Air Quality in Ontario 2020 Report

Learn about the state of ambient air quality in 2020 and long-term trends for key airborne quality.

Air quality highlights

- Overall, air quality in Ontario has improved over time as both ambient concentrations emissions to air have decreased. Over the last 10 years, nitrogen dioxide concentratior particulate matter concentrations by 17%, maximum ground-level ozone concentratior concentrations by 50% on average across the province (see table below).
- In 2020, Ontario reported air quality in the low risk category 96.0% of the time, based c
- Ozone and fine particulate matter, the main components of smog, remain as pollutant measured concentrations of ozone continue to decrease indicating reduced emissions
- In 2020, there were exceedances of the provincial Ambient Air Quality Criteria (https://w ontario-2020-report/10-year-trends-and-annual-results#section-5) and/or Canadian Ambient (https://www.ontario.ca/document/air-quality-ontario-2020-report/national-air-quality-managen ozone, fine particulate matter and sulphur dioxide in some communities.
- Air quality in Ontario can vary from year to year due to a variety of factors including pc events such as forest fires, and the long-range transport of air pollutants from the Unit trends are thus a better reflection of any improvements or a deterioration in air quality changes.

Trends in common air pollutants, 2011-2020

Pollutant	Concentrations	Emiss
Nitrogen dioxide/ Nitrogen oxides (NO_2/NO_x)	-25%	-36%
Fine particulate matter ($PM_{2.5}$)	-17%	-18%

Ground-level ozone (O_3)	-13%	N/A
Sulphur dioxide (SO_2)	-50%	-57%

Note: Trends for pollutant concentrations are based on annual means except for ground-le

Introduction

Protecting the air we breathe

The ministry is protecting Ontario's air quality and ensuring we have strong environmental and the environment. In doing so, the ministry is working to ensure cleaner air for all Ontar released by certain industrial and commercial facilities, limiting emissions from commercia understanding the transboundary flow of air pollutants into Ontario.

Overall, ambient air quality confirms Ontario's actions to reduce airborne pollutants are wo been steadily improving in Ontario for many common air pollutants over the past 10 years.

While improvements have been made, we recognize more work needs to be done to ensur sources of contaminants to air. The ministry will continue to hold facilities accountable, wh Indigenous communities, and industry to improve air quality and address unique challenge solutions.

Learn more about what Ontario is doing to protect our air. (https://www.ontario.ca/page/air-qu

About this report

This report summarizes 10-year air quality trends and the state of ambient air quality in Or major sources of emissions to air, pollutant concentrations measured across the ministry's network, and Ontario's performance against both provincial and federal ambient air quality ministry monitored ambient air quality in real time at 39 air monitoring stations in commun with the federal National Air Pollutant Surveillance (https://open.canada.ca/data/en/datase acea-47bc3abd859b) (NAPS) program during 2020. This information was reported 24 hours ministry's public website (http://www.airqualityontario.com/) .

The ministry's Air Quality Health Index monitoring stations are generally representative of a contribution of all sources of air contaminants to air. These air monitoring stations are site

population exposure and thus do not necessarily reflect air quality at locations within a cor nearby local sources of air contaminants such as large industrial facilities or major transpo some air contaminants in neighborhoods located in close proximity to local sources such a than those measured at the ministry's Air Quality Health Index monitoring stations.

There are local air quality monitoring networks operated by industrial associations in the c Monitoring Network (http://www.hamnair.ca/)), Sarnia (Clean Air Sarnia and Area (https://v Sudbury (Greater Sudbury Air Quality (http://www.airquality-sudbury-vale.com/index.asp)) information for these communities.

Two photographs showing the exterior (left) and interior (right) of the Toronto North Air Quality Health Index Station.

Air Quality Health Index monitoring stations

This is a map depicting the 39 Air Quality Health Index monitoring stations across Ontario t

Notes:

T: telemetry

NO_2: nitrogen dioxide

$PM_{2.5}$: fine particulate matter

O_3: ground-level ozone

SO_2: sulphur dioxide

CO: carbon monoxide

TRS: total reduced sulphur

Key air contaminants

Ontario monitors levels of common air pollutants associated with smog formation across t
These pollutants have numerous, diverse and widespread sources, and can have adverse e
environment, and property. More information on the key air contaminants, their impacts to
sources is available below.

Nitrogen dioxide

Nitrogen dioxide (NO_2) is a reddish-brown gas with a pungent odour, which transforms in t
acid and nitrates.

NO_2 plays a major role in atmospheric reactions that produce ground-level ozone, a major

NO_2 also reacts with other gaseous contaminants in the air (e.g., ammonia) leading to the f

Impacts to health and environment

NO_2 can irritate the lungs and lower resistance to respiratory infection. People with asthma
sensitivity to NO_2.

NO_2 chemically transforms into nitric acid in the atmosphere and, when deposited, contrib
soils in Ontario. Nitric acid can also corrode metals, fade fabrics, degrade rubber, and dam

Sources of nitrogen oxides

Combustion or burning of carbon-based materials (e.g., wood, gasoline etc.) in air produce
a component. The transportation sector is the main source of nitrogen dioxide in Ontario.

Fine particulate matter

Airborne particulate is the general term used to describe a mixture of microscopic solid pa

air. Particulate matter (PM) includes aerosols, smoke, fumes, dust, fly ash and pollen.

Fine particulate matter, denoted as $PM_{2.5}$, is less than 2.5 micrometres in diameter, approx average diameter of a human hair.

Impacts to health and environment

Fine particulate matter can have various negative health effects, especially on the respiratc

Exposure to fine particulate matter is associated with increased hospital admissions and er death from heart or lung diseases. Both long- and short-term particle exposures have beer

People with heart or lung disease, children and older adults are particularly sensitive to thi

Sources of fine particulate matter

Fine particulate matter consists of primary and secondary $PM_{2.5}$. Primary $PM_{2.5}$ is emitted sources of primary $PM_{2.5}$ include residential fireplaces and wood stoves, motor vehicles, sr facilities, and agricultural burning and forest fires. Secondary $PM_{2.5}$ is formed indirectly in t complex chemical reactions of gaseous precursors such as nitrogen dioxide and sulphur di

Ground-level ozone

Ground-level ozone (O_3) is a colourless, odourless gas at typical ambient concentrations, ar

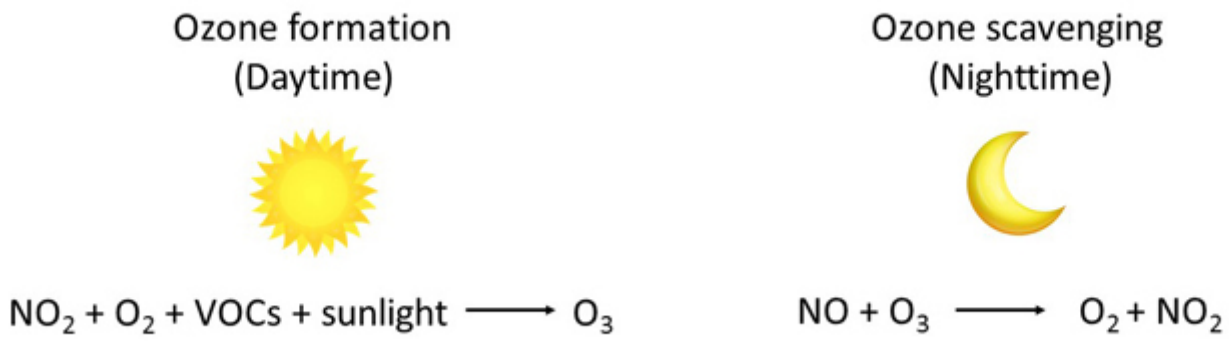
Ground-level ozone is a gas formed when NO_X and volatile organic compounds (VOCs) reac sunlight. NO_2 breaks down in the presence of sunlight to form oxygen atoms (O) and NO. T with molecular oxygen (O_2) in the atmosphere to produce ground-level ozone.

The formation and transport of ozone is strongly dependent on weather conditions and en the formation of ozone, such as NO_X and VOCs (also known as ozone precursors).

Schematic formation and scavenging of ozone

Ground-level ozone is a gas formed when nitrogen oxides (NO_X) and volatile organic com of sunlight. NO_X is comprised of NO_2 and nitric oxide (NO). NO_2 breaks down in the pres atoms (O) and NO. These oxygen atoms then react rapidly with molecular oxygen (O_2) in level ozone. This series of reactions, however, can be influenced by the presence of othe level ozone is depleted when it reacts with nitric oxide to form NO_2 (a process known as

level ozone is depleted when it reacts with nitric oxide to form NO_2 (a process known as concentrations.



Schematic of ozone formation during the day and the scavenging of ozone at night.

In large urban centres, ozone concentrations are generally lower, because ozone is deplete vehicles and other local combustion sources to form NO_2. The NO_2 reacts with volatile org sunlight to form ozone in downwind suburban and rural areas, resulting in higher ozone le

Impacts to health and environment

Ozone irritates the respiratory tract and eyes. Exposure to ozone in sensitive people can re wheezing. Children who are active outdoors during the summer, when ozone levels are hig with pre-existing respiratory disorders, such as asthma and chronic obstructive pulmonary associated with increased hospital admissions and premature deaths.

Sources of ground-level ozone

Major sources of ozone precursors, NO_x and VOCs, include the transportation and industri

Sulphur dioxide

Sulphur dioxide (SO_2) is a colourless gas that smells like burnt matches. It can also be oxidi sulphuric acid aerosols. In addition, SO_2 is a precursor to sulphates, one of the main comp

Impacts to health and environment

Health effects caused by exposure to high levels of SO_2 include breathing problems, respira 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 and reduces visibility.

Sources of sulphur dioxide

Major sources of SO_2 include smelters, industrial processes and coal-fired electric power ge

Volatile organic compounds

Volatile organic compounds (VOCs) are organic chemical compounds that may evaporate u temperature and pressure, such as benzene and toluene. VOCs are precursors of ground-le into the atmosphere from a variety of sources, including vehicles, fossil fuel combustion, st refilling, industrial and residential solvent use, paint application, manufacturing of syntheti processing, agricultural activities and wood processing and burning.

Benzene

Benzene is primarily used in the production of plastics and other chemical products. Large from petroleum-related processes, either by direct extraction from certain types of crude o gasoline. Benzene is classified as a human carcinogen (USEPA, 2016).

Toluene

Toluene is used to make chemicals, explosives, dyes and many other compounds. It is also lacquers, resins, cleaners, glues and adhesives. Toluene is found in gasoline and aviation fu the central nervous system of humans and animals; however, there is little evidence to clas

Ethylbenzene

Ethylbenzene is a colourless liquid that smells like gasoline and is mainly used in the manu ethylbenzene occurs from the use of consumer products, fuel, pesticides, solvents, carpet g acute exposure results in respiratory and neurological effects and chronic exposure is asso neurotoxic effects. Limited information is available on the carcinogenic effects of ethylbenz

Xylene

Xylene is a colourless, sweet-smelling liquid or gas occurring naturally in petroleum, coal ar in the printing, rubber, paint and leather industries. Xylene, also referred to as mixed xylen ortho-, meta- and para-xylene, commonly known as o-, m- and p-xylene, which have the sa

chemical structure, meaning the arrangement of their atoms is different. In humans, acute respiratory and neurological effects. There is no information on the carcinogenic effects of 2016).

1,3-Butadiene

1,3-Butadiene is a colourless gas with a mild gasoline-like odour. It is released into the air t manufacturing and processing facilities, forest fires or other combustion. Acute exposure t humans results in irritation of the eyes, nasal passages, throat and lungs; in addition, 1,3-b inhalation (USEPA, 2016).

10-year trends and annual results

Concentrations of air contaminants measured at the ministry's Air Quality Health Index mo representative of ambient air quality which reflects the contribution of all sources of air co stations are sited to be representative of general population exposure and thus do not nec within a community that may be influenced by nearby local sources of air contaminants su transportation corridors. Concentrations of some air contaminants in neighborhoods locat such as an industrial facility may be higher than those measured at the Ministry's Air Quali

This section presents the 10-year trends and annual results for concentrations of key air co volatile organic compounds such as benzene, toluene, ethylbenzene, xylene (BTEX) and 1,3 Ministry's Air Quality Health Index air monitoring stations. Emission trends for these key ai sources in Ontario such as industry, electricity utilities, transportation, and residential prop also provided.

Concentrations of volatile organic compounds (VOC) are measured at select ambient air m part of a co-operative federal-provincial program under the National Air Pollution Surveilla collected in 2020 as Environment and Climate Change Canada's laboratories were shut dov following Public Health guidelines. As a result, only 10-year trend data based on 2019 meas for context. For 2019 VOC results, please see the Air Quality in Ontario 2019 Report (https:// ontario-2019-report) .

Nitrogen dioxide

Highlights

10-year trends

- NO_2 concentrations have decreased by 25%
- NO_x emissions have decreased by 36%

2020 results

- No exceedances of Ontario's 1-hour and 24-hour Ambient Air Quality Criteria (AAQC

10-year trends

Trend of NO_2 annual means across Ontario, 2011-2020

This is a line graph showing the trend of nitrogen dioxide annual means from 2011 to 2020 concentrations across Ontario have decreased 25% over this 10-year period. To view the da the 'Stations' radio button and use the drop-down menu.

Note:

- The Ontario 10-year trend is based on data from 34 ambient air monitoring stations.
- Ontario does not have an annual AAQC for NO_2.

The 10-year trend for NO_2 at individual AQHI air monitoring stations in Ontario is presente nitrogen dioxide (NO_2) (https://www.ontario.ca/document/air-quality-ontario-2020-report/appendi

Ontario NO_x emission trend, 2011-2020

This is a stacked column chart displaying the Ontario nitrogen oxides emissions trend from approximately 36% or 129 kilotonnes, of which 72 kilotonnes was due to the road vehicles; transportation sector (e.g., air, rail, marine transportation, and non-road vehicles/engines) electricity utilities sector. Please note this chart excludes emissions from open and natural Inventory 1990-2020, 2022). Ontario's former emissions trading regulations (O. Reg. 397/01 light duty vehicle program, and the phase-in of more stringent emission and vehicle standa to the reduction in nitrogen dioxide emissions over time.

2020 results

Summary of annual NO_2 results for 2020

Averaging time	Low range	High range	Number of
NO_2 1-hour max	18.2 ppb at Port Stanley	63.9 ppb at Toronto East	0
NO_2 24-hour max	7.8 ppb at Port Stanley	38.0 ppb at Toronto Downtown	0
NO_2 Annual mean	2.28 ppb at Grand Bend	12.3 ppb at Toronto Downtown	Not applicab

The highest NO_2 means were recorded in large, urbanized areas which are influenced by si Greater Toronto Area of southern Ontario.

A summary of the 2020 NO_2 annual statistics for individual AQHI air monitoring stations is dioxide (NO_2) annual statistics (https://www.ontario.ca/document/air-quality-ontario-2020-report/

Ontario NO_x emissions by sector, 2020

This is a pie chart depicting Ontario's NO_x emissions by sector based on 2020 estimates for Please note this chart excludes emissions from open and natural sources (Air Pollutant Em

The transportation sector accounted for approximately 65% of total NO_x emissions in 2020

Fine particulate matter

Highlights

10-year trends

- $PM_{2.5}$ concentrations have decreased by 17%
- $PM_{2.5}$ emissions have decreased by 18%

2020 results

- Fourteen AQHI air monitoring stations measured above the 24-hour $PM_{2.5}$ Ambient (AAQC) of 27 µg/m^3 on at least one occasion.
- No exceedances of Ontario's annual Ambient Air Quality Criteria (AAQC).

10-year trends

Trend of $PM_{2.5}$ annual means across Ontario, 2011-2020

This is a line graph showing the trend of fine particulate matter annual means from 2011 to annual mean concentrations across Ontario have decreased 17% over this 10-year period. please select the 'Stations' radio button and use the drop-down menu.

Note:

- The Ontario 10-year trend is based on data from 38 ambient air monitoring stations.
- A correction factor was applied to $PM_{2.5}$ concentrations measured by TEOM (2011-201 measurements. $PM_{2.5}$ concentrations measured by SHARP are reflected from 2013 and
- The Ontario annual AAQC for $PM_{2.5}$ is 8.8 µg/m^3.

The 10-year trend for $PM_{2.5}$ at individual AQHI air monitoring stations in Ontario is present fine particulate matter ($PM_{2.5}$) (https://www.ontario.ca/document/air-quality-ontario-2020-report/

Ontario $PM_{2.5}$ emissions trend, 2011-2020

This is a stacked column chart displaying the Ontario $PM_{2.5}$ emissions trend from 2011 to 2 approximately 18% or 11 kilotonnes, of which 6 kilotonnes was due to the transportation s transportation, and non-road vehicles/engines) and 3 kilotonnes was contributed by variou excludes emissions from open and natural sources (Air Pollutant Emission Inventory 1990-2 stringent emission and vehicle standards for new vehicles, Ontario's closure of coal burning reduced emissions from industrial processes have contributed to the reduction in fine part

2020 results

Summary of annual $PM_{2.5}$ results for 2020

Averaging time	Low range	High range	Number of s
$PM_{2.5}$ 1-hour max	22 µg/m^3 at Petawawa	74 µg/m^3 at Sarnia	Not applicabl
$PM_{2.5}$ 24-hour max	12 µg/m^3 at Petawawa	33 µg/m^3 at Hamilton Downtown	14
$PM_{2.5}$ Annual mean	4.2 µg/m^3 at Petawawa	8.8 µg/m^3 at Windsor West	0

A summary of the 2020 $PM_{2.5}$ annual statistics for individual AQHI air monitoring stations i
particulate matter ($PM_{2.5}$) annual statistics (https://www.ontario.ca/document/air-quality-ontario

Ontario $PM_{2.5}$ emissions by sector, 2020

This is a pie chart depicting Ontario's $PM_{2.5}$ emissions by sector based on 2020 estimates f
Please note this chart excludes emissions from open and natural sources (Air Pollutant Emi

Residential fuel combustion accounted for approximately 38% of the total $PM_{2.5}$ emissions
residential emissions is fuel wood combustion in fireplaces and wood stoves.

Ground-level ozone

Highlights

10-year trends

- Ozone maximum concentrations have decreased by 13%
- No significant trends in the annual and seasonal means

2020 results

- Thirteen AQHI air monitoring stations measured ozone levels above the 1-hour AAQ
least one occasion

least one occasion.

10-year trends

Trend of ozone maximums across Ontario, 2011-2020

This is a line graph showing the trend of ozone one-hour maximums from 2011 to 2020. Th concentrations across Ontario have decreased 13% over this 10-year period. To view the da the 'Stations' radio button and use the drop-down menu.

Note:

- The Ontario 10-year trend is based on data from 38 ambient air monitoring stations.
- The Ontario one-hour AAQC for ozone is 80 ppb.

Progressive reductions of NO_X emissions in Ontario and the U.S. have resulted in a decreas and the duration of elevated ozone events in the province (OMOECC, 2018).

The 10-year trend of one-hour maximum ozone for individual AQHI air monitoring stations Appendix: 10-year trend for ozone (O_3) maximums (https://www.ontario.ca/document/air-quali o3a) .

Trend of ozone means across Ontario, 2011-2020

This is a line graph showing the trend of ozone annual, summer and winter means from 20 trends detected for Ontario over this 10-year period. To view the data for a specific locatior button and use the drop-down menu.

Note:

- The Ontario 10-year trend is based on data from 38 ambient air monitoring stations.
- Summer: May - September; Winter: January - April, October - December.
- Ontario does not have an annual or seasonal AAQC for ozone.

There has been no significant trend (increasing or decreasing) in annual and seasonal ozon

Ozone levels continue to exceed Ontario's 1-hour AAQC for ozone during the warmer mont the province, such as southwestern Ontario. However, ozone concentrations during the wi ozone 1-hour AAQC of 80 ppb in 2020.

The 10-year trend of annual, summer and winter ozone for individual AQHI air monitoring
Appendix: 10-year trend for ozone (O_3) (https://www.ontario.ca/document/air-quality-ontario-20
trend for ozone (O_3) summer means (https://www.ontario.ca/document/air-quality-ontario-2020-
and 10-year trend for ozone (O_3) winter means (https://www.ontario.ca/document/air-quality-o
winter) .

Ozone annual means for urban and rural Ontario, 2011-2020

This is a line graph displaying the ozone annual means for urban and rural Ontario from 20

Note:

- Urban S. are urban areas in southern Ontario - Windsor, London, Hamilton, Toronto.
- Urban N. are urban areas in northern Ontario - Thunder Bay, Sault Ste. Marie, Sudbury
- Rural areas in Ontario - Port Stanley, Tiverton, Parry Sound, Petawawa.
- Ontario does not have an annual AAQC for ozone.

Ozone annual mean concentrations in urban areas in southern Ontario have been more cc
northern Ontario in recent years. This indicates that the decrease in ozone scavenging (http
ontario-2020-report/key-air-contaminants#ozone) observed over the past 10 years due to local
greater in urban areas in southern Ontario than in northern Ontario.

Generally, ozone concentrations are higher in rural, transboundary-influenced sites on the
eastern shore of Lake Huron. Ozone concentrations are lower in urban areas because it is
NO emitted by vehicles and other local combustion sources.

2020 results

Summary of annual O_3 results for 2020

Averaging time	Low range	High range	Numb exceed
Ozone 1-hour max	56 ppb at Thunder	95 ppb at Toronto North	13

	Bay		
Ozone 24-hour max	43 ppb at Dorset	58 ppb at Sault Ste. Marie	Not ap
Ozone annual mean	22.9 ppb at Thunder Bay	30.9 ppb at Grand Bend and Port Stanley	Not ap

A summary of the 2020 ozone annual statistics for individual AQHI air monitoring stations i
(O_3) annual statistics (https://www.ontario.ca/document/air-quality-ontario-2020-report/appendix#

Sulphur dioxide

Highlights

10-year trends

- SO_2 concentrations have decreased by 50%
- SO_2 emissions have decreased by 57%

2020 results

- Four AQHI air monitoring stations measured sulphur dioxide levels above the 10-mi
  67 ppb on at least one occasion
- Four AQHI air monitoring stations measured sulphur dioxide levels above the 1-hou
  on at least one occasion
- No exceedances of Ontario's annual AAQC.

10-year trends

Trend of SO_2 annual means across Ontario, 2011-2020

This is a line graph showing the trend of sulphur dioxide annual means from 2011 to 2020.
concentrations across Ontario have decreased 50% over this 10-year period. To view the da

the 'Stations' radio button and use the drop-down menu.

Note:

- The Ontario 10-year trend is based on data from 10 ambient air monitoring stations.

The 10-year trend for SO_2 at individual AQHI air monitoring stations in Ontario is presented
sulphur dioxide (SO_2) (https://www.ontario.ca/document/air-quality-ontario-2020-report/appendix

Ontario SO_2 emission trend, 2011-2020

This is a stacked column chart displaying the Ontario SO_2 emissions trend from 2011 to 20
approximately 57% or 148 kilotonnes, of which 103 kilotonnes was due to the smelter secto
electricity utilities sector. Please note this chart excludes emissions from open and natural
Inventory 1990-2020, 2022). Emissions reductions at Ontario smelters through the implem
under O. Reg. 419/05, Ontario's closure of coal burning electricity generating utilities, Ontar
regulations (O. Reg. 397/01 and O. Reg. 194/05), and low sulphur content in transportation
in sulphur dioxide emissions in Ontario.

2020 results

Summary of annual SO_2 results for 2020

Averaging time	Low range	High range	Numbe exceed
SO_2 10-minutes max	5.1 ppb at Ottawa Downtown	144.5 ppb at Hamilton Downtown	4
SO_2 1-hour max	4.0 ppb at Ottawa Downtown	89.7 ppb at Hamilton Downtown	4
SO_2	0.8 ppb	44.8 ppb	Not app

24-hour max	at Ottawa Downtown	at Sarnia	
SO_2 Annual mean	0.12 ppb at Ottawa Downtown	3.65 ppb at Hamilton Downtown	0

Concentrations of sulphur dioxide in neighborhoods that are located in close proximity to l facility may be higher than those measured at the ministry's Air Quality Health Index monit representative of general population exposure.

A summary of the 2020 SO_2 annual statistics for individual AQHI air monitoring stations is dioxide (SO_2) annual statistics (https://www.ontario.ca/document/air-quality-ontario-2020-report/

There are local air quality monitoring networks operated by industrial associations in the c Monitoring Network (http://www.hamnair.ca/)), Sarnia (Clean Air Sarnia and Area (https://v Sudbury (Greater Sudbury Air Quality (http://www.airquality-sudbury-vale.com/index.asp)) information for these communities.

Ontario SO_2 emissions by sector, 2020

This is a pie chart depicting Ontario's sulphur dioxide emissions by sector based on 2020 e sources. Please note this chart excludes emissions from open and natural sources (Air Poll 2022).

Smelters in northern Ontario are the major sources of SO_2 emissions in Ontario, accountin provincial SO_2 emissions in 2020.

Volatile organic compounds

Volatile organic compounds (VOC) are measured at select ambient air monitoring stations federal-provincial program under the National Air Pollution Surveillance program.

Note: VOC samples were not collected in 2020 as Environment and Climate Change Canad COVID measures put in place following Public Health guidelines. As a result, only 10-year tr are provided in this report for context, however, VOC emissions estimates are presented t the Air Quality in Ontario 2019 Report (https://www.ontario.ca/document/air-quality-ontari

Highlights

10-year trends

- Benzene concentrations have decreased by 41%
- Toluene concentrations have decreased by 54%
- Ethylbenzene have decreased by 39%
- m- and p-xylene have decreased by 39%
- o-xylene have decreased by 34%
- 1,3-butadiene have decreased by 55%

10-year trends

VOCs are measured at eight AQHI air monitoring stations (Windsor West, Sarnia, London, K North, Newmarket and Ottawa). Toronto North began monitoring VOCs in 2017 and therefo trends.

In 2019, 107 VOCs were analyzed and reported for each sample at each site. For the purpo VOCs (benzene, toluene, ethylbenzene, xylene, and 1,3-butadiene) between 2010 and 2019

Trend of benzene annual means across Ontario, 2010-2019

This is a line graph showing the trend of benzene annual mean from 2010 to 2019. The ber across Ontario have decreased 41% over this 10-year period. To view the data for a specific radio button and use the drop-down menu.

Note:

- The Ontario 10-year trend is based on data from 7 ambient air monitoring stations.

Trend of toluene annual means across Ontario, 2010-2019

This is a line graph showing the trend of toluene annual mean from 2010 to 2019. The tolu Ontario have decreased 54% over this 10-year period. To view the data for a specific locatio button and use the drop-down menu.

Note:

- The Ontario 10-year trend is based on data from 7 ambient air monitoring stations.
- Ontario does not have an annual AAQC for toluene.

Trend of ethylbenzene annual means across Ontario, 2010-2019

This is a line graph showing the trend of ethylbenzene annual mean from 2010 to 2019. Th concentrations across Ontario have decreased 39% over this 10-year period. To view the da the 'Stations' radio button and use the drop-down menu.

Note:

- The Ontario 10-year trend is based on data from 7 ambient air monitoring stations.
- Ontario does not have an annual AAQC for ethylbenzene.

Trend of xylene annual means across Ontario, 2010-2019

This is a line graph showing the trend of xylene annual mean from 2010 to 2019. The m- ar concentrations across Ontario have decreased 39%, and decreased 34%, respectively, over for a specific location, please select the 'Stations' radio button and use the drop-down men

Note:

- The Ontario 10-year trend is based on data from 7 ambient air monitoring stations.
- Ontario does not have an annual AAQC for xylene.

Trend of 1,3-butadiene annual means across Ontario, 2010-2019

This is a line graph showing the trend of 1,3-butadiene annual mean from 2010 to 2019. Th concentrations across Ontario have decreased 55% over this 10-year period. Select anothe learn the percent change in air quality for other communities.

Note:

- The Ontario 10-year trend is based on data from 7 ambient air monitoring stations.

The 10-year trend for VOCs at individual AQHI air monitoring stations in Ontario is presente benzene (https://www.ontario.ca/document/air-quality-ontario-2020-report/appendix#tenyear-benz (https://www.ontario.ca/document/air-quality-ontario-2020-report/appendix#tenyear-toluene) , 10-y (https://www.ontario.ca/document/air-quality-ontario-2020-report/appendix#tenyear-ethylbenzene) (https://www.ontario.ca/document/air-quality-ontario-2020-report/appendix#tenyear-p-xylene) , 10-

(https://www.ontario.ca/document/air-quality-ontario-2020-report/appendix#tenyear-p-xylene) , and (https://www.ontario.ca/document/air-quality-ontario-2020-report/appendix#tenyear-butadiene) .

2020 results

Ontario VOC emission trend, 2011-2020

This is a stacked column chart displaying the Ontario VOC emissions trend from 2011 to 20 approximately 27% or 101 kilotonnes, of which 60 kilotonnes was due to the transportation the solvent use, surface coating and printing sectors. Please note this chart excludes emiss (Air Pollutant Emission Inventory 1990-2020, 2022).

The introduction of more stringent vehicle and engine emission standards for new vehicles vehicle program and various regulations, Canadian Council of Ministers of the Environmen of practice for VOC emitting products and materials have contributed to the reduction in V

Ontario VOC emissions by sector, 2020

This is a pie chart depicting Ontario's volatile organic compound emissions by sector based /transportation sources. Please note this chart excludes emissions from open and natural s Inventory 1990-2020, 2022).

Transportation sector accounted for 28% of VOC emissions in 2020; and general solvent us sealants, consumer and commercial products) accounted for approximately 26% (Air Pollut 2022).

Ontario Ambient Air Quality Criteria

Ambient air quality refers to general air quality resulting from all sources of contaminants t (https://www.ontario.ca/page/ontarios-ambient-air-quality-criteria) (AAQC) are a concentration of against adverse effects on health and/or the environment.

AAQC are not regulatory values but are used to assess general (ambient) air quality resultir non-industrial sources) of a contaminant to air. AAQC are most commonly used in environ using ambient air monitoring data, assessment of general air quality in a community and a the province.

Ontario's Ambient Air Quality Criteria for common air pollu

Ontario's Ambient Air Quality Criteria for common air pollu

Contaminant	10 minutes AAQC Assesses protection against acute effects	1-hour AAQC Assesses protection against acute effects	8-hour AAQC Assesses protection against acute effects	24-ho Asse prote agair effec
NO_2	N/A	200 ppb	N/A	100 p
$PM_{2.5}$	N/A	N/A	N/A	27 µg has a 24-ho CAAQ is" for to the meas air qu
O_3	N/A	80 ppb	N/A	N/A
SO_2	67 ppb	40 ppb	N/A	N/A
CO	N/A	30 ppm	13 ppm	N/A
Benzene	N/A	N/A	N/A	2.3 µg
Toluene	N/A	N/A	N/A	2,000 Based

				Based
Ethylbenzene	1,900 µg/m^3	N/A	N/A	1,000
1,3-Butadiene	N/A	N/A	N/A	10 µg

Notes:

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

National Air Quality Management System

The national Air Quality Management System (https://ccme.ca/en/air-quality-report) (AQMS reducing air pollution in Canada. It consists of several elements:

- Canadian Ambient Air Quality Standards (non-regulatory health and environmental-ba drive improvements where needed)
- air zones (management areas delineated within a province or territory)
- regional airsheds - transboundary air pollution (broad geographic areas that encompa provincial/territorial and international boundaries)
- base-level industrial emissions requirements
- mobile emission sources (transportation)

Canadian Ambient Air Quality Standards

The Canadian Council of Ministers of the Environment (https://www.ccme.ca/en) have deve Standards (CAAQS) as a key element of the Air Quality Management System to drive impro CAAQS are non-regulatory health and environmentally based ambient air objectives that ar reflect desirable concentrations of contaminants in air from all sources. CAAQS have been ozone, nitrogen dioxide and sulphur dioxide.

Canadian Ambient Air Quality Standards

Pollutant	Averaging time	Numerical value 2015	Numerical value 2020	Numeri value 2025
Fine particulate matter ($PM_{2.5}$)	24-hour	28 µg/m^3	27 µg/m^3	N/A
Fine particulate matter ($PM_{2.5}$)	Annual	10.0 µg/m^3	8.8 µg/m^3	N/A
Ozone (O_3)	8-hour	63 ppb	62 ppb	60 ppb
Nitrogen Dioxide (NO_2)	1-hour	N/A	60 ppb	42 ppb
Nitrogen Dioxide (NO_2)	Annual	N/A	17 ppb	12 ppb

Sulphur dioxide (SO_2)	1-hour	N/A	70 ppb	65 ppb
Sulphur dioxide (SO_2)	Annual	N/A	17.0 ppb	12.0 ppb

Source: Canadian Council of Ministers of the Environment (https://ccme.ca/en)

Air zone management framework

- The air zone management framework (AZMF) is a place-based approach to managing a
- The framework provides guidance on management, monitoring and reporting actions t achieve the CAAQS.
- Under the AQMS, each jurisdiction is required to:
  - delineate air zones to cover their entire jurisdiction
  - publicly report on monitored levels of the CAAQS pollutants in their air zones
  - develop management plans outlining actions to improve air quality in their air zon

Air zones – Managing air quality in Ontario

Ontario has identified three air zone categories under the federal Air Quality Management pollutant sources, topography, meteorological patterns, population density and other pote concentrations.

This has resulted in six air zone areas for the province as presented in the table below.

Ontario air zone categories and areas

Air zone categories
Category 1 Areas with limited pollution from either point or non-point sources or transboundary influence
Category 2 Areas under pressure from multiple sources including some or all of the following: non-point sources, smaller point sources, individual large industrial point sources, transboundary influences
Category 3 Areas with a concentration of large industrial sources

Ontario has designated 27 Air Quality Health Index ambient air monitoring stations locatec reporting stations for each of the identified air zones in the province. These 27 designated parameters, except for SO_2 which only has 9 CAAQS reporting stations. Designated sites n populations greater than 100,000 and/or communities with large industrial sources.

CAAQS reporting stations in Ontario air zone categories and areas

This map presents the locations of the designated CAAQS reporting stations within the air z Ontario.

Air zone management levels and objectives

- The air zone management level is determined by the designated CAAQS reporting stati within the air zone.
- Four “management levels” provide general guidance on the nature of the management be implemented in an air zone.
- The four management levels are identified by specific colours: red, orange, yellow and contaminant concentration range that is specific to each CAAQS.

- Each management level is associated with a suite of actions that become progressively concentrations approach or exceed the CAAQS.

The air zone management framework

Progressively more rigorous actions as air pollutant concentrations approach or exceed the

Management level	Objective
Red The highest level of air quality management	To reduce pollutant levels below the management actions
Orange The second highest level of air quality management	To improve air quality through active exeedance of the CAAQS
Yellow The second lowest level of air quality management	To improve air quality using early and improvement
Green The lowest level of air quality management	To maintain good air quality through measures to keep clean areas clean

The management levels for each CAAQS pollutant are presented in the Appendix: Manager (https://www.ontario.ca/document/air-quality-ontario-2020-report/appendix#management-levels) .

Canadian Ambient Air Quality Standard achievement

Highlights

10-year trends

10-year trends

- 24-hour $PM_{2.5}$ CAAQS metric concentrations have decreased by 19%.
- A trend was not detected in the annual $PM_{2.5}$ CAAQS metric concentrations.
- 8-hour ozone CAAQS metric concentrations have decreased by 9%.
- 1-hour NO_2 CAAQS metric concentrations have decreased by 9%.
- Annual NO_2 CAAQS metric concentrations have decreased by 27%.
- 1-hour SO_2 CAAQS metric concentrations have decreased by 19%.
- Annual SO_2 CAAQS metric concentrations have decreased by 47%.

2020 results

- No exceedances of the 24-hour and annual $PM_{2.5}$ CAAQS.
- Thirteen designated sites met the CAAQS of 62 ppb for ozone in 2020.
- No exceedances of the 1-hour and annual NO_2 CAAQS.
- Eight of the 9 designated sites met the 1-hour CAAQS of 70 ppb for SO_2 in 2020.
- No exceedances of the annual SO_2 CAAQS.

10-year trends – Fine particulate matter

10-year trend of 24-hour $PM_{2.5}$ CAAQS metrics in Ontario

This is a line graph showing the trend of the 24-hour fine particulate matter Canadian Amb 2011 to 2020 in Ontario. This trend shows Ontario's decrease of 19% over this 10-year peri location, please select the 'Stations' radio button and use the drop-down menu.

Note:

- The Ontario 10-year trend is based on data from 26 ambient air monitoring stations.
- The CAAQS for 24h $PM_{2.5}$ (27 $\mu g/m^3$) is based on the 98^{th} percentile measurement anr years.

10-year trend of annual $PM_{2.5}$ CAAQS metrics in Ontario

This is a line graph showing the trend of the annual fine particulate matter Canadian Ambie

This is a line graph showing the trend of the annual fine particulate matter Canadian Ambi
2011 to 2020 in Ontario. There was no significant trend for Ontario over this 10-year period
location, please select the 'Stations' radio button and use the drop-down menu.

Note:

- The Ontario 10-year trend is based on data from 26 ambient air monitoring stations.
- The CAAQS for annual $PM_{2.5}$ (8.8 µg/m^3) is based on the annual mean averaged over th

The 10-year trends, based on the 24-hour and annual $PM_{2.5}$ CAAQS metrics at each of the
presented in Appendix: $PM_{2.5}$ and ozone CAAQS metric trends for designated sites across O
(https://www.ontario.ca/document/air-quality-ontario-2020-report/appendix#tenyear-caaqs) .

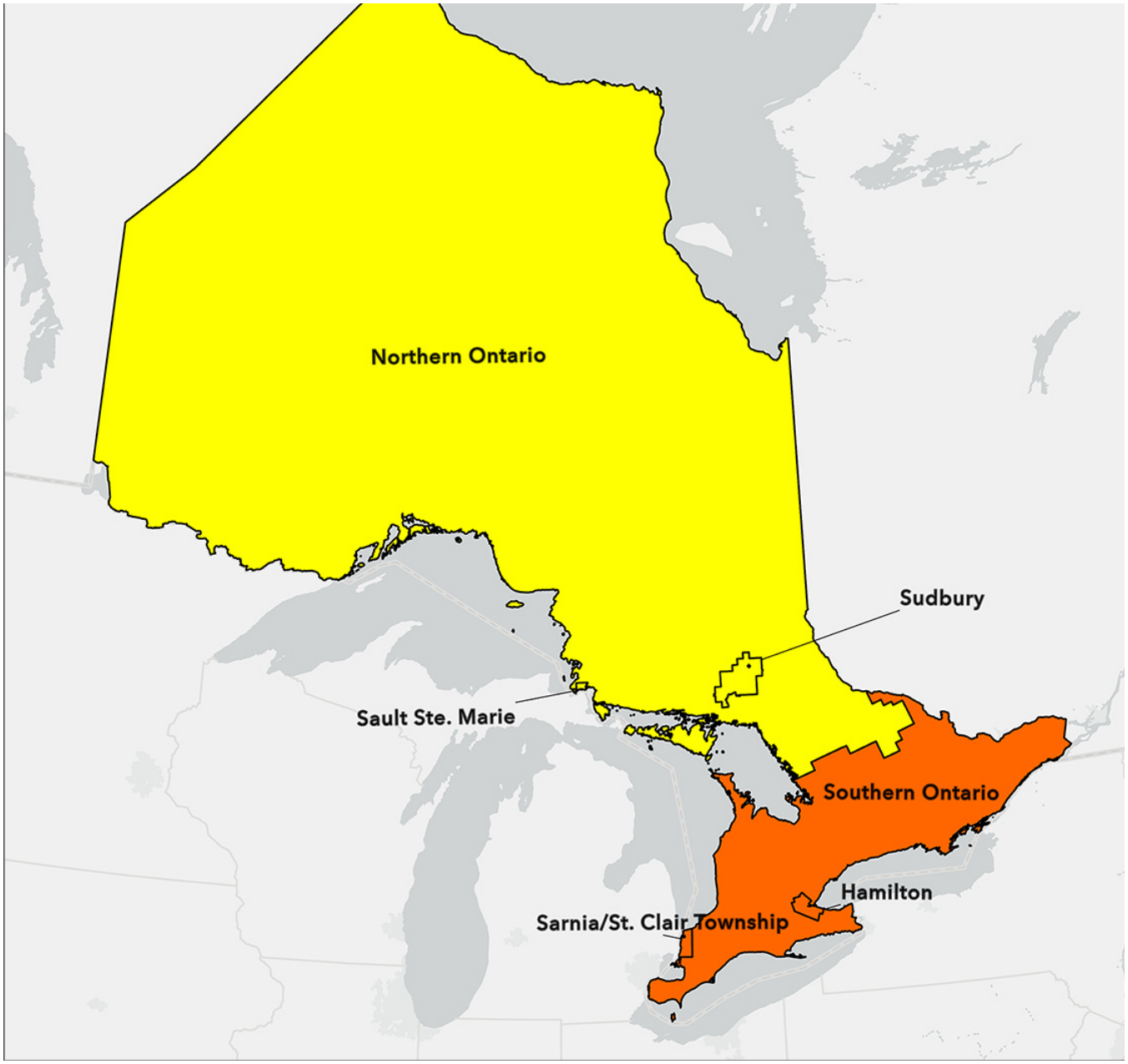
2020 results – Fine particulate matter

Summary of $PM_{2.5}$ CAAQS metrics for 2020

Averaging time	Range in CAAQS metrics Low	Range in CAAQS metrics High	Nur exc
$PM_{2.5}$ 24-hour	13 µg/m^3 at Sault Ste. Marie	22 µg/m^3 at Hamilton Downtown	0
$PM_{2.5}$ annual	4.9 µg/m^3 at Sault Ste. Marie	8.7 µg/m^3 at Hamilton Downtown	0

A summary of the 2020 CAAQS metric values for the 24-hour and annual $PM_{2.5}$ at individua
Appendix: $PM_{2.5}$ and ozone CAAQS metric values for designated sites across Ontario (2020
quality-ontario-2020-report/appendix#annual-caaqs) .

$PM_{2.5}$ CAAQS management levels for air zones across Ontario, 2020



This map displays the fine particulate matter Canadian Ambient Air Quality Standard man
across Ontario in 2020. These management levels are based on the highest CAAQS metric
designated Canadian Ambient Air Quality Standard reporting sites within each air zone. A
management levels assigned, it is recommended for the Sarnia/St. Clair Township, Hamilt
zones to improve air quality by active air management and prevent exceedance of the CA
Ste. Marie and Northern Ontario air zones are encouraged to use early and ongoing actio
improvement.

The $PM_{2.5}$ CAAQS metrics associated with the management levels are presented in the App
(https://www.ontario.ca/document/air-quality-ontario-2020-report/appendix#management-levels) .

10-year trends – Ground-level ozone

10-year trend of 8-hour O_3 CAAQS metrics in Ontario

This is a line graph showing the trend of the 8-hour ozone Canadian Ambient Air Quality St
Ontario. This trend shows Ontario's decrease of 9% over this 10-year period. Select anothe
learn the percent change in air quality for other communities.

Note:

- The Ontario 10-year trend is based on data from 26 ambient air monitoring stations.
- The CAAQS for ozone (62 ppb) is based on the consecutive three-year average of the a
  hour running average.

The 10-year trends, based on the 8-hour ozone CAAQS metrics at each of the designated m
Appendix: $PM_{2.5}$ and ozone CAAQS metric trends for designated sites across Ontario (2011
/air-quality-ontario-2020-report/appendix#tenyear-caaqs) .

2020 results – Ground-level ozone

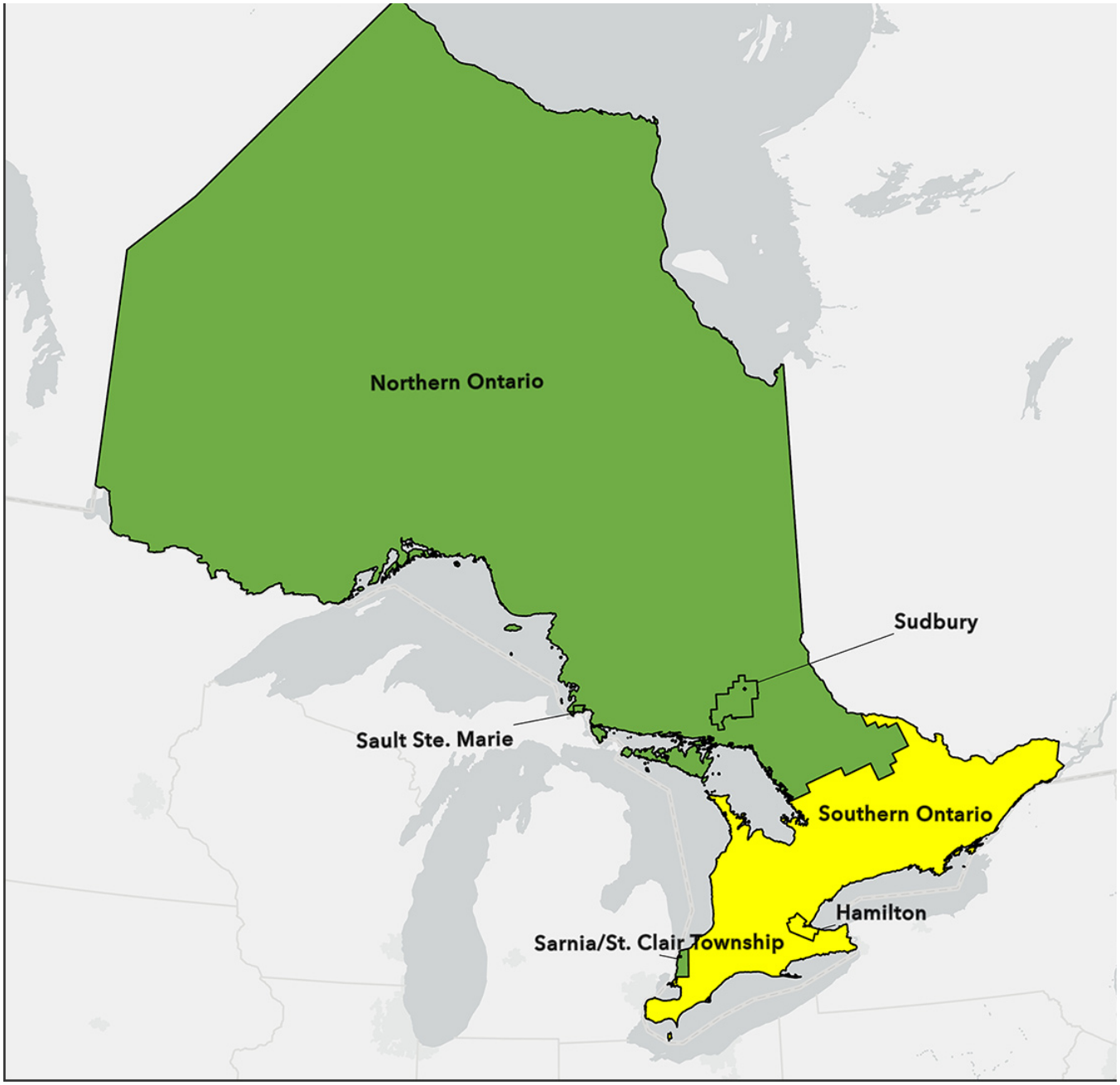
Summary of ozone CAAQS metrics for 2020

Averaging time	Low range	High range	Number of sites wi
Ozone 8-hour	50 ppb at Thunder Bay	72 ppb at Sarnia	13

Transboundary influences, from both the U.S. and beyond, account for a significant portion
are elevated. Ontario's CAAQS reporting stations would have met the ozone CAAQS if trans
from the calculated metric using a weight of evidence (WOE) analysis.

A summary of the 2020 CAAQS metric values for 8-hour ozone at individual CAAQS reportin
and ozone CAAQS metric values for designated sites across Ontario (2020) (https://www.onta
report/appendix#annual-caaqs) .

Ozone CAAQS effective management levels for air zones across Ontario, 2020



This map displays the ozone Canadian Ambient Air Quality Standard effective managemer Ontario in 2020. The assignment of effective management levels was based upon the rem influence using a Weight of Evidence (WOE) approach. These management levels are base Ambient Air Quality Standard metric value reported by designated CAAQS reporting sites According to the air quality management levels assigned, it is recommended for the Hami air zones to use early and ongoing actions for continuous improvement, while the Sarnia/ Sault Ste. Marie and Northern Ontario air zones are encouraged to maintain good air qua management measures to keep clean areas clean.

The ozone CAAQS metrics associated with the management levels are presented in the App (https://www.ontario.ca/document/air-quality-ontario-2020-report/appendix#management-levels) .

Weight of Evidence analysis

Weight of Evidence analysis

Transboundary influences, from both the U.S. and beyond, account for a significant portion
are elevated. A Weight of Evidence (WOE) analysis demonstrates the influence of transbou
concentrations and confirms that Ontario's CAAQS reporting stations would have met the c
days were excluded from the calculated metric.

The WOE approach consists of performing, evaluating, and documenting a series of technic
the conclusion that exceedances of the CAAQS on a given day were influenced by transbou
These analyses may include assessing the meteorological conditions (airflow, wind speed a
etc.) and pollutant concentrations in Ontario and upwind locations.

10-year trends – Nitrogen Dioxide

10-year trend of 1-hour NO_2 CAAQS metrics in Ontario

This is a line graph showing the trend of the 1-hour nitrogen dioxide Canadian Ambient Air
2020 in Ontario. This trend shows Ontario's decrease of 9% over this 10-year period. To vie
select the 'Stations' radio button and use the drop-down menu.

Note:

- The Ontario 10-year trend is based on data from 25 ambient air monitoring stations.
- The CAAQS for 1-hour NO_2 (60 ppb) is based on the 98th percentile of the daily maximu
  averaged over three consecutive years.

10-year trend of annual NO_2 CAAQS metrics in Ontario

This is a line graph showing the trend of the annual nitrogen dioxide Canadian Ambient Air
2020 in Ontario. This trend shows Ontario's decrease of 27% over this 10-year period. To vi
please select the 'Stations' radio button and use the drop-down menu.

Note:

- The Ontario 10-year trend is based on data from 26 ambient air monitoring stations.
- The CAAQS for annual NO_2 (17 ppb) is based on the average over a single calendar yea
  concentrations.

The 10-year trends, based on the 1-hour and annual NO_2 CAAQS metrics at each of the des
presented in Appendix: NO_2 and SO_2 CAAQS metric trends for designated sites across Onta

/document/air-quality-ontario-2020-report/appendix#tenyear-caaqs-b) .

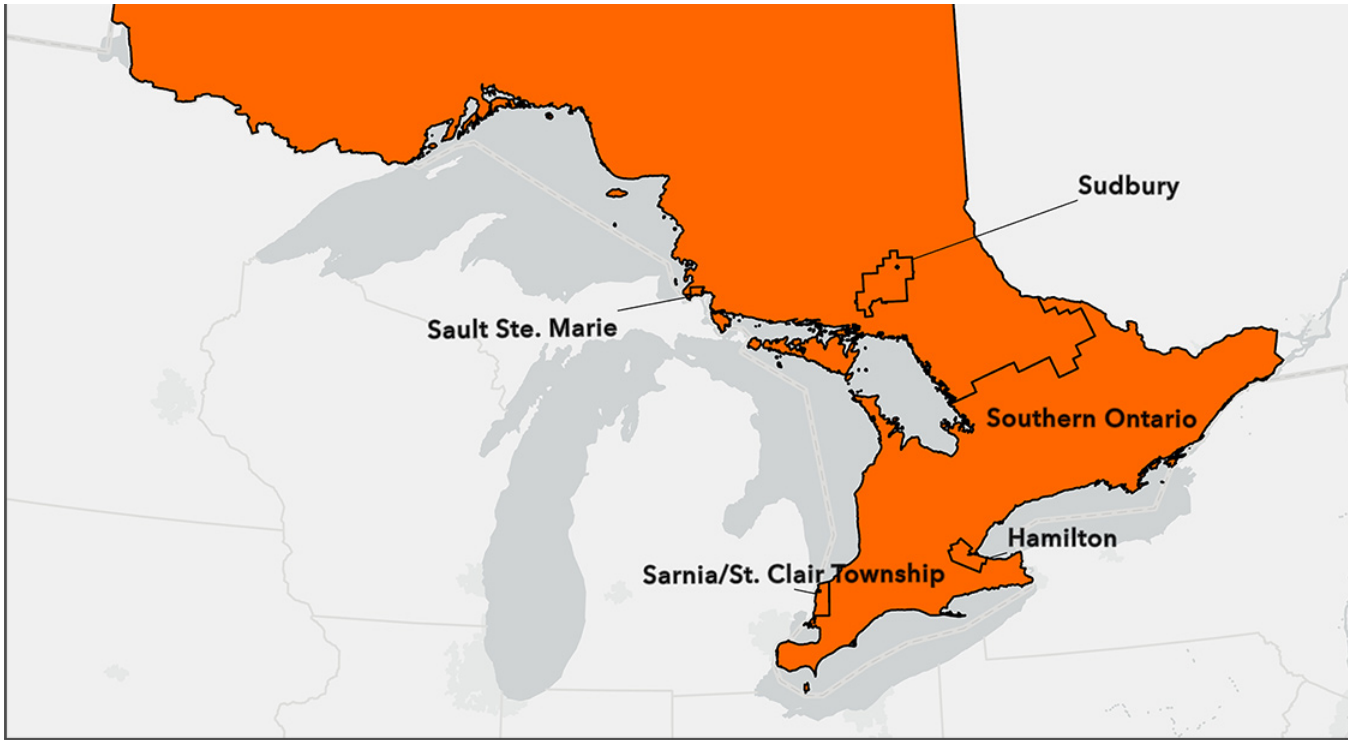
2020 results – Nitrogen Dioxide

Summary of NO_2 CAAQS metrics for 2020

Averaging time	Range in CAAQS metrics Low	Range in CAAQS metrics High	N ex
NO_2 1-hour	23 ppb at Oshawa	51 ppb at Milton and Toronto West	0
NO_2 annual	3.5 ppb at Kingston	12.3 ppb at Toronto Downtown	0

A summary of the 2020 CAAQS metric values for the 1-hour and annual NO_2 at individual C
Appendix: NO_2 and SO_2 CAAQS metric values for designated sites across Ontario (2020) (ht
ontario-2020-report/appendix#annual-caaqs_b) .

NO_2 CAAQS management levels for air zones across Ontario, 2020



This map displays the nitrogen dioxide Canadian Ambient Air Quality Standard manageme Ontario in 2020. These management levels are based on the highest CAAQS metric value Canadian Ambient Air Quality Standard reporting sites within each air zone. According to levels assigned, it is recommended for all air zones in Ontario to improve air quality by act prevent exceedance of the CAAQS.

The NO_2 CAAQS metrics associated with the management levels are presented in the Appe (https://www.ontario.ca/document/air-quality-ontario-2020-report/appendix#management-levels) .

10-year trends – Sulphur Dioxide

10-year trend of 1-hour SO_2 CAAQS metrics in Ontario

This is a line graph showing the trend of the 1-hour sulphur dioxide Canadian Ambient Air 2020 in Ontario. This trend shows Ontario's decrease of 19% over this 10-year period. To vi please select the 'Stations' radio button and use the drop-down menu.

Note:

- The Ontario 10-year trend is based on data from 9 ambient air monitoring stations.
- The CAAQS for 1-hour SO_2 (70 ppb) is based on the annual 99th percentile of the SO_2 c concentrations, averaged over three consecutive years.

10-year trend of annual SO_2 CAAQS metrics in Ontario

10-year trend of annual SO_2 CAAQS metrics in Ontario

This is a line graph showing the trend of the annual sulphur dioxide Canadian Ambient Air
2020 in Ontario. This trend shows Ontario's decrease of 47% over this 10-year period. To vi
please select the 'Stations' radio button and use the drop-down menu.

Note:

- The Ontario 10-year trend is based on data from 9 ambient air monitoring stations.
- The CAAQS for annual SO_2 (5.0 ppb) is based on the average over a single calendar yea
  concentrations.

The 10-year trends, based on the 1-hour and annual SO_2 CAAQS metrics at each of the des
in Appendix: NO_2 and SO_2 CAAQS metric trends for designated sites across Ontario (2011-2
/air-quality-ontario-2020-report/appendix# tenyear-caaqs-b) .

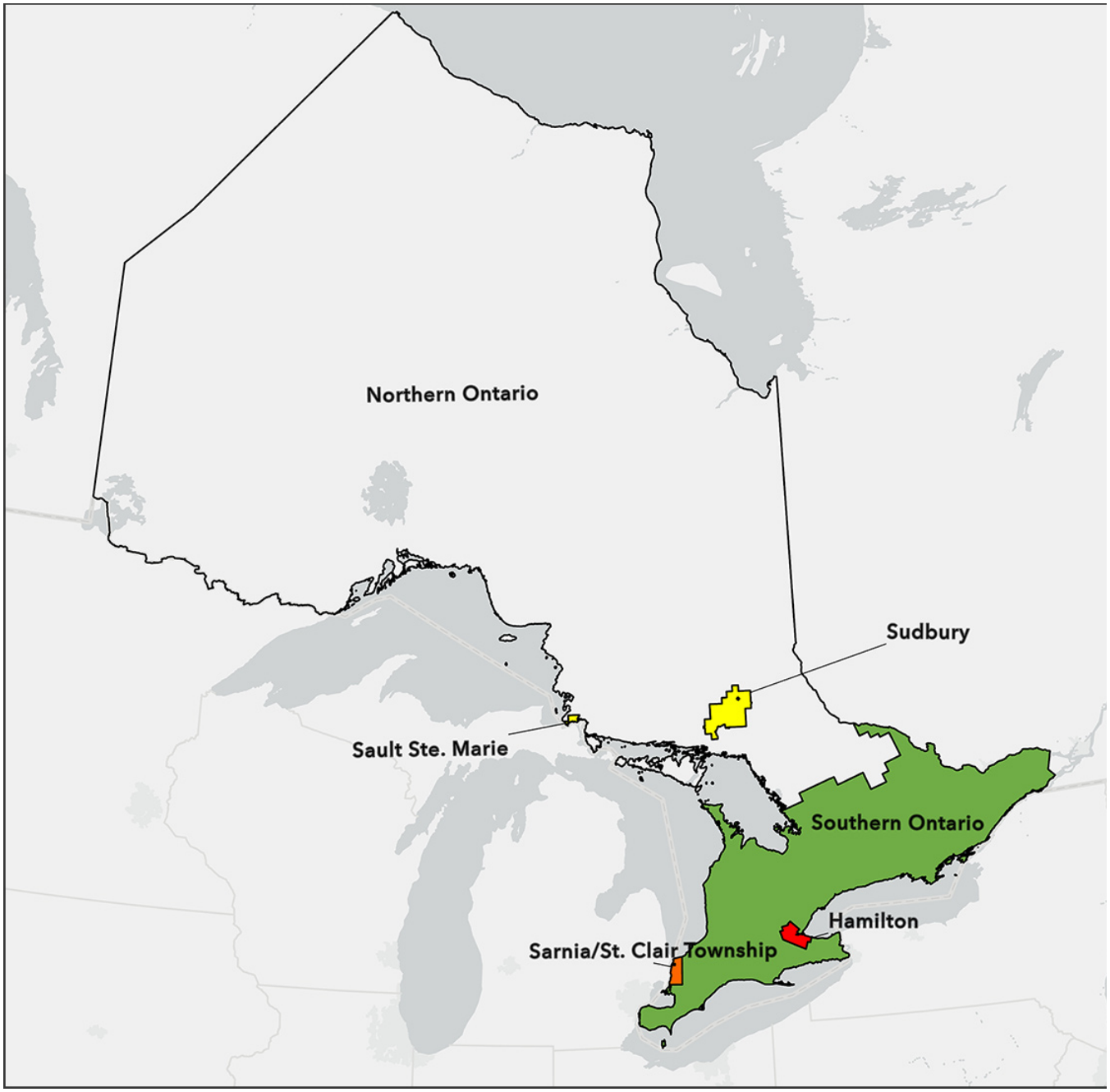
2020 results – Sulphur Dioxide

Summary of SO_2 CAAQS metrics for 2020

Averaging time	Range in CAAQS metrics Low	Range in CAAQS metrics High
SO_2 1-hour	2 ppb at Ottawa Downtown	87 ppb at Hamilton Downtown
SO_2 annual	0.1 ppb at Toronto North and Ottawa Downtown	3.7 ppb at Hamilton Downtown

A summary of the 2020 CAAQS metric values for the 1-hour and annual SO_2 at individual C
Appendix: NO_2 and SO_2 CAAQS metric values for designated sites across Ontario (2020) (ht
ontario-2020-report/appendix#annual-caaqs_b) .

SO_2 CAAQS management levels for air zones across Ontario, 2020



This map displays the sulphur dioxide Canadian Ambient Air Quality Standard manageme
Ontario in 2020. These management levels are based on the highest CAAQS metric value
Canadian Ambient Air Quality Standard reporting sites within each air zone. According to
levels assigned, it is recommended for the Hamilton air zone to reduce pollutant levels be
advanced air management actions. For the Sarnia/St. Clair Township air zone, it is recomm
through active air management and prevent exceedance of the CAAQS. Using early and o
improvement is encouraged for both the Sudbury and Sault Ste. Marie air zones, while it i
Ontario air zone to maintain good air quality through proactive management measures to
Note: The designated CAAQS site in the Northern Ontario air zone does not measure SO_2.

The SO_2 CAAQS metrics associated with the management levels are presented in the Appe

(https://www.ontario.ca/document/air-quality-ontario-2020-report/appendix# management-levels) .

Transboundary influences on Ontario's sm

Smog related air pollutants (i.e., $PM_{2.5}$, ozone and their precursors) are generated both loc travel hundreds of kilometres, affecting areas far from the source of the pollution. The long flow of air pollutants play a significant role in Ontario's air quality. Typically, during the sum related pollutants are often associated with distinct weather patterns (e.g., slow-moving hig south of the lower Great Lakes) that results in the long-range transport of these pollutants industrial and urbanized states during south to southwesterly flow conditions (Yap et al., 2

Transboundary sources from around the globe (global background) are also significant con

Long-range transport and transboundary flow of air pollutants

During the smog season (May to September) prevailing southwesterly airflows results in th from U.S. (for example, NO_x emissions from electricity generators in the Ohio Valley) into C

NO_x emissions from electricity generators and prevailing winds

This map shows the nitrogen oxides emissions from electricity generators located in easter winds during smog season.

Note:

- Canadian Data: National Pollutant Release Inventory, Environment and Climate Change (https://www.canada.ca/en/services/environment/pollution-waste-management/nation
- US Data: Air Markets Program Data, United States Environmental Protection Agency (U

Modelling transboundary impacts on Ontario's air quality

The Community Multi-Scale Air Quality model (CMAQ) (USEPA, 2018), developed by the U.S. used to characterize and predict the formation, transportation, deposition and transformat ozone and $PM_{2.5}$) in the atmosphere. Emissions of smog precursors from a region that incl along with meteorological conditions to assess ambient concentrations of pollutants for 20 the impact of transboundary flows of smog related pollutants into and across Ontario.

Transboundary influences on Ontario's smog

Fine particulate matter ($PM_{2.5}$)

Transboundary contributions to Ontario's $PM_{2.5}$ concentrations are mainly due to seconda in the atmosphere through a series of complex reactions involving precursor emissions suc oxides) originating from U.S. sources. These transboundary contributions vary across the p 25% to 87%.

Along Canada-U.S. border areas of southwestern Ontario, transboundary sources of $PM_{2.5}$ contributing to over 70% of the annual $PM_{2.5}$ concentrations, and decreasing further away

Transboundary influences on Ontario's annual average $PM_{2.5}$ concentrations

This map shows the transboundary influences on Ontario's annual average fine particulate

In the Greater Toronto Area (GTA) and Ottawa, where there are many more local sources of contributions of $PM_{2.5}$ are much less (e.g. up to 25% in the GTA and 35% in Ottawa).

Outside of urban areas, transboundary influences increase in all directions. In much of nor is dominated by transboundary sources (over 80% in most cases) as there are very few loca

Ozone

The influence of transboundary sources (U.S. and global background) on ozone levels in Or Transboundary contributions are most notable in areas of southwestern Ontario, in close p the northern shore of Lake Erie and the eastern shore of Lake Huron/Georgian Bay. In sout are elevated, over 95% of the ozone is attributable to transboundary sources, with the U.S. the remainder attributable to global background, as shown below.

Transboundary contributions vary across the province, ranging from approximately 87% to accounting for approximately 11% to 38%.

Influences on Ontario's ozone concentrations on high concentration days

This map shows influences on Ontario's ground-level ozone concentrations on high concen

Global background plays a significant role in Ontario's transboundary air pollution, contribu concentrations on poor air quality days across the province. In areas of northern and easte are much more significant.

As ozone precursor emissions continue to decrease across North America, the rising globa
important role in Ontario's air quality (Environment and Climate Change Canada, 2013).

Air Quality Health Index overview

The federal Air Quality Health Index (https://www.canada.ca/en/environment-climate-chan
index/about.html) (AQHI) is a health protection communication tool designed to help the p
health by limiting short-term exposure to air pollution and adjusting activities during increa
on the cumulative health effects of three common air pollutants: ozone, nitrogen dioxide, a
measured on a scale from 1 to 10+, the lower the number, the lower the risk. Each risk cate
messaging. The health messages associated with the AQHI are outlined in the table below.

Air Quality Health Index categories and health messages

Health risk	Air Quality Health Index	Health messages At risk populationPeople with heart or breathing problems are at greater risk. Follow your doctor's usual advice about exercising and managing your condition.
Low	1-3	Enjoy your usual outdoor activities
Moderate	4-6	Consider reducing or rescheduling strenuous activities outdoors if you are experiencing symptoms.
High	7-10	Reduce or reschedule strenuous activities outdoors. Children and the elderly should also take it easy.

Very high	Above 10	Avoid strenuous activities outdoors. Children and the elderly should also avoid outdoor physical exertion.

Source: Environment and Climate Change Canada.

Air Quality Health Index annual results

- Based on the AQHI categories, in 2020, Ontario reported low risk air quality 96% of the and high risk 0.01% of the time.
- The percentage distribution of hourly AQHI readings for each of the 39 monitoring site high risk AQHI days is detailed in the Appendix: 2020 Air Quality Health Index summar quality-ontario-2020-report/appendix#section-8) .

Impact of the COVID-19 pandemic on Onta quality in 2020

The Government of Ontario declared a provincial state of emergency on March 17, 2020, in pandemic. Various measures were put in place including a temporary stay-at-home order v industrial activities across the province. The stay-at-home-order in 2020 offered a unique o transportation and industrial emissions impacted ambient levels of common air pollutants collected through the ministry's ambient and roadside air monitoring networks were asses 2020 to determine the impact of the stay-at-home-order on ambient air quality including 1 period, and 3) re-opening period. Historical data collected from 2017 to 2019 was used as b measurements.

2020 time periods assessed

Period	Date

Pre-COVID	January 1 to March 16
Stay-at-home	March 17 to May 18
Re-opening	May 19 to December 31

Impact on traffic volumes at the Highway 401 roadside air monitoring st

During the pre-COVID period, traffic volumes of cars and trucks in 2020 measured at the m air monitoring station were similar to the baseline years; however, traffic volumes were gre period in 2020 for both cars and trucks. Traffic volumes decreased by 33% for cars and 22% period. Traffic volumes gradually increased after some of the stay-at-home measures were car volumes were 14% lower while truck volumes were similar in comparison to the pre-CC

Changes in traffic volumes at the Highway 401 roadside station

This is a bar graph showing change percentages in 2020 relative to the 2017-2019 baseline trucks during the stay-at-home and re-opening periods at the ministry's Highway 401 roads

Note:

- Baseline years: 2017 to 2019.
- Pre-COVID period: January 1 - March 18; Stay-at-home period: March 19 - May 18; Re-o

A summary of the traffic volumes and air pollution concentrations is detailed in the Appen concentrations in baseline years and changes in 2020 at the Highway 401 roadside station quality-ontario-2020-report/appendix#section-9) .

Impact on air pollutants at the Highway 401 roadside air monitoring sta

During the stay-at-home period, concentrations of common air pollutants measured at the research air monitoring station decreased by 27% for black carbon (BC), 21% for ultrafine p (NO_2) and 35% for sulphur dioxide (SO_2). Reduced traffic-related emissions due to less veh environment was responsible for the observed decrease in pollutant concentrations. As tra opening period, levels of these air pollutants remained lower than the baseline period but at-home period.

In contrast, concentrations of fine particulate matter ($PM_{2.5}$) and ozone (O_3) changed little

were higher during the re-opening period in comparison to the baseline years (2017-2019). air directly and formed as a secondary pollutant, and ozone is formed as a secondary pollu are impacted by local emissions and their regional background levels. The little change in le at-home period and the increased levels of $PM_{2.5}$ and O_3 during the re-opening period refl sources (e.g., forest fires) and its secondary formation in air, as well as reduced O_3 titration oxide emissions (e.g., transportation emissions).

Changes in pollutant concentrations at the Highway 401 roadside station

This is a bar graph showing change percentages of pollution concentrations for BC, NO_2, Pl baseline years during the stay-at-home and re-opening periods at Highway 401.

Note:

- Baseline years: 2017 to 2019.
- Pre-COVID period: January 1 - March 18; Stay-at-home period: March 19 - May 18; Re-o

Data summaries of pollution concentrations in the baseline years and changes in 2020 are concentrations of black carbon and changes in 2020 (https://www.ontario.ca/document/air-qua /appendix#baseline-bc) ; Baseline concentrations of nitrogen dioxide and changes in 2020 (ht ontario-2020-report/appendix#baseline-no2) ; Baseline concentrations of fine particulate matte (https://www.ontario.ca/document/air-quality-ontario-2020-report/appendix#baseline-pm) ; and Ba changes in 2020 (https://www.ontario.ca/document/air-quality-ontario-2020-report/appendix#base

Impact on air pollutants across the province

Concentrations of common and traffic-related air pollutants collected through the ministry monitoring station and select ambient air monitoring stations located in close proximity to baseline years (2017-2019).

Average change in pollutant concentrations during stay-at-home and re-opening periods in 2020

Pollutants	Stay-at-home period	Re-opening period

BC	-27% (-34% to -20%)	-18% (-25% to -4%)
NO_2	-10% (-16% to -1%)	2% (-12% to 19%)
$PM_{2.5}$	5% (-5% to 17%)	10% (-1% to 23%)
O_3	-2% (-4% to 1%)	6% (-8% to 13%)

This table provides a summary of the average changes in common and traffic related air co
Highway 401 roadside air monitoring station and select ambient air monitoring stations du
periods.

Note:

- Ranges of changes are in parentheses.
- Baseline years: 2017 to 2019.
- Pre-COVID period: January 1 - March 18; Stay-at-home period: March 19 - May 18; Re-o

Changes in black carbon concentrations across the province

- 2020 stay-at-home period: Average change percentage of BC concentrations was -27%
  Downtown to -20% at Etobicoke South.
- 2020 re-opening period: Average change percentage of BC concentrations was -18%, ra
  Downtown to -4% at Etobicoke South.
- The reduced BC concentrations in the stay-at-home and re-opening periods are attribu
  and associated decrease in traffic emissions.

Changes in NO_2 concentrations across the province

- 2020 stay-at-home period: Average change percentage of NO_2 concentrations was -7%
  to -1% at Windsor Downtown and Toronto North.
- 2020 re-opening period: Average change percentage of NO_2 concentrations was 2%, ra
  19% at North Bay

19% at North Bay.

- The decreases in NO_2 concentrations during the stay-at-home and re-opening periods especially at stations close to major roads like the Highway 401 roadside station. At a f decrease in NO_2 concentrations during the re-opening period is less than that observe reflective of a combination of increased traffic during the re-opening period and differe pre-COVID and re-opening periods.

Changes in $PM_{2.5}$ concentrations across the province

- 2020 stay-at-home period: Average change percentage of $PM_{2.5}$ concentrations was 5% 17% at Thunder Bay.
- 2020 re-opening period: Average change percentage of $PM_{2.5}$ concentrations was 9%, r at Hamilton West.
- The change in $PM_{2.5}$ concentrations varied among stations across the province reflecti $PM_{2.5}$ sources (e.g., forest fires) and its secondary formation in air.

Changes in O_3 concentrations across the province

- 2020 stay-at-home period: Average change percentage of O_3 concentrations was -2%, r Downtown and Thunder Bay to 1% at a few stations.
- 2020 re-opening period: Average change percentage of O_3 concentrations was 6%, ran Hamilton West.
- The changes in O_3 concentrations varied among stations across the province. The sligh period is attributable to decreased precursor emissions (i.e., volatile organic compoun during the re-opening period reflects recovered transportation and industrial related a attributable to reduced titration effects due to the reduction in nitric oxide emissions (

Additional information on specific air contaminants is presented in the Appendix: Baseline changes in 2020 (https://www.ontario.ca/document/air-quality-ontario-2020-report/appendix#base nitrogen dioxide and changes in 2020 (https://www.ontario.ca/document/air-quality-ontario-202(concentrations of fine particulate matter and changes in 2020 (https://www.ontario.ca/docum /appendix#baseline-pm) ; and Baseline concentrations of ozone and changes in 2020 (https://v ontario-2020-report/appendix#baseline-ozone) .

Acronyms

AAQC
Ambient Air Quality Criterion (Ontario)

AQHI
Air Quality Health Index

BC
black carbon

CAAQS
Canadian Ambient Air Quality Standard

CCME
Canadian Council of Ministers of the Environment

CO
carbon monoxide

ECCC
Environment and Climate Change Canada

M-K
Mann-Kendall (statistical test)

NAPS
National Air Pollution Surveillance

NO
nitric oxide

NO_2
nitrogen dioxide

NO_x
nitrogen oxides

O3
ozone

PM
particulate matter

$PM_{2.5}$
fine particulate matter

SAHA
Smog and Air Health Advisory

SAQS
Special Air Quality Statement

SHARP
Synchronized Hybrid Ambient Real-time Particulate

SO_2
sulphur dioxide

TEOM
Tapered Element Oscillating Microbalance

TRAP
Traffic-related air pollutants

TRS
total reduced sulphur

UFP
ultrafine particles

U.S.
United States (of America)

VOCs
volatile organic compounds

WOE
weight of evidence

Km
kilometres

Kt
kilotonnes

#/cm^3
number (of contaminant) per cubic centimetre (of air) – count

ng/m^3
nanograms (of contaminant) per cubic metre (of air) – by weight

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

Glossary

Air Quality Health Index
Real-time information system that provides the public with an indication of air quality in cit Ontario. The AQHI derives a value based on the cumulative health effects of three pollutan

AQHI station

Continuous monitoring station used to inform the public of general ambient air quality leve area) on a real-time basis; station reports on criteria pollutant levels that are not unduly inf but rather are the result of emissions from multiple sources, including those in neighbouri

Ambient air
Outdoor or open air.

Ambient monitoring
Measurements of regional air quality less influenced by local and industrial sources of air c

Annual mean
The average value of data for a given year.

Area sources
Small collective emission sources that are inventoried as a group, such as any small reside commercial or industrial fuel combustion operations, which are too numerous to inventory

Black carbon
The sooty black material produced through incomplete combustion processes. It is emitted coal-fired power plants) and natural sources (e.g., forest fires). BC comprises a significant p linked to both climate warming and adverse health effects.

Carbon monoxide
A colourless, odourless, tasteless, and at high concentrations, poisonous gas.

Continuous pollutants
Pollutants for which a continuous measurement record exists; effectively, pollutants that h 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 exam

Criterion
Maximum concentration or level (based on potential effects) of pollutant that is desirable c

Downwind
The direction the wind is going to. If the wind is blowing towards the Southeast (blowing fr direction is towards the Southeast and the upwind direction is towards the Northwest.

Exceedance
Above the air pollutant concentration levels established by environmental protection criter

Fine Particulate Matter
Also referred as respirable particles: particles smaller than 2.5 micrometres in aerodynami combustion, condensation of hot vapors and chemically driven gas-to-particle conversion p 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 org generating heat.

Fly ash
Generated as a by-product of coal combustion and is used as a replacement for cement in

Ground-level ozone
Colourless gas formed from chemical reactions between nitrogen oxides and volatile orgar of sunlight near the Earth's surface.

Mann-Kendall (M-K) test
A nonparametric statistical approach that can be applied to data without making assumpti distribution. The M-K test is suitable for environmental monitoring data to handle missing,

Meteorological conditions
The conditions in the atmosphere (e.g. temperature, air pressure, water vapour, air flows, e space, both vertically and horizontally) and interactions of these conditions.

Metric
Concentrations measured at a monitoring station calculated in the statistical form of a star

Micrometre
A millionth of a metre.

Natural sources
Emission sources such as biogenic emissions from vegetation, biological and geological sou made by humans.

Nitrogen dioxide
A reddish-brown gas with a pungent and irritating odour.

Open sources
Emission sources that emit air contaminants over large geographical areas. Examples inclu paved and unpaved roads.

Oxidation
A chemical reaction where a substance gains an oxygen; for example, in the atmosphere, s radicals to form sulphate.

Particulate matter
The general term used to describe a mixture of microscopic solid particles and liquid dropl

Point sources
Sources that have a fixed location and are identified individually by name and location.

Primary pollutant
Pollutant emitted directly to the atmosphere.

Residence time
The average length of time during which a particle is in a given location or condition.

Respirable particles
See definition for fine particulate matter.

Secondary pollutant
pollutant formed from other pollutants in the atmosphere.

Sen’s slope
The Sen’s slope (also known as the Thiel-Sen’s estimator) is closely-related to and applied ir

The Sen's slope (also known as the Theil-Sen's estimator) is closely related to and applied i
Test. Compared to the common least squares regression, the Sen's slope procedure is a no
value of the true slope when there are gross errors or outliers in the data (Gilbert, 1987) wi
distribution on the data.

Smog
A contraction of smoke and fog; colloquial term used for photochemical smog, which inclu
other contaminants; tends to be a brownish haze.

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 radiat
of the sun's ultraviolet radiation and prevents it from reaching the Earth.

Styrene
Primarily a synthetic chemical that is used extensively in the manufacture of plastics, rubbe
vinylbenzene, ethenylbenzene, cinnamene, or phenylethylene.

Sulphur dioxide
A colourless gas that smells like burnt matches.

Transportation sources
Mobile emission sources such as wheeled vehicles, ships, aircraft and railroad locomotives.

Troposphere
Atmospheric layer extending from the surface up to about 10 kilometres above the Earth's

Ultrafine particles
Particles that are less than 0.1 µm in aerodynamic diameter; mostly emitted from road traf
particles have larger surface areas per unit mass to absorb toxic chemicals and can penetra

Upwind
The direction the wind is coming from. If the wind is blowing from the Northwest (blowing t
direction is toward the Northwest and the downwind direction is toward the Southeast.

Appendix

The Appendix is intended for use in conjunction with the 2020 Annual Air Quality in Ontario
describes the provincial Air Quality Health Index (AQHI) network, quality assurance and qua
Ministry of the Environment, Conservation and Parks' air quality database. It also includes a
locations and a listing of the summary statistics including means, maximums, percentile va
the Ontario Ambient Air Quality Criteria (AAQC) for each pollutant. In addition, trends for se
year period.

Monitoring network operations

Network description

In 2020, the ministry operated 39 ambient air monitoring sites across Ontario as part of the
comprised of 134 continuous monitoring instruments at 39 sites. These instruments have t
(approximately 70 million data points per year) that are used to scan and validate the conti

Quality assurance and quality control

Day-to-day maintenance and support of the instruments are administered by ministry staf
by daily automatic internal zero and span checks. Data analysts and station operators revie
instrument precision using a telemetry system. A quarterly quality assurance and quality co
the ambient data set to highlight anomalies and administer corrective action in a timely ma

The air monitoring station operators routinely inspect and maintain monitoring equipment
on-site visits where secondary transfer standards are used to calibrate instrumentation. Sta
recorded using FieldWorker Inc. software, an electronic documentation solution; this inforr
ministry's database. The instrumentation used throughout the provincial air monitoring ne
Thermo Electron Corporation analyzers to streamline parts inventory and leverage commo
The following is a summary of the instrumentation deployed within the network and are al
methods:

- Nitrogen Oxides – TE42C/I
- Fine Particulate Matter – SHARP 5030
- Ozone – TE49C/I
- Sulphur Dioxide – TE43I
- Carbon Monoxide – TE48I
- Total Reduced Sulphur – TE43I/CDN101

The ministry operates a laboratory with gas reference standards that adhere to those of th
and Technology (NIST) and the Air Quality Research Division of Environment and Climate Cl
standards used by station operators are referenced and certified to the ministry's NIST prir

The Ontario ambient air quality monitoring network undergoes constant maintenance to e
control. Continuous real-time data are consistently reviewed, assessed and validated by mi
taken to correct any inconsistencies that may affect the validity of the data. These measure
are valid, complete, comparable, representative and accurate. As a result, the 2020 ambien
99% valid data from over one million hourly data points.

Data base

The ambient air quality data used in this report are stored in the ministry's air quality infor available through the Air Quality Ontario web site (http://www.airqualityontario.com/histor Catalogue (https://data.ontario.ca/) . A statistical pattern test is used to identify data anom concentrations. Each pollutant has a predetermined concentration range based on historic flagged for further investigation.

Data are obtained from automated ambient air monitoring instruments that operate conti measurement for every hour for a possible total of 8,760 measurements in a given year. H $NO/NO_2/NO_x$, $PM_{2.5}$, O_3, SO_2, CO and TRS compounds. An annual mean requires at least 6 quarter of the year should have 75% valid data for $PM_{2.5}$, whereas for ozone, only the 2nd 75% valid data based on protocols that are consistent with the Canadian Council of Ministe United States Environmental Protection Agency (U.S. EPA). For VOC samples, half of the me appropriate to concentrations measured below the detection limit. An annual and/or mont require 50% of valid samples.

Network descriptive table

The AQHI network for 2020 is summarized in the 2020 Ontario Continuous Ambient Air Mo the station name, numerical identifier and pollutants measured. The numerical identifier is of which identifies the geographic region in which the station is located. Air monitoring stat measure up to six common pollutants (NO_2, $PM_{2.5}$, ozone, SO_2, CO and TRS compounds) b the regional area it represents.

The 2020 Ontario Continuous Ambient Air Monitoring Network also identifies the type of a Canadian Ambient Air Quality Standard (CAAQS), and/or National Air Pollution Surveillance general air quality of an area without any direct influence of local industrial sources. Road-s 100 m of a major roadway with daily traffic volumes greater than 10,000 vehicles per day.

Annual statistics and trends

The annual statistical data and trends for various continuous pollutants and selected volati the Appendix. The annual averages, maximums and percentiles are displayed in the annua value equal to or below which a given percentage of the data set falls. For example, if 70% 0.10 ppm, the 70th percentile is 0.10 ppm).

The trends are calculated from monthly means through the Mann-Kendall (M-K) test. The M approach that can be applied to data without making assumptions on the nature of the da

essentially a test for uniform progression (zero change) in the slope of the linear regressior (Gilbert, 1987). The M-K test is particularly suitable for environmental monitoring data sinc limit values can be handled. This test can also be used to compare trends at multiple statio performed in this Report, is a generalization of the M-K test (Gilbert, 1987) for use to deter seasonal cycles in the data which do not constitute a true long-term trend. The change ove also known as the Thiel-Sen's estimator of linear trend. The Sen's slope is closely-related to M-K Test. Compared to the common least squares regression, the Sen's slope procedure is computing the value of the true slope when there are gross errors or outliers in the data w distribution on the data (Gilbert, 1987).

Other informative tables

Calculated CAAQS metrics for $PM_{2.5}$, ozone, NO_2 and SO2 are presented for 2020 (based o over a 10-year period in Canadian Ambient Air Quality Standard Reporting. The air zone ma CAAQS reporting pollutant is also provided for reference. The percentage distribution of hc health risk categories for each of the 39 monitoring sites, and the number of air quality ale summarized in AQHI and Air Quality Alert Program Reporting. Traffic volumes and pollutan pandemic period are presented as well.

2020 air monitoring network

2020 Ontario continuous ambient air monitoring network

ID	Station name	Station location	Year	Latitude
12008	Windsor Downtown	467 University Ave. W.	1969	42°18'58.8"
12016	Windsor West	College Ave./South St.	1975	42°17'34.4"
13001	Chatham	435 Grand Ave. W.	2005	42°24'13.3"
14111	Sarnia	700 Christina St. N.	2016	42°59'25.0"

15020	Grand Bend	Point Blake Conservation Area	1991	43°19'59.1"
15026	London	42 St. Julien St.	2013	42°58'28.1"
16015	Port Stanley	43665 Dexter Line, Elgin Water T. Plant	2002	42°40'19.5"
18007	Tiverton	4th Concession/Bruce Rd. 23	1979	44°18'52.1"
21005	Brantford	324 Grand River Ave.	2004	43°08'19.0"
26060	Kitchener	West Ave./Homewood Ave.	1990	43°26'37.8"
27067	St. Catharines	Argyle Cres., Pump Stn.	1987	43°09'36.2"
28028	Guelph	Exhibition St./Clark St. W.	2000	43°33'05.8"
29000	Hamilton Downtown	Elgin St./Kelly St.	1987	43°15'28.0"
29118	Hamilton West	Main St. W./Hwy 403	1985	43°15'26.8"
29214	Hamilton Mountain	250 Fennell Ave. W.	2019	43°14'28.4"

31129	Toronto Downtown	55 John St., Metro Hall	2019	43°38'43.5"
33003	Toronto East	Kennedy Rd./Lawrence Ave. E.	1970	43°44'52.5"
34021	Toronto North	4905 Dufferin St., ECCC	1988	43°46'53.8"
35125	Toronto West	125 Resources Rd.	2003	43°42'34.0"
44008	Burlington	North Shore Blvd. E./Lakeshore Rd.	1979	43°18'54.4"
44017	Oakville	EightLine/Glenashton Dr., Halton Reservoir	2003	43°29'12.9"
44029	Milton	1120 Main St. E.	2019	43°31'46.7"
45027	Oshawa	Brittania Ave. W., Ep Taylor Stables	2005	43°57'07.5"
46090	Brampton	109 Mclaughlin Rd. S.	2000	43°41'55.5"
46108	Mississauga	3359 Mississauga Rd. N., U of T Campus	2007	43°32'49.1"
47045	Barrie	83 Perry St.	2001	44°22'56.5"
48006	Newmarket	Eagle St. W./Mccaffrey Rd.	2001	44°02'39.5"

49005	Parry Sound	7 Bay St.	2001	45°20'16.3"
49010	Dorset	1026 Bellwood Acres Rd.	1981	45°13'27.4"
51001	Ottawa Downtown	Rideau St./Wurtemburg St.	1971	45°26'03.6"
51010	Petawawa	Petawawa Research Forest Facility	2007	45°59'48.2"
52023	Kingston	23 Beechgrove Lane	2014	44°13'11.5"
54012	Belleville	2 Sidney St., Water Treatment Plant	2002	44°09'01.9"
56051	Cornwall	Bedford St./3rd St. W.	1970	45°01'04.7"
59006	Peterborough	10 Hospital Dr.	1998	44°18'06.9"
63203	Thunder Bay	421 James St. S.	2004	48°22'45.8"
71078	Sault Ste. Marie	Sault College	2004	46°31'59.5"
75010	North Bay	Chippewa St. W., Dept. National Defence	1979	46°19'23.5"
77233	Sudbury	155 Elm St.	2013	46°29'31.0"

Total				

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
Canadian Ambient Air Quality Standard (CAAQS)

N
National Air Pollution Surveillance (NAPS)

AQHI
Air Quality Health Index

T
telemetry

NO_2
nitrogen dioxide

$PM_{2.5}$
fine particulate matter

O_3
ground-level ozone

SO_2
sulphur dioxide

CO
carbon monoxide

TRS
total reduced sulphur

total reduced sulphur

Y
yes

2020 annual statistics

2020 nitric oxide (NO) annual statistics

Unit: parts per billion (ppb)

ID	City	Location	Valid h	10%	3(
12008	Windsor Downtown	467 University Ave. W.	8701	0.0	0.
12016	Windsor West	College Ave./South St.	8633	0.1	0.
13001	Chatham	435 Grand Ave. W.	8742	0.3	0.
14111	Sarnia	700 Christina St. N.	8698	0.4	0.
15020	Grand Bend	Point Blake Conservation Area	8707	0.2	0.
15026	London	42 St. Julien St.	8720	0.0	0.
16015	Port Stanley	43665 Dexter Line, Elgin Water T. Plt	8694	0.0	0.
21005	Brantford	324 Grand River Ave.	8684	0.1	0.

26060	Kitchener	West Ave./Homewood Ave.	8655	0.0	0.
27067	St. Catharines	Argyle Cres., Pump Stn.	8729	0.1	0.
28028	Guelph	Exhibition St./Clark St. W.	8719	0.0	0.
29000	Hamilton Downtown	Elgin St./Kelly St.	8759	0.2	0.
29118	Hamilton West	Main St. W./Hwy 403	8674	0.0	0.
29214	Hamilton Mountain	250 Fennell Ave. W.	8721	0.2	0.
31129	Toronto Downtown	55 John St.	8628	1.0	1.
33003	Toronto East	Kennedy Rd./Lawrence Ave. E.	8713	0.0	0.
34021	Toronto North	4905 Dufferin St., ECCC	8688	0.1	0.
35125	Toronto West	125 Resources Rd.	8681	0.1	0.
44008	Burlington	North Shore Blvd. E./Lakeshore Rd.	8771	0.2	0.

44017	Oakville	EightLine/Glenashton Dr., Halton Res.	8743	0.1	0.
44029	Milton	1120 Main St. E.	8541	0.3	0.
45027	Oshawa	Brittania Ave. W., EP Taylor Stables	8508	0.0	0.
46090	Brampton	109 McLaughlin Rd. S.	8719	0.0	0.
46108	Mississauga	3359 Mississauga Rd. N., U of T Campus	8719	0.0	0.
47045	Barrie	83 Perry St.	8714	0.1	0.
48006	Newmarket	Eagle St. W./McCaffrey Rd.	8724	0.0	0.
49005	Parry Sound	7 Bay St.	8710	0.0	0.
51001	Ottawa Downtown	Rideau St./Wurtemburg St.	8770	0.3	0.
52023	Kingston	23 Beechgrove Lane	8715	0.2	0.
54012	Belleville	2 Sidney St., Water Treatment Plant	8744	0.3	0.
56051	Cornwall	Bedford St./3rd St. W.	8718	0.1	0.

59006	Peterborough	10 Hospital Dr.	8362	0.0	0.
63203	Thunder Bay	421 James St. S.	8759	0.5	0.
71078	Sault Ste. Marie	Sault College	8497	0.1	0.
75010	North Bay	Chippewa St. W., Dept. National Defence	8766	0.3	0.
77233	Sudbury	155 Elm St.	8699	0.4	0.

2020 nitrogen dioxide (NO_2) annual statistics

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

ID	City	Location	Valid h	10%	3(
12008	Windsor Downtown	467 University Ave. W.	8701	3.3	5.
12016	Windsor West	College Ave./South St.	8633	2.6	4.
13001	Chatham	435 Grand Ave. W.	8742	1.9	2.

14111	Sarnia	700 Christina St. N.	8698	0.8	2.
15020	Grand Bend	Point Blake Conservation Area	8707	0.4	1.
15026	London	42 St. Julien St.	8720	1.2	2.
16015	Port Stanley	43665 Dexter Line, Elgin Water T. Plt	8694	1.0	1.
21005	Brantford	324 Grand River Ave.	8684	1.5	2.
26060	Kitchener	West Ave./Homewood Ave.	8655	1.3	2.
27067	St. Catharines	Argyle Cres., Pump Stn.	8729	2.0	2.
28028	Guelph	Exhibition St./Clark St. W.	8719	1.3	2.
29000	Hamilton Downtown	Elgin St./Kelly St.	8759	3.1	5.
29118	Hamilton West	Main St. W./Hwy 403	8674	2.9	4.
29214	Hamilton Mountain	250 Fennell Ave. W.	8721	1.7	2.
31129	Toronto	55 John St	8628	4.7	7

	Downtown				
33003	Toronto East	Kennedy Rd./Lawrence Ave. E.	8713	2.2	4.
34021	Toronto North	4905 Dufferin St., ECCC	8688	2.6	4.
35125	Toronto West	125 Resources Rd.	8681	3.4	6.
44008	Burlington	North Shore Blvd. E./Lakeshore Rd.	8771	2.5	4.
44017	Oakville	EightLine/Glenashton Dr., Halton Res.	8743	2.0	3.
44029	Milton	1120 Main St. E.	8541	2.1	3.
45027	Oshawa	Brittania Ave. W., EP Taylor Stables	8508	0.9	1.
46090	Brampton	109 McLaughlin Rd. S.	8719	1.3	2.
46108	Mississauga	3359 Mississauga Rd. N., U of T Campus	8719	1.9	3.
47045	Barrie	83 Perry St.	8714	1.5	2.
48006	Newmarket	Eagle St. W./McCaffrey Rd.	8724	0.8	1.

49005	Parry Sound	7 Bay St.	8710	0.5	1.
51001	Ottawa Downtown	Rideau St./Wurtemburg St.	8770	1.4	2.
52023	Kingston	23 Beechgrove Lane	8715	1.0	1.
54012	Belleville	2 Sidney St., Water Treatment Plant	8744	0.9	1.
56051	Cornwall	Bedford St./3rd St. W.	8718	1.1	1.
59006	Peterborough	10 Hospital Dr.	8362	0.8	1.
63203	Thunder Bay	421 James St. S.	8759	1.2	2.
71078	Sault Ste. Marie	Sault College	8497	1.0	1.
75010	North Bay	Chippewa St. W., Dept. National Defence	8766	0.9	1.
77233	Sudbury	155 Elm St.	8699	1.5	2.

2020 nitrogen oxides (NO_x) annual statistics

Unit: parts per billion (ppb)

ID	City	Location	Valid h	10%	3(

12008	Windsor Downtown	467 University Ave. W.	8701	3.7	5.
12016	Windsor West	College Ave./South St.	8633	2.9	4.
13001	Chatham	435 Grand Ave. W.	8742	2.4	3.
14111	Sarnia	700 Christina St. N.	8698	1.5	3.
15020	Grand Bend	Point Blake Conservation Area	8707	0.6	1.
15026	London	42 St. Julien St.	8720	1.5	2.
16015	Port Stanley	43665 Dexter Line, Elgin Water T. Plt	8694	1.1	1.
21005	Brantford	324 Grand River Ave.	8684	1.8	2.
26060	Kitchener	West Ave./Homewood Ave.	8655	1.5	2.
27067	St. Catharines	Argyle Cres., Pump Stn.	8729	2.4	3.
28028	Guelph	Exhibition St./Clark St. W.	8719	1.5	2.

29000	Hamilton Downtown	Elgin St./Kelly St.	8759	3.7	5.
29118	Hamilton West	Main St. W./Hwy 403	8674	3.1	5.
29214	Hamilton Mountain	250 Fennell Ave. W.	8721	2.1	3.
31129	Toronto Downtown	55 John St.	8628	6.2	9.
33003	Toronto East	Kennedy Rd./Lawrence Ave. E.	8713	2.4	4.
34021	Toronto North	4905 Dufferin St., ECCC	8688	3.1	5.
35125	Toronto West	125 Resources Rd.	8681	3.8	8.
44008	Burlington	North Shore Blvd. E./Lakeshore Rd.	8771	3.1	5.
44017	Oakville	EightLine/Glenashton Dr., Halton Res.	8743	2.4	3.
44029	Milton	1120 Main St. E.	8541	2.6	4.
45027	Oshawa	Brittania Ave. W., EP Taylor Stables	8508	1.1	2.
46090	Brampton	109 McLaughlin Rd.	8719	1.4	2.

		S.			
46108	Mississauga	3359 Mississauga Rd. N., U of T Campus	8719	2.1	3.
47045	Barrie	83 Perry St.	8714	1.8	2.
48006	Newmarket	Eagle St. W./McCaffrey Rd.	8724	0.9	1.
49005	Parry Sound	7 Bay St.	8710	0.6	1.
51001	Ottawa Downtown	Rideau St./Wurtemburg St.	8770	1.9	3.
52023	Kingston	23 Beechgrove Lane	8715	1.3	1.
54012	Belleville	2 Sidney St., Water Treatment Plant	8744	1.2	1.
56051	Cornwall	Bedford St./3rd St. W.	8718	1.3	2
59006	Peterborough	10 Hospital Dr.	8362	0.9	1.
63203	Thunder Bay	421 James St. S.	8759	1.9	3.
71078	Sault Ste. Marie	Sault College	8497	1.6	2.
75010	North Bay	Chippewa St. W., Dept. National Defence	8766	1.3	2.

		Defence			
77233	Sudbury	155 Elm St.	8699	2.1	3.

2020 fine particulate matter ($PM_{2.5}$) annual statistics

Unit: micrograms per cubic metre ($\mu g/m^3$)
$PM_{2.5}$ 24h AAQC: 27 $\mu g/m^3$
$PM_{2.5}$ Annual AAQC: 8.8 $\mu g/m^3$

ID	City	Location	Valid h	10%	3(
12008	Windsor Downtown	467 University Ave. W.	8722	2	4
12016	Windsor West	College Ave./South St.	8375	2	5
13001	Chatham	435 Grand Ave. W.	8699	2	3
14111	Sarnia	700 Christina St. N.	8757	2	3
15020	Grand Bend	Point Blake Conservation Area	8619	2	2
15026	London	42 St. Julien St.	8693	2	4
16015	Port Stanley	43665 Dexter Line,	8586	2	3

		Elgin Water T. Plt			
18007	Tiverton	4th Concession/Bruce Rd. 23	8442	2	2
21005	Brantford	324 Grand River Ave.	8690	2	4
26060	Kitchener	West Ave./Homewood Ave.	8753	2	3
27067	St. Catharines	Argyle Cres., Pump Stn.	8685	2	4
28028	Guelph	Exhibition St./Clark St. W.	8702	1	3
29000	Hamilton Downtown	Elgin St./Kelly St.	8748	2	4
29118	Hamilton West	Main St. W./Hwy 403	8626	2	4
29214	Hamilton Mountain	250 Fennell Ave. W.	8743	2	4
31129	Toronto Downtown	55 John St.	8627	3	5
33003	Toronto East	Kennedy Rd./Lawrence Ave. E.	8721	1	3

34021	Toronto North	4905 Dufferin St., ECCC	8689	1	3
35125	Toronto West	125 Resources Rd.	8675	2	4
44008	Burlington	North Shore Blvd. E./Lakeshore Rd.	8762	2	3
44017	Oakville	EightLine/Glenashton Dr., Halton Res.	8672	2	4
44029	Milton	1120 Main St. E.	8504	2	4
45027	Oshawa	Brittania Ave. W., EP Taylor Stables	8700	2	4
46090	Brampton	109 McLaughlin Rd. S.	8749	2	4
46108	Mississauga	3359 Mississauga Rd. N., U of T Campus	8748	1	3
47045	Barrie	83 Perry St.	8363	2	3
48006	Newmarket	Eagle St. W./McCaffrey Rd.	8747	2	3
49005	Parry Sound	7 Bay St.	8673	1	2
49010	Dorset	1026 Bellwood Acres Rd.	8622	1	2

51001	Ottawa Downtown	Rideau St./Wurtemburg St.	8726	2	3
51010	Petawawa	Petawawa Research Forest Facility	8556	1	2
52023	Kingston	23 Beechgrove Lane	8587	2	3
54012	Belleville	2 Sidney St., Water Treatment Plant	8578	2	3
56051	Cornwall	Bedford St./3rd St. W.	8731	2	4
59006	Peterborough	10 Hospital Dr.	8386	1	2
63203	Thunder Bay	421 James St. S.	8697	2	3
71078	Sault Ste. Marie	Sault College	8749	2	2
75010	North Bay	Chippewa St. W., Dept. National Defence	8744	1	2
77233	Sudbury	155 Elm St.	8730	2	3

Notes

Measurements taken by SHARP 5030.

The $PM_{2.5}$ AAQC values, based on the 24-hour $PM_{2.5}$ Canadian Ambient Air Quality Standar comparison to an average concentration in a year.

2020 ground-level ozone (O_3) annual statistics

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

ID	City	Location	Valid h	10%	30
12008	Windsor Downtown	467 University Ave. W.	8705	12	21
12016	Windsor West	College Ave./South St.	8644	11	20
13001	Chatham	435 Grand Ave. W.	8744	15	23
14111	Sarnia	700 Christina St. N.	8719	13	21
15020	Grand Bend	Point Blake Conservation Area	8709	17	25
15026	London	42 St. Julien St.	8648	11	22
16015	Port Stanley	43665 Dexter Line, Elgin Water T. Plt	8669	17	25
18007	Tiverton	4th Concession/Bruce	8510	18	26

		Rd. 23			
21005	Brantford	324 Grand River Ave.	8716	12	22
26060	Kitchener	West Ave./Homewood Ave.	8697	14	22
27067	St. Catharines	Argyle Cres., Pump Stn.	8730	15	25
28028	Guelph	Exhibition St./Clark St. W.	8711	13	22
29000	Hamilton Downtown	Elgin St./Kelly St.	8752	11	20
29118	Hamilton West	Main St. W./Hwy 403	8689	8	19
29214	Hamilton Mountain	250 Fennell Ave. W.	8742	14	23
31129	Toronto Downtown	55 John St.	8632	10	18
33003	Toronto East	Kennedy Rd./Lawrence Ave. E.	8717	11	20
34021	Toronto North	4905 Dufferin St., ECCC	8704	9	19
35125	Toronto West	125 Resources Rd.	8663	6	16

44008	Burlington	North Shore Blvd. E./Lakeshore Rd.	8757	12	22
44017	Oakville	EightLine/Glenashton Dr., Halton Res.	8739	13	22
44029	Milton	1120 Main St. E.	8514	9	21
45027	Oshawa	Brittania Ave. W., EP Taylor Stables	8754	9	20
46090	Brampton	109 McLaughlin Rd. S.	8692	12	22
46108	Mississauga	3359 Mississauga Rd. N., U of T Campus	8720	8	20
47045	Barrie	83 Perry St.	8750	10	20
48006	Newmarket	Eagle St. W./McCaffrey Rd.	8722	14	23
49005	Parry Sound	7 Bay St.	8717	16	25
49010	Dorset	1026 Bellwood Acres Rd.	8694	10	21
51001	Ottawa Downtown	Rideau St./Wurtemburg St.	8770	10	19
51010	Petawawa	Petawawa Research	8776	11	21

	Petawawa	Petawawa Research Forest Facility	8770	11	21
52023	Kingston	23 Beechgrove Lane	8715	17	25
54012	Belleville	2 Sidney St., Water Treatment Plant	8744	15	24
56051	Cornwall	Bedford St./3rd St. W.	8718	12	21
59006	Peterborough	10 Hospital Dr.	8351	14	22
63203	Thunder Bay	421 James St. S.	8756	8	18
71078	Sault Ste. Marie	Sault College	8756	14	23
75010	North Bay	Chippewa St. W., Dept. National Defence	8764	10	21
77233	Sudbury	155 Elm St.	8698	10	19

2020 sulphur dioxide (SO_2) annual statistics

Unit: parts per billion (ppb)
SO_2 10 min AAQC: 67 ppb
SO_2 1h AAQC: 40 ppb
SO_2 1y AAQC: 4 ppb

ID	City	Location	Valid h	10%	30%	5

12008	Windsor Downtown	467 University Ave. W.	8707	0.0	0.0	(
12016	Windsor West	College Ave./South St.	8397	0.1	0.2	(
14111	Sarnia	700 Christina St. N.	8718	0.0	0.1	(
29000	Hamilton Downtown	Elgin St./Kelly St.	8737	0.0	0.2	(
29214	Hamilton Mountain	250 Fennell Ave. W.	8734	0.0	0.0	(
34021	Toronto North	4905 Dufferin St., ECCC	8694	0.0	0.0	(
35125	Toronto West	125 Resources Rd.	8569	0.0	0.0	(
44029	Milton	1120 Main St. E.	4367	0.3	0.4	(
51001	Ottawa Downtown	Rideau St./Wurtemburg St.	8769	0.0	0.0	(
71078	Sault Ste. Marie	Sault College	8755	0.2	0.3	(

	Marie					
77233	Sudbury	155 Elm St.	8129	0.1	0.2	(

2020 carbon monoxide (CO) annual statistics

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

ID	City	Location	Valid h	10%	30%	5
12008	Windsor Downtown	467 University Ave. W.	8423	0.14	0.17	(
29000	Hamilton Downtown	Elgin St./Kelly St.	8761	0.14	0.16	(
34021	Toronto North	4905 Dufferin St., ECCC	8618	0.14	0.16	(
35125	Toronto West	125 Resources Rd.	8504	0.15	0.18	(
51001	Ottawa Downtown	Rideau St./Wurtemburg St.	8691	0.12	0.15	(

2020 total reduced sulphur (TRS) compounds annual statistics

2020 total reduced sulphur (TRS) compounds annual statistics

Unit: parts per billion (ppb)

ID	City	Location	Valid h	10%	30%	50%
12016	Windsor West	College Ave./South St.	8469	0	0	0
14111	Sarnia	700 Christina St. N.	7747	0	0	0
29000	Hamilton Downtown	Elgin St./Kelly St.	8726	0	0	0
71078	Sault Ste. Marie	Sault College	8724	0	0	0

10-year trends

10-year trend for nitric oxide (NO)

Annual mean (ppb)

ID	City/Town	2011	2012	2013	2014	2015
12008	Windsor	4.5	4.7	3.7	4.0	3.5

12008	Windsor Downtown	4.5	4.7	3.7	4.0	3.5	
12016	Windsor West	3.8	4.6	3.6	3.8	4.2	
13001	Chatham	1.9	1.8	1.6	1.5	1.7	
14111	Sarnia	3.1	2.1	1.7	1.9	2.4	
15020	Grand Bend	0.3	0.3	1.0	0.2	0.3	
15026	London	3.3	4.2	1.4	1.3	1.4	
21005	Brantford	1.2	1.1	1.2	0.9	1.3	
26060	Kitchener	2.0	2.1	1.6	1.6	1.6	
27067	St. Catharines	2.3	2.5	2.2	1.7	2.1	
28028	Guelph	2.3	2.2	1.1	1.2	1.3	
29000	Hamilton Downtown	4.8	4.6	4.3	3.9	1.3	
29118	Hamilton West	6.4	6.3	5.4	5.9	5.1	
29214	Hamilton	2.3	1.9	2.0	2.0	1.8	

	Mountain					
33003	Toronto East	7.6	6.6	5.7	6.2	5.8
34021	Toronto North	6.2	5.0	4.1	4.3	3.9
35125	Toronto West	12.4	11.3	8.6	9.5	9.2
44008	Burlington	4.6	4.6	4.6	4.6	3.9
44017	Oakville	2.7	3.4	2.1	3.4	2.7
44029	Milton	4.6	4.8	2.8	3.1	3.5
45027	Oshawa	2.3	2.1	1.5	2.0	2.3
46090	Brampton	4.6	4.4	4.6	4.0	3.8
46108	Mississauga	4.1	3.8	3.1	2.9	3.1
47045	Barrie	3.8	3.2	3.2	3.7	3.5
48006	Newmarket	2.2	2.0	1.5	1.4	1.7
49005	Parry Sound	0.9	0.5	0.5	0.6	0.8
51001	Ottawa Downtown	1.8	2.4	2.1	1.9	2.0

52023	Kingston	0.5	0.4	0.2	0.8	0.9	
54012	Belleville	2.3	1.6	1.7	1.2	1.5	
56051	Cornwall	1.9	2.2	1.9	1.5	1.8	
59006	Peterborough	2.2	1.8	1.7	1.8	1.5	
63203	Thunder Bay	5.9	5.1	4.7	4.2	5.2	
71078	Sault Ste. Marie	2.0	1.7	1.3	2.0	1.7	
75010	North Bay	4.0	2.9	2.5	2.6	2.1	
77233	Sudbury	N/A	N/A	2.9	3.3	2.9	

Notes:

N/A indicates data not available.

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

Station 14111 replaced station 14064 as the Sarnia site in 2016.

Station 15026 replaced station 15025 as the London site in 2013.

Station 29214 replaced station 29114 as the Hamilton Mountain site in 2019.

Station 34021 replaced station 34020 as the Toronto North site in 2017.

Station 44029 was operated by the Halton Region prior to 2019.

Station 45027 replaced station 45026 as the Oshawa site in 2018.

Station 46090 replaced station 46089 as the Brampton site in 2017.

Station 52023 replaced station 52022 as the Kingston site in 2014.

Station 52023 replaced station 52022 as the Kingston site in 2014.

SSS - Significant Sen's Slope (significant trend detected).

Non-SSS - Non-Significant Sen's Slope (significant trend not detected).

10-year trend for nitrogen dioxide (NO_2)

Annual mean (ppb)

ID	City/Town	2011	2012	2013	2014	2015
12008	Windsor Downtown	14.5	13.2	12.4	14.0	12.7
12016	Windsor West	12.9	11.4	11.5	11.8	11.4
13001	Chatham	6.6	5.7	6.0	6.8	6.8
14111	Sarnia	8.6	8.6	8.1	9.0	9.3
15020	Grand Bend	3.6	3.6	4.4	3.1	3.4
15026	London	8.3	6.3	6.4	6.9	6.6
21005	Brantford	6.1	5.4	4.8	5.5	5.5
26060	Kitchener	7.7	7.1	6.7	7.0	6.8
27067	St.	8.5	8.1	7.7	7.3	7.3

	Catharines					
28028	Guelph	7.3	6.5	6.6	7.1	6.3
29000	Hamilton Downtown	13.5	11.9	12.4	12.4	12.2
29118	Hamilton West	13.1	12.1	12.7	12.8	12.2
29214	Hamilton Mountain	9.9	8.6	9.0	9.3	9.0
33003	Toronto East	15.2	14.0	13.6	14.2	13.9
34021	Toronto North	15.4	13.4	12.9	13.4	12.9
35125	Toronto West	19.1	16.3	16.1	17.1	16.6
44008	Burlington	11.8	11.0	11.0	10.9	10.4
44017	Oakville	10.3	9.1	9.2	8.2	7.5
44029	Milton	12.1	10.4	8.5	8.4	9.4
45027	Oshawa	7.0	5.6	5.9	6.8	6.6
46090	Brampton	11.3	10.4	9.1	10.6	9.9
46108	Mississauga	10.6	9.6	9.5	9.2	9.2

47045	Barrie	8.6	8.1	7.8	8.1	7.4	
48006	Newmarket	8.1	7.2	6.8	6.8	6.8	
49005	Parry Sound	3.6	3.3	2.9	3.3	3.2	
51001	Ottawa Downtown	7.9	7.8	7.9	7.4	7.4	
52023	Kingston	4.6	4.0	3.6	3.9	4.4	
54012	Belleville	6.3	4.7	4.7	4.5	4.8	
56051	Cornwall	6.5	6.1	6.2	5.6	5.3	
59006	Peterborough	4.3	3.7	5.0	5.3	5.1	
63203	Thunder Bay	8.6	7.3	7.3	7.8	7.5	
71078	Sault Ste. Marie	5.3	4.8	5.0	5.3	4.8	
75010	North Bay	7.4	6.1	5.8	5.6	5.6	
77233	Sudbury	N/A	N/A	7.2	7.3	7.2	

Notes:

N/A indicates data not available.

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

Station 14111 replaced station 14064 as the Sarnia site in 2016.

Station 15026 replaced station 15025 as the London site in 2013.

Station 29214 replaced station 29114 as the Hamilton Mountain site in 2019.

Station 34021 replaced station 34020 as the Toronto North site in 2017.

Station 44029 was operated by the Halton Region prior to 2019.

Station 45027 replaced station 45026 as the Oshawa site in 2018.

Station 46090 replaced station 46089 as the Brampton site in 2017.

Station 52023 replaced station 52022 as the Kingston site in 2014.

SSS - Significant Sen's Slope (significant trend detected).

10-year trend for nitrogen oxides (NO_x)

Annual mean (ppb)

ID	City/Town	2011	2012	2013	2014	2015
12008	Windsor Downtown	18.9	17.8	16.2	18.0	16.2
12016	Windsor West	16.7	16.0	15.2	15.7	15.5
13001	Chatham	8.4	7.5	7.7	8.2	8.5
14111	Sarnia	11.7	10.7	9.8	10.9	11.7
15020	Grand Bend	4.0	3.9	5.4	3.4	3.8

15026	London	11.6	10.5	7.8	8.3	8.0
21005	Brantford	7.3	6.7	5.7	6.4	6.8
26060	Kitchener	9.6	9.2	8.3	8.5	8.4
27067	St. Catharines	10.9	10.6	9.9	9.1	9.4
28028	Guleph	9.5	8.8	7.8	8.4	7.7
29000	Hamilton Downtown	18.3	16.6	16.8	16.3	7.7
29118	Hamilton West	19.5	18.4	18.1	18.7	17.3
29214	Hamilton Mountain	12.2	10.5	11.0	11.3	10.9
33003	Toronto East	22.8	20.6	19.4	20.4	19.7
34021	Toronto North	21.5	18.5	17.0	17.7	16.9
35125	Toronto West	31.5	27.6	24.7	26.5	25.7
44008	Burlington	16.4	15.6	15.6	15.5	14.3
44017	Oakville	13.0	12.6	11.2	11.6	10.1

44017	Oakville	13.0	12.0	11.2	11.0	10.1
44029	Milton	16.7	15.3	11.8	12.0	13.2
45027	Oshawa	9.2	7.8	7.4	8.8	8.9
46090	Brampton	15.9	14.8	13.9	14.6	13.7
46108	Mississauga	14.7	13.4	12.6	12.1	12.3
47045	Barrie	12.4	11.3	11.0	11.8	10.9
48006	Newmarket	10.3	9.2	8.4	8.2	8.5
49005	Parry Sound	4.5	3.8	3.4	4.0	4.0
51001	Ottawa Downtown	9.7	10.2	10.1	9.3	9.5
52023	Kingston	5.3	4.6	3.8	4.8	5.3
54012	Belleville	8.7	6.4	6.3	5.7	6.2
56051	Cornwall	8.4	8.4	8.0	7.0	7.1
59006	Peterborough	6.6	5.4	6.6	7.1	6.6
63203	Thunder Bay	14.5	12.4	12.0	11.9	12.7
71078	Sault Ste. Marie	7.2	6.4	6.3	7.3	6.6

	Marie					
75010	North Bay	11.5	9.1	8.3	8.1	7.8
77233	Sudbury	N/A	N/A	10.1	10.6	10.2

Notes:

N/A indicates data not available.

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

Station 14111 replaced station 14064 as the Sarnia site in 2016.

Station 15026 replaced station 15025 as the London site in 2013.

Station 29214 replaced station 29114 as the Hamilton Mountain site in 2019.

Station 34021 replaced station 34020 as the Toronto North site in 2017.

Station 44029 was operated by the Halton Region prior to 2019.

Station 45027 replaced station 45026 as the Oshawa site in 2018.

Station 46090 replaced station 46089 as the Brampton site in 2017.

Station 52023 replaced station 52022 as the Kingston site in 2014.

SSS - Significant Sen's Slope (significant trend detected).

10-year trend for fine particulate matter ($PM_{2.5}$)

Annual mean ($\mu g/m^3$)

ID	City/Town	2011	2012	2013	2014	2015
12008	Windsor Downtown	9.4	9.8	9.2	10.1	9.3

	Downtown					
12016	Windsor West	9.7	9.5	10.0	10.7	9.9
13001	Chatham	8.2	7.5	8.1	8.6	8.1
14111	Sarnia	12.9	12.7	8.5	9.0	8.4
15020	Grand Bend	7.6	7.4	7.3	8.1	7.7
15026	London	7.7	8.1	9.1	8.8	8.3
16015	Port Stanley	7.5	7.4	7.4	8.2	8.0
18007	Tiverton	6.0	6.0	5.8	6.5	6.4
21005	Brantford	8.2	7.8	8.5	9.2	8.7
26060	Kitchener	7.7	7.7	8.7	9.3	8.8
27067	St. Catharines	7.8	7.9	8.5	8.8	8.4
28028	Guelph	7.4	7.4	8.1	8.9	8.4
29000	Hamilton Downtown	10.0	10.2	10.1	10.8	10.2
29118	Hamilton West	8.8	9.0	9.6	9.9	9.9

29214	Hamilton Mountain	8.3	8.1	9.2	9.4	9.0	
33003	Toronto East	7.8	7.8	8.2	8.9	8.5	
34021	Toronto North	9.5	9.0	8.3	9.2	9.4	
35125	Toronto West	8.7	8.8	8.8	9.1	8.5	
44008	Burlington	7.8	8.0	8.7	9.6	9.4	
44017	Oakville	8.0	7.6	8.0	8.5	8.3	
44029	Milton	8.0	7.9	8.5	10.3	8.8	
45027	Oshawa	6.9	6.9	7.4	7.7	7.5	
46090	Brampton	7.6	7.2	8.5	8.9	8.4	
46108	Mississauga	7.7	7.5	7.9	8.7	8.5	
47045	Barrie	7.2	7.1	7.5	7.6	7.6	
48006	Newmarket	6.9	7.1	7.3	7.3	7.1	
49005	Parry Sound	6.0	6.0	5.8	5.8	5.7	
49010	Dorset	5.4	5.3	5.4	5.3	5.6	

51001	Ottawa Downtown	6.3	6.2	7.0	7.0	6.9	
51010	Petawawa	4.5	4.8	4.8	4.7	4.8	
52023	Kingston	8.5	8.3	6.5	6.8	6.3	
54012	Belleville	6.2	6.5	6.9	6.8	6.6	
56051	Cornwall	7.3	6.9	7.7	7.0	6.9	
59006	Peterborough	7.0	6.3	7.4	6.9	6.8	
63203	Thunder Bay	6.2	5.4	6.3	6.6	6.5	
71078	Sault Ste. Marie	5.7	5.6	5.6	6.0	5.9	
75010	North Bay	5.5	5.3	5.2	5.3	5.3	
77233	Sudbury	5.2	5.1	5.7	6.0	6.3	

Notes:

From 2011-2012, measurements were taken by TEOM sampler operated at 30°C with a San

As of 2013, measurements taken by Synchronized Hybrid Ambient Real-time Particulate (SH

An approximate correction factor was applied to the TEOM data prior to 2013 to be compa
generate an approximate 10-year trend.

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

Station 14111 replaced station 14064 as the Sarnia site in 2016.

Station 15026 replaced station 15025 as the London site in 2013.

Station 29214 replaced station 29114 as the Hamilton Mountain site in 2019.

Station 34021 replaced station 34020 as the Toronto North site in 2017.

Station 44029 was operated by the Halton Region prior to 2019.

Station 45027 replaced station 45026 as the Oshawa site in 2018.

Station 46090 replaced station 46089 as the Brampton site in 2017.

Station 52023 replaced station 52022 as the Kingston site in 2014.

Station 77233 replaced station 77219 as the Sudbury site in 2013.

SSS - Significant Sen's Slope (significant trend detected).

Non-SSS - Non-Significant Sen's Slope (significant trend not detected).

10-year trend for ground-level ozone (O_3) 1h maximum

1h Maximum (ppb)
O_3 1h AAQC: 80 ppb

ID	City/Town	2011	2012	2013	2014	2015
12008	Windsor Downtown	100	128	89	78	89
12016	Windsor West	101	128	87	86	87
13001	Chatham	92	104	85	78	79

14111	Sarnia	94	101	83	79	83	
15020	Grand Bend	115	124	86	90	87	
15026	London	83	88	82	82	77	
16015	Port Stanley	94	104	85	87	86	
18007	Tiverton	89	93	92	86	83	
21005	Brantford	94	88	74	80	79	
26060	Kitchener	87	89	72	76	76	
27067	St. Catharines	83	98	96	70	73	
28028	Guelph	94	94	73	79	79	
29000	Hamilton Downtown	92	88	86	74	74	
29118	Hamilton West	88	85	78	70	71	
29214	Hamilton Mountain	95	91	86	79	79	

33003	Toronto East	82	89	87	73	91	
34021	Toronto North	85	92	87	82	90	
35125	Toronto West	87	94	83	72	82	
44008	Burlington	85	91	92	73	84	
44017	Oakville	95	96	101	72	80	
44029	Milton	93	94	93	80	80	
45027	Oshawa	85	92	96	73	73	
46090	Brampton	88	92	84	80	84	
46108	Mississauga	87	81	83	76	79	
47045	Barrie	67	91	73	68	80	
48006	Newmarket	84	105	72	87	92	
49005	Parry Sound	81	94	77	74	86	

49010	Dorset	72	82	69	79	78	
51001	Ottawa Downtown	66	76	67	64	69	
51010	Petawawa	67	77	69	68	70	
52023	Kingston	80	92	79	81	74	
54012	Belleville	86	87	92	80	77	
56051	Cornwall	72	76	73	70	69	
59006	Peterborough	86	90	74	74	78	
63203	Thunder Bay	60	74	63	70	62	
71078	Sault Ste. Marie	80	82	66	73	75	
75010	North Bay	74	82	72	71	70	
77233	Sudbury	67	84	76	73	67	

Notes:

Station 14111 replaced station 14064 as the Sarnia site in 2016.

Station 15026 replaced station 15025 as the London site in 2013.

Station 29214 replaced station 29114 as the Hamilton Mountain site in 2019.

Station 34021 replaced station 34020 as the Toronto North site in 2017.

Station 44029 was operated by the Halton Region prior to 2019.

Station 45027 replaced station 45026 as the Oshawa site in 2018.

Station 46090 replaced station 46089 as the Brampton site in 2017.

Station 52023 replaced station 52022 as the Kingston site in 2014.

Station 77233 replaced station 77219 as the Sudbury site in 2013.

SSS - Significant Sen's Slope (significant trend detected).

Non-SSS - Non-Significant Sen's Slope (significant trend not detected).

10-year trend for ground-level ozone (O_3)

Annual mean (ppb)

ID	City/Town	2011	2012	2013	2014	2015
12008	Windsor Downtown	27.2	28.0	26.9	26.0	27.0
12016	Windsor West	26.4	28.0	26.7	27.2	26.5
13001	Chatham	29.7	29.5	29.6	29.3	29.6

14111	Sarnia	29.7	29.7	28.6	27.1	27.8	
15020	Grand Bend	32.8	33.2	32.3	31.0	30.4	
15026	London	26.8	27.7	28.7	28.1	27.9	
16015	Port Stanley	32.8	33.1	33.9	32.3	32.8	
18007	Tiverton	32.1	32.0	32.4	31.8	32.5	
21005	Brantford	28.7	28.8	29.0	29.4	28.9	
26060	Kitchener	27.6	28.0	28.0	27.3	27.9	
27067	St. Catharines	28.0	28.7	28.6	28.5	28.6	
28028	Guelph	28.9	28.8	29.0	27.8	27.7	
29000	Hamilton Downtown	25.4	25.7	25.0	25.3	25.9	
29118	Hamilton West	24.2	24.2	24.4	22.7	23.9	
29214	Hamilton Mountain	28.8	30.2	29.5	29.1	29.4	

33003	Toronto East	23.3	24.6	24.1	23.4	23.5	
34021	Toronto North	23.6	25.7	25.3	25.3	25.7	
35125	Toronto West	20.1	21.5	21.5	21.1	21.3	
44008	Burlington	25.9	26.7	26.4	25.5	26.5	
44017	Oakville	26.8	27.7	28.3	27.2	27.4	
44029	Milton	25.7	26.5	27.6	27.1	27.2	
45027	Oshawa	26.6	27.0	27.2	27.2	26.2	
46090	Brampton	26.1	26.6	26.7	26.5	26.5	
46108	Mississauga	24.1	25.6	25.2	25.4	25.4	
47045	Barrie	25.3	26.3	25.5	25.6	25.4	
48006	Newmarket	27.8	29.4	28.7	28.6	28.5	
49005	Parry Sound	29.7	30.1	30.4	29.6	30.4	

49010	Dorset	27.0	28.0	28.1	27.7	27.0	
51001	Ottawa Downtown	24.2	26.0	25.6	24.8	25.6	
51010	Petawawa	26.7	27.7	27.6	26.8	26.7	
52023	Kingston	30.3	32.7	30.3	31.4	30.3	
54012	Belleville	27.9	28.0	29.2	29.6	29.6	
56051	Cornwall	26.1	27.1	26.9	27.3	27.9	
59006	Peterborough	27.9	29.1	28.6	29.2	29.3	
63203	Thunder Bay	25.2	25.0	26.3	23.4	24.0	
71078	Sault Ste. Marie	27.8	28.8	28.9	28.4	27.8	
75010	North Bay	26.7	26.1	27.4	26.7	27.0	
77233	Sudbury	28.7	28.5	27.2	26.3	25.7	

Notes:

Station 14111 replaced station 14064 as the Sarnia site in 2016.

Station 15026 replaced station 15025 as the London site in 2013.

Station 29214 replaced station 29114 as the Hamilton Mountain site in 2019.

Station 34021 replaced station 34020 as the Toronto North site in 2017.

Station 44029 was operated by the Halton Region prior to 2019.

Station 45027 replaced station 45026 as the Oshawa site in 2018.

Station 46090 replaced station 46089 as the Brampton site in 2017.

Station 52023 replaced station 52022 as the Kingston site in 2014.

Station 77233 replaced station 77219 as the Sudbury site in 2013.

SSS - Significant Sen's Slope (significant trend detected).

Non-SSS - Non-Significant Sen's Slope (significant trend not detected).

10-year trend for ground-level ozone (O_3) summer means (May - September)

Summer mean (ppb)

ID	City/Town	2011	2012	2013	2014	2015
12008	Windsor Downtown	33.8	36.8	32.5	30.9	33.3
12016	Windsor West	31.9	35.7	30.9	30.9	31.8
13001	Chatham	34.4	36.6	34.2	32.4	34.4
14111	Sarnia	32.9	36.6	32.0	29.4	31.1

15020	Grand Bend	33.9	38.9	33.1	31.5	32.3	
15026	London	30.7	34.4	30.9	29.5	31.0	
16015	Port Stanley	35.5	38.4	36.9	33.7	35.6	
18007	Tiverton	31.7	36.0	32.5	30.8	33.3	
21005	Brantford	31.1	33.5	30.1	29.9	31.2	
26060	Kitchener	30.2	33.5	29.8	28.5	30.2	
27067	St. Catharines	31.2	35.0	31.2	29.5	31.7	
28028	Guelph	31.3	34.5	30.4	28.9	30.2	
29000	Hamilton Downtown	28.7	32.4	28.4	27.5	29.5	
29118	Hamilton West	26.2	29.2	26.4	22.7	26.5	
29214	Hamilton Mountain	32.3	37.4	32.5	31.6	33.9	

33003	Toronto East	27.4	30.6	27.1	25.9	27.7
34021	Toronto North	27.5	32.7	29.4	28.6	30.7
35125	Toronto West	23.6	27.5	24.4	23.5	25.0
44008	Burlington	29.2	32.5	29.2	27.4	30.1
44017	Oakville	29.9	34.2	30.6	28.3	30.2
44029	Milton	29.2	32.2	30.6	28.2	30.4
45027	Oshawa	28.5	31.1	28.3	27.9	28.9
46090	Brampton	29.3	32.7	29.5	28.9	30.3
46108	Mississauga	26.7	30.4	26.5	26.5	28.0
47045	Barrie	26.2	29.7	25.6	25.4	26.8
48006	Newmarket	30.5	34.2	30.3	29.4	31.2

49005	Parry Sound	28.7	32.8	30.1	28.2	31.4	
49010	Dorset	23.8	28.3	25.3	24.4	24.6	
51001	Ottawa Downtown	25.1	29.3	26.5	24.6	27.8	
51010	Petawawa	22.8	28.1	24.5	22.9	24.4	
52023	Kingston	32.0	38.5	32.4	32.7	32.2	
54012	Belleville	29.9	32.7	30.6	30.4	33.2	
56051	Cornwall	26.7	30.7	28.1	27.0	29.7	
59006	Peterborough	29.8	34.2	29.5	30.0	31.5	
63203	Thunder Bay	24.2	25.3	24.7	22.7	23.6	
71078	Sault Ste. Marie	26.4	30.3	28.2	27.4	28.1	
75010	North Bay	26.3	28.5	26.9	26.2	27.8	

77233	Sudbury	26.9	29.8	28.0	27.0	27.7

Notes:

Station 14111 replaced station 14064 as the Sarnia site in 2016.

Station 15026 replaced station 15025 as the London site in 2013.

Station 29214 replaced station 29114 as the Hamilton Mountain site in 2019.

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Station 46090 replaced station 46089 as the Brampton site in 2017.

Station 52023 replaced station 52022 as the Kingston site in 2014.

Station 77233 replaced station 77219 as the Sudbury site in 2013.

SSS - Significant Sen's Slope (significant trend detected).

Non-SSS - Non-Significant Sen's Slope (significant trend not detected).

10-year trend for ground-level ozone (O_3) winter means (January-April, October-Dec

Winter mean (ppb)

ID	City/Town	2011	2012	2013	2014	2015
12008	Windsor Downtown	22.5	21.7	22.8	22.8	22.4
12016	Windsor West	22.5	22.3	23.4	24.5	22.7

13001	Chatham	26.7	24.3	26.2	27.1	26.3
14111	Sarnia	27.4	24.7	26.2	25.4	25.4
15020	Grand Bend	32.1	29.1	31.8	30.6	29.1
15026	London	24.2	22.9	26.9	27.1	25.8
16015	Port Stanley	31.0	29.3	31.8	31.3	31.2
18007	Tiverton	32.2	29.2	32.4	32.7	31.9
21005	Brantford	27.1	25.4	28.3	28.8	27.2
26060	Kitchener	25.7	24.0	26.7	26.5	26.1
27067	St. Catharines	25.8	24.1	26.8	27.9	26.3
28028	Guelph	27.2	24.8	28.0	27.0	26.0

29000	Hamilton Downtown	23.1	20.9	22.5	23.7	23.3	
29118	Hamilton West	22.7	20.6	23.0	22.8	22.1	
29214	Hamilton Mountain	26.3	25.0	27.3	27.3	26.3	
33003	Toronto East	20.4	20.3	22.0	21.6	20.5	
34021	Toronto North	20.8	20.7	22.3	22.8	22.1	
35125	Toronto West	17.7	17.2	19.5	19.4	18.6	
44008	Burlington	23.5	22.5	24.4	24.1	23.8	
44017	Oakville	24.7	23.1	26.6	26.5	25.3	
44029	Milton	23.3	22.2	25.5	26.3	24.9	
45027	Oshawa	25.2	24.1	26.4	26.7	24.3	
46090	Brampton	23.8	22.2	24.6	24.8	23.8	
46108	Mississauga	22.5	22.2	24.3	24.7	23.6	

47045	Barrie	24.7	23.9	25.5	25.8	24.4
48006	Newmarket	25.8	26.0	27.5	28.1	26.6
49005	Parry Sound	30.4	28.1	30.6	30.6	29.8
49010	Dorset	29.5	27.7	30.1	30.1	28.8
51001	Ottawa Downtown	23.6	23.5	24.9	25.1	24.0
51010	Petawawa	29.5	27.5	29.9	29.6	28.5
52023	Kingston	29.0	28.6	28.8	30.4	28.9
54012	Belleville	26.4	24.6	28.2	29.1	27.0
56051	Cornwall	25.7	24.2	25.7	27.6	26.6
59006	Peterborough	26.6	25.5	28.0	28.6	27.7
63203	Thunder Bay	26.1	24.7	27.4	23.8	24.2
71078	Sault Ste	28.0	27.6	29.4	29.2	27.7

71078	Sault Ste. Marie	28.9	27.6	29.4	29.2	27.7	
75010	North Bay	27.0	24.4	27.8	27.1	26.4	
77233	Sudbury	30.0	27.6	26.6	25.8	24.3	

Notes:

Station 14111 replaced station 14064 as the Sarnia site in 2016.

Station 15026 replaced station 15025 as the London site in 2013.

Station 29214 replaced station 29114 as the Hamilton Mountain site in 2019.

Station 34021 replaced station 34020 as the Toronto North site in 2017.

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Station 46090 replaced station 46089 as the Brampton site in 2017.

Station 52023 replaced station 52022 as the Kingston site in 2014.

Station 77233 replaced station 77219 as the Sudbury site in 2013.

SSS - Significant Sen's Slope (significant trend detected).

Non-SSS - Non-Significant Sen's Slope (significant trend not detected).

10-year trend for sulphur dioxide (SO_2)

Annual mean (ppb)
SO_2 1y AAQC: 4 ppb

ID	City/Town	2011	2012	2013	2014	2015	2

12008	Windsor Downtown	3.5	2.8	2.4	2.4	1.9	1
12016	Windsor West	3.4	2.8	2.6	2.8	1.9	1
14111	Sarnia	5.3	4.1	3.8	3.5	3.2	IN
29000	Hamilton Downtown	5.2	4.8	4.8	5.1	4.3	3
29214	Hamilton Mountain	4.1	3.7	2.8	2.9	2.6	1
35125	Toronto West	1.5	0.6	0.6	0.7	1.0	0
44029	Milton	1.0	1.3	1.2	1.3	1.1	0
51001	Ottawa Downtown	0.4	0.3	0.3	0.3	0.4	0
71078	Sault Ste. Marie	0.8	0.6	0.8	0.8	0.8	0
77233	Sudbury	1.5	1.3	2.8	2.4	2.4	2

Notes:

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

Station 14111 replaced station 14064 as the Sarnia site in 2016.

Station 29214 replaced station 29114 as the Hamilton Mountain site in 2019.

Station 44029 was operated by the Halton Region prior to 2019.

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Non-SSS - Non-Significant Sen's Slope (significant trend not detected).

10-year trend for carbon monoxide (CO)

1h maximum (ppm)
CO 1h AAQC: 30 ppm

ID	City/Town	2011	2012	2013	2014	2015	2
12008	Windsor Downtown	3.8	2.1	1.9	1.8	1.9	2
29000	Hamilton Downtown	1.8	1.7	2.0	2.9	1.3	1
35125	Toronto West	1.4	1.4	1.4	1.6	1.3	1
51001	Ottawa Downtown	1.5	0.9	0.9	0.8	0.8	0

Note:

Non-SSS - Non-Significant Sen's Slope (significant trend not detected).

10-year trend for benzene

Annual mean (µg/m^3)
Benzene 1y AAQC: 0.45 µg/m^3

ID	City/Town	2010	2011	2012	2013	2014	
12016	Windsor West	0.687	INS	0.558	0.519	0.610	
14111	Sarnia	0.961	INS	0.900	0.820	1.007	
15026	London	0.490	INS	0.455	0.413	0.446	
26060	Kitchener	0.537	INS	0.479	N/A	0.483	
29000	Hamilton Downtown	1.060	INS	0.977	INS	0.899	
48006	Newmarket	0.416	N/A	0.371	0.406	0.422	
51001	Ottawa Downtown	0.451	0.418	0.422	0.442	0.413	

Notes:

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

N/A indicates data not available.

The 2016 average for Sarnia is derived from data from May to December 2016.

Station 14111 replaced station 14064 as the Sarnia site in 2016.

The 2018 average for Windsor West is derived from data from February to July, and Octobe

The 2018 average for Sarnia is derived from data from February to May, July, and October t

The 2018 average for Hamilton Downtown is derived from data from March to June, August

SSS - Significant Sen's Slope (significant trend detected).

10-year trend for toluene

Annual mean (µg/m^3)

ID	City/Town	2010	2011	2012	2013	2014	
12016	Windsor West	1.679	INS	1.392	1.017	1.542	
14111	Sarnia	2.037	INS	2.539	1.587	1.908	
15026	London	1.334	INS	1.408	0.887	0.839	
26060	Kitchener	1.477	INS	1.322	N/A	1.278	
29000	Hamilton Downtown	2.842	INS	2.067	INS	2.229	
48006	Newmarket	0.878	N/A	0.877	0.916	0.732	
51001	Ottawa	1.212	0.929	0.899	0.975	0.741	

	Downtown						

Notes:

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N/A indicates data not available.

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The 2018 average for Windsor West is derived from data from February to July, and Octobe

The 2018 average for Sarnia is derived from data from February to May, July, and October t

The 2018 average for Hamilton Downtown is derived from data from March to June, Augus

SSS - Significant Sen's Slope (significant trend detected).

10-year trend for ethylbenzene

Annual mean (µg/m^3)

ID	City/Town	2010	2011	2012	2013	2014	
12016	Windsor West	0.275	INS	0.221	0.179	0.267	
14111	Sarnia	0.392	INS	0.278	0.255	0.253	
15026	London	0.190	INS	0.143	0.125	0.121	
26060	Kitchener	0.220	INS	0.162	N/A	0.167	

29000	Hamilton Downtown	0.278	INS	0.193	INS	0.192	
48006	Newmarket	0.154	N/A	0.115	0.134	0.125	
51001	Ottawa Downtown	0.144	0.122	0.105	0.112	0.099	

Notes:

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

N/A indicates data not available.

The 2016 average for Sarnia is derived from data from May to December 2016.

Station 14111 replaced station 14064 as the Sarnia site in 2016.

The 2018 average for Windsor West is derived from data from February to July, and Octobe

The 2018 average for Sarnia is derived from data from February to May, July, and October t

The 2018 average for Hamilton Downtown is derived from data from March to June, August

SSS - Significant Sen's Slope (significant trend detected).

10-year trend for m- and p-xylene

Annual mean (µg/m^3)

ID	City/Town	2010	2011	2012	2013	2014	
12016	Windsor West	0.818	INS	0.689	0.536	0.825	

14111	Sarnia	0.790	INS	0.676	0.510	0.629	
15026	London	0.500	INS	0.388	0.345	0.318	
26060	Kitchener	0.639	INS	0.478	N/A	0.469	
29000	Hamilton Downtown	0.842	INS	0.603	INS	0.594	
48006	Newmarket	0.437	N/A	0.333	0.362	0.334	
51001	Ottawa Downtown	0.429	0.355	0.310	0.329	0.309	

Notes:

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

N/A indicates data not available.

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Station 14111 replaced station 14064 as the Sarnia site in 2016.

The 2018 average for Windsor West is derived from data from February to July, and Octobe

The 2018 average for Sarnia is derived from data from February to May, July, and October t

The 2018 average for Hamilton Downtown is derived from data from March to June, Augus

SSS - Significant Sen's Slope (significant trend detected).

10-year trend for o-xylene

Annual mean (µg/m^3)

ID	City/Town	2010	2011	2012	2013	2014	
12016	Windsor West	0.255	INS	0.228	0.184	0.283	
14111	Sarnia	0.262	INS	0.244	0.171	0.226	
15026	London	0.147	INS	0.126	0.118	0.113	
26060	Kitchener	0.188	INS	0.157	N/A	0.166	
29000	Hamilton Downtown	0.241	INS	0.195	INS	0.206	
48006	Newmarket	0.133	N/A	0.116	0.126	0.134	
51001	Ottawa Downtown	0.147	0.128	0.118	0.118	0.111	

Notes:

- INS indicates there was insufficient data to calculate a valid annual mean.
- N/A indicates data not available.
- The 2016 average for Sarnia is derived from data from May to December 2016.
- Station 14111 replaced station 14064 as the Sarnia site in 2016.
- The 2018 average for Windsor West is derived from data from February to July, and Oc
- The 2018 average for Sarnia is derived from data from February to May, July, and Octol
- The 2018 average for Hamilton Downtown is derived from data from March to June, Au

2018.

- SSS - Significant Sen's Slope (significant trend detected).
- Non-SSS - Non-Significant Sen's Slope (significant trend not detected).

10-year trend for 1,3-butadiene

Annual mean (µg/m^3)
1,3-butadiene 1y AAQC: 2.0 µg/m^3

ID	City/Town	2010	2011	2012	2013	2014	
12016	Windsor West	0.056	INS	0.048	0.036	0.042	
14111	Sarnia	0.167	INS	0.205	0.209	0.124	
15026	London	0.050	INS	0.040	0.023	0.025	
26060	Kitchener	0.056	INS	0.042	N/A	0.029	
29000	Hamilton Downtown	0.060	INS	0.046	INS	0.032	
48006	Newmarket	0.051	N/A	0.039	0.021	0.020	
51001	Ottawa Downtown	0.052	0.041	0.040	0.035	0.026	

Notes:

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

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The 2018 average for Windsor West is derived from data from February to July, and Octobe

The 2018 average for Sarnia is derived from data from February to May, July, and October t

The 2018 average for Hamilton Downtown is derived from data from March to June, August

SSS - Significant Sen's Slope (significant trend detected).

Canadian Ambient Air Quality Standard reporting

$PM_{2.5}$ and ozone CAAQS metric values for designated sites across Ontario (2020)

Air zone area	City/Town	24-hour $PM_{2.5}$ ($\mu g/m^3$)	Annual ($\mu g/m^3$)
Sarnia	Sarnia	19	7.2
Hamilton	Hamilton Downtown	22	8.7
Hamilton	Hamilton Mountain	19	8.6
Sudbury	Sudbury	14	5.2
Sault Ste. Marie	Sault Ste. Marie	13	4.9

Northern Ontario	Thunder Bay	14	5.5
Southern Ontario	Windsor Downtown	19	7.8
Southern Ontario	Chatham	17	6.8
Southern Ontario	London	18	6.8
Southern Ontario	Brantford	18	7.3
Southern Ontario	Kitchener	19	7.1
Southern Ontario	Guelph	20	7.1
Southern Ontario	St. Catharines	17	6.8
Southern Ontario	Burlington	18	6.9
Southern Ontario	Oakville	18	6.9
Southern Ontario	Milton	19	7.4
Southern Ontario	Mississauga	18	7.0
Southern Ontario	Brampton	19	7.0
Southern Ontario	Toronto West	18	7.2
Southern Ontario	Toronto Downtown	INS	INS

Southern Ontario	Toronto North	19	7.0
Southern Ontario	Toronto East	19	7.0
Southern Ontario	Oshawa	17	6.2
Southern Ontario	Barrie	20	7.0
Southern Ontario	Peterborough	17	6.0
Southern Ontario	Kingston	14	5.5
Southern Ontario	Ottawa Downtown	16	5.9

Note:

Designated sites normally refer to communities with populations greater than 100,000.

The CAAQS for 24h $PM_{2.5}$ is 27 µg/m^3 based on the 98th percentile measurement annually,

The CAAQS for annual $PM_{2.5}$ is 8.8 µg/m^3 based on the annual average of the daily 24-hour three consecutive years.

The CAAQS for ozone is 62 ppb based on the consecutive three-year average of the annual running average.

An asterisk denotes an exceedance of the CAAQS.

INS denotes insufficient data to report a valid CAAQS metric.

Value in parenthesis is the calculated 8h ozone CAAQS metric once the transboundary influ

NO_2 and SO_2 CAAQS metric values for designated sites across Ontario (2020)

Air zone area	City/Town	1-hour NO_2 (ppb)	Annual NO_2 (ppb)
Sarnia	Sarnia	36	5.9
Hamilton	Hamilton Downtown	43	9.9
Hamilton	Hamilton Mountain	41	6.9
Sudbury	Sudbury	49	6.3
Sault Ste. Marie	Sault Ste. Marie	32	3.7
Northern Ontario	Thunder Bay	42	6.1
Southern Ontario	Windsor Downtown	44	9.0
Southern Ontario	Chatham	31	5.1
Southern Ontario	London	31	4.5
Southern Ontario	Brantford	28	4.3

Southern Ontario	Kitchener	36	4.9
Southern Ontario	Guelph	34	4.9
Southern Ontario	St. Catharines	34	5.3
Southern Ontario	Burlington	43	8.2
Southern Ontario	Oakville	43	6.8
Southern Ontario	Milton	51	7.6
Southern Ontario	Mississauga	38	6.7
Southern Ontario	Brampton	45	6.8
Southern Ontario	Toronto West	51	12.1
Southern Ontario	Toronto Downtown	INS	12.3
Southern Ontario	Toronto North	45	8.9

Ontario			
Southern Ontario	Toronto East	47	8.4
Southern Ontario	Oshawa	23	3.6
Southern Ontario	Barrie	40	5.6
Southern Ontario	Peterborough	34	4.0
Southern Ontario	Kingston	32	3.5
Southern Ontario	Ottawa Downtown	41	5.9

Note:

Designated sites normally refer to communities with populations greater than 100,000.

The CAAQS for 1h NO_2 is 60 ppb is based on the 3-year average of the annual 98th percent average NO_2 concentrations.

The CAAQS for annual NO_2 is 17.0 ppb based on the average over a single calendar year of

The CAAQS for 1h SO_2 is 70 ppb based on the 3-year average of the annual 99th percentile average concentrations.

The CAAQS for annual SO_2 is 5.0 ppb based on the average over a single calendar year of a

An asterisk denotes an exceedance of the CAAQS.

INS denotes insufficient data to report a valid CAAQS metric.

N/A denotes not applicable (parameter not monitored at location).

$PM_{2.5}$ and ozone CAAQS metric trends for designated sites across Ontario (2011-202

Air zone area	City/Town	10-year trend (%) based on 24-hour $PM_{2.5}$	10-year (%) bas annual
Sarnia	Sarnia	-34.5	-50.0
Hamilton	Hamilton Downtown	-27.0	-14.5
Hamilton	Hamilton Mountain	-13.6	-9.6*
Sudbury	Sudbury	0.0*	-15.0
Sault Ste. Marie	Sault Ste. Marie	-24.1	-14.3*
Northern Ontario	Thunder Bay	-11.3	-8.0*
Southern Ontario	Windsor Downtown	-18.8	-19.1
Southern Ontario	Chatham	-21.4	-19.4
Southern Ontario	London	-12.9*	-17.8
Southern Ontario	Brantford	-20.5	-11.2*

Southern Ontario	Kitchener	-14.3	-10.2*
Southern Ontario	Guelph	-7.1*	-3.5*
Southern Ontario	St. Catharines	-21.4	-17.3
Southern Ontario	Burlington	-20.5	-14.4*
Southern Ontario	Oakville	-12.9	-10.8*
Southern Ontario	Milton	-10.7*	-7.4*
Southern Ontario	Mississauga	-14.3*	-8.5*
Southern Ontario	Brampton	-6.1*	-6.2*
Southern Ontario	Toronto West	-18.4	-22.0
Southern Ontario	Toronto Downtown	INS	INS
Southern Ontario	Toronto North	-27.7	-23.3
Southern Ontario	Toronto East	-13.6	-13.0
Southern Ontario	Oshawa	-16.9	-14.9*
Southern Ontario	Barrie	0.0*	3.7*
Southern Ontario	Peterborough	-22.5	-11.7

Southern Ontario	Kingston	-50.4	-39.8
Southern Ontario	Ottawa Downtown	-21.4	-8.4*

Notes:

Designated sites normally refer to communities with populations greater than 100,000.

*Non-Significant Sen's Slope (significant trend not detected).

INS denotes insufficient data for a valid 10-year trend.

NO_2 and SO_2 CAAQS metric trends for designated sites across Ontario (2011-2020)

Air zone area	City/Town	10-year trend (%) based on 1-hour NO_2	10-year trend (%) based on annual NO_2
Sarnia	Sarnia	0.0*	-22.9
Hamilton	Hamilton Downtown	-9.4	-14.1
Hamilton	Hamilton Mountain	0.0*	-19.5
Sudbury	Sudbury	INS	-12.6
Sault Ste.	Sault Ste. Marie	-11.8	-25.5

Marie			
Northern Ontario	Thunder Bay	0.0*	-19.6
Southern Ontario	Windsor Downtown	-19.0	-26.9
Southern Ontario	Chatham	-12.5	-17.3
Southern Ontario	London	-20.0	-25.5
Southern Ontario	Brantford	-23.7	-11.6
Southern Ontario	Kitchener	-20.0	-22.5
Southern Ontario	Guelph	-14.8	-24.5
Southern Ontario	St. Catharines	-15.0	-34.5
Southern Ontario	Burlington	-7.5	-22.5
Southern Ontario	Oakville	-12.5	-20.1

Southern Ontario	Milton	0.0*	-16.7
Southern Ontario	Mississauga	-15.7	-27.9
Southern Ontario	Brampton	-11.5	-31.4
Southern Ontario	Toronto West	-12.2	-26.6
Southern Ontario	Toronto Downtown	INS	INS
Southern Ontario	Toronto North	-11.3	-35.6
Southern Ontario	Toronto East	-6.8*	-41.0
Southern Ontario	Oshawa	-7.9*	-36.3
Southern Ontario	Barrie	-5.6*	-27.4
Southern Ontario	Peterborough	0.0*	-25.9
Southern Ontario	Kingston	0.0*	-12.4

Southern Ontario	Ottawa Downtown	0.0*	-20.9

Notes:

Designated sites normally refer to communities with populations greater than 100,000.

*Non-Significant Sen's Slope (significant trend not detected).

INS denotes insufficient data for a valid 10-year trend.

N/A denotes not applicable (parameter not monitored at location).

Milton is based on 8 years of available data.

Management levels for Canadian Ambient Air Quality Standard pollutants

Ozone

Management level	8-hour 2020
Red	> 62 ppb
Orange	57 to 62 ppb
Yellow	51 to 56 ppb
Green	≤ 50 ppb

Fine particulate matter ($PM_{2.5}$)

Management Level	24-hour	Annual

Management Level	24-hour 2020	Annual 2020
Red	> 27 µg/m^3	> 8 µg/m^3
Orange	20 to 27 µg/m^3	6.5 to 8.8 µg/m^3
Yellow	11 to 19 µg/m^3	4.1 to 6.4 µg/m^3
Green	≤ 10 µg/m^3	≤ 4.0 µg/m^3

Sulphur dioxide (SO_2)

Management Level	1-hour 2020	Annual 2020
Red	> 70 ppb	> 5.0 ppb
Orange	51 to 70 ppb	3.1 to 5.0 ppb
Yellow	31 to 50 ppb	2.1 to 3.0 ppb
Green	≤ 30 ppb	≤ 2.0 ppb

Nitrogen dioxide (NO_2)

Management Level	1-hour 2020	Annual 2020

Red	> 60 ppb	> 17.0 ppb
Orange	32 to 60 ppb	7.1 to 17.0 ppb
Yellow	21 to 30 ppb	2.1 to 7.0 ppb
Green	≤ 20 ppb	≤ 2.0 ppb

AQHI and Air Quality Alert Program Reporting

2020 Air Quality Health Index summary

Station ID	City/Town	No. of valid hours	Low risk AQHI=1	Low risk AQHI=2	Low risk AQHI=3
12008	Windsor Downtown	8714	2.90	51.54	38.54
12016	Windsor West	8370	4.17	53.73	36.50
13001	Chatham	8699	9.92	61.13	24.96
14111	Sarnia	8729	11.51	61.90	21.46
15020	Grand Bend	8621	17.09	66.37	14.07

15026	London	8619	14.29	62.15	21.26
16015	Port Stanley	8559	14.24	61.95	20.76
18007	Tiverton	8339	14.64	67.86	15.73
21005	Brantford	8657	14.01	60.88	22.43
26060	Kitchener	8679	12.70	61.80	23.42
27067	St. Catharines	8685	7.29	58.63	30.74
28028	Guelph	8696	14.20	61.28	21.81
29000	Hamilton Downtown	8737	3.55	46.18	40.47
29118	Hamilton West	8608	5.96	49.72	36.80
29214	Hamilton Mountain	8740	5.90	52.71	33.92
31129	Toronto Downtown	8597	3.43	41.29	43.64
33003	Toronto East	8722	7.44	55.00	31.09
34021	Toronto North	8684	8.65	50.26	34.55

35125	Toronto West	8612	3.89	45.05	42.86
44008	Burlington	8752	5.12	51.51	36.79
44017	Oakville	8671	7.61	57.84	29.96
44029	Milton	8451	7.03	55.51	32.27
45027	Oshawa	8477	22.51	61.27	13.85
46090	Brampton	8723	8.77	53.90	31.51
46108	Mississauga	8728	11.70	60.55	24.53
47045	Barrie	8347	17.73	55.16	23.67
48006	Newmarket	8747	15.08	59.45	22.57
49005	Parry Sound	8674	21.96	60.18	16.66
49010	Dorset	8623	26.58	58.48	14.45
51001	Ottawa Downtown	8720	19.71	54.27	23.20
51010	Petawawa	8560	28.79	57.21	13.66
52023	Kingston	8586	13.72	63.92	20.24

54012	Belleville	8577	13.20	63.04	20.79
56051	Cornwall	8727	18.55	61.80	17.54
59006	Peterborough	8376	20.49	58.39	18.82
63203	Thunder Bay	8701	22.80	60.14	15.44
71078	Sault Ste. Marie	8506	21.53	61.11	15.87
75010	North Bay	8743	24.85	59.16	14.72
77233	Sudbury	8734	21.42	55.61	19.91

2020 air quality alert summary

Air quality forecast region	Special air quality statement
Algonquin	0
Atikokan - Upsala - Quetico	0
Attawapiskat	0
Bancroft - Bon Echo Park	0
Barrie - Orillia - Midland	0

Belleville - Quinte - Northumberland	0
Big Trout Lake - Sachigo Lake	0
Brockville - Leeds and Grenville	0
Burk's Falls - Bayfield Inlet	0
Chapleau - Gogama	0
City of Hamilton	0
City of Ottawa	0
City of Thunder Bay	0
City of Toronto	2
Cornwall - Morrisburg	0
Dryden - Ignace	0
Dufferin - Innisfil	0
Dunnville - Caledonia - Haldimand	0
Elgin	1
Elliot Lake - Ranger Lake	0

Fort Frances - Rainy Lake	0
Fort Hope - Webequie	1
Fort Severn	0
Geraldton - Manitouwadge - Hornepayne	1
Greater Sudbury and Vicinity	0
Grey - Bruce	0
Haliburton	0
Halton - Peel	2
Huron - Perth	2
Kapuskasing - Hearst	0
Kenora - Nestor Falls	0
Kingston - Prince Edward	0
Kirkland Lake - New Liskeard - Temagami	0
Lake Nipigon - Wabakimi	0

London - Middlesex	1
Manitoulin - Northshore - Killarney	0
Moosonee - Fort Albany	0
Niagara	0
Nipigon - Marathon - Superior North	0
North Bay - West Nipissing	0
Oxford - Brant	0
Parry Sound - Muskoka	0
Peawanuck	0
Peterborough - Kawartha Lakes	0
Pickle Lake - Wunnummin Lake	1
Prescott and Russell	0
Red Lake - Ear Falls	1
Renfrew - Pembroke - Barry's Bay	0
Sandy Lake - Pikangikum	1

Sarnia - Lambton	4
Sault Ste. Marie - Superior East	0
Simcoe - Delhi - Norfolk	0
Sioux Lookout - Savant Lake	0
Smiths Falls - Lanark - Sharbot Lake	0
Stirling - Tweed - South Frontenac	0
Superior West	0
Timmins - Cochrane	0
Waterloo - Wellington	0
Wawa - White River - Pukaskwa	0
Windsor - Essex - Chatham - Kent	4
York - Durham	2
Ontario	**6**

COVID-19 pandemic period

Traffic volumes and air pollution concentrations in baseline years and changes in 20 station

Means in baseline years

Parameter	Pre-COVID period	Stay-at-home perio
Car volume (counts/hour)	7340	7569
Truck volume (counts/hour)	1146	1353
BC ($\mu g/m^3$)	1.2	1.2
NO_2 (ppb)	22.6	19.2
$PM_{2.5}$ ($\mu g/m^3$)	10.6	8.0
O_3 (ppb)	18.2	24.0

Changed means in 2020 relative to the baseline years

Parameter	Pre-COVID period	Stay-at-home perio
Car volume (counts/hour)	134	-2349
Truck volume (counts/hour)	13	-281

BC ($\mu g/m^3$)	0.05	-0.27
NO_2 (ppb)	-2.2	-4.2
$PM_{2.5}$ ($\mu g/m^3$)	-1.6	-1.2
O_3 (ppb)	-0.5	-0.5

Changes attributable to the pandemic (%)

Parameter	Stay-at-home period	Re-opening peri
Car volume (counts/hour)	-33%	-14%
Truck volume (counts/hour)	-22%	0%
BC ($\mu g/m^3$)	-27%	-23%
NO_2 (ppb)	-10%	0%
$PM_{2.5}$ ($\mu g/m^3$)	6%	23%
O_3 (ppb)	0%	9%

Notes:

Baseline years: 2017-2019.

Pre-COVID period: January 1 - March 18; Stay-at-home period: March 19 - May 18; Re-openi

Baseline concentrations of black carbon and changes in 2020

Means in baseline years (µg/m^3)

ID	City/Town	Pre-COVID period	Stay-at-home per
12008	Windsor Downtown	0.4	0.4
29000	Hamilton Downtown	0.5	0.7
33003	Toronto East	0.4	0.4
34021	Toronto North	0.4	0.4
35033	Etobicoke South	0.7	0.8
83126	Highway 401	1.2	1.2

Changed means in 2020 relative to the baseline years (µg/m

ID	City/Town	Pre-COVID period	Stay-at-home per
12008	Windsor Downtown	0	-0.14
29000	Hamilton Downtown	0.02	-0.18

29000	Hamilton Downtown	0.02	-0.18
33003	Toronto East	0.02	-0.07
34021	Toronto North	0.06	-0.08
35033	Etobicoke South	0.07	-0.08
83126	Highway 401	0.05	-0.27

Changes attributable to the pandemic (%)

ID	City/Town	Stay-at-home period	Re-opening pe
12008	Windsor Downtown	-34%	-25%
29000	Hamilton Downtown	-28%	-22%
33003	Toronto East	-24%	-19%
34021	Toronto North	-31%	-17%
35033	Etobicoke South	-20%	-4%
83126	Highway 401	-27%	-23%

Notes:

Baseline years: 2017-2019.

Pre-COVID period: January 1 - March 18; Stay-at-home period: March 19 - May 18; Re-openi

Baseline concentrations of nitrogen dioxide and changes in 2020

Means in baseline years (ppb)

ID	City/Town	Pre-COVID period	Stay-at-home per
12008	Windsor Downtown	14.2	10.2
29000	Hamilton Downtown	13.6	13.0
29118	Hamilton West	12.4	11.7
33003	Toronto East	13.8	9.9
34021	Toronto North	13.6	9.8
35033	Etobicoke South	17.4	15.4
35125	Toronto West	18.2	14.0
63203	Thunder Bay	11.0	7.6
75010	North Bay	8.1	4.8
83126	Highway 401	22.6	19.2

Changed means in 2020 relative to the baseline years (ppb)

ID	City/Town	Pre-COVID period	Stay-at-home per
12008	Windsor Downtown	3.1	-2.6
29000	Hamilton Downtown	-1.7	-3.0
29118	Hamilton West	-1.4	-2.1
33003	Toronto East	-2.7	-3.1
34021	Toronto North	-2.0	-2.1
35033	Etobicoke South	-1.3	-3.7
35125	Toronto West	-1.8	-3.5
63203	Thunder Bay	-1.1	-1.6
75010	North Bay	-1.1	-1.4
83126	Highway 401	-2.2	-4.2

Changes attributable to the pandemic (%)

ID	City/Town	Stay-at-home period	Re-opening pe

12008	Windsor Downtown	-1%	6%
29000	Hamilton Downtown	-10%	-5%
29118	Hamilton West	-6%	0%
33003	Toronto East	-5%	5%
34021	Toronto North	-1%	6%
35033	Etobicoke South	-16%	-12%
35125	Toronto West	-12%	-7%
63203	Thunder Bay	-7%	10%
75010	North Bay	-5%	19%
83126	Highway 401	-10%	0%

Notes:

Baseline years: 2017-2019.

Pre-COVID period: January 1 - March 18; Stay-at-home period: March 19 - May 18; Re-openi

Baseline concentrations of fine particulate matter and changes in 2020

Means in baseline years (µg/m^3)			

ID	City/Town	Pre-COVID period	Stay-at-home per
12008	Windsor Downtown	9.0	6.9
29000	Hamilton Downtown	8.8	9.0
29118	Hamilton West	8.2	7.7
33003	Toronto East	8.1	6.4
34021	Toronto North	8.2	6.5
35033	Etobicoke South	8.8	7.6
35125	Toronto West	8.1	6.3
63203	Thunder Bay	5.8	4.6
75010	North Bay	4.9	4.4
83126	Highway 401	10.6	8.0

Changed means in 2020 relative to the baseline years (µg/m

ID	City/Town	Pre-COVID period	Stay-at-home pe
12008	Windsor Downtown	-1.4	-1.0

129000	Hamilton Downtown	-0.9	-1.2
129118	Hamilton West	-1.0	-0.8
133003	Toronto East	-0.9	-0.4
134021	Toronto North	-1.2	-1.0
135033	Etobicoke South	-1.3	-1.3
135125	Toronto West	-1.2	-0.5
163203	Thunder Bay	-0.4	0.4
175010	North Bay	-0.3	-0.5
183126	Highway 401	-1.6	-1.2

Changes attributable to the pandemic (%)

ID	City/Town	Stay-at-home period	Re-opening p
12008	Windsor Downtown	6%	7%
29000	Hamilton Downtown	-2%	4%
329118	Hamilton West	3%	19%

329118	Hamilton West	3%	19%
33003	Toronto East	8%	8%
34021	Toronto North	2%	7%
35033	Etobicoke South	0%	12%
335125	Toronto West	11%	11%
363203	Thunder Bay	17%	10%
375010	North Bay	-5%	1%
83126	Highway 401	6%	23%

Notes:

Baseline years: 2017-2019.

Pre-COVID period: January 1 - March 18; Stay-at-home period: March 19 - May 18; Re-openi

Baseline concentrations of ozone and changes in 2020

Means in baseline years (ppb)

ID	City/Town	Pre-COVID period	Stay-at-home per
12008	Windsor Downtown	23.6	32.2
29000	Hamilton Downtown	25.1	29.9

29118	Hamilton West	25.2	30.1
33003	Toronto East	24.6	30.5
34021	Toronto North	24.1	30.8
35033	Etobicoke South	21.8	26.9
35125	Toronto West	21.1	27.7
63203	Thunder Bay	26.9	31.8
75010	North Bay	28.1	32.7
83126	Highway 401	18.2	24.0

Changed means in 2020 relative to the baseline years (ppb)

ID	City/Town	Pre-COVID period	Stay-at-home pe
12008	Windsor Downtown	-0.4	-1.6
129000	Hamilton Downtown	0.1	-0.8
129118	Hamilton West	-1.4	-1.0
133003	Toronto East	0.2	0.3

134021	Toronto North	0.4	-0.2
135033	Etobicoke South	0.1	0.3
135125	Toronto West	1.2	0.4
163203	Thunder Bay	-1.7	-2.8
175010	North Bay	1.3	0.3
183126	Highway 401	-0.5	-0.5

Changes attributable to the pandemic (%)

ID	City/Town	Stay-at-home period	Re-opening p
12008	Windsor Downtown	-4%	6%
29000	Hamilton Downtown	-3%	8%
329118	Hamilton West	1%	13%
33003	Toronto East	1%	8%
34021	Toronto North	-2%	8%
35033	Etobicoke South	1%	2%

35033	Etobicoke South	1%	3%
335125	Toronto West	-3%	2%
363203	Thunder Bay	-4%	8%
375010	North Bay	-3%	-8%
83126	Highway 401	0%	9%

Notes:

Baseline years: 2017-2019.

Pre-COVID period: January 1 - March 18; Stay-at-home period: March 19 - May 18; Re-openi

References and resources

Air Pollutant Emission Inventory (https://www.canada.ca/en/environment-climate-change/s inventory-overview.html) (APEI) 1990-2020. Environment and Climate Change Canada. Mar

Air Pollutant Emission Inventory (https://www.canada.ca/en/environment-climate-change/s inventory-overview.html) (APEI) 1990-2019. Environment and Climate Change Canada. Mar

Brook, J.R., Dann, T. and R.T. Burnett. 1997. The Relationship among TSP, PM_{10}, $PM_{2.5}$ and I Particulate Matter at Multiple Canadian Locations. Journal of Air and Waste Management A

Brauer, M., Reynolds, C., Hystad, P. 2013. Traffic-Related Air Pollution and Health in Canada 185(18): 1557–1558

Burnett, R.T., Dales, R.E., Krewski, D., Vincent, R., Dann, T., and J.R. Brook. 1995. Associations and Admissions to Ontario Hospitals for Cardiac and Respiratory Diseases. American Journ

Canadian Council of Ministers of the Environment, 2012. Guidance Document on Achievem Air Quality Standards for Particulate Matter and Ozone.

Environment and Climate Change Canada, March 2017, Glossary of terms: National Polluta (https://www.canada.ca/en/environment-climate-change/services/national-pollutant-releas

Environment and Climate Change Canada, 2013. Canadian Smog Science Assessment High

Evans G.J., Audette, C., Badali, K., Celo, V., Dabek-Zlotorszynka, E., Debosz, J., Ding, L., Doerk
Herod, D., Hilker, N., Jeong, C.-H., Johnson, D., Jones, K., Munoz, A., Noble, M., Reid, K., Schill
White, L. 2019. Near-Road Air Pollution Pilot Study Final Report. Southern Ontario Centre fo
University of Toronto.

Federal Register. 2006. 40 CFR Parts 53 and 58: Revisions to Ambient Air Monitoring Regula
61236-61328. October 17, 2006.

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

Geddes, J.A., Murphy, J.G. and D.K.Wang. 2009. Long term changes in nitrogen oxides and v
and the challenges facing local ozone control. Atmospheric Environment, Vol. 43, pp. 3407-

Gilbert, R.O., 1987. Statistical methods for environmental pollution monitoring. Van Nostra

Health Effects Institute. 2010. Traffic-related air pollution: a critical review of the literature o
effects. Report prepared by the Health Effects Institute, Boston, MA, Special Report 17, Janu

Health Canada. 2013. Canadian SMOG Science Assessment, Volume 2: Health Effects.

IARC. 2013. Diesel and gasoline engine exhausts and some nitroarenes. Vol. 105. Lyon, Fra
in Cancer. IARC Monographs on the Evaluation of the Carcinogenic Risks to Humans.

Itano, Y., Bandow, H., Takenaka, N., Saitoh, Y., Asayama, A. and J. Fukuyama. 2007. Impact o
trends in an urban atmosphere. Science of the Total Environment, Vol. 379, pp. 46-55.

Lin, C.C.-Y., Jacob, D.J., Munger, J.W., and A.M. Fiore. 2000. Increasing Background Ozone in S
Geophysical Research Letters, Vol. 27 (21), pp. 3465-3468.

Lioy, P., 1991. Assessing Human Exposure to Airborne Pollutants. Environmental Science ar

Lipfert, F.W. and T. Hammerstrom. 1992. Temporal Patterns in Air Pollution and Hospital Ac
59, pp. 374-399.

Lippmann, M. 1991. Health Effects of Tropospheric Ozone. Environmental Science and Tech

Logan, J. A., Staehelin, J., Megretskaia, I. A., Cammas, J.-P., Thouret, V., Claude, H., Backer, H.
R., Frohlich, M., and R. G. Derwent. 2012. Changes in ozone over Europe: Analysis of ozone
aircraft (MOZAIC) and alpine surface sites (http://doi.org/10.1029/2011JD016952) . Journal o

Ontario Ministry of the Environment, 2020. Ontario's Ambient Air Quality Criteria (https://w
air-quality-criteria) .

Ontario Ministry of the Environment, 2011. Publications (http://www.airqualityontario.com/
Ministry of the Environment.

Ministry of the Environment.

Ontario Ministry of the Environment and Climate Change (OMECC). 2021. Air Quality in Ont

Ontario Ministry of the Environment and Climate Change (OMECC). 2018. Air Quality in Ont

Ontario Ministry of Transportation (MTO). 2016. Provincial Highways Traffic Volumes, Minis Standards Branch, Traffic Office.

Ontario Ministry of Transportation (MTO). 2019. Long Combination Vehicle (LCV) Program (combination-vehicle-program) (accessed on February 25, 2020). Ontario Ministry of Transp

Parrish, D.D., Law, K.S., Staechlin, J., Cooper, O.R., Tanimoto, H., Volz-Thomas, A., Gilge, S., Sc Chan. 2012. Long-term changes in lower tropospheric baseline ozone concentrations at no Chemistry and Physics, Vol. 12, pp. 11485-11504.

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

Pengelly, L.D., Silverman, F. and C.H. Goldsmith. 1992. Health Effects of Air Pollution Assess Urban Air Group, McMaster University.

Penkett, S.A. and K.A. Brice. 1986. The Spring Maximum in Photo-oxidants in the Northern 319, pp. 655-657.

Reid, N., Yap, D. and R. Bloxam. 2008. The potential role of background ozone on current ar Quality, Atmosphere & Health, Vol. 1, pp. 19-29.

Rethinking the Ozone Problem in Urban and Regional Air Pollution. National Academy Pres

Seinfeld, J.H. and S.N. Pandis. 2006. Atmospheric chemistry and physics: From air pollution Jersey: John Wiley & Sons Inc.

SOCCAR. 2019. Near-Road Air Pollution Pilot Study Summary Report. Fall 2019. Faculty of A University of Toronto.

Sofowote, U.M., Healy, R.M., Su, Y., Debosz, J., Noble, N., Munoz, A., Jeong, C.-H., Wang, J.M., Understanding the $PM_{2.5}$ imbalance between a far and near-road location: Results of High Apportionment and Parameterization of Black Carbon. Atmospheric Environment, 173, 277

Sofowote, U. and F. Dempsey. 2015. Impacts of Forest Fires on Ambient near Real-Time PM Analyses and Source Apportionment of the July 2011-2013 Episodes (http://doi.org/10.5094 Research.

Sofowote, U., Su, Y., Bitzos, M.M., and Munoz, A. 2014. Improving the Correlations of Ambie FEM in Ontario: a Multiple Linear Regression Analysis. Journal of the Air & Waste Managem

Su, Y., Sofowote, U., Debosz, J., White, L., and Munoz, A. 2018. Multi-year Continuous $PM_{2.5}$ Equivalent Method SHARP 5030 and Comparisons to Filter-Based and TEOM Measurement 191. 10.3390/atmos9050191.

United States Environmental Protection Agency. 2003. Latest Findings on National Air Quali

United States Environmental Protection Agency. 2003. National Air Quality and Emission Tr

United States Environmental Protection Agency. 2004. Particle Pollution Report, Current Ur Emissions through 2003.

United States Environmental Protection Agency (USEPA). 2011. List of Designated Referenc October 12, 2011.

United States Environmental Protection Agency (USEPA). Health Effects Notebook for Hazar (https://www.epa.gov/haps/health-effects-notebook-hazardous-air-pollutants) . November

United States Environmental Protection Agency (USEPA). 2018, CMAQ website (https://www

Vingarzan, R. 2004. A review of surface ozone background levels and trends. Atmospheric E

Wang, J., C-H. Jeong, N. Zimmerman, R. Healy, D.K.W Wang, F. Ke, and G. J. Evans. 2015. Plun Pollutant Emissions and the Contribution from Heavy Emitters. Atmos. Measure Tech. 8, 32

Wolff, G.T., Kelley, N.A. and M.A. Ferman. 1982. Source Regions of Summertime Ozone and Water, Air and Soil Pollution, 18: pp. 65-81.

Xu, X., Zhang, T. and Y. Su. 2019. Temporal Variations and Trend of Ground-Level Ozone Bas Windsor, Canada. Atmos. Chem. Phys., 19, 7335-7345.

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

Yap, D., Reid, N., De Brou, G. and R. Bloxam. 2005. Transboundary Air Pollution in Ontario.

Zhang, T., Xu, X. and Y. Su. 2020. Impacts of Regional Transport and Meteorology on Ground Atmosphere, 11 (10), 1111.