THE

AUSTRALIAN CAPITAL TERRITORY
2006 AMBIENT AIR QUALITY REPORT

AGAINST THE

AMBIENT AIR QUALITY
NATIONAL ENVIRONMENT PROTECTION MEASURE

JUNE 2007

Section A - Monitoring Summary

This 2006 annual report has been prepared with reference to the national Peer Review Committee's (PRC) *Technical Paper No. 8 – Annual Reports* (October 2002).

This report covers four of the six criteria pollutants, namely carbon monoxide, nitrogen dioxide, ozone and particulate matter less than 10 microns (PM_{10}). Lead monitoring ceased in 2002 with levels significantly less then the national standard and sulfur dioxide has never been measured due to a lack of industry. The report also covers particulate matter less than 2.5 microns ($PM_{2.5}$).

With a population of 322,492[1] Canberra only requires one performance monitoring station (PMS). In regions where only a single PMS is required, the PRC[2] recommends that such a station be located to be generally representative of upper bound (GRUB) pollutant concentrations.

By using GRUB stations to monitor the ambient air across a region, we can be reasonably sure that if the NEPM Standards are met at those sites, then in theory, the majority of the region's population would be exposed to air at or below these pollution levels. In this way the NEPM's desired environmental outcome of adequate protection of human health and well-being should be assured.

The suburb of Monash is located in southern Canberra and sits centrally in the Tuggeranong Valley. The station is located approximately 250 metres north of Isabella Drive and 150 metres west of Cockcroft Avenue on vacant land. Maximums measured at the existing station at Monash are at the upper bound of levels historically recorded in Canberra and it has been designated as the ACT PMS.

The Monash station has been operational since 1996 and is sited in accordance with AS2922-1987 (*Ambient Air - Guide for Siting of Sampling Sites*). It is intended that this remain a permanent monitoring and trend site for the ACT.

For the 2006 reporting year the ACT Government monitoring network was National Association of Testing Authorities (NATA) accredited for all parameters measured, with the exception of $PM_{2.5}$.

As with previous years, the inability to control balance room relative humidity has resulted in all $PM_{2.5}$ data being invalidated as it does not meet filter condition criteria. However this data has been analysed and included in this report as it shows that Canberra has a problem in the winter months with $PM_{2.5}$ and when bush fires and controlled burns occur in and around the region.

The Monash station was extensively vandalised during the reporting year resulting in the instrument that measures PM_{10} (a TEOM) being off line from the 28th of May until the 25th of July.

[1] Source Australian Bureau of Statistics, Publication number 3218.0 Regional Population Growth, Friday 22 March 2004

[2] The Peer Review Committee (PRC) was established by the National Environment Protection Council to provide guidance to jurisdictions in developing monitoring plans, advise on the adequacy of plans, once developed and provide a consistent framework for national Reporting.

Section B - Assessment of Compliance with Goal and Standards

Annual compliance summary for 8-hour carbon monoxide

NEPM standard - 9.0 ppm

Region/ Performance monitoring station	Data availability rates (% of hours)					Number of exceedences (days)	Performance against the standards and goal
	Q1	Q2	Q3	Q4	Annual		
Canberra Monash	95.6	95.6	95.2	95.4	95.4	0	Met

Annual compliance summary for 1-hour and 1-year nitrogen dioxide

NEPM standard - 1hour 0.12 ppm, 1year 0.03 ppm

Region/ Performance monitoring station	Data availability rates (% of hours)					Annual mean Concentration (ppm)	Number of 1-hour exceedences (days)	Performance against the standards and goal	
	Q1	Q2	Q3	Q4	Annual			1- hour	1-year
Canberra Monash	90.7	95.6	95.2	95.5	94.2	0.018	0	Met	Met

Annual compliance summary for 1-hour and 4-hour ozone

NEPM standard - 1-hour 0.10 ppm , 4-hour 0.08 ppm

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
Canberra Monash	95.3	95.5	95.2	95.4	95.4	0	0	Met	Met

Annual compliance summary for 24-hour PM_{10}*

NEPM standard 50 $\mu g/m^3$

Region/ Performance monitoring station	Data availability rates (% of days)					Number of exceedences (days)	Performance against the standards and goal
	Q1	Q2	Q3	Q4	Annual		
Canberra Monash	100	63.7	72.8	100.0	84.1	4	Not demonstrated**

* TEOM data adjusted for temperature in accordance with Technical paper No. 10

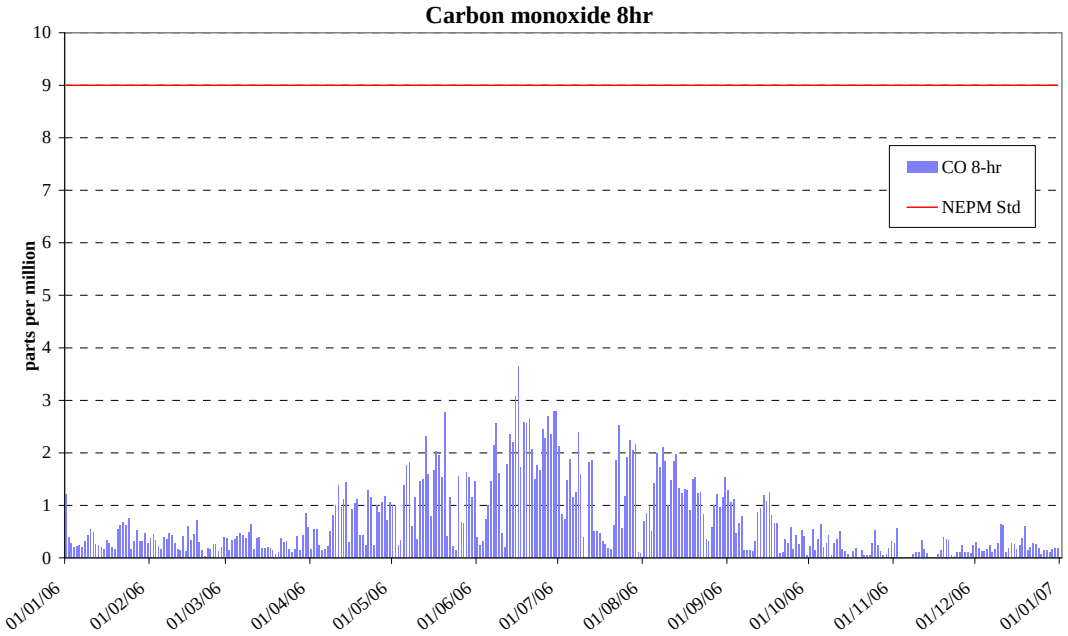
** ND - due to less than 75% data in Q2 and Q3

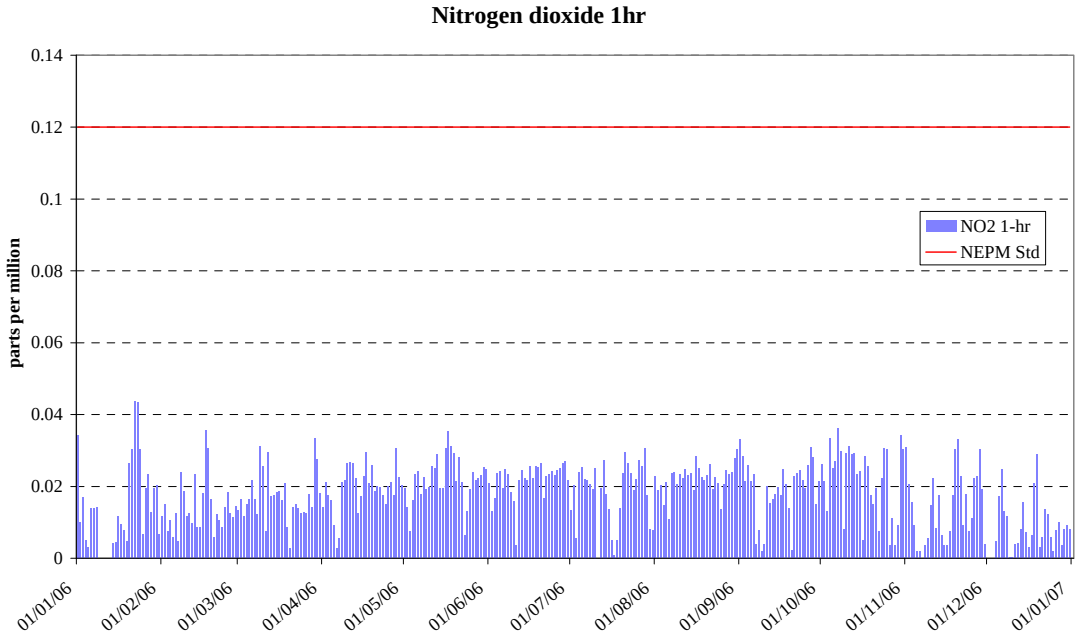
Annual compliance summary for 24-hour and 1-year $PM_{2.5}$*
NEPM standard - 24hour 25 μg/m^3, 1year 8 μg/m^3

Region/ Performance monitoring station	Data availability rates (% of days)					Annual mean Concentration (μg/m^3)	Number of 24-hour exceedences (days)
	Q1	Q2	Q3	Q4	Annual		
Canberra Monash	100	84.6	57.6	91.2	83.4	7.9	20

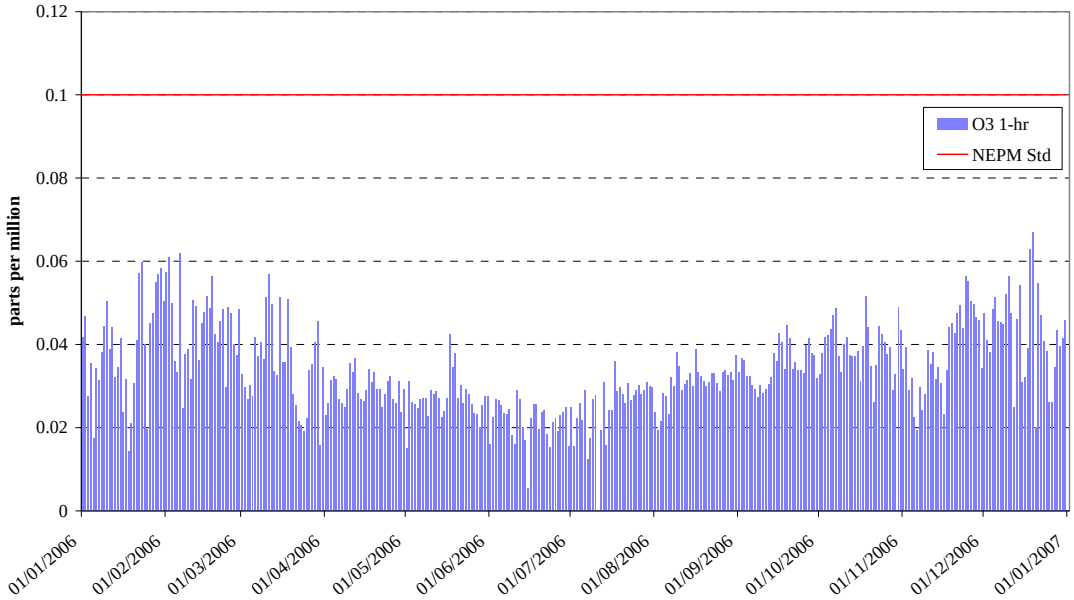
* All $PM_{2.5}$ data has been invalidated due to a failure to meet filter conditioning criteria.

Daily Peak time series graphs

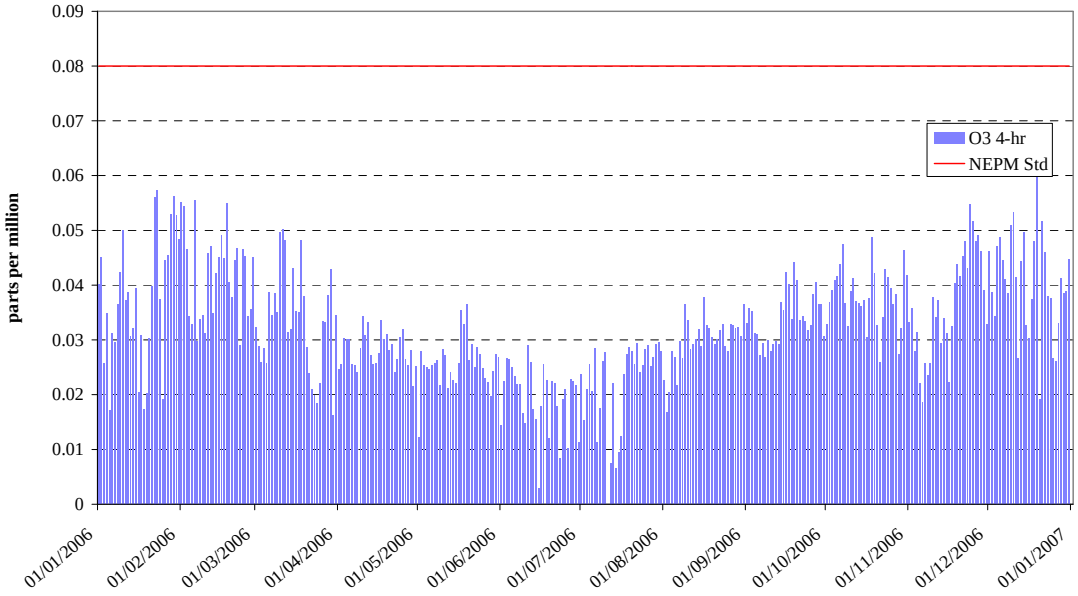




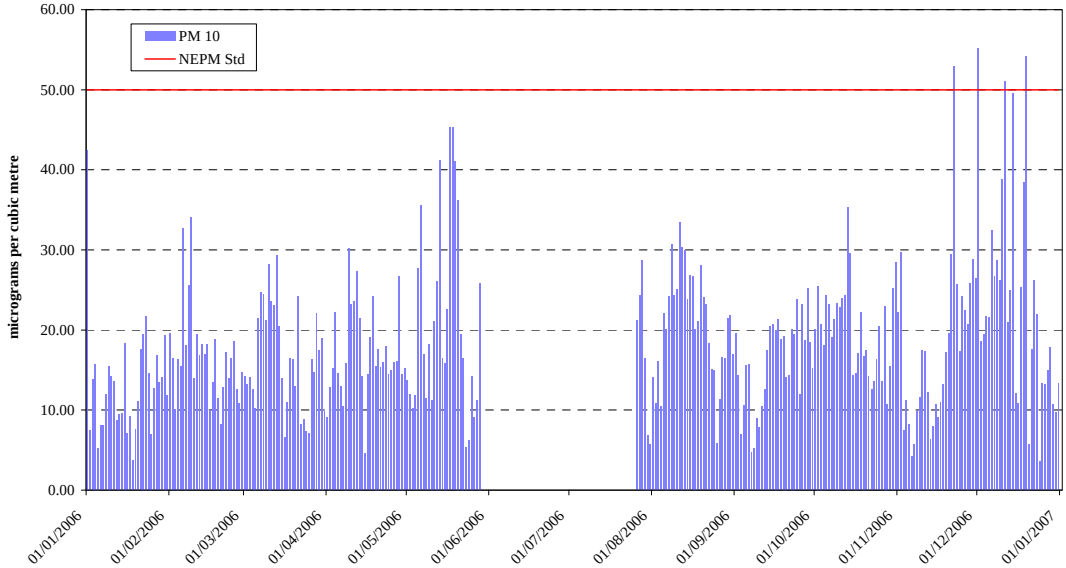
Ozone 1hr

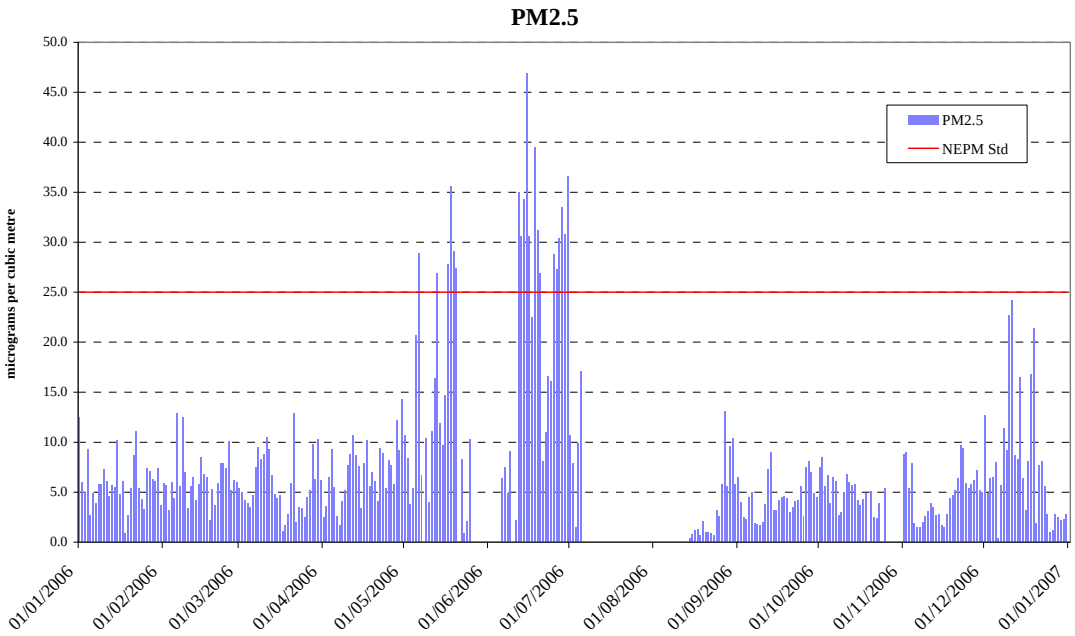


Ozone 4hr



PM10 (TEOM)





Section C - Analysis of Air Quality Monitoring

The ACT is making steady progress towards achieving the goal of the NEPM, which is to achieve the standards specified in Schedule 2 by June 2008.

The daily peak time series graphs above clearly show that carbon monoxide, nitrogen dioxide and ozone are well below NEPM standards. The time series graph for $PM_{2.5}$ clearly shows the winter increase in particulate matter due to emissions from solid fuel heaters. The ACT Government is targeting this problem through on-going public education, regulation - including the requirement for wood heaters sold in the ACT to be certified to meet the emissions performance standards in Australian Standard AS4013 and the licensing of firewood merchants - and active programs such as the *Don't Burn Tonight* campaign and the implementation of a wood heater replacement program (over 600 units have been removed since January 2004). In more recent years exceedences have also been recorded from dust storms and large bushfires due to continuing drought conditions.

During 2006 a total of 4 PM_{10} exceedences were recorded. However as noted in Section A the TEOM was off line from the 28th of May until the 25th of July due to extensive vandalism, which covers a large proportion of the wood heating season.

The PM_{10} head was stolen some time on the weekend of 27-28 May. While awaiting a replacement PM_{10} head, on the weekend of 9-10 June the tripod for supporting the PM_{10} head, the flow-splitter and a thermocouple were stolen. The process of the vandals removing these items badly damaged the instrument unit itself. Orders for new parts were made in late June and received mid July, with the TEOM coming back online on 25 July.

All the exceedences, as well as overall higher particle levels, occurred in late November and December due to large bushfires in NSW, including fires in the Blue Mountains (started 14/11/06), Tumut (started 10/11/06), and Victoria. Significant lightning activity on 1 December 2006 started numerous bushfires across north eastern Victoria and Gippsland which subsequently burnt more than 1 million hectares across the Great Divide including State Forest Areas in Gippsland and North East Victoria.

Annual summary statistics for daily peak 8-hour carbon monoxide
NEPM standard 9.0 ppm

Region/ Performance monitoring station	Number of valid days	Highest (ppm)	Highest (date/ time)	2nd Highest (ppm)	2nd Highest (date/ time)
Canberra Monash	364	3.7	Jun16:02	2.7	Jun15:23

Annual summary statistics for daily peak 1-hour nitrogen dioxide
NEPM standard 0.12 ppm

Region/ Performance monitoring station	Number of valid days	Highest (ppm)	Highest (date/ time)	2nd Highest (ppm)	2nd Highest (date/ time)
Canberra Monash	359	0.044	Jan22:21	0.041	Jan23:21

Annual summary statistics for daily peak 1-hour ozone
NEPM standard 0.10 ppm

Region/ Performance monitoring station	Number of valid days	Highest (ppm)	Highest (date/ time)	2nd Highest (ppm)	2nd Highest (date/ time)
Canberra Monash	364	0.067	Dec19:11	0.063	Dec18:22

Annual summary statistics for daily peak 4-hour ozone
NEPM standard 0.08 ppm

Region/ Performance monitoring station	Number of valid days	Highest (ppm)	Highest (date/ time)	2nd Highest (ppm)	2nd Highest (date/ time)
Canberra Monash	364	0.061	19 Dec:12	0.057	23 Jan:19

Annual summary statistics for 24-hour PM_{10}
NEPM standard 50 μg/m^3

Region/ Performance monitoring station	Number of valid days	Highest (μg/m^3)	Highest (date)	6th Highest (μg/m^3)	6th Highest (date)
Canberra Monash	307	55.2	Dec 1	45.3	17 May

Annual summary statistics for 24-hour $PM_{2.5}$
NEPM standard 25 μg/m^3

Region/ Performance monitoring station	Number of valid days	Highest (μg/m^3)	Highest (date)	6th Highest (μg/m^3)	6th Highest (date)
Canberra Monash	304	46.9	15 Jun	34.3	14 Jun

Section D – Data Analysis

Percentiles of daily peak pollutant concentration (2006)

Pollutant	Data recovery rates (%)	Max conc. (ppm)	99th percen tile (ppm)	98th percen tile (ppm)	95th percen tile (ppm)	90th percen tile (ppm)	75th percen tile (ppm)	50th percen tile (ppm)
CO 8 hr	99.7	3.7	2.8	2.6	2.2	1.8	1.1	0.4
NO2 1hr	98.4	0.044	0.036	0.033	0.031	0.029	0.024	0.019
Ozone 1hr	99.7	0.067	0.060	0.057	0.052	0.049	0.040	0.032
Ozone 4hr	99.7	0.061	0.056	0.055	0.050	0.046	0.038	0.031
PM10	84.1	55.2	51.0	44.9	33.9	28.3	22.7	16.9
PM2.5	83.3	46.9	35.6	33.3	27.8	15.6	8.7	5.8

Daily peak 8-hour carbon monoxide data summary (1998-2006)

Year	Data Recovery (%)	No. of Exceedences (days)	Max conc. (ppm)	99th percentile (ppm)	98th percentile (ppm)	95th percentile (ppm)	90th percentile (ppm)	75th percentile (ppm)	50th percentile (ppm)
1998	90.5	0	5.8	4.6	4.4	3.7	2.9	1.2	0.5
1999	82.6	0	4.5	4.2	4.2	3.7	3.2	2.2	0.7
2000	79.1	0	5.8	4.5	4.4	3.7	3.0	1.7	0.7
2001	91.7	0	4.2	4.0	3.8	3.1	2.5	1.2	0.4
2002	92	0	4.3	3.7	3.4	2.9	2.3	1.2	0.4
2003	86.8	0	3.7	3.0	2.8	2.5	2.0	0.8	0.3
2004	94.1	0	3.2	2.7	2.5	2.0	1.6	0.9	0.5
2005	99.5	0	3.2	2.8	2.5	2.2	1.7	1.0	0.4
2006	99.7	0	3.7	2.8	2.6	2.2	1.8	1.1	0.4

Daily peak Nitrogen dioxide data summary (1998-2006)

Year	Data Recovery (%)	No. of Exceedences (days)	Max conc. (ppm)	99th percentile (ppm)	98th percentile (ppm)	95th percentile (ppm)	90th percentile (ppm)	75th percentile (ppm)	50th percentile (ppm)
1998	70.9	0	0.045	0.039	0.034	0.030	0.028	0.023	0.016
1999	86.3	0	0.054	0.034	0.031	0.030	0.028	0.025	0.019
2000	90.0	0	0.042	0.034	0.031	0.028	0.026	0.022	0.018
2001	86.3	0	0.039	0.036	0.036	0.033	0.029	0.024	0.020
2002	88.3	0	0.045	0.036	0.034	0.031	0.026	0.022	0.017
2003	90.4	0	0.064	0.042	0.033	0.028	0.025	0.021	0.016
2004	91.8	0	0.040	0.033	0.031	0.028	0.026	0.022	0.018
2005	97.8	0	0.041	0.034	0.031	0.028	0.027	0.024	0.018
2006	98.4	0	0.044	0.036	0.033	0.031	0.029	0.024	0.019

Daily peak 1-hour ozone data summary (1998-2006)

Year	Data Recovery (%)	No. of Exceedences (days)	Max conc. (ppm)	99th percentile (ppm)	98th percentile (ppm)	95th percentile (ppm)	90th percentile (ppm)	75th percentile (ppm)	50th percentile (ppm)
1998	82.5	0	0.075	0.034	0.032	0.031	0.028	0.0221	0.018
1999	87.5	0	0.069	0.061	0.055	0.045	0.039	0.030	0.024
2000	57.9	0	0.054	0.047	0.044	0.041	0.032	0.027	0.022
2001	81.5	0	0.062	0.044	0.041	0.038	0.034	0.030	0.026
2002	93.5	0	0.063	0.055	0.052	0.047	0.042	0.032	0.024
2003	92.4	1	0.102	0.069	0.061	0.050	0.045	0.035	0.025
2004	94.1	0	0.064	0.56	0.054	0.048	0.044	0.038	0.030
2005	97.8	0	0.065	0.058	0.053	0.045	0.041	0.034	0.030
2006	99.7	0	0.067	0.060	0.057	0.052	0.049	0.040	0.032

Daily peak 4-hour ozone data summary (1998-2006)

Year	Data Recovery (%)	No. of Exceedences (days)	Max conc. (ppm)	99th percentile (ppm)	98th percentile (ppm)	95th percentile (ppm)	90th percentile (ppm)	75th percentile (ppm)	50th percentile (ppm)
1998	82.5	0	0.038	0.033	0.031	0.028	0.026	0.021	0.017
1999	87.5	0	0.063	0.054	0.046	0.042	0.036	0.029	0.024
2000	57.9	0	0.047	0.043	0.041	0.035	0.030	0.026	0.019
2001	81.5	0	0.051	0.041	0.038	0.035	0.032	0.028	0.024
2002	93.5	0	0.058	0.051	0.049	0.044	0.039	0.031	0.023
2003	92.4	1	0.082	0.063	0.058	0.048	0.043	0.033	0.025
2004	94.1	0	0.060	0.053	0.051	0.045	0.042	0.036	0.029
2005	97.5	0	0.062	0.054	0.049	0.044	0.039	0.033	0.029
2006	99.7	0	0.061	0.056	0.055	0.050	0.046	0.038	0.031

Daily peak PM10 data summary (1999-2006)

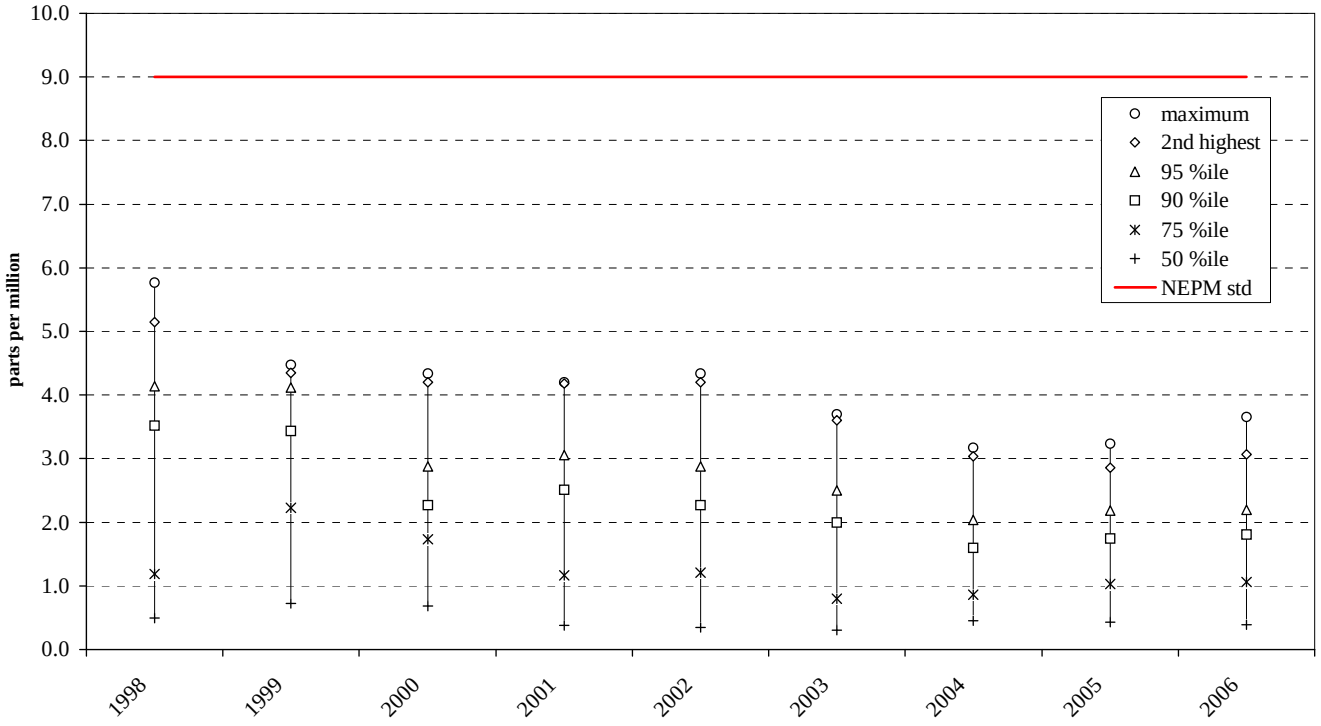
Year	Data Recovery (%)	No. of Exceedences (days)	Max conc. (ppm)	99th percentile (ppm)	98th percentile (ppm)	95th percentile (ppm)	90th percentile (ppm)	75th percentile (ppm)	50th percentile (ppm)
1999	9.0	4	65.11	65.0	64.9	63.6	51.3	37.7	21.1
2000	15.3	1	56.4	52.6	49.4	47.6	42.4	23.1	14.5
2001	15.9	4	70.6	66.1	61.9	56.2	45.6	25.0	13.9
2002	75	0	108.4	56.6	48.5	42.4	37.7	25.3	16.2
2003	97.5	13	350.4	136.4	105.3	39.6	30.3	21.2	14.6
2004	99.7	3	52.0	48.2	46.0	33.8	28.5	20.7	14.7
2005	97.5	10	98.8	57.6	52.7	37.3	31.0	21.2	14.5
2006	83.8	4	55.2	51.0	44.9	33.9	28.3	22.7	16.9

Daily peak PM2.5 data summary (2004-2006)

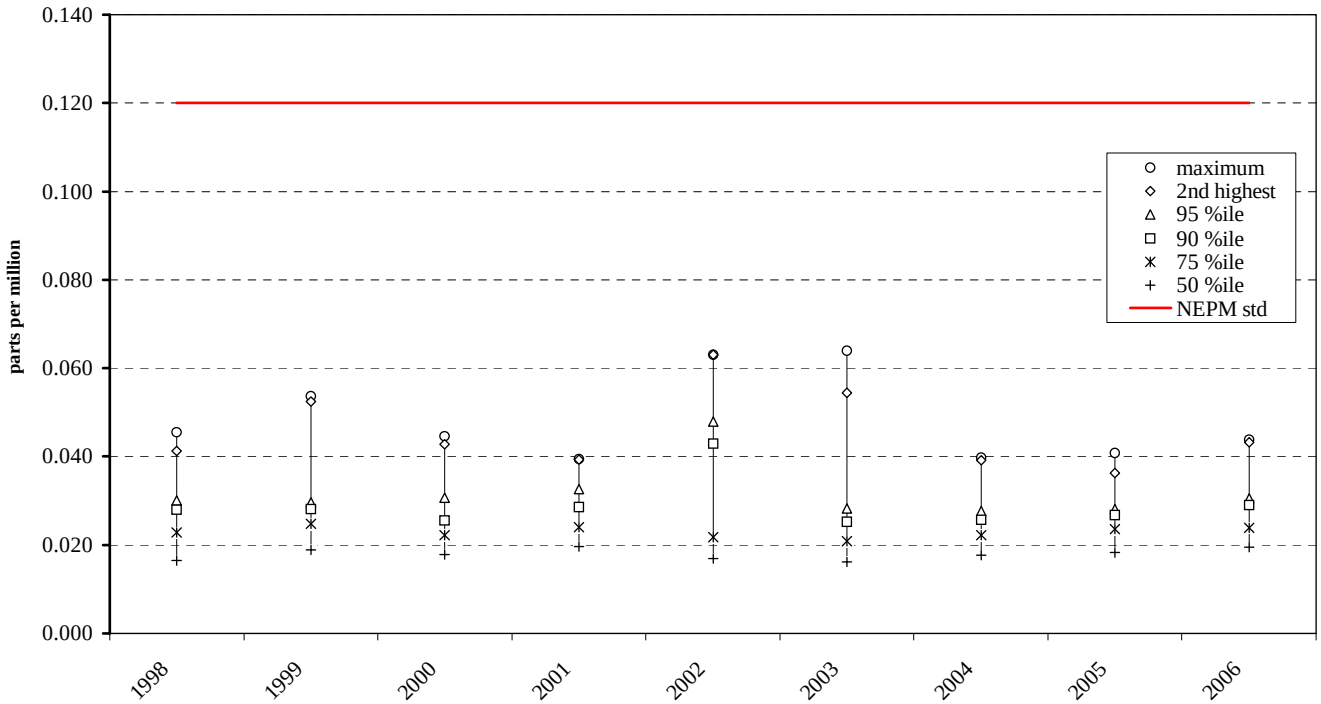
Year	Data Recovery (%)	No. of Exceedences (days)	Max conc. (ppm)	99th percentile (ppm)	98th percentile (ppm)	95th percentile (ppm)	90th percentile (ppm)	75th percentile (ppm)	50th percentile (ppm)
2004	93.1	15	38.3	35.8	31.5	23.5	16.6	9.5	6.2
2005	73.6	14	38.6	31.4	29.3	25.0	20.7	9.0	4.9
2006	83.3	20	46.9	35.6	33.3	27.8	15.6	8.7	5.8

Daily peak data summary graphs

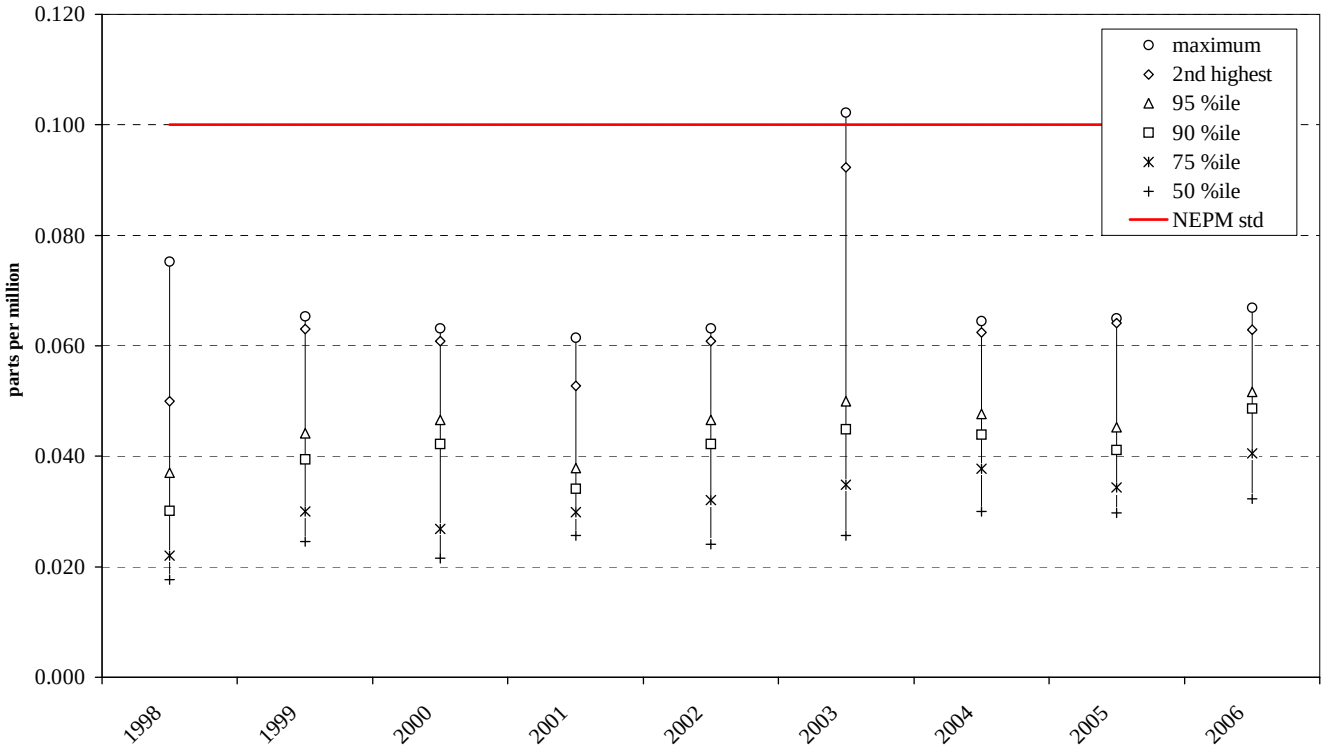
Carbon monoxide 8hr



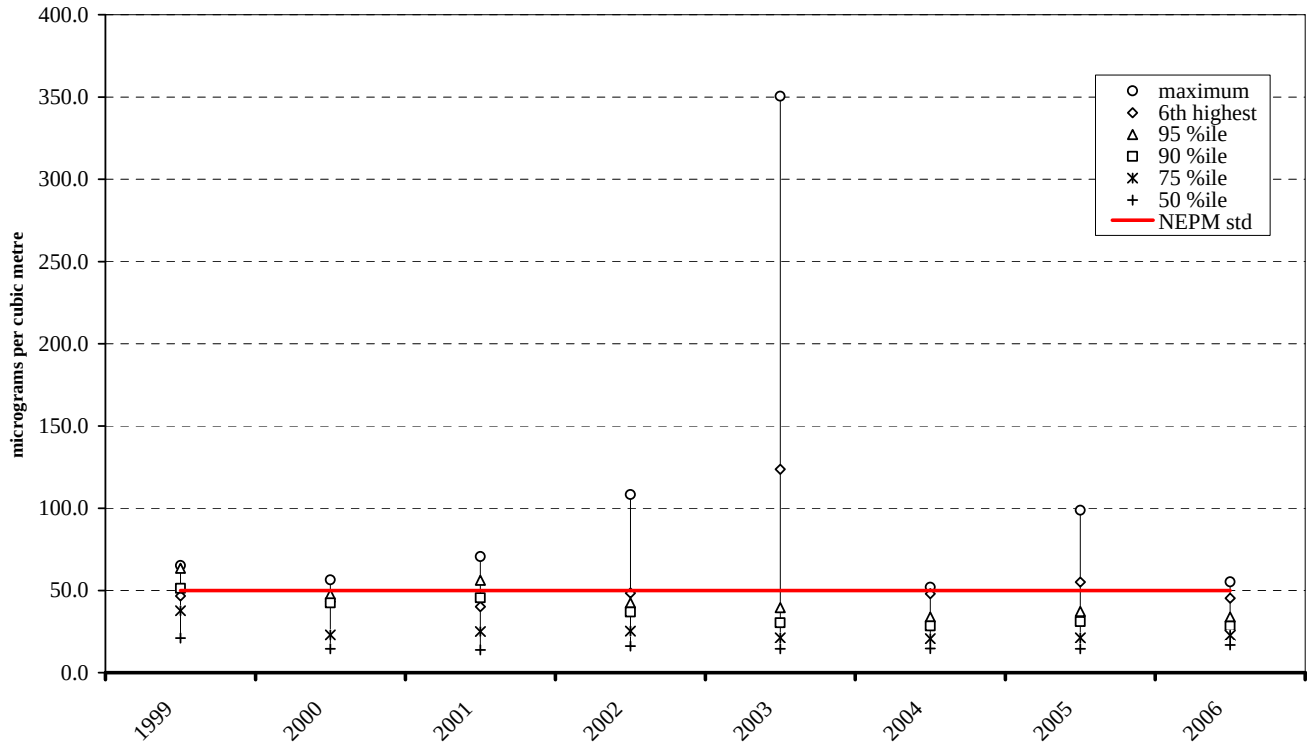
Nitrogen dioxide 1hr



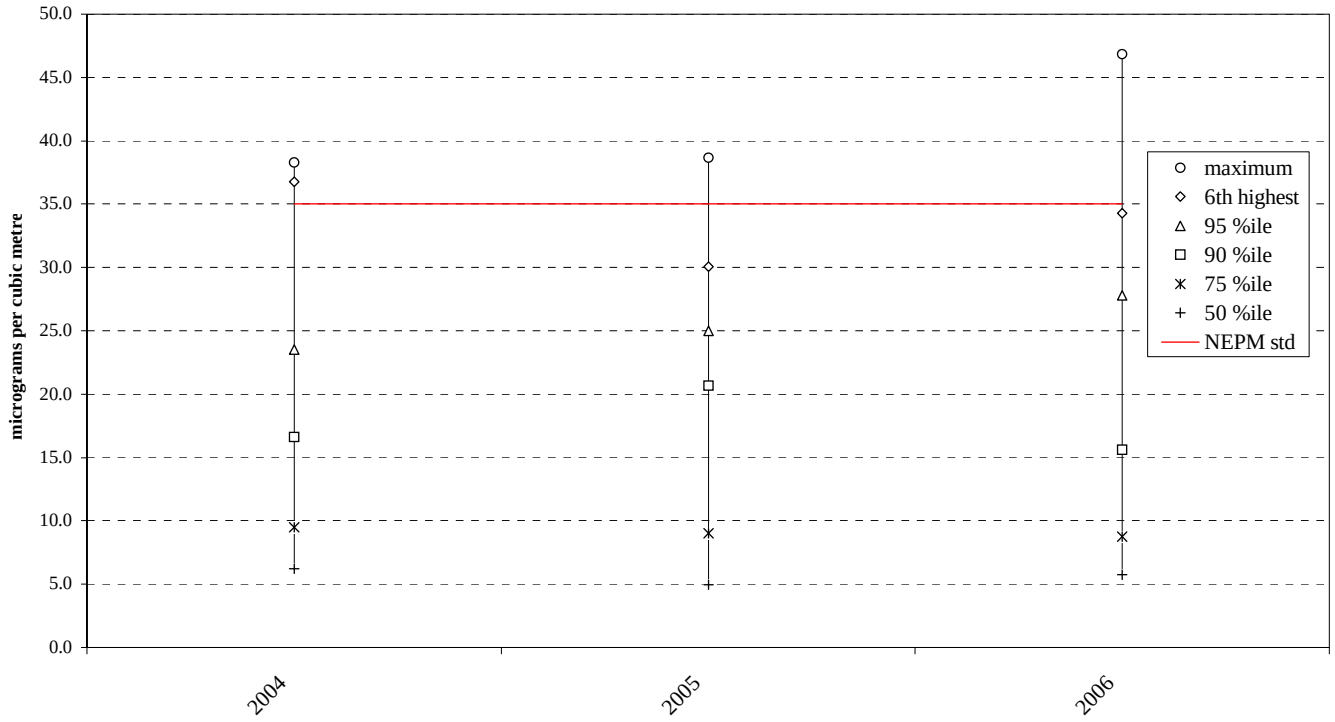
Ozone 1hr



PM10



PM2.5


micrograms per cubic metre
50.0
45.0
40.0
35.0
30.0
25.0
20.0
15.0
10.0
5.0
0.0
2004
2005
2006
maximum
6th highest
95 %ile
90 %ile
75 %ile
50 %ile
NEPM std