Department of Science, Information Technology and Innovation

Air quality bulletin

North Queensland

December 2015

Queensland Government

Prepared by

Air Quality Monitoring
Environmental Monitoring and Assessment Sciences
Science Division
Department of Science, Information Technology and Innovation
PO Box 5078
Brisbane QLD 4001

Acknowledgements

This report has been prepared by the Department of Science, Information Technology and Innovation.
Acknowledgement is made of the following organisations that have supplied air quality monitoring data for this bulletin:
• Sun Metals Corporation
• Port of Townsville Limited

March 2016

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 December 2015. 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_{10} (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 Queenland 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 December 2015. 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 December. 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_{10}	TSP	Lead	Copper	Zinc	Nickel	Arsenic	Cadmium	Dustfall	Dustfall lead
Townsville													
Pimlico	✓	✓	✓	✓								✓	✓
Coast Guard				✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
North Ward (Warburton St)												✓	✓
Stuart (industry)			✓										
Mount Isa													
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_{10}, 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_{10} concentrations are also compared against the *National Environment Protection (Ambient Air Quality) Measure* (Air NEPM) annual standard.

Sulfur dioxide, PM_{10}, arsenic and cadmium levels in Mount Isa are also compared against the air quality limits specified in the *Transitional Environmental Program (TEP) Xstrata Mount Isa Mines (Air Quality).*

Copper and zinc levels present in TSP particles are compared against the Ontario Ministry of Environment ambient air quality criteria.

Limit values for TSP and dustfall specified in the Department of Environment and Heritage Protection (DEHP) guideline document *Application requirements for activities with impacts to Air* (Air Impacts Guideline) are used to assess dust nuisance levels.

The relevant guidelines are shown in the air quality summary table for each pollutant.

Compliance with air quality guidelines - Townsville

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

TSP levels exceeded the New Zealand dust nuisance trigger level at the Townsville Coast Guard monitoring site on 22 December 2015, with elevated dust levels measured during moderate to strong easterly winds. This wind direction indicates that activities taking place within the Port of Townsville may have contributed to this exceedence.

Table 2. Number of occasions during December when measured levels exceeded EPP (Air) objectives or Air NEPM standards for nitrogen dioxide, ozone, sulfur dioxide, PM_{10}, 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	*EPP (Air)*	
	Annual	0
	1-hour	0
Ozone	*EPP (Air)*	
	4-hour	0
	1-hour	0
Sulfur dioxide	*EPP (Air)*	
	Annual	0
	24-hour	0
	1-hour	0
PM_{10}	*Air NEPM*	
	Annual	0
	EPP (Air)	
	24-hour	0
TSP (24-hour period refers to dust nuisance, not health and wellbeing)	*EPP (Air)*	
	Annual	0
	DEHP limit	
	24-hour	1
TSP Lead	*EPP (Air)*	
	Annual	0
TSP Copper	*Ontario criterion*	
	24-hour	0
TSP Zinc	*Ontario criterion*	
	24-hour	0
PM_{10} Nickel	*EPP (Air)*	
	Annual	0
PM_{10} Arsenic	*EPP (Air)*	
	Annual	0
PM_{10} Cadmium	*EPP (Air)*	
	Annual	0
Dustfall (30-day period refers to dust nuisance, not health and wellbeing)	*DEHP limit*	
	30-day	0

Compliance with air quality guidelines - Mount Isa

During December, measured pollutant levels, with the exception of sulfur dioxide and PM_{10}, did not exceed the relevant air quality guideline at Queensland Government air monitoring sites in Mount Isa.

From April 2012 smelter operations in Mount Isa have been operating under a Transitional Environmental Program (TEP) which sets out a staged program of works to achieve compliance with air quality objectives set out in the *Environmental Protection (Air) Policy 2008* by December 2016. In 2015 the TEP requires smelter operations to achieve compliance with the limits in Table 4 at industry air monitoring sites in the Mount Isa community (note: the Queensland Government monitoring sites are not part of this network).

Sulfur dioxide levels exceeded the EPP (Air) 1-hour objective for two 1-hour periods at the Menzies monitoring site and three 1-hour periods at The Gap monitoring sites during December due to industry emissions. Sulfur dioxide levels at both the Menzies and The Gap monitoring sites complied with the TEP limits during December.

There have been no exceedences of the TEP 1-hour sulfur dioxide limit value at either the Menzies or The Gap monitoring sites since 1 January 2015.

Windblown dust generated by the passage of a low pressure trough led to an exceedence of the EPP (Air) 24-hour objective / TEP limit value for PM_{10} at The Gap monitoring site on 12 December. On this day winds blew predominantly from the south-east, indicating that industry emissions were unlikely to have contributed significantly to this exceedence.

There have been six exceedences of the TEP PM_{10} limit value since 1 January 2015. Only two of these exceedences have occurred during wind conditions where industry emissions may have contributed to the exceedence.

Lead levels at The Gap monitoring site over the 12-month period ending December 2015 complied with the EPP (Air) objective.

The average PM_{10} arsenic concentration at The Gap monitoring site over the 12-month period ending December 2015 complied with both the EPP (Air) objective and TEP limit value.

Cadmium levels at The Gap monitoring site over the 12-month period ending December 2015 complied with both the EPP (Air) objective and the TEP limit value.

Table 3. Number of occasions during December when measured levels exceeded EPP (Air) objectives or Air NEPM standards for sulfur dioxide, PM_{10}, lead, arsenic and cadmium, and the TEP limits for sulfur dioxide, PM_{10}, arsenic and cadmium at Queensland Government air monitoring sites in Mount Isa.

Pollutant	Averaging Period	Exceedences
Sulfur dioxide	*EPP (Air)*	
	Annual	0
	24-hour	0
	1-hour	5
	TEP	
	Annual	0
	1-hour	0
PM_{10}	*Air NEPM*	
	Annual	0
	EPP (Air) / TEP	
	24-hour	1
TSP Lead	*EPP (Air)*	
	Annual	0
PM_{10} Arsenic	*EPP (Air)*	
	Annual	0
	TEP	
	Annual	0
PM_{10} Cadmium	*EPP (Air)*	
	Annual	0
	TEP	
	Annual	0

Table 4. Transitional Environmental Program (TEP) air quality limits applying to smelter operations in Mount Isa

Pollutant	Averaging period	Limit value	Number of allowable exceedences	Period when limit value applies
Sulfur dioxide	Annual	57 µg/m^3 [(a)] (= 0.020 ppm)	Nil	21 April 2012 to 31 December 2016
	1-hour	2500 µg/m^3 [(b)] (= 0.955 ppm)	3 events per calendar year	
PM_{10}	24-hour	50 µg/m^3	7 days	1 January to 31 December 2015
Arsenic	Annual	0.017 µg/m^3	Nil	1 January to 31 December 2015
Cadmium	Annual	0.007 µg/m^3	Nil	1 January 2014 to 31 December 2016

[(a)] measured at 0°C, [(b)] measured at 25°C

Measured ambient concentrations - Townsville

Nitrogen dioxide

Figure 1. Ambient concentrations of nitrogen dioxide at the Pimlico site. Daily maximum 1-hour average concentrations (ppm), December 2015.

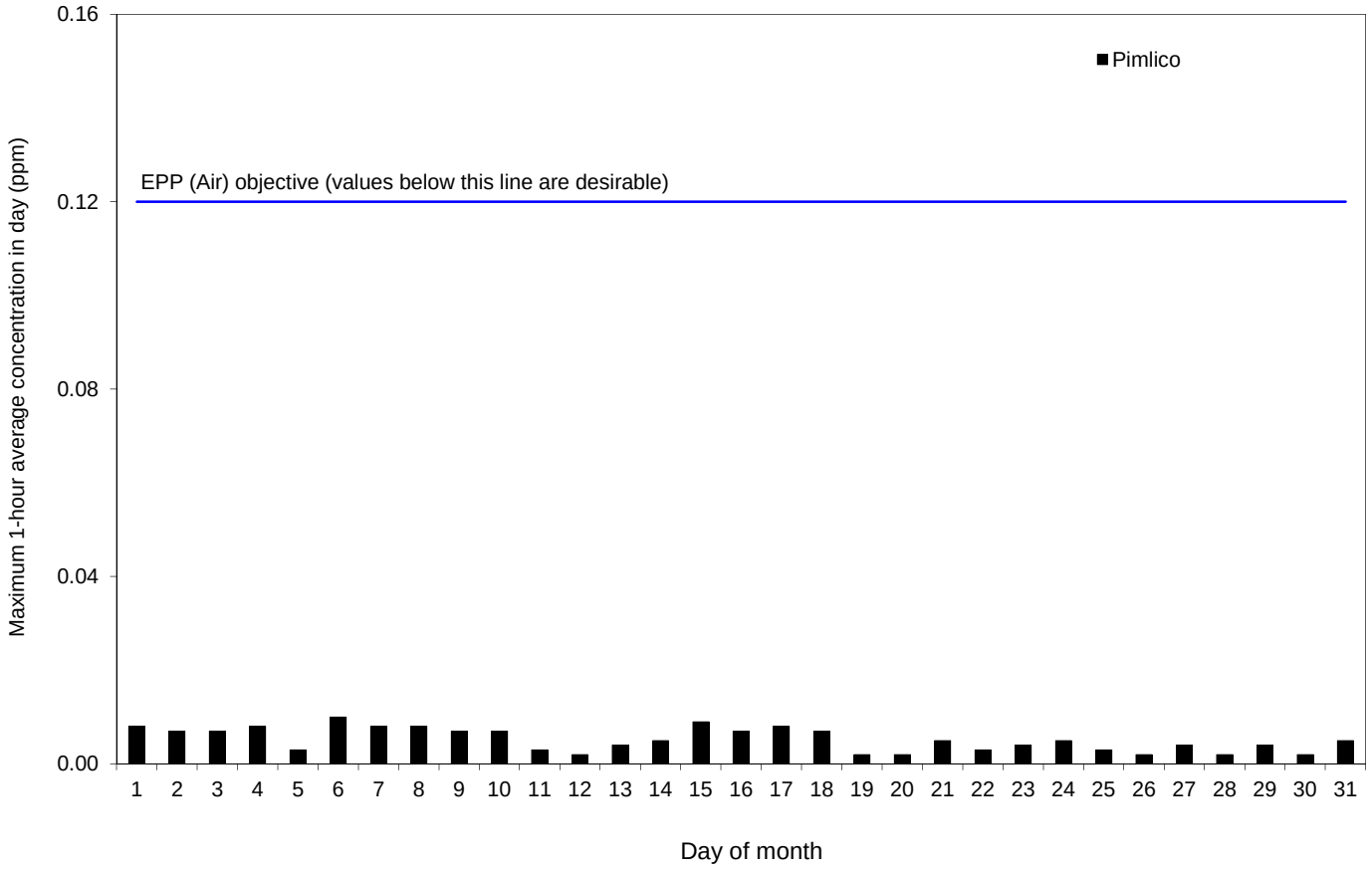

Table 5. Ambient concentrations of nitrogen dioxide. Annual average and monthly maximum 1-hour concentrations (ppm), January 2015 to December 2015.

Site		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Townsville													
Pimlico													
Annual average:	0.004												
Maximum 1-hour		0.012	0.014	0.014	0.031	0.028	0.028	0.031	0.040	0.025	0.015	0.011	0.010
% I.A.		79	98	98	98	94	98	98	97	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 *Environmental Protection (Air) Policy 2008* 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), December 2015.

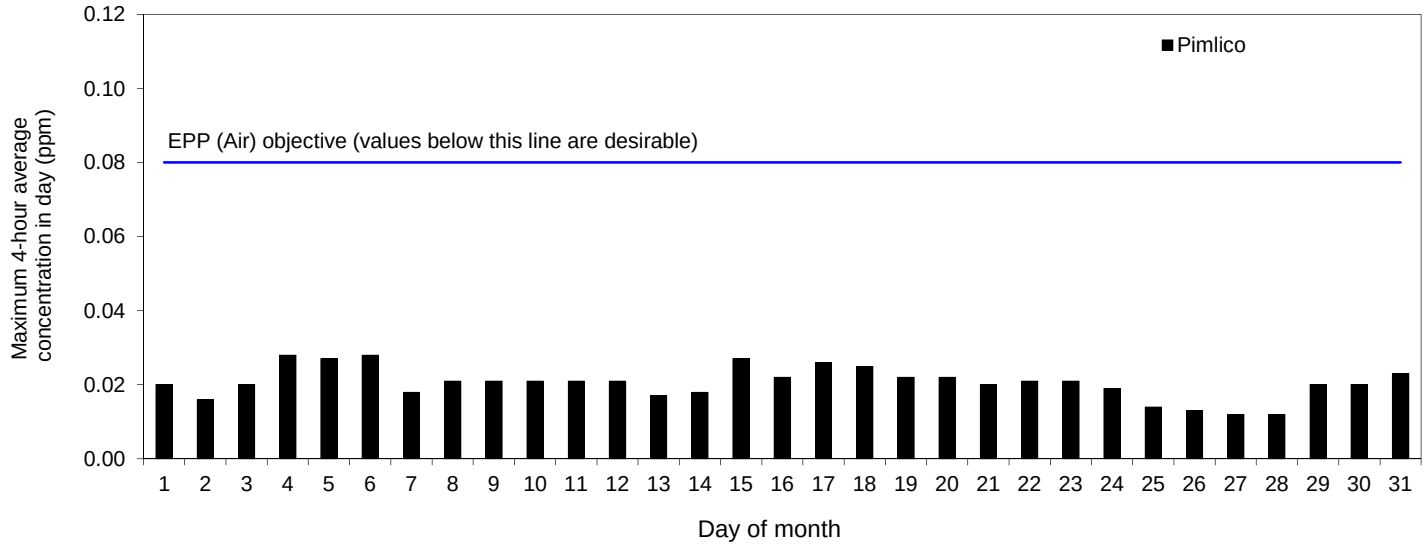

Figure 3. Ambient concentrations of ozone at the Pimlico site. Daily maximum 1-hour average concentrations (ppm), December 2015.

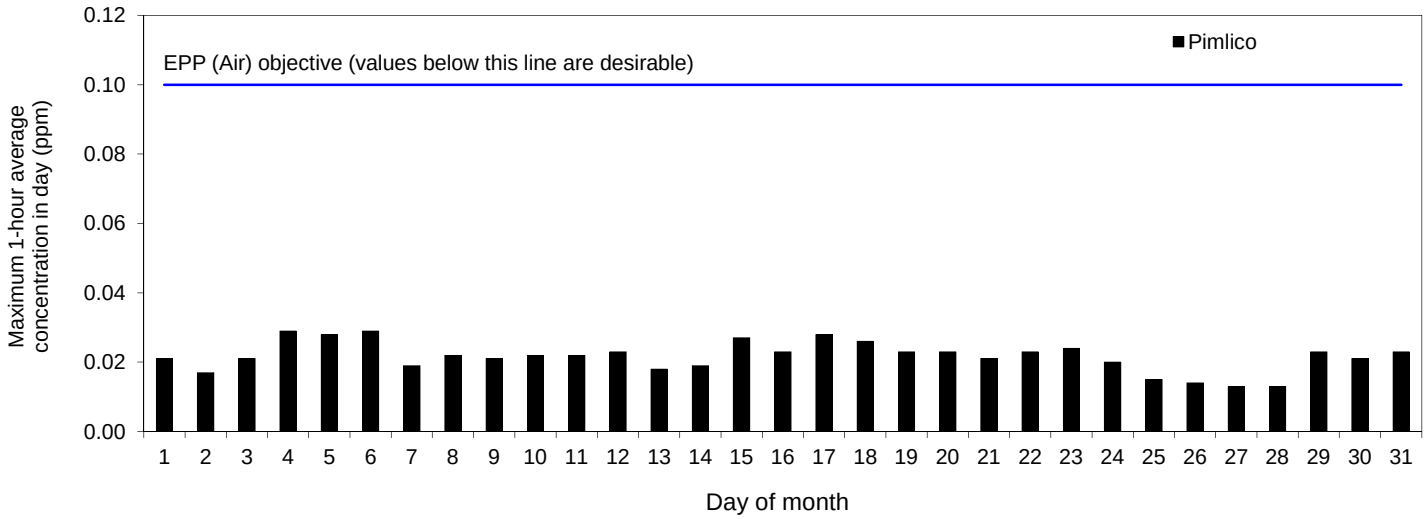

Table 6. Ambient concentrations of ozone. Monthly maximum 4-hour and 1-hour concentrations (ppm), January 2015 to December 2015.

Site	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Townsville												
Pimlico												
Maximum 4-hour	0.035	0.031	0.033	0.037	0.036	0.042	0.041	0.043	0.049	0.039	0.035	0.028
Maximum 1-hour	0.037	0.033	0.034	0.040	0.040	0.045	0.043	0.049	0.051	0.043	0.040	0.029
% I.A.	98	98	98	98	94	98	98	97	98	96	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 *Environmental Protection (Air) Policy 2008* air quality objectives for ozone are a 4-hour average of 0.080 ppm (not to be exceeeded on more than one day per year) and a 1-hour average of 0.100 ppm (not to be exceeeded 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), December 2015.

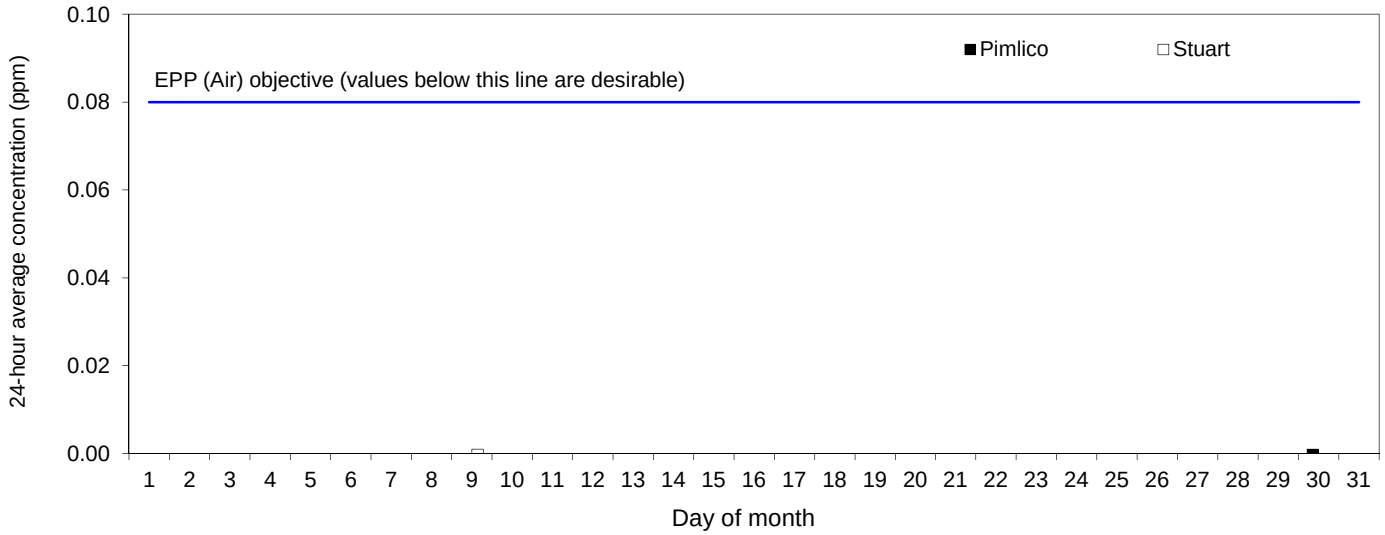

Figure 5. Ambient concentrations of sulfur dioxide at Pimlico and Stuart sites. Daily maximum 1-hour average concentrations (ppm), December 2015.

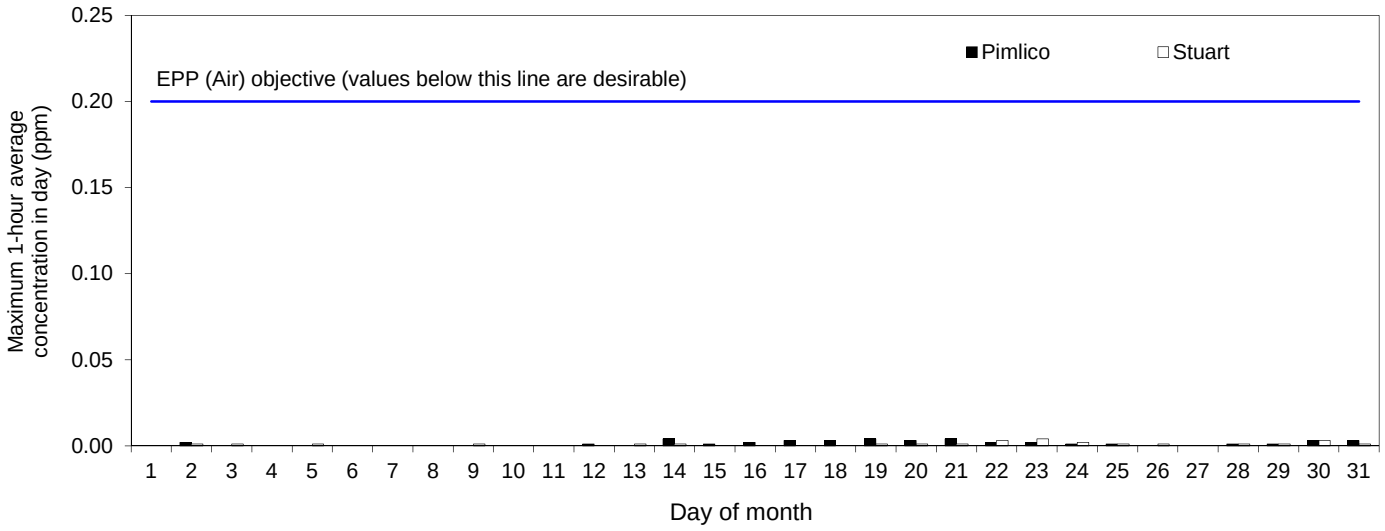

Table 7. Ambient concentrations of sulfur dioxide. Annual average and monthly maximum 24-hour and 1-hour average concentrations (ppm), January 2015 to December 2015.

Site	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Townsville												
Pimlico												
Annual average: 0.001												
Maximum 24-hour	0.001	0.003	0.002	0.002	0.003	0.001	0.001	0.001	0.001	0.001	0.000	0.001
Maximum 1-hour	0.003	0.004	0.003	0.004	0.004	0.003	0.004	0.003	0.003	0.002	0.001	0.004
% I.A.	98	98	98	98	94	98	98	97	98	98	98	98
Stuart (industry-operated site)												
Annual average: -												
Maximum 24-hour	-	0.001	0.001	0.001	-	n.d.	n.d.	0.001	0.002	0.000	0.002	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
% I.A.	40	64	80	91	51	0	0	87	98	98	92	98

% 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 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_{10}

Figure 6. Ambient concentrations of PM_{10} at Pimlico and Coast Guard sites. Daily 24-hour average concentrations (µg/m^3), December 2015.

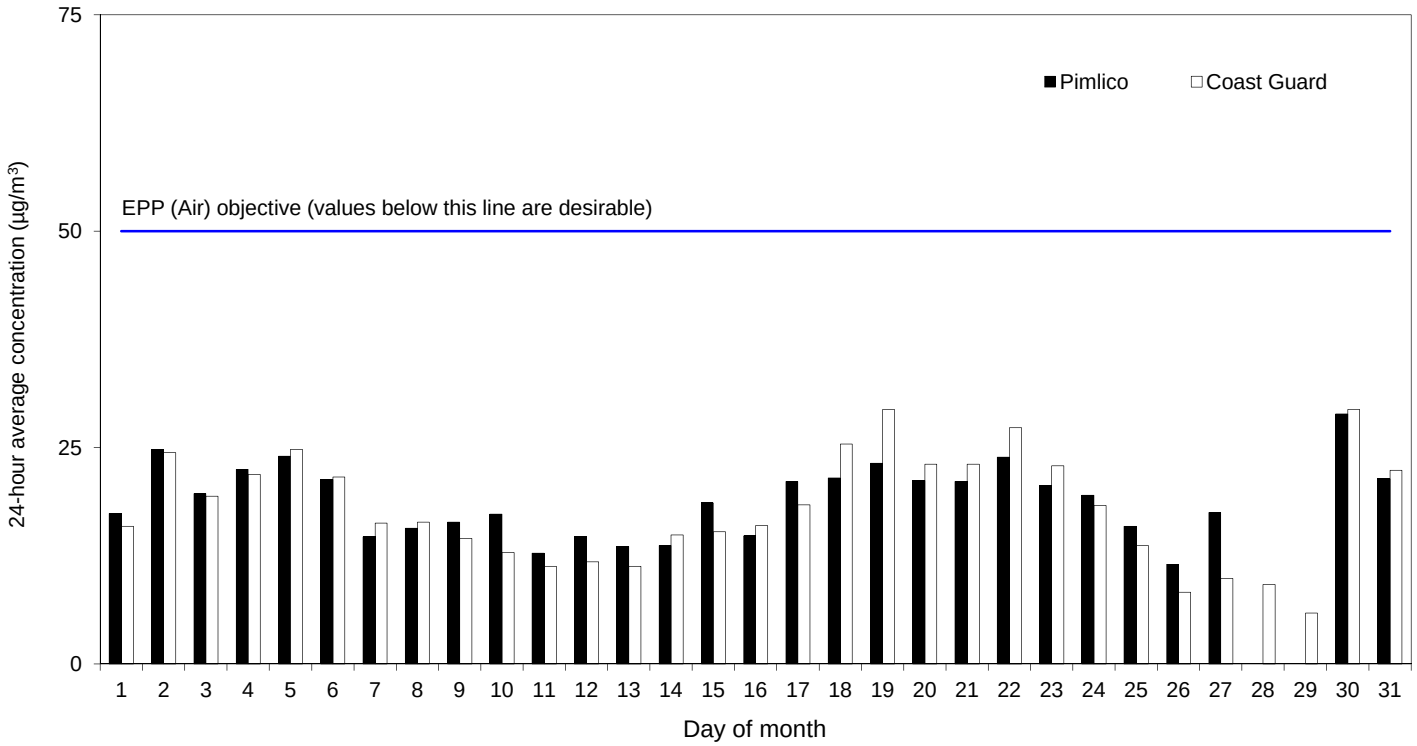

Table 8. Ambient concentrations of PM_{10}. Annual average and monthly maximum 24-hour average concentrations (µg/m^3), January 2015 to December 2015.

Site		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Townsville													
Pimlico													
Annual average:	17.6												
Maximum 24-hour		20.7	25.5	21.1	21.9	25.7	30.0	28.8	31.8	36.6	42.0	25.7	28.9
% I.A.		95	92	87	88	94	99	100	98	97	86	95	92
Coast Guard													
Annual average:	19.6												
Maximum 24-hour		30.6	28.7	29.7	37.5	38.1	34.9	31.6	30.5	35.7	35.0	26.5	29.4
% I.A.		89	96	98	94	97	100	99	100	88	98	99	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 PM_{10} is a 24-hour average of 50 µg/m^3 (not to be exceeded on more than five days per year).

The *National Environment Protection (Ambient Air Quality) Measure* standards for PM_{10} are an annual average of 25 µg/m^3 and a 24-hour average of 50 µg/m^3.

TSP

Figure 7. Ambient concentrations of TSP (continuous monitoring) at the Coast Guard site. Daily 24-hour average concentrations (µg/m^3), December 2015.

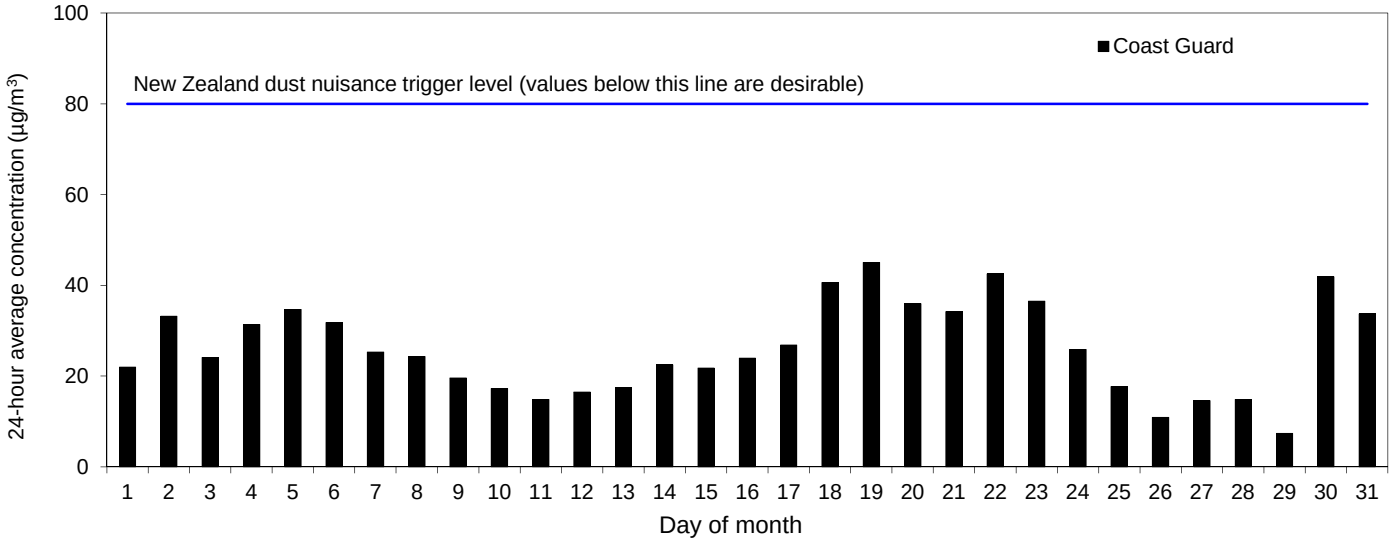

Figure 8. Ambient concentrations of TSP (one day in six monitoring) at the Coast Guard site. 24-hour average concentrations (µg/m^3), December 2015.

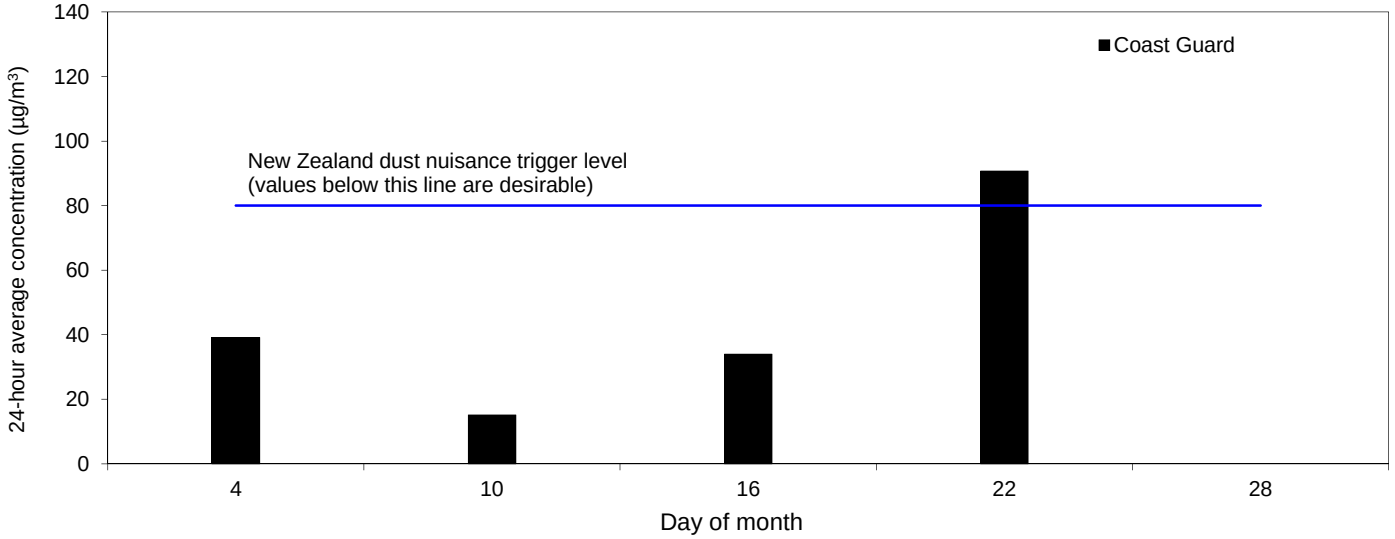

Table 9. Ambient concentrations of TSP. Annual average and monthly maximum 24-hour average concentrations (µg/m^3), January 2015 to December 2015.

Site	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Townsville												
Coast Guard (continuous monitoring)												
Annual average: 29.0												
Maximum 24-hour	44.0	45.8	43.9	60.4	71.9	41.4	56.6	53.8	55.8	73.9	34.6	45.1
% I.A.	89	97	98	94	96	90	93	99	89	94	99	100
Coast Guard (one day in six monitoring)												
Annual average: 36.9												
Maximum 24-hour	40.2	44.4	55.2	63.3	57.0	44.9	48.8	64.5	76.7	64.4	33.1	90.7
% I.A.	100	100	100	100	100	80	100	80	67	100	100	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 µg/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 µg/m^3.

TSP Lead

Figure 9. Ambient concentrations of TSP lead (one day in six monitoring) at the Coast Guard site. Annual average concentration (µg/m^3), January 2015 to December 2015.

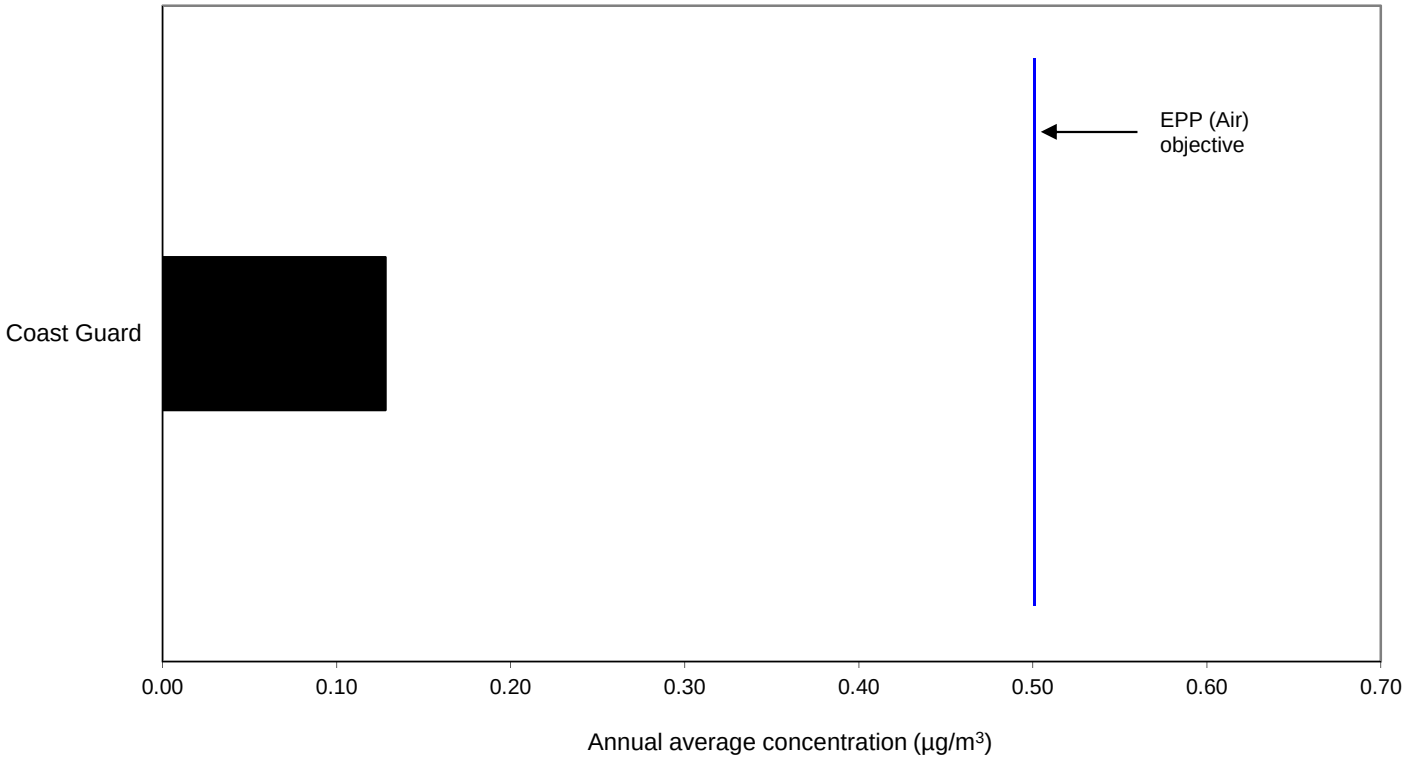

Table 10. Ambient concentrations of TSP lead. Annual average and monthly maximum 24-hour average concentrations (µg/m^3) for one day in six monitoring, January 2015 to December 2015.

Site		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Townsville													
Coast Guard													
Annual average:	0.13												
Maximum 24-hour		0.21	0.17	0.62	0.43	0.11	0.21	0.11	0.10	0.24	0.19	1.29	0.31
% I.A.		100	100	100	100	100	80	100	80	67	100	100	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 lead is an annual average of 0.5 µg/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 (µg/m^3), December 2015.

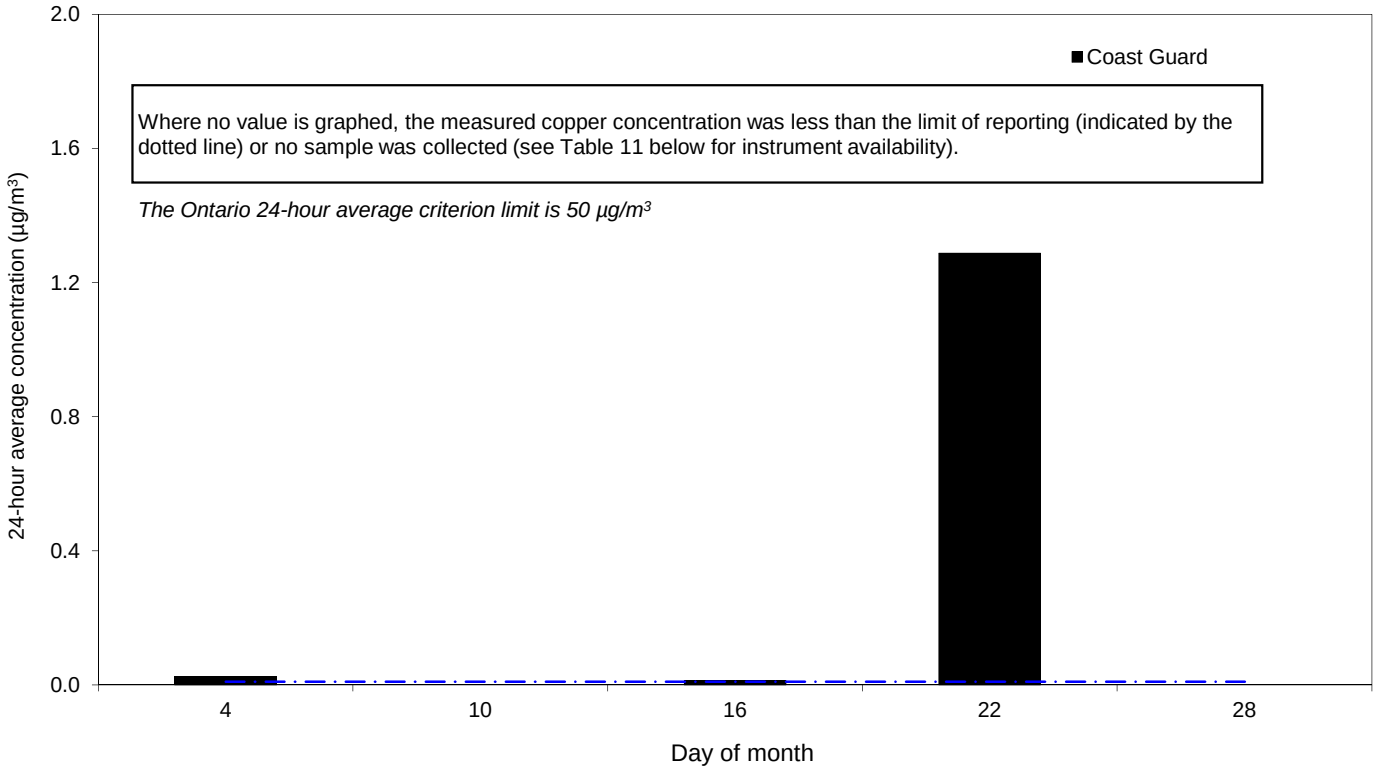

Table 11. Ambient concentrations of TSP copper. Monthly maximum 24-hour average concentrations (µg/m^3) for one day in six monitoring, January 2015 to December 2015.

Site	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Townsville												
Coast Guard												
Maximum 24-hour	0.02	0.08	1.71	0.91	0.05	0.04	0.07	0.18	0.07	0.04	0.02	1.29
% I.A.	100	100	100	100	100	80	100	80	67	100	100	80

% 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 µg/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 (µg/m^3), December 2015.

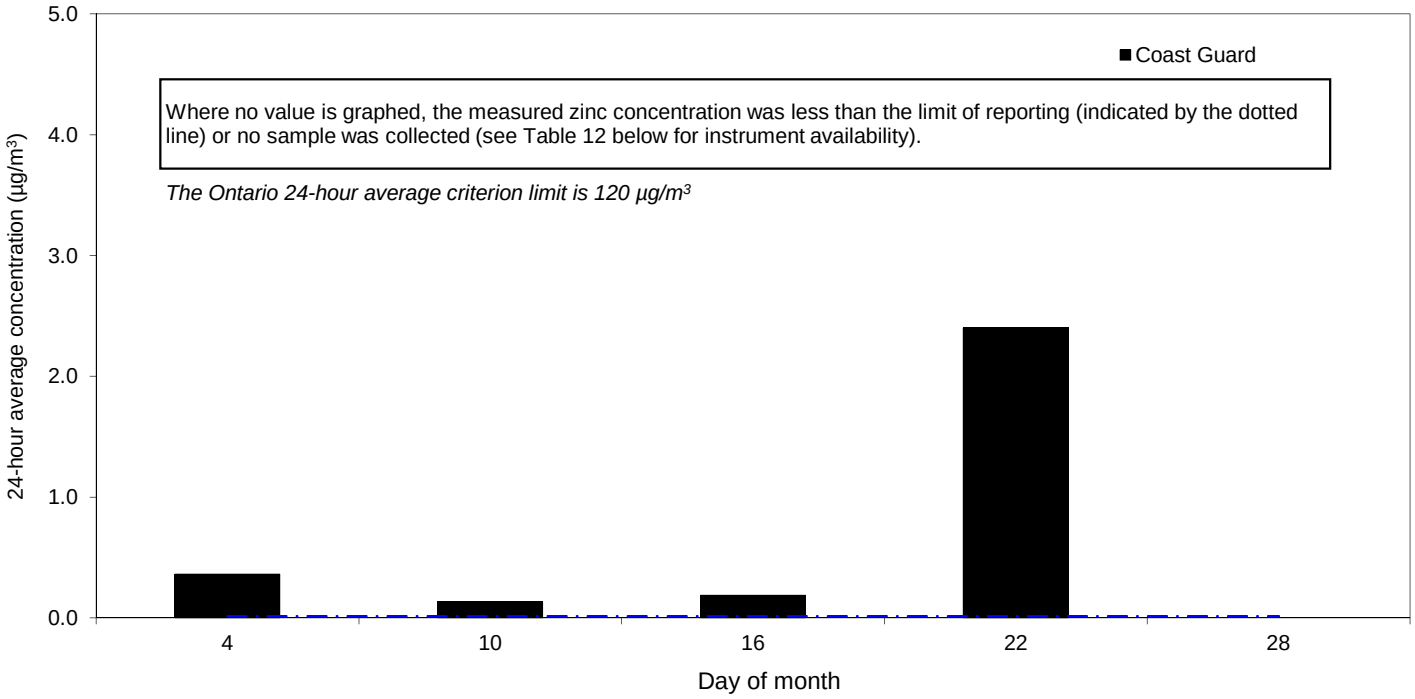

Table 12. Ambient concentrations of TSP zinc. Monthly maximum 24-hour average concentrations (µg/m^3) for one day in six monitoring, January 2015 to December 2015.

Site	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Townsville												
Coast Guard												
Maximum 24-hour	0.46	1.90	3.16	2.28	1.60	1.90	0.57	0.55	3.09	0.86	0.64	2.40
% I.A.	100	100	100	100	100	80	100	80	67	100	100	80

% 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 µg/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 (µg/m^3), January 2015 to December 2015.

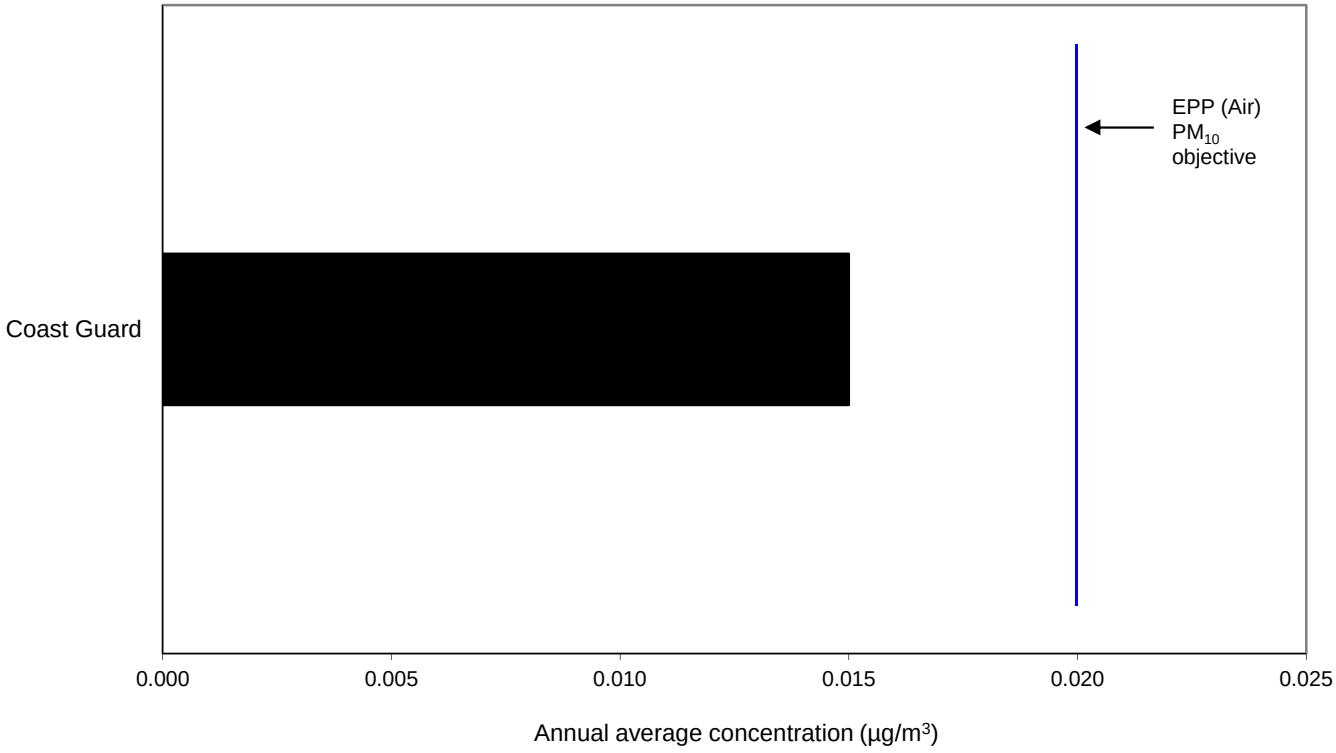

Table 13. Ambient concentrations of TSP nickel. Annual average and monthly maximum 24-hour average concentrations (µg/m^3) for one day in six monitoring, January 2015 to December 2015.

Site		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Townsville													
Coast Guard													
Annual average:	0.015												
Maximum 24-hour		0.033	0.040	0.052	0.027	<0.010	0.016	<0.010	0.054	0.033	0.047	0.047	0.056
% I.A.		100	100	100	100	100	80	100	80	67	100	100	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 nickel is an annual average of 0.020 µg/m^3 (measured as the total metal content in PM_{10} particles).

Monitoring conducted by the Queensland Government measures the amount of nickel present in the TSP fraction. As PM_{10} is a subset of TSP, if the TSP nickel concentration is less than the EPP (Air) PM_{10} objective value, it follows that the 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 (µg/m^3), January 2015 to December 2015.

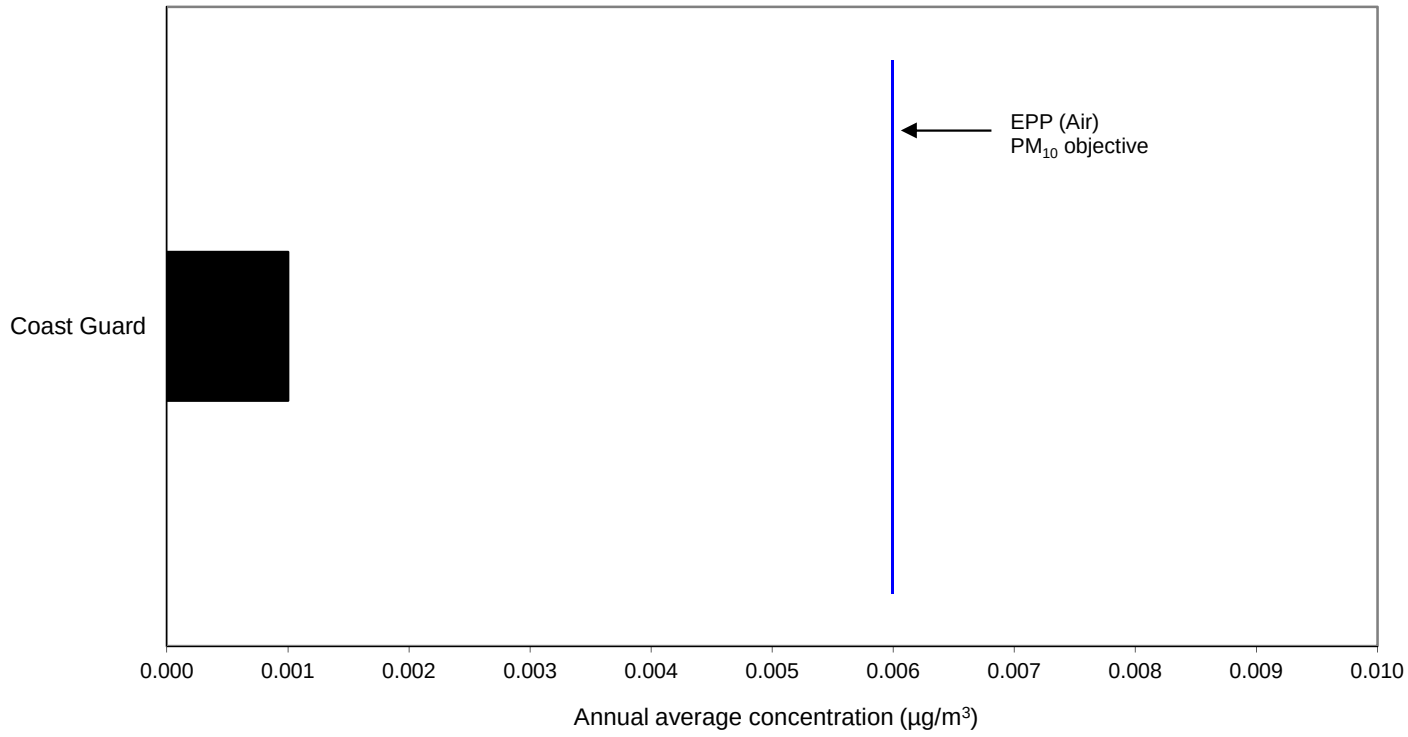

Table 14. Ambient concentrations of TSP arsenic. Annual average and monthly maximum 24-hour average concentrations (µg/m^3) for one day in six monitoring, January 2015 to December 2015.

Site		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Townsville													
Coast Guard													
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	100	80	100	80	67	100	100	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 arsenic is an annual average of 0.006 µg/m^3 (measured as the total metal content in PM_{10} particles).

Monitoring conducted by the Queensland Government measures the amount of arsenic present in the TSP fraction. As PM_{10} is a subset of TSP, if the TSP arsenic concentration is less than the EPP (Air) PM_{10} objective value, it follows that the 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 (µg/m^3), January 2015 to December 2015.

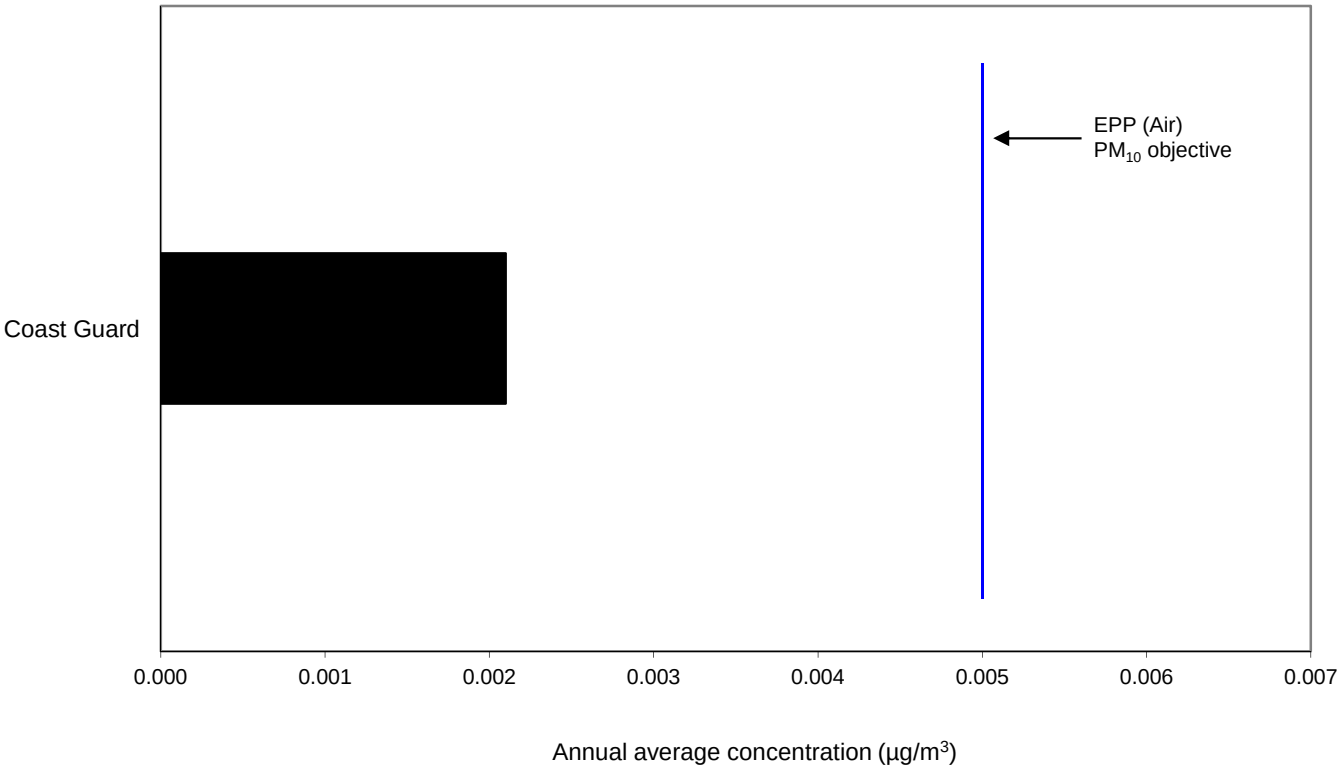

Table 15. Ambient concentrations of TSP cadmium. Annual average and monthly maximum 24-hour average concentrations (µg/m^3) for one day in six monitoring, January 2015 to December 2015.

Site		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Townsville													
Coast Guard													
Annual Average	0.0021												
Maximum 24-hour		0.002	0.005	0.015	0.007	0.004	0.006	0.002	0.002	0.009	0.003	0.004	0.006
% I.A.		100	100	100	100	100	80	100	80	67	100	100	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 cadmium is an annual average of 0.005 µg/m^3 (measured as the total metal content in PM_{10} particles).

Monitoring conducted by the Queensland Government measures the amount of cadmium present in the TSP fraction. As PM_{10} is a subset of TSP, if the TSP cadmium concentration is less than the EPP (Air) PM_{10} objective value, it follows that the 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 (mg/m^2/day) for month of December 2015.

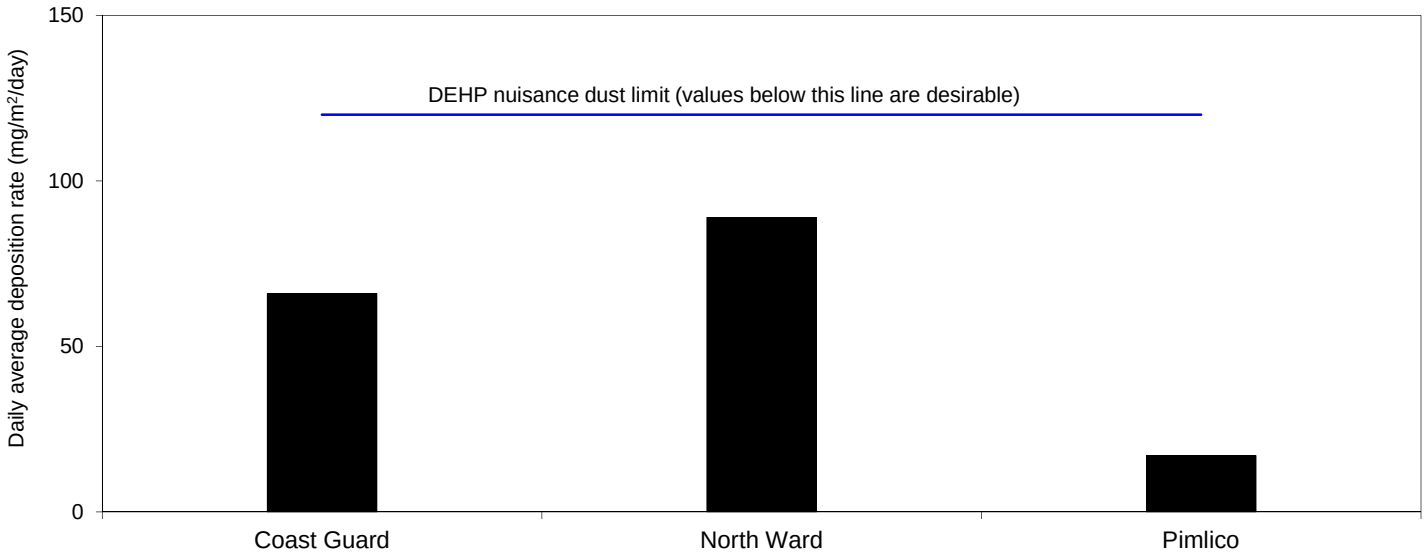

Table 16. Daily average dust (insoluble solids fraction) deposition rate (mg/m^2/day), January 2015 to December 2015.

Site	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Townsville												
Coast Guard												
Daily average	31	56	45	47	53	46	30	46	241	80	91	66
North Ward (Warburton St)												
Daily average	17	111	123	141	217	171	158	204	197	n.d.	165	89
Pimlico												
Daily average	n.d.	30	10	13	20	11	7	40	21	17	15	17

n.d. indicates no data are available.

The Department of Environment and Heritage Protection Air Impacts Guideline recommends a dust deposition limit of 120 mg/m^2/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 (µg/m^2/day) for month of December 2015.

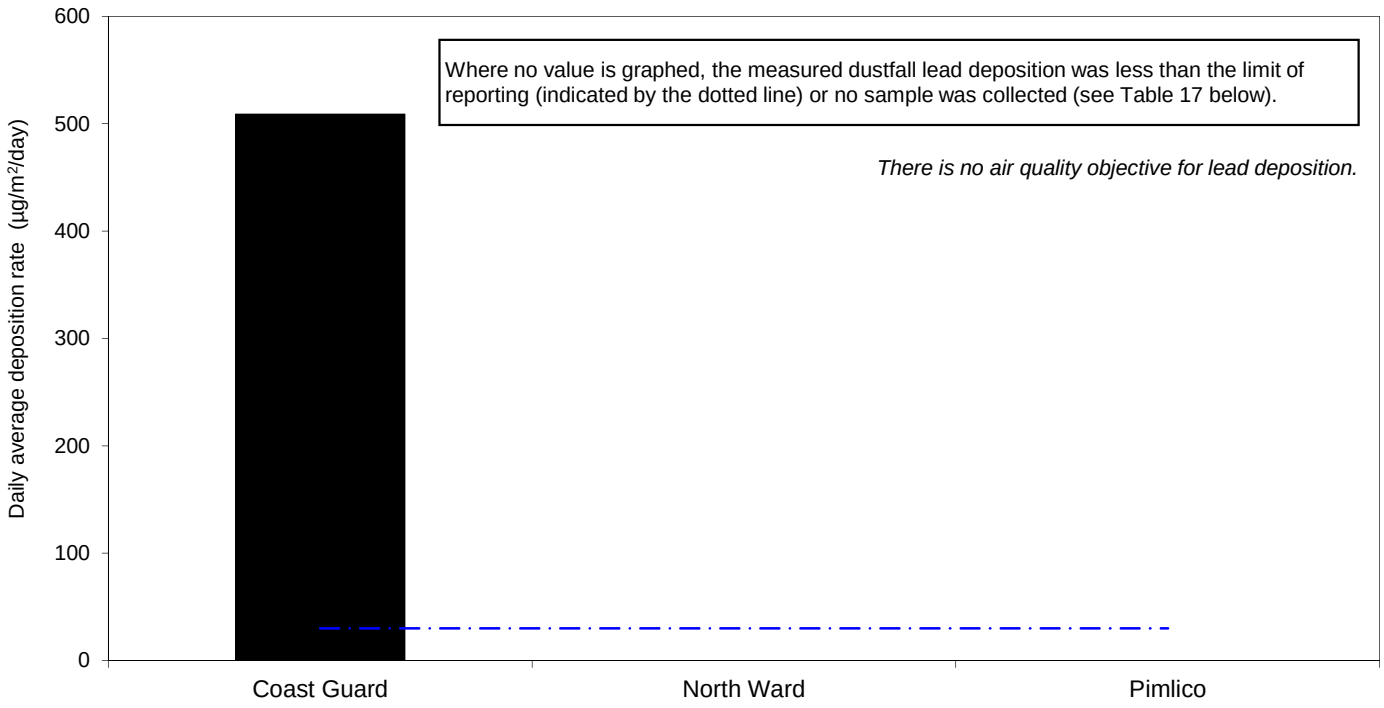

Table 17. Daily average lead deposition rate (µg/m^2/day), January 2015 to December 2015.

Site		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Townsville													
Coast Guard													
Annual average:	324												
Daily average		314	481	387	313	167	136	85	154	262	606	400	509
North Ward (Warburton St)													
Annual average:	<30												
Daily average		<29	<37	<32	<31	<33	<36	<30	<36	<34	n.d.	<29	<29
Pimlico													
Annual average:	<30												
Daily average		n.d.	<37	<32	<31	<33	<36	<24	<50	<34	<29	<29	<29

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 µg/m^2/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), December 2015.

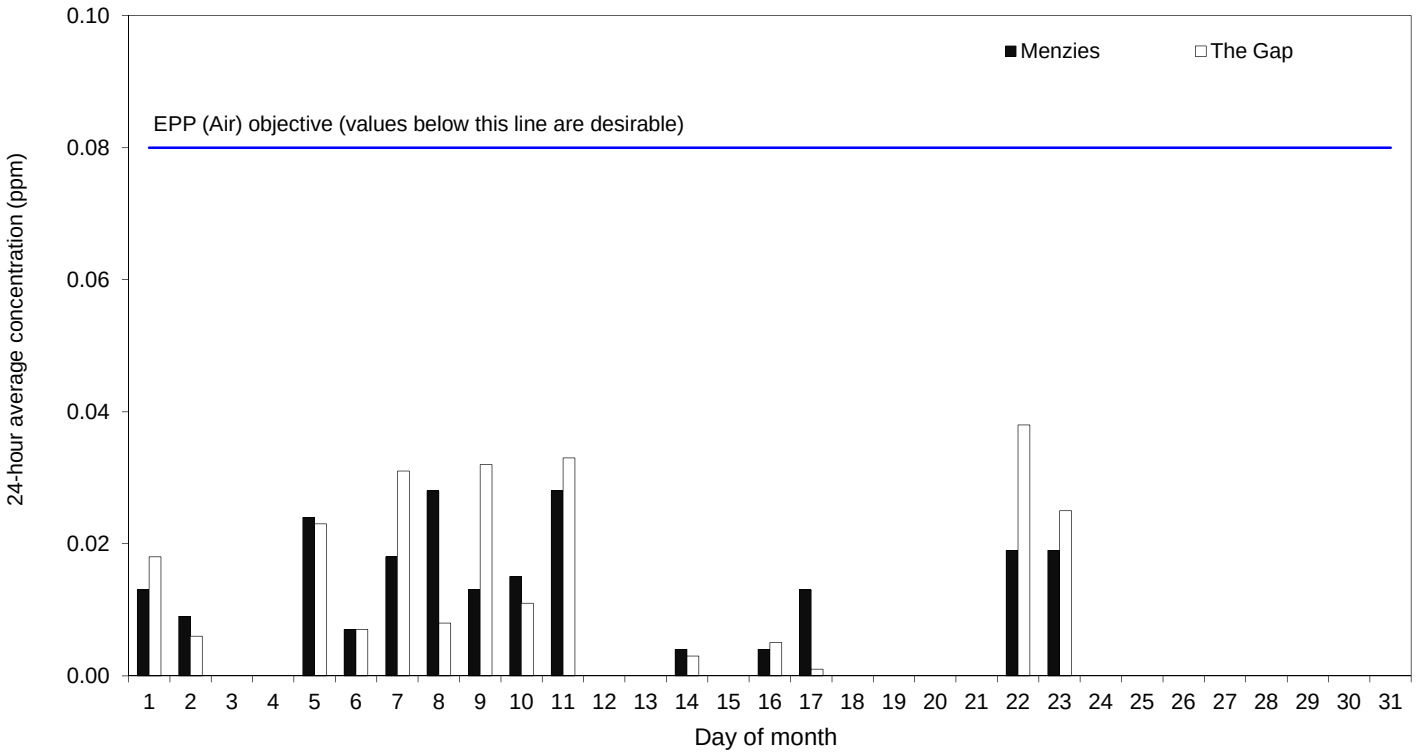

Figure 18. Ambient concentrations of sulfur dioxide at the Menzies and The Gap sites. Daily maximum 1-hour average concentrations (ppm), December 2015.

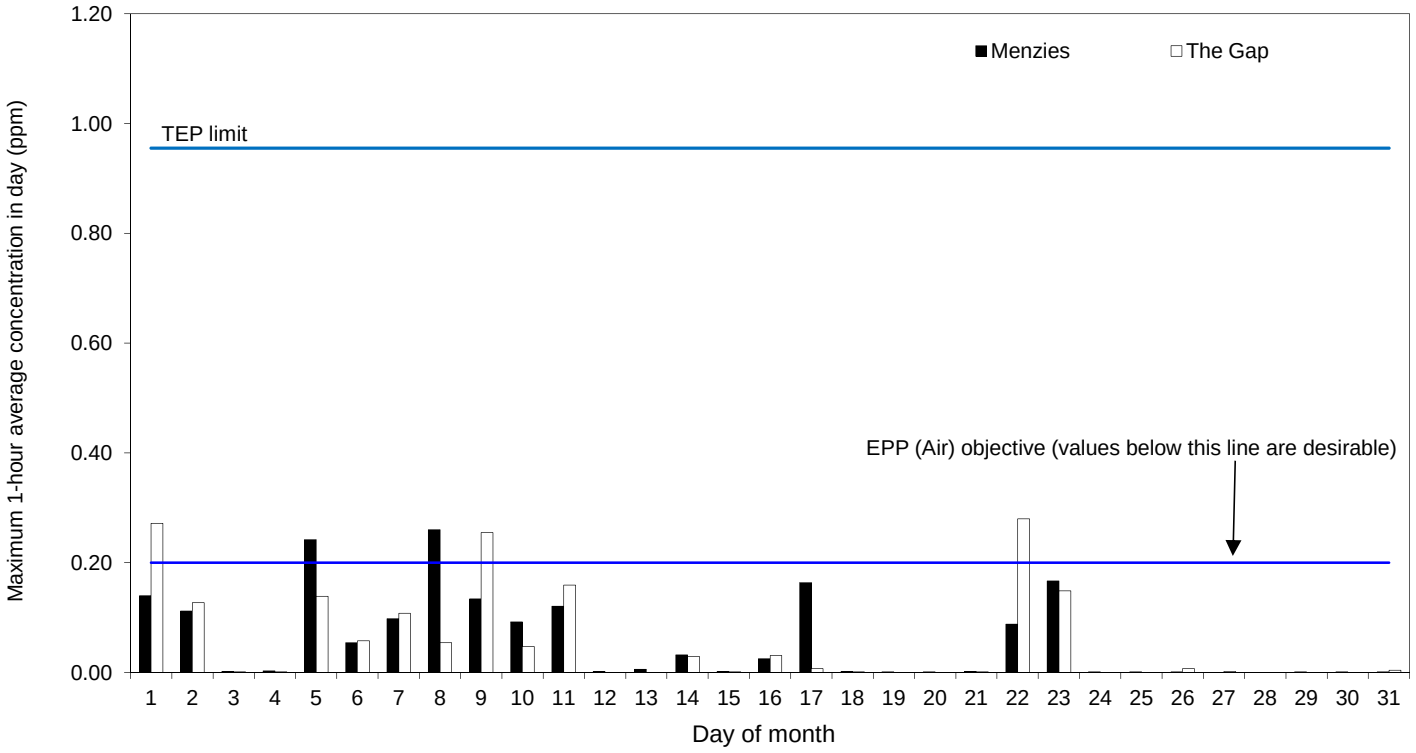

Table 18. Ambient concentrations of sulfur dioxide. Annual average and monthly maximum 24-hour and 1-hour average concentrations (ppm), January 2015 to December 2015.

Site		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Mount Isa													
Menzies													
Annual average:	0.006												
Maximum 24-hour		0.081	0.106	0.045	0.037	0.031	0.006	0.047	0.035	0.037	0.040	0.079	0.028
Maximum 1-hour		0.512	0.428	0.468	0.276	0.245	0.050	0.577	0.285	0.216	0.371	0.466	0.260
% I.A.		98	98	98	98	98	98	98	98	98	97	98	98
The Gap													
Annual average:	0.004												
Maximum 24-hour		0.045	0.035	0.036	0.016	0.034	0.004	0.030	0.022	0.021	0.056	0.044	0.038
Maximum 1-hour		0.341	0.231	0.383	0.123	0.340	0.067	0.335	0.212	0.141	0.463	0.494	0.280
% I.A.		98	98	98	98	98	98	98	98	98	96	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 *Environmental Protection (Air) Policy 2008* 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).

The Transitional Environmental Program (TEP) air quality limits for sulfur dioxide are an annual average of 0.020 ppm and a maximum 1-hour average of 0.955 ppm, not to be exceeded more than three times during 2015.

PM_{10}

Figure 19. Ambient concentrations of PM_{10} at The Gap site. Daily 24-hour average concentrations (µg/m^3), December 2015.

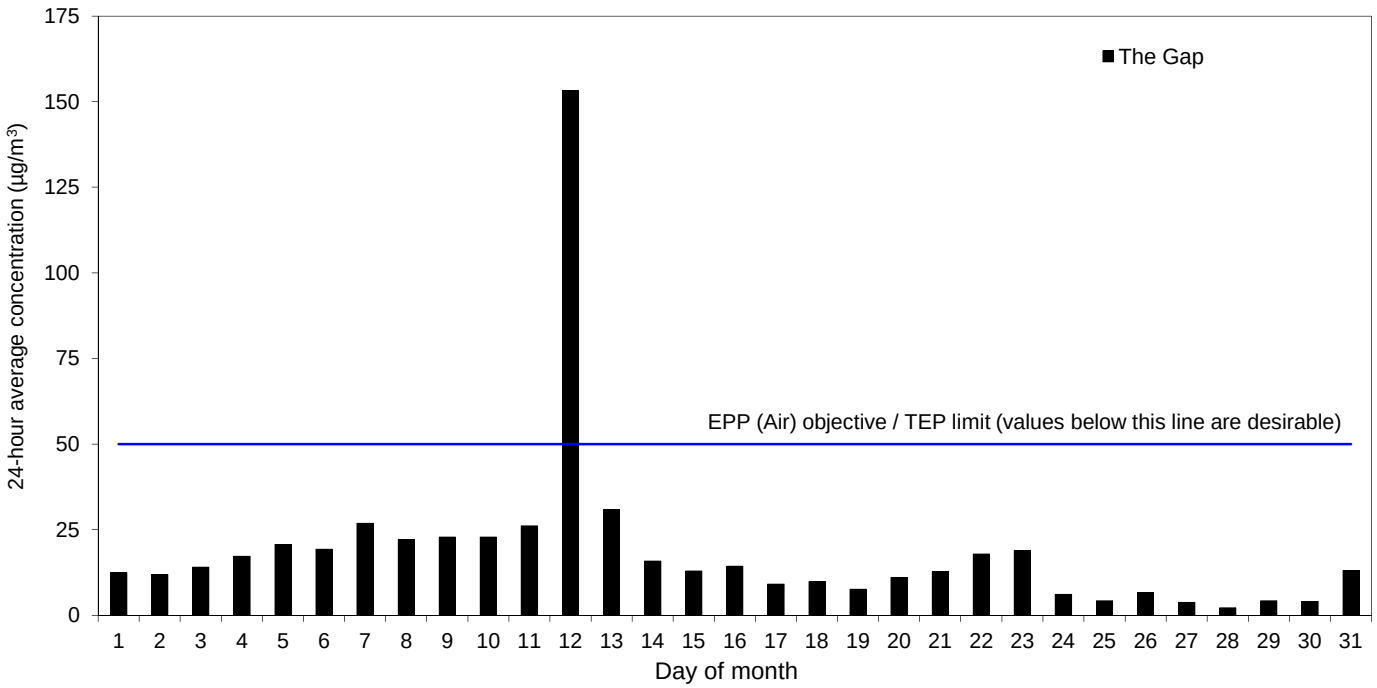

Table 19. Ambient concentrations of PM_{10}. Annual average and monthly maximum 24-hour average concentrations (µg/m^3), January 2015 to December 2015.

Site		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Mount Isa													
The Gap													
Annual average:	19.5												
Maximum 24-hour		65.3	45.7	47.7	37.7	56.9	29.0	37.9	50.0	59.7	40.6	54.2	153.3
% I.A.		96	97	99	100	100	93	100	99	100	99	100	97

% 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_{10} is a 24-hour average of 50 µg/m^3 (not to be exceeded on more than five days per year).

The *National Environment Protection (Ambient Air Quality) Measure* standards for PM_{10} are an annual average of 25 µg/m^3 and a 24-hour average of 50 µg/m^3.

The Transitional Environmental Program air quality limit for PM_{10} is a maximum 24-hour average of 50 µg/m^3, not to be exceeded on more than seven days between 1 January 2015 and 31 December 2015.

TSP Lead

Figure 20. Ambient concentrations of TSP lead at The Gap site. Annual average concentration (µg/m^3), January 2015 to December 2015.

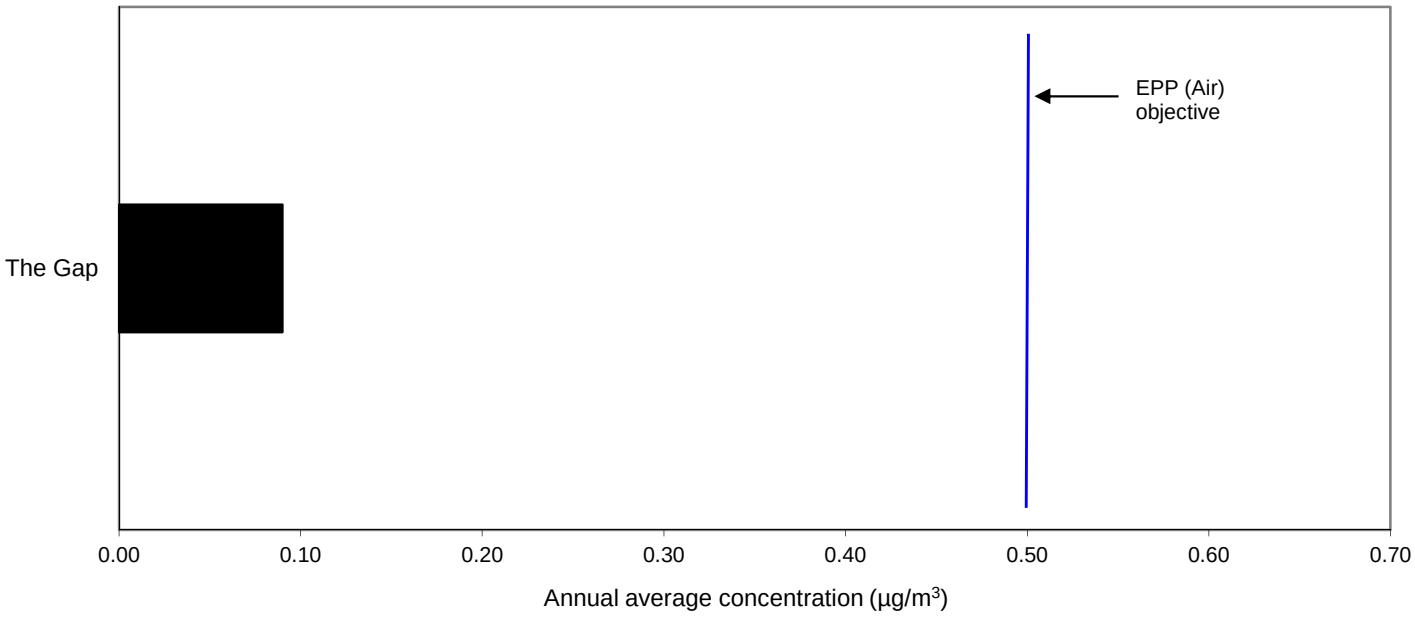

Table 20. Ambient concentrations of TSP lead. Annual average and monthly maximum 24-hour average concentrations (µg/m^3), January 2015 to December 2015.

Site		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Mount Isa													
The Gap													
Annual average:	0.09												
Maximum 24-hour		0.27	0.39	0.23	0.02	0.02	0.03	0.03	0.14	0.10	0.15	1.28	0.95
% 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 lead is an annual average of 0.5 µg/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.

PM_{10} Arsenic

Figure 21. Ambient concentrations of PM_{10} arsenic at The Gap site. Annual average concentration (µg/m^3), January 2015 to December 2015.

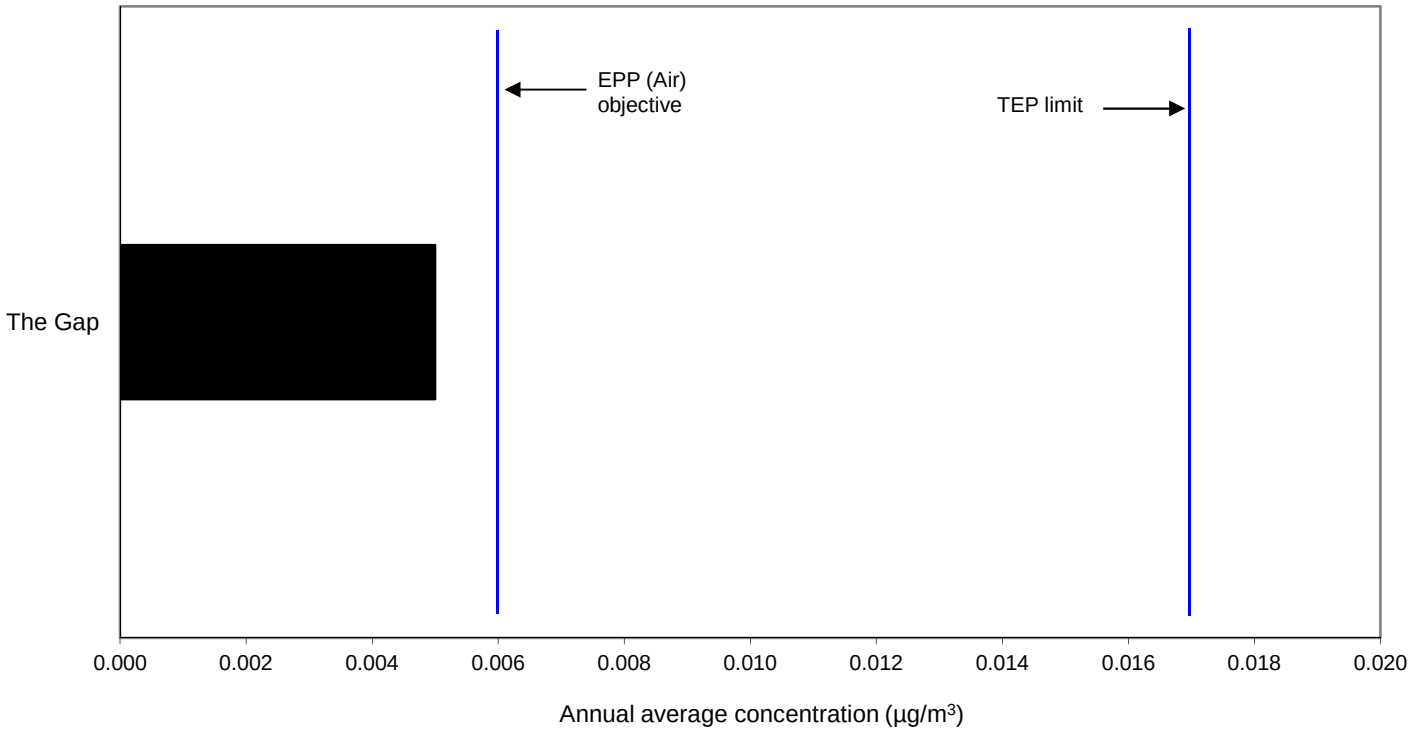

Table 21. Ambient concentrations of PM_{10} arsenic. Annual average and monthly maximum 24-hour average concentrations (µg/m^3), January 2015 to December 2015.

Site		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Mount Isa													
The Gap													
Annual average:	0.005												
Maximum 24-hour		0.039	0.022	0.022	<0.001	<0.001	<0.001	<0.001	0.019	0.008	0.028	0.046	0.020
% 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^3 (measured as the total metal content in PM_{10} particles).

The Transitional Environmental Program air quality limit for arsenic is an annual average of 0.017 µg/m^3 (measured as the total metal content in PM_{10} particles between 1 January and 31 December 2015).

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_{10} high volume samplers has determined that the ratio of PM_{10} arsenic to TSP arsenic is 0.88:1 in Mount Isa. The PM_{10} 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_{10} Cadmium

Figure 22. Ambient concentrations of PM_{10} cadmium at The Gap site. Annual average concentration (µg/m^3), January 2015 to December 2015.

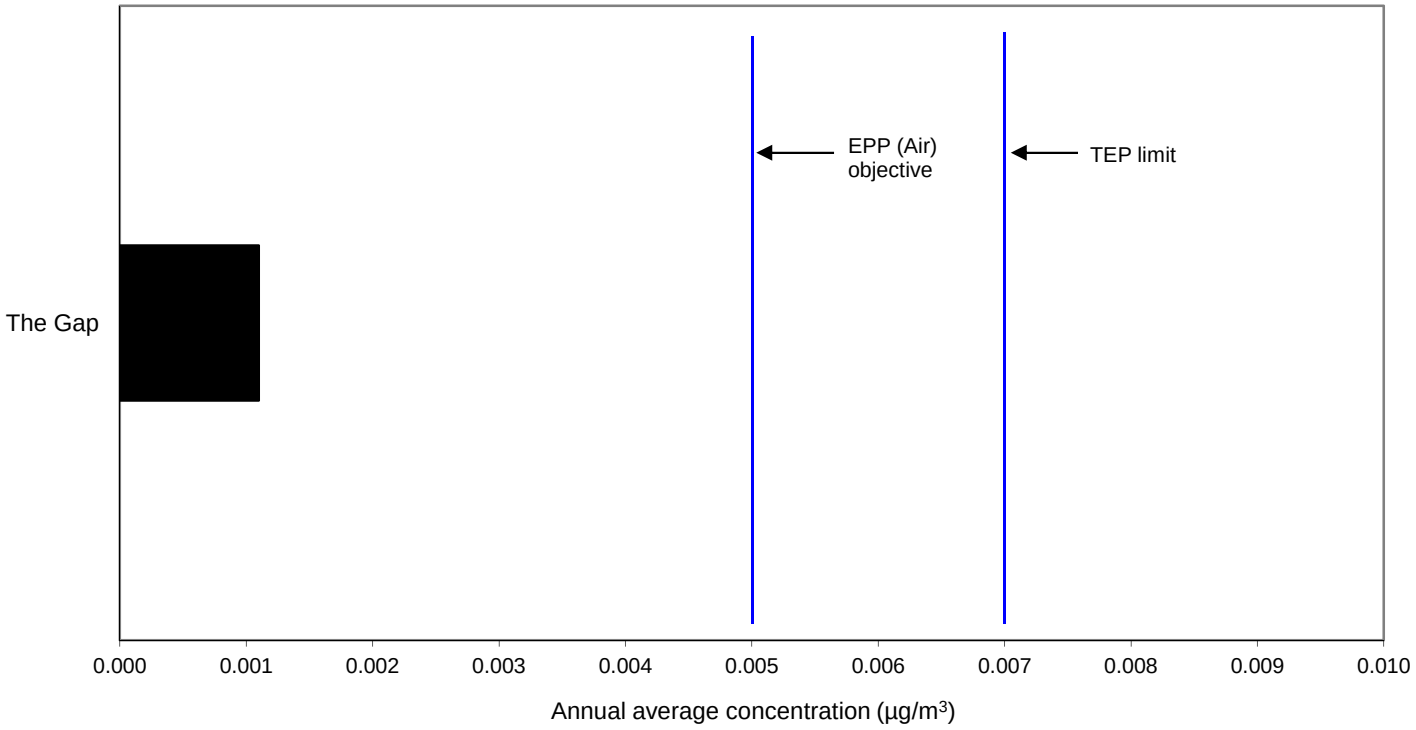

Table 22. Ambient concentrations of PM_{10} cadmium. Annual average and monthly maximum 24-hour average concentrations (µg/m^3), January 2015 to December 2015.

Site		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Mount Isa													
The Gap													
Annual average:	0.001												
Maximum 24-hour		0.004	0.007	0.004	<0.001	<0.001	0.001	<0.001	0.002	<0.001	0.003	0.010	0.021
% 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 cadmium is an annual average of 0.005 µg/m^3 (measured as the total metal content in PM_{10} particles).

The Transitional Environmental Program air quality limit for cadmium is an annual average of 0.007 µg/m^3 (measured as the total metal content in PM_{10} particles between 1 January and 31 December 2015).

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_{10} high volume samplers has determined that the ratio of PM_{10} cadmium to TSP cadmium is 0.76:1 in Mount Isa. The PM_{10} 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 December 2015.

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.

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

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