wagga Wagga	
25-Feb-2006	Wagga Wagga	
06-Mar-2006	Wagga Wagga	
09-Mar-2006	Wagga Wagga	
10-Mar-2006	Wagga Wagga	
12-Mar-2006	Wagga Wagga	
13-Mar-2006	Kembla Grange	
28-Mar-2006	Wagga Wagga	
04-Apr-2006	Wagga Wagga	
28-Apr-2006	Albury	
26-May-2006	Wagga Wagga	
15-Aug-2006	Wagga Wagga	
22-Sep-2006	Wagga Wagga	
24-Sep-2006	Chullora, Kembla Grange, Macarthur	Bushfires (Southern Highlands, Hawkesbury River)
08-Oct-2006	Wollongong	
13-Oct-2006	Albury, Kembla Grange, Wagga Wagga	
14-Oct-2006	Albury, Kembla Grange	
27-Oct-2006	Wagga Wagga	Dust storm
01-Nov-2006	Oakdale	Bushfire (Lake Burragorang)
02-Nov-2006	Albury, Wagga Wagga	Dust storm
11-Nov-2006	Wagga Wagga	
20-Nov-2006	Kembla Grange	
21-Nov-2006	Albion Park South, Bringelly, Chullora, Kembla Grange , Liverpool, Macarthur, Richmond, Wagga Wagga, Wollongong	Bushfires (Blue Mountains, Mt Buller)
22-Nov-2006	Albury, Bathurst, Beresfield, Bringelly, Chullora, Kembla Grange, Liverpool, Macarthur, Newcastle, Richmond, Rozelle, Wagga Wagga, Wollongong	Bushfires (Blue Mountains, Mt Buller)
25-Nov-2006	Wagga Wagga	Bushfires (Mt Buller)
28-Nov-2006	Wagga Wagga	
29-Nov-2006	Wagga Wagga	
30-Nov-2006	Wagga Wagga	
01-Dec-2006	Albion Park South, Bathurst, Bringelly, Chullora, Kembla Grange, Liverpool, Macarthur, Richmond, Wagga Wagga, Wollongong	Bushfires (Blue Mountains, Colo, Muswellbrook)
03-Dec-2006	Albury	Victorian bushfire emergency (Dec 2006 – Jan 2007). Widespread fires in Gippsland, and the Australian Alps. Smaller fires near Tumut and Holbrook (11-12 December).
04-Dec-2006	Wagga Wagga	
05-Dec-2006	Albury, Wagga Wagga	
06-Dec-2006	Wagga Wagga	
07-Dec-2006	Albury, Wagga Wagga	
08-Dec-2006	Albury, Wagga Wagga	
10-Dec-2006	Wagga Wagga	
11-Dec-2006	Albury, Wagga Wagga	
12-Dec-2006	Albury, Wagga Wagga	
13-Dec-2006	Albury	
14-Dec-2006	Albury, Kembla Grange, Wagga Wagga	
19-Dec-2006	Albury, Wagga Wagga	
22-Dec-2006	Albury, Wagga Wagga	
23-Dec-2006	Wagga Wagga, Wollongong	
30-Dec-2006	Wagga Wagga	

(#) 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 $0.03\mu\text{g}/\text{m}^3$ with many 24-hour average samples below the minimum detection limit for lead of $0.007\mu\text{g}/\text{m}^3$ using ICP-AES (Inductively Coupled Plasma-Atomic Emission Spectroscopy) analysis. Since 2002 the highest annual average recorded in New South Wales was $0.09\mu\text{g}/\text{m}^3$ 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 and Climate Change 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 and can be found on the EPHC website.

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 17: Statistical summary for CO - Daily maximum rolling 8-hour average concentrations (2006)

Region/ Performance monitoring Station	Data availability rates (%)	Maximum conc. (ppm)	Percentiles (ppm)						
			99 th	98 th	95 th	90 th	75 th	50 th	25 th
Sydney									
Chullora	94.7	2.3	1.5	1.4	1.1	1.0	0.6	0.4	0.3
Liverpool	96.4	2.1	1.8	1.6	1.5	1.3	0.8	0.5	0.3
Macarthur	98.2	1.8	1.6	1.2	0.5	0.4	0.3	0.2	0.2
Rozelle	96.6	2.0	1.4	1.3	1.1	0.9	0.6	0.3	0.3
Illawarra									
Wollongong	98.6	1.5	1.2	1.1	0.9	0.8	0.6	0.4	0.3
Lower Hunter									
Newcastle	94.7	2.2	1.5	1.4	0.9	0.7	0.4	0.3	0.2

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

Trend analysis

Table 18: Daily maximum rolling 8-hour average concentrations for CO (ppm)

Region/ Performance monitoring Station	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
Sydney										
Blacktown	4.5	4.7	3.5	3.1	2.6	3.0	2.5	1.7		
Chullora								3.4	2.8	2.3
Liverpool	5.9	5.4	4.0	4.8	3.5	3.6	5.5	3.0	2.8	2.1
Macarthur									1.0	1.8
Rozelle	6.5	5.9	4.0	4.5	3.2	2.8	2.2	2.2	2.1	2.0
Illawarra										
Wollongong	3.5	2.2	2.4	2.4	4.2	2.3	2.1	2.1	2.6	1.5
Lower Hunter										
Newcastle	2.9	4.3	3.3	3.1	4.0	3.2	2.8	2.4	1.9	2.2

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

Table 19: Statistical summary for CO - Daily maximum rolling 8-hour average concentrations

Station: Blacktown

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
1997	91.9	0	4.5	3.2	2.5	2.1	1.8	1.4	0.9	0.6
1998	89.6	0	4.7	4.0	3.8	2.5	2.1	1.2	0.7	0.4
1999	98.2	0	3.5	3.0	2.7	2.1	1.8	1.2	0.6	0.2
2000	92.3	0	3.1	2.4	2.3	2.0	1.6	1.0	0.4	0.2
2001	95.5	0	2.6	1.9	1.8	1.6	1.3	0.8	0.3	0.2
2002	94.5	0	3.0	2.4	2.0	1.8	1.3	0.6	0.3	0.1
2003	93.6	0	2.5	1.9	1.6	1.2	0.8	0.4	0.1	0.0
2004	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									

Station closed pending relocation.

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

Station: Chullora

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
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

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

Station: Liverpool

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
1997	75.7	0	5.9	5.0	4.6	3.6	2.9	1.8	0.9	0.5
1998	74.6	0	5.4	4.5	4.1	3.1	2.5	1.5	0.9	0.6
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

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

Station: Macarthur

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
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

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

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

Station: Rozelle

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
1997	84.7	0	6.5	5.7	3.8	2.5	2.0	1.2	0.8	0.6
1998	92.9	0	5.9	5.0	4.0	2.8	2.2	1.3	0.9	0.6
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

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

Station: Wollongong

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
1997	36.3	0	3.5	3.1	2.9	2.6	2.1	1.3	0.7	0.5
1998	97.1	0	2.2	2.1	2.0	1.8	1.4	1.0	0.6	0.4
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

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

Station: Newcastle

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
1997	15.8	0	2.9	2.4	2.2	2.1	1.6	1.0	0.5	0.3
1998	75.5	0	4.3	3.0	2.7	2.1	1.4	0.7	0.3	0.1
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

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

Nitrogen Dioxide

Statistical summary

Table 26: Statistical summary for NO₂ - Daily maximum 1-hour average concentrations (2006)

Region/ Performance monitoring Station	Data availability rates (%)	Maximum conc. (ppm)	Percentiles (ppm)						
			99 th	98 th	95 th	90 th	75 th	50 th	25 th
Sydney									
Bringelly	92.1	0.040	0.035	0.031	0.026	0.023	0.018	0.014	0.010
Chullora	91.7	0.066	0.053	0.046	0.042	0.037	0.031	0.025	0.019
Liverpool	92.7	0.053	0.049	0.047	0.041	0.036	0.029	0.024	0.018
Macarthur	93.9	0.066	0.048	0.047	0.043	0.036	0.030	0.024	0.018
Richmond	91.4	0.044	0.035	0.032	0.027	0.024	0.020	0.015	0.011
Rozelle	92.9	0.057	0.048	0.044	0.038	0.035	0.030	0.025	0.018
Illawarra									
Albion Park South	78.9	0.051	0.039	0.033	0.027	0.022	0.017	0.012	0.007
Wollongong	87.8	0.050	0.044	0.040	0.035	0.031	0.025	0.020	0.015
Lower Hunter									
Newcastle	89.2	0.042	0.034	0.033	0.031	0.029	0.024	0.018	0.010
Wallsend	92.1	0.037	0.035	0.034	0.029	0.027	0.023	0.018	0.013

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

Trend analysis

Table 27: Maximum 1-hour average concentrations for NO₂ (ppm)

Region/ Performance monitoring Station	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
Sydney										
Blacktown	0.096	0.060	0.058	0.070	0.058	0.057	0.055	0.048		
Bringelly	0.060	0.050	0.045	0.045	0.048	0.052	0.044	0.041	0.045	0.040
Chullora/Lidcombe*	0.080*	0.126*	0.073*	0.070*	0.071*	0.052*	0.066	0.056	0.064	0.066
Liverpool	0.060	0.063	0.054	0.079	0.067	0.068	0.064	0.060	0.063	0.053
Macarthur								0.052	0.081	0.066
Richmond	0.064	0.053	0.044	0.037	0.038	0.048	0.036	0.037	0.036	0.044
Rozelle	0.082	0.081	0.062	0.070	0.066	0.086	0.052	0.064	0.052	0.057
Illawarra										
Albion Park / Albion Park South*	0.044	0.081	0.049	0.055	0.051	0.048	0.048	0.044	0.035	0.051*
Wollongong	0.064	0.058	0.062	0.065	0.056	0.056	0.049	0.044	0.058	0.050
Lower Hunter										
Newcastle	0.048	0.039	0.049	0.044	0.040	0.047	0.039	0.044	0.041	0.042
Wallsend	0.058	0.035	0.034	0.054	0.044	0.043	0.050	0.041	0.038	0.037

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

Bold font indicates values that exceed the AAQ NEPM standard

Table 28: Annual average concentrations for NO₂ (ppm)

Region/ Performance monitoring Station	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
Sydney										
Blacktown	0.015	0.015	0.014	0.013	0.013	0.014	0.013	0.013		
Bringelly	0.007	0.006	0.007	0.007	0.006	0.009	0.007	0.006	0.006	0.006
Chullora/Lidcombe*	0.015*	0.016*	0.016*	0.015*	0.016*	0.013*	0.016	0.016	0.014	0.014
Liverpool	0.014	0.014	0.014	0.014	0.014	0.015	0.013	0.013	0.013	0.013
Macarthur								0.009	0.012	0.011
Richmond	0.008	0.007	0.007	0.006	0.007	0.007	0.007	0.007	0.006	0.006
Rozelle	0.020	0.016	0.015	0.014	0.014	0.015	0.014	0.014	0.013	0.013
Illawarra										
Albion Park / Albion Park South*	0.004	0.004	0.004	0.005	0.004	0.004	0.005	0.004	0.013	0.005*
Wollongong	0.011	0.010	0.011	0.010	0.010	0.011	0.010	0.009	0.009	0.009
Lower Hunter										
Newcastle	0.009	0.008	0.009	0.009	0.009	0.009	0.008	0.009	0.009	0.008
Wallsend	0.006	0.008	0.009	0.008	0.009	0.009	0.008	0.008	0.008	0.009

AAQ NEPM Standard - 0.03 ppm (Annual average)

Table 29: Statistical summary for NO₂ - Annual daily maximum 1-hour average concentrations

Station: Blacktown

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
1997	73.0	0	0.096	0.055	0.051	0.045	0.039	0.033	0.028	0.022
1998	84.6	0	0.060	0.050	0.048	0.043	0.039	0.031	0.026	0.021
1999	90.8	0	0.058	0.048	0.047	0.040	0.035	0.030	0.026	0.021
2000	90.3	0	0.070	0.054	0.043	0.039	0.034	0.029	0.024	0.019
2001	93.3	0	0.058	0.047	0.045	0.037	0.034	0.030	0.025	0.020
2002	92.4	0	0.057	0.050	0.046	0.043	0.037	0.032	0.026	0.020
2003	89.8	0	0.055	0.049	0.047	0.038	0.035	0.030	0.025	0.020
2004	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 [#]									

Station closed pending relocation.

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

Table 30: Statistical summary for NO₂ - Annual daily maximum 1-hour average concentrations

Station: Bringelly

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
1997	78.6	0	0.060	0.040	0.034	0.029	0.026	0.020	0.015	0.011
1998	85.1	0	0.050	0.032	0.031	0.028	0.024	0.018	0.014	0.010
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

Table 31: Statistical summary for NO₂ - Annual daily maximum 1-hour average concentrationsStation: Lidcombe⁽¹⁾ / Chullora⁽²⁾

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
1997 ⁽¹⁾	83.1	0	0.080	0.060	0.055	0.048	0.042	0.034	0.027	0.021
1998 ⁽¹⁾	69.4	1	0.126	0.052	0.050	0.046	0.040	0.031	0.026	0.021
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

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

Station: Liverpool

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
1997	86.2	0	0.060	0.055	0.051	0.043	0.039	0.031	0.026	0.019
1998	85.1	0	0.063	0.050	0.046	0.040	0.035	0.028	0.022	0.018
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

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

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

Station: Macarthur

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
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

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

Station: Richmond

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
1997	85.9	0	0.064	0.038	0.035	0.031	0.028	0.023	0.020	0.014
1998	84.2	0	0.053	0.037	0.033	0.028	0.025	0.021	0.017	0.013
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

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

Station: Rozelle

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
1997	70.6	0	0.082	0.076	0.066	0.059	0.051	0.039	0.030	0.026
1998	72.0	0	0.081	0.057	0.053	0.046	0.042	0.033	0.027	0.020
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

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

Table 36: Statistical summary for NO₂ - Annual daily maximum 1-hour average concentrations

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

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
1997 ⁽¹⁾	29.5	0	0.044	0.033	0.030	0.027	0.024	0.017	0.009	0.003
1998 ⁽¹⁾	87.4	0	0.081	0.042	0.038	0.033	0.024	0.017	0.010	0.004
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

Table 37: Statistical summary for NO₂ - Annual daily maximum 1-hour average concentrations

Station: Wollongong

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
1997	82.8	0	0.064	0.054	0.047	0.040	0.036	0.028	0.023	0.017
1998	86.9	0	0.058	0.044	0.042	0.036	0.031	0.025	0.021	0.016
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

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

Station: Newcastle

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
1997	69.3	0	0.048	0.040	0.039	0.035	0.031	0.027	0.020	0.014
1998	83.4	0	0.039	0.035	0.034	0.031	0.029	0.024	0.019	0.011
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

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

Table 39: 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
1997	11.1	0	0.058	0.028	0.025	0.021	0.019	0.014	0.013	0.011
1998	78.6	0	0.035	0.034	0.030	0.028	0.025	0.022	0.017	0.013
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

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

Ozone

Statistical summary

Table 40: Statistical summary for O₃ - Daily maximum 1-hour average concentrations (2006)

Region/ Performance monitoring Station	Data availability rates (%)	Maximum conc. (ppm)	Percentiles (ppm)						
			99 th	98 th	95 th	90 th	75 th	50 th	25 th
Sydney									
Bringelly	92.1	0.119	0.106	0.093	0.070	0.057	0.044	0.033	0.028
Chullora	94.3	0.117	0.077	0.072	0.057	0.048	0.037	0.030	0.024
Liverpool	91.4	0.128	0.092	0.084	0.069	0.054	0.040	0.030	0.025
Macarthur	94.3	0.128	0.111	0.100	0.073	0.059	0.044	0.032	0.027
Oakdale	87.9	0.109	0.088	0.081	0.068	0.060	0.048	0.035	0.030
Richmond	92.8	0.108	0.086	0.077	0.068	0.058	0.046	0.035	0.029
Rozelle	92.2	0.093	0.069	0.060	0.051	0.042	0.033	0.027	0.023
St Marys	92.6	0.124	0.089	0.076	0.067	0.056	0.043	0.032	0.027
Illawarra									
Albion Park South	86.2	0.096	0.082	0.074	0.054	0.046	0.037	0.031	0.027
Kembla Grange	94.6	0.093	0.067	0.063	0.051	0.045	0.036	0.030	0.027
Wollongong	94.6	0.096	0.072	0.063	0.053	0.046	0.035	0.030	0.026
Lower Hunter									
Newcastle	93.7	0.068	0.061	0.059	0.047	0.042	0.035	0.030	0.024
Wallsend	93.2	0.086	0.068	0.061	0.050	0.045	0.036	0.029	0.024
Regional									
Bathurst	94.5	0.075	0.066	0.059	0.054	0.048	0.041	0.034	0.029

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

Bold font indicates values that exceed the AAQ NEPM standard

Table 41: Statistical summary for O₃ - Daily maximum rolling 4-hour average concentrations (2006)

Region/ Performance monitoring Station	Data availability rates (%)	Maximum conc. (ppm)	Percentiles (ppm)						
			99 th	98 th	95 th	90 th	75 th	50 th	25 th
Sydney									
Bringelly	96.2	0.110	0.083	0.075	0.062	0.051	0.041	0.031	0.026
Chullora	98.8	0.104	0.070	0.063	0.053	0.044	0.034	0.028	0.022
Liverpool	95.2	0.124	0.075	0.073	0.062	0.049	0.036	0.028	0.023
Macarthur	98.5	0.117	0.093	0.081	0.066	0.054	0.040	0.030	0.026
Oakdale	91.6	0.086	0.077	0.070	0.061	0.053	0.044	0.034	0.029
Richmond	97.3	0.095	0.075	0.072	0.061	0.052	0.042	0.034	0.027
Rozelle	96.6	0.082	0.062	0.055	0.046	0.037	0.030	0.026	0.021
St Marys	96.6	0.109	0.079	0.067	0.059	0.052	0.041	0.030	0.026
Illawarra									
Albion Park South	90.0	0.078	0.070	0.062	0.048	0.042	0.035	0.030	0.026
Kembla Grange	98.9	0.081	0.061	0.055	0.046	0.041	0.034	0.029	0.025
Wollongong	98.6	0.086	0.064	0.055	0.047	0.042	0.033	0.028	0.024
Lower Hunter									
Newcastle	97.9	0.064	0.054	0.052	0.043	0.038	0.033	0.028	0.022
Wallsend	97.3	0.066	0.062	0.056	0.046	0.039	0.033	0.027	0.023
Regional									
Bathurst	98.5	0.071	0.061	0.056	0.050	0.045	0.040	0.033	0.028

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

Bold font indicates values that exceed the AAQ NEPM standard

Trend analysis

Table 42: Maximum 1-hour average concentrations for O₃ (ppm)

Region/ Performance monitoring Station	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
Sydney										
Blacktown	0.149	0.109	0.091	0.113	0.153	0.130	0.181	0.123		
Bringelly	0.135	0.113	0.114	0.130	0.175	0.118	0.155	0.122	0.112	0.119
Chullora/Lidcombe*	0.168*	0.142*	0.092*	0.118*	0.156*	0.100*	0.084	0.105	0.086	0.117
Liverpool	0.151	0.130	0.102	0.133	0.141	0.100	0.151	0.113	0.149	0.128
Macarthur								0.099	0.142	0.128
Oakdale	0.152	0.109	0.107	0.126	0.135	0.094	0.102	0.124	0.130	0.109
Richmond	0.120	0.113	0.127	0.088	0.117	0.125	0.148	0.096	0.125	0.108
Rozelle		0.088	0.059	0.080	0.115	0.100	0.083	0.094	0.081	0.093
St Marys	0.124	0.122	0.113	0.158	0.146	0.119	0.093	0.142	0.113	0.124
Illawarra										
Albion Park / Albion Park South*	0.144	0.140	0.090	0.106	0.088	0.094	0.130	0.112	0.073	0.096*
Kembla Grange	0.124	0.137	0.101	0.117	0.119	0.099	0.113	0.120	0.091	0.093
Wollongong	0.120	0.105	0.087	0.108	0.116	0.121	0.097	0.103	0.102	0.096
Lower Hunter										
Newcastle	0.141	0.080	0.066	0.071	0.072	0.083	0.079	0.112	0.078	0.068
Wallsend	0.129	0.095	0.069	0.073	0.078	0.081	0.077	0.103	0.094	0.086
Regional										
Bathurst					0.063	0.064	0.056	0.092	0.056	0.075

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

Bold font indicates values that exceed the AAQ NEPM standard

Table 43: Maximum rolling 4-hour average concentrations for O₃ (ppm)

Region/ Performance monitoring Station	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
Sydney										
Blacktown	0.100	0.097	0.077	0.101	0.120	0.107	0.157	0.107		
Bringelly	0.102	0.089	0.092	0.115	0.128	0.099	0.133	0.110	0.102	0.110
Chullora/Lidcombe*	0.121*	0.119*	0.077*	0.095*	0.137*	0.084*	0.077	0.086	0.080	0.104
Liverpool	0.116	0.108	0.084	0.107	0.120	0.089	0.132	0.092	0.121	0.124
Macarthur								0.084	0.126	0.117
Oakdale	0.133	0.092	0.090	0.098	0.105	0.080	0.089	0.099	0.106	0.086
Richmond	0.103	0.097	0.098	0.078	0.111	0.112	0.138	0.088	0.101	0.095
Rozelle		0.079	0.053	0.073	0.083	0.087	0.070	0.087	0.065	0.082
St Marys	0.104	0.091	0.091	0.136	0.125	0.093	0.091	0.128	0.091	0.109
Illawarra										
Albion Park / Albion Park South*	0.124	0.116	0.081	0.083	0.082	0.083	0.111	0.092	0.063	0.078*
Kembla Grange	0.099	0.117	0.081	0.089	0.092	0.083	0.107	0.100	0.084	0.081
Wollongong	0.113	0.082	0.073	0.086	0.091	0.099	0.080	0.090	0.099	0.086
Lower Hunter										
Newcastle	0.125	0.068	0.065	0.065	0.069	0.077	0.061	0.073	0.070	0.064
Wallsend	0.105	0.084	0.059	0.070	0.073	0.074	0.059	0.078	0.074	0.066
Regional										
Bathurst					0.060	0.062	0.053	0.067	0.055	0.071

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

Bold font indicates values that exceed the AAQ NEPM standard

Table 44: Statistical summary for O₃ - Annual daily maximum 1-hour average concentrations

Station: Blacktown

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
1997	93.7	4	0.149	0.088	0.075	0.064	0.053	0.036	0.026	0.021
1998	83.8	3	0.109	0.093	0.083	0.063	0.052	0.038	0.024	0.018
1999	95.1	0	0.091	0.079	0.075	0.063	0.050	0.035	0.026	0.020
2000	91.5	2	0.113	0.088	0.075	0.061	0.051	0.037	0.028	0.024
2001	93.6	5	0.153	0.107	0.088	0.075	0.054	0.040	0.030	0.024
2002	91.7	2	0.130	0.093	0.083	0.068	0.059	0.043	0.033	0.026
2003	90.3	3	0.181	0.085	0.073	0.061	0.050	0.037	0.029	0.025
2004	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 [#]									

Station closed pending relocation.

Table 45: Statistical summary for O₃ - Annual daily maximum 1-hour average concentrations

Station: Bringelly

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
1997	93.7	5	0.135	0.102	0.087	0.069	0.058	0.044	0.029	0.024
1998	74.5	4	0.113	0.101	0.098	0.078	0.066	0.044	0.029	0.024
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

Table 46: Statistical summary for O₃ - Annual daily maximum 1-hour average concentrationsStation: Lidcombe⁽¹⁾ / Chullora⁽²⁾

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
1997 ⁽¹⁾	95.1	2	0.168	0.087	0.083	0.064	0.050	0.034	0.023	0.019
1998 ⁽¹⁾	89.5	5	0.142	0.106	0.080	0.070	0.051	0.034	0.025	0.020
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

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

Bold font indicates values that exceed the AAQ NEPM standard

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

Station: Liverpool

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
1997	88.5	2	0.151	0.090	0.083	0.055	0.044	0.033	0.022	0.016
1998	93.1	4	0.130	0.098	0.091	0.069	0.055	0.035	0.023	0.018
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

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

Station: Macarthur

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
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

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

Station: Oakdale

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
1997	89.6	8	0.152	0.111	0.105	0.079	0.063	0.045	0.031	0.027
1998	54.5	2	0.109	0.086	0.084	0.071	0.058	0.042	0.034	0.028
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

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

Bold font indicates values that exceed the AAQ NEPM standard

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

Station: Richmond

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
1997	79.4	3	0.120	0.094	0.077	0.066	0.056	0.041	0.030	0.026
1998	91.1	1	0.113	0.090	0.078	0.067	0.056	0.041	0.031	0.025
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

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

Station: Rozelle

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
1997	0.0									
1998	72.5	0	0.088	0.056	0.050	0.045	0.040	0.027	0.020	0.015
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	0	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

Table 52: Statistical summary for O₃ - Annual daily maximum 1-hour average concentrations

Station: St Marys

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
1997	81.8	3	0.124	0.095	0.087	0.070	0.059	0.044	0.029	0.023
1998	84.9	3	0.122	0.097	0.081	0.065	0.056	0.039	0.027	0.023
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

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

Bold font indicates values that exceed the AAQ NEPM standard

Table 53: Statistical summary for O₃ - Annual daily maximum 1-hour average concentration
Station: Albion Park ⁽¹⁾/ Albion Park South ⁽²⁾

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
1997 ⁽¹⁾	41.0	5	0.144	0.115	0.111	0.068	0.056	0.037	0.028	0.025
1998 ⁽¹⁾	89.9	2	0.140	0.099	0.086	0.062	0.050	0.036	0.029	0.026
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

Table 54: Statistical summary for O₃ - Annual daily maximum 1-hour average concentrations
Station: Kembla Grange

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
1997	89.7	4	0.124	0.095	0.070	0.056	0.047	0.032	0.028	0.023
1998	87.1	2	0.137	0.098	0.092	0.063	0.050	0.036	0.029	0.025
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

Table 55: Statistical summary for O₃ - Annual daily maximum 1-hour average concentrations
Station: Wollongong

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
1997	90.6	4	0.120	0.094	0.064	0.055	0.047	0.032	0.026	0.023
1998	87.0	1	0.105	0.082	0.071	0.060	0.048	0.034	0.027	0.023
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

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

Bold font indicates values that exceed the AAQ NEPM standard

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

Station: Newcastle

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
1997	92.0	1	0.141	0.062	0.055	0.048	0.041	0.030	0.025	0.020
1998	94.6	0	0.080	0.065	0.054	0.044	0.040	0.031	0.026	0.021
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

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

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
1997	76.8	1	0.129	0.065	0.054	0.048	0.042	0.034	0.027	0.020
1998	86.6	0	0.095	0.072	0.063	0.050	0.041	0.033	0.027	0.022
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

Table 58: Statistical summary for O₃ - Annual daily maximum 1-hour average concentrations

Station: Bathurst

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
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

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

Bold font indicates values that exceed the AAQ NEPM standard

Table 59: Statistical summary for O₃ - Daily maximum rolling 4-hour average concentration

Station: Blacktown

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
1997	94.8	2	0.100	0.076	0.064	0.057	0.046	0.033	0.024	0.019
1998	84.9	3	0.097	0.079	0.069	0.055	0.047	0.035	0.023	0.017
1999	99.3	0	0.077	0.064	0.061	0.054	0.045	0.031	0.024	0.018
2000	95.3	3	0.101	0.078	0.065	0.054	0.045	0.034	0.026	0.021
2001	97.7	8	0.120	0.091	0.080	0.065	0.048	0.036	0.029	0.022
2002	95.7	6	0.107	0.083	0.077	0.061	0.054	0.040	0.031	0.024
2003	94.3	3	0.157	0.078	0.066	0.056	0.045	0.035	0.028	0.023
2004	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 [#]									

Station closed pending relocation.

Table 60: Statistical summary for O₃ - Daily maximum rolling 4-hour average concentration

Station: Bringelly

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
1997	87.3	5	0.102	0.081	0.074	0.060	0.050	0.040	0.028	0.024
1998	77.6	9	0.089	0.085	0.083	0.064	0.056	0.038	0.027	0.023
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

Table 61: Statistical summary for O₃ - Daily maximum rolling 4-hour average concentrationStation: Lidcombe⁽¹⁾ / Chullora⁽²⁾

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
1997 ⁽¹⁾	90.2	4	0.121	0.078	0.070	0.058	0.045	0.032	0.022	0.017
1998 ⁽¹⁾	87.8	5	0.119	0.082	0.073	0.056	0.045	0.031	0.023	0.017
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

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

Bold font indicates values that exceed the AAQ NEPM standard

Table 62: Statistical summary for O₃ - Daily maximum rolling 4-hour average concentration

Station: Liverpool

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
1997	73.3	2	0.116	0.076	0.067	0.048	0.039	0.025	0.020	0.015
1998	97.2	5	0.108	0.084	0.077	0.058	0.046	0.031	0.022	0.016
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

Table 63: Statistical summary for O₃ - Daily maximum rolling 4-hour average concentration

Station: Macarthur

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
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

Table 64: Statistical summary for O₃ - Daily maximum rolling 4-hour average concentration

Station: Oakdale

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
1997	93.2	12	0.133	0.090	0.081	0.068	0.055	0.041	0.030	0.026
1998	56.8	2	0.092	0.079	0.075	0.061	0.051	0.039	0.032	0.027
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

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

Bold font indicates values that exceed the AAQ NEPM standard

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

Station: Richmond

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
1997	76.6	4	0.103	0.082	0.067	0.058	0.051	0.039	0.029	0.025
1998	94.8	2	0.097	0.074	0.068	0.058	0.050	0.037	0.029	0.024
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

Table 66: Statistical summary for O₃ - Daily maximum rolling 4-hour average concentration

Station: Rozelle

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
1997	0.0									
1998	75.1	0	0.079	0.046	0.044	0.039	0.034	0.025	0.019	0.014
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

Table 67: Statistical summary for O₃ - Daily maximum rolling 4-hour average concentration

Station: St Marys

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
1997	78.9	4	0.104	0.084	0.071	0.062	0.053	0.040	0.028	0.022
1998	88.6	4	0.091	0.080	0.071	0.057	0.049	0.034	0.026	0.021
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

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

Bold font indicates values that exceed the AAQ NEPM standard

Table 68: Statistical summary for O₃ - Daily maximum rolling 4-hour average concentration
Station: Albion Park ⁽¹⁾/ Albion Park South ⁽²⁾

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
1997 ⁽¹⁾	43.3	5	0.124	0.099	0.087	0.063	0.049	0.033	0.027	0.024
1998 ⁽¹⁾	91.2	5	0.116	0.084	0.065	0.052	0.044	0.033	0.028	0.025
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

Table 69: Statistical summary for O₃ - Daily maximum rolling 4-hour average concentration
Station: Kembla Grange

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
1997	92.3	5	0.099	0.084	0.060	0.048	0.042	0.030	0.026	0.022
1998	87.7	6	0.117	0.081	0.074	0.053	0.044	0.033	0.027	0.023
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

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

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
1997	91.6	4	0.113	0.081	0.062	0.050	0.042	0.030	0.025	0.021
1998	87.3	1	0.082	0.076	0.067	0.050	0.042	0.031	0.026	0.022
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

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

Bold font indicates values that exceed the AAQ NEPM standard

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

Station: Newcastle

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
1997	95.4	1	0.125	0.056	0.050	0.043	0.037	0.029	0.023	0.018
1998	98.6	0	0.068	0.058	0.049	0.040	0.034	0.029	0.024	0.019
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

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

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
1997	76.0	2	0.105	0.054	0.049	0.044	0.039	0.032	0.026	0.019
1998	90.2	1	0.084	0.061	0.052	0.043	0.037	0.030	0.026	0.020
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

Table 73: Statistical summary for O₃ - Daily maximum rolling 4-hour average concentration

Station: Bathurst

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
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

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

Bold font indicates values that exceed the AAQ NEPM standard

Sulfur Dioxide

Statistical summary

Table 74: Statistical summary for SO₂ - Daily maximum 1-hour average concentrations (2006)

Region/ Performance monitoring Station	Data availability rates (%)	Maximum conc. (ppm)	Percentiles (ppm)						
			99 th	98 th	95 th	90 th	75 th	50 th	25 th
Sydney									
Bringelly	91.4	0.009	0.006	0.005	0.004	0.003	0.002	0.001	0.001
Chullora	93.9	0.015	0.012	0.010	0.009	0.006	0.004	0.003	0.002
Macarthur	93.2	0.010	0.007	0.006	0.005	0.004	0.002	0.001	0.001
Richmond	92.0	0.018	0.010	0.008	0.006	0.004	0.002	0.001	0.001
Illawarra									
Albion Park South	86.7	0.038	0.027	0.024	0.018	0.011	0.004	0.001	0.000
Warrawong	37.9	0.022	0.021	0.019	0.014	0.010	0.004	0.001	0.000
Wollongong	94.5	0.035	0.019	0.018	0.015	0.012	0.007	0.004	0.001
Lower Hunter									
Newcastle	93.3	0.034	0.026	0.020	0.017	0.013	0.007	0.004	0.002
Wallsend	94.5	0.058	0.026	0.024	0.020	0.016	0.010	0.005	0.002

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

Table 75: Statistical summary for SO₂ - Daily 24-hour average concentrations (2006)

Region/ Performance monitoring Station	Data availability rates (%)	Maximum conc. (ppm)	Percentiles (ppm)						
			99 th	98 th	95 th	90 th	75 th	50 th	25 th
Sydney									
Bringelly	95.3	0.002	0.002	0.001	0.001	0.001	0.001	0.000	0.000
Chullora	98.4	0.004	0.004	0.003	0.003	0.002	0.002	0.001	0.001
Macarthur	97.0	0.003	0.003	0.002	0.002	0.001	0.001	0.000	0.000
Richmond	95.9	0.003	0.002	0.002	0.002	0.001	0.001	0.000	0.000
Illawarra									
Albion Park South	89.3	0.010	0.008	0.007	0.004	0.003	0.001	0.000	0.000
Warrawong	39.2	0.007	0.006	0.004	0.003	0.002	0.001	0.000	0.000
Wollongong	98.9	0.007	0.005	0.004	0.003	0.002	0.001	0.001	0.000
Lower Hunter									
Newcastle	97.3	0.009	0.005	0.004	0.004	0.003	0.002	0.001	0.000
Wallsend	98.9	0.009	0.007	0.005	0.004	0.003	0.002	0.001	0.000

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

Trend analysis

Table 76: Maximum 1-hour average concentrations for SO₂ (ppm)

Region/ Performance monitoring Station	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
Sydney										
Blacktown	0.018	0.020	0.020	0.015	0.020	0.021	0.016	0.016		
Bringelly	0.012	0.013	0.012	0.018	0.012	0.010	0.017	0.015	0.009	0.009
Chullora									0.015	0.015
Macarthur									0.015	0.010
Richmond	0.016	0.012	0.019	0.015	0.012	0.028	0.012	0.021	0.015	0.018
Illawarra										
Albion Park / Albion Park South*	0.034	0.055	0.033	0.042	0.034	0.029	0.035	0.034	0.032	0.038*
Warrawong		0.058	0.051	0.110	0.162	0.046	0.063	0.088	0.070	0.022
Wollongong	0.043	0.033	0.041	0.031	0.030	0.039	0.031	0.053	0.038	0.035
Lower Hunter										
Newcastle									0.037	0.034
Wallsend	0.101	0.063	0.074	0.041	0.049	0.045	0.047	0.067	0.048	0.058

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

Table 77: Maximum 24-hour average concentrations for SO₂ (ppm)

Region/ Performance monitoring Station	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
Sydney										
Blacktown	0.010	0.008	0.003	0.004	0.005	0.004	0.004	0.004		
Bringelly	0.003	0.003	0.003	0.004	0.003	0.002	0.002	0.002	0.002	0.002
Chullora									0.005	0.004
Macarthur									0.003	0.003
Richmond	0.003	0.007	0.003	0.004	0.010	0.004	0.003	0.003	0.003	0.003
Illawarra										
Albion Park / Albion Park South*	0.011	0.014	0.009	0.014	0.013	0.009	0.009	0.009	0.011	0.010*
Warrawong		0.010	0.009	0.010	0.013	0.009	0.012	0.012	0.009	0.007
Wollongong	0.011	0.009	0.006	0.007	0.007	0.008	0.006	0.015	0.006	0.007
Lower Hunter										
Newcastle									0.007	0.009
Wallsend	0.022	0.016	0.014	0.010	0.013	0.011	0.010	0.014	0.007	0.009

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

Table 78: Annual average concentrations for SO₂ (ppm)

Region/ Performance monitoring Station	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
Sydney										
Blacktown	0.002	0.001	0.001	0.001	0.001	0.001	0.001	0.001		
Bringelly	0.001	0.001	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Chullora									0.001	0.001
Macarthur									0.001	0.001
Richmond	0.001	0.001	0.001	0.000	0.000	0.001	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	0.001	0.001	0.002	0.001*
Warrawong		0.001	0.001	0.001	0.002	0.001	0.001	0.001	0.001	0.001
Wollongong	0.001	0.002	0.001	0.002	0.001	0.001	0.001	0.001	0.001	0.001
Lower Hunter										
Newcastle									0.002	0.001
Wallsend	0.004	0.003	0.002	0.002	0.002	0.002	0.002	0.002	0.001	0.001

AAQ NEPM Standard - 0.02 ppm (Annual average)

Table 79: Statistical summary for SO₂ - Annual daily maximum 1-hour average concentrations

Station: Blacktown

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
1997	82.0	0	0.018	0.015	0.011	0.009	0.007	0.005	0.003	0.002
1998	84.9	0	0.020	0.013	0.011	0.009	0.007	0.004	0.003	0.002
1999	88.8	0	0.020	0.009	0.008	0.007	0.006	0.004	0.003	0.002
2000	85.9	0	0.015	0.011	0.010	0.008	0.006	0.004	0.003	0.002
2001	93.9	0	0.020	0.014	0.012	0.008	0.007	0.005	0.003	0.002
2002	93.2	0	0.021	0.013	0.010	0.008	0.006	0.004	0.003	0.002
2003	91.3	0	0.016	0.012	0.010	0.007	0.005	0.004	0.003	0.002
2004	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 #									

Station closed pending relocation.

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

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

Station: Bringelly

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
1997	92.1	0	0.012	0.008	0.007	0.005	0.004	0.002	0.001	0.001
1998	87.8	0	0.013	0.007	0.006	0.005	0.004	0.002	0.002	0.001
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

Table 81: Statistical summary for SO₂ - Annual daily maximum 1-hour average concentrations

Station: Chullora

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
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

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

Station: Macarthur

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
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

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

Station: Richmond

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
1997	86.1	0	0.016	0.009	0.008	0.006	0.005	0.003	0.002	0.001
1998	73.0	0	0.012	0.008	0.006	0.005	0.004	0.003	0.001	0.001
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

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

Table 84: Statistical summary for SO₂ - Annual daily maximum 1-hour average concentrations
Station: Albion Park ⁽¹⁾/ Albion Park South ⁽²⁾

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
1997 ⁽¹⁾	41.2	0	0.034	0.028	0.025	0.020	0.016	0.007	0.001	0.000
1998 ⁽¹⁾	87.7	0	0.055	0.027	0.025	0.018	0.012	0.005	0.001	0.000
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

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

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
1997	0.0									
1998	86.8	0	0.058	0.033	0.030	0.019	0.015	0.006	0.002	0.001
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

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

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
1997	90.5	0	0.043	0.022	0.018	0.014	0.010	0.007	0.004	0.002
1998	91.3	0	0.033	0.027	0.022	0.017	0.013	0.007	0.004	0.002
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

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

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

Station: Newcastle

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
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

Table 88: Statistical summary for SO₂ - 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
1997	70.5	0	0.101	0.068	0.062	0.046	0.033	0.021	0.011	0.006
1998	86.6	0	0.063	0.053	0.039	0.034	0.027	0.018	0.009	0.005
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

Table 89: Statistical summary for SO₂ - 24-hour average concentrations

Station: Blacktown

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
1997	83.8	0	0.010	0.005	0.004	0.003	0.003	0.002	0.001	0.001
1998	89.9	0	0.008	0.005	0.004	0.003	0.003	0.002	0.001	0.001
1999	95.3	0	0.003	0.003	0.003	0.002	0.002	0.001	0.001	0.000
2000	84.2	0	0.004	0.003	0.003	0.003	0.002	0.001	0.001	0.000
2001	98.1	0	0.005	0.004	0.003	0.003	0.002	0.001	0.001	0.001
2002	96.4	0	0.004	0.003	0.003	0.002	0.002	0.001	0.001	0.001
2003	95.1	0	0.004	0.003	0.003	0.002	0.002	0.001	0.001	0.001
2004	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 #									

Station closed pending relocation.

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

Table 90: Statistical summary for SO₂ - 24-hour average concentrations

Station: Bringelly

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
1997	96.2	0	0.003	0.002	0.002	0.002	0.001	0.001	0.001	0.000
1998	92.1	0	0.003	0.002	0.002	0.002	0.001	0.001	0.001	0.000
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

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

Station: Chullora

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
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

Table 92: Statistical summary for SO₂ - 24-hour average concentrations

Station: Macarthur

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
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

Table 93: Statistical summary for SO₂ - 24-hour average concentrations

Station: Richmond

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
1997	89.0	0	0.003	0.003	0.003	0.002	0.002	0.001	0.001	0.001
1998	75.1	0	0.007	0.004	0.003	0.002	0.001	0.001	0.001	0.000
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

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

Table 94: Statistical summary for SO₂ - 24-hour average concentrations

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

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
1997	33.2	0	0.011	0.008	0.007	0.006	0.003	0.001	0.000	0.000
1998	94.0	0	0.014	0.010	0.008	0.004	0.003	0.001	0.000	0.000
1999	98.6	0	0.009	0.008	0.006	0.004	0.003	0.001	0.000	0.000
2000	98.1	0	0.014	0.009	0.008	0.006	0.004	0.002	0.000	0.000
2001	98.1	0	0.013	0.008	0.007	0.005	0.003	0.002	0.000	0.000
2002	60.0	0	0.009	0.008	0.007	0.006	0.004	0.001	0.000	0.000
2003	98.9	0	0.009	0.007	0.005	0.004	0.003	0.001	0.000	0.000
2004	97.0	0	0.009	0.007	0.006	0.004	0.003	0.001	0.000	0.000
2005	4.9	0	0.011	0.009	0.009	0.007	0.006	0.001	0.000	0.000
2006	89.3	0	0.010	0.008	0.007	0.004	0.003	0.001	0.000	0.000

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

Station: Warrawong

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
1997	0.0									
1998	92.6	0	0.011	0.007	0.005	0.004	0.003	0.001	0.000	0.000
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

Table 96: Statistical summary for SO₂ - 24-hour average concentrations

Station: Wollongong

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
1997	92.6	0	0.011	0.006	0.005	0.003	0.003	0.002	0.001	0.000
1998	97.3	0	0.009	0.005	0.005	0.004	0.003	0.002	0.001	0.001
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

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

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

Station: Newcastle

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
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

Table 98: Statistical summary for SO₂ - 24-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
1997	72.6	0	0.022	0.018	0.015	0.012	0.008	0.004	0.003	0.002
1998	91.0	0	0.016	0.014	0.010	0.008	0.006	0.004	0.002	0.002
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

Particles as PM₁₀

Statistical summary

Table 99: Statistical summary for PM₁₀ - 24-hour average concentrations (2006)

Region/ Performance monitoring Station	Data availability rates (%)	Maximum conc. (ppm)	Percentiles (ppm)						
			99 th	98 th	95 th	90 th	75 th	50 th	25 th
Sydney									
Bringelly	88.2	72.0	44.9	41.4	32.9	29.5	25.0	18.9	14.7
Chullora	97.3	65.1	43.5	37.9	34.7	30.9	26.5	21.3	16.5
Liverpool	95.9	74.0	48.2	40.1	34.6	31.3	26.1	20.6	15.9
Macarthur	100.0	91.1	43.7	34.4	29.8	26.0	22.2	15.7	11.6
Oakdale	96.4	57.3	35.7	32.1	28.5	23.7	17.8	12.7	8.7
Richmond	97.0	60.9	43.5	37.2	30.8	26.9	21.4	15.9	12.0
Rozelle	94.0	52.2	40.6	37.2	33.3	29.4	24.7	19.3	15.4
Illawarra									
Albion Park South	85.8	60.1	40.2	37.8	35.2	29.6	21.8	15.4	10.6
Kembla Grange	99.2	84.3	61.6	52.2	38.5	34.4	25.9	18.8	12.9
Wollongong	96.7	62.0	52.1	45.2	36.3	31.9	25.7	18.5	13.0
Lower Hunter									
Beresfield	96.4	51.7	44.8	41.8	37.0	33.5	26.9	19.1	14.7
Newcastle	97.3	51.1	40.8	36.7	33.9	31.2	25.7	20.2	15.8
Regional									
Albury	87.9	189.2	105.3	73.4	47.2	34.4	24.0	17.8	13.1
Bathurst	98.6	61.3	45.5	43.8	34.4	28.4	21.9	15.2	11.3
Tamworth	79.2	48.0	38.7	32.0	29.2	26.8	21.3	15.1	11.0
Wagga Wagga	95.6	172.9	111.5	83.7	59.6	50.2	36.8	25.1	16.4

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

Bold font indicates values that exceed the AAQ NEPM standard

Trend analysis

Table 100: Maximum 24-hour average concentrations for PM₁₀ (µg/m³)

Region/ Performance monitoring Station	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
Sydney										
Blacktown	57.3	66.9	37.4	36.2	127.1	122.0	186.8	42.6		
Bringelly	68.2	45.9	33.9	36.5	99.4	120.2	274.7	60.3	53.9	72.0
Chullora/Lidcombe*	49.8*	38.7*	37.0*	52.5*	65.3*	86.4*	212.8	57.5	49.7	65.1
Liverpool	58.7	45.7	46.0	64.1	61.4	127.6	282.6	60.5	55.1	74.0
Macarthur								59.1	54.9	91.1
Oakdale								41.3	42.6	57.3
Richmond	71.5	55.6	44.4	43.2	119.9	126.4	194.3	46.2	49.1	60.9
Rozelle							36.8	51.4	47.1	52.2
Illawarra										
Albion Park / Albion Park South*	61.6	63.6	48.7	62.5	58.7	88.3	281.0	51.5	41.8	60.1*
Kembla Grange								57.6	59.0	84.3
Wollongong	64.8	56.9	40.2	58.1	68.2	76.7	280.5	48.1	54.8	62.0
Lower Hunter										
Beresfield	71.8	46.1	48.0	53.6	81.0	166.4	88.0	55.7	53.2	51.7
Newcastle								46.9	49.9	51.1
Regional										
Albury					28.8	81.3	921.4	55.6	55.1	189.2
Bathurst				35.2	35.6	258.2	621.7	72.9	44.9	61.3
Tamworth				21.1	34.6	189.8	243.3	55.7	88.8	48.0
Wagga Wagga					69.8	178.2	837.0	105.9	163.1	172.9

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

Bold font indicates values that exceed the AAQ NEPM standard

Table 101: Statistical summary for PM₁₀ - 24-hour average concentrations

Station: Blacktown

Year	Data availability rates (%)	Number of Exceedences (days)	Maximum value (ug/m3)	Percentiles (ug/m3)						
				99 th	98 th	95 th	90 th	75 th	50 th	25 th
1997	74.2	2	57.3	44.0	41.7	35.8	31.3	23.6	17.8	13.5
1998	98.1	1	66.9	36.3	33.4	30.8	28.3	21.0	16.0	11.4
1999	92.3	0	37.5	29.3	26.4	24.1	22.1	18.3	14.6	11.3
2000	94.8	0	36.2	29.1	27.9	24.2	21.2	18.1	14.4	11.8
2001	92.9	3	127.1	43.2	41.7	35.7	32.5	24.8	18.9	13.9
2002	93.4	11	122.0	82.4	64.5	42.9	33.6	25.2	18.4	14.6
2003	94.8	4	186.8	52.7	41.0	34.3	28.9	21.7	17.0	12.7
2004	35.8	0	42.6	41.9	41.5	36.3	33.7	27.6	22.3	17.9
2005	0.0 [#]									
2006	0.0 [#]									

[#] Station closed pending relocation.Table 102: Statistical summary for PM₁₀ - 24-hour average concentrations

Station: Bringelly

Year	Data availability rates (%)	Number of Exceedences (days)	Maximum value (ug/m3)	Percentiles (ug/m3)						
				99 th	98 th	95 th	90 th	75 th	50 th	25 th
1997	98.4	1	68.2	40.2	34.3	31.8	27.6	21.1	15.0	10.9
1998	95.9	0	45.9	37.9	36.3	30.6	28.2	20.2	15.1	10.4
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

Table 103: Statistical summary for PM₁₀ - 24-hour average concentrationsStation: Lidcombe⁽¹⁾ / Chullora⁽²⁾

Year	Data availability rates (%)	Number of Exceedences (days)	Maximum value (ug/m3)	Percentiles (ug/m3)						
				99 th	98 th	95 th	90 th	75 th	50 th	25 th
1997 ⁽¹⁾	81.1	0	49.8	39.8	36.8	31.8	27.5	21.2	15.9	11.9
1998 ⁽¹⁾	100.0	0	38.7	32.5	30.8	28.1	23.2	17.8	13.1	10.0
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

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

Bold font indicates values that exceed the AAQ NEPM standard

Table 104: Statistical summary for PM₁₀ - 24-hour average concentrations

Station: Liverpool

Year	Data availability rates (%)	Number of Exceedences (days)	Maximum value (ug/m3)	Percentiles (ug/m3)						
				99 th	98 th	95 th	90 th	75 th	50 th	25 th
1997	92.6	1	58.7	41.4	38.3	35.1	29.8	22.9	16.9	12.3
1998	98.6	0	45.7	40.3	39.2	33.2	29.4	22.5	16.7	11.3
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	41.8	36.9	31.1	26.2	20.6	16.4	12.6
2001	95.3	2	61.4	37.0	34.9	30.2	28.1	22.6	18.3	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

Table 105: Statistical summary for PM₁₀ - 24-hour average concentrations

Station: Macarthur

Year	Data availability rates (%)	Number of Exceedences (days)	Maximum value (ug/m3)	Percentiles (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

Table 106: Statistical summary for PM₁₀ - 24-hour average concentrations

Station: Oakdale

Year	Data availability rates (%)	Number of Exceedences (days)	Maximum value (ug/m3)	Percentiles (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

Table 107: Statistical summary for PM₁₀ - 24-hour average concentrations

Station: Richmond

Year	Data availability rates (%)	Number of Exceedences (days)	Maximum value (ug/m3)	Percentiles (ug/m3)						
				99 th	98 th	95 th	90 th	75 th	50 th	25 th
1997	94.8	4	71.5	49.5	42.8	35.2	28.6	21.4	16.3	11.2
1998	74.8	1	55.6	40.0	35.2	31.4	26.4	18.5	13.6	9.4
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	25.1	22.9	17.7	13.9	10.9
2001	87.4	4	119.9	58.1	32.6	27.9	25.3	20.1	16.0	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

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

Bold font indicates values that exceed the AAQ NEPM standard

Table 108: Statistical summary for PM₁₀ - 24-hour average concentrations

Station: Rozelle

Year	Data availability rates (%)	Number of Exceedences (days)	Maximum value (ug/m3)	Percentiles (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

Table 109: Statistical summary for PM₁₀ - 24-hour average concentrationsStation: Albion Park ⁽¹⁾/ Albion Park South ⁽²⁾

Year	Data availability rates (%)	Number of Exceedences (days)	Maximum value (ug/m3)	Percentiles (ug/m3)						
				99 th	98 th	95 th	90 th	75 th	50 th	25 th
1997	43.8	2	61.6	48.5	45.6	39.3	32.6	24.6	15.1	9.8
1998	93.2	5	63.6	56.6	41.9	33.6	28.9	19.3	12.6	8.0
1999	98.9	0	48.7	36.8	32.6	25.4	22.1	16.3	11.0	7.8
2000	96.4	2	62.5	41.3	35.8	29.4	25.1	18.2	12.9	9.6
2001	97.3	1	58.7	41.9	38.0	34.5	28.5	20.6	14.9	9.9
2002	59.5	6	88.3	65.1	53.1	40.2	34.6	26.1	16.4	10.9
2003	96.2	4	281.0	50.2	38.8	29.9	25.7	19.0	13.7	9.9
2004	95.9	1	51.5	42.6	39.6	33.3	29.4	22.2	15.4	10.5
2005	3.0	0	41.8	39.8	39.3	37.9	36.9	29.7	22.1	15.6
2006	85.8	2	60.1	40.2	37.8	35.2	29.6	21.8	15.4	10.6

Table 110: Statistical summary for PM₁₀ - 24-hour average concentrations

Station: Kembla Grange

Year	Data availability rates (%)	Number of Exceedences (days)	Maximum value (ug/m3)	Percentiles (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

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

Bold font indicates values that exceed the AAQ NEPM standard

Table 111: Statistical summary for PM₁₀ - 24-hour average concentrations

Station: Wollongong

Year	Data availability rates (%)	Number of Exceedences (days)	Maximum value (ug/m3)	Percentiles (ug/m3)						
				99 th	98 th	95 th	90 th	75 th	50 th	25 th
1997	95.3	2	64.8	46.7	42.7	38.4	33.0	24.4	18.1	12.9
1998	96.4	1	56.9	45.4	42.1	34.9	28.7	22.1	16.8	12.7
1999	96.4	0	40.2	35.4	32.5	28.4	25.4	20.2	15.8	12.4
2000	93.4	3	58.1	46.1	42.3	34.2	26.9	20.7	15.5	11.6
2001	97.5	4	68.2	48.0	42.6	36.7	31.2	22.6	16.5	12.1
2002	94.5	9	76.7	61.9	53.1	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

Table 112: Statistical summary for PM₁₀ - 24-hour average concentrations

Station: Beresfield

Year	Data availability rates (%)	Number of Exceedences (days)	Maximum value (ug/m3)	Percentiles (ug/m3)						
				99 th	98 th	95 th	90 th	75 th	50 th	25 th
1997	97.8	6	71.8	51.1	48.0	40.8	33.8	24.4	17.3	11.2
1997	97.8	6	71.8	51.1	48.0	40.8	33.8	24.4	17.3	11.2
1998	99.7	0	46.1	37.5	36.1	33.1	28.8	23.3	17.1	11.9
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	84.6	70.8	56.8	46.3	33.1	21.2	15.9
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
2006	96.4	2	51.7	44.8	41.8	37.0	33.5	26.9	19.1	14.7

Table 113: Statistical summary for PM₁₀ - 24-hour average concentrations

Station: Newcastle

Year	Data availability rates (%)	Number of Exceedences (days)	Maximum value (ug/m3)	Percentiles (ug/m3)						
				99 th	98 th	95 th	90 th	75 th	50 th	25 th
2004	19.4	0	46.9	46.0	44.6	37.3	33.3	26.6	21.9	17.1
2005	81.6	0	49.9	40.9	38.9	35.1	31.7	26.2	21.1	16.6
2006	97.3	1	51.1	40.8	36.7	33.9	31.2	25.7	20.2	15.8

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

Bold font indicates values that exceed the AAQ NEPM standard

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

Station: Albury

Year	Data availability rates (%)	Number of Exceedences (days)	Maximum value (ug/m3)	Percentiles (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	56.8	44.4	38.0	31.2	22.9	16.1	12.9
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

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

Station: Bathurst

Year	Data availability rates (%)	Number of Exceedences (days)	Maximum value (ug/m3)	Percentiles (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

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

Station: Tamworth

Year	Data availability rates (%)	Number of Exceedences (days)	Maximum value (ug/m3)	Percentiles (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

Table 117: Statistical summary for PM₁₀ - 24-hour average concentrations

Station: Wagga Wagga

Year	Data availability rates (%)	Number of Exceedences (days)	Maximum value (ug/m3)	Percentiles (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

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

Bold font indicates values that exceed the AAQ NEPM standard

Assessment of progress towards achieving the goal

The air quality management programs and strategies put in place by the NSW Government are directed at protecting ambient air quality. The Ambient Air Quality NEPM goal provides additional impetus for the implementation of these strategies and a useful benchmark against which programs to manage the air environment can be assessed.

Framework for Air Quality Management in the Sydney Greater Metropolitan Region

The NSW State Plan released in November 2006 includes Priority E3: Cleaner Air and Progress on Greenhouse Gas Reductions, with a target for air of meeting the national air quality 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 and Climate Change (DECC) is the lead agency on the air and greenhouse priority. 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

Motor vehicle emissions are the major source of ozone precursors in the Sydney region, making up 71% of Oxides of Nitrogen (NO_x) emissions and 38% of Volatile Organic Compound (VOC) emissions. In the Greater Metropolitan Region (GMR), motor vehicles are the source of 30% of NO_x and 38% of VOC emissions, with industry making a more significant contribution to NO_x emissions in the GMR (60%).

a) Low Volatility Petrol

While the Commonwealth Government has introduced the Fuel Quality Standards Act 2000, which provides for national fuel standards to be established as determinations under the Act, the management of petrol volatility has been left to the States because of the need to take account of regional climatic and seasonal factors when setting volatility limits. NSW amended the Protection of the Environment Operations Clean Air (Motor Vehicle and Motor Vehicle Fuels) Regulation 2002 to limit petrol volatility from the start of the 2004/05 summer. The regulation is estimated to reduce motor vehicle VOC emissions in the GMR by around 17% over the summer period. This equates to a reduction in VOC emissions of over 2500 tonnes each summer.

The volatility limit of 62 kilopascals (average) now applying in the Greater Metropolitan Region is lower than that for any other Australian urban air shed. The regulatory requirement will be reviewed again in 2007-08, when the possibility of a lower limit will be examined.

b) NSW Cleaner Vehicles Action Plan

The traditionally slow turnover of the Australian vehicle fleet has been a limiting factor in realising the air quality benefits from cleaner vehicle technology. To address this, the NSW Government has taken steps to improve the environmental performance of the NSW fleet by introducing the Cleaner Vehicles Action Plan. The Plan is designed to hasten the uptake of vehicles complying with the most advanced emission standards. It includes Clean Car Benchmarks which rate the environmental performance of new motor vehicles, a Clean Fleet Program for private fleets and a web based consumer guide on the environmental performance of passenger vehicles. The Government has also banned the purchase of V8 vehicles on Government contracts and set targets for the environmental performance of its fleet of 25,000 vehicles. There has been a reduction in the number of vehicles in the large passenger

category purchased by Government, down by approximately 1,000 vehicles on the figure for 2004-05, and a corresponding increase in purchases in the small and medium/micro categories.

c) Diesel Retrofit Program

NSW has undertaken a Diesel Retrofit Demonstration Project to improve the emissions performance of in-service diesel vehicles by fitting emission reduction devices to their exhausts to reduce particle emissions. The trial has assessed the feasibility, costs and benefits of implementing diesel retrofit, as the basis for designing a broader program. The program is now being expanded.

d) Emissions Standards for Light and Heavy Duty Vehicles

In 1999, the Commonwealth Government announced a timetable for the introduction of progressively more stringent emission standards for light and heavy-duty vehicles as Australian Design Rules under the Motor Vehicles Standards Act 1989.

NSW is conducting a project, under the 2005 NSW Greenhouse Plan, to develop a scheme for rating new heavy vehicles based on their emission performance (including CO₂ or fuel economy), to help inform vehicle and fleet operators' vehicle purchasing decisions. Consultancies for the project will be finalised in mid-2007.

e) National Fuel Standards

The effective operation of the more advanced emission control technology required to meet the more stringent emissions standards depends upon the availability of fuel of an appropriate quality. The Commonwealth Government has enacted the Fuel Quality Standards Act 2000 and under this legislation has established environmental standards for petrol and diesel covering a comprehensive range of parameters which effect vehicle emissions performance.

In combination, it is expected that the new vehicle emissions and fuel standards will achieve significant emission reductions. For example in Sydney from 2002 to 2020 emissions of VOCs from the motor vehicles fleet are forecast to fall by 46%, NO_x by 67%, CO by 75% and PM₁₀ by 40%, though these reductions will be realised only if in-service motor vehicles perform to their design standards.

f) Smoky vehicle program

The DECC operates the Smoky Vehicle Program that identifies vehicles that emit visible smoke continuously for more than 10 seconds. In the 2005/06 year 694 penalty infringement notices and 1,405 warning letters were issued. The community can also report smoky vehicles, including on the DECC's website. DECC receives around 285 reports each month from the public.

g) RTA-Clean Fleet Program

The NSW RTA has worked in conjunction with public and private bus and truck fleets to develop maintenance guidelines to reduce excessive emissions from diesel vehicles. The guidelines form part of a Clean Fleet program for private fleet operators that focuses on maintenance practices for heavy-duty fleets and vehicle purchasing policies for light-duty fleets. These guidelines have been tested with a number of NSW fleets. To support this program, the RTA has developed a diesel emissions training course available through TAFE for diesel mechanics and fleet/workshop managers.

h) Greener bus and taxi fleets

In 2006-07, the State Transit Authority has begun purchasing 250 ultra-low emission Euro 5 diesel buses and 255 Compressed Natural Gas buses for heavily trafficked inner city areas. The buses will comply with the tougher Euro 5 standards that are not proposed to apply in Australia until 2010. There is also a \$4 million program in place to retrofit 1300 older diesel buses with after-treatment technology.

The NSW Government is working with the NSW Taxi Council on trial of an environmentally friendly taxi for Sydney's metropolitan area. The hybrid taxi is performing successfully 18 months into the 2 year trial.

Licensed Industry

Industrial emissions are a relatively small proportion of total emissions of NO_x and VOCs in the Sydney region, at 15% and 11% respectively. The situation changes somewhat when considering the Greater Metropolitan Region (GMR), with industry responsible for 60% of NO_x and 10% VOC emissions. Industry emissions make up a greater proportion of particle emissions, namely 37% for the Sydney region and 62% for the GMR.

Controls on emissions to air from industrial sources are in place under NSW EPA licensing arrangements for scheduled facilities under the Protection of the Environment Operations Act. The Protection of the Environment (Clean Air) Regulation provides the regulatory framework for this licensing and specifies never-to-be exceeded concentration limits for air pollutants.

The Regulation was reviewed in 2004–05 and changes arising from the review were incorporated by amendment into the Protection of the Environment Operations (Clean Air) Regulation in 2005. These include more stringent air pollution standards for future industry, equipment that undergoes major modification, and equipment which is replaced in the Greater Metropolitan Region; phased retirement from 2008 to 2012 of standards that apply to older industry; and additional standards for air toxics when non-standard fuels are used. The phased retirement of older standards is a two-stage process and reviews the suitability of old emission standards and their ability to protect human health and the environment. The first stage of the retirement of older limits is currently underway.

In 1999 load based licensing was introduced, which retains licence specific limits but links licence fees to the amount of pollution discharged thus providing a financial incentive for licensees to achieve discharges below the required minimum performance. In the GMR, the load fee for emissions of NO_x and VOCs is higher because of the sensitivity of this region and to provide greater incentive to reduce pollution. Load based licence fees for air emissions increased from July 2004 to provide a stronger incentive for reducing emissions.

Small industrial, commercial and domestic sources

Trends in population growth and economic development are expected to increase the significance of small commercial and domestic sources of emissions as a proportion of total emissions, particularly VOCs. These industries are generally service oriented and include the following: surface coating, mobile asphalt plants, service stations, printers and dry cleaners.

The domestic sector is also a contributor to VOC emissions. Household sources include petrol lawnmowers, garden tools, solvents and paints and solid wood heaters.

In combination these “area sources” are responsible for 39% of VOC emissions in the Sydney region and 40% of VOC emissions in the GMR as a whole.

NSW has held discussions with the Commonwealth and other jurisdictions and is leading a working group to develop a national approach on reducing emissions from products such as paints, solvents and aerosols.

Under the Protection of the Environment Operations Act 1997 local councils have the principal responsibility for managing emissions from commercial and domestic premises. The NSW Government is developing capacity building programs for local government, including the Air Quality Toolkit completed in 2006 and associated training for local government.

Emissions from domestic solid fuel heaters are being addressed through national initiatives to improve solid fuel heater design standards. In 2006 NSW introduced an offence under the Protection of the Environment Operations Act relating to excessive smoke emissions from residential chimneys, which local councils have authority to enforce. Local councils also have powers to manage the installation of domestic solid fuel heaters. DECC is currently conducting woodsmoke management workshops with council officers (mid-2007).

NSW is also investigating new proposals to reduce petrol vapour emissions from service stations in the Greater Metropolitan Region.

Conclusions

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

The data presented in this report demonstrate that during 2006 NSW achieved compliance with the Ambient Air Quality NEPM goals for carbon monoxide, nitrogen dioxide, sulfur dioxide and lead. Levels of these pollutants continue to be well below Ambient Air Quality NEPM standards. Compliance was not demonstrated for ozone in Sydney and for fine particles (as PM₁₀) in the Illawarra, Albury and Wagga Wagga.

Meeting the Ambient Air Quality NEPM goal for ozone will be a challenge for the major urban areas of NSW given pressures from a growing population, urban expansion and increase in motor vehicle use. However, NSW has a broad range of strategies to reduce precursor pollutants in place and being developed under *Action for Air*. These include the requirement for Stage 1 vapour controls at service stations in Sydney, mandatory limits for petrol volatility in summer and the NSW Cleaner Vehicles Action Plan as well as initiatives to assist local councils to manage precursor emissions from smaller, commercial/industrial sources and domestic sources. A regulatory framework, which restricts emissions from larger industry through licence limits and load-based fees, is in place. The regulations limiting industrial emissions were reviewed and strengthened in 2005. These measures, together with stricter motor vehicle emission standards, tighter fuel regulations, NSW Diesel NEPM programs and new actions brought forward under the NSW State Plan and *Action for Air* Review will help move NSW towards meeting the NEPM goal for ozone in the longer term.

The continued severe drought conditions experienced across SE Australia during 2006 have contributed to elevated fine particle levels. 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 NSW. *Action for Air* includes a broad range of strategies for managing particle emissions (both PM₁₀ and PM_{2.5}) across mobile, industry and domestic sources. These include: national vehicle emission and fuel quality standards and actions under the Diesel National Environment Protection Measure which requires jurisdictions to assess the impact of emissions from in service diesel vehicles and where necessary to implement programs to reduce them. NSW programs include the Smoky Vehicle Enforcement program; particle emissions limits for industrial combustion processes under the Protection of the Environment (Clean Air) Regulation; environmental Impact Assessment processes for new developments; and emission limits for particles from solid fuel heaters.

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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 and Climate Change website www.dec.nsw.gov.au/air/nepm/index.htm

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 Blacktown 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 Woollooware 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.

Table A1: Sydney region Ambient Air Quality NEPM monitoring network

Station	Station type ⁽¹⁾	Number of parameters	Ozone	Nitrogen dioxide	PM ₁₀	Carbon monoxide	Sulfur dioxide
Blacktown ⁽²⁾	T	5	X	X	X	X	X
Bringelly	T	4	X	X	X		X
Central Coast ⁽³⁾	C	4	X	X	X		X
Chullora ⁽⁴⁾	T	5	X	X	X	X	X
Liverpool ⁽⁵⁾	C	5	X	X	X	X	
Macarthur	T	5	X	X	X	X	X
Oakdale	P	2	X		X		
Richmond	T	4	X	X	X		X
Rozelle	T	4	X	X	X	X	
St Marys	P	1	X				

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

(2) Currently closed, will be replaced by a new station at Prospect.

(3) To be established.

(4) Replaced the Lidcombe trend station.

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

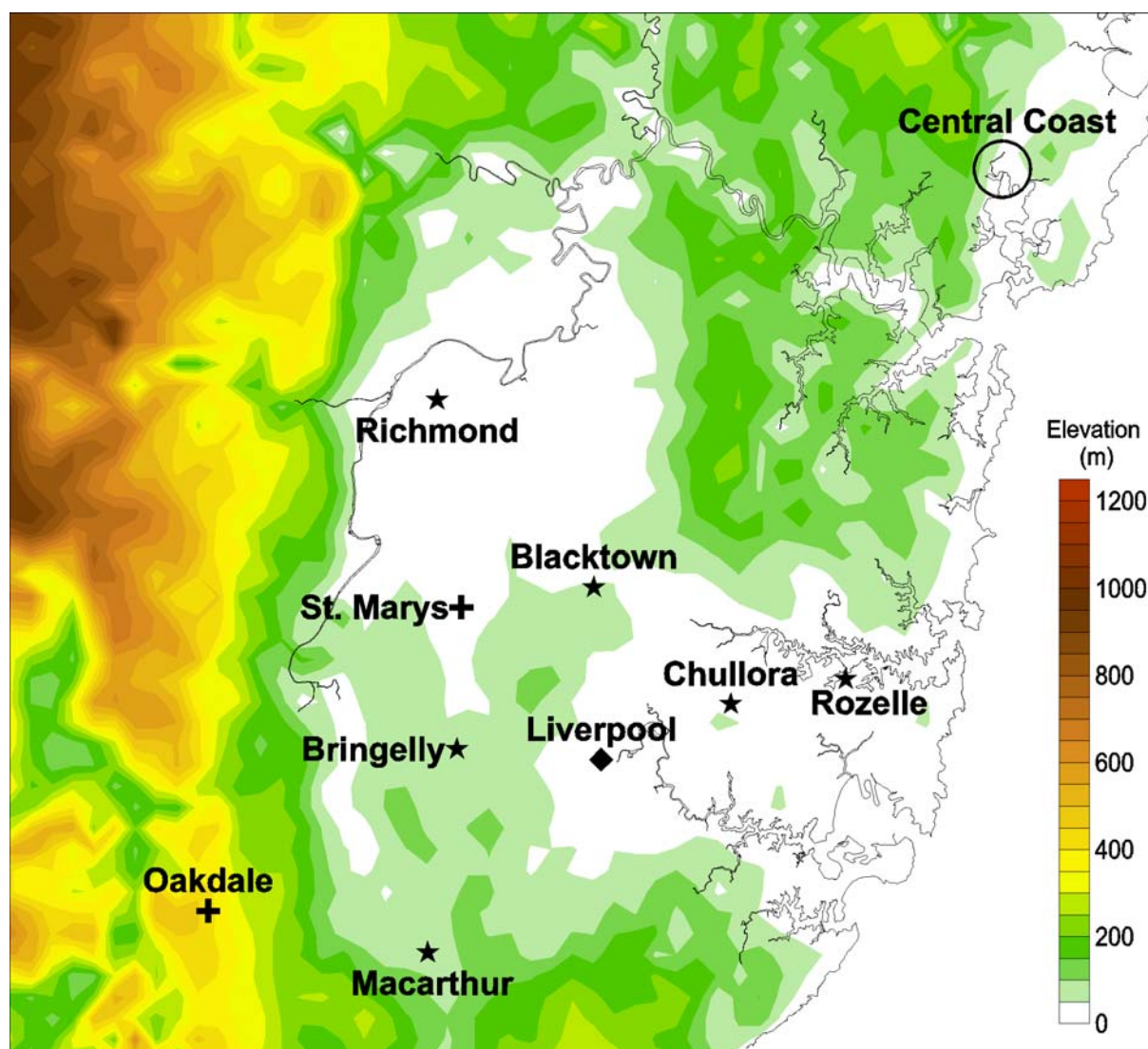


Figure A1: Ambient Air Quality NEPM Monitoring in the Sydney region (AMG co-ordinates)

★ trend station; + performance station; ◆ campaign station; ○ 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.

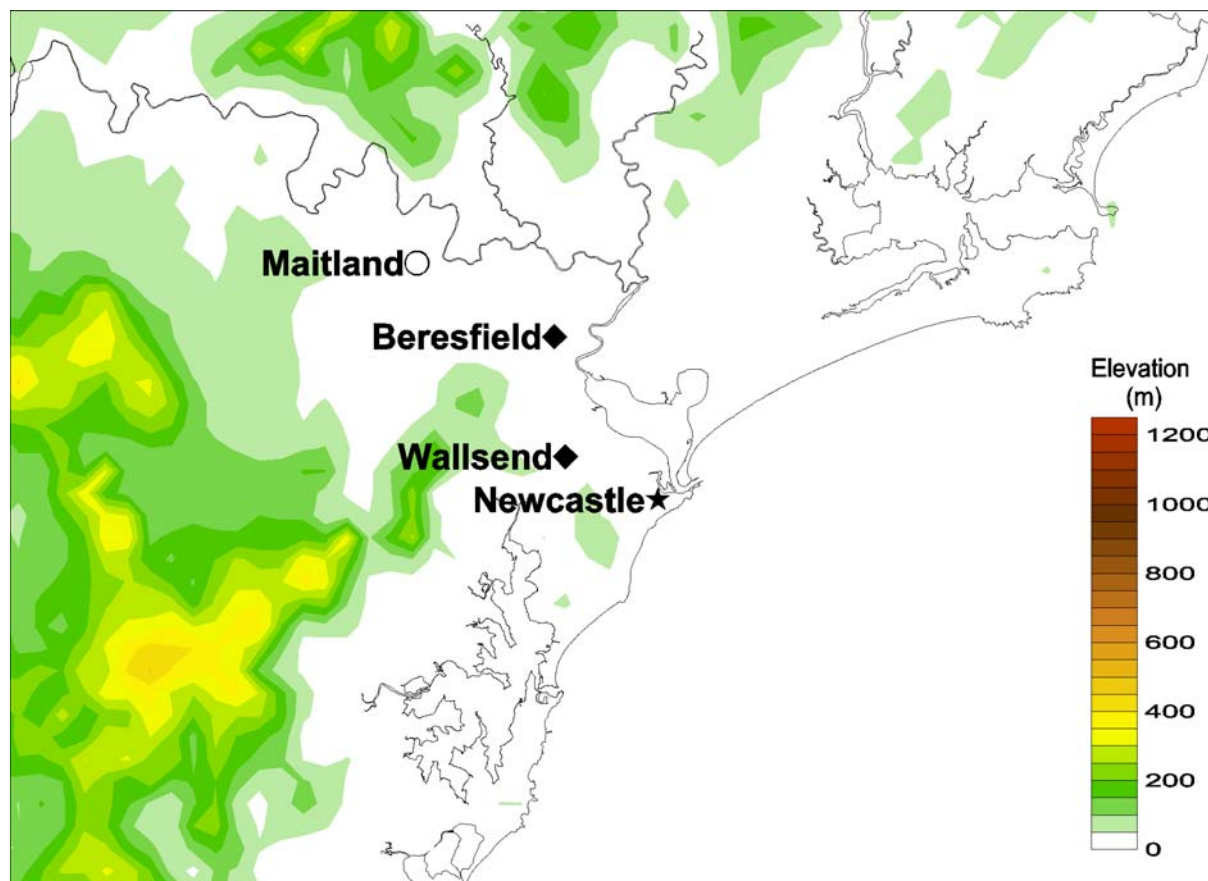


Figure A2: Ambient Air Quality NEPM Monitoring in the Lower Hunter region

★ trend station; ◆ campaign station; ○ proposed station;

Table A2: Lower Hunter region Ambient Air Quality NEPM monitoring network

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

(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.

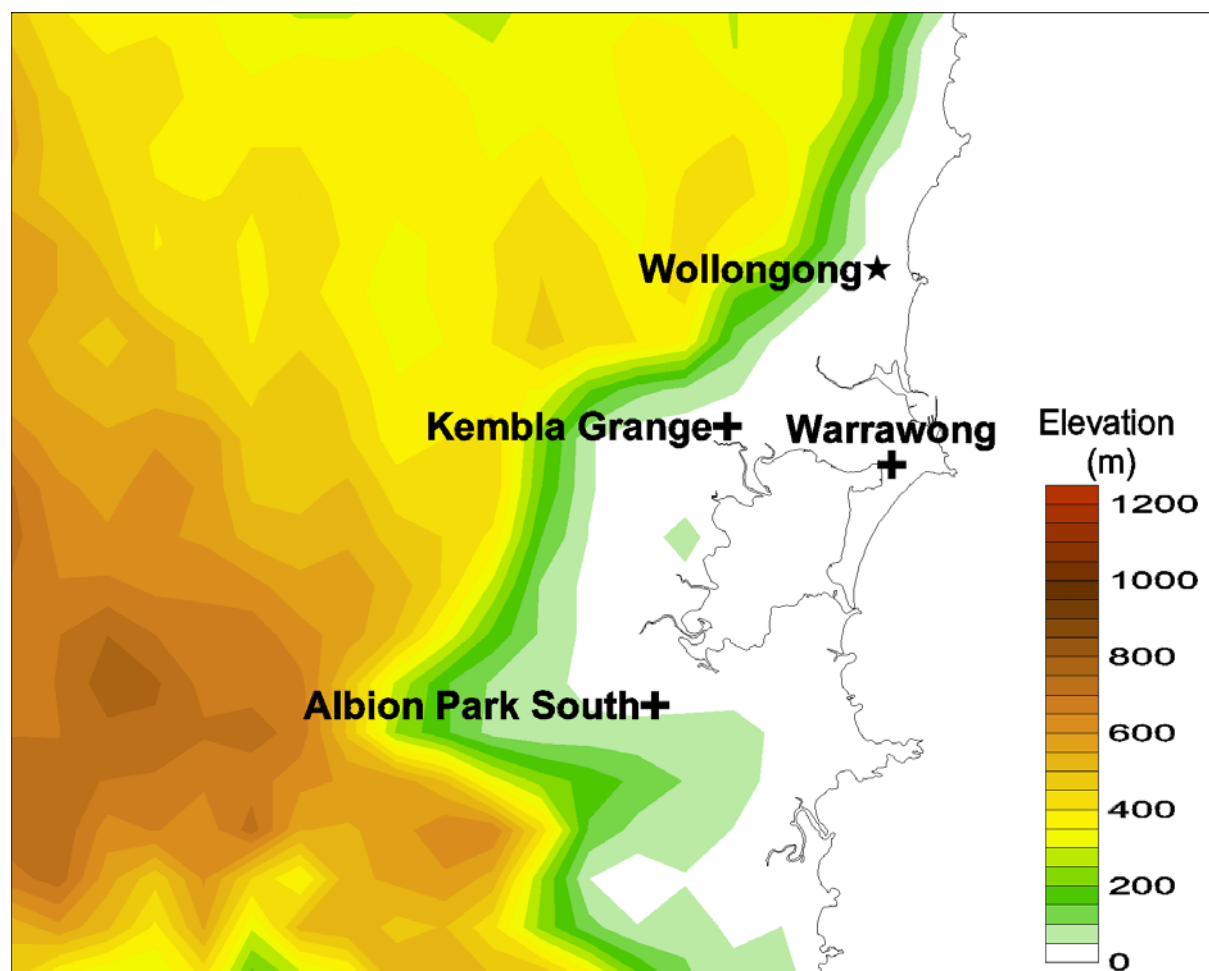


Figure A3: Ambient Air Quality NEPM Monitoring in the Illawarra region

★ trend station; + performance station;

Table A3: Illawarra region Ambient Air Quality NEPM monitoring network

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

(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 DECC 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.

Table A4: Rural NSW Ambient Air Quality NEPM monitoring network

Station	Station type ⁽¹⁾	Number of parameters	Ozone	PM ₁₀
Albury	C	1		X
Bathurst	C	2	X	X
Dubbo ⁽²⁾	C	1		X
Lismore ⁽²⁾	C	1		X
Orange ⁽²⁾	C	1		X
Tamworth	C	1		X
Wagga Wagga	C	1		X

(1) C denotes campaign monitoring.

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

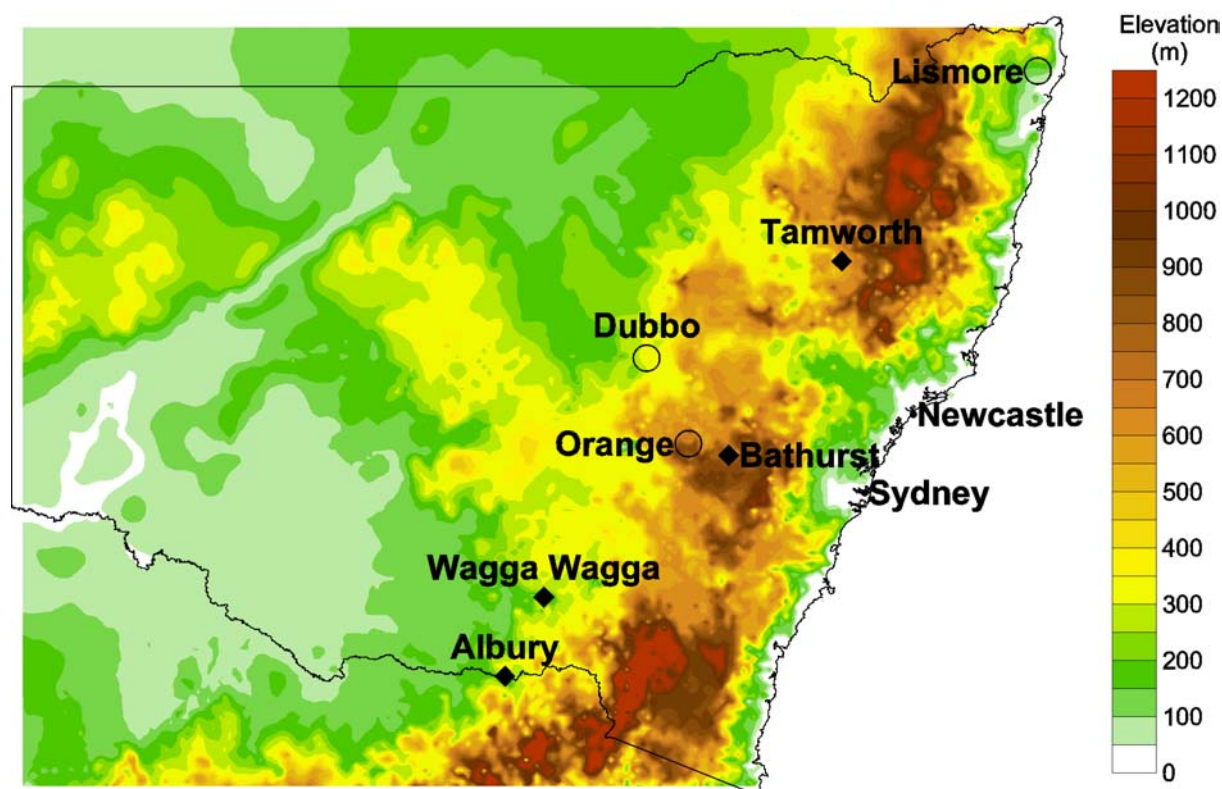


Figure A4: Ambient Air Quality NEPM Monitoring in rural New South Wales

◆ campaign station; ○ 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.

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

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.	Trees have grown since establishment of station.
Tamworth	Less than 20m from trees.	Best location in urban area specifically targeted for monitoring.
Wagga Wagga	Less than 20m from trees.	Street trees within about 15 m of station

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 DECC website <http://www.dec.nsw.gov.au/air/nepm/index.htm>

Table A6: Population exposure

Station	Exposed population
Sydney Region	
Blacktown	Trend station in a largely residential area in the northwest sub-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.
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	Performance 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	Performance station in a residential area used as a proxy for the yet-to-be-established Maitland station.
Illawarra	
Albion Park	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 centres	
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.

(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 DECC website <http://www.dec.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 PM₁₀, the Tapered Element Oscillating Microbalance (TEOM) method is used for NEPM monitoring and reporting. PM₁₀ data from the TEOM are presented as measured and unadjusted.

Table A7: Instruments used in NSW for NEPM monitoring

Pollutant	Standard	Title	Method used
Carbon monoxide	AS3580.7.1-1992	Ambient Air - Determination of Carbon Monoxide - Direct Reading Instrument Method	Gas Filter Correlation /Infra-Red
Nitrogen dioxide	AS3580.5.1-1993	Ambient Air - Determination of Oxides of Nitrogen - Chemiluminescence Method	Gas Phase Chemiluminescence
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)

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 25µg/m³ for a daily (24-hour) average, and 8µg/m³ for an annual average.

Below are presented data measuring particles as PM_{2.5} from NSW during 2006. Also included are historical trend data from 1997 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 PM₁₀. At present PM₁₀ and PM_{2.5} monitoring is performed concurrently at five of the eighteen stations currently specified as NEPM monitoring stations for PM₁₀ - Chullora, Liverpool, Richmond, Beresfield and Wollongong. PM₁₀ and PM_{2.5} monitoring is also performed at the Earlwood, Wallsend and Warrawong stations which are not designated as NEPM monitoring stations for PM₁₀.

The DECC 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 [Technical Paper on monitoring of particles for PM2.5](#) 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 DECC 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 DECC have been operated along similar lines to the TEOM PM₁₀ monitors and in accordance with AS3580.9.8 (*Determination of suspended particulate matter - PM₁₀ 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 PM₁₀ the adjustment is based on empirical results designed to achieve comparable results to the USEPA PM₁₀ reference methods. This adjustment is of the form:

$$Y = A + Bx$$

$$\text{For PM}_{10}: A = 3.0, B = 1.03$$

Historically all TEOM monitors used by the DECC 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 PM₁₀ 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, Warrawong 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 DECC website

<http://www.dec.nsw.gov.au/air/nepm/index.htm>.

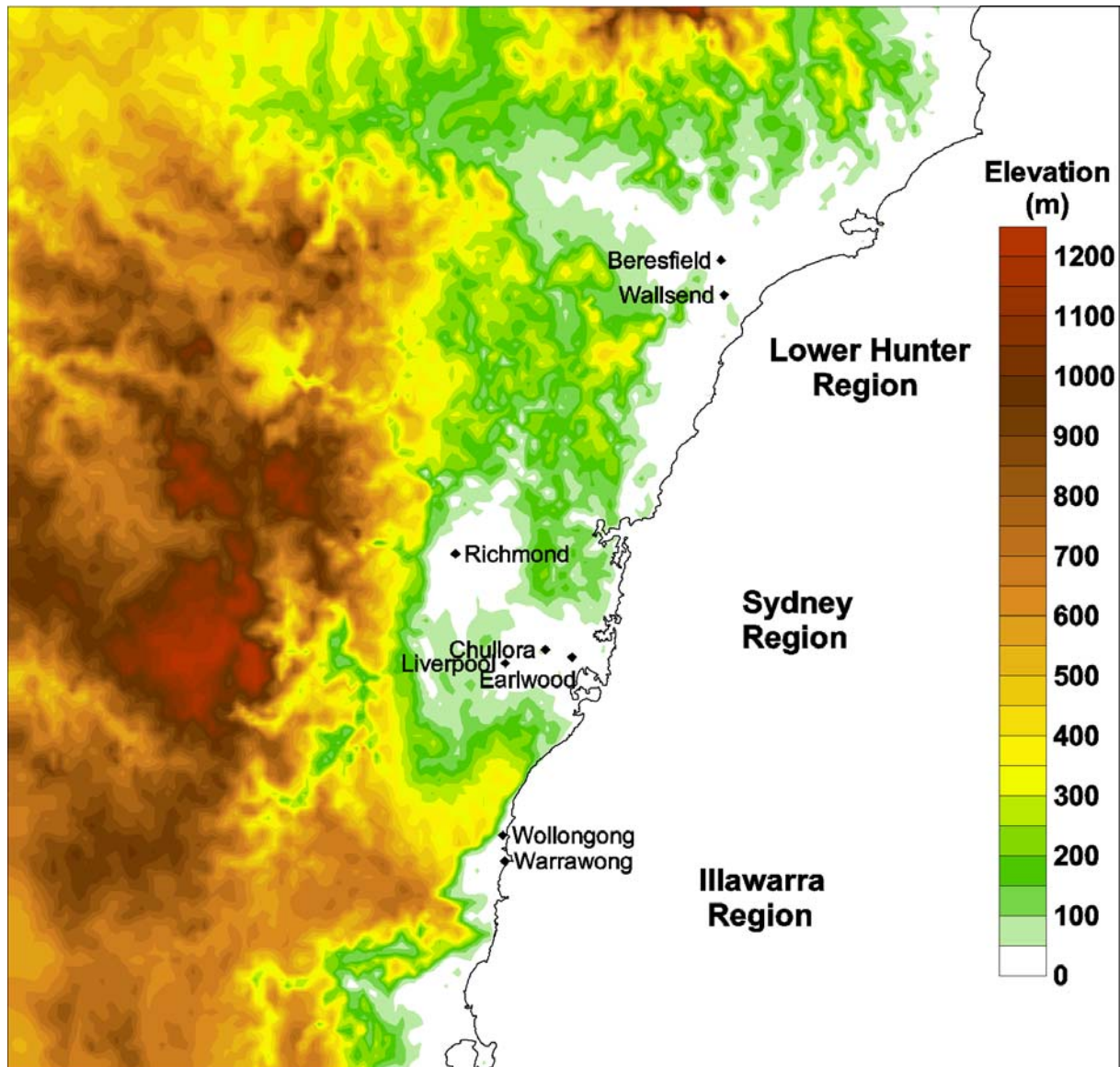
Table B1: Stations not complying with all siting and exposure criteria

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 B2: Population exposure

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	
Warrawong	Non-NEPM (for PM ₁₀) station in an industrial-residential area.
Wollongong	Trend station in the main population/commercial centre.

Figure B1: PM_{2.5} monitoring in NSW



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.

Table B3: Summary of PM_{2.5} concentrations in NSW (2006)

Region/ Performance monitoring Station	Data availability rates (% of hours)					Advisory Reporting Standard			
						25 µg/m ³ (24-hour average)		8 µg/m ³ (Annual average)	
	Q1	Q2	Q3	Q4	Annual	Number of Exceed- ences (days)	Annual mean (µg/m ³)	Performance against the standard	
								24-hour	1-year
Sydney									
Earlwood	96.7	100.0	100.0	97.8	98.6	3	10.1	Not met	Not met
Liverpool	100.0	100.0	95.7	98.9	98.6	3	12.2	Not met	Not met
Illawarra									
Warrawong	96.7	67.0	00.0	00.0	40.5	0	9.2	ND	Not met
Wollongong	100.0	100.0	100.0	100.0	100.0	2	9.5	Not met	Not met
Lower Hunter									
Beresfield	100.0	98.9	96.7	100.0	98.9	2	10.0	Not met	Not met
Wallsend	100.0	100.0	98.9	97.8	99.2	2	9.6	Not met	Not met

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

Days with PM_{2.5} levels greater than the Ambient Air Quality NEPM advisory reporting standards were recorded in all regions during 2006. Readings in excess of the 24-hour reporting standard were recorded at all stations in the Sydney, Illawarra and lower Hunter regions except at Warrawong, which ceased operation in April 2006. Levels above the 24-hour average reporting standard were recorded on five days during 2006 with Earlwood and Liverpool exceeding the standard on three of these days. The highest 24-hour average recorded was 51.5µg/m³ on the 1st December at Liverpool.

Annual averages above the reporting standard of 8µg/m³ were recorded in all regions where monitoring occurred. Liverpool recorded the highest annual average of 12.2µg/m³.

Table B4: Summary for PM_{2.5} – Maximum 24-hour average concentrations (2006)

Region/ Performance monitoring Station	Data availability rates (%)	Number of valid days	Highest Value	Maximum values (ppm)		
				Highest Date	2 nd Highest Value	2 nd Highest Date
Sydney						
Earlwood	98.6	360	33.1	22-Nov	30.5	21-Nov
Liverpool	98.6	360	51.5	01-Dec	48.9	22-Nov
Illawarra						
Warrawong	40.5	148	18.6	11-Apr	18.3	18-Feb
Wollongong	100.0	365	30.7	21-Nov	29.0	01-Dec
Lower Hunter						
Beresfield	98.9	361	29.6	02-Dec	28.2	12-Apr
Wallsend	99.2	362	30.5	02-Dec	27.2	22-Nov

AAQ NEPM Advisory Reporting Standard – 25 µg/m³ (24-hour average)

Bold font indicates values that exceed the AAQ NEPM reporting standard

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

Date	Stations where standard exceeded	Comments ^(#)
12-Apr-2006	Beresfield	
21-Nov-2006	Earlwood, Liverpool, Wollongong	
22-Nov-2006	Earlwood, Liverpool, Wallsend	
01-Dec-2006	Earlwood, Liverpool, Wollongong	
02-Dec-2006	Beresfield, Wallsend	

Table B6: Statistical summary for PM_{2.5} - Daily 24-hour average concentrations (2005)

Region/ Performance monitoring Station	Data availability rates (%)	Maximum conc. (ppm)	Percentiles (ppm)						
			99 th	98 th	95 th	90 th	75 th	50 th	25 th
Sydney									
Earlwood	98.6	33.1	19.6	18.5	16.6	14.9	11.7	9.6	7.5
Liverpool	98.6	51.5	24.1	21.3	19.3	17.4	14.1	11.5	9.0
Illawarra									
Warrawong	40.5	18.6	17.8	16.9	15.4	13.7	11.3	9.1	6.4
Wollongong	100.0	30.7	19.7	17.7	15.8	14.3	11.6	8.9	6.7
Lower Hunter									
Beresfield	98.9	29.6	19.4	18.3	16.7	14.5	11.7	9.0	7.4
Wallsend	99.2	30.5	18.7	17.5	15.6	13.8	11.2	9.0	7.2

AAQ NEPM advisory reporting standard - 25 µg/m³ (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.

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

Region/ Performance monitoring Station	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
Sydney										
Earlwood	39.3	33.4	27.6	35.4	81.7	56.1	39.4	24.4	31.2	33.1
Liverpool		26.5	25.4	45.1	118.6	89.2	50.1	41.8	34.9	51.5
Illawarra										
Warrawong	37.1	27.0	19.9	32.6	23.2	89.6	160.3	26.8	27.4	18.6
Wollongong		18.8	19.4	31.1	53.4	93.8	112.5	26.7	25.2	30.7
Lower Hunter										
Beresfield		18.5	21.4	34.1	66.4	50.4	40.9	31.7	22.1	29.6
Wallsend	43.4	38.1	21.9	61.5	56.4	59.6	34.1	26.9	23.5	30.5

AAQ NEPM advisory reporting standard - 25µg/m³ (24-hour average)

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

Region/ Performance monitoring Station	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006
Sydney										
Earlwood	10.2	10.3	10.2	10.3	11.6	12.8	11.0	10.8	10.3	10.1
Liverpool		10.1	9.6	10.4	11.8	15.2	13.6	12.5	11.6	12.2
Illawarra										
Warrawong	8.7	8.8	8.3	9.1	9.9	12.7	12.0	11.4	10.6	9.2
Wollongong		7.7	8.0	8.3	9.4	11.5	10.5	9.8	9.5	9.5
Lower Hunter										
Beresfield		8.2	8.8	8.8	12.4	13.6	9.4	11.0	10.0	10.0
Wallsend	9.6	8.5	8.0	8.4	10.2	11.3	9.8	9.9	9.7	9.6

AAQ NEPM advisory reporting standard - 8µg/m³ (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 rates (%)	Number of Exceedences (days)	Maximum value (ug/m3)	Percentiles (ug/m3)						
				99 th	98 th	95 th	90 th	75 th	50 th	25 th
1997	98.1	12	39.3	30.4	27.4	22.1	16.5	12.1	8.8	6.5
1998	95.6	7	33.4	25.8	24.4	19.0	16.9	12.7	9.0	6.9
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

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

Station: Liverpool

Year	Data availability rates (%)	Number of Exceedences (days)	Maximum value (ug/m3)	Percentiles (ug/m3)						
				99 th	98 th	95 th	90 th	75 th	50 th	25 th
1998	85.5	1	26.5	22.3	21.2	19.2	17.0	12.7	9.6	6.4
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

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

Station: Warrawong

Year	Data availability rates (%)	Number of Exceedences (days)	Maximum value (ug/m3)	Percentiles (ug/m3)						
				99 th	98 th	95 th	90 th	75 th	50 th	25 th
1997	99.7	4	37.1	23.5	21.0	16.9	13.8	10.6	7.6	5.8
1998	97.3	1	27.0	20.3	19.2	17.0	13.2	10.5	8.1	6.2
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

AAQ NEPM advisory reporting standard - 25µg/m³ (24-hour average)

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

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

Station: Wollongong

Year	Data availability rates (%)	Number of Exceedences (days)	Maximum value (ug/m3)	Percentiles (ug/m3)						
				99 th	98 th	95 th	90 th	75 th	50 th	25 th
1998	83.6	0	18.8	16.4	14.8	12.6	11.4	9.1	7.3	5.7
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

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

Station: Beresfield

Year	Data availability rates (%)	Number of Exceedences (days)	Maximum value (ug/m3)	Percentiles (ug/m3)						
				99 th	98 th	95 th	90 th	75 th	50 th	25 th
1998	81.9	0	18.5	16.3	15.6	14.1	12.8	10.1	7.8	5.7
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

Table B14: Statistical summary for PM_{2.5} - 24-hour average concentrations

Station: Wallsend

Year	Data availability rates (%)	Number of Exceedences (days)	Maximum value (ug/m3)	Percentiles (ug/m3)						
				99 th	98 th	95 th	90 th	75 th	50 th	25 th
1997	86.8	3	43.4	23.3	21.5	17.3	14.0	11.4	8.4	6.7
1998	95.6	1	38.1	17.5	16.9	15.4	13.6	10.4	7.9	5.9
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	96.2	0	23.5	19.9	19.0	16.8	14.4	11.6	9.0	7.2
2006	99.2	2	30.5	18.7	17.5	15.6	13.8	11.2	9.0	7.2

AAQ NEPM advisory reporting standard - 25µg/m³ (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 DECC 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.