# AIR MONITORING REPORT 2005:

## COMPLIANCE WITH THE NATIONAL ENVIRONMENT PROTECTION (AMBIENT AIR QUALITY) MEASURE

Publication 1045

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**SUMMARY**

This report assesses compliance of air quality in Victoria with the *Ambient Air Quality National Environment Protection Measure*[1] (AAQ NEPM). In addition, EPA also produces an annual air quality report for a more general audience.[2]

Victoria's monitoring results for 2005 indicated that:

- the goal of the AAQ NEPM, to achieve by 2008 the standards to the extent specified, was met for all pollutants at all monitoring stations where there was sufficient data capture to assess compliance, except particles (as $PM_{10}$) at three of the 10 stations.
- $PM_{10}$ exceeded the standard at about half the monitoring stations, on up to nine days in Port Phillip Region and 24 days in Mildura. On the majority of these days the cause was windblown dust. Poor dispersion in highly stable air accounted for most of the remaining exceedences.
- The 24-hour advisory reporting standard for particles (as $PM_{2.5}$) was exceeded at the two stations in the Port Phillip region. The annual reporting standard for $PM_{2.5}$ was exceeded at Alphington.
- The four-hour ozone standard was exceeded on one day at one station. The one-hour ozone standard was met at all stations.
- The high data capture rates required to demonstrate compliance with the AAQ NEPM goals were achieved in all stations that operated continuously throughout the year.
- EPA Victoria commenced a three-year program to replace and upgrade instrumentation and infrastructure at all of its monitoring stations. When stations are taken off-line for these upgrades, the AAQ NEPM data capture targets may not be met. This affected monitoring at Traralgon in quarter four.

Performance monitoring stations operated continuously throughout the year and campaign monitoring was conducted to fulfil commitments in Victoria's monitoring plan.[3] Monitoring proceeded in accordance with the monitoring plan, AAQ NEPM Technical Papers and EPA's NATA accreditation.

[1] *National Environment Protection Measure for Ambient Air Quality*, National Environment Protection Council publication, available from www.ephc.gov.au.
[2] *Victoria's Air Quality – 2005* (EPA publication 1044), available from www.epa.vic.gov.au/publications.
[3] *Ambient Air Quality NEPM Monitoring Plan Victoria,* (EPA Publication 763), available from www.epa.vic.gov.au.

## A. MONITORING SUMMARY

### Current performance monitoring stations

Victoria's AAQ NEPM air monitoring plan was approved by the National Environment Protection Council (NEPC) Ministers in February 2001. Data presented in this report have been produced in accordance with the monitoring plan, except where amendments or other issues are noted.

The AAQ NEPM requires the monitoring of the pollutants carbon monoxide (CO), nitrogen dioxide ($NO_2$), ozone ($O_3$), sulfur dioxide ($SO_2$), lead (Pb), particles less than 10 micrometres in diameter ($PM_{10}$) and particles less than 2.5 micrometres in diameter ($PM_{2.5}$).

Eight regions are defined in the monitoring plan. They are shown in Figure 1. Port Phillip and Latrobe Valley regions have permanent performance monitoring stations (shown in Figure 1 and Figure 2, respectively). The six rural regions, Ballarat, Bendigo, Shepparton, Wodonga, Warrnambool, and Mildura are being monitored sequentially for a year each by a mobile monitoring station.

The performance monitoring stations, pollutants monitored and site types are summarised in Table 1. Site types are defined[4] as: generally representative upper bound for community exposure sites; population-average sites; and peak sites.

[4] National Environment Protection (Ambient Air Quality) Measure Technical Paper No. 3, *Monitoring Strategy*, available from www.ephc.gov.au.

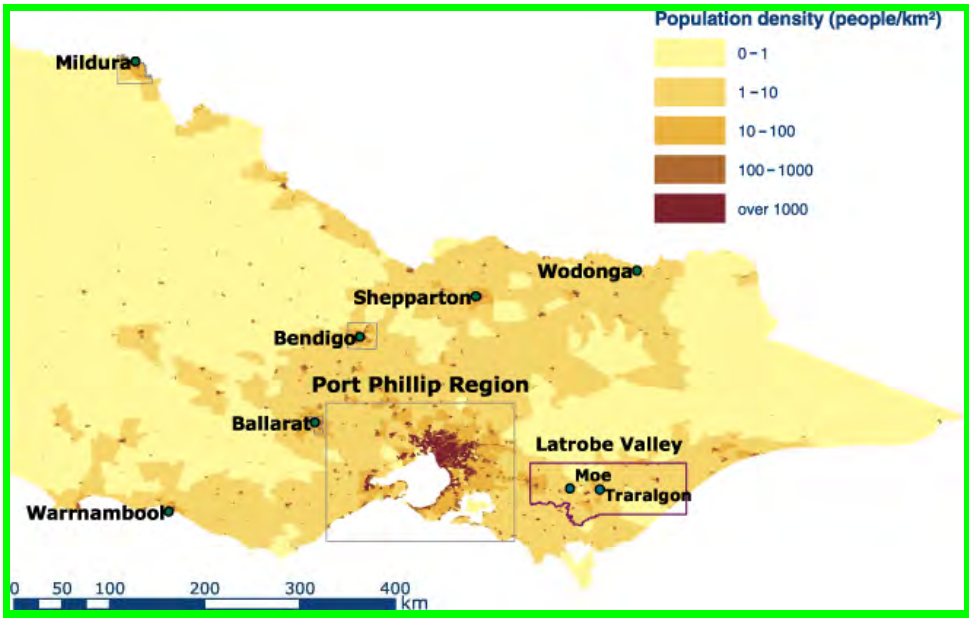


**Figure 1: AAQ NEPM regions and population density in Victoria**

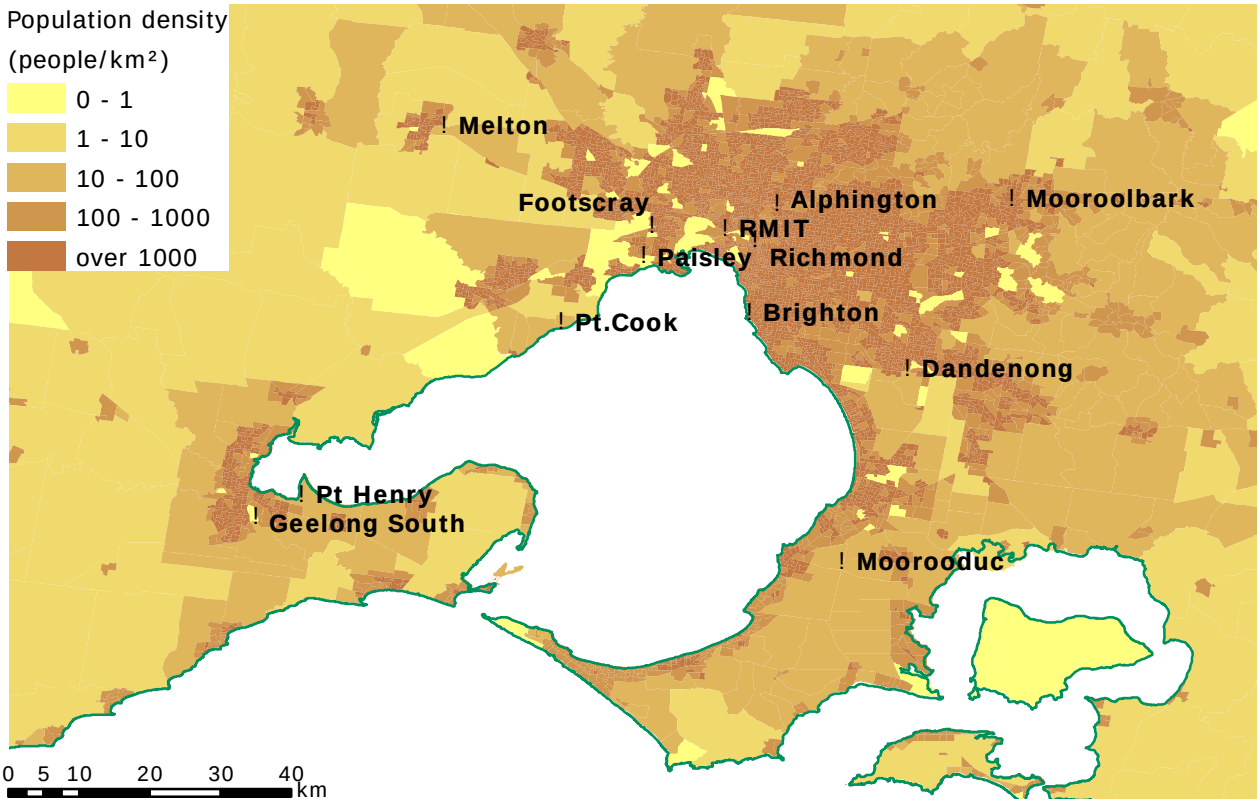


**Figure 2: Monitoring stations in Port Phillip region**

**Table 1: Victorian performance monitoring stations**

| Region<br>Performance monitoring station | Location category | Site type | | | | |
|---|---|---|---|---|---|---|
| | | CO | $NO_2$ | $O_3$ | $SO_2$ | $PM_{10}$ |
| **Port Phillip** | | | | | | |
| Alphington | Res/LI | G* | G* | Pop | Pop* | G* |
| Brighton | Res | | G | Pop* | | Pop |
| Dandenong | LI | | | Pop | | Pop |
| Footscray | I/Res | | G* | G* | | G* |
| Geelong South | LI/Res | G* | G* | Pop* | G* | G* |
| Melton | Res | | | G | | |
| Mooroolbark | Res | | | Pop | | Pop |
| Paisley | I/Res | | | | G | |
| Point Cook | Rur/Res | | Pop* | G* | | |
| Point Henry | I/Rur | | | Pop | | |
| Richmond | Res | G | | | | G |
| RMIT (CBD) | CBD | G* | G* | | G | G* |
| **Latrobe Valley** | | | | | | |
| Moe | Res | | Pop | G | G | G |
| Traralgon | Res | | G* | G* | G* | G* |

| | | | |
|---|---|---|---|
| RMIT (CBD) | RMIT University | CBD | Central business district |
| I | Industrial | LI | Light industrial |
| Res | Residential | Rur | Rural |
| G | Generally representative upper bound | Pop | Population-average |
| * | Trend station | | |

**Description of exposed population**

The exposed population represented by each monitoring station is described qualitatively by the location category column in Table 1 and Table 2. Further information is given in Appendix C of the monitoring plan.

**Implementation of the monitoring plan**

In addition to the performance monitoring stations specified in the monitoring plan, mobile monitoring stations commenced in 2005 at Ballarat, in July for a period of 12 months.

The peak station for lead, at Collingwood, was closed in December 2004. This change to Victoria's monitoring plan was approved in accordance with NEPM procedures, because levels were so low.[5]

Campaign monitoring continued at:

- Bendigo until July 2005, when the mobile laboratory moved to Ballarat
- Moorooduc, where ozone has been monitored since December 2004.
- Mildura, where $PM_{10}$ has been monitored since December 2004.

[5] National Environment Protection (Ambient Air Quality) Measure Technical Paper No. 9, *Lead Monitoring*, available from www.ephc.gov.au.

**Table 2: Summary of campaign stations' siting compliance with AS 2922-1987**

| **Region** Station | Location category | Height above ground | Minimum distance to support structure | Clear sky angle of 120° | Unrestricted airflow of 270°/360° | 20m from trees | No boiler or incinerators nearby | Minimum distance from road or traffic |
|---|---|---|---|---|---|---|---|---|
| **Port Phillip** | | | | | | | | |
| Moorooduc | Rur | ☑ | ☑ | ☑ | ☑ | ☑ | ☑ | ☑ |
| Mooroolbark | Res | ☑ | ☑ | ☑ | ☑ | ☑ | ☑ | ☑ |
| **Bendigo** | Res | ☑ | ☑ | ☑ | ☑ | ☒ | ☑ | ☑ |
| **Ballarat** | Res | ☑ | ☑ | ☑ | ☑ | ☑ | ☑ | ☑ |
| **Mildura** | Res | ☑ | ☑ | ☑ | ☑ | ☑ | ☑ | ☑ |

Res Residential Rur Rural

Each of these campaign stations meets the requirements of the Australian standard for siting of sampling units, except for proximity to trees at Bendigo as shown in Table 2, and the data is included in this report. Alphington, Richmond and Moe also continue to have minor non-compliances due to the proximity of trees.

Victorian monitoring is conducted in accordance with the standards shown in Table 3. Data not meeting the requirements of these standards and EPA's quality assurance procedures are invalidated and not reported. At Mildura a substantial quantity of $PM_{10}$ data were invalidated because of an incorrect flow calibration, resulting in an underestimation of actual levels. During the period of incorrect calibration, two days that exceeded the standard are reported as exceedences although they are not included in the data availability rates.

TEOM $PM_{10}$ data quoted in this report have been adjusted according to the default procedure[6], using the temperature-dependent formula with a constant value of K equal to 0.04. The resulting adjustments vary from no change at daily average temperatures at or above 15°C to an increase of 40 per cent at a temperature of 5°C.

**NATA status**

All performance monitoring stations and AAQ NEPM campaign monitoring operated by EPA are covered by its NATA accreditation (Number 1576).

Monitoring in the Latrobe Valley region was performed for EPA by Connell Wagner PPI under its NATA accreditation (Number 4669).

[6] National Environment Protection (Ambient Air Quality) Measure Technical Paper No. 10, *Collection and Reporting of TEOM $PM_{10}$ Data*, available from www.ephc.gov.au.

**Monitoring methods**

**Table 3: Methods for monitoring the NEPM pollutants**

| Pollutant | | Standard | Title | Method Used |
|---|---|---|---|---|
| Carbon monoxide | CO | AS3580.7.1-1992 | Ambient Air – Determination of Carbon Monoxide – Direct Reading Instrument Method | Gas filter correlation/ Infrared. |
| Nitrogen dioxide | $NO_2$ | AS3580.5.1–1993 | Ambient Air – Determination of Oxides of Nitrogen – Chemiluminescence Method | Gas phase chemiluminescence. |
| Photochemical oxidant (ozone) | $O_3$ | AS3580.6.1–1990 | Ambient Air – Determination of Ozone – Direct Reading Instrument Method | Non-dispersive ultraviolet. |
| Sulfur dioxide | $SO_2$ | AS3580.4.1–1990 | Ambient Air – Determination of Sulfur Dioxide – Direct Reading Instrument Method | Pulsed fluorescence |
| Particles | $PM_{10}$ | AS3580.9.8–2001 | Determination of Suspended Particulate Matter - $PM_{10}$ Continuous Direct Mass Method using a Tapered Element Oscillating Microbalance Analyser | Tapered element oscillating microbalance (TEOM). |
| | $PM_{2.5}$ | US CFR 40 Part 50 Appendix L[a] | Reference Method for the Determination of Fine Particulate matter as $PM_{2.5}$ in the Atmosphere | Gravimetric reference method |
| | $PM_{2.5}$ | AS3580.9.8-2001[a] | Technical Paper on Monitoring for Particles as $PM_{2.5}$ | TEOM |

a Modified for use in the $PM_{2.5}$ Equivalence Program according to the NEPM Technical Paper

**Screening**

For regions other than Port Phillip and Latrobe Valley, the monitoring plan presents a process to demonstrate whether levels of CO, $NO_2$, $O_3$ and $PM_{10}$ are consistently below the standards. Monitoring is not required if specified screening procedures are satisfied.[7]

CO monitored at Bendigo satisfies Procedure A of the Technical Paper for Bendigo and Procedure F for Shepparton, Mildura, Wodonga and Warrnambool.

As proposed in Victoria's monitoring plan, CO data from Toowoomba have been used to satisfy Screening Procedure F for Ballarat.

$NO_2$ monitoring at Bendigo in 2004-05 yielded a maximum one-hour reading of 0.046 ppm and an annual average of 0.006 ppm. These are sufficiently low to satisfy Procedure A for Bendigo and Procedure F for Shepparton, Wodonga, Warrnambool and Mildura. Screening for $NO_2$ at Ballarat is not completed and compliance is reported as 'not demonstrated'.

[7] National Environment Protection (Ambient Air Quality) Measure Technical Paper No. 4, *Screening Procedures*, available from www.ephc.gov.au.

Screening for $O_3$ in rural regions is not completed and compliance is reported as 'not demonstrated'.

Campaign monitoring for $PM_{10}$, which has been performed at Bendigo[8], Ballarat[9] and Shepparton[10] (and is currently under way at Mildura)[11] has indicated that ongoing monitoring will be required. Monitoring at Albury by NSW Department of Environment and Conservation indicates that this is so for Wodonga also. The mobile monitoring station was moved to Ballarat during 2005 and will be relocated to other rural regions sequentially in future years.

**$PM_{2.5}$ monitoring**

The 2003 modifications to the NEPM commit Victoria to monitoring $PM_{2.5}$ at at least one $PM_{10}$ performance monitoring station. $PM_{2.5}$ was monitored by the reference method (on a one-day-in-three basis) at two stations (Alphington and Footscray) throughout 2005. Control of humidity in the filter weighing room was upgraded in 2005, allowing substantial compliance with the recommended operating procedures.[12]

Victoria also participates in the $PM_{2.5}$ Equivalence Program, with TEOM monitors located at Alphington and Footscray – not Alphington and Mooroolbark, as proposed in the NEPM. TEOM $PM_{2.5}$ readings are taken with the inbuilt adjustment for $PM_{10}$ removed (A and B constants set to 0 and 1) and no adjustment for loss of volatiles.

## B. ASSESSMENT OF COMPLIANCE WITH STANDARDS AND GOAL

The following tables summarise the compliance of monitoring with the standards and goal of the AAQ NEPM. Performance is assessed as meeting the 2008 goal if the number of exceedences of the standard is no more than the number specified in Schedule 2 of the AAQ NEPM and data availability was at least 75 per cent in each quarter of the year. Regions also meet the standards and goal if they do not require monitoring on the basis that screening shows pollutant levels are reasonably expected to be consistently below the relevant standards.

Performance is assessed as 'not demonstrated' if there has been insufficient data collected to demonstrate that the standards and 2008 goal have been met or not met. Regions may also be assessed as 'not demonstrated' if screening has not been completed.

[8] *Air quality assessment of fine particles in Bendigo – a pilot study* (EPA Publication 869), available from www.epa.gov.au.
[9] *Airborne particle monitoring at Ballarat, February 2002 to September 2003* (EPA Publication 936), available from www.epa.gov.au.
[10] *Airborne particle monitoring at Shepparton, December 2003 to December 2004* (EPA Publication 992), available from www.epa.gov.au.
[11] *Airborne particle monitoring at Mildura, December 2004 to May 2005* – interim report (EPA Publication 1004), available from www.epa.vic.gov.au.
*12 National Environment Protection (Ambient Air Quality) Measure Technical Paper on Monitoring for $PM_{2.5}$*, available from www.ephc.gov.au.

**Carbon monoxide**

**Table 4: 2005 Compliance summary for carbon monoxide in Victoria**

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

| **Region** Performance monitoring station | Data availability rates (% of hours) Q1 | Q2 | Q3 | Q4 | Annual | Number of exceedences (days) | Performance against the standard and goal |
|---|---|---|---|---|---|---|---|
| **Port Phillip** | | | | | | | |
| Alphington | 93.0 | 94.1 | 86.5 | 91.3 | 91.2 | 0 | Met |
| Geelong South | 92.3 | 92.9 | 91.6 | 94.4 | 92.8 | 0 | Met |
| Richmond | 93.1 | 93.1 | 92.1 | 93.5 | 92.9 | 0 | Met |
| RMIT (CBD) | 94.9 | 94.5 | 86.3 | 94.1 | 92.4 | 0 | Met |
| **Ballarat**[a] | 0.0 | 0.0 | 51.1 | 86.0 | 34.5 | 0 | ND |
| **Bendigo**[b] | 92.8 | 94.2 | 4.4 | 0.0 | 47.5 | 0 | ND |

ND Not demonstrated by monitoring. See comments below.
a Campaign monitoring commenced at Ballarat in July.
b Campaign monitoring ceased at Bendigo in July.

Regions which do not require monitoring on the basis that screening shows pollutant levels are reasonably expected to be consistently below the relevant AAQ NEPM standard: Latrobe Valley, Ballarat, Bendigo, Shepparton, Warrnambool, Wodonga, Mildura.

During 2005, the carbon monoxide standard was not exceeded at any station and compliance was demonstrated at all stations where there was adequate data capture. Bendigo and Ballarat regions have been assessed as complying with the standard and goal on the basis of screening procedures; there was insufficient monitoring data to confirm this in 2005. Monitoring at Bendigo from May 2004 to July 2005 demonstrated compliance during that period.

**Nitrogen dioxide**

**Table 5: 2005 Compliance summary for nitrogen dioxide in Victoria**

AAQ NEPM standards: 0.12ppm (1-hour average); 0.03ppm (1-year average)

| **Region** Performance monitoring station | Data availability rates (% of hours) Q1 | Q2 | Q3 | Q4 | Annual | Number of exceedences (days) | Annual mean (ppm) | Performance against the standards and goal 1-hour | 1-year |
|---|---|---|---|---|---|---|---|---|---|
| **Port Phillip** | | | | | | | | | |
| Alphington | 94.0 | 93.2 | 86.5 | 91.3 | 91.3 | 0 | 0.011 | Met | Met |
| Brighton | 94.1 | 94.7 | 94.5 | 93.2 | 94.1 | 0 | 0.009 | Met | Met |
| Footscray | 94.3 | 94.8 | 94.4 | 94.3 | 94.5 | 0 | 0.011 | Met | Met |
| Geelong South | 94.4 | 94.1 | 92.0 | 94.4 | 93.7 | 0 | 0.007 | Met | Met |
| Pt Cook | 92.3 | 94.8 | 90.9 | 93.5 | 92.9 | 0 | 0.005 | Met | Met |
| RMIT (CBD) | 94.8 | 94.6 | 94.6 | 90.1 | 93.5 | 0 | 0.017 | Met | Met |
| **Latrobe Valley** | | | | | | | | | |
| Moe | 95.7 | 90.1 | 92.2 | 95.6 | 93.4 | 0 | 0.007 | Met | Met |
| Traralgon[a] | 95.4 | 95.6 | 95.6 | 64.3 | 87.6 | 0 | 0.008 | ND | ND |
| **Ballarat[b]** | 0.0 | 0.0 | 53.4 | 63.9 | 29.6 | 0 | 0.004 | ND | ND |
| **Bendigo[c]** | 93.6 | 94.9 | 4.4 | 0.0 | 47.9 | 0 | 0.007 | ND | ND |

ND Not demonstrated by monitoring. See comments below.
a Traralgon was out of service for one month for a major station refurbishment.
b Campaign monitoring commenced at Ballarat in July.
c Campaign monitoring ceased at Bendigo in July.

Regions which do not require monitoring on the basis of screening arguments that pollutant levels are reasonably expected to be consistently below the relevant AAQ NEPM standard: Bendigo, Shepparton, Warrnambool, Wodonga, Mildura. Region for which screening has not been completed: Ballarat.

During 2005, the nitrogen dioxide standards were not exceeded at any station and compliance was demonstrated at all stations where there was adequate data capture. Monitoring of nitrogen dioxide at Bendigo in 2004-05 yielded a maximum one-hour average of 0.046ppm and a 14-month average of 0.006ppm. This satisfies Screening Procedure A for Bendigo and procedure F for Shepparton, Mildura, Warrnambool and Wodonga. At Traralgon data capture was reduced because the station was taken out of service for a major upgrade.

**Ozone**

**Table 6: 2005 compliance summary for ozone in Victoria**

AAQ NEPM standards: 0.10ppm (1-hour average); 0.08ppm (4-hour average)

| **Region** Performance monitoring station | Data availability rates (% of hours) Q1 | Q2 | Q3 | Q4 | Annual | Number of exceedences (days) 1-hour | 4-hour | Performance against the standards and goal 1-hour | 4-hour |
|---|---|---|---|---|---|---|---|---|---|
| **Port Phillip** | | | | | | | | | |
| Alphington | 90.8 | 93.4 | 86.5 | 88.1 | 89.7 | 0 | 0 | Met | Met |
| Brighton | 94.1 | 94.7 | 94.5 | 89.6 | 93.2 | 0 | 0 | Met | Met |
| Dandenong | 88.0 | 79.0 | 94.7 | 94.0 | 88.9 | 0 | 0 | Met | Met |
| Footscray | 94.4 | 94.8 | 94.2 | 94.3 | 94.4 | 0 | 0 | Met | Met |
| Geelong South | 94.3 | 94.2 | 92.0 | 94.4 | 93.7 | 0 | 0 | Met | Met |
| Melton | 92.5 | 84.4 | 91.4 | 95.2 | 90.9 | 0 | 0 | Met | Met |
| Moorooduc | 95.0 | 94.9 | 92.0 | 95.1 | 94.2 | 0 | 0 | Met | Met |
| Mooroolbark | 94.0 | 93.4 | 95.0 | 90.9 | 93.3 | 0 | 0 | Met | Met |
| Point Cook | 92.8 | 94.8 | 93.5 | 91.2 | 93.1 | 0 | 1 | Met | Met |
| Point Henry | 93.5 | 95.6 | 95.4 | 95.4 | 95.0 | 0 | 0 | Met | Met |
| **Latrobe Valley** | | | | | | | | | |
| Moe | 95.6 | 95.0 | 94.8 | 95.6 | 95.3 | 0 | 0 | Met | Met |
| Traralgon[a] | 82.9 | 94.6 | 95.4 | 64.2 | 84.2 | 0 | 0 | ND | ND |
| **Ballarat[b]** | 0.0 | 0.0 | 61.0 | 90.4 | 38.2 | 0 | 0 | ND | ND |
| **Bendigo[c]** | 94.0 | 94.9 | 4.4 | 0.0 | 47.9 | 0 | 0 | ND | ND |

ND Not demonstrated by monitoring. See comments below.
a Traralgon was out of service for one month for a major station refurbishment.
b Campaign monitoring commenced at Ballarat in July.
c Campaign monitoring ceased at Bendigo in July.

Screening by generic modelling was approved by the Peer Review Committee (PRC) and used last year to screen all rural regions. Further work on revising the generic screening procedures has been undertaken by the PRC – this work is yet to be completed.

During 2005, compliance was demonstrated for ozone at all stations where there was adequate data capture. At Traralgon data capture was reduced because the station was taken out of service for a major upgrade. Monitoring at Bendigo from May 2004 to July 2005 demonstrated compliance during that period.

The single exceedence occurred in typical conditions conducive to the accumulation of photochemical oxidant, as described in Section C.

**Sulfur dioxide**

**Table 7: 2005 compliance summary for sulfur dioxide in Victoria**

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

| Region<br>Performance monitoring station | Data availability rates (% of hours) | | | | | 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 |
| **Port Phillip** | | | | | | | | | | | |
| Alphington | 92.3 | 93.9 | 86.5 | 91.3 | 91.0 | 0 | 0 | 0.000 | Met | Met | Met |
| Geelong South | 89.2 | 86.3 | 88.7 | 90.3 | 88.6 | 0 | 0 | 0.001 | Met | Met | Met |
| Paisley | 93.5 | 90.2 | 90.7 | 94.5 | 92.2 | 0 | 0 | 0.002 | Met | Met | Met |
| RMIT (CBD) | 94.8 | 94.4 | 94.1 | 94.1 | 94.3 | 0 | 0 | 0.001 | Met | Met | Met |
| **Latrobe Valley** | | | | | | | | | | | |
| Moe | 96.7 | 95.8 | 95.6 | 94.6 | 95.7 | 0 | 0 | 0.001 | Met | Met | Met |
| Traralgon[a] | 96.4 | 95.7 | 95.6 | 63.1 | 87.6 | 0 | 0 | 0.002 | ND | ND | ND |

ND Not demonstrated by monitoring. See comments below.

a Traralgon was out of service for one month for a major station refurbishment.

Regions which do not require monitoring on the basis of screening arguments that pollutant levels are reasonably expected to be consistently below the relevant AAQ NEPM standard: Ballarat, Bendigo, Shepparton, Warrnambool, Wodonga, Mildura.

During 2005, the sulphur dioxide standards were not exceeded at any station and compliance was demonstrated at all stations where there was adequate data capture. At Traralgon data capture was reduced because the station was taken out of service for a major upgrade. Annual mean values are close to the limits of detection.

**Lead**

Following the phasing out of leaded petrol, levels are below the level of precision threshold[13] at the peak station, Collingwood. EPA ceased monitoring lead in Melbourne at the end of 2004. Past results easily meet Screening Procedure A and all other regions also satisfy screening arguments, as in the monitoring plan. All regions are assessed as complying with the standard and goal.

[13] National Environment Protection (Ambient Air Quality) Measure Technical Paper No. 9, *Lead Monitoring*, available from www.ephc.gov.au.

**Particles as $PM_{10}$**

**Table 8: 2005 compliance summary for $PM_{10}$ in Victoria**

AAQ NEPM Standard: 50µg/$m^3$ (24-hour average)

| **Region** Performance monitoring station | Data availability rates (% of days) Q1 | Q2 | Q3 | Q4 | Annual | Number of exceedences (days) | Performance against the standard and goal |
|---|---|---|---|---|---|---|---|
| **Port Phillip** | | | | | | | |
| Alphington | 100.0 | 92.3 | 90.2 | 88.0 | 92.6 | 0 | Met |
| Brighton | 83.3 | 89.0 | 83.7 | 80.4 | 84.1 | 0 | Met |
| Dandenong | 84.4 | 81.3 | 100.0 | 94.6 | 90.1 | 0 | Met |
| Footscray | 91.1 | 94.5 | 100.0 | 100.0 | 96.4 | 0 | Met |
| Geelong South | 100.0 | 97.8 | 96.7 | 90.2 | 96.2 | 7 | Not met |
| Mooroolbark | 100.0 | 100.0 | 97.8 | 100.0 | 99.5 | 9 | Not met |
| Richmond | 98.9 | 97.8 | 91.3 | 96.7 | 96.2 | 1 | Met |
| RMIT (CBD) | 100.0 | 100.0 | 95.7 | 97.8 | 98.4 | 0 | Met |
| **Latrobe Valley** | | | | | | | |
| Moe | 98.9 | 100.0 | 100.0 | 100.0 | 99.7 | 0 | Met |
| Traralgon[a] | 100.0 | 100.0 | 100.0 | 60.9 | 90.1 | 0 | ND |
| **Ballarat[b]** | 0.0 | 0.0 | 63.0 | 91.3 | 38.9 | 0 | ND |
| **Bendigo[c]** | 100.0 | 98.9 | 4.3 | 0.0 | 50.4 | 2 | ND |
| **Mildura** | 100.0 | 97.8 | 31.5 | 28.3 | 64.1 | 24[d] | Not met |

Monitoring was by TEOM.

ND Not demonstrated by monitoring. See comments below.

a Traralgon was out of service for one month for a major station refurbishment.

b Campaign monitoring commenced at Ballarat in July.

c Campaign monitoring ceased at Bendigo in July.

d Some readings in Q3 and Q4 at Mildura were flagged as invalid because of an incorrect flow calibration. The readings are known to be too low and two exceedences are counted although the invalid data are excluded from other statistics in this report.

Screening has not been completed for any region and regions not shown are assessed as 'not demonstrated'.

For $PM_{10}$, the goal was met at all Port Phillip stations, except Geelong South and Mooroolbark. In the Latrobe Valley region, no exceedences were recorded but at Traralgon data capture was reduced because the station was taken out of service for a major upgrade. The campaign stations at Bendigo and Ballarat had insufficient data capture to demonstrate compliance in the calendar year 2005.

On the basis of May 2004 to July 2005 data, Bendigo achieved the 2008 goal. Mildura was confirmed as a location severely affected by windblown dust. In addition to TEOM monitoring, $PM_{10}$ was also monitored by high-volume sampler one day in six at Alphington, Geelong South and RMIT (CBD) throughout the year – no additional exceedence days were recorded.

The most common causes of $PM_{10}$ exceedences were windblown dust in the warmer months and accumulation of combustion particles in poor dispersion conditions during the colder months; the former was predominant at Geelong South and Mildura, the latter at Mooroolbark. Details are given in Section C.

**Particles as $PM_{2.5}$**

The NEPM was revised in 2003 to include advisory reporting standards for particles as $PM_{2.5}$. There is no time frame for compliance, but monitoring by the reference method and other acceptable methods is required to be reported. Table 9 summarises Victoria's monitoring of $PM_{2.5}$ by the reference method. Only reference method monitoring is to be used for comparisons with the advisory reporting standards. The goal is to gather sufficient data nationally to facilitate a review of the advisory reporting standards as part of the review of the NEPM which commenced in 2005. Data losses occurred at Footscray in the first and fourth quarters, due to equipment failures. Exceedences of the 24-hour standard occurred when particles were trapped in stable conditions during the colder months.

Table 10 summarises Victoria's monitoring of $PM_{2.5}$ by TEOM. Details are given in Section C.

**Table 9: 2005 monitoring summary for $PM_{2.5}$ in Victoria**

AAQ NEPM advisory reporting standards: 25μg/m³ (24-hour average); 8μg/m³ (1-year average)

| **Region**<br>Performance monitoring station | Data availability rates (% of days) | | | | | Number of exceedences (days) | Annual mean (μg/m³) |
|---|---|---|---|---|---|---|---|
| | Q1 | Q2 | Q3 | Q4 | Annual | | |
| **Port Phillip** | | | | | | | |
| Alphington | 96.7 | 96.7 | 87.1 | 96.8 | 94.3 | 3 | **8.1** |
| Footscray | 66.7 | 100.0 | 93.5 | 64.5 | 81.1 | 2 | 7.1 |

Monitoring by reference method (one-day-in-three).

**Table 10: $PM_{2.5}$ Equivalence Program 2005 TEOM monitoring – summary**

| **Region**<br>Performance monitoring station | Data availability rates (% of days) | | | | | Annual mean (μg/m³) |
|---|---|---|---|---|---|---|
| | Q1 | Q2 | Q3 | Q4 | Annual | |
| **Port Phillip** | | | | | | |
| Alphington | 98.9 | 90.1 | 90.2 | 94.6 | 93.4 | 5.5 |
| Footscray | 98.9 | 100.0 | 100.0 | 100.0 | 99.7 | 4.7 |

Monitoring by TEOM (daily).

**Table 11: 2005 summary statistics for daily peak eight-hour carbon monoxide in Victoria**

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

| **Region**<br>Performance monitoring station | Number of valid days | Highest (ppm) | Highest (date:hour) | 2nd highest (ppm) | 2nd highest (date:hour) |
|---|---|---|---|---|---|
| **Port Phillip** | | | | | |
| Alphington | 342 | 3.1 | Jun 28:03 | 2.9 | May 20:02 |
| Geelong South | 352 | 3.5 | Jun 08:02 | 2.9 | Jun 07:24 |
| Richmond | 351 | 3.8 | Jun 28:03 | 3.5 | May 10:02 |
| RMIT (CBD) | 348 | 2.3 | May 14:02<br>Jun 29:04 | | |
| **Ballarat**[a] | 126 | 1.5 | Sep 06:02 | 1.1 | Sep 05:24 |
| **Bendigo**[b] | 179 | 2.0 | May 21:02 | 1.9 | Jun 25:02 |

a Campaign monitoring commenced at Ballarat in July.
b Campaign monitoring ceased at Bendigo in July.

## C. ANALYSIS OF AIR QUALITY MONITORING

Annual summary statistics that allow assessment of how close air quality was to the standards are presented in this section. The AAQ NEPM states that the short-term standards should not be exceeded on more than one day for carbon monoxide, nitrogen dioxide, ozone and sulfur dioxide, or on more than five days per year for $PM_{10}$. The second highest non-overlapping daily value for the year (or the sixth for $PM_{10}$) can indicate the extent to which the standards are, or are not, met. Concentrations exceeding the standard are highlighted in bold.

All occasions when a standard was exceeded are also listed and the circumstances leading to the exceedence are noted, if they can be inferred.

Tables of monitoring statistics presented in this Section have been prepared according to AAQ NEPM guidelines.[14]

### Carbon monoxide

Refer to Table 11.

Carbon monoxide levels were well within the standard at all stations. The highest readings were at the inner-suburban site Richmond, where carbon monoxide reached 42 per cent of the standard.

[14] *National Environment Protection (Ambient Air Quality) Measure Technical Paper No. 8*, Annual Reports, available from www.ephc.gov.au.

**Nitrogen dioxide**

**Table 12: 2005 summary statistics for daily peak one-Hour nitrogen dioxide in Victoria**

AAQ NEPM standard: 0.12ppm (1-hour average)

| **Region**<br>Performance monitoring station | Number of valid days | Highest (ppm) | Highest (date:hour) | 2nd highest (ppm) | 2nd highest (date:hour) |
|---|---|---|---|---|---|
| **Port Phillip** | | | | | |
| Alphington | 346 | 0.050 | Apr 27:18 | 0.049 | Apr 23:19 |
| Brighton | 362 | 0.054 | Apr 27:20 | 0.044 | Apr 22:19 |
| Footscray | 363 | 0.053 | Feb 23:17 | 0.052 | Apr 27:20 |
| Geelong South | 358 | 0.048 | Apr 28:08 | 0.044 | Apr 27:21 |
| Point Cook | 353 | 0.043 | Jun 24:14<br>Apr 27:21 | | |
| RMIT (CBD) | 358 | 0.058 | Apr 22:19 | 0.054 | Jun 27:15<br>Apr 27:19 |
| **Latrobe Valley** | | | | | |
| Moe | 357 | 0.039 | May 04:18 | 0.036 | Apr 01:19 |
| Traralgon | 334 | 0.040 | Apr 13:18 | 0.033 | May 04:18<br>Apr 02:20 |
| **Ballarat**[a] | 112 | 0.030 | Sep 02:20 | 0.026 | Sep 05:19 |
| **Bendigo**[b] | 180 | 0.037 | Jun 06:19 | 0.036 | Mar 11:22<br>Apr 22:20 |

a Campaign monitoring commenced at Ballarat in July.
b Campaign monitoring ceased at Bendigo in July.

Nitrogen dioxide levels were well within the standard at all stations. The highest reading occurred at the CBD site, RMIT (CBD), and was 48 per cent of the standard. The highest annual average was 57 per cent of the standard (Table 5).

**Ozone**

**Table 13: 2005 summary statistics for daily peak one-hour ozone in Victoria**

AAQ NEPM standard: 0.10ppm (1-hour average)

| **Region**<br>Performance monitoring station | Number of valid days | Highest (ppm) | Highest (date:hour) | 2nd highest (ppm) | 2nd highest (date:hour) |
|---|---|---|---|---|---|
| **Port Phillip** | | | | | |
| Alphington | 339 | 0.077 | Feb 23:18 | 0.076 | Dec 31:14 |
| Brighton | 357 | 0.088 | Dec 31:15 | 0.074 | Mar 12:17 |
| Dandenong | 338 | 0.072 | Jan 13:16 | 0.070 | Mar 12:15 |
| Footscray | 362 | 0.082 | Dec 31:15 | 0.076 | Mar 12:14 |
| Geelong South | 357 | 0.080 | Feb 23:17 | 0.075 | Mar 12:18 |
| Melton | 343 | 0.079 | Mar 12:17 | 0.078 | Jan 10:16 |
| Moorooduc | 361 | 0.080 | Mar 12:15 | 0.069 | Jan 25:17 |
| Mooroolbark | 357 | 0.089 | Dec 31:13 | 0.081 | Jan 27:16 |
| Point Cook | 354 | 0.092 | Mar 12:15 | 0.075 | Feb 23:16 |
| Point Henry | 363 | 0.088 | Feb 23:16 | 0.075 | Mar 12:15 |
| **Latrobe Valley** | | | | | |
| Moe | 363 | 0.062 | Mar 01:17 | 0.059 | Mar 13:15<br>Mar 14:16 |
| Traralgon | 315 | 0.067 | Mar 01:17 | 0.058 | Mar 13:14 |
| **Ballarat**[a] | 143 | 0.056 | Dec 11:18 | 0.045 | Dec 30:18<br>Nov 02:19 |
| **Bendigo**[b] | 181 | 0.055 | Jan 24:19 | 0.051 | Mar 01:13 |

a Campaign monitoring commenced at Ballarat in July.
b Campaign monitoring ceased at Bendigo in July.

**Table 14: 2005 summary statistics for daily peak four-hour ozone in Victoria**

AAQ NEPM standard: 0.08ppm (4-hour average)

| **Region**<br>Performance monitoring station | Number of valid days | Highest (ppm) | Highest (date:hour) | 2nd highest (ppm) | 2nd highest (date:hour) |
|---|---|---|---|---|---|
| **Port Phillip** | | | | | |
| Alphington | 339 | 0.070 | Feb 23:19 | 0.056 | Dec 31:17 |
| Brighton | 357 | 0.069 | Mar 12:17 | 0.065 | Nov 01:18 |
| Dandenong | 339 | 0.067 | Jan 13:18 | 0.066 | Feb 23:17 |
| Footscray | 362 | 0.066 | Mar 12:16 | 0.063 | Jan 10:18 |
| Geelong South | 356 | 0.068 | Feb 23:17 | 0.067 | Mar 12:19 |
| Melton | 344 | 0.075 | Mar 12:19 | 0.073 | Jan 10:18 |
| Moorooduc | 361 | 0.072 | Mar 12:17 | 0.061 | Mar 13:14 |
| | | | | | Jan 25:18 |
| Mooroolbark | 357 | 0.072 | Dec 31:15 | 0.071 | Jan 27:18 |
| Point Cook | 354 | **0.082** | Mar 12:17 | 0.067 | Feb 23:18 |
| Point Henry | 363 | 0.076 | Feb 23:18 | 0.069 | Mar 12:17 |
| **Latrobe Valley** | | | | | |
| Moe | 363 | 0.051 | Mar 13:16 | 0.050 | Mar 14:18 |
| | | | | | Jan 31:18 |
| | | | | | Dec 30:18 |
| Traralgon | 315 | 0.055 | Mar 13:16 | 0.052 | Mar 01:19 |
| **Ballarat**[a] | 143 | 0.049 | Dec 11:20 | 0.044 | Nov 02:20 |
| **Bendigo**[b] | 182 | 0.050 | Jan 24:20 | 0.049 | Mar 01:15 |

a Campaign monitoring commenced at Ballarat in July.
b Campaign monitoring ceased at Bendigo in July.

Ozone is generated by chemical reactions in strong sunlight as precursor chemicals are transported from the point of emission. Ozone events are highly variable in terms of both frequency and severity. Four-hour averages are usually higher relative to the standard than one-hour averages, leading to more exceedences. In 2005 there was only one exceedence, of the four-hour standard, at Point Cook. On this day there was a typical build-up of ozone as precursors from Melbourne entered Port Phillip Bay and then were blown back towards land.

**Table 15: 2005 ozone exceedences**

AAQ NEPM standard: 0.08ppm (4-hour average)

| Date | Port Phillip<br>Point Cook | Inferred cause |
|---|---|---|
| 12-Mar-2005 | 0.082 ppm | Recirculation |

**Sulfur dioxide**

**Table 16: 2005 summary statistics for daily peak one-hour sulfur dioxide in Victoria**

AAQ NEPM standard: 0.20ppm (1-hour average)

| **Region**<br>Performance monitoring station | Number of valid days | Highest (ppm) | Highest (date:hour) | 2nd highest (ppm) | 2nd highest (date:hour) |
|---|---|---|---|---|---|
| **Port Phillip** | | | | | |
| Alphington | 345 | 0.011 | Dec 02:09 | 0.010 | Jan 02:05 |
| Geelong South | 352 | 0.054 | Jun 25:14 | 0.050 | Jun 26:13 |
| Paisley | 351 | 0.044 | Dec 17:20 | 0.036 | Nov 20:04 |
| RMIT (CBD) | 361 | 0.017 | Dec 20:08 | 0.016 | Jan 02:05<br>Jun 29:09 |
| **Latrobe Valley** | | | | | |
| Moe | 365 | 0.047 | Feb 27:14 | 0.039 | Feb 13:19 |
| Traralgon | 334 | 0.061 | Nov 05:11 | 0.060 | Feb 27:12 |

**Table 17: 2005 summary statistics for daily peak 24-hour sulfur dioxide in Victoria**

AAQ NEPM standard: 0.08ppm (24-hour average)

| **Region**<br>Performance monitoring station | Number of valid days | Highest (ppm) | Highest (date:hour) | 2nd highest (ppm) | 2nd highest (date:hour) |
|---|---|---|---|---|---|
| **Port Phillip** | | | | | |
| Alphington | 345 | 0.002 | Nov 27 | | |
| | | | Oct 17 | | |
| | | | Jan 02 | | |
| | | | Aug 26 | | |
| | | | Aug 24 | | |
| | | | Jun 27 | | |
| | | | Jun 02 | | |
| | | | May 29 | | |
| | | | Mar 15 | | |
| | | | Mar 04 | | |
| | | | Jan 17 | | |
| Geelong South | 352 | 0.008 | Jun 06 | 0.005 | Aug 25 |
| | | | | | Jun 26 |
| | | | | | Jun 25 |
| | | | | | Feb 28 |
| Paisley | 351 | 0.010 | Dec 18 | 0.009 | Jan 06 |
| RMIT (CBD) | 361 | 0.005 | Mar 15 | 0.004 | Oct 17 |
| | | | | | Aug 22 |
| | | | | | Jun 29 |
| | | | | | May 29 |
| | | | | | May 12 |
| **Latrobe Valley** | | | | | |
| Moe | 365 | 0.009 | Nov 05 | 0.007 | Oct 17 |
| Traralgon | 334 | 0.012 | May 29 | 0.008 | Nov 05 |

Sulfur dioxide levels were well within the standards at all stations. One-hour averages are higher relative to the standard than 24-hour or annual averages. The highest readings occurred in the Latrobe Valley and were 31 per cent of the one-hour standard and 15 per cent of the 24-hour standard. The highest annual average was approximately 10 per cent of the standard (Table 7).

**Particles as $PM_{10}$**

**Table 18: 2005 summary statistics for 24-hour $PM_{10}$ in Victoria**

AAQ NEPM standard: 50μg/m³ (24-hour average)

| **Region**<br>Performance monitoring station | Number of valid days | Highest (μg/m³) | Highest (date) | 6th highest (μg/m³) | 6th highest (date) |
|---|---|---|---|---|---|
| **Port Phillip** | | | | | |
| Alphington | 338 | 46.6 | Jun 27 | 38.6 | Mar 13 |
| Brighton | 307 | 41.5 | Jun 27 | 33.4 | Jun 28 |
| Dandenong | 329 | 43.7 | Jun 27 | 38.0 | Jun 08 |
| Footscray | 352 | 48.9 | May 19 | 43.9 | Apr 28 |
| Geelong South | 351 | **83.0** | Apr 03 | **52.0** | Apr 01 |
| Mooroolbark | 363 | **57.6** | Apr 28 | **53.5** | Jun 27 |
| | | | | | May 21 |
| Richmond | 351 | **54.9** | Dec 28 | 37.7 | Dec 31 |
| RMIT (CBD) | 359 | 41.7 | Apr 23 | 36.0 | May 29 |
| **Latrobe Valley** | | | | | |
| Moe | 364 | 36.9 | Apr 28 | 32.8 | Apr 03 |
| | | | | | Jan 11 |
| Traralgon | 329 | 44.9 | Apr 01 | 36.0 | May 03 |
| **Ballarat**[a] | 142 | 26.0 | Dec 15 | 24.0 | Nov 23 |
| **Bendigo**[b] | 184 | **55.7** | Apr 28 | 45.2 | Jun 06 |
| **Mildura** | 234 | **476.0** | Apr 03 | **110.2** | Jan 20 |

a Campaign monitoring commenced at Ballarat in July
b Campaign monitoring ceased at Bendigo in July.

In addition to TEOM monitoring shown in Table 18, PM10 was monitored by high-volume sampler one day in six at Alphington, Geelong South and RMIT (CBD) throughout the year. The highest high-volume sampler readings were 33.6, 67.5 and 38.5 μg/m³, respectively. The single exceedence at Geelong South was on a day (June 7) when the TEOM also registered an exceedence.

In 2005 $PM_{10}$ exceedences occurred on the days listed in Table 19. Most exceedences have been attributed to windblown dust from the ground, typically in high winds and with high coarse-to-fine particle ratios. The standard is also exceeded in stable atmospheric conditions with low winds, which allow combustion particle emissions to accumulate, especially in colder weather.

**Table 19: 2005 $PM_{10}$ exceedences**

AAQ NEPM standard: 50µg/m³ (24-hour average)

| Date | Port Phillip | | | Bendigo | Mildura | Inferred cause |
|---|---|---|---|---|---|---|
| | Geelong S | Mooroolbark | Richmond | Bendigo | Mildura | |
| 04-Jan-2005 | | | | | 100.8 | Dust |
| 20-Jan-2005 | | | | | 110.2 | Dust |
| 01-Feb-2005 | | | | | 177.5 | Dust |
| 02-Feb-2005 | | | | | 117.5 | Dust |
| 03-Feb-2005 | | | | | 71.3 | Dust |
| 18-Feb-2005 | | | | | 82.2 | Dust |
| 28-Feb-2005 | | 56.9 | | | | Stable conditions. |
| 01-Mar-2005 | | | | | 258.2 | Dust. |
| 02-Mar-2005 | | | | | 58.4 | Dust |
| 15-Mar-2005 | | | | | 56.6 | Dust |
| 25-Mar-2005 | | | | | 53.5 | Dust |
| 01-Apr-2005 | 52.0 | | | | | Dust. |
| 03-Apr-2005 | 83.0 | | | | 476.0 | Dust |
| 09-Apr-2005 | | 52.7 | | | | Local source |
| 10-Apr-2005 | | | | | 68.9 | Dust |
| 23-Apr-2005 | | 56.0 | | | | Prescribed burns |
| 28-Apr-2005 | 80.0 | 57.6 | | 55.7 | | Dust (Geelong South, Bendigo). Prescribed burns and dust (Mooroolbark) |
| 03-May-2005 | | 54.0 | | | | Stable conditions |
| 04-May-2005 | | 50.1 | | | | Stable conditions |
| 20-May-2005 | | | | 50.7 | | Stable conditions |
| 21-May-2005 | | 53.5 | | | | Stable conditions |
| 30-May-2005 | | | | | 52.1 | Stable conditions |
| 03-Jun-2005 | | | | | 85.7 | Stable conditions |
| 06-Jun-2005 | 51.4 | | | | 55.4 | Stable conditions |
| 07-Jun-2005 | 73.8 | | | | | Stable conditions |
| 08-Jun-2005 | | 53.0 | | | | Stable conditions |
| 27-Jun-2005 | | 53.5 | | | | Stable conditions |
| 18-Jul-2005 | | | | | 50.1 | Stable conditions |
| 30-Aug-2005 | | | | | 208.1[a] | Dust |
| 15-Oct-2005 | 56.2 | | | | | Stable conditions |
| 19-Oct-2005 | 54.1 | | | | | Local dust |
| 02-Dec-2005 | | | | | 218.1[a] | Dust |
| 12-Dec-2005 | | | | | 104.3 | Dust |
| 15-Dec-2005 | | | | | 102.1 | Dust |
| 17-Dec-2005 | | | | | 62.3 | Dust |
| 21-Dec-2005 | | | | | 75.5 | Dust |
| 23-Dec-2005 | | | | | 203.0 | Dust |
| 28-Dec-2005 | | | 54.9 | | | Unknown |
| 31-Dec-2005 | | | | | 63.2 | Dust |
| Total 2005 | 7 | 9 | 1 | 2 | 24 | |

All readings in µg/m³.

a Some readings at Mildura were flagged as invalid because of an incorrect flow calibration. The readings indicated are known to be too low and would have been true exceedences.

The two main causes of $PM_{10}$ exceedences were *dust* and *stable conditions*. *Dust* is defined as crustal material carried by (usually high) winds. The dust may be picked up from the ground by the wind or generated by other mechanical disturbances. It may originate either close to the monitoring station or be transported over large distances. *Stable conditions* refer to the build-up of pollutants in conditions of poor dispersion such as typically occur on calm, cold nights, when pollutants may be transported in the airshed with little dilution.

Mildura station had the most $PM_{10}$ exceedence days, and most of them were attributed to windblown dust, which is exacerbated by the hot, dry climate and the flat sandy soils of the Mallee region. Most often these events at Mildura were associated with the passage of a cold front or trough. Dust was also the most frequent cause of exceedences at Geelong South.

At Mooroolbark, exceedences were caused by the accumulation of local emissions in stable air overnight, sometimes added to by traffic emissions during the day. The location of this station in a valley makes it prone to this type of occurrence.

**Particles as $PM_{2.5}$**

**Table 20: 2005 summary statistics for 24-hour $PM_{2.5}$ in Victoria**

AAQ NEPM advisory reporting standard: 25μg/m$^3$ (24-hour average)

| **Region** Performance monitoring station | Number of valid days | Highest (μg/m$^3$) | Highest (date) |
|---|---|---|---|
| **Port Phillip** | | | |
| Alphington | 115 | 37.4 | Jun 25 |
| Footscray | 99 | 31.8 | Jun 28 |

Monitoring by reference method (one-day-in-three).

The 24-hour reporting standard was exceeded at both stations and the annual reporting standard was exceeded at Alphington (Table 9). The 24-hour exceedences occurred on three days when poor dispersion conditions caused the accumulation of pollution. Results of $PM_{2.5}$ monitoring by TEOM are not adjusted for loss of volatiles and are often lower than the reference method results.

**Table 21: $PM_{2.5}$ Equivalence Program 2004 TEOM monitoring – daily statistics**

| **Region** Performance monitoring station | Number of valid days | Highest (μg/m$^3$) | Highest (date) |
|---|---|---|---|
| **Port Phillip** | | | |
| Alphington | 341 | 24.8 | Apr 23 |
| Footscray | 364 | 20.3 | Apr 23 |

**Table 22: 2005 $PM_{2.5}$ exceedences**

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

| Date | Port Phillip | | Inferred Cause |
|---|---|---|---|
| | Alphington | Footscray | |
| 23-Apr-2005 | 26.8 | 29.4 | Stable conditions |
| 25-Jun-2005 | 37.4 | | Stable conditions |
| 28-Jun-2005 | 30.7 | 31.8 | Stable conditions |

All readings in μg/m³. Measured by reference method.

**Summary of Progress towards achieving the AAQ NEPM 2008 goal**

*Compliance*

The AAQ NEPM goal for carbon monoxide, nitrogen dioxide, ozone, sulfur dioxide, lead and $PM_{10}$ is to achieve the standards, to the extent specified by the number of allowed exceedences, by 2008. As assessed in accordance with the monitoring protocol, in 2005 the 2008 goal was met for all pollutants except for $PM_{10}$.

Compliance with the 2008 goal for $PM_{10}$ was demonstrated at all stations with sufficient data, except for Geelong South, Mooroolbark and Mildura (see Table 8 and Table 19).

For ozone, the goal of no more than one exceedence of the standards was achieved at all stations. The one-hour standard was not exceeded at any stations. There was a single exceedence of the four-hour standard (see Table 6 and Table 15).

The AAQ NEPM goal for $PM_{2.5}$ is to gather sufficient data to facilitate a review of the advisory reporting standards as part of the review of the NEPM. $PM_{2.5}$ has been monitored at two stations in the Port Phillip region.

*Data Capture*

There were no 'not demonstrated' assessments due to insufficient data at stations operating continuously throughout the year. This is attributed to Victoria's ongoing program to increase data capture through improvements to systems and instrument upgrades.

In 2005, EPA commenced a three-year program to replace and upgrade instrumentation and infrastructure at all of its monitoring stations. When stations are taken off-line for these upgrades, the AAQ NEPM data capture targets may not be met. This affected monitoring at Traralgon in quarter four, where the station was out of service for one month. As there were no exceedences, it is likely the standards and goal would have been met at Traralgon for all pollutants.

In 2005, compliance could not be demonstrated at the campaign stations Ballarat and Bendigo, as they did not operate for the full year. Bendigo results for May 2004 to July 2005 demonstrated compliance for nitrogen dioxide, ozone and $PM_{10}$ during this period and compliance is likely for Ballarat also.

*Screening*

Regions which do not require monitoring on the basis of screening procedures are listed below the compliance summary tables (Table 4 to Table 8).

Screening by campaign monitoring is being progressively implemented. Monitoring of nitrogen dioxide at Bendigo in 2004-05 satisfied screening criteria for Bendigo and the other rural regions, except Ballarat. Campaign monitoring for $PM_{10}$ at Bendigo, Ballarat, Shepparton and Mildura has not met the screening criteria. Compliance in regions

where screening criteria have not been met are reported as 'not demonstrated'.

## D. DATA ANALYSIS

Results of further analysis of the monitoring data are presented in this section. In these tables daily peak values are formed only when at least 75 per cent of the data for the day are valid. Data for stations with less than 15 per cent data availability are omitted and stations with less than 75 per cent data availability are shown in italics. Exceedences are shown in bold. The percentiles for 8-hour carbon monoxide and 4-hour ozone are based on running averages, including those that overlap from one day to the next.

Percentiles of 2005 daily peak concentrations are presented for each station and standard. Annual statistics for the past ten years are also presented for trend stations with at least five years of data. Trends at different stations and for different statistics have different statistical significance and in most cases there is no obvious overall trend over the ten-year period shown, in spite of increasing population pressures. lead is an exception, where annual averages have decreased markedly, so that monitoring is no longer necessary. Carbon monoxide has also decreased over the period.

### Carbon monoxide

**Table 23: 2005 percentiles of daily peak eight-hour carbon monoxide concentrations in Victoria**

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

| **Region**<br>Performance monitoring station | Data availability (% of days) | Max (ppm) | Percentiles (ppm) 99th | 98th | 95th | 90th | 75th | 50th |
|---|---|---|---|---|---|---|---|---|
| **Port Phillip** | | | | | | | | |
| Alphington | 93.7 | 3.1 | 2.5 | 2.4 | 2.0 | 1.6 | 0.9 | 0.6 |
| Geelong South | 96.4 | 3.5 | 1.8 | 1.5 | 0.9 | 0.7 | 0.2 | 0.1 |
| Richmond | 96.2 | 3.8 | 3.1 | 2.8 | 2.2 | 1.5 | 0.6 | 0.2 |
| RMIT (CBD) | 95.3 | 2.3 | 2.1 | 1.9 | 1.7 | 1.3 | 0.9 | 0.6 |
| **Ballarat** | *34.5* | *1.5* | *1.1* | *0.9* | *0.4* | *0.2* | *0.1* | *0.0* |
| **Bendigo** | *49.0* | *2.0* | *1.9* | *1.7* | *1.5* | *1.0* | *0.5* | *0.2* |

Years with data availability below 75 per cent shown in italics.

**Table 24: Percentiles of daily maximum eight-hour carbon monoxide at Alphington (1996–2005)**

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

| Year | Data availability (% of days) | No. of exceedences (days) | Max (ppm) | Percentiles (ppm) | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | 99th | 98th | 95th | 90th | 75th | 50th |
| 1996 | 98.6 | 0 | 6.5 | 5.8 | 5.0 | 3.3 | 2.5 | 1.6 | 0.8 |
| 1997 | 98.9 | 0 | 6.5 | 5.5 | 4.4 | 3.4 | 2.6 | 1.5 | 0.8 |
| 1998 | 95.3 | 0 | 6.8 | 6.0 | 5.1 | 3.9 | 2.7 | 1.7 | 0.7 |
| 1999 | *55.1* | *0* | *6.2* | *4.7* | *4.1* | *3.0* | *2.1* | *1.1* | *0.6* |
| 2000 | 96.7 | 0 | 5.0 | 4.5 | 4.3 | 3.1 | 2.4 | 1.2 | 0.6 |
| 2001 | 92.9 | 0 | 5.2 | 3.8 | 3.4 | 2.9 | 2.0 | 1.1 | 0.6 |
| 2002 | 93.7 | 0 | 3.8 | 3.5 | 3.1 | 2.7 | 2.0 | 0.9 | 0.4 |
| 2003 | 96.7 | 0 | 5.4 | 3.9 | 3.5 | 2.7 | 1.8 | 0.9 | 0.5 |
| 2004 | 97.0 | 0 | 3.7 | 2.4 | 2.3 | 1.7 | 1.3 | 0.8 | 0.5 |
| 2005 | 93.7 | 0 | 3.1 | 2.5 | 2.4 | 2.0 | 1.6 | 0.9 | 0.6 |

Years with data availability below 75 per cent shown in italics.

**Table 25: Percentiles of daily maximum eight-hour carbon monoxide at Geelong South (1996–2005)**

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

| Year | Data availability (% of days) | No. of exceedences (days) | Max (ppm) | Percentiles (ppm) | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | 99th | 98th | 95th | 90th | 75th | 50th |
| 1996 | 86.3 | 0 | 4.3 | 3.3 | 2.9 | 1.9 | 1.2 | 0.5 | 0.3 |
| 1997 | 0.0 | | | | | | | | |
| 1998 | *66.0* | *0* | *3.3* | *2.8* | *2.6* | *2.3* | *1.6* | *0.7* | *0.4* |
| 1999 | 92.6 | 0 | 3.0 | 2.7 | 2.3 | 1.6 | 1.1 | 0.7 | 0.3 |
| 2000 | 85.8 | 0 | 2.7 | 2.1 | 1.9 | 1.4 | 1.0 | 0.5 | 0.3 |
| 2001 | 87.7 | 0 | 2.2 | 1.9 | 1.6 | 1.2 | 0.9 | 0.5 | 0.2 |
| 2002 | 87.1 | 0 | 2.3 | 1.8 | 1.4 | 1.0 | 0.6 | 0.3 | 0.1 |
| 2003 | 87.1 | 0 | 3.2 | 1.8 | 1.6 | 1.1 | 0.7 | 0.4 | 0.2 |
| 2004 | 85.8 | 0 | 2.6 | 1.7 | 1.6 | 0.9 | 0.6 | 0.4 | 0.1 |
| 2005 | 96.4 | 0 | 3.5 | 1.8 | 1.5 | 0.9 | 0.7 | 0.2 | 0.1 |

Years with data availability below 75 per cent shown in italics. Years with data availability below 15 per cent not shown.

**Table 26: Percentiles of daily maximum eight-hour carbon monoxide at RMIT (CBD) (1996–2005)**

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

| Year | Data availability (% of days) | No. of exceedences (days) | Max (ppm) | Percentiles (ppm) | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | 99th | 98th | 95th | 90th | 75th | 50th |
| 1996 | 90.4 | 0 | 5.5 | 4.5 | 3.8 | 2.8 | 2.2 | 1.6 | 0.9 |
| 1997 | 98.4 | 0 | 5.5 | 4.3 | 3.8 | 2.9 | 2.4 | 1.4 | 0.9 |
| 1998 | 86.3 | 0 | 5.9 | 4.7 | 4.4 | 3.0 | 2.1 | 1.4 | 0.8 |
| 1999 | *35.6* | *0* | *5.9* | *5.0* | *3.3* | *2.7* | *2.0* | *1.5* | *1.2* |
| 2000 | 96.4 | 0 | 5.0 | 3.4 | 3.2 | 2.5 | 1.8 | 1.1 | 0.8 |
| 2001 | 88.8 | 0 | 3.6 | 2.7 | 2.4 | 2.1 | 1.7 | 1.1 | 0.7 |
| 2002 | 85.2 | 0 | 3.2 | 2.9 | 2.7 | 1.8 | 1.5 | 0.9 | 0.5 |
| 2003 | 96.7 | 0 | 3.9 | 3.0 | 2.6 | 1.8 | 1.5 | 0.9 | 0.6 |
| 2004 | 91.5 | 0 | 2.1 | 1.9 | 1.8 | 1.5 | 1.2 | 0.8 | 0.6 |
| 2005 | 95.3 | 0 | 2.3 | 2.1 | 1.9 | 1.7 | 1.3 | 0.9 | 0.6 |

Years with data availability below 75 per cent shown in italics.

**Nitrogen dioxide**

**Table 27: 2005 percentiles of daily peak one-hour nitrogen dioxide concentrations in Victoria**

AAQ NEPM standard: 0.12ppm (1-hour average)

| **Region** Performance monitoring station | Data availability (% of days) | Max (ppm) | Percentiles (ppm) | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | | 99th | 98th | 95th | 90th | 75th | 50th |
| **Port Phillip** | | | | | | | | |
| Alphington | 94.8 | 0.050 | 0.043 | 0.039 | 0.035 | 0.033 | 0.027 | 0.022 |
| Brighton | 99.2 | 0.054 | 0.040 | 0.038 | 0.034 | 0.032 | 0.027 | 0.020 |
| Footscray | 99.5 | 0.053 | 0.046 | 0.043 | 0.038 | 0.034 | 0.027 | 0.021 |
| Geelong South | 98.1 | 0.048 | 0.038 | 0.034 | 0.029 | 0.026 | 0.021 | 0.015 |
| Pt Cook | 96.7 | 0.043 | 0.039 | 0.037 | 0.032 | 0.027 | 0.021 | 0.014 |
| RMIT (CBD) | 97.8 | 0.058 | 0.050 | 0.047 | 0.040 | 0.037 | 0.032 | 0.027 |
| **Latrobe Valley** | | | | | | | | |
| Moe | 97.8 | 0.039 | 0.034 | 0.032 | 0.027 | 0.024 | 0.019 | 0.014 |
| Traralgon | 91.5 | 0.040 | 0.032 | 0.030 | 0.028 | 0.026 | 0.023 | 0.016 |
| **Ballarat** | *30.7* | *0.030* | *0.026* | *0.024* | *0.022* | *0.019* | *0.015* | *0.010* |
| **Bendigo** | *49.3* | *0.037* | *0.036* | *0.035* | *0.032* | *0.030* | *0.026* | *0.017* |

Stations with data availability below 75 per cent shown in italics.

**Table 28: Percentiles of daily maximum one-hour nitrogen dioxide at Alphington (1996–2005)**

AAQ NEPM standard: 0.12ppm (1-hour average)

| Year | Data availability (% of days) | No. of exceedences (days) | Max (ppm) | Percentiles (ppm) | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | 99th | 98th | 95th | 90th | 75th | 50th |
| 1996 | 93.7 | 0 | 0.061 | 0.046 | 0.043 | 0.038 | 0.034 | 0.029 | 0.024 |
| 1997 | 84.4 | 0 | 0.075 | 0.059 | 0.051 | 0.044 | 0.038 | 0.030 | 0.025 |
| 1998 | 95.9 | 0 | 0.073 | 0.058 | 0.055 | 0.045 | 0.039 | 0.031 | 0.026 |
| 1999 | 97.5 | 0 | 0.065 | 0.046 | 0.045 | 0.038 | 0.035 | 0.029 | 0.025 |
| 2000 | 89.0 | 0 | 0.069 | 0.053 | 0.048 | 0.040 | 0.035 | 0.029 | 0.024 |
| 2001 | 90.4 | 0 | 0.060 | 0.052 | 0.047 | 0.039 | 0.034 | 0.029 | 0.024 |
| 2002 | 93.7 | 0 | 0.060 | 0.048 | 0.046 | 0.038 | 0.034 | 0.030 | 0.023 |
| 2003 | 90.1 | 0 | 0.065 | 0.050 | 0.046 | 0.037 | 0.032 | 0.027 | 0.023 |
| 2004 | 95.6 | 0 | 0.056 | 0.044 | 0.039 | 0.034 | 0.032 | 0.028 | 0.023 |
| 2005 | 94.8 | 0 | 0.050 | 0.043 | 0.039 | 0.035 | 0.033 | 0.027 | 0.022 |

**Table 29: Percentiles of daily maximum one-hour nitrogen dioxide at Footscray (1996–2005)**

AAQ NEPM standard: 0.12 ppm (1-hour average)

| Year | Data availability (% of days) | No. of exceedences (days) | Max (ppm) | Percentiles (ppm) | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | 99th | 98th | 95th | 90th | 75th | 50th |
| 1996 | 91.5 | 0 | 0.071 | 0.054 | 0.049 | 0.043 | 0.037 | 0.028 | 0.023 |
| 1997 | 98.1 | 0 | 0.088 | 0.066 | 0.058 | 0.048 | 0.040 | 0.032 | 0.026 |
| 1998 | 89.9 | 0 | 0.070 | 0.057 | 0.053 | 0.048 | 0.042 | 0.032 | 0.024 |
| 1999 | 97.8 | 0 | 0.081 | 0.057 | 0.051 | 0.045 | 0.040 | 0.033 | 0.026 |
| 2000 | 82.7 | 0 | 0.070 | 0.060 | 0.054 | 0.046 | 0.039 | 0.030 | 0.025 |
| 2001 | *32.6* | *0* | *0.041* | *0.040* | *0.039* | *0.036* | *0.033* | *0.028* | *0.021* |
| 2002 | 91.8 | 0 | 0.059 | 0.055 | 0.049 | 0.040 | 0.035 | 0.029 | 0.022 |
| 2003 | 97.8 | 0 | 0.065 | 0.058 | 0.054 | 0.044 | 0.037 | 0.029 | 0.022 |
| 2004 | 95.6 | 0 | 0.056 | 0.047 | 0.044 | 0.040 | 0.035 | 0.029 | 0.023 |
| 2005 | 99.5 | 0 | 0.053 | 0.046 | 0.043 | 0.038 | 0.034 | 0.027 | 0.021 |

Years with data availability below 75 per cent shown in italics.

**Table 30: Percentiles of daily maximum one-hour nitrogen dioxide at Geelong South (1996-2005)**

AAQ NEPM standard: 0.12ppm (1-hour average)

| Year | Data availability (% of days) | No. of exceedences (days) | Max (ppm) | Percentiles (ppm) | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | 99th | 98th | 95th | 90th | 75th | 50th |
| 1996 | 86.6 | 0 | 0.044 | 0.041 | 0.038 | 0.033 | 0.028 | 0.024 | 0.018 |
| 1997 | 0.0 | | | | | | | | |
| 1998 | *68.5* | *0* | *0.067* | *0.039* | *0.037* | *0.034* | *0.032* | *0.026* | *0.020* |
| 1999 | 93.7 | 0 | 0.046 | 0.038 | 0.035 | 0.031 | 0.028 | 0.022 | 0.016 |
| 2000 | 85.2 | 0 | 0.048 | 0.038 | 0.037 | 0.028 | 0.024 | 0.019 | 0.015 |
| 2001 | 91.2 | 0 | 0.047 | 0.035 | 0.032 | 0.029 | 0.027 | 0.022 | 0.015 |
| 2002 | 94.2 | 0 | 0.056 | 0.036 | 0.031 | 0.027 | 0.025 | 0.019 | 0.012 |
| 2003 | 87.7 | 0 | 0.050 | 0.034 | 0.033 | 0.028 | 0.025 | 0.021 | 0.014 |
| 2004 | 93.2 | 0 | 0.050 | 0.037 | 0.030 | 0.027 | 0.024 | 0.020 | 0.015 |
| 2005 | 98.1 | 0 | 0.048 | 0.038 | 0.034 | 0.029 | 0.026 | 0.021 | 0.015 |

Years with data availability below 75 per cent shown in italics. Years with data availability below 15 per cent not shown.

**Table 31: Percentiles of daily maximum one-hour nitrogen dioxide at Point Cook (1996-2005)**

AAQ NEPM standard: 0.12ppm (1-hour average)

| Year | Data availability (% of days) | No. of exceedences (days) | Max (ppm) | Percentiles (ppm) | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | 99th | 98th | 95th | 90th | 75th | 50th |
| 1996 | 91.5 | 0 | 0.054 | 0.046 | 0.045 | 0.038 | 0.029 | 0.023 | 0.015 |
| 1997 | 0.0 | | | | | | | | |
| 1998 | 92.1 | 0 | 0.064 | 0.049 | 0.046 | 0.036 | 0.028 | 0.022 | 0.015 |
| 1999 | 84.4 | 0 | 0.044 | 0.037 | 0.036 | 0.032 | 0.028 | 0.018 | 0.011 |
| 2000 | *68.8* | *0* | *0.048* | *0.043* | *0.039* | *0.032* | *0.028* | *0.020* | *0.014* |
| 2001 | 87.7 | 0 | 0.054 | 0.044 | 0.040 | 0.033 | 0.029 | 0.022 | 0.015 |
| 2002 | 96.2 | 0 | 0.056 | 0.045 | 0.041 | 0.031 | 0.027 | 0.021 | 0.013 |
| 2003 | 93.2 | 0 | 0.064 | 0.048 | 0.044 | 0.031 | 0.028 | 0.020 | 0.013 |
| 2004 | 94.8 | 0 | 0.066 | 0.041 | 0.035 | 0.030 | 0.026 | 0.020 | 0.013 |
| 2005 | 96.7 | 0 | 0.043 | 0.039 | 0.037 | 0.032 | 0.027 | 0.021 | 0.014 |

Years with data availability below 75 per cent shown in italics. Years with data availability below 15 per cent not shown.

**Table 32: Percentiles of daily maximum one-hour nitrogen dioxide at RMIT (CBD) (1996–2005)**

AAQ NEPM standard: 0.12ppm (1-hour average)

| Year | Data availability (% of days) | No. of exceedences (days) | Max (ppm) | Percentiles (ppm) | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | 99th | 98th | 95th | 90th | 75th | 50th |
| 1996 | 92.1 | 0 | 0.085 | 0.059 | 0.052 | 0.045 | 0.040 | 0.032 | 0.027 |
| 1997 | 90.4 | 0 | 0.100 | 0.074 | 0.065 | 0.055 | 0.046 | 0.039 | 0.032 |
| 1998 | 83.8 | 0 | 0.089 | 0.067 | 0.057 | 0.049 | 0.046 | 0.036 | 0.028 |
| 1999 | 97.3 | 0 | 0.078 | 0.062 | 0.050 | 0.045 | 0.041 | 0.033 | 0.028 |
| 2000 | 91.5 | 0 | 0.090 | 0.064 | 0.058 | 0.049 | 0.041 | 0.032 | 0.026 |
| 2001 | 93.4 | 0 | 0.071 | 0.055 | 0.050 | 0.043 | 0.036 | 0.029 | 0.024 |
| 2002 | 94.2 | 0 | 0.079 | 0.053 | 0.046 | 0.039 | 0.035 | 0.028 | 0.023 |
| 2003 | 98.9 | 0 | 0.069 | 0.059 | 0.053 | 0.045 | 0.039 | 0.032 | 0.026 |
| 2004 | 93.7 | 0 | 0.075 | 0.049 | 0.046 | 0.040 | 0.037 | 0.031 | 0.026 |
| 2005 | 97.8 | 0 | 0.058 | 0.050 | 0.047 | 0.040 | 0.037 | 0.032 | 0.027 |

**Table 33: Percentiles of daily maximum one-hour nitrogen dioxide at Traralgon (1996-2005)**

AAQ NEPM standard: 0.12ppm (1-hour average)

| Year | Data availability (% of days) | No. of exceedences (days) | Max (ppm) | Percentiles (ppm) | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | 99th | 98th | 95th | 90th | 75th | 50th |
| 1996 | 85.8 | 0 | 0.035 | 0.032 | 0.029 | 0.027 | 0.025 | 0.022 | 0.016 |
| 1997 | 64.7 | *0* | *0.038* | *0.037* | *0.034* | *0.031* | *0.028* | *0.024* | *0.018* |
| 1998 | 89.0 | 0 | 0.036 | 0.030 | 0.029 | 0.027 | 0.025 | 0.022 | 0.016 |
| 1999 | 80.8 | 0 | 0.042 | 0.034 | 0.031 | 0.028 | 0.027 | 0.023 | 0.018 |
| 2000 | 98.4 | 0 | 0.041 | 0.037 | 0.033 | 0.027 | 0.025 | 0.021 | 0.017 |
| 2001 | 98.9 | 0 | 0.033 | 0.031 | 0.026 | 0.024 | 0.022 | 0.019 | 0.015 |
| 2002 | 98.1 | 0 | 0.033 | 0.031 | 0.030 | 0.027 | 0.025 | 0.020 | 0.015 |
| 2003 | 99.2 | 0 | 0.053 | 0.032 | 0.030 | 0.028 | 0.026 | 0.022 | 0.016 |
| 2004 | 98.6 | 0 | 0.036 | 0.034 | 0.030 | 0.028 | 0.024 | 0.019 | 0.015 |
| 2005 | 91.5 | 0 | 0.040 | 0.032 | 0.030 | 0.028 | 0.026 | 0.023 | 0.016 |

Years with data availability below 75 per cent shown in italics.

**Ozone**

**Table 34: 2005 percentiles of daily peak one-hour ozone concentrations in Victoria**

AAQ NEPM standard: 0.10ppm (1-hour average)

| **Region** | Data availability | Max | Percentiles (ppm**)** | | | | | |
|---|---|---|---|---|---|---|---|---|
| Performance monitoring station | (% of days) | (ppm) | 99th | 98th | 95th | 90th | 75th | 50th |
| **Port Phillip** | | | | | | | | |
| Alphington | 92.9 | 0.077 | 0.058 | 0.051 | 0.045 | 0.039 | 0.031 | 0.026 |
| Brighton | 97.8 | 0.088 | 0.067 | 0.053 | 0.047 | 0.040 | 0.032 | 0.028 |
| Dandenong | 92.6 | 0.072 | 0.062 | 0.054 | 0.045 | 0.041 | 0.033 | 0.028 |
| Footscray | 99.2 | 0.082 | 0.063 | 0.052 | 0.044 | 0.039 | 0.031 | 0.027 |
| Geelong South | 97.8 | 0.080 | 0.059 | 0.056 | 0.046 | 0.039 | 0.031 | 0.028 |
| Melton | 94.0 | 0.079 | 0.063 | 0.056 | 0.048 | 0.043 | 0.036 | 0.031 |
| Moorooduc | 98.9 | 0.080 | 0.065 | 0.061 | 0.048 | 0.042 | 0.034 | 0.030 |
| Mooroolbark | 97.8 | 0.089 | 0.064 | 0.053 | 0.045 | 0.042 | 0.035 | 0.029 |
| Point Cook | 97.0 | 0.092 | 0.068 | 0.059 | 0.047 | 0.038 | 0.031 | 0.027 |
| Point Henry | 99.5 | 0.088 | 0.059 | 0.057 | 0.048 | 0.038 | 0.033 | 0.029 |
| **Latrobe Valley** | | | | | | | | |
| Moe | 99.5 | 0.062 | 0.055 | 0.047 | 0.041 | 0.036 | 0.031 | 0.027 |
| Traralgon | 86.3 | 0.067 | 0.050 | 0.046 | 0.040 | 0.035 | 0.031 | 0.026 |
| **Ballarat** | *39.2* | *0.056* | *0.045* | *0.044* | *0.041* | *0.037* | *0.032* | *0.029* |
| **Bendigo** | *49.6* | *0.055* | *0.049* | *0.048* | *0.045* | *0.041* | *0.034* | *0.028* |

Stations with data availability below 75 per cent shown in italics.

**Table 35: 2005 percentiles of daily peak four-hour ozone concentrations in Victoria**

AAQ NEPM standard: 0.08ppm (4-hour average)

| **Region** | Data availability | Max | Percentiles (ppm) | | | | | |
|---|---|---|---|---|---|---|---|---|
| Performance monitoring station | (% of days) | (ppm) | 99th | 98th | 95th | 90th | 75th | 50th |
| **Port Phillip** | | | | | | | | |
| Alphington | 92.9 | 0.070 | 0.050 | 0.047 | 0.042 | 0.037 | 0.030 | 0.025 |
| Brighton | 97.8 | 0.069 | 0.062 | 0.051 | 0.043 | 0.038 | 0.030 | 0.026 |
| Dandenong | 92.9 | 0.067 | 0.054 | 0.052 | 0.043 | 0.039 | 0.031 | 0.026 |
| Footscray | 99.2 | 0.066 | 0.053 | 0.047 | 0.042 | 0.035 | 0.030 | 0.025 |
| Geelong South | 97.5 | 0.068 | 0.055 | 0.049 | 0.042 | 0.037 | 0.030 | 0.026 |
| Melton | 94.2 | 0.075 | 0.054 | 0.051 | 0.045 | 0.041 | 0.034 | 0.030 |
| Moorooduc | 98.9 | 0.072 | 0.059 | 0.054 | 0.046 | 0.040 | 0.032 | 0.029 |
| Mooroolbark | 97.8 | 0.072 | 0.055 | 0.049 | 0.043 | 0.039 | 0.033 | 0.028 |
| Point Cook | 97.0 | **0.082** | 0.062 | 0.050 | 0.043 | 0.037 | 0.030 | 0.026 |
| Point Henry | 99.5 | 0.076 | 0.056 | 0.051 | 0.045 | 0.036 | 0.031 | 0.028 |
| **Latrobe Valley** | | | | | | | | |
| Moe | 99.5 | 0.051 | 0.049 | 0.042 | 0.038 | 0.034 | 0.030 | 0.025 |
| Traralgon | 86.3 | 0.055 | 0.046 | 0.039 | 0.035 | 0.033 | 0.029 | 0.024 |
| **Ballarat** | *39.2* | *0.049* | *0.043* | *0.041* | *0.039* | *0.035* | *0.031* | *0.028* |
| **Bendigo** | *49.9* | *0.050* | *0.048* | *0.046* | *0.042* | *0.040* | *0.034* | *0.027* |

Stations with data availability below 75 per cent shown in italics. Exceedences shown in bold.

**Table 36: Percentiles of daily maximum one-hour ozone at Brighton (1996–2005)**

AAQ NEPM standard: 0.10ppm (1-hour average)

| Year | Data availability (% of days) | No. of exceedences (days) | Max (ppm) | Percentiles (ppm) | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | 99th | 98th | 95th | 90th | 75th | 50th |
| 1996 | 95.6 | 0 | 0.089 | 0.077 | 0.062 | 0.049 | 0.039 | 0.029 | 0.024 |
| 1997 | 95.6 | 3 | **0.112** | 0.082 | 0.072 | 0.056 | 0.039 | 0.028 | 0.024 |
| 1998 | 95.6 | 0 | 0.085 | 0.070 | 0.060 | 0.050 | 0.037 | 0.027 | 0.022 |
| 1999 | 99.5 | 0 | 0.070 | 0.067 | 0.063 | 0.052 | 0.041 | 0.030 | 0.024 |
| 2000 | 96.4 | 0 | 0.073 | 0.068 | 0.060 | 0.048 | 0.041 | 0.028 | 0.023 |
| 2001 | 80.3 | 0 | 0.078 | 0.071 | 0.058 | 0.049 | 0.039 | 0.029 | 0.024 |
| 2002 | 93.7 | 0 | 0.085 | 0.063 | 0.053 | 0.043 | 0.036 | 0.029 | 0.025 |
| 2003 | 99.2 | 2 | **0.109** | 0.070 | 0.065 | 0.056 | 0.046 | 0.029 | 0.025 |
| 2004 | 94.5 | 1 | **0.106** | 0.062 | 0.058 | 0.043 | 0.039 | 0.030 | 0.025 |
| 2005 | 97.8 | 0 | 0.088 | 0.067 | 0.053 | 0.047 | 0.040 | 0.032 | 0.028 |

Exceedences shown in bold.

**Table 37: Percentiles of daily maximum one-hour ozone at Footscray (1996–2005)**

AAQ NEPM standard: 0.10ppm (1-hour average)

| Year | Data availability (% of days) | No. of exceedences (days) | Max (ppm) | Percentiles (ppm) | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | 99th | 98th | 95th | 90th | 75th | 50th |
| 1996 | 96.4 | 0 | 0.082 | 0.069 | 0.063 | 0.049 | 0.040 | 0.028 | 0.025 |
| 1997 | 98.1 | 1 | **0.105** | 0.090 | 0.073 | 0.055 | 0.042 | 0.030 | 0.025 |
| 1998 | 94.2 | 1 | **0.113** | 0.064 | 0.059 | 0.048 | 0.038 | 0.028 | 0.023 |
| 1999 | 95.9 | 0 | 0.079 | 0.070 | 0.066 | 0.054 | 0.041 | 0.032 | 0.025 |
| 2000 | 88.2 | 0 | 0.064 | 0.054 | 0.052 | 0.046 | 0.038 | 0.027 | 0.022 |
| *2001* | 34.5 | *0* | *0.044* | *0.043* | *0.041* | *0.038* | *0.036* | *0.030* | *0.026* |
| 2002 | 96.7 | 0 | 0.095 | 0.066 | 0.047 | 0.042 | 0.038 | 0.028 | 0.024 |
| 2003 | 98.1 | 1 | **0.105** | 0.072 | 0.061 | 0.051 | 0.041 | 0.027 | 0.023 |
| 2004 | 94.8 | 1 | **0.106** | 0.058 | 0.049 | 0.042 | 0.036 | 0.028 | 0.024 |
| 2005 | 99.2 | 0 | 0.082 | 0.063 | 0.052 | 0.044 | 0.039 | 0.031 | 0.027 |

Years with data availability below 75 per cent shown in italics. Exceedences shown in bold.

**Table 38: Percentiles of daily maximum one-hour ozone at Geelong South (1996–2005)**

AAQ NEPM standard: 0.10ppm (1-hour average)

| Year | Data availability (% of days) | No. of exceedences (days) | Max (ppm) | Percentiles (ppm) | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | 99th | 98th | 95th | 90th | 75th | 50th |
| 1996 | 86.8 | 0 | 0.091 | 0.063 | 0.056 | 0.044 | 0.033 | 0.027 | 0.022 |
| 1997 | 0.0 | | | | | | | | |
| 1998 | 95.3 | 0 | 0.083 | 0.056 | 0.046 | 0.035 | 0.031 | 0.027 | 0.024 |
| 1999 | 95.3 | 0 | 0.073 | 0.053 | 0.048 | 0.040 | 0.033 | 0.027 | 0.022 |
| 2000 | 88.8 | 0 | 0.065 | 0.057 | 0.049 | 0.040 | 0.033 | 0.021 | 0.017 |
| 2001 | 92.3 | 0 | 0.082 | 0.064 | 0.057 | 0.040 | 0.032 | 0.024 | 0.020 |
| 2002 | 90.7 | 0 | 0.058 | 0.056 | 0.053 | 0.043 | 0.032 | 0.025 | 0.021 |
| 2003 | 97.3 | 0 | 0.081 | 0.069 | 0.063 | 0.043 | 0.033 | 0.023 | 0.020 |
| 2004 | 92.1 | 0 | 0.094 | 0.061 | 0.058 | 0.044 | 0.035 | 0.030 | 0.025 |
| 2005 | 97.8 | 0 | 0.080 | 0.059 | 0.056 | 0.046 | 0.039 | 0.031 | 0.028 |

**Table 39: Percentiles of daily maximum one-hour ozone at Point Cook (1996–2005)**

AAQ NEPM standard: 0.10 ppm (1-hour average)

| Year | Data availability (% of days) | No. of exceedences (days) | Max (ppm) | Percentiles (ppm) | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | 99th | 98th | 95th | 90th | 75th | 50th |
| 1996 | 99.5 | 0 | 0.090 | 0.079 | 0.069 | 0.051 | 0.038 | 0.030 | 0.026 |
| 1997 | 86.8 | 2 | **0.126** | 0.080 | 0.064 | 0.049 | 0.037 | 0.030 | 0.025 |
| 1998 | 94.5 | 1 | **0.107** | 0.083 | 0.063 | 0.044 | 0.034 | 0.025 | 0.021 |
| 1999 | 91.2 | 0 | 0.083 | 0.071 | 0.067 | 0.055 | 0.040 | 0.028 | 0.023 |
| 2000 | 85.2 | 0 | 0.079 | 0.067 | 0.063 | 0.049 | 0.040 | 0.032 | 0.028 |
| 2001 | 91.0 | 0 | 0.099 | 0.072 | 0.064 | 0.050 | 0.044 | 0.031 | 0.025 |
| 2002 | 97.0 | 0 | 0.093 | 0.068 | 0.063 | 0.048 | 0.039 | 0.030 | 0.027 |
| 2003 | 97.0 | 0 | 0.094 | 0.080 | 0.069 | 0.053 | 0.041 | 0.031 | 0.025 |
| 2004 | 98.6 | 0 | 0.093 | 0.065 | 0.056 | 0.047 | 0.039 | 0.028 | 0.025 |
| 2005 | 97.0 | 0 | 0.092 | 0.068 | 0.059 | 0.047 | 0.038 | 0.031 | 0.027 |

Exceedences shown in bold.

**Table 40: Percentiles of daily maximum one-hour ozone at Traralgon (1996–2005)**

AAQ NEPM standard: 0.10ppm (1-hour average)

| Year | Data availability (% of days) | No. of exceedences (days) | Max (ppm) | Percentiles (ppm) | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | 99th | 98th | 95th | 90th | 75th | 50th |
| 1996 | 80.8 | 0 | 0.049 | 0.043 | 0.041 | 0.036 | 0.033 | 0.028 | 0.022 |
| 1997 | *60.3* | *0* | *0.072* | *0.058* | *0.057* | *0.052* | *0.041* | *0.030* | *0.025* |
| 1998 | 92.3 | 0 | 0.075 | 0.062 | 0.054 | 0.044 | 0.037 | 0.030 | 0.026 |
| 1999 | *31.8* | *0* | *0.060* | *0.055* | *0.050* | *0.043* | *0.036* | *0.028* | *0.023* |
| 2000 | 96.2 | 0 | 0.056 | 0.050 | 0.047 | 0.039 | 0.033 | 0.027 | 0.023 |
| 2001 | 97.0 | 0 | 0.064 | 0.053 | 0.048 | 0.040 | 0.034 | 0.028 | 0.024 |
| 2002 | 100.0 | 0 | 0.057 | 0.048 | 0.043 | 0.036 | 0.033 | 0.029 | 0.024 |
| 2003 | 97.3 | 0 | 0.077 | 0.062 | 0.060 | 0.049 | 0.037 | 0.030 | 0.024 |
| 2004 | 97.5 | 0 | 0.058 | 0.049 | 0.048 | 0.042 | 0.037 | 0.031 | 0.025 |
| 2005 | 86.3 | 0 | 0.067 | 0.050 | 0.046 | 0.040 | 0.035 | 0.031 | 0.026 |

Years with data availability below 75 per cent shown in italics.

**Table 41: Percentiles of daily maximum four-hour ozone at Brighton (1996–2005)**

AAQ NEPM standard: 0.08ppm (4-hour average)

| Year | Data availability (% of days) | No. of exceedences (days) | Max (ppm) | Percentiles (ppm) | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | 99th | 98th | 95th | 90th | 75th | 50th |
| 1996 | 95.6 | 0 | 0.078 | 0.065 | 0.056 | 0.044 | 0.035 | 0.027 | 0.022 |
| 1997 | 95.6 | 3 | **0.097** | 0.068 | 0.062 | 0.049 | 0.037 | 0.026 | 0.023 |
| 1998 | 95.6 | 1 | **0.082** | 0.062 | 0.055 | 0.042 | 0.034 | 0.026 | 0.021 |
| 1999 | 99.5 | 0 | 0.069 | 0.059 | 0.056 | 0.047 | 0.037 | 0.028 | 0.022 |
| 2000 | 96.4 | 0 | 0.064 | 0.061 | 0.052 | 0.044 | 0.038 | 0.026 | 0.022 |
| 2001 | 80.0 | 0 | 0.068 | 0.059 | 0.055 | 0.046 | 0.038 | 0.027 | 0.022 |
| 2002 | 93.2 | 0 | 0.072 | 0.056 | 0.048 | 0.039 | 0.034 | 0.028 | 0.023 |
| 2003 | 98.4 | 2 | **0.102** | 0.065 | 0.061 | 0.048 | 0.042 | 0.028 | 0.024 |
| 2004 | 94.5 | 1 | **0.092** | 0.057 | 0.051 | 0.042 | 0.036 | 0.029 | 0.024 |
| 2005 | 97.5 | 0 | 0.069 | 0.062 | 0.051 | 0.043 | 0.038 | 0.030 | 0.026 |

Exceedences shown in bold.

**Table 42: Percentiles of daily maximum four-hour ozone at Footscray (1996–2005)**

AAQ NEPM standard: 0.08ppm (4-hour average)

| Year | Data availability (% of days) | No. of exceedences (days) | Max (ppm) | Percentiles (ppm) | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | 99th | 98th | 95th | 90th | 75th | 50th |
| 1996 | 96.2 | 0 | 0.070 | 0.062 | 0.057 | 0.043 | 0.036 | 0.027 | 0.023 |
| 1997 | 98.1 | 3 | **0.095** | 0.072 | 0.063 | 0.049 | 0.038 | 0.028 | 0.024 |
| 1998 | 94.2 | 1 | **0.089** | 0.055 | 0.051 | 0.041 | 0.035 | 0.027 | 0.022 |
| 1999 | 95.9 | 0 | 0.069 | 0.063 | 0.057 | 0.048 | 0.037 | 0.030 | 0.024 |
| 2000 | 87.7 | 0 | 0.055 | 0.052 | 0.047 | 0.043 | 0.035 | 0.026 | 0.021 |
| 2001 | *34.5* | *0* | *0.042* | *0.042* | *0.040* | *0.035* | *0.034* | *0.028* | *0.025* |
| 2002 | 96.7 | 1 | **0.080** | 0.051 | 0.046 | 0.038 | 0.034 | 0.027 | 0.023 |
| 2003 | 97.8 | 2 | **0.094** | 0.063 | 0.056 | 0.045 | 0.038 | 0.026 | 0.021 |
| 2004 | 94.8 | 1 | **0.083** | 0.051 | 0.045 | 0.039 | 0.034 | 0.027 | 0.022 |
| 2005 | 98.9 | 0 | 0.066 | 0.053 | 0.047 | 0.042 | 0.035 | 0.030 | 0.025 |

Years with data availability below 75per cent shown in italics. Exceedences shown in bold.

**Table 43: Percentiles of daily maximum four-hour ozone at Geelong South (1996–2005)**

AAQ NEPM standard: 0.08ppm (4-hour average)

| Year | Data availability (% of days) | No. of exceedences (days) | Max (ppm) | Percentiles (ppm) | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | 99th | 98th | 95th | 90th | 75th | 50th |
| 1996 | 86.8 | 0 | 0.076 | 0.058 | 0.051 | 0.039 | 0.031 | 0.026 | 0.021 |
| 1997 | 0.0 | | | | | | | | |
| 1998 | 95.1 | 0 | 0.076 | 0.048 | 0.042 | 0.033 | 0.029 | 0.026 | 0.022 |
| 1999 | 95.6 | 0 | 0.063 | 0.048 | 0.044 | 0.038 | 0.031 | 0.026 | 0.021 |
| 2000 | 89.0 | 0 | 0.057 | 0.052 | 0.045 | 0.035 | 0.030 | 0.020 | 0.016 |
| 2001 | 92.3 | 0 | 0.075 | 0.057 | 0.054 | 0.038 | 0.030 | 0.023 | 0.019 |
| 2002 | 89.3 | 0 | 0.053 | 0.048 | 0.046 | 0.038 | 0.031 | 0.024 | 0.020 |
| 2003 | 97.0 | 0 | 0.072 | 0.059 | 0.054 | 0.040 | 0.029 | 0.022 | 0.019 |
| 2004 | 91.3 | 1 | **0.085** | 0.054 | 0.052 | 0.041 | 0.034 | 0.028 | 0.023 |
| 2005 | 97.3 | 0 | 0.068 | 0.055 | 0.049 | 0.042 | 0.037 | 0.030 | 0.026 |

Exceedences shown in bold.

**Table 44: Percentiles of daily maximum four-hour ozone at Point Cook (1996–2005)**

AAQ NEPM standard: 0.08ppm (4-hour average)

| Year | Data availability (% of days) | No. of exceedences (days) | Max (ppm) | Percentiles (ppm) | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | 99th | 98th | 95th | 90th | 75th | 50th |
| 1996 | 99.5 | 0 | 0.079 | 0.066 | 0.057 | 0.045 | 0.034 | 0.029 | 0.025 |
| 1997 | 86.8 | 2 | **0.113** | 0.073 | 0.057 | 0.044 | 0.034 | 0.028 | 0.024 |
| 1998 | 94.8 | 3 | **0.090** | 0.075 | 0.061 | 0.039 | 0.032 | 0.024 | 0.020 |
| 1999 | 91.2 | 0 | 0.069 | 0.065 | 0.060 | 0.047 | 0.035 | 0.026 | 0.022 |
| 2000 | 85.5 | 0 | 0.067 | 0.060 | 0.058 | 0.046 | 0.037 | 0.030 | 0.027 |
| 2001 | 91.0 | 1 | **0.095** | 0.063 | 0.057 | 0.048 | 0.040 | 0.029 | 0.024 |
| 2002 | 96.4 | 0 | 0.070 | 0.062 | 0.056 | 0.044 | 0.036 | 0.029 | 0.025 |
| 2003 | 96.2 | 1 | **0.093** | 0.072 | 0.063 | 0.048 | 0.038 | 0.029 | 0.024 |
| 2004 | 98.6 | 1 | **0.082** | 0.058 | 0.051 | 0.044 | 0.036 | 0.027 | 0.024 |
| 2005 | 96.7 | 1 | **0.082** | 0.062 | 0.050 | 0.043 | 0.037 | 0.030 | 0.026 |

Exceedences shown in bold.

**Table 45: Percentiles of daily maximum four-hour ozone at Traralgon (1996–2005)**

AAQ NEPM standard: 0.08ppm (4-hour average)

| Year | Data availability (% of days) | No. of exceedences (days) | Max (ppm) | Percentiles (ppm) | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | 99th | 98th | 95th | 90th | 75th | 50th |
| 1996 | 80.8 | 0 | 0.043 | 0.039 | 0.037 | 0.033 | 0.031 | 0.026 | 0.021 |
| 1997 | *60.5* | *0* | *0.064* | *0.055* | *0.051* | *0.045* | *0.039* | *0.029* | *0.024* |
| 1998 | 92.1 | 0 | 0.058 | 0.053 | 0.048 | 0.041 | 0.035 | 0.029 | 0.024 |
| 1999 | *31.8* | *0* | *0.053* | *0.051* | *0.044* | *0.040* | *0.033* | *0.026* | *0.021* |
| 2000 | 96.7 | 0 | 0.050 | 0.046 | 0.043 | 0.034 | 0.031 | 0.026 | 0.021 |
| 2001 | 97.3 | 0 | 0.052 | 0.047 | 0.045 | 0.037 | 0.031 | 0.026 | 0.022 |
| 2002 | 100.0 | 0 | 0.049 | 0.046 | 0.038 | 0.034 | 0.031 | 0.027 | 0.022 |
| 2003 | 97.3 | 0 | 0.067 | 0.056 | 0.052 | 0.046 | 0.035 | 0.027 | 0.023 |
| 2004 | 97.3 | 0 | 0.050 | 0.044 | 0.043 | 0.039 | 0.034 | 0.029 | 0.023 |
| 2005 | 86.1 | 0 | 0.055 | 0.046 | 0.039 | 0.035 | 0.033 | 0.029 | 0.024 |

Years with data availability below 75 per cent shown in italics.

**Sulfur Dioxide**

**Table 46: 2005 percentiles of daily peak one-hour sulfur dioxide concentrations in Victoria**

AAQ NEPM standard: 0.20ppm (1-hour average)

| **Region** | Data availability | Max | Percentiles (ppm) | | | | | |
|---|---|---|---|---|---|---|---|---|
| Performance monitoring station | (% of days) | (ppm) | 99th | 98th | 95th | 90th | 75th | 50th |
| **Port Phillip** | | | | | | | | |
| Alphington | 94.5 | 0.011 | 0.008 | 0.007 | 0.005 | 0.004 | 0.002 | 0.001 |
| Geelong South | 96.4 | 0.054 | 0.029 | 0.022 | 0.017 | 0.012 | 0.008 | 0.003 |
| Paisley | 96.2 | 0.044 | 0.032 | 0.028 | 0.021 | 0.018 | 0.009 | 0.005 |
| RMIT (CBD) | 98.9 | 0.017 | 0.015 | 0.012 | 0.010 | 0.008 | 0.005 | 0.003 |
| **Latrobe Valley** | | | | | | | | |
| Moe | 100.0 | 0.047 | 0.029 | 0.026 | 0.017 | 0.012 | 0.006 | 0.002 |
| Traralgon | 91.5 | 0.061 | 0.044 | 0.034 | 0.022 | 0.015 | 0.009 | 0.005 |

**Table 47: 2005 percentiles of daily sulfur dioxide concentrations in Victoria**

AAQ NEPM standard: 0.08ppm (24-hour average)

| **Region** | Data availability | Max | Percentiles (ppm) | | | | | |
|---|---|---|---|---|---|---|---|---|
| Performance monitoring station | (% of days) | (ppm) | 99th | 98th | 95th | 90th | 75th | 50th |
| **Port Phillip** | | | | | | | | |
| Alphington | 94.5 | 0.002 | 0.002 | 0.002 | 0.001 | 0.001 | 0.001 | 0.000 |
| Geelong South | 96.4 | 0.008 | 0.005 | 0.004 | 0.003 | 0.002 | 0.001 | 0.001 |
| Paisley | 96.2 | 0.010 | 0.007 | 0.006 | 0.004 | 0.003 | 0.002 | 0.001 |
| RMIT (CBD) | 98.9 | 0.005 | 0.004 | 0.003 | 0.003 | 0.002 | 0.001 | 0.001 |
| **Latrobe Valley** | | | | | | | | |
| Moe | 100.0 | 0.009 | 0.006 | 0.004 | 0.004 | 0.003 | 0.002 | 0.001 |
| Traralgon | 91.5 | 0.012 | 0.007 | 0.005 | 0.004 | 0.003 | 0.002 | 0.001 |

**Table 48: Percentiles of daily maximum one-hour sulfur dioxide at Alphington (1996–2005)**

AAQ NEPM standard: 0.20ppm (1-hour average)

| Year | Data availability (% of days) | No. of exceedences (days) | Max (ppm) | Percentiles (ppm) | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | 99th | 98th | 95th | 90th | 75th | 50th |
| 1996 | 97.0 | 0 | 0.008 | 0.006 | 0.006 | 0.005 | 0.003 | 0.002 | 0.001 |
| 1997 | 94.2 | 0 | 0.012 | 0.010 | 0.008 | 0.006 | 0.004 | 0.003 | 0.001 |
| 1998 | 97.0 | 0 | 0.015 | 0.012 | 0.008 | 0.007 | 0.005 | 0.003 | 0.002 |
| 1999 | 97.8 | 0 | 0.012 | 0.007 | 0.006 | 0.005 | 0.003 | 0.002 | 0.001 |
| 2000 | 97.8 | 0 | 0.010 | 0.007 | 0.006 | 0.004 | 0.003 | 0.001 | 0.000 |
| 2001 | 93.4 | 0 | 0.009 | 0.008 | 0.007 | 0.006 | 0.004 | 0.002 | 0.000 |
| 2002 | 98.4 | 0 | 0.012 | 0.008 | 0.007 | 0.006 | 0.004 | 0.002 | 0.000 |
| 2003 | 96.7 | 0 | 0.009 | 0.007 | 0.006 | 0.004 | 0.003 | 0.002 | 0.001 |
| 2004 | 99.7 | 0 | 0.014 | 0.009 | 0.007 | 0.005 | 0.004 | 0.003 | 0.001 |
| 2005 | 94.5 | 0 | 0.011 | 0.008 | 0.007 | 0.005 | 0.004 | 0.002 | 0.001 |

**Table 49: Percentiles of daily maximum one-hour sulfur dioxide at Geelong South (1996–2005)**

AAQ NEPM standard: 0.20ppm (1-hour average)

| Year | Data availability (% of days) | No. of exceedences (days) | Max (ppm) | Percentiles (ppm) | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | 99th | 98th | 95th | 90th | 75th | 50th |
| 1996 | 76.8 | 0 | 0.032 | 0.026 | 0.023 | 0.016 | 0.010 | 0.004 | 0.001 |
| 1997 | 0.0 | | | | | | | | |
| 1998 | *68.8* | *0* | *0.038* | *0.023* | *0.021* | *0.016* | *0.012* | *0.008* | *0.003* |
| 1999 | 94.0 | 0 | 0.029 | 0.020 | 0.019 | 0.015 | 0.011 | 0.007 | 0.003 |
| 2000 | 88.2 | 0 | 0.029 | 0.019 | 0.014 | 0.010 | 0.007 | 0.004 | 0.001 |
| 2001 | *50.7* | *0* | *0.037* | *0.024* | *0.023* | *0.018* | *0.012* | *0.006* | *0.002* |
| 2002 | 84.9 | 0 | 0.040 | 0.029 | 0.024 | 0.016 | 0.012 | 0.005 | 0.001 |
| 2003 | 96.2 | 0 | 0.039 | 0.032 | 0.026 | 0.015 | 0.011 | 0.005 | 0.001 |
| 2004 | 90.7 | 0 | 0.069 | 0.026 | 0.023 | 0.019 | 0.013 | 0.007 | 0.003 |
| 2005 | 96.4 | 0 | 0.054 | 0.029 | 0.022 | 0.017 | 0.012 | 0.008 | 0.003 |

Years with data availability below 75 per cent shown in italics. Years with data availability below 15 per cent not shown.

**Table 50: Percentiles of daily maximum one-hour sulfur dioxide at Traralgon (1996–2005)**

AAQ NEPM standard: 0.20ppm (1-hour average)

| Year | Data availability (% of days) | No. of exceedences (days) | Max (ppm) | Percentiles (ppm) | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | 99th | 98th | 95th | 90th | 75th | 50th |
| 1996 | 85.8 | 0 | 0.032 | 0.017 | 0.014 | 0.011 | 0.008 | 0.006 | 0.003 |
| 1997 | *67.1* | *0* | *0.116* | *0.025* | *0.021* | *0.014* | *0.011* | *0.007* | *0.004* |
| 1998 | 84.1 | 0 | 0.055 | 0.022 | 0.020 | 0.016 | 0.013 | 0.009 | 0.006 |
| 1999 | 80.3 | 0 | 0.032 | 0.020 | 0.017 | 0.013 | 0.012 | 0.007 | 0.004 |
| 2000 | 90.4 | 0 | 0.061 | 0.038 | 0.024 | 0.018 | 0.013 | 0.008 | 0.004 |
| 2001 | 98.6 | 0 | 0.063 | 0.036 | 0.020 | 0.014 | 0.011 | 0.008 | 0.005 |
| 2002 | 96.7 | 0 | 0.062 | 0.032 | 0.022 | 0.016 | 0.012 | 0.008 | 0.005 |
| 2003 | 97.5 | 0 | 0.082 | 0.038 | 0.030 | 0.020 | 0.015 | 0.009 | 0.005 |
| 2004 | 98.4 | 0 | 0.079 | 0.042 | 0.030 | 0.018 | 0.013 | 0.008 | 0.005 |
| 2005 | 91.5 | 0 | 0.061 | 0.044 | 0.034 | 0.022 | 0.015 | 0.009 | 0.005 |

Years with data availability below 75 per cent shown in italics.

**Table 51: Percentiles of daily average sulfur dioxide at Alphington (1996–2005)**

AAQ NEPM standard: 0.08ppm (24-hour average)

| Year | Data availability (% of days) | No. of exceedences (days) | Max (ppm) | Percentiles (ppm) | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | 99th | 98th | 95th | 90th | 75th | 50th |
| 1996 | 97.0 | 0 | 0.003 | 0.002 | 0.002 | 0.002 | 0.001 | 0.001 | 0.000 |
| 1997 | 94.2 | 0 | 0.003 | 0.002 | 0.002 | 0.001 | 0.001 | 0.001 | 0.000 |
| 1998 | 97.0 | 0 | 0.003 | 0.002 | 0.002 | 0.002 | 0.001 | 0.001 | 0.000 |
| 1999 | 97.8 | 0 | 0.001 | 0.001 | 0.001 | 0.001 | 0.000 | 0.000 | -0.001 |
| 2000 | 97.8 | 0 | 0.002 | 0.001 | 0.001 | 0.000 | 0.000 | 0.000 | -0.001 |
| 2001 | 93.4 | 0 | 0.002 | 0.001 | 0.001 | 0.000 | 0.000 | 0.000 | -0.001 |
| 2002 | 98.4 | 0 | 0.002 | 0.001 | 0.001 | 0.000 | 0.000 | 0.000 | -0.001 |
| 2003 | 96.7 | 0 | 0.002 | 0.002 | 0.001 | 0.001 | 0.001 | 0.000 | 0.000 |
| 2004 | 99.7 | 0 | 0.003 | 0.002 | 0.002 | 0.001 | 0.001 | 0.001 | 0.000 |
| 2005 | 94.5 | 0 | 0.002 | 0.002 | 0.002 | 0.001 | 0.001 | 0.001 | 0.000 |

**Table 52: Percentiles of daily average sulfur dioxide at Geelong South (1996–2005)**

AAQ NEPM standard: 0.08ppm (24-hour average)

| Year | Data availability (% of days) | No. of exceedences (days) | Max (ppm) | Percentiles (ppm) | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | 99th | 98th | 95th | 90th | 75th | 50th |
| 1996 | 76.8 | 0 | 0.005 | 0.004 | 0.003 | 0.002 | 0.001 | 0.000 | -0.001 |
| 1997 | 0.0 | | | | | | | | |
| 1998 | *68.8* | *0* | *0.006* | *0.004* | *0.004* | *0.003* | *0.002* | *0.001* | *0.001* |
| 1999 | 94.0 | 0 | 0.005 | 0.003 | 0.003 | 0.002 | 0.002 | 0.001 | 0.000 |
| 2000 | 88.2 | 0 | 0.006 | 0.003 | 0.002 | 0.002 | 0.001 | 0.001 | 0.000 |
| 2001 | *50.7* | *0* | *0.006* | *0.005* | *0.003* | *0.002* | *0.001* | *0.000* | *-0.001* |
| 2002 | 84.9 | 0 | 0.004 | 0.002 | 0.002 | 0.001 | 0.001 | 0.000 | -0.001 |
| 2003 | 96.2 | 0 | 0.004 | 0.003 | 0.002 | 0.002 | 0.001 | 0.000 | -0.001 |
| 2004 | 90.7 | 0 | 0.006 | 0.004 | 0.003 | 0.002 | 0.002 | 0.001 | 0.000 |
| 2005 | 96.4 | 0 | 0.008 | 0.005 | 0.004 | 0.003 | 0.002 | 0.001 | 0.001 |

Years with data availability below 75 per cent shown in italics. Years with data availability below 15 per cent not shown.

**Table 53: Percentiles of daily average sulfur dioxide at Traralgon (1996–2005)**

AAQ NEPM standard: 0.08ppm (24-hour average)

| Year | Data availability (% of days) | No. of exceedences (days) | Max (ppm) | Percentiles (ppm) | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | 99th | 98th | 95th | 90th | 75th | 50th |
| 1996 | 85.8 | 0 | 0.008 | 0.004 | 0.003 | 0.003 | 0.002 | 0.002 | 0.001 |
| 1997 | *67.1* | *0* | *0.028* | *0.008* | *0.006* | *0.004* | *0.003* | *0.002* | *0.001* |
| 1998 | 84.1 | 0 | 0.009 | 0.007 | 0.007 | 0.005 | 0.005 | 0.004 | 0.002 |
| 1999 | 80.3 | 0 | 0.006 | 0.005 | 0.004 | 0.004 | 0.003 | 0.003 | 0.001 |
| 2000 | 90.4 | 0 | 0.013 | 0.007 | 0.005 | 0.004 | 0.003 | 0.002 | 0.001 |
| 2001 | 98.6 | 0 | 0.008 | 0.006 | 0.005 | 0.004 | 0.003 | 0.002 | 0.002 |
| 2002 | 96.7 | 0 | 0.009 | 0.008 | 0.005 | 0.004 | 0.004 | 0.003 | 0.002 |
| 2003 | 97.5 | 0 | 0.008 | 0.006 | 0.005 | 0.005 | 0.004 | 0.002 | 0.001 |
| 2004 | 98.4 | 0 | 0.010 | 0.007 | 0.006 | 0.004 | 0.003 | 0.002 | 0.001 |
| 2005 | 91.5 | 0 | 0.012 | 0.007 | 0.005 | 0.004 | 0.003 | 0.002 | 0.001 |

Years with data availability below 75 per cent shown in italics.

**Particles as $PM_{10}$**

**Table 54: 2005 percentiles of daily $PM_{10}$ concentrations in Victoria**

AAQ NEPM standard: 50 μg/m³ (24-hour average)

| **Region**<br>Performance monitoring station | Data availability (% of days) | Max (μg/m³) | Percentiles (μg/m³) 99th | 98th | 95th | 90th | 75th | 50th |
|---|---|---|---|---|---|---|---|---|
| **Port Phillip** | | | | | | | | |
| Alphington | 92.6 | 46.6 | 40.7 | 36.8 | 34.5 | 31.4 | 23.3 | 17.0 |
| Brighton | 84.1 | 41.5 | 33.8 | 32.7 | 28.0 | 25.8 | 19.7 | 14.4 |
| Dandenong | 90.1 | 43.7 | 40.5 | 37.5 | 34.0 | 31.5 | 24.8 | 17.4 |
| Footscray | 96.4 | 48.9 | 44.7 | 41.3 | 37.4 | 35.0 | 26.0 | 18.9 |
| Geelong South | 96.2 | **83.0** | **55.2** | 49.3 | 40.6 | 33.7 | 26.6 | 18.5 |
| Mooroolbark | 99.5 | **57.6** | **53.7** | **52.1** | 43.1 | 36.1 | 27.4 | 19.3 |
| Richmond | 96.2 | **54.9** | 39.0 | 37.0 | 32.0 | 28.9 | 22.5 | 17.1 |
| RMIT (CBD) | 98.4 | 41.7 | 36.5 | 35.2 | 33.2 | 29.4 | 22.8 | 17.4 |
| **Latrobe Valley** | | | | | | | | |
| Moe | 99.7 | 36.9 | 33.4 | 32.6 | 28.5 | 24.7 | 19.8 | 14.2 |
| Traralgon | 90.1 | 44.9 | 41.0 | 36.8 | 31.5 | 26.3 | 20.8 | 16.2 |
| **Ballarat** | *38.9* | *26.0* | *25.2* | *24.7* | *23.5* | *21.5* | *18.2* | *14.6* |
| **Bendigo** | *50.4* | ***55.7*** | *49.2* | *46.4* | *40.9* | *35.2* | *26.0* | *16.8* |
| **Mildura** | *64.1* | ***476.0*** | ***194.5*** | ***112.7*** | ***72.8*** | *46.5* | *32.4* | *23.5* |

Years with data availability below 75 per cent shown in italics. Exceedences shown in bold.

**Table 55: Percentiles of 24-hour $PM_{10}$ at Alphington (1996–2005)**

AAQ NEPM standard: 50 μg/m³ (24-hour average)

| Year | Data availability (% of days) | No. of exceedences (days) | Max (μg/m³) | Percentiles (μg/m³) | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | 99th | 98th | 95th | 90th | 75th | 50th |
| 1996 | 97.0 | 0 | 41.7 | 39.6 | 37.8 | 30.4 | 26.1 | 21.5 | 17.2 |
| 1997 | 98.1 | 2 | **68.6** | 44.3 | 37.8 | 33.4 | 29.5 | 23.0 | 18.1 |
| 1998 | 90.1 | 1 | **53.5** | 46.0 | 42.1 | 36.6 | 31.8 | 24.4 | 18.5 |
| 1999 | 84.7 | 0 | 43.7 | 34.1 | 32.7 | 30.3 | 26.3 | 21.6 | 17.4 |
| 2000 | 95.1 | 2 | **56.5** | 43.6 | 34.8 | 31.6 | 26.8 | 21.4 | 16.8 |
| 2001 | 91.0 | 2 | **72.6** | 39.6 | 35.1 | 32.8 | 27.9 | 23.4 | 17.2 |
| 2002 | 97.5 | 1 | **66.2** | 35.9 | 34.5 | 30.4 | 27.9 | 22.4 | 17.2 |
| 2003 | 95.9 | 10 | **181.7** | **80.9** | **56.4** | 38.3 | 30.9 | 22.9 | 17.2 |
| 2004 | 97.0 | 1 | **51.6** | 45.2 | 36.8 | 30.9 | 27.6 | 22.0 | 16.5 |
| 2005 | 92.6 | 0 | 46.6 | 40.7 | 36.8 | 34.5 | 31.4 | 23.3 | 17.0 |

Exceedences shown in bold.

**Table 56: Percentiles of 24-hour $PM_{10}$ at Footscray (1996–2005)**

AAQ NEPM standard: 50 μg/m³ (24-hour average)

| Year | Data availability (% of days) | No. of exceedences (days) | Max (μg/m³) | Percentiles (μg/m³) | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | 99th | 98th | 95th | 90th | 75th | 50th |
| 1996 | 13.1 | | | | | | | | |
| 1997 | 98.9 | 4 | **65.5** | **50.1** | 41.5 | 38.2 | 32.5 | 25.7 | 19.8 |
| 1998 | 94.8 | 4 | **59.8** | **50.5** | 43.9 | 41.4 | 34.7 | 26.9 | 19.8 |
| 1999 | 96.7 | 1 | **50.7** | 41.2 | 38.0 | 32.8 | 28.4 | 23.9 | 19.1 |
| 2000 | 89.0 | 2 | **57.8** | 43.6 | 40.7 | 36.6 | 30.0 | 23.9 | 17.6 |
| 2001 | *40.5* | *0* | *38.9* | *33.7* | *28.4* | *26.3* | *23.5* | *18.2* | *15.1* |
| 2002 | 98.4 | 2 | **79.1** | 42.9 | 38.7 | 32.2 | 28.3 | 22.1 | 17.5 |
| 2003 | 87.7 | 10 | **314.5** | **89.1** | **66.0** | 41.0 | 32.2 | 23.4 | 17.6 |
| 2004 | 93.2 | 3 | **58.1** | 48.4 | 40.4 | 33.5 | 29.1 | 22.3 | 16.1 |
| 2005 | 96.4 | 0 | 48.9 | 44.7 | 41.3 | 37.4 | 35.0 | 26.0 | 18.9 |

Years with data availability below 75 per cent shown in italics. Years with data availability below 15 per cent not shown.
Exceedences shown in bold.

**Particles as $PM_{2.5}$**

**Table 57: 2005 percentiles of Daily $PM_{2.5}$ Concentrations in Victoria**

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

| **Region**<br>Performance monitoring station | Data availability (% of days) | Max (μg/m³) | Percentiles (μg/m³) 99th | 98th | 95th | 90th | 75th | 50th |
|---|---|---|---|---|---|---|---|---|
| **Port Phillip** | | | | | | | | |
| Alphington | 94.3 | **37.4** | **30.2** | **25.5** | 18.7 | 16.2 | 8.9 | 6.7 |
| Footscray | 81.1 | **31.8** | **29.5** | 20.5 | 15.9 | 13.0 | 8.5 | 5.6 |

Monitoring by reference method (one-day-in-three). Exceedences shown in bold.

**Table 58: $PM_{2.5}$ Equivalence Program 2005 TEOM monitoring – Daily Concentrations in Victoria**

| **Region**<br>Performance monitoring station | Data availability (% of days) | Max (μg/m³) | Percentiles (μg/m³) 99th | 98th | 95th | 90th | 75th | 50th |
|---|---|---|---|---|---|---|---|---|
| **Port Phillip** | | | | | | | | |
| Alphington | 93.4 | 24.8 | 17.9 | 16.2 | 14.0 | 11.2 | 6.9 | 4.4 |
| Footscray | 99.5 | 20.3 | 14.3 | 13.0 | 10.9 | 9.1 | 5.9 | 3.9 |

Monitoring for the $PM_{2.5}$ Equivalence Program was conducted using TEOM instruments. Results are presented in Table 58. Preliminary results of comparisons indicate that the ratio of TEOM to reference method is less than one on average and lower in winter than in summer, which is similar to behaviour established for $PM_{10}$. Seasonal regression analyses such as those in Table 59 may allow readings from the two methods to be related.

**Table 59: Preliminary results of Equivalence Program (2003-2005)**

| | Regression parameters[a] | | | Ave(TEOM)/ Ave (reference) |
|---|---|---|---|---|
| | B | A | Correlation | |
| **Alphington** | | | | |
| Summer | 1.12 | -1.42 | 0.91 | 0.90 |
| Autumn | 0.75 | 0.56 | 0.91 | 0.81 |
| Winter | 0.77 | -0.77 | 0.76 | 0.67 |
| Spring | 0.89 | -0.62 | 0.74 | 0.78 |
| All seasons | 0.83 | -0.33 | 0.83 | 0.79 |
| **Footscray** | | | | |
| Summer | 0.91 | -0.53 | 0.75 | 0.83 |
| Autumn | 0.76 | -0.50 | 0.93 | 0.71 |
| Winter | 0.55 | -0.01 | 0.93 | 0.55 |
| Spring | 0.98 | -1.14 | 0.68 | 0.76 |
| All seasons | 0.71 | -0.05 | 0.87 | 0.71 |

a TEOM = B * (Reference method) + A
Reduced major axis regression and $R^2$ correlation.