

# Air monitoring report 2017 – Compliance with the National Environment Protection (Ambient Air Quality) Measure



Environment  
Protection  
Authority Victoria

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**This report presents the 2017 Victorian air quality monitoring results as assessed against the National Environment Protection (Ambient Air Quality) Measure<sup>1</sup> (referred to as the Measure). Victoria's air quality in 2017 was generally good.**

## Executive summary

### What is the Measure?

The Measure establishes national ambient air quality standards, and provides a consistent framework for monitoring and reporting on common air pollutants. The Measure aims to guide policies around the protection of human health and wellbeing. The Measure establishes the requirements for monitoring the following air pollutants:

- carbon monoxide
- nitrogen dioxide
- ozone
- sulfur dioxide
- lead
- particles equal to or less than 10 µm in diameter (PM<sub>10</sub>)
- particles equal to or less than 2.5 µm in diameter (PM<sub>2.5</sub>).

The Measure also establishes goals associated with each of these pollutants. Environment Protection Authority Victoria (EPA) is responsible for monitoring and reporting on Victoria's ambient air quality in accordance with the requirements of the Measure. EPA also provides air quality data (updated hourly) on its website<sup>2</sup> and produces annual air quality summaries.<sup>3</sup>

### Compliance with the Measure

Air quality is assessed against the standards defined in the Measure and the associated goals shown in

Table 4. Standards are concentrations, in parts per million (ppm) or micrograms per cubic metre (µg/m<sup>3</sup>), against which air quality can be assessed.

Compliance with the Measure has the following two requirements:

- 1) Air quality standards must not exceed more than the allowable number outlined in Schedule 2 of the Measure; and
- 2) At least 75 per cent of data for each quarter of the year for a given standard must be available.

### Air quality in Victoria in 2017

Victoria's air quality in 2017 was generally good, with most of the Measure's goals being met at EPA's air monitoring stations.

The Measure's goals for carbon monoxide, nitrogen dioxide and sulfur dioxide were met, with no measured exceedances at any of EPA's air monitoring stations.

In 2017, where there was sufficient data captured, the goals for carbon monoxide, nitrogen dioxide, ozone, sulfur dioxide, PM<sub>10</sub>, and lead were met at all stations, except for PM<sub>10</sub> at Geelong South.

The PM<sub>2.5</sub> goal of 25 µg/m<sup>3</sup> was not met at any air monitoring station during 2017. The PM<sub>2.5</sub> standard was exceeded at:

- Alphington on eight days
- Footscray on four days
- Geelong on two days
- Traralgon on five days.

More than half of the exceedances occurred on still, cold days and have been attributed to wood heater smoke. This highlights that urban sources such as domestic wood heaters are a major source of PM<sub>2.5</sub> in the Victorian airshed. Another cause of the exceedances were hazard reduction burns

<sup>1</sup> National Environment Protection Measure for Air Quality, National Environment Protection Council publication, available from <https://www.legislation.gov.au>

<sup>2</sup> EPA hourly data tables <http://www.epa.vic.gov.au>

<sup>3</sup> [Air monitoring results around Victoria](#)

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(planned burns in Victoria) and unplanned burns. These include planned burns<sup>4</sup> for:

- fuel reduction – to reduce fuel levels
- ecological reasons – to achieve ecological objectives
- regeneration – to regenerate particular species or vegetation types
- catchment protection – to prevent the spread of bushfires in forested water catchments.

The Measure's goal for PM<sub>10</sub> was not met at Geelong South (due to exceedances) and Dandenong (not demonstrated due to insufficient data). The PM<sub>10</sub> standard was exceeded at:

- Geelong South on three days, two of these three days were due to local dust.
- Mooroolbark on two days due to planned burns. Exceedances associated with planned burns

(and other exceptional events) are not included when assessing against the 1-day average goals of the NEPM. As such, the 24-hour goal was met at Mooroolbark.

There were no measured exceedances of ozone in 2017. However, the Measure's goal for ozone was not met at Dandenong, Melton, Mooroolbark or Point Cook due to instruments being turned off during the colder months, as ozone generally forms in warm weather.

Separate to this report, EPA has a number of issue-specific air monitoring stations not included in the Measure. These are located at sites such as the Brooklyn Industrial Precinct and in the Latrobe Valley (excluding Traralgon air monitoring station). Results for these air monitoring stations are reported separately on EPA's website.<sup>5</sup>

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<sup>4</sup> [Managing bushfire risk](#)

<sup>5</sup> EPA publications <http://www.epa.vic.gov.au/our-work/publications>

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## 1 Monitoring summary

### Current Measure performance monitoring stations

Victoria's air monitoring plan for the Measure was first approved in February 2001 by the National Environment Protection Council Ministers. Data presented in this report has been produced in accordance with the monitoring plan, except where noted.

The Measure requires the monitoring of the pollutants carbon monoxide (CO), nitrogen dioxide (NO<sub>2</sub>), ozone (O<sub>3</sub>), sulfur dioxide (SO<sub>2</sub>), particles less than 10 micrometres in diameter (PM<sub>10</sub>) particles less than 2.5 micrometres in diameter (PM<sub>2.5</sub>), and lead (Pb). However lead concentrations are no longer monitored as levels have decreased significantly.

Eight regions are defined in the monitoring plan; these include:

- Port Phillip and Latrobe Valley regions, which have permanent performance monitoring stations.

- Ballarat, Bendigo, Shepparton, Warrnambool and Mildura, where campaign monitoring was previously conducted.
- Wodonga, where data from monitoring at Albury New South Wales has been used.

Stations at which monitoring was conducted in 2017 are shown in Figure 1 and Figure 2. The monitoring stations, pollutants monitored and site types are summarised in Table 1. Site types are defined as generally representative upper bound for community exposure sites and population-average sites.

EPA will be reviewing its air monitoring network in response to *Clean air for all Victorian: Victoria's Air quality statement*<sup>6</sup> and Victorian Auditor General's Office (VAGO) report<sup>7</sup>.

### Description of exposed population

The exposed population represented by each monitoring station is described qualitatively by the location category column in Table 1.

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<sup>6</sup> [Victoria's air quality statement](#)

<sup>7</sup> [Improving Victoria's air quality](#)

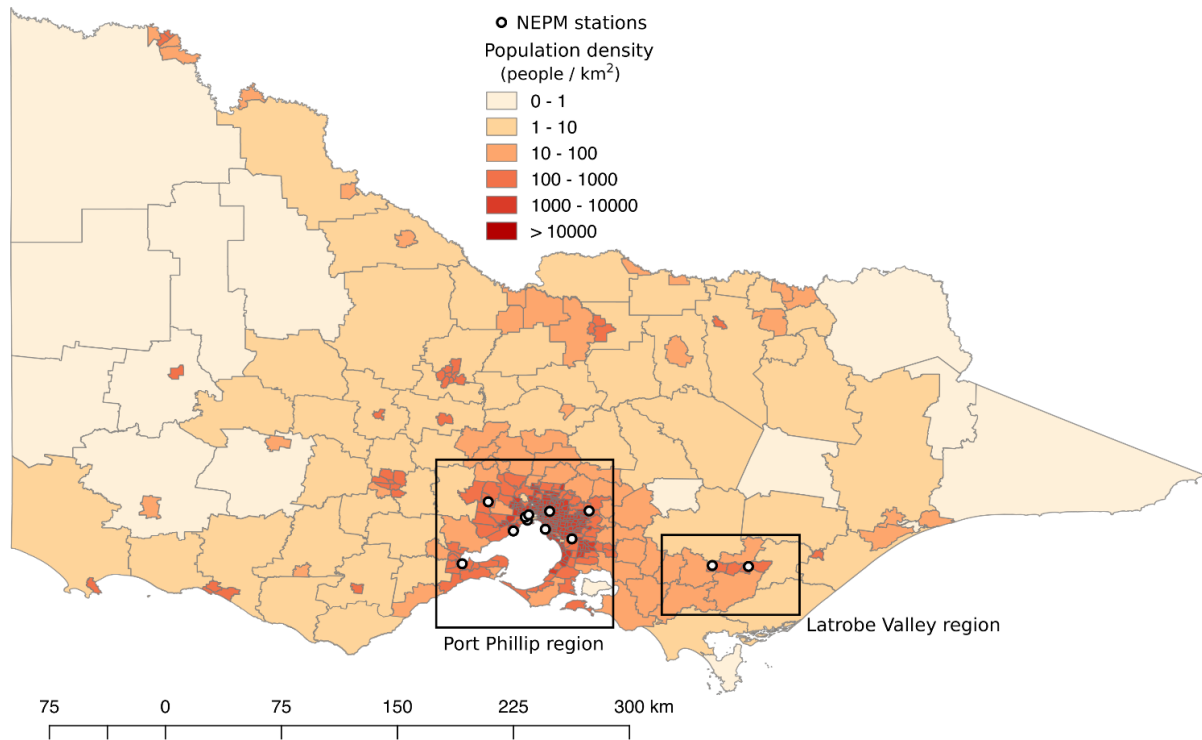


Figure 1: Defined regions and population density in Victoria

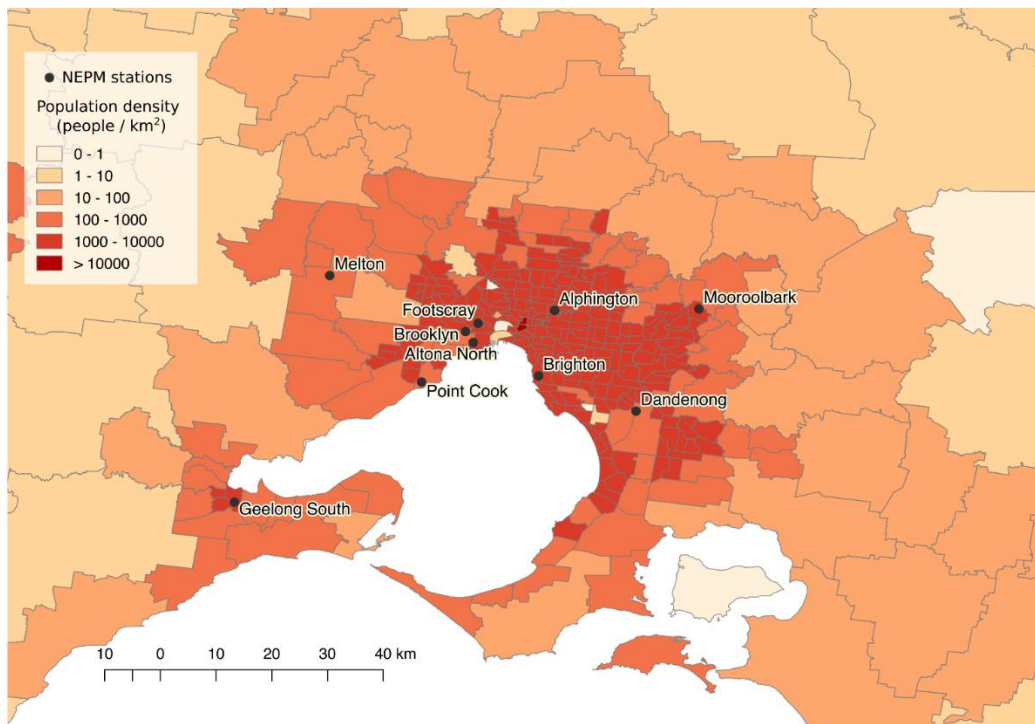


Figure 2: Monitoring stations and population density in Port Phillip region

**Table 1: Victorian performance monitoring stations**

Region	Location category	Site type					
		CO	NO <sub>2</sub>	O <sub>3</sub>	SO <sub>2</sub>	PM <sub>10</sub>	PM <sub>2.5</sub>
<b>Port Phillip</b>							
<b>Alphington</b>	Residential/light industrial	G*	G*	Pop	Pop*	G*	G*
<b>Altona North</b>	Industrial/residential				G		
<b>Brighton</b>	Residential		G	Pop*		Pop	
<b>Dandenong</b>	Light industrial			Pop		Pop	
<b>Footscray</b>	Industrial/residential		G*	G*		G*	G*
<b>Geelong South</b>	Light industrial/residential	G*	G*	Pop*	G*	G*	G*
<b>Melton</b>	Residential			G			
<b>Mooroolbark</b>	Residential			Pop		Pop	
<b>Point Cook</b>	Rural/residential		Pop*	G*			
<b>Point Henry<sup>c</sup></b>	Industrial/rural			Pop			
<b>Richmond<sup>d</sup></b>	Residential	G				G	
<b>RMIT (CBD)<sup>a</sup></b>	CBD	G*	G*		G	G*	
<b>Latrobe Valley</b>							
<b>Moe<sup>b</sup></b>	Residential		Pop	G	G	G	
<b>Traralgon</b>	Residential		G*	G*	G*	G*	G*

\* Trend station.

G Generally representative upper bound.

Pop Population average.

a RMIT station closed in 2006.

b Moe closed in 2009, monitoring for PM<sub>2.5</sub> (beta attenuation started in 2015).

c Point Henry closed in 2011.

d Richmond station closed in 2016.

### Implementation of the monitoring plan

Victoria's air quality monitoring program is continually examined and options for what is monitored and where are considered each year. Stations are located and setup according to the Australian Standard as shown in Table 2.

Generally, the monitoring stations remain stable over the years, however changes to the network are made as needed. Changes include:

- The closure of the peak station for lead, in Collingwood, in December 2004 because levels were very low over a period of time compared to the air quality standard. This change to Victoria's monitoring plan was approved in accordance with procedures outlined in the Measure.
- The station at Paisley was renamed Altona North in June 2006 to better reflect its geographic location.

- Monitoring ceased at the CBD station (at RMIT University) in October 2006, when the lease was terminated due to building extensions.
- The station at Moe was closed in October 2009 when the lease was terminated due to building construction works, and following a review which found the Traralgon station was comparable to Moe and representative of Latrobe Valley. A new Moe station was established in 2015 after the Hazelwood mine fire to monitor for PM<sub>2.5</sub>.
- Ozone monitoring was stopped at Point Henry in March 2011 as the Point Henry site was not representative of the general area.
- Monitoring ceased at the CBD station (at Richmond) in 2016, when the lease was terminated. A non-NEPM roadside station was established in the Melbourne CBD in 2017. Data from this station is available on EPA's website.

### Screening procedure



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The monitoring plan outlines how to demonstrate whether concentrations of pollutants are consistently below the standards. If screening procedures are satisfied, monitoring may not be required, or may be conducted at fewer locations.

Screening procedures conducted in accordance with the Measure have been satisfied for Victorian regions, except for PM<sub>10</sub>, at Ballarat, Bendigo, Mildura, Shepparton, Wodonga and Warrnambool. EPA did not monitor air quality at Ballarat, Bendigo, Shepparton, Warrnambool, Wodonga and Mildura in 2017 as previous monitoring campaigns in these areas showed that pollutant levels were expected to be consistently below the relevant standards in the Measure. Additional information can be found in the following reports.

- [Air monitoring at Warrnambool, October 2006 to October 2007](#)
- [Airborne particle monitoring at Mildura, December 2004 to June 2006](#)
- [Air monitoring at Ballarat August 2005 to August 2006](#)
- [Air monitoring at Bendigo, May 2004 to July 2005](#)
- [Airborne particle monitoring at Shepparton, December 2003 to December 2004](#)

## Monitoring methods

Victorian monitoring is conducted in accordance with the Australian Standard as shown in Table 3. Data not meeting the requirements of these Standards and EPA's quality assurance procedures was identified as invalid and not included in reporting.

TEOM PM<sub>10</sub> data included in this report has been adjusted according to the approved procedure as outlined in *Technical Paper No. 10 – Collection and Reporting of TEOM PM<sub>10</sub> Data*<sup>8</sup>, 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

## Table 2: Summary of stations' siting compliance with AS 3580.1.1-2016

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<sup>8</sup> *Technical Paper No. 10 – Collection and Reporting of TEOM PM<sub>10</sub> Data*, Former Standing Council on Environment and Water (incorporating the National Environment Protection Council) <http://www.scew.gov.au>

increase of 40 per cent at a temperature of 5°C. Particle concentration units of µg/m<sup>3</sup> refer to volumes at 0°C and one atmosphere of pressure.

## PM<sub>2.5</sub> monitoring

On 25 February 2016, the Measure was varied to introduce a daily standard of 25 µg/m<sup>3</sup> for PM<sub>2.5</sub> and an 8 µg/m<sup>3</sup> annual standard for PM<sub>2.5</sub>. The varied Measure also removed the number of allowable exceedances for PM<sub>2.5</sub> and PM<sub>10</sub>.

Victoria monitors PM<sub>2.5</sub> by the reference method specified in the Measure (on a one-day-in-three basis) at two stations (Alphington and Footscray). It also monitors PM<sub>2.5</sub> continuously at these two stations along with Geelong and Traralgon using beta attenuation monitors (BAMs).

Prior to this, Victoria also participated in the PM<sub>2.5</sub> Equivalence Program, with tapered element oscillating microbalance (TEOM) monitors located at Alphington and Footscray. Alphington was substituted for Mooroolbark, which was originally proposed. TEOM PM<sub>2.5</sub> readings are taken with the inbuilt adjustment for PM<sub>10</sub> removed (A and B constants set to 0 and 1) and no adjustment for loss of volatiles.

## NATA status

All methods currently used by EPA for performance monitoring are covered by its National Association of Testing Authorities (NATA) accreditation (Number 15119) except for PM<sub>2.5</sub> using BAMs. Work is being carried out to incorporate monitoring for PM<sub>2.5</sub> using BAMs as part of EPA Victoria's NATA accreditation. Conformance or non-conformance of the siting is noted within this report. EPA was successfully reaccredited by NATA in 2016.

As of February 2016, monitoring for PM<sub>10</sub> and PM<sub>2.5</sub> using the Hivol and Partisol manual methods are outsourced by EPA to Golder Associates (NATA accreditation Number 1910).

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Region station	Height above ground	Minimum distance to support structure	Clear sky angle of 120°	Unrestricted airflow of 270°/360°	20 m from trees	No boilers or incinerators nearby	Minimum distance from road or traffic
<b>Port Phillip</b>							
Alphington	Y	Y	Y	Y	N	Y	N
Altona North	Y	Y	Y	Y	Y	Y	N
Dandenong	Y	Y	Y	Y	N	Y	N
Footscray	Y	Y	Y	Y	N	Y	Y
Geelong South	Y	Y	Y	Y	N	Y	N
Melton	Y	Y	Y	Y	N	Y	N
Mooroolbark	Y	Y	Y	Y	N	Y	N
Point Cook	Y	Y	Y	Y	N	Y	N
<b>Latrobe Valley</b>							
Traralgon	Y	Y	Y	Y	N	Y	N
Moe	Y	Y	Y	Y	N	Y	N

**Table 3: Methods for monitoring pollutants in the Measure**

Pollutant		Applicable Standard "Title of Standard"	Method used
Carbon monoxide	CO	Australian Standard 3580.7.1 "Ambient air - Determination of carbon monoxide, direct instrumental method"	Gas filter correlation/infrared
Nitrogen dioxide	NO <sub>2</sub>	Australian Standard 3580.5.1 "Ambient air — Determination of oxides of nitrogen — Direct reading instrument method"	Gas phase chemiluminescence
Photochemical oxidant (ozone)	O <sub>3</sub>	Australia Standard 3580.6.1 "Ambient air — Determination of ozone — Direct reading instrument method"	Non-dispersive ultraviolet
Sulfur dioxide	SO <sub>2</sub>	Australian Standard 3580.4.1 "Ambient air — Determination of sulfur dioxide — Direct reading instrument method"	Pulsed fluorescence
Particles	PM <sub>10</sub>	Australian Standard 3580.9.8 "Determination of suspended particulate matter — PM <sub>10</sub> continuous direct mass method using a tapered element oscillating microbalance analyser"	Tapered element oscillating microbalance (TEOM)
	PM <sub>2.5</sub>	Australian Standard 3580.9.10 "Determination of suspended particulate matter – PM <sub>2.5</sub> low volume sampler – Gravimetric method"	Gravimetric reference method
		Australian Standard 3580.9.12 Determination of suspended particulate matter PM <sub>2.5</sub> beta attenuation monitors	Beta attenuation monitors (BAM)

## 2 Assessment of compliance with standards and goals

Air quality is assessed against the standards defined in the Measure and the associated goals shown in Table 4. Standards are concentrations, in parts per million (ppm) or micrograms per cubic metre ( $\mu\text{g}/\text{m}^3$ ), against which air quality can be assessed.

The goal of the Measure is to achieve the National Environment Protection Standards as assessed in accordance with the monitoring protocol to the extent specified in Schedule 2 of the Measure. The extent is expressed as a maximum allowable number of exceedances for each standard (shown in column four of

Table 4). For  $\text{PM}_{2.5}$ , there is an additional goal to further reduce concentrations to below a daily concentration of  $20 \mu\text{g}/\text{m}^3$  and an annual concentration of  $7 \mu\text{g}/\text{m}^3$  by 2025.

The number of allowable exceedances associated with the standards has been set to account for unusual meteorological conditions and, in the case of particles, exceptional events such as bushfires, jurisdiction authorised hazard reduction burning or

continental scale windblown dust that cannot be controlled through normal air quality management strategies. Air quality monitoring data from each monitoring site is assessed against these standards and the associated goals.

Air quality is assessed as complying with the Measure if the number of exceedances of the standard is no more than the number specified in Schedule 2 of the Measure 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. This includes lead, which was shown to be below standards over time until monitoring ceased in 2004.

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

**Table 4: Air quality standards and goals in the Measure**

Pollutant	Averaging period	Standard	Goal max. allowable exceedances
<b>Carbon monoxide</b>	8 hours	9.0 ppm	1 day a year
<b>Nitrogen dioxide</b>	1 hour	0.12 ppm	1 day a year
	1 year	0.03 ppm	None
<b>Ozone</b>	1 hour	0.10 ppm	1 day a year
	4 hours	0.08 ppm	1 day a year
<b>Sulfur dioxide</b>	1 hour	0.20 ppm	1 day a year
	1 day	0.08 ppm	1 day a year
	1 year	0.02 ppm	None
<b>Particles as <math>\text{PM}_{10}</math></b>	1 day	$50 \mu\text{g}/\text{m}^3$	None
	1 year	$25 \mu\text{g}/\text{m}^3$	None
<b>Particles as <math>\text{PM}_{2.5}</math></b>	1 day	$25 \mu\text{g}/\text{m}^3$	None
	1 year	$8 \mu\text{g}/\text{m}^3$	None
<b>Lead</b>	1 year	$0.50 \mu\text{g}/\text{m}^3$	None

## 3 Summary of progress towards achieving the goals of the Measure

The Measure's goals for carbon monoxide, nitrogen dioxide, ozone, sulfur dioxide, PM<sub>10</sub>, PM<sub>2.5</sub> and lead are to be below the standards within the extent specified, taking into consideration exceptional events as described in the measure.

A traffic light system has been implemented to indicate compliance.

- **Green** – standard and goal achieved.
- **Amber** – standard and goal not achieved due to insufficient data capture.
- **Red** – standard and goal not achieved.

### Compliance in 2017

In 2017, where there was sufficient data captured, the goals for carbon monoxide, nitrogen dioxide, ozone, sulfur dioxide, PM<sub>10</sub>, PM<sub>2.5</sub> and lead were met at all stations, except for PM<sub>10</sub> at Geelong South, and for PM<sub>2.5</sub> at Alphington, Footscray, Geelong and Traralgon.

The ozone goal was not met at Dandenong, Melton, Mooroolbark and Point Cook as there was insufficient data to demonstrate that no exceedances occurred. These stations only measured ozone during the summer months when ozone tends to form. No exceedances were recorded when instruments were operating. No exceedances were observed at stations which operated for the entire year with sufficient data capture (Alphington, Footscray, Geelong and Traralgon).

The PM<sub>10</sub> goal was not met at Dandenong due to insufficient data to demonstrate that no exceedances occurred. This was due to an issue with instrument calibration.

The PM<sub>10</sub> goal was not met at Geelong South due to two exceedances of the standard, which were due to local dust sources. There was an additional exceedance at Geelong South related to planned burns, which were considered exceptional events.

The PM<sub>10</sub> goal was met at Mooroolbark, however there were two exceedances of the standard related to planned burns.

The PM<sub>2.5</sub> goal was not met at any of the stations as all had one or more exceedances of the standard. Alphington and Traralgon each exceeded the annual standard. A majority of exceedances

during 2017 were related to urban sources such as domestic wood heaters and occurred on days where the minimum temperature was less than 5°C and there were low winds which limited the ability of the environment to disperse the smoke.

## 4 Compliance of individual pollutants

### A Carbon monoxide (CO)

#### Assessment of compliance with standards and goals of the Measure for carbon monoxide

In Victoria, carbon monoxide is assessed against an 8-hour standard of 9.0 ppm, with one exceedance day allowed per year. The carbon monoxide standard was not exceeded and compliance was demonstrated at all stations. The highest reading occurred at Alphington, where carbon monoxide reached 20 per cent of the standard.

**Table 5: 2017 compliance summary for carbon monoxide in Victoria**

Region Performance monitoring station	Data availability rates (% of hours)					Number of exceedances (days)	Performance against the standard and goals
	Q1	Q2	Q3	Q4	Annual		
<b>Port Phillip</b>							
Alphington	98.0	96.2.1	96.5	98.2	97.2	0	MET
Footscray	98.2	98.8	98.1	82.9	94.5	0	MET
Geelong South	98.3	98.6	96.2	91.6	96.1	0	MET

**Table 6: 2017 summary statistics for daily peak eight-hour carbon monoxide in Victoria**

Region Performance monitoring station	Number of valid days	Highest reading (ppm)	Highest reading (date: hour)	2nd highest reading (ppm)	2nd highest reading (date:hour)
<b>Port Phillip</b>					
Alphington	344	1.6	11 May 2:00	1.4	19 May 3:00 5 May 3:00 18 Jun 3:00
Footscray	338	1.1	6 May 22:00	1	7 May 24:00 2 Aug 16:00 18 May 11:00
Geelong South	341	1.1	16 May 2:00	1	11 May 2:00 11 Jul 2:00

**Table 7: 2017 percentiles for daily peak eight-hour carbon monoxide in Victoria**

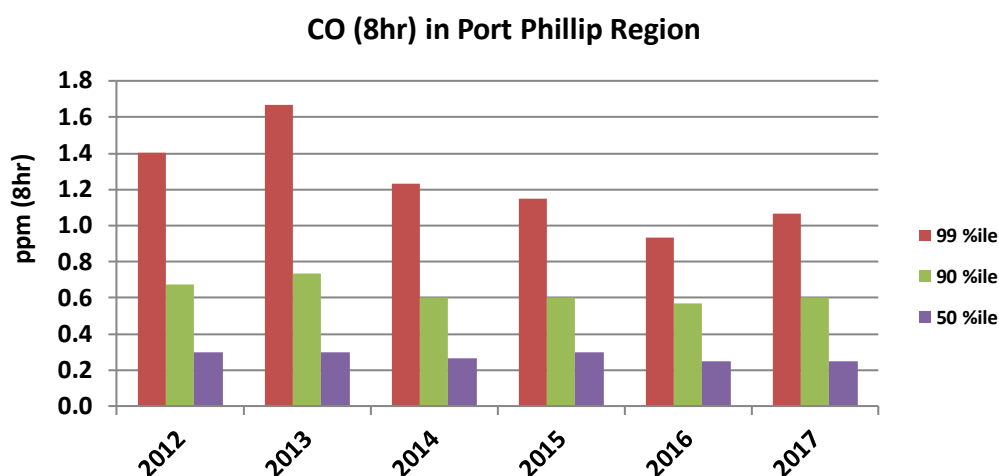
Region Performance monitoring station	Data availability (% of days)	Max (ppm)	Percentiles (ppm)					
			99 <sup>th</sup>	98 <sup>th</sup>	95 <sup>th</sup>	90 <sup>th</sup>	75 <sup>th</sup>	50 <sup>th</sup>
<b>Port Phillip</b>								
Alphington	94.2	1.6	1.4	1.2	1.1	0.9	0.4	0.3
Footscray	92.6	1.1	0.9	0.8	0.6	0.5	0.3	0.2
Geelong South	93.4	1.1	0.9	0.8	0.5	0.4	0.3	0.2

#### Trends and pollutant distributions for carbon monoxide between 2012 and 2017

Percentiles of 2017 daily peak concentrations (over an eight hour averaging period) are provided for carbon monoxide each station and standard. 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 in the year are

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omitted and stations with less than 75 per cent data are shown in italics. The percentiles for eight-hour carbon monoxide is based on running averages, including those that overlap from one day to the next (Table 7). Figure 3 shows the daily eight hour carbon monoxide concentration for 2012–2017.



**Figure 3: Percentiles of daily maximum carbon monoxide (average of Port Phillip stations 2012–2017)**

The results for individual stations are shown in Tables 8 to 11. Monitoring at Richmond ceased in March 2015, as this CBD station tended to record higher carbon monoxide levels, averages for 2016 and 2017 may be relatively lower.

**Table 8: Percentiles of daily maximum eight-hour carbon monoxide at Alphington (2012–2017)**

Year	Data availability (% of days)	No. of exceedances (days)	Max (ppm)	Percentiles (ppm)					
				99 <sup>th</sup>	98 <sup>th</sup>	95 <sup>th</sup>	90 <sup>th</sup>	70 <sup>th</sup>	50 <sup>th</sup>
2012 <sup>a</sup>	32.8	0	1.6	1.5	1.3	1.1	0.9	0.5	0.2
2013	83.8	0	2.6	2.1	1.9	1.5	1.1	0.7	0.4
2014	94	0	1.7	1.4	1.2	1.0	0.8	0.6	0.4
2015	93.7	0	1.7	1.5	1.3	1.0	0.8	0.5	0.4
2016	90.2	0	2.1	1.3	1.2	0.9	0.8	0.5	0.3
2017	94.2	0	1.6	1.4	1.2	1.1	0.9	0.4	0.3

a: Data availability between 15 and 75 per cent, values displayed in italics

**Table 9: Percentiles of daily maximum eight-hour carbon monoxide at Footscray (2016–2017)**

Year	Data availability (% of days)	No. of exceedances (days)	Max (ppm)	Percentiles (ppm)					
				99 <sup>th</sup>	98 <sup>th</sup>	95 <sup>th</sup>	90 <sup>th</sup>	70 <sup>th</sup>	50 <sup>th</sup>
2016	93.4	0	1.3	0.7	0.7	0.6	0.5	0.3	0.2
2017	92.6	0	1.1	0.9	0.8	0.6	0.5	0.3	0.2

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**Table 10: Percentiles of daily maximum eight-hour carbon monoxide at Geelong (2012–2017)**

Year	Data availability (% of days)	No. of exceedances (days)	Max (ppm)	Percentiles (ppm)					
				99 <sup>th</sup>	98 <sup>th</sup>	95 <sup>th</sup>	90 <sup>th</sup>	70 <sup>th</sup>	50 <sup>th</sup>
2012	97.8	0	1.7	1.2	0.9	0.8	0.6	0.4	0.3
2013	97.8	0	1.5	1.2	1.0	0.6	0.4	0.3	0.2
2014	100.0	0	1.4	1.0	0.8	0.6	0.4	0.2	0.1
2015	98.4	0	1.1	0.8	0.7	0.5	0.4	0.2	0.2
2016	92.3	0	1.7	0.8	0.8	0.6	0.4	0.3	0.2
2017	93.4	0	1.1	0.9	0.8	0.5	0.4	0.3	0.2

**Table 11: Percentiles of daily maximum eight-hour carbon monoxide at Richmond (2012–2015)**

Year	Data availability (% of days)	No. of exceedances (days)	Max (ppm)	Percentiles (ppm)					
				99 <sup>th</sup>	98 <sup>th</sup>	95 <sup>th</sup>	90 <sup>th</sup>	70 <sup>th</sup>	50 <sup>th</sup>
2012	95.9	0	2.2	1.6	1.5	1.1	0.8	0.4	0.3
2013	98.9	0	2.4	1.7	1.6	1.1	0.7	0.5	0.3
2014	100.0	0	1.6	1.3	1.0	0.8	0.6	0.4	0.3
2015 <sup>a</sup>	<i>19.5<sup>a</sup></i>	<i>0</i>	<i>0.5</i>	<i>0.4</i>	<i>0.4</i>	<i>0.4</i>	<i>0.3</i>	<i>0.3</i>	<i>0.3</i>

a: Data availability between 15 and 75 per cent, values displayed in italics.

Note: monitoring stopped in 2015

## B Nitrogen dioxide (NO<sub>2</sub>)

### Assessment of compliance with standards and goals of the Measure for nitrogen dioxide

In Victoria, nitrogen dioxide is assessed against a one-hour standard of 0.12 ppm, with one exceedance day allowed per year and an annual standard of 0.030 ppm, with no exceedances allowed. At all stations operated during 2017, the nitrogen dioxide standard was not exceeded and compliance was demonstrated. The highest one-hour average at Alphington was 47.5 per cent of the standard as shown in Table 15.

**Table 12: 2017 compliance summary for nitrogen dioxide in Victoria**

Region Performance monitoring station	Data availability rates (% of hours)					Number of exceedances (days)	Annual mean (ppm)	Performance against the standard and goals	
	Q1	Q2	Q3	Q4	Annual			1-hour	Annual
<b>Port Phillip</b>									
Alphington	94.7	88.1	86.1	93.6	90.6	0	0.010	MET	MET
Footscray	75.9	94.9	93.2	93.4	89.4	0	0.012	MET	MET
Geelong South	94.6	94.6	92.8	88.1	92.5	0	0.006	MET	MET
<b>Latrobe Valley</b>									
Traralgon	73.2	94.1	90.9	94.0	88.1	0	0.006	MET	MET

**Table 13: 2017 summary statistics for peak one-hour nitrogen dioxide in Victoria**

Region Performance monitoring station	Number of valid days	Highest reading (ppm)	Highest reading (date   hour)	2 <sup>nd</sup> highest reading (ppm)	2 <sup>nd</sup> highest reading (date   hour)
<b>Port Phillip</b>					
Alphington	339	0.057	3 Aug 18:00	0.045	4 Oct 19:00
Footscray	339	0.050	3 Aug 16:00 5 Apr 20:00		
Geelong South	347	0.042	3 Oct 6:00	0.041	7 Apr 8:00
<b>Latrobe Valley</b>					
Traralgon	331	0.034	20 Apr 18:00 16 Jun 19:00 12 May 19:00		

**Table 14: 2017 percentiles for daily peak one-hour nitrogen dioxide in Victoria**

Region Performance monitoring station	Data availability (% of days)	Max (ppm)	Percentiles (ppm)					
			99 <sup>th</sup>	98 <sup>th</sup>	95 <sup>th</sup>	90 <sup>th</sup>	75 <sup>th</sup>	50 <sup>th</sup>
<b>Port Phillip</b>								
Alphington	92.6	0.057	0.038	0.036	0.033	0.031	0.027	0.020
Footscray	92.6	0.050	0.047	0.042	0.039	0.035	0.029	0.023
Geelong South	94.8	0.042	0.038	0.034	0.030	0.027	0.021	0.015
<b>Latrobe Valley</b>								
Traralgon	90.4	0.034	0.031	0.030	0.027	0.024	0.020	0.013



### Trends and pollutant distributions for nitrogen dioxide between 2012 and 2017

Percentiles of 2017 daily peak concentrations are provided for nitrogen dioxide for each station and standard as shown in Tables 15–20. 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 in the year are omitted and stations with less than 75 per cent data are shown in italics. Exceedances are shown in bold. Figure 3. Figure 4 shows the daily maximum one-hour nitrogen dioxide concentration for 2012–2017.

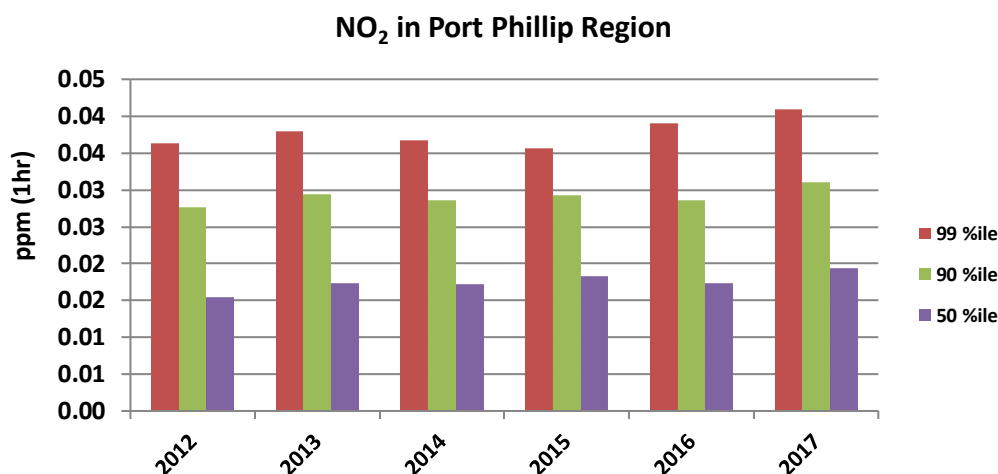


Figure 4: Percentiles of daily maximum nitrogen dioxide (average of Port Phillip stations 2012–2017)

Table 15: Percentiles of daily maximum one-hour nitrogen dioxide at Alphington (2012–2017)

Year	Data availability (% of days)	No. of exceedances (days)	Max (ppm)	Percentiles (ppm)					
				99 <sup>th</sup>	98 <sup>th</sup>	95 <sup>th</sup>	90 <sup>th</sup>	70 <sup>th</sup>	50 <sup>th</sup>
2012 <sup>a</sup>	33.1	0	0.037	0.036	0.033	0.030	0.028	0.025	0.021
2013	84.4	0	0.046	0.039	0.037	0.035	0.032	0.027	0.022
2014	90.7	0	0.064	0.039	0.037	0.032	0.030	0.026	0.020
2015	93.4	0	0.043	0.035	0.033	0.032	0.030	0.025	0.021
2016	91.5	0	0.043	0.038	0.036	0.031	0.029	0.023	0.018
2017	92.6	0	0.057	0.038	0.036	0.033	0.031	0.027	0.020

a: Data availability between 15 and 75 per cent, values displayed in italics.

Table 16: Percentiles of daily maximum one-hour nitrogen dioxide at Brighton (2012–2015)

Year	Data availability (% of days)	No. of exceedances (days)	Max (ppm)	Percentiles (ppm)					
				99 <sup>th</sup>	98 <sup>th</sup>	95 <sup>th</sup>	90 <sup>th</sup>	70 <sup>th</sup>	50 <sup>th</sup>
2012	98.4	0	0.041	0.035	0.034	0.031	0.029	0.024	0.017
2013	98.9	0	0.042	0.038	0.037	0.033	0.031	0.025	0.019
2014	95.9	0	0.044	0.038	0.036	0.033	0.030	0.025	0.019
2015 <sup>a</sup>	15.6	0	0.27	0.026	0.025	0.023	0.019	0.016	0.011

a: Data availability between 15 and 75 per cent, values displayed in italics.

Note: monitoring stopped in 2015.

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**Table 17: Percentiles of daily maximum one-hour nitrogen dioxide at Footscray (2012–2017)**

Year	Data availability (% of days)	No. of exceedances (days)	Max (ppm)	Percentiles (ppm)					
				99 <sup>th</sup>	98 <sup>th</sup>	95 <sup>th</sup>	90 <sup>th</sup>	70 <sup>th</sup>	50 <sup>th</sup>
2012	89.3	0	0.058	0.042	0.040	0.036	0.032	0.027	0.020
2013	83.6	0	0.051	0.045	0.040	0.037	0.035	0.028	0.022
2014	97.3	0	0.064	0.045	0.040	0.036	0.033	0.027	0.021
2015	98.6	0	0.046	0.040	0.038	0.035	0.032	0.028	0.021
2016	95.1	0	0.052	0.042	0.038	0.035	0.032	0.026	0.020
2017	92.6	0	0.050	0.047	0.042	0.039	0.035	0.029	0.023

**Table 18: Percentiles of daily maximum one-hour nitrogen dioxide at Geelong South (2012–2017)**

Year	Data availability (% of days)	No. of exceedances (days)	Max (ppm)	Percentiles (ppm)					
				99 <sup>th</sup>	98 <sup>th</sup>	95 <sup>th</sup>	90 <sup>th</sup>	70 <sup>th</sup>	50 <sup>th</sup>
2012	94.3	0	0.041	0.032	0.031	0.028	0.026	0.020	0.014
2013	98.9	0	0.064	0.033	0.030	0.027	0.023	0.018	0.012
2014	99.5	0	0.036	0.030	0.029	0.027	0.025	0.019	0.014
2015	91.0	0	0.038	0.032	0.031	0.028	0.026	0.020	0.013
2016	95.4	0	0.044	0.037	0.031	0.028	0.025	0.021	0.014
2017	94.8	0	0.042	0.038	0.034	0.030	0.027	0.021	0.015

**Table 19: Percentiles of daily maximum one-hour nitrogen dioxide at Point Cook (2012–2015)**

Year	Data availability (% of days)	No. of exceedances (days)	Max (ppm)	Percentiles (ppm)					
				99 <sup>th</sup>	98 <sup>th</sup>	95 <sup>th</sup>	90 <sup>th</sup>	70 <sup>th</sup>	50 <sup>th</sup>
2012	95.9	0	0.039	0.036	0.033	0.027	0.024	0.017	0.011
2013	95.3	0	0.044	0.035	0.033	0.030	0.026	0.020	0.012
2014	98.9	0	0.044	0.032	0.031	0.028	0.025	0.020	0.012
2015 <sup>a</sup>	22.2	0	0.023	0.022	0.021	0.020	0.018	0.014	0.009

a: Data availability between 15 and 75 per cent, values displayed in italics.

Note: monitoring stopped in 2015.

**Table 20: Percentiles of daily maximum one-hour nitrogen dioxide at Traralgon (2012–2017)**

Year	Data availability (% of days)	No. of exceedances (days)	Max (ppm)	Percentiles (ppm)					
				99 <sup>th</sup>	98 <sup>th</sup>	95 <sup>th</sup>	90 <sup>th</sup>	70 <sup>th</sup>	50 <sup>th</sup>
2012	97.8	0	0.032	0.028	0.026	0.025	0.022	0.019	0.013
2013	94.2	0	0.034	0.030	0.028	0.025	0.022	0.019	0.013
2014	95.3	0	0.031	0.028	0.027	0.025	0.022	0.018	0.013
2015	95.1	0	0.034	0.029	0.029	0.026	0.022	0.017	0.012
2016	86.6	0	0.036	0.033	0.030	0.027	0.024	0.020	0.014
2017	90.4	0	0.034	0.031	0.030	0.027	0.024	0.020	0.013

## C Ozone (O<sub>3</sub>)

### Assessment of compliance with standards and goals of the Measure for ozone

In Victoria, ozone is assessed against a one-hour standard of 0.10 ppm and a four-hour standard of 0.08 ppm, with one exceedance day allowed per year. The one-hour and four-hour standards for ozone were met at all stations during 2017 where there was sufficient data captured. The highest one-hour average at Point Cook was 80 per cent of the standard. The highest four-hour average at Point Cook was 89 per cent of the standard.

**Table 21: 2017 compliance summary for ozone in Victoria**

Region	Data availability rates (% of hours)					Number of exceedances (days) annual mean (ppm)		Performance against the standard and goals		
	Performance monitoring station	Q1	Q2	Q3	Q4	Annual	1-hour	4-hour	1-hour	4-hour
<b>Port Phillip</b>										
Alphington	94.3	94.8	93.9	51.4	83.5	0	0	MET	MET	
Dandenong <sup>a</sup>	94	6.5	0.0	79.7	44.9 <sup>a</sup>	ND	ND	NOT MET	NOT MET	
Footscray	93.7	94.9	95.1	93.6	94.3	0	0	MET	MET	
Geelong South	95.0	94.9	94.8	90.6	93.8	0	0	MET	MET	
Melton <sup>a</sup>	91.3	9.8	0.0	74.4	43.7	ND	ND	NOT MET	NOT MET	
Mooroolbark <sup>a</sup>	94.9	26.5	0.0	84.3	51.3	ND	ND	NOT MET	NOT MET	
Point Cook <sup>a</sup>	94.9	9.8	0.0	77.2	45.3	ND	ND	NOT MET	NOT MET	
<b>Latrobe Valley</b>										
Traralgon	95.1	95.2	92.8	94.1	94.3	0	0	MET	MET	

- ND: No exceedance detected.
- a: Insufficient data to calculate percentile, <75 per cent data capture during year, values shown are excluded from trend analysis.

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**Table 22: 2017 summary statistics for daily peak one-hour ozone in Victoria**

The Measure's standards: 0.10 ppm (one-hour average).

The Measure's goal: standards exceeded on no more than one day per year.

Region Performance monitoring station	Number of valid days	Highest reading (ppm)	Highest reading (date   hour)	2 <sup>nd</sup> highest reading (ppm)	2 <sup>nd</sup> highest reading (date   hour)
<b>Port Phillip</b>					
Alphington	314	0.073	6 Jan 15:00	0.069	16 Jan 18:00
Dandenong	170	0.069	19 Mar 15:00	0.068	16 Jan 17:00
Footscray	358	0.079	22 Nov 16:00	0.067	20 Nov 17:00 6 Jan 14:00
Geelong South	356	0.067	21 Nov 18:00	0.065	22 Nov 17:00
Melton	163	0.073	6 Jan 15:00	0.071	22 Nov 17:00
Mooroolbark	193	0.071	17 Jan 17:00	0.065	10 Jan 16:00
Point Cook	171	0.080	22 Nov 16:00	0.074	29 Nov 17:00
<b>Latrobe Valley</b>					
Traralgon	357	0.064	17 Jan 14:00	0.057	23 Jan 15:00

**Table 23: 2017 summary statistics for daily peak four-hour ozone in Victoria**

The Measure's standards: 0.08 ppm (four-hour average).

The Measure's goal: standards exceeded on no more than one day per year.

Region Performance monitoring station	Number of valid days	Highest reading (ppm)	Highest reading (date   hour)	2 <sup>nd</sup> highest reading (ppm)	2 <sup>nd</sup> highest reading (date   hour)
<b>Port Phillip</b>					
Alphington	313	0.067	6 Jan 16:00	0.062	16 Jan 19:00
Dandenong	170	0.064	19 Mar 17:00	0.060	24 Nov 18:00
Footscray	358	0.067	22 Nov 19:00	0.061	20 Nov 18:00
Geelong South	355	0.061	21 Nov 19:00	0.060	22 Nov 17:00
Melton	163	0.067	22 Nov 19:00	0.066	6 Jan 17:00
Mooroolbark	193	0.067	17 Jan 17:00	0.061	23 Jan 17:00
Point Cook	171	0.071	29 Nov 17:00	0.070	22 Nov 17:00
<b>Latrobe Valley</b>					
Traralgon	331	0.056	17 Jan 15:00	0.052	23 Jan 16:00

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**Table 24: 2017 percentiles for daily peak one-hour ozone in Victoria**

Region Performance monitoring station	Data availability (% of days)	Max (ppm)	Percentiles (ppm)					
			99 <sup>th</sup>	98 <sup>th</sup>	95 <sup>th</sup>	90 <sup>th</sup>	75 <sup>th</sup>	50 <sup>th</sup>
<b>Port Phillip</b>								
Alphington	86.0	0.073	0.061	0.057	0.050	0.040	0.030	0.025
<i>Dandenong<sup>a</sup></i>	<i>46.6</i>	<i>0.069</i>	<i>0.067</i>	<i>0.062</i>	<i>0.058</i>	<i>0.053</i>	<i>0.042</i>	<i>0.031</i>
Footscray	98.1	0.079	0.063	0.057	0.051	0.043	0.031	0.027
Geelong South	97.5	0.067	0.058	0.057	0.048	0.042	0.032	0.029
<i>Melton<sup>a</sup></i>	<i>44.7</i>	<i>0.073</i>	<i>0.070</i>	<i>0.068</i>	<i>0.064</i>	<i>0.055</i>	<i>0.046</i>	<i>0.033</i>
<i>Mooroolbark<sup>a</sup></i>	<i>52.9</i>	<i>0.071</i>	<i>0.064</i>	<i>0.063</i>	<i>0.056</i>	<i>0.050</i>	<i>0.042</i>	<i>0.032</i>
<i>Point Cook<sup>a</sup></i>	<i>46.8</i>	<i>0.080</i>	<i>0.066</i>	<i>0.062</i>	<i>0.058</i>	<i>0.052</i>	<i>0.041</i>	<i>0.029</i>
<b>Latrobe Valley</b>								
Traralgon	97.8	0.064	0.052	0.049	0.043	0.038	0.030	0.026

a: Data availability between 15 and 75 per cent, values displayed in italics.

**Table 25: 2017 percentiles for daily peak four-hour ozone in Victoria**

Region Performance monitoring station	Data availability (% of days)	Max (ppm)	Percentiles (ppm)					
			99 <sup>th</sup>	98 <sup>th</sup>	95 <sup>th</sup>	90 <sup>th</sup>	75 <sup>th</sup>	50 <sup>th</sup>
<b>Port Phillip</b>								
Alphington	85.8	0.067	0.056	0.054	0.048	0.040	0.028	0.024
<i>Dandenong<sup>a</sup></i>	<i>46.6</i>	<i>0.064</i>	<i>0.059</i>	<i>0.057</i>	<i>0.054</i>	<i>0.051</i>	<i>0.039</i>	<i>0.029</i>
Footscray	98.1	0.067	0.058	0.051	0.046	0.040	0.030	0.026
Geelong South	97.3	0.061	0.056	0.052	0.046	0.040	0.031	0.028
<i>Melton<sup>a</sup></i>	<i>44.7</i>	<i>0.067</i>	<i>0.064</i>	<i>0.062</i>	<i>0.059</i>	<i>0.052</i>	<i>0.044</i>	<i>0.032</i>
<i>Mooroolbark<sup>a</sup></i>	<i>52.9</i>	<i>0.067</i>	<i>0.059</i>	<i>0.055</i>	<i>0.051</i>	<i>0.047</i>	<i>0.040</i>	<i>0.029</i>
<i>Point Cook<sup>a</sup></i>	<i>46.8</i>	<i>0.071</i>	<i>0.061</i>	<i>0.056</i>	<i>0.055</i>	<i>0.048</i>	<i>0.038</i>	<i>0.028</i>
<b>Latrobe Valley</b>								
Traralgon	97.8	0.056	0.049	0.045	0.040	0.036	0.029	0.025

a: Data availability between 15 and 75 per cent, values displayed in italics.

## Trends and pollutant distributions for ozone between 2012 and 2017

Percentiles of 2017 daily peak concentrations are provided for ozone each station and standard for one-hour and four-hour averaging periods. In tables 26–43, 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 in the year are omitted and stations with less than 75 per cent data are shown in italics. Exceedances are shown in bold. The percentiles for four-hour ozone are based on running averages, including those that overlap from one day to the next. Figure 5 and 6 show the daily maximum one-hour and four-hour ozone concentration for 2012–2017 in the Port Phillip Region.

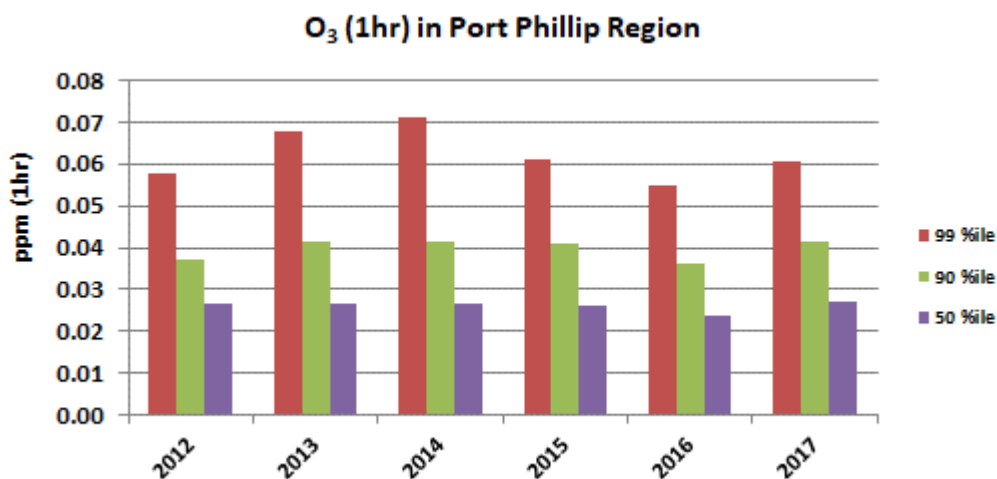


Figure 5: Percentiles of daily maximum one-hour ozone (average of Port Phillip stations 2012–2017)

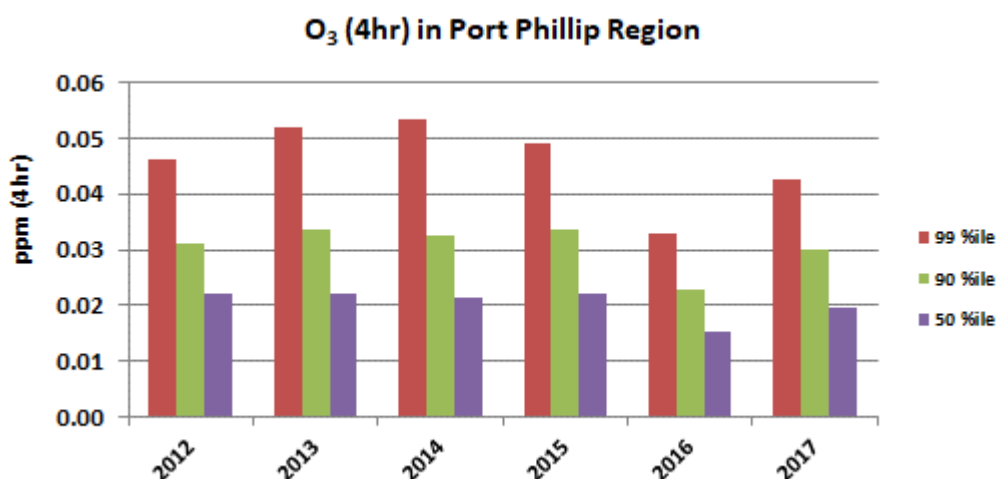


Figure 6: Percentiles of daily maximum four-hour ozone (average of Port Phillip stations 2012–2017)

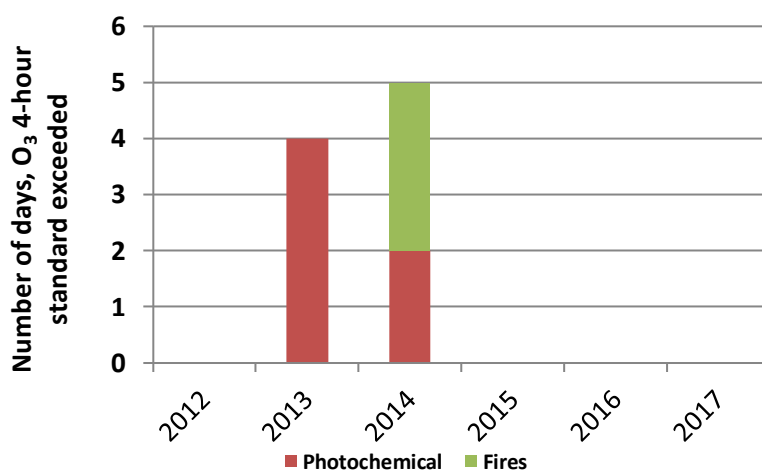


Figure 7: Inferred causes of exceedances of the ozone four-hour standard (Port Phillip region 2012–2017)

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Exceedances of both the four-hour and (less frequently) one-hour standards have been recorded. Major bushfires in 2014 are likely to have caused or exacerbated the ozone exceedances observed. No exceedances of the four-hour standard have been recorded for 2015–2017 as shown in Figure 7.

### One-hour ozone trends

**Table 26: Percentiles of daily maximum one-hour ozone at Alphington (2012–2017)**

Year	Data availability (% of days)	No. of exceedances (days)	Max (ppm)	Percentiles (ppm)					
				99 <sup>th</sup>	98 <sup>th</sup>	95 <sup>th</sup>	90 <sup>th</sup>	70 <sup>th</sup>	50 <sup>th</sup>
2012 <sup>a</sup>	33.1	0	0.057	0.055	0.051	0.042	0.033	0.026	0.023
2013	85.2	0	0.097	0.062	0.059	0.044	0.038	0.030	0.025
2014 <sup>b</sup>	97.0	1	<b>0.131</b>	0.076	0.065	0.052	0.043	0.031	0.026
2015	91.0	0	0.061	0.055	0.053	0.048	0.042	0.032	0.025
2016	96.7	0	0.066	0.058	0.054	0.047	0.037	0.028	0.022
2017	86.0	0	0.073	0.061	0.057	0.050	0.040	0.030	0.025

a: Data availability between 15 and 75 per cent, values displayed in italics.

b: Compliance with one hour O<sub>3</sub> not met, values displayed in bold.

**Table 27: Percentiles of daily maximum one-hour ozone at Brighton (2012–2017)**

Year	Data availability (% of days)	No. of exceedances (days)	Max (ppm)	Percentiles (ppm)					
				99 <sup>th</sup>	98 <sup>th</sup>	95 <sup>th</sup>	90 <sup>th</sup>	70 <sup>th</sup>	50 <sup>th</sup>
2012	99.2	0	0.069	0.055	0.050	0.044	0.038	0.030	0.026
2013	99.2	0	0.078	0.066	0.060	0.052	0.042	0.031	0.026
2014 <sup>a</sup>	68.5	0	0.091	0.087	0.078	0.056	0.047	0.033	0.026
2015	99.5	0	0.067	0.061	0.058	0.046	0.041	0.030	0.025
2016 <sup>b</sup>	1.4								

a: Data availability between 15 and 75 per cent, values displayed in italics.

b: Data availability less than 15 per cent, no values displayed.

**Table 28: Percentiles of daily maximum one-hour ozone at Dandenong (2012–2017)**

Year	Data availability (% of days)	No. of exceedances (days)	Max (ppm)	Percentiles (ppm)					
				99 <sup>th</sup>	98 <sup>th</sup>	95 <sup>th</sup>	90 <sup>th</sup>	70 <sup>th</sup>	50 <sup>th</sup>
2012	98.6	0	0.068	0.060	0.051	0.042	0.038	0.029	0.026
2013 <sup>a</sup>	72.6	0	0.094	0.066	0.064	0.056	0.044	0.031	0.025
2014 <sup>a</sup>	72.1	0	0.083	0.078	0.075	0.057	0.048	0.033	0.025
2015	98.6	0	0.071	0.060	0.057	0.050	0.041	0.031	0.026
2016 <sup>a</sup>	42.1	0	0.060	0.058	0.057	0.053	0.046	0.036	0.026
2017 <sup>a</sup>	46.6	0	0.069	0.067	0.062	0.058	0.053	0.042	0.031

a: Data availability between 15 and 75 per cent, values displayed in italics.

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**Table 29: Percentiles of daily maximum one-hour ozone at Footscray (2012–2017)**

Year	Data availability (% of days)	No. of exceedances (days)	Max (ppm)	Percentiles (ppm)					
				99 <sup>th</sup>	98 <sup>th</sup>	95 <sup>th</sup>	90 <sup>th</sup>	70 <sup>th</sup>	50 <sup>th</sup>
2012	81.1	0	0.057	0.053	0.044	0.042	0.036	0.030	0.026
2013 <sup>a</sup>	74.8	0	0.083	0.060	0.055	0.042	0.037	0.029	0.025
2014	99.5	0	0.100	0.077	0.063	0.050	0.042	0.031	0.026
2015	99.5	0	0.064	0.058	0.054	0.046	0.040	0.031	0.025
2016 <sup>a</sup>	64.8	0	0.065	0.055	0.052	0.044	0.040	0.030	0.024
2017	98.1	0	0.079	0.063	0.057	0.051	0.043	0.031	0.027

a: Data availability between 15 and 75 per cent, values displayed in italics.

**Table 30: Percentiles of daily maximum one-hour ozone at Geelong South (2012–2017)**

Year	Data availability (% of days)	No. of exceedances (days)	Max (ppm)	Percentiles (ppm)					
				99 <sup>th</sup>	98 <sup>th</sup>	95 <sup>th</sup>	90 <sup>th</sup>	70 <sup>th</sup>	50 <sup>th</sup>
2012	98.9	0	0.079	0.059	0.053	0.039	0.034	0.029	0.026
2013	99.2	0	0.079	0.066	0.058	0.046	0.036	0.029	0.026
2014	98.1	0	0.077	0.058	0.053	0.045	0.038	0.030	0.026
2015	99.7	0	0.079	0.062	0.054	0.044	0.038	0.030	0.026
2016	98.1	0	0.056	0.052	0.048	0.043	0.035	0.028	0.025
2017	97.5	0	0.067	0.058	0.057	0.048	0.042	0.032	0.029

**Table 31: Percentiles of daily maximum one-hour ozone at Melton (2012–2017)**

Year	Data availability (% of days)	No. of exceedances (days)	Max (ppm)	Percentiles (ppm)					
				99 <sup>th</sup>	98 <sup>th</sup>	95 <sup>th</sup>	90 <sup>th</sup>	70 <sup>th</sup>	50 <sup>th</sup>
2012	95.9	0	0.068	0.060	0.050	0.044	0.037	0.031	0.027
2013	98.6	0	0.086	0.071	0.066	0.054	0.045	0.033	0.029
2014	96.2	0	0.088	0.070	0.066	0.051	0.042	0.034	0.028
2015	99.5	0	0.072	0.066	0.057	0.048	0.042	0.033	0.028
2016 <sup>a</sup>	48.6	0	0.070	0.062	0.058	0.052	0.046	0.038	0.028
2017 <sup>a</sup>	44.7	0	0.073	0.070	0.068	0.064	0.055	0.046	0.033

a: Data availability between 15 and 75 per cent, values displayed in italics

**Table 32: Percentiles of daily maximum one-hour ozone at Mooroolbark (2012–2017)**

Year	Data availability (% of days)	No. of exceedances (days)	Max (ppm)	Percentiles (ppm)					
				99 <sup>th</sup>	98 <sup>th</sup>	95 <sup>th</sup>	90 <sup>th</sup>	70 <sup>th</sup>	50 <sup>th</sup>
2012	99.5	0	0.077	0.057	0.055	0.048	0.039	0.031	0.027
2013	98.6	0	0.088	0.068	0.064	0.054	0.046	0.033	0.027
2014 <sup>a</sup>	69.6	0	0.099	0.081	0.076	0.055	0.050	0.035	0.026
2015 <sup>a</sup>	58.1	0	0.065	0.055	0.051	0.046	0.039	0.028	0.024
2016 <sup>a</sup>	42.9	0	0.073	0.068	0.065	0.054	0.049	0.040	0.029
2017 <sup>a</sup>	52.9	0	0.071	0.064	0.063	0.056	0.050	0.042	0.032

a: Data availability between 15 and 75 per cent, values displayed in italics.



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Table 33: Percentiles of daily maximum one-hour ozone at Point Cook (2012–2017)

Year	Data availability (% of days)	No. of exceedances (days)	Max (ppm)	Percentiles (ppm)					
				99 <sup>th</sup>	98 <sup>th</sup>	95 <sup>th</sup>	90 <sup>th</sup>	70 <sup>th</sup>	50 <sup>th</sup>
2012	97.5	0	0.092	0.061	0.058	0.046	0.039	0.032	0.028
2013	97.0	0	0.089	0.075	0.068	0.052	0.042	0.032	0.028
2014	98.9	0	0.093	0.075	0.067	0.054	0.043	0.032	0.028
2015	98.4	0	0.076	0.066	0.064	0.047	0.042	0.032	0.028
2016 <sup>a</sup>	<i>54.9</i>	<i>0</i>	<i>0.066</i>	<i>0.061</i>	<i>0.059</i>	<i>0.049</i>	<i>0.043</i>	<i>0.033</i>	<i>0.026</i>
2017 <sup>a</sup>	<i>46.8</i>	<i>0</i>	<i>0.080</i>	<i>0.066</i>	<i>0.062</i>	<i>0.058</i>	<i>0.052</i>	<i>0.041</i>	<i>0.029</i>

a: Data availability between 15 and 75 per cent, values displayed in italics.

Table 34: Percentiles of daily maximum one-hour ozone at Traralgon (2012–2017)

Year	Data availability (% of days)	No. of exceedances (days)	Max (ppm)	Percentiles (ppm)					
				99 <sup>th</sup>	98 <sup>th</sup>	95 <sup>th</sup>	90 <sup>th</sup>	70 <sup>th</sup>	50 <sup>th</sup>
2012	99.7	0	0.054	0.047	0.043	0.036	0.033	0.028	0.024
2013	97.3	0	0.092	0.059	0.054	0.044	0.039	0.029	0.024
2014	97.0	0	0.077	0.066	0.056	0.045	0.037	0.028	0.024
2015	97.5	0	0.059	0.053	0.049	0.041	0.035	0.028	0.023
2016	90.4	0	0.063	0.051	0.043	0.038	0.033	0.028	0.025
2017	97.8	0	0.064	0.052	0.049	0.043	0.038	0.030	0.026

## Four-hour ozone trends

Table 35: Percentiles of daily maximum four-hour ozone at Alphington (2012–2017)

Year	Data availability (% of days)	No. of exceedances (days)	Max (ppm)	Percentiles (ppm)					
				99 <sup>th</sup>	98 <sup>th</sup>	95 <sup>th</sup>	90 <sup>th</sup>	70 <sup>th</sup>	50 <sup>th</sup>
2012 <sup>a</sup>	<i>33.1</i>	<i>0</i>	<i>0.054</i>	<i>0.048</i>	<i>0.048</i>	<i>0.038</i>	<i>0.032</i>	<i>0.025</i>	<i>0.022</i>
2013 <sup>b</sup>	84.9	1	<b>0.082</b>	0.057	0.054	0.041	0.036	0.029	0.024
2014 <sup>b</sup>	96.7	1	<b>0.114</b>	0.066	0.055	0.048	0.039	0.030	0.025
2015	91.0	0	0.059	0.052	0.048	0.044	0.040	0.029	0.024
2016	96.4	0	0.058	0.052	0.050	0.044	0.035	0.027	0.022
2017	85.8	0	0.067	0.056	0.054	0.048	0.040	0.028	0.024

a: Data availability between 15 and 75 per cent, values displayed in italics.

b: Compliance with four hour O<sub>3</sub> not met, values displayed in **bold**.

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**Table 36: Percentiles of daily maximum four-hour ozone at Brighton (2012–2016)**

Year	Data availability (% of days)	No. of exceedances (days)	Max (ppm)	Percentiles (ppm)					
				99 <sup>th</sup>	98 <sup>th</sup>	95 <sup>th</sup>	90 <sup>th</sup>	70 <sup>th</sup>	50 <sup>th</sup>
2012	99.2	0	0.065	0.052	0.048	0.041	0.037	0.029	0.025
2013	99.2	0	0.067	0.057	0.055	0.049	0.040	0.030	0.025
2014	68.5	1	<b>0.084</b>	0.078	0.071	0.053	0.044	0.031	0.024
2015	99.5	0	0.060	0.056	0.053	0.044	0.038	0.029	0.024
2016 <sup>a</sup>	1.4								

a: Data availability less the 15 per cent, no values displayed.

b: Compliance with four hour O<sub>3</sub> not met, values displayed in **bold**.

**Table 37: Percentiles of daily maximum four-hour ozone at Dandenong (2012–2017)**

Year	Data availability (% of days)	No. of exceedances (days)	Max (ppm)	Percentiles (ppm)					
				99 <sup>th</sup>	98 <sup>th</sup>	95 <sup>th</sup>	90 <sup>th</sup>	70 <sup>th</sup>	50 <sup>th</sup>
2012	98.6	0	0.066	0.052	0.048	0.040	0.036	0.028	0.024
2013 <sup>ab</sup>	72.6	1	<b>0.083</b>	<i>0.062</i>	<i>0.058</i>	<i>0.053</i>	<i>0.040</i>	<i>0.029</i>	<i>0.024</i>
2014 <sup>a</sup>	72.1	0	<i>0.078</i>	<i>0.071</i>	<i>0.068</i>	<i>0.053</i>	<i>0.046</i>	<i>0.031</i>	<i>0.024</i>
2015	98.6	0	0.064	0.058	0.054	0.046	0.039	0.029	0.025
2016 <sup>a</sup>	42.1	0	<i>0.057</i>	<i>0.055</i>	<i>0.054</i>	<i>0.049</i>	<i>0.043</i>	<i>0.033</i>	<i>0.025</i>
2017 <sup>a</sup>	46.6	0	<i>0.064</i>	<i>0.059</i>	<i>0.057</i>	<i>0.054</i>	<i>0.051</i>	<i>0.039</i>	<i>0.029</i>

a: Data availability between 15 and 75 per cent, values displayed in italics.

b: Compliance with four hour O<sub>3</sub> not met, values displayed in **bold**.

**Table 38: Percentiles of daily maximum four-hour ozone at Footscray (2012–2017)**

Year	Data availability (% of days)	No. of exceedances (days)	Max (ppm)	Percentiles (ppm)					
				99 <sup>th</sup>	98 <sup>th</sup>	95 <sup>th</sup>	90 <sup>th</sup>	70 <sup>th</sup>	50 <sup>th</sup>
2012	81.1	0	0.052	0.048	0.043	0.038	0.034	0.029	0.025
2013 <sup>a</sup>	74.8	0	<i>0.065</i>	<i>0.054</i>	<i>0.051</i>	<i>0.041</i>	<i>0.033</i>	<i>0.028</i>	<i>0.024</i>
2014	99.5	1	0.082	0.069	0.056	0.046	0.039	0.030	0.025
2015	99.5	0	0.055	0.051	0.049	0.043	0.037	0.029	0.024
2016 <sup>a</sup>	64.8	0	<i>0.053</i>	<i>0.051</i>	<i>0.049</i>	<i>0.043</i>	<i>0.038</i>	<i>0.029</i>	<i>0.023</i>
2017	98.1	0	0.067	0.058	0.051	0.046	0.040	0.030	0.026

a: Data availability between 15 and 75 per cent, values displayed in italics.

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**Table 39: Percentiles of daily maximum four-hour ozone at Geelong South (2012–2017)**

Year	Data availability (% of days)	No. of exceedances (days)	Max (ppm)	Percentiles (ppm)					
				99 <sup>th</sup>	98 <sup>th</sup>	95 <sup>th</sup>	90 <sup>th</sup>	70 <sup>th</sup>	50 <sup>th</sup>
2012	98.9	0	0.070	0.053	0.049	0.037	0.032	0.028	0.025
2013	99.2	0	0.065	0.060	0.054	0.044	0.035	0.029	0.025
2014	98.4	0	0.075	0.053	0.049	0.042	0.036	0.029	0.025
2015	99.7	0	0.061	0.056	0.050	0.042	0.035	0.029	0.025
2016	98.1	0	0.051	0.047	0.044	0.039	0.033	0.027	0.024
2017	97.3	0	0.061	0.056	0.052	0.046	0.040	0.031	0.028

**Table 40: Percentiles of daily maximum four-hour ozone at Melton (2012–2017)**

Year	Data availability (% of days)	No. of exceedances (days)	Max (ppm)	Percentiles (ppm)					
				99 <sup>th</sup>	98 <sup>th</sup>	95 <sup>th</sup>	90 <sup>th</sup>	70 <sup>th</sup>	50 <sup>th</sup>
2012	95.9	0	0.061	0.052	0.046	0.040	0.035	0.030	0.027
2013	98.6	1	0.081	0.062	0.060	0.049	0.042	0.032	0.028
2014	96.2	0	0.078	0.063	0.057	0.049	0.041	0.033	0.027
2015	99.5	0	0.070	0.059	0.050	0.045	0.040	0.032	0.027
2016 <sup>a</sup>	48.6	0	0.058	0.057	0.053	0.049	0.044	0.036	0.027
2017 <sup>a</sup>	44.7	0	0.067	0.064	0.062	0.059	0.052	0.044	0.032

a: Data availability is less than 15 per cent, percentile values not shown.

**Table 41: Percentiles of daily maximum four-hour ozone at Mooroolbark (2012–2017)**

Year	Data availability (% of days)	No. of exceedances (days)	Max (ppm)	Percentiles (ppm)					
				99 <sup>th</sup>	98 <sup>th</sup>	95 <sup>th</sup>	90 <sup>th</sup>	70 <sup>th</sup>	50 <sup>th</sup>
2012	99.5	0	0.069	0.055	0.050	0.043	0.036	0.030	0.026
2013 <sup>b</sup>	98.4	1	<b>0.083</b>	0.062	0.058	0.049	0.043	0.032	0.026
2014 <sup>b</sup>	69.6	1	<b>0.081</b>	0.074	0.068	0.050	0.045	0.034	0.025
2015 <sup>a</sup>	58.1	0	0.061	0.049	0.047	0.042	0.035	0.027	0.023
2016 <sup>a</sup>	42.9	0	0.066	0.062	0.061	0.052	0.045	0.038	0.027
2017 <sup>a</sup>	52.9	0	0.067	0.059	0.055	0.051	0.047	0.040	0.029

a: Data availability between 15 and 75 per cent, values displayed in italics.

b: Compliance with four hour O<sub>3</sub> not met, values displayed in **bold**.

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**Table 42: Percentiles of daily maximum four-hour ozone at Point Cook (2012–2017)**

Year	Data availability (% of days)	No. of exceedances (days)	Max (ppm)	Percentiles (ppm)					
				99 <sup>th</sup>	98 <sup>th</sup>	95 <sup>th</sup>	90 <sup>th</sup>	70 <sup>th</sup>	50 <sup>th</sup>
2012	97.5	0	0.073	0.058	0.051	0.043	0.037	0.031	0.027
2013	97.0	0	0.079	0.065	0.059	0.050	0.039	0.031	0.027
2014	99.2	0	0.080	0.070	0.061	0.050	0.040	0.031	0.027
2015	98.4	0	0.062	0.060	0.057	0.046	0.040	0.031	0.027
2016 <sup>a</sup>	<i>54.9</i>	<i>0</i>	<i>0.057</i>	<i>0.057</i>	<i>0.055</i>	<i>0.046</i>	<i>0.040</i>	<i>0.032</i>	<i>0.026</i>
2017 <sup>a</sup>	<i>46.8</i>	<i>0</i>	<i>0.071</i>	<i>0.061</i>	<i>0.056</i>	<i>0.055</i>	<i>0.048</i>	<i>0.038</i>	<i>0.028</i>

a: Data availability between 15 and 75 per cent, values displayed in italics.

**Table 43: Percentiles of daily maximum four-hour ozone at Traralgon (2012–2017)**

Year	Data availability (% of days)	No. of exceedances (days)	Max (ppm)	Percentiles (ppm)					
				99 <sup>th</sup>	98 <sup>th</sup>	95 <sup>th</sup>	90 <sup>th</sup>	70 <sup>th</sup>	50 <sup>th</sup>
2012	99.7	0	0.053	0.041	0.039	0.033	0.030	0.026	0.022
2013 <sup>a</sup>	97.3	1	<b>0.086</b>	0.054	0.05	0.04	0.035	0.027	0.022
2014	97.5	0	0.062	0.059	0.053	0.042	0.035	0.026	0.023
2015	97.5	0	0.053	0.047	0.045	0.036	0.033	0.026	0.022
2016	90.4	0	0.059	0.047	0.041	0.035	0.031	0.027	0.024
2017	97.8	0	0.056	0.049	0.045	0.040	0.036	0.029	0.025

a: Compliance with four hour O<sub>3</sub> not met, values displayed in **bold**.

## D Sulfur dioxide (SO<sub>2</sub>)

### Assessment of compliance with standards and goals of the Measure for sulfur dioxide

In Victoria, sulfur dioxide is assessed against a one-hour standard of 0.200 ppm, a daily standard of 0.080 ppm and an annual standard of 0.020 ppm, with one exceedance day allowed per year. There were no exceedances of the one-hour, daily standards or annual standard. The highest one-hour average at Traralgon was 32 per cent of the standard, the highest 24-hour average at Traralgon was 19 per cent of the standard.

**Table 44: 2017 compliance summary for sulfur dioxide in Victoria**

Region Performance monitoring station	Date availability rates (% of hours)					Exceedances (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
<b>Port Phillip</b>											
Alphington	94.7	91.1	92.9	94.6	93.3	0	0	0.0004	MET	MET	MET
Altona North <sup>a</sup>	94.9	91.8	89.8	63.9	85.0	0	0	0.0015	MET	MET	MET
Geelong South	92.8	94.9	92.8	88.1	92.1	0	0	0.0003	MET	MET	MET
<b>Latrobe Valley</b>											
Traralgon	88.3	94.1	90.9	94.0	91.8	0	0	0.0010	MET	MET	MET

**Table 45: 2017 summary statistics for daily peak one-hour sulfur dioxide in Victoria**

The Measure's standard: 0.20 ppm (one-hour average).

The Measure's goal: standard exceeded on no more than one day per year.

Region Performance monitoring station	Number of valid days	Highest (ppm)	Highest (date   hour)	2 <sup>nd</sup> highest (ppm)	2 <sup>nd</sup> highest (date   hour)
<b>Port Phillip</b>					
Alphington	350	0.011	2 Aug 18:00 15 Jan 3:00		
Altona North	317	0.049	31 Jan 8:00	0.047	7 Sep 17:00
Geelong South	346	0.017	28 Feb 12:00	0.015	8 Mar 11:00
<b>Latrobe Valley</b>					
Traralgon	346	0.063	27 Jan 13:00	0.054	25 Jan 12:00

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**Table 46: 2017 summary statistics for daily sulfur dioxide in Victoria**

The Measure's standard: 0.08 ppm (24-hour average).

The Measure's goal: standard exceeded on no more than one day per year.

Region Performance monitoring station	Number of valid days	Highest (ppm)	Highest (date)	2 <sup>nd</sup> highest (ppm)	2 <sup>nd</sup> highest (date)
<b>Port Phillip</b>					
Alphington	350	0.003	3 Aug 3 Jun		
Altona North	317	0.014	8 Sep	0.013	12 Feb
Geelong South	346	0.002	29 Jul 17 Jul 18 May 28 Feb 27 Jul 6 Apr 16 May 27 May		
<b>Latrobe Valley</b>					
Traralgon	346	0.015	27 Jan	0.007	25 Jan

**Table 47: 2017 percentiles of daily peak one-hour sulfur dioxide concentrations in Victoria**

The Measure's standard: 0.20 ppm (one-hour average).

The Measure's goal: standard exceeded on no more than one day per year.

Region Performance monitoring station	Data availability (% of days)	Max (ppm)	Percentiles (ppm)					
			99 <sup>th</sup>	98 <sup>th</sup>	95 <sup>th</sup>	90 <sup>th</sup>	75 <sup>th</sup>	50 <sup>th</sup>
<b>Port Phillip</b>								
Alphington	95.9	0.003	0.002	0.002	0.001	0.001	0.001	0.000
Altona North	86.8	0.014	0.009	0.007	0.005	0.003	0.002	0.001
Geelong South	94.8	0.002	0.002	0.002	0.001	0.001	0.001	0.000
<b>Latrobe Valley</b>								
Traralgon	94.8	0.063	0.036	0.022	0.012	0.009	0.006	0.003

At the 50<sup>th</sup> percentile, levels of SO<sub>2</sub> are close to the limit of detection of the instruments.

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**Table 48: 2017 percentiles of daily sulfur dioxide concentrations in Victoria**

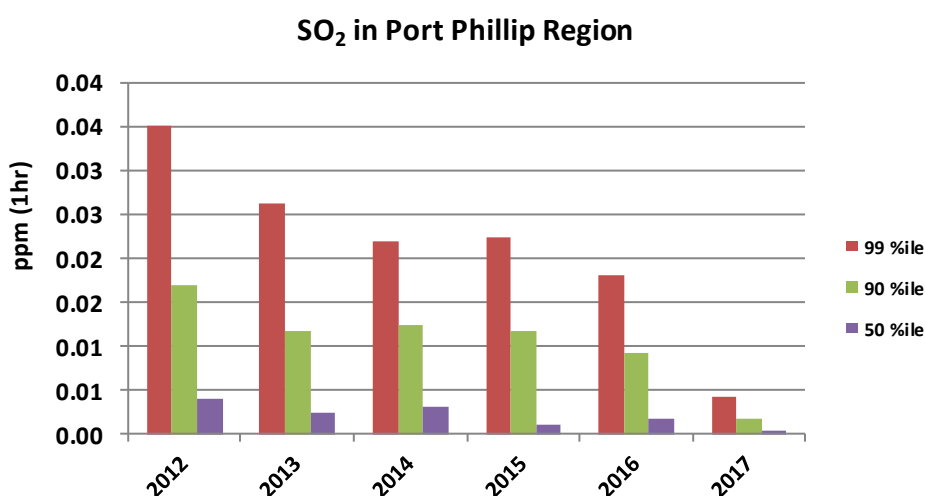
The Measure’s standard: 0.08 ppm (24-hour average).

The Measure’s goal: standard exceeded on no more than one day per year.

Region	Data availability	Max	Percentiles (ppm)					
Performance monitoring station	(% of days)	(ppm)	99 <sup>th</sup>	98 <sup>th</sup>	95 <sup>th</sup>	90 <sup>th</sup>	75 <sup>th</sup>	50 <sup>th</sup>
<b>Port Phillip</b>								
Alphington	95.6	0.003	0.002	0.002	0.001	0.001	0.001	0.000
Altona North	86.6	0.014	0.009	0.007	0.005	0.003	0.002	0.001
Geelong South	94.5	0.002	0.002	0.002	0.001	0.001	0.001	0.000
<b>Latrobe Valley</b>								
Traralgon	94.5	0.015	0.006	0.004	0.002	0.002	0.001	0.001

## Trends and pollutant distributions for sulfur dioxide between 2012 and 2017

Percentiles of 2017 daily peak concentrations are provided for sulfur dioxide for each station and standard. 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 in the year are omitted and stations with less than 75 per cent data are shown in italics. Exceedances are shown in bold. Figure 8 shows the daily maximum one-hour sulfur dioxide concentration for 2012–2017.



**Figure 8: Percentiles of daily maximum one-hour sulfur dioxide (average of Port Phillip stations 2012–2017)**

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**Table 49: Percentiles of daily maximum one-hour sulfur dioxide at Alphington (2012–2017)**

Year	Data availability (% of days)	No. of exceedances (days)	Percentiles (ppm)						
			Max	99 <sup>th</sup>	98 <sup>th</sup>	95 <sup>th</sup>	90 <sup>th</sup>	70 <sup>th</sup>	50 <sup>th</sup>
2012 <sup>a</sup>	33.1	0	0.014	0.011	0.009	0.006	0.004	0.003	0.002
2013	79.7	0	0.035	0.010	0.007	0.005	0.004	0.003	0.001
2014	90.1	0	0.011	0.010	0.009	0.007	0.005	0.003	0.002
2015	86.6	0	0.012	0.009	0.007	0.006	0.004	0.003	0.001
2016	92.1	0	0.009	0.008	0.007	0.005	0.004	0.002	0.001
2017	95.9	0	0.003	0.002	0.002	0.001	0.001	0.001	0.000

a: Data availability between 15 and 75 per cent, values displayed in italics.

**Table 50: Percentiles of daily maximum one-hour sulfur dioxide at Altona (2012–2017)**

Year	Data availability (% of days)	No. of exceedances (days)	Percentiles (ppm)						
			Max	99 <sup>th</sup>	98 <sup>th</sup>	95 <sup>th</sup>	90 <sup>th</sup>	70 <sup>th</sup>	50 <sup>th</sup>
2012	96.2	0	0.066	0.043	0.033	0.026	0.021	0.012	0.005
2013	97.0	0	0.052	0.042	0.036	0.025	0.019	0.008	0.004
2014	99.7	0	0.041	0.033	0.031	0.027	0.023	0.012	0.005
2015	98.4	0	0.062	0.041	0.039	0.031	0.025	0.011	0.004
2016	75.4	0	0.044	0.039	0.033	0.024	0.020	0.008	0.003
2017	86.8	0	0.014	0.009	0.007	0.005	0.003	0.002	0.001

**Table 51: Percentiles of daily maximum one-hour sulfur dioxide at Geelong (2012–2017)**

Year	Data availability (% of days)	No. of exceedances (days)	Max (ppm)	Percentiles (ppm)					
				99 <sup>th</sup>	98 <sup>th</sup>	95 <sup>th</sup>	90 <sup>th</sup>	70 <sup>th</sup>	50 <sup>th</sup>
2012	97.8	0	0.060	0.027	0.021	0.015	0.013	0.007	0.003
2013	97.3	0	0.029	0.027	0.023	0.015	0.012	0.006	0.002
2014	87.4	0	0.029	0.023	0.017	0.012	0.009	0.005	0.002
2015	98.6	0	0.026	0.017	0.014	0.010	0.006	0.003	0.001
2016	97.3	0	0.010	0.007	0.006	0.005	0.004	0.002	0.001
2017	94.8	0	0.002	0.002	0.002	0.001	0.001	0.001	0.000

**Table 52: Percentiles of daily maximum one-hour sulfur dioxide at Traralgon (2012–2017)**

Year	Data availability (% of days)	No. of exceedances (days)	Max (ppm)	Percentiles (ppm)					
				99 <sup>th</sup>	98 <sup>th</sup>	95 <sup>th</sup>	90 <sup>th</sup>	70 <sup>th</sup>	50 <sup>th</sup>
2012	99.7	0	0.101	0.023	0.017	0.013	0.010	0.005	0.003
2013	92.1	0	0.070	0.028	0.025	0.014	0.009	0.005	0.003
2014	85.8	0	0.044	0.036	0.029	0.015	0.009	0.006	0.003
2015	96.4	0	0.061	0.023	0.020	0.013	0.010	0.006	0.003
2016	88.5	0	0.057	0.023	0.017	0.014	0.010	0.006	0.003
2017	94.8	0	0.063	0.036	0.022	0.012	0.009	0.006	0.003



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**Table 53: Percentiles of daily sulfur dioxide at Alphington (2012–2017)**

Year	Data availability (% of days)	No. of exceedances (days)	Max (ppm)	Percentiles (ppm)					
				99 <sup>th</sup>	98 <sup>th</sup>	95 <sup>th</sup>	90 <sup>th</sup>	70 <sup>th</sup>	50 <sup>th</sup>
2012 <sup>a</sup>	<i>33.1</i>	0	<i>0.003</i>	<i>0.003</i>	<i>0.002</i>	<i>0.002</i>	<i>0.001</i>	<i>0.001</i>	<i>0.000</i>
2013	79.7	0	0.003	0.002	0.002	0.001	0.001	0.001	0.000
2014	89.9	0	0.004	0.003	0.002	0.002	0.001	0.001	0.000
2015	86.6	0	0.003	0.002	0.002	0.001	0.001	0.001	0.000
2016	92.1	0	0.002	0.002	0.002	0.001	0.001	0.001	0.000
2017	95.6	0	0.003	0.002	0.002	0.001	0.001	0.001	0.000

a: Data availability between 15 and 75 per cent, values displayed in italics

**Table 54: Percentiles of daily sulfur dioxide at Altona (2012–2017)**

Year	Data availability (% of days)	No. of exceedances (days)	Max (ppm)	Percentiles (ppm)					
				99 <sup>th</sup>	98 <sup>th</sup>	95 <sup>th</sup>	90 <sup>th</sup>	70 <sup>th</sup>	50 <sup>th</sup>
2012	96.2	0	0.018	0.010	0.008	0.005	0.004	0.002	0.001
2013	97.0	0	0.009	0.007	0.006	0.005	0.003	0.002	0.001
2014	99.5	0	0.011	0.009	0.007	0.006	0.004	0.002	0.001
2015	98.4	0	0.018	0.012	0.010	0.005	0.003	0.002	0.001
2016	75.4	0	0.013	0.008	0.006	0.004	0.003	0.002	0.001
2017	86.6	0	0.014	0.009	0.007	0.005	0.003	0.002	0.001

**Table 55: Percentiles of daily sulfur dioxide at Geelong (2012–2017)**

Year	Data availability (% of days)	No. of exceedances (days)	Max (ppm)	Percentiles (ppm)					
				99 <sup>th</sup>	98 <sup>th</sup>	95 <sup>th</sup>	90 <sup>th</sup>	70 <sup>th</sup>	50 <sup>th</sup>
2012	97.8	0	0.006	0.004	0.004	0.003	0.002	0.001	0.001
2013	97.3	0	0.005	0.003	0.003	0.003	0.002	0.001	0.000
2014	87.1	0	0.005	0.004	0.003	0.002	0.001	0.001	0.000
2015	98.6	0	0.003	0.003	0.002	0.002	0.001	0.001	0.000
2016	97.3	0	0.002	0.002	0.002	0.001	0.001	0.000	0.000
2017	94.5	0	0.002	0.002	0.002	0.001	0.001	0.001	0.000

**Table 56: Percentiles of daily sulfur dioxide at Traralgon (2012–2017)**

Year	Data availability (% of days)	No. of exceedances (days)	Max (ppm)	Percentiles (ppm)					
				99 <sup>th</sup>	98 <sup>th</sup>	95 <sup>th</sup>	90 <sup>th</sup>	70 <sup>th</sup>	50 <sup>th</sup>
2012	99.7	0	0.015	0.005	0.004	0.004	0.003	0.002	0.002
2013	92.1	0	0.007	0.005	0.004	0.003	0.002	0.001	0.001
2014	85.8	0	0.010	0.005	0.004	0.003	0.002	0.001	0.001
2015	96.4	0	0.007	0.005	0.003	0.003	0.002	0.001	0.001
2016	88.5	0	0.006	0.005	0.004	0.003	0.002	0.001	0.001
2017	94.5	0	0.015	0.006	0.004	0.002	0.002	0.001	0.001

## E Particulate matter less than 10 µm (PM<sub>10</sub>)

### Assessment of compliance with standards and goals of the Measure for PM<sub>10</sub>

In Victoria, PM<sub>10</sub> is assessed against a daily standard of 50 µg/m<sup>3</sup>, with a goal of zero exceedance days allowed per year, excluding exceptional events. PM<sub>10</sub> is also assessed against an annual standard of 25 µg/m<sup>3</sup>. The goal was not met at Dandenong in 2017 due to insufficient data capture, this was related to an instrument calibration issue which invalidated the data. The goal was also not met at Geelong South due to local dust impacts. While there were two exceedances of the standard recorded at Mooroolbark, these were attributed to planned burns and were excluded when assessing performance against the daily goal. The highest daily average for PM<sub>10</sub> in the Port Phillip region, at Geelong South was 147 per cent of the standard. The high levels of localised dust have been attributed to an unsealed carpark and high levels of vehicle movement associated with the Geelong races.

**Table 57: 2017 compliance summary for daily PM<sub>10</sub> in Victoria**

Region Performance monitoring station	Data availability rates (% of hours)					Number of exceedances (days)	Annual average <sup>a</sup> (µg/m <sup>3</sup> )	Performance against the standard and goals
	Q1	Q2	Q3	Q4	Annual			
<b>Port Phillip</b>								
Alphington	94.4	95.6	96.7	96.7	95.9	0	16.4	Met
Dandenong	0.0	0.0	0.0	90.2	22.7	ND	NA*	Not Met
Footscray	93.3	93.4	95.7	82.6	91.2	0	18.1	Met
Geelong South	55.6	97.8	92.4	72.8	79.7	3*	18.6	Not Met
Mooroolbark	64.4	97.8	73.9	91.3	81.9	2**	15.1	Not Met
<b>Latrobe Valley</b>								
Traralgon	97.8	97.8	76.1	95.7	91.8	0	15.3	Met

ND: not demonstrated

\* - One exceedance associated with a planned burn, so excluded when assessing performance against the daily goal.

\*\* - Two exceedances associated with planned burns, so excluded when assessing performance against the daily goal.

**Table 58: 2017 summary statistics for daily PM<sub>10</sub> in Victoria**

Region Performance monitoring station	Number of valid days	Highest reading (µg/m <sup>3</sup> )	Highest reading (date)	2nd highest reading (µg/m <sup>3</sup> )	2nd highest reading (date)
<b>Port Phillip</b>					
Alphington	350	41.1	3 Aug	31.8	11 May
Dandenong	83	37.5	11 Nov	29.3	20 Oct
Footscray	333	49.8	5 Oct	36.7	19 Apr
Geelong South	291	73.7	19 Dec	40.1	5 Nov
Mooroolbark	299	55.4	6 Apr	34.0	19 Apr
<b>Latrobe Valley</b>					
Traralgon	335	42.8	7 Apr	31.0	22 Jul

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**Table 59: 2017 PM<sub>10</sub> exceedances**

Date	Port Phillip <sup>b</sup>						Latrobe Valley	Inferred cause <sup>a</sup>
	Alphington	Brighton	Dandenong	Footscray	Geelong South (µg/m <sup>3</sup> )	Mooroolbark (µg/m <sup>3</sup> )	Traralgon	
April 06						55.4		Planned burns <sup>c</sup>
April 07					61.1	54.0		Planned burns <sup>c</sup>
October 29					56.3			Dust
December 19					73.7			Dust

a: Inferred causes include windborne dust (crustal material, often from distant sources), smoke from bushfires, planned burning or agricultural burning and particles accumulating in stable atmospheric conditions, typically from motor vehicles or domestic wood heaters (urban).

b: Exceedances are highlighted in red.

c: Considered to be an exceptional event as per the definition of exceptional event in the Measure.

**Table 60: 2017 percentiles for daily PM<sub>10</sub> concentrations in Victoria**

Region	Performance monitoring station	Data availability	Max (µg/m <sup>3</sup> )	Percentiles					
				99 <sup>th</sup>	98 <sup>th</sup>	95 <sup>th</sup>	90 <sup>th</sup>	75 <sup>th</sup>	50 <sup>th</sup>
<b>Port Phillip</b>									
	Alphington	95.9	41.1	32.5	31.2	27.3	24.1	20.0	15.8
	Dandenong	22.7	37.5	35.3	34.2	30.0	28.1	22.8	16.7
	Footscray	91.2	49.8	39.5	36.6	31.0	28.1	23.0	17.4
	Geelong South	79.7	73.7	44.3	39.6	32.4	29.6	22.8	16.6
	Mooroolbark	81.9	55.4	36.3	31.2	24.5	21.6	18.5	14.4
<b>Latrobe Valley</b>									
	Traralgon	91.8	42.8	32.2	28.4	24.6	21.8	18.0	14.7

## Trends and pollutant distributions for PM<sub>10</sub> between 2012 and 2017

Percentiles of 2017 daily peak concentrations are provided for PM<sub>10</sub> for each station and standard. In tables 61 to 68, 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 in the year are omitted and stations with less than 75 per cent data are shown in italics. Figure 9 shows the daily average for PM<sub>10</sub> concentration for 2012–2017.

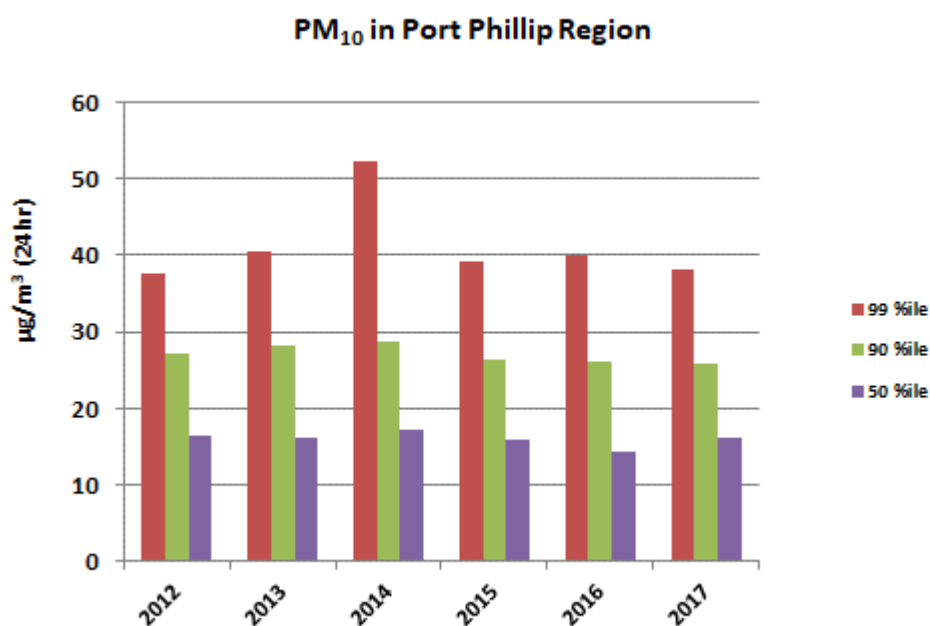


Figure 9: Percentiles of daily PM<sub>10</sub> (average of Port Phillip stations 2012–2017)

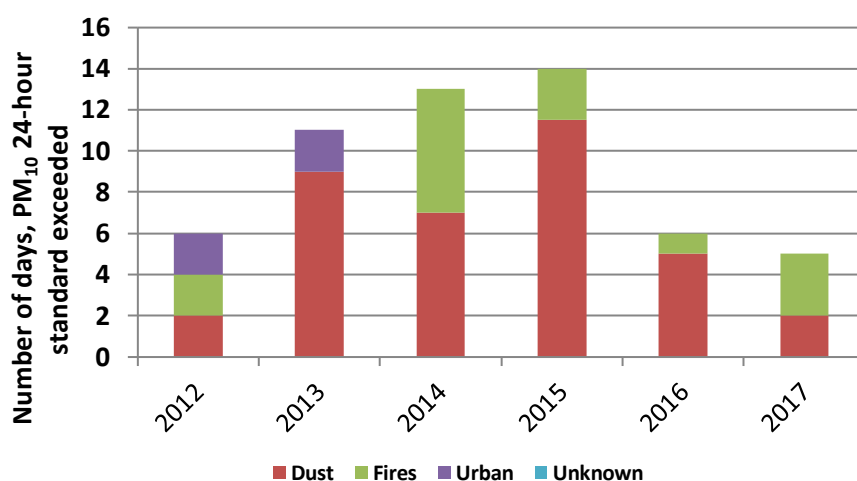


Figure 10: Inferred causes of exceedances of the PM<sub>10</sub> standard (Port Phillip region 2012-2017)

In 2017, PM<sub>10</sub> exceedances at Geelong South (three days) were due to non-continental scale windblown dust, and one due to jurisdiction authorised hazard reduction burns (that is, planned burns). There were also two exceedances at Mooroolbark due to hazard reduction burns. Bushfires and jurisdiction authorised hazard reduction burns are considered exceptional events under the Measure.

Table 61: Percentiles of daily PM<sub>10</sub> at Alphington (2012–2017)

Year	Data availability (% of days)	No. of exceedances (days)	Max (µg/m <sup>3</sup> )	Percentiles (µg/m <sup>3</sup> )					
				99 <sup>th</sup>	98 <sup>th</sup>	95 <sup>th</sup>	90 <sup>th</sup>	70 <sup>th</sup>	50 <sup>th</sup>
2012	97.8	0	40.7	30.8	29.5	26.3	23.7	19.4	15.1
2013	98.9	0	44.3	35.5	32.7	29.2	25.1	19.9	15.1
2014	96.2	4	<b>64.5</b>	45.9	33.4	30.7	24.6	20.4	16.3
2015	92.9	0	<b>108.0<sup>b</sup></b>	38.4	33.3	27.5	24.7	20.0	15.3

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Year	Data availability (% of days)	No. of exceedances (days)	Max ( $\mu\text{g}/\text{m}^3$ )	Percentiles ( $\mu\text{g}/\text{m}^3$ )					
				99 <sup>th</sup>	98 <sup>th</sup>	95 <sup>th</sup>	90 <sup>th</sup>	70 <sup>th</sup>	50 <sup>th</sup>
2016	75.3	0	37.9	35.0	32.6	28.4	25.3	20.3	15.0
2017	95.9	0	41.1	32.5	31.2	27.3	24.1	20.0	15.8

a: Compliance with 24-hour PM<sub>10</sub> not met, values displayed in bold.

b: Recorded on a day with less than 25 per cent data capture, not included in count of exceedances days.

**Table 62: Percentiles of daily PM<sub>10</sub> at Brighton (2012–2015)**

Year	Data availability (% of days)	No. of exceedances (days)	Max ( $\mu\text{g}/\text{m}^3$ )	Percentiles ( $\mu\text{g}/\text{m}^3$ )					
				99 <sup>th</sup>	98 <sup>th</sup>	95 <sup>th</sup>	90 <sup>th</sup>	70 <sup>th</sup>	50 <sup>th</sup>
2012	98.6	0	45.8	31.8	30.7	27.5	24.8	20.1	15.5
2013	97.8	0	36.3	33.3	31.0	28.4	24.7	20.0	15.2
2014 <sup>b</sup>	97.3	2	<b>58.1</b>	38.1	36.1	29.6	25.6	20.1	16.0
2015 <sup>a</sup>	<i>17.0</i>	0	47.6	37.9	31.1	27.7	23.8	21.1	17.2

a: Data availability between 15 and 75 per cent, values displayed in italics.

b: Compliance with 24-hour PM<sub>10</sub> not met, values displayed in **bold**.

Note: Monitoring ceased in 2015.

**Table 63: Percentiles of daily PM<sub>10</sub> at Dandenong (2012–2017)**

Year	Data availability (% of days)	No. of exceedances (days)	Max ( $\mu\text{g}/\text{m}^3$ )	Percentiles ( $\mu\text{g}/\text{m}^3$ )					
				99 <sup>th</sup>	98 <sup>th</sup>	95 <sup>th</sup>	90 <sup>th</sup>	70 <sup>th</sup>	50 <sup>th</sup>
2012	98.6	0	49.8	39.7	35.4	30.8	27.8	22.1	16.9
2013 <sup>b</sup>	93.4	1	<b>52.9</b>	38.1	36.6	33.7	30.2	23.6	17.3
2014 <sup>b</sup>	99.2	4	<b>68.6</b>	<b>53.0</b>	40.8	35.1	29.3	23.0	17.9
2015 <sup>a</sup>	<i>69.9</i>	0	47.8	41.9	38.1	32.9	26.5	22.6	17.5
2016	95.9	0	41.8	37.1	33.9	30.2	26.3	20.0	14.6
2017 <sup>a</sup>	<i>22.7</i>	0	37.5	35.3	34.2	30.0	28.1	22.8	16.7

a: Data availability between 15 and 75 per cent, values displayed in italics.

b: Compliance with 24-hour PM<sub>10</sub> not met, values displayed in **bold**.

**Table 64: Percentiles of daily PM<sub>10</sub> at Footscray (2012–2017)**

Year	Data availability (% of days)	No. of exceedances (days)	Max ( $\mu\text{g}/\text{m}^3$ )	Percentiles ( $\mu\text{g}/\text{m}^3$ )					
				99 <sup>th</sup>	98 <sup>th</sup>	95 <sup>th</sup>	90 <sup>th</sup>	70 <sup>th</sup>	50 <sup>th</sup>
2012	98.9	3	57.7	45.1	38.7	33.7	28.6	23.6	17.1
2013	97.3	2	<b>50.5</b>	43.0	38.9	34.4	28.8	22.5	16.6
2014 <sup>a</sup>	98.6	<b>6</b>	<b>79.2</b>	<b>63.0</b>	42.2	36.5	30.6	23.0	18.0
2015 <sup>a</sup>	97.0	<b>3</b>	<b>71.8</b>	44.7	35.7	32.5	28.8	21.9	16.4
2016	94.2	0	42.7	37.9	35.1	29.3	25.9	20.2	14.1
2017	91.2	0	49.8	39.5	36.6	31.0	28.1	23.0	17.4

a: Compliance with 24-hour PM<sub>10</sub> not met, values displayed in **bold**.

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**Table 65: Percentiles of daily PM<sub>10</sub> at Geelong (2012–2017)**

Year	Data availability (% of days)	No. of exceedances (days)	Max (µg/m <sup>3</sup> )	Percentiles (µg/m <sup>3</sup> )					
				99 <sup>th</sup>	98 <sup>th</sup>	95 <sup>th</sup>	90 <sup>th</sup>	70 <sup>th</sup>	50 <sup>th</sup>
2012 <sup>a</sup>	98.1	1	<b>53.8</b>	42.7	38.7	34.9	29.8	23.6	16.9
2013 <sup>a</sup>	99.5	<b>8</b>	<b>107.6</b>	<b>60.7</b>	<b>52.4</b>	40.6	33.3	24.8	16.5
2014 <sup>a</sup>	99.5	<b>8</b>	<b>75.8</b>	<b>58.8</b>	<b>51.7</b>	43.3	33.8	24.3	17.7
2015 <sup>a</sup>	79.7	<b>10</b>	<b>286.1</b>	<b>84.4</b>	<b>64.1</b>	45.5	32.4	23.8	16.6
2016 <sup>a</sup>	93.7	<b>5</b>	<b>68.3</b>	<b>56.9</b>	47.3	36.8	30.4	21.9	15.9
2017 <sup>a</sup>	79.7	<b>3</b>	<b>73.7</b>	44.3	39.6	32.4	29.6	22.8	16.6

a: Compliance with 24-hour PM<sub>10</sub> not met, values displayed in **bold**.

**Table 66: Percentiles of daily PM<sub>10</sub> at Mooroolbark (2012–2017)**

Year	Data availability (% of days)	No. of exceedances (days)	Max (µg/m <sup>3</sup> )	Percentiles (µg/m <sup>3</sup> )					
				99 <sup>th</sup>	98 <sup>th</sup>	95 <sup>th</sup>	90 <sup>th</sup>	70 <sup>th</sup>	50 <sup>th</sup>
2012 <sup>b</sup>	99.2	2	<b>53.9</b>	40.8	38.2	34.0	31.2	23.7	17.6
2013	98.4	0	42.6	39.7	37.9	34.9	30.4	23.6	16.4
2014 <sup>b</sup>	98.4	4	<b>109.3</b>	<b>55.4</b>	40.9	34.1	30.1	23.2	17.5
2015 <sup>ab</sup>	<i>15.6</i>	0	39.5	37.5	35.5	31.8	27.2	22.0	17.5
2016	96.4	0	44.7	32.4	29.7	26.3	22.4	17.4	12.5
2017 <sup>b</sup>	<b>81.9</b>	<b>2</b>	<b>55.4</b>	36.3	31.2	24.5	21.6	18.5	14.4

a: Data availability between 15 and 75 per cent, values displayed in *italics*.

b: Compliance with 24-hour PM<sub>10</sub> not met, values displayed in **bold**.

**Table 67: Percentiles of daily PM<sub>10</sub> at Richmond (2012–2016)**

Year	Data availability (% of days)	No. of exceedances (days)	Max (µg/m <sup>3</sup> )	Percentiles (µg/m <sup>3</sup> )					
				99 <sup>th</sup>	98 <sup>th</sup>	95 <sup>th</sup>	90 <sup>th</sup>	70 <sup>th</sup>	50 <sup>th</sup>
2012	96.2	0	47.4	32.7	29.2	26.7	24.7	20.5	15.6
2013	98.1	0	41.5	33.8	32.4	28.3	25.2	20.8	15.6
2014 <sup>a</sup>	97.5	4	<b>63.4</b>	<b>50.7</b>	37.6	33.1	27.3	20.9	16.7
2015 <sup>a</sup>	96.2	<b>1</b>	<b>52.4</b>	35.7	32.8	27.7	24.9	20.8	16.4
2016 <sup>b</sup>	8								

a: Compliance with 24-hour PM<sub>10</sub> not met, values displayed in **bold**.

b: Data availability less than 15 per cent, no values displayed.

**Table 68: Percentiles of daily PM<sub>10</sub> at Traralgon (2012–2017)**

Year	Data availability (% of days)	No. of exceedances (days)	Max (µg/m <sup>3</sup> )	Percentiles (µg/m <sup>3</sup> )					
				99 <sup>th</sup>	98 <sup>th</sup>	95 <sup>th</sup>	90 <sup>th</sup>	70 <sup>th</sup>	50 <sup>th</sup>
2012	97.8	0	35.0	29.4	27.6	24.4	21.4	18.1	14.5
<b>2013<sup>a</sup></b>	<b>92.9</b>	<b>4</b>	<b>104.8</b>	48.7	36	27.6	22.9	17.8	13.4
<b>2014<sup>a</sup></b>	<b>97.5</b>	<b>3</b>	<b>84.9</b>	47.1	41.3	32.2	26	19.9	15.3
2015	84.4	0	45.0	29.7	29.0	26.2	21.9	17.2	13.9
2016	98.6	0	49.2	36.0	30.2	25.4	21.8	17.4	14.0
2017	91.8	0	42.8	32.2	28.4	24.6	21.8	18.0	14.7

a: Compliance with 24-hour PM<sub>10</sub> not met, values displayed in **bold**.

## F Particulate matter less than 2.5 µm (PM<sub>2.5</sub>)

### Assessment of compliance with standards and goals of the Measure for PM<sub>2.5</sub>

PM<sub>2.5</sub> is monitored using two methods as part of the network, the first is the reference Partisol method and the second is the equivalent beta attenuation monitor (BAM) method. In Victoria, PM<sub>2.5</sub> is assessed against a one-day standard of 25 µg/m<sup>3</sup> and an annual standard of 8 µg/m<sup>3</sup>. The goal for PM<sub>2.5</sub> was not met at any stations where monitoring was carried out. The highest daily average for PM<sub>2.5</sub> at Alphington was 144 per cent of the standard as shown in Table 76. The highest annual average was 111 per cent of the standard at Alphington as shown in Table 72.

#### *Partisol method (manual sample once every three days)*

**Table 69: 2017 compliance summary for daily PM<sub>2.5</sub> in Victoria (Partisol)**

Region	Data availability rates (% of hours)					Number of exceedances (days)	Annual average (µg/m <sup>3</sup> )	Performance against the standard and goals
	Q1	Q2	Q3	Q4	Annual			
<b>Port Phillip</b>								
<b>Alphington</b>	100.0	93.3	96.8	100.0	97.5	<b>4</b>	7.9	<b>NOT MET</b>
<b>Footscray</b>	100.0	100.0	100.0	100.0	100.0	<b>2</b>	7.4	<b>NOT MET</b>

Data availability rates are based on a one-day-in-three sampling regime.

**Table 70: 2017 summary statistics for daily PM<sub>2.5</sub> in Victoria (Partisol)**

Region	Number of valid days	Highest (µg/m <sup>3</sup> )	Highest (date)
Performance monitoring station			
<b>Port Phillip</b>			
<b>Alphington</b>	119	33.1	3 Aug
<b>Footscray</b>	122	29.2	3 Aug

Data availability rates are based on a one-day-in-three sampling regime.

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**Table 71: 2017 percentiles for daily PM<sub>2.5</sub> concentrations in Victoria (Partisol)**

Region	Data availability	Max (µg/m <sup>3</sup> )	Percentiles (µg/m <sup>3</sup> )					
			99 <sup>th</sup>	98 <sup>th</sup>	95 <sup>th</sup>	90 <sup>th</sup>	75 <sup>th</sup>	50 <sup>th</sup>
<b>Port Phillip</b>								
<b>Alphington</b>	97.5	33.1	27.1	26.4	18.1	14.7	8.5	6.7
<b>Footscray</b>	100	29.2	26.2	19.5	16.0	11.8	8.6	6.4

Data availability rates are based on a one-day-in-three sampling regime.

## **Continuous equivalence methods**

Victoria monitors PM<sub>2.5</sub> by the reference method specified in the Measure (on a one-day-in-three basis) at two stations (Alphington and Footscray). It also monitors PM<sub>2.5</sub> continuously at these four stations (Alphington, Footscray, Geelong and Traralgon) using BAM.

**Table 72: 2017 compliance summary for daily PM<sub>2.5</sub> in Victoria (BAM)**

Region	Data availability rates (% of hours)					Number of exceedances (days)	Annual average (µg/m <sup>3</sup> )	Performance against the standard and goals
	Q1	Q2	Q3	Q4	Annual			
<b>Port Phillip</b>								
<b>Alphington</b>	97.8	97.8	92.4	82.6	92.6	<b>8</b>	<b>8.9</b>	<b>NOT MET</b>
<b>Footscray</b>	93.3	100.0	96.7	95.7	96.4	<b>4</b>	7.8	<b>NOT MET</b>
<b>Geelong<sup>a</sup></b>	65.6	96.7	89.1	79.3	82.7	<b>2</b>	7.0	<b>NOT MET</b>
<b>Latrobe Valley</b>								
<b>Traralgon</b>	96.7	97.8	84.8	67.4	86.6	<b>5</b>	<b>8.5</b>	<b>NOT MET</b>

a: Data availability between 15 and 75 per cent, values displayed in italics.

**Table 73: 2017 summary statistics for daily PM<sub>2.5</sub> in Victoria (BAM)**

Region Performance monitoring station	Number of valid days	Highest (µg/m <sup>3</sup> )	Highest (date)
<b>Port Phillip</b>			
<b>Alphington</b>	338	35.9	3 Aug
<b>Footscray</b>	352	34.8	12 May
<b>Geelong</b>	302	26.8	12 May
<b>Latrobe Valley</b>			
<b>Traralgon</b>	317	32.3	23 May

The TEOM Equivalence Program ceased at Alphington and Footscray in 2012. The TEOMs were replaced by BAMs during 2014.



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**Table 74: 2017 PM<sub>2.5</sub> exceedances**

Date	Port Phillip Region				Inferred cause <sup>a</sup>
	Alphington (µg/m <sup>3</sup> )	Footscray (µg/m <sup>3</sup> )	Geelong (µg/m <sup>3</sup> )	Traralgon (µg/m <sup>3</sup> )	
3 Aug	35.9	31.9			Domestic wood heaters
12 May <sup>c</sup>		34.8	26.8	25.1	Planned burns/domestic wood heaters
23 May <sup>c</sup>				32.3	Planned burns
4 Jun	30				Domestic wood heaters
22 Jul				29.9	Domestic wood heaters
11 May <sup>c</sup>	29.2	29.6			Planned burns/domestic wood heaters
7 Apr <sup>c</sup>				29	Planned burns
6 Apr <sup>c</sup>				28.5	Planned burns
15 May	27.9				Domestic wood heaters
2 Jul	27.4				Domestic wood heaters
12 May	27.4				Domestic wood heaters
18 May		26.8			Urban
17 Jun	26.7				Domestic wood heaters
5 Apr <sup>c</sup>			26.6		Planned burns
14 May	26.5				Domestic wood heaters

a: Inferred causes include smoke from bushfires, planned burning or agricultural burning and particles accumulating in stable atmospheric conditions, typically from motor vehicles or domestic wood heaters (urban). These causes are in addition to existing sources and weather conditions.

b: Exceedances are highlighted in red.

c: Considered to be an exceptional event as per the definition of exceptional event in the Measure.

**Table 75: 2017 percentiles for daily PM<sub>2.5</sub> concentrations in Victoria (BAM)**

Region	Performance monitoring station	Data availability	Max (µg/m <sup>3</sup> )	Percentiles (µg/m <sup>3</sup> )					
				99 <sup>th</sup>	98 <sup>th</sup>	95 <sup>th</sup>	90 <sup>th</sup>	75 <sup>th</sup>	50 <sup>th</sup>
<b>Port Phillip</b>									
	Alphington	92.6	35.9	27.7	26.6	20.3	15.7	10.2	7.4
	Footscray	96.4	34.8	24.5	20.7	15.5	13.1	9.2	6.8
	Geelong <sup>a</sup>	82.7	26.8	22.3	18.2	13.5	10.9	8.5	6.4
<b>Latrobe Valley</b>									
	Traralgon	86.8	32.3	28.0	22.0	18.3	14.8	9.8	7.2

a: Insufficient data to calculate percentile, <75 per cent data capture during year, values shown are excluded from trend analysis.

### Trends and pollutant distributions for PM<sub>2.5</sub> between 2012 and 2017

Percentiles of 2017 daily peak concentrations are provided for PM<sub>2.5</sub> each station. In tables 76 to 81, 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 in the year are omitted and stations with less than 75 per cent data are shown in italics. Exceedances are shown in bold. Figure 11-12 shows the daily average for PM<sub>2.5</sub> concentrations for 2012-2017 in the Port Phillip Region.

#### Partisol method (manual sample once every three days)

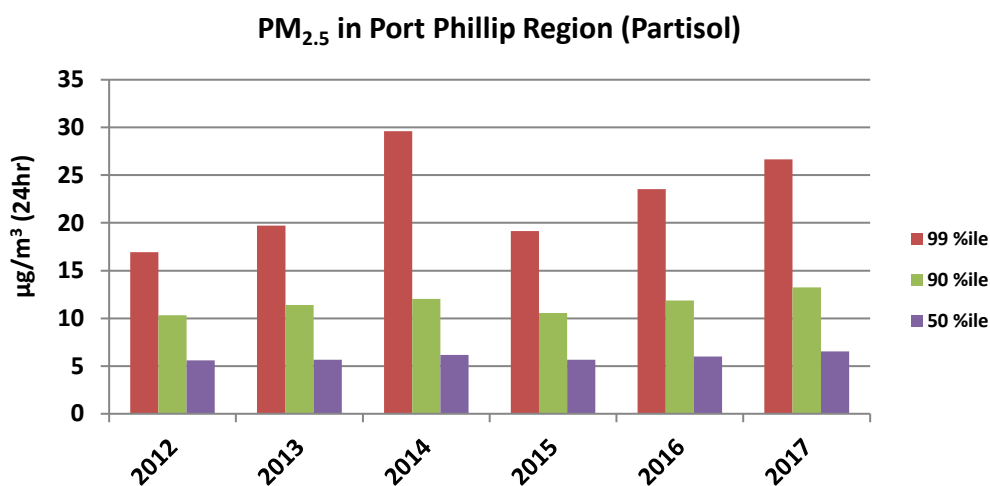


Figure 11: Percentiles of daily Partisol PM<sub>2.5</sub> (average of Port Phillip stations 2012–2017)

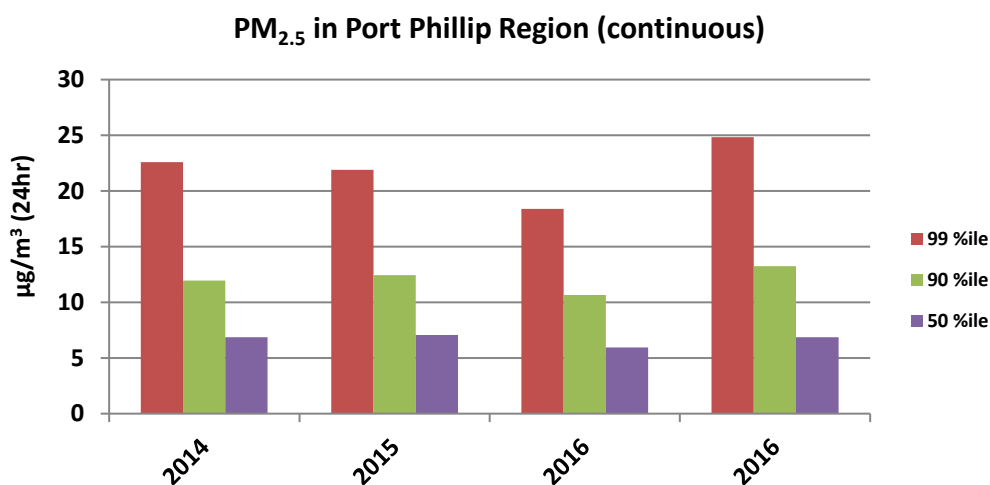
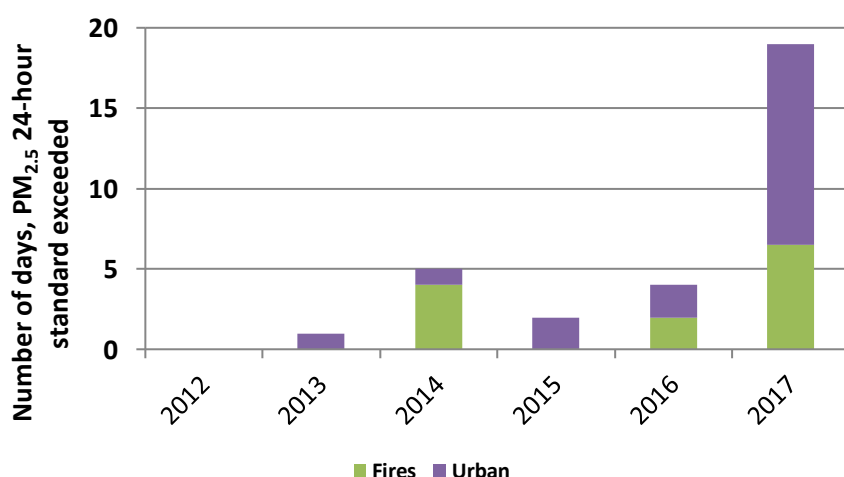


Figure 12: Percentiles of daily continuous PM<sub>2.5</sub> (average of Port Phillip stations 2014–2017)

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**Figure 13: Inferred causes of exceedances of the PM<sub>2.5</sub> standard (Port Phillip region 2012–2017)**

PM<sub>2.5</sub> has been monitored at two stations (Alphington and Footscray) in the Port Phillip Control Region (PPCR) since 2002 using the Partisol method. In 2017, the Partisol method detected an exceedance at Alphington which was due to domestic sources such as wood heaters in winter and at Footscray during a summer bushfire event.

Continuous PM<sub>2.5</sub> has been continuously monitored at two stations (Alphington and Footscray) in the Port Phillip Control Region (PPCR) since 2014 using a BAM method. Continuous PM<sub>2.5</sub> has been included in this report for Geelong and Traralgon using the BAM method. In 2017, the BAM method detected an additional exceedance at Alphington during a summer bushfire event, as well as an exceedance at Traralgon related to planned burns in Autumn.

Where exceedances of the daily PM<sub>2.5</sub> standards have occurred at these stations (see Figure 13), they are attributed to urban sources, as well as bushfires and planned burns. This is based on the time of year that the event occurred, and referenced against known events.

**Table 76: Percentiles of daily PM<sub>2.5</sub> at Alphington (2012-2017) Partisol**

Year	Data availability (% of days)	No. of exceedances (days)	Max (µg/m <sup>3</sup> )	Percentiles (µg/m <sup>3</sup> )					
				99 <sup>th</sup>	98 <sup>th</sup>	95 <sup>th</sup>	90 <sup>th</sup>	70 <sup>th</sup>	50 <sup>th</sup>
2012	98.4	0	19.0	17.6	15.2	13.8	10.6	7.8	5.7
2013	97.5	1	26.4	22.8	17.2	14.4	12.0	8.6	5.8
2014	97.5	<b>5</b>	<b>40.6</b>	<b>32.4</b>	23.8	16.5	12.7	8.7	6.4
2015	100	0	20.7	19.3	18.2	13.4	10.6	7.9	5.8
2016 <sup>a</sup>	98.4	<b>2</b>	<b>26</b>	24.1	17.6	14.1	12.1	9.4	6.2
2017 <sup>a</sup>	97.5	<b>4</b>	<b>33.1</b>	<b>27.1</b>	<b>26.4</b>	18.1	14.7	8.5	6.7

a: Compliance with 24-hour PM<sub>2.5</sub> not met, values displayed in **bold**.

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**Table 77: Percentiles of daily PM<sub>2.5</sub> at Footscray (2012–2017) Partisol**

Year	Data availability (% of days)	No. of exceedances (days)	Max (µg/m <sup>3</sup> )	Percentiles (µg/m <sup>3</sup> )					
				99 <sup>th</sup>	98 <sup>th</sup>	95 <sup>th</sup>	90 <sup>th</sup>	70 <sup>th</sup>	50 <sup>th</sup>
2012	100.0	0	23.1	16.2	14.9	11.2	10.0	7.2	5.5
2013	100.0	0	17.1	16.6	15.5	12	10.8	7.7	5.5
2014	100.0	2	39.1	26.8	21.9	17.4	11.4	7.9	5.9
2015	100.0	0	20.8	19.0	14.0	12.3	10.5	7.8	5.5
2016 <sup>a</sup>	94.3	<b>2</b>	<b>27</b>	23	17.4	14.0	11.6	9.0	5.8
2017 <sup>a</sup>	100	<b>2</b>	<b>29.2</b>	<b>26.2</b>	19.5	16.0	11.8	8.6	6.4

a: Compliance with 24-hour PM<sub>2.5</sub> not met, values displayed in **bold**

### **Equivalence methods (continuous)**

Victoria monitors PM<sub>2.5</sub> by the reference method specified in the Measure (on a one-day-in-three basis) at two stations (Alphington and Footscray). It also monitors PM<sub>2.5</sub> continuously at four stations (Alphington, Footscray, Geelong and Traralgon) using BAM.

Prior to this, Victoria also participated in the PM<sub>2.5</sub> Equivalence Program, with TEOM monitors located at Alphington and Footscray.

**Table 78: Percentiles of daily PM<sub>2.5</sub> at Alphington (2012–2017) (equivalence methods)**

Year	Data availability (% of days)	No. of exceedances (days)	Max (µg/m <sup>3</sup> )	Percentiles (µg/m <sup>3</sup> )					
				99 <sup>th</sup>	98 <sup>th</sup>	95 <sup>th</sup>	90 <sup>th</sup>	70 <sup>th</sup>	50 <sup>th</sup>
2012 <sup>a</sup>	91.5	N/A	21.1	13.5	12.3	9.9	8.2	5.6	3.6
2013 <sup>ac</sup>	<i>29.0</i>	<i>N/A</i>	<i>17.4</i>	<i>12.7</i>	<i>12.1</i>	<i>11.6</i>	<i>9.2</i>	<i>6.6</i>	<i>4.2</i>
2014 <sup>b</sup>	91.8	N/A	44.8	31.5	22.1	15.8	13.8	9.8	7.2
2015 <sup>b</sup>	79.5	2	30.0	24.5	23.3	19.2	13.3	10.0	7.3
2016 <sup>b</sup>	84.4	<b>2</b>	<b>33.6</b>	23.0	22.3	14.5	11.9	8.6	6.3
2017 <sup>b</sup>	92.6	<b>8</b>	<b>35.9</b>	<b>27.7</b>	<b>26.6</b>	20.3	15.7	10.2	7.4

a: Measured using a TEOM.

b: Measured using a BAM.

c: data availability between 15 and 75 per cent, values displayed in italics.

d: Compliance with 24-hour PM<sub>2.5</sub> not met, values displayed in **bold**.

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**Table 79: Percentiles of daily PM<sub>2.5</sub> at Footscray (2012–2017) (equivalence methods)**

Year	Data availability (% of days)	No. of exceedances (days)	Max (µg/m <sup>3</sup> )	Percentiles (µg/m <sup>3</sup> )					
				99 <sup>th</sup>	98 <sup>th</sup>	95 <sup>th</sup>	90 <sup>th</sup>	70 <sup>th</sup>	50 <sup>th</sup>
2012 <sup>a</sup>	97.3	N/A	26.3	14.8	13.1	10.4	8.0	5.5	3.7
2013 <sup>ac</sup>	29.6	N/A	17.6	15	14.5	11.5	9.7	6.4	4.4
2014 <sup>bc</sup>	25.2	N/A	18.1	13.7	13.1	11.8	10.1	8.1	6.5
2015 <sup>b</sup>	73.4	0	23.3	19.3	16.4	13.4	11.6	9.0	6.8
2016 <sup>bd</sup>	93.4	<b>2</b>	<b>25.9</b>	19.6	14.6	12.9	11.1	8.4	6.2
2017 <sup>bd</sup>	96.4	<b>4</b>	<b>34.8</b>	24.5	20.7	15.5	13.1	9.2	6.8

a: Measured using a TEOM.

b: Measured using a BAM.

c: Data availability between 15 and 75 per cent, values displayed in italics.

b: Compliance with 24-hour PM<sub>2.5</sub> not met, values displayed in **bold**.

**Table 80: Percentiles of daily PM<sub>2.5</sub> at Geelong (2017) (equivalence methods)**

Year	Data availability (% of days)	No. of exceedances (days)	Max (µg/m <sup>3</sup> )	Percentiles (µg/m <sup>3</sup> )					
				99 <sup>th</sup>	98 <sup>th</sup>	95 <sup>th</sup>	90 <sup>th</sup>	70 <sup>th</sup>	50 <sup>th</sup>
2016 <sup>a</sup>	51.4	0	15.5	12.6	11.6	10.0	9.0	6.8	5.3
2017 <sup>b</sup>	82.7	<b>2</b>	<b>26.8</b>	22.3	18.2	13.5	10.9	8.5	6.4

a: Data availability between 15 and 75 per cent, values displayed in italics.

b: Compliance with 24-hour PM<sub>2.5</sub> not met, values displayed in **bold**.

**Table 81: Percentiles of daily PM<sub>2.5</sub> at Traralgon (2017) (equivalence methods)**

Year	Data availability (% of days)	No. of exceedances (days)	Max (µg/m <sup>3</sup> )	Percentiles (µg/m <sup>3</sup> )					
				99 <sup>th</sup>	98 <sup>th</sup>	95 <sup>th</sup>	90 <sup>th</sup>	70 <sup>th</sup>	50 <sup>th</sup>
2016 <sup>a</sup>	95.1	<b>1</b>	<b>25.7</b>	22.9	20.6	15.6	12.4	9.3	6.9
2017 <sup>a</sup>	86.8	<b>5</b>	<b>32.3</b>	<b>28.0</b>	22.0	18.3	14.8	9.8	7.2

a: Compliance with 24-hour PM<sub>2.5</sub> not met, values displayed in **bold**.