Air Quality in Ontario

2012 Report

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Ontario

2012 Air Quality Report Highlights

- The 2012 air quality report marks 42 years of long-term reporting on the state of air quality in Ontario. This report summarizes province-wide trends for key airborne pollutants affecting Ontario's air quality.
- Overall, air quality has improved significantly over the past 10 years, especially for nitrogen dioxide (NO_2), sulphur dioxide (SO_2) and carbon monoxide (CO) – pollutants emitted by vehicles and industry, as well as fine particulate matter ($PM_{2.5}$), which may be emitted directly into the atmosphere as a by-product of fuel combustion or it may be formed indirectly in the atmosphere through a series of complex chemical reactions.
- Ozone is a secondary pollutant formed when nitrogen oxides (NO_x) and volatile organic compounds (VOCs) react in the presence of sunlight. Ozone annual means have increased by 8 per cent from 2003 to 2012; however, ozone summer means have remained constant over the same period.
- Emissions of nitrogen oxides (NO_x), CO and SO_2 continue to decrease due in part to Ontario's air quality initiatives such as the phase-out of coal-fired generating stations, emissions trading regulations (O. Reg. 397/01 and O. Reg. 194/05), emissions controls at Ontario smelters, and Drive Clean emissions testing, which supports the federal vehicle emission standards and lower sulphur content in transportation fuels.

reduce smog, reduce the risk
breathe easy

Decreasing Provincial Ambient Concentrations (2003 – 2012)	
NO_2	▼ 43%
SO_2	▼ 52%
CO	▼ 43%
$PM_{2.5}$	▼ 31%

Decreasing Provincial Emmissions (2002 – 2011)	
NO_x	▼ 39%
SO_2	▼ 55%
CO	▼ 22%
$PM_{2.5}$	▼ 25%

For more information on Ontario's air quality,
visit www.airqualityontario.com

1.0 Introduction

This annual report, the 42nd in a series, summarizes the state of ambient air quality in Ontario during 2012 and examines 10-year trends. It reports on the measured levels of six common air pollutants: ground-level ozone (O_3), fine particulate matter ($PM_{2.5}$), nitrogen dioxide (NO_2), carbon monoxide (CO), sulphur dioxide (SO_2) and total reduced sulphur (TRS) compounds. This report also provides an overview of the Air Quality Index (AQI) and Smog Alert programs. Annual statistics, as well as 10- and 20-year trends of ambient air quality data are in the attached appendix.

Ontario continues to benefit from one of the most comprehensive air monitoring systems in North America, comprised of 40 monitoring sites across the province that undergo regularly scheduled maintenance and strict data quality assurance and quality control (QA/QC) procedures to ensure a high standard of data quality and data completeness. The data, which are collected continuously at these sites, are used to determine the current state of air quality and are reported every hour on the ministry's web site, www.airqualityontario.com.

2.0 Ground-Level Ozone (O_3)

Ground-level ozone is a gas formed when nitrogen oxides (NO_X) and volatile organic compounds (VOCs) react in the presence of sunlight. While ozone at ground level is a significant environmental and health concern, the naturally occurring ozone in the stratosphere, 10 to 40 kilometres above the Earth's surface, is beneficial as it shields the earth from harmful ultraviolet radiation.

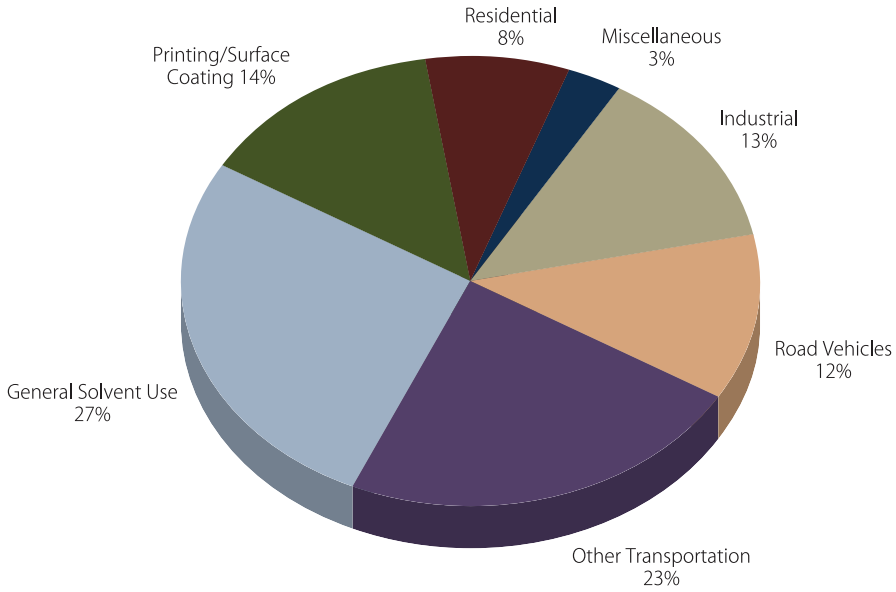
Ozone is a colourless, odourless gas at typical ambient concentrations, and is a major component of smog. Ozone is not generally emitted directly into the atmosphere; the formation and transport of ozone is strongly dependent on meteorological conditions and emissions of chemical precursors, particularly NO_X and VOCs. Changing weather patterns contribute to differences in ozone concentrations hour-to-hour, day-to-day, season-to-season, and year-to-year. In Ontario, the highest concentrations of ground-level ozone are typically recorded on hot and sunny days from mainly May to September, between noon and early evening.

Figure 1 shows the estimates of Ontario's VOCs emissions from point, area and transportation sources. Transportation sectors accounted for approximately 35 per cent of VOCs emissions and the second largest source was general solvent use accounting for approximately 27 per cent. Figure 2 shows the estimates for Ontario's NO_X emissions from point, area and transportation sources. The transportation sectors accounted for approximately 72 per cent of NO_X emissions (NPRI, 2013).

Ozone irritates the respiratory tract and eyes. Exposure to ozone in sensitive people can result in chest tightness, coughing and wheezing. Children who are active outdoors during the summer, when ozone levels are highest, are particularly at risk. Individuals with pre-existing respiratory disorders, such as asthma and chronic obstructive pulmonary disease (COPD), are also at risk. Ozone is associated with increased hospital admissions and premature deaths. Ozone also causes many losses in agricultural crops each year in Ontario, with visible leaf damage in many crops, garden plants and trees, especially during the summer months.

Figure 1: Ontario VOCs Emissions by Sector

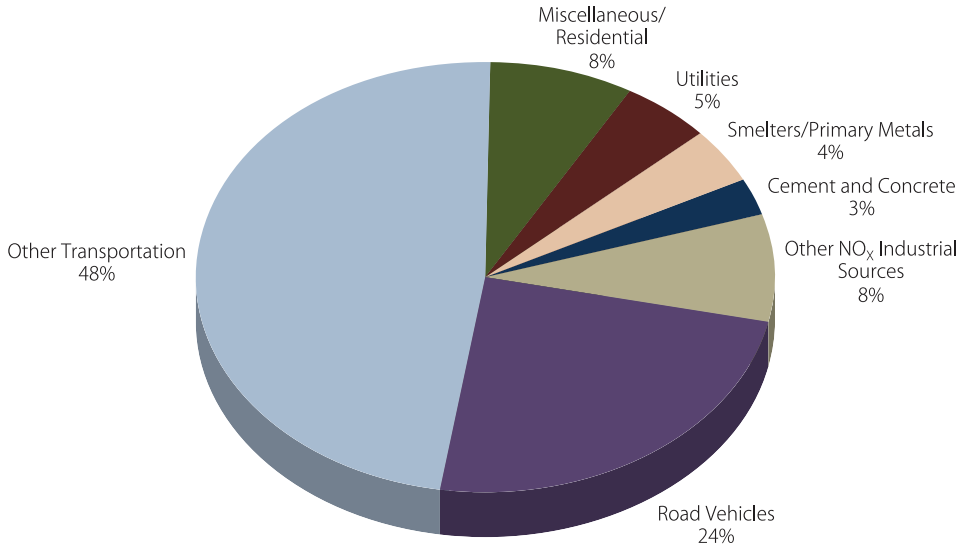
(2011 Estimates for Point/Area/Transportation Sources)



Note: Excludes emissions from open and natural sources.

Figure 2: Ontario Nitrogen Oxides Emissions by Sector

(2011 Estimates for Point/Area/Transportation Sources)

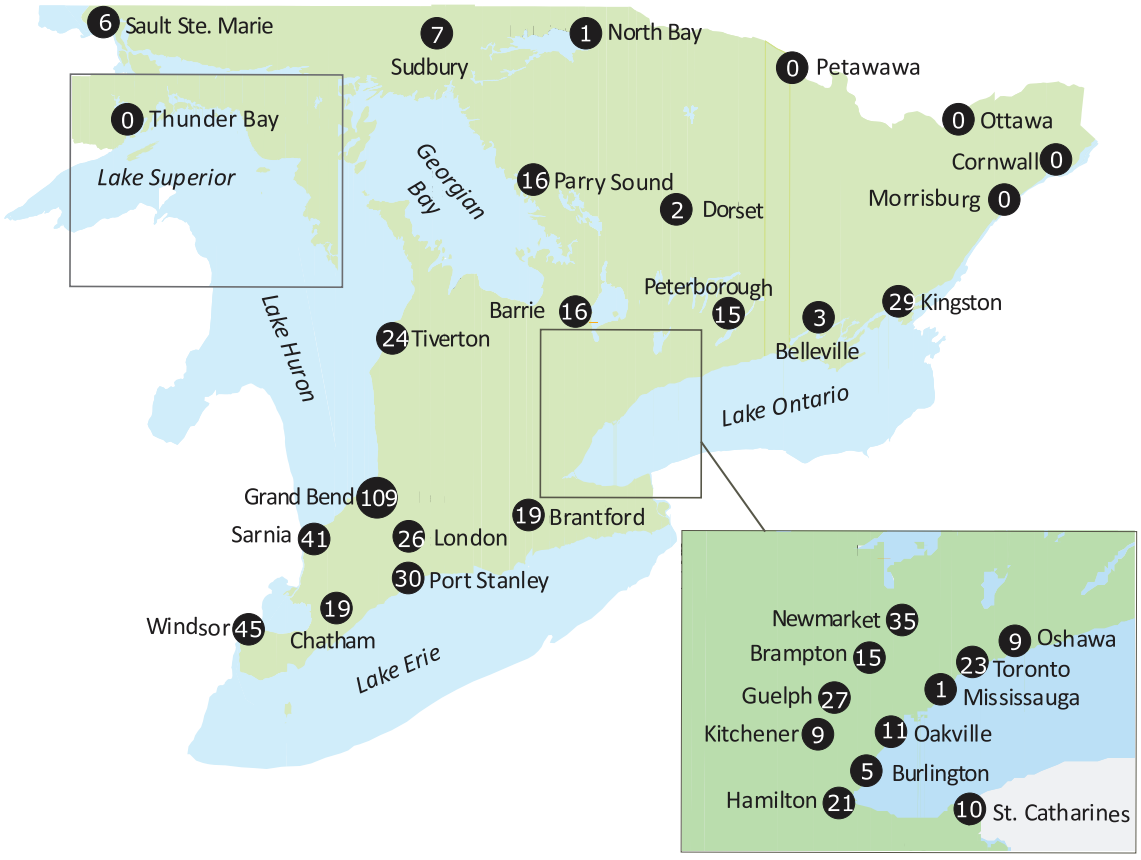


Note: Excludes emissions from open and natural sources.

In 2012, ozone was monitored at the ministry's 40 AQI sites. The highest annual mean was 33.2 parts per billion (ppb), measured at Grand Bend, a transboundary-influenced site on the eastern shore of Lake Huron. The lowest annual mean, 22.3 ppb, was measured at Toronto West, an urban site located near a major transportation corridor, Highway 401, and directly impacted by local nitric oxide (NO) emissions from vehicles. Generally, ozone concentrations are lower in urban areas because ozone is depleted by reacting with NO emitted by vehicles and other local combustion sources.

Ground-level ozone concentrations continued to exceed the provincial one-hour Ambient Air Quality Criterion (AAQC) of 80 ppb at 34 sites in 2012. The maximum one-hour ozone concentrations ranged from 74 ppb recorded in Thunder Bay, to 128 ppb recorded in Windsor. Ontario's one-hour AAQC for ozone was exceeded the most often at Grand Bend on 109 occasions. The geographical distribution of one-hour ozone exceedances across the province are shown in Figure 3.

Figure 3: Geographical Distribution of One-Hour Ozone Exceedances Across Ontario in 2012

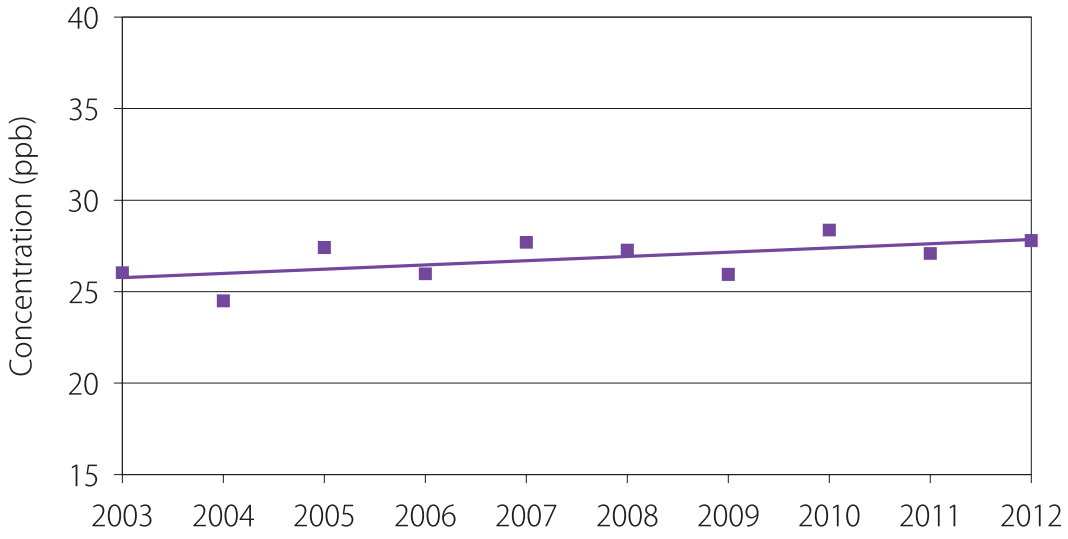


Generally, ozone exceedances are greater in southwestern Ontario, on the eastern shore of Lake Huron and on the northern shore of Lake Erie, more so than over central and eastern Ontario. As stated in the *Transboundary Air Pollution in Ontario* report, elevated ozone levels in southwestern Ontario are generally attributed to the long-range transport of pollutants from the United States. Transboundary air pollution is combined with local emissions of smog-related pollutants, and can impact various areas of the province during a smog episode (Yap et al., 2005).

As referenced in the *Guidance Document on Achievement Determination* (GDAD), the Canada-wide Standard (CWS) for ozone is 65 ppb, eight-hour running average time, based on the 4th highest annual ambient measurement averaged over three consecutive years. Of the 40 ambient air quality monitoring stations, 21 meet the requirements outlined in the GDAD (Canadian Council of Ministers of the Environment, 2007). In 2012, only two of the 21 CWS designated sites, Ottawa and Thunder Bay, met the CWS of 65 ppb for ozone. Table A19 of the Appendix provides a complete summary of reported CWS metrics since 2005.

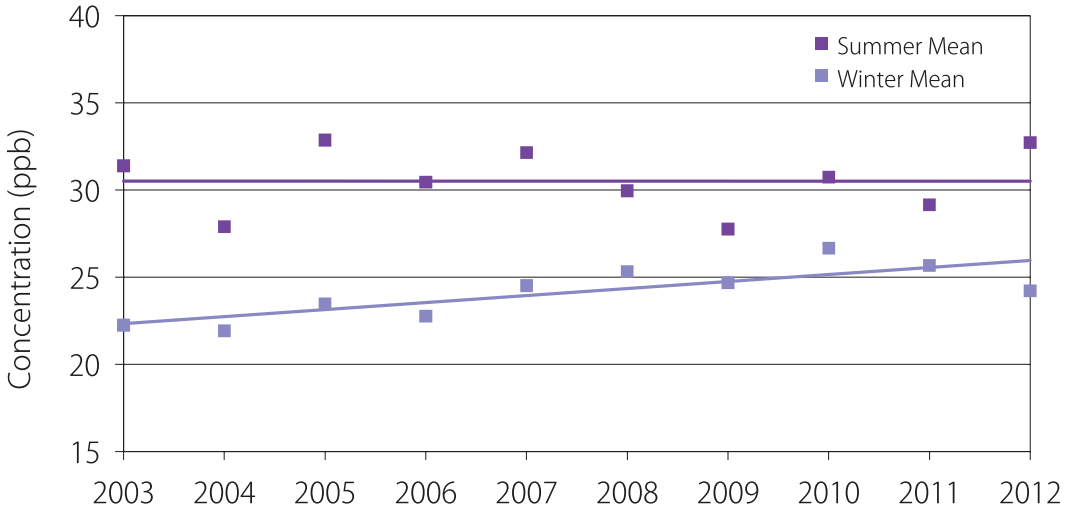
The ozone annual means in Figure 4 display an increasing trend of 8 per cent for the 10-year period from 2003 to 2012. The trend of ozone summer means and ozone winter means are shown in Figure 5. The ozone summer means trend remained constant from 2003 to 2012, whereas the ozone winter means have increased by 16 per cent over the same 10-year period. The increase in the ozone winter means are mainly attributed to the rising global background concentrations which in turn drives the increasing trend of ozone annual means.

Figure 4: Trend of Ozone Annual Means Across Ontario (2003-2012)



Note: Ten-year trend is a composite annual mean based on data from 37 monitoring sites.

Figure 5: Trend of Ozone Summer and Winter Means Across Ontario (2003-2012)



Note: Ten-year trends are composite means for the summer and winter months based on data from 37 monitoring sites. Summer: May - September; Winter: January - April, October - December.

3.0 Fine Particulate Matter ($PM_{2.5}$)

Airborne particulate is the general term used to describe a mixture of microscopic solid particles and liquid droplets suspended in air. Particulate matter is classified according to its aerodynamic size, mainly due to the different health effects associated with particles of different diameters. Fine particulate matter, denoted as $PM_{2.5}$, refers to respirable particles that are less than 2.5 microns in diameter, approximately 30 times smaller than the average diameter of a human hair. Due to their small size, they can penetrate deep into the lungs.

Particulate matter includes aerosols, smoke, fumes, dust, fly ash and pollen. Its composition is complex and varies with origin, residence time in the atmosphere, time of year and environmental conditions. Major components of $PM_{2.5}$ in Ontario are typically nitrates, sulphates, organic matter and particle-bound water. Higher nitrate levels are common in the cooler months whereas sulphates are more elevated during warm temperatures. Fineparticulate matter may be emitted directly into the atmosphere as a by-product of fuel combustion or it may be formed indirectly in the atmosphere through a series of complex chemical reactions. Major sources of $PM_{2.5}$ include motor vehicles, smelters, power plants, industrial facilities, residential fireplaces and wood stoves, agricultural burning and forest fires.

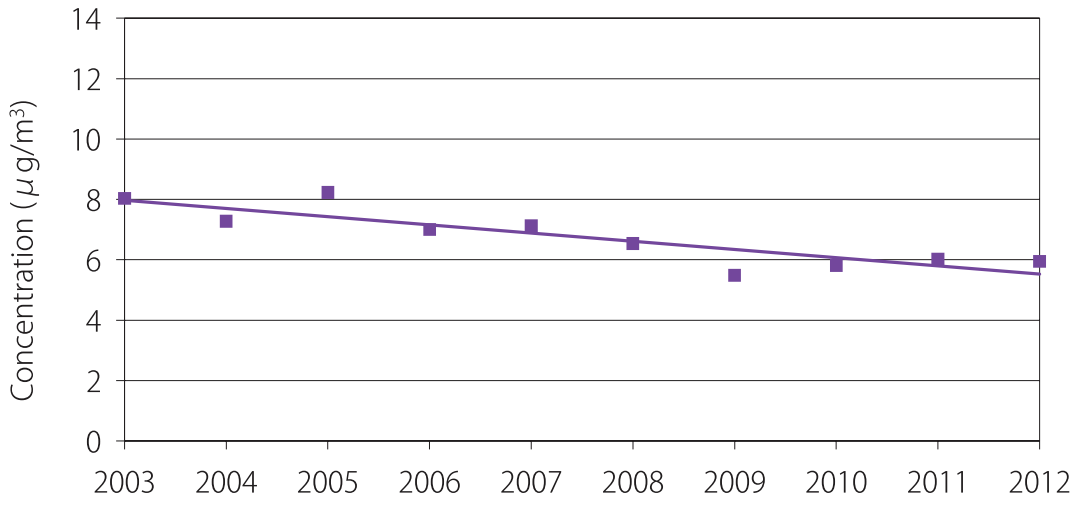
The 2011 estimates for Ontario's $PM_{2.5}$ emissions from point, area and transportation sources (excluding emissions from open and natural sources) indicate residential fuel combustion accounted for 40 per cent. The major contributor to residential emissions is fuel wood combustion in fireplaces and wood stoves. Industrial processes and transportation sectors accounted for 29 per cent and 24 per cent, respectively (NPRI, 2013).

The 2012 $PM_{2.5}$ annual mean concentrations ranged from 3.6 µg/m³ in Petawawa to 10.2 µg/m³ in Sarnia. During periods of elevated concentrations of $PM_{2.5}$ in Ontario, it is estimated that there are significant contributions from the U.S., specifically affecting border communities (Yap et al., 2005). The $PM_{2.5}$ 24-hour maximum concentrations ranged from 13 µg/m³ in Thunder Bay to 36 µg/m³ in Parry Sound. The $PM_{2.5}$ 24-hour maximum concentration in Parry Sound was recorded on July 22, 2012 due to forest fire smoke that originated in northern Manitoba and travelled over 600 kilometres. In 2012, four of the 40 sites exceeded Ontario's 24-hour $PM_{2.5}$ reference level of 30 µg/m³ on at least one occasion.

Similar to Ontario's 24-hour $PM_{2.5}$ reference level, the CWS for $PM_{2.5}$ is also 30 µg/m³, 24-hour averaging time; however, as referenced in the GDAD, the CWS is based on the 98th percentile annual ambient measurement averaged over three consecutive years (Canadian Council of Ministers of the Environment, 2007), thus making the CWS for $PM_{2.5}$ markedly different from Ontario's $PM_{2.5}$ reference level. The 2012 $PM_{2.5}$ CWS metric concentrations ranged from 13 µg/m³ reported for both Sudbury and Thunder Bay to 25 µg/m³ reported for Hamilton Downtown. The CWS for $PM_{2.5}$ was not exceeded in 2012 at any of the 21 CWS designated sites. Table A20 of the Appendix provides a complete summary of reported CWS metrics since 2005.

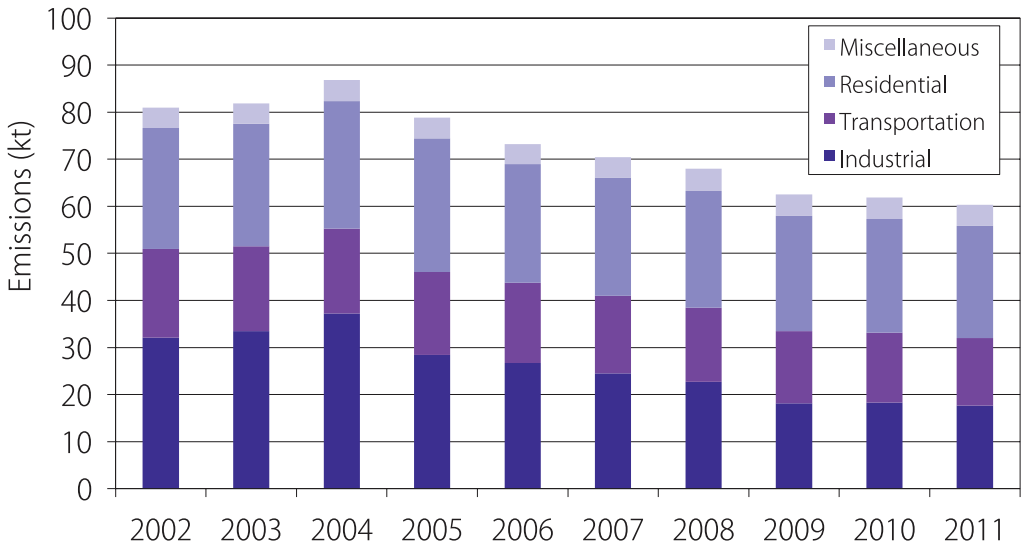
The $PM_{2.5}$ annual means in Figure 6 display a decreasing trend of 31 per cent for the 10-year period of 2003 to 2012. Similarly, provincial $PM_{2.5}$ emissions have decreased approximately 25 per cent from 2002 to 2011 as shown in Figure 7. Fine particulate emissions from industrial processes have been reduced approximately 40 per cent during this period. Emissions from the transportation sector decreased 24 per cent with the phase-in of new vehicles/engines having more stringent emission standards over the same period.

Figure 6: Trend of $PM_{2.5}$ Annual Means Across Ontario (2003-2012)



Note: The trend is a composite mean based on data from 37 monitoring sites.
$PM_{2.5}$ concentrations as measured by TEOM operated at 30°C with SES.

Figure 7: Ontario $PM_{2.5}$ Emissions Trend (2002-2011)



Note: Excludes emissions from open and natural sources.

4.0 Other Air Pollutants

NITROGEN DIOXIDE (NO_2)

Nitrogen dioxide is a reddish-brown gas with a pungent odour, which transforms in the atmosphere to form gaseous nitric acid and nitrates. It plays a major role in atmospheric reactions that produce ground-level ozone, a major component of smog. Nitrogen dioxide also reacts in the air and contributes to the formation of $PM_{2.5}$ (Seinfeld & Pandis, 2006). All combustion in air produces NO_X, of which NO_2 is a component. Major sources of NO_X emissions include the transportation sector, industrial processes and utilities.

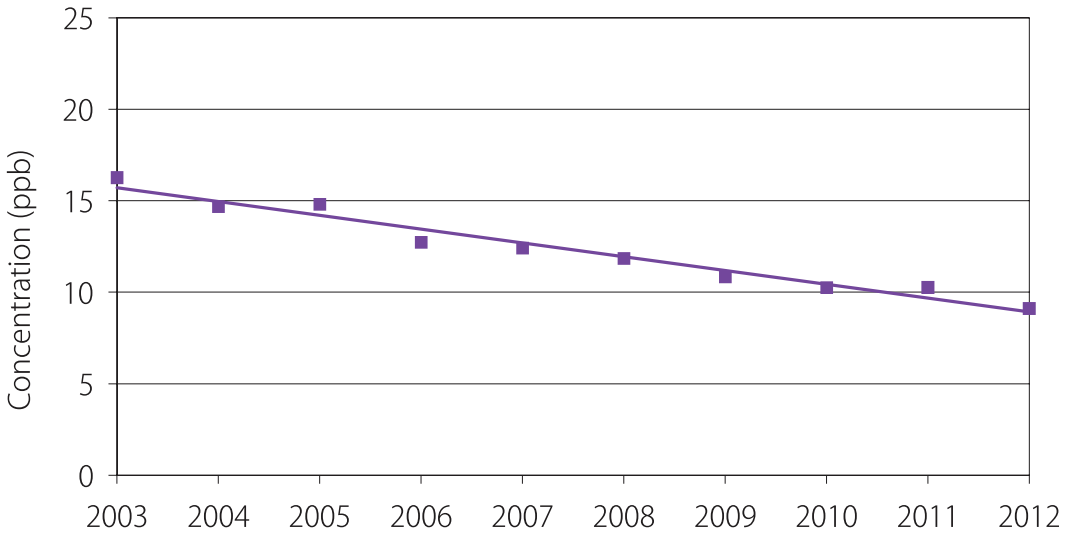
Nitrogen dioxide can irritate the lungs and lower their resistance to respiratory infection. People with asthma and bronchitis have increased sensitivity to NO_2. Nitrogen dioxide chemically transforms into nitric acid in the atmosphere and, when deposited, contributes to the acidification of lakes and soils in Ontario. Nitric acid can also corrode metals, fade fabrics, degrade rubber, and damage trees and crops.

The Toronto West air monitoring station, located in an area of Toronto influenced by significant vehicular traffic, recorded the highest NO_2 annual mean (16.3 ppb) during 2012; whereas Tiverton, a rural site, recorded the lowest NO_2 annual mean (2.5 ppb). The highest NO_2 means were recorded in large urbanized areas, such as the Greater Toronto

Area of southern Ontario. The Toronto West station also recorded the highest one-hour NO_2 concentration (70 ppb), and Windsor Downtown recorded the highest 24-hour NO_2 concentration (40 ppb). There were no exceedances of the provincial one-hour and 24-hour AAQC for NO_2, 100 ppb and 200 ppb, respectively, at any of the monitoring locations in Ontario during 2012.

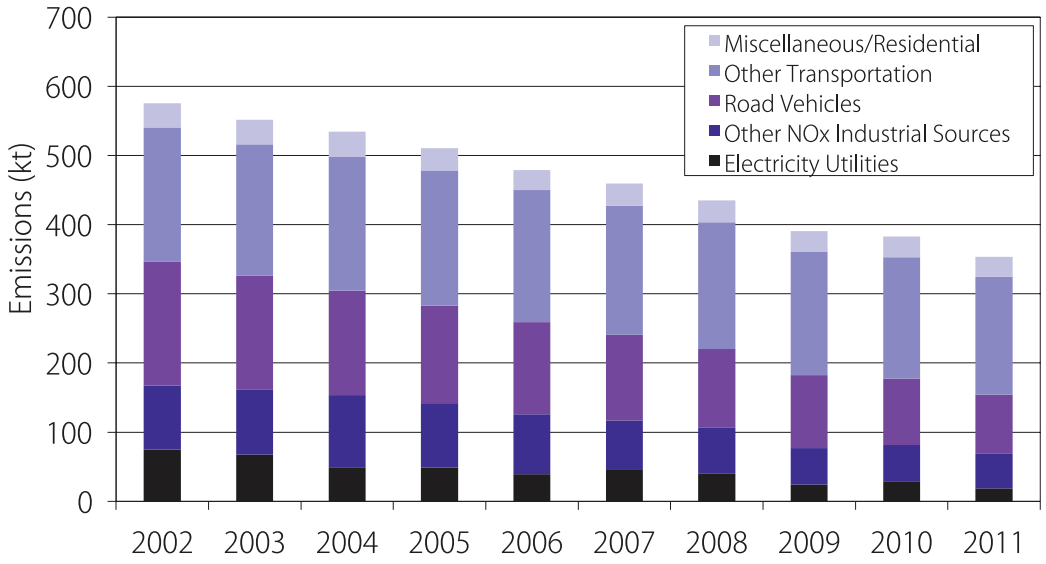
The NO_2 annual mean concentrations across Ontario have decreased 43 per cent from 2003 to 2012, as displayed in Figure 8. The NO_X emission trend from 2002 to 2011 indicates a decrease of approximately 39 per cent as shown in Figure 9 (NPRI, 2013). Ontario's emissions trading regulations on sulphur dioxide and nitrogen oxides (O. Reg. 397/01 and O. Reg. 194/05) have contributed to the reduction in nitrogen oxides emissions in recent years. The NO_X emissions from on-road vehicles also decreased due to the phase-in of new vehicles having more stringent emission standards. The implementation of the Ontario Drive Clean program in southern Ontario in 1999 also helped further reduce the NO_X emissions from light duty gasoline vehicles.

Figure 8: Trend of NO_2 Annual Means Across Ontario (2003-2012)



Note: The trend is a composite mean based on data from 22 monitoring sites.

Figure 9: Ontario NO_x Emissions Trend (2002 -2011)



Note: Excludes emissions from open and natural sources.

SULPHUR DIOXIDE (SO_2)

Sulphur dioxide is a colourless gas that smells like burnt matches. It can also be oxidized in the atmosphere to form sulphuric acid aerosols. In addition, sulphur dioxide is a precursor to sulphates, one of the main components of airborne secondary $PM_{2.5}$. Electric utilities and smelters are the major sources of SO_2 emissions in Ontario, accounting for approximately 64 per cent of the provincial SO_2 emissions according to 2011 estimates for point, area and transportation sources (excluding emissions from open and natural sources). Other industrial processes (e.g. petroleum refining, cement and concrete manufacturing) accounted for an additional 27 per cent. The transportation sector and miscellaneous sources accounted for the remaining 9 per cent of all SO_2 emissions in the province according to 2011 estimates (NPRI, 2013).

Health effects caused by exposure to high levels of SO_2 include breathing problems, respiratory illness, and the exacerbation of respiratory and cardiovascular disease. People with asthma, chronic lung disease or heart disease are the most sensitive to SO_2. Sulphur dioxide damages trees and crops. Similar to NO_2, SO_2 leads to the formation of $PM_{2.5}$ and is also a precursor to acid rain, which contributes to the acidification of soils, lakes and streams, accelerated corrosion of buildings, and reduced visibility.

Hamilton Downtown recorded the highest SO_2 annual mean (4.8 ppb) and 24-hour maximum concentration (29 ppb) during 2012, whereas Sudbury recorded the highest one-hour maximum concentration (142 ppb). There were no exceedances of the provincial one-hour, 24-hour and annual AAQC for SO_2, 250 ppb,

100 ppb and 20 ppb, respectively, at any of the monitoring locations in Ontario during 2012.

The SO_2 annual mean concentrations from 2003 to 2012 show a decreasing trend of 52 per cent across Ontario in Figure 10. Overall, provincial SO_2 emissions have reduced by approximately 55 per cent from 2002 to 2011 as shown in Figure 11 (NPRI, 2013). The reduction of SO_2 over the years is the result of various initiatives, which include, but are not limited to,

i. Control orders for Ontario smelters;

ii. Countdown Acid Rain program and Canada-wide Acid Rain Strategy;

iii. Ontario emissions trading regulations on sulphur dioxide and nitrogen oxides (O. Reg. 397/01 and O. Reg. 194/05);

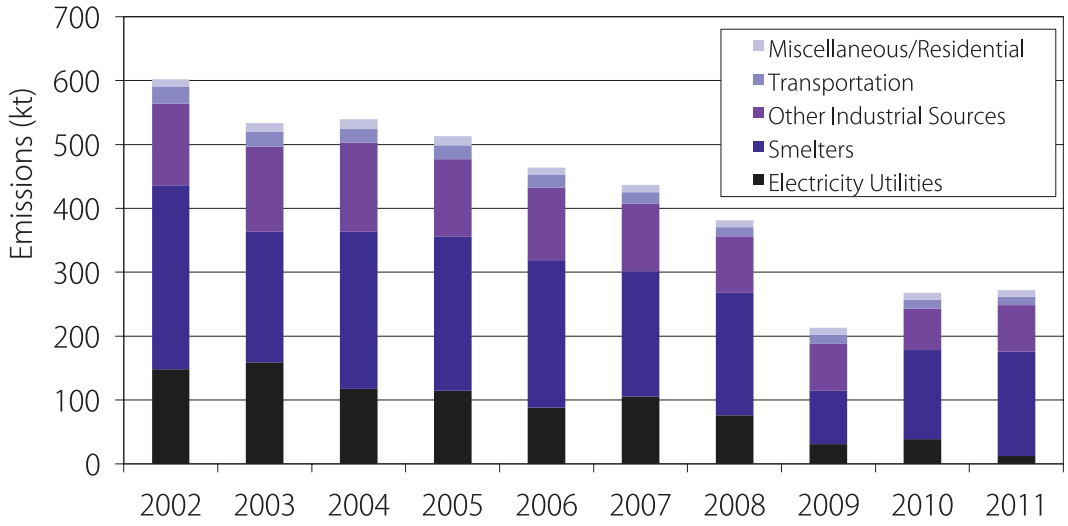
iv. Phase-out of coal-fired generating stations, with Lakeview Thermal Generating Station shut down in 2005; and

v. Low sulphur content in transportation fuels.

Figure 10: Trend of SO_2 Annual Means Across Ontario (2003-2012)

Note: Ten-year trend is a composite mean based on 9 sites.

Figure 11: Ontario SO_2 Emissions Trend (2002-2011)



Note: Excludes emissions from open and natural sources.

CARBON MONOXIDE (CO)

Carbon monoxide is a colourless, odourless, tasteless and, at high concentrations, poisonous gas. This gas can enter the bloodstream and reduce oxygen delivery to the organs and tissues. People with heart disease are particularly sensitive to CO. Exposure to high CO levels is associated with the impairment of vision, work capacity, learning ability and performance of complex tasks. Carbon monoxide is produced primarily by the incomplete combustion of fossil fuels. The 2011 estimates for point, area and transportation sources (excluding emissions from open and natural sources) indicate that the transportation sector accounted for 87 per cent of all CO emissions (NPRI, 2013).

In 2012, the highest one-hour CO maximum, 2.09 parts per million (ppm) and the highest eight-hour maximum (1.21 ppm) were recorded at the Windsor Downtown site. Typically, higher CO concentrations are recorded in urban centres attributable to vehicle emissions.

There were no exceedances of the provincial one-hour and eight-hour AAQC, 30 ppm and 13 ppm, respectively, at any of the monitoring locations in Ontario during 2012.

The annual means of the one-hour and eight-hour CO maximums have decreased 43 per cent and 50 per cent, respectively, across the province from 2003 to 2012. Carbon monoxide emissions have been reduced by approximately 22 per cent from 2002 to 2011 (NPRI, 2013).

5.0 Air Quality Index and Smog Advisories

ONTARIO AIR QUALITY INDEX (AQI)

The Air Quality Office of the Environmental Monitoring and Reporting Branch continuously obtains near real-time data for criteria pollutants from 40 AQI sites as displayed in Map A1 of the Appendix. The AQI, based on pollutants that have adverse effects on human health and the environment, includes O_3, $PM_{2.5}$, NO_2, SO_2, CO and TRS compounds. At the end of each hour, the concentration of each pollutant measured at each site is converted into a number ranging from zero upwards using a common scale or index. The calculated number for each pollutant is a sub-index. At a given air monitoring site, the highest sub-index for any given hour becomes the reporting AQI for that hour. The index is a relative scale, in that the lower the index, the better the air quality. The ministry web site, www.airqualityontario.com, provides index values, corresponding categories, and potential health and environmental effects.

The AQI network provides the public with hourly air quality information (24 hours per day) from across the province. The public can access AQI readings via the ministry's web site or via the Interactive Voice Response (IVR) system. (To access an English recording, call 1.800.387.7768, or in Toronto, call 416.246.0411. For a French recording, call 1.800.221.8852). The ministry's web site and IVR system also provides daily air quality forecasts, based on regional meteorological conditions and current pollution levels in Ontario and bordering U.S. states.

Based on the AQI categories, in 2012, Ontario reported very good to good air quality 92 per cent of the time, and moderate to poor air quality 8 per cent of the time. Table A21 of the Appendix provides the percentage distribution of hourly AQI readings for each of the 40 monitoring sites by AQI category and the number of poor air quality days.

SMOG ADVISORIES

Smog advisories are issued to the public in advance when AQI values are expected to be in the poor category due to elevated, widespread and persistent levels of O_3 and/or $PM_{2.5}$. Generally, smog advisories are issued 24 hours in advance; however, if elevated smog conditions occur suddenly, and weather conditions conducive to elevated smog levels are expected to continue for several hours, a smog advisory is issued effective immediately. Note that a smog advisory is a forecast and does not necessarily mean elevated smog is a certainty since it is based on weather forecasts.

Smog advisories are issued via the ministry's web site and the ministry's IVR system (refer to Ontario's Air Quality Index section above for details), and through email notification as per the Smog Alert network. (To receive a direct email notification of a smog advisory, visit the ministry web site and subscribe to the Smog Alert network).

The ministry issued 12 smog advisories in 2012, which covered 30 days. Table A22 of the Appendix summarizes the number of smog advisories issued for Ontario from 2003.

Glossary

Air Quality Index	real-time information system that provides the public with an indication of air quality in cities, towns and in rural areas across Ontario.
AQI station	continuous monitoring station used to inform the public of general ambient air quality levels over an entire region (not a localized area) on a real-time basis; station reports on criteria pollutant levels that are not unduly influenced by a single emission source, but rather are the result of emissions from multiple sources, including those in neighbouring provinces and states.
Ambient air	outdoor or open air.
Carbon monoxide	a colourless, odourless, tasteless, and at high concentrations, poisonous gas.
Continuous pollutants	pollutants for which a continuous record exists; effectively, pollutants that have hourly data (maximum 8,760 values per year except leap year – e.g. 2004 where maximum values for the year are 8,784).
Continuous station	where pollutants are measured on a real-time basis and data determined hourly (for example ozone, sulphur dioxide).
Criterion	maximum concentration or level (based on potential effects) of pollutant that is desirable or considered acceptable in ambient air.
Exceedance	violation of the air pollutant concentration levels established by environmental protection criteria or other environmental standards.
Fine Particulate Matter	particles smaller than 2.5 microns in aerodynamic diameter, which arise mainly from fuel combustion, condensation of hot vapours and chemically-driven gas-to-particle conversion processes; also referred to as $PM_{2.5}$ or respirable particles. These are fine enough to penetrate deep into the lungs.
Fossil fuels	natural gas, petroleum, coal and any form of solid, liquid or gaseous fuel derived from organic materials for the purpose of generating heat.
Ground-level ozone	colourless gas formed from chemical reactions between nitrogen oxides and volatile organic compounds (VOCs) in the presence of sunlight near the Earth's surface.
Micron	a millionth of a metre.
Nitrogen dioxide	a reddish-brown gas with a pungent and irritating odour.
Oxidation	a chemical reaction where a substance gains an oxygen; for example, in the atmosphere, sulphur dioxide is oxidized by hydroxyl radicals to form sulphate.

Particulate matter	refers to all airborne finely divided solid or liquid material with an aerodynamic diameter smaller than 44 microns.
Percentile value	percentage of the data set that lies below the stated value; if the 70 percentile value is 0.10 ppm, then 70 per cent of the data are equal to or below 0.10 ppm.
Primary pollutant	pollutant emitted directly to the atmosphere.
Secondary pollutant	pollutant formed from other pollutants in the atmosphere.
Smog	a contraction of smoke and fog; colloquial term used for photochemical smog, which includes ozone, and may include fine particulate matter, and other contaminants; tends to be a brownish haze.
Smog advisory	smog advisories are issued to the public when there is a strong likelihood that widespread, elevated and persistent smog levels are expected.
Stratosphere	atmosphere 10 to 40 kilometres above the Earth's surface.
Stratospheric ozone	ozone formed in the stratosphere from the conversion of oxygen molecules by solar radiation; ozone found there absorbs much ultraviolet radiation and prevents it from reaching the Earth.
Sulphur dioxide	a colourless gas that smells like burnt matches.
Troposphere	atmospheric layer extending from the surface up to about 10 kilometres above the Earth's surface.

Acronyms

AAQC	Ambient Air Quality Criteria (Ontario)
AQI	Air Quality Index
CO	carbon monoxide
CWS	Canada-wide Standard
GDAD	Guidance Document on Achievement Determination
IVR	Interactive Voice Response
NO	nitric oxide
NO_2	nitrogen dioxide
NOX	nitrogen oxides
O_3	ozone
$PM_{2.5}$	fine particulate matter
SES (TEOM)	Sample Equilibration System
SO_2	sulphur dioxide
TEOM	Tapered Element Oscillating Microbalance
TRS	total reduced sulphur
VOCs	volatile organic compounds

kt	kilotonnes
µg/m^3	micrograms (of contaminant) per cubic metre (of air) – by weight
ppb	parts (of contaminant) per billion (parts of air) – by volume
ppm	parts (of contaminant) per million (parts of air) – by volume

References

1. Canadian Council of Ministers of the Environment, 2007. *Guidance Document on Achievement Determination: Canada-Wide Standards for Particulate Matter and Ozone (Revised).*

2. NPRI, 2013. National Pollutant Release Inventory (NPRI) Downloadable Datasets. Environment Canada. http://www.ec.gc.ca/inrp-npri/default.asp?lang=en&n=0EC58C98- (accessed February 2013).

3. Ontario Ministry of the Environment. 2013. *Air Quality in Ontario – Report for 2011.*

4. Seinfeld, J.H. and S.N. Pandis. 2006. *Atmospheric chemistry and physics: From air pollution to climate change*. (2nd ed.) New Jersey: John Wiley & Sons Inc.

5. Yap, D., Reid, N., De Brou, G. and R. Bloxam. 2005. *Transboundary Air Pollution in Ontario*. Ontario Ministry of the Environment.

Resources

1. Brook, J.R., Dann, T. and R.T. Burnett. 1997. *The Relationship among TSP, PM10, PM2.5 and Inorganic Constituents of Atmospheric Particulate Matter at Multiple Canadian Locations*. Journal of Air and Waste Management Association, Vol 46, pp. 2-18.

2. Burnett, R.T., Dales, R.E., Krewski, D., Vincent, R., Dann, T., and J.R. Brook. 1995. *Associations between Ambient Particulate Sulphate and Admissions to Ontario Hospitals for Cardiac and Respiratory Diseases*. American Journal of Epidemiology, Vol 142, pp. 15-22.

3. Fraser, D., Yap, D., Kiely, P. and D. Mignacca. 1991. *Analysis of Persistent Ozone Episodes in Southern Ontario 1980-1991*. Technology Transfer Conference, Toronto, 1991. Proceedings AP14, pp. 222-227.

4. Geddes, J.A., Murphy, J.G., D.K.Wang. 2009. *Long term changes in nitrogen oxides and volatile organic compounds in Toronto and the challenges facing local ozone control*. Atmospheric Environment, Vol. 43, pp. 3407-3415.

5. Itano, Y., Bandow, H., Takenaka, N., Saitoh, Y., Asayama, A., J. Fukuyama. 2007. *Impact of NOX reduction on long-term ozone trends in an urban atmosphere*. Science of the Total Environment, Vol. 379, pp. 46-55.

6. Lin, C.C.-Y., Jacob, D.J., Munger, J.W., and A.M. Fiore. 2000. *Increasing Background Ozone in Surface Air Over the United States*. Geophysical Research Letters, Vol. 27 (21), pp. 3465-3468.

7. Lioy, P. et al., 1991. *Assessing Human Exposure to Airborne Pollutants*. Environmental Science and Technology, Vol. 25, pp. 1360.

8. Lipfert, F.W. and T. Hammerstrom. 1992. *Temporal Patterns in Air Pollution and Hospital Admissions*. Environmental Research, Vol. 59, pp. 374-399.

9. Lippmann, M. 1991. *Health Effects of Tropospheric Ozone*. Environmental Science and Technology, Vol. 25, No. 12, pp. 1954-1962.

10. Logan, J. A., Staehelin, J., Megretskaia, I. A., Cammas, J.-P., Thouret, V., Claude, H., Backer, H. D., Steinbacher, M., Scheel, H.-E., Stubi, R., Frohlich, M., and R. G. Derwent. 2012. *Changes in ozone over Europe: Analysis of ozone measurements from sondes, regular aircraft (MOZAIC) and alpine surface sites*. Journal of Geophysical Research, 117, D09301, doi:10.1029/2011JD016952.

11. Ontario Ministry of the Environment, 2011. Publications. Ontario Ministry of the Environment. http://www.airqualityontario.com/press/publications.php.

12. Pengelly, L.D., Silverman, F. and C.H. Goldsmith. 1992. *Health Effects of Air Pollution Assessed Using Ontario Health Survey Data*. Urban Air Group, McMaster University.

13. Reid, N., Yap, D., R. Bloxam. 2008. *The potential role of background ozone on current and emerging air issues: An overview*. Air Quality, Atmosphere & Health, Vol. 1, pp. 19-29.

14. *Rethinking the Ozone Problem in Urban and Regional Air Pollution*. National Academy Press, Washington, D.C., 1991.

15. United States Environmental Protection Agency. 2003. *Latest Findings on National Air Quality, 2002 Status and Trends*.

16. United States Environmental Protection Agency. 2003. *National Air Quality and Emission Trends, 2003 Special Studies Edition*.

17. United States Environmental Protection Agency. 2004. *Particle Pollution Report, Current Understanding of Air Quality and Emissions through 2003*.

18. Vingarzan, R. 2004. *A review of surface ozone background levels and trends*. Atmospheric Environment, Vol. 38, pp. 3431-42.

19. Wolff, G.T., Kelley, N.A. and M.A. Ferman. 1982. *Source Regions of Summertime Ozone and Haze Episodes in the Eastern U.S. Water, Air and Soil Pollution*, 18: pp. 65-81.

20. Yap, D., Ning, D.T. and W. Dong. 1988. *An Assessment of Source Contribution to the Ozone Concentrations in Southern Ontario*. Atmospheric Environment, Vol. 22, No. 6, pp. 1161-1168.

Appendix

The Appendix is intended for use in conjunction with the 2012 Annual Air Quality in Ontario report. The Appendix briefly describes the provincial Air Quality Index (AQI) network, quality assurance and quality control procedures, and the Ministry of the Environment and Climate Change's air quality database. It also includes a series of tables displaying station locations and a listing of the summary statistics including means, maximums, percentile values and the number of exceedances of the Ontario Ambient Air Quality Criteria (AAQC) for each pollutant. In addition, trends for select pollutants are displayed for 10- and 20-year periods.

MONITORING NETWORK OPERATIONS

NETWORK DESCRIPTION

In 2012, the Environmental Monitoring and Reporting Branch (EMRB) operated 40 ambient air monitoring sites across Ontario. Monitoring site locations for the AQI network are illustrated in Map A1. The AQI network was comprised of 133 continuous monitoring instruments at 40 sites. These instruments have the capability of recording minute data (approximately 70 million data points per year) that are used to scan and validate the continuous hourly data.

QUALITY ASSURANCE AND QUALITY CONTROL

Day-to-day maintenance and support of the instruments are administered by EMRB staff. Instrumentation precision is verified by daily automatic internal zero and span checks. Data analysts and station operators review span control charts to confirm instrument precision using a telemetry system. A quarterly quality assurance and quality control (QA/QC) review is performed on the ambient data set in order to highlight anomalies and administer corrective action in a timely manner.

The air monitoring station operators routinely inspect and maintain monitoring equipment and stations with mandatory bi-monthly on-site visits where secondary transfer standards are used to calibrate instrumentation. Station activity is recorded using FieldWorker Inc. software, an electronic documentation solution; this information is transferred directly to the ministry's database. The instrumentation used throughout the provincial air monitoring network has been standardized to Thermo Electron Corporation analyzers in an effort to streamline parts inventory and leverage common hardware used within each analyzer. The following is a summary of the instrumentation deployed within the network:

- Ozone – TE49C/I
- Fine Particulate Matter – TEOM 1400AB/SES
- Nitrogen Oxides – TE42C/I
- Carbon Monoxide – TE48C/I
- Total Reduced Sulphur – TE43C/CDN101
- Sulphur Dioxide – TE43C/I

EMRB operates a laboratory with gas reference standards that adhere to those of the U.S. National Institute of Standards and Technology (NIST) and the Air Quality Research Division of Environment Canada. The secondary

transfer standards used by station operators are referenced and certified to EMRB's NIST primary standards on a quarterly basis. Primary weighed filter standards from Environment Canada are used to calibrate the TEOM twice a year.

The Ontario ambient air quality monitoring network undergoes constant maintenance to ensure a high standard of quality control. Continuous real-time data are consistently reviewed, assessed and validated by EMRB staff. Immediate actions are taken to correct any inconsistencies that may affect the validity of the data. These measures ensure ambient air monitoring data are valid, complete, comparable, representative and accurate. As a result, the 2012 ambient air quality monitoring network had greater than 98 per cent valid data from over one million hourly data points.

CONTINUOUS $PM_{2.5}$ MONITORING NETWORK UPGRADE

The ministry historically relied on the non-continuous Federal Reference Method (FRM) for $PM_{2.5}$ monitoring, which produces 24-hour averaged measurements on a 3-day or 6-day cycle. The FRM is resource-intensive and requires sample setup and laboratory analysis and can take up to several months to report $PM_{2.5}$ data. Continuous particulate matter (PM) monitoring is essential for reporting hourly ambient concentrations; however, it comes with technical challenges. The Tapered Element Oscillating Microbalance (TEOM) technology was developed for continuous real-time PM monitoring (Patashnick and Rupprecht, 1991) and received United States Environmental Protection Agency (USEPA) Class III Federal Equivalent Method (FEM) designation in 1990 for PM_{10} reporting (USEPA, 2011). The Class III FEM is a designation for measuring ambient concentrations of specified air pollutants in accordance with Title 40, Part 53 of the Code of Federal Regulations (40 CFR Part 53).

Ontario was the first province in Canada to report continuous real-time $PM_{2.5}$ concentrations to the public in 2002 under the AQI program when continuous measurements of $PM_{2.5}$ became a priority for provincial and federal governments. TEOM was the most innovative method at the time for continuous real-time $PM_{2.5}$ monitoring, and continues to be used by many jurisdictions across North America. Over the last decade, continuous $PM_{2.5}$ monitoring technologies have evolved dramatically to address the technical issues associated with cold weather $PM_{2.5}$ measurements. To ensure consistency and comparability in $PM_{2.5}$ monitoring and reporting, in 2006, the USEPA published criteria for designating a continuous $PM_{2.5}$ monitor as Class III FEM (Federal Register, 2006). Manufacturers are required to collocate their $PM_{2.5}$ monitors with FRM measurements and pass rigorous tests following the USEPA guidelines to receive the Class III FEM $PM_{2.5}$ designation (Federal Register, 2006). Six continuous $PM_{2.5}$ monitors received the Class III FEM designation as of October 12, 2011.

After extensive evaluation of four designated Class III FEM $PM_{2.5}$ monitors, Ontario selected the Thermo Scientific Synchronized Hybrid Ambient Real-time Particulate (SHARP) 5030 to replace the TEOM monitors currently deployed in the AQI network. In 2012, as part of a national initiative funded by Environment Canada, Ontario deployed the SHARP 5030 monitor across Ontario's ambient air monitoring network. This deployment enables the ministry to learn about the new $PM_{2.5}$ monitoring method in preparation for the reporting of $PM_{2.5}$ concentrations as measured by the SHARP 5030 to commence in January 2013. It is anticipated that the SHARP 5030 will report higher $PM_{2.5}$ concentrations than those reported by TEOM during cold weather due to the improved performance of the SHARP 5030 when compared to measurements with the FRM (Sofowote et al., 2013). Ontario's upgrade of its $PM_{2.5}$ monitoring network to the USEPA Class III FEM will standardize monitoring methods and ensure consistency of data quality across Canada.

DATA BASE

The ambient air quality data used in this report are stored in the ministry's air quality information system (AQUIS). A statistical pattern test is used to identify data anomalies, such as unusual pollutant concentrations. Each pollutant has a predetermined concentration range based on historical data. Values outside this range are flagged for further investigation.

Data obtained from automated ambient air monitoring instruments that operate continuously to produce an average measurement for every hour for a possible total of 8,760 measurements in a given year. Hourly parameters measured include O_3, $PM_{2.5}$, $NO/NO_2/NO_X$, CO, SO_2 and TRS compounds. A valid annual mean requires at least 6,570 hourly readings. In addition, the 2nd and 3rd quarters of the year should have 75 per cent valid data for ozone, whereas for $PM_{2.5}$, each quarter of the year should have 75 per cent valid data (Canadian Council of Ministers of the Environment, 2002).

NETWORK DESCRIPTIVE TABLE, ANNUAL STATISTICS AND TRENDS

The AQI network for 2012 is summarized in Table A1. The table displays the station name, numerical identifier and pollutants measured. The numerical identifier is the station (ID) number, the first digit of which identifies the geographic region in which the station is located.

Table A1 also identifies the *type* of air monitoring site: ambient, road-side, Canada-wide Standard (CWS), and/or National Air Pollution Surveillance (NAPS). Ambient sites represent the general air quality of an area without any direct influence of local industrial sources. Road-side sites are within approximately 100 m of a major roadway with daily traffic volumes greater than 10,000 vehicles per day.

The 2012 statistical data and 10-year trends for various continuous pollutants are provided in Tables A2-A9, and Tables A10-A18, respectively. To be included in the 10-year trend analysis, a site must have valid annual means for a minimum of 8 years over the 10-year period from 2003-2012. The 20-year trends for ozone, NO_2 and SO_2 are provided in Figures A1-A26, Figures A27-A40, and Figures A41-A48, respectively. To be included in the 20-year trend analysis, a site must have valid annual means for a minimum of 15 years over the 20-year period from 1993-2012. A linear regression was applied to each of the 20-year trends presented to calculate the per cent change in concentrations over time.

References For Appendix

1. Canadian Council of Ministers of the Environment, 2002. *Guidance Document on Achievement Determination: Canada-Wide Standards for Particulate Matter and Ozone*.

2. Federal Register. 2006. *40 CFR Parts 53 and 58: Revisions to Ambient Air Monitoring Regulations; Final Rule*. 71 (200), 61236-61328. October 17, 2006.

3. Patashnick, H. and E.G. Rupprecht. 1991. *Continuous PM-10 Measurements Using the tapered Element Oscillating Microbalance*. Journal of the Air & Waste Management Association, Vol. 41, pp. 1079-1083.

4. Sofowote, U., Su, Y., Bitzos, M.M., and Munoz, A. 2013. *Improving the Correlations of Ambient TEOM $PM_{2.5}$ Data and SHARP 5030 FEM in Ontario: a Multiple Linear Regression Analysis*. Journal of the Air & Waste Management Association, in press.

5. United States Environmental Protection Agency (USEPA). 2011. *List of Designated Reference and Equivalent Methods*. Issue Date: October 12, 2011.

Map A1: Air Quality Index (AQI) Monitoring Sites across Ontario in 2012

Table A1: 2012 Ontario Continuous Ambient Air Monitoring Network

ID	STATION NAME	STATION LOCATION	YEAR	LATITUDE (D:M:S)	LONGITUDE (D:M:S)	AIR INTAKE (AGL)	TYPE	AQI	O_3	$PM_{2.5}$	NO_2	SO_2	CO	TRS
12008	Windsor Downtown	467 University Ave. W.	1969	42° 18'56.8"	-83° 02'37.2"	8	A/RS/C/N	Y	T	T	T	T	T	.
12016	Windsor West	College Ave./South St.	1975	42° 17'34.4"	-83° 04'23.3"	4	A/N	Y	T	T	T	T	.	T
13001	Chatham	435 Grand Ave. W.	2005	42° 24'13.3"	-82° 12'29.9"	15	A/C/N	Y	T	T	T	.	.	.
14064	Sarnia	Front St. N./Cn Tracks, Centennial Park	1978	42° 58'56.2"	-82° 24'18.3"	3	A/N	Y	T	T	T	T	.	T
15020	Grand Bend	Point Blake Conservation Area	1991	43° 19'59.1"	-81° 44'34.4"	5	A/N	Y	T	T	T	.	.	.
15025	London	900 Highbury Ave. N.	1995	43° 00'24.2"	-81° 12'23.1"	4	A/C/N	Y	T	T	T	.	.	.
16015	Port Stanley	43665 Dexter Line, Elgin Water T. Plant	2002	42° 40'19.5"	-81° 09'46.4"	5	A/N	Y	T	T	.	.	.	.
18007	Tiverton	4th Concession/Bruce Rd. 23	1979	44° 18'52.1"	-81° 32'59.0"	4	A/N	Y	T	T	T	.	.	.
21005	Brantford	324 Grand River Ave.	2004	43° 08'19.0"	-80° 17'33.5"	5	A/C/N	Y	T	T	T	.	.	.
26060	Kitchener	West Ave./Homewood Ave.	1990	43° 26'37.8"	-80° 30'13.7"	5	A/C/N	Y	T	T	T	.	.	.
27067	St. Catharines	Argyle Cres., Pump Stn.	1987	43° 09'36.2"	-79° 14'05.1"	4	A/C/N	Y	T	T	T	.	.	.
28028	Guelph	Exhibition St./Clark St. W.	2000	43° 33'05.8"	-80° 15'51.0"	4	A/C/N	Y	T	T	T	.	.	.
29000	Hamilton Downtown	Elgin St./Kelly St.	1987	43° 15'28.0"	-79° 51'42.0"	4	A/RS/C/N	Y	T	T	T	T	T	T
29114	Hamilton Mountain	Vickers Rd./E. 18th St.	1985	43° 13'45.9"	-79° 51'46.0"	3	A/C/N	Y	T	T	T	T	.	.
29118	Hamilton West	Main St. W./Hwy 403	1985	43° 15'26.8"	-79° 54'27.9"	3	A/RS	Y	T	T	T	.	.	.
31103	Toronto Downtown	Bay St./Wellesley St. W.	2000	43° 39'46.7"	-79° 23'17.2"	10	A/RS/C/N	Y	T	T	T	.	.	.
33003	Toronto East	Kennedy Rd./Lawrence Ave. E.	1970	43° 44'52.5"	-79° 16'26.6"	4	A/RS/C/N	Y	T	T	T	.	.	.
34020	Toronto North	Hendon Ave./Yonge St.	1988	43° 46'53.8"	-79° 25'03.8"	5	A/RS/C/N	Y	T	T	T	.	.	.
35125	Toronto West	125 Resources Rd.	2003	43° 42'34.0"	-79° 32'36.6"	8	A/RS/C/N	Y	T	T	T	T	T	.
44008	Burlington	North Shore Blvd. E./Lakeshore Rd.	1979	43° 18'54.4"	-79° 48'09.5"	5	A/C/N	Y	T	T	T	.	.	.
44017	Oakville	Eighth Line/Glenashton Dr., Halton Reservoir	2003	43° 29'12.9"	-79° 42'08.2"	12	A/C/N	Y	T	T	T	.	.	.
45026	Oshawa	2000 Simcoe St. N., Durham College	2005	43° 56'45.4"	-78° 53'41.7"	7	A/RS/C/N	Y	T	T	T	.	.	.
46089	Brampton	525 Main St. N., Peel Manor	2000	43° 41'55.5"	-79° 46'51.3"	5	A/C/N	Y	T	T	T	.	.	.
46108	Mississauga	3359 Mississauga Rd. N., U of T Mississauga	2007	43° 32'49.1"	-79° 39'31.3"	5	A/C/N	Y	T	T	T	T	.	.
47045	Barrie	83 Perry St.	2001	44° 22'56.5"	-79° 42'08.3"	5	A/C/N	Y	T	T	T	.	.	.
48006	Newmarket	Eagle St. W./McCaffrey Rd.	2001	44° 02'39.5"	-79° 28'59.7"	5	A/N	Y	T	T	T	.	.	.
49005	Parry Sound	7 Bay St.	2001	45° 20'16.3"	-80° 02'17.4"	5	A/N	Y	T	T	T	.	.	.
49010	Dorset	1026 Bellwood Acres Rd.	1981	45° 13'27.4"	-78° 55'58.6"	3	A/N	Y	T	T	.	.	.	.
51001	Ottawa Downtown	Rideau St./Wurtemburg St.	1971	45° 26'03.6"	-75° 40'33.6"	4	A/C/N	Y	T	T	T	T	T	.
51002	Ottawa Central	960 Carling Ave.	2007	45° 22'57.1"	-75° 42'51.1"	5	A/N	Y	T	T	T	.	.	.
51010	Petawawa	Petawawa Research Forest Facility	2007	45° 59'48.2"	-77° 26'28.3"	6	A/N	Y	T	T	.	.	.	.
52022	Kingston	752 King St. W.	2006	44° 12'58.5"	-76° 31'41.9"	13	A/C/N	Y	T	T	T	.	.	.

Table A1: 2012 Ontario Continuous Ambient Air Monitoring Network

ID	STATION NAME	STATION LOCATION	YEAR	LATITUDE (D:M:S)	LONGITUDE (D:M:S)	AIR INTAKE (AGL)	TYPE	AQI	O_3	$PM_{2.5}$	NO_2	SO_2	CO	TRS
54012	Belleville	2 Sidney St., Water Treatment Plant	2002	44° 09'01.9"	-77° 23'43.8"	10	A/N	Y	T	T	T	.	.	.
56010	Morrisburg	County Rd. 2, Morrisburg Water Tower	2005	44° 53'59.1"	-75° 11'23.8"	5	A/N	Y	T	T	.	.	.	.
56051	Cornwall	Bedford St./3rd St. W.	1970	45° 01'04.7"	-74° 44'06.8"	4	A/N	Y	T	T	T	.	.	.
59006	Peterborough	10 Hospital Dr.	1998	44° 18'06.9"	-78° 20'46.4"	10	A/C/N	Y	T	T	T	.	.	.
63203	Thunder Bay	421 James St. S.	2004	48° 22'45.8"	-89° 17'24.6"	15	A/RS/C/N	Y	T	T	T	.	.	.
71078	Sault Ste. Marie	Sault College	2004	46° 31'59.5"	-84° 18'35.7"	8	A/N	Y	T	T	T	T	.	T
75010	North Bay	Chippewa St. W., Dept. National Defence	1979	46° 19'23.5"	-79° 26'57.4"	4	A/RS/N	Y	T	T	T	.	.	.
77219	Sudbury	1222 Ramsey Lake Rd.	2004	46° 28'32.5"	-80° 57'46.6"	3	A/C/N	Y	T	T	.	T	.	.
TOTAL								**40**	**40**	**40**	**35**	**10**	**4**	**4**

Notes:

ID: station identfication number

Year: year station began monitoring

Air intake: height of air intake above ground (m)

Type: type of monitoring site: A = ambient, RS = road-side, C = CWS, N = NAPS

AQI: Air Quality Index site

T: telemetry

O_3: ground-level ozone

$PM_{2.5}$: fine particulate matter

NO_2: nitrogen dioxide

CO: carbon monoxide

SO_2: sulphur dioxide

TRS: total reduced sulphur

Table A2: 2012 Ozone (O_3) Annual Statistics

Unit: parts per billion (ppb)
O_3 1h AAQC: 80 ppb

ID	City	Station Location	Valid h	PERCENTILES						Mean	Maximum		No. of Times Above Criterion
				10%	30%	50%	70%	90%	99%		1h	24h	1h
12008	Windsor Downtown	467 University Ave. W.	8741	7	18	26	35	51	76	28.0	128	69	45
12016	Windsor West	College Ave./South St.	8666	6	18	26	35	51	75	28.0	128	70	41
13001	Chatham	435 Grand Ave. W.	8710	13	21	28	35	49	74	29.5	104	65	19
14064	Sarnia	Front St. N./Cn Tracks, Centennial Park	8682	12	22	29	35	49	74	29.7	101	60	41
15020	Grand Bend	Point Blake Conservation Area	8761	16	26	32	38	51	82	33.2	124	74	109
15025	London	900 Highbury Ave. N.	8771	10	19	26	33	47	72	27.7	88	62	26
16015	Port Stanley	43665 Dexter Line, Elgin Water T. Plt	8767	17	25	31	38	52	75	33.1	104	68	30
18007	Tiverton	4th Concession/Bruce Rd. 23	8717	18	25	30	36	48	72	32.0	93	66	24
21005	Brantford	324 Grand River Ave.	8773	8	20	28	35	50	72	28.8	88	57	19
26060	Kitchener	West Ave./Homewood Ave.	8759	10	20	27	34	47	68	28.0	89	58	9
27067	St. Catharines	Argyle Cres., Pump Stn.	8685	9	21	28	35	49	69	28.7	98	63	10
28028	Guelph	Exhibition St./Clark St. W.	8685	10	21	28	35	49	71	28.8	94	57	27
29000	Hamilton Downtown	Elgin St./Kelly St.	8724	7	18	25	32	45	65	25.7	88	55	7
29114	Hamilton Mountain	Vickers Rd./E. 18th St.	8734	12	22	29	36	51	72	30.2	91	70	21
29118	Hamilton West	Main St. W./Hwy 403	8771	4	16	24	30	43	64	24.2	85	53	4
31103	Toronto Downtown	Bay St./Wellesley St. W.	8763	8	19	25	32	46	69	26.6	90	62	11
33003	Toronto East	Kennedy Rd./Lawrence Ave. E.	8680	5	17	23	30	44	69	24.6	89	65	12
34020	Toronto North	Hendon Ave./Yonge St.	8769	7	18	25	32	44	70	25.7	92	61	15
35125	Toronto West	125 Resources Rd.	8708	2	12	20	27	42	69	21.5	94	58	23
44008	Burlington	North Shore Blvd. E./Lakeshore Rd.	8707	8	18	26	33	46	67	26.7	91	56	5
44017	Oakville	Eighth Line/Glenashton Dr., Halton Res.	8735	9	20	27	34	47	70	27.7	96	59	11
45026	Oshawa	2000 Simcoe St. N., Durham College	8731	10	20	26	32	43	69	27.0	92	58	9
46089	Brampton	525 Main St. N., Peel Manor	8701	6	18	26	33	46	70	26.6	92	56	15
46108	Mississauga	3359 Mississauga Rd. N., U of T Campus	8747	5	18	25	32	45	67	25.6	81	57	1
47045	Barrie	83 Perry St.	8728	8	19	26	33	43	66	26.3	91	57	16
48006	Newmarket	Eagle St. W./Mccaffrey Rd.	8720	12	22	29	35	48	71	29.4	105	64	35
49005	Parry Sound	7 Bay St.	8777	14	24	30	35	46	70	30.1	94	66	16
49010	Dorset	1026 Bellwood Acres Rd.	8776	10	21	28	34	44	65	28.0	82	52	2
51001	Ottawa Downtown	Rideau St./Wurtemburg St.	8622	9	19	26	32	42	59	26.0	76	64	0
51002	Ottawa Central	960 Carling Ave.	8664	8	19	26	32	42	58	25.6	76	62	0

Table A2: 2012 Ozone (O_3) Annual Statistics

Unit: parts per billion (ppb)
O_3 1h AAQC: 80 ppb

ID	City	Station Location	Valid h	PERCENTILES						Mean	Maximum		No. of Times Above Criterion
				10%	30%	50%	70%	90%	99%		1h	24h	1h
51010	Petawawa	Petawawa Research Forest Facility	8758	12	22	28	33	43	60	27.7	77	55	0
52022	Kingston	752 King St. W.	8726	17	26	31	37	49	73	32.7	92	67	29
54012	Belleville	2 Sidney St., Water Treatment Plant	8742	12	21	27	33	45	67	28.0	87	59	3
56010	Morrisburg	County Rd. 2, Morrisburg Water Tower	8767	11	22	28	34	44	61	28.2	78	62	0
56051	Cornwall	Bedford St./3rd St. W.	8592	10	20	27	33	44	59	27.1	76	61	0
59006	Peterborough	10 Hospital Dr.	8707	13	22	28	34	46	70	29.1	90	64	15
63203	Thunder Bay	421 James St. S.	8764	8	19	26	31	39	53	25.0	74	56	0
71078	Sault Ste. Marie	Sault College	8765	15	23	28	33	43	66	28.8	82	69	6
75010	North Bay	Chippewa St. W., Dept. National Defence	8769	10	20	26	32	42	63	26.1	82	56	1
77219	Sudbury	1222 Ramsey Lake Rd.	8663	15	23	28	33	43	63	28.5	84	63	7

Table A3: 2012 Fine Particulate Matter ($PM_{2.5}$) Annual Statistics

Unit: micrograms per cubic metre (µg/m³)
$PM_{2.5}$ 24h Reference Level: 30 µg/m³

ID	City	Station Location	Valid h	PERCENTILES						Mean	Maximum		No. of Times Above Reference Level
				10%	30%	50%	70%	90%	99%		1h	24h	24h
12008	Windsor Downtown	467 University Ave. W.	8652	1	4	6	9	15	24	7.4	81	22	0
12016	Windsor West	College Ave./South St.	8580	1	4	6	10	16	26	7.6	63	22	0
13001	Chatham	435 Grand Ave. W.	8604	0	3	5	8	13	23	6.0	46	20	0
14064	Sarnia	Front St. N./Cn Tracks, Centennial Park	8583	4	6	9	12	19	30	10.2	93	28	0
15020	Grand Bend	Point Blake Conservation Area	8677	0	2	5	8	13	22	5.8	38	20	0
15025	London	900 Highbury Ave. N.	8539	0	3	5	8	14	25	6.5	74	23	0
16015	Port Stanley	43665 Dexter Line, Elgin Water T. Plt	8550	1	3	5	7	12	23	5.9	74	24	0
18007	Tiverton	4th Concession/Bruce Rd. 23	7702	0	2	3	6	11	20	INS	39	19	0
21005	Brantford	324 Grand River Ave.	8711	1	3	5	8	13	25	6.2	101	24	0
26060	Kitchener	West Ave./Homewood Ave.	8540	1	3	5	7	13	24	6.0	46	24	0
27067	St. Catharines	Argyle Cres., Pump Stn.	8642	1	3	5	8	13	22	6.3	64	19	0
28028	Guelph	Exhibition St./Clark St. W.	8661	1	3	5	7	13	23	5.8	48	21	0
29000	Hamilton Downtown	Elgin St./Kelly St.	8617	1	4	6	10	18	37	8.3	111	33	3
29114	Hamilton Mountain	Vickers Rd./E. 18th St.	8695	1	3	5	8	14	28	6.5	115	31	1
29118	Hamilton West	Main St. W./Hwy 403	8612	1	3	6	9	16	32	7.3	76	28	0
31103	Toronto Downtown	Bay St./Wellesley St. W.	8627	0	3	5	8	14	25	6.4	45	26	0
33003	Toronto East	Kennedy Rd./Lawrence Ave. E.	8622	0	3	5	8	14	24	6.3	70	21	0
34020	Toronto North	Hendon Ave./Yonge St.	8683	1	3	6	9	16	27	7.3	43	24	0
35125	Toronto West	125 Resources Rd.	8595	1	3	6	9	15	26	7.1	45	23	0
44008	Burlington	North Shore Blvd. E./Lakeshore Rd.	8445	1	3	5	8	14	24	6.4	68	28	0
44017	Oakville	Eighth Line/Glenashton Dr., Halton Res.	8639	1	3	5	8	13	23	6.1	42	20	0
45026	Oshawa	2000 Simcoe St. N., Durham College	8412	0	2	4	7	12	21	5.5	38	21	0
46089	Brampton	525 Main St. N., Peel Manor	8421	0	2	4	7	13	24	5.7	57	24	0
46108	Mississauga	3359 Mississauga Rd. N., U of T Campus	8572	1	3	5	7	13	23	6.0	40	21	0
47045	Barrie	83 Perry St.	8658	0	2	4	7	12	23	5.6	79	28	0
48006	Newmarket	Eagle St. W./McCaffrey Rd.	8708	0	2	4	7	12	23	5.6	39	22	0
49005	Parry Sound	7 Bay St.	8747	0	2	3	6	11	22	4.8	86	36	1
49010	Dorset	1026 Bellwood Acres Rd.	8707	0	1	3	5	10	19	4.1	36	18	0
51001	Ottawa Downtown	Rideau St./Wurtemburg St.	8604	0	2	4	6	11	21	4.8	95	22	0
51002	Ottawa Central	960 Carling Ave.	8680	0	2	4	6	11	20	5.0	32	22	0

Table A3: 2012 Fine Particulate Matter ($PM_{2.5}$) Annual Statistics

Unit: micrograms per cubic metre (µg/m³)
$PM_{2.5}$ 24h Reference Level: 30 µg/m³

ID	City	Station Location	Valid h	PERCENTILES						Mean	Maximum		No. of Times Above Reference Level
				10%	30%	50%	70%	90%	99%		1h	24h	24h
51010	Petawawa	Petawawa Research Forest Facility	8691	0	1	2	4	9	17	3.6	28	17	0
52022	Kingston	752 King St. W.	8578	1	3	5	8	15	27	6.8	44	24	0
54012	Belleville	2 Sidney St., Water Treatment Plant	8358	0	2	4	7	11	20	5.1	44	19	0
56010	Morrisburg	County Rd. 2, Morrisburg Water Tower	8733	1	2	4	6	11	20	5.0	32	20	0
56051	Cornwall	Bedford St./3rd St. W.	8641	0	2	4	7	12	25	5.4	57	27	0
59006	Peterborough	10 Hospital Dr.	8615	0	2	4	6	11	20	4.9	50	21	0
63203	Thunder Bay	421 James St. S.	8381	0	2	3	5	9	15	4.1	30	13	0
71078	Sault Ste. Marie	Sault College	8213	0	1	3	5	10	21	4.4	86	27	0
75010	North Bay	Chippewa St. W., Dept. National Defence	8726	0	2	3	5	10	18	4.1	42	19	0
77219	Sudbury	1222 Ramsey Lake Rd.	8754	0	1	3	5	9	19	4.0	50	33	1

Note:

Measurements taken by Tapered Element Oscillating Microbalance (TEOM) sampler operated at 30 degrees Celsius with a Sample Equilibration System (SES).

INS indicates there was insufficient data in any one quarter to calculate a valid annual mean.

The $PM_{2.5}$ reference level is 30 µg/m³ for a 24h period based on CWS.

Table A4: 2012 Nitric Oxide (NO) Annual Statistics Unit: parts per billion (ppb)

ID	City	Station Location	Valid h	PERCENTILES							Maximum	
				10%	30%	50%	70%	90%	99%	Mean	1h	24h
12008	Windsor Downtown	467 University Ave. W.	8764	0	1	1	3	10	60	4.7	248	92
12016	Windsor West	College Ave./South St.	8536	0	0	1	2	8	73	4.6	292	90
13001	Chatham	435 Grand Ave. W.	8678	0	0	1	2	4	16	1.8	95	20
14064	Sarnia	Front St. N./Cn Tracks, Centennial Park	8689	0	1	1	2	4	20	2.1	89	20
15020	Grand Bend	Point Blake Conservation Area	8759	0	0	0	0	1	4	0.3	24	3
15025	London	900 Highbury Ave. N.	8771	1	2	2	4	8	32	4.2	144	36
18007	Tiverton	4th Concession/Bruce Rd. 23	8709	0	0	1	1	1	4	0.7	34	4
21005	Brantford	324 Grand River Ave.	8771	0	0	0	1	2	17	1.1	63	21
26060	Kitchener	West Ave./Homewood Ave.	8756	0	0	1	1	3	42	2.1	160	38
27067	St. Catharines	Argyle Cres., Pump Stn.	8687	0	0	1	1	4	44	2.5	151	40
28028	Guelph	Exhibition St./Clark St. W.	8668	0	1	1	1	3	33	2.2	119	31
29000	Hamilton Downtown	Elgin St./Kelly St.	8702	0	1	2	3	10	54	4.6	146	40
29114	Hamilton Mountain	Vickers Rd./E. 18th St.	8670	0	0	1	1	4	27	1.9	86	27
29118	Hamilton West	Main St. W./Hwy 403	8714	0	1	2	4	15	74	6.3	243	55
31103	Toronto Downtown	Bay St./Wellesley St. W.	8701	0	0	1	2	7	31	2.8	126	30
33003	Toronto East	Kennedy Rd./Lawrence Ave. E.	8617	0	1	3	6	15	64	6.6	208	75
34020	Toronto North	Hendon Ave./Yonge St.	8767	0	1	2	3	12	51	5.0	151	58
35125	Toronto West	125 Resources Rd.	8706	0	2	4	10	29	100	11.3	214	81
44008	Burlington	North Shore Blvd. E./Lakeshore Rd.	8202	0	0	1	3	10	58	4.6	204	40
44017	Oakville	Eighth Line/Glenashton Dr., Halton Res.	8728	0	0	1	3	7	39	3.4	168	29
45026	Oshawa	2000 Simcoe St. N., Durham College	8686	0	0	1	2	5	19	2.1	90	25
46089	Brampton	525 Main St. N., Peel Manor	8619	0	0	1	2	9	67	4.4	164	47
46108	Mississauga	3359 Mississauga Rd. N., U of T Campus	8619	0	1	1	1	7	57	3.8	142	42
47045	Barrie	83 Perry St.	8768	0	1	1	1	5	44	3.2	239	45
48006	Newmarket	Eagle St. W./McCaffrey Rd.	8682	0	0	1	1	3	26	2.0	91	22
49005	Parry Sound	7 Bay St.	8777	0	0	0	0	1	9	0.5	38	6
51001	Ottawa Downtown	Rideau St./Wurtemburg St.	8551	0	1	1	2	4	26	2.4	124	30
51002	Ottawa Central	960 Carling Ave.	8664	0	0	0	1	3	42	2.0	94	40
52022	Kingston	752 King St. W.	8721	0	0	0	0	1	4	0.4	46	7
54012	Belleville	2 Sidney St., Water Treatment Plant	8697	0	0	0	1	3	21	1.6	92	21

Table A4: 2012 Nitric Oxide (NO) Annual Statistics Unit: parts per billion (ppb)

ID	City	Station Location	Valid h	PERCENTILES						Mean	Maximum	
				10%	30%	50%	70%	90%	99%		1h	24h
56051	Cornwall	Bedford St./3rd St. W.	8758	0	0	1	1	3	38	2.2	156	38
59006	Peterborough	10 Hospital Dr.	8765	0	1	1	1	3	18	1.8	89	17
63203	Thunder Bay	421 James St. S.	8691	1	2	2	4	12	40	5.1	122	35
71078	Sault Ste. Marie	Sault College	8747	0	1	1	1	3	13	1.7	40	7
75010	North Bay	Chippewa St. W., Dept. National Defence	8761	1	1	2	2	5	28	2.9	156	20

Table A5: 2012 Nitrogen Dioxide (NO_2) Annual Statistics

Unit: parts per billion (ppb)
NO_2 1h AAQC: 200 ppb
NO_2 24h AAQC: 100 ppb

				PERCENTILES							Maximum		No. of Times Above Criteria	
ID	City	Station Location	Valid h	10%	30%	50%	70%	90%	99%	Mean	1h	24h	1h	24h
12008	Windsor Downtown	467 University Ave. W.	8764	5	8	11	16	25	40	13.2	58	40	0	0
12016	Windsor West	College Ave./South St.	8536	4	6	9	14	23	37	11.4	51	36	0	0
13001	Chatham	435 Grand Ave. W.	8678	1	3	4	7	12	23	5.7	38	24	0	0
14064	Sarnia	Front St. N./Cn Tracks, Centennial Park	8689	2	4	7	11	18	29	8.6	53	24	0	0
15020	Grand Bend	Point Blake Conservation Area	8759	1	2	3	4	8	14	3.6	30	14	0	0
15025	London	900 Highbury Ave. N.	8771	2	3	5	7	12	22	6.3	36	17	0	0
18007	Tiverton	4th Concession/Bruce Rd. 23	8709	0	1	2	3	5	10	2.5	21	10	0	0
21005	Brantford	324 Grand River Ave.	8771	2	3	4	6	12	22	5.4	43	25	0	0
26060	Kitchener	West Ave./Homewood Ave.	8756	1	3	5	8	16	32	7.1	60	28	0	0
27067	St. Catharines	Argyle Cres., Pump Stn.	8687	3	4	6	9	17	29	8.1	45	22	0	0
28028	Guelph	Exhibition St./Clark St. W.	8668	1	3	5	7	15	27	6.5	43	25	0	0
29000	Hamilton Downtown	Elgin St./Kelly St.	8702	4	6	9	14	25	37	11.9	51	33	0	0
29114	Hamilton Mountain	Vickers Rd./E. 18th St.	8670	3	4	6	10	19	33	8.6	52	33	0	0
29118	Hamilton West	Main St. W./Hwy 403	8714	4	7	10	14	24	36	12.1	53	32	0	0
31103	Toronto Downtown	Bay St./Wellesley St. W.	8701	5	8	11	16	25	38	13.4	57	36	0	0
33003	Toronto East	Kennedy Rd./Lawrence Ave. E.	8617	5	8	12	17	27	40	14.0	52	34	0	0
34020	Toronto North	Hendon Ave./Yonge St.	8767	4	7	11	17	27	41	13.4	60	35	0	0
35125	Toronto West	125 Resources Rd.	8706	5	10	14	20	31	44	16.3	70	35	0	0
44008	Burlington	North Shore Blvd. E./Lakeshore Rd.	8202	3	6	9	13	23	37	11.0	54	28	0	0
44017	Oakville	Eighth Line/Glenashton Dr., Halton Res.	8728	2	4	7	10	20	35	9.1	48	29	0	0
45026	Oshawa	2000 Simcoe St. N., Durham College	8686	2	3	4	6	12	22	5.6	36	23	0	0
46089	Brampton	525 Main St. N., Peel Manor	8619	2	4	7	12	25	40	10.4	55	29	0	0
46108	Mississauga	3359 Mississauga Rd. N., U of T Campus	8619	3	5	7	11	20	32	9.6	45	25	0	0
47045	Barrie	83 Perry St.	8768	3	4	6	9	18	32	8.1	48	26	0	0
48006	Newmarket	Eagle St. W./McCaffrey Rd.	8682	2	3	5	8	16	30	7.2	51	32	0	0
49005	Parry Sound	7 Bay St.	8777	1	1	2	3	7	19	3.3	38	13	0	0
51001	Ottawa Downtown	Rideau St./Wurtemburg St.	8551	2	3	5	9	17	33	7.8	46	28	0	0
51002	Ottawa Central	960 Carling Ave.	8664	1	2	4	7	16	36	6.6	52	29	0	0

Table A5: 2012 Nitrogen Dioxide (NO_2) Annual Statistics

Unit: parts per billion (ppb)
NO_2 1h AAQC: 200 ppb
NO_2 24h AAQC: 100 ppb

				PERCENTILES							Maximum		No. of Times Above Criteria	
ID	City	Station Location	Valid h	10%	30%	50%	70%	90%	99%	Mean	1h	24h	1h	24h
52022	Kingston	752 King St. W.	8721	2	2	3	4	8	19	4.0	33	15	0	0
54012	Belleville	2 Sidney St., Water Treatment Plant	8697	1	2	3	5	10	23	4.7	33	18	0	0
56051	Cornwall	Bedford St./3rd St. W.	8758	2	3	4	6	14	31	6.1	51	29	0	0
59006	Peterborough	10 Hospital Dr.	8765	1	1	2	4	8	20	3.7	32	18	0	0
63203	Thunder Bay	421 James St. S.	8691	2	3	5	8	16	29	7.3	46	24	0	0
71078	Sault Ste. Marie	Sault College	8747	1	2	3	5	10	21	4.8	42	13	0	0
75010	North Bay	Chippewa St. W., Dept. National Defence	8761	1	2	4	6	14	35	6.1	55	23	0	0

Table A6: 2012 Nitrogen Oxides (NO_x) Annual Statistics Unit: parts per billion (ppb)

ID	City	Station Location	Valid h	PERCENTILES							Maximum	
				10%	30%	50%	70%	90%	99%	Mean	1h	24h
12008	Windsor Downtown	467 University Ave. W.	8764	5	9	13	19	34	96	17.8	290	133
12016	Windsor West	College Ave./South St.	8536	4	7	11	16	30	107	16.0	332	126
13001	Chatham	435 Grand Ave. W.	8678	2	4	6	8	15	34	7.5	118	43
14064	Sarnia	Front St. N./Cn Tracks, Centennial Park	8689	3	5	8	12	22	46	10.7	122	43
15020	Grand Bend	Point Blake Conservation Area	8759	1	2	3	5	8	17	3.9	40	17
15025	London	900 Highbury Ave. N.	8771	3	5	8	11	20	51	10.5	165	50
18007	Tiverton	4th Concession/Bruce Rd. 23	8709	1	2	3	4	6	13	3.1	47	14
21005	Brantford	324 Grand River Ave.	8771	2	3	5	7	14	37	6.7	92	46
26060	Kitchener	West Ave./Homewood Ave.	8756	2	4	6	9	19	69	9.2	213	66
27067	St. Catharines	Argyle Cres., Pump Stn.	8687	3	5	7	10	21	69	10.6	178	60
28028	Guelph	Exhibition St./Clark St. W.	8668	2	4	6	9	18	55	8.8	145	50
29000	Hamilton Downtown	Elgin St./Kelly St.	8702	5	7	11	18	34	85	16.6	186	67
29114	Hamilton Mountain	Vickers Rd./E. 18th St.	8670	3	5	7	11	22	56	10.5	116	55
29118	Hamilton West	Main St. W./Hwy 403	8714	5	8	11	18	40	103	18.4	290	78
31103	Toronto Downtown	Bay St./Wellesley St. W.	8701	6	9	12	18	31	65	16.2	181	63
33003	Toronto East	Kennedy Rd./Lawrence Ave. E.	8617	6	10	15	22	41	98	20.6	248	109
34020	Toronto North	Hendon Ave./Yonge St.	8767	4	8	13	21	39	87	18.5	211	89
35125	Toronto West	125 Resources Rd.	8706	6	12	19	30	59	134	27.6	249	114
44008	Burlington	North Shore Blvd. E./Lakeshore Rd.	8202	3	6	10	16	32	88	15.6	258	68
44017	Oakville	Eighth Line/Glenashton Dr., Halton Res.	8728	3	6	8	13	26	69	12.6	197	58
45026	Oshawa	2000 Simcoe St. N., Durham College	8686	2	4	6	9	16	36	7.8	117	45
46089	Brampton	525 Main St. N., Peel Manor	8619	3	5	8	14	35	100	14.8	212	74
46108	Mississauga	3359 Mississauga Rd. N., U of T Campus	8619	4	6	9	13	27	82	13.4	173	67
47045	Barrie	83 Perry St.	8768	3	5	7	10	23	71	11.3	274	72
48006	Newmarket	Eagle St. W./McCaffrey Rd.	8682	3	4	6	9	19	52	9.2	114	53
49005	Parry Sound	7 Bay St.	8777	1	1	2	4	9	26	3.8	54	17
51001	Ottawa Downtown	Rideau St./Wurtemburg St.	8551	3	4	7	10	22	55	10.2	153	55
51002	Ottawa Central	960 Carling Ave.	8664	2	3	4	7	19	71	8.7	132	60
52022	Kingston	752 King St. W.	8721	2	3	3	5	9	22	4.6	66	19
54012	Belleville	2 Sidney St., Water Treatment Plant	8697	2	3	4	6	13	43	6.4	114	30

Table A6: 2012 Nitrogen Oxides (NO_x) Annual Statistics Unit: parts per billion (ppb)

				PERCENTILES							Maximum	
ID	City	Station Location	Valid h	10%	30%	50%	70%	90%	99%	Mean	1h	24h
56051	Cornwall	Bedford St./3rd St. W.	8758	2	3	5	7	17	64	8.4	204	62
59006	Peterborough	10 Hospital Dr.	8765	1	2	4	5	11	34	5.4	98	35
63203	Thunder Bay	421 James St. S.	8691	4	5	8	13	27	66	12.4	144	53
71078	Sault Ste. Marie	Sault College	8747	2	3	4	7	13	32	6.4	71	19
75010	North Bay	Chippewa St. W., Dept. National Defence	8761	3	4	5	8	19	58	9.1	206	40

Table A7: 2012 Sulphur Dioxide (SO_2) Annual Statistics

Unit: parts per billion (ppb)
SO_2 1h AAQC: 250 ppb
SO_2 24h AAQC: 100 ppb
SO_2 1y AAQC: 20 ppb

				PERCENTILES							Maximum		No. of Times Above Criteria		
ID	City	Station Location	Valid h	10%	30%	50%	70%	90%	99%	Mean	1h	24h	1h	24h	1y
12008	Windsor Downtown	467 University Ave. W.	8654	0	1	1	2	7	22	2.8	62	18	0	0	0
12016	Windsor West	College Ave./South St.	8413	0	0	1	2	8	24	2.8	69	14	0	0	0
14064	Sarnia	Front St. N./Cn Tracks, Centennial Park	8659	0	0	1	2	11	49	4.1	110	42	0	0	0
29000	Hamilton Downtown	Elgin St./Kelly St.	8727	0	1	1	3	15	50	4.8	112	29	0	0	0
29114	Hamilton Mountain	Vickers Rd./E. 18th St.	8769	1	1	2	3	8	30	3.7	107	25	0	0	0
35125	Toronto West	125 Resources Rd.	8659	0	0	0	1	2	5	0.6	18	4	0	0	0
46108	Mississauga	3359 Mississauga Rd. N., U of T Campus	8746	0	0	0	1	2	6	0.6	20	3	0	0	0
51001	Ottawa Downtown	Rideau St./Wurtemburg St.	8586	0	0	0	0	1	2	0.3	8	2	0	0	0
71078	Sault Ste. Marie	Sault College	8758	0	0	0	0	1	13	0.6	56	7	0	0	0
77219	Sudbury	1222 Ramsey Lake Rd.	8767	0	0	0	0	2	27	1.3	142	13	0	0	0

Table A8: 2012 Carbon Monoxide (CO) Annual Statistics

Unit: parts per million (ppm)
CO 1h AAQC: 30 ppm
CO 8h AAQC: 13 ppm

ID	CITY	STATION LOCATION	Valid h	PERCENTILES						Mean	Maximum		No. of Times Above Criteria	
				10%	30%	50%	70%	90%	99%		1h	8h	1h	8h
12008	Windsor Downtown	467 University Ave. W.	8770	0.17	0.2	0.22	0.26	0.37	0.73	0.26	2.09	1.21	0	0
29000	Hamilton Downtown	Elgin St./Kelly St.	8710	0.16	0.19	0.22	0.26	0.40	0.76	0.25	1.71	0.87	0	0
35125	Toronto West	125 Resources Rd.	8711	0.16	0.2	0.23	0.26	0.38	0.7	0.25	1.39	1.20	0	0
51001	Ottawa Downtown	Rideau St./Wurtemburg St.	8260	0.14	0.18	0.2	0.24	0.33	0.54	0.23	0.93	0.77	0	0

Table A9: 2012 Total Reduced Sulphur (TRS) Compounds Annual Statistics

Unit: parts per billion (ppb)

ID	CITY	STATION LOCATION	Valid h	PERCENTILES						Mean	Maximum	
				10%	30%	50%	70%	90%	99%		1h	24h
12016	Windsor West	College Ave./South St.	8667	0	0	0	1	1	3	0.5	13	2
14064	Sarnia	Front St. N./Cn Tracks, Centennial Park	8603	0	0	1	1	2	2	0.7	5	2
29000	Hamilton Downtown	Elgin St./Kelly St.	8651	0	0	0	0	1	3	0.2	13	4
71078	Sault Ste. Marie	Sault College	8677	0	0	0	0	0	1	0.1	4	1

Table A10: 10y Trend for O_3 Annual Mean (ppb)

ID	City/Town	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	Change Over Time
12008	Windsor Downtown	22.9	20.2	25.3	24.6	27.0	26.9	24.8	28.0	27.2	28.0	▲ 26%
12016	Windsor West	22.9	22.6	25.6	24.3	25.3	25.9	24.9	26.7	26.4	28.0	▲ 19%
13001	Chatham	INS	INS	31.0	28.7	30.9	30.9	28.8	31.9	29.7	29.5	▼ 1%
14064	Sarnia	24.7	23.8	27.4	26.7	28.6	28.7	26.6	30.7	29.7	29.7	▲ 22%
15020	Grand Bend	30.7	25.8	32.5	29.7	31.7	31.3	29.6	35.0	32.8	33.2	▲ 16%
15025	London	26.9	23.6	26.1	25.1	27.2	27.0	25.1	28.2	26.8	27.7	▲ 9%
16015	Port Stanley	34.9	32.2	34.6	32.4	34.3	34.3	30.9	34.6	32.8	33.1	▼ 3%
18007	Tiverton	33.2	28.1	31.8	29.0	34.3	32.6	31.4	33.8	32.1	32.0	▲ 6%
21005	Brantford	INS	26.2	27.9	27.0	28.9	28.4	26.5	29.4	28.7	28.8	▲ 7%
26060	Kitchener	28.1	24.8	28.0	26.6	28.6	28.1	27.0	29.4	27.6	28.0	▲ 5%
27067	St. Catharines	25.3	23.6	26.3	26.2	28.1	27.5	25.6	28.3	28.0	28.7	▲ 15%
28028	Guelph	24.4	25.9	28.6	26.8	28.1	27.9	27.3	30.7	28.9	28.8	▲ 15%
29000	Hamilton Downtown	21.7	20.1	23.3	23.2	24.8	25.1	24.3	26.9	25.4	25.7	▲ 24%
29114	Hamilton Mountain	28.4	24.6	28.2	27.5	29.2	29.0	27.2	29.7	28.8	30.2	▲ 10%
29118	Hamilton West	22.0	19.2	21.2	20.9	23.0	23.3	21.8	24.5	24.2	24.2	▲ 20%
31103	Toronto Downtown	23.6	22.8	24.5	22.6	25.7	26.0	24.6	26.1	25.4	26.6	▲ 14%
33003	Toronto East	21.8	19.9	22.4	22.0	23.2	21.6	22.1	23.0	23.3	24.6	▲ 13%
34020	Toronto North	23.6	22.5	24.5	23.3	24.5	22.7	22.1	24.8	23.6	25.7	▲ 5%
35125	Toronto West	18.7	17.6	20.3	19.0	21.1	20.7	19.5	20.6	20.1	21.5	▲ 13%
44008	Burlington	22.8	21.0	23.9	23.5	24.6	24.9	24.1	26.6	25.9	26.7	▲ 21%
44017	Oakville	INS	24.6	27.7	26.1	27.5	27.0	25.5	28.0	26.8	27.7	▲ 6%
45026	Oshawa	24.1	23.3	28.6	25.1	28.0	27.0	25.5	28.0	26.6	27.0	▲ 10%
46089	Brampton	25.1	25.1	26.8	25.5	26.8	26.6	25.2	27.5	26.1	26.6	▲ 5%
46108	Mississauga	24.8	20.6	23.1	22.4	23.3	24.6	24.0	25.9	24.1	25.6	▲ 13%
47045	Barrie	23.2	24.8	26.9	24.1	25.9	26.5	24.3	26.8	25.3	26.3	▲ 7%
48006	Newmarket	29.6	28.3	30.8	28.8	31.7	29.5	28.6	31.5	27.8	29.4	▼ 1%
49005	Parry Sound	INS	31.1	33.8	30.7	31.8	32.1	29.7	31.3	29.7	30.1	▼ 7%
49010	Dorset	30.1	28.8	32.3	28.9	29.9	29.3	27.7	28.6	27.0	28.0	▼ 10%
51001	Ottawa Downtown	24.7	21.7	23.3	23.6	24.7	23.3	23.4	25.7	24.2	26.0	▲ 9%
54012	Belleville	30.9	28.1	29.4	29.2	32.0	29.8	28.5	30.0	27.9	28.0	▼ 5%
56010	Morrisburg	INS	28.0	27.8	28.0	29.2	27.9	26.1	28.6	27.2	28.2	▼ 1%
56051	Cornwall	25.9	23.8	27.7	27.5	28.3	26.6	25.5	27.9	26.1	27.1	▲ 4%
59006	Peterborough	29.7	27.1	31.2	24.9	27.6	28.2	27.7	30.5	27.9	29.1	▲ 1%
63203	Thunder Bay	26.1	22.0	22.3	23.5	24.2	23.0	24.2	25.7	25.2	25.0	▲ 7%
71078	Sault Ste. Marie	26.8	27.0	30.2	29.1	29.7	28.9	27.8	28.4	27.8	28.8	▲ 2%
75010	North Bay	27.0	25.2	28.0	26.7	27.1	27.7	26.1	28.0	26.7	26.1	► 0%
77219	Sudbury	28.5	27.8	31.0	28.4	28.1	27.9	25.9	28.7	28.7	28.5	▼ 2%

Notes:

n/a indicates pollutant not monitored.

INS indicates there was insufficient data in the 2nd and/or 3rd quarter to calculate a valid annual mean.

Station 44017 replaced station 44015 as the Oakville site in 2003.

Station 45026 replaced station 45025 as the Oshawa site in 2005.

Station 46108 replaced station 46109 as the Mississauga site in 2009.

Station 46109 replaced station 46110 as the Mississauga site in 2004.

Station 63203 replaced station 63200 as the Thunder Bay site in 2004.

Station 71078 replaced station 71068 as the Sault Ste. Marie site in 2004.

Station 77219 replaced station 77203 as the Sudbury site in 2004.

Table A11: 10y Trend for O_3 Summer Means (May - September) Summer Mean (ppb)

ID	City/Town	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	Change Over Time
12008	Windsor Downtown	32.3	26.3	35.6	32.6	36.3	34.1	30.4	34.6	33.8	36.8	▲ 14%
12016	Windsor West	32.3	29.6	35.8	31.9	33.5	32.1	29.5	31.8	31.9	35.7	▲ 3%
13001	Chatham	n/a	INS	39.5	35.5	38.2	36.7	32.6	36.5	34.4	36.6	▼ 8%
14064	Sarnia	31.8	26.6	34.1	32.0	34.2	33.0	28.6	34.3	32.9	36.6	▲ 14%
15020	Grand Bend	33.6	29.8	36.3	33.5	34.9	32.4	29.7	37.8	33.9	38.9	▲ 12%
15025	London	33.9	28.5	33.9	31.2	33.2	31.6	28.4	32.5	30.7	34.4	▲ 1%
16015	Port Stanley	41.2	35.7	42.3	38.5	40.4	38.8	33.2	38.9	35.5	38.4	▼ 8%
18007	Tiverton	37.6	29.8	33.3	30.4	38.3	34.0	30.3	33.3	31.7	36.0	▼ 1%
21005	Brantford	INS	28.9	33.5	31.8	33.6	31.0	27.5	31.6	31.1	33.5	▲ 2%
26060	Kitchener	34.3	29.8	34.3	32.0	34.2	31.0	28.8	31.6	30.2	33.5	▼ 5%
27067	St. Catharines	31.7	28.3	33.6	32.6	33.9	31.2	27.7	32.0	31.2	35.0	▲ 4%
28028	Guelph	29.7	29.5	34.0	31.5	33.1	30.4	28.7	32.5	31.3	34.5	▲ 7%
29000	Hamilton Downtown	28.3	24.9	30.4	29.2	30.8	29.8	28.2	31.6	28.7	32.4	▲ 13%
29114	Hamilton Mountain	35.0	29.7	36.7	33.7	36.1	33.6	31.0	34.4	32.3	37.4	▲ 3%
29118	Hamilton West	26.3	22.7	25.7	25.3	26.9	26.7	23.9	27.9	26.2	29.2	▲ 13%
31103	Toronto Downtown	31.1	28.3	31.9	28.7	33.2	30.9	27.9	31.1	29.5	33.3	▲ 3%
33003	Toronto East	28.3	24.5	30.6	27.2	28.3	24.9	25.2	26.7	27.4	30.6	▲ 2%
34020	Toronto North	29.2	26.3	30.2	28.6	29.9	26.4	25.6	28.0	27.5	32.7	▲ 3%
35125	Toronto West	24.1	21.4	26.5	24.3	25.9	24.8	22.5	24.3	23.6	27.5	▲ 6%
44008	Burlington	29.0	25.1	30.2	29.2	30.0	28.3	26.7	30.2	29.2	32.5	▲ 10%
44017	Oakville	35.5	28.6	34.4	31.7	32.8	30.8	28.2	31.5	29.9	34.2	▼ 5%
45026	Oshawa	27.8	25.9	INS	28.0	31.5	28.3	26.4	29.5	28.5	31.1	▲ 10%
46089	Brampton	31.2	29.1	31.7	31.3	31.9	31.0	28.5	30.8	29.3	32.7	► 0%
46108	Mississauga	31.3	24.6	31.6	28.5	28.6	27.3	26.2	29.0	26.7	30.4	▼ 3%
47045	Barrie	25.7	27.3	30.7	28.1	28.6	30.0	25.0	27.9	26.2	29.7	▲ 1%
48006	Newmarket	34.7	32.3	36.1	33.7	36.0	32.1	30.9	34.4	30.5	34.2	▼ 6%
49005	Parry Sound	33.0	33.2	36.9	33.3	33.6	32.2	28.6	30.4	28.7	32.8	▼ 13%
49010	Dorset	29.5	28.5	33.0	29.2	30.0	27.2	25.0	25.2	23.8	28.3	▼ 17%
51001	Ottawa Downtown	29.0	23.5	27.2	26.5	28.2	24.9	24.6	26.1	25.1	29.3	► 0%
54012	Belleville	37.7	33.0	35.6	34.1	37.0	32.3	30.6	34.2	29.9	32.7	▼ 13%
56010	Morrisburg	n/a	29.7	30.6	30.6	31.6	27.8	26.7	29.5	27.1	31.1	▼ 5%
56051	Cornwall	31.1	26.1	31.8	29.8	31.1	27.6	27.1	29.8	26.7	30.7	▼ 4%
59006	Peterborough	34.0	30.0	36.5	27.2	30.0	31.6	29.2	32.0	29.8	34.2	▼ 2%
63203	Thunder Bay	27.3	22.7	23.6	24.7	24.6	21.3	24.2	23.9	24.2	25.3	▼ 2%
71078	Sault Ste. Marie	28.0	27.3	32.0	31.4	31.5	28.4	27.5	27.2	26.4	30.3	▼ 4%
75010	North Bay	29.8	28.4	31.0	29.0	28.5	28.3	26.5	28.4	26.3	28.5	▼ 9%
77219	Sudbury	32.0	28.7	32.4	30.1	29.5	26.0	25.7	26.3	26.9	29.8	▼ 14%

Notes:

n/a indicates pollutant not monitored.

INS indicates there was insufficient data in the 2nd and/or 3rd quarter to calculate a valid annual mean.

Station 44017 replaced station 44015 as the Oakville site in 2003.

Station 45026 replaced station 45025 as the Oshawa site in 2005.

Station 46108 replaced station 46109 as the Mississauga site in 2009.

Station 46109 replaced station 46110 as the Mississauga site in 2004.

Station 63203 replaced station 63200 as the Thunder Bay site in 2004.

Station 71078 replaced station 71068 as the Sault Ste. Marie site in 2004.

Station 77219 replaced station 77203 as the Sudbury site in 2004.

Table A12: 10y Trend for O_3 Winter Means (January-April, October-December)												Winter Mean (ppb)
ID	City/Town	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	Change Over Time
12008	Windsor Downtown	16.4	16.0	16.5	18.8	20.3	21.7	20.8	23.2	22.5	21.7	▲ 46%
12016	Windsor West	16.1	17.7	18.2	18.8	19.4	21.5	21.6	22.8	22.5	22.3	▲ 40%
13001	Chatham	INS	INS	25.1	23.9	25.4	26.8	26.1	28.5	26.7	24.3	▲ 6%
14064	Sarnia	19.6	22.0	INS	23.0	24.7	25.5	25.2	28.1	27.4	24.7	▲ 31%
15020	Grand Bend	28.7	22.7	29.8	26.8	29.4	30.5	29.5	33.0	32.1	29.1	▲ 20%
15025	London	21.8	20.0	20.4	20.7	22.8	23.7	22.8	25.0	24.2	22.9	▲ 18%
16015	Port Stanley	30.7	29.9	29.2	28.0	30.0	31.0	29.4	31.5	31.0	29.3	▲ 2%
18007	Tiverton	29.7	INS	30.7	28.2	31.5	31.7	32.3	34.1	32.2	29.2	▲ 7%
21005	Brantford	INS	24.1	23.9	23.6	25.5	26.6	25.8	27.8	27.1	25.4	▲ 13%
26060	Kitchener	23.7	21.1	23.4	22.7	24.6	26.0	25.9	27.8	25.7	24.0	▲ 16%
27067	St. Catharines	20.8	20.2	20.9	21.7	24.1	24.9	24.1	25.6	25.8	24.1	▲ 27%
28028	Guelph	20.8	23.4	24.8	23.4	24.8	26.1	26.4	29.3	27.2	24.8	▲ 23%
29000	Hamilton Downtown	16.9	16.6	18.2	18.9	20.5	21.7	21.5	23.5	23.1	20.9	▲ 38%
29114	Hamilton Mountain	23.7	21.1	22.1	23.0	24.2	25.7	24.5	26.3	26.3	25.0	▲ 19%
29118	Hamilton West	18.9	16.6	17.9	17.8	20.1	20.9	20.4	22.1	22.7	20.6	▲ 27%
31103	Toronto Downtown	18.2	18.7	19.1	18.2	20.4	22.2	22.4	22.4	22.6	21.8	▲ 27%
33003	Toronto East	17.2	16.6	17.5	18.2	19.5	19.3	19.9	20.4	20.4	20.3	▲ 23%
34020	Toronto North	19.7	19.7	20.4	19.4	20.7	20.1	19.5	22.5	20.8	20.7	▲ 7%
35125	Toronto West	14.6	14.9	15.8	15.1	17.7	17.7	17.4	18.0	17.7	17.2	▲ 22%
44008	Burlington	18.5	18.1	19.3	19.3	20.7	22.5	22.3	23.9	23.5	22.5	▲ 33%
44017	Oakville	22.7	21.7	22.8	22.0	23.7	24.4	23.6	25.5	24.7	23.1	▲ 10%
45026	Oshawa	21.5	21.4	24.1	23.0	25.6	25.7	24.9	26.9	25.2	24.1	▲ 17%
46089	Brampton	20.8	22.3	23.3	21.4	23.1	23.4	22.8	25.2	23.8	22.2	▲ 9%
46108	Mississauga	20.2	18.0	17.0	18.0	19.2	22.8	22.5	23.7	22.5	22.2	▲ 31%
47045	Barrie	21.3	22.9	24.2	21.3	24.0	24.2	23.8	26.0	24.7	23.9	▲ 13%
48006	Newmarket	26.0	25.4	27.0	25.3	28.6	27.6	27.1	29.4	25.8	26.0	▲ 4%
49005	Parry Sound	INS	29.6	31.6	28.9	30.6	32.0	30.5	31.9	30.4	28.1	▼ 2%
49010	Dorset	29.0	29.0	31.8	28.6	30.1	30.7	29.6	31.0	29.5	27.7	▼ 2%
51001	Ottawa Downtown	20.8	20.4	20.7	21.4	22.0	22.2	22.6	25.5	23.6	23.5	▲ 20%
54012	Belleville	26.1	24.6	25.1	25.8	28.4	28.0	26.9	27.0	26.4	24.6	▲ 3%
56010	Morrisburg	INS	26.6	25.7	26.2	27.5	27.9	25.7	28.0	27.5	26.0	▲ 2%
56051	Cornwall	22.4	22.2	24.8	25.9	26.3	26.0	24.5	26.5	25.7	24.2	▲ 10%
59006	Peterborough	26.6	25.0	27.3	23.3	25.9	26.0	26.7	29.5	26.6	25.5	▲ 5%
63203	Thunder Bay	25.4	21.9	21.7	22.6	23.9	24.3	24.2	27.1	26.1	24.7	▲ 13%
71078	Sault Ste. Marie	24.7	26.8	28.9	27.5	28.6	29.3	28.4	29.3	28.9	27.6	▲ 9%
75010	North Bay	25.0	23.0	25.9	25.0	26.2	27.2	25.8	27.7	27.0	24.4	▲ 8%
77219	Sudbury	25.9	27.2	30.0	27.2	27.2	29.3	26.0	30.5	30.0	27.6	▲ 7%

Notes:

n/a indicates pollutant not monitored.

INS indicates there was insufficient data in the 2nd and/or 3rd quarter to calculate a valid annual mean.

Station 44017 replaced station 44015 as the Oakville site in 2003.

Station 45026 replaced station 45025 as the Oshawa site in 2005.

Station 46108 replaced station 46109 as the Mississauga site in 2009.

Station 46109 replaced station 46110 as the Mississauga site in 2004.

Station 63203 replaced station 63200 as the Thunder Bay site in 2004.

Station 71078 replaced station 71068 as the Sault Ste. Marie site in 2004.

Station 77219 replaced station 77203 as the Sudbury site in 2004.

Table A13: 10y Trend for $PM_{2.5}$ Annual Mean (µg/m³)

ID	City/Town	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	Change Over Time
12008	Windsor Downtown	8.5	8.6	10.4	8.2	9.5	8.3	7.2	7.7	7.6	7.4	▼ 20%
12016	Windsor West	9.6	9.5	10.5	9.2	9.8	8.9	7.4	7.8	7.8	7.6	▼ 26%
13001	Chatham	INS	INS	9.1	7.4	7.9	7.3	6.3	6.5	6.6	6.0	▼ 31%
14064	Sarnia	11.9	12.2	12.9	11.3	12.2	11.4	9.8	10.4	10.5	10.2	▼ 19%
15020	Grand Bend	INS	7.0	7.4	6.5	6.7	6.8	5.8	6.1	6.1	5.8	▼ 20%
15025	London	7.9	7.8	8.8	6.9	6.5	6.8	5.7	INS	6.2	6.5	▼ 27%
16015	Port Stanley	8.0	7.5	8.6	7.3	7.2	6.7	5.6	5.9	6.0	5.9	▼ 32%
18007	Tiverton	6.5	5.8	6.6	5.6	5.6	5.0	4.0	4.5	4.7	INS	▼ 34%
21005	Brantford	INS	7.5	8.9	7.6	7.7	6.8	5.8	6.5	6.6	6.2	▼ 26%
26060	Kitchener	8.1	8.1	9.5	7.7	8.0	7.1	5.8	6.3	6.2	6.0	▼ 34%
27067	St. Catharines	7.8	7.3	8.6	7.9	8.2	7.4	6.0	6.5	6.3	6.3	▼ 25%
28028	Guelph	7.3	7.8	8.8	7.0	7.5	6.5	5.6	5.7	5.9	5.8	▼ 32%
29000	Hamilton Downtown	10.6	8.9	10.0	9.1	8.9	8.3	6.8	7.7	8.1	8.3	▼ 25%
29114	Hamilton Mountain	9.6	9.3	9.8	8.1	7.8	7.3	6.3	6.2	6.7	6.5	▼ 40%
29118	Hamilton West	INS	8.4	9.6	8.2	8.3	7.6	6.1	6.8	7.1	7.3	▼ 26%
31103	Toronto Downtown	8.4	7.1	8.5	7.3	7.3	6.6	5.6	6.0	6.2	6.4	▼ 28%
33003	Toronto East	8.8	7.4	8.4	7.6	7.8	6.7	5.9	6.7	6.2	6.3	▼ 30%
34020	Toronto North	8.3	7.7	9.4	7.6	7.8	7.3	5.9	6.2	7.7	7.3	▼ 20%
35125	Toronto West	9.8	9.8	10.0	8.2	8.4	7.5	6.1	6.5	6.9	7.1	▼ 38%
44008	Burlington	8.6	7.9	9.1	7.6	7.3	6.9	5.9	6.2	6.2	6.4	▼ 33%
44017	Oakville	INS	8.1	8.9	7.4	7.6	6.7	5.3	5.7	6.4	6.1	▼ 34%
45026	Oshawa	INS	INS	8.1	6.8	6.8	6.3	5.2	5.6	5.5	5.5	▼ 33%
46089	Brampton	8.2	7.7	8.9	7.2	7.4	6.8	5.6	5.8	6.0	5.7	▼ 36%
46108	Mississauga	7.9	8.0	9.2	7.6	7.2	7.1	5.8	6.1	6.0	6.0	▼ 33%
47045	Barrie	7.5	6.9	8.1	6.7	6.9	6.1	5.2	5.4	5.7	5.6	▼ 31%
48006	Newmarket	7.3	6.4	7.7	6.4	6.6	6.0	5.1	5.6	5.5	5.6	▼ 28%
49005	Parry Sound	INS	5.3	6.1	5.3	5.5	4.7	3.9	4.4	4.7	4.8	▼ 23%
49010	Dorset	5.9	4.7	5.8	4.5	5.0	4.5	3.6	4.0	4.1	4.1	▼ 32%
51001	Ottawa Downtown	7.2	6.5	7.7	6.1	6.0	5.3	4.6	4.5	4.9	4.8	▼ 41%
54012	Belleville	6.9	6.4	7.0	6.2	6.2	6.1	4.9	INS	4.8	5.1	▼ 31%
56010	Morrisburg	INS	6.2	7.0	6.8	6.2	5.7	5.0	5.3	5.2	5.0	▼ 29%
56051	Cornwall	INS	6.8	7.6	6.5	6.4	6.1	5.4	5.7	5.7	5.4	▼ 26%
59006	Peterborough	6.7	5.9	7.5	6.3	6.4	6.0	4.9	5.1	5.5	4.9	▼ 28%
63203	Thunder Bay	INS	4.2	4.4	4.8	4.4	4.2	3.8	4.1	4.8	4.1	▼ 4%
71078	Sault Ste. Marie	INS	4.5	5.4	5.2	5.3	4.4	4.0	4.1	4.4	4.4	▼ 18%
75010	North Bay	5.5	4.5	5.6	4.9	5.0	4.6	3.8	3.8	4.2	4.1	▼ 28%
77219	Sudbury	INS	INS	5.1	4.6	4.9	4.1	3.4	3.6	4.0	4.0	▼ 32%

Notes:

Measurements taken by Tapered Element Oscillating Microbalance (TEOM) sampler operated at 30° C with a Sample Equilibration System (SES).

INS indicates there was insufficient data in any one quarter to calculate a valid annual mean.

Station 44017 replaced station 44015 as the Oakville site in 2003.

Station 45026 replaced station 45025 as the Oshawa site in 2005.

Station 46108 replaced station 46109 as the Mississauga site in 2009.

Station 46109 replaced station 46110 as the Mississauga site in 2004.

Station 63203 replaced station 63200 as the Thunder Bay site in 2004.

Station 71078 replaced station 71068 as the Sault Ste. Marie site in 2004.

Station 77219 replaced station 77203 as the Sudbury site in 2004.

Table A14: 10y Trend for NO Annual Mean (ppb)

ID	City/Town	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	Change Over Time
12008	Windsor Downtown	INS	10.5	7.8	7.2	6.4	5.9	5.6	4.7	4.5	4.7	▼ 58%
12016	Windsor West	INS	11.3	8.3	7.2	6.5	5.1	5.4	6.1	3.8	4.6	▼ 62%
13001	Chatham	INS	INS	2.5	2.6	2.4	3.1	3.5	2.6	1.9	1.8	▼ 22%
14064	Sarnia	5.0	3.7	3.8	3.7	3.2	3.2	2.8	2.2	3.1	2.1	▼ 51%
15025	London	INS	6.0	5.5	4.4	3.6	3.1	2.8	2.9	3.3	4.2	▼ 45%
21005	Brantford	INS	2.8	3.8	2.5	1.8	1.3	1.7	1.3	1.2	1.1	▼ 74%
26060	Kitchener	INS	4.9	4.4	3.5	2.7	2.5	2.1	2.5	2.0	2.1	▼ 64%
29000	Hamilton Downtown	11.7	9.6	9.9	8.0	7.7	6.5	5.8	5.0	4.8	4.6	▼ 64%
31103	Toronto Downtown	8.7	7.6	7.2	7.0	5.9	5.0	5.1	4.1	3.4	2.8	▼ 67%
33003	Toronto East	17.0	16.0	14.4	12.5	10.8	9.2	7.8	7.8	7.6	6.6	▼ 67%
34020	Toronto North	12.4	10.5	10.8	10.0	8.3	7.7	7.1	5.7	6.2	5.0	▼ 60%
35125	Toronto West	30.2	26.6	26.1	20.1	17.5	16.2	13.5	13.4	12.4	11.3	▼ 68%
44008	Burlington	14.0	11.1	12.3	9.8	8.8	6.5	5.9	5.0	4.6	4.6	▼ 75%
44017	Oakville	INS	5.3	5.2	4.3	3.9	4.0	3.5	3.6	2.7	3.4	▼ 43%
45026	Oshawa	9.33	8.22	INS	3.8	3.2	3.2	3.0	2.3	2.3	2.1	▼ 89%
46089	Brampton	10.4	8.7	8.9	9.1	6.0	5.8	6.5	3.7	4.6	4.4	▼ 63%
47045	Barrie	9.3	7.3	7.1	8.0	5.5	5.5	5.1	4.3	3.8	3.2	▼ 64%
48006	Newmarket	4.0	3.1	3.5	3.0	2.2	2.6	3.2	2.3	2.2	2.0	▼ 45%
51001	Ottawa Downtown	5.8	3.2	3.3	3.0	3.4	2.7	2.4	1.6	1.8	2.4	▼ 63%
54012	Belleville	6.1	5.6	4.5	3.0	3.2	3.0	1.9	2.3	2.3	1.6	▼ 78%
59006	Peterborough	3.4	n/a	n/a	2.5	2.3	3.0	1.9	1.7	2.2	1.8	▼ 47%
75010	North Bay	6.4	8.8	3.7	4.4	3.5	3.8	4.2	3.4	4.0	2.9	▼ 57%

Notes:

n/a indicates pollutant not monitored.

INS indicates there was insufficient data to calculate a valid annual mean.

Station 44017 replaced station 44015 as the Oakville site in 2003.

Station 45026 replaced station 45025 as the Oshawa site in 2005.

Table A15: 10y Trend for NO_2 Annual Mean (ppb)

ID	City/Town	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	Change Over Time
12008	Windsor Downtown	INS	18.3	16.9	17.2	17.2	15.2	14.4	15.6	14.5	13.2	▼ 25%
12016	Windsor West	INS	17.6	17.1	15.7	16.1	16.2	13.2	14.5	12.9	11.4	▼ 32%
13001	Chatham	INS	INS	11.0	9.5	8.6	7.0	7.5	6.4	6.6	5.7	▼ 47%
14064	Sarnia	13.1	11.7	12.7	11.0	11.3	10.8	8.2	8.0	8.6	8.6	▼ 40%
15025	London	INS	13.7	14.1	12.3	11.7	10.8	9.0	8.8	8.3	6.3	▼ 53%
21005	Brantford	INS	8.6	10.1	8.8	7.7	6.9	7.3	5.8	6.1	5.4	▼ 43%
26060	Kitchener	INS	13.1	12.9	10.8	9.7	9.0	8.6	7.7	7.7	7.1	▼ 49%
29000	Hamilton Downtown	21.3	16.8	19.3	17.0	17.0	14.7	13.6	12.7	13.5	11.9	▼ 42%
31103	Toronto Downtown	23.2	20.1	20.7	19.2	18.2	17.0	16.5	16.1	14.9	13.4	▼ 38%
33003	Toronto East	21.3	19.8	20.1	17.4	17.2	16.5	14.9	14.8	15.2	14.0	▼ 35%
34020	Toronto North	20.4	17.3	19.2	17.4	16.7	16.5	15.8	14.3	15.4	13.4	▼ 29%
35125	Toronto West	26.2	24.8	26.6	22.3	22.1	20.8	19.0	20.1	19.1	16.3	▼ 36%
44008	Burlington	17.3	15.3	17.2	16.2	16.0	13.6	12.5	12.2	11.8	11.0	▼ 37%
44017	Oakville	INS	13.5	14.5	12.5	13.0	12.0	11.1	9.2	10.3	9.1	▼ 36%
45026	Oshawa	16.2	14.2	INS	8.9	8.1	8.5	7.4	7.2	7.0	5.6	▼ 67%
46089	Brampton	17.6	16.2	16.9	15.2	13.9	13.1	13.3	10.7	11.3	10.4	▼ 42%
47045	Barrie	14.8	13.3	13.8	12.6	11.5	10.8	9.9	8.7	8.6	8.1	▼ 47%
48006	Newmarket	10.2	9.9	8.5	9.0	8.3	8.0	7.8	7.2	8.1	7.2	▼ 28%
51001	Ottawa Downtown	13.7	11.1	9.8	8.6	8.7	11.4	8.6	7.4	7.9	7.8	▼ 39%
54012	Belleville	10.5	9.4	8.2	4.5	6.4	7.3	6.0	5.5	6.3	4.7	▼ 49%
59006	Peterborough	8.3	n/a	n/a	6.3	6.4	7.0	5.6	5.0	4.3	3.7	▼ 52%
75010	North Bay	10.1	9.2	6.8	7.7	7.4	7.5	8.2	7.6	7.4	6.1	▼ 25%

Notes:

n/a indicates pollutant not monitored.

INS indicates there was insufficient data to calculate a valid annual mean.

Station 44017 replaced station 44015 as the Oakville site in 2003.

Station 45026 replaced station 45025 as the Oshawa site in 2005.

Table A16: 10y Trend for NO_x Annual Mean (ppb)

ID	City/Town	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	Change Over Time
12008	Windsor Downtown	INS	29.3	24.9	24.4	23.6	21.1	20.0	20.2	18.9	17.8	▼ 37%
12016	Windsor West	INS	29.1	25.6	22.8	22.6	21.3	18.6	20.6	16.7	16.0	▼ 43%
13001	Chatham	INS	INS	13.5	12.1	11.0	10.1	10.9	9.0	8.4	7.5	▼ 42%
14064	Sarnia	18.1	15.7	16.8	14.7	14.5	13.9	11.0	10.2	11.7	10.7	▼ 44%
15025	London	INS	19.4	19.4	16.7	15.3	13.9	11.9	11.7	11.6	10.5	▼ 50%
21005	Brantford	INS	11.6	13.7	11.3	9.5	8.2	9.1	7.2	7.3	6.7	▼ 50%
26060	Kitchener	INS	18.2	17.4	14.3	12.4	11.5	10.8	10.3	9.6	9.2	▼ 53%
29000	Hamilton Downtown	33.3	27.7	30.1	24.9	24.7	21.2	19.5	17.8	18.3	16.6	▼ 52%
31103	Toronto Downtown	32.2	28.1	28.2	26.1	24.2	22.1	21.6	20.3	18.4	16.2	▼ 47%
33003	Toronto East	37.9	36.3	34.7	29.9	28.0	25.7	22.7	22.6	22.8	20.6	▼ 49%
34020	Toronto North	33.1	28.3	30.4	27.5	25.0	24.3	22.8	20.0	21.5	18.5	▼ 42%
35125	Toronto West	56.9	51.2	52.4	42.4	39.6	37.0	32.5	33.5	31.5	27.6	▼ 53%
44008	Burlington	31.0	26.1	29.3	26.0	24.8	20.0	18.4	17.2	16.4	15.6	▼ 53%
44017	Oakville	INS	18.3	19.5	16.7	16.9	16.1	14.6	12.8	13.0	12.6	▼ 37%
45026	Oshawa	25.5	22.5	INS	12.7	11.3	11.7	10.4	9.5	9.2	7.8	▼ 75%
46089	Brampton	28.1	25.0	25.9	24.2	19.9	18.9	19.9	14.4	15.9	14.8	▼ 50%
47045	Barrie	24.2	20.8	21.0	20.6	17.0	16.3	15.1	13.1	12.4	11.3	▼ 54%
48006	Newmarket	14.1	13.0	12.2	11.8	10.4	10.4	11.0	9.5	10.3	9.2	▼ 33%
51001	Ottawa Downtown	20.1	14.7	13.7	11.5	12.0	14.0	11.0	9.0	9.7	10.2	▼ 48%
54012	Belleville	15.8	14.4	12.6	7.5	9.6	10.2	7.9	7.8	8.7	6.4	▼ 57%
59006	Peterborough	11.7	n/a	n/a	8.8	8.6	10.0	7.5	6.7	6.6	5.4	▼ 51%
75010	North Bay	16.4	19.0	11.2	12.1	10.9	11.3	12.4	11.0	11.5	9.1	▼ 41%

Notes:

n/a indicates pollutant not monitored.

INS indicates there was insufficient data to calculate a valid annual mean.

Station 44017 replaced station 44015 as the Oakville site in 2003.

Station 45026 replaced station 45025 as the Oshawa site in 2005.

Table A17: 10y Trend for CO

1h Maximum (ppm)
CO 1-hour AAQC is 30 ppm

ID	City/Town	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	Change Over Time
12008	Windsor Downtown	4.3	2.3	1.3	2.9	5.0	1.3	1.4	2.5	3.8	2.1	▼ 23%
29000	Hamilton Downtown	3.1	4.0	2.6	2.8	6.0	3.3	5.0	2.2	1.8	1.7	▼ 35%
35125	Toronto West	3.4	2.9	2.7	3.0	1.4	1.7	1.6	1.8	1.4	1.4	▼ 65%
51001	Ottawa Downtown	2.2	2.2	2.0	1.4	1.5	1.3	1.4	1.5	1.5	0.9	▼ 50%

Table A18: 10y Trend for SO_2

Annual Mean (ppb)
SO_2 1-year AAQC is 20 ppb

ID	City/Town	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	Change Over Time
12008	Windsor Downtown	5.9	4.8	4.9	5.0	5.5	4.5	3.5	3.5	3.5	2.8	▼ 47%
12016	Windsor West	6.4	4.6	5.1	4.9	5.2	4.7	3.6	3.2	3.4	2.8	▼ 50%
14064	Sarnia	7.1	8.2	7.8	8.3	8.0	7.7	4.5	3.9	5.3	4.1	▼ 49%
29000	Hamilton Downtown	5.0	4.0	5.3	4.8	4.2	4.3	3.3	3.3	5.2	4.8	▼ 9%
29114	Hamilton Mountain	5.3	n/a	n/a	3.3	3.5	3.0	3.0	2.9	4.1	3.7	▼ 28%
35125	Toronto West	2.9	2.7	2.3	2.0	1.5	1.4	1.2	0.9	1.5	0.6	▼ 76%
51001	Ottawa Downtown	INS	1.0	1.5	1.1	0.9	1.0	0.9	0.2	0.4	0.3	▼ 81%
71078	Sault Ste. Marie	2.0	0.9	1.5	1.4	1.8	1.2	0.6	0.7	0.8	0.6	▼ 64%
77219	Sudbury	2.0	INS	2.8	2.4	2.3	2.0	1.1	1.3	1.5	1.3	▼ 51%

Notes:

n/a indicates pollutant not monitored.

INS indicates there was insufficient data to calculate a valid annual mean.

Station 71078 replaced station 71068 as the Sault Ste. Marie site in 2004.

Station 77219 replaced station 77203 as the Sudbury site in 2004.

Table A19: Ozone CWS Metric for Designated Sites Across Ontario Unit: parts per billion (ppb)

City/Town	2003 – 2005	2004 – 2006	2005 – 2007	2006 – 2008	2007 – 2009	2008 – 2010	2009 – 2011	2010 – 2012	Change Over Time
Windsor Downtown	82	81	89	85	81	74	75	79	▼ 10%
Chatham	n/a	86	86	80	78	73	72	75	▼ 17%
London	74	70	73	72	69	67	65	71	▼ 8%
Brantford	n/r	n/r	n/r	n/r	n/r	n/r	72	74	–
Kitchener	79	74	77	74	71	68	66	69	▼ 15%
Guelph	79	77	79	75	73	70	69	72	▼ 12%
St. Catharines	81	75	81	76	73	67	67	70	▼ 17%
Hamilton Downtown	77	72	76	74	71	69	67	68	▼ 12%
Hamilton Mountain	82	76	80	76	74	71	70	72	▼ 13%
Burlington	75	72	76	74	71	68	66	69	▼ 11%
Oakville	81	74	80	77	75	71	69	71	▼ 13%
Mississauga	80	75	80	77	66	66	65	68	▼ 19%
Brampton	80	75	79	76	74	69	68	70	▼ 14%
Toronto	81	75	80	78	76	74	71	73	▼ 10%
Oshawa	n/a	77	80	76	74	70	68	71	▼ 13%
Barrie	72	69	72	71	70	67	62	67	▼ 10%
Peterborough	81	72	73	71	73	73	71	73	▼ 6%
Kingston	77	77	89	85	81	77	74	76	▼ 6%
Ottawa Downtown	69	67	71	68	65	61	58	60	▼ 17%
Sudbury	76	74	77	71	69	66	65	66	▼ 16%
Thunder Bay	58	57	57	55	53	54	54	56	▼ 6%

Notes:

The CWS for ozone is 65 ppb, which is based on eight-hour running average time and the 4th highest annual ambient measurement averaged over three consecutive years.

CWS metrics are calculated as per the GDAD.

Toronto reporting is based on Toronto Downtown, Toronto North, Toronto East and Toronto West sites.

Red font indicates an exceedance of the CWS.

n/a indicates data are not sufficient to calculate metrics.

n/r indicates site not designated for CWS reporting. Brantford was added as a CWS designated site in 2009-2011.

A linear regression is applied to derive per cent change over time.

Table A20: $PM_{2.5}$ CWS Metric for Designated Sites Across Ontario Unit: micrograms per cubic metre (µg/m³)

City/Town	2003 – 2005	2004 – 2006	2005 – 2007	2006 – 2008	2007 – 2009	2008 – 2010	2009 – 2011	2010 – 2012	Change Over Time
Windsor Downtown	31	29	29	25	23	21	21	21	▼ 37%
Chatham	n/a	28	28	25	23	20	19	19	▼ 38%
London	30	28	26	23	22	20	17	17	▼ 46%
Brantford	n/r	n/r	n/r	n/r	n/r	n/r	20	20	–
Kitchener	34	30	29	25	22	19	18	19	▼ 50%
Guelph	34	30	28	24	21	19	18	18	▼ 52%
St. Catharines	29	30	31	27	23	20	19	19	▼ 43%
Hamilton Downtown	34	32	32	29	25	23	22	25	▼ 36%
Hamilton Mountain	32	31	29	26	23	21	19	20	▼ 44%
Burlington	30	29	28	25	22	21	19	20	▼ 40%
Oakville	34	30	28	24	21	19	18	18	▼ 52%
Mississauga	34	32	29	27	19	19	17	18	▼ 56%
Brampton	31	29	28	24	22	19	17	18	▼ 48%
Toronto	33	31	30	25	22	20	19	20	▼ 47%
Oshawa	n/a	29	29	25	21	19	18	18	▼ 45%
Barrie	30	29	28	24	21	18	17	18	▼ 48%
Peterborough	28	29	28	23	20	17	17	18	▼ 47%
Kingston	n/a	n/a	30	28	24	23	22	24	▼ 24%
Ottawa Downtown	30	26	25	20	17	15	14	15	▼ 58%
Sudbury	n/a	20	21	18	16	13	12	13	▼ 45%
Thunder Bay	n/a	n/a	16	15	14	13	14	13	▼ 17%

Notes:

The CWS for $PM_{2.5}$ is 30 µg/m³, 24-hour average time, based on the 98th percentile annual ambient measurement averaged over three consecutive years.

CWS metrics are calculated as per the GDAD.

Toronto reporting is based on Toronto Downtown, Toronto North, Toronto East and Toronto West sites.

Red font indicates an exceedance of the CWS.

n/a indicates data are not sufficient to calculate metrics.

n/r indicates site not designated for CWS reporting. Brantford was added as a CWS designated site in 2009-2011.

A linear regression is applied to derive per cent change over time.

Table A21: 2012 Air Quality Summary

City/Town	No. of Valid Hours	Percentage of Valid Hours AQI in Range					No. of Days At Least 1 Hour > 49
		Very Good 0-15	Good 16-31	Moderate 32-49	Poor 50-99	Very Poor 100+	
Windsor Downtown	8781	35.8	53.1	10.5	0.5	0	14
Windsor West	8698	35.4	52.9	11.2	0.5	0	13
Chatham	8715	34.3	56.1	9.4	0.2	0	6
Sarnia	8753	21.6	66.8	11.1	0.6	0	16
Grand Bend	8769	22.1	67.0	9.7	1.2	0	22
London	8775	36.5	54.7	8.4	0.3	0	11
Port Stanley	8781	23.7	64.4	11.6	0.3	0	10
Tiverton	8726	22.2	69.2	8.3	0.3	0	11
Brantford	8777	31.6	57.8	10.3	0.3	0	8
Kitchener	8765	34.0	57.8	8.0	0.1	0	3
St. Catharines	8693	32.0	58.7	9.2	0.1	0	3
Guelph	8712	31.7	59.0	9.0	0.3	0	8
Hamilton Downtown	8772	36.5	52.7	10.4	0.4	0	9
Hamilton Mountain	8772	28.2	60.1	11.4	0.3	0	7
Hamilton West	8776	39.5	52.6	7.8	0.1	0	3
Toronto Downtown	8765	40.1	52.1	7.6	0.1	0	4
Toronto East	8778	45.5	47.8	6.7	0.1	0	4
Toronto North	8776	36.7	56.1	7.1	0.2	0	5
Toronto West	8771	50.9	41.8	7.0	0.3	0	9
Burlington	8767	37.7	54.5	7.7	0.1	0	2
Oakville	8745	36.1	55.4	8.3	0.1	0	4
Oshawa	8764	36.9	57.8	5.2	0.1	0	5
Brampton	8717	36.9	55.2	7.8	0.2	0	5
Mississauga	8755	39.7	53.5	6.8	<0.1	0	1
Barrie	8781	37.3	57.4	5.0	0.3	0	7
Newmarket	8782	31.8	60.0	7.9	0.4	0	11
Parry Sound	8782	27.1	66.2	6.4	0.3	0	6
Dorset	8780	34.1	60.6	5.4	<0.1	0	2
Ottawa Downtown	8682	38.9	57.1	4.0	<0.1	0	0
Ottawa Central	8730	39.2	57.1	3.7	0	0	0
Petawawa	8763	33.9	62.1	4.0	0	0	0
Kingston	8733	20.3	70.0	9.3	0.3	0	8
Belleville	8749	34.9	59.0	6.0	<0.1	0	2
Morrisburg	8774	31.9	62.9	5.2	0	0	0
Cornwall	8775	35.4	59.6	5.0	0	0	0
Peterborough	8773	32.1	61.1	6.6	0.2	0	5
Thunder Bay	8775	40.6	57.8	1.6	0	0	0
Sault Ste. Marie	8772	31.2	63.9	4.7	0.2	0	5
North Bay	8776	38.8	57.7	3.4	<0.1	0	1
Sudbury	8782	32.5	63.3	4.1	0.1	0	3

Table A22: Summary of Smog Advisories (2003 - 2012)

Air Quality Forecast Region	2003		2004		2005		2006		2007		2008		2009		2010		2011		2012	
	Adv.	Days	Adv.	Days	Adv.	Days	Adv.	Days	Adv.	Days	Adv.	Days	Adv.	Days	Adv.	Days	Adv.	Days	Adv.	Days
Algonquin	2	4	3	6	5	16	1	3	1	3	0	0	1	1	0	0	0	0	1	3
Bancroft-Bon Echo	5	12	6	12	7	21	1	3	4	13	2	3	2	4	1	5	0	0	2	5
Barrie-Orillia-Midland	4	11	5	12	13	39	5	11	8	21	3	7	2	4	1	4	1	1	7	15
Belleville-Quinte-Northumberland	5	12	5	10	13	42	5	12	9	24	4	8	2	4	2	8	1	1	6	13
Brockville-Leeds and Grenville	4	9	5	10	7	24	2	5	3	5	2	4	2	4	1	2	0	0	2	4
Burk's Falls Bayfield Inlet	4	10	5	11	8	24	2	4	1	3	0	0	1	1	0	0	0	0	2	4
City of Hamilton	6	15	6	15	13	45	5	11	10	31	6	13	2	4	2	8	2	2	7	18
City of Ottawa	3	5	1	1	7	25	2	5	2	4	1	1	2	4	1	2	0	0	1	2
City of Toronto	5	12	6	14	14	48	5	11	11	29	6	13	2	4	2	8	1	1	8	16
Cornwall-Morrisburg	3	5	1	1	7	25	2	5	3	5	2	4	2	4	1	2	0	0	1	2
Dufferin-Innisfil	5	12	5	13	13	44	5	11	9	27	3	7	2	4	1	5	1	1	7	15
Dunnville-Caledonia-Haldimand	5	14	6	16	13	45	5	11	12	31	4	11	2	4	2	8	1	1	6	16
Elgin	5	15	6	16	12	45	4	13	13	37	6	15	2	4	2	10	2	4	7	18
Elliot Lake-Ranger Lake	1	5	0	0	4	12	1	3	1	3	0	0	0	0	0	0	0	0	2	4
Greater Sudbury and Vicinity	1	4	0	0	7	20	2	4	1	3	0	0	1	1	0	0	0	0	2	4
Grey-Bruce	4	11	4	10	10	32	4	10	9	22	1	2	2	4	2	8	1	1	6	14
Haliburton	4	10	6	12	10	30	4	10	6	17	1	2	2	4	1	4	0	0	3	6
Halton-Peel	5	13	6	14	14	48	5	11	11	31	6	13	2	4	2	8	1	1	8	17
Huron-Perth	5	12	6	16	12	44	4	11	12	27	3	7	2	4	2	10	1	1	7	18
Kingston-Prince Edward	4	9	5	10	10	32	5	12	9	23	4	8	2	4	2	8	1	1	5	11
London-Middlesex	5	14	6	16	12	45	4	12	12	27	5	11	2	4	2	9	1	1	7	18
Manitoulin-Northshore-Killarney	1	4	0	0	6	18	2	4	1	3	0	0	1	1	0	0	0	0	2	4
Niagara	5	13	5	13	13	45	5	11	10	29	4	11	2	4	2	8	1	1	6	16
North Bay-West Nipissing	1	4	2	4	7	20	2	4	1	3	0	0	1	1	0	0	0	0	2	4
Oxford-Brant	5	14	6	16	13	46	5	11	12	31	4	11	2	4	2	8	1	1	6	16
Parry Sound-Muskoka-Huntsville	4	10	5	11	10	30	4	10	8	21	2	5	2	4	1	4	0	0	5	10
Peterborough-Kawartha Lakes	5	12	6	12	12	38	4	10	8	21	3	6	2	4	2	8	0	0	6	13
Prescott and Russell	3	5	1	1	7	25	2	5	2	4	1	1	2	4	1	2	0	0	1	2
Renfrew-Pembroke-Barry's Bay	2	4	3	6	5	17	1	3	2	5	0	0	2	4	1	2	0	0	1	2
Sarnia-Lambton	5	14	6	16	13	46	4	12	13	29	4	10	2	4	2	10	2	4	7	18
Sault Ste. Marie-Superior East	1	5	0	0	4	10	1	3	1	3	0	0	0	0	0	0	0	0	1	3

Table A22: Summary of Smog Advisories (2003 - 2012)

Air Quality Forecast Region	2003		2004		2005		2006		2007		2008		2009		2010		2011		2012	
	Adv.	Days	Adv.	Days	Adv.	Days	Adv.	Days	Adv.	Days	Adv.	Days	Adv.	Days	Adv.	Days	Adv.	Days	Adv.	Days
Simcoe-Delhi-Norfolk	5	14	6	16	13	46	5	11	12	31	4	11	2	4	2	10	1	1	6	16
Smiths Falls-Lanark-Sharbot Lake	3	7	4	8	6	19	2	5	2	4	1	1	2	4	1	2	0	0	1	2
Stirling-Tweed-South Frontenac	5	12	5	10	8	25	2	5	5	13	2	3	2	4	2	8	0	0	3	6
Waterloo-Wellington	5	12	5	13	13	45	5	11	11	29	3	7	2	4	2	8	1	1	6	15
Windsor-Essex-Chatham-Kent	6	17	6	16	13	46	4	14	13	38	5	12	3	5	2	10	4	8	8	24
York-Durham	5	12	6	14	14	48	5	11	11	29	5	9	2	4	2	8	1	1	8	16
ONTARIO	7	19	8	20	15	53	6	17	13	39	8	17	3	5	3	12	5	9	12	30

Note:

A smog advisory day refers to a calendar day when a smog advisory is in effect.

Figure A1: 20y Trend of Ozone Annual Mean at Windsor Downtown

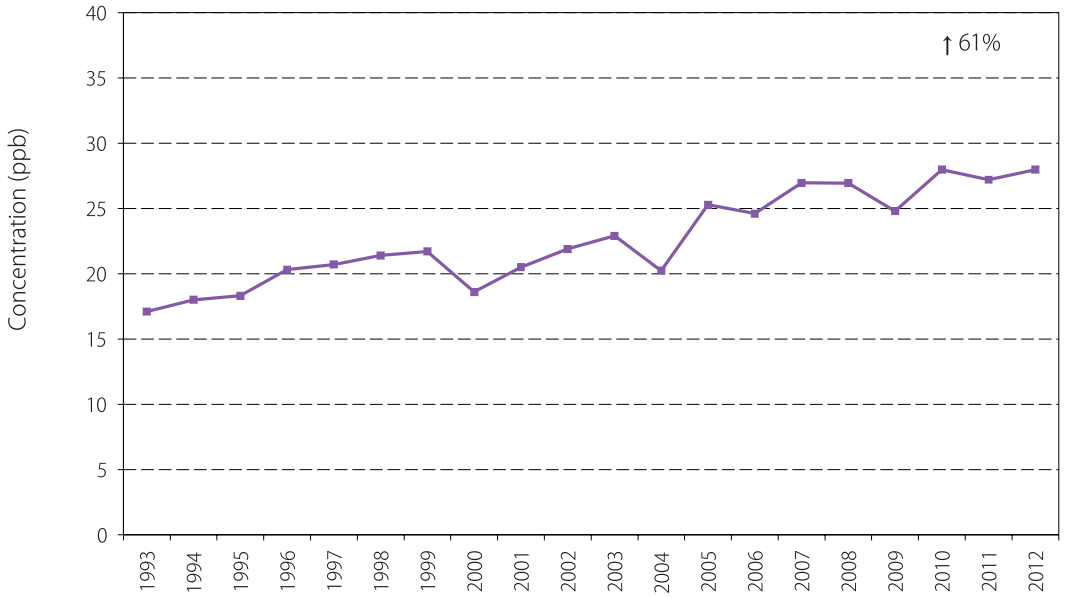


Figure A2: 20y Trend of Ozone Annual Mean at Windsor West

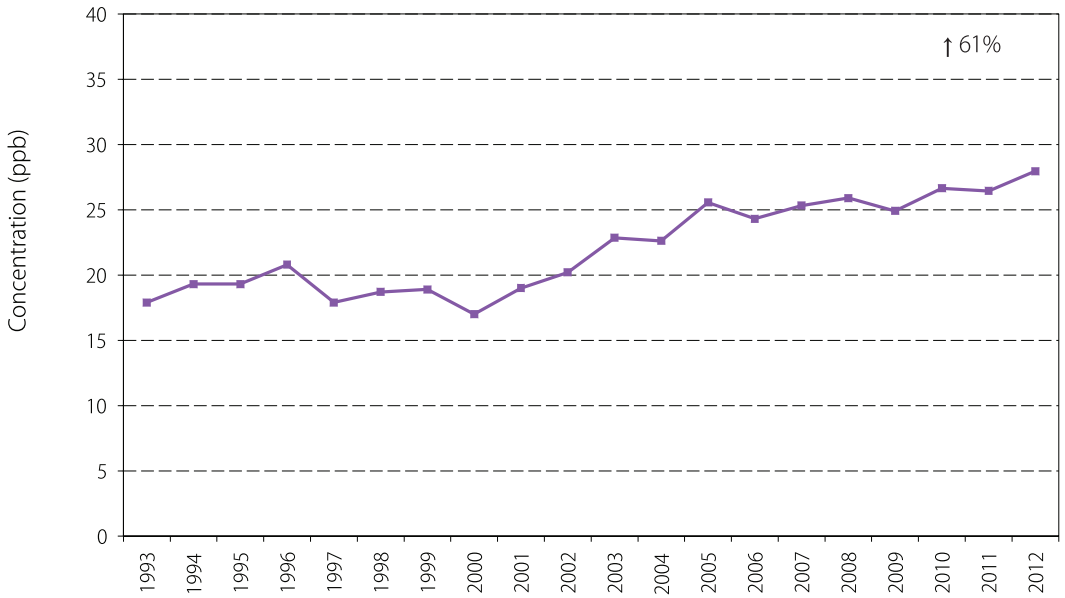


Figure A3: 20y Trend of Ozone Annual Mean at Sarnia

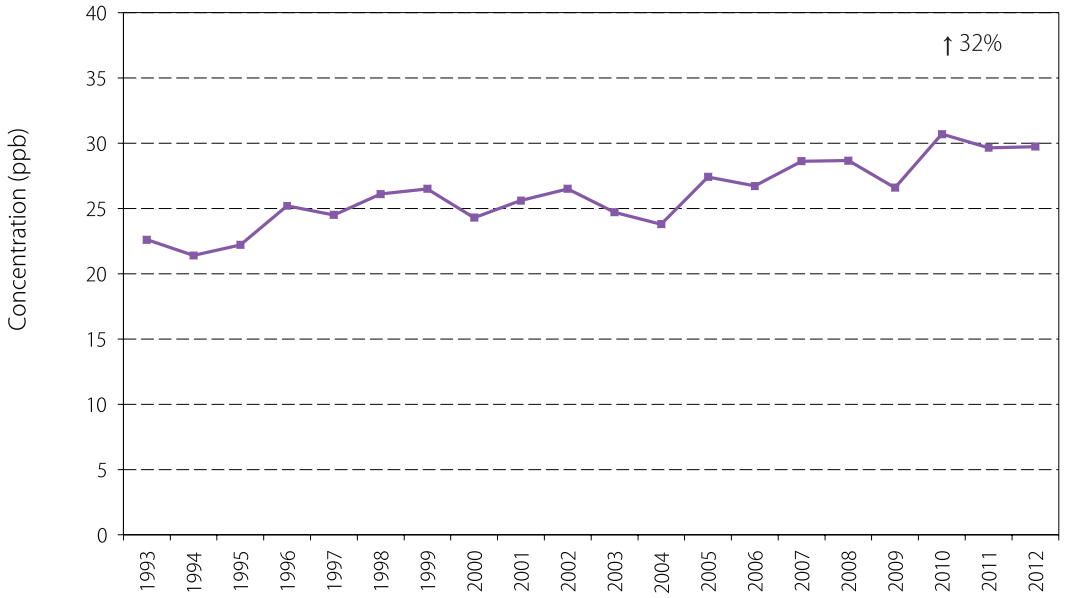


Figure A4: 20y Trend of Ozone Annual Mean at Grand Bend

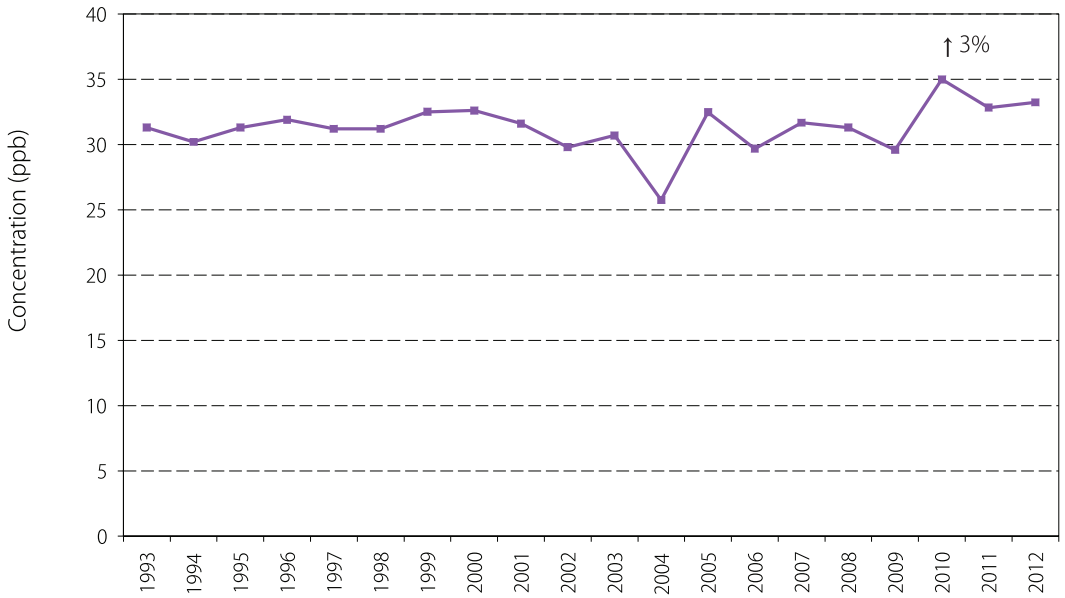


Figure A5: 20y Trend of Ozone Annual Mean at London

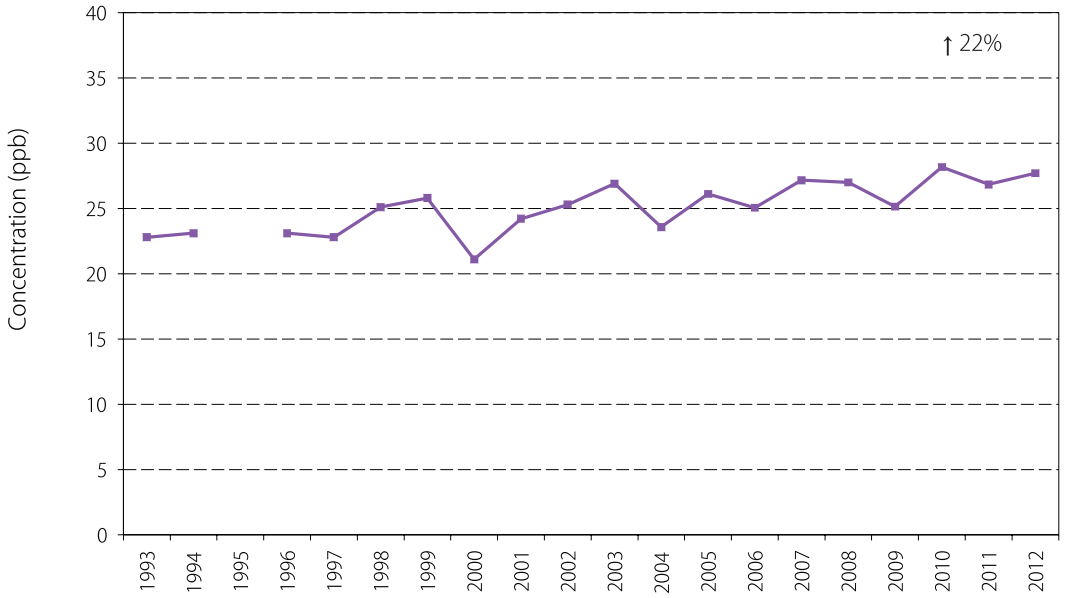


Figure A6: 20y Trend of Ozone Annual Mean at Tiverton

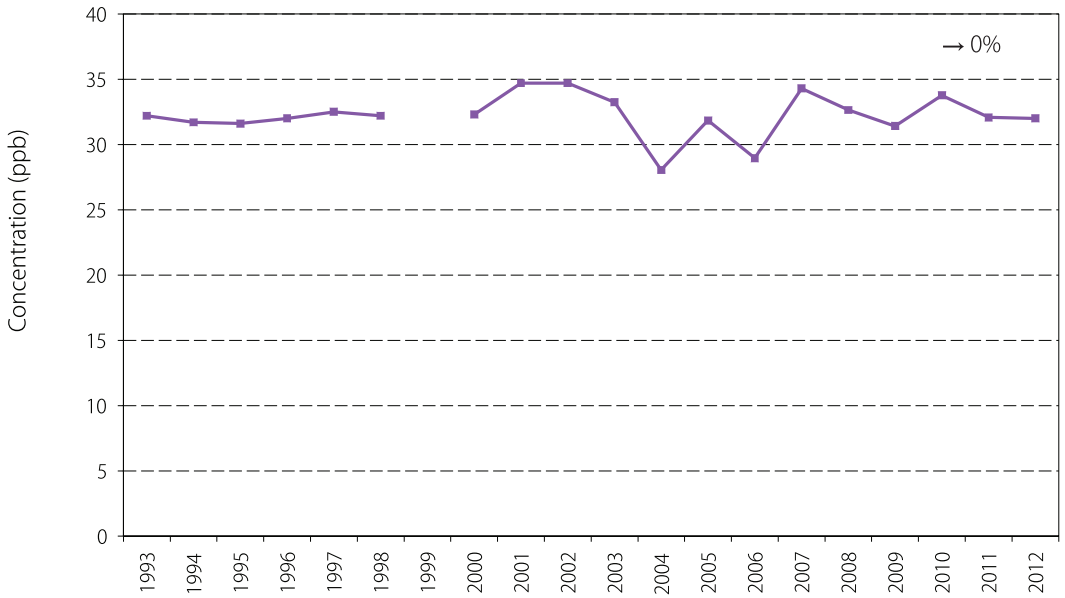


Figure A7: 20y Trend of Ozone Annual Mean at Kitchener

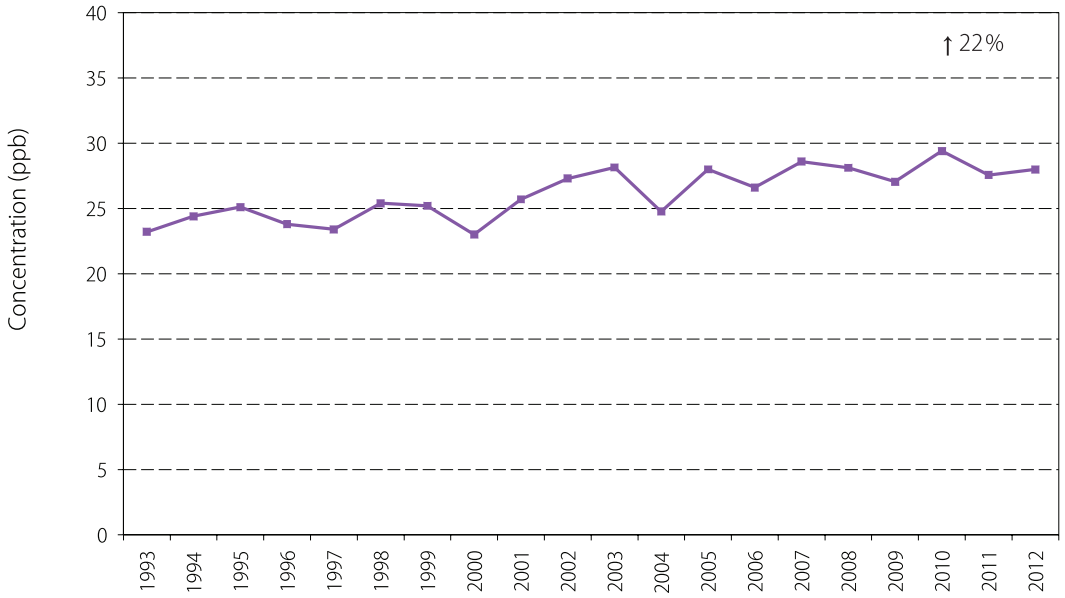


Figure A8: 20y Trend of Ozone Annual Mean at St. Catharines

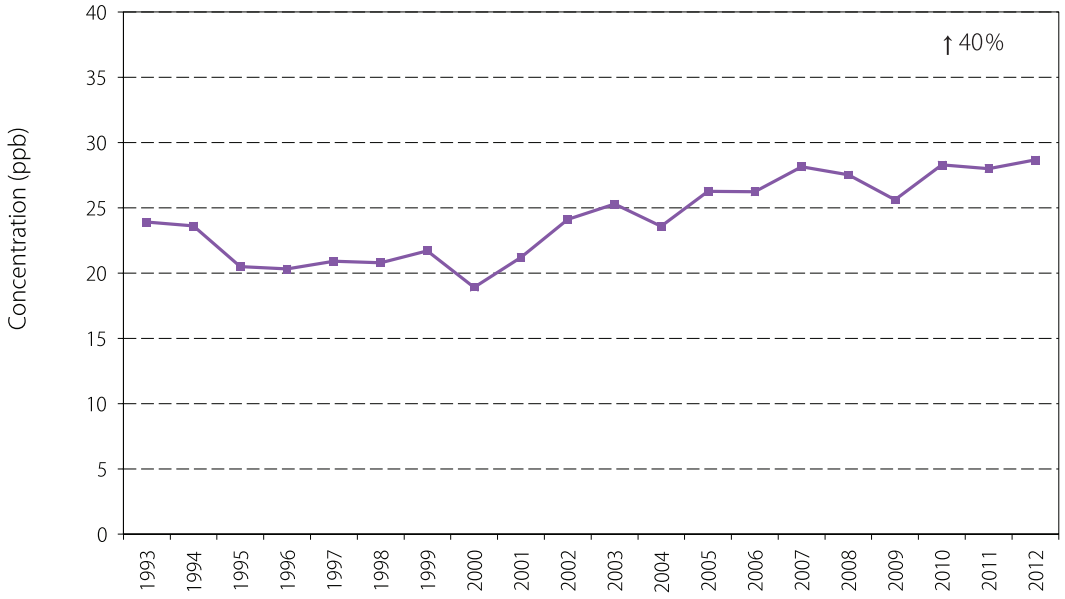


Figure A9: 20y Trend of Ozone Annual Mean at Guelph

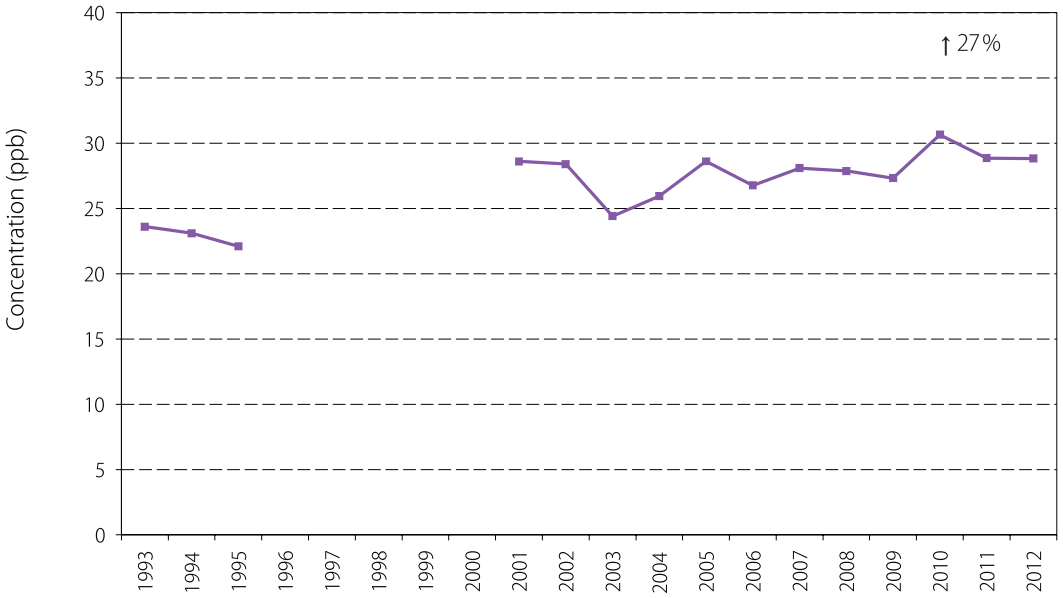


Figure A10: 20y Trend of Ozone Annual Mean at Hamilton Downtown

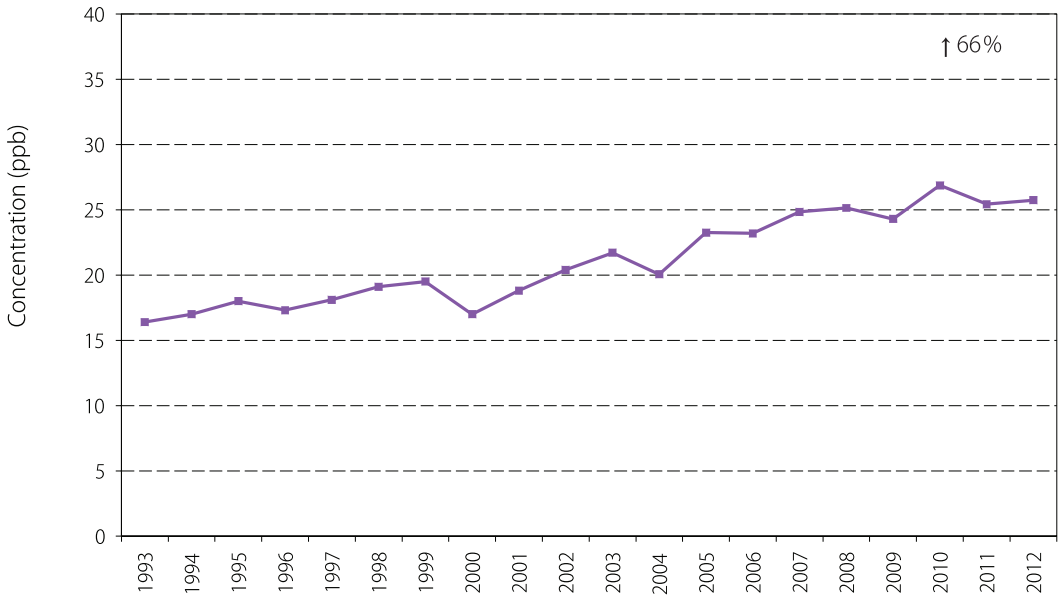


Figure A11: 20y Trend of Ozone Annual Mean at Hamilton Mountain

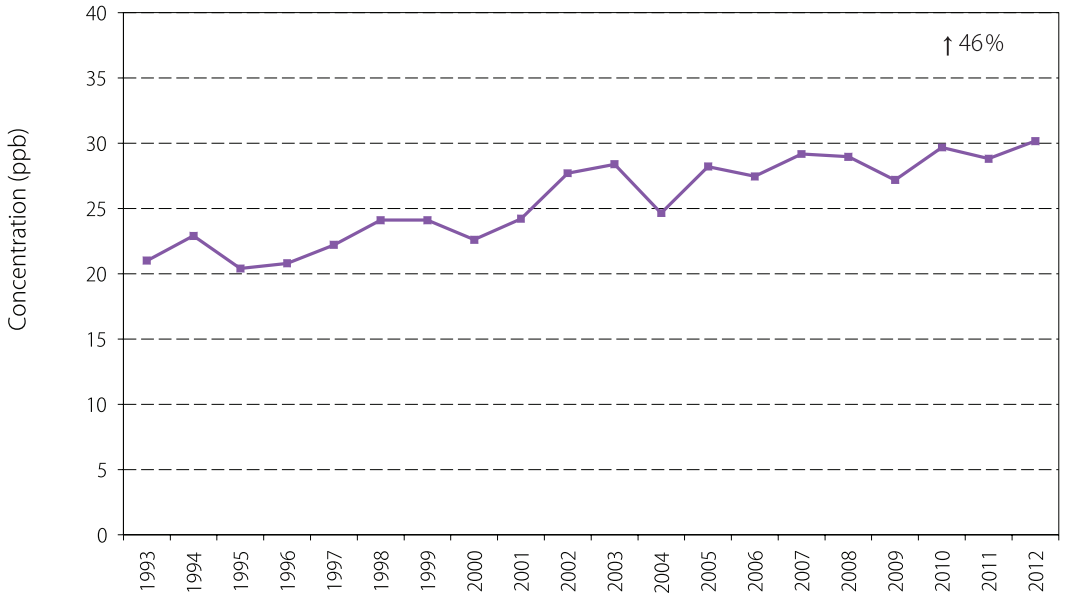


Figure A12: 20y Trend of Ozone Annual Mean at Hamilton West

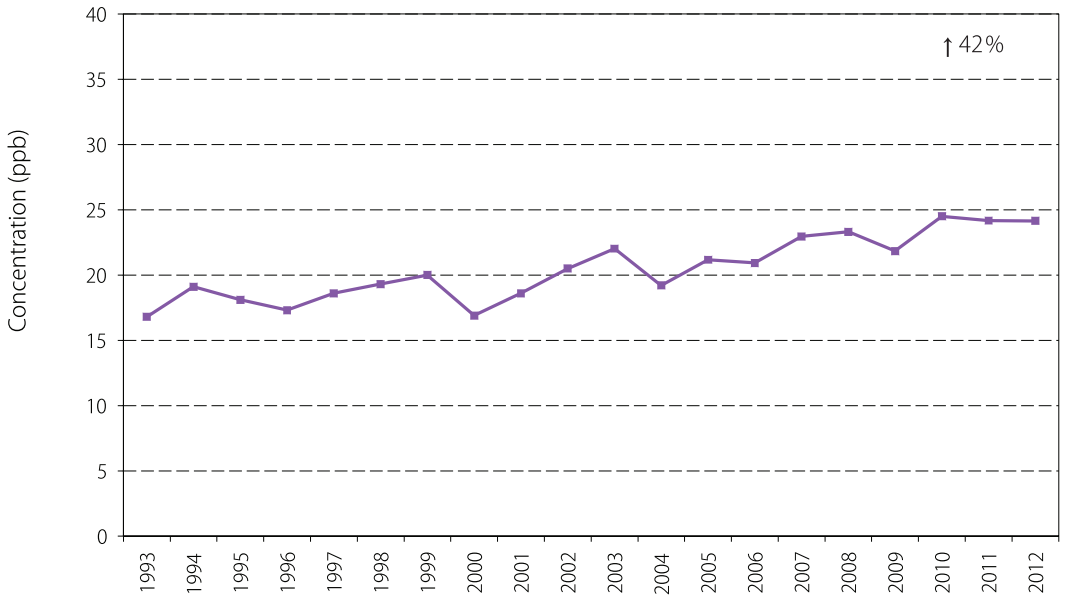


Figure A13: 20y Trend of Ozone Annual Mean at Toronto Downtown

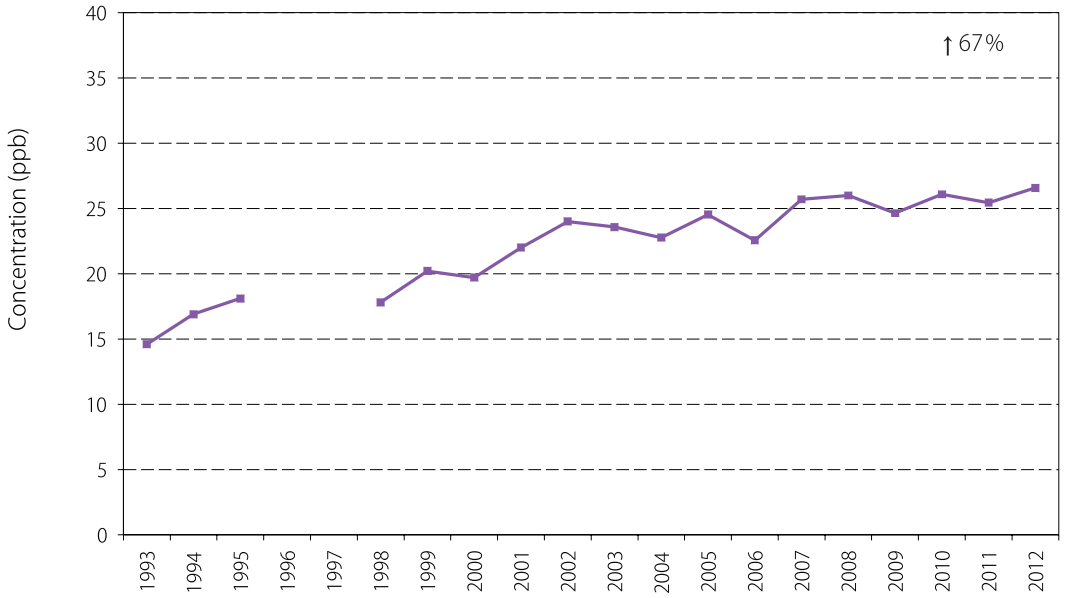


Figure A14: 20y Trend of Ozone Annual Mean at Toronto East

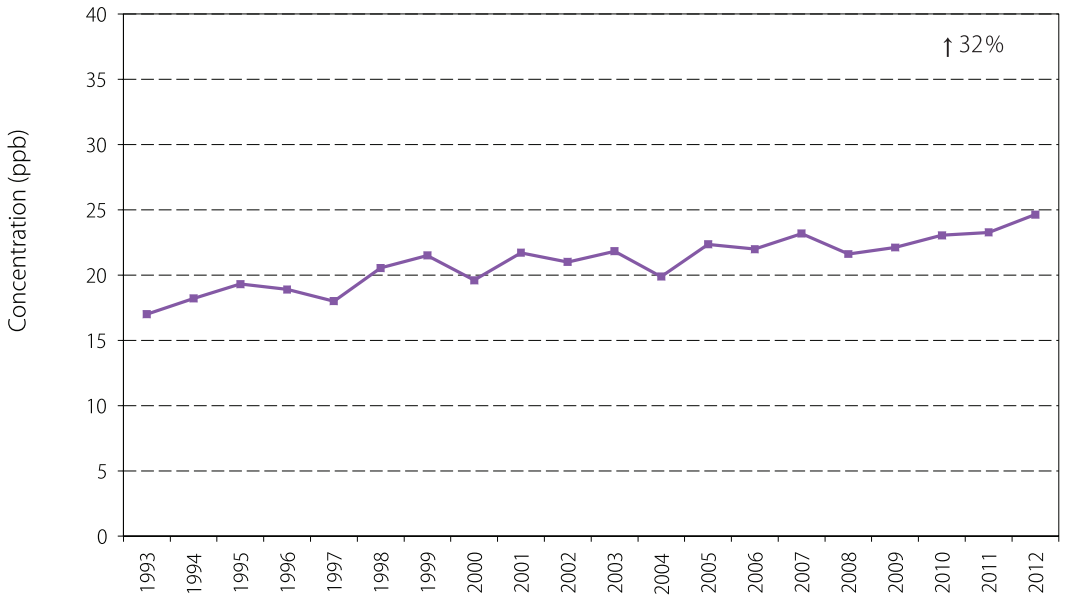


Figure A15: 20y Trend of Ozone Annual Mean at Toronto North

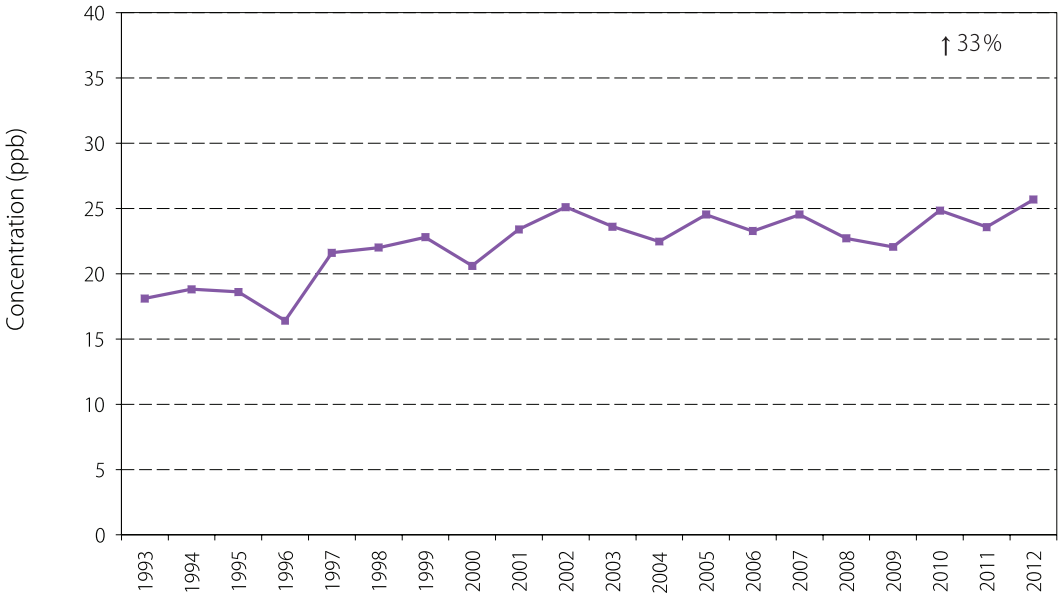


Figure A16: 20y Trend of Ozone Annual Mean at Burlington

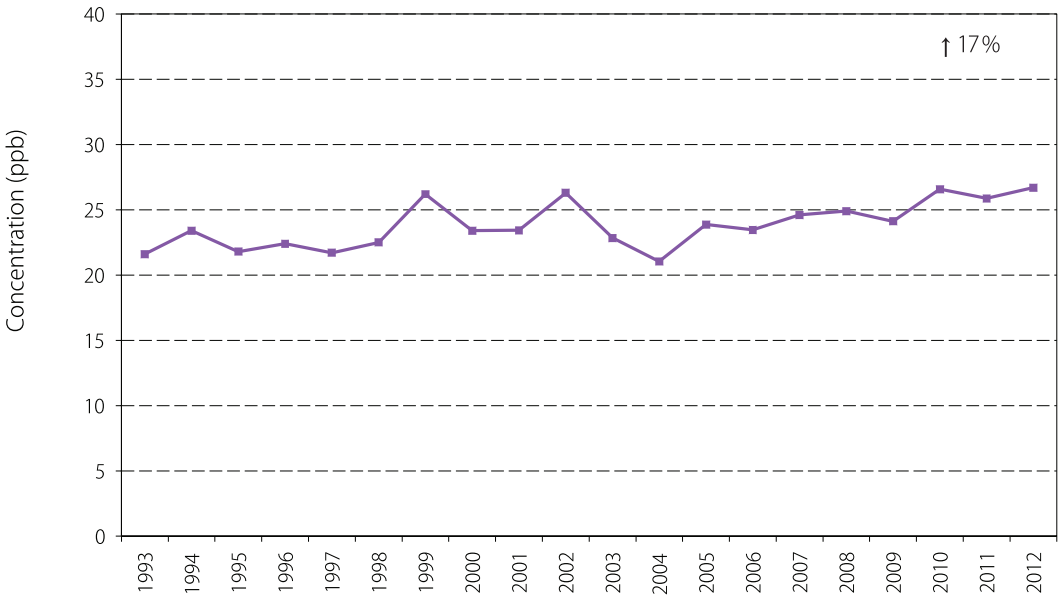


Figure A17: 20y Trend of Ozone Annual Mean at Oakville

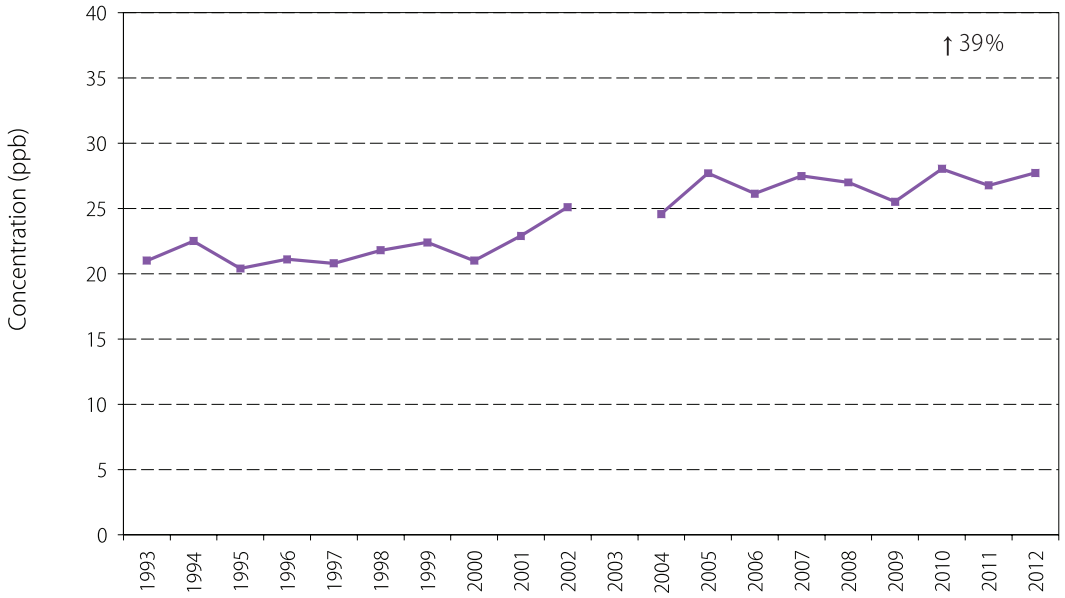


Figure A18: 20y Trend of Ozone Annual Mean at Oshawa

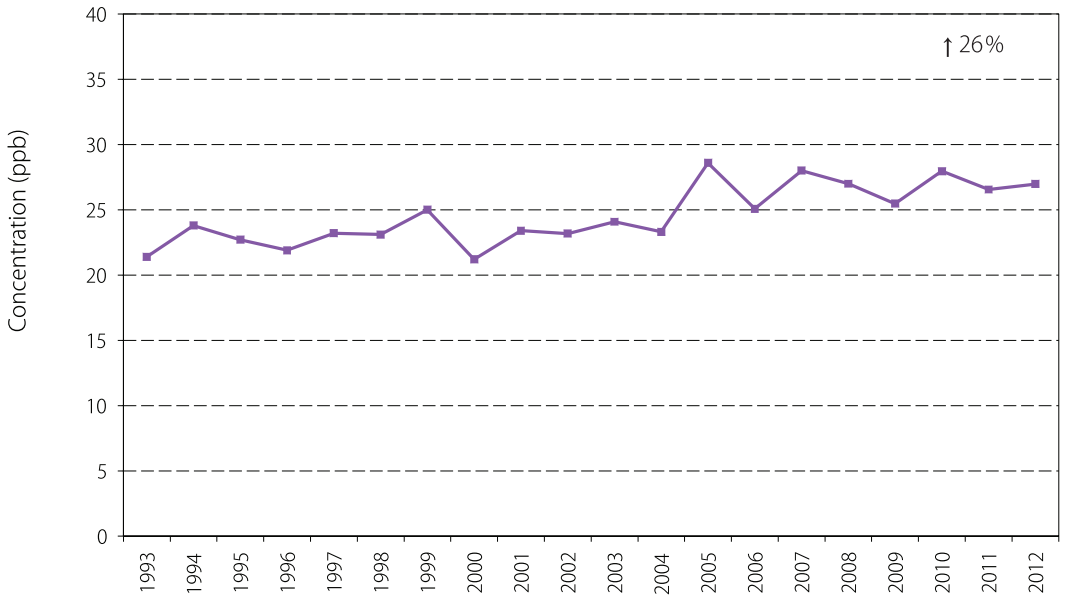


Figure A19: 20y Trend of Ozone Annual Mean at Mississauga

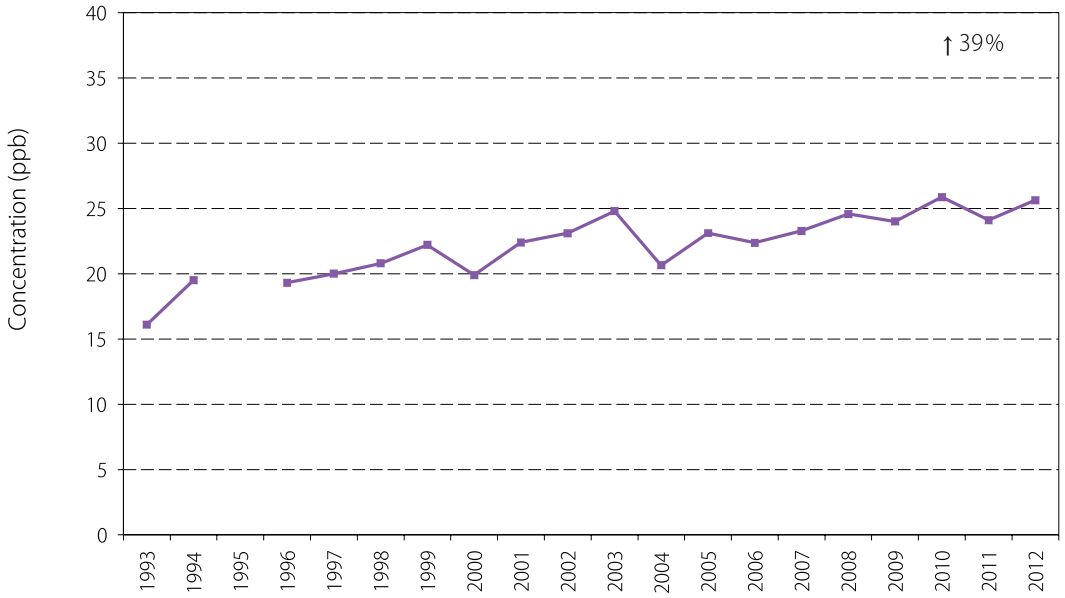


Figure A20: 20y Trend of Ozone Annual Mean at Dorset

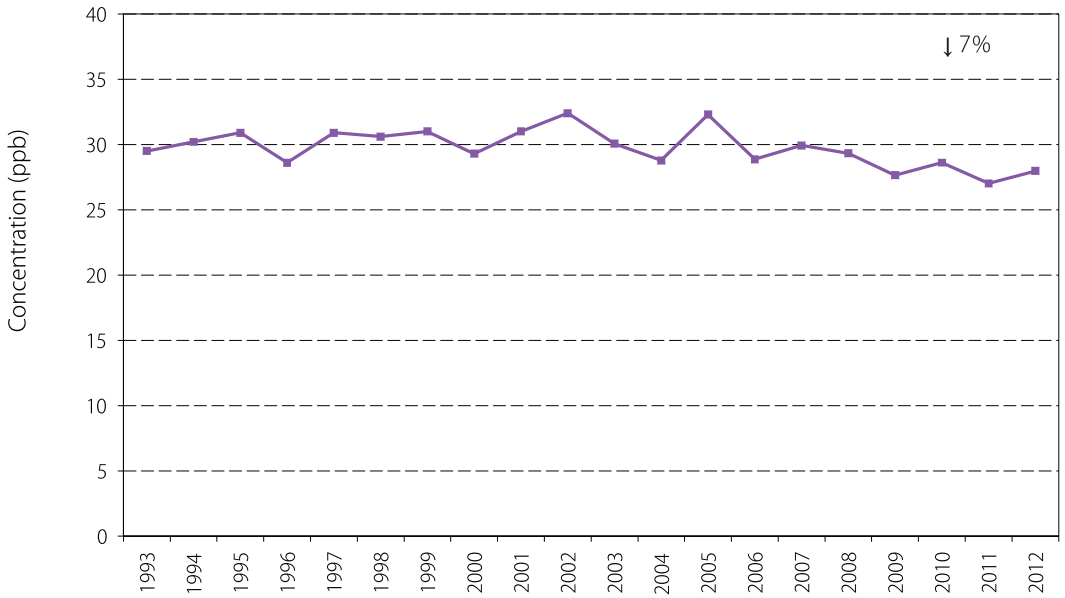


Figure A21: 20y Trend of Ozone Annual Mean at Ottawa Downtown

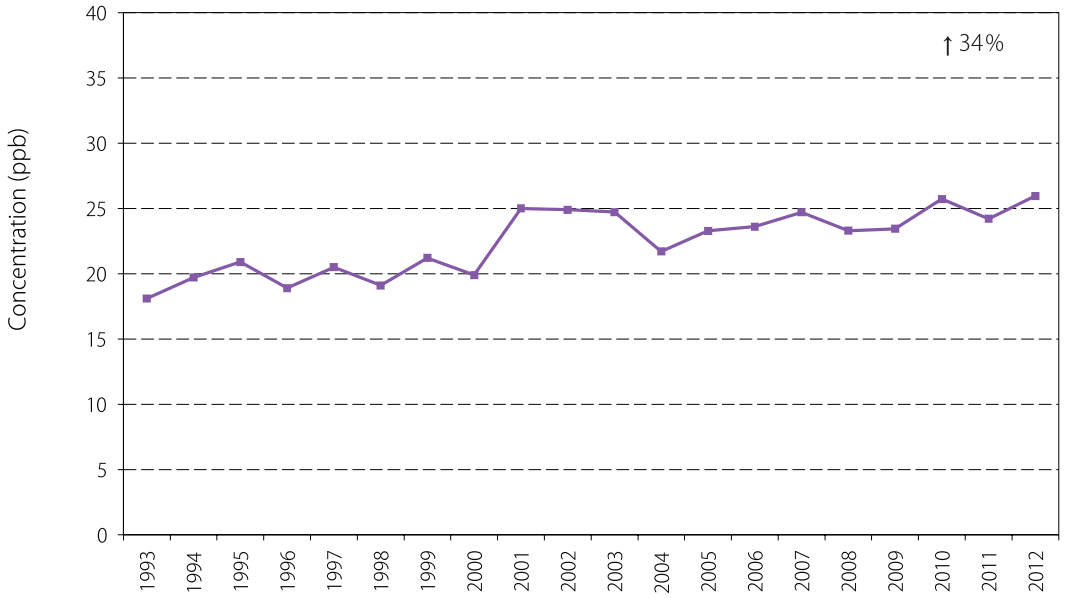


Figure A22: 20y Trend of Ozone Annual Mean at Cornwall

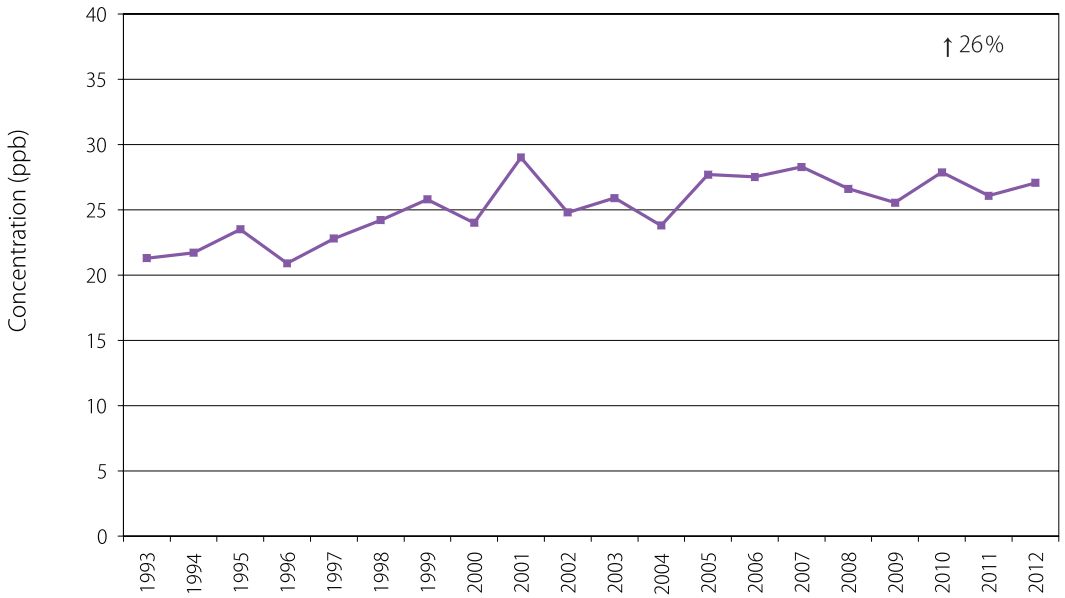


Figure A23: 20y Trend of Ozone Annual Mean at Thunder Bay

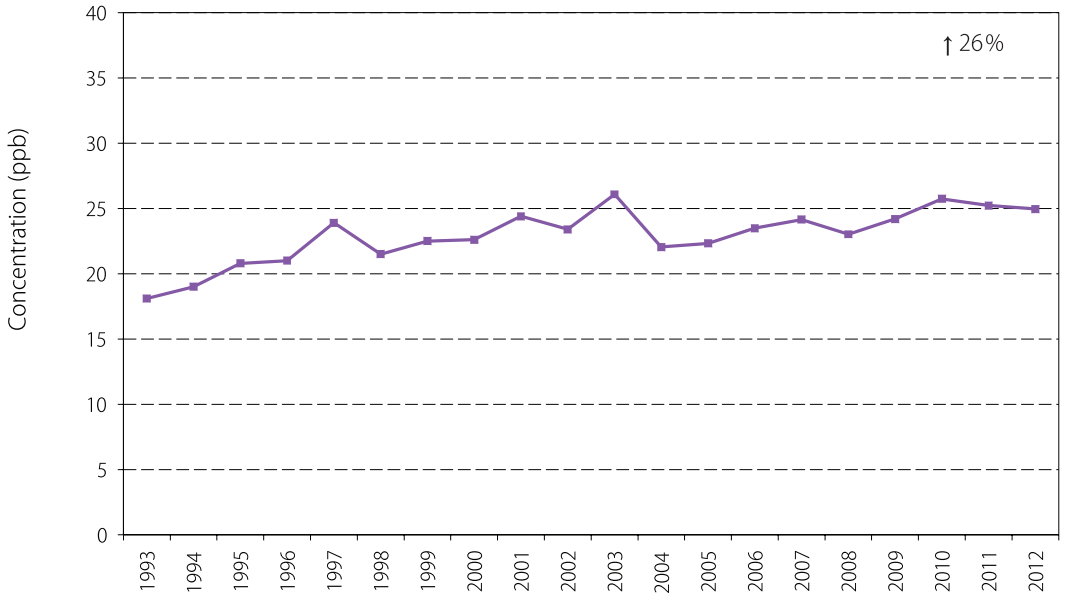


Figure A24: 20y Trend of Ozone Annual Mean at Sault Ste. Marie

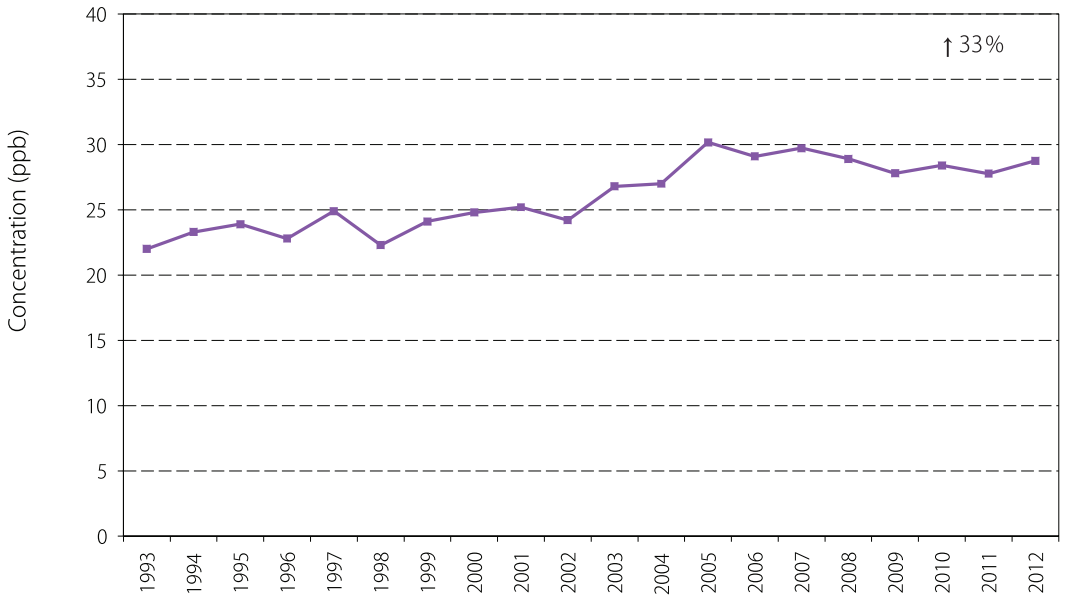


Figure A25: 20y Trend of Ozone Annual Mean at North Bay

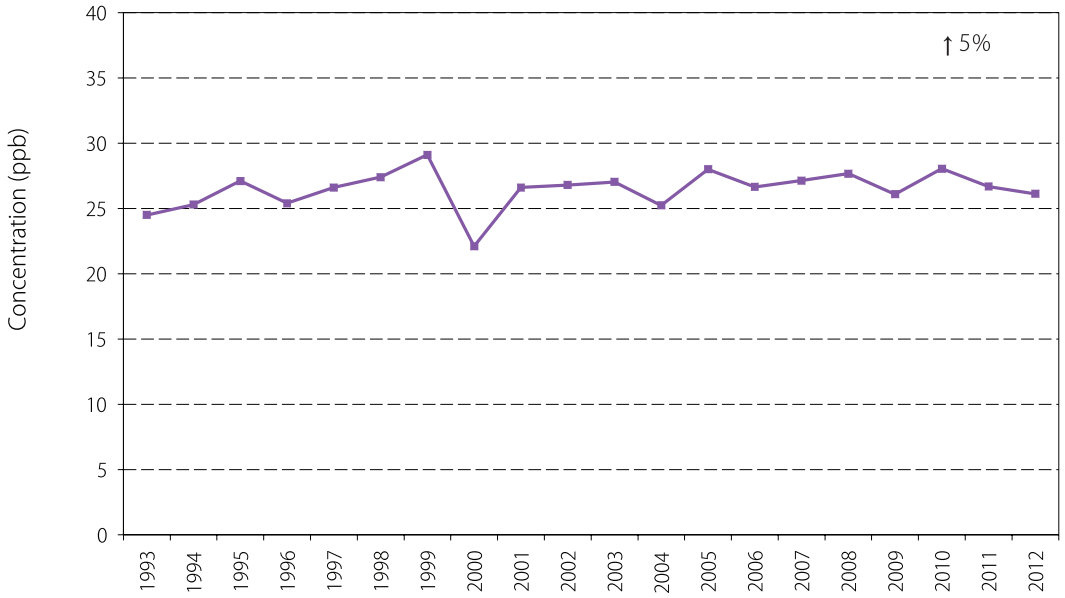


Figure A26: 20y Trend of Ozone Annual Mean at Sudbury

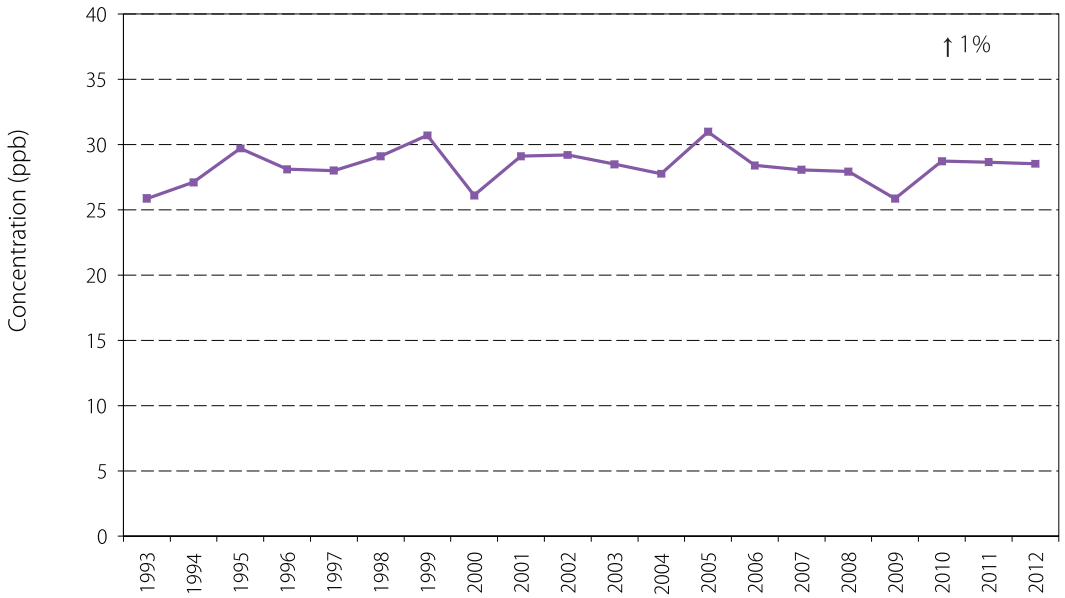


Figure A27: 20y Trend of NO_2 Annual Mean at Windsor Downtown

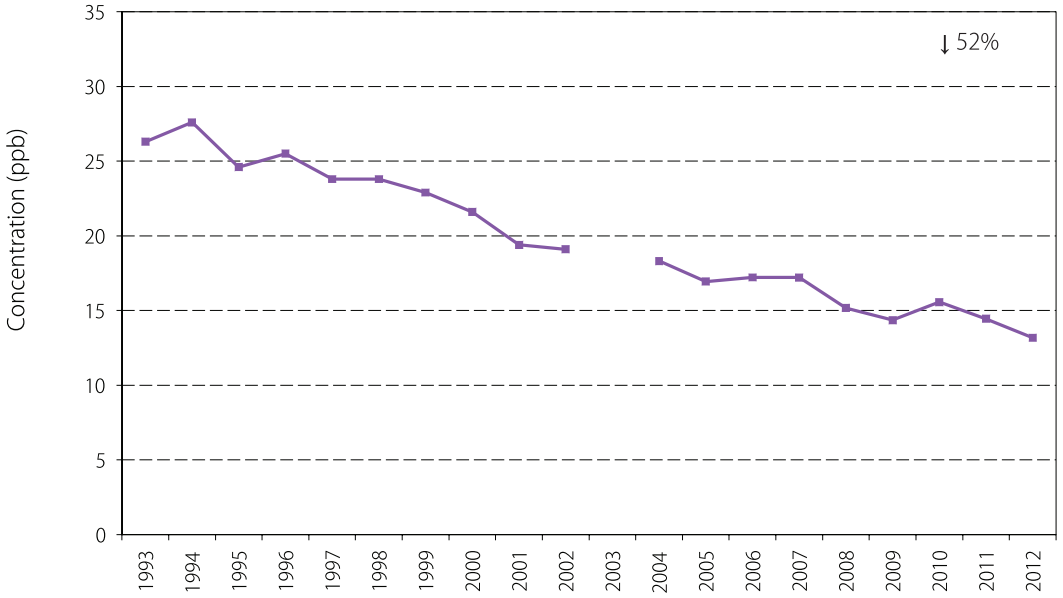


Figure A28: 20y Trend of NO_2 Annual Mean at Sarnia

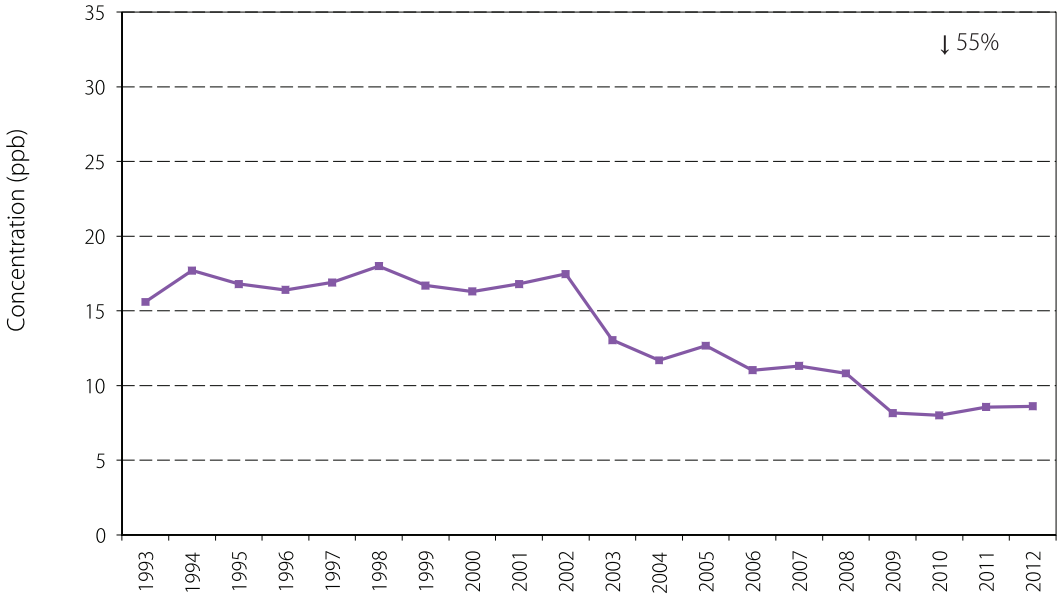


Figure A29: 20y Trend of NO_2 Annual Mean at London

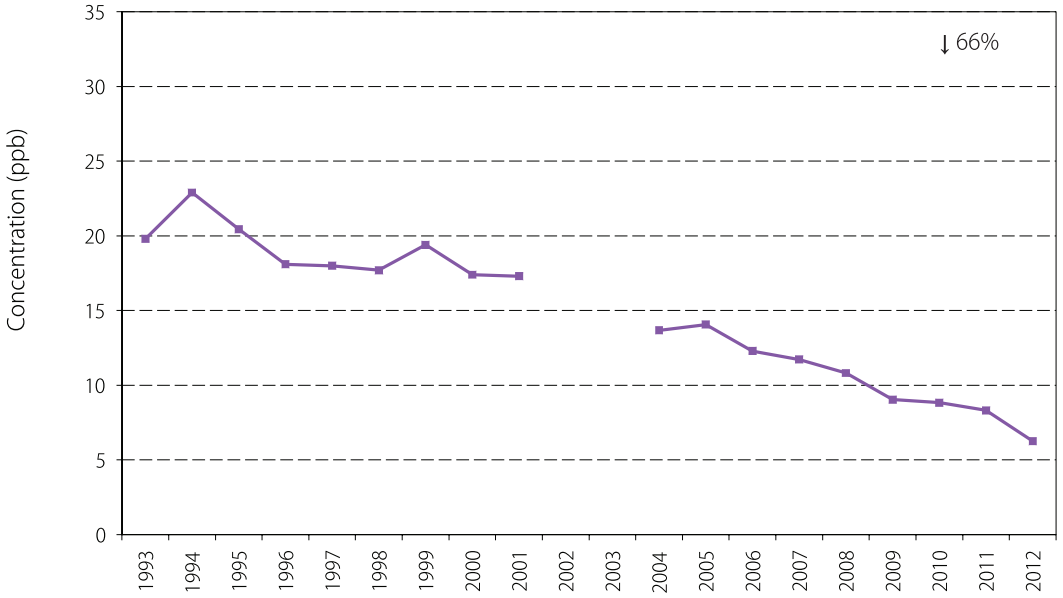


Figure A30: 20y Trend of NO_2 Annual Mean at Kitchener

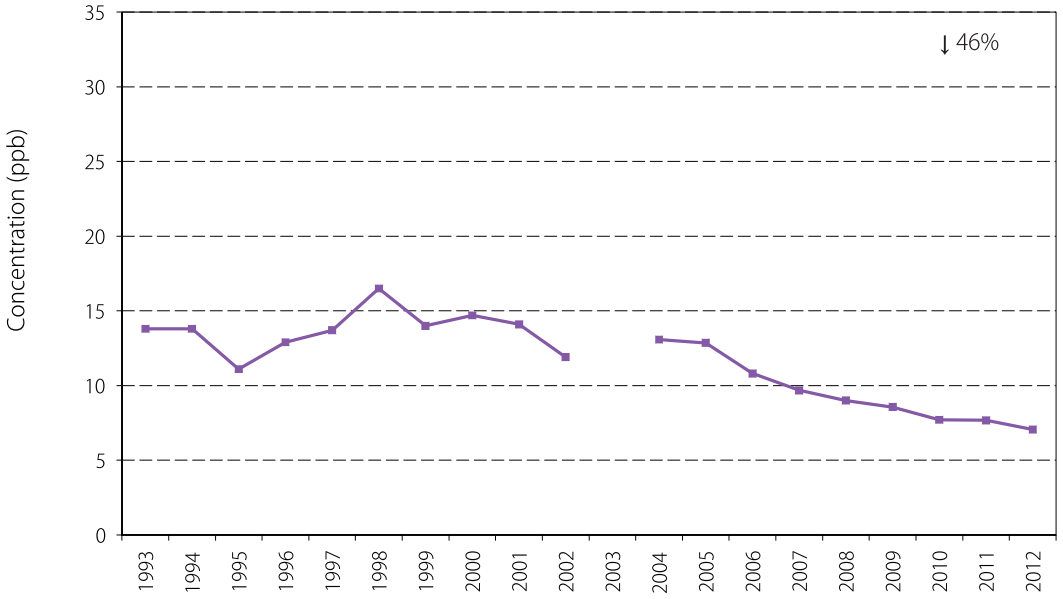


Figure A31: 20y Trend of NO_2 Annual Mean at St. Catharines

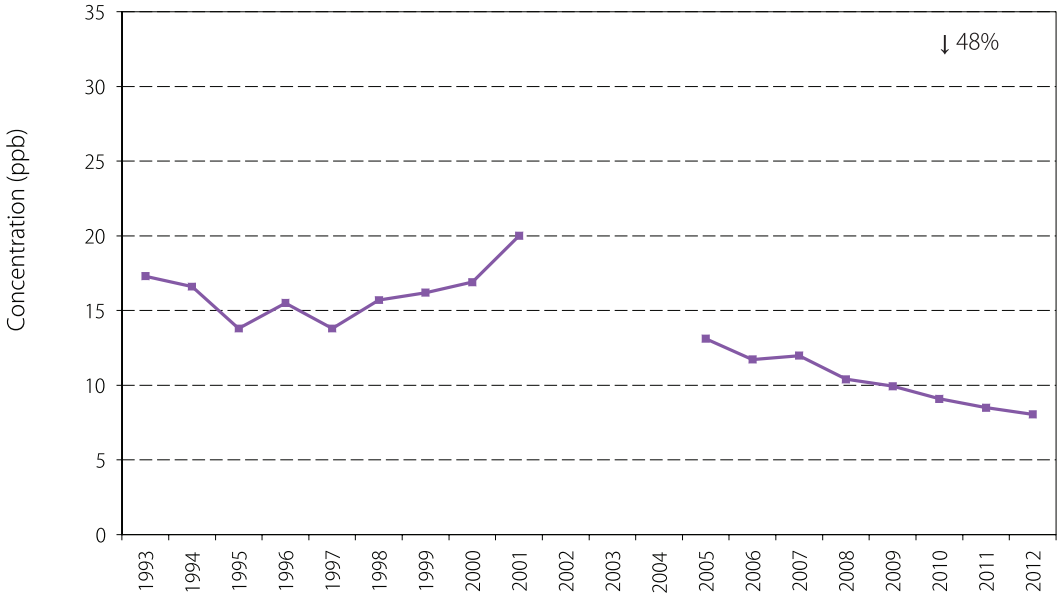


Figure A32: 20y Trend of NO_2 Annual Mean at Hamilton Downtown

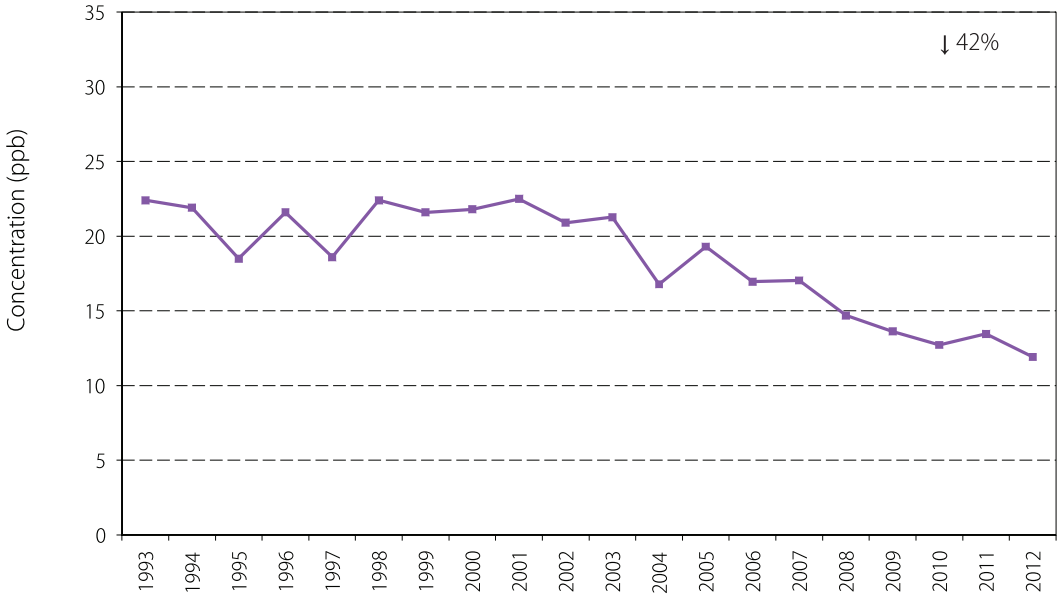


Figure A33: 20y Trend of NO_2 Annual Mean at Hamilton Mountain

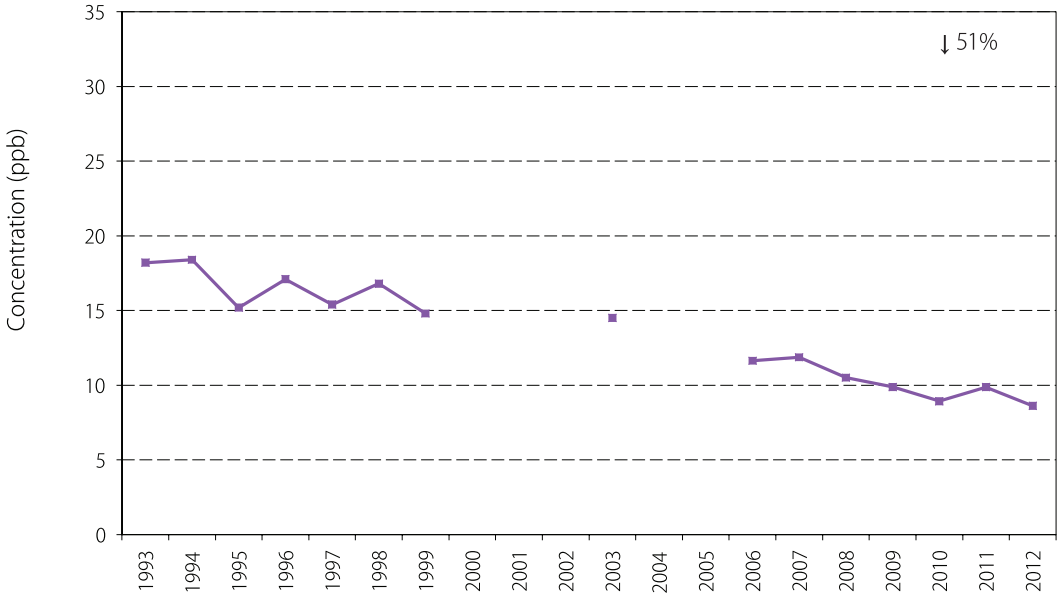


Figure A34: 20y Trend of NO_2 Annual Mean at Toronto Downtown

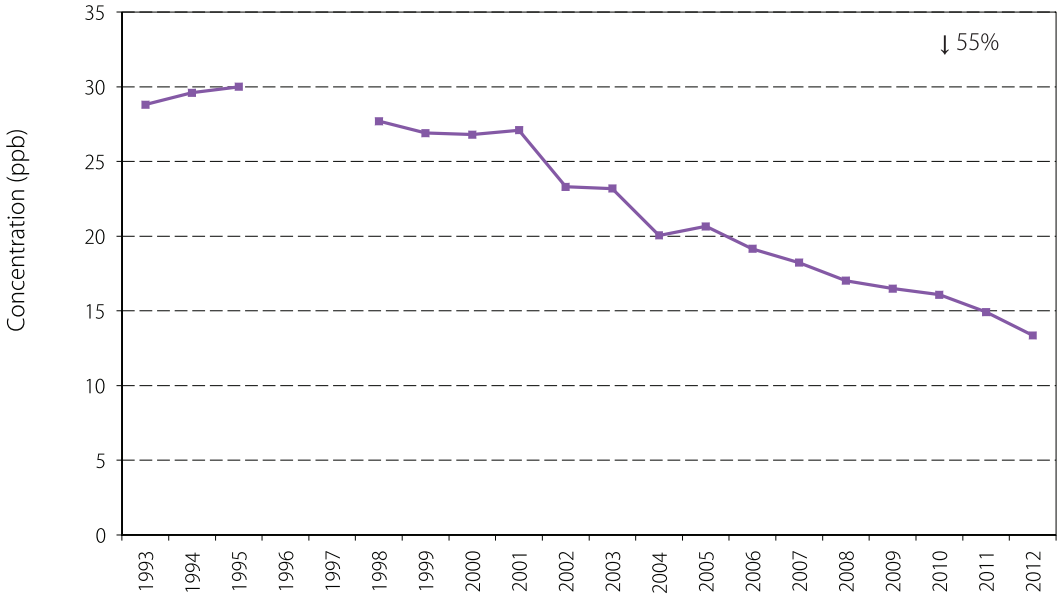


Figure A35: 20y Trend of NO_2 Annual Mean at Toronto East

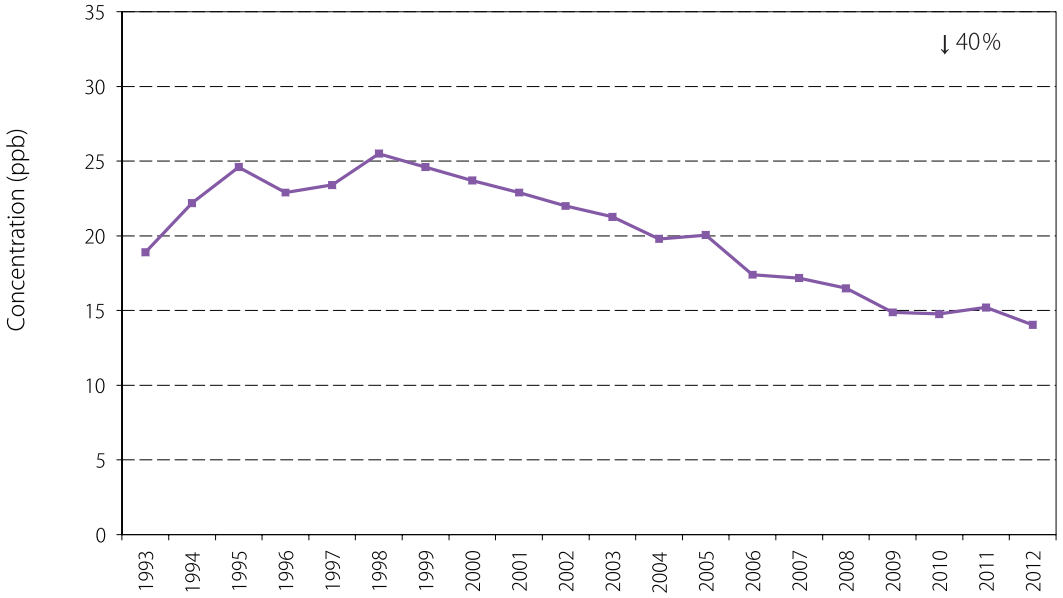


Figure A36: 20y Trend of NO_2 Annual Mean at Toronto North

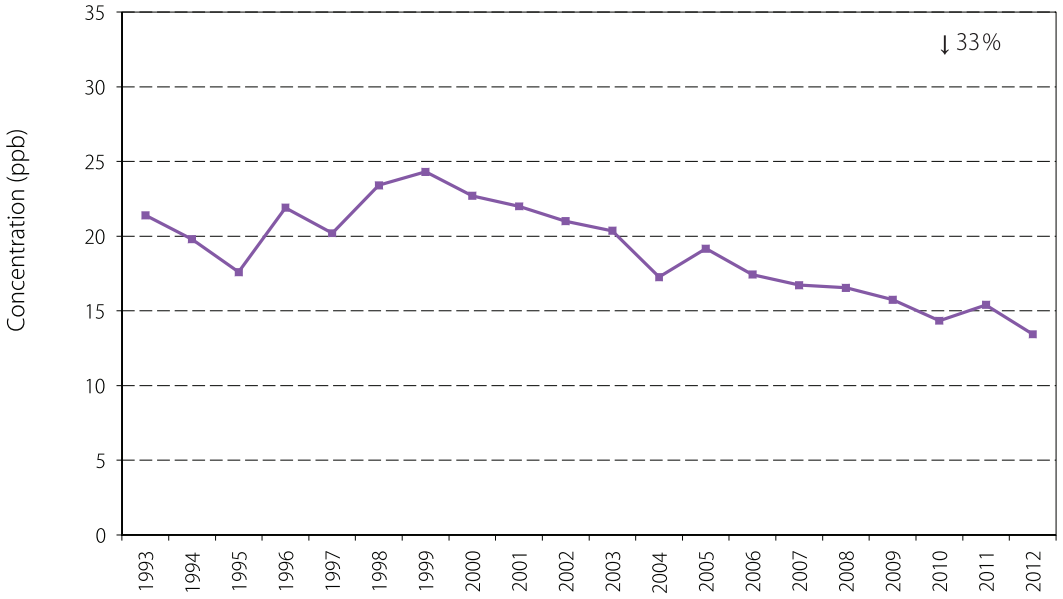


Figure A37: 20y Trend of NO_2 Annual Mean at Burlington

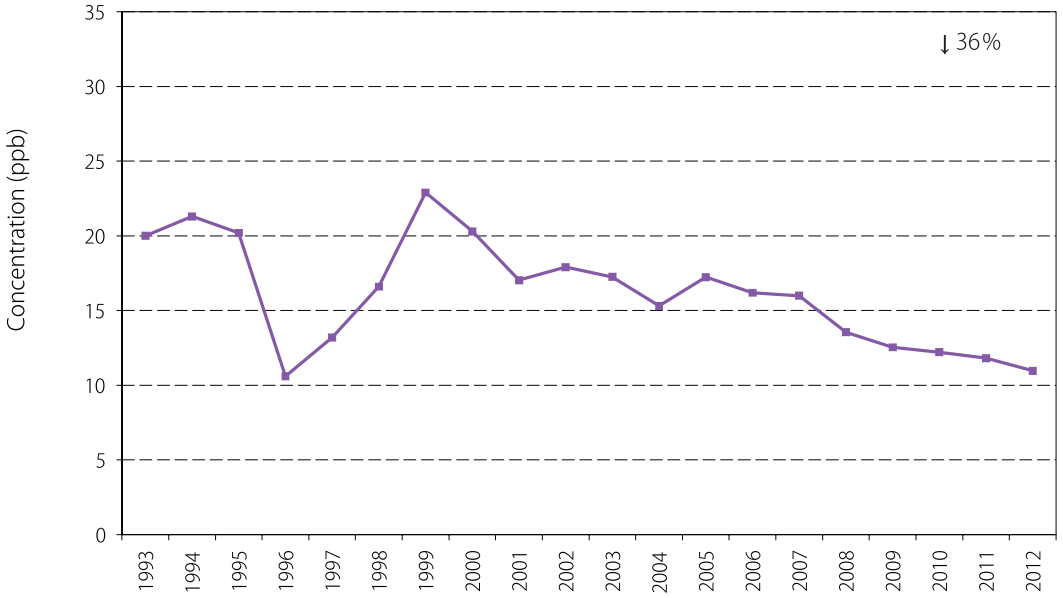


Figure A38: 20y Trend of NO_2 Annual Mean at Oakville

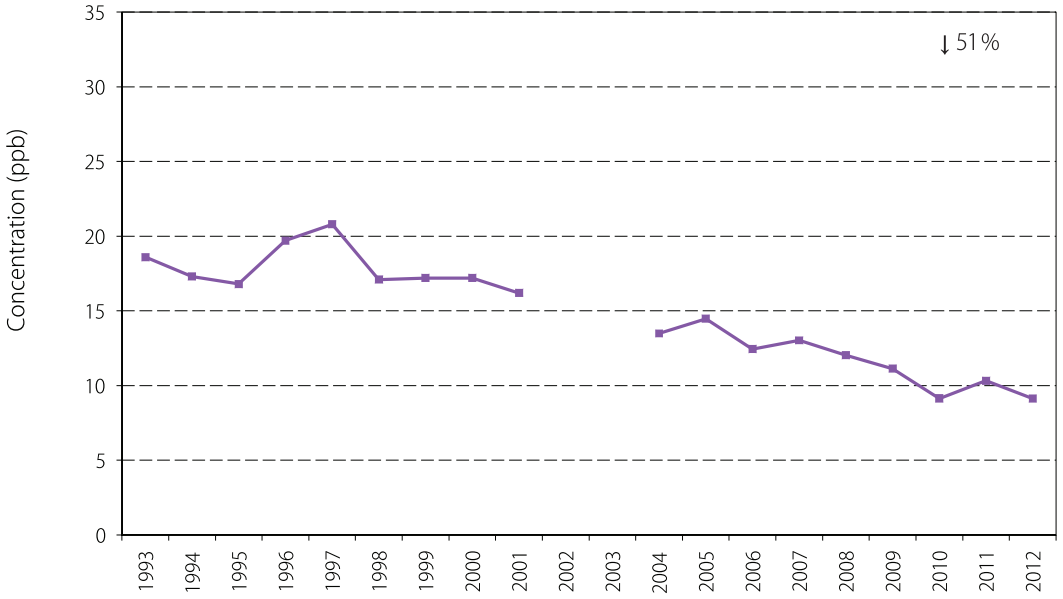


Figure A39: 20y Trend of NO_2 Annual Mean at Oshawa

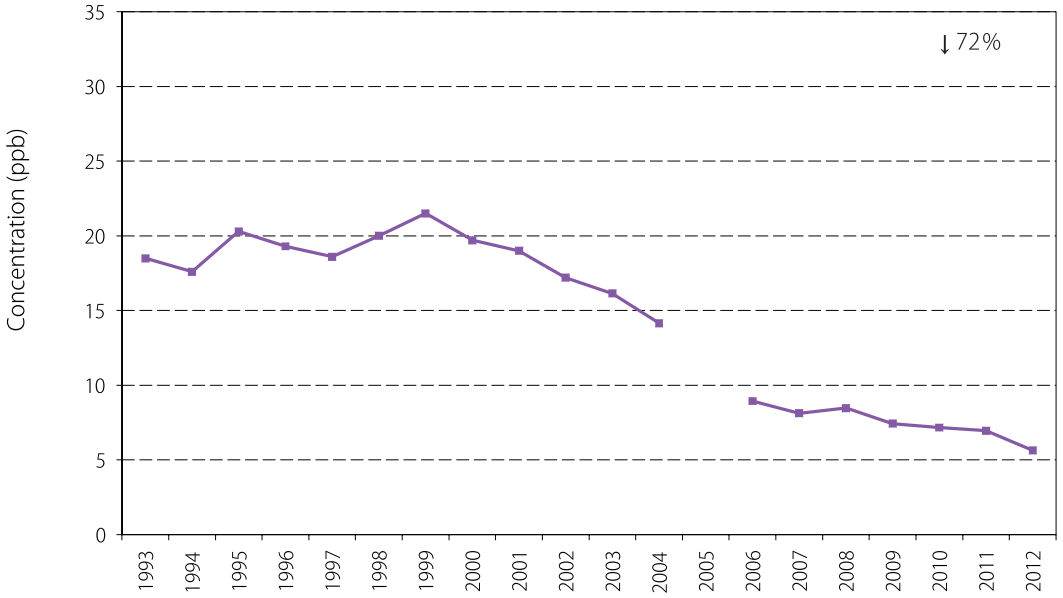


Figure A40: 20y Trend of NO_2 Annual Mean at Ottawa Downtown

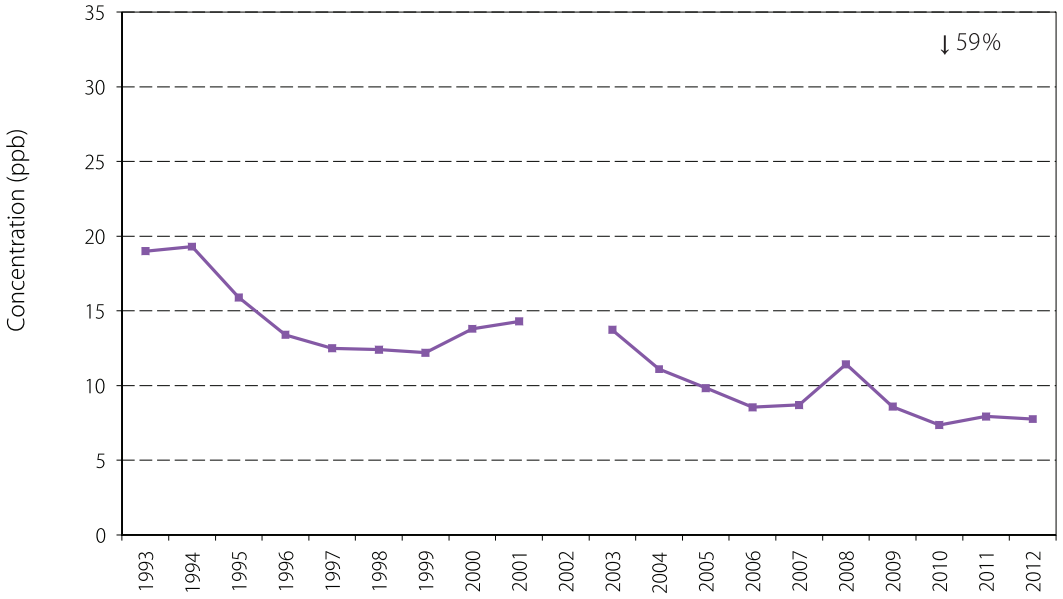


Figure A41: 20y Trend of SO_2 Annual Mean at Windsor Downtown

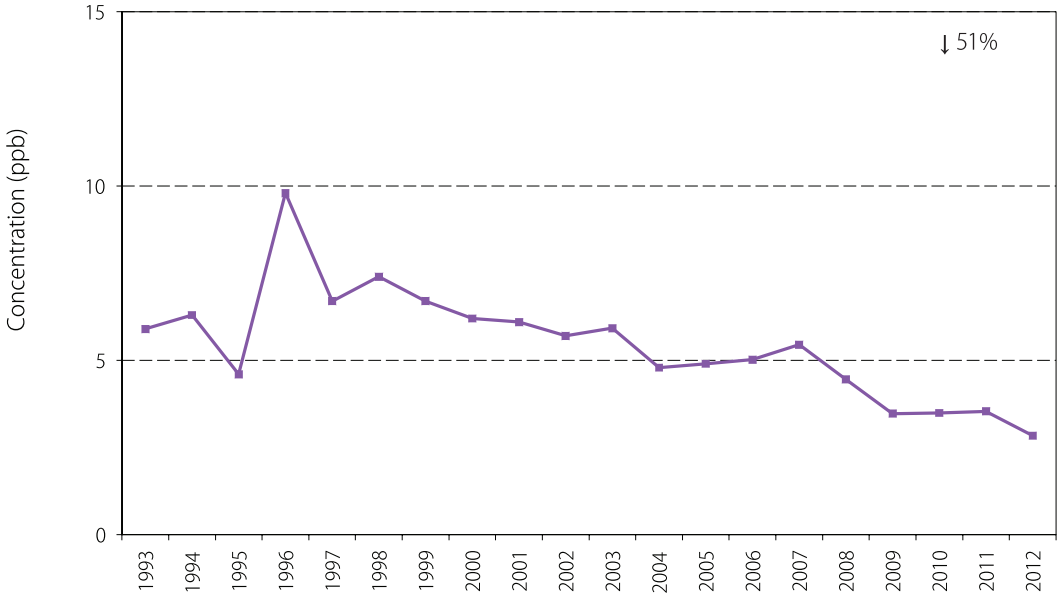


Figure A42: 20y Trend of SO_2 Annual Mean at Windsor West

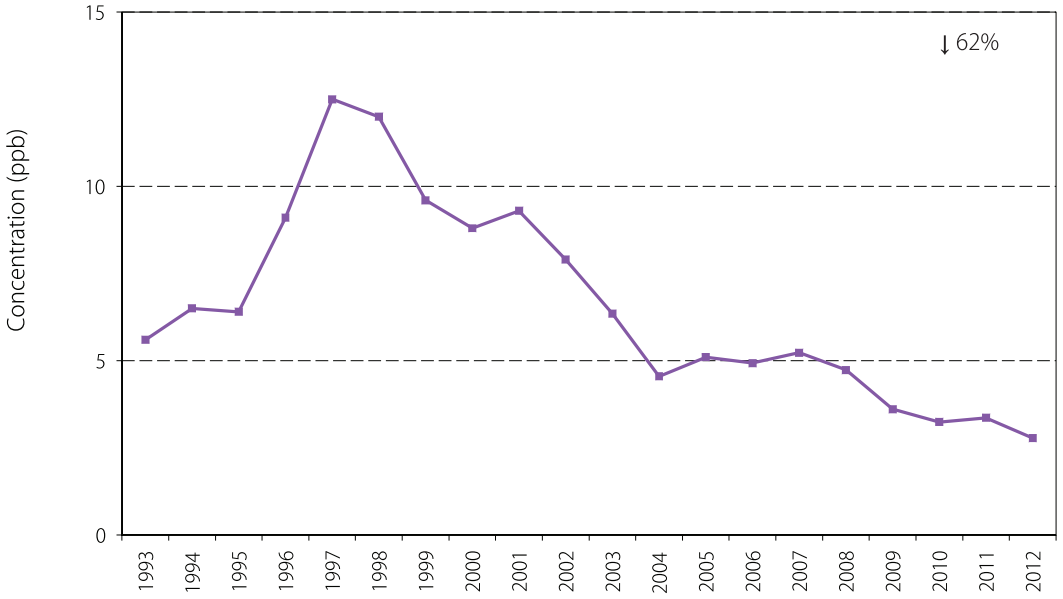


Figure A43: 20y Trend of SO_2 Annual Mean at Sarnia

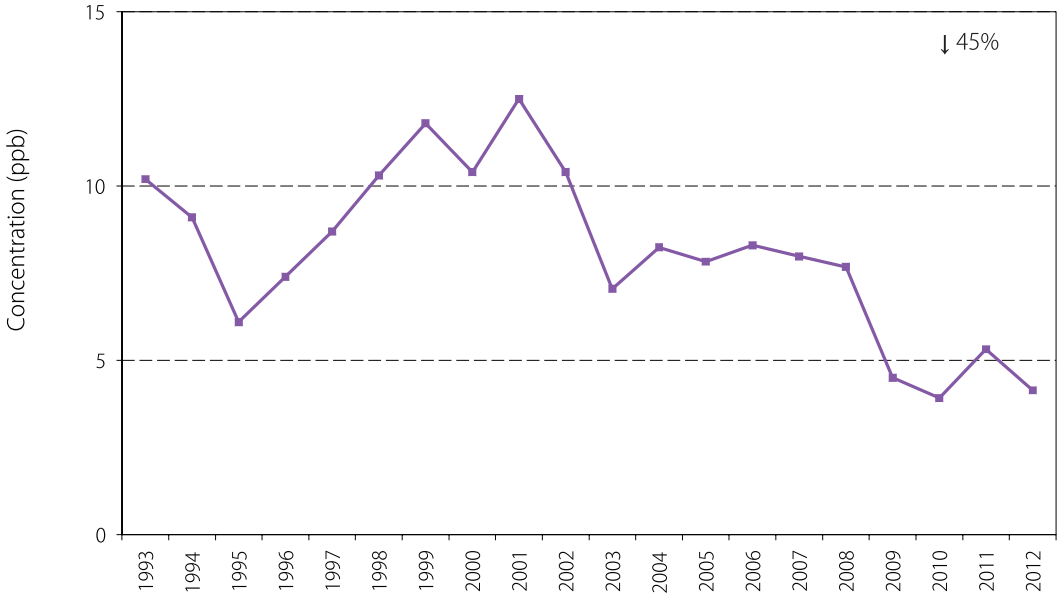


Figure A44: 20y Trend of SO_2 Annual Mean at Hamliton Downtown

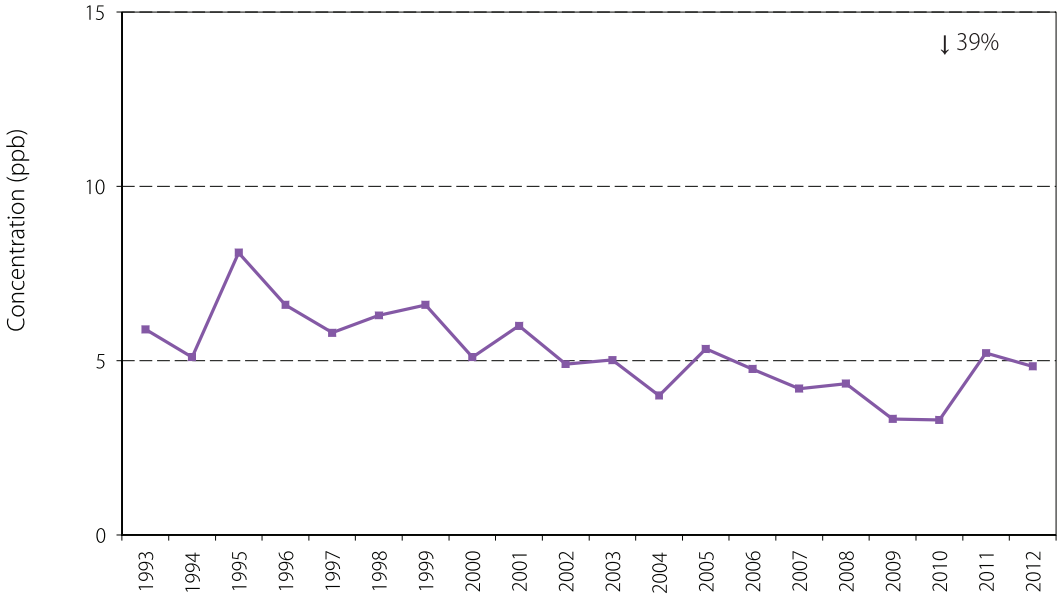


Figure A45: 20y Trend of SO_2 Annual Mean at Hamliton Mountain

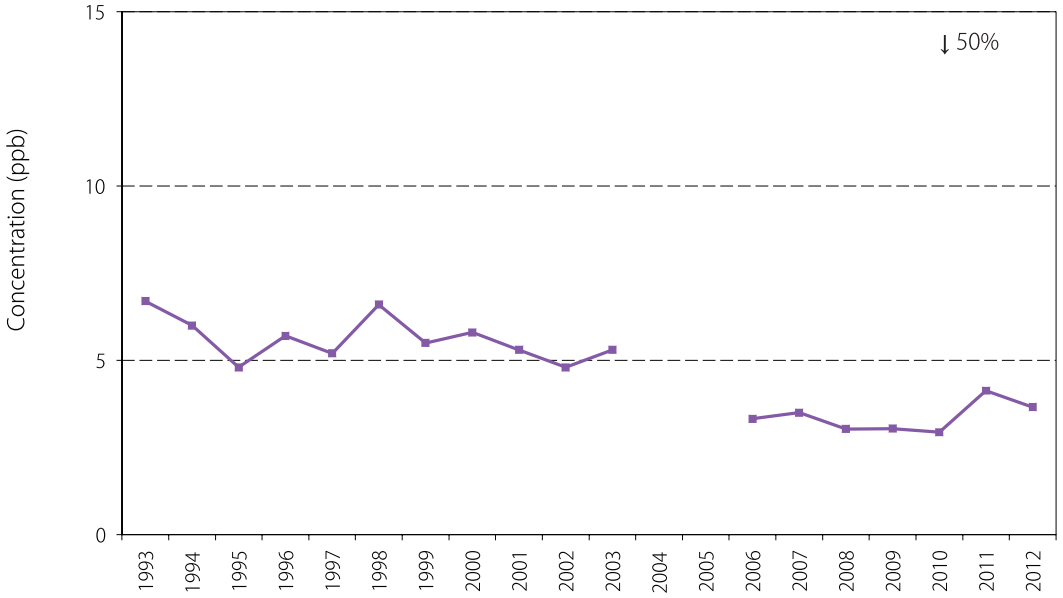


Figure A46: 20y Trend of SO_2 Annual Mean at Ottawa Downtown

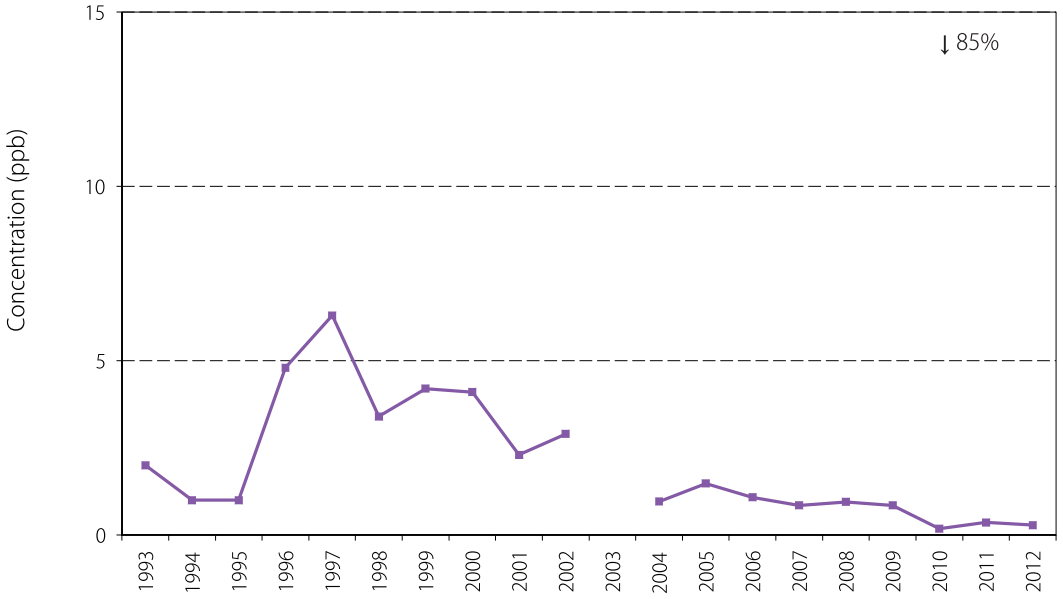


Figure A47: 20y Trend of SO_2 Annual Mean at Sault Ste. Marie

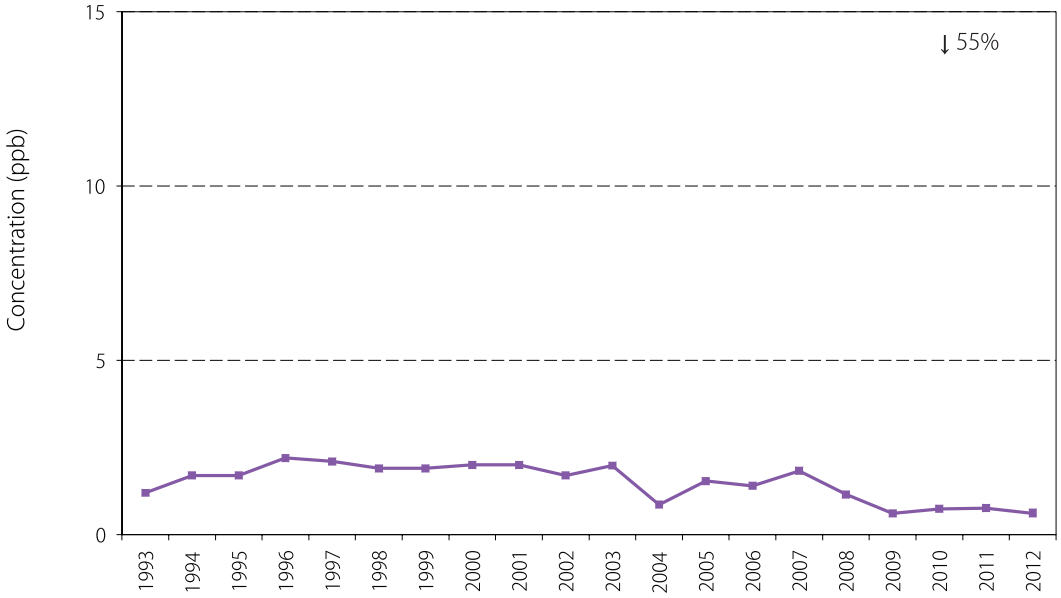
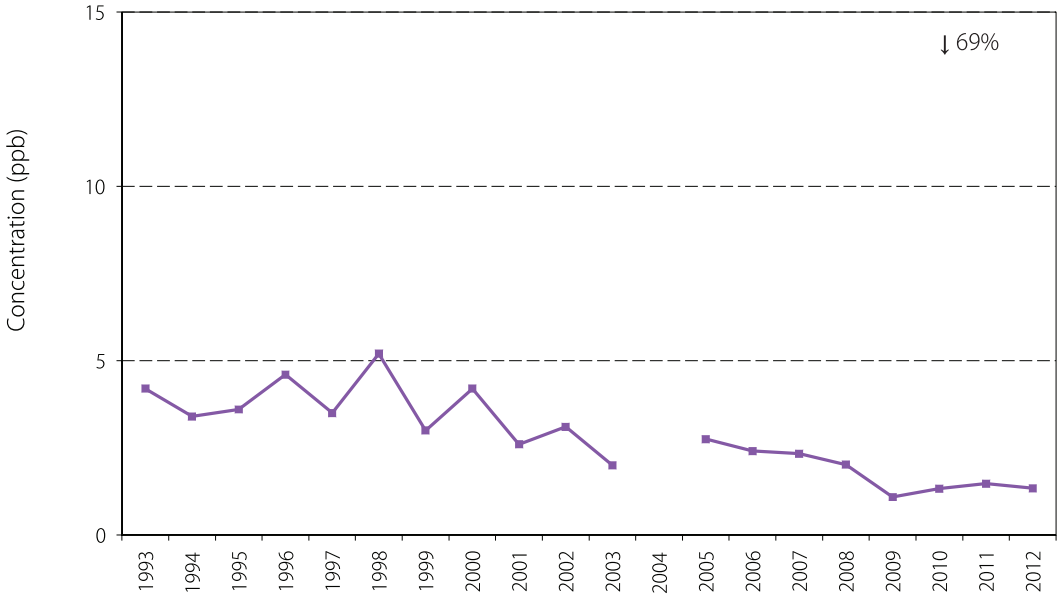


Figure A48: 20y Trend of SO_2 Annual Mean at Sudbury



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