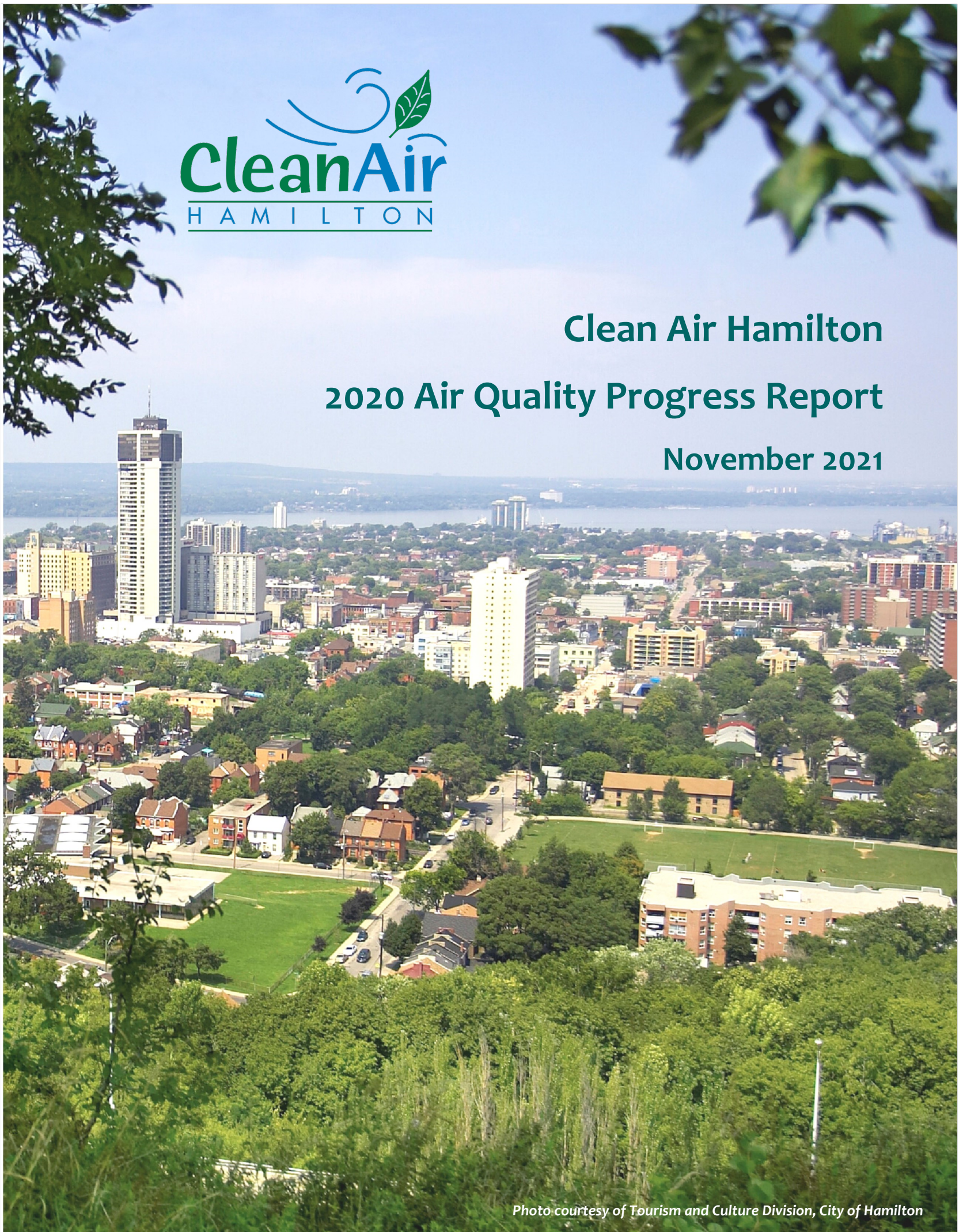




# Clean Air Hamilton

## 2020 Air Quality Progress Report

### November 2021



*Photo courtesy of Tourism and Culture Division, City of Hamilton*

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Top Row (L to R): Jahanvi Desai, Bruce Newbold (Chair), Andrew Sebestyen, Nico Strabac, Barry Duffey  
Second Row (L to R): Stephen Burt, Denis Corr, Trevor Imhoff, Dan Dobrin, Geoffrey Knapper  
Middle Row (L to R): George McKibbin, Heidi Levitzky, John Lundrigan, Julie Wedzinga, Kerry LeClair  
Fourth Row (L to R): Lubna Hussain, Mainul Husain, Lynda Lukasik, Mark Smithson, Megan Sutton  
Bottom Row (L to R): Tiffany Singh, Spencer Skidmore, Timothy Hung, Stephanie Gasko, Abigail Amponsah

For the full list of Clean Air Hamilton members, please go to <https://cleanairhamilton.ca/members/>

## Message from the Chair

I am pleased to provide the Clean Air Hamilton Annual Report for 2020, which provides annual air quality data and our on-going work to improve air quality in Hamilton.

For previous years' activities and reports, please go to <http://www.cleanairhamilton.ca>.

With the COVID-19 pandemic impacting so much of our daily lives, to say that 2020 was a difficult year is an understatement. While we all practiced physical distancing, stayed at home in the early months of the pandemic, and shifted our meetings to a virtual format, our commitment to improving Hamilton's air quality remained.

Clean Air Hamilton's mandate includes involving and informing our citizens of all these issues and giving sound, science-based advice and recommendations. Reflecting this, we were well into planning for our bi-annual Upwind-Downwind conference and Clean Air Fair, both of which had been planned for June 2020. COVID-19, of course, meant that the events were cancelled.

In its place, Clean Air Hamilton proceeded with a series of noon-hour '[Lunch and Learns](#)' that were meant to echo the planned conference sessions. The first Lunch and Learn was held in December of 2020 on the topic of Transboundary Air Pollution. The event featured contributions from partners in the US, along with a discussion of trucks and air quality. If you missed the presentation, the recording is available on the [Clean Air Hamilton website](#). Additional Lunch and Learns are planned for 2021.

We continue to see improvements in Hamilton's air quality, but challenges remain. In particular, we are noting increases in sulfur dioxide (SO<sub>2</sub>) in the industrial area, along with concerns over exposure to benzene and benzo[a]pyrene. Clean Air Hamilton will continue to work with our partners to understand these trends and work to address them, ensuring healthier air for all.

We thank the Healthy and Safe Communities department and the City Council for their ongoing support of Clean Air Hamilton and its special projects. Funding has allowed us to work closely with local partner groups including Environment Hamilton and Green Venture on projects that have raised awareness amongst local citizens about air quality issues, as well as allowed us to work towards improving local air quality.

Together, Clean Air Hamilton and its various partners are working to reduce emissions as well as our personal exposures and live healthier lives. Clean Air Hamilton's special projects and this report helps us to do that.



A handwritten signature in black ink, appearing to read 'K. B. Newbold'.

*Bruce Newbold, Ph.D.*  
*Chair, Clean Air Hamilton*

## Strategic Activities

Clean Air Hamilton is dedicated to improving air quality across the City of Hamilton. This will be accomplished through sound science-based decision making, using the most up-to-date information and tools available, such as the Hamilton Airshed Modelling System (HAMS). Clean Air Hamilton plans to focus on education and outreach, air quality monitoring, and to continue to update the HAMS and identify major sources of pollution to prioritize action for maximum air quality improvement and exposure reduction. Clean Air Hamilton has identified the following issues for research, communication and program activities in collaboration with our partners.

### Governance & Structure:

To remain a multi-stakeholder group dedicated to improving air quality by increasing public perception and expanding Clean Air Hamilton membership while providing communication and promotion of realistic, science-based decision making and sustainable practices.

### Air Zone Management:

Comply with the Ministry of the Environment, Conservation and Parks (MECP) and Canadian Ambient Air Quality Standards. This will be done through implementation of a systems level approach and future advocacy towards an industrial mandatory monitoring regulation.

### Transportation:

To encourage and facilitate more use of public and active transportation through commentary on transportation related matters, supporting educational programs and localized monitoring leading to detailed information to encourage changes in behaviour.

### Air Monitoring:

To improve air monitoring activities across the City of Hamilton by providing support for additional portable air monitors and fixed air monitors that provide real-time monitoring for contaminants of concern in Hamilton.

### Dust & PM<sub>2.5</sub> Mitigation:

Lower concentrations of Particulate Matter (PM<sub>2.5</sub>) across the City of Hamilton below Canadian Ambient Air Quality Standards by effectively utilizing the airshed model to create partnerships and pollution inventory specific to street sweeper and dust mitigation programs.

### 2020 Meetings

January 13, 2020  
February 10, 2020  
March 9, 2020  
n/a  
\*May 11, 2020  
\*June 8, 2020  
\*July 13, 2020  
\*September 14, 2020  
\*October 19, 2020  
\*November 9, 2020  
\*December 14, 2020

### 2021 Meetings

\*January 11, 2021  
\*February 8, 2021  
\*March 8, 2021  
\*April 12, 2021  
\*May 10, 2021  
\*June 14, 2021  
\*August 9, 2021  
\*September 13, 2021  
\*October 18, 2021  
\*November 8, 2021  
\*December 13, 2021

\*signifies virtual meetings

### Clean Air Hamilton Meetings

Clean Air Hamilton meetings are usually held on the second Monday of each month, virtually using Cisco Webex in light of the COVID-19 pandemic.



Photo courtesy of Tourism and Culture Division, City of Hamilton

## Clean Air Hamilton (CAH) - 2020 Funded Projects

Clean Air Hamilton is an innovative, multi-stakeholder agent of change dedicated to improving air quality in our community. In 2020, Hamilton Public Health Services provided \$24,868 to fund projects resulting in air quality improvement and awareness.

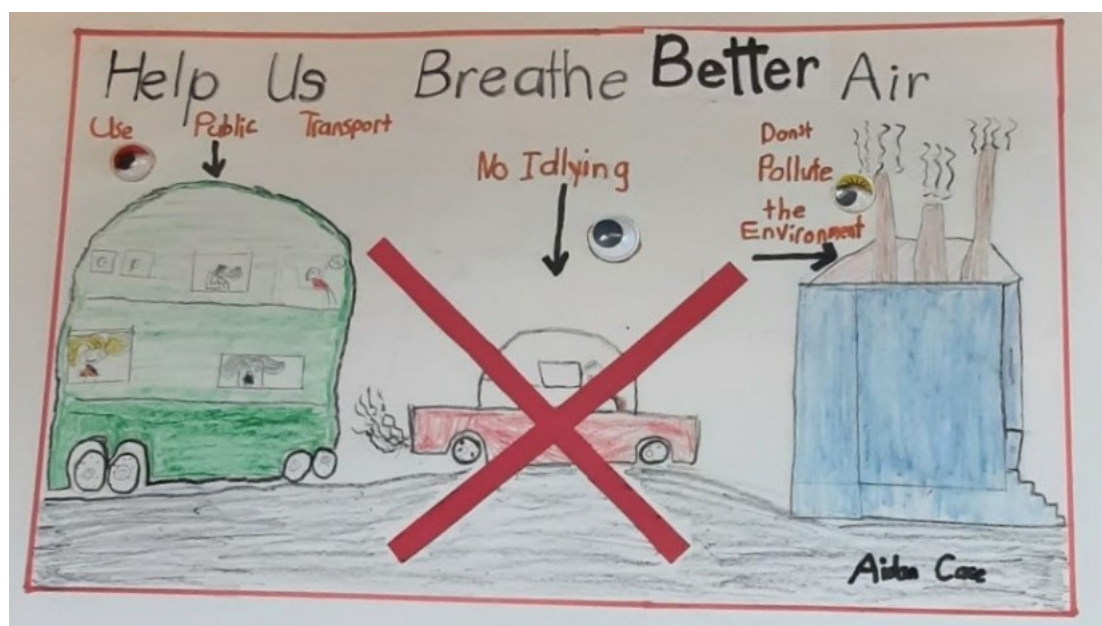
These projects have reached hundreds of citizens and contribute to improving Hamilton's air quality through monitoring, promotion and spreading awareness. Clean Air Hamilton is proud to support the 2020 funded projects.

## Fresh Air for Kids



With support from Clean Air Hamilton and the Ontario Trillium Foundation, Green Venture and Corr Research brought the Fresh Air for Kids program (FAFK) to 18 new schools across Hamilton from Oct. 2018 to Apr. 2022.

Through a series of four modules, FAFK educated students on air quality, mapped neighbourhood air quality using a mobile monitoring unit from the Ministry of Environment, Conservation and Parks (MECP), taught students about the monitoring of local air quality using hand-held scientific devices, and created and delivered an environmental anti-idling campaign. Linking to the Ontario Elementary School Curriculum in Science and Technology, FAFK seeks to educate students in creative, meaningful, and hands-on ways, while inspiring the next generation's young scientists and environmental activists. Through the education and anti-idling campaign, kids and families change their behaviour in various ways, including idling their cars less and choosing more environmentally friendly modes of transportation.



A poster created by a student at Grandview Adventist School

## Clean Air Hamilton 2020 Funded Projects Cont'd...

### Fresh Air for Kids

In 2020, the FAFK program needed to adapt to the new virtual learning environment, as the staff were not able to visit schools. The team pivoted instead, to providing some sessions using different strategies:

- pre-recorded videos and PDF activity sheets;
- providing other sessions through pre-booked live video calls; and
- creating online versions of student surveys, teacher surveys, and student pledges.

Even though the neighbourhood walkabout with Dr. Denis Corr was suspended due to COVID-19, school neighbourhood air quality mapping was carried out with the MECP van.

The program was re-worked such that engagement and action could take place regardless of whether students were physically present at the school to run an anti-idling campaign.

During the 2020 school year, seven schools participated in the FAFK program, out of which:

- Three completed all four modules of the program;
- One completed three modules of the program; and
- Three completed two modules of the program.

The City of Hamilton [Anti-Idling By-law No. 07-160](#) can be found on the City's Bylaw website at:

<https://www.hamilton.ca/government-information/by-laws-and-enforcement/city-hamilton-by-laws>

School Name	# of students participating
Bernie Custis Secondary School	15
Colin MacDonald Community School	9
Dundana Elementary School	24
Grandview Adventist School	12
Highview Public School	89
HWDSB Remote Class	30
Lawfield Elementary School	39
<b>Total</b>	<b>218</b>




**Idling is a serious issue because it**

- Causes dirty, smoggy, polluted air that's hard to breathe
- Leads to serious health problems, especially in children
- Contributes to climate change
- Wastes money and gasoline



**IDLING INFRACTION**

**What is Idling?**  
When you're waiting or parked in your vehicle and you have the engine running you're idling.

Read on for more information about idling and what you can do to stop it.

**Idling Facts**

- 1) Over 10 seconds of idling uses more fuel than restarting your engine.
- 2) Idling isn't an effective way to warm up your vehicle, even in cold weather. The best way to warm up your vehicle is to drive it.
- 3) Excessive idling can damage your engine's components, including cylinders, spark plugs, and the exhaust system.

**How to Avoid Idling**

- Step 1** - Reduce warm-up idling to 30 seconds
- Step 2** - If you are going to be stopped for more than 10 seconds, turn your engine off (except in traffic).
- Step 3** - Don't ever use a remote car starter as they encourage idling.
- Step 4** - With really cold temperatures, consider using a block heater to warm your vehicle's engine before you start it.
- Step 5** - Spread the anti-idling message to your family and friends.
- Step 6** - Keep this card handy with you to remind yourself not to idle. Afterall, everyone can forget.

**If you're waiting or parked  
TURN OFF your engine.  
Remember Idling Stinks!**



## Trees Please

Trees Please is a citizen science project led by Environment Hamilton and the Hamilton Naturalists' Club since 2016.

This initiative collects data with a team of volunteers trained to use specialized equipment and to follow specific data collection protocols. The project includes tree inventorying (measuring, identifying and noting any changes in tree health) and collecting air quality data, specifically Particulate Matter (PM) levels.

The goal of this project is to engage residents on local issues around air quality and urban forest health by helping them understand that trees can help improve air quality, among their many other benefits.

When air quality data is layered with tree health maps, strategic tree planting areas can be determined based on those areas with high particulate pollution as well as poor tree cover. The project team then works with residents towards planting native trees in these vulnerable areas through Trees Please free tree giveaways and by partnering with the City's Forestry and Horticulture Division in a community tree planting.

In 2020, the project was able to meet goals despite the pandemic. COVID-19 protocols included:

- Following the most up-to-date Ontario government and Hamilton Public Health guidelines;
- Ensuring contact tracing by requiring all volunteers to register for each session / event;
- Hosting every in-person event outdoors;
- Requiring staff and volunteers to wear masks;
- Limiting each session to less than 10 people in total and then dividing the group into smaller groups; and
- Sanitizing all equipment before and after each session.



*Air and Tree walk in the Homeside neighbourhood*

*This is an Ash tree and participants are looking for the distinctive "D" shaped holes made by the Emerald Ash Borer*

## Clean Air Hamilton 2020 Funded Projects Cont'd...

### Trees Please

With thanks to support from Clean Air Hamilton, Trees Please was able to successfully achieve the following:

- 1** Inventoried 451 existing trees in the Homeside Neighbourhood (Kenilworth Avenue North to Strathearne Avenue and Queenston Road to the rail lines). This included measuring, identifying and noting any challenges the trees face (ex. too close to a structure).
- 2** Organized air quality monitoring walkabouts and distributed flyers.
- 3** Increased the native tree canopy through a Free Tree Giveaway (31 trees in total). This is an addition to a larger community-wide giveaway of 600 native trees and shrubs.
- 4** Organized a community tree planting in the fall of 2020, planting 200 native trees with 15 volunteers.



*Community Tree Planting Day, Fall 2020*



*Training Session with volunteers, 2020*



## Upwind Downwind Conference 2020: Clean Air Hamilton's Signature Event that Wasn't

Plans for the 2020 version of Clean Air Hamilton's Upwind-Downwind conference, Our Health and Air Quality: Past, Present and Future, along with the Clean Air Fair were quickly taking shape through early 2020. Held every other year with participants drawn from government, non-governmental organizations, the local community, industry and academics from both Canada and the United States, the 2020 version was to be held June 8 and 9.



The Clean Air Fair, which was to be held on the evening of June 8, was to include a public lecture on Electric Vehicles by Cara Clairman from Plug 'n Drive followed by a panel discussion and would have showcased a variety of student projects with environmental focuses. The Upwind Downwind conference, scheduled for June 9, included panel sessions that engaged our international neighbors on the topics of trans-border air quality and addressed topics such as air quality and health effects, transportation and air quality, and how industry was working towards meeting its air quality goals.

The COVID-19 pandemic meant that both events were cancelled. Rather than abandoning our plans altogether, Clean Air Hamilton shifted gears and moved to run a series of virtual Lunch and Learns, with the first one held in late 2020 on the topic of *Transboundary Air Quality*. Please see the next section for key takeaways from our debut event!

Additional talks have been planned for 2021, including a discussion on *Air Pollution Sensors in Hamilton and How Can They Help?* by Dr. Matthew Adams and updates from Dr. Janya Kelly on the *Hamilton Airshed Modelling System; Sub-Region Analysis*. Through these Lunch and Learns, we plan to continue to keep the community informed about air quality issues in Hamilton.

In late 2021, we will turn our attention towards planning the 2022 version of the Upwind Downwind Conference, with the hope that we can once again return to an in-person event.

## Upwind Downwind Lunch & Learn Seminars Kick-Off

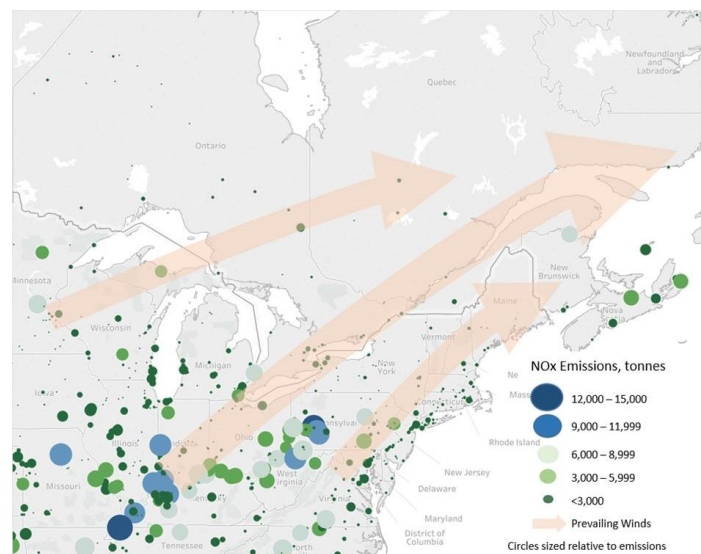
On December 1, 2020, Clean Air Hamilton hosted their first of three Upwind Downwind lunch and learn seminars in lieu of the Upwind Downwind Conference (which was originally scheduled for June 9, 2020). The event's theme was befittingly 'Transboundary Air Quality', exploring air pollution trends and sources on both sides of the border.

Distinct weather patterns drive prevailing winds to carry pollutants from neighbouring U.S. industrial and urbanized cities, elevating air pollution levels in Ontario's lower great lakes region. The result is a shared challenge for both Canada and the U.S.

Featured guest speakers included Zac Adelman, Executive Director, Lake Michigan Air Directors Consortium (LADCO); Paul Miller, Executive Director, Northeast States for Coordinated Air Use Management (NESCAUM), from Boston, MA; with moderator, Brian Jantzi of Clean Air Hamilton.

LADCO is an air quality research and planning organization that focuses on understanding and improving air quality in the Great Lakes region.

One of the key highlights included perspectives on the continuing pressing problems with air quality, which are namely regional haze and ozone. Most air quality indicators such as nitrogen dioxide (NO<sub>2</sub>) and sulphur dioxide (SO<sub>2</sub>) are now at historical lows but ozone continues to be an issue. In order to get ozone in check, precursors such as Nitrogen Dioxide (NO<sub>2</sub>) and volatile organic compounds (VOCs) need further reductions.



2016 NO<sub>x</sub> Emissions from Electricity Generators Located in Eastern U.S. and Canada with Prevailing Winds During Smog Season. Source: Ontario.ca



LADCO also noted a reduction in nitrogen dioxide (NO<sub>x</sub>) in urban areas due to the pandemic and States making remarkable progress on addressing regional haze, where the goal is to attain natural visibility by 2065. Recommended transboundary collaborations include improving lakeshore ozone simulation, identifying NO<sub>x</sub> and VOC emissions control strategies, holistic approach for pollutant planning, and integrating climate impacts and co-benefits in planning.

## UWDW Lunch & Learn Seminars Kick-Off Cont'd...

NESCAUM is a nonprofit association of air quality agencies in the northeastern United States which address a wide spectrum of air quality, climate, and energy issues such as mercury contamination, diesel exhaust, climate change adaptation and mitigation, energy efficiency, cleaner cars and fuels, environmental justice, and new and more effective regulatory policies, to name just a few.



In particular regions of the U.S., on-road diesel trucks are the second largest source of NOx emissions, next to on-road gasoline light duty vehicles. Similar to the prevailing winds, trucks also travel across borders and in doing so bring pollution with them.

In 2018, New York City saw the highest ozone levels since 2006 which was disconcerting because progress was thought to have been made. During the pandemic, they saw reductions in vehicle and truck traffic initially, but truck traffic only slightly dips and then reaches a little higher level pre-Covid. The challenge is that despite a 25% drop in vehicle traffic, ozone levels were still above the standards. This means if 25% of vehicles on the road were electric, standards would still be exceeded.

In the U.S., diesel engine NOx emissions only meet the standards when they are on a highway travelling greater than >50 mph, which is why better truck traffic data is needed.

NESCAUM's project includes working with a local truck fleet base to put on data loggers to collect emissions data, and Environment and Climate Change Canada is assisting with the analytical analysis to realize year-round truck performance.

There is a multi-state zero emission vehicle initiative that has been launched which focuses on trucks. The heavy-duty vehicle side is a fast-growing sector and more programs and policies that individual states could adopt to facilitate a more rapid introduction of zero emission trucks are needed.

In July 2020 NESCAUM developed a Memorandum of Understanding (MOU) to move forward. It has been signed by 15 states, roughly representing 50% of U.S. Economy and 40% of goods moved, and where 100% of fleets will be zero emission by 2050. Learn more here: <https://www.nescaum.org/documents/multistate-truck-zev-governors-mou-20200714.pdf>



**MULTI-STATE MEDIUM- AND HEAVY-DUTY ZERO EMISSION VEHICLE  
MEMORANDUM OF UNDERSTANDING**

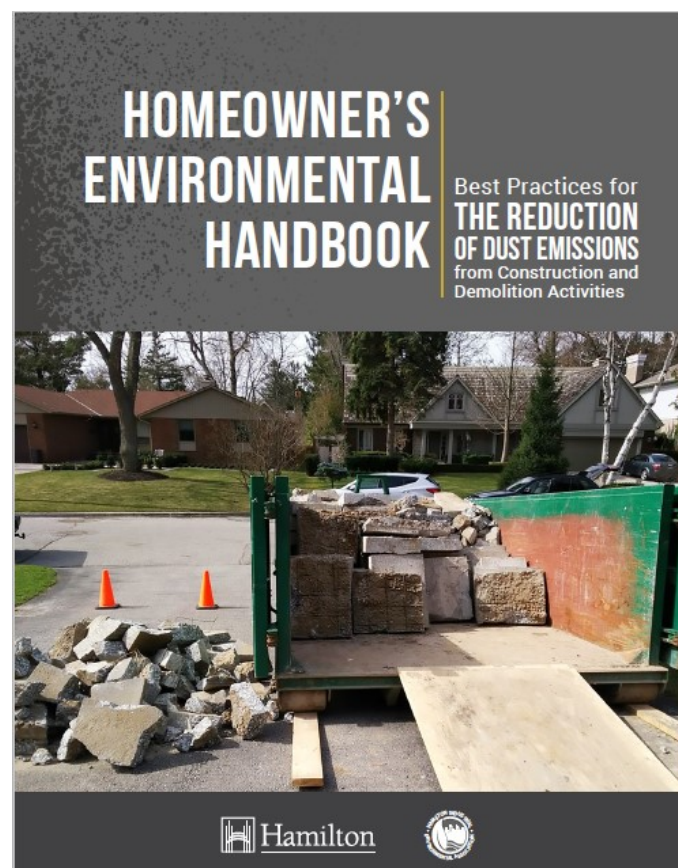
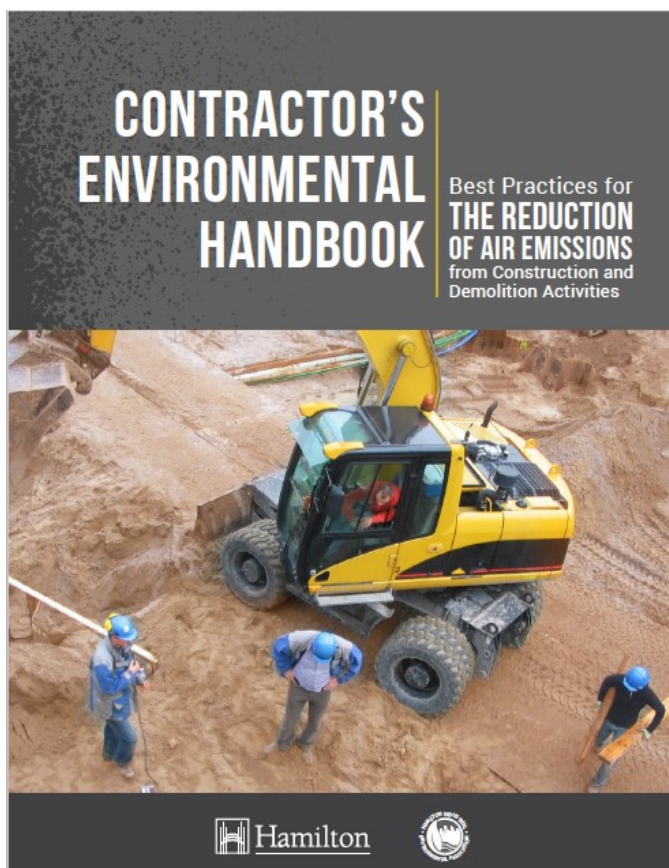
To view a recording of this webinar, please visit: <https://cleanairhamilton.ca/upwind-downwind-lunch-n-learns/>

## Dust Group & Handbooks, Demolition Guidelines

Airborne Particulate Matter emissions in the City of Hamilton are a concern both for all stakeholders. The Dust and Particulate Matter Working Group, a sub-committee of Clean Air Hamilton, has undertaken a number of initiatives over the last few years to attempt to address these issues.

The latest, a pair of handbooks on managing dust and particulate matter emissions for construction and demolition projects, is nearing completion. The first handbook is directed towards contractors and is a comprehensive document describing many technical mitigation measures commonly applied on construction and demolition sites. The second is a smaller document meant for homeowners engaged in Do-It-Yourself construction or demolition projects, and contains user-friendly directions on how to control emissions for the health of the homeowners and their neighbours.

The documents have been approved and designed, and will be posted soon to the Clean Air Hamilton website (<https://cleanairhamilton.ca/dust-abatement/>), with links distributed by the City's Buildings staff as part of the Building Permit Process. Other distribution avenues for print versions are also under discussion.



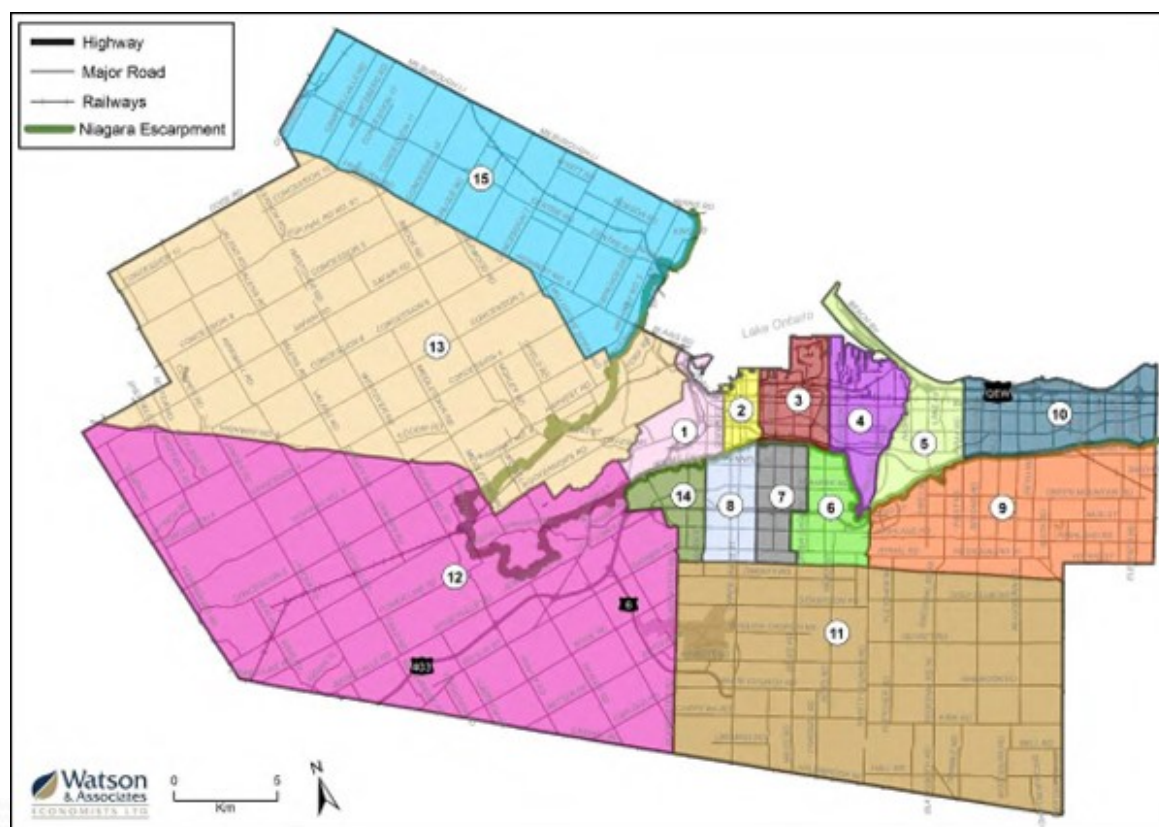
## Hamilton's Ambient Air Quality Trends 2020

The City of Hamilton is a port city in Ontario. It is located 58 kilometres southwest of Toronto in the Greater Toronto and Hamilton Area (GTHA). As one of Canada's leading industrial and transportation hubs, Hamilton's industrial sector, including the iron and steel industry, accounts for major local and national Gross Domestic Product (GDP) and job creation.

The following section provides the ambient Air Quality Trends for the City of Hamilton for the year 2020. Through the completion of Hamilton's Airshed Modelling System (HAMS)<sup>1</sup>, we are able to understand that a significant amount of transboundary (air emission sources outside of Hamilton) emissions contribute to local airshed pollution concentrations. For example, HAMS models that approximately 90% of PM<sub>2.5</sub> concentrations come from transboundary sources. Local industrial, on-road and off-road transportation emissions continue to contribute to localized air pollution and downwind airsheds as well.

It is important that Hamilton continues to reduce local sources of emissions (including industrial, transportation, and off-road sources), not only to improve local air quality, but also to be a good neighbour to reduce downwind transboundary emissions to other municipalities.

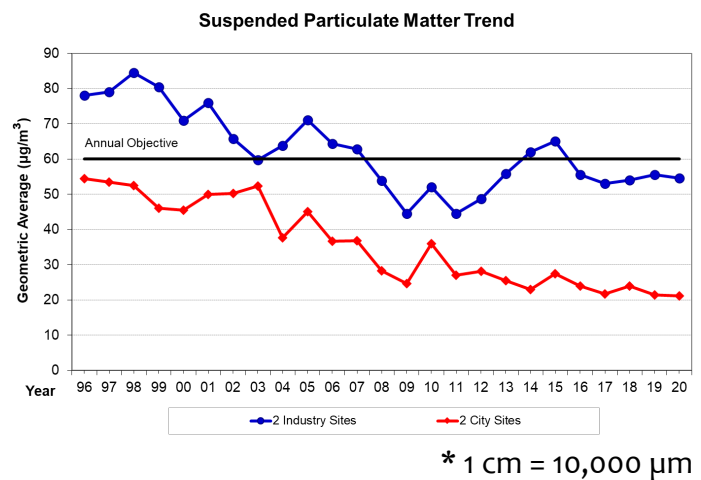
*Clean Air Hamilton would like to sincerely thank the Ministry of Conservation, Environment, and Parks (Hamilton Regional Office) for their support in providing air quality trends data.*



## Particulate Material: Total Suspended Particulate (TSP)

Total suspended particulate (TSP) includes all particulate material with diameters less than about 45 micrometers ( $\mu\text{m}^*$ ). A substantial portion of TSP is composed of road dust, soil particles and emissions from industrial activities and transportation sources.

TSP averages have reduced at municipal and industrial sites since 1996. The 2020 emissions at industrial sites are below the annual objective (AO). The AO is the desired concentration established by the MECP as documented in the Ontario Ambient Air Quality Criteria (AAQC).



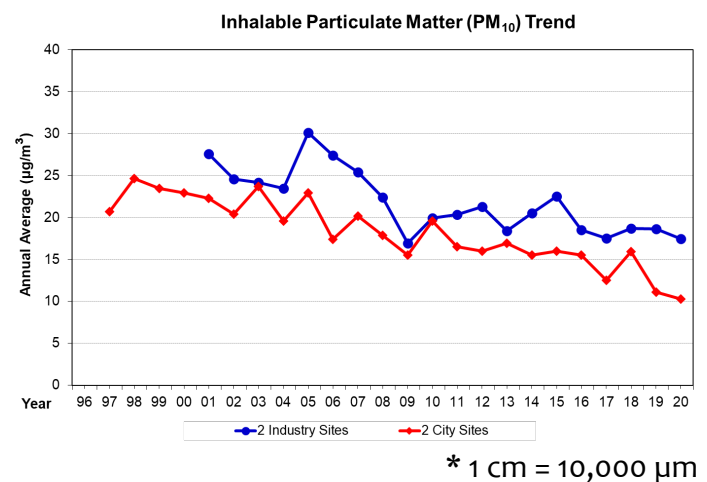
Included in the TSP category are inhalable particulates (PM<sub>10</sub>) and respirable particulates (PM<sub>2.5</sub>).

## Particulate Material: Inhalable Particulate Matter (PM<sub>10</sub>)

Inhalable particulate matter (PM<sub>10</sub>) has a diameter of 10  $\mu\text{m}^*$  or less. PM<sub>10</sub> makes up 40-50% of TSP in Hamilton and has been linked to respiratory, cardiovascular and other health impacts in humans.<sup>2</sup>

PM<sub>10</sub> is primarily derived from vehicle exhaust emissions, industrial stack and fugitive dusts (non-stack), and the finer fraction of re-entrained road dust.

PM<sub>10</sub> at City and Industry sites has decreased over the past two decades. This is likely a combination of better performance of vehicle



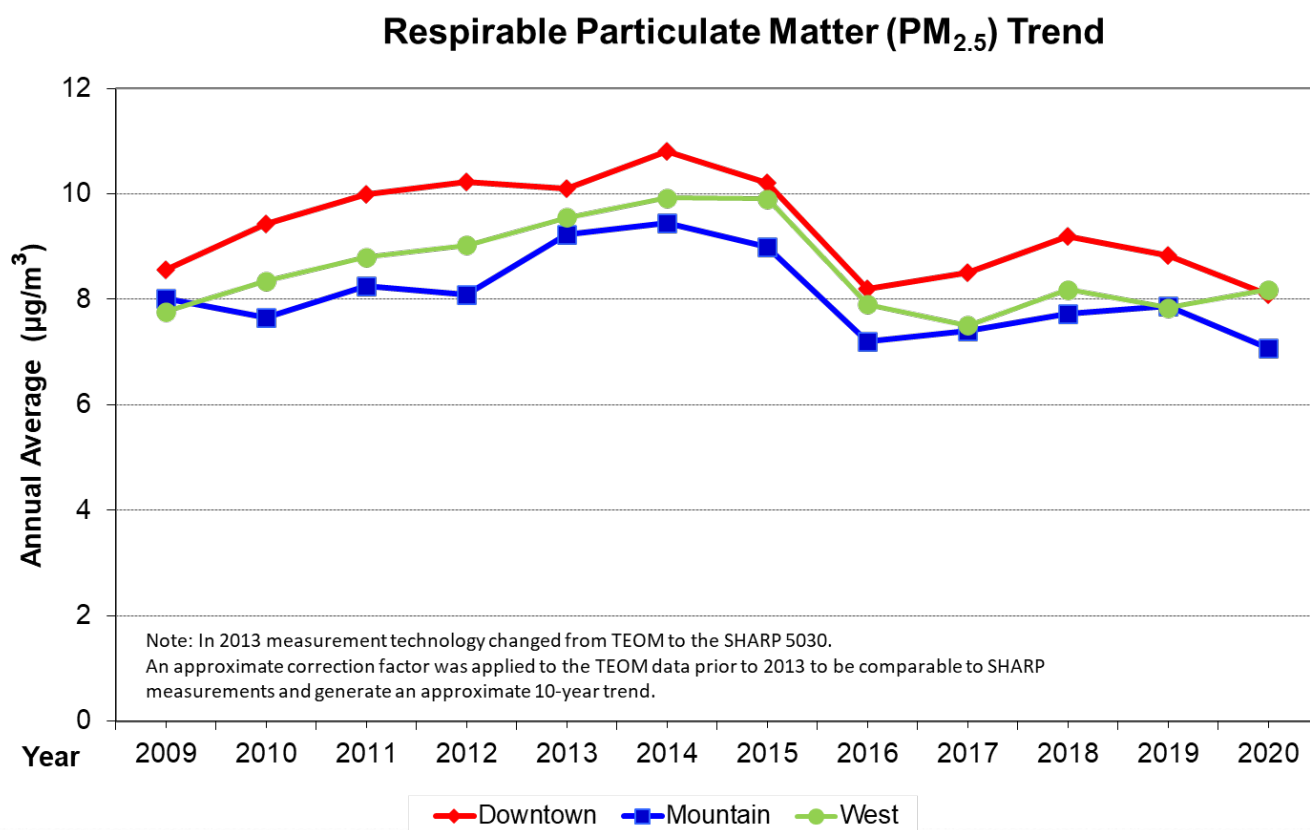
fleets, improved process emissions, increased management of dust track-out by industries, and the use of better street sweepers and street sweeping practices by the city. From the Hamilton Airshed Modeling System (HAMS)<sup>1</sup>, transboundary PM<sub>10</sub> levels are primarily from transportation related emissions, and they amount to over 90% of the total PM<sub>10</sub> emissions.

## Particulate Material: Respirable Particulate Matter (PM<sub>2.5</sub>)

The Ontario government started measuring PM<sub>2.5</sub> across Ontario in 1999. PM<sub>2.5</sub> makes up about 60% of PM<sub>10</sub> and in most cities is derived from residential and transportation sectors. In Hamilton, there would also be some industrial contributions. Another significant portion of PM<sub>2.5</sub> is regionally generated emissions that can travel hundreds of kilometers via wind from where they originated. These transboundary flows play a significant role in Ontario’s air quality and according to HAMS<sup>1</sup>, transboundary emissions in Hamilton for PM<sub>2.5</sub> amounted to 91%.

Exposure to fine particulate matter has been associated with hospital admissions and several serious health effects, including premature death<sup>3</sup>.

The apparent increase in 2013 is not reflective of a change in air quality but is a result of change in monitoring to a more sophisticated and sensitive PM<sub>2.5</sub> monitoring technology. The trend for PM<sub>2.5</sub> since 2016 appears to be relatively constant, with no significant increases or decreases. The Mountain, Downtown, and West remain below the Annual Canadian Ambient Air Quality Standard (CAAQS). CAAQS became more stringent in 2020 (decreasing from 10.0 µg/m<sup>3</sup> to 8.8 µg/m<sup>3</sup>).





## Ground Level Ozone (O<sub>3</sub>)

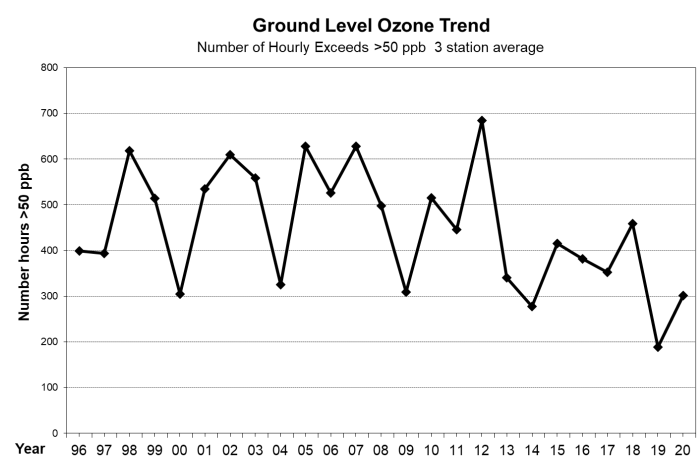
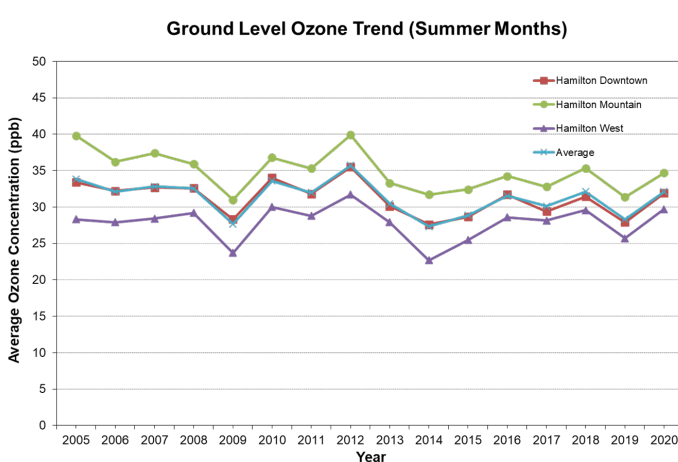
Ground-level ozone is a colourless, odourless gas not emitted directly into the atmosphere. It is a result of photochemical reactions between oxides of Nitrogen (NO<sub>x</sub>) and Volatile Organic Compounds (VOCs) in the presence of sunlight and is a major component of smog<sup>2</sup>. This is why O<sub>3</sub> concentrations are higher during summer months, generally from May to September.

Major sources of O<sub>3</sub> include (but are not limited to):

- coal-fired power plants
- vehicles
- urban activities

The trend in O<sub>3</sub> shows that concentrations have been highly variable in the past 20+ years and showed a marked increase in 2020 for almost all seven cities (see page 21). O<sub>3</sub> is a main contributor for Hamilton’s Special Air Health Advisories (SAHA) and Special Air Quality Statements (SAQS), and unlike other pollutants, the majority of O<sub>3</sub> comes from precursors emitted by sources upwind of Hamilton such as the Midwest Ohio Valley region. Sources from Hamilton contributing to O<sub>3</sub> pollution will affect areas downwind of Hamilton which makes lowering O<sub>3</sub> very important.

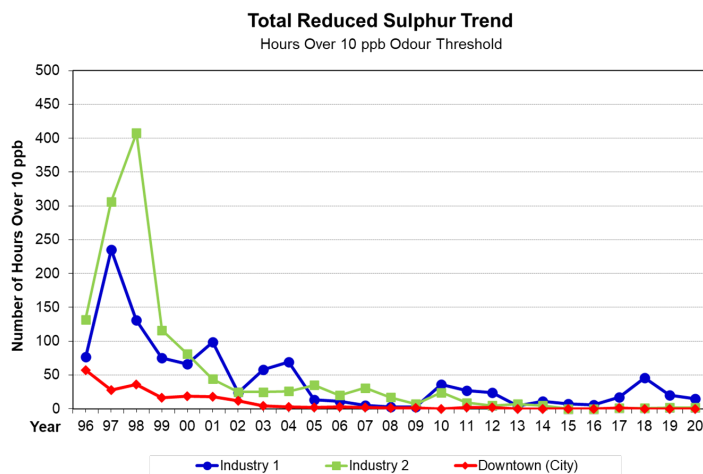
The number of hourly exceedances greater than 50 ppb increased in 2020 in comparison to 2019. The Government of Ontario has been dedicated to lowering O<sub>3</sub> precursor emissions by eliminating all coal fired power plants in Ontario.





## Total Reduced Sulphur (TRS)

Total Reduced Sulphur (TRS) is a measure of the volatile, sulphur-containing compounds that are the basis of many of the odour complaints related to steel mill operations. TRS compounds are not normally considered a health hazard. An odour threshold has been set at 10 parts per billion (ppb) TRS because at this level about one-half of any group of people can detect an odour similar to the smell of rotten eggs.

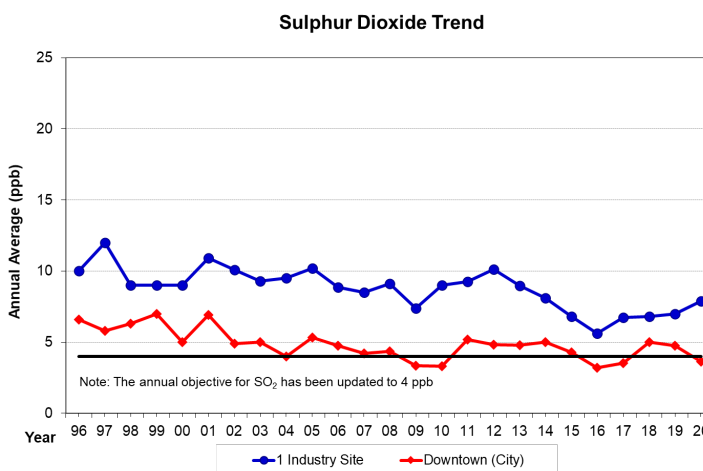


The number of hours per year in which measurements exceed 10 ppb have been reduced by over 90% since the mid-1990s. This is due to significant changes in the management and operation of the coke ovens, blast furnaces, and slag quenching operations associated with steel mill operations.

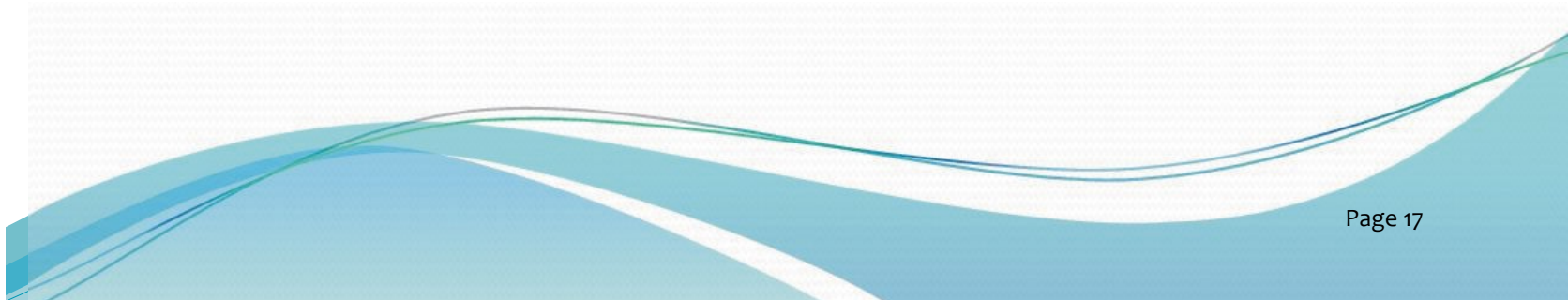
## Sulphur Dioxide (SO<sub>2</sub>)

Sulphur Dioxide (SO<sub>2</sub>), a by-product of industrial activity, is not only a respiratory irritant but is also converted in the atmosphere over several hours to sulphuric acid (H<sub>2</sub>SO<sub>4</sub>), which is then converted to sulphate particles. These particles are acidic in nature and tend to cause lung irritation<sup>4</sup>.

Significant reductions in air levels of SO<sub>2</sub> were made in the 1970s and 1980s. There has been a gradual decline in air levels of SO<sub>2</sub> since 1998. However, concentrations since 2016 have shown a slight increase for Industrial Site 1.



Transboundary emissions represent about 69% of the annual contribution to SO<sub>2</sub> levels within Hamilton of which 97% are from industrial sources<sup>1</sup>.

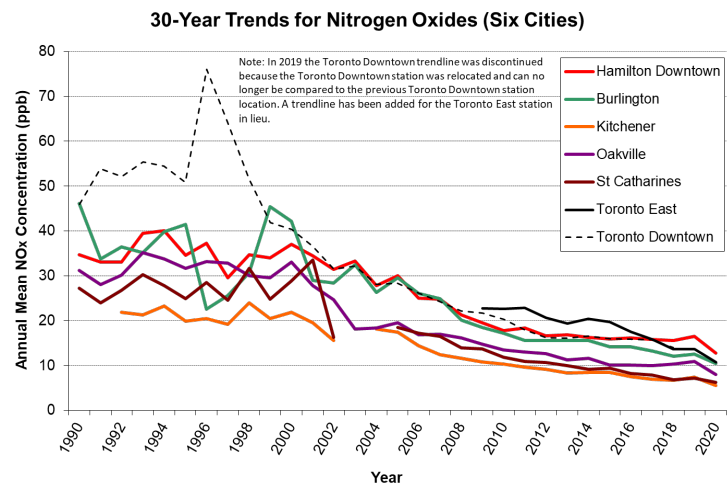


## Nitrogen Oxides (NOx)

Nitrogen Oxides (NOx) are the collective term and combined total of Nitrogen Monoxide (NO) and Nitrogen Dioxide (NO<sub>2</sub>). NO and NO<sub>2</sub> are routinely measured and their sum reported as NOx to reflect the presence of both species in urban areas.

This chart displays the steadily decreasing trend of NOx in six cities in Ontario, including Hamilton. Since the 1990s downtown Toronto has seen reductions in NOx levels of approximately 60%. Hamilton's NOx levels have decreased by approximately 46% since 1990.

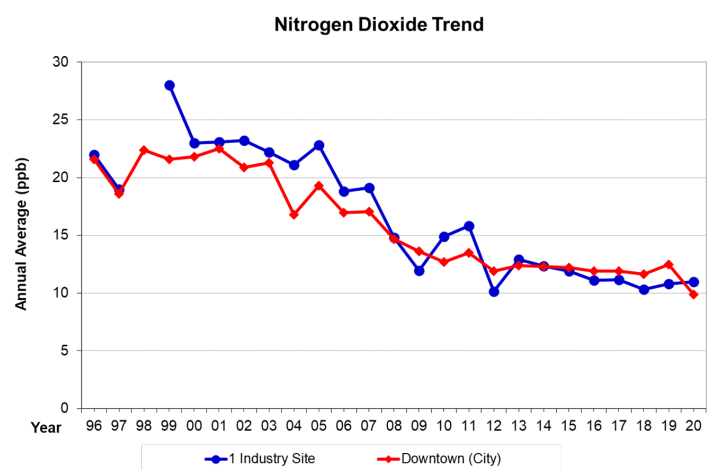
Overall, the decrease in NOx levels is a reflection of improvements in emission performance of the vehicle fleets in Ontario over the past decade as well as industrial process improvements.



## Nitrogen Dioxide (NO<sub>2</sub>)

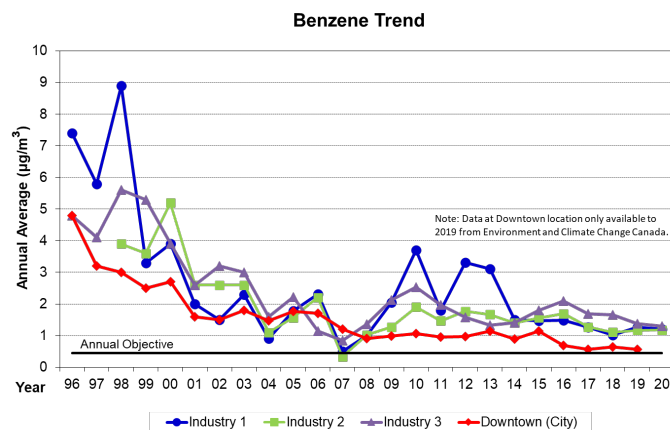
NO<sub>2</sub> is formed in the atmosphere from NO which is produced during combustion of fuels (i.e. gasoline, diesel, coal, wood, oil and natural gas). The leading sectors producing these emissions are transportation and industry. The level of vehicle use across Hamilton has increased slightly during the past decade, however overall NO<sub>2</sub> levels have decreased most likely due to improved engine technologies.

Based on HAMS<sup>1</sup>, local emissions are highest for on-road transport at 34% and transboundary emissions contribute to 44% of NO<sub>2</sub> sources in Hamilton.



## Benzene

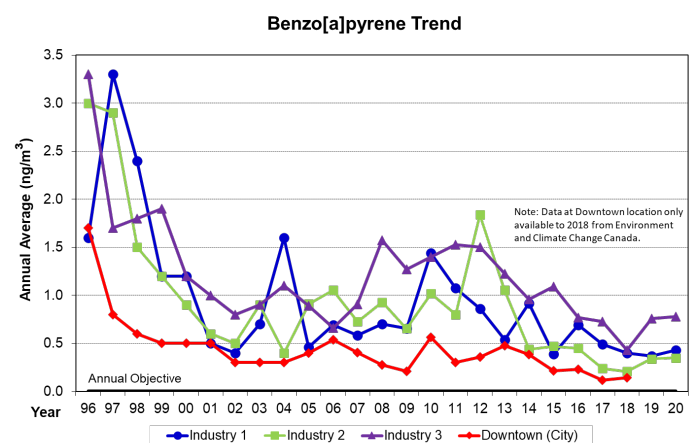
Benzene is a carcinogenic (cancer causing) volatile organic compound (VOC) that is emitted from some operations within the steel industry, specifically coke ovens and coke oven by-product plant operations. Gasoline can also be up to 5% benzene. Vapours containing benzene may be released during pumping at gasoline stations.



Air levels of benzene have been reduced dramatically since the 1990s, due to significant upgrading of coking plant operations, improved operating procedures, and improved control of release of benzene vapours from the coke by-products. Transboundary benzene levels amount to 70% (HAMS<sup>1</sup>) and more work remains to be done to achieve the stringent Annual Objective and reduce exposures to benzene from all sources.

## Benzo[a]pyrene

Benzo[a]pyrene (BaP) is also a carcinogen. BaP is a member of a larger class of chemical compounds called polycyclic aromatic hydrocarbons (PAHs), which are emitted when carbon-based fuels such as coke, oil, wood, coal and diesel fuel are burned. BaP generating activities include coke oven operations within the steel industry, incomplete combustion producing smoke such as vehicle traffic, burning of refuse, cooking, tobacco smoking, and wood burning.



There have been significant decreases in BaP levels since the late 1990s and further decreases since 2013. Source apportionment for BaP from HAMS<sup>1</sup> shows that industrial sources amount to 47% emissions, while transboundary emissions contribute to 29% of BaP emissions in the City of Hamilton.

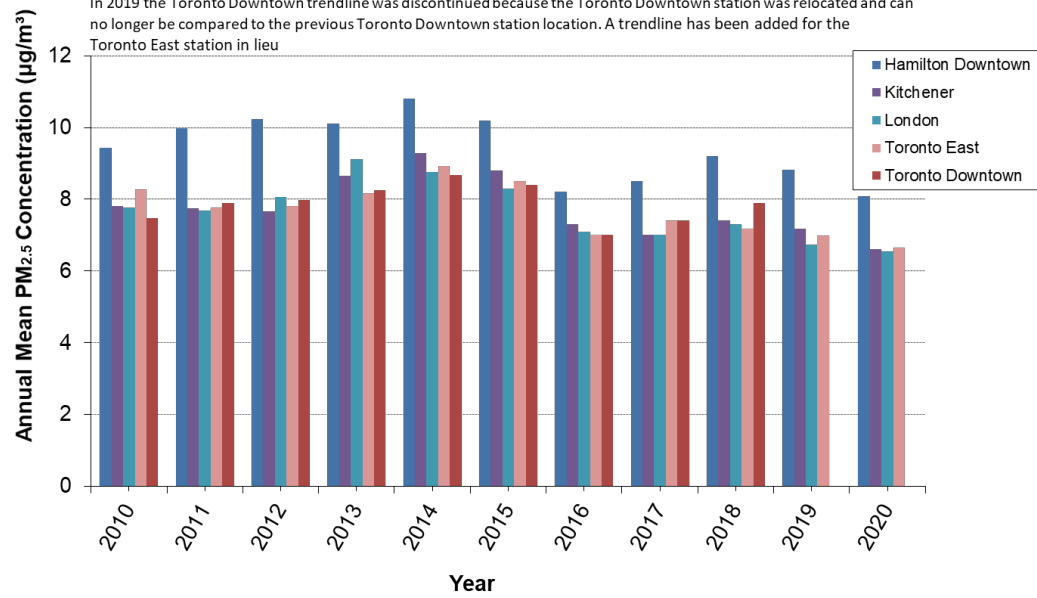
Please note that BaP concentrations for the downtown Hamilton monitoring station for 2019 and 2020 were not available from Environment and Climate Change Canada.

# Multi-City Air Quality Comparisons

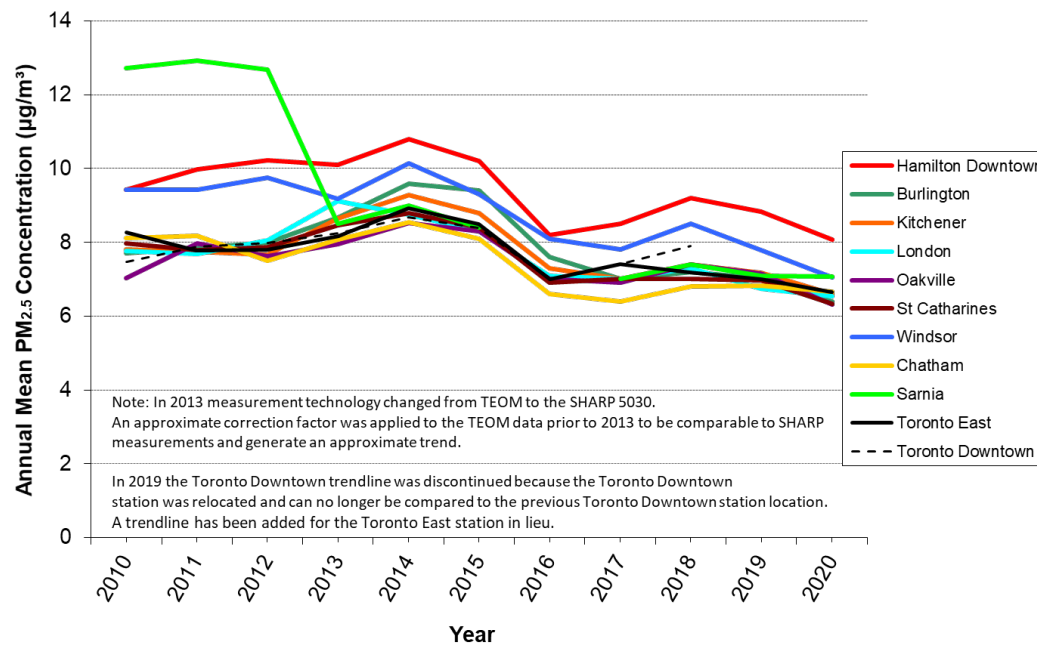
## Particulate Material: Respirable Particulate Matter (PM<sub>2.5</sub>)

### 10-Year Trends for PM<sub>2.5</sub> (Four Cities)

Note: In 2013 measurement technology changed from TEOM to the SHARP 5030. An approximate correction factor was applied to the TEOM data prior to 2013 to be comparable to SHARP measurements and generate an approximate trend.  
In 2019 the Toronto Downtown trendline was discontinued because the Toronto Downtown station was relocated and can no longer be compared to the previous Toronto Downtown station location. A trendline has been added for the Toronto East station in lieu.

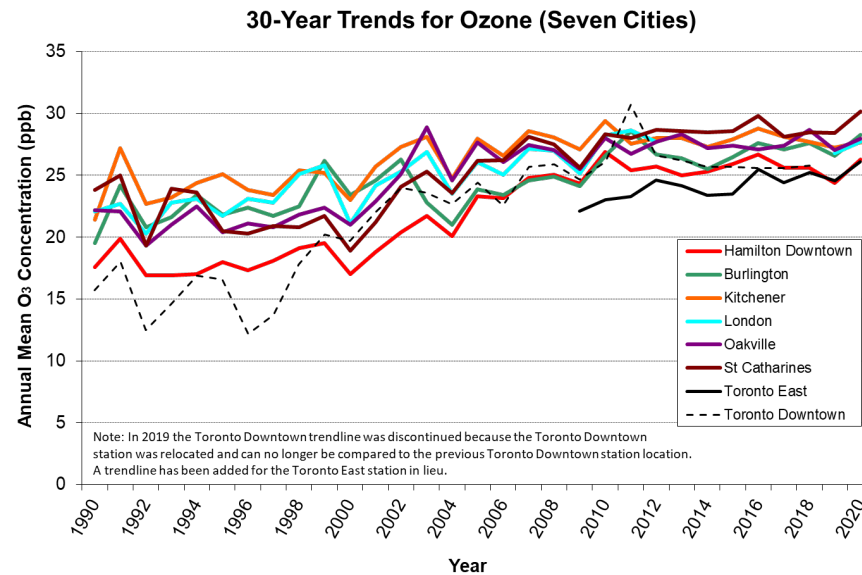


### 10-Year Trends for PM<sub>2.5</sub> (Ten Cities)



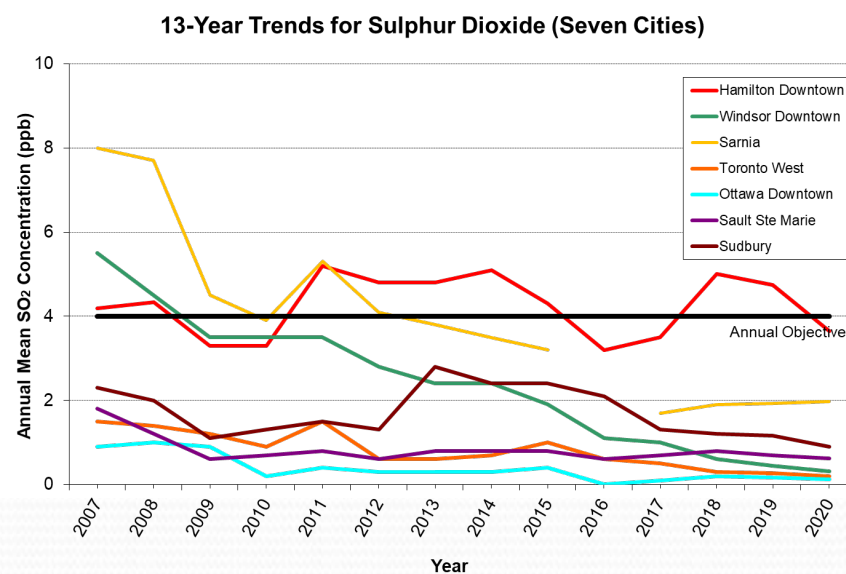
## Ozone (O<sub>3</sub>)

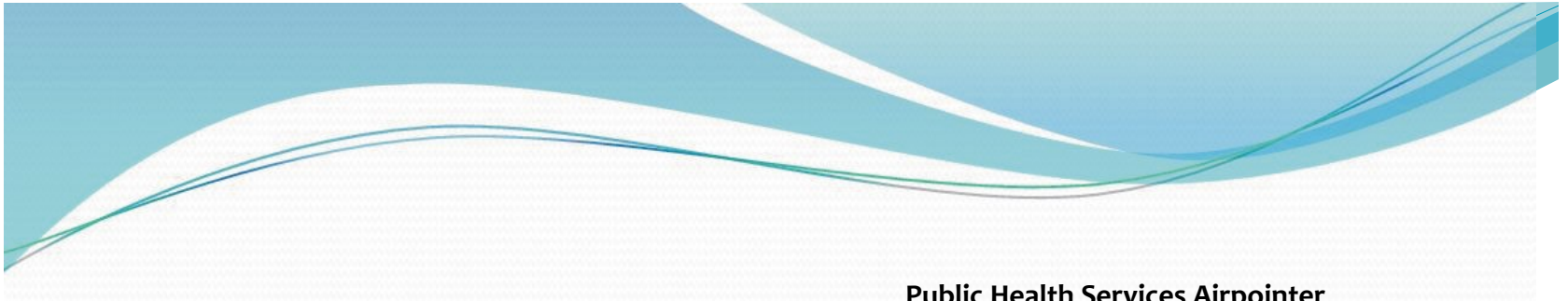
Hamilton's 30-year ozone trend is comparable to many other municipalities. Recent 2020 concentrations show Hamilton having one of the lowest concentrations of O<sub>3</sub>. Air pollution from Hamilton can cause increased O<sub>3</sub> concentrations downwind and so reducing air pollutants such as Nitrogen Oxides (NO<sub>x</sub>) and Volatile Organic Compounds (VOCs) is very important.



## Sulphur Dioxide (SO<sub>2</sub>)

While Sulphur Dioxide (SO<sub>2</sub>) concentrations in Hamilton are achieving the Annual Objective of 4 parts per billion (ppb), this is much higher compared to other municipalities. HAMS Sub-Regional Analysis<sup>1</sup> predicts higher levels for SO<sub>2</sub> concentration in the industrial core and West-lower areas of Hamilton from industrial and non-road sources.





### Public Health Services Airpointer

## Acknowledgements

In 2020, the City of Hamilton provided financial and in-kind support to Clean Air Hamilton and its activities. Descriptions of some of the programs supported by Clean Air Hamilton can be found on pages 5 - 8 in this report.

This annual funding is leveraged significantly in two ways: first, Clean Air Hamilton uses these funds in partnership with funds provided by other agencies and institutions to develop programs related to air quality; second, since all of the members of Clean Air Hamilton donate their time and expertise, there is a significant amount of in-kind support provided. It is estimated that Clean Air Hamilton's partners provide well over \$200,000 of in-kind support.

Bruce Newbold, Ph.D.  
Chair, Clean Air Hamilton



For more information contact Public Health Services (905) 546-2424 ext. 5288



**Hamilton Air Monitoring Network  
Beach Strip Station 29102**

<sup>1</sup>Golder Associates. 2018, February. "Hamilton Airshed Monitoring System Results". November 1, 2021.

<sup>2</sup>Ministry of the Environment, Conservation and Parks. 2010. "Ground Level Ozone". September 19, 2021. <<http://www.airqualityontario.com/science/pollutants/ozone.php>>.

<sup>3</sup>Ministry of the Environment, Conservation and Parks. 2019. "Air quality health index and air quality alerts". September 19, 2021. <<https://www.ontario.ca/document/air-quality-ontario-2016-report/air-quality-health-index-and-air-quality-alerts>>.

<sup>4</sup>Ministry of the Environment, Conservation and Parks. 2010. "Sulphur Dioxide (SO<sub>2</sub>)". September 19, 2021. <<http://www.airqualityontario.com/science/pollutants/sulphur.php>>.

<sup>5</sup>SENEC Consultants Limited. "Health Impacts Exposure to Outdoor Air Pollution in Hamilton, Ontario". February 2012. Final Report: Page 19. September 19, 2021. <<https://cleanairhamilton.ca/wp-content/uploads/2017/05/2011-Clean-Air-Hamilton-Health-Impacts-FINAL-1-1.pdf>>.

## Air Quality - Additional Resources

To learn more about Clean Air Hamilton and our work visit [www.cleanairhamilton.ca](http://www.cleanairhamilton.ca).  
For annual air quality trends provided by the Ministry of the Environment, Conservation and Parks, please see pages 13 to 21.

### Air Quality and Health

To learn about how to protect your health visit:  
[www.airhealth.ca](http://www.airhealth.ca)

To learn about Hamilton Public Health Services and actions on air quality visit:  
<http://preview.hamilton.ca/public-health/health-topics/air-quality-pollution-smog>

### Government Actions on Air Quality

To learn about the Province of Ontario's actions on air quality visit: [www.airqualityontario.com/](http://www.airqualityontario.com/)

To learn about the Government of Canada's actions on air quality visit: <http://www.ec.gc.ca/Air/default.asp?lang=En&n=14F71451-1>

### Air Quality Monitoring

For a detailed model of hourly concentrations for a variety of pollutants across Hamilton visit:  
<http://www.hamiltonaqhi.com>

To check our air pollution levels in Hamilton and Ministry run air monitors visit:  
<http://www.airqualityontario.com/>

To check out the Hamilton Air Monitoring Network visit: <http://www.hamnair.ca/>

To check out Hamilton Air Quality Health Index website visit: <http://www.hamiltonaqhi.com>





**Who we are:**

**"Clean Air Hamilton is an innovative, multi-stakeholder agent of change dedicated to improving air quality in our community. We are committed to improving the health and quality of life of citizens through communication and promoting realistic, science-based decision-making and sustainable practices."**

## 2020 Members

Bruce Newbold, *Chair -McMaster University*

ArcelorMittal Dofasco

Citizens

City of Hamilton - *Community Initiatives\**

City of Hamilton Planning - *Community Planning*

City of Hamilton Public Works - *Office of Energy Initiatives*

City of Hamilton Public Works - *Transportation Demand Management\**

Corr Research

Environment & Climate Change Canada\*

Environment Hamilton

Green Venture

Hamilton Conservation Authority

Hamilton Industrial Environmental Association

Hamilton Port Authority

Hamilton Public Health Services

Health Canada\*

McKibbon Wakefield Inc.

McMaster Institute for Health Equity

Ministry of Environment Conservation and Parks (MECP)  
- *Hamilton Regional Office*

Mohawk College\*

Stelco

*\* indicates "observing member"*



This report and the work of our members is dedicated to the memory of Clean Air Hamilton member

Peter Chernets (1949—2019)

## Clean Air Hamilton, December 2020

Production: Public Health Services  
City of Hamilton

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