

# Air quality bulletin

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North Queensland

January 2016

## Prepared by

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## Acknowledgements

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- Sun Metals Corporation
- Port of Townsville Limited

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**Introduction**

Air quality monitoring gathers information on the quality of the air environment. The objectives of the monitoring are to check compliance with ambient air quality guidelines, identify long-term trends in air quality, investigate local air quality concerns, and assess the effectiveness of air quality management strategies.

Air quality monitoring was carried out by the Queensland Government at three sites in Townsville and two sites in Mount Isa during January 2016. In addition, monitoring was also conducted by Port of Townsville Limited and Sun Metals Corporation in Townsville. In May 2014 the former Townsville Port monitoring site operated by Port of Townsville Limited and the Queensland Government's Townsville Coast Guard monitoring site were amalgamated into a single monitoring site located at the Townsville Coast Guard.

Air pollutants monitored included ozone, nitrogen dioxide, sulfur dioxide, PM<sub>10</sub> (particles less than 10µm in diameter), TSP (total suspended particulate matter - particles less than 50µm approximately in diameter) and dustfall (particles large enough to settle from the air). The TSP and dustfall samples were analysed for metal content.

The air pollutants monitored at North Queensland sites are shown in Table 1. Site locations are shown in Figure 23 on the last page of this bulletin.

**Reporting protocol**

Data presented in this bulletin are based on clock hours. Hourly or other averages are constrained to start and finish on a clock hour.

**Air quality summary graphs**

Figures 1 to 14 summarise available air quality data for sampling days at Townsville sites during January 2016. Monthly average dustfall and deposited lead for Townsville sites are shown in figures 15 and 16. Figures 17 to 20 summarise air quality data for sampling days at Mount Isa sites during January. The maximum recorded level for each day is used to show the day-to-day variation in air quality.

**Air quality summary tables**

Tables 5 to 22 present monthly summaries of air quality data for the preceding 12 months. These tables show the month-to-month variation in air quality. A monthly entry is given when at least three-fifths of the maximum possible number of observations during the month are available. When data is not available for the entire month, due to equipment malfunction, this is indicated by the abbreviation 'n.d.' (no data). A dash is inserted when less than three-fifths of data are available. Where no data is recorded, the reason for the low data availability is summarised in Table 23 at the end of this bulletin.

Table 1. Air pollutants monitored at North Queensland sites

	Ozone	Nitrogen dioxide	Sulfur dioxide	PM <sub>10</sub>	TSP	Lead	Copper	Zinc	Nickel	Arsenic	Cadmium	Dustfall	Dustfall lead
<b>Townsville</b>													
Pimlico	✓	✓	✓	✓								✓	✓
Coast Guard				✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
North Ward (Warburton St)												✓	✓
Stuart (industry)			✓										
<b>Mount Isa</b>													
Menzies			✓										
The Gap			✓	✓		✓				✓	✓		

**Guidelines**

Wherever possible, air quality measurements are compared against Australian air quality standards. In their absence relevant international standards are used for comparison.

Measured concentrations of nitrogen dioxide, ozone, sulfur dioxide, PM<sub>10</sub>, TSP, lead, nickel, cadmium and arsenic are compared to the air quality objectives contained in the Queensland *Environmental Protection (Air) Policy 2008* (EPP (Air)) to assess whether pollutant levels could harm health and wellbeing. Twelve-month average PM<sub>10</sub> concentrations are also compared against the *National Environment Protection (Ambient Air Quality) Measure* (Air NEPM) annual standard.

Sulfur dioxide, PM<sub>10</sub> and arsenic levels in Mount Isa are also compared against the air quality limits specified in the Mount Isa Mines Limited Environmental Authority EPML00977513.

**Compliance with air quality guidelines - Townsville**

During January, measured pollutant levels, with the exception of dustfall, did not exceed the relevant air quality guideline at Queensland Government and industry air monitoring sites in Townsville.

The DEHP dust nuisance limit value was exceeded at the North Ward monitoring site during January due to local activities (such as grounds maintenance at the sports reserve) contributing to elevated dust levels in the vicinity of the sampler. Lower dust levels at the Townsville Coast Guard site indicate that Port of Townsville activities were not responsible for the higher dustfall levels at the North Ward site.

Table 2. Number of occasions during January when measured levels exceeded EPP (Air) objectives or Air NEPM standards for nitrogen dioxide, ozone, sulfur dioxide, PM<sub>10</sub>, TSP, lead, nickel, arsenic and cadmium; Ontario Ministry of Environment air quality criteria for copper and zinc; and DEHP nuisance dust limits for TSP and dustfall at Queensland Government and industry air monitoring sites in Townsville.

Pollutant	Averaging Period	Exceedences
Nitrogen dioxide	<i>EPP (Air)</i>	
	Annual	0
	1-hour	0
Ozone	<i>EPP (Air)</i>	
	4-hour	0
	1-hour	0
Sulfur dioxide	<i>EPP (Air)</i>	
	Annual	0
	24-hour	0
PM <sub>10</sub>	<i>EPP (Air)</i>	
	Annual	0
	24-hour	0
TSP (24-hour period refers to dust nuisance, not health and wellbeing)	<i>EPP (Air)</i>	
	Annual	0
	<i>DEHP limit</i>	
TSP Lead	24-hour	0
	Annual	0
TSP Copper	<i>EPP (Air)</i>	
	Annual	0
TSP Zinc	<i>Ontario criterion</i>	
	24-hour	0
PM <sub>10</sub> Nickel	<i>Ontario criterion</i>	
	24-hour	0
PM <sub>10</sub> Arsenic	<i>EPP (Air)</i>	
	Annual	0
PM <sub>10</sub> Cadmium	<i>EPP (Air)</i>	
	Annual	0
Dustfall (30-day period refers to dust nuisance, not health and wellbeing)	<i>EPP (Air)</i>	
	Annual	0
Dustfall (30-day period refers to dust nuisance, not health and wellbeing)	<i>DEHP limit</i>	
	30-day	1

## Compliance with air quality guidelines - Mount Isa

During January, measured pollutant levels, with the exception of sulfur dioxide and PM<sub>10</sub>, did not exceed the relevant air quality guideline at Queensland Government air monitoring sites in Mount Isa.

Sulfur dioxide levels exceeded the EPP (Air) 1-hour objective for six 1-hour periods at the Menzies monitoring site and four 1-hour periods at The Gap monitoring sites during January due to industry emissions.

Windblown dust generated by the passage of a low pressure trough led to an exceedence of the EPP (Air) 24-hour objective for PM<sub>10</sub> at The Gap monitoring site on 15 January. On this day winds blew predominantly from a south to south-east direction, indicating that industry emissions would not have contributed significantly to this exceedence.

Average lead, arsenic and cadmium concentrations at The Gap monitoring site over the 12-month period ending January 2016 complied with the EPP (Air) objectives.

### Compliance with smelter air quality limits

From January 2016 smelter operations in Mount Isa have been operating under an amended Environmental Authority (EA) which sets alternative air quality limits for some air pollutants as part of the Copper Smelter Extension Project. Table 4 details the EA air quality limit values applying in 2016 where these differ from the EPP (Air) objectives. As compliance with the EA limits is to be determined over the 2016 calendar year, no assessment of compliance is possible at this time. Information on the progressive status against the EA limit values for the Queensland Government air monitoring sites is provided below.

Since 1 January 2016 there have been no 24-hour sulfur dioxide concentrations above the EA air quality limit value at either the Menzies or The Gap monitoring sites. At the Menzies site 1-hour sulfur dioxide concentrations have exceeded 0.200 ppm for six hours and 0.400 ppm for one hour since 1 January 2016. At The Gap site 1-hour sulfur dioxide concentrations have exceeded 0.200 ppm for four hours but have not exceeded 0.400 ppm since 1 January 2016.

At The Gap site 24-hour PM<sub>10</sub> concentrations have exceeded 50 µg/m<sup>3</sup> on only one day since 1 January 2016. The exceedence occurred as a result of a dust storm.

The average arsenic concentration at The Gap site for the 12-month period ending January 2016 was less than the EA air quality limit value.

Table 3. Number of occasions during January when measured levels exceeded EPP (Air) objectives or Air NEPM standards for sulfur dioxide, PM<sub>10</sub>, lead, arsenic and cadmium at Queensland Government air monitoring sites in Mount Isa.

Pollutant	Averaging Period	Exceedences
Sulfur dioxide	<i>EPP (Air)</i>	
	Annual	0
	24-hour	0
PM <sub>10</sub>	1-hour	10
	<i>Air NEPM</i>	
	Annual	0
TSP Lead	<i>EPP (Air)</i>	
	24-hour	1
PM <sub>10</sub> Arsenic	<i>EPP (Air)</i>	
	Annual	0
PM <sub>10</sub> Cadmium	<i>EPP (Air)</i>	
	Annual	0

Table 4. Environmental Authority (EA) air quality limits applying to smelter operations in Mount Isa

Pollutant	Averaging period	Limit value	Assessment criterion <sup>(a)</sup>	Period when limit value applies
Sulfur dioxide	24-hour	230 µg/m <sup>3</sup> (= 0.080 ppm)	<= 1% of total days	1 January to 31 December 2016
	1-hour	570 µg/m <sup>3</sup> (= 0.200 ppm)	<= 2% of total hours	
		1140 µg/m <sup>3</sup> (= 0.400 ppm)	<= 0.4% of total hours	
PM <sub>10</sub>	24-hour	50 µg/m <sup>3</sup>	<= 5 days	1 January to 31 December 2016
Arsenic	Annual	0.016 µg/m <sup>3</sup>	Does not exceed	1 January to 31 December 2016

<sup>(a)</sup> Compliance is on an individual monitoring site basis, not across the monitoring network

## Measured ambient concentrations - Townsville

### Nitrogen dioxide

Figure 1. Ambient concentrations of nitrogen dioxide at the Pimlico site. Daily maximum 1-hour average concentrations (ppm), January 2016.

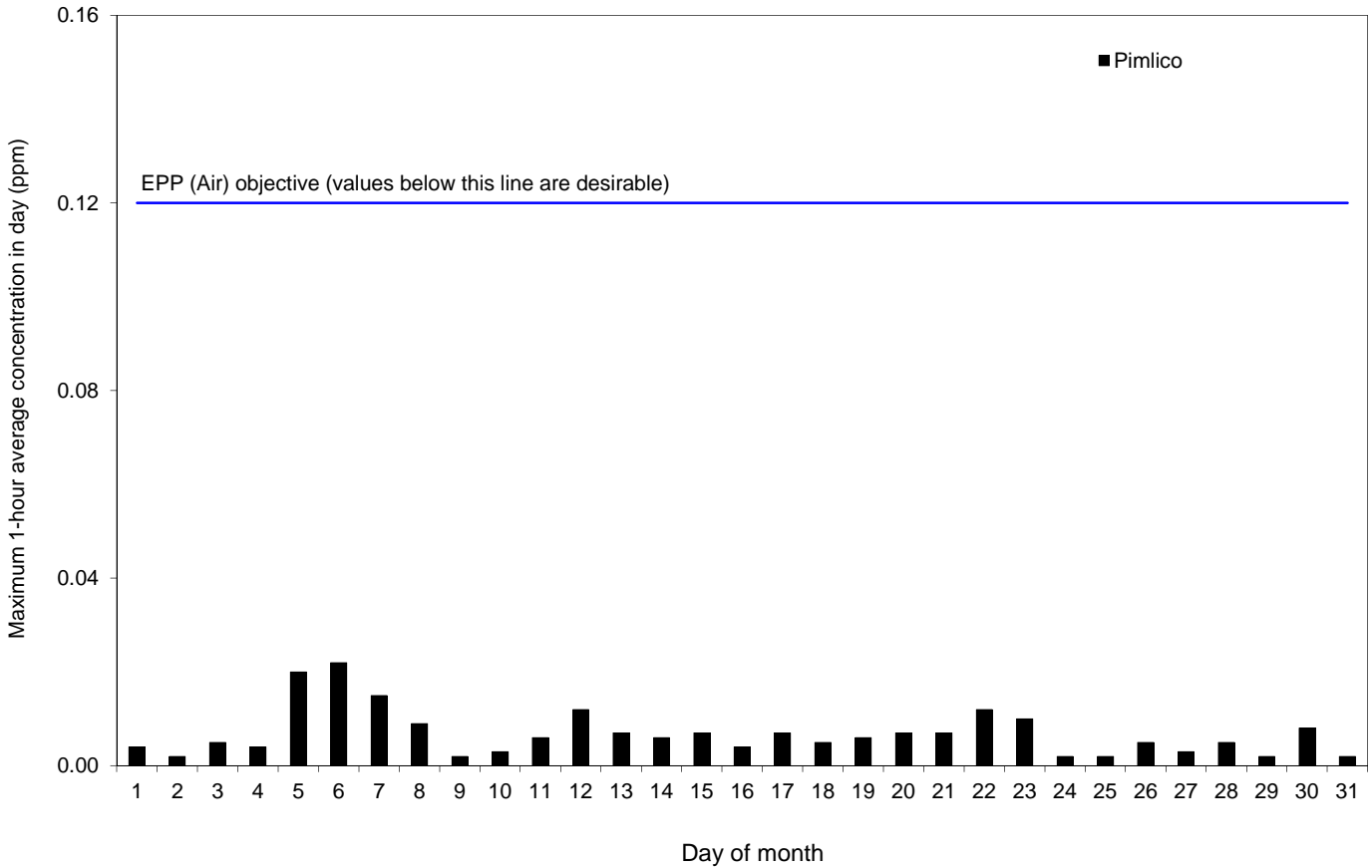


Table 5. Ambient concentrations of nitrogen dioxide. Annual average and monthly maximum 1-hour concentrations (ppm), February 2015 to January 2016.

Site	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan
<b>Townsville</b>												
<b>Pimlico</b>												
Annual average:	0.004											
Maximum 1-hour	0.014	0.014	0.031	0.028	0.028	0.031	0.040	0.025	0.015	0.011	0.010	0.022
% I.A.	98	98	98	94	98	98	97	98	98	98	98	98
% I.A. indicates instrument availability. - indicates less than three-fifths of the data are available. n.d. indicates no data are available.												
The <i>Environmental Protection (Air) Policy 2008</i> air quality objectives for nitrogen dioxide are an annual average of 0.030 ppm and a 1-hour average of 0.120 ppm (not to be exceeded on more than one day per year).												

### Ozone (photochemical oxidants)

Figure 2. Ambient concentrations of ozone at the Pimlico site. Daily maximum 4-hour average concentrations (ppm), January 2016.

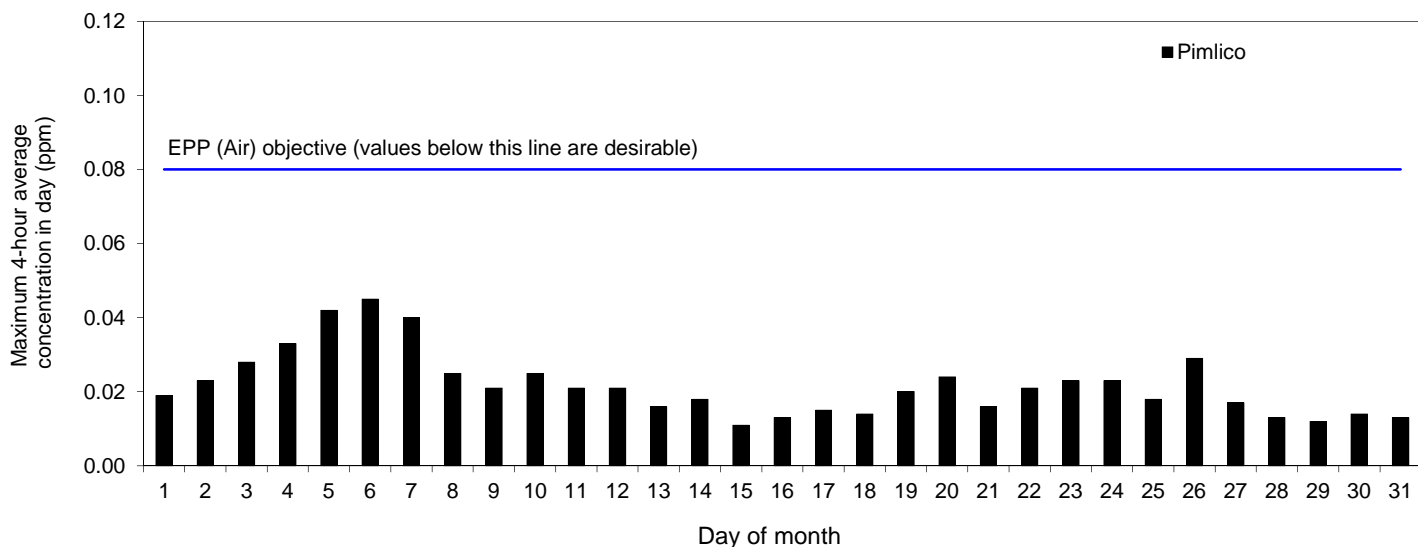


Figure 3. Ambient concentrations of ozone at the Pimlico site. Daily maximum 1-hour average concentrations (ppm), January 2016.

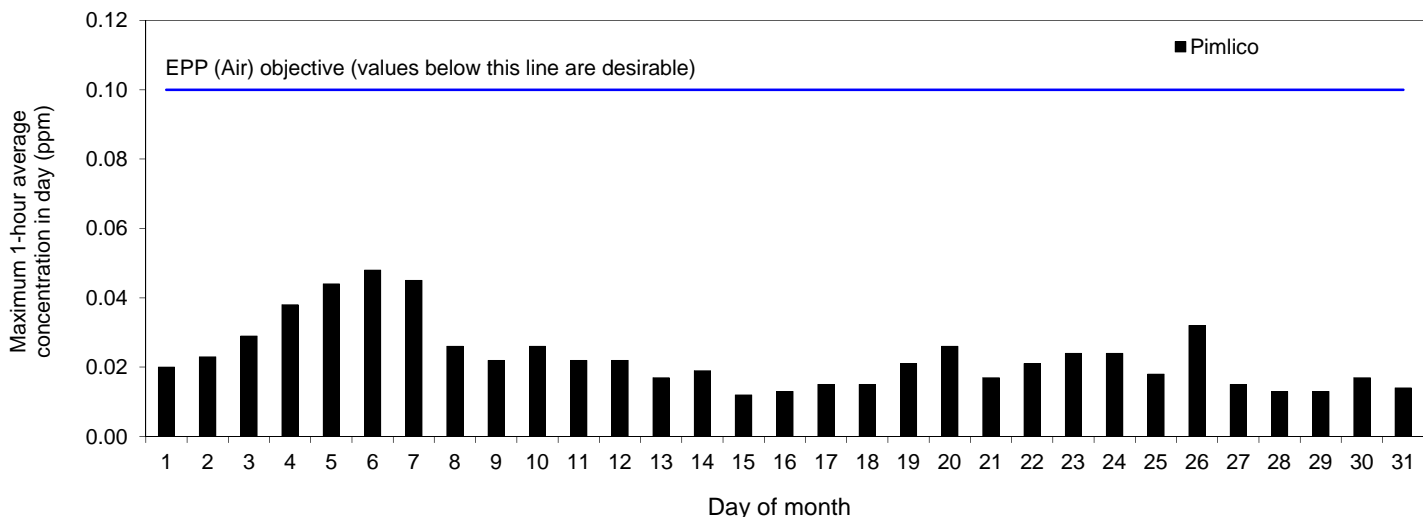


Table 6. Ambient concentrations of ozone. Monthly maximum 4-hour and 1-hour concentrations (ppm), February 2015 to January 2016.

Site	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan
<b>Townsville</b>												
<b>Pimlico</b>												
Maximum 4-hour	0.031	0.033	0.037	0.036	0.042	0.041	0.043	0.049	0.039	0.035	0.028	0.045
Maximum 1-hour	0.033	0.034	0.040	0.040	0.045	0.043	0.049	0.051	0.043	0.040	0.029	0.048
% I.A.	98	98	98	94	98	98	97	98	96	98	98	98
% I.A. indicates instrument availability. - indicates less than three-fifths of the data are available. n.d. indicates no data are available. The <i>Environmental Protection (Air) Policy 2008</i> air quality objectives for ozone are a 4-hour average of 0.080 ppm (not to be exceeded on more than one day per year) and a 1-hour average of 0.100 ppm (not to be exceeded on more than one day per year).												

**Sulfur dioxide**

Figure 4. Ambient concentrations of sulfur dioxide at Pimlico and Stuart sites. Daily 24-hour average concentrations (ppm), January 2016.

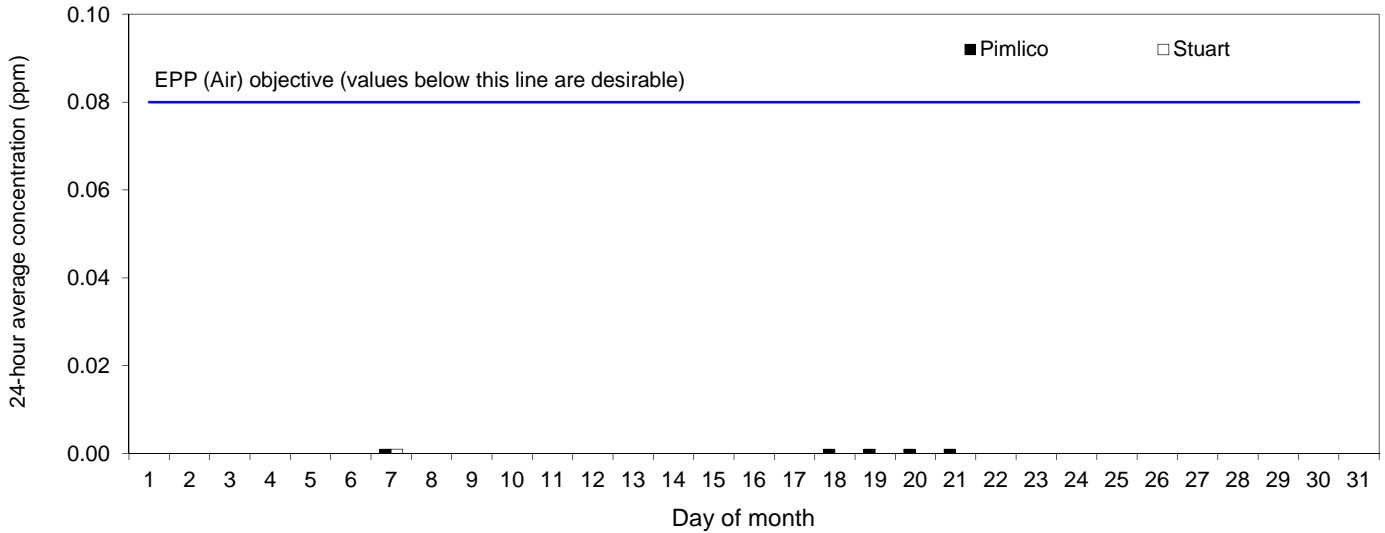


Figure 5. Ambient concentrations of sulfur dioxide at Pimlico and Stuart sites. Daily maximum 1-hour average concentrations (ppm), January 2016.

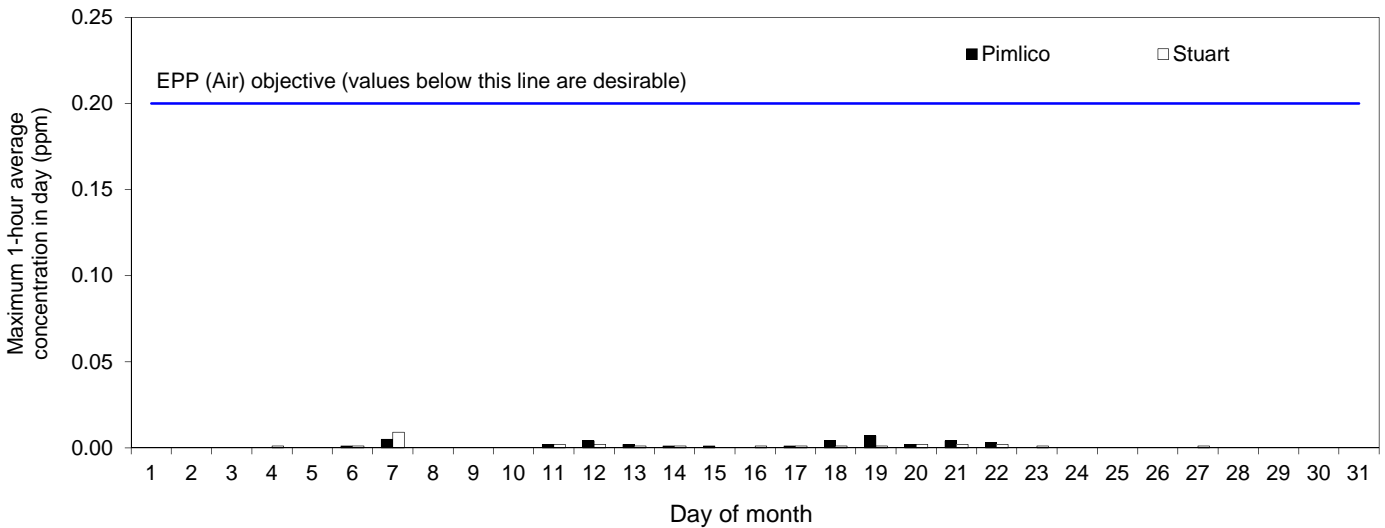


Table 7. Ambient concentrations of sulfur dioxide. Annual average and monthly maximum 24-hour and 1-hour average concentrations (ppm), February 2015 to January 2016.

Site	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan
<b>Townsville</b>												
<b>Pimlico</b>												
Annual average:	0.001											
Maximum 24-hour	0.003	0.002	0.002	0.003	0.001	0.001	0.001	0.001	0.001	0.000	0.001	0.001
Maximum 1-hour	0.004	0.003	0.004	0.004	0.003	0.004	0.003	0.003	0.002	0.001	0.004	0.007
% I.A.	98	98	98	94	98	98	97	98	98	98	98	98
<b>Stuart (industry-operated site)</b>												
Annual average:	0.000											
Maximum 24-hour	0.001	0.001	0.001	-	n.d.	n.d.	0.001	0.002	0.000	0.002	0.001	0.001
Maximum 1-hour	0.002	0.003	0.002	-	n.d.	n.d.	0.005	0.004	0.003	0.003	0.004	0.009
% I.A.	64	80	91	51	0	0	87	98	98	92	98	98
% I.A. indicates instrument availability. - indicates less than three-fifths of the data are available. n.d. indicates no data are available.												
The <i>Environmental Protection (Air) Policy 2008</i> air quality objectives for sulfur dioxide are an annual average of 0.020 ppm, a 24-hour average of 0.080 ppm (not to be exceeded on more than one day per year) and a 1-hour average of 0.200 ppm (not to be exceeded on more than one day per year).												



**PM<sub>10</sub>**

Figure 6. Ambient concentrations of PM<sub>10</sub> at Pimlico and Coast Guard sites. Daily 24-hour average concentrations (µg/m<sup>3</sup>), January 2016.

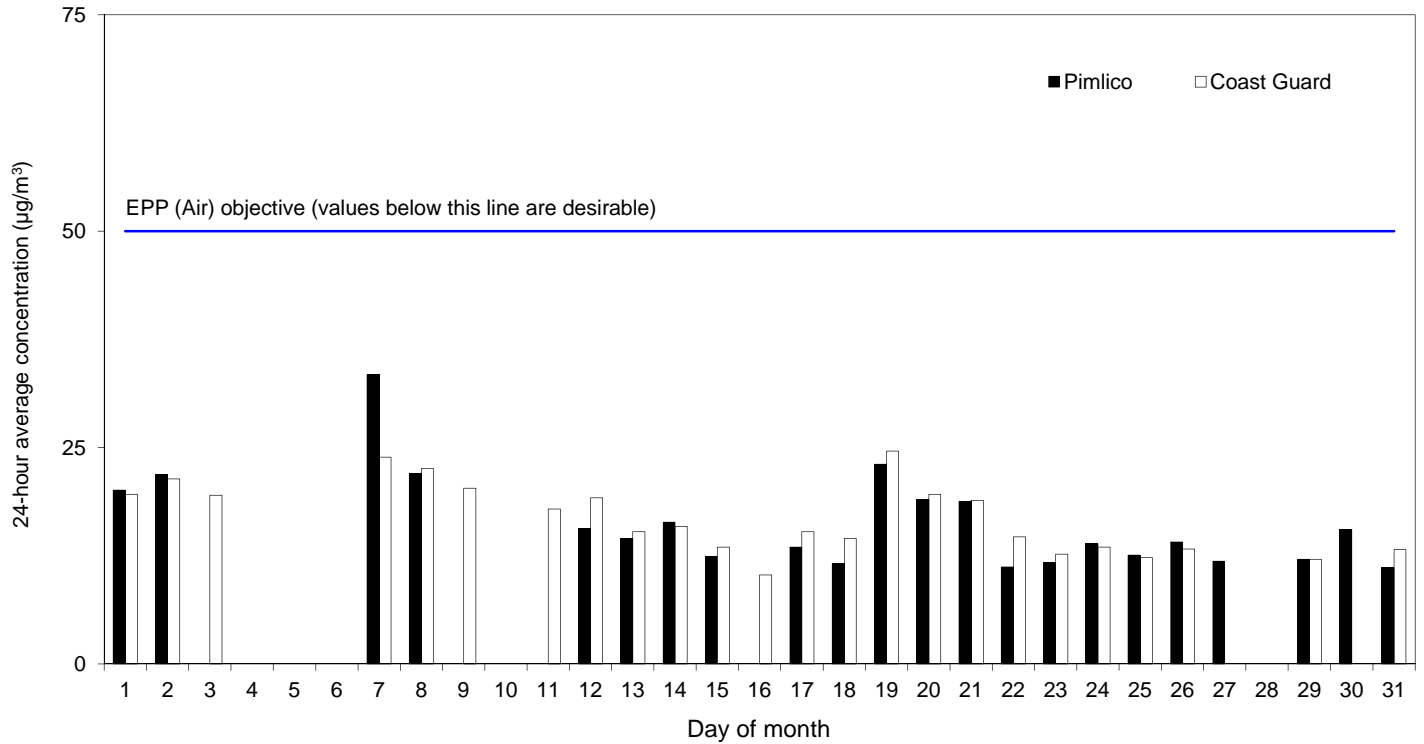


Table 8. Ambient concentrations of PM<sub>10</sub>. Annual average and monthly maximum 24-hour average concentrations (µg/m<sup>3</sup>), February 2015 to January 2016.

Site	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan
<b>Townsville</b>												
<b>Pimlico</b>												
Annual average:	17.9											
Maximum 24-hour	25.5	21.1	21.9	25.7	30.0	28.8	31.8	36.6	42.0	25.7	28.9	33.4
% I.A.	92	87	88	94	99	100	98	97	86	95	92	77
<b>Coast Guard</b>												
Annual average:	19.6											
Maximum 24-hour	28.7	29.7	37.5	38.1	34.9	31.6	30.5	35.7	35.0	26.5	29.4	24.6
% I.A.	96	98	94	97	100	99	100	88	98	99	100	88

% I.A. indicates instrument availability. - indicates less than three-fifths of the data are available. n.d. indicates no data are available.

The *Environmental Protection (Air) Policy 2008* air quality objective for PM<sub>10</sub> is a 24-hour average of 50 µg/m<sup>3</sup> (not to be exceeded on more than five days per year).

The *National Environment Protection (Ambient Air Quality) Measure* standards for PM<sub>10</sub> are an annual average of 25 µg/m<sup>3</sup> and a 24-hour average of 50 µg/m<sup>3</sup>.

**TSP**

Figure 7. Ambient concentrations of TSP (continuous monitoring) at the Coast Guard site. Daily 24-hour average concentrations ( $\mu\text{g}/\text{m}^3$ ), January 2016.

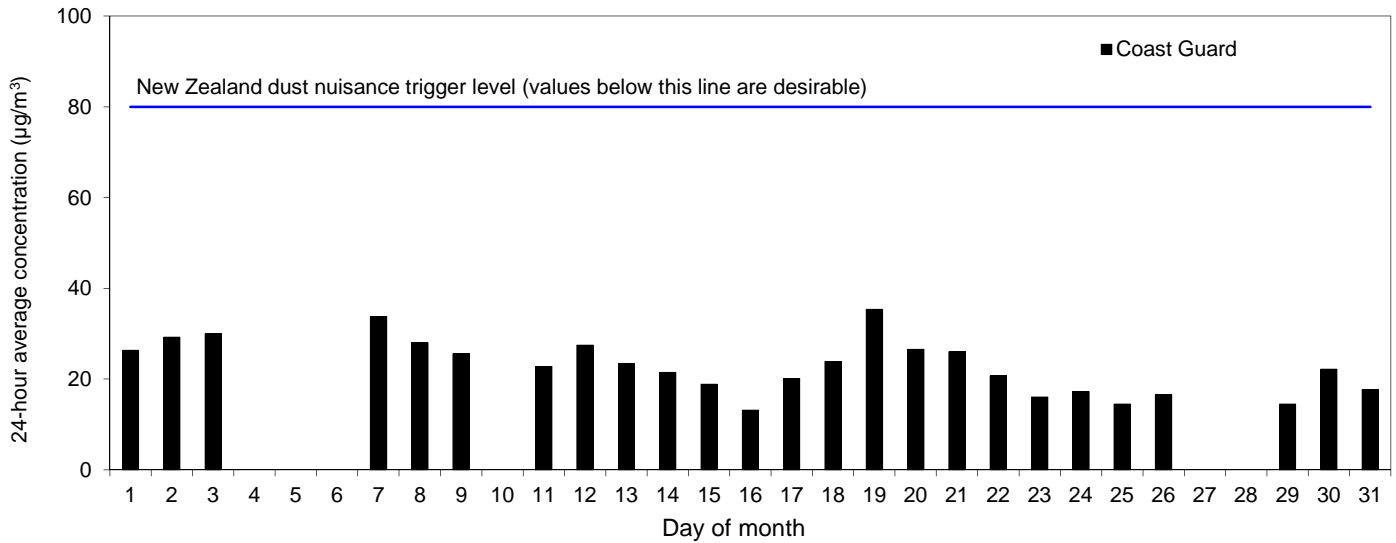


Figure 8. Ambient concentrations of TSP (one day in six monitoring) at the Coast Guard site. 24-hour average concentrations ( $\mu\text{g}/\text{m}^3$ ), January 2016.

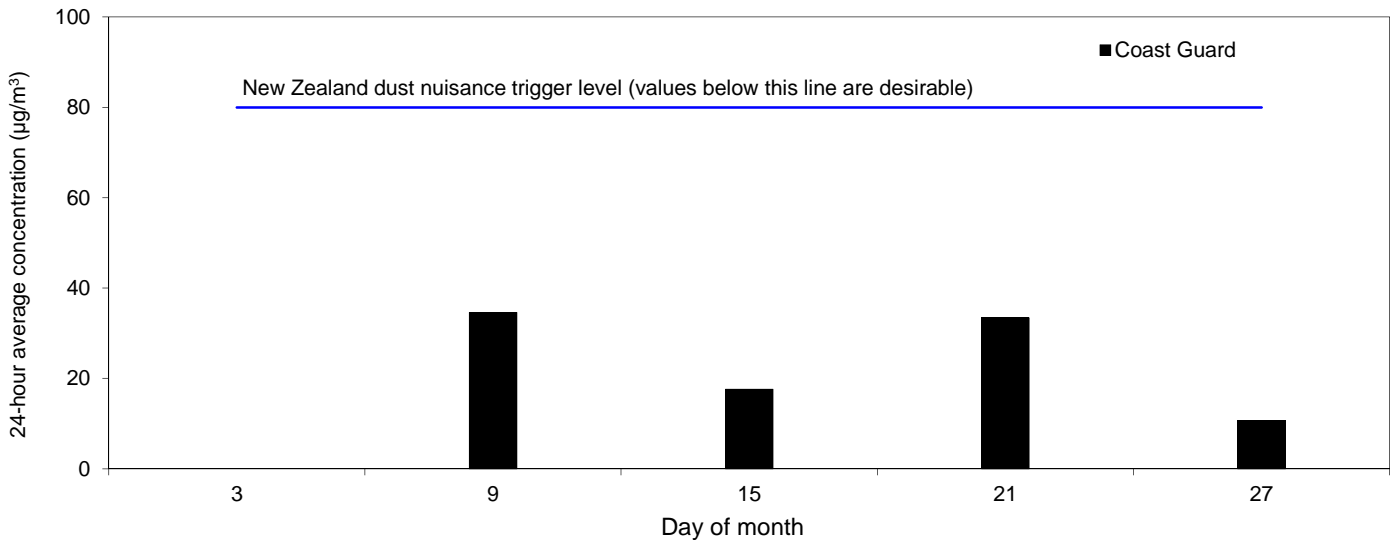


Table 9. Ambient concentrations of TSP. Annual average and monthly maximum 24-hour average concentrations ( $\mu\text{g}/\text{m}^3$ ), February 2015 to January 2016.

Site	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan
<b>Townsville</b>												
<b>Coast Guard (continuous monitoring)</b>												
Annual average:	29.2											
Maximum 24-hour	45.8	43.9	60.4	71.9	41.4	56.6	53.8	55.8	73.9	34.6	45.1	35.4
% I.A.	97	98	94	96	90	93	99	89	94	99	100	87
<b>Coast Guard (one day in six monitoring)</b>												
Annual average:	37.1											
Maximum 24-hour	44.4	55.2	63.3	57.0	44.9	48.8	64.5	76.7	64.4	33.1	90.7	34.6
% I.A.	100	100	100	100	80	100	80	67	100	100	80	80

% I.A. indicates instrument availability. - indicates less than three-fifths of the data are available. n.d. indicates no data are available.

The *Environmental Protection (Air) Policy 2008* air quality objective for TSP is an annual average of  $90 \mu\text{g}/\text{m}^3$ .

The Department of Environment and Heritage Protection Air Impacts Guideline recommends that short-term (24-hour) TSP concentrations be compared against the trigger levels provided in the New Zealand Ministry for the Environment's *Good practice guide for assessing and managing the environmental effects of dust emissions to assess dust nuisance impacts*. The New Zealand dust nuisance (sensitive areas) trigger level is a 24-hour average of  $80 \mu\text{g}/\text{m}^3$ .

**TSP Lead**

Figure 9. Ambient concentrations of TSP lead (one day in six monitoring) at the Coast Guard site. Annual average concentration ( $\mu\text{g}/\text{m}^3$ ), February 2015 to January 2016.

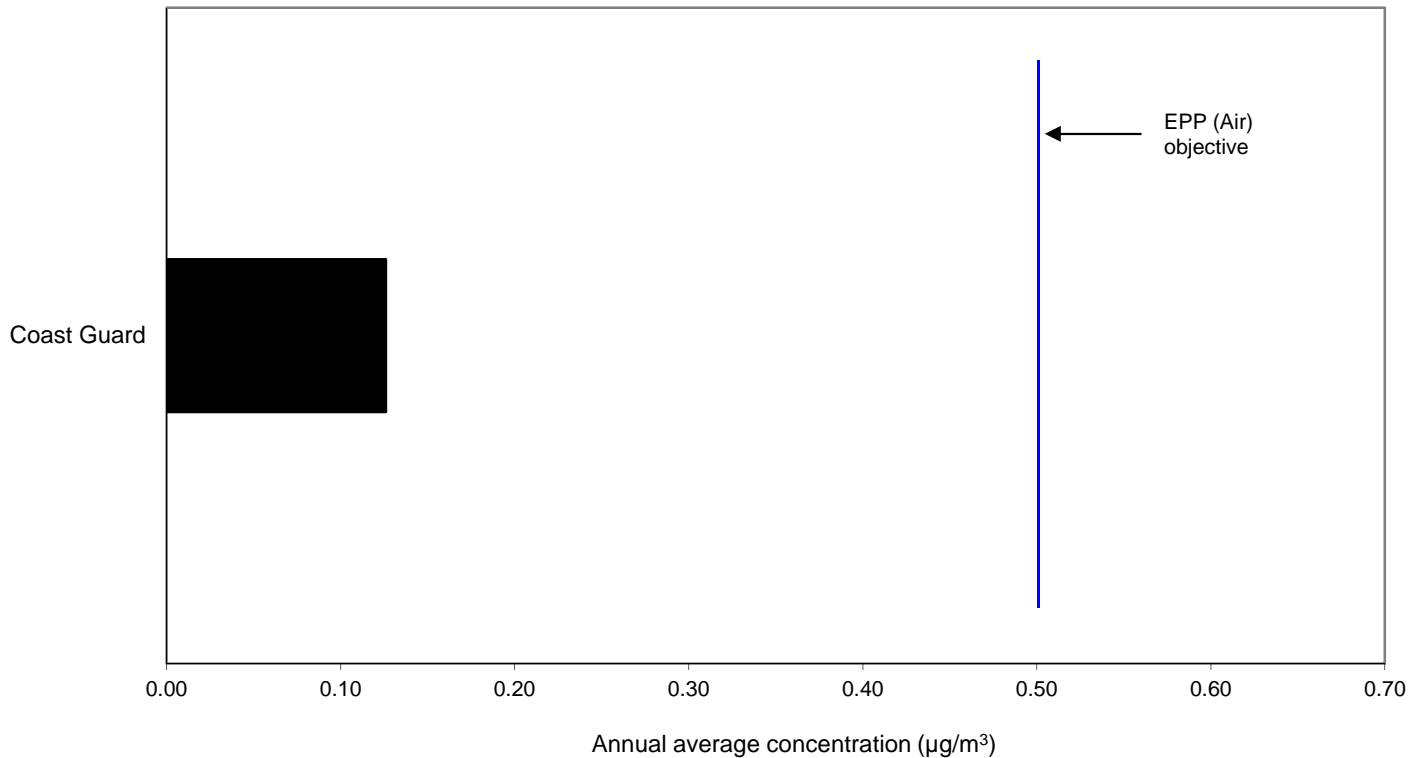


Table 10. Ambient concentrations of TSP lead. Annual average and monthly maximum 24-hour average concentrations ( $\mu\text{g}/\text{m}^3$ ) for one day in six monitoring, February 2015 to January 2016.

Site	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan
<b>Townsville</b>												
<b>Coast Guard</b>												
Annual average:	0.13											
Maximum 24-hour	0.17	0.62	0.43	0.11	0.21	0.11	0.10	0.24	0.19	1.29	0.31	0.05
% I.A.	100	100	100	100	80	100	80	67	100	100	80	100
% I.A. indicates instrument availability. - indicates less than three-fifths of the data are available. n.d. indicates no data are available.												
The <i>Environmental Protection (Air) Policy 2008</i> air quality objective for lead is an annual average of $0.5 \mu\text{g}/\text{m}^3$ .												
The limit of reporting is the minimum measured lead concentration that can be determined with the sampling equipment and laboratory method used. Lead concentrations below this limit are preceded by a "<" sign in the table. The annual average concentration has been calculated using half the minimum measurable concentration value for samples where no lead was detected.												

**TSP Copper**

Figure 10. Ambient concentrations of TSP copper (one day in six monitoring) at the Coast Guard site. Maximum 24-hour average concentrations ( $\mu\text{g}/\text{m}^3$ ), January 2016.

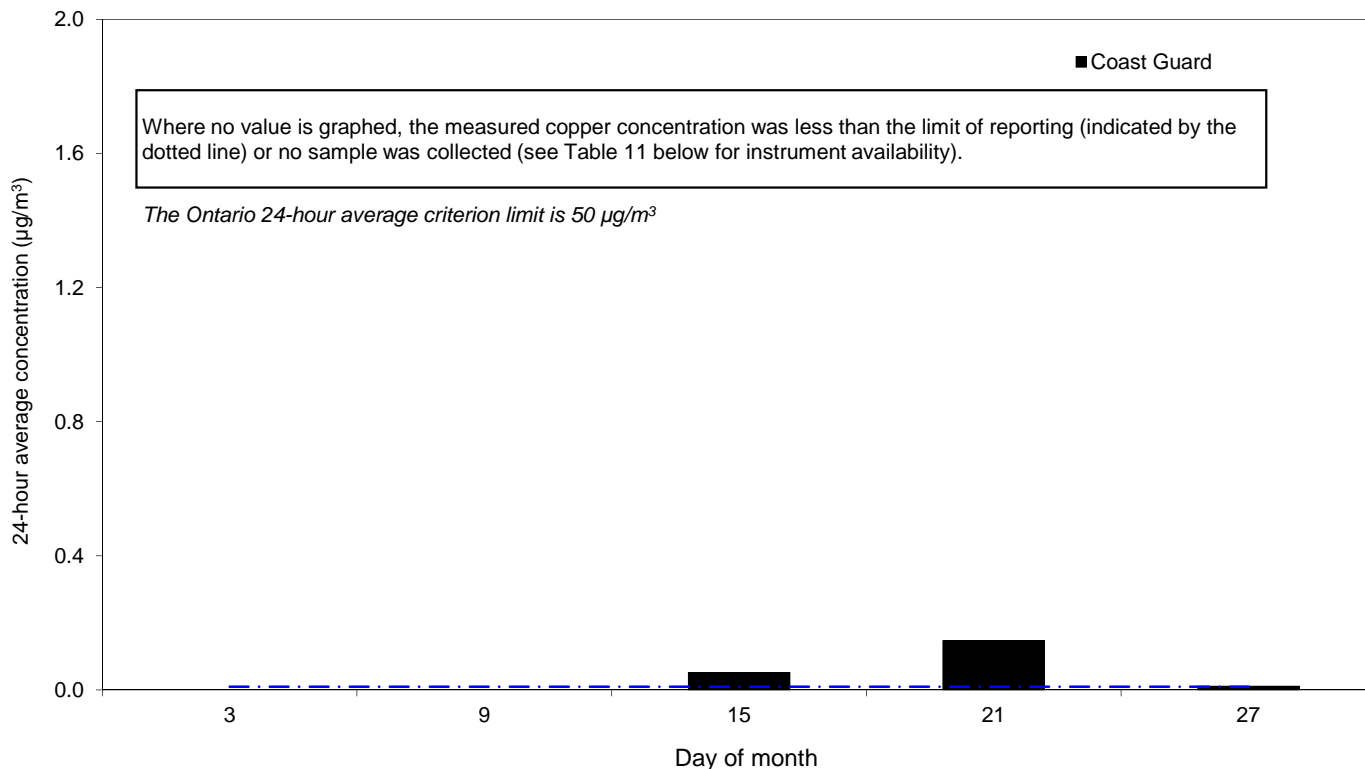


Table 11. Ambient concentrations of TSP copper. Monthly maximum 24-hour average concentrations ( $\mu\text{g}/\text{m}^3$ ) for one day in six monitoring, February 2015 to January 2016.

Site	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan
<b>Townsville</b>												
<b>Coast Guard</b>												
Maximum 24-hour	0.08	1.71	0.91	0.05	0.04	0.07	0.18	0.07	0.04	0.02	1.29	0.15
% I.A.	100	100	100	100	80	100	80	67	100	100	80	100
% I.A. indicates instrument availability. - indicates less than three-fifths of the data are available. n.d. indicates no data are available. The Ontario Ministry of Environment ambient air quality criterion for copper is a 24-hour average of $50 \mu\text{g}/\text{m}^3$ . The limit of reporting is the minimum measured copper concentration that can be determined with the sampling equipment and laboratory method used. Copper concentrations below this limit are preceded by a "<" sign in the table.												

**TSP Zinc**

Figure 11. Ambient concentrations of TSP zinc (one day in six monitoring) at the Coast Guard site. Maximum 24-hour average concentrations ( $\mu\text{g}/\text{m}^3$ ), January 2016.

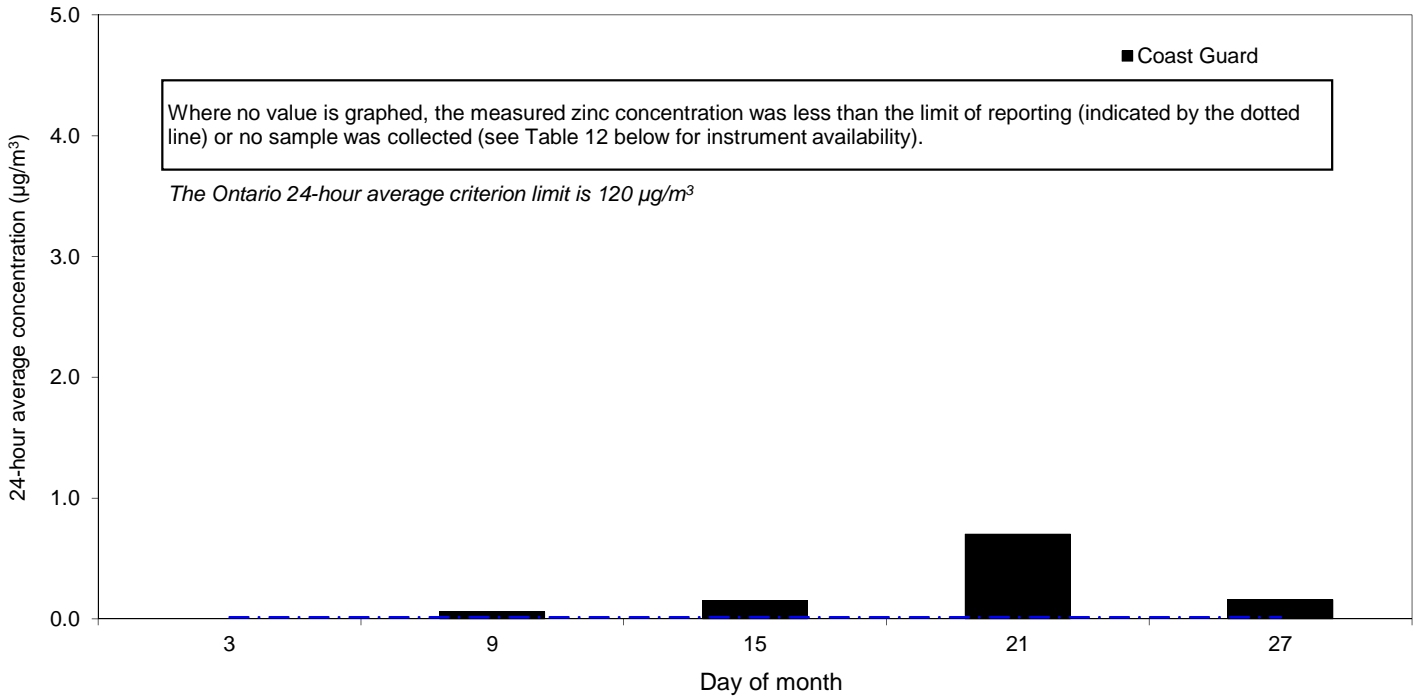


Table 12. Ambient concentrations of TSP zinc. Monthly maximum 24-hour average concentrations ( $\mu\text{g}/\text{m}^3$ ) for one day in six monitoring, February 2015 to January 2016.

Site	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan
<b>Townsville</b>												
<b>Coast Guard</b>												
Maximum 24-hour	1.90	3.16	2.28	1.60	1.90	0.57	0.55	3.09	0.86	0.64	2.40	0.70
% I.A.	100	100	100	100	80	100	80	67	100	100	80	100
% I.A. indicates instrument availability. - indicates less than three-fifths of the data are available. n.d. indicates no data are available. The Ontario Ministry of Environment ambient air quality criterion for zinc is a 24-hour average of $120 \mu\text{g}/\text{m}^3$ . The limit of reporting is the minimum measured zinc concentration that can be determined with the sampling equipment and laboratory method used. Zinc concentrations below this limit are preceded by a "<" sign in the table.												

**TSP Nickel**

Figure 12. Ambient concentrations of TSP nickel (one day in six monitoring) at the Coast Guard site. Annual average concentrations ( $\mu\text{g}/\text{m}^3$ ), February 2015 to January 2016.

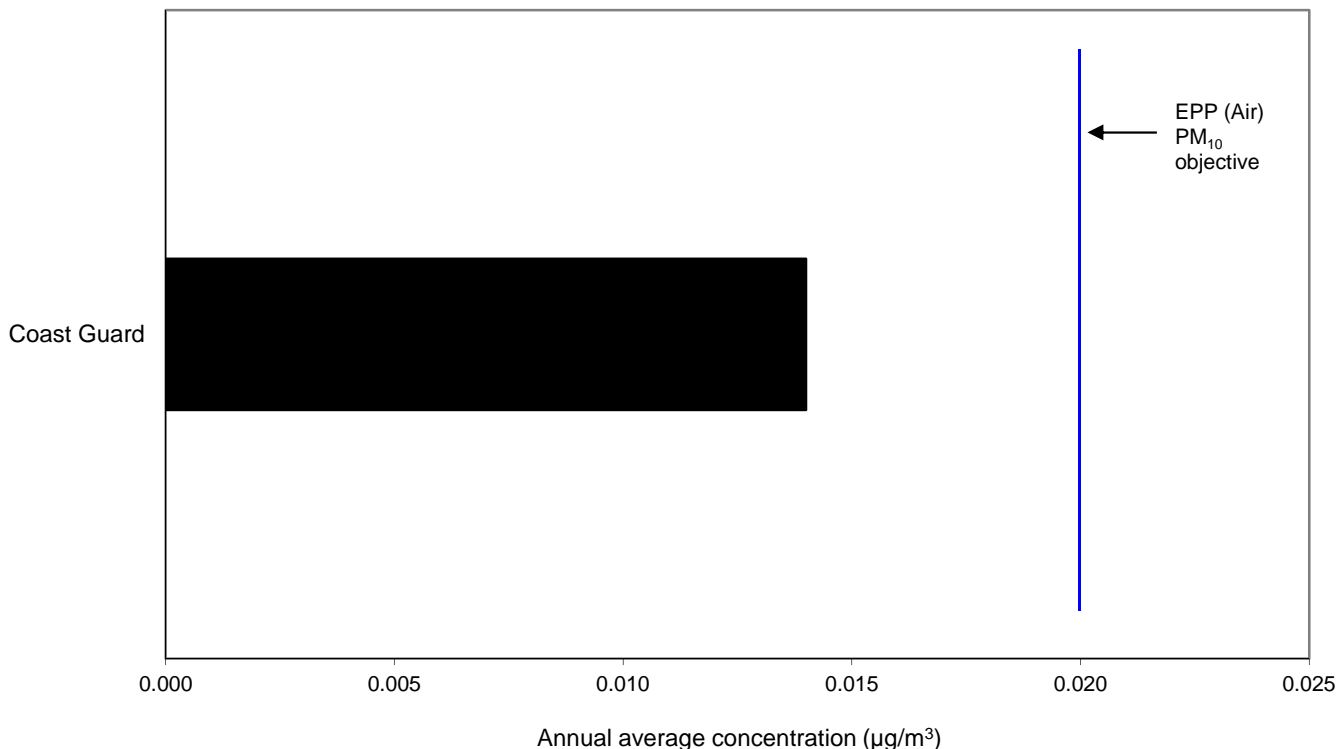


Table 13. Ambient concentrations of TSP nickel. Annual average and monthly maximum 24-hour average concentrations ( $\mu\text{g}/\text{m}^3$ ) for one day in six monitoring, February 2015 to January 2016.

Site	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan
<b>Townsville</b>												
<b>Coast Guard</b>												
Annual average:	0.014											
Maximum 24-hour	0.040	0.052	0.027	<0.010	0.016	<0.010	0.054	0.033	0.047	0.047	0.056	0.038
% I.A.	100	100	100	100	80	100	80	67	100	100	80	100

% I.A. indicates instrument availability. - indicates less than three-fifths of the data are available. n.d. indicates no data are available.

The *Environmental Protection (Air) Policy 2008* air quality objective for nickel is an annual average of  $0.020 \mu\text{g}/\text{m}^3$  (measured as the total metal content in  $\text{PM}_{10}$  particles).

Monitoring conducted by the Queensland Government measures the amount of nickel present in the TSP fraction. As  $\text{PM}_{10}$  is a subset of TSP, if the TSP nickel concentration is less than the EPP (Air)  $\text{PM}_{10}$  objective value, it follows that the  $\text{PM}_{10}$  nickel concentration complies with the EPP (Air) objective.

The limit of reporting is the minimum measured nickel concentration that can be determined with the sampling equipment and laboratory method used. Nickel concentrations below this limit are preceded by a "<" sign in the table. Annual average concentrations have been calculated using half the minimum measurable concentration value for samples where no nickel was detected.

**TSP Arsenic**

Figure 13. Ambient concentrations of TSP arsenic (one day in six monitoring) at the Coast Guard site. Annual average concentrations ( $\mu\text{g}/\text{m}^3$ ), February 2015 to January 2016.

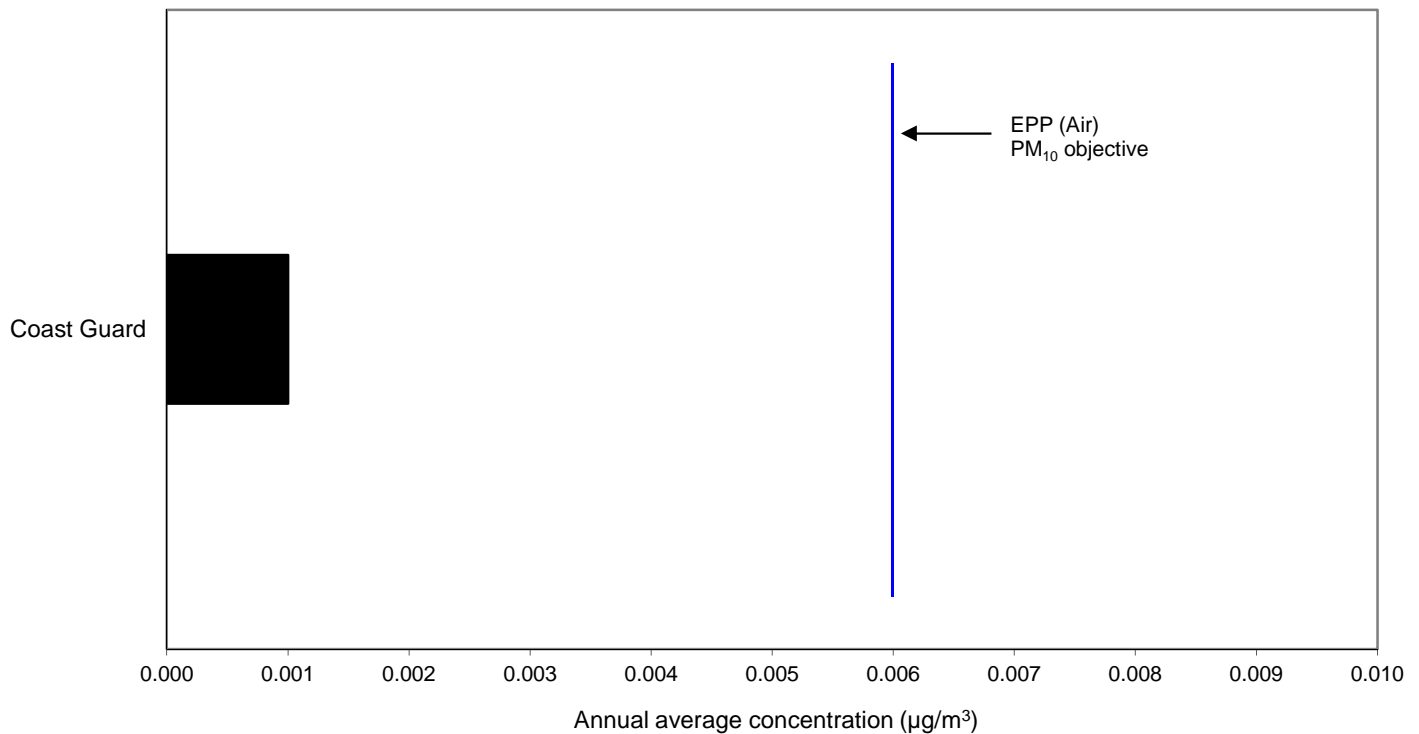


Table 14. Ambient concentrations of TSP arsenic. Annual average and monthly maximum 24-hour average concentrations ( $\mu\text{g}/\text{m}^3$ ) for one day in six monitoring, February 2015 to January 2016.

Site	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan
<b>Townsville</b>												
<b>Coast Guard</b>												
Annual average	0.001											
Maximum 24-hour	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
% I.A.	100	100	100	100	80	100	80	67	100	100	80	100

% I.A. indicates instrument availability. - indicates less than three-fifths of the data are available. n.d. indicates no data are available.

The *Environmental Protection (Air) Policy 2008* air quality objective for arsenic is an annual average of  $0.006 \mu\text{g}/\text{m}^3$  (measured as the total metal content in  $\text{PM}_{10}$  particles).

Monitoring conducted by the Queensland Government measures the amount of arsenic present in the TSP fraction. As  $\text{PM}_{10}$  is a subset of TSP, if the TSP arsenic concentration is less than the EPP (Air)  $\text{PM}_{10}$  objective value, it follows that the  $\text{PM}_{10}$  arsenic concentration complies with the EPP (Air) objective.

The limit of reporting is the minimum measured arsenic concentration that can be determined with the sampling equipment and laboratory method used. Arsenic concentrations below this limit are preceded by a "<" sign in the table. Annual average concentrations have been calculated using half the minimum measurable concentration value for samples where no arsenic was detected.

**TSP Cadmium**

Figure 14. Ambient concentrations of TSP cadmium (one day in six monitoring) at the Coast Guard site. Annual average concentrations ( $\mu\text{g}/\text{m}^3$ ), February 2015 to January 2016.

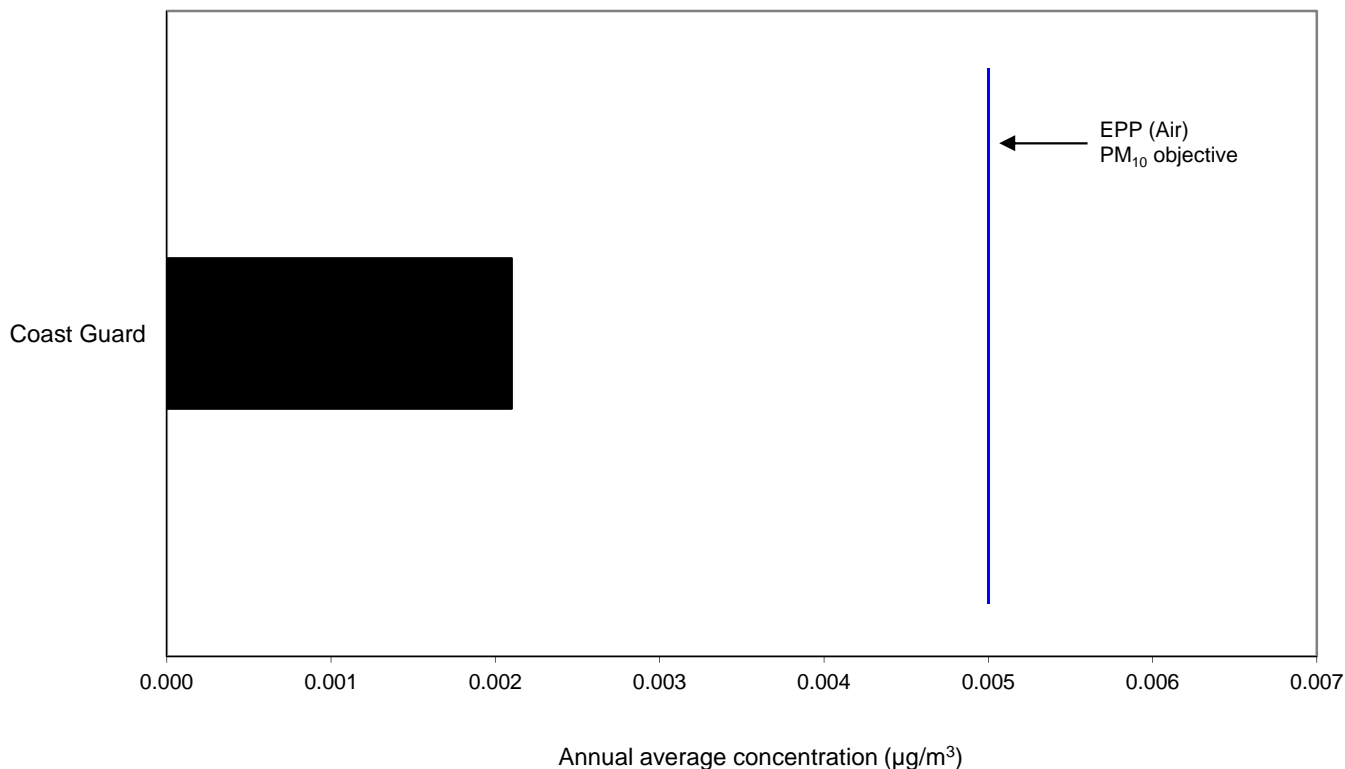


Table 15. Ambient concentrations of TSP cadmium. Annual average and monthly maximum 24-hour average concentrations ( $\mu\text{g}/\text{m}^3$ ) for one day in six monitoring, February 2015 to January 2016.

Site	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan
<b>Townsville</b>												
<b>Coast Guard</b>												
Annual Average	0.0021											
Maximum 24-hour	0.005	0.015	0.007	0.004	0.006	0.002	0.002	0.009	0.003	0.004	0.006	0.002
% I.A.	100	100	100	100	80	100	80	67	100	100	80	100

% I.A. indicates instrument availability. - indicates less than three-fifths of the data are available. n.d. indicates no data are available.

The *Environmental Protection (Air) Policy 2008* air quality objective for cadmium is an annual average of  $0.005 \mu\text{g}/\text{m}^3$  (measured as the total metal content in  $\text{PM}_{10}$  particles).

Monitoring conducted by the Queensland Government measures the amount of cadmium present in the TSP fraction. As  $\text{PM}_{10}$  is a subset of TSP, if the TSP cadmium concentration is less than the EPP (Air)  $\text{PM}_{10}$  objective value, it follows that the  $\text{PM}_{10}$  cadmium concentration complies with the EPP (Air) objective.

The limit of reporting is the minimum measured cadmium concentration that can be determined with the sampling equipment and laboratory method used. Cadmium concentrations below this limit are preceded by a "<" sign in the table. Annual average concentrations have been calculated using half the minimum measurable concentration value for samples where no cadmium was detected.



## Dustfall

Figure 15. Dustfall monitoring at the Coast Guard, North Ward (Warburton Street) and Pimlico sites. Daily average dust (insoluble solids fraction) deposition rate ( $\text{mg}/\text{m}^2/\text{day}$ ) for month of January 2016.

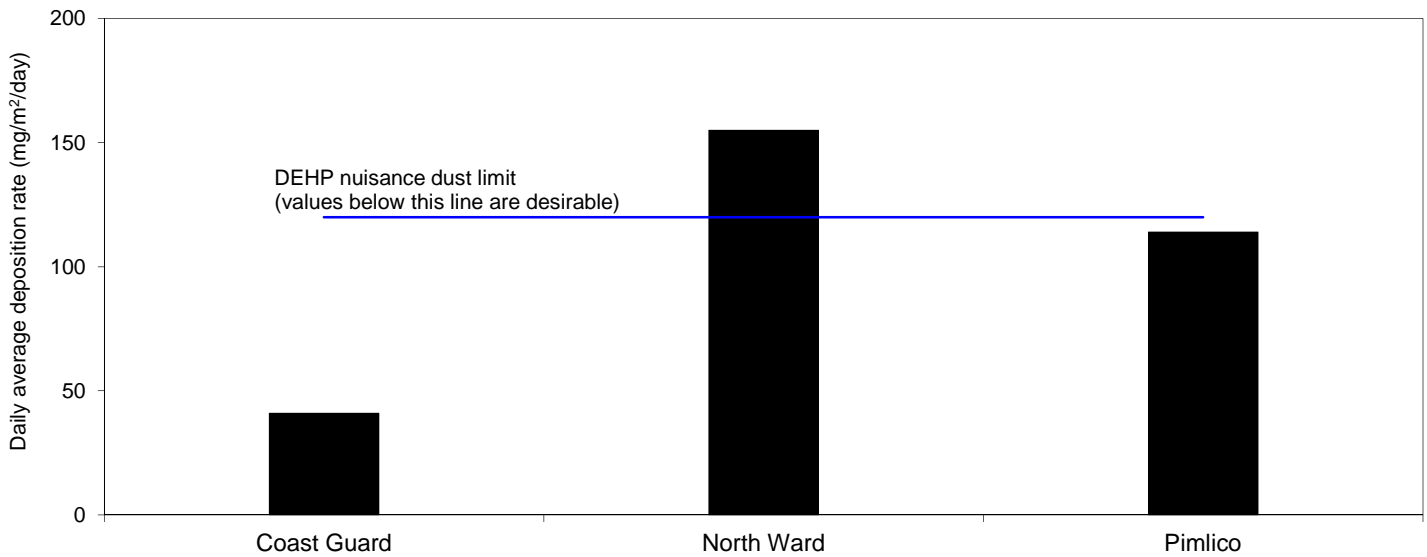


Table 16. Daily average dust (insoluble solids fraction) deposition rate ( $\text{mg}/\text{m}^2/\text{day}$ ), February 2015 to January 2016.

Site	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan
<b>Townsville</b>												
<b>Coast Guard</b>												
Daily average	56	45	47	53	46	30	46	241	80	91	66	41
<b>North Ward (Warburton St)</b>												
Daily average	111	123	141	217	171	158	204	197	n.d.	165	89	155
<b>Pimlico</b>												
Daily average	30	10	13	20	11	7	40	21	17	15	17	114
n.d. indicates no data are available.												
The Department of Environment and Heritage Protection Air Impacts Guideline recommends a dust deposition limit of $120 \text{ mg}/\text{m}^2/\text{day}$ , averaged over one month, be used to assess dust nuisance.												
The limit of reporting is the minimum measured dust deposition rate that can be determined with the sampling equipment and laboratory method used. Dust deposition rates below this limit are preceded by a "<" sign in the table.												

**Dustfall lead**

Figure 16. Dustfall lead monitoring at the Coast Guard, North Ward (Warburton Street) and Pimlico sites. Daily average lead deposition rate ( $\mu\text{g}/\text{m}^2/\text{day}$ ) for month of January 2016.

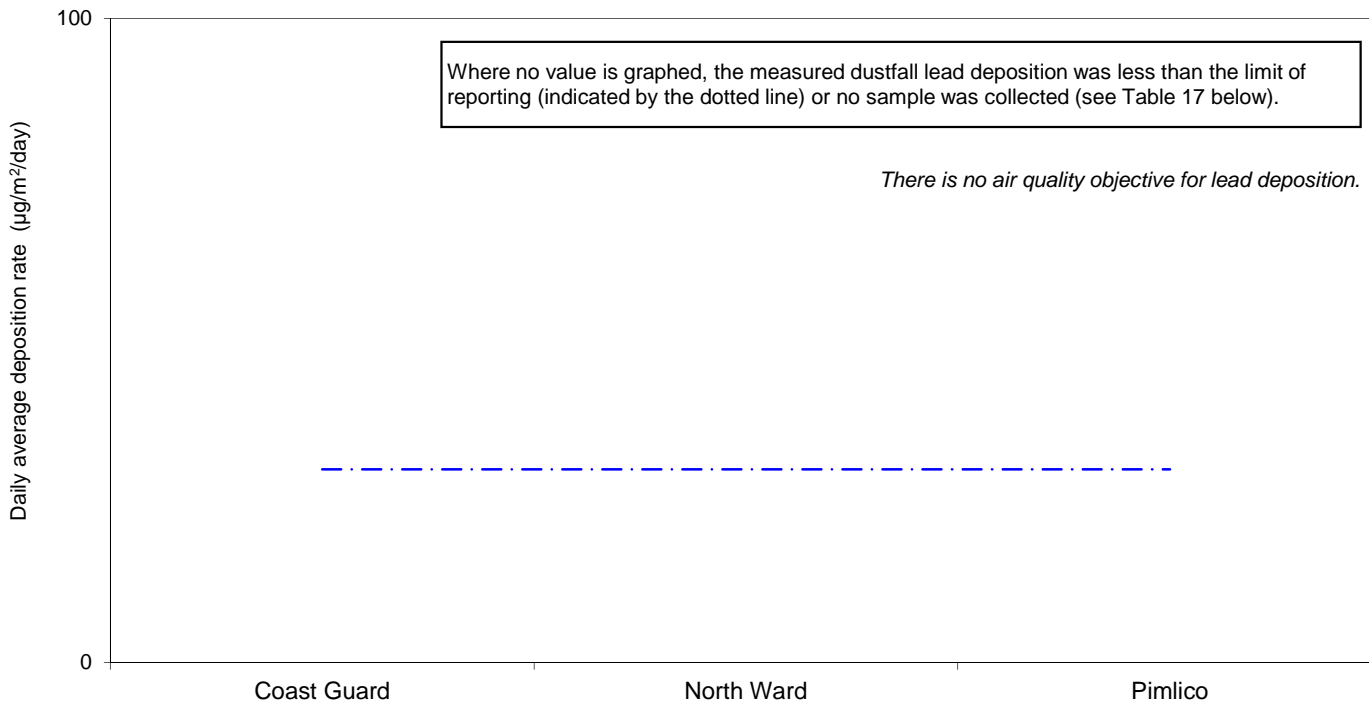


Table 17. Daily average lead deposition rate ( $\mu\text{g}/\text{m}^2/\text{day}$ ), February 2015 to January 2016.

Site	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan
<b>Townsville</b>												
<b>Coast Guard</b>												
Annual average:	299											
Daily average	481	387	313	167	136	85	154	262	606	400	509	<34
<b>North Ward (Warburton St)</b>												
Annual average:	<30											
Daily average	<37	<32	<31	<33	<36	<30	<36	<34	n.d.	<29	<29	<34
<b>Pimlico</b>												
Annual average:	<30											
Daily average	<37	<32	<31	<33	<36	<24	<50	<34	<29	<29	<29	<34
n.d. indicates no data are available.												
There is no air quality objective for ambient lead deposition. Some data indicate that lead fallout levels between 250 and 750 $\mu\text{g}/\text{m}^2/\text{day}$ (averaged over a 12-month period) are associated with a slight increase in blood lead levels (Air Quality Guidelines for Europe, Second Edition, World Health Organization, 2000).												
The limit of reporting is the minimum measured lead deposition rate that can be determined with the sampling equipment and laboratory method used. Lead deposition rates below this limit are preceded by a "<" sign in the table.												

## Measured ambient concentrations - Mount Isa

### Sulfur dioxide

Figure 17. Ambient concentrations of sulfur dioxide at the Menzies and The Gap sites. Daily 24-hour average concentrations (ppm), January 2016.

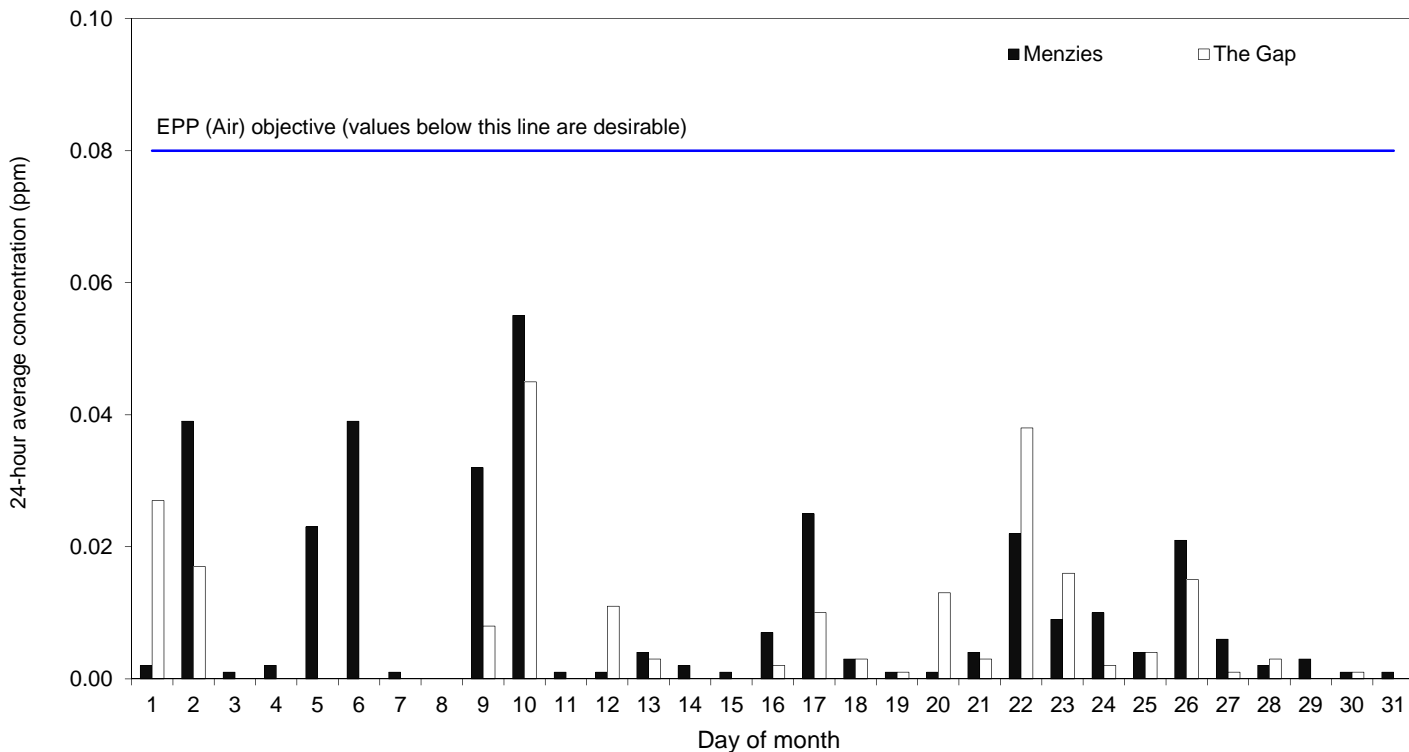


Figure 18. Ambient concentrations of sulfur dioxide at the Menzies and The Gap sites. Daily maximum 1-hour average concentrations (ppm), January 2016.

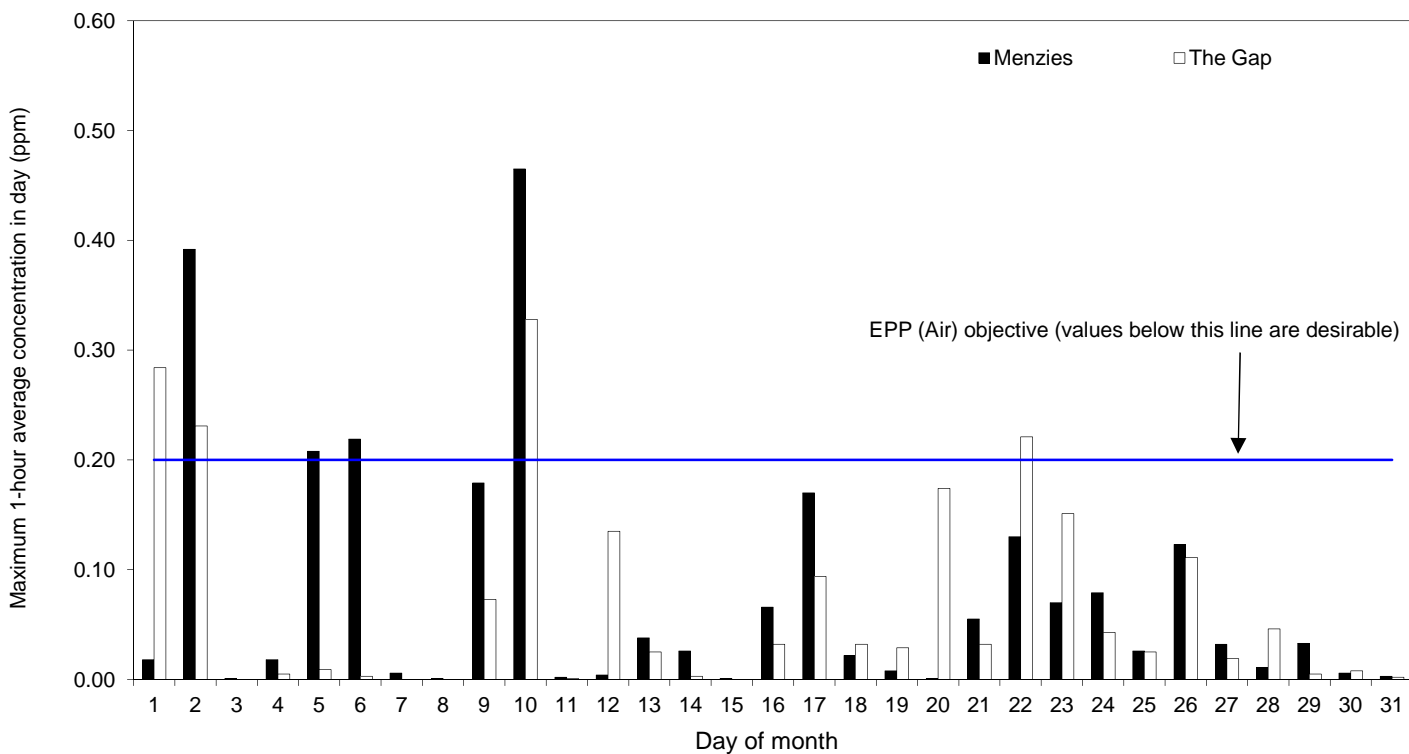


Table 18. Ambient concentrations of sulfur dioxide. Annual average and monthly maximum 24-hour and 1-hour average concentrations (ppm), February 2015 to January 2016.

Site	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan
<b>Mount Isa</b>												
<b>Menzies</b>												
Annual average:	0.006											
Maximum 24-hour	0.106	0.045	0.037	0.031	0.006	0.047	0.035	0.037	0.040	0.079	0.028	0.055
Maximum 1-hour	0.428	0.468	0.276	0.245	0.050	0.577	0.285	0.216	0.371	0.466	0.260	0.465
% I.A.	98	98	98	98	98	98	98	98	97	98	98	98
<b>The Gap</b>												
Annual average:	0.004											
Maximum 24-hour	0.035	0.036	0.016	0.034	0.004	0.030	0.022	0.021	0.056	0.044	0.038	0.045
Maximum 1-hour	0.231	0.383	0.123	0.340	0.067	0.335	0.212	0.141	0.463	0.494	0.280	0.328
% I.A.	98	98	98	98	98	98	98	98	96	98	98	98
% I.A. indicates instrument availability. - indicates less than three-fifths of the data are available. n.d. indicates no data are available. The <i>Environmental Protection (Air) Policy 2008</i> air quality objectives for sulfur dioxide are an annual average of 0.020 ppm, a 24-hour average of 0.080 ppm (not to be exceeded on more than one day per year) and a 1-hour average of 0.200 ppm (not to be exceeded on more than one day per year).												

**PM<sub>10</sub>**

Figure 19. Ambient concentrations of PM<sub>10</sub> at The Gap site. Daily 24-hour average concentrations (µg/m<sup>3</sup>), January 2016.

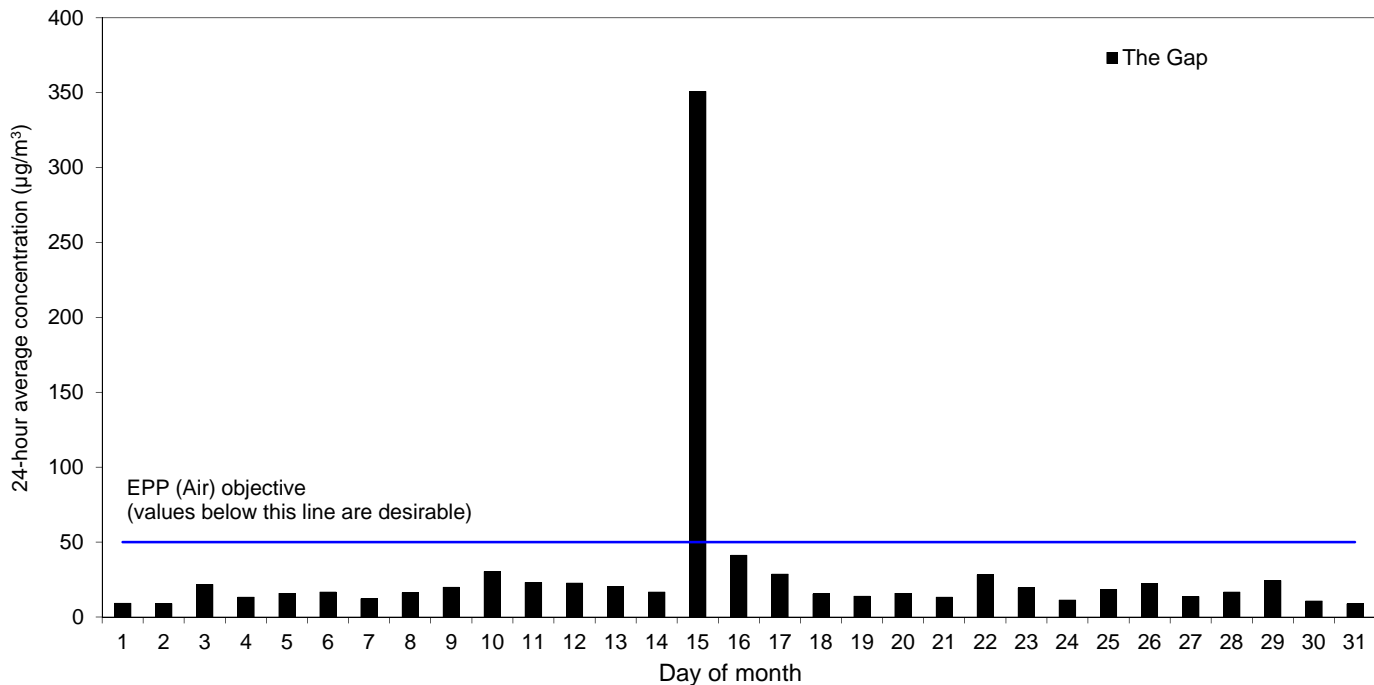


Table 19. Ambient concentrations of PM<sub>10</sub>. Annual average and monthly maximum 24-hour average concentrations (µg/m<sup>3</sup>), February 2015 to January 2016.

Site	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan
<b>Mount Isa</b>												
<b>The Gap</b>												
Annual average:	20.1											
Maximum 24-hour	45.7	47.7	37.7	56.9	29.0	37.9	50.0	59.7	40.6	54.2	153.3	350.8
% I.A.	97	99	100	100	93	100	99	100	99	100	97	99
% I.A. indicates instrument availability. - indicates less than three-fifths of the data are available. n.d. indicates no data are available. The <i>Environmental Protection (Air) Policy 2008</i> air quality objective for PM <sub>10</sub> is a 24-hour average of 50 µg/m <sup>3</sup> (not to be exceeded on more than five days per year). The <i>National Environment Protection (Ambient Air Quality) Measure</i> standards for PM <sub>10</sub> are an annual average of 25 µg/m <sup>3</sup> and a 24-hour average of 50 µg/m <sup>3</sup> .												

**TSP Lead**

Figure 20. Ambient concentrations of TSP lead at The Gap site. Annual average concentration (µg/m<sup>3</sup>), February 2015 to January 2016.

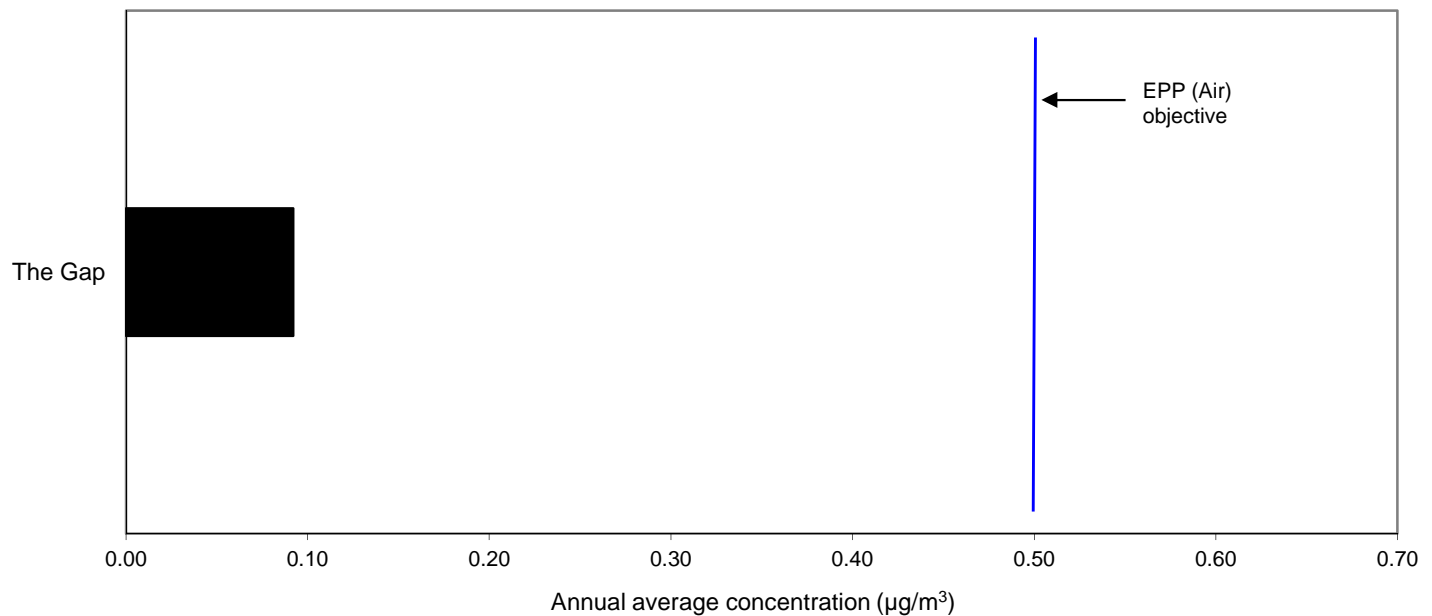


Table 20. Ambient concentrations of TSP lead. Annual average and monthly maximum 24-hour average concentrations (µg/m<sup>3</sup>), February 2015 to January 2016.

Site	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan
<b>Mount Isa</b>												
<b>The Gap</b>												
Annual average:	0.09											
Maximum 24-hour	0.39	0.23	0.02	0.02	0.03	0.03	0.14	0.10	0.15	1.28	0.95	0.47
% I.A.	100	100	100	100	100	100	100	100	100	100	100	100
% I.A. indicates instrument availability. - indicates less than three-fifths of the data are available. n.d. indicates no data are available. The <i>Environmental Protection (Air) Policy 2008</i> air quality objective for lead is an annual average of 0.5 µg/m <sup>3</sup> . The limit of reporting is the minimum measured lead concentration that can be determined with the sampling equipment and laboratory method used. Lead concentrations below this limit are preceded by a "<" sign in the table. The annual average concentration has been calculated using half the minimum measurable concentration value for samples where no lead was detected.												

**PM<sub>10</sub> Arsenic**

Figure 21. Ambient concentrations of PM<sub>10</sub> arsenic at The Gap site. Annual average concentration (µg/m<sup>3</sup>), February 2015 to January 2016.

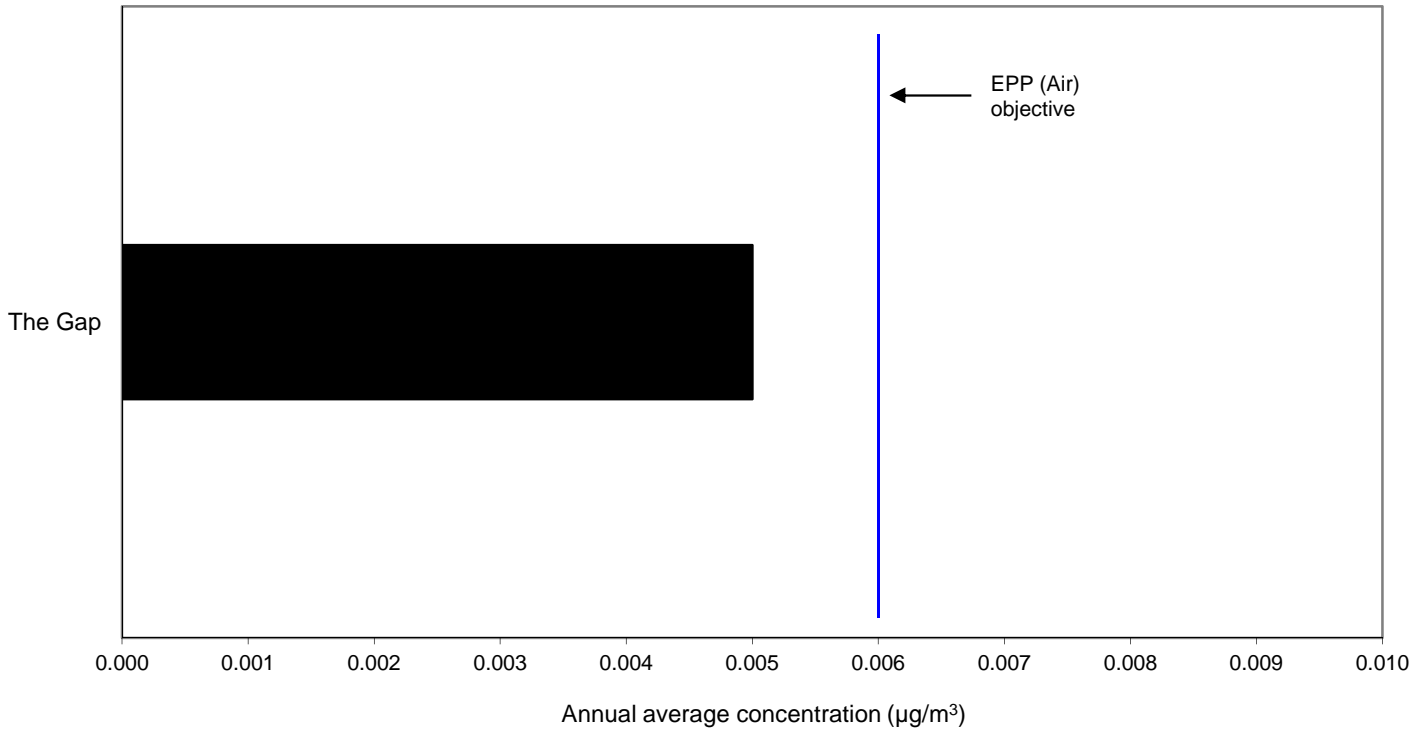


Table 21. Ambient concentrations of PM<sub>10</sub> arsenic. Annual average and monthly maximum 24-hour average concentrations (µg/m<sup>3</sup>), February 2015 to January 2016.

Site	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan
<b>Mount Isa</b>												
<b>The Gap</b>												
Annual average:	0.005											
Maximum 24-hour	0.022	0.022	<0.001	<0.001	<0.001	<0.001	0.019	0.008	0.028	0.046	0.020	0.027
% I.A.	100	100	100	100	100	100	100	100	100	100	100	100

% I.A. indicates instrument availability. - indicates less than three-fifths of the data are available. n.d. indicates no data are available.

The *Environmental Protection (Air) Policy 2008* air quality objective for arsenic is an annual average of 0.006 µg/m<sup>3</sup> (measured as the total metal content in PM<sub>10</sub> particles).

Monitoring conducted by the Queensland Government measures the amount of arsenic present in the TSP fraction (the TSP fraction is collected so lead levels can be compared against the EPP (Air) objective). Monitoring using co-located TSP and PM<sub>10</sub> high volume samplers has determined that the ratio of PM<sub>10</sub> arsenic to TSP arsenic is 0.88:1 in Mount Isa. The PM<sub>10</sub> arsenic values presented in this table have been generated by applying this factor to the measured TSP arsenic concentrations.

The limit of reporting is the minimum measured arsenic concentration that can be determined with the monitoring instrumentation used. Arsenic concentrations below this limit are preceded by a "<" sign in the table. The annual average concentration has been calculated using half the minimum measurable concentration value for samples where no arsenic was detected.

**PM<sub>10</sub> Cadmium**

Figure 22. Ambient concentrations of PM<sub>10</sub> cadmium at The Gap site. Annual average concentration (µg/m<sup>3</sup>), February 2015 to January 2016.

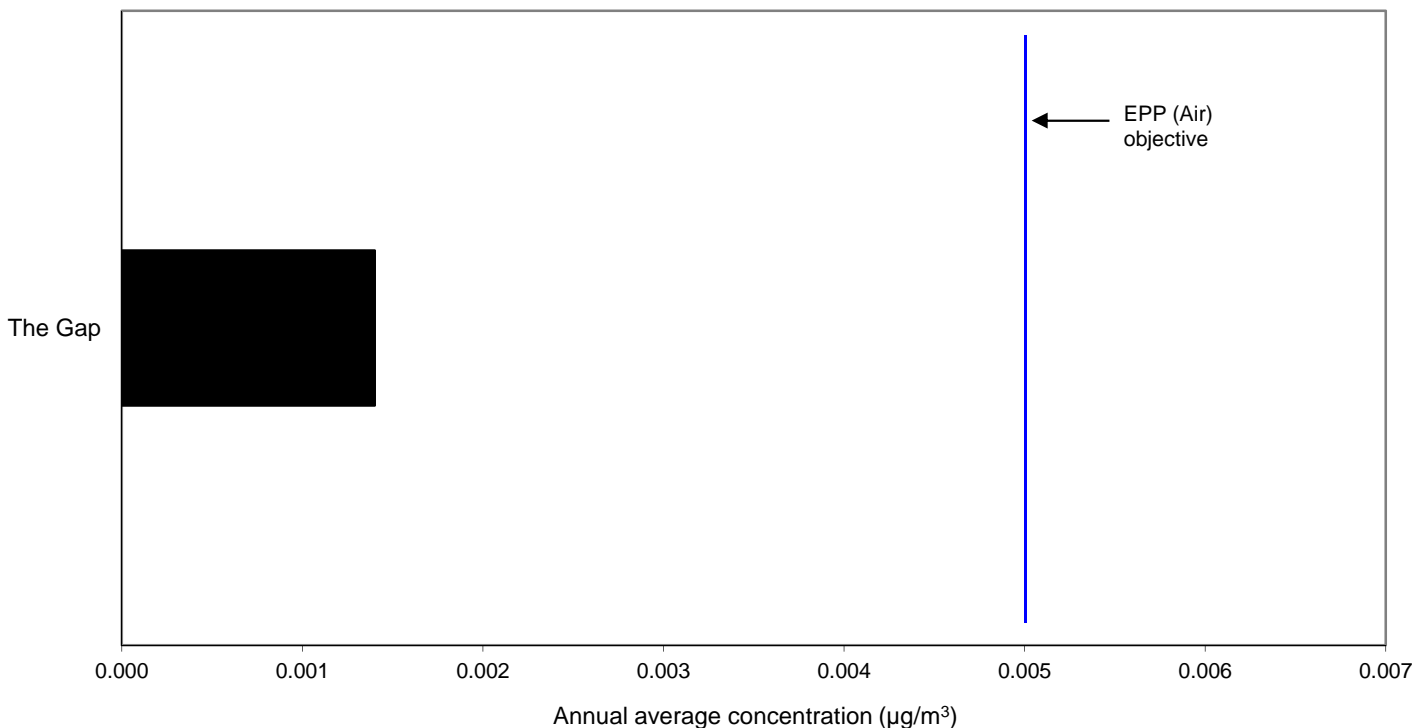


Table 22. Ambient concentrations of PM<sub>10</sub> cadmium. Annual average and monthly maximum 24-hour average concentrations (µg/m<sup>3</sup>), February 2015 to January 2016.

Site	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan
<b>Mount Isa</b>												
<b>The Gap</b>												
Annual average:	0.001											
Maximum 24-hour	0.007	0.004	<0.001	<0.001	0.001	<0.001	0.002	<0.001	0.003	0.010	0.021	0.015
% I.A.	100	100	100	100	100	100	100	100	100	100	100	100
% I.A. indicates instrument availability. - indicates less than three-fifths of the data are available. n.d. indicates no data are available. The <i>Environmental Protection (Air) Policy 2008</i> air quality objective for cadmium is an annual average of 0.005 µg/m <sup>3</sup> (measured as the total metal content in PM <sub>10</sub> particles). Monitoring conducted by the Queensland Government measures the amount of cadmium present in the TSP fraction (the TSP fraction is collected so lead levels can be compared against the EPP(Air) objective). Monitoring using co-located TSP and PM <sub>10</sub> high volume samplers has determined that the ratio of PM <sub>10</sub> cadmium to TSP cadmium is 0.76:1 in Mount Isa. The PM <sub>10</sub> cadmium values presented in this table have been generated by applying this factor to the measured TSP cadmium concentrations. The limit of reporting is the minimum measured cadmium concentration that can be determined with the monitoring instrumentation used. Cadmium concentrations below this limit are preceded by a "<" sign in the table. The annual average concentration has been calculated using half the minimum measurable concentration value for samples where no cadmium was detected.												

**Data Availability**

When required, Table 23 summarises the reasons for data availability below the minimum criteria for reporting at North Queensland monitoring sites.

Table 23. Reasons for low data availability at North Queensland ambient air monitoring sites during January 2016.

Station	Air Pollutant	Cause
Nil		

**Related air quality information**

Current hourly air quality data is available from the internet at [www.ehp.qld.gov.au/air/data/search.php](http://www.ehp.qld.gov.au/air/data/search.php).

Additional information on air quality monitoring and related issues is also available from the above website.

**Further information**

For further information about the data presented in this bulletin or related publications, contact:

Air Quality Monitoring  
 Environmental Monitoring and Assessment Sciences  
 Science Division  
 Department of Science, Information Technology and Innovation  
 Ecosciences Precinct  
 41 Boggo Rd  
 DUTTON PARK QLD 4102  
 Telephone (07) 3170 5477  
 Email: [air.sciences@dsitia.qld.gov.au](mailto:air.sciences@dsitia.qld.gov.au)

Figure 23. North Queensland ambient air quality monitoring station locations.

