



Clean Air Hamilton


2022 and 2023 Air Quality Progress Report

September 2025



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Message from the Chair

We are pleased to provide the Clean Air Hamilton Annual report for 2022 and 2023, which provides annual air quality data and trends along with Clean Air Hamilton's ongoing work to improve air quality in our community.

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

Clean Air Hamilton remained committed to improving Hamilton's air quality in 2022 and 2023. Clean Air Hamilton is committed to improving the health and quality of life of citizens through communication, promoting realistic, science-based decision-making and sustainable practices. Our monthly meetings remained on-line in 2022 due to COVID-19. And we had strong participation among our partners. In June 2022, we hosted the biannual *Upwind Downwind Conference*, with over 60 in-person attendees and an additional 15 on-line participants. Speakers included Yuill Herbert (Sustainability Solutions Group), John Lundrigan (ArcelorMittal Dofasco), Dinara Millington (Transition Accelerator), Cheryll Case (CP Planning), Brian Asher (Environment and Climate Change Canada) and Bern Grush (Urban Robotics Foundation). While we continued to see normalization post-pandemic, air quality data showed signs of a pickup in industrial activity despite long-term improvements in Hamilton's air quality. Nevertheless, challenges remain, with carcinogenic pollutants such as benzene and benzo[a]pyrene trending in the wrong direction. At the same time, we are excited about decarbonization initiatives within the City and Clean Air Hamilton's partners and look forward to the benefits of cleaner air in the future. Clean Air Hamilton will continue to work with our partners to understand these trends and work to address them. Together, we can ensure healthier air for all.

Finally, we would like to note that Dr. Bruce Newbold left the Chair position after serving six years in the role. He has been replaced with Barry Duffey from January 2024 to January 2025. We would like to thank Dr. Newbold for his advocacy and many contributions to the city of Hamilton during his tenure.



Barry Duffey
2023-2024 Chair, Clean Air



Chair Appointment

In Fall 2023, Barry Duffey was elected as chair of Clean Air Hamilton following the end of Bruce Newbold's second term. The vote was conducted by the voting members of Clean Air Hamilton. Barry Duffey began his term as Clean Air Hamilton Chair in January 2024, until January 2025. A new chair, Zobia Javed, was elected in February 2025 and remains the chair of Clean Air Hamilton today.

Strategic Activities

Clean Air Hamilton is dedicated to improving air quality across the City of Hamilton. This is 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)¹, an airshed model that provides information on air pollution sources and contributions in Hamilton. 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:

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:

Promote compliance 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:

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.

¹ Golder Associates. 2018, February. "Hamilton Airshed Monitoring System Results". November 1, 2021



Air Monitoring:

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_{2.5} Mitigation:

Lower concentrations of Respirable Particulate Matter (PM_{2.5}) 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.

Carcinogenic Emissions Mitigation:

Clean Air Hamilton notes that emissions of carcinogenic compounds such as benzene and benzo[a]pyrene have recently been trending in the wrong direction. We will be making a priority of looking for opportunities to mitigate this in the coming years.

Members & Meeting Dates

In 2022 and 2023, Clean Air Hamilton meetings were held in-person at Hamilton City Hall on the second Monday of each month. Members also had the option of joining virtually through Microsoft Teams.

2022 Meeting Dates

- January 10, 2022
- February 14, 2022
- March 14, 2022
- April 11, 2022
- May 9, 2022
- July 11, 2022
- August 8, 2022
- September 12, 2022
- October 3, 2022
- November 14, 2022
- December 12, 2022

2023 Meeting Dates

- January 9, 2023
- February 13, 2023
- March 13, 2023
- April 17, 2023
- May 8, 2023
- June 12, 2023
- September 11, 2023
- October 2, 2023
- November 13, 2023



Equity, Diversity, and Inclusion Policy

Clean Air Hamilton is committed to the principles of equity, diversity, and inclusion (EDI) in all aspects of our community organization and partnerships. We believe we are stronger when we not only celebrate our many differences, values, and voices, but include them in practice. This means that our members actively work to understand and remove barriers to equity and inclusion, be they systematic, physical, or otherwise. In addition, we are committed to ongoing learning and development in the areas of EDI so that we can apply an “equity lens” in all areas of our activities. Further, Clean Air Hamilton adheres to the Ontario Human Rights Code and the Accessibility for Ontarians with Disabilities Act at all times.

In 2021, Clean Air Hamilton developed the Equity, Diversity, and Inclusion Policy. The purpose of this policy is to outline our principles and expectations when it comes to EDI. Clean Air Hamilton continued to apply this policy throughout 2022 and 2023. At Clean Air Hamilton we strive to ensure that all people are treated equally and to be a culturally competent community organization. We value diversity and will continue to actively work to build a diverse membership which is reflective of our community and inclusive of persons of various groups in terms of age, sex, race, ethnicity, physical and intellectual ability, religion, sexual orientation, educational background, and expertise.

We believe in equal treatment and opportunity for all of our members. We will ensure the right to equal treatment is upheld in participation in meetings and activities, opportunities for advocacy, enabling contributions and ideas to be fully heard and considered and assessment of grant applications. Discrimination is not tolerated.

Every person who participates at Clean Air Hamilton has a responsibility to treat others with dignity and respect and make sure all people feel included and have access to the same opportunities to contribute. We actively strive to create an environment where all persons are able to share their ideas, beliefs, and skills.



28 Years of Clean Air Hamilton

Accomplishments

Clean Air Hamilton (CAH) arose in 1997 as an outcome of the Hamilton Air Quality Initiative (HAQI).


The reason for HAQI/CAH was that Hamilton's air quality poses unique challenges due to its topography and concentration of industrial activities and major transportation corridors.

After consulting with researchers from McMaster University, in 1993 officials from the Ontario Ministry of the Environment (the Ministry) met with Region of Hamilton Wentworth officials to discuss formation of the Hamilton Air Quality Initiative.

HAQI was a community air quality improvement outreach. It became a template for other air quality initiatives and was awarded the Dubai/U.N. Habitat award for "Best Practice Worldwide for City Scale Air Quality Improvement". HAQI, now Clean Air Hamilton, links air quality with public health outcomes.


Here are selected highlights:

- The community wide approach has been fundamental to improving air quality on a city scale. This has been recognized internationally.
- Foundational reports prepared by HAQI before Clean Air Hamilton's creation and updated subsequently in 2002 and 2009 (Senes Consultants Limited) link specific Hamilton air contaminants with real public health outcomes.
- Until 1996/7, the Province of Ontario's air quality monitoring system enabled public health researchers to map air quality throughout Hamilton. This mapping helped correlate neighborhood health outcomes with ambient air quality. Provincial funding cutbacks in 1996 resulted in the monitoring system's reduction and partial transfer to industry in the late 90's.
- In December 2001, the Ontario Ministry of the Environment approached Clean Air Hamilton to work together with local industry to facilitate the formation of a new air monitoring network. Industries were asked to collaborate on the operation of as many of the former Ministry stations as possible. Data from the remaining operational Ministry's Air Quality Index (AQI) monitoring sites would be shared with that of the new system for reporting purposes. Clean Air Hamilton chaired a steering committee to facilitate this transition.
- On May 1, 2003, the new system, the Hamilton Air Monitoring Network (HAMN) became operational. Operations were financially supported by local industries and



administered by a contractor and administrator, with quarterly audits of equipment and reporting procedures conducted by the Ministry to ensure robust data quality. With these continuing sources of data, the Ministry continued to provide yearly monitoring analysis from the new system and three existing AQI stations.

- In 2003, Hamilton's transportation master plan included analysis of transportation emissions. The transportation sector was identified as the leading source of nitrogen oxides. This knowledge broadened Clean Air Hamilton's attention to include the transportation sector. Nitrogen dioxide is a pollutant in its own right as well as a precursor of ground level ozone, affecting neighbourhoods throughout the City, particularly active transportation users (e.g. cyclists, pedestrians).
- In 2004/5, with the Ministry's assistance, Clean Air Hamilton began mobile air quality monitoring to help fill the gaps in the stationary monitoring system. Initial results showed that respirable particulate matter (PM_{2.5}) and nitrogen oxide levels were 20 to 50 times higher on arterial roads. This reinforced the need to pay attention to transportation emissions, particularly where road dust is resuspended and together with local fugitive (i.e. non-stack) emissions. Mobile monitoring data provided a much more granular urban air quality picture than data provided solely from the stationary HAMN and AQI monitoring network.
- In 2006, greater attention was placed on fugitive emissions, including road dust. Fugitive emissions are significant sources of inhalable and respirable particulate, both of which present significant health concerns. The worst dust was generated on industrial streets in the north end of Hamilton. This led to a fugitive emissions workshop for all stakeholders in 2006. The work culminated with the release of construction and demolition dust management guidelines.
- In 2013, Clean Air Hamilton produced a Clean Air Action Plan of 10 recommended actions. The first action was to produce an air quality computerized model of Hamilton's air quality. That model could then be used to guide land use and transportation planning throughout the City of Hamilton. Industry and the City together with Ministry assistance hired a consultant to develop the model. Three years later the model was released to the City of Hamilton. It continues to be used to this day to assist in City planning and design.
- Annual reports were prepared and submitted to the City of Hamilton for each year except 2013. These reports summarized Clean Air Hamilton's activities and analyzed yearly results of Hamilton's air quality monitoring. These contaminant summaries compared each year's results with past performance. The trend results guided subsequent actions. Hamilton's air quality was also compared with that of other Ontario cities. The reports became important sources of public information. In the



years leading up to 2013, Clean Air Hamilton's website was often visited in excess of 1500 times a week for Clean Air Hamilton research.

- In 2010 and 2011, Clean Air Hamilton monitored air quality in 11 urban neighborhoods. Using Senes 2009 analysis and assumptions, monitored data was used to generate increased mortality risk due to particulate matter and oxides of nitrogen. Five of the 11 neighborhoods were shown to have above average mortality risk while highway data demonstrated that driver and passenger exposure is nearly three times the neighborhood average.
- As an additional outreach, Clean Air Hamilton has supported a grant program for local air quality initiatives. Through a grant process, organizations can apply for funding through the City of Hamilton to support education and research projects on an annual basis.



Clean Air Hamilton 2022 and 2023 Projects

Clean Air Hamilton is an innovative, multi-stakeholder agent of change dedicated to improving air quality in our community. In 2022, Hamilton Public Health Services provided \$18,000 to fund projects resulting in air quality improvement and awareness. In 2023, Hamilton Public Health services provided \$11,000 for similar projects. 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 2022 and 2023 funded projects.

Advocacy Letters

During the 2022 provincial election, Clean Air Hamilton reached out to candidates and newly elected members of provincial parliament, as well as the Premier of Ontario, with advocacy letters identifying actions to improve air quality in Hamilton. The advocacy letters focused on the following priority items related to air quality:

1. Invest in the expansion of air quality monitoring for contaminants of concern in areas of high risk across the City of Hamilton.
2. Direct the Ministry of the Environment, Conservation, and Parks (MECP) to consult with Clean Air Hamilton to create a special air quality subcommittee to complete work committed to under the Air Zone Management Framework, leveraging local organizations and expertise in Hamilton, Ontario.
3. Accelerate, engage, and provide updates to stakeholders on a regular basis related to work on improving the province's Local Air Quality Regulation (O.Reg. 419/05), Environmental Compliance Approval processes and Cumulative Effects (combined effects from multiple sources of pollution) to better protect population health.

Trees Please

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

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

The goal of this project is to engage residents in hands-on activities and learning opportunities that integrate local issues around air quality with the benefits of urban trees and gardens.

When air quality data is layered with tree health maps, strategic tree planting areas can be determined based on those areas with high particulate matter 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 giveaways and by partnering with the City of Hamilton's Forestry and Horticulture Division in a community tree planting event.

In 2022, the Trees Please project engaged around 200 Hamilton residents and planted 350+ native tree species in lower Hamilton. This included 57 trees strategically given to homeowners without cost. Part of the project work for 2022 also included Urban Air & Tree Walkabouts where participants are led on a walk with discussions on neighborhood air quality.



Some of the community volunteers at the September 22nd Windermere Basin Park tree planting event. Photo Courtesy of Environment Hamilton

Fresh Air for Kids

The Fresh Air for Kids (FAFK) program consists of four components: air quality education, air quality monitoring, creating an action campaign, and a wrap up celebration. During up to four visits to local schools from the project team, students are introduced to the science of air pollution and its health effects, and also learn about tool sand resources to measure air quality and turn their knowledge into action to make a difference in their community.

2022 FAFK program

The FAFK program had a successful 2021-2022 school year, with Green Venture and Corr Environmental delivering the program to 9 classes from grades two to six, totaling 214 students across four schools.

In 2022, FAFK was delivered in person at all four schools. The program included an educational presentation on air quality, a neighbourhood walkabout to monitor air quality with handheld monitors, an anti-idling campaign, and sharing of campaign results.

In the post-program survey, 68% of students reported that they or their family reduced car idling and 92% indicated that participating in FAFK increased their knowledge on how they can improve local air quality. All participating classes completed anti-idling education campaigns and brought the message to their broader school communities through posters, banners, videos, speeches, brochures, and messages to the school newsletters. Green Venture and Corr Environmental received positive reviews from students and school staff.

Students highlighted that the most important action they learned from the FAFK program was to stop vehicle idling.



Students at Templemead work on their Anti-Idling Campaign materials to bring the message to their community. Photo courtesy of Green Venture



Dr. Denis Corr taking questions from a group of St. David's students in a field. Photo Courtesy of Green Venture

2023 FAFK Program

The FAFK program was awarded funding by Clean Air Hamilton in 2023. The program was delivered by Corr Environmental to four schools, which included 326 students across grades two to seven. It should be noted that the project did not commence until early 2024.

The presentation and program were presented in-person by Dr. Denis Corr. The program consisted of air quality risk mapping of local school neighbourhoods for each of the schools and using these maps with students to determine the best and worst air quality routes to commute to school. The program also included a presentation educating students on air quality, as well as an anti-idling module and a neighbourhood walkabout with handheld air pollution monitors. The final component of the program included a questionnaire asking students to identify how they could improve air quality and how they could breathe less pollution.



Dr. Denis Corr with students on a neighbourhood air monitoring walk. Photo courtesy of Corr Environmental



Signs made as a part of students' anti-idling campaign. Photo courtesy of Corr Environmental



Mobile monitoring van used to map local air quality around participating schools. Photo courtesy of Corr Environmental.



Upwind Downwind Conference

The Upwind Downwind conference is a bi-annual two-day event hosted by Clean Air Hamilton and members of Clean Air Hamilton. Due to the COVID-19 pandemic, in-person conferences were shifted to webinars in 2020. In 2022, the Upwind Downwind conference resumed in a hybrid format with in-person and virtual attendees. The Conference was held on Thursday, June 16, 2022, at the David Braley Health Sciences Centre. The conference had more than 75 participants and was sponsored by the Hamilton Industrial Environmental Association (HIEA).

Presentations involved discussions on Canada's air quality management, decarbonization, innovations in industry, future transport and technology and best practices on land-use planning.

In the fall of 2023, the Upwind Downwind planning committee began planning for the 2024 Upwind Downwind conference.



UPWIND DOWNWIND CONFERENCE 2022

BUILDING HEALTHY, POST-CARBON CITIES

THURSDAY, JUNE 16 2022

Join us for a day full of presentations, panel discussions, and networking!



YUILL HERBERT
SSG



JOHN LUNDRIGAN
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DINARA MILLINGTON
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CHERYLL CASE
CP Planning



BRIAN ASHER
ECCC



BERN GRUSH
Urban Robotics Foundation

DETAILS



THURSDAY, JUNE 16, 2022

09.00 AM - 4:30 PM EDT



IN-PERSON:
DAVID BRALEY HEALTH SCIENCES
CENTRE, MCMASTER UNIVERSITY
100 MAIN STREET WEST, HAMILTON, ON, L8P 1H6

ONLINE:
VIRTUAL WEBINAR

WWW.CLEANAIRHAMILTON.CA/UPWIND-DOWNWIND-2022

The 2022 Upwind Downwind Conference Materials



Presentations at Monthly Meetings

In 2022 and 2023, Clean Air Hamilton continued as a knowledge-sharing platform for multiple stakeholders through monthly presentations on relevant air quality topics. Meeting minutes can be seen on the Clean Air Hamilton website. Below is a summary of the presentations made throughout 2022 and 2023:

2022

January 2022

Clean Air Hamilton and the Air Quality Task Force, Trevor Imhoff, Senior Project Manager, City of Hamilton

- Updates were shared on the Air Quality Task Force workplan. This included identifying what future actions should be prioritized, removed, or replaced.

February 2022

Draft Community Energy and Emissions Plan, Spencer Skidmore, Area Planning Manager, City of Hamilton

- The draft Community Energy and Emissions Plan (CEEP) document was shared with the group by Spencer Skidmore. This Plan was a part of the City of Hamilton's response to the 2019 climate change emergency declaration. The Plan was developed through community engagement, data collection, creating a baseline scenario, identifying actions, modelling future scenarios, developing the plan, and finalizing the plan. The final plan can be seen on the City of Hamilton's website.

March 2022

Air Quality and Micro-Climate Monitoring, Shiroom Ali, Ecosystem Informatics

- The Air Quality and Micro-Climate Monitoring was a project undertaken for the City of Hamilton by Ecosystem Informatics (ESI). The project measured carbon monoxide, sulphur dioxide, ozone, and nitrogen dioxide through localized data collection. Using AI-driven technology and analytics, the project provided real-time 10-minute data and insights. The project also included a dashboard demo, showing emissions levels over time and comparing these to Canadian Ambient Air Quality Standards.



April 2022

Extreme Heat Working Group, Andrea McDowell, Senior Project Manager, City of Hamilton

- The Extreme Heat Working Group is a part of the Climate Change Adaptation Planning Project. This was a pilot project being implemented in the community, in partnership with City Housing and Community Partners. The project included a research and literature review, survey, and workshops with pilot interventions

May 2022

Hamilton Air Sampling Project, Matthew Adams, University of Toronto

- Dr. Adams presented an overview of a project sampling air pollution across Hamilton in collaboration with the City of Hamilton, Environment Hamilton, and Health Canada. The primary questions this research aims to answer are “How does Air Pollution vary across Hamilton” and “Are socioeconomic variables correlated with pollution concentrations”.

July 2022

Hamilton Tree Equity Project, Annabella Aoshana, Green Venture

- Green Venture presented on a research project that worked towards an equitable Urban Forest Canopy. The project included completing tree inventory data, GIS mapping, and conducting engagement surveys and workshops to identify three to five pilot locations for tree planting events. The recommendations for tree planting locations were made to the City of Hamilton and City Housing Hamilton.

August 2022


Trees Please 2022 and Review of 2021, Ian Borsuk and Brittany Killingbeck, Environment Hamilton

- Environment Hamilton presented on the Trees Please program. The program used information gathered from air quality monitoring to identify areas where trees are required most. In 2021 and 2022, the project looked at areas with poor canopy cover and poor air quality. Community Tree Planting and the City of Hamilton collaborated on planting up to 1,000 trees given to the City.

October 2022

Climate Action Strategy, Trevor Imhoff, Senior Project Manager, City of Hamilton

- This presentation focused on the City of Hamilton's Climate Action Strategy. The strategy focuses on transformations in industry, buildings, transportation, energy, and



the natural environment. The final Climate Action Strategy can be seen on the City of Hamilton's website

November 2022

Environmental Justice in Vulnerable Communities: Exploring Partnership Opportunities, Ingrid Waldron, McMaster University

- This presentation provided an overview of the projects led by Dr. Waldron to address environmental injustices in Indigenous, Black, and other racialized and vulnerable communities. The presentation included an opportunity to connect on projects with members of Clean Air Hamilton.

December 2022

The Race to Zero, Shiroom Ali, Ecosystem Informatics

- ESI presented on air quality data collected through Hamilton on a number of projects. Both fixed and mobile monitors were used, monitoring sulphur dioxide, carbon monoxide, ozone, nitrogen dioxide, and respirable particulate matter (PM_{2.5}). The goal of the project was to create heat maps of locations where monitoring occurred over time, and to compare measurements to Canadian Ambient Air Quality Standards.

2023

January 2023


Carmeuse Low-Carbon Fuel Project, Chris Martin, Carmeuse

- Carmeuse and Stantec staff presented Carmeuse's plan to reduce emissions by using alternative low-carbon fuels at the Carmeuse Dundas facility. Switching to low-carbon fuels would decrease carbon dioxide and sulphur dioxide emissions. The proposed fuel would include non-recyclable packaging, paper by-product, non-recyclable rubber and plastic, and nylon tire fluff. The emission intensity of the proposed alternative low-carbon fuel is half of the petcoke currently used.

February 2023

Air Quality Monitoring Using Low-Cost Sensors in the City of Kitchener, Lucas Neil, Stantec

- Researchers at Wilfred Laurier University worked with Ausenco, an engineering consulting company, to establish a low-cost monitoring network in Kitchener, Ontario. The purpose of the study was to observe the state of air quality during drop off and pick-up times outside elementary schools, as children are at higher risk of being impacted by



air pollution. A secondary objective was to monitor the accuracy of the installed low-cost AQMesh sensors. The study found that the monitors are reasonably accurate for ozone and respirable particulate matter (PM_{2.5}).

March 2023

DeGroot School of Business and Ward 3: Community Mapping Project, Lauren Reny, Erin Oughtred, Jennifer Hong, Maeve Reid, Nathaniel Will, Virginia Purvis, McMaster University

- A student team from McMaster University presented their work on creating an interactive map that makes it simple and efficient for community members to access information about the businesses that operate in their area. In the future, this information will also include how these companies are contributing to air pollution.

Dundas & Greensville Against Burning Garbage, Steve Smillie, Citizen Group

- This presentation was made by a group of citizens in Hamilton who are concerned about the health risks associated with the burning of alternative low-carbon fuels by Carmeuse in Dundas. The committee was specifically concerned with an increase in dioxins and furans (known carcinogens), as well as contamination of water wells and food supply.

April 2023

Assessing Airborne Exposure using Novel Sampling and Measurement Techniques, Joseph Okeme, McMaster University

- Dr. Okeme presented a study with the research goal of improving how we measure and understand the contribution of the exposure to overall population health. The study includes different methods to measure external and internal exposomes.

May 2023

Air Pollution Health Literacy Among Active Commuters in Hamilton, ON, Reed Ciarloni, McMaster University

- Commuters may incur greater health risks due to increased exposure to air pollution. This study explored how commuters understand these health risks and if they engage in efforts to mitigate air pollution exposure. The study found that knowledge of air pollution health risks is a predictor of adopting self-protective behaviour. The study recommended mobilizing knowledge that equips and empowers commuters with accurate and tangible information to mitigate air pollution exposure.



Fresh Air For Kids 2022 Report, Green Venture

- Green Venture staff presented the program funded by Clean Air Hamilton in 2022. The program was delivered to 214 students across four schools in Hamilton in collaboration with Dr. Denis Corr. Multiple schools inquired about participating in the next year.

Overview of Ministry of the Environment, Conservation and Parks (MECP) Air Monitoring Data Review, Natalie Stacey, Abigail Amponsah, Tim Hung, Ontario MECP

- Ontario MECP staff presented an overview of the air monitoring data in Hamilton. The presentation summarized the Hamilton air monitoring network, the MECP's West Central Region technical support section data access and uses, publicly available data access and uses, and how the MECP is notified of and responds to exceedances.

June 2023

City of Hamilton Sustainable Mobility Update, Alison Carlyle, Sustainable Mobility Integration, City of Hamilton

- The City of Hamilton Transportation Planning team provided an update on sustainable mobility programs. This included community programs, the Complete Streets design manual, updates on the City's cycling network, the cargo e-bike pilot program, and school and workplace programs.

September 2023

Expansion of new particulate-detecting environmental sensors in Hamilton, Scott Weichenthal & Blake Laufer, McGill University

- Dr. Scott Weichenthal presented the IMAGINE algorithm and platform which measures traffic related air pollution, noise, temperature, and traffic counts/characterization. The presentation discussed IMAGINE platform's efficacy and examples from implementation.

October 2023

Air Quality Monitoring in the City of Hamilton, Matthew Adams, University of Toronto

- Dr. Adams provided an update to a study being completed at University of Toronto doing air quality monitoring in the City of Hamilton. The primary research questions include "How does air pollution vary across Hamilton?" and "Are socioeconomic variables correlated with pollution concentrations?". Sixty-seven sites were identified across the City of Hamilton with six pollutants being measured, as well as nineteen Polycyclic Aromatic Hydrocarbon compounds. The presentation also included preliminary results from the fieldwork.



Hamilton's Ambient Air Quality Trends 2022 and 2023

The City of Hamilton is a port city and industrial hub in Ontario. 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 2022 and 2023. It should be noted that Canada was affected by a record-setting series of wildfires in 2023. As wildfire smoke can travel great distances, the air quality in Hamilton was adversely affected by wildfires in other parts of Canada, and this was reflected in the pollution trends for 2023.

Through the completion of Hamilton's Airshed Modelling System (HAMS)², we are able to understand that a significant amount of transboundary emissions (air emission sources outside of Hamilton) contribute to local airshed pollution concentrations. For example, the HAMS models show that 91% of respirable particulate matter (PM_{2.5}) concentrations at the time of the modelling are a result of 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 neighbor to reduce downwind transboundary emissions to other municipalities in Ontario, as well as our neighbours in Quebec and the United States.

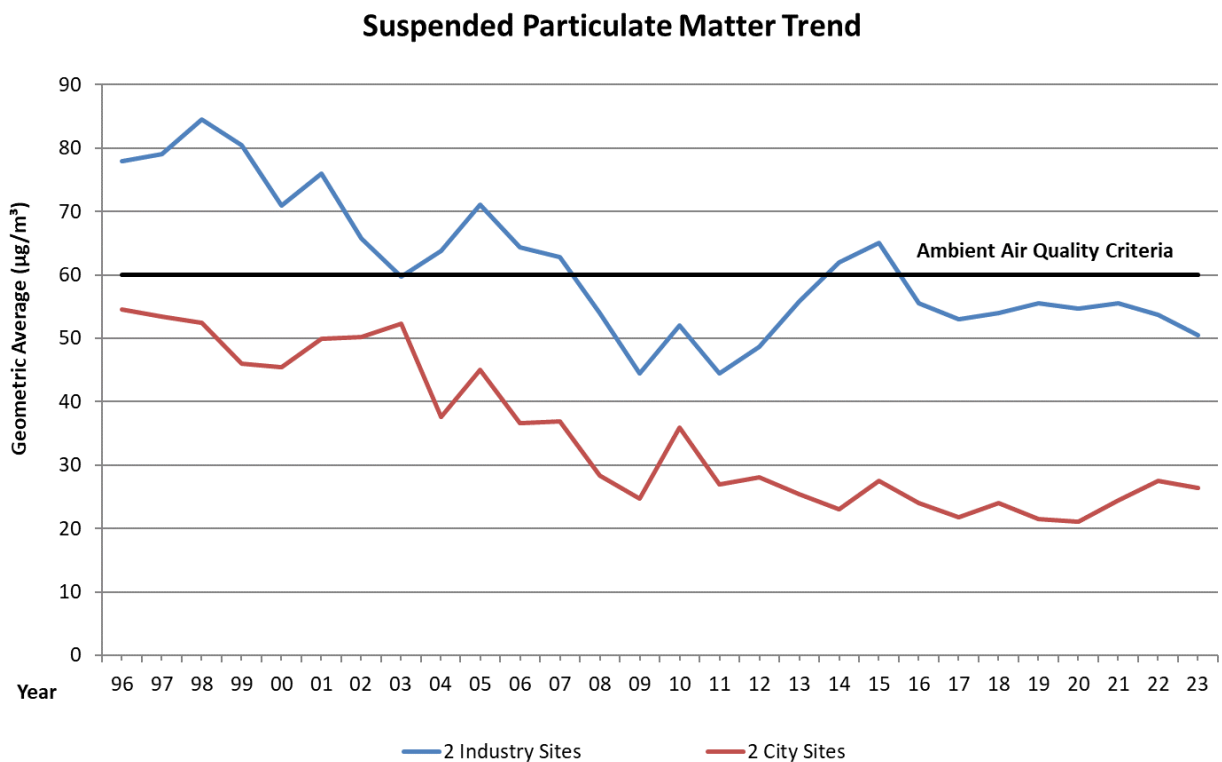
All figures in the section below have been provided by the Ministry of the Environment, Conservation, and Parks. Clean Air Hamilton would like to sincerely thank the Ministry of Environment, Conservation and Parks (Hamilton Regional Office) for their support in providing air quality trends data.

² Golder Associates. 2018, February. "Hamilton Airshed Monitoring System Results". November 1, 2021.

Contaminants of Concern in Hamilton

Particulate Matter (TSP, PM₁₀, PM_{2.5})

Total Suspended Particulate Matter: Suspended Particulate Matter includes all particulate matter that has not settled out of the air. Numerous studies have linked particulate matter to aggravated cardiac and respiratory diseases such as asthma, bronchitis, and emphysema and to various forms of heart disease³. In addition to having well-established associations with respiratory and cardiovascular health impacts, exposure to particulate matter may also be linked to neurological disorders, including dementia⁴.



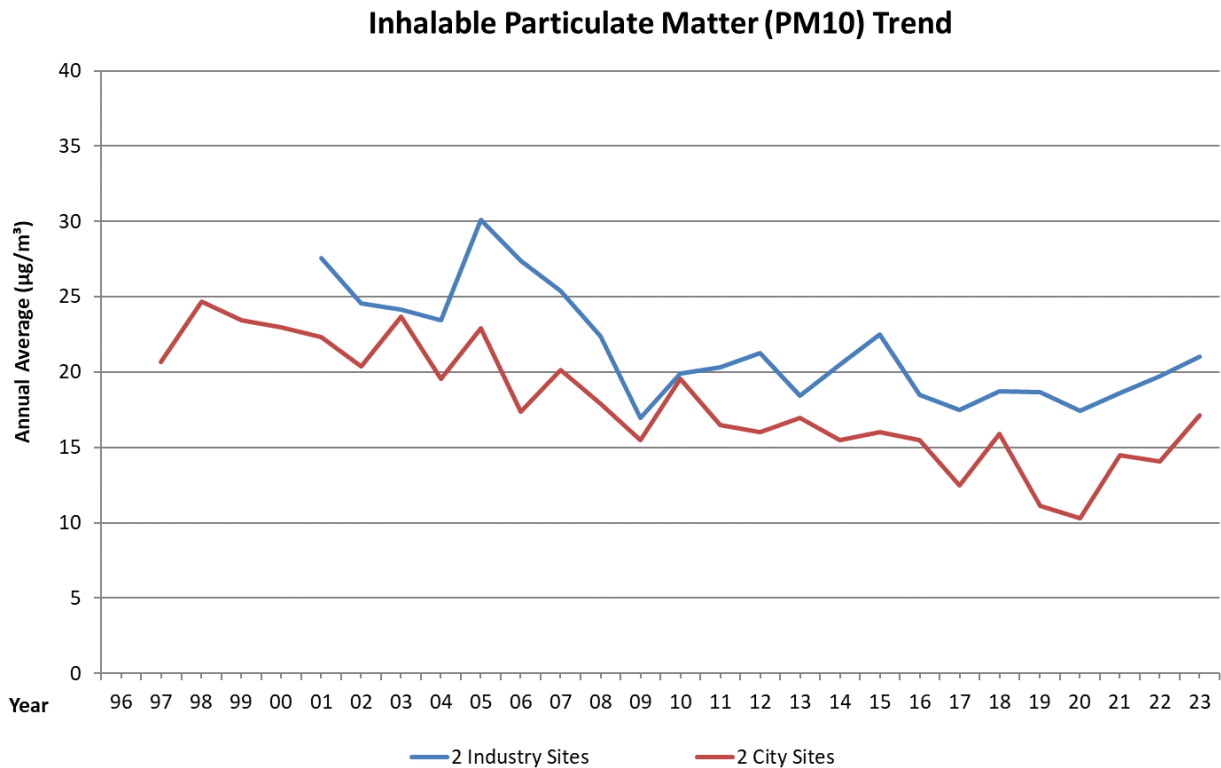
Particle pollution can come from outdoor and indoor sources. High levels of particulate matter in the air can also reduce visibility and cause the air to appear hazy.

³ Health Canada. <https://www.canada.ca/en/environment-climate-change/services/air-pollution/pollutants/common-contaminants/particulate-matter.html>

⁴ Statistics Canada Health Report. <https://www150.statcan.gc.ca/n1/pub/82-003-x/2020007/article/00001-eng.htm>

While there are ups and downs in the data from one year to the next, there is a clear downward trend indicating improving air quality, with data for the last six years being consistently below the annual objective of 60 $\mu\text{g}/\text{m}^3$. There are many sources of particulate matter in air making it challenging to identify specific sources, however the higher levels near industrial sites show that industry and nearby road traffic are likely important sources.

Inhalable Particulate Matter (PM₁₀): Inhalable Particulate Matter (PM₁₀) is defined as particles less 10 μ (microns, there are 1,000 μ in one millimetre). This class of particles is important as they are small enough to be inhaled and deposited throughout the airways in the upper regions of the lung. Particles deposited on the lung surface can induce tissue damage and lung inflammation, impacting respiratory and cardiovascular health⁵.

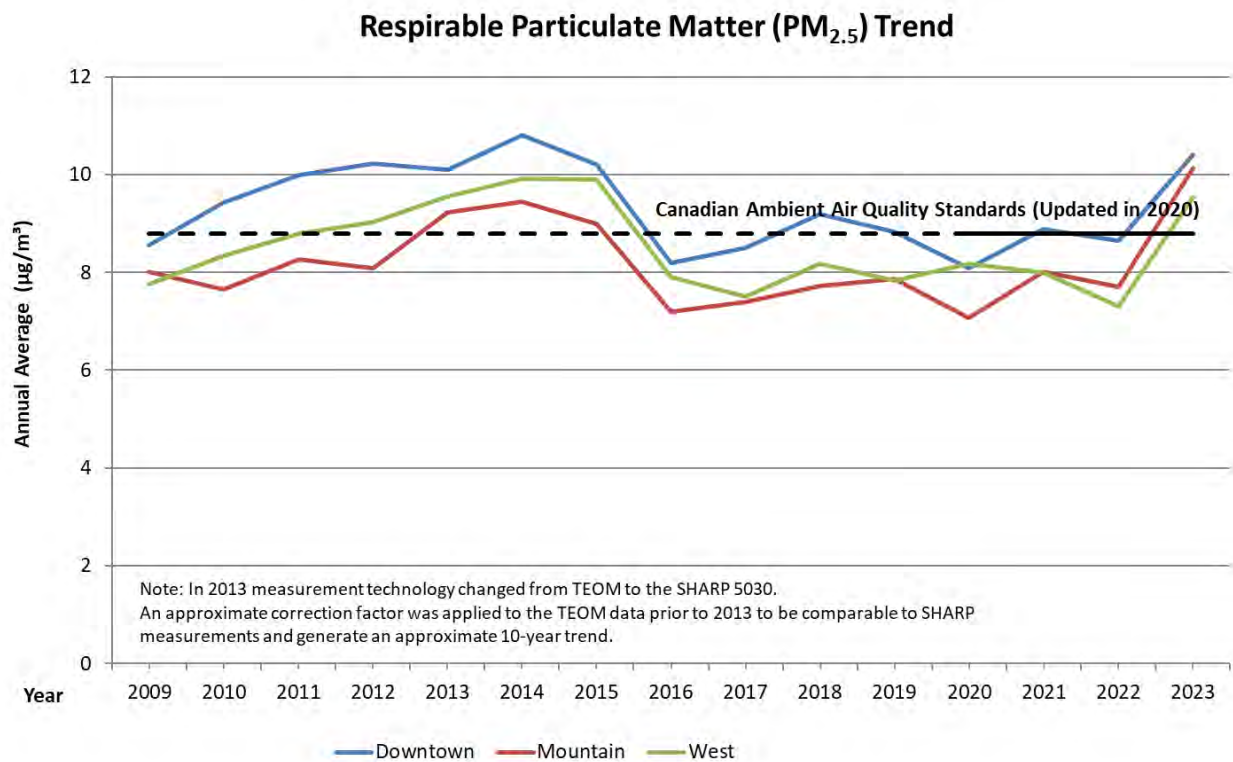


Similar to Suspended Particulate Matter, the data shows a clear downward trend of PM₁₀ over the long term, although a recent uptick warrants attention in the coming years. From the Hamilton Airshed Modeling System (HAMS), transboundary PM₁₀ levels are primarily from

⁵ California Air Resources Board: <https://ww2.arb.ca.gov/resources/fact-sheets/particulate-matter-and-health-fact-sheet>

transportation related emissions, and they amount to over 90% of the total PM₁₀ emissions⁶. Increased levels in 2023 may be attributable to heavy wildfire smoke.

Fine Particulate Matter (PM_{2.5}): Respirable Particulate Matter (PM_{2.5}) is defined as particles less 2.5 microns (μ). This class of particles is important as they are small enough to be carried deep into the lungs. Exposure to high levels of fine particulate matter has been associated with hospital admissions and several serious health effects, including premature death. People with asthma, cardiovascular or lung disease, as well as children and elderly people, are considered to be the most sensitive to the effects of fine particulate matter⁷.



The data shows that concentrations have been steady since 2016, with a recent uptick in 2023 which may be attributable to heavy wildfire smoke. Hamilton’s concentrations are slightly higher than other cities in Southern Ontario, likely because of its geography and due to industrial activity, although there are many non-industrial sources as well. Another significant portion of PM_{2.5} 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

⁶ Golder Associates. 2018, February. “Hamilton Airshed Monitoring System Results”. November 1, 2021.

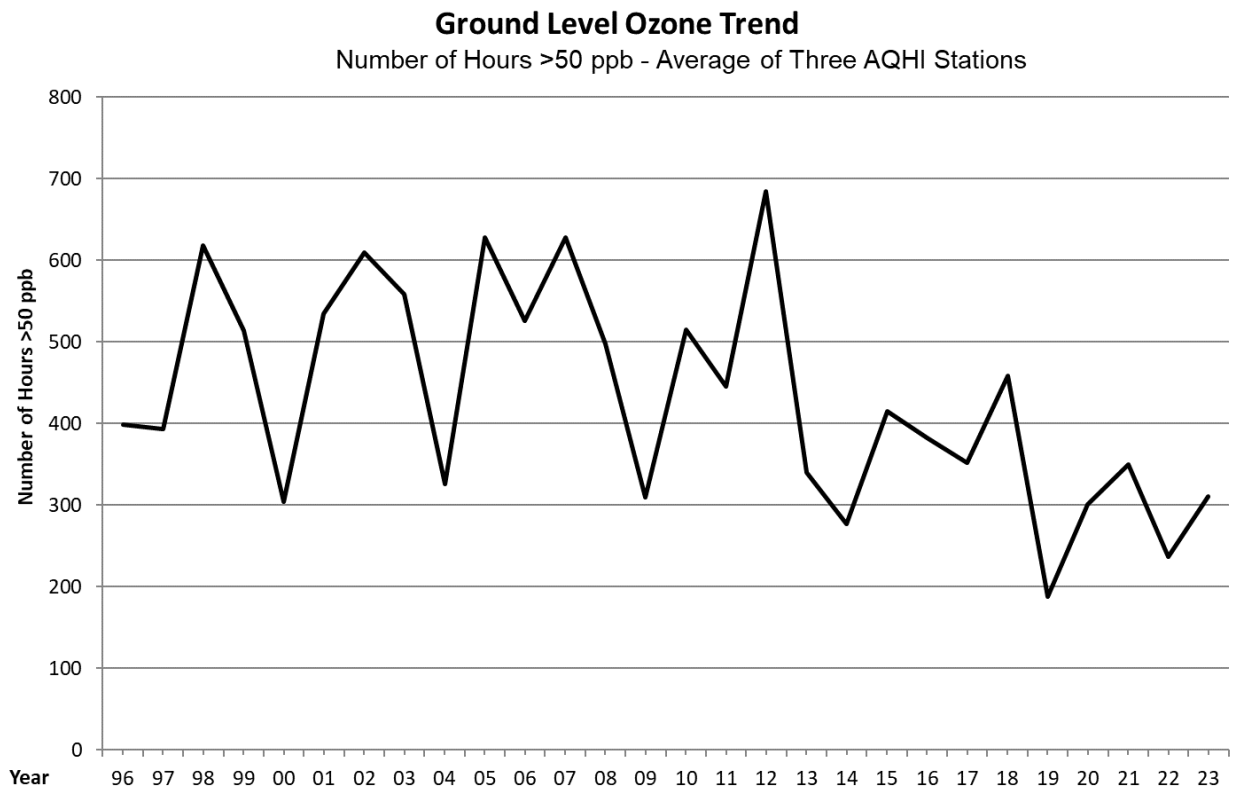
⁷ Ontario Ministry of the Environment, Conservation, and Parks:

<https://www.airqualityontario.com/science/pollutants/particulates.php>

air quality and according to HAMS, transboundary emissions in Hamilton for PM_{2.5} amounted to 91%⁸.

Ground Level Ozone (O₃)

Breathing ground-level ozone can trigger a variety of health problems and worsen health symptoms. Exposure to high levels results in chest tightness, coughing and wheezing. People with respiratory and heart problems are at a higher risk. Ozone has been linked to increased hospital admissions and premature death⁹.



Ground level ozone is a secondary pollutant, meaning it is not directly emitted to the atmosphere, but is formed from other pollutants, notably nitrogen dioxide and others, particularly in the summer when sunlight is strongest. It is a regional pollutant, travelling over long distances; for this reason, concentrations in Hamilton are generally in line with other cities in Southern Ontario. The majority of ozone in Hamilton comes from precursors emitted by sources upwind of Hamilton such as the Midwest Ohio Valley region.

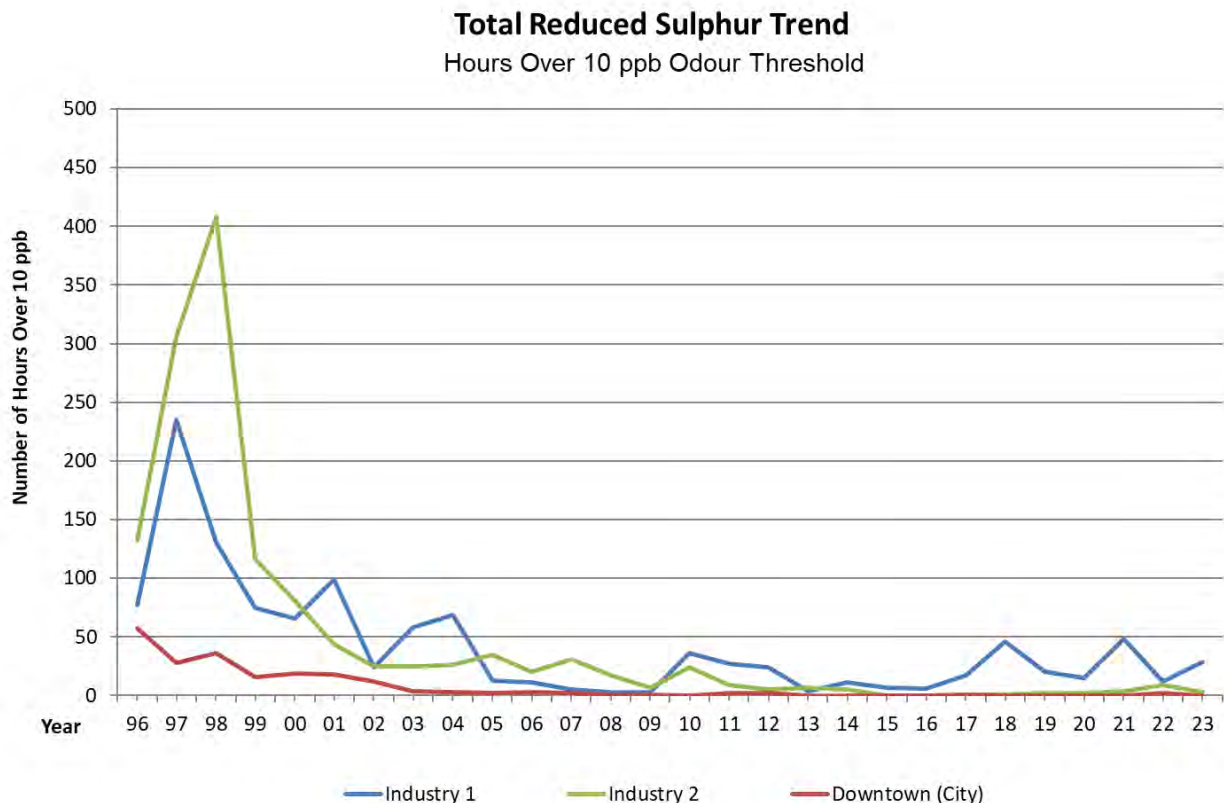
⁸ Golder Associates. 2018, February. "Hamilton Airshed Monitoring System Results". November 1, 2021.

⁹ Ontario Ministry of the Environment, Conservation, and Parks:

<https://www.airqualityontario.com/science/pollutants/ozone.php>

Total Reduced Sulphur (TRS)

Total reduced sulphur (TRS) includes all sulphurous compounds that have not fully oxidized to sulphur dioxide (SO₂). While not considered to be a health hazard, TRS produces an unpleasant rotten egg-like odour at very low concentrations¹⁰. Exposure to Total Reduced Sulphur (TRS) is associated with irritation of the mucous membranes (i.e., eyes, nose, throat, respiratory system). Long and repeated exposure to TRS can cause health effects such as nausea, fatigue, and headaches.



The data here are presented as the number of hours over the 10 parts per billion (ppb) odour threshold and show dramatic improvements over time.

Sulphur Dioxide (SO₂)

Exposure to sulfur dioxide (SO₂) may cause irritation to the eyes, nose, throat, and lungs¹¹. Health effects caused by exposure to high levels of sulphur dioxide include breathing problems,

¹⁰ Ontario Ministry of the Environment, Conservation and Parks:

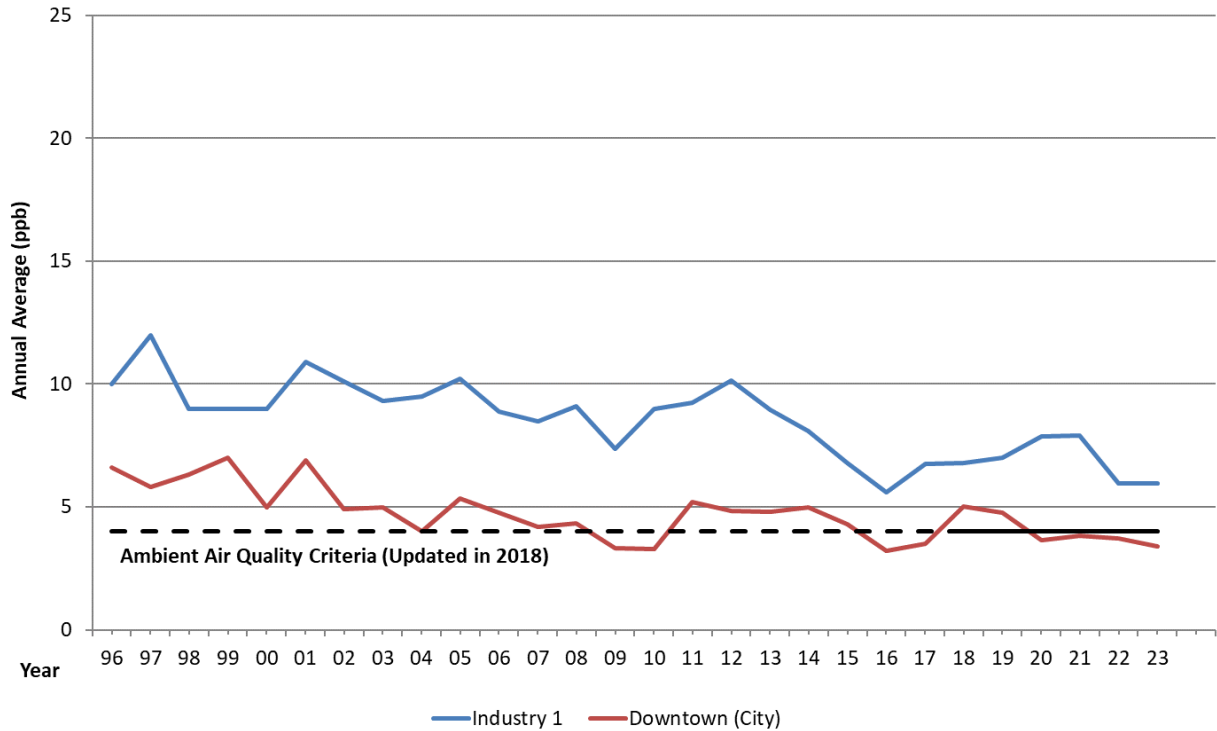
<https://www.airqualityontario.com/science/pollutants/trs.php>

¹¹ U.S. Department of Health & Human Services:

<https://wwwn.cdc.gov/TSP/MMG/MMGDetails.aspx?mmgid=249&toxid=46#:~:text=Inhaling%20sulfur%20dioxide%20causes%20irritation,can%20cause%20irritation%20or%20burns.>

respiratory illness, changes in the lung's defences, and worsening respiratory and cardiovascular disease. People with asthma or chronic lung or heart disease are the most sensitive to sulphur dioxide¹².

Sulphur Dioxide Trend



Sulphur dioxide is emitted primarily by industries such as steel-manufacturing and metal refining. Hamilton has higher levels than most Ontario cities because of the high level of industrial activity, although other cities such as Sarnia and Sudbury face similar challenges due to industry. The data show incremental improvements over time, with current levels close to the annual objective. Transboundary emissions represent about 69% of the annual contribution to SO₂ levels within Hamilton¹³.

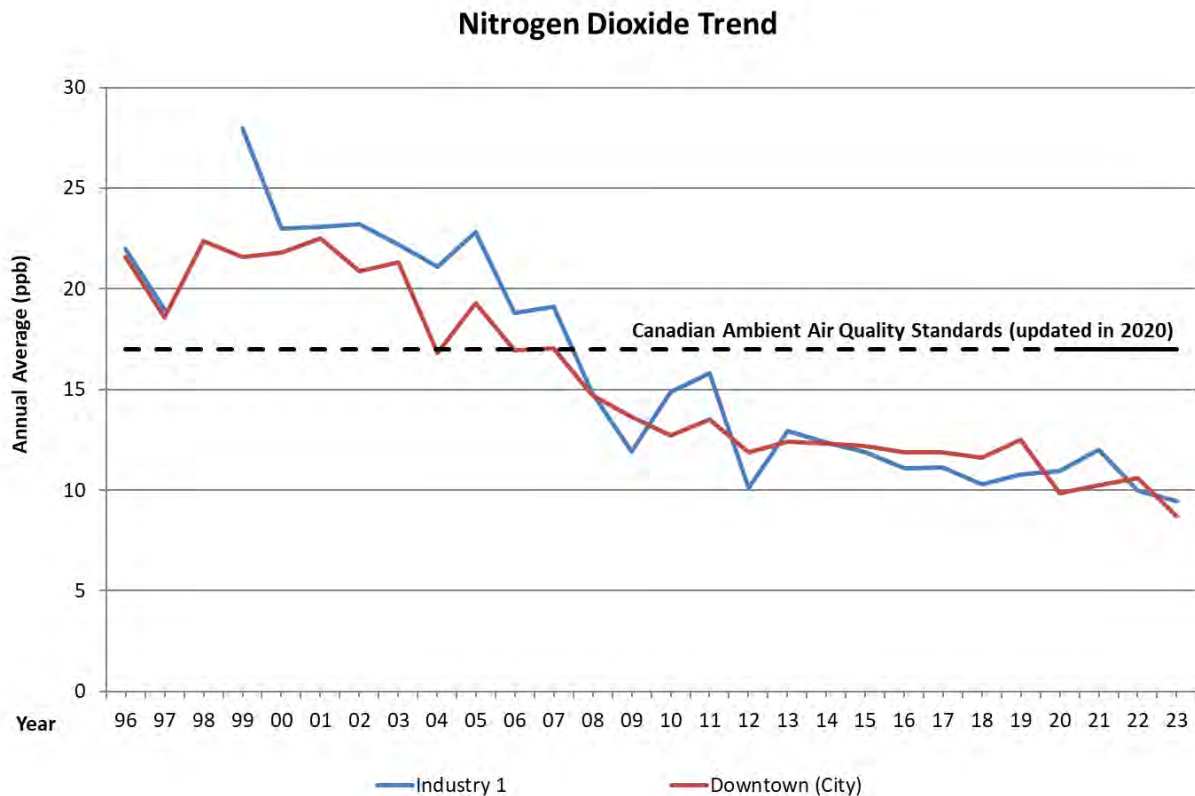
¹² Ontario Ministry of the Environment, Conservation, and Parks: <https://www.airqualityontario.com/science/pollutants/sulphur.php>

¹³ Golder Associates. 2018, February. "Hamilton Airshed Monitoring System Results". November 1, 2021.

Oxides of Nitrogen (NO, NO₂)

Oxides of nitrogen include nitrogen oxide (NO) and nitrogen dioxide (NO₂). Nitrogen oxide is rapidly converted to nitrogen dioxide in air. Nitrogen dioxide can irritate the lungs and lower resistance to respiratory infection. Sensitivity increases for people with asthma and bronchitis¹⁴.

Nitrogen Dioxide



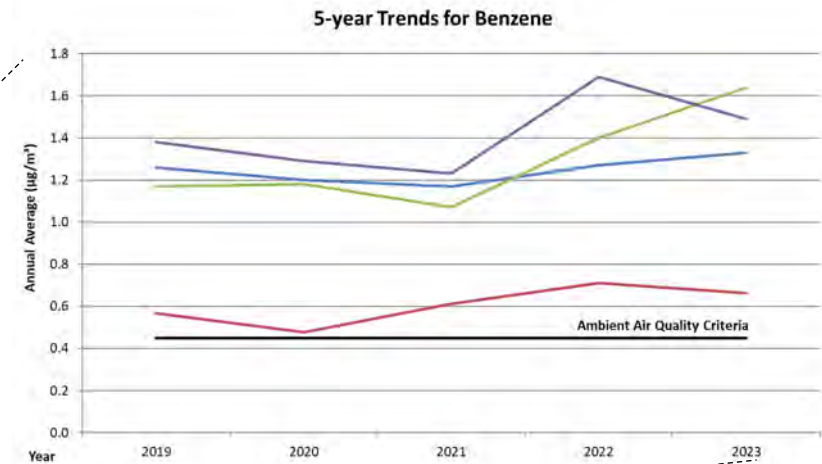
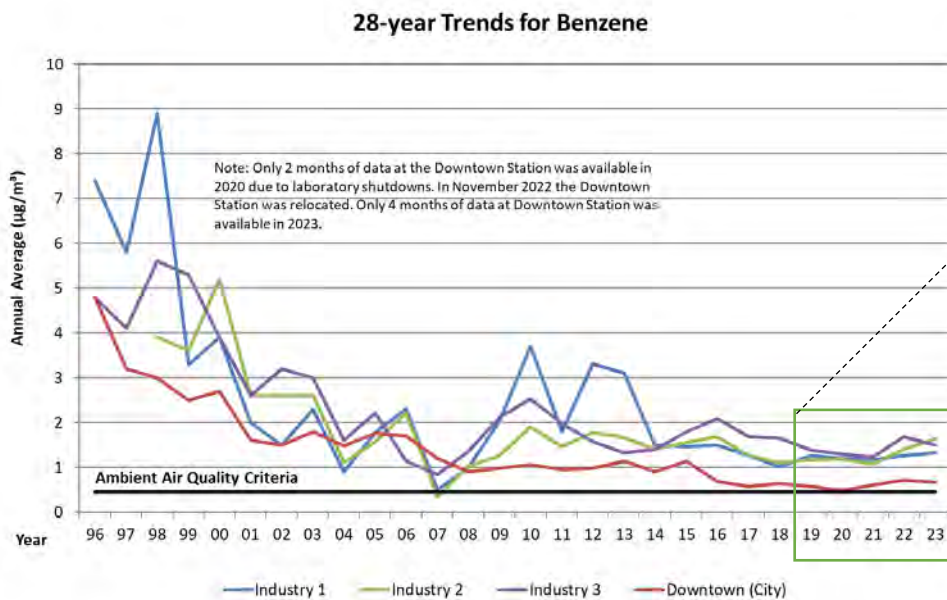
The clear downward trend in nitrogen dioxide concentrations is largely the result of technological improvements in newer vehicles, despite increasing numbers of vehicles on the road. Because the concentrations are generally linked to transportation emissions as opposed to industrial emissions, concentrations in Hamilton are generally in line with those of other cities in Southern Ontario. Going forward, this downward trend is expected to continue as electric vehicles are increasingly adopted. Based on HAMS, transboundary emissions contribute to 44% of NO₂ sources in Hamilton¹⁵.

¹⁴ Ontario Ministry of the Environment, Conservation, and Parks:
<https://www.airqualityontario.com/science/pollutants/nitrogen.php>

¹⁵ Golder Associates. 2018, February. "Hamilton Airshed Monitoring System Results". November 1, 2021

Benzene

Benzene is a known carcinogen¹⁶, mostly in occupational settings. Short-term inhalation exposure of humans to benzene may cause drowsiness, dizziness, headaches, as well as eye, skin, and respiratory tract irritation. Long term exposure, most commonly encountered in occupational settings, can cause various blood disorders such as reduced numbers of red blood cells and increased incidence of leukemia.



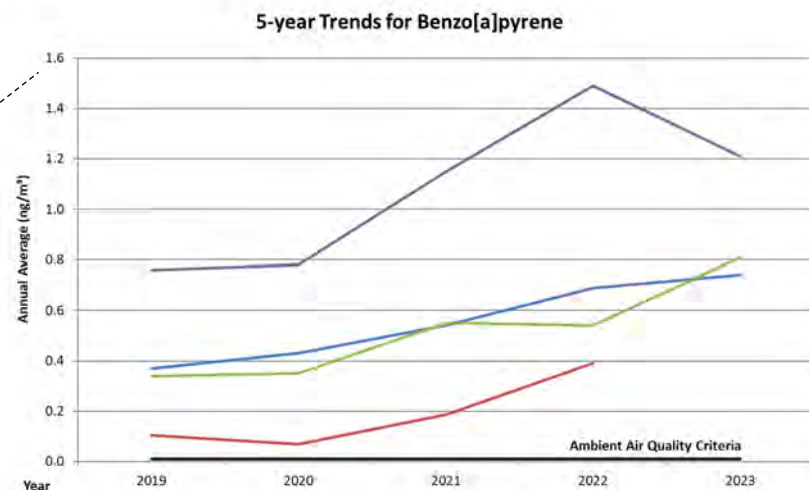
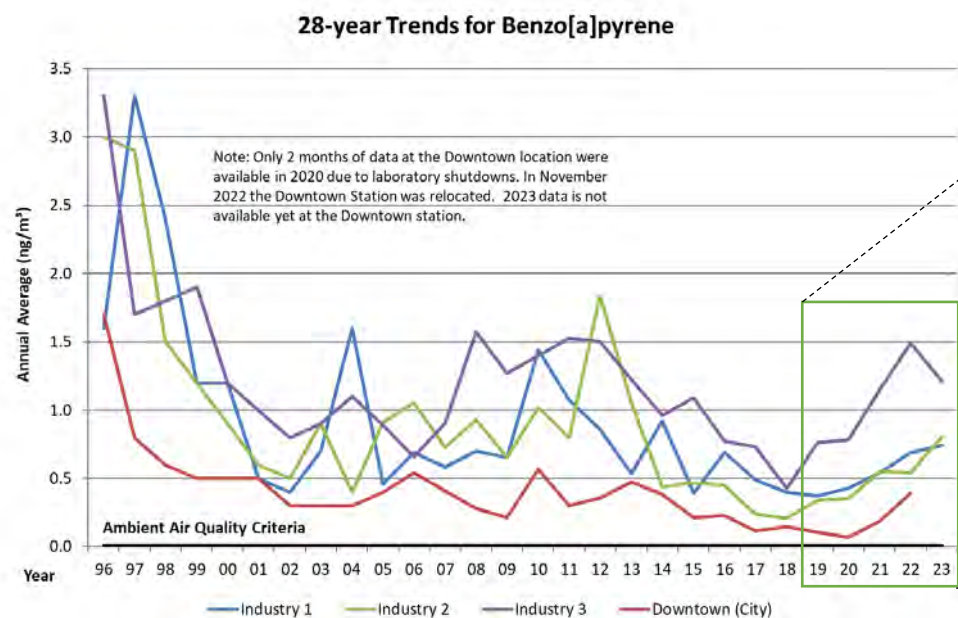
Sources of benzene include various industries such as steel manufacturing and vehicles / fuels. While the mid-1990s and early 2000s brought significant improvements, these improvements appear to have levelled off over the past decade and annual benzene measurements remain above the MECP's annual Ambient Air Quality Criteria in the industrial core and slightly above the AAQC at

¹⁶ US Environmental Protection Agency: <https://www.epa.gov/sites/default/files/2016-09/documents/benzene.pdf>

the downtown station. The recent uptick in concentrations warrants attention in the coming years. Based on HAMS modelling, transboundary emissions contribute to 70% of benzene emissions in Hamilton¹⁷.


Benzo[a]pyrene

Benzo[a]pyrene is a known carcinogen¹⁸ with numerous sources, including industrial emissions, residential wood burning, diesel engine exhaust, forest fires, and fuels. Short-term health effects of exposure to benzo[a]pyrene include skin rash and eye irritation with redness and burning sensation. Exposure to sunlight and benzo[a]pyrene together can increase these effects. Benzo[a]pyrene is a known carcinogen with numerous sources, including industrial emissions, residential wood burning, diesel engine exhaust, forest fires, and fuels.



¹⁷ Golder Associates. 2018, February. "Hamilton Airshed Monitoring System Results". November 1, 2021.

¹⁸ United States Environmental Protection Agency: <https://cfpub.epa.gov/ncea/risk/hhra/recordisplay.cfm?deid=329750>



While the 1990s and early 2000s have brought improvements, measured concentrations remain consistently above the MECP's Ambient Air Quality Criteria; the rise in concentrations over the past 4 years is a concern and warrants attention in the coming years. Expected technological improvements in various industries, such as transportation and integrated iron and steel industries, may bring improvements to benzo[a]pyrene levels in the coming years. In addition, transboundary emissions contribute to 29% of benzo[a]pyrene emissions per HAMS modelling¹⁹.

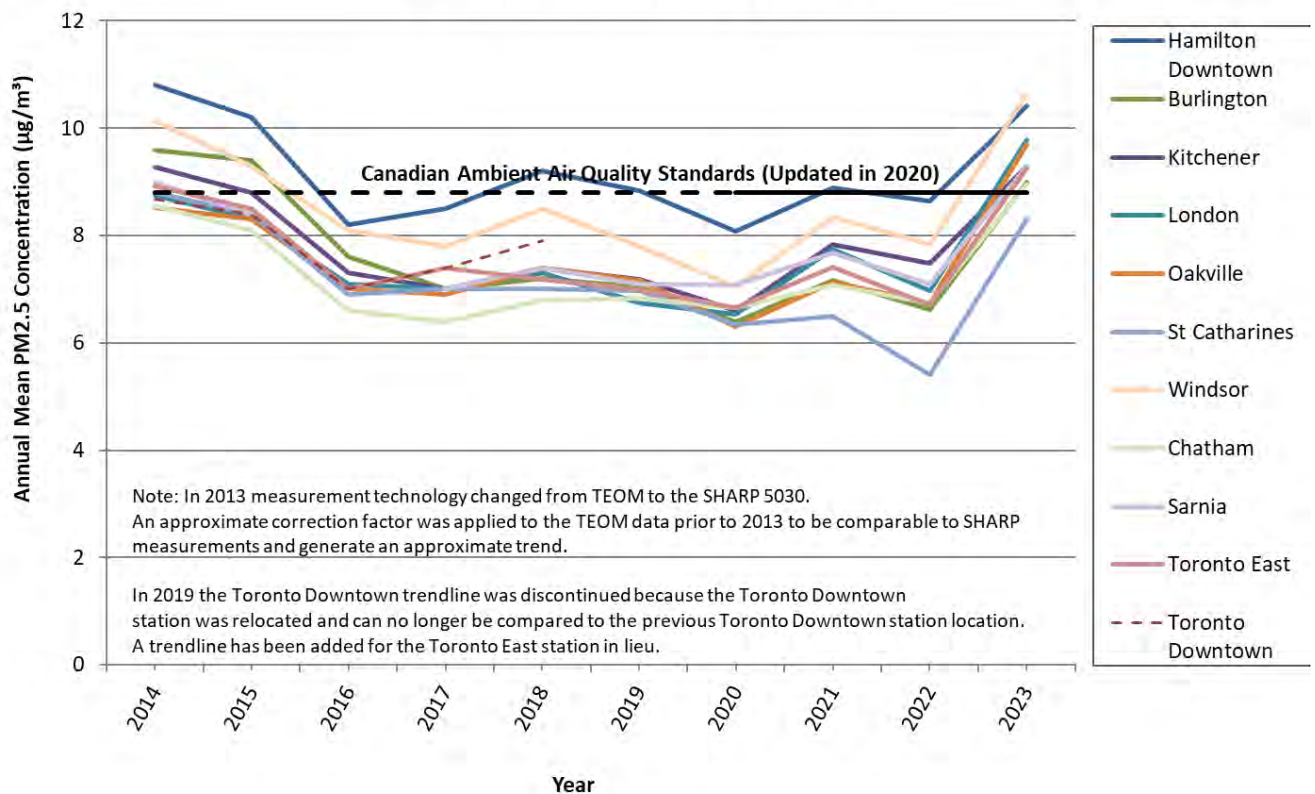
¹⁹ Golder Associates. 2018, February. "Hamilton Airshed Monitoring System Results". November 1, 2021.

Multi-City Air Quality Comparisons

Respirable Particulate Matter (PM_{2.5})

When compared to other cities in Ontario, Hamilton measured higher annual respirable particulate matter (PM_{2.5}) concentrations in 2022 and 2023. This is likely due to both the industrial and transportation sector in Hamilton. Overall, the respirable particulate matter (PM_{2.5}) trend in Hamilton follows the same trend as municipalities across Ontario. PM_{2.5} levels were higher in 2023 than previous years likely due to increased wildfire smoke in 2023.

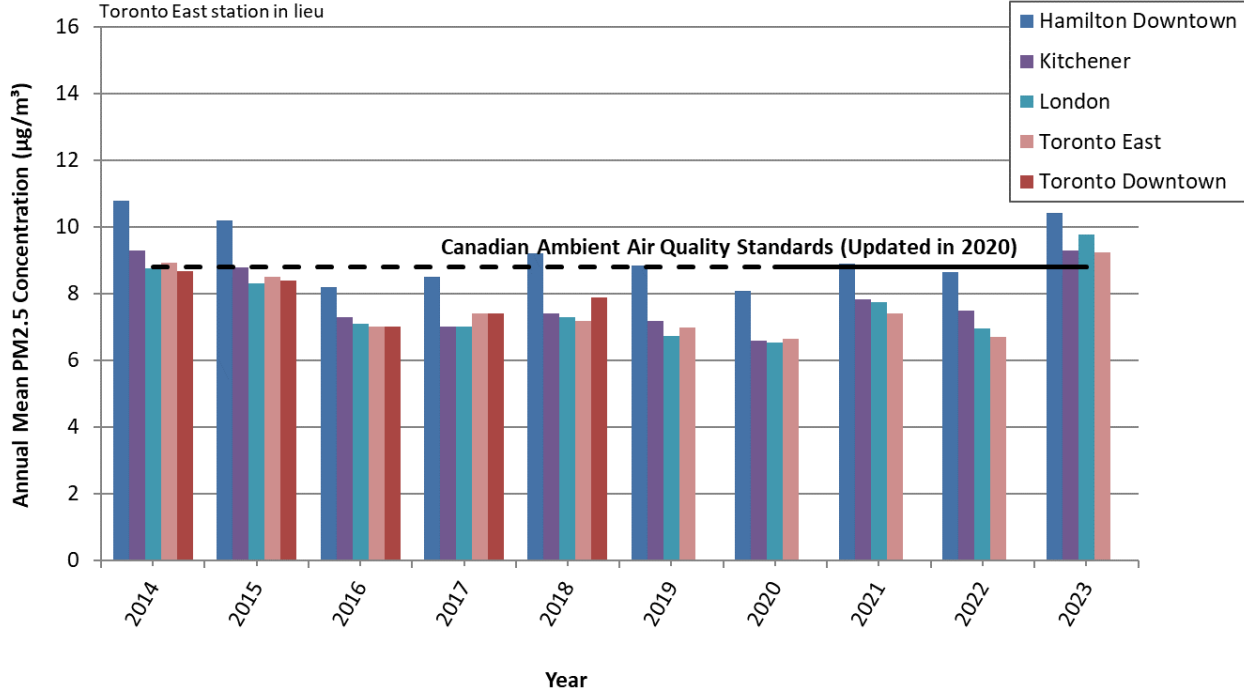
10-Year Trends for PM_{2.5} (Ten Cities)



10-Year Trends for PM2.5 (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.

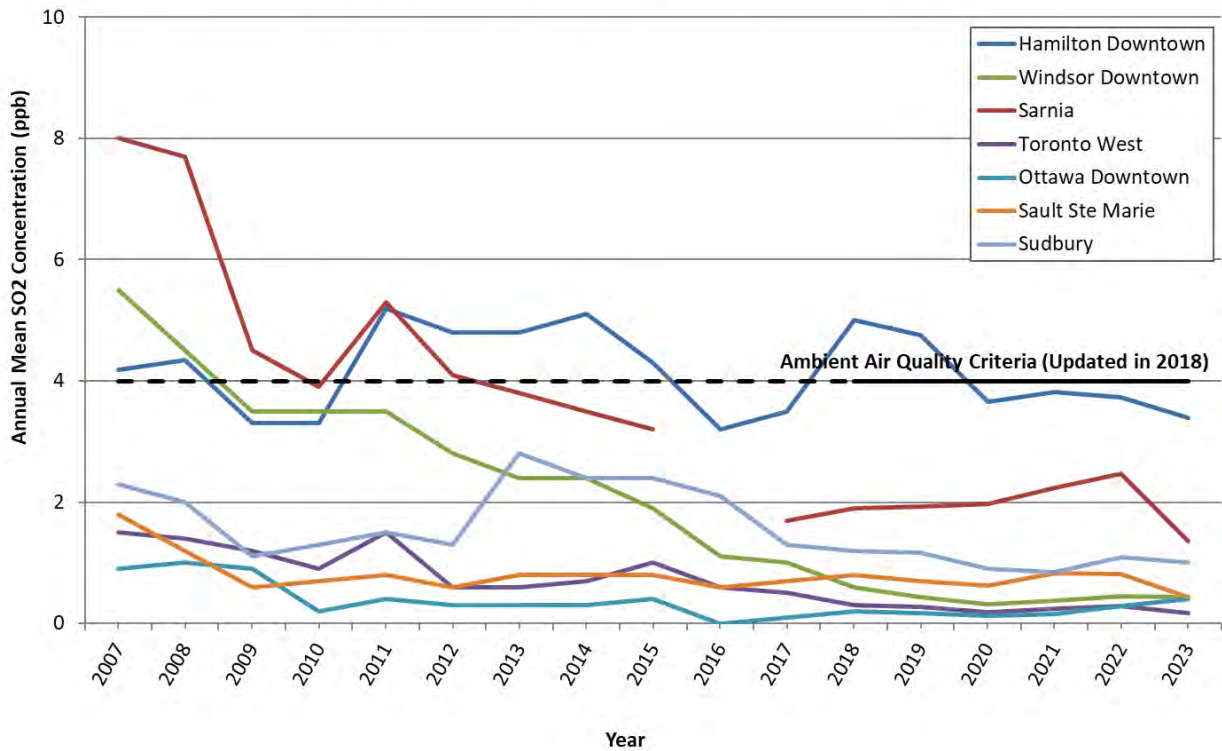
In 2019 the Toronto Downtown trendline was discontinued because the Toronto Downtown station was relocated and can no longer be compared to the previous Toronto Downtown station location. A trendline has been added for the Toronto East station in lieu



Sulphur Dioxide (SO₂)

While sulphur dioxide (SO₂) concentrations have been below the annual objective since 2020, Hamilton continued to measure higher annual sulphur dioxide when compared to other municipalities in 2022 and 2023. This is due in large part to major industrial emitters in Hamilton, including integrated iron and steel facilities.

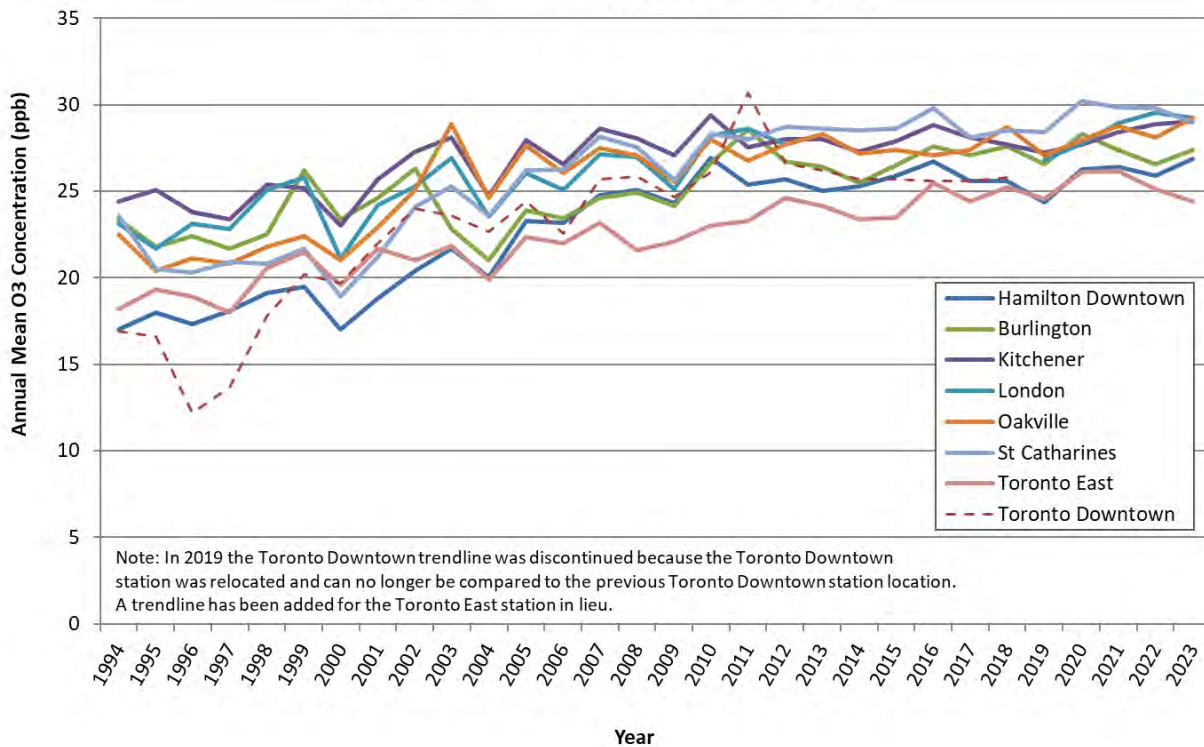
17-Year Trends for Sulphur Dioxide (Seven Cities)



Ozone (O₃)

Over the last ten years, ozone concentrations in Hamilton have remained relatively steady. The data from 2022 and 2023 show Hamilton on the lower end of ozone concentrations when compared with other municipalities. The Air Quality in Ontario 2021 report states that approximately 87-99% of the ozone in Ontario can be attributed to transboundary sources including the United States and global background levels.

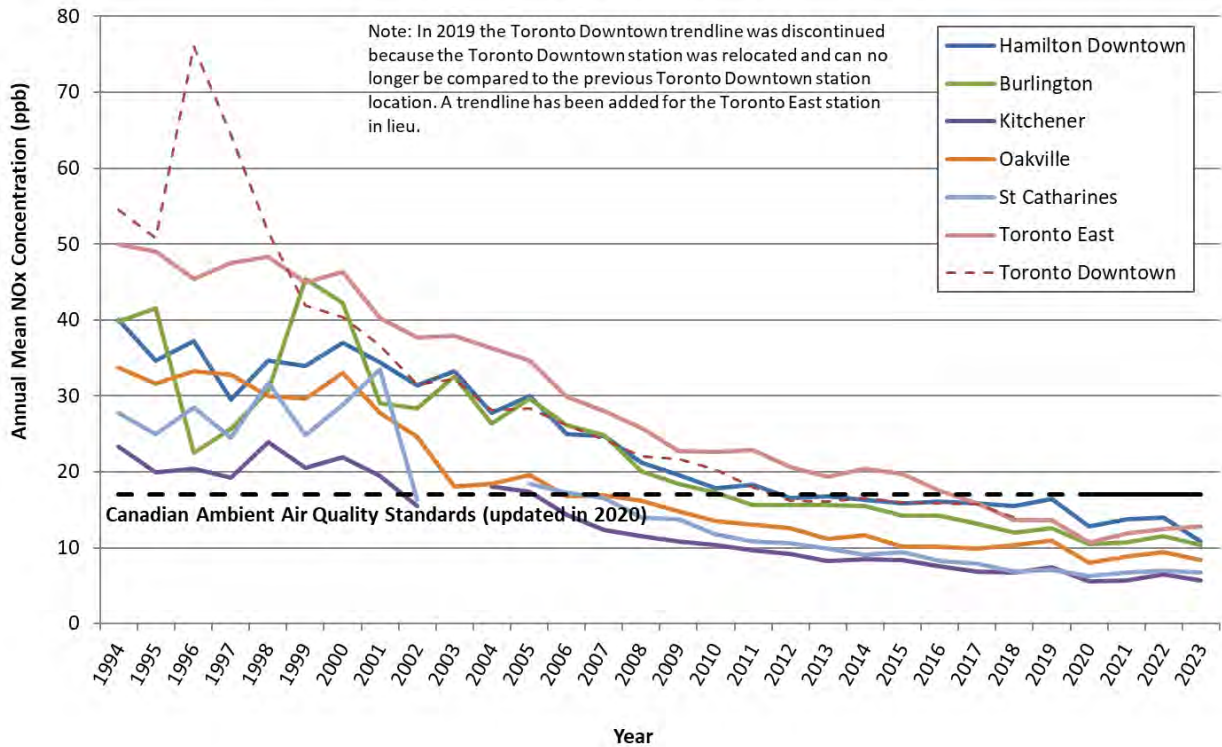
30-Year Trends for Ozone (Seven Cities)



Nitrogen Oxides (NOx)

Similar to other municipalities, 2022 and 2023 data in Hamilton shows a steadily decreasing trend in measured nitrogen oxides. This is likely due to improvements in vehicle engine technology over time.

30-Year Trends for Nitrogen Oxides (Six Cities)





Improving Air Quality – What Can You Do?

Every time you drive, use gasoline-powered equipment, burn wood, use a heater, air conditioner or other appliance, your choice can reduce or increase air pollution. Purchasing high efficiency heating and cooling appliances and reducing vehicle or gasoline-powered equipment use will reduce the amount of pollutants emitted to the air.

When going to work or school, using transit instead of a personal vehicle can make a significant difference. If you do drive, consider buying an electric or hybrid vehicle. Regardless of what kind of vehicle you use, make sure it is properly maintained and your tires properly inflated.

Burning, including burning wood and yard waste, is a source of air pollution. To reduce the impact of wood smoke on air quality, consider adopting cleaner burning practices and technologies. Using EPA-certified wood stoves and fireplaces, which are designed to burn wood more efficiently and with less smoke, can significantly cut down on particulate emissions. It is also important to use dry, seasoned wood and to maintain a small, hot fire, as this helps the wood burn more completely and produces less smoke. In addition, composting or using municipal waste disposal services are better alternatives that reduce air pollution.

You can track air quality day-to-day in your community on the Ministry of the Environment, Conservation and Parks website at <https://www.airqualityontario.com/history/summary.php>. The MECP also reports Air Quality Health Index readings in communities across Ontario, which you can access at <https://www.airqualityontario.com/aqhi/index.php>. The Air Quality Health Index measures air pollution in relation to health.

On days when high levels of the Air Quality Health Index are expected, aim for a cleaner commute by using transit or carpooling. Avoid engine idling, burning, and defer chores that use gasoline-powered equipment. Wait until evening to refuel your vehicle. In addition, reducing vehicle use and avoiding the use of fireplaces and wood-burning stoves is also helpful in reducing particulate matter pollution.

Acknowledgements

In 2022 and 2023, 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 11 - 15 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.



Public Health Services Air Pointer

Barry Duffey,

Chair, 2023-2024, Clean Air Hamilton



Hamilton Air Monitoring Network Beach Strip Station 29102

Air Quality – Additional Resources

To learn more about Clean Air Hamilton and our work visit www.cleanairhamilton.ca.

For annual air quality trends provided by the Ministry of the Environment, Conservation and Parks, please see pages 23 to 37.

Air Quality and Health (Health Canada)

To learn about how to protect your health visit: www.airhealth.ca

Government Actions on Air Quality (MECP)

To learn about the Province of Ontario's actions on air quality visit: 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 (MECP)

To check our air pollution levels in Hamilton and MECP run air monitors visit:

https://www.airqualityontario.com/aqi/locations.php?pol=122&text_only=1

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

To check out Hamilton Air Quality Health Index website visit: <https://www.airqualityontario.com/aqi/index.php>

2022 and 2023 Members

Barry Duffey, Chair
ArcelorMittal Dofasco
Citizens
City of Hamilton - Various Departments
Corr Environmental
Environment & Climate Change Canada
Environment Hamilton
Ecosystem Informatics
Green Venture
Hamilton Conservation Authority
Hamilton Industrial Environmental Association
Hamilton Port Authority
Hamilton Public Health Services
Health Canada
McKibbon Wakefield Inc.
McMaster University
Ministry of Environment Conservation and Parks
Mohawk College
Niagara College
Stantec
Stelco



Clean Air Hamilton, September 2025

Production: Public Health Services

City of Hamilton

For further information, please contact:

Air Quality Coordinator

Public Health Services,

Healthy Environments Division,

Healthy & Safe Communities Department

City of Hamilton

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www.cleanairhamilton.ca