



**ACT**  
Government



# **ACT AIR QUALITY REPORT 2014**

**Environment Protection Authority | June 2015**

## TABLE OF CONTENTS

LIST OF TABLES.....	ii
LIST OF FIGURES.....	iii
LIST OF DEFINITIONS AND ABBREVIATIONS .....	iv
OVERVIEW.....	1
MONITORING SUMMARY .....	2
Current Performance Monitoring Stations.....	2
Monitoring Methods .....	3
NATA Accreditation Status .....	3
ASSESSMENT OF COMPLIANCE WITH STANDARDS AND 2008 GOAL.....	4
Carbon monoxide .....	6
Nitrogen dioxide .....	7
Ozone.....	9
PM <sub>10</sub> .....	12
PM <sub>2.5</sub> .....	14
ANALYSIS OF AIR QUALITY MONITORING.....	16
Carbon monoxide .....	16
Nitrogen dioxide .....	16
Ozone.....	17
PM <sub>10</sub> .....	17
PM <sub>2.5</sub> .....	18
ASSESSMENT OF PROGRESS TOWARDS ACHIEVING THE GOAL .....	19
APPENDIX A: STATISTICAL SUMMARY AND TRENDS .....	20
Carbon monoxide .....	20
Nitrogen dioxide .....	21
Ozone.....	22
PM <sub>10</sub> .....	26
PM <sub>2.5</sub> .....	28

## LIST OF TABLES

Table 1 Summary of stations' siting compliance with AS 3580.1.1:2007 .....	2
Table 2 Methods used for monitoring AAQ NEPM pollutants.....	3
Table 3: AAQ NEPM standards and goals .....	4
Table 4: 2014 compliance summary for CO .....	6
Table 5: 2014 compliance summary for NO <sub>2</sub> .....	7
Table 6: 2014 compliance summary for O <sub>3</sub> .....	9
Table 7: 2014 compliance summary for PM <sub>10</sub> .....	12
Table 8: 2014 compliance summary for PM <sub>2.5</sub> .....	14
Table 9: 2014 summary statistics for daily peak 8-hour CO .....	16
Table 10: 2014 summary statistics for daily peak 1-hour NO <sub>2</sub> .....	16
Table 11: 2014 summary statistics for daily peak 1-hour O <sub>3</sub> .....	17
Table 12: 2014 summary statistics for daily peak 4-hour O <sub>3</sub> .....	17
Table 13: 2014 summary statistics for daily peak PM <sub>10</sub> .....	17
Table 14: 2014 summary statistics for daily peak PM <sub>2.5</sub> .....	18
Table 15: Statistical summary for daily maximum 8-hour CO Monash 2005 – 2014 .....	20
Table 17: Statistical summary for daily maximum 1-hour NO <sub>2</sub> Monash 2005 – 2014 .....	21
Table 19: Statistical summary for daily maximum 1-hour O <sub>3</sub> Monash 2005 – 2014.....	22
Table 20: Statistical summary for daily maximum 1-hour O <sub>3</sub> Civic 2005 – 2014.....	23
Table 21: Statistical summary for daily maximum 4-hour O <sub>3</sub> Monash 2005 – 2014.....	24
Table 22: Statistical summary for daily maximum 4-hour O <sub>3</sub> Civic 2005 – 2014.....	25
Table 23: Statistical summary for daily maximum 24-hour PM <sub>10</sub> Monash 2005 – 2014.....	26
Table 24: Statistical summary for daily maximum 24-hour PM <sub>10</sub> Civic 2005 – 2014 .....	27
Table 25: Statistical summary for daily maximum 24-hour PM <sub>2.5</sub> Monash 2005 – 2014 .....	28

## LIST OF FIGURES

Figure 1: Daily max for CO 8-hour average – Monash .....	6
Figure 2: Daily max for CO 8-hour average – Florey .....	7
Figure 3: Daily max for NO <sub>2</sub> – Monash .....	8
Figure 4: Daily max for NO <sub>2</sub> – Florey .....	8
Figure 5: Daily max for 1 hour O <sub>3</sub> – Monash.....	9
Figure 6: Daily max for 1 hour O <sub>3</sub> – Civic .....	10
Figure 7: Daily max for 1 hour O <sub>3</sub> – Florey.....	10
Figure 8: Daily max for 4 hours O <sub>3</sub> - Monash.....	11
Figure 9: Daily max for 4 hours O <sub>3</sub> – Civic.....	11
Figure 10: Daily max for 4 hours O <sub>3</sub> – Florey .....	12
Figure 11: Daily max for PM <sub>10</sub> – Monash.....	13
Figure 12: Daily max for PM <sub>10</sub> – Civic.....	13
Figure 13: Daily max for PM <sub>10</sub> – Florey .....	14
Figure 14: Daily max for PM <sub>2.5</sub> – Monash .....	15
Figure 15: Daily max for PM <sub>2.5</sub> – Florey .....	15
Figure 16: Statistical summary for daily maximum 8-hour CO Monash 2005 – 2014 .....	20
Figure 17: Statistical summary for daily maximum 1-hour NO <sub>2</sub> Monash 2005 – 2014.....	21
Figure 18: Annual average 1-hour NO <sub>2</sub> Monash 2005 – 2014.....	22
Figure 19: Statistical summary for daily maximum 1-hour O <sub>3</sub> Monash 2005 – 2014.....	23
Figure 20: Statistical summary for daily maximum 1-hour O <sub>3</sub> Civic 2005 – 2014 .....	24
Figure 21: Statistical summary for daily maximum 4-hour O <sub>3</sub> Monash 2005 – 2014.....	25
Figure 22: Statistical summary for daily maximum 4-hour O <sub>3</sub> Civic 2005 – 2014 .....	26
Figure 23: Statistical summary for daily maximum 24-hour PM <sub>10</sub> Monash 2005 – 2014 .....	27
Figure 24: Statistical summary for daily maximum 24-hour PM <sub>10</sub> Civic 2005 – 2014 .....	28
Figure 25: Statistical summary for daily maximum 24-hour PM <sub>2.5</sub> Monash 2005 – 2014.....	29
Figure 26: Annual average 24-hour PM <sub>2.5</sub> Monash 2005 - 2014 .....	29

## LIST OF DEFINITIONS AND ABBREVIATIONS

Term	Definition
AAQ NEPM	National Environment Protection (Ambient Air Quality ) Measure
ACT	Australian Capital Territory
CO	Carbon Monoxide
BAM	Beta Attenuation Monitor
NATA	National Association of Testing Authorities
ND	Not Demonstrated
NO <sub>2</sub>	Nitrogen Dioxide
O <sub>3</sub>	Ozone
PMS	Performance Monitoring Station
PM <sub>2.5</sub>	Particles with an equivalent aerodynamic diameter less than or equal to 2.5 Micrometers
PM <sub>10</sub>	Particles with an equivalent aerodynamic diameter less than or equal to 10 Micrometers
ppm	Parts per million by volume – parts of pollutant per million parts of air
Q	Quarter (e.g. Q1 means the first quarter of the year)
SO <sub>2</sub>	Sulfur Dioxide
µg/m <sup>3</sup>	micrograms per cubic metre

## OVERVIEW

This report presents the results of ambient air quality monitoring in the ACT for the 2014 calendar year and assesses them in accordance with the requirements of the National Environment Protection (Ambient Air Quality) Measure (AAQ NEPM) which was made by the National Environment Protection Council on 26 June 1998.

The AAQ NEPM establishes:

- requirements for monitoring air quality;
- air quality standards that are levels of specified pollutants against which air quality can be assessed; and
- a goal that the air quality standards be met to the extent specified in the NEPM. Recognising that certain events can impact on air quality, the NEPM specifies a maximum number of days on which it is permissible to exceed the standard.

The ACT monitors four of the six NEPM pollutants, namely carbon monoxide (CO), nitrogen dioxide (NO<sub>2</sub>), photochemical oxidants as ozone (O<sub>3</sub>) and particulate matter (particles less than 10 microns in diameter – PM<sub>10</sub> and particles less than 2.5 microns in diameter – PM<sub>2.5</sub>). Due to a lack of heavy industry, the ACT has never monitored sulfur dioxide (SO<sub>2</sub>) as it is primarily an industrial pollutant, and lead monitoring ceased in 2002 with the phase out of leaded petrol. Monitoring was performed in accordance with the ACT's monitoring plan, AAQ NEPM Technical Papers and ACT Health's accreditation by the National Association of Testing Authorities (NATA).

This is the first year that the ACT's Air Quality Report includes the data from the new monitoring station located in Florey.

Monitoring results demonstrate that Canberra's air quality is excellent compared to other capital cities, with no exceedences of the AAQ NEPM standards for CO, NO<sub>2</sub>, O<sub>3</sub>, and PM<sub>10</sub>. The major impacts on Canberra's air quality in 2014 came from the accumulation of combustion particles from hazard reduction burns.

There were four exceedences of the PM<sub>2.5</sub> 24-hour advisory reporting standard measured at Monash. Three exceedences occurred on 4, 10 and 23 February 2014 respectively due to smoke coming from a number of hazard reduction burns in NSW. The other exceedence happened on 3 August 2014 due to domestic wood heater emissions.

## MONITORING SUMMARY

### Current Performance Monitoring Stations

The ACT Government has been undertaking ambient air quality monitoring in Canberra since the early 1990's. The Health Directorate is responsible for the Government's ambient air quality monitoring network. The Environment Protection Authority within the Chief Minister, Treasury and Economic Development Directorate is responsible for annual reporting under the AAQ NEPM.

The AAQ NEPM monitoring network in the ACT currently consists of three monitoring stations at Monash, Civic and Florey respectively. The Monash station is approximately 300 metres west of Cockcroft Avenue in the Monash district playing fields. The Civic station is located at the northern end of the carpark on the western side of the Olympic swimming pool adjacent to Allara Street. The Florey station, which has been operational since 28 February 2014, is located at the end of Neumann Place, Florey in public land. The compliance and non-compliance criteria for the above stations against the siting standard AS/NZS 3580.1.1:2007 are listed in Table 1 below.

**Table 1 Summary of stations' siting compliance with AS 3580.1.1:2007**

Station	Height above ground	Minimum distance to support structure	Clear sky angle of 120°	Unrestricted airflow of 270°/360°	20m from trees	No boilers or incinerators nearby	Minimum distance from road or traffic
Monash	☑	☑	☑	☑	☑	☑	☑
Civic	☑	☒	☒	☒	☒	☑	☒
Florey	☑	☑	☑	☑	☑	☑	☑

Both Monash and Florey stations contain instrumentation that continuously monitors CO, O<sub>3</sub>, NO<sub>2</sub>, PM<sub>10</sub>, and PM<sub>2.5</sub>. Following the establishment of the Florey station, the Civic station now only monitors O<sub>3</sub> and PM<sub>10</sub>.

## Monitoring Methods

The ACT monitoring is conducted in accordance with the relevant Australian standards as shown in Table 2. Data not meeting the requirements of these Standards are identified as invalid and not included in this report.

**Table 2 Methods used for monitoring AAQ NEPM pollutants**

Pollutant	Standard	Title	Method Used
Carbon Monoxide	AS 3580.7.1-2011	Ambient Air – Determination of Carbon Monoxide – Direct Reading Instrument Method	Gas filter correlation/ Infrared.
Nitrogen dioxide	AS 3580.5.1-2011	Ambient Air – Determination of Oxides of Nitrogen – Chemiluminescence Method	Gas phase chemiluminescence.
Photochemical oxidant (ozone)	AS 3580.6.1-2011	Ambient Air – Determination of Ozone – Direct Reading Instrument Method	Non-dispersive ultraviolet.
Particles PM <sub>10</sub>	AS 3580.9.11-2008	Method for sampling and analysis of ambient air Method – Determination of suspended particles matter – PM <sub>10</sub> beta attenuation monitors	Beta Attenuation Monitor (BAM)
PM <sub>10</sub>	AS/NZS 3580.9.6-2005	Methods for sampling and analysis of ambient air - Determination of suspended particulate matter - PM <sub>10</sub> high volume sampler with size-selective inlet - Gravimetric method	Gravimetric reference method
PM <sub>2.5</sub>	AS/NZS 3580.9.10-2006	Reference Method for the Determination of Fine Particulate matter as PM <sub>2.5</sub> in the Atmosphere	Gravimetric reference method

## NATA Accreditation Status

The ACT Government monitoring network is accredited by NATA for the measurement of all AAQ NEPM pollutants except SO<sub>2</sub> as required under Clause 12 of the AAQ NEPM.



## ASSESSMENT OF COMPLIANCE WITH STANDARDS AND 2008

### GOAL

For the purpose of this report, air quality is assessed against the AAQ NEPM standards and goals as specified in Schedule 2 of the AAQ NEPM and reproduced in Table 3.

The standards against which air quality is assessed are concentrations in parts per million (ppm) or micrograms per cubic metre ( $\mu\text{g}/\text{m}^3$ ) (refer to column 3, Table 3).

The goal of the AAQ NEPM is to achieve the Standards as assessed in accordance with the monitoring protocol within 10 years of commencement (i.e. 2008) to the extent specified in Schedule 2 of the AAQ NEPM. The extent is expressed as a maximum allowable number of exceedences for each standard (shown in column 4, Table 3). These are set to account for unusual meteorological conditions and, in the case of particles, natural events such as dust storms and bushfires, which cannot be controlled through normal air quality management programs.

The AAQ NEPM also specifies advisory reporting standards for  $\text{PM}_{2.5}$ . The goal for  $\text{PM}_{2.5}$  is to collect sufficient data to facilitate a review of the  $\text{PM}_{2.5}$  standards, which has been completed through the review of the AAQ NEPM.

**Table 3: AAQ NEPM standards and goals**

<b>Pollutant</b>	<b>Averaging Period</b>	<b>Maximum concentration</b>	<b>Goal within 10 years Maximum allowable exceedences</b>	<b>Monitoring Station</b>
Carbon monoxide	8 hours	9.0 ppm	1 day a year	Monash Florey
Nitrogen dioxide	1 hour 1 year	0.12 ppm 0.03 ppm	1 day a year none	Monash Florey
Photochemical oxidants	1 hour 4 hours	0.10 ppm 0.08 ppm	1 day a year 1 day a year	Monash Florey Civic
Sulfur dioxide	1 hour 1 day 1 year	0.20 ppm 0.08 ppm 0.02 ppm	1 day a year 1 day a year none	Not monitored
Lead	1 year	$0.050 \mu\text{g}/\text{m}^3$	none	Not monitored
Particles as $\text{PM}_{10}$	1 day	$50 \mu\text{g}/\text{m}^3$	5 days a year	Monash Florey Civic
Particles as $\text{PM}_{2.5}$	1 day 1 year	$25 \mu\text{g}/\text{m}^3$ $8 \mu\text{g}/\text{m}^3$	Not applicable Not applicable	Monash Florey

The following tables (Table 4 to Table 8) summarise compliance with the standards and goals of the AAQ NEPM. For each pollutant, the data availability (quarterly and annual), the number of days when standards were exceeded, the annual mean (where an annual standard exists) and an assessment of compliance, are given for each monitoring station.

Air quality is assessed as complying with the AAQ NEPM (i.e. 'MET') if the number of exceedences is no more than the number specified in Schedule 2 of the AAQ NEPM and data availability was at least 75% in each quarter of the year.

Air quality is assessed as not complying with the AAQ NEPM (i.e. 'NOT MET') if there is more than the number of exceedences specified in Schedule 2 of the AAQ NEPM.

Air quality is assessed as 'NOT DEMONSTRATED' (ND) if there has been insufficient data collected to demonstrate that the standards and goal have been met or not met.

During 2014, compliance was not demonstrated at Florey as this station was only fully operational from 28 February 2014 onwards and did not meet the 75% minimum data availability requirement in the first quarter.

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

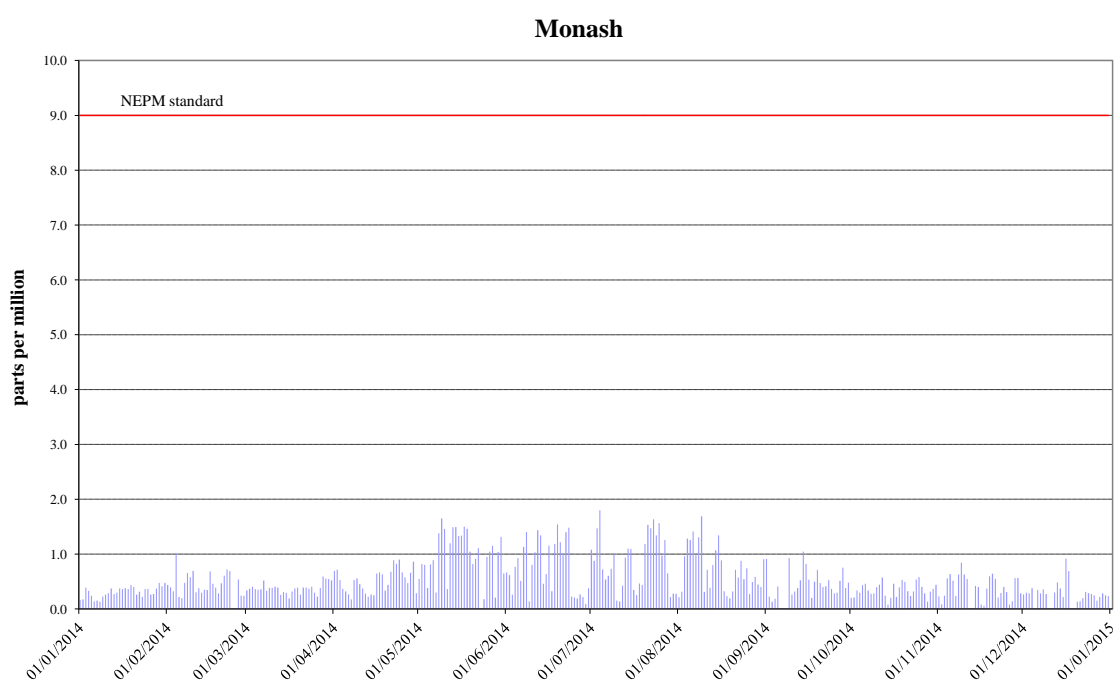
## Carbon monoxide

During 2014, no exceedences of the CO standard were recorded in the ACT and compliance against the AAQ NEPM goal was demonstrated at Monash.

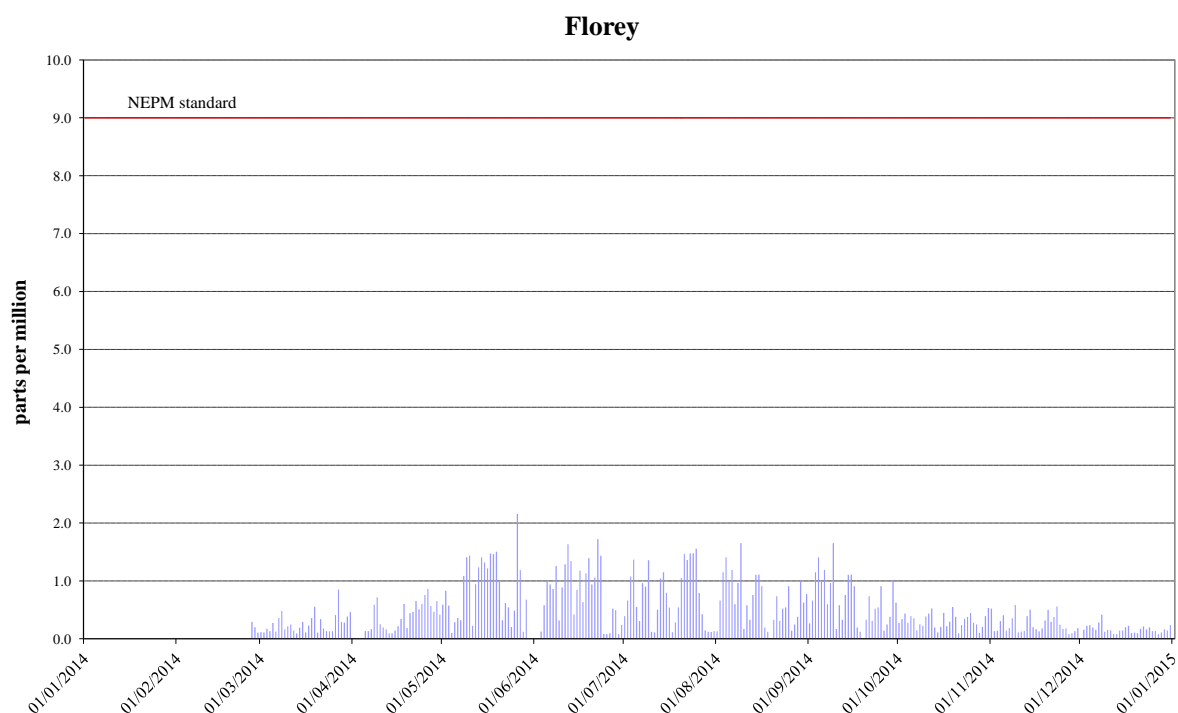
**Table 4: 2014 compliance summary for CO**

AAQ NEPM standard - 9.0 ppm (8-hour average)

Performance monitoring station	Data availability rates (% of hours)					Number of exceedences (days)	Performance against the standards and goal
	Q1	Q2	Q3	Q4	Annual		
Monash	94.7	94.9	93.7	92.7	94.0	0	MET
Florey	36.6	89.0	95.4	95.1	79.2	0	ND



**Figure 1: Daily max for CO 8-hour average – Monash**



**Figure 2: Daily max for CO 8-hour average – Florey**

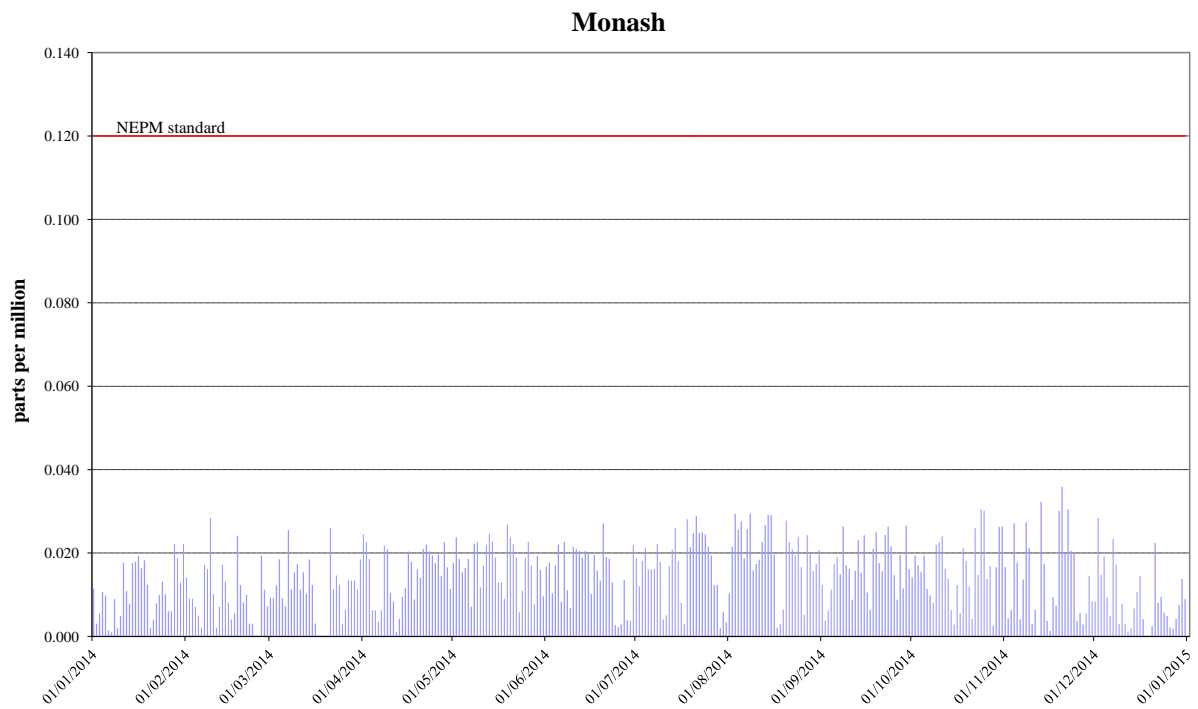
## Nitrogen dioxide

During 2014, no exceedences of the NO<sub>2</sub> standards were recorded in the ACT. Compliance against the AAQ NEPM goal was demonstrated at Monash.

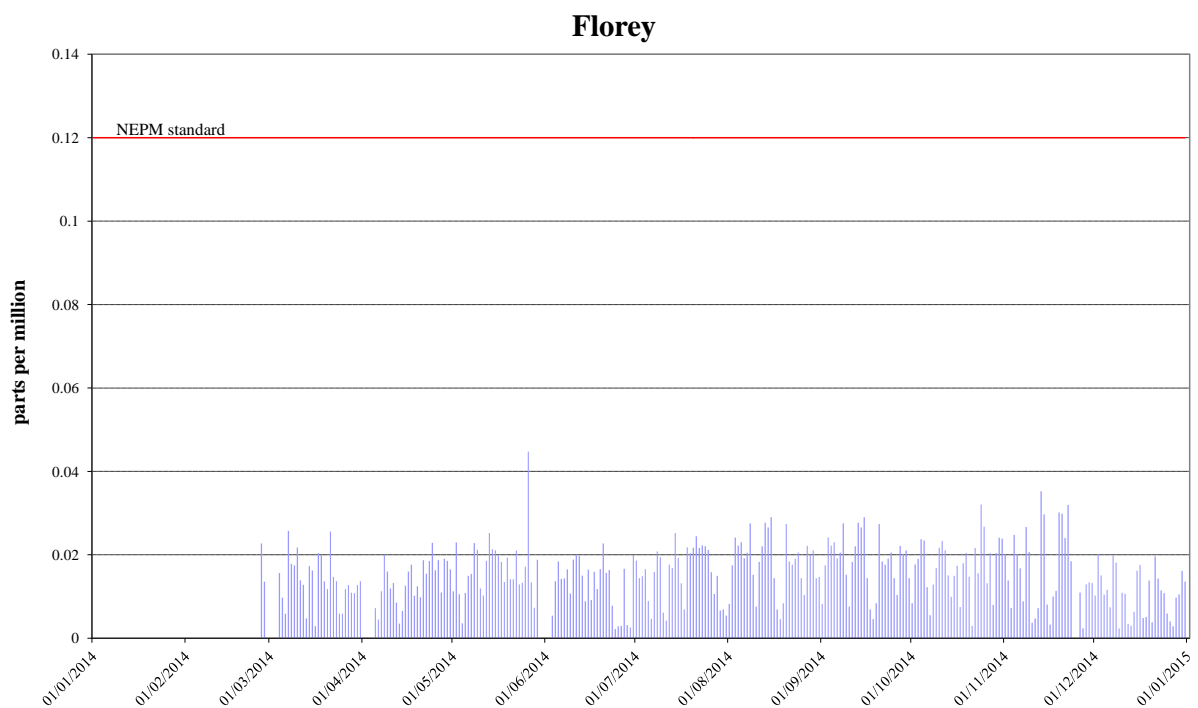
**Table 5: 2014 compliance summary for NO<sub>2</sub>**

AAQ NEPM standard – 0.12 ppm (1-hour average), 0.03 ppm (1-year average)

Performance monitoring station	Data availability rates (% of hours)					Annual mean Concentration (ppm)	Number of 1 hour exceedences (days)	Performance against the standards and goal	
								1 hour	1 year
	Q1	Q2	Q3	Q4	Annual				
Monash	91.4	94.9	95.7	94.5	94.1	0.005	0	MET	MET
Florey	33.4	89.0	95.4	94.5	78.3	0.006	0	ND	ND



**Figure 3: Daily max for NO<sub>2</sub> – Monash**



**Figure 4: Daily max for NO<sub>2</sub> – Florey**

## Ozone

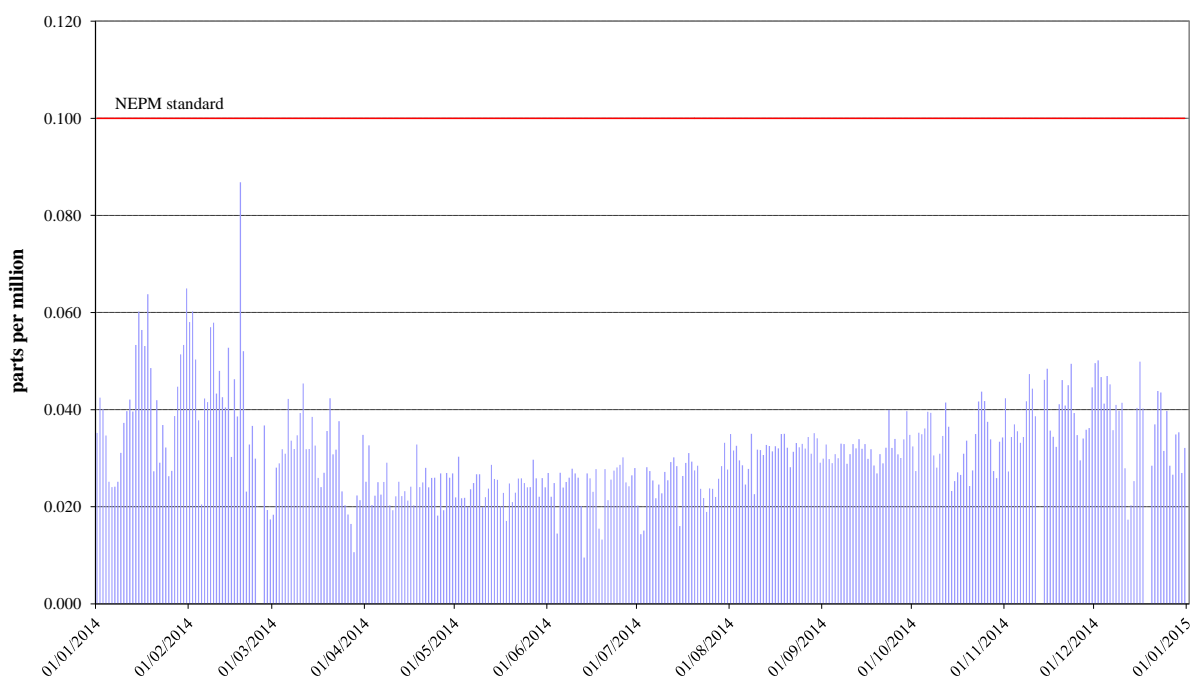
During 2014, no exceedences of the 1-hour and 4-hour standards for O<sub>3</sub> were recorded in the ACT, and compliance against the AAQ NEPM goal was demonstrated at Monash and Civic.

**Table 6: 2014 compliance summary for O<sub>3</sub>**

AAQ NEPM standard – 0.10 ppm (1-hour average), 0.08 ppm (4-hour average)

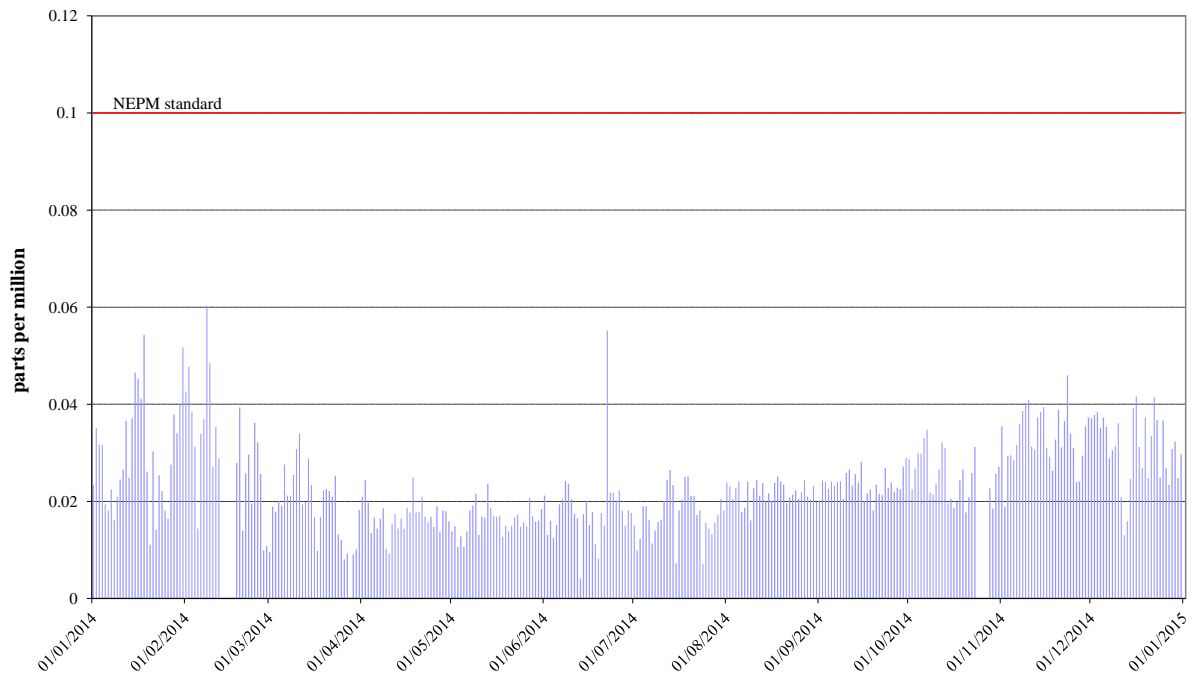
Performance monitoring station	Data availability rates (% of hours)					Number of exceedences (days)		Performance against the standards and goal	
	Q1	Q2	Q3	Q4	Annual	1 hour	4 hours	1 hour	4 hours
Monash	94.8	95.8	95.7	92.9	94.8	0	0	MET	MET
Civic	91.6	95.7	95.5	93.1	94.0	0	0	MET	MET
Florey	36.5	89.0	95.6	95.7	79.4	0	0	ND	ND

### Monash



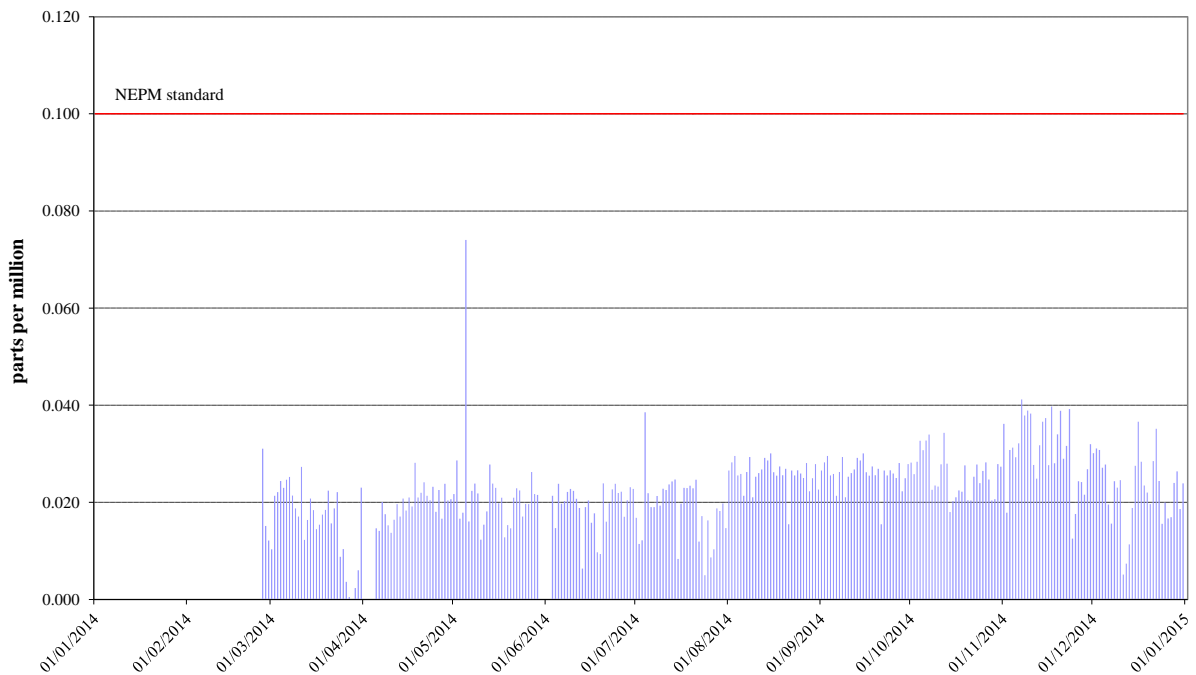
**Figure 5: Daily max for 1 hour O<sub>3</sub> – Monash**

### Civic

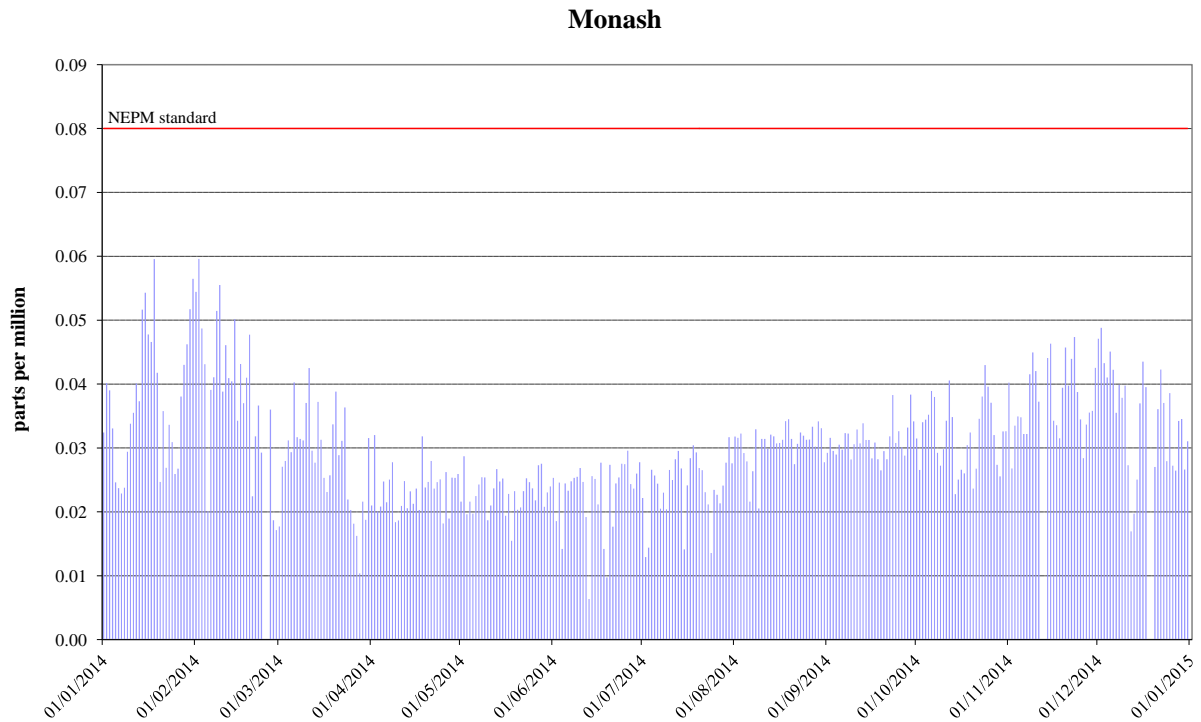


**Figure 6: Daily max for 1 hour O<sub>3</sub> – Civic**

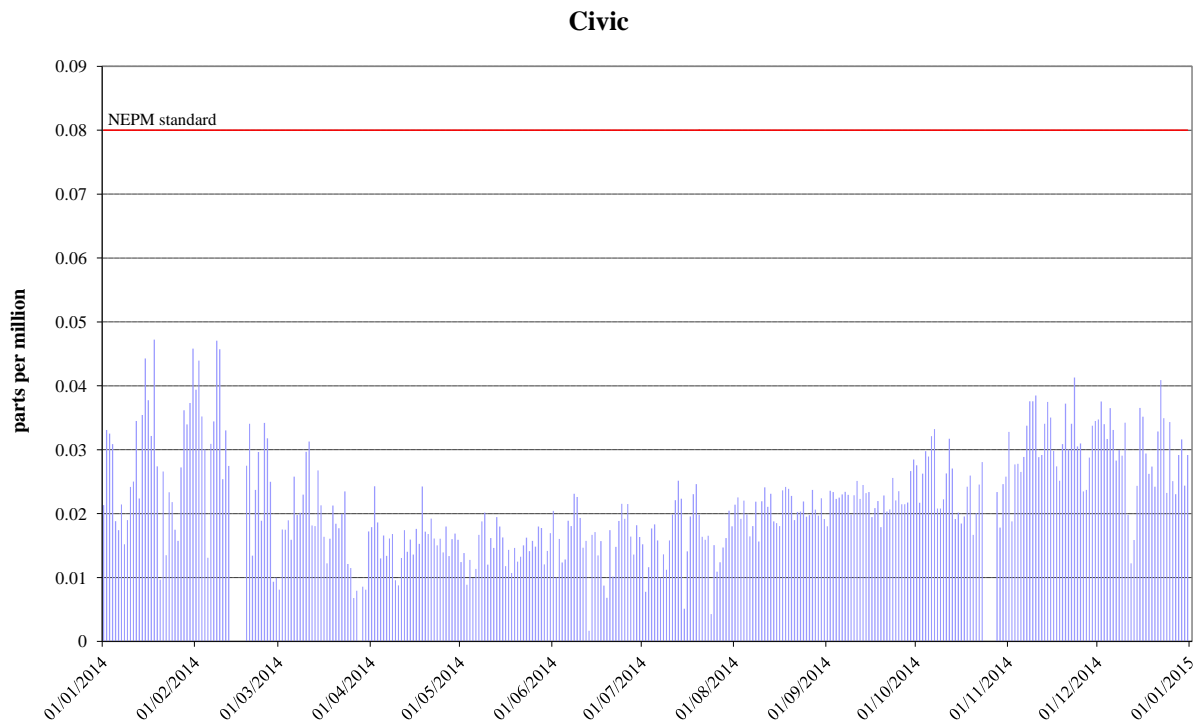
### Florey



**Figure 7: Daily max for 1 hour O<sub>3</sub> – Florey**



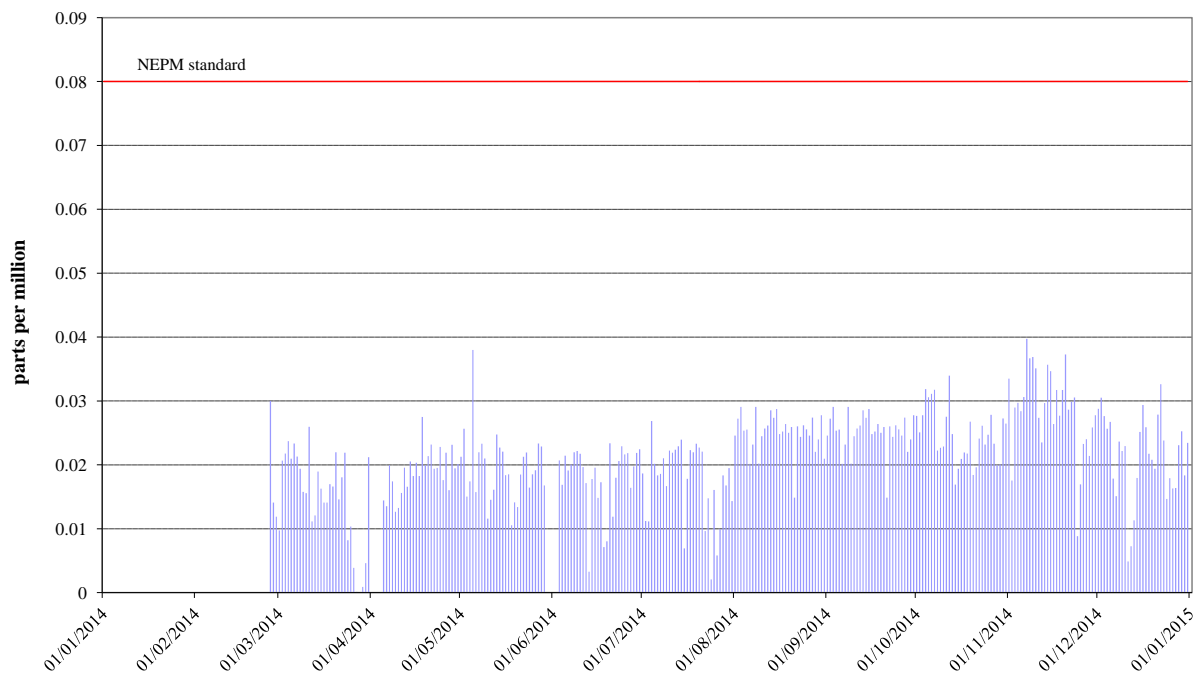
**Figure 8: Daily max for 4 hours O<sub>3</sub> - Monash**



**Figure 9: Daily max for 4 hours O<sub>3</sub> – Civic**



### Florey



**Figure 10: Daily max for 4 hours O<sub>3</sub> – Florey**

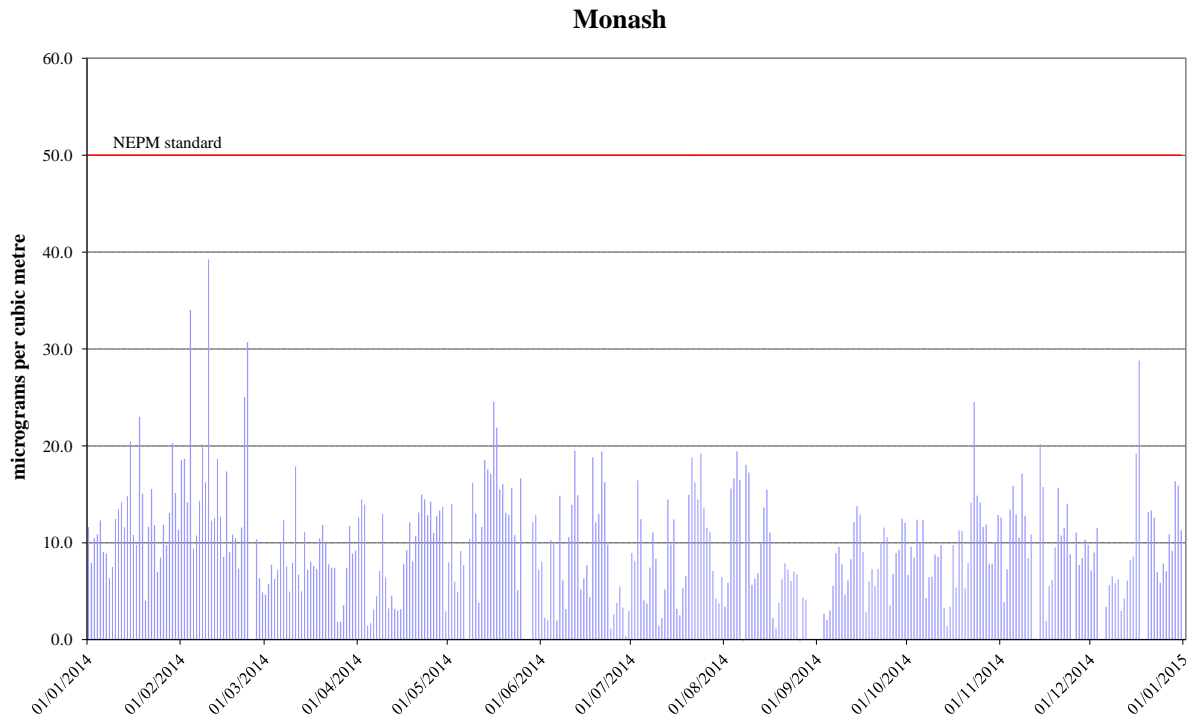
### PM<sub>10</sub>

During 2014, no exceedences of the 24-hour PM<sub>10</sub> standard were recorded in the ACT. Compliance against the AAQ NEPM goal was demonstrated at Monash and Civic.

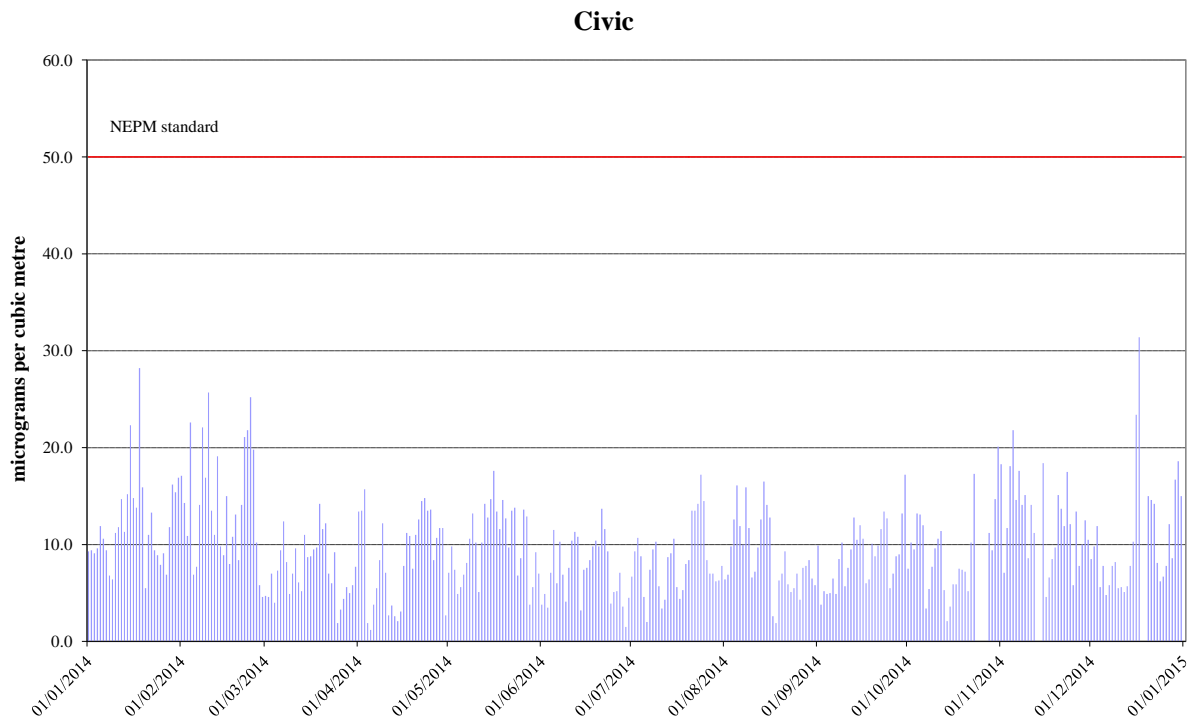
**Table 7: 2014 compliance summary for PM<sub>10</sub>**

AAQ NEPM standard 50 µg/m<sup>3</sup> 1-day average

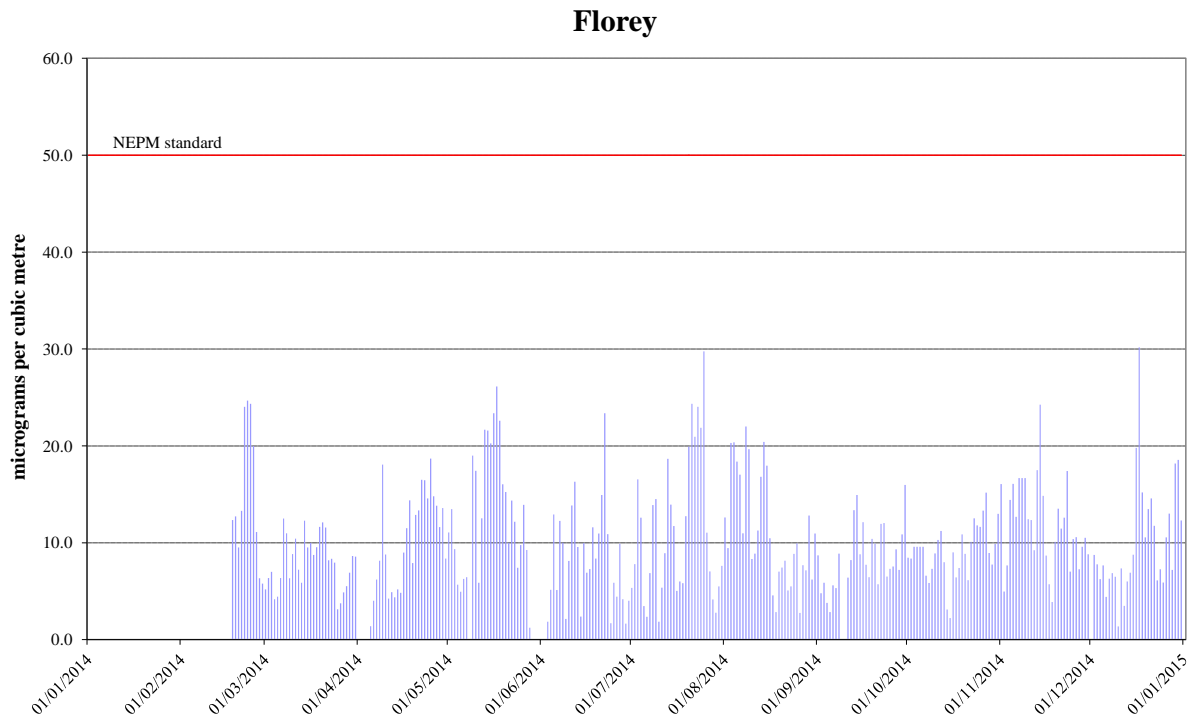
Performance monitoring station	Data availability rates (% of days)					Number of exceedences (days)	Performance against the standards and goal
	Q1	Q2	Q3	Q4	Annual		
Monash	100	100	100	91.3	97.8	0	MET
Civic	97.8	95.6	94.6	92.4	95.1	0	MET
Florey	46.7	89.0	97.8	98.9	83.3	0	ND



**Figure 11: Daily max for PM<sub>10</sub> – Monash**



**Figure 12: Daily max for PM<sub>10</sub> – Civic**



**Figure 13: Daily max for PM<sub>10</sub> – Florey**

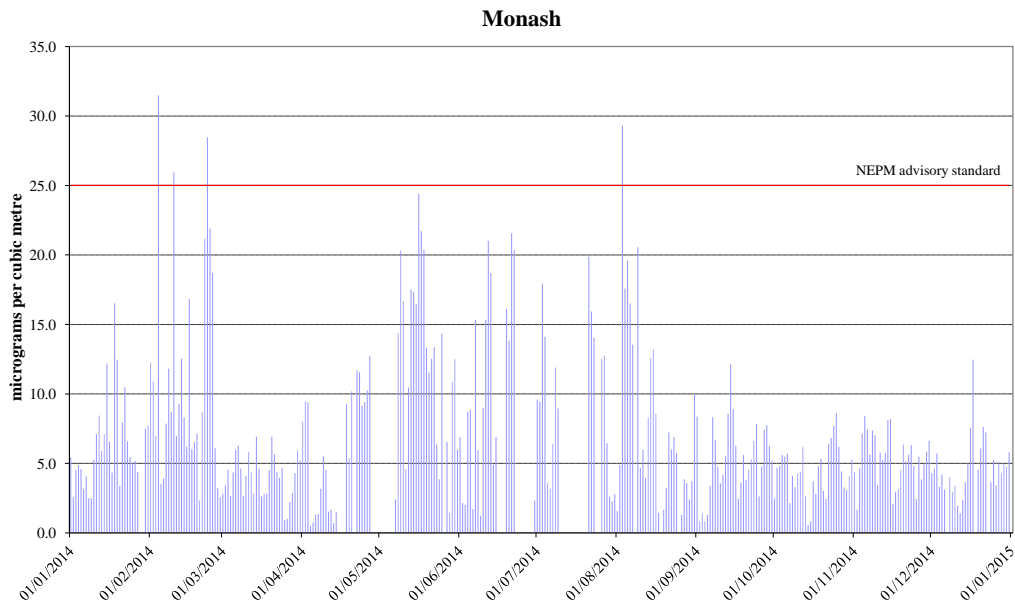
## PM<sub>2.5</sub>

Four exceedences of the 24-hour advisory reporting standard were recorded at Monash during 2014.

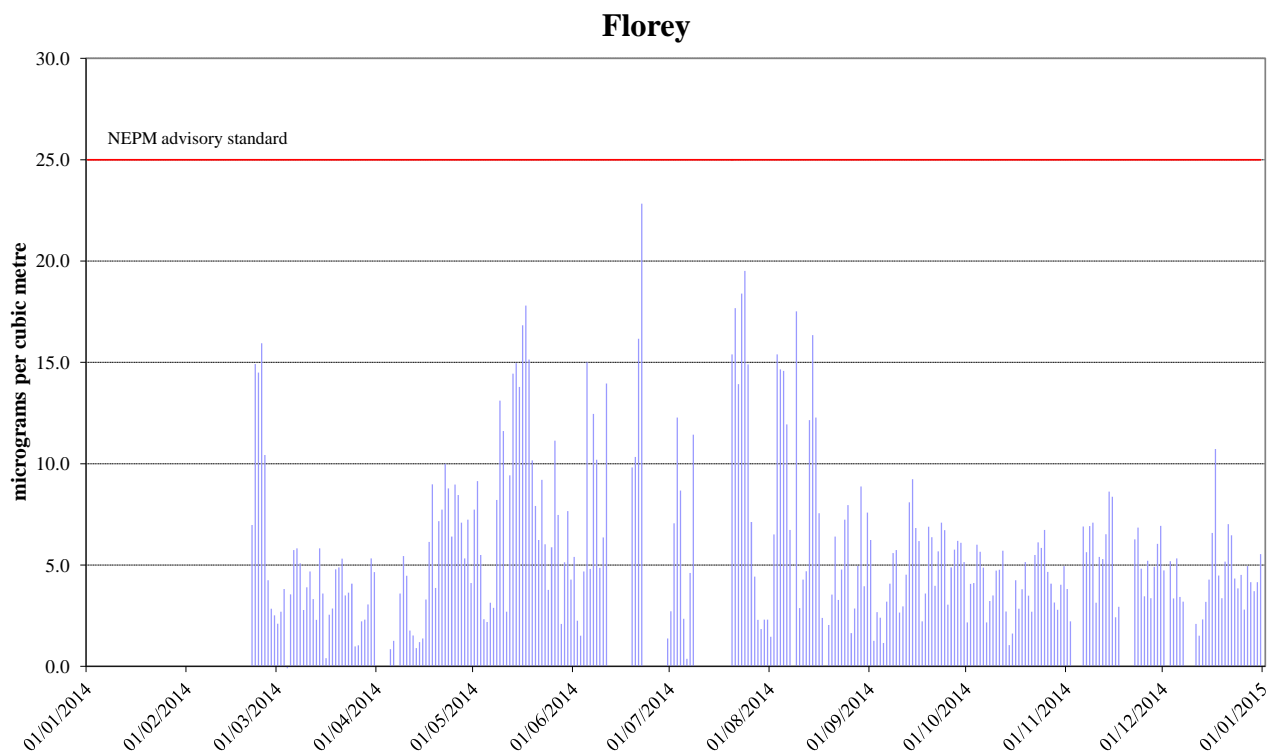
**Table 8: 2014 compliance summary for PM<sub>2.5</sub>**

AAQ NEPM standard – 25 µg/m<sup>3</sup> (1-day), 8 µg/m<sup>3</sup> (1-year)

Performance monitoring station	Data availability rates (% of days)					Annual mean Concentration (µg/m <sup>3</sup> )	Number of exceedences (days)
	Q1	Q2	Q3	Q4	Annual		
Monash	97.8	73..6	82.6	96.7	87.7	7.1	4
Florey	43.3	79.1	85.9	88.0	74.2	5.9	0



**Figure 14: Daily max for PM<sub>2.5</sub> – Monash**



**Figure 15: Daily max for PM<sub>2.5</sub> – Florey**

## ANALYSIS OF AIR QUALITY MONITORING

Annual summary statistics contained in Table 9 to Table 14 below allow assessment of air quality against the standards and the extent of compliance with the goal. Instances where the standard or goal has been exceeded are highlighted in bold. The AAQ NEPM states that the short-term standards should not be exceeded on more than one day for CO, NO<sub>2</sub> and O<sub>3</sub>, and on no more than five days per year for PM<sub>10</sub>. The second highest daily value for the year (or the sixth for PM<sub>10</sub>) indicates the extent to which the standards are or are not met.

### Carbon monoxide

**Table 9: 2014 summary statistics for daily peak 8-hour CO**

AAQ NEPM standard - 9.0 ppm (8-hour average)

Performance monitoring station	Number of valid days	Highest (ppm)	Highest (date/time)	2 <sup>nd</sup> Highest (ppm)	2 <sup>nd</sup> Highest (date/time)
Monash	365	1.8	04 Jul 03:00	1.7	09 Aug 06:00
Florey	309	2.2	26 May 20:00	1.7	22 Jun 05:00

Carbon monoxide levels are well below the AAQ NEPM standard. The highest recorded value in the ACT during 2014 was 2.2ppm at Florey, which is 24% of the standard.

### Nitrogen dioxide

**Table 10: 2014 summary statistics for daily peak 1-hour NO<sub>2</sub>**

AAQ NEPM standard 0.12 ppm (1-hour average)

Performance monitoring station	Number of valid days	Highest (ppm)	Highest (date/time)	2 <sup>nd</sup> Highest (ppm)	2 <sup>nd</sup> Highest (date/time)
Monash	365	0.036	20 Nov 21:00	0.032	13 Nov 21:00
Florey	309	0.045	26 May 13:00	0.035	13 Nov 21:00

Nitrogen dioxide levels are well below the AAQ NEPM standard and have remained stable over the last decade. The highest recorded 1-hour value during 2014 was 0.045ppm at Florey, which is only 38% of the standard. The highest recorded annual average in 2014 was 0.006ppm at Florey (refer to table 5). This is 20% of the annual standard 0.03ppm.

## Ozone

**Table 11: 2014 summary statistics for daily peak 1-hour O<sub>3</sub>**

AAQ NEPM standard 0.10 ppm (1-hour average)

Performance monitoring station	Number of valid days	Highest (ppm)	Highest (date/time)	2 <sup>nd</sup> Highest (ppm)	2 <sup>nd</sup> Highest (date/time)
Monash	365	0.087	18 Feb 22:00	0.065	31 Jan 10:00
Civic	365	0.060	08 Feb 11:00	0.055	22 Jun 00:00
Florey	309	0.074	05 May 13:00	0.041	07 Nov 14:00

**Table 12: 2014 summary statistics for daily peak 4-hour O<sub>3</sub>**

AAQ NEPM standard 0.08 ppm (4-hour average)

Performance monitoring station	Number of valid days	Highest (ppm)	Highest (date/time)	2 <sup>nd</sup> Highest (ppm)	2 <sup>nd</sup> Highest (date/time)
Monash	365	0.060	02 Feb 17:00	0.060	18 Jan 12:00
Civic	365	0.047	18 Jan 18:00	0.047	08 Feb 13:00
Florey	309	0.040	07 Nov 16:00	0.038	05 May 10:00

Ozone levels are below the AAQ NEPM standard. The highest recorded 1-hour value in the ACT during 2014 was 0.087ppm at Monash, which is 87% of the standard. The highest recorded 4-hour value in the ACT during 2014 was 0.060ppm at Monash, which is 75% of the standard.

## PM<sub>10</sub>

**Table 13: 2014 summary statistics for daily peak PM<sub>10</sub>**

AAQ NEPM standard 50 µg/m<sup>3</sup> (24-hour average)

Performance monitoring station	Number of valid days	Highest (µg/m <sup>3</sup> )	Highest (date)	6 <sup>th</sup> Highest (µg/m <sup>3</sup> )	6 <sup>th</sup> Highest (date)
Monash	347	39.3	10 February	24.6	15 May
Civic	357	31.4	17 December	22.6	04 February
Florey	304	30.2	17 December	24.4	24 February

PM<sub>10</sub> levels are below the AAQ NEPM standard. The highest PM<sub>10</sub> level recorded during 2014 was 39.3µg/m<sup>3</sup> at Monash on 10 February 2014.

## PM<sub>2.5</sub>

**Table 14: 2014 summary statistics for daily peak PM<sub>2.5</sub>**

AAQ NEPM standard 25 µg/m<sup>3</sup> (24-hour average)

Performance monitoring station	Number of valid days	Highest (µg/m <sup>3</sup> )	Highest (date)	6 <sup>th</sup> Highest (µg/m <sup>3</sup> )	6 <sup>th</sup> Highest (date)
Monash	360	<b>31.5</b>	04 February	21.9	24 February
Florey	271	22.8	22 June	17.5	09 August

The 24-hour advisory reporting standard for PM<sub>2.5</sub> was exceeded four times at Monash. Three exceedences occurred on 4, 10 and 23 February 2014 respectively due to smoke coming from a number of hazard reduction burns in NSW. The other exceedence happened on 3 August 2014 due to domestic wood heater emissions.

## ASSESSMENT OF PROGRESS TOWARDS ACHIEVING THE GOAL

The ACT is currently compliant with the goal specified in Schedule 2 of the AAQ NEPM.

Historical monitoring results indicate that the only AAQ NEPM pollutant of concern in the Canberra airshed is particulate matter, which increases during winter because of emissions from domestic wood heaters. In more recent years exceedences of the particulate matter standards have also been attributed to dust storms and smoke from controlled burns.

The ACT Government acknowledges that woodsmoke is a problem and is working towards addressing the issue in an informed and measured manner to ensure a satisfactory outcome for all Canberrans.

It will continue to implement an integrated program to address woodsmoke. This will involve public education and enforcement activities, the licensing of firewood merchants, the implementation of the 'Don't Burn Tonight Campaign' and 'Burn Right Tonight Campaign', and the on-going administration of the Wood Heater Replacement Program.

The ACT is also working with the Commonwealth and other jurisdictions at a national level to progress actions to improve air quality. At the Environment Ministers Meeting on 29 April 2014, Ministers signalled their intention to vary the AAQ NEPM for particles reflecting the latest scientific understanding on health risks arising from particle pollution. The Measure seeks to establish a more stringent reporting standard for particle pollution (PM<sub>2.5</sub> and PM<sub>10</sub>).





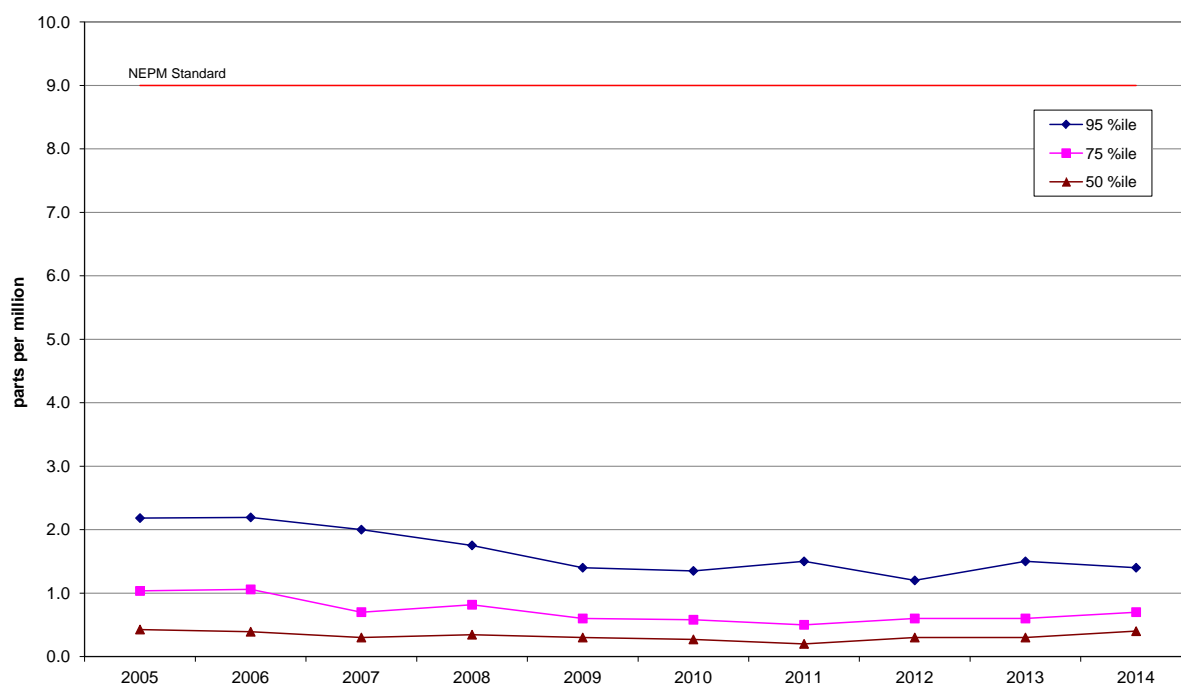
## APPENDIX A: STATISTICAL SUMMARY AND TRENDS

The following section provides a basic statistical summary, using percentiles, for Monash and Civic stations and for each standard. Percentiles for daily maximum values are presented. As the Florey station is newly-established, there is insufficient data to show the statistical summary and trends.

### Carbon monoxide

**Table 15: Statistical summary for daily maximum 8-hour CO Monash 2005 – 2014**

Year	Data Availability (%)	No. of Exceedences (days)	Max conc. (ppm)	99 <sup>th</sup> percentile (ppm)	98 <sup>th</sup> percentile (ppm)	95 <sup>th</sup> percentile (ppm)	90 <sup>th</sup> percentile (ppm)	75 <sup>th</sup> percentile (ppm)	50 <sup>th</sup> percentile (ppm)
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
2007	95.3	0	2.6	2.5	2.4	2.0	1.5	0.7	0.4
2008	88.0	0	2.4	2.2	2.1	1.8	1.5	0.8	0.3
2009	96.4	0	2.0	1.7	1.5	1.4	1.1	0.6	0.3
2010	99.2	0	1.8	1.7	1.6	1.4	1.1	0.6	0.3
2011	98.6	0	2.2	1.9	1.8	1.5	1.1	0.5	0.2
2012	99.7	0	1.8	1.7	1.7	1.2	1.0	0.6	0.3
2013	95.9	0	2.1	1.9	1.8	1.5	1.2	0.6	0.3
2014	94.0	0	1.8	1.6	1.5	1.4	1.1	0.7	0.4

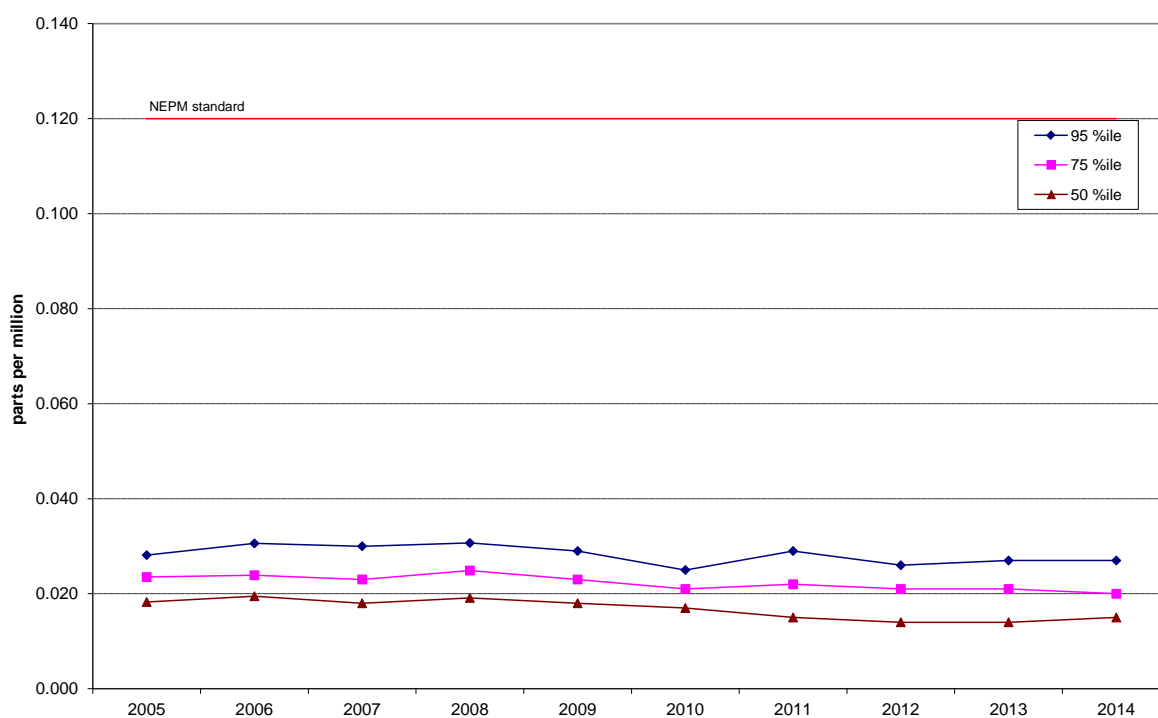


**Figure 16: Statistical summary for daily maximum 8-hour CO Monash 2005 – 2014**

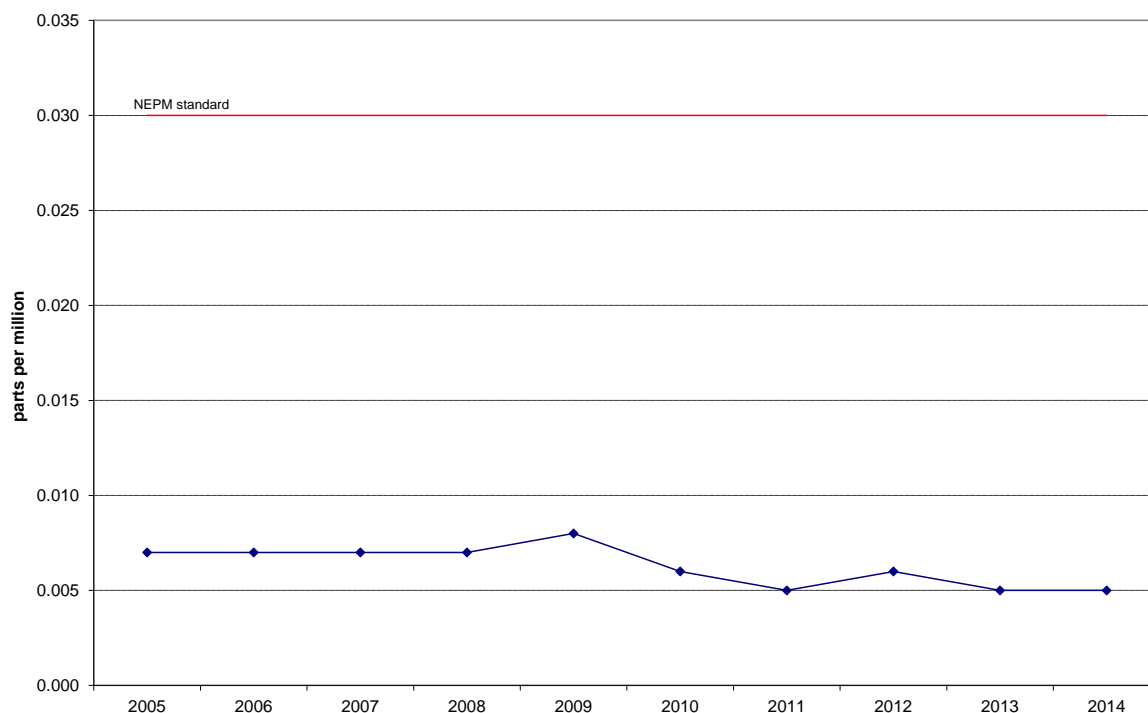
## Nitrogen dioxide

**Table 16: Statistical summary for daily maximum 1-hour NO<sub>2</sub> Monash 2005 – 2014**

Year	Data Recovery (%)	No. of Exceedences (days)	Max conc. (ppm)	99 <sup>th</sup> percentile (ppm)	98 <sup>th</sup> percentile (ppm)	95 <sup>th</sup> percentile (ppm)	90 <sup>th</sup> percentile (ppm)	75 <sup>th</sup> percentile (ppm)	50 <sup>th</sup> percentile (ppm)
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
2007	97.0	0	0.039	0.037	0.035	0.030	0.028	0.023	0.018
2008	86.5	0	0.103	0.040	0.032	0.031	0.028	0.025	0.019
2009	92.6	0	0.041	0.034	0.033	0.029	0.027	0.023	0.019
2010	89.1	0	0.037	0.029	0.028	0.025	0.023	0.021	0.017
2011	96.7	0	0.043	0.031	0.030	0.029	0.026	0.022	0.015
2012	97.5	0	0.033	0.030	0.029	0.026	0.025	0.021	0.014
2013	97.5	0	0.037	0.031	0.030	0.027	0.025	0.021	0.014
2014	94.1	0	0.036	0.030	0.029	0.027	0.025	0.020	0.015



**Figure 17: Statistical summary for daily maximum 1-hour NO<sub>2</sub> Monash 2005 – 2014**

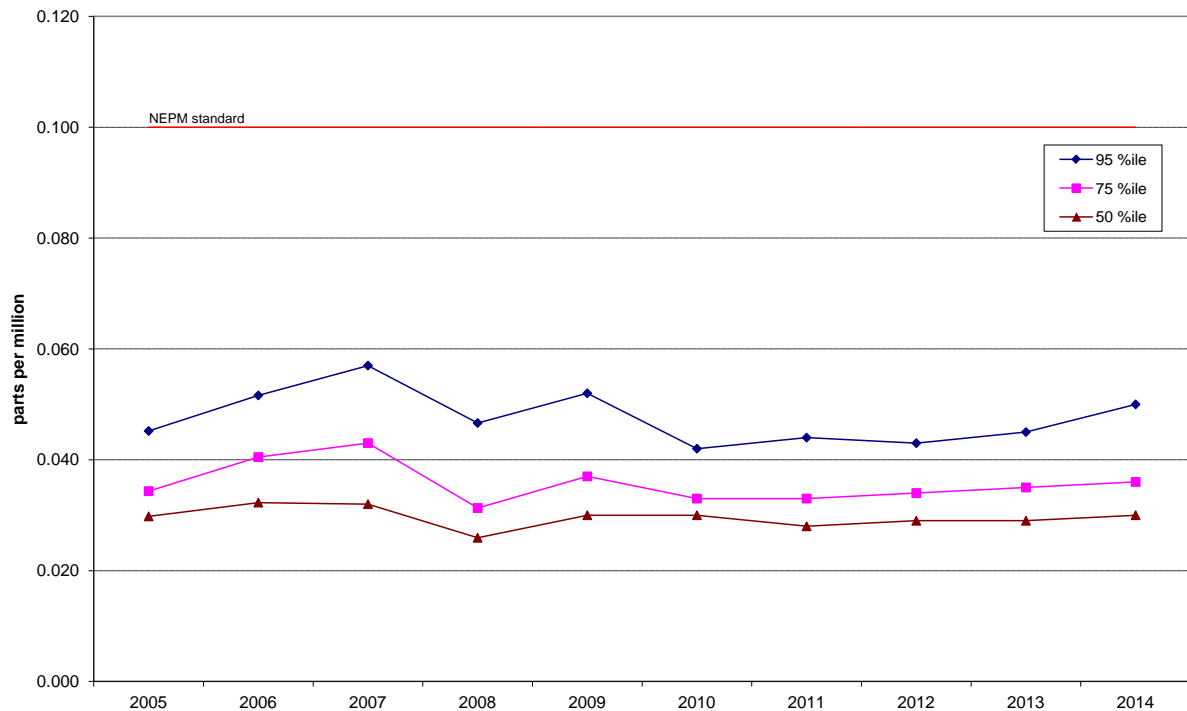


**Figure 18: Annual average 1-hour NO<sub>2</sub> Monash 2005 – 2014**

## Ozone

**Table 17: Statistical summary for daily maximum 1-hour O<sub>3</sub> Monash 2005 – 2014**

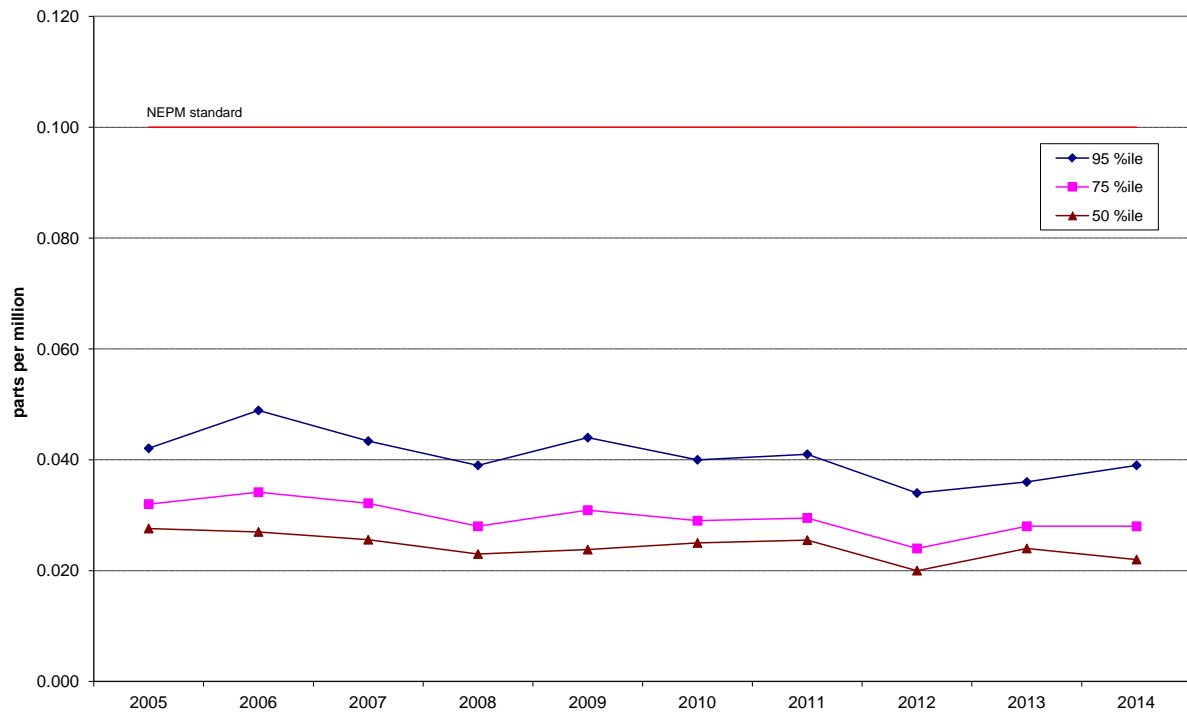
Year	Data Recovery (%)	No. of Exceedences (days)	Max conc. (ppm)	99 <sup>th</sup> percentile (ppm)	98 <sup>th</sup> percentile (ppm)	95 <sup>th</sup> percentile (ppm)	90 <sup>th</sup> percentile (ppm)	75 <sup>th</sup> percentile (ppm)	50 <sup>th</sup> percentile (ppm)
2005	97.8	0	0.065	0.058	0.053	0.045	0.041	0.034	0.030
2006	99.7	0	0.067	0.060	0.057	0.052	0.049	0.040	0.032
2007	95.4	0	0.075	0.064	0.062	0.057	0.052	0.043	0.032
2008	84.2	0	0.065	0.055	0.053	0.047	0.040	0.031	0.026
2009	96.4	0	0.073	0.063	0.059	0.052	0.045	0.038	0.030
2010	86.6	0	0.051	0.048	0.046	0.042	0.037	0.033	0.030
2011	99.2	0	0.056	0.052	0.047	0.044	0.040	0.033	0.028
2012	100	0	0.055	0.048	0.046	0.043	0.040	0.034	0.029
2013	97.8	0	0.062	0.051	0.049	0.045	0.041	0.035	0.029
2014	94.8	0	0.087	0.060	0.057	0.050	0.044	0.036	0.030



**Figure 19: Statistical summary for daily maximum 1-hour O<sub>3</sub> Monash 2005 – 2014**

**Table 18: Statistical summary for daily maximum 1-hour O<sub>3</sub> Civic 2005 – 2014**

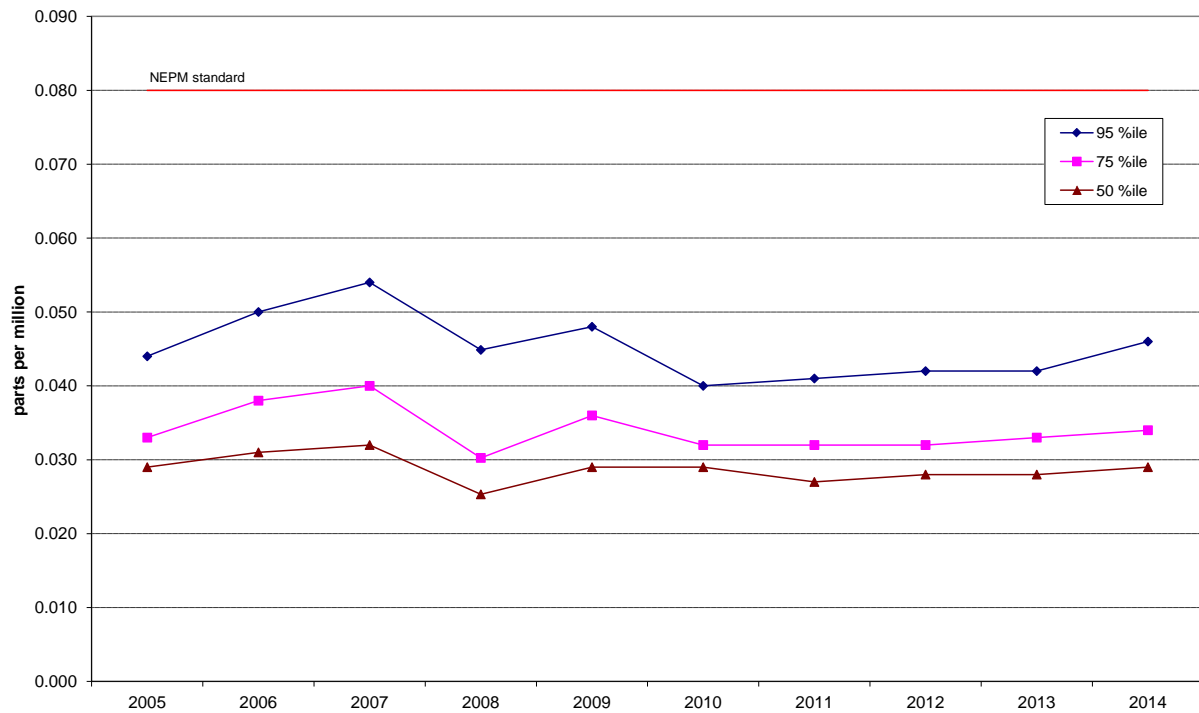
Year	Data Recovery (%)	No. of Exceedences (days)	Max conc. (ppm)	99 <sup>th</sup> percentile (ppm)	98 <sup>th</sup> percentile (ppm)	95 <sup>th</sup> percentile (ppm)	90 <sup>th</sup> percentile (ppm)	75 <sup>th</sup> percentile (ppm)	50 <sup>th</sup> percentile (ppm)
2005	85.5	0	0.070	0.061	0.051	0.042	0.038	0.032	0.028
2006	95.5	3	0.252	0.084	0.060	0.049	0.043	0.034	0.027
2007	91.5	1	0.112	0.057	0.050	0.044	0.040	0.032	0.026
2008	91.4	0	0.052	0.050	0.044	0.039	0.034	0.028	0.023
2009	97.8	0	0.060	0.055	0.052	0.044	0.040	0.031	0.024
2010	99.2	0	0.058	0.050	0.048	0.040	0.036	0.029	0.025
2011	96.4	0	0.052	0.046	0.045	0.041	0.036	0.030	0.026
2012	100	0	0.053	0.041	0.038	0.034	0.030	0.024	0.020
2013	92.1	0	0.060	0.043	0.041	0.036	0.032	0.028	0.024
2014	94.0	0	0.060	0.050	0.046	0.039	0.036	0.028	0.022



**Figure 20: Statistical summary for daily maximum 1-hour O<sub>3</sub> Civic 2005 – 2014**

**Table 19: Statistical summary for daily maximum 4-hour O<sub>3</sub> Monash 2005 – 2014**

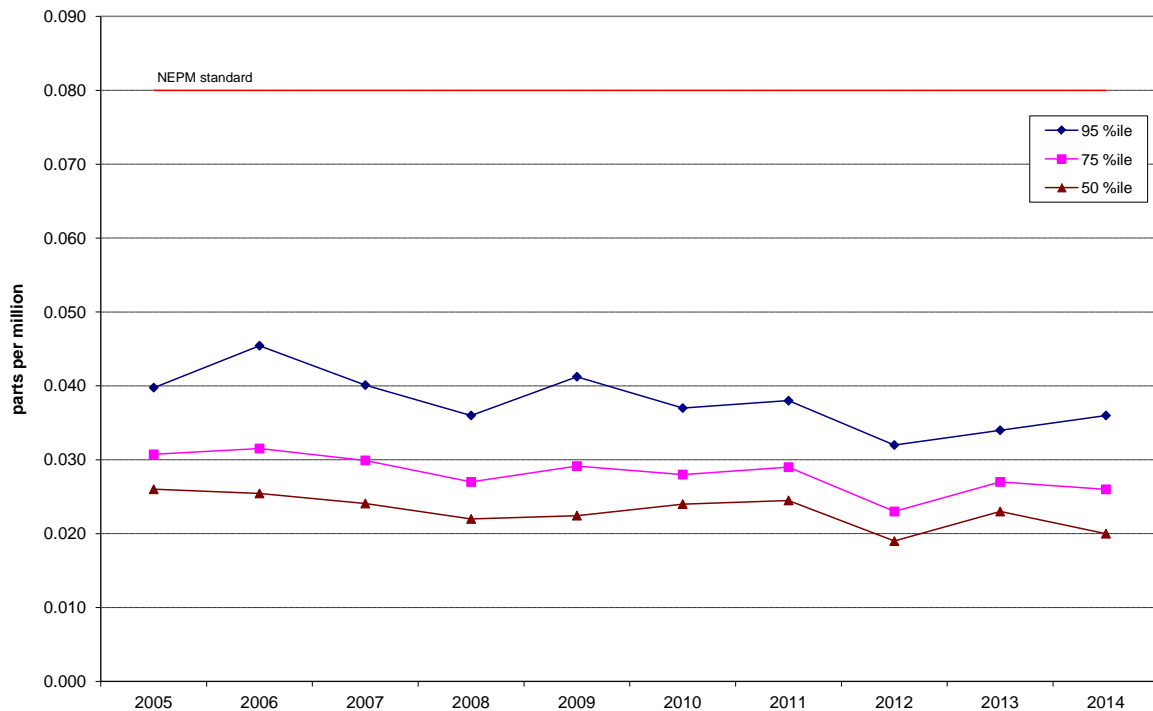
Year	Data Recovery (%)	No. of Exceedences (days)	Max conc. (ppm)	99 <sup>th</sup> percentile (ppm)	98 <sup>th</sup> percentile (ppm)	95 <sup>th</sup> percentile (ppm)	90 <sup>th</sup> percentile (ppm)	75 <sup>th</sup> percentile (ppm)	50 <sup>th</sup> percentile (ppm)
2005	97.5	0	0.062	0.054	0.049	0.044	0.039	0.033	0.029
2006	99.7	0	0.061	0.056	0.055	0.050	0.046	0.038	0.031
2007	100	0	0.072	0.061	0.059	0.054	0.050	0.040	0.032
2008	84.2	0	0.061	0.052	0.049	0.045	0.038	0.030	0.025
2009	96.2	0	0.068	0.058	0.056	0.048	0.044	0.036	0.029
2010	86.6	0	0.049	0.046	0.043	0.040	0.037	0.032	0.029
2011	98.9	0	0.054	0.048	0.044	0.041	0.038	0.032	0.027
2012	99.7	0	0.052	0.048	0.046	0.043	0.040	0.034	0.029
2013	97.8	0	0.059	0.048	0.047	0.042	0.039	0.033	0.028
2014	94.8	0	0.060	0.055	0.052	0.046	0.042	0.034	0.029



**Figure 21: Statistical summary for daily maximum 4-hour O<sub>3</sub> Monash 2005 – 2014**

**Table 20: Statistical summary for daily maximum 4-hour O<sub>3</sub> Civic 2005 – 2014**

Year	Data Recovery (%)	No. of Exceedences (days)	Max conc. (ppm)	99 <sup>th</sup> percentile (ppm)	98 <sup>th</sup> percentile (ppm)	95 <sup>th</sup> percentile (ppm)	90 <sup>th</sup> percentile (ppm)	75 <sup>th</sup> percentile (ppm)	50 <sup>th</sup> percentile (ppm)
2005	85.5	0	0.061	0.054	0.047	0.040	0.036	0.031	0.026
2006	95.5	1	0.145	0.066	0.053	0.045	0.040	0.032	0.026
2007	91.5	1	0.097	0.052	0.046	0.040	0.037	0.030	0.025
2008	91.4	0	0.051	0.047	0.039	0.036	0.033	0.027	0.022
2009	97.8	0	0.059	0.049	0.047	0.041	0.037	0.030	0.023
2010	99.2	0	0.056	0.047	0.044	0.037	0.034	0.028	0.024
2011	96.4	0	0.050	0.044	0.041	0.038	0.035	0.029	0.025
2012	100	0	0.042	0.037	0.036	0.032	0.028	0.023	0.019
2013	91.8	0	0.057	0.040	0.038	0.034	0.030	0.027	0.023
2014	94.0	0	0.047	0.045	0.040	0.036	0.034	0.026	0.020

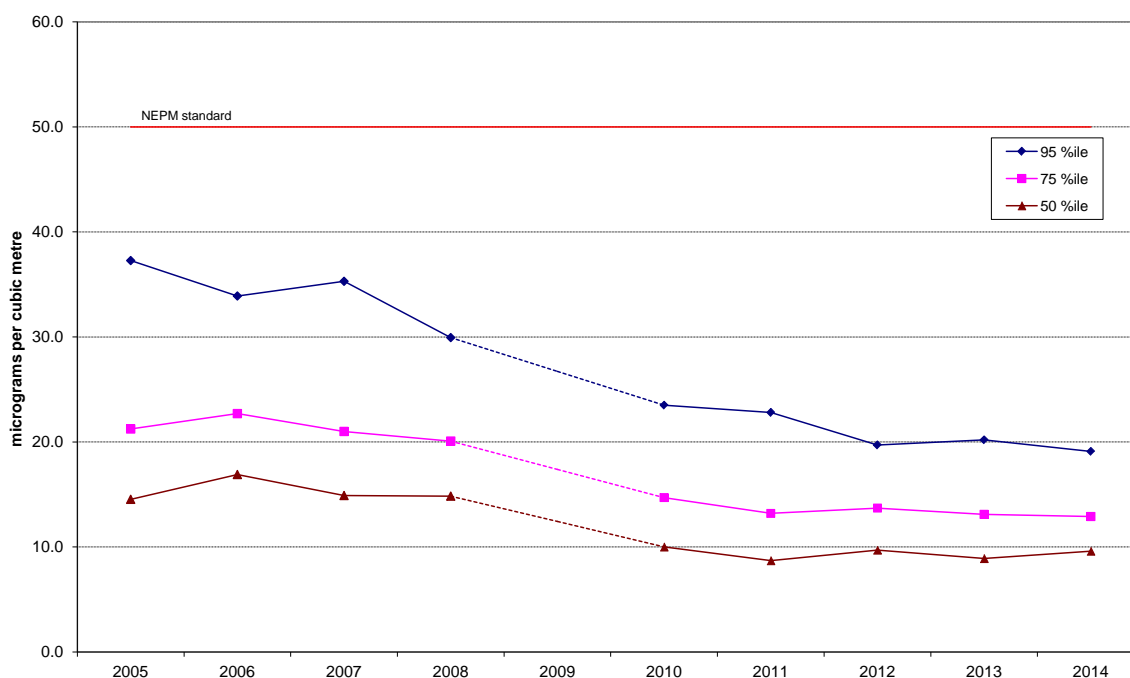


**Figure 22: Statistical summary for daily maximum 4-hour O<sub>3</sub> Civic 2005 – 2014**

## PM<sub>10</sub>

**Table 21: Statistical summary for daily maximum 24-hour PM<sub>10</sub> Monash 2005 – 2014**

Year	Data Recovery (%)	No. of Exceedences (days)	Max conc. (ppm)	99 <sup>th</sup> percentile (ppm)	98 <sup>th</sup> percentile (ppm)	95 <sup>th</sup> percentile (ppm)	90 <sup>th</sup> percentile (ppm)	75 <sup>th</sup> percentile (ppm)	50 <sup>th</sup> percentile (ppm)
2005	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
2007	99.7	5	117.7	61.8	42.5	35.3	28.0	21.0	14.9
2008	82	3	96.6	45.8	35.7	29.9	26.6	20.1	14.8
2009	42.3	9	210.0	116.0	62.4	50.5	37.7	25.5	15.2
2010	95.4	0	48.4	35.6	27.4	23.5	20.2	14.7	10.0
2011	99.2	0	40.0	33.7	30.3	22.8	18.6	13.2	8.7
2012	98.6	0	41.0	24.2	21.8	19.7	17.4	13.7	9.7
2013	95.6	0	43.5	29.1	25.1	20.2	16.8	13.1	8.9
2014	97.8	0	39.3	27.1	23.1	19.1	16.4	12.9	9.6



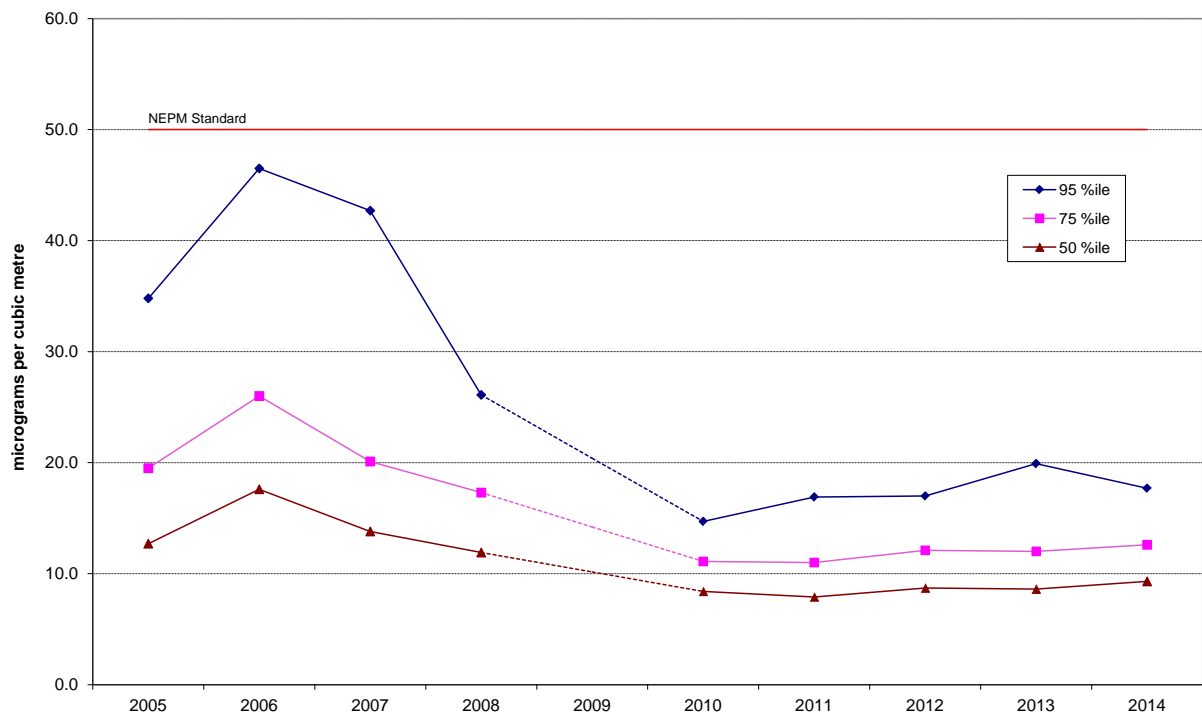
**Figure 23: Statistical summary for daily maximum 24-hour PM<sub>10</sub> Monash 2005 – 2014**

**Note:** 2009 data has not been included in Figure 23 as the percentile data has been skewed because of insufficient data in Q1 and Q2 (zero and twenty five percent respectively) and the extreme readings associated with the dust storm which affected most of eastern Australia on 22 and 23 September, 2009.

**Table 22: Statistical summary for daily maximum 24-hour PM<sub>10</sub> Civic 2005 – 2014**

Year	Data Recovery (%)	No. of Exceedences (days)	Max conc. (ppm)	99 <sup>th</sup> percentile (ppm)	98 <sup>th</sup> percentile (ppm)	95 <sup>th</sup> percentile (ppm)	90 <sup>th</sup> percentile (ppm)	75 <sup>th</sup> percentile (ppm)	50 <sup>th</sup> percentile (ppm)
2005	9.6	1	50.64	47.2	43.8	34.8	27.5	19.5	12.7
2006	13.2	2	70.8	61.2	51.5	46.5	35.1	26.0	17.6
2007	13.2	1	50.9	48.7	46.5	42.7	31.4	20.1	13.8
2008	12.0	1	53.3	42.5	31.7	26.1	24.2	17.3	11.9
2009	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
2010	57.6	0	23.8	19.7	17.1	14.7	13.7	11.1	8.4
2011	97.0	0	29.2	22.3	20.9	16.9	14.4	11.0	7.9
2012	95.1	0	49.5	22.8	20.2	17.0	14.9	12.1	8.7
2013	92.9	1	57.8	26.5	24.4	19.9	15.8	12.0	8.6
2014	95.1	0	31.4	24.2	22.1	17.7	15.1	12.6	9.3





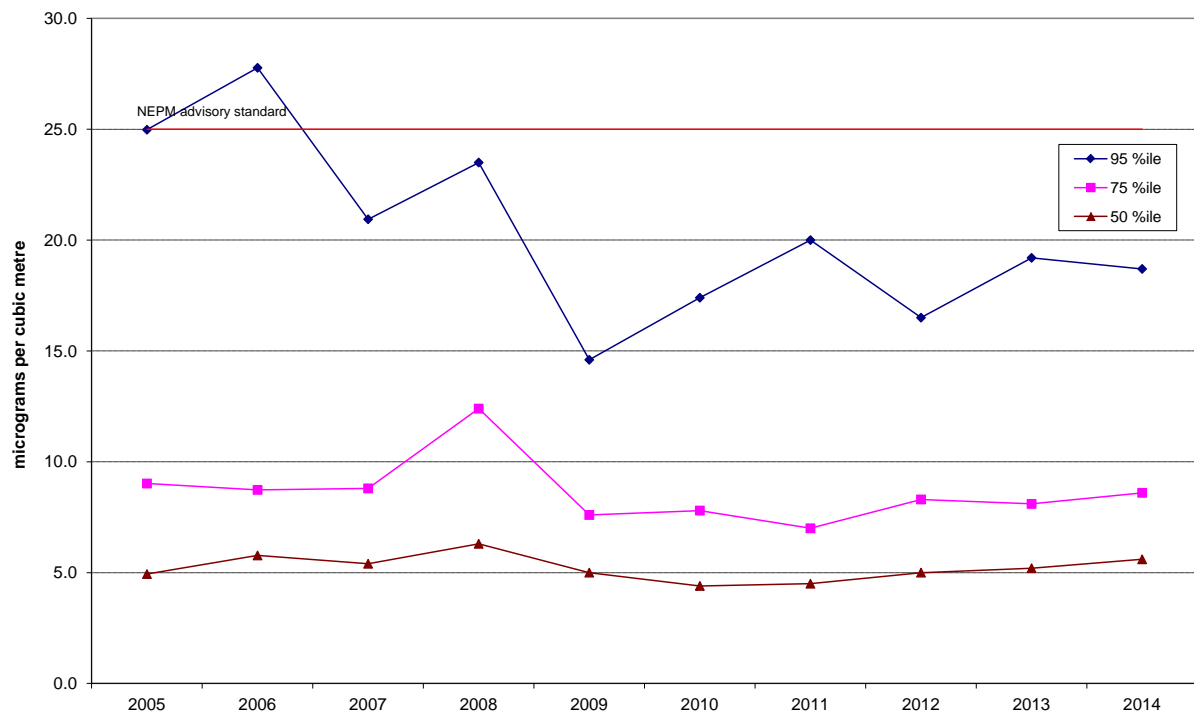
**Figure 24: Statistical summary for daily maximum 24-hour PM<sub>10</sub> Civic 2005 – 2014**

**Note:** No PM<sub>10</sub> monitoring was conducted at Civic in 2009.

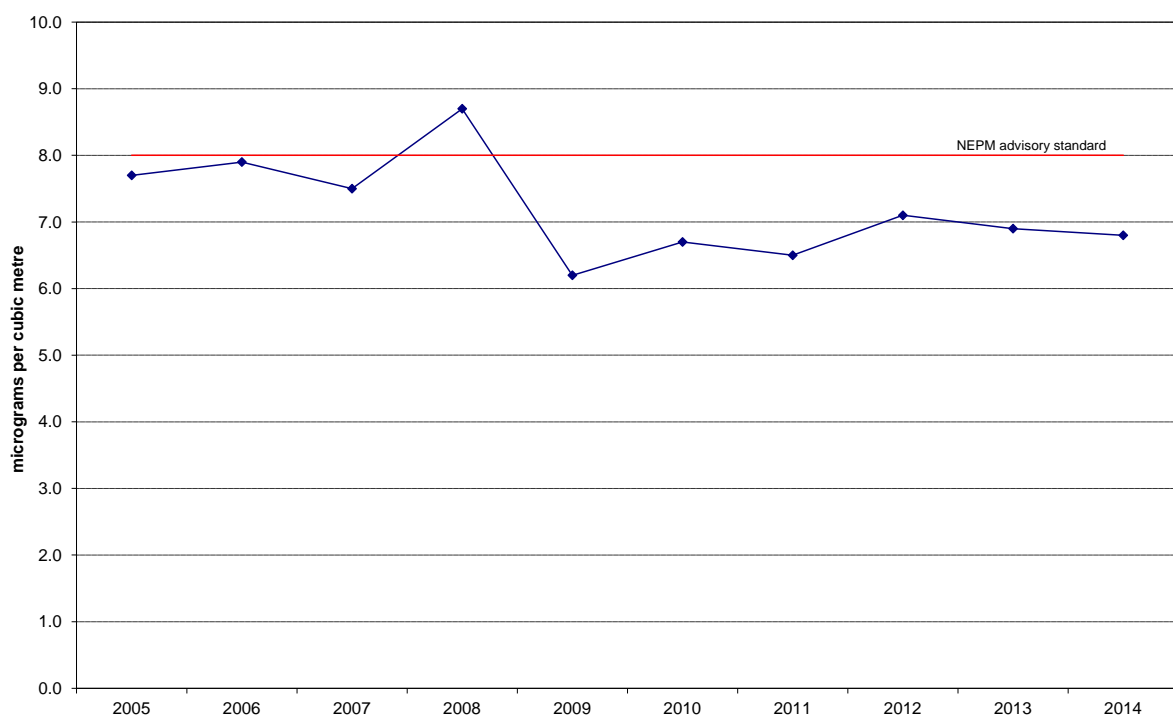
## PM<sub>2.5</sub>

**Table 23: Statistical summary for daily maximum 24-hour PM<sub>2.5</sub> Monash 2005 – 2014**

Year	Data Recovery (%)	No. of Exceedences (days)	Max conc. (ppm)	99 <sup>th</sup> percentile (ppm)	98 <sup>th</sup> percentile (ppm)	95 <sup>th</sup> percentile (ppm)	90 <sup>th</sup> percentile (ppm)	75 <sup>th</sup> percentile (ppm)	50 <sup>th</sup> percentile (ppm)
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
2007	58.1	8	45.7	27.8	27.6	20.9	15.7	8.8	5.4
2008	45.4	6	30.7	28.0	25.7	23.5	19.7	12.4	6.3
2009	64.5	2	33.5	23.0	20.0	14.6	12.2	7.6	5.0
2010	95.1	2	52.4	22.1	20.9	17.4	14.3	7.8	4.4
2011	92.1	4	32.8	25.6	22.9	20.0	12.5	7.0	4.5
2012	95.1	3	29.2	23.8	19.8	16.5	13.2	8.3	5.0
2013	98.6	6	38.4	30.5	22.7	19.2	12.9	8.1	5.2
2014	87.7	4	31.5	25.7	21.6	18.7	14.4	8.6	5.6



**Figure 25: Statistical summary for daily maximum 24-hour PM<sub>2.5</sub> Monash 2005 – 2014**



**Figure 26: Annual average 24-hour PM<sub>2.5</sub> Monash 2005 - 2014**