CLEAN AIR HAMILTON CLEAN AIR HAMILTON CLEAN AIR HAMILTON CLEAN AIR HAMILTON

CleanAir HAMILTON

AIR QUALITY PROGRESS REPORT 2011

June 2012

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Executive Summary

- *Clean Air Hamilton* is a community initiative to improve air quality in the City of Hamilton. It has a diverse membership with representation from environmental organizations, industry, businesses, academic institutions, and different levels of government. Initiated in 1998, *Clean Air Hamilton* works to improve air quality throughout the City of Hamilton and meet all ambient air quality criteria by:
    - Initiating research on air quality;
    - Providing information and policy advice that decision-makers value at all levels of government;
    - Raising *Clean Air Hamilton*'s visibility in the community and be recognized as the authoritative voice on local air quality issues;
    - Galvanized broad-based support for actions to improve air quality;
    - Encouraging emission reductions among individuals and companies operating in Hamilton;
    - Influencing decision-makers to choose sustainable practices; and
    - Promoting behavioural changes in companies, government, institutions and individuals in Hamilton that will improve air quality.
- Over the past ten years, there have been constant improvements in air quality in Hamilton. These improvements have contributed to better health for citizens as well as improved perceptions of the City.
- Since the mid-1990s, the levels of all pollutants in Hamilton (except for the long-range pollutant, ozone) have shown a steady downward trend year over year. The annual percentage decreases over this time are significant in many pollutant categories as measured at the downtown air monitoring site (Station 29000); these decreases include a 3.3% per year reduction in total suspended particulate (TSP) levels, 1.9% per year in inhalable particulate matter (PM_{10}), 3.2% per year in respirable particulate matter ($PM_{2.5}$), 2.7% per year in nitrogen dioxide (NO_2), 2.8% per year in sulphur dioxide (SO_2), 6.5% per year in total reduced sulphur odours, 6.0% per year in benzene and 5.3% per year in PAH (measured by benzo[a]pyrene).
- A 2011 Air Quality Health Assessment Study prepared for *Clean Air Hamilton* by SENES Consulting Inc. estimated that the six key air pollutants - nitrogen dioxide (NO_2), ground-level ozone (O_3), inhalable particulate matter (PM_{10}), respirable particulate matter ($PM_{2.5}$), sulphur dioxide (SO_2), and carbon monoxide (CO) - contribute to about 186 premature deaths, 395 respiratory hospital admissions and 322 cardiovascular hospital admissions each year in Hamilton.

- A well-conceived air quality health index provides the public with useful information about air quality conditions and strategies citizens can use to reduce their exposures to pollutants. Hamilton's Public Health Services in partnership with *Clean Air Hamilton*, Environment Canada and Health Canada introduced the Air Quality Health Index in Hamilton in the summer of 2011.
- Emissions from mobile sources (personal and commercial vehicles), home and industrial heating, road dust re-entrainment and fugitive dusts are the major local sources of pollutants to the air. Reductions in these sources must also be realized if we are to continue to make meaningful improvements to local air quality.
- Significant reductions in industrial emissions have been realized over the years but more needs to be done to achieve emissions levels that are in line with international industrial best practices.
- Mobile air monitoring studies conducted in Hamilton have shown that higher pollutant exposures occur along arterial roads and major highways and at major intersections due to emissions from cars, light duty trucks and heavy-duty trucks. Exposures to air pollutants are significantly lower at distances about 200 metres from arterial roads and major highways. Many residential areas of the city fall into this category.
- Expansion of the network of fixed air monitoring stations combined with continued mobile air monitoring is useful for identifying air pollution "hot spots" in Hamilton and for enhancing our knowledge of local air emission sources and their impacts. This monitoring work assists in the development of policies, strategies for abatement and initiatives to reduce local emissions in communities and neighbourhoods.
- There are a number of sustainable transportation initiatives in the City. These initiatives range from car sharing, carpooling, driver education and transit education to increased active transportation initiatives such as policies that encourage cycling and walking; the latter are particularly important because they help reduce air emissions and improve individual health by encouraging health lifestyles. These initiatives should be encouraged as they promote healthy lifestyles and reduce air emissions from transportation.
- Where possible, transportation and land use programs should co-ordinate their efforts and consider both the short-term and long-term health impacts of transportation-related pollutants. The factors need to be considered in transportation planning, urban design and encouragement to adopt active modes of transportation.
- Comprehensive Airshed Management areas have been proposed as strategies for improving air quality in communities across Canada. *Clean Air Hamilton* is very interested in engaging with the Province to partner in the development of a place-based airshed management strategy for Hamilton.
- Community greenhouse gas (GHG) emissions in 2009 were 12 million tonnes in Hamilton. Land use and transportation planning decisions should be made that are consistent with reductions in GHG emissions. Municipal and community involvement in reducing emissions of GHGs (from commercial and personal transportation sources, commercial and residential energy sources, etc.) is necessary to reduce climate change impacts.

- In 2011, Hamilton was the first municipality in Ontario to introduce a Community Climate Change Action Charter to promote leadership on climate change and to share and communicate local actions amongst various organizations, businesses and groups in Hamilton. In 2011, 29 organizations signed the Charter; other organizations are encouraged to adopt the Charter's principles by signing the Charter in 2012.
- The City needs to maintain support for strategies and actions that will improve local air quality, reduce greenhouse gas emissions, and increase energy conservation. These strategies should be aimed at increasing the level of dialogue between and within community groups on the health impacts of poor air quality on society and the actions and lifestyle changes that will result in improved air quality for all citizens.
- *Clean Air Hamilton* continues to encourage activities undertaken by the City, industries and citizens to reduce air pollutants and greenhouse gas emissions, and improve local air quality in their operations and transportation choices. *Clean Air Hamilton* actively cultivates partnerships with organizations that have air quality improvement goals that are aligned with those of *Clean Air Hamilton* and the City of Hamilton.

1.0 Introduction

Clean Air Hamilton is pleased to present the 2011 Progress Report on Air Quality to Hamilton City Council. This report presents information on local air quality trends and the activities undertaken by *Clean Air Hamilton* in 2011 to help improve air quality in the City of Hamilton. This report gives an update on new initiatives and on activities that have continued from previous years.

Over the past ten years, there have been steady improvements in air quality in Hamilton. These changes have contributed to better health for citizens as well as improved perceptions of the City.

1.1 Background

The former Hamilton-Wentworth Regional Council endorsed the establishment of *Clean Air Hamilton* (then called the Hamilton-Wentworth Air Quality Improvement Committee or HAQIC) in 1998, following the publication of a series of reports by the Hamilton Air Quality Initiative (HAQI) in October 1997.

In 1997, HAQI made 25 recommendations to improve air quality in Hamilton. Over the past 14 years, *Clean Air Hamilton* and its partners have made significant progress in addressing and responding to these recommendations (see the **2008 Clean Air Hamilton Report Appendix A** for a detailed list of these recommendations).

The original air quality reports prepared by HAQI in 1997 and 1998, together with the complete collection of *Clean Air Hamilton* Annual Reports from 2000 to 2010 are available and can be downloaded at: www.cleanair.hamilton.ca/default.asp?id=71

1.2 Impact

Clean Air Hamilton continues to receive regional, national and international attention for its outstanding leadership and commitment to improving local air quality. The *Clean Air Hamilton* website (**www.cleanair.hamilton.ca**) receives over 1,500 hits a week, and inquiries about *Clean Air Hamilton's* activities are received regularly from organizations and individuals in Ontario, Canada, the U.S. and from around the world. Many innovative projects have emerged, directly and indirectly, from *Clean Air Hamilton's* activities. *Clean Air Hamilton* is viewed as an organization which is model of how to effect change at the local level.

On Monday, February 27, 2012, 148 delegates attended the 2012 Upwind Downwind Conference. The conference was hosted by *Clean Air Hamilton* and the City of Hamilton, and was held at the Sheraton Hotel in downtown Hamilton. The conference title, "Unlikely Partners" aptly reflected the conference goals of sharing practical solutions for air quality improvement, discussing air pollution and climate change issues and highlighting the potential impacts of partnerships in developing actions in the fields of health, planning, community and municipal policy. A free public talk featuring author Jay Walljasper called "What is the Commons?" was held on Sunday, February 26, 2012 at the Art Gallery of Hamilton. The talk attracted 75 people.

Locally, *Clean Air Hamilton* was actively involved in numerous events to promote air quality within the community. Air quality education programs facilitated by Green Venture introduced over 2000 adults to air quality issues in Hamilton at nineteen (19) public events and five (5) speaking engagements. Green Venture also worked with *Clean Air Hamilton* in engaging local media to promote events and highlight steps individuals can take to improve air quality and reduce greenhouse gas emissions. *Living Green* episodes on the Cable 14 '*Hamilton Life*' and '*For the Record*' television shows featured Clean Air is a Yard Away Gas Lawnmower Recycling Events (May 2), Clean Air Commute Week (June 13), Neighbourhood Mobile Air Monitoring and Air Quality (Dec 12) and Cleaner Wood burning for Home Heating (Dec 19-21); it is estimated that these programs reached over 150,000 households. Print media attention was received for *Clean Air Hamilton*-funded programs including Clean Air is a Yard Away and Neighbourhood Mobile Air Monitoring events.

Clean Air Hamilton and its work were featured in three *Inside Hamilton* videos on topics including idling vehicles, climate change and air quality. These videos were posted on YouTube and have received 500 responses to date. *Clean Air Hamilton* also created a Facebook page to keep residents informed of activities and research on air quality in Hamilton.

Members of *Clean Air Hamilton* have provided City Council, City Staff and the community with science-based information to help them make better decisions that promote and protect air quality. *Clean Air Hamilton* has provided support for issues important to our community including transportation (e.g., Eco driver, Totally Transit, Rapid Transit), planning (e.g., mobile monitoring, comments of the Urban Official Plan), air monitoring (e.g., mobile monitoring, Hamilton Air Monitoring Network), and air quality education and awareness (e.g., 2012 Upwind Downwind Conference, High School Heroes, and the *Clean Air Hamilton* website).

2.0 *Clean Air Hamilton*

2.1 Vision Statement

"*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."

2.2 Goals of *Clean Air Hamilton*

Clean Air Hamilton has identified the following goals as a guide for future actions:

- To improve air quality throughout the City and to meet all ambient air quality criteria;
- To raise *Clean Air Hamilton*'s visibility in the community and to be recognized as the authoritative voice on local air quality issues;
- To galvanize broad-based support for a process and an action plan to improve air quality;
- To provide information and advice that decision-makers value;
- To influence decision-makers to choose sustainable practices and alternatives; and
- To affect behavioural changes to improve air quality.

2.3 *Clean Air Hamilton* Terms of Reference

In the Fall of 2011, *Clean Air Hamilton* created Terms of Reference that address the administration, decision-making and membership components of the group. The Terms of Reference were approved at the *Clean Air Hamilton* meeting in December 2011. A copy of the approved 2011 Terms of Reference can be found in **Appendix A** of this report.

2.4 *Clean Air Hamilton* Membership 2011

Dr. Brian McCarry (Chair)	McMaster University
Paul Barrett	Green Venture
Julie Bennett	Ontario Ministry of the Environment
Michael Brown	ArcelorMittal Dofasco
Tom Chessman	Public Works, City of Hamilton
Dr. Denis Corr	Corr Research/Rotek Environmental
Heather Donison	Planning & Economic Development, City of Hamilton
Jordan Fysh	Green Venture
Frank Harrison	US Steel Canada
Chris Hill	Public Works, City of Hamilton
Zobia Jawed	Ontario Ministry of the Environment
James Kaspersetz	Citizen

Matthew Lawson	Public Health Services, City of Hamilton
Brian Lennie	Horizon Energy Solutions Inc.
Karen Logan	Hamilton Industrial Environmental Association
Lynda Lukasik	Environment Hamilton
Samantha Lundy	Horizon Utilities
George McKibbon	McKibbon Wakefield
Brian Montgomery	Planning & Economic Development, City of Hamilton
Sally Radisic	Public Health Services, City of Hamilton
Andrew Sebestyen	US Steel Canada
Carl Slater	Ontario Ministry of the Environment
Mark Smithson	Ontario Ministry of the Environment
Peter Topalovic	Public Works, City of Hamilton
Lorraine Vanderzwet	Mohawk College
Julie Wallace	Citizen
Steve Walsh	Public Health Services, City of Hamilton
Pete Wobschall	Green Venture
Anna Yusa	Health Canada

Clean Air Hamilton is dependent upon the voluntary contributions of its members. In order to continue to make air quality improvements in Hamilton, *Clean Air Hamilton* continues to supplement the voluntary contributions of members with renewed and ongoing commitments of funding from key stakeholders, including various levels of government, the City of Hamilton, local industries and academic institutions, as well as recruiting new members into the organization.

Clean Air Hamilton is committed to recruiting new members who have the time, expertise and interest in air quality issues to work in a committee-based format to find ways to improve air quality in the City. *Clean Air Hamilton* is particularly interested in engaging with committed individuals who want to undertake research to improve air quality in Hamilton. *Clean Air Hamilton* is interested in working with individuals and with representatives from industries, schools and school boards, community groups and others who partner on one or more actions identified by *Clean Air Hamilton*.

Interested individuals should contact the City of Hamilton's Air Quality Coordinator by telephone at (905) 546-2424 ext. 1275 or by e-mail: cleanair@hamilton.ca

2.5 Strategic Activities - 2011 and Beyond

Clean Air Hamilton has identified nine strategic issues related to air quality improvements and climate change issues that the committee wishes to focus on over the next 2-3 years. These issues have been identified for research, communication and program activities by *Clean Air Hamilton* in collaboration with our partners:

- **Public Health Protection:** With an Air Quality Health Index (AQHI) now in Hamilton, encourage widespread use of the AQHI and produce communications to aid citizens in understanding what actions they can take to mitigate the health effects of poor air quality, particularly on smog days and inversion days.

- **Active & Sustainable Transportation:** Encourage the use of active and sustainable means of energy-efficient transportation and encourage emissions reductions by moving away from single occupancy personal transportation.
- **Smart Drivers:** Reduce unnecessary idling of vehicles, reduce impacts of vehicle emissions, and reduce emissions from driving.
- **Air Quality Communication:** Continue to communicate on the impacts and sources of poor air quality, encourage behavioural changes, and increase support for *Clean Air Hamilton*.
- **Climate Change:** Provide a forum to discuss the linkages between climate change and air quality and encourage strategies and actions industries, government and citizens can take to reduce climate change impacts in Hamilton.
- **Emission Reductions Strategies:** Develop a plan to reduce emissions from small, medium and large-scale sources on "bad air" days (e.g., smog days).
- **Energy Conservation:** Encourage energy conservation by promoting best practices in energy efficiency and renewable energy, and by encouraging reductions in wasteful use of electricity. This promotion will assist the public and decision-makers to make the connection between climate change mitigation and air quality improvements.
- **Land Use Planning:** Encourage actions by the City through land use policies to promote reductions of emissions and improvements in air quality through better planning tools.
- **Tree Programs:** Develop a tree networking and tree inventory organization for coordination of all tree planting activities across the City.

The 2011 *Clean Air Hamilton* Report presents the actions undertaken in 2011 by members of *Clean Air Hamilton* and our partners to address these strategic issues. Details of these activities can be found in **Appendix B**.

2.6 Financial and In-Kind Contributions

The City of Hamilton currently provides an annual contribution of $80,000/year in support of *Clean Air Hamilton* and its activities. This money 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* are community volunteers who donate their time and expertise, there is a significant amount of in-kind support provided to *Clean Air Hamilton*. In 2011, it is estimated that *Clean Air Hamilton*'s partners and volunteers provided $73,900 in in-kind support. *Clean Air Hamilton*'s 2011 financial report is available in **Appendix C**.

2.7 Upwind Downwind Conference 2012

Every two years *Clean Air Hamilton* hosts the Upwind Downwind Conference, an event which highlights (a) the latest in air quality research, particularly as it applies to the human health impacts of air pollution, and (b) strategies and activities to improve air quality on local, regional and national scales. The programs at these conferences have been designed to be accessible to the non-expert and are targeted to the identification of problems and the implementation of practical solutions to improve air quality and public health at the local level. Sessions in past conferences have been devoted to the health impacts of air pollution, urban planning and urban design strategies to reduce air pollution, energy efficient strategies for homes and industries and local initiatives and success stories from across North America that have led to real improvements in the quality of life of citizens.

The 2012 Upwind Downwind Conference was held in Hamilton, Ontario on Monday, February 27 2012 at the Sheraton Hotel in downtown Hamilton. The 2012 Upwind Downwind Conference: Unlikely Partners was the seventh biennial conference focusing on practical solutions to the air quality, transboundary air and climate change issues and impacts facing urban regions. This one-day conference aimed to provide a forum to enable an improved understanding of these issues in relation to air quality policy and to create partnerships and understanding amongst groups.

The Conference invited 13 speakers from the fields of human health, science, public policy, municipal government, industry and community initiatives. Featured speakers and topics included: Dr. David Mowatt, Medical Officer of Health with Peel Region speaking on healthy and sustainability communities; Dr. Douglas Chambers with SENES Consulting speaking on the updates to health impacts of air pollutants in Hamilton: a municipal panel representing Clean Air Sudbury, the City of Ottawa, Halton Region, and the City of London speaking on their air quality initiatives and partnerships; and Dr. Denis Corr on mobile air monitoring in a number of neighbourhoods in Hamilton.

The 2012 Conference provided an opportunity to discuss the types of actions that governments, industries and citizens will need to take in order to make significant progress to address air quality improvements and health impacts. Approximately 148 planners, health promoters, university/college students, environmental consultants, and citizens participated in the one-day 2012 Conference.

A free-to-the-public, afternoon talk was also a feature of the 2012 Upwind Downwind Conference. On February 26 author Jay Walljasper presented an excellent presentation and question-and-answer session at the Art Gallery of Hamilton. The focus of his talk was on his concept of “the commons”. The public talk attracted 75 individuals.

More detailed information on the 2012 Upwind Downwind Conference can be found in **Appendix E**.

All conference presentations are available for viewing and/or downloading at:
www.cleanair.hamilton.ca/default.asp?id=47

3.0 Air Quality in Hamilton

3.1 Air Pollution Health Impacts – Hamilton

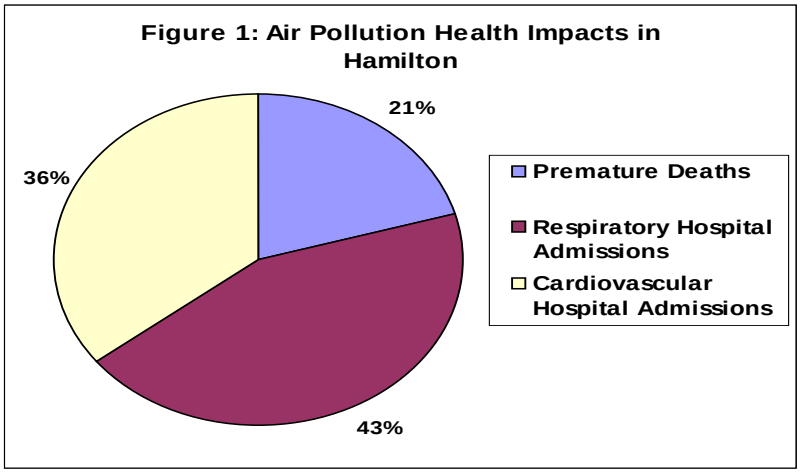
While the correlation between exposure to air pollution and illnesses and mortality related to these exposures is well established (OMA, 2005), current research efforts are seeking to understand and quantify the impacts on a range of specific health outcomes with specific air contaminants and overall risks such exposures pose to the public.

Poor air quality has been associated with a range of health impacts including eye, nose and throat irritation, breathing difficulties, and cardiovascular disease. These insights come from increasingly sophisticated statistical analyses of large-scale epidemiological data sets linking air quality data and health outcomes.

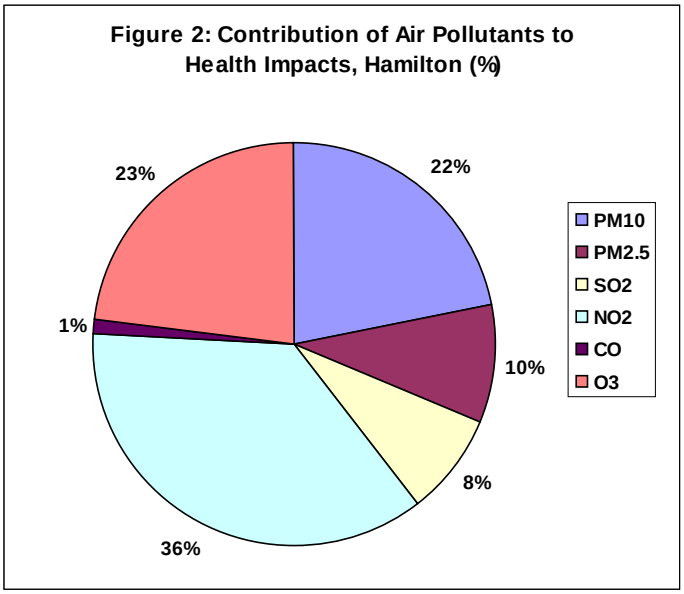
In 2011, *Clean Air Hamilton* in partnership with Hamilton Public Health Services decided that it was time to update the two previous health studies that had been undertaken by *Clean Air Hamilton* and reported in 1997 as part of HAQI reports and in 2003. SENES Consulting agreed to undertake the task of providing a comprehensive review of the scientific literature linking air pollutants and health effects and to use ambient air data from Hamilton to determine the health impacts of air pollution in Hamilton.

This study updates the health risks (cardiovascular and respiratory) associated with air pollutants (particulate matter, nitrogen oxides, ground-level ozone, sulphur dioxide and carbon monoxide). This report provides the clearest picture of the health impacts associated with poor air quality in our City. Due to improvements in air quality in Hamilton over the last 10 years, there was interest to see if associated health impacts have been reduced.

The 2011 Air Quality Health Assessment Study prepared for *Clean Air Hamilton* by SENES Consulting Inc. estimated that the six key air pollutants - nitrogen dioxide (NO_2), ground-level ozone (O_3), inhalable particulate matter (PM_{10}), respirable particulate matter ($PM_{2.5}$), sulphur dioxide (SO_2), and carbon monoxide (CO) - contribute to about 186 premature deaths, 395 respiratory hospital admissions and 322 cardiovascular hospital admissions each year in Hamilton (see **Figure 1**).



The main air pollutants contributing to respiratory admissions to hospitals are ground-level ozone, sulphur dioxide and nitrogen oxides while particular matter (PM_{10} and $PM_{2.5}$) and carbon monoxide contributed to cardiovascular admissions to hospitals. **Figure 2** below outlines the relative contributions of air pollutants to health impacts in Hamilton.



Overall, with the average measured air quality for the Hamilton region improving, the number of hospital admissions associated with respiratory ailments has remained unchanged since the 2003 study; however, hospital admissions associated with cardiovascular effects have decreased significantly since 2003. Overall, deaths due to air pollution remained relatively steady, decreasing from 229 in 2003 to 186 in 2012.[1]

The complete 2011 Health Impacts Study of Air Pollutants in Hamilton can be read online at the *Clean Air Hamilton* website – **www.cleanair.hamilton.ca**

3.2 Air Monitoring - Hamilton

Air monitors collect information about outdoor air quality data across the City of Hamilton and these data can be compared to provincial and federal air quality standards and to levels at cities across Canada and around the world. Other uses of these data are to identify sources of air pollutants, and to evaluate the potential impacts of air emissions on human health.

Air quality monitors are located at a number of locations across the City. The air quality monitors are operated by two different organizations. The Ontario Ministry of the Environment (MOE) operates a network of three fixed air monitoring stations which serve as Provincial Air Quality Index (AQI) monitoring stations; these stations are situated in West Hamilton, on the Mountain and just east of downtown. The Hamilton Air Monitoring Network (HAMN) operates a network of 15 stations that serve to monitor the industrial sector of Hamilton. This network is fully funded by local industry member companies. The locations of these stations, pollutants monitored and the

[1] Not corrected for a 10% population increase in Hamilton since 2003.

data quality is subject to Ministry of the Environment (MOE) scrutiny. Two of the MOE's AQI sites serve as sites for equipment owned by Environment Canada as part of its National Air Pollution Surveillance Station (NAPS) network.

Hamilton is the Canadian pioneer in undertaking a program of mobile air quality monitoring. The mobile monitoring van can roam city-wide and can measure ambient air quality conditions on a minute-by-minute basis at street level. This type of monitoring affords a dramatic real-time picture of the changing exposures people experience. The first mobile air monitoring in Hamilton was done in 2004 as a pilot project funded by the City and *Clean Air Hamilton*. The monitoring van and the monitoring equipment were brought together as a result of a partnership between *Clean Air Hamilton*, the Ministry of the Environment, Environment Canada and Rotek Environmental.

Additional air monitoring is conducted by the local Ministry of the Environment Office and includes routine particulate monitoring and short-term survey work. For example, in one 2011 project the Ministry of the Environment examined air particulate impacts at 8 locations across greater Hamilton.

Air monitoring resources in Hamilton tend to be focussed on the east end industrial sector of the City. As a result of mobile monitoring activities in 2005, additional industrial areas in Hamilton were identified (see **Section 3.5**) that are not actively monitored or connected to the existing monitoring network. In addition, mobile monitoring and health research (see **Section 6.1**) have identified gaps in the capturing of air pollution data and associated health impacts in neighbourhoods and transportation corridors across Hamilton. There is recognition that expansion of the fixed network combined with continued mobile monitoring can identify community "hot spots" in Hamilton and enhance the knowledge of local air emission sources, as well as, their impacts, and assist in the development of policies and initiatives to reduce local emission sources in the community.

The air quality data from the MOE's three AQI stations are available here:
www.airqualityontario.com/reports/summary.cfm

3.2.1 Hamilton Air Monitoring Network (HAMN)

The Hamilton Air Monitoring Network (HAMN) is an industry-funded, local air monitoring network, comprised of 22 local companies who have committed to the assessment of air quality in Hamilton on a regular basis (**Table 1**). A map of the air monitoring network is shown in **Figure 3.** On-going operating costs and expenses related to the upgrading of air monitoring equipment and instruments are borne by the industries who are members of the network. The network provides air quality reports to the Ontario Ministry of the Environment (MOE) on a regular basis and to *Clean Air Hamilton*. All air quality data and reports are audited by the MOE to ensure a consistent and high quality data. The MOE also conducts regular audits of the equipment at the HAMN sampling sites.

Table 1: HAMN Participating Industries

Bartek Ingredients	MultiServ - ArcelorMittal Dofasco Inc.	Liberty Energy Inc.
Baycoat Ltd.	MultiServ - U. S. Steel Canada	U. S. Steel Canada – Hamilton Works
Bunge Canada	Lafarge Canada – Jones Road	ArcelorMittal Hamilton East
City of Hamilton	Lafarge Canada - Victoria	Ruetgers Canada
Shell Canada Ltd.	Lafarge Hamilton Slag	Vopak Terminals of Canada Inc.
ArcelorMittal Dofasco Inc.	Triple M Metal LP	Columbia Chemicals Canada ULC
Federal Marine Terminals	Newalta	Westway Terminal Canada
Biox Canada Ltd.		

Figure 3: Map featuring the Hamilton Air Monitoring Network

In June 2009, public access was provided to all real-time air monitoring data collected by HAMN (www.HAMNair.ca). This website was developed as a partnership between *Clean Air Hamilton*, HAMN, the City and the MOE.

To access the real-time air monitoring data of HAMN visit: www.HAMNair.ca

3.2.2 Regulating Air Contaminants

Ontario Regulation 419/05: Air Pollution - Local Air Quality made under the *Environmental Protection Act* is the Ontario Ministry of the Environment's (MOE) main tool used to regulate air contaminants released by industrial, commercial and institutional facilities. The Regulation includes three approaches for industry to demonstrate compliance. These include:

1. Meeting the *provincial air standards* by the specified phase-in date, which is generally five years; or
2. Requesting and meeting a *site-specific standard*; or
3. Registering under a sector-based *technical standard* (if available) and complying with requirements set out therein.

All three approaches are valid under the regulation. Ontario's Local Air Quality Regulation (O. Regulation 419/05) is the main tool used by the Ministry of the Environment to regulate air contaminants released by industrial facilities to protect local communities. The regulation aims to limit or reduce substances released into air that can affect human health and the environment, while ensuring industry can remain competitive and productive. The regulation establishes air standard concentration limits for contaminants against which an industrial facility's emissions are assessed using air dispersion models or monitoring. Ontario currently has air standards for over 120 contaminants and guidelines for over 200 more.

In 2011, MOE set new or updated air standards for an additional nine contaminants – uranium and uranium compounds (PM_{10} fraction), nickel and nickel compounds, chromium and their compounds, hexavalent chromium, benzene, benzo[a]pyrene (as a surrogate for polycyclic aromatic hydrocarbons), 1,3-butadiene, dioxins and dioxin-like compounds, and manganese and its compounds. These standards come into effect July 1, 2016.

In September of 2011, the ministry introduced a modernized approach for issuing instruments formerly called Certificates of Approval (CofA). There are now two streams to obtain approval. One stream is to electronically register for certain discharges that are established through regulation. These are known as Environmental Activity Sector Registrations (EASR). The initial phase of EASR covered certain low risk emission sources such as certain auto repair and finishing and standby electricity generators. Other low risk sources are planned for phase in. The second stream of approval is for Environmental Compliance Approvals (ECA). These are the higher risk, significant source or complex approvals that require careful, thorough assessment and detailed technical review. ECA includes large sewage systems, landfills and waste transfer sites and many air emissions. For an air ECA application, an approval is granted based on the specific facility and the controls proposed for the air emissions. This approval is issued if the facility and the controls are expected to only emit contaminants into the air below the air standards set out in O.Reg 419/05. Since an ECA is required before a facility can be built, the assessment and approval is often based on the modeling of air emissions to determine the air quality at any point off-property. Unless explicitly exempted, most industrial processes and equipment that discharge to the air require an ECA in order to operate.

What is a contaminant?

The term 'contaminant' is defined under the Environmental Protection Act as any solid, liquid, gas, odour, heat, sound, vibration, radiation or combination of any of them resulting directly or indirectly from human activities that causes or may cause an adverse effect. The definition of a contaminant is very broad. Examples include particulate emissions from a process, solvent emissions from a painting line, nitrogen oxides from combustion sources, or sound and vibration from a metal stamping operation. The Ministry of the Environment does not require that compounds have published criteria to be considered contaminants. Unless explicitly exempted, most industrial processes and equipment, and modifications to industrial processes and equipment that discharge contaminants require approval. Under O. Reg 419/05 heat, sound and vibration are excluded.

While the ECA is based on the modelled prediction that air standards or a site-specific standard will be met, there could be circumstances where the operation of the facility or equipment is not able to demonstrate compliance with applicable air standards or site-specific standard. If standards are not met or if conditions on the ECA are not met, the Ministry of the Environment will take action to require that corrective measures be taken to bring the operation into compliance with the regulation and ECA conditions.

For further information on air regulation and standards visit:
www.ene.gov.on.ca/en/air/ministry/index.php#ts

For information on Environmental Compliance Approvals visit:
http://www.ene.gov.on.ca/environment/en/resources/STDPROD_089449.html

O.Reg 419/05 includes three compliance approaches for industry to demonstrate environmental performance, and make improvements when required. Industry can meet the air standard, request and meet a site-specific standard or register under a technical standard (if available for the sector). All three approaches are valid under the regulation.

Under O. Reg. 419/05, new or more stringent standards are phased in over time. The first of set of new or more stringent air quality standards for industrial facilities in Ontario took effect on February 1, 2010, with the next set to phase in on February 1, 2013 and another set on July 1, 2016. A facility that is not able to meet the standards within the prescribed timeline may request approval for a site-specific air standard, while it implements an Action Plan of projects to reduce emissions and continuously improve. The MOE introduced the site-specific standard process to acknowledge time, technical, and economic factors related to the significant adjustments and investments needed to comply with the Regulation. A site- specific air standard may be approved for a period of five years to ten years. Furthermore, O. Reg. 419/05 provides that a facility may also re-apply for site specific air standard.

Table 2 below presents a summary of site specific standards that have been approved or are currently under review.

Table 2: Ontario Companies who have Requested Alterations to an Air Standard under O.Reg. 419/05

Organization	Date of Request	City	Status
Royal Polymers Limited	December 2006	Sarnia	Plant closed during 2008. File closed.
Oxy Vinyls Canada Inc.	March 2007	Niagara Falls	Approval issued January 2009.
Vale Inco Limited	October 2008	Sudbury	Approval issued December 2011.
ArcelorMittal Dofasco Inc.	October 2008 (updated September 2009)	Hamilton	Approval issued July 2010.
U. S. Steel Canada Inc.	October 2008 (to be updated with further information)	Hamilton	Efforts currently underway to update request. Final request application expected during 2013.
U. S. Steel Canada Inc.	October 2008 (to be updated with further information)	Nanticoke	Efforts currently underway to update request. Final request application expected during 2012.
Xstrata Canada Corporation (Xstrata Copper Canada - Kidd Metallurgical)	October 2008	Timmins	Approval issued February 2010.
Xstrata Canada Corporation (Xstrata Nickel)	January 2011 (for sulphur dioxide)	Falconbridge	Notice of Proposed Decision posted to the EBR closing April 29, 2012. Decision to be finalized after consideration of comments.
Xstrata Canada Corporation (Xstrata Nickel)	October 2011 (for cadmium)	Falconbridge	Request is currently under review.

Vale Inco Limited	December 2011 (for sulphur dioxide)	Sudbury	Request is currently under review.
ADM Agri-Industries	April 2012	Windsor	Request is currently under review

A request for the site specific air standard must (at a minimum) include the following information:

- **Emission Summary and Dispersion Modeling (ESDM) Report** –which includes results from a modeling/monitoring study, and an assessment of the magnitude and frequency of exceedence of the standards.
- **Technology Benchmarking Report (TBR)** - assessment and ranking of technical methods for reductions in contaminant concentrations and provide an assessment of feasible technologies.
- **Action Plan** - schedule of dates/timelines.
- **Public Consultation Report** – summary of the mandatory public meeting with the local community.

The request may also include:

- **Economic Feasibility Analysis (Optional)** - cost of technically feasible mitigation options, and comparison to the cost of reductions in off-property concentration of various options.

An important element of the site-specific standards process is public transparency. Therefore, the requestor for a site-specific air standard must engage in public consultation efforts to ensure that:

- Community members are given an opportunity to understand the barriers for the facility in meeting an air standard at this time.
- Stakeholders/Community members are given an opportunity to review the proposed Action Plan.
- Community members understand the regulatory framework and have an opportunity to comment on the proposal by the facility for a site- specific standard and the outcome reached by the facility in terms of corrective actions to address the issue, through the Environmental Registry.
- The community is given an opportunity to provide input into the risk-based, decision-making process.
- Stakeholders know where information is available and whom to contact for answers to their questions.

Both ArcelorMittal Dofasco Inc. and U. S. Steel Canada Inc. established community liaison committees (CLCs) in 2010. The CLCs include representatives from the Ontario Ministry of the Environment and Hamilton-area stakeholder organizations, and individual community members.

ArcelorMittal Dofasco's CLC began to meet quarterly to keep the community informed of the environmental implications (air, water, waste) of their operations. The CLCs include representatives of the Ontario Ministry of the Environment and Hamilton-area stakeholder organizations and individual community members. Meetings focus on advising on the site-specific standards process, the progress of the Action Plans proposed by the company to reduce emissions, and addressing concerns of the community.

Although U. S. Steel Canada's site-specific standard activities have been delayed as a result of production outages, its CLC began meeting to discuss actions to reduce emissions being taken under its Environmental Performance Agreement with the Ministry of the Environment as well as concerns raised by the community.

These CLCs are separate from the Hamilton Industrial Environmental Association's (HIEA) Community Advisory Panel (CAP) that has met since 1998 and acts as a direct link between industry, neighbourhood groups and individuals and local environmental community-based initiatives. HIEA represents twelve companies, including ArcelorMittal Dofasco and U. S. Steel Canada Inc., that aim to improve the local environment – air, land and water – through joint and individual activities, and by partnering with the community to enhance future understanding of environmental issues and help establish priorities for action.

For further information on ArcelorMittal Dofasco's CLC visit:
http://www.arcelormittal.com/hamilton/dofasco/bins/content_page.asp?cid=315910-1852-341131

For further information on HIEA Community Advisory Panel visit:
http://www.hiea.org/community-advisory-panel.aspx

In summary, if a facility receives approval for a site-specific air standard, the facility is operating in compliance with O. Reg. 419/05. The site-specific standard becomes the legally enforceable standard for that facility for the time period of the approval. The decision on whether or not to approve a site-specific standard includes an extensive technology benchmarking assessment which compares the facility to other facilities and evaluates best available technologies or practices to minimize emissions. A site-specific standard approval may also include conditions relating to actions to be undertaken by the company to reduce emissions over the duration of the approval. O. Reg. 419 states that the site-specific air standard is only in effect if the facility is complying with the conditions imposed in the approval. There is also authority to issue a notice that revokes the approval of the site-specific air standard. Compliance and/or enforcement action is also possible. Ultimately, the goal of the air standard regime set out in O.Reg. 419 is continuous improvement of emissions that will occur as new technologies become available or economic circumstances change.

For further information on Site-Specific Standards visit:
www.ene.gov.on.ca/environment/en/industry/standards/industrial_air_emissions/air_pollution/STDPROD_078054.html

Sectors are eligible to request a technical standard if there are at least two facilities in a sector that cannot meet at least one air standard. Once this criterion is met, the technical standard can include a wide range of contaminants, including those without air standards.

A technical standard sets out the technical and operational requirements for major sources of air emissions identified in a sector. The standard can include requirements relating to technology used at the facility, operation of the facility, monitoring and reporting of information and other related matters.

Development of a technical standard includes a better understanding of the specific sources of the contaminant for that sector, benchmarking technology to address the sources of a contaminant, and consideration of economic issues that relate to the sector.

The goal is to have a more efficient tool to better manage air emissions from these industry sectors, thereby reducing overall exposure in the community.

There are two types of technical standards:

Industry Standards regulate all sources of a specified contaminant(s) within an industry sector.

Equipment Standards address a source of contaminant(s), but may apply to one or multiple industry sectors.

A facility that meets its obligations under a technical standard is in compliance with the regulation for the registered contaminants.

3.3 Hamilton Air Quality – Trends and Comparisons over Past Ten Years

Examination of the trends in ambient air quality in Hamilton over the last decade or so (see **Appendix D**) shows that there have been large reductions in the airborne levels of some pollutants. The ambient levels of pollutants, such as particulate material (PM_{10} and $PM_{2.5}$), nitrogen oxides (NO_x) and sulphur dioxide (SO_2) have decreased steadily over the past couple of decades. These reductions are the result of improved emissions performance of the vehicle fleet and of actions taken by companies within the industrial sector in Hamilton to reduce their emissions. Levels of other pollutants have seen real but more modest reductions over the last decade; for example, total suspended particulate material arising from transportation sources, the roadway system due to road dust resuspension and various other sources of fugitive dusts has not shown as large a decrease as some other parameters. While year-to-year changes have often been incremental and have shown both increases and decreases, the overall trends since the mid 1990's have shown a decreasing trend.

The levels of Total Reduced Sulphur and Benzene show decreases compared to 2010 levels while Benzo[a]pyrene shows increases in 2011 when compared to levels reported in 2009; however, the current concentrations are still well below the levels measured in the mid-1990s. Finally, the levels of ground level ozone (O_3) during the summer months have shown an upward trend. Essentially all of the O_3 measured in Hamilton is the result of emissions in the US Midwest; the O_3 created following release of these pollutants arrives in southern Ontario via long-range transport of pollutants from a number of US states.

When comparing recent levels of air pollutants in Hamilton to levels of the same pollutants in other southern Ontario communities over the past 9 -21 years (see **Appendix D**), one notes that:

- The levels of nitrogen oxides (NO_x) in Hamilton have decreased in recent years and are now similar to other cities in southern Ontario but are not the highest;
- The levels of ground-level ozone (O_3) in southern Ontario during the summer months have varied significantly from year to year depending on the weather conditions in a given summer. Overall, there is an increasing trend over the past decade, primarily due to long-range transport from the US. O_3 levels in Hamilton are usually about the same as or lower than levels in other southern Ontario cities. Some rural areas of Ontario can experience rather high ozone levels; the highest levels of ground-level O_3 in Ontario are often observed at sites adjacent to large lakes, including Turkey Point, Simcoe and the Bay of Quinte;
- The levels of sulphur dioxide (SO_2) in Hamilton tend to be higher than in other southern Ontario communities due to higher emissions from local industrial activities; however, as noted above, SO_2 levels in Hamilton have continued to decrease in recent years.

The air quality in Hamilton is impacted by a combination of factors that do not co-occur in other communities in southern Ontario:

- The roads in and around Hamilton are heavily used by local citizens, commuters passing through Hamilton and long-distance traffic. As a consequence, the air quality is adversely impacted by the mobile emissions generated by gasoline-powered vehicles and diesel-powered transport trucks;
- Hamilton is home to a large number of small, medium and large industries;
- Hamilton is located at the west end of Lake Ontario and is surrounded by the escarpment, a combination that brings unique meteorological challenges to the area. The local topography (i.e., the escarpment) and prevailing weather conditions contribute to conditions where air pollution levels are usually higher below the escarpment where there are more industries and higher density urban development. A few times a year certain unusual meteorological conditions can give rise to atmospheric inversion events, which may last from 2 to 12 hours. During these events, pollutant levels can rise dramatically for a short time. These events are most common in the spring and fall;
- Hamilton is also affected by transboundary air pollution (primarily ground-level ozone and air particulates from sources in the mid-western United States). In this respect, Hamilton is no different from many other urban areas, small communities and rural areas in southwestern Ontario.

3.4 Smog Advisories and Smog Advisory Days

What is a Smog Advisory?

The Ontario Ministry of Environment (MOE) monitors the air quality in Ontario and provides a rating of the air quality called the Air Quality Index (AQI). A smog advisory is issued by the MOE when the Air Quality Index reaches or exceeds a value of 50; a smog advisory day is declared when it is predicted that it is likely that the AQI may reach or exceed 50 on an upcoming day or the AQI has already reached a value over 50 and is expected to remain above 50 for the advisory period. There are three AQI stations in Hamilton that provide the air quality index data used to calculate the AQI at each site. Smog advisories are issued to alert the public when widespread elevated levels of air pollution exist (i.e., when AQI values exceed a value of 50). Such conditions exist during persistent smog episodes and are commonly characterized by high levels of ozone (typically in summer months) and/or particulate matter (typically in the fall and spring). Local smog advisories may be issued just for Hamilton, if local emissions are expected to result in AQI values of 50 or higher usually due to particulate matter.

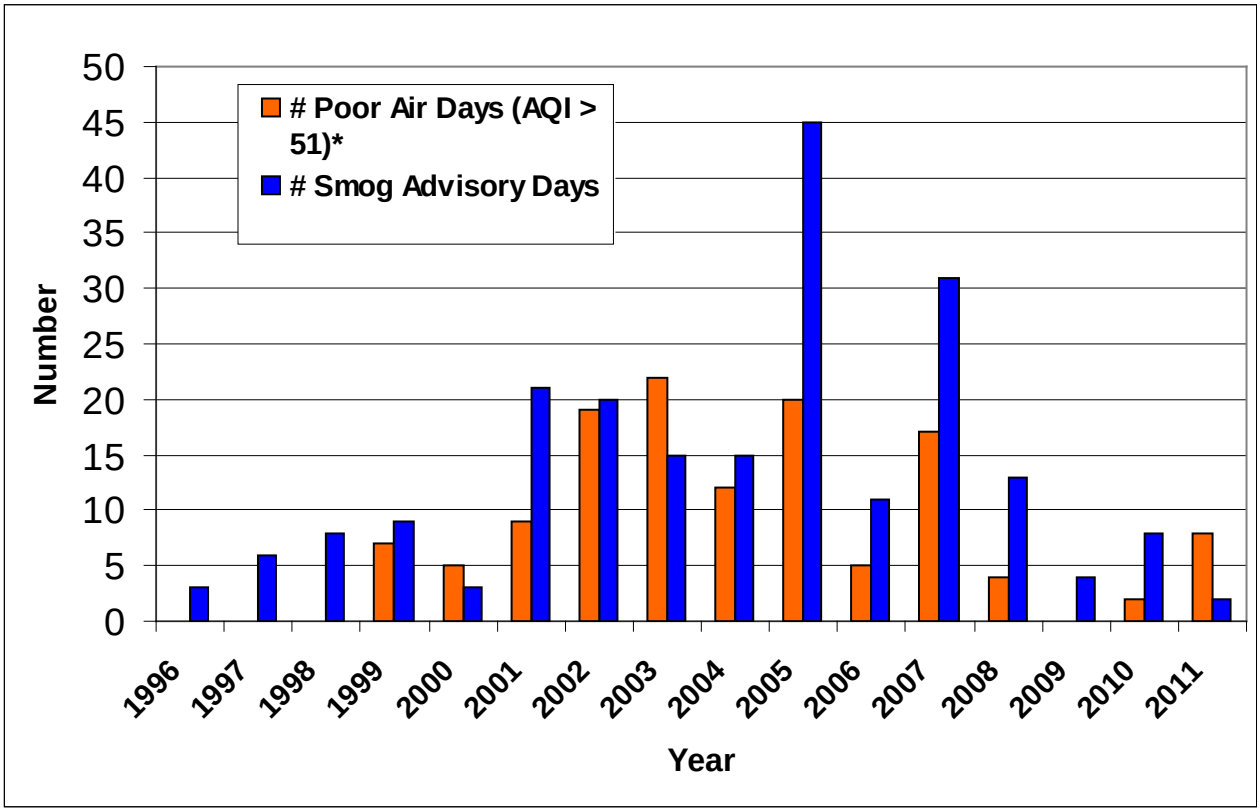
The AQI is determined based on the highest single value of any one of six key air health-related contaminants – fine particulate matter ($PM_{2.5}$,) nitrogen dioxide (NO_2), sulphur dioxide (SO_2), carbon monoxide (CO), total reduced sulphur compounds and ground-level ozone (O_3). In the summer months, smog days and air quality advisories are usually issued based on high ozone levels due to regional and long-range pollution sources whereas in the spring and fall smog alerts are issued primarily due to high levels of particulate matter due to local pollution sources.

Gaseous air pollutants such as nitrogen oxides and volatile organic compounds (NO_X, VOCs) can react under the influence of sunlight to afford a complex mixture of chemical products, including ground-level ozone (O_3). This mixture of pollutants is commonly called smog. The ozone that forms one of the constituents of smog is called ground-level ozone to distinguish it from the ozone in the stratosphere (i.e., the ozone which is found ~20-40 km above the earth's surface); stratospheric ozone is important in absorbing harmful ultraviolet radiation from the sun and reducing the intensity of ultraviolet light that reaches the earth's surface. Ozone is a severe lung irritant and when inhaled along with respirable particulate matter and other pollutants such as nitrogen oxides, can cause dramatic impacts on the lungs of susceptible individuals, such as the elderly and the young.

There were a total of 8 days in 2011 when the air quality would be considered poor (an AQI of 50 or greater for at least 1 hour). In 2011, 2 smog advisory days were declared by the Ontario Ministry of Environment (MOE) for the City of Hamilton (see **Figure 4**). The advisory issued on July 2nd covered most of Southern Ontario including Hamilton. The advisory was driven by ground-level ozone concentrations. The second advisory, which occurred on October 11, 2011, was a localized event resulting from atmospheric conditions that limited the usual mixing and dispersion of airborne contaminants including particulate matter. The October 11 advisory lasted from 12:30 pm until 10:30 pm that evening.

Figure 4 below shows the numbers of smog advisory days and poor air quality days in Hamilton over the past twelve years. Poor air quality days are defined as days where the Air Quality Index (AQI) was greater than or equal to 50 for at least 1 hour during the day.

Figure 4: Number of Poor Air Quality Days and Smog Advisory Days in Hamilton between 1996 and 2011



Data from Downtown Hamilton Air Monitoring Station

Ontario's Smog Alert Program was enhanced on August 23, 2002 when $PM_{2.5}$ was incorporated into the provincial Air Quality Index (AQI). Prior to this date, smog advisories were issued only for exceedances in ground-level ozone levels.

For further information, consult the MOE's Air Quality site: www.airqualityontario.com

3.5 Air Quality Health Index

Clean Air Hamilton and Hamilton Public Health Services have advocated for the development of a health-based Air Quality Index; a well-conceived health index would provide the public with useful information about current air quality conditions and provide the public with strategies they can use to reduce their exposures. The Government of Canada has developed an Air Quality Health Index (AQHI) and has piloted this index in selected cities across Canada. Daily AQHI reporting for Hamilton began on Environment Canada's website in July 2011.

The Government of Canada's new AQHI is calculated in a different manner compared to the MOE's Air Quality Index (AQI). While the MOE's AQI currently takes into account 6 air pollutants [fine particulate matter ($PM_{2.5}$,) nitrogen dioxide (NO_2), sulphur dioxide (SO_2), carbon monoxide (CO), total reduced sulphur (TRS) compounds and ground-level ozone (O_3)], the AQI value is calculated based on **only one** of these six pollutants, depending on which pollutant has the highest value on its scale.

We have known for many years that the impacts of individual air pollutants are additive; in other words an air quality index should be based on the health effects of all pollutants. The MOE's AQI values do not reflect these additive effects. The AQHI is calculated using a formula that combines the concentrations and the relative health impacts of three air pollutants: ground-level ozone (O_3), particulate matter ($PM_{2.5}$/PM_{10}) and nitrogen dioxide (NO_2). According to the Government of Canada, sulphur dioxide (SO_2) and carbon monoxide (CO) were removed from the formula as they were not associated with health risks in many areas of Canada.

Federal, provincial and municipal governments collaborated in order to develop the AQHI as a numeric tool that could be used by health professionals and the public to determine the health risks related to air quality at a given time. In **Figure 5** the AQHI scale is shown as a continuous, open-ended scale that ranges from low risk levels (one to three), moderate risk levels (four to six), high risk levels (seven to ten) and very high risk levels (greater than ten).

Figure 5: Air Quality Health Index Scale

(Source: Environment Canada, 2010)

Health messages are directed at two distinct populations – the "at risk" population and the "general" population (see Figure 8). The "at risk" population includes individuals at increased risk due to age or a variety of health conditions; the "at risk" population includes young children, the elderly, people with existing respiratory conditions (e.g., asthma, chronic obstructive pulmonary disease (COPD), including bronchitis, emphysema and lung cancer) and people with existing cardiovascular conditions (e.g., angina, previous history of heart attack, congestive heart failure, arrhythmia or irregular heartbeat). The 'general population' includes all other individuals who do not fall under the "at risk" population (Environment Canada, 2010).

Those in the "at risk" category are encouraged to monitor the AQHI regularly since they are more sensitive to air pollution. Individuals are encouraged to develop their own self-calibration points on the AQHI scale. Most people understand how to use temperature, wind chill, UV Index and Humidex values prior to going outdoors and to make decisions based on these parameters. The AQHI value is yet another factor that individuals will need to calibrate themselves against.

Table 3: Air Quality Health Index Health Messaging

Health Risk	Air Quality Health Index	Health Messages	
		At Risk Population*	**General Population**
Low	**1 - 3**	**Enjoy** your usual outdoor activities.	**Ideal** air quality for outdoor activities.
Moderate	**4 - 6**	**Consider reducing** or rescheduling strenuous activities outdoors if you are experiencing symptoms.	**No need to modify** your usual outdoor activities unless you experience symptoms such as coughing and throat irritation.
High	**7 - 10**	**Reduce** or reschedule strenuous activities outdoors. Children and the elderly should also take it easy.	**Consider reducing** or rescheduling strenuous activities outdoors if you experience symptoms such as coughing and throat irritation.
Very High	**Above 10**	**Avoid** strenuous activities outdoors. Children and the elderly should also avoid outdoor physical exertion.	**Reduce** or reschedule strenuous activities outdoors, especially if you experience symptoms such as coughing and throat irritation

(Source: Environment Canada, 2010)

Promotion of the AQHI in the City of Hamilton was initiated in June 2011 prior to the reporting of the AQHI and continued throughout October 2011. Some of the promotional media channels used include: bus shelters, internal bus ads, billboards, newspapers, community magazines, pamphlets and post cards. In addition to these promotional media channels, outdoor special events in the City of Hamilton serve as an effective venue for public health program promotion. Outdoor special events in the City of Hamilton can be described as community fairs that are typically held in the spring, summer and early fall. Special events are open to the public and take place in various parts of the City of Hamilton that include both rural and urban areas. The graphics used for AQHI promotion are shown in **Figure 9**.

The AQHI was promoted at the following special events for four-hour time periods within the hours of 11 am and 5 pm:

- Transportation and Healthy Living Fair (THLF) (June 16, 2011)
- Your Festival Gage Park (YFGP) (July 1-3, 2011)
- Winona Peach Festival (WPF) (August 27-28, 2011)
- Binbrook Fair (BF) (September 17-18, 2011)
- Transportation and Healthy Living Fair (THLF) (September 22, 2011)
- Rockton Fair (RF) (October 8-9, 2011).

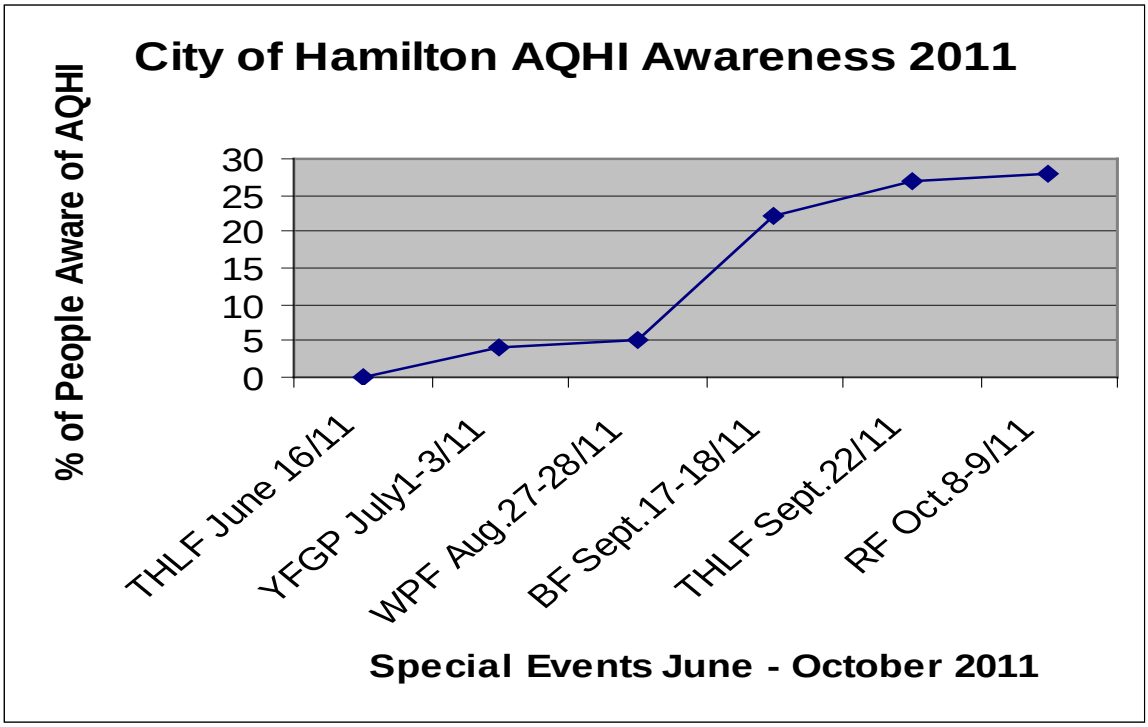
Figure 6. City of Hamilton AQHI Promotional Graphics
(Source: City of Hamilton, 2011)

The total number of people that approached the AQHI information booth at the special events was 944. The number of people that approach the AQHI information booth at each of the special events is displayed in **Figure 7**. Based on feedback from these special events, it was clear that the intent of the AQHI was effectively messaged and maintained since individuals identified that it is important to be aware of the AQHI because of its implications for health. Individuals identified the value of the AQHI for those who belong to the "at risk" population, whether it was themselves or someone they care for. In addition, they identified the value of the tool for those who are active outdoors.

Figure 7. Number of People Visiting the AQHI Promotional Booth

There was an increase in AQHI awareness from June to October 2011 recorded at special events as shown in **Figure 8** below.

Figure 8. City of Hamilton AQHI Awareness 2011



Not only was the importance of the AQHI awareness identified for attributed to health risk but also for the environmental. Linkages were made between the AQHI and air emissions to AQHI with respect to emission contributions from industry and motor vehicles were also identified. Therefore, the importance of raising AQHI awareness stimulated thought with respect to thinking around environmental air quality issues.

For further information on The Government of Canada's AQHI visit www.airhealth.ca

3.6 Local Poor Air Quality Notifications

The local office of the Ontario Ministry of the Environment (MOE) has put in place a program whereby about 30 industries will be asked to curtail emissions and control dust-generating activities on days when local air quality is poor. This system was developed by the MOE in partnership with the City of Hamilton Public Health Services, McMaster University Institute of Environment and Health, *Clean Air Hamilton* and the Hamilton Industrial Environmental Association (HIEA). Participating companies are told when local air quality is poor or is likely to become poor due to increased levels of fine particulate matter ($PM_{2.5}$). The participating companies already have plans and protocols in place to implement so as to reduce local sources of fine particulate matter. Such notifications serve to help the local air quality situation even though a notification cannot have any effect on long-range pollutants, i.e., contaminants coming in from sources outside Canada (e.g., transportation, cross-border sources, long-range sources, etc.).

This air quality notification process was put in place because it is possible to lessen the impacts of poor air quality on a local basis even if other areas do not have poor air quality at that time. The main reason for these "Hamilton-specific" events is a weather event known as a "temperature inversion". Normally, air near the ground is warmest and the air temperature decreases with increasing altitude. During a temperature inversion, a layer of warm air acts as a 'cap' over the ground level air. In this condition the air is usually very still. So as a result of the cap and the still air, local emissions from industry, transportation or other sources can no longer disperse readily and higher concentrations tend to build up in the air underneath the inversion layer. These inversions are unstable and tend to last from 1-6 hours before they break up and disperse.

Temperature inversions can be caused by very still air combined with the unique local geography of a sharp rise in elevation (the Niagara Escarpment), and the lake breeze from Lake Ontario. They are most likely to occur in spring and fall. In a typical year, Hamilton experiences 1-3 such events lasting 1-2 days; although events lasting up to 5 days have been known to occur.

The system of reporting on and taking action for local poor air quality is different from the MOE's Air Quality Index (AQI). The MOE's existing province-wide system of smog alerts is based on the AQI.

During a Local Poor Air Quality Event, industries are asked to voluntarily undertake control measures and curtail activities with a strong focus on reducing emissions of particulate matter to air. This could include wetting or covering materials piles (e.g., coal, gravel), postponing materials-handling, increasing property and road cleaning, and curtailing some production processes. In 2011, a local poor air quality notification took place in Hamilton on October 11th. The Local Poor Air Quality Notification remained in place for approximately 20 hours until atmospheric conditions indicated that the inversion had dissipated.

The focus of the notification system is on fine particulate matter ($PM_{2.5}$) because there is a significant amount of $PM_{2.5}$ that is locally-generated. Therefore, any local efforts to reduce air pollution in general will be beneficial. When fine particulate matter goes over a certain level, and when the forecast predicts inversion conditions will last for at least 6 hours, and when wind direction is such that emissions from the industrial core are being blown toward populated areas of the city, participating industries would be notified to implement their plans to reduce local sources of fine particulate matter.

3.7 Emission Sources within Hamilton

The task of compiling an accurate and up-to-date inventory of emission sources within an urban area is a significant challenge for a number of reasons. First, not all sources are required to report their emissions and are thus not accounted for in the National Pollutant Release Inventory (NPRI). Second, not all sources of emissions are reported accurately, often because those who report the data do not have the information needed or the skill set to complete an accurate emissions report.

Figure 9: The Air Pollution Picture

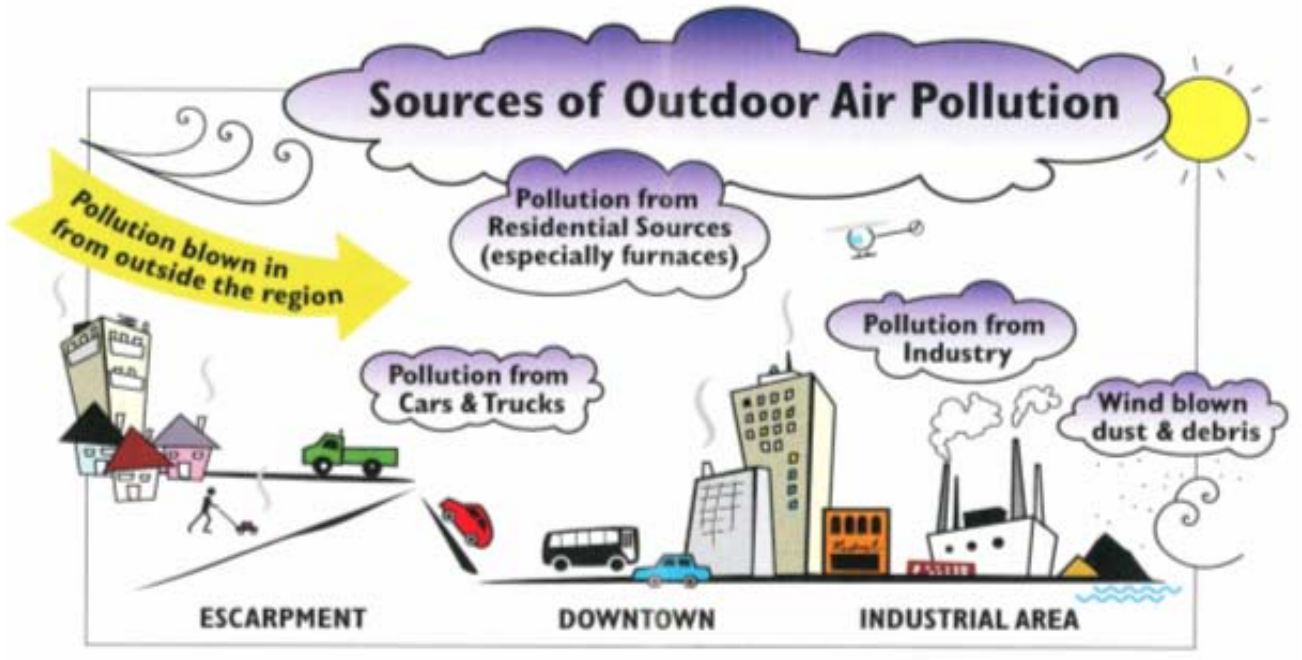


Table 4: NPRI Total Emissions by Source Category for Hamilton (2008)

Source Category	CO	SO_x	NO_x	PM_{10}	$PM_{2.5}$	VOC
Industrial	18,490	16,589	9,585	2,414	1,711	2,019
Fuel Combustion	7,271	415	1,558	1,120	1,104	1,483
Transportation	99,680	76	10,415	604	502	6,732
Incineration	22	20	6	0	0	6
Miscellaneous	56	0	0	144	144	8,333
Open Sources	147	18	75	37,672	7,891	792
Total Tonnes	**125,666**	**17,118**	**21,639**	**41,954**	**11,352**	**19,365**

Figure 10: NPRI Total Emissions by Contaminant and Source (2008)

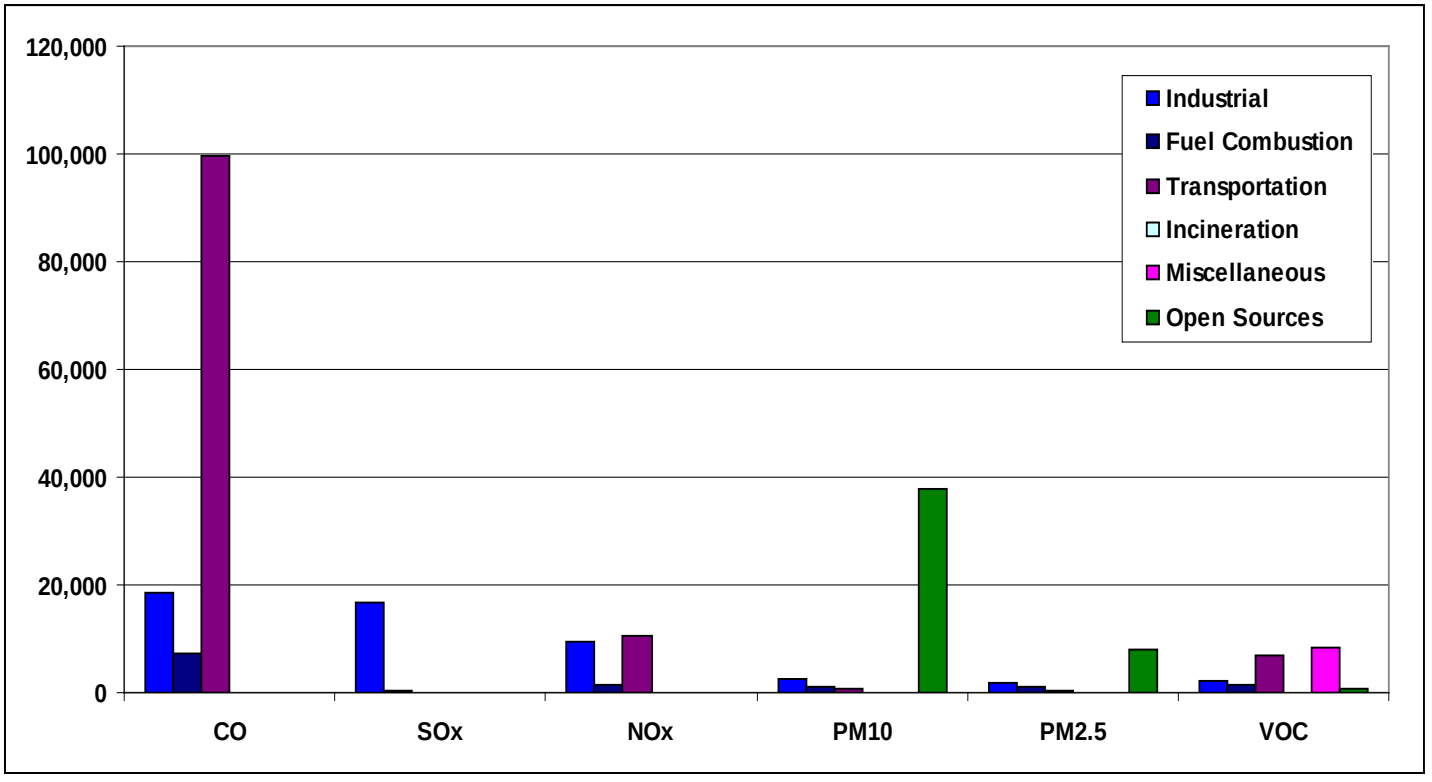
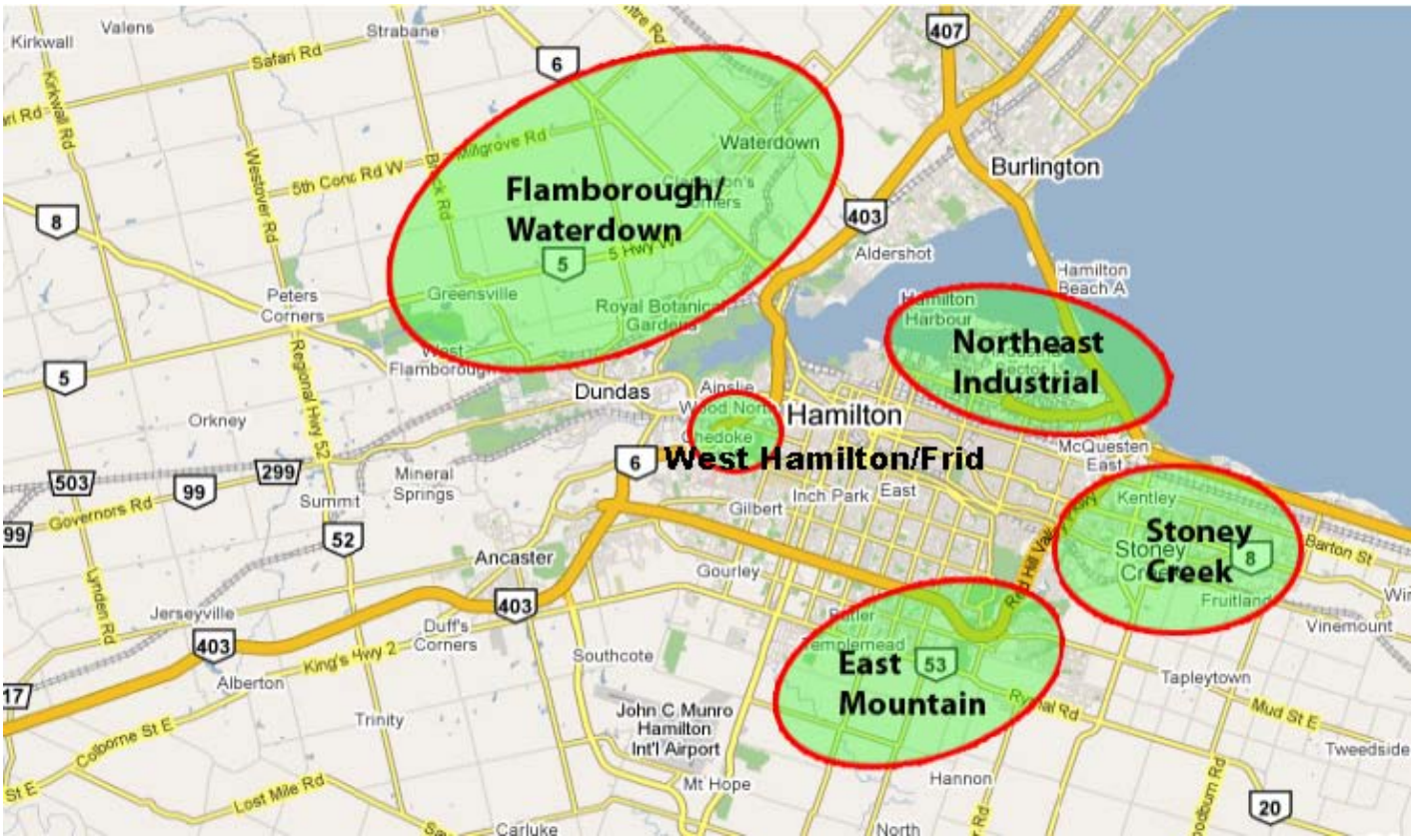


Table 4 and **Figure 10** show the total emissions data from the NPRI, broken down by source category; these data show that carbon monoxide (CO) is the air pollutant with the largest emissions. Based on available emissions inventory data from the Ministry of the Environment and Environment Canada, it is possible to conclude that:

- The transportation sector (i.e., mobile sources, such as cars and trucks) is the leading source of nitrogen oxide (NO_x) emissions within the City of Hamilton, followed closely by the industrial sector;
- Road dust, construction activities and area sources, such as fireplaces and home heating, are primary sources of $PM_{2.5}$ and PM_{10} in Hamilton, followed closely by emissions from the industrial sector;
- The industrial sector is the leading source of sulphur dioxide (SO_2) in Hamilton (~90%);
- The transportation sector is the leading source of carbon monoxide (CO) emissions within Hamilton; and
- The transportation sector is the leading source (~60%) of volatile organic compounds (VOCs); the remaining VOCs are releases due to general solvent use by companies and individuals.

Five separate industrial areas have been identified in the greater Hamilton area from mobile air monitoring (**Figure 11)**: Flamborough/Waterdown (aggregates industries), East Mountain (aggregates industries), West Hamilton/Frid (mixed industrial and University), Northeast Industrial Area (heavy and mixed industrial activities) and Stoney Creek (mixed industrial activities and aggregates industries).

Figure 11: Emission Sources by Region in the Hamilton Area

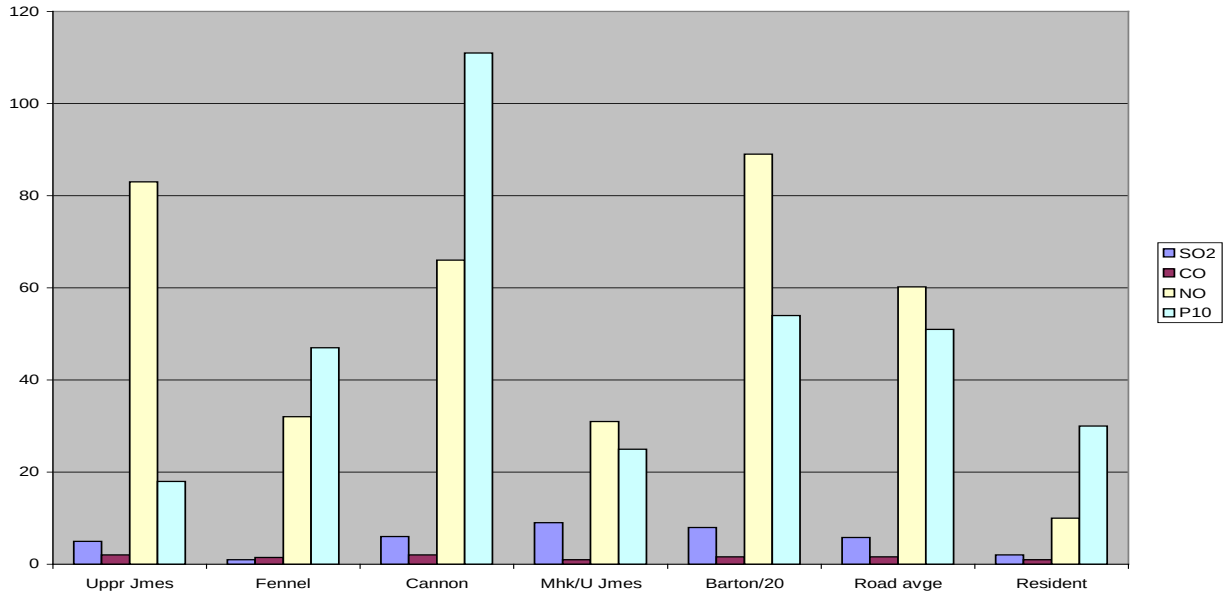


Mobile air monitoring studies were performed by driving a van outfitted with air monitoring equipment in traverses across the City, through selected industrial areas, and at selected major traffic intersections. The industrial point sources monitored included large integrated steel industries, steel by-products processors, recycling/scrap operations, foundries, chemical plants, companies with large storage piles, agricultural materials processing plants, a brick manufacturing operation, university operations, a vegetable oil processing plant, a carbon black manufacturing plant, a rail shunting yard and truck transfer station and a cogeneration natural gas plant.

These mobile air monitoring studies found that overall, the highest concentrations of pollutants were observed near major road intersections and along heavily used roads, particularly roads affected by dirt track-out from industrial sites throughout the City. These high levels of pollutants are attributed to the impacts of traffic emissions from automobiles, light trucks and heavy trucks. Industrial sources made significant contributions, particularly for SO_2, but these contributions were often overwhelmed by local traffic emissions.

Figure 12 shows the levels of four important air contaminants (sulphur dioxide SO_2, carbon monoxide CO; nitric oxide NO and inhalable particulate material PM_{10}) at seven road locations in Hamilton. The first five (on the left in the figure) are values obtained along major roads or at major intersections; the remaining data are the average for all roads in Hamilton (called “Road avge.”) and a typical example of data from a street in a residential area of Hamilton; residential areas are at a distance from major roads but are usually within 200-500 m of such roads.

Figure 12: Mobile Monitoring Study - Levels of Four Air Contaminants



Details of these studies are described in previous *Clean Air Hamilton* reports and can be downloaded from the *Clean Air Hamilton* web site – **www.cleanair.hamilton.ca.**

3.8 Air Quality Management Systems (AQMS)

Ontario has been actively engaged in a multi-stakeholder process to develop the national Air Quality Management System (AQMS). At the October 20, 2010 meeting of the Canadian Council of Ministers of the Environment (CCME), federal, provincial and territorial Environment Ministers agreed to move forward to develop the "major elements" of the AQMS by 2011 and to "begin implementation" in 2013. Since then, Canada, Ontario, other provinces/territories, industry, environmental and health organizations have worked collaboratively to develop a detailed proposal for the AQMS. The proposal includes five key elements:

- **Canadian Ambient Air Quality Standards (CAAQS)** – new ambient air standards for ground-level ozone and fine particulate matter ($PM_{2.5}$).
- **Base Level Industrial Emissions Requirements (BLIERs)** – emission standards for smog causing pollutants for major industry sectors and equipment to be implemented through provincial instruments.
- **Air Zone Management (AZM)** – a framework for place-based air quality management to be tailored for implementation by each province and territory.
- **Regional Airshed Coordination** – a framework for working with the federal government on transboundary and inter-provincial air pollution issues.
- **Mobile Sources Working Group** – an inter-governmental forum established to propose recommendations to Environment Ministers for reducing emissions of criteria air contaminants from the transportation sector through collaborative action among jurisdictions.

3.8.1 Air Zone Management

The Air Quality Management System (AQMS) is an integrated system designed to achieve the new Canadian Ambient Air Quality Standards (CAAQS) for ground-level ozone and $PM_{2.5}$, and future air quality standards as they are established. It recognizes that there are substantial differences in the nature of air quality issues and challenges across the country and that these differences can be regional in nature or very localized. In view of this, the AQMS provides broad flexibility in how each province and territory designs the details of their air zone management system.

Air zone management (AZM) is proposed as a provincial/territorial responsibility within the AQMS. Ontario's design of an air zone management system will suit provincial circumstances and address all sources of air emissions affecting air quality within a given zone. This approach has the potential to reduce both criteria air contaminants and greenhouse gases within the zone, resulting in benefits for air quality and climate change.

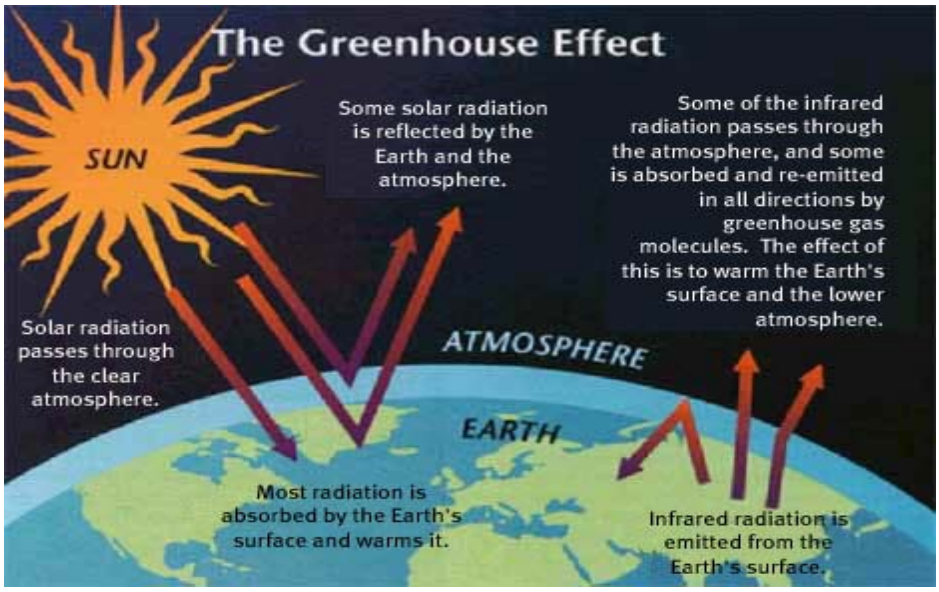
Provinces and territories also have the option of progressively rolling out air zone management, focussing initially on priority areas with particular air quality challenges or high population densities or other air management considerations.

Details of AZM governance and management (cost/funding, description, performance measures) are still being developed. To inform this development, Ontario Ministry of Environment staff have met with selected communities that have some form of existing community engagement on air quality and draw on their experience with local air quality initiatives. *Clean Air Hamilton* members met with ministry staff in 2011 and provided feedback to the MOE. *Clean Air Hamilton* has always worked within an air zone construct and is very interested in participating in the development of workable air zone management systems within the Greater Toronto Area, across Ontario and across Canada.

4.0 Linkages between Climate Change and Air Quality

Climate Change refers to the long-term change in average weather patterns resulting from the release of substantial amounts of greenhouse gases (GHGs), such as carbon dioxide (CO_2), methane (CH_4) and nitrous oxide (N_2O) into the atmosphere; these levels are over and above the natural levels of these substances. The increased levels of these infrared-absorbing substances result in an intensification of the earth's natural greenhouse effect. These chemicals absorb heat energy very efficiently and transfer this heat energy to the atmosphere, resulting in an increased warming of the atmosphere.

Figure 13: The Greenhouse Effect



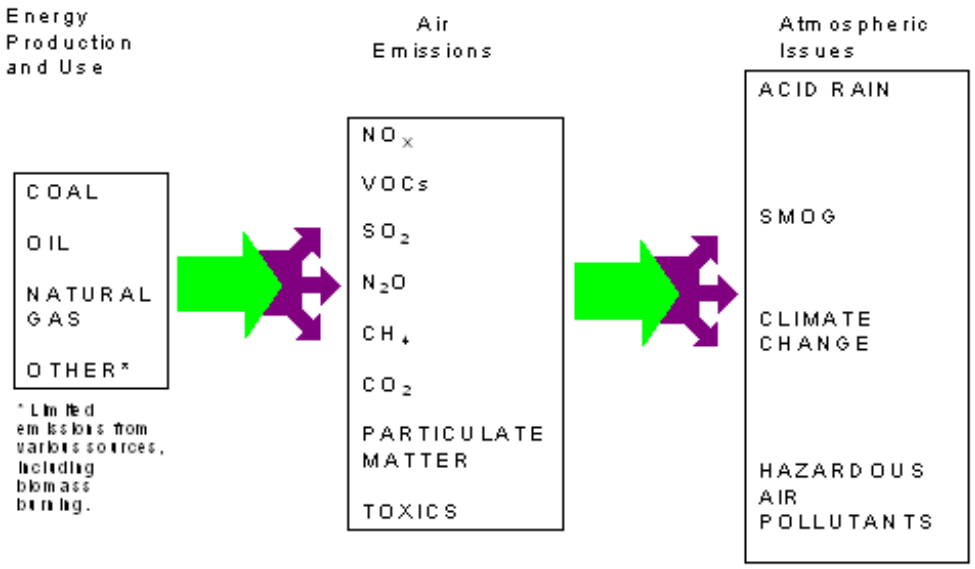
Climate change can be caused by natural processes, such as a change in the sun's strength, and by human activities. Dramatic changes in climate and weather patterns over the past 25 years are a direct result of human activities and the release of carbon dioxide due to the combustion of fossil fuels for transportation, manufacturing, heating, cooling and generation of electricity. This use alone is responsible for 70-90% of greenhouse gasses produced by humans, with the rest coming from land uses such as agriculture and forestry.

In 2007, the Intergovernmental Panel on Climate Change (IPCC) issued a series of reports, which outlined the unanimous consensus of nearly 1000 scientists from around the world. This consensus was reached after thorough evaluation of all available scientific evidence on climate change. The IPCC has declared that there is a very high probability that increases in the emissions of GHGs due to fossil fuel combustion, large-scale deforestation via the burning of forests and the intensification of agriculture have resulted in and will continue to cause a net increase in global mean temperatures with concomitant changes to climates around the world. Changes will be most profound in the extremes of the northern and southern hemispheres.

Climate change will also affect the severity of air pollution. Increased temperatures will exacerbate air pollution through increased chemical reaction rates in the atmosphere and increased smog formation. Climate change may affect air pollution by changing ambient ground-level concentrations of ozone (O_3) and $PM_{2.5}$, two of the primary components of smog.

The most important linkage between climate change and air pollution is the combustion of fossil fuels (see **Figure 14**). The burning of fossil fuels for energy (e.g., in heating and cooling buildings, in personal and commercial transportation, for lighting, etc.) results in emissions of carbon dioxide, sulphur dioxide, nitrogen oxides, volatile organic compounds, black carbon, organic carbon, and particulate matter, all of which contribute to air pollution and the health effects due to air pollution. In other words, reductions in emissions of the major greenhouse gas (carbon dioxide) will result in a commensurate reduction in the other combustion by-products that contribute to and cause air pollution.

Figure 14: Combustion of Fossil Fuels for Electricity, Home Energy, Transportation, Industry, and Municipalities Results in Air Emissions and Atmospheric Issues



(Chiotti, 2003)

Higher temperatures result in increasing demands for electricity for air conditioning; thus, on hot days the levels of air pollutants are driven higher by combustion-based emissions needed to satisfy energy demands. If Canada had met its Kyoto targets, fossil fuel consumption would have decreased by almost 25% compared to today; thus, the average air quality would be about 25% better today due to lower combustion-based emissions had we realized the reductions from combustion sources that were implicit in the Kyoto emissions targets.

Poor air quality, combined with heat stress during hotter weather, poses serious health challenges to the most vulnerable people in society, the very young and the elderly. Climate change is predicted to have significant impacts on human health. In 2008 Health Canada (2008) identified eight significant health concerns related to Climate Change (**Table 5**). They include health effects from increased smog episodes, illnesses and deaths caused by heat and cold waves, water-borne and food-borne contamination, diseases transmitted by insects, health effects of stratospheric ozone depletion and an increased number of extreme weather events.

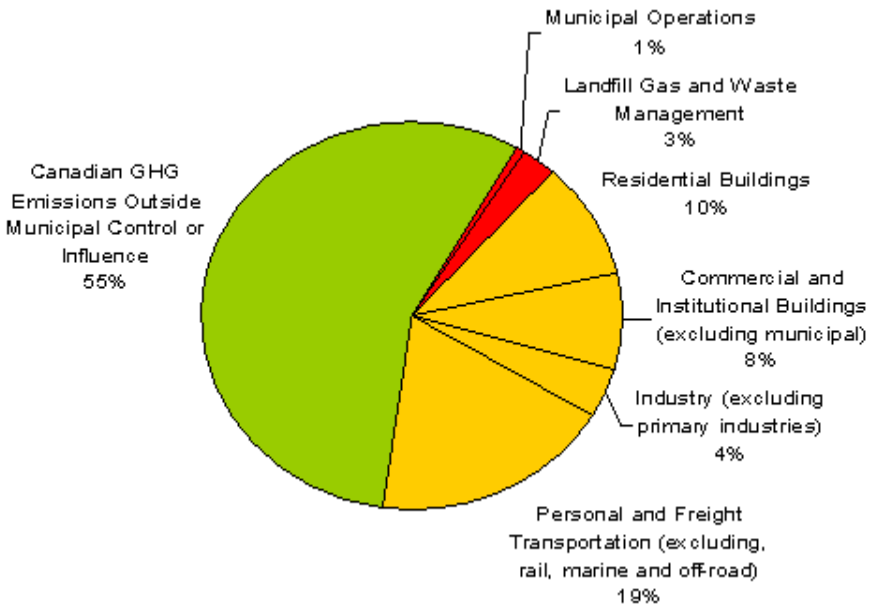
Table 5: Health Impacts from Climate Change and Variability (Health Canada, 2008)

Health Issues	Examples of Health Vulnerabilities
Temperature-related morbidity and mortality	Cold and heat related illnesses, mental health, respiratory and cardiovascular stress, occupational health stress.
Health effects of extreme weather events	Social and mental health stress due to disasters, injuries, preparedness and population displacements, damaged public health infrastructure, occupational health hazards.
Air pollution related health effects	Respiratory diseases, cardiovascular diseases, cancer, allergens and asthma, changed exposure to outdoor and indoor air pollutants and allergens.
Water and food borne contamination	Enteric diseases.
Vector-borne infections and diseases	Changed patterns of diseases caused by bacteria, viruses and other pathogens carried by mosquitoes, ticks and other vectors.
Health effects of stratospheric ozone depletion	Cancer, cataracts, immune suppression.
Population vulnerabilities in cities and communities	Rural and urban health, seniors, children, homeless and low income, traditional cultures, disabled, immigrant populations.
Health and socio-economic impacts	Loss of income and productivity, social disruption, diminished quality of life, Increased costs to health care.

Adapted from http://www.hc-sc.gc.ca

According to the Federation of Canadian Municipalities (FCM), just less than half of Canada's 2006 greenhouse gas emissions (315 Mt or 315 million tonnes) are under the direct or indirect control or influence of municipal governments. Municipalities directly control decisions that result in only 24 Mt of greenhouse gas emissions from municipal operations, residential waste, and landfill sites; municipalities contribute 7.6% of Canada's greenhouse gas emissions. The remaining 93.4% of Canada's greenhouse gas emissions (or 291 Mt) are not under the direct control of municipal governments (see **Figure 15**).

Figure 15: Canadian GHG Emissions Directly & Indirectly Controlled by Municipalities Compared to Total National Emissions (2006)



(Federation of Canadian Municipalities, 2009)

4.1 The City's Climate Change Inventory

In 2008, the City of Hamilton approved an Air Quality and Climate Change Strategic Plan to undertake actions to meet corporate emission targets of 10% reduction of 2005 greenhouse gases levels by 2012, followed by a further 20% reduction of 2005 greenhouse gases levels by 2020. Community targets were recommended as a 10% reduction of 2006 greenhouse gases levels by 2012, followed by a further 20% reduction of 2005 greenhouse gases levels by 2020.

In 2009, the City of Hamilton undertook a greenhouse gas emissions inventory for its operations and the community as part of the FCM Partners for Climate Protection Program. The inventory was also undertaken to measure how the City was doing in reducing its greenhouse gas emissions compared to the emissions targets.

In 2010, the Corporation reduced its greenhouse gas emissions to 125,765 tonnes, a 9% reduction of emissions from the 2005 baseline of 135,058 tonnes and is on course for achieving the 10% reduction target of 121,552 tonnes by 2012. The reductions in corporate greenhouse gas emissions have risen from increased energy and fuel conservation efforts by City operations and City staff through buildings, lighting, fleets and employee travel. Municipal operations contribute to only 1% of our community's GHG emissions **(Figure 16)**. However, municipal policies influence GHG emissions from waste, transportation, and residential and commercial buildings and to some aspects of industrial emissions.

The total greenhouse gas emissions for Hamilton in 2009 were estimated to be 12,891,000 tonnes, a reduction of 26% from 2006 emissions levels (estimated at 17,382,000 tonnes). These changes occurred due to a downturn in the economy, reduced energy demand due to a cooler summer, improved energy efficiencies and conservation actions in the community, and the shift away from coal as a source of electricity generation as part of the Province's phase out of coal in Ontario's energy sources by 2014. **Figure 17** shows the changes in community emissions since 2006.

Figure 16: Total Greenhouse Gas Emissions Corporate and Community (2009)

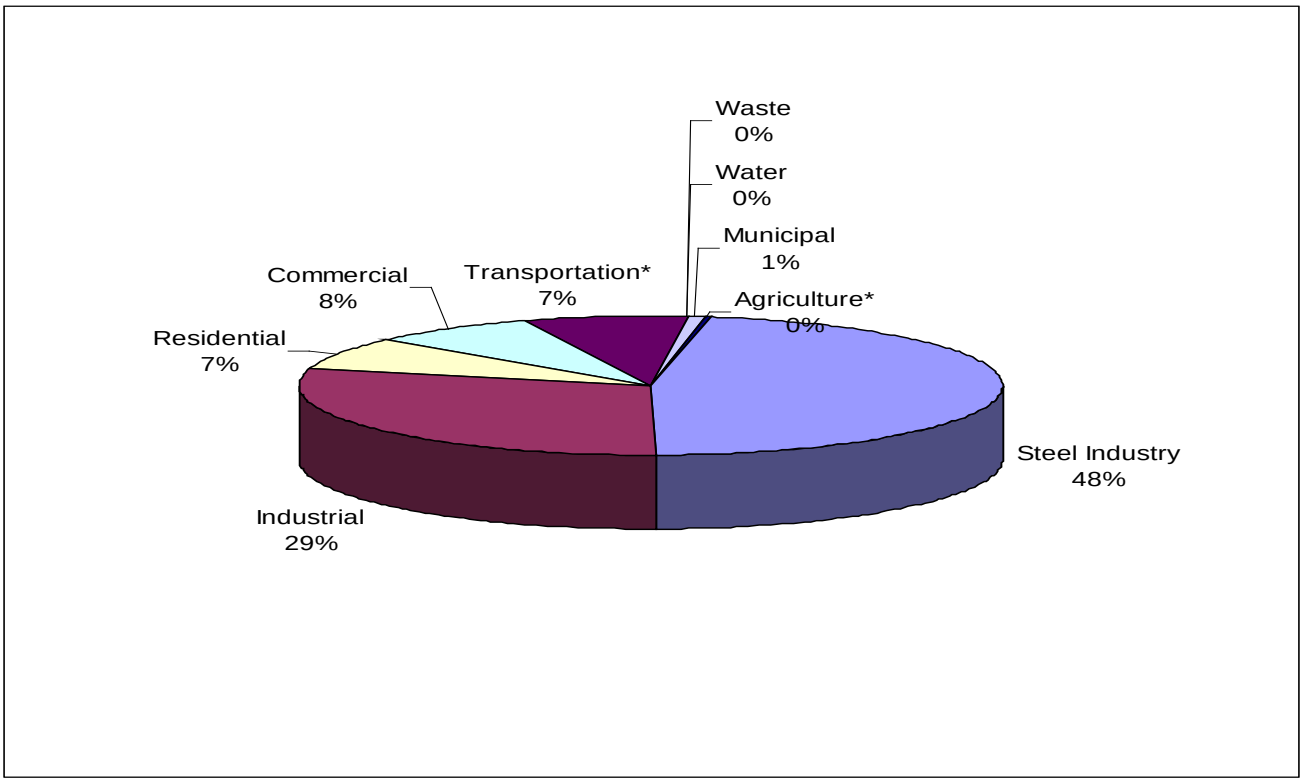
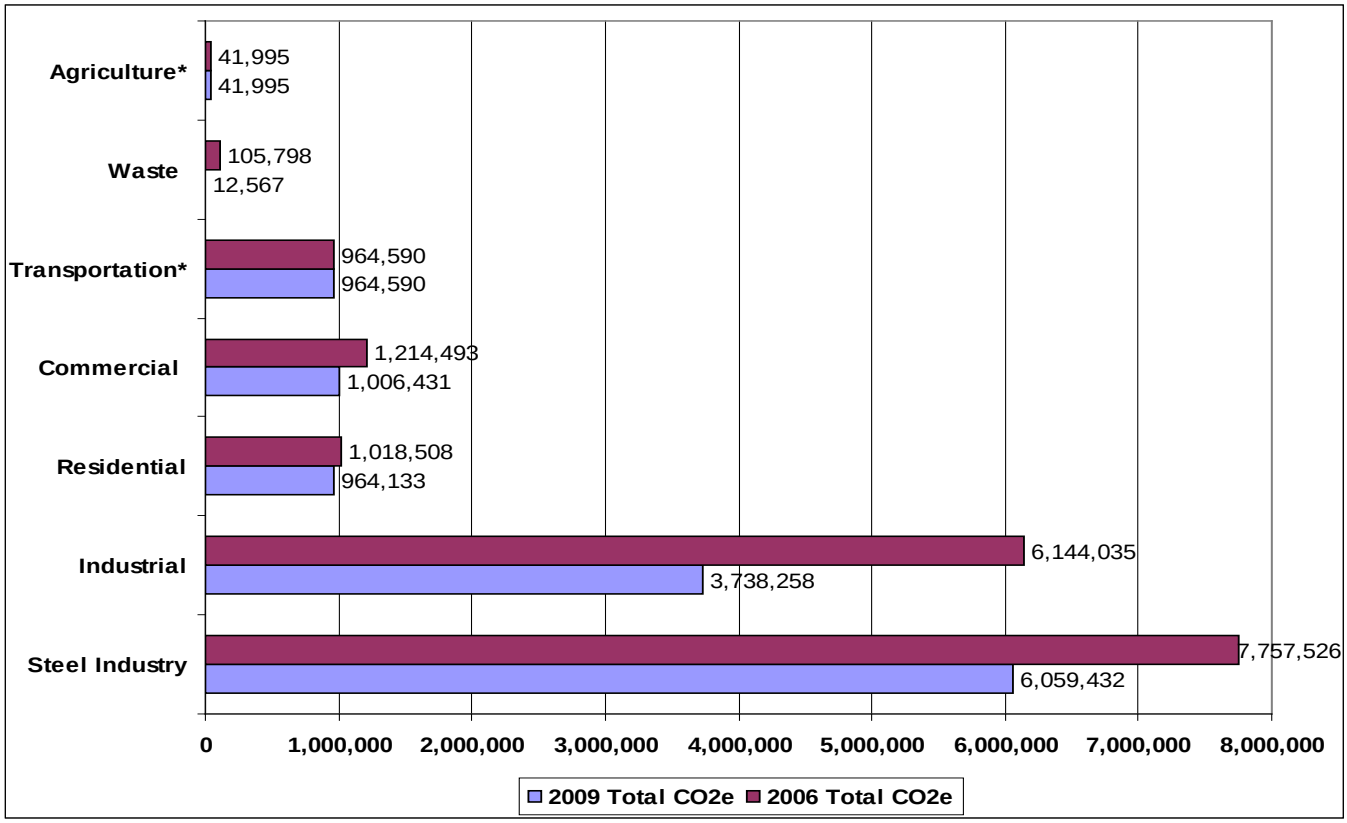


Figure 17: Community CO_2e Emissions in Hamilton in 2006 and 2009



Municipal and community involvement in reducing sources of GHG emissions – commercial and personal transportation, commercial and residential energy usage, land-use development – in Hamilton is critical. Provincial policies on phasing out coal-fired electricity and encouraging renewable alternative energy in the provincial energy mix and the MoveOntario 2020 Rapid Transit Action Plan will also affect the reductions in Hamilton's emissions.

To read the City's actions on Climate Change visit: www.hamilton.ca/climatechange

4.2 Hamilton Climate Change Community Action Charter

In 2011, Hamilton became the first municipality in Ontario to enact a community Climate Change Action Charter. The purpose of the community Climate Change Action Charter is to engage Hamilton organizations, businesses and individuals in taking individual and collective action and leadership on climate change.

The Hamilton Climate Change Action Charter is a voluntary agreement that states clearly that action on climate change is needed. The Charter builds awareness and communication within Hamilton on climate change issues; the Charter can be used by individual citizens, by organizations and by businesses of all types and sizes.

Signing the Hamilton Climate Change Action Charter is a way to show commitment to tackle the causes and consequences of climate change. It represents a broad public statement that any Hamilton individual or organization can make. Many organizations and corporations in the Hamilton area have already developed their own climate change and sustainability programs.

In 2011, the following organizations endorsed and signed Hamilton's Climate Change Action Charter:

- Blue Green Canada
- The City of Hamilton
- *Clean Air Hamilton*
- Congress of Union Retirees of Canada
- Corr Research
- Council of Canadians - Hamilton Chapter
- Creating Healthy and Sustainable Environments(CHASE)
- Dundas in Transition
- Eco Churches of West Hamilton
- Environment Hamilton
- First Unitarian Church of Hamilton
- Green Venture
- Greening Marketing Inc.
- Hamilton 350
- Hamilton Area Steelworkers
- Hamilton/Burlington KAIROS Committee
- Hamilton CarShare
- Hamilton Conservation Authority
- Hamilton District Labour Council
- Hamilton-Wentworth District School Board
- McKibbon Wakefield Inc
- McMaster Centre for Climate Change Research
- McMaster University
- Mohawk College
- North End Neighbours
- St. James's Anglican Church
- Sustainable Hamilton
- The Hammer Active Alternative Transportation
- Union Gas

To learn more about or to sign the Charter visit: http://climatechangehamilton.ca/

4.3 Hamilton High School Heroes

Hamilton high school students, and the teachers that support them, continue to take environmental action in their schools and communities. Green Venture's Hamilton High School Heroes program reaches out to motivated youth and their supportive teachers and connects them with credible information sources, air quality science, the work of *Clean Air Hamilton* and what we can all do to reduce harmful air emissions. In 2011 over 200 students were engaged at student forums and through the "Air Quality-What You Can Do" and "Climate Change 101" presentation series.

Figure 18: Winning 2012 "Fighting Climate Change Poster submissions

The 2nd annual "Fighting Climate Change" poster contest invited high school students to submit original artistic posters depicting actions people can take to fight climate change. The contest reached out to all Hamilton high schools and a public opening for the forty-five (45) artists and their entries will occur during the April 13th 2012 Art Crawl at the Hamilton Central Library. Thereafter, the top works will travel to a variety of venues for display and to inspire the artists' peers to take positive action on climate change.

5.0 Land Use Planning – Linkages to Air Quality

Introduction:

According to the United States Federal Highway Administration, among young people aged 14 to 34, between 2000 and 2006, the percentage without driving licenses rose from 21 to 26%. In addition, among these age cohorts, vehicle miles traveled declined 23% from 10300 miles to 7900 miles between these years. Together with the needs of older families who are downsizing, the creation of more physically active communities must become a stronger priority.[2]

Furthermore, "*a survey conducted by the US National Association of Realtors in March 2011 that 62 percent of people ages 18-29 said they would prefer to live in communities with a mix of single family homes, condos and apartments, nearby retail shops, restaurants, cafes and bars, as well as workplaces, libraries, and schools served by public transportation. A separate 2011 Urban Land Institute survey found that nearly two-thirds of 18 to 32-year-olds polled preferred to live in walkable communities*".[3]

In **Appendix B**, *Active and Sustainable Transportation* and *Smart Driver* programs are important actions *Clean Air Hamilton* and its stakeholders are taking to improve regional and local neighbourhood air quality.

In Section 2.4, *Active and Sustainable Transportation*

- involves encouraging *the use of active and sustainable means of energy efficient transportation and encourage emissions reduction by moving away from single occupancy personal transportation*

while *Smart Drivers*

- involves reducing *unnecessary idling of vehicles, impacts of vehicles emissions and emissions from driving*.

We believe significant opportunities exist to further reduce tailpipe emissions and improve local air quality through land use and transportation improvements. In this section we place *Clean Air Hamilton*'s strategic land use and transportation strategies into context with comparable approaches used elsewhere. We conclude with an assessment of how we are doing and what we might do next.

[2] Florida, Richard. "Why Young Americans are Driving so much less than their Parents, found at The Atlantic Cities Places matters, http://www.theatlanticcities.com/commute/2012/04/why-young-americans-are-driving-so-much-less-their-parents/1712/

[3] Ibid, Florida

Background:

Moving Cooler: An Analysis of Transportation Strategies for Reducing Greenhouse Gas Emissions is a publication of the Urban Land Institute released in 2009[4]. The report describes urban land use and transportation measures that can be employed to reduce greenhouse gas emissions. The report represents a comprehensive and thoughtful analysis that sets an analytical standard for this approach. While the report addresses greenhouse gas emissions reduction, it also provides a useful framework that can be used to help improve air quality. In this section, *Clean Air Hamilton*'s strategic activities are evaluated using the *"Moving Cooler"* analytical framework.

Analysis:

The *Moving Cooler* report recommends the following transportation objectives to reduce greenhouse gases:

- *"Improving the energy efficiency of the vehicle fleet by implementing more advanced technologies,*
- *Reducing the carbon content of fuels through the use of alternative fuels (for instance, natural gas, biofuels and hydrogen),*
- *Reducing the number of miles traveled by transportation vehicles, or shifting those miles to more efficient modes of transportation, and*
- *Improving the efficiency of the transportation network so that a larger share of vehicle operations occur in favourable conditions, with respect to speed and smoothness of traffic flows, resulting in more fuel efficient vehicle operations*."[5]

The following eight strategies contribute to achievement of these objectives in the *Moving Cooler* analysis. Each strategy is described briefly below. Where *Clean Air Hamilton* and its stakeholders are employing these strategies or similar strategies, this application is described.

1. ***Pricing and Taxes. Strategies raise the costs associated with the use of the transportation system, including the costs of vehicle miles of travel and fuel consumption.[6]***

Increased parking fees in central business districts, employments areas, retail centres and institutions are intended to reduce single person occupancy trips and encourage the use of other transportation modes like public transit, walking and cycling. Hamilton's major institutions and stakeholders are beginning to adopt this approach. This subject and other matters were the focus of attention at a recent City of Hamilton's Transportation Summit.

The City's Transportation Demand Management Coordinating Committee is working with Sustainable Prosperity, a research and policy network focused on market-based approaches to a greener economy, to develop a parking management pilot project to test these theories. The 2011 Transportation Summit discussed Environmental Price Reform and Sustainable Prosperity developed a working paper on the topic.

[4] Cambridge Systematics, Inc., Moving Cooler: An Analysis of Transportation Strategies for reducing Greenhouse Gas Emissions, Urban Land Institute, July 2009.
[5] Ibid, Urban Land Institute, page 1.
[6] Ibid, Urban Land Institute, page 2.

Other examples not considered to date include cordon pricing around the central business district; congestion pricing; pay-as-you-drive insurance; a vehicle-miles traveled fee associated with vehicle licensing and a motor fuel tax.

2. **"*Land Use and Smart Growth Strategies: This category focuses on creating more transportation efficient land use patterns."*** [7]

The New City of Hamilton Urban Official Plan 2009 under Ontario Municipal Board appeal, implements a nodes and corridor growth structure for the City. The Official Plan policies emphasize the importance of public transit, cycling and walking as well as vehicular travel. Official Plan policies also promote higher densities and mixed use areas as a means of creating built environments where people have transportation destinations that can be accessed by walking and cycling rather than places where people are dependant on private automobiles.

The Transportation Master Plan, Transit Oriented Development Guidelines and specific planning projects such as secondary plans and corridor plans for future rapid transit lines support the development of land uses throughout the City that can be serviced efficiently by walking, cycling, public transit and vehicular movement.

Award winning programming such as Open Streets Hamilton, a street festival that closes streets to car traffic and opens them as urban parks twice per year, experiment with the concept of creating pedestrian streets while the transformation of Gore Park will create a pedestrian plaza. These programming and infrastructure projects support and help implement the City's planning policies by providing exciting and functional pedestrian, cycling and public transit destinations.

In 2011, the City held a Transportation Demand Management and Land Use Workshop to discuss sustainable land use reform. The City Staff Transportation Demand Management Implementing Committee was established to create guidelines for new and existing developments through a checklist process and, in partnership with Public Health Services, school facility location guidelines.

3. ***Non-motorized Transportation Strategies: Strategies in this category are intended to encourage greater levels of walking and bicycling as an alternative to driving."*** [8]

The City of Hamilton has Transportation and Cycling Master Plans and is in the process of preparing a Pedestrian Mobility Plan. These actions and others such as the walkability studies, and safe route to school programming undertaken by Public Health Services support the planning vision set out in the New City of Hamilton Official Plan. These actions will improve public health by creating physically active built environments that help reduce the incidence of obesity and overweight conditions and by providing for more community social interaction.

Recently, the 2012 Transportation Summit helped identified the need for the development of a Complete Streets Strategy that inventories the tools and examples that currently exist in Hamilton to accommodate various transportation modes and road users. The strategy can also help link all the existing plans and policies together to ensure ease of implementation.

[7] Ibid, Urban Land Institute, pg. 2
[8] Ibid, Urban Land Institute, pg. 2.

4. ***Public Transportation Improvement Strategies: Strategies for improving public transportation can include subsidizing fares, increasing service on existing routes, building new infrastructure, and improving service in and between urban areas*****."** [9]

The City is studying the implementation of a light rail transit system on the B Line as well as rapid transit along the A-Line. Other corridors are identified for higher order transit to link nodes Employment Areas and Activity areas identified in the new Urban Official Plan.

The City is also considering the development of a public bike share system to help feed the A Line and B Line rapid transit corridors and eliminate barriers associated with first and last mile commuting issues. In 2011, a business plan, station location analysis and market analysis were conducted to ensure a coordinated approach to developing the bike share program.

5. **"*Regional Ride-Sharing, Car Sharing, and Commuting Strategies: Regional ride-sharing and car-sharing strategies are compromised of different approaches aimed at getting drivers to use HOV lanes or to use a shared car service."*** [10]

Hamilton CarShare is a cooperative operating in the downtown and the West end of Hamilton with four vehicles available for use by members of the cooperative. Hamilton City Council recently approved a $150,000 revolving line of credit to expand this service. The City of Hamilton is a corporate member and is conducting a two-year pilot project study to determine the effectiveness of fleet augmentation using CarShare vehicles.

Smart Commute Hamilton operates the regional ride-sharing website CarpoolZone.ca with its regional partners and Metrolinx. The number of users in the program has increased by 110% and has seen a 35% growth in carpool matches formed.

The Smart Commute Hamilton program works with 15 Hamilton area employers, representing over 80,000 employees, to deliver active transportation, transit and carpooling services.

6. **"*Regulatory Strategies: This category includes various regulatory measures to moderate vehicle travel and encourage efficient driving."*** [11]

Measures such as non-motorized zones, parking restrictions and lower speed limits are examples of regulatory strategies to moderate vehicle travel. The City of Hamilton has an anti-idling by-law for stationary vehicles that is enforced by the City. *Clean Air Hamilton* has undertaken educational programming on this topic, especially in areas near schools where children are picked up and dropped off.

The City of Hamilton is undertaking a Neighbourhood Development Strategy focusing on neighbourhoods where health, social and economic outcomes are poorest but "where there was a strong willingness amongst residents to work together to address various issues. In all of these neighbourhoods some form of planning group existed which can help us build a strong planning team."[12]

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[9] Ibid, Urban Land Institute, pg. 2.
[10] Ibid, Urban Land Institute, pg. 2.
[11] Ibid, Urban Land Institute, pg. 2.
[12] Johnson, Paul., Neighbourhood Development Strategy Handout presented to the Clean Air Hamilton Coordinating Committee, pg. 2.

Neighbourhood Strategies may result in community plans that recommend lower speed limits on major arterials through their neighbourhoods. These community plans will be important considerations where new regulatory strategies are considered in the future to balance active and public transportation with single occupancy vehicle usage.

7. **"*Operational and Intelligent Transportation System Strategies: These is a broad ranging set of strategies and techniques that can educate and provide information to drivers, and improve the operation of the transportation system to better use the existing capacity and reduce congestion and fuel loss due to traffic delays.*"** [13]

The Eco-driving program operated by Green Venture is an example of this kind of programming. The City of Hamilton's Green Fleet Plan introduced hybrid vehicles into City operations. Hybrid buses have also been added to the Hamilton Street Railway's fleet of vehicles.

8. ***"Bottleneck Relief and Capacity Expansion: Infrastructure investments…would be implemented to improve traffic flow and to reduce congestion and fuel lost to delay."*** [14]

Implementation of the City of Hamilton Recreational Trails and Cycling Master Plans has improved pedestrian and cycling flows and improved residents ability to chose alternative modes where possible. The Downtown Public Transportation Hub is intended to address these concerns where public transit is concerned.

Assessment:

Transportation planning, design and management have focused almost solely on vehicular movement since the 1950s. Transportation planning, design and management represent a system of thought and practice that is an interwoven matrix of legislation, regulations, design guidelines and practice that makes improving pedestrian, cycling and public transit usage difficult to achieve. A successful transition to increased active transportation and public transit usage will require the same comprehensive attention to detail and systematic action as has been paid to assisting vehicular movement since the 1950's. The ingredients necessary to implement this change are in place in Hamilton.

Successful change to a planning environment scenario where pedestrian needs, cycling needs and public transit usage are integrated with vehicular needs will require consistent actions between Departments and stakeholders as well as between the various levels of decisions made by the City, all the way from the development and implementation of official plan policies to the actions of the maintenance crews on the street.

Many of the City programs, policies and actions discussed in this section address Urban Land Institute's Growing Cooler strategies but more discussion on the benefits of increased coordination and focused action would help. Furthermore there are ways to bundle the strategies and actions such as by geography (i.e., neighbourhood planning), outcomes (i.e., transportation demand management plans) and/or time frames (short, mid-term and long term) that will help implementation and enable early successes upon which to construct this transition.

[13] Ibid, Urban Land Institute, pg. 3.
[14] Ibid, Urban Land Institute, pg. 3.

Special attention also needs to be focused on those neighbourhoods where mobile air monitoring results indicate that health risks from exposures to tailpipe emission are elevated, particularly along heavily travelled arterials.

Provincial involvement would be helpful. For example, the Provincial Highway Traffic Act and associated regulations and policies may be inconsistent with Provincial planning policy directions, including the Growth Plan and the Provincial Policy Statement where active transportation and pubic transit goals, objectives and policies are concerned.

Future Steps:

The following recommendations are made:

- During the upcoming review of draft Neighbourhood Community Plans, it is recommended that *Clean Air Hamilton* and its stakeholders use this framework to make recommendations on the finalization and implementation of the draft community plans.

- In the event the Provincial Highway Act is reviewed in the immediate future, it is recommended that *Clean Air Hamilton* and its stakeholders use this framework to make recommendations on the updating of this legislation, regulation and guidelines.

6.0 Transportation Emissions - Linkages between Air Quality and Human Health

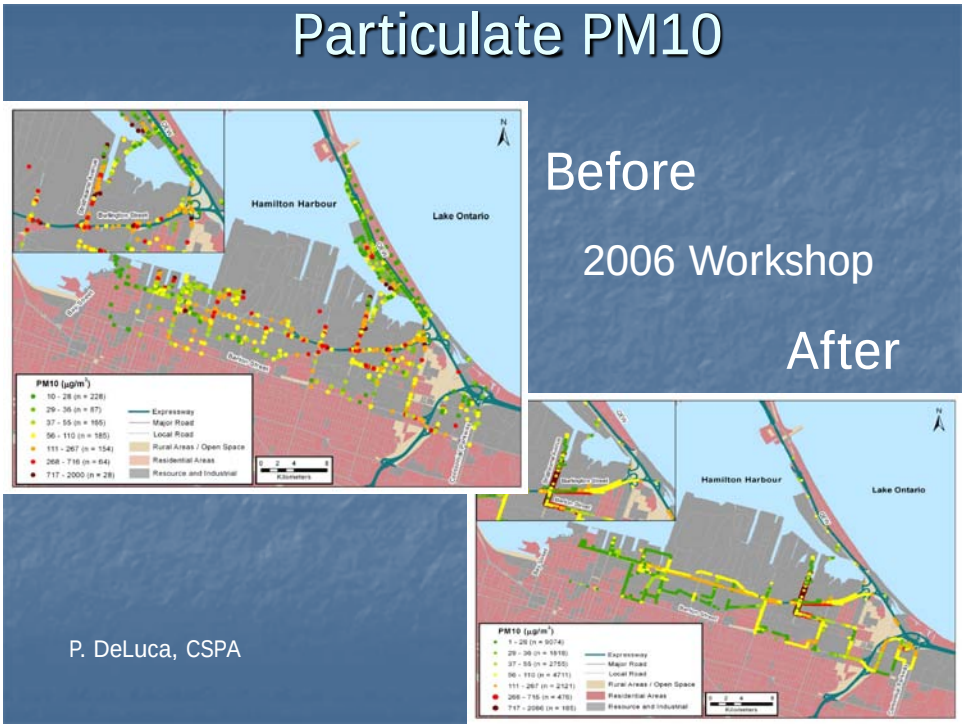
6.1 Mobile Air Monitoring Research

Mobile air monitoring surveys have been undertaken through funding provided to *Clean Air Hamilton* starting in 2004; these studies continue as additional funds become available for more research work. The original motivation for undertaking these studies was to provide a 'street-level view' of air quality in the city and to compare the air quality in different areas and neighbourhoods across the city. Data from earlier mobile air surveys has been presented in previous *Clean Air Hamilton* reports (please see the 2005 to 2010 reports). Some recent findings are included in this 2011 report.

The reason for undertaking mobile air monitoring surveys is be able to get high quality air monitoring data from sites such as a street corner, a neighbourhood, outside a school, along the length of a street or next to a highway. The idea was to outfit a van with the same air monitoring equipment that would normally only be available in a fully outfitted fixed air monitoring station and drive the air monitoring van to areas that people live, work and travel. The mobile van can be driven while it is making measurements or it can be set up in fixed locations for periods of time.

An early application of the mobile monitoring technique showed very high levels of fugitive dusts and resuspended road dusts in the north end of the City. As a result a workshop with local industries, the City and MOE was held in December, 2006 to address these issues and to provide solutions to reduce airborne particulate levels.

Figure 19: Reductions in PM_{10} after 2006 Fugitive Dust Workshop

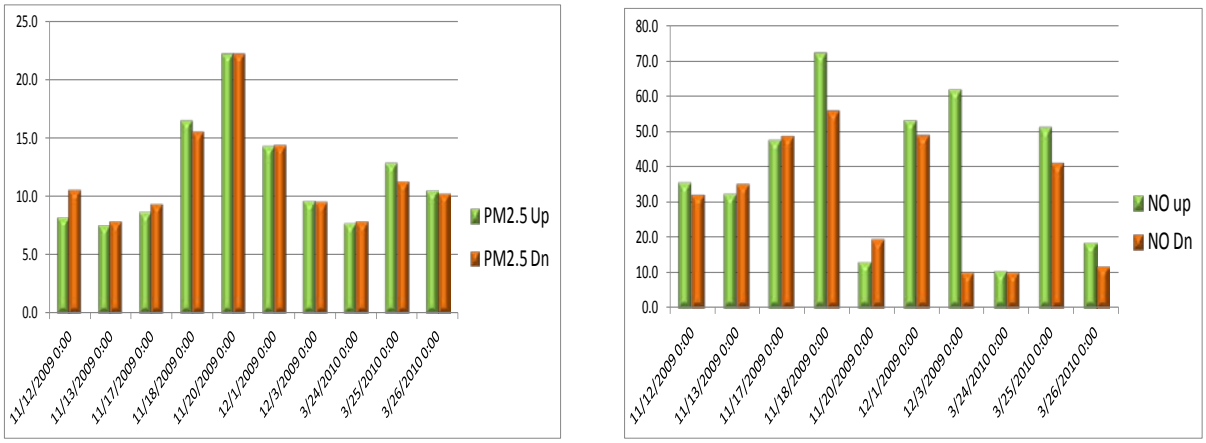


A few months after this workshop, mobile monitoring was used to assess whether there had been any change in airborne particulate levels; these data showed significant reductions in PM_{10} (**Figure 19**).

Residents living near the Red Hill Valley Parkway had expressed concerns to the City that their health was being adversely impacted by emissions from vehicles on the Parkway. In response to these concerns, Public Health Services commissioned a mobile monitoring study of air quality in neighbourhoods directly adjacent to the Parkway. A series of mobile air quality surveys was conducted in these areas on 10 different days under different weather conditions in November and December, 2009.

These data did not show any significant differences in respirable air particulate ($PM_{2.5}$) between neighbourhoods on either side of the expressway (that is, upwind and downwind of the Parkway; **Figure 20**, left panel). The different levels measured on different days were consistent with changes in PM levels across the City on that day and not to any specific emissions associated with the Parkway. The nitric oxide levels adjacent to the Parkway (NO; **Figure 20**, right panel) were not different except on one day. Overall, based on these data there is no evidence for poorer air quality in the vicinity of the Parkway.

Figure 20: Upwind vs. Downwind Measurements of $PM_{2.5}$ and NO Adjacent to the Red Hill Valley Parkway



This conclusion seemed completely counterintuitive. How could the air quality impacts be so low on neighbours who live right next to a major highway? As part of the agreement with construction of the Parkway, the City promised to undertake six months of continuous monitoring in the same way at the same site that air quality monitoring had been done prior to construction of the Parkway. This site is right next to the Parkway. The data from the post-construction monitoring showed that overall the Parkway was extremely effective in channelling winds either down the valley toward Lake Ontario or up the valley away from the lake. Over the course of the six months of measurements, the winds at this site were only from these two general directions. Vehicular emissions from the Parkway were channelled either up the valley or down the valley, depending on the wind direction that day. Neighbourhoods adjacent to the Parkway were unaffected by vehicular emissions from the Parkway because emissions moved up or down the valley, rather than laterally into the neighbourhoods.

In this report the monitoring of neighbourhoods across the City is featured; the mobile capabilities of the van allows one to be able to collect air quality data at sites throughout the neighbourhood, allowing comparisons of ambient levels of pollutants throughout the neighbourhood and the City.

For complete information on the mobile monitoring research, please visit:
www.cleanair.hamilton.ca/default.asp?id=26

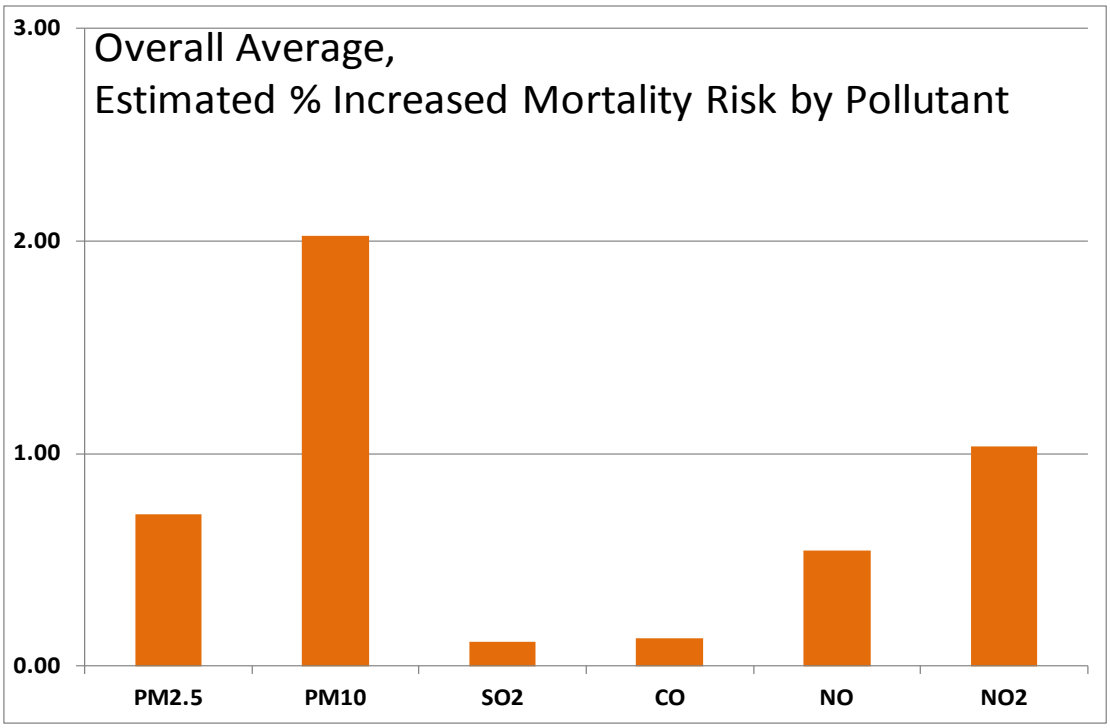
6.1.1 Neighbourhood Monitoring

In 2010 and 2011, *Clean Air Hamilton* in partnership with Green Venture began a mobile monitoring project to measure the ambient air quality, to identify potential emissions sources and to determine the potential health impacts of the ambient air in various neighbourhoods across Hamilton. Funding for the project was provided by a grant from ArcelorMittal Dofasco to help build the capacity for mobile monitoring in Hamilton and to identify local sources of pollution in neighbourhoods. Neighbourhood groups were encouraged to identify their desire for monitoring through a local media release sent to local media and via neighbourhood association announcements. Ads were placed in the Hamilton Community News (Mountain News, Stoney Creek News, Ancaster News, and Dundas Star) and the Hamilton Spectator. A parallel social media campaign was also launched through ArcelorMittal Dofasco's Community Strength blog; an entry was posted about the program on the ArcelorMittal Dofasco's Community Strength and on Green Venture's Twitter and Facebook accounts.

Requests for monitoring came in from 26 neighbourhoods in Hamilton; only 11 neighbourhoods and sites were selected based on resource and time limitations. These neighbourhoods and sites included Dundas, the area near Limeridge Mall, Red Hill Neighbourhoods, Delta, Lawrence Ave. to Burlington St, North West End, Wentworth North, McAnulty Blvd, Beach Blvd/Eastport Drive, and Jones Rd/Arvin Ave.

Citizens tend to care most about the overall health impacts of air pollution, rather than the levels of individual pollutants. In order to provide the most meaningful results for neighbourhood residents concerned about health effects, as well as for government officials pursuing air pollution control actions, total health effects (additional mortality percentages) due to air pollution were calculated for each neighbourhood, using the most recently available risk values from the SENES 2011 Health Study report (see **Section 3.1**). These total health impact values were then further structured into values for each individual pollutant, allowing assessment of the particular problem(s) in each neighbourhood.

Figure 21: Overall Average Estimated Percent Increased Mortality Risk by Pollutant for the City of Hamilton



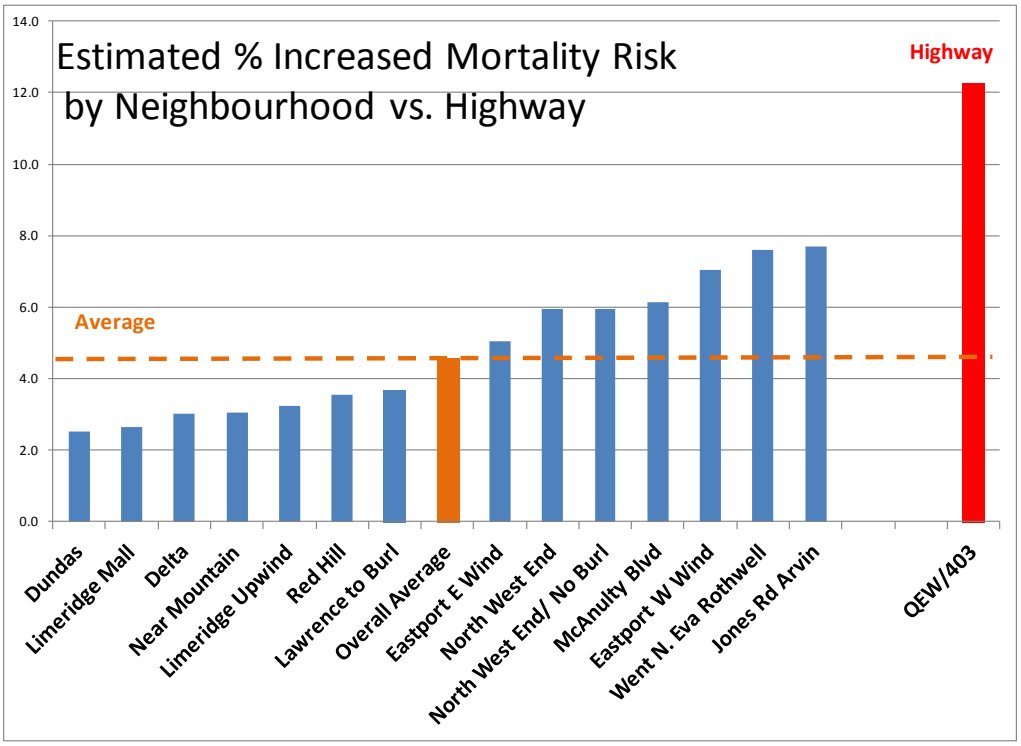
Of the 11 neighbourhoods monitored, all showed some air pollution impacts, ranging from 2.5% to 7.7% increased mortality risk, with an overall average of 4.6% increased mortality risk due to air pollution. The majority of impacts were due to particulate matter and oxides of nitrogen, primarily from transportation corridors.

Explanatory Note concerning the term “Increased Estimated Percent Risk of Mortality”: The “mortality calculations” represent the increased risk due to exposures to air pollutants above a true “zero exposure” to air pollutants. Even the most remote sites on earth have low but measureable levels of airborne pollutants, particularly fine particulate material. These remote sites have low (but non-zero) levels of air pollutants and therefore low (but non-zero) increased risks of mortality due to exposures to these pollutants. Increased risk numbers should be interpreted as general aids to decision-making because they provide comparisons of relative risks between different areas; these values should not be interpreted as exact representations of the burden of illness due to air pollutants. The ‘health risk values’ for individuals are influenced by additional factors including air pollutants not measured, personal lifestyle choices, diet, physical fitness and by a variety of personal health conditions that cannot be considered in such general estimates. Also, mobile monitoring data only provide short term “snapshots” of localized pollutant concentrations; at any location pollutant concentrations can vary considerably.

As a “reality check” the overall average of 4.6% increased mortality risk due to air pollution in Hamilton was applied to the base rate of approximately 4000 deaths per year, resulting in a calculated mortality rate of 184 deaths per year; this value compares favourably with the 186 mortality rate determined by SENES in their February 2012 report “Health Impacts Exposure to Outdoor Air Pollution in Hamilton, Ontario”. The Ontario Medical Association estimate for premature deaths due to air pollution in Hamilton in 2008 was 445 deaths per year; however, this latter number includes long-term health effects as well as the acute effects estimated above.

The results of the health evaluations are combined in **Figure 22** to show a city-wide ranking of health impacts. Five neighbourhoods showed above average levels of air pollution effects. The "Overall Average" number in **Figure 22** refers to the average of the data from the neighbourhoods studied as part of the neighbourhood mobile monitoring study; this average does not include the 'Highway' value in Figure 22 nor does it include any data from any other sites in Hamilton. As a result, Ministry of Environment staff have been notified and action is being taken to improve local air quality in these neighbourhoods. The five neighbourhoods above average were the McAnulty Blvd. area, North West End, Jones Rd./Arvin Ave., Eastport Dr. and Wentworth North. The Jones Rd/Arvin Ave, McAnulty Blvd, NW end, Wentworth N. and Eastport Dr. areas all showed increased particulate effects above city averages, while the NW end, Wentworth N and Eastport Dr. areas showed increased nitrogen oxides impacts.

Figure 22: Estimated % Increased Mortality Risk by Neighbourhood vs. Highway in Hamilton

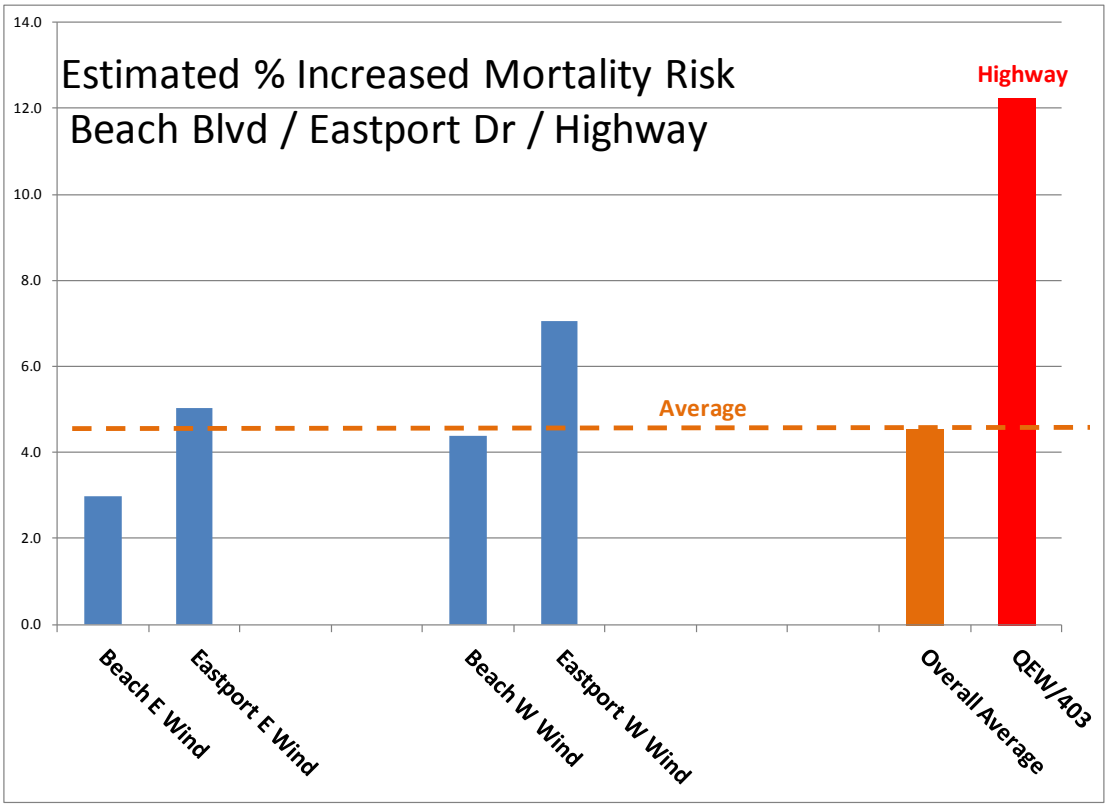


The "Highway" data in Figure 22 was the average value obtained while driving on the Queen Elizabeth Way and reflects the typical exposures drivers and passengers experience with in a vehicle on a major highway; the highway exposure is nearly three times the neighbourhood average. Clearly, highway exposures (i.e., exposures to air pollutants while driving on the highway) are far above any neighbourhood exposures.

During the study, the winds blew almost exclusively from the south west, the prevailing wind direction in Hamilton. On a couple of occasions winds from the northeast were observed; data was collected on Eastport Dr. and on Beach Blvd. from both wind directions. **Figure 23** shows the different mortality risks associated with the two wind directions along Beach Blvd. and Eastport Drive. Clearly, Eastport Drive experiences a higher level of pollutant impacts compared to Beach Blvd.; both sites show higher impacts when winds come from the westerly direction, reflecting

increased levels of pollutants from Hamilton compared burdens from air masses coming off the lake. Along the east side of the Queen Elizabeth Way there is a noise barrier which acts as an upward wind deflector for westerly winds, resulting in lower pollutant concentrations along Beach Blvd compared to Eastport Drive under westerly wind conditions.

Figure 23: Estimated % Increased Mortality Risk Comparison by Wind Direction, Beach Blvd / Eastport Dr / Highway



The results of this mobile monitoring project were shared with the community at a presentation in January, 2012 at the Central Library. Sixty individuals attended this event representing the 11 neighbourhoods in the study. A presentation was also made at the Upwind Downwind Conference in February, 2012. Presenting these results has led to increased interest in the project and more requests from neighbourhoods for air quality and health impacts monitoring.

The full report and the individual neighbourhood reports can be found on the Clean Air Hamilton website, visit: http://www.cleanair.hamilton.ca/default.asp?id=72

6.2 Active & Sustainable Transportation

6.2.1 Smart Commute and Transportation Demand Management (TDM)

Smart Commute Hamilton and the City of Hamilton's Public Works Transportation Demand Management (TDM) office were very active with a variety of new programs underway in 2011 (see **Table 11**). The programs vary in nature from new incentive programs for carpooling to education, communications and event planning. The office continues to develop and improve relationships with partner organizations including *Clean Air Hamilton*, Public Health Services, Green Venture, Environment Hamilton, McMaster University, Hamilton Health Sciences, St. Joseph's Healthcare, Mohawk College, Horizon Utilities, McMaster Innovation Park, McMaster Downtown Centre, Hamilton Chamber of Commerce, CAA and ILR Industries. Smart Commute Hamilton is also working with Hamilton areas School Boards, Federal and Provincial offices, WSIB, Good Shepherd Centres Bayshore Home Health, Yale Properties and Arcelor-Mittal Dofasco as provisional members expressing interest in the program. In the 2011, Smart Commute Hamilton enjoyed a variety of successes including:

- From November 2011 to March 2012, Smart Commute Hamilton increased the number of carpools formed in the CarpoolZone.ca ride-matching web tool by 35%, and number of registrants by 105%

- Expanded the Smart Commute Hamilton Transportation Management Association, forming new partnerships with Hamilton-Wentworth Catholic District School Board (HWCDSB), Redeemer University-College and Canada Bread Ltd.

- Awarded the "Most participants to log sustainable commutes" prize in the 2500 – 5000 Employees category (McMaster University) for the Pollution Probe Clean Air Commute Competition which occurred in June 2011, across the Greater Toronto and Hamilton Area. Also, Smart Commute Hamilton had an Hamilton Employee win the award for most innovative commute.

- Developed a business plan for a bike sharing strategy that would connect Smart Commute Hamilton employers to the downtown and residential areas.

- Held a Transportation and Healthy Living Fair and Open Streets Hamilton events in June and September, paired with Clean Air Commute Week and Smart Commute Week to reward Smart Commute Employers/Employees and engage potential employer-partners. The strategy assisted in negotiations with Arcelor-Mittal Dofasco, Young Drivers, Amity-Goodwill and Yale Properties

Table 11: 2010-11 TDM Program Descriptions and Status

Activity	Description	Status
Hamilton Car Share Expansion	Provide Hamilton Car Share with a $150,000 revolving line of credit from the City of Hamilton to expand CarSharing in Hamilton and establish it as a sustainable mode of convenient transportation	Plan approved and legal documents are in the process of being signed. Program launch will be in June 2012.
Secure Bike Parking	Opened a facility in the City Hall Parking Lot for 32 bikes in October 2010; at Mohawk College in 2011, holding 60 bikes; and St. Joe's Hospital parking construction is scheduled for 2012.	Ongoing construction of new facilities.
2011 Transportation Summit	Annual event hosted at the Sheraton Hamilton themed "Environmental Pricing Reform in Hamilton". The summit examined road pricing, parking pricing and storm water pricing, amongst other tools to help fund aging infrastructure maintenance.	Evaluation and Report Complete 2012 (Nov. 4 to 7) ACT Canada National Conference Planning is underway.
Expanded Subsidised Employer Commuter (EC) Pass program	TransitZone.ca will be used to manage employee requests for subsidised passes from various employers as a one year pilot for 2012. Mohawk is scheduled to be the first employer to use the program.	Program launch to occur in September 2012
Open Streets Hamilton	Two events were held which aimed to create an urban park, closed to car traffic for 2 Sundays per year (June and September) to support sustainable transportation and healthy communities.	Events were held in June and September 2011 events on James Street North from Cannon (or York) to Guise Street. 17,000 people attended the two events
TDM Framework and Communications Plan	IBI Group and Urban Trans completed a strategy to communicate TDM principles to various groups, wards and communities in Hamilton, along with social marketing programs for communities	The plan is complete and being finalized. As a phase 2 project, a community-based social marketing pilot will occur in 2012 in Kirkendall and Ward 8 neighbourhoods.

Activity	Description	Status
Transportation Management Association (TMA)	Meets monthly to engage community groups, city departments and engaged employers & institutions	Canada Bread, Redeemer University-College and the Hamilton Wentworth Separate School Board joined in 2011.
Active and Safe Routes to School	Undertaking inventories/audits/ walkabouts and assisting in trip/route planning. In addition, in 2011 a points based system for having schools certified as sustainable transportation schools was developed, to sustain the school travel planning efforts developed through the Stepping It Up pilot project.	A total of 15 Pilot School Site Analysis were completed by 2011. The points based certification system is being piloted in 2012.
Bike Share Implementation Study and Business Plan	Developed a business plan, market analysis and station location analysis.	Develop an implementation and funding plan for implementation in 2013.
Emergency Ride Home program (See TDM)	Program to provide employees with the security that they can get home for an emergency and their taxi fee can be recovered.	Advertising the program internally and evaluating its success
Rural Roots	Transportation and Food Linkages – using public transit to access farms for food education and purchasing	Once per month bus service to local area farms with 5 farms visited in 2011 and over 300 participants.
CAN Bike Instruction to Hamilton	Work with Public Health Services and Recreation to establish CAN Bike Courses at various Recreation Centres	The courses are being piloted in 2011-12 through the recreation department.
Metrolinx Partnership	Work with Metrolinx to deliver Smart Commute Programs including: Carpoolzone.ca Transitzone.ca Active Transportation Promotion GTHA-based Events	Ongoing work to plan events, work with employers, recruit employers, and report successes through surveys and statistical analysis.

For more information on Smart Commute Hamilton, visit: www.smartcommutehamilton.ca

6.2.2 Totally Transit

Totally Transit is a unique bus education program that teaches Hamilton elementary school-aged students how to use the HSR bus network properly while making the connection between air quality, climate change and transportation emissions. Through hands-on experience this one-of-a-kind program empowers students to feel confident about choosing transit and other forms of sustainable active transportation.

In 2011, forty-two (42) Totally Transit lessons were delivered to 851 students from twenty-five (25) Hamilton area schools (grades 5-8). More than 70% of these presentations involved using a chartered HSR bus to transport students and to be used as a classroom for lesson delivery.

Totally Transit and *Clean Air Hamilton* were featured in a segment on the Cable 14 'For the Record' television show (Nov.14) and will be acknowledged in the 2012 Transit Supportive Guidelines issued by the Ministry of Transportation.

The program continues to resonate with teachers and students alike as it provided hands-on experience to address some of the barriers facing young people (and their families) to choosing transit as their sustainable transportation mode.

Since 2007 Green Venture has delivered Totally Transit to more than 2700 students and reached an additional 820 students with similar bus education in mini-presentations at school environmental fairs.

For more information on Totally Transit, visit: air.greenventure.ca/totally-transit

6.2.3 EcoDriver

Green Venture's EcoDriver program aims to help drivers of light duty cars and trucks decrease their fuel use. EcoDriver was developed in tandem with Green Communities Canada and was originally funded by Ontario's Ministry of the Environment 'Go Green Fund'. *Clean Air Hamilton*'s funding of this program ensured that the important messages of this program continued to be delivered through 2011.

Driving produces tailpipe emissions that reduce air quality and contribute to climate change. EcoDriver encourages drivers to reduce the number of vehicle trips and choose sustainable transportation modes as often as possible. EcoDriver also recognizes that, since people will continue to drive, it is imperative that drivers learn and practice behaviours that will reduce their fuel usage and thereby reduce their vehicles' emissions and impacts on local air quality and global climate change. Through presentations, workshops, tire pressure clinics, media and communication materials, the program educates and encourages drivers to achieve fuel savings by promoting the following three core messages: Drive Fuel-Efficiently, Buy Fuel-Efficiently and Drive Less. The program also has a strong anti-idling component that is consistent with Hamilton's

Idling Stinks Campaign (2006-2008) message: engine idling for more than 10 seconds requires more fuel than turning off and restarting the engine.

EcoDriver Tips:

- Try to be 100% fuel-efficient by walking, cycling and using transit whenever possible.
- Turn the engine off when you will be stopped for more than 10 seconds.
- Leave a three-second buffer between you and the next vehicle to maintain a steady speed.
- Anticipate traffic speed changes and coast to decelerate.
- Find the recommended cold tire pressures on your vehicle information placard.
- Drive the speed limit on the highway for best fuel economy.
- Get in the carpool zone.

In 2011 Green Venture worked with community partners, met the public at events and distributed 800 solution packed EcoDriver info-cards and 300 tire pressure gauges.

To drive home the message that underinflated tires waste fuel and create unnecessary emissions, Green Venture partnered with Canadian Tire Auto Services at the Centres on Barton Street, Upper Gage and in Ancaster for a series of three (3) public Tire Pressure Clinics. In August 2011, the Canadian Tire parking lots were home base for Green Venture's Clean Air Ambassadors who taught 257 store visitors how to check the tire pressures on their cars, and filled tires where needed. Local newspaper articles helped further spread the Clinic's message. One additional Tire Pressure Clinic was held at the Living the Environment conference in Stoney Creek in October and twelve more attendees learned how and why to check tire pressures.

Natural Resources Canada states that "by adopting a few simple driving techniques, the average driver could save $500 per year in fuel costs and prevent more than 1000 kg of CO_2 from needlessly entering the atmosphere." These simple techniques are what EcoDriver messaging communicates.

6.2.4 Vehicle Emissions Enforcement Program (VEEP)

Vehicle emissions enforcement officers regularly work in partnership with local Police, OPP, RCMP, Ministry of Transportation, Ministry of Finance, Ministry of Natural Resources, Transport Canada and other agencies to conduct various inspection blitzes across the province. One of the benefits of these multiple agency inspection blitzes is that with a single vehicle stop officers can determine if a vehicle is an environmental health and/or safety risk to the community.

As an example, while working at one of the Hamilton safety blitzes (Operation Slo-Mo), Hamilton Police brought in a vehicle for inspection, a 1987 Nissan 240. The vehicle was found to be non-compliant with the Environmental Protection Act ; a catalytic converter was missing, resulting in excessive tailpipe emissions and exhaust noise. The police dealt with the muffler issue (excessive

noise) while the Ministry of Transportation found that the vehicle was too low to ground (tires were rubbing).

The Ministry of the Environment supports this project because illegally modified vehicles used for street racing can emit more smog-causing pollutants and burn more fuel than properly tuned vehicles. Vehicles inspected in support of Project E.R.A.S.E. often identify vehicles that have had their emission control systems modified or removed completely; these vehicles may not meet regulated emission standards. The emissions generated by these vehicles can be substantial.

The Ministry of Environment's Sector Compliance Branch participated in eight joint force blitzes (with local police and/or the Ministry of Transportation, etc.) in Hamilton this past year. A total of 219 vehicles were inspected. One hundred twenty three (123) vehicles passed inspection, ninety-six (96) vehicles were found to have some degree of deficiency with respect to vehicle emissions. For the ninety six (96) vehicles found to have serious deficiencies, the Ministry of Environment issued 44 tickets, 22 Notices to Submit to an Emissions Test, 4 Notices of Violation, 24 Warnings, 8 Provincial Officers Orders and, seized the plates of 5 vehicles.

7.0 Industrial Partners and Actions in Hamilton

7.1 Hamilton Industrial Environmental Association (HIEA)

The Hamilton Industrial Environmental Association (HIEA) is a non-profit association of local private sector industries. HIEA's mandate is: "to improve the local environment – air, land and water – through joint and individual activities, and by partnering with the community to enhance future understanding of environmental issues and help establish priorities for action."

HIEA's Environmental Survey provides the aggregate environmental performance of its members for key parameters such as air emissions, water discharges, recycling and waste management, and environmental spending and stewardship. Environmental trends are evaluated by using 1997 as the baseline year, although it should be noted that membership has changed since 1997 with the addition of several new members. Data from new members is collected and included in the survey only from the date they joined. This survey is presented at the association's Annual General Meeting and to the Community Advisory Panel and is available to the public both in print and on the association's website - www.hiea.org.

Released in late 2011, HIEA's 2010 Environmental Survey shows a continuing trend of improvement. This performance is evidence of the continuing success of HIEA member companies in improving the environment in the Hamilton community. Some highlights of the association's performance in air emissions include a 16% reduction in Greenhouse Gases, a 27% reduction in Volatile Organic Compounds, a 28% reduction in Nitrogen Oxides, a 58% reduction in Particulate Matter and a 75% reduction in Polycyclic Aromatic Hydrocarbons.

More information about the Hamilton Industrial Environmental Association can be found at: http://www.hiea.org

7.2 Horizon Holdings / Horizon Utilities / Horizon Energy Solutions

Horizon Holdings Inc. is the owner of Horizon Utilities Corporation, the municipally-owned local electric distribution company, and Horizon Energy Solutions Inc., an energy services company focusing on utility grade metering, solar photovoltaic cells and other energy services. The company continues to improve its sustainable development leadership each year. In 2011, it Horizon Holdings Inc. was awarded the Sustainability Company of the Year award by the Canadian Energy Association for its overall sustainable development leadership and innovation.

In 2011, Horizon had three important milestones. First, it received ISO 14001 accreditation for its Environmental Management System. In addition, Horizon received guidance that it had achieved the ISO 26000 standard for Social Responsibility. The implementation of ISO 14001 and 26000 greatly assists Horizon in maintaining its commitment to sustainable development.

Horizon also published its third Sustainability-Based Annual Report in 2011 and received "external assurance" of its GRI filing, getting an A+ rating from Ernst and Young. The report focuses on the social, environmental and economic dimensions of Horizon's business while the GRI filing benchmarks its performance against the international standard for sustainability.

Horizon Utilities' Sustainability-Based Annual Report can be read at: http://www.horizonutilities.com/HHSC/html/leadership/sustainableDevelopment.jsp

7.2.1 Conservation and Demand Management

Horizon Utilities, utilizing Ontario Power Authority (OPA) programs, makes it simple for residents and businesses to conserve energy. The Fridge and Freezer Pickup had successful uptake in 2011 with 2,684 old fridges and freezers being picked up. In 2011, a total of 716 small businesses had received retrofit upgrades for improved indoor lighting with average savings of $210 per year in their electricity bills.

For information on the Small Business Lighting program or to sign up, visit:
https://www.saveonenergy.ca/Business/Program-Overviews/Small-Business-Lighting-and-AC.aspx

The saveONenergy Retrofit program focuses on lighting, motors, heating, ventilation and air conditioning, and overall electricity systems. In 2011, Horizon Utilities' customers achieved a total of 4.46 MW in reductions through the Retrofit program. Horizon awarded the City of Hamilton's water dept. the largest rebate in Ontario at $2.3 million and General Motors in St. Catharines received $1.4 million. The Hamilton water department project achieved a total of 2,597 kW in peak demand reduction and 20 percent in annual electricity savings.

For more information, visit:
https://www.saveonenergy.ca/Business/Program-Overviews/Retrofit-forCommercial.aspx

7.2.2 Energy Mapping

Horizon Utilities is the first Ontario local distribution company (LDC) to begin correlating its electricity consumption data with MPAC building attributes and Teranet geospatial property data, through a geographic information system (GIS). The objective is to improve the targeting effectiveness and deployment of conservation and demand management (CDM) programs. The learnings from the pilot will be applicable to all Ontario LDCs and will support and enhance the success of the OPA's CDM initiatives and Ontario's Long-Term Energy Plan. This project was made possible through the financial support of the Ontario Power Authority's Conservation Fund.

Hamilton Energy Mapping Final Report can be accessed here:
http://www.canurb.org/energymapping

7.2.3 Horizon Energy Solutions Inc.

Horizon Energy Solutions (HESI) is an affiliate business of Horizon Utilities that is one of the few Measurement Canada-approved Meter Services Providers (MSP) and even fewer IESO accredited wholesale market MSPs, with other interests in sentinel lighting. In 2010, HESI expanded its offering to full turnkey solar photovoltaic (PV) rooftop installations for customers in Ontario. In 2011, HESI expanded again to provide turnkey CDM services for Ontario LDCs. In addition, HESI exited the water heater rental business in 2011.

For more information, please visit:
http://www.horizonenergysolutionsinc.com

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8.0 Conclusions and Recommendations

Over the past ten years, there have been dramatic improvements in air quality in Hamilton. These changes will have contributed to better health for citizens as well as improved perceptions of the City. The long-term downward trend in air emissions continues due to the concerted actions of individuals, organizations, industries, the City of Hamilton and other levels of government.

Clean Air Hamilton and its members continue to recognize the relationship between air quality and public health through the initiatives supported by the committee. Energy conservation and climate change have been highlighted as topics of significant concern for the future. Transportation emissions are a major source of airborne contaminants and are a substantial determinant of local air quality as well as being a significant source of green house gases.

- Health research continues to confirm that exposure to air borne pollutants ($PM_{2.5,}$ PM_{10}, NO_x, and SO_2) may adversely impact human health ($PM_{2.5,}$ PM_{10}, NO_x, and SO_2). The 2011 SENES Health Study undertaken for *Clean Air Hamilton* reflects the current knowledge of the relationship between air quality and public health and the increased health care costs associated with the exposure to increased health care costs to air pollutants.

- The Air Quality Health Index (AQHI) developed by the Government of Canada provides the public with useful information about current air quality conditions and strategies they can use to reduce their exposures. *Clean Air Hamilton* is please to have the AQHI in Hamilton thanks to the collaborative efforts of partners including Hamilton, Public Health Services, Ministry of the Environment, Environment Canada and Health Canada.

- Hamilton has one of the most extensive networks of fixed air monitors in Ontario. Ambient air monitoring allows for the collection of outdoor air quality data which is; used to identify local sources of air emissions and to evaluate the potential health impacts due to these exposures. At present the majority of these monitors are concentrated primarily in the industrial north end of the City. *Clean Air Hamilton* continues to work with its member to encourage the expansion of monitoring efforts to capture new emission source currently not being covered.The information for an expanded air monitoring network will further enhance the capabilities of decision-makers at all levels in the development of policies and initiatives to reduce local emissions within the community and thereby the exposures of citizens.

- As a result of partnerships between members of *Clean Air Hamilton* neighbourhood monitoring to measure the ambient air quality, to identify potential emissions sources and to raise public awareness of air quality an the associated potential health impacts in 11 neighbourhoods across Hamilton was undertaken in 2011. Neighbourhoods with above average levels of air pollutants have been identified and authorities have been notified. A total of 26 neighbourhoods have expressed interest in being included in the mobile air monitoring program. This public response highlights the need and interest for this type of work to continue in Hamilton.

- Comprehensive Airshed Management has been proposed for improving air quality across Canada. *Clean Air Hamilton* will continue to work with the Ministry of the Environment to partner and provide input towards the development of a place-based airshed management system for Hamilton.

- In the event the Provincial Highway Act is reviewed in the immediate future, *Clean Air Hamilton* and its stakeholders should be consulted to make recommendations on the updating of this legislation, regulation and guidelines.

- *Clean Air Hamilton* endorses the Hamilton Community Climate Change Action Charter and encourages organizations, businesses, community groups, and individuals to endorse the Charter and take action on climate change locally.

- Local economic and development renewal influences air quality, creates liveable communities and attracts investment. Local economic recovery must be done with the consideration of sustainability to continue to improve our environment.

Air quality improvements in the City of Hamilton will be incremental and will require actions on many fronts. We recommend that the City of Hamilton:

- Recognize the health impacts of transportation-based pollutants near major traffic corridors and take steps to implement this recognition into their transportation planning and urban design practices. A balance needs to be found between active transportation, vehicular and goods movement where Particulate Matter (PM_{10} and $PM_{2.5}$) is concerned.

- Work with local industries and the Ministry of the Environment to control both point sources and area sources of air particulate pollution, particularly road dusts, as well as reducing NO_x and SO_2 emissions, from stationary and mobile sources.

- Undertake partnerships and enhance air monitoring in Hamilton to increase coverage of local sources throughout Hamilton through fixed stations, portable monitors, and increased mobile monitoring.

- During the upcoming review of draft Neighbourhood Community Plans, *Clean Air Hamilton* and its stakeholders wish to be consulted to make recommendations on the finalization and implementation of the draft community plans.

- Support and encourage Hamiltonians to reduce their transportation-based emissions through the use of transportation alternatives including public transit, bicycles, walking, hybrid vehicles, etc. The City of Hamilton needs to continue to lead by example through transportation demand management, transportation planning and fleet upgrades.

- Develop a Complete Streets Strategy for Hamilton that incorporates inventories, the tools and examples that currently exist in Hamilton to accommodate various transportation modes and road users. The strategy can also help link all the existing plans and policies together to ensure ease of implementation.

- Develop Transportation Demand Management guidelines for new developments and re-developments.

- Take measures to reduce green house gas emissions through reduced energy consumption, water and waste generation in City buildings and reduced energy consumption in fleets. Educate and encourage the community to reduce their green house gas emissions through energy and water consumption and waste generation at home, business and on the road.

- Take a broad suite of actions to improve local air quality and combat climate change and to increase the level of dialogue with community groups on the health impacts of poor air quality and the actions and lifestyle changes that will lead to air quality improvements for all.

In 2012, *Clean Air Hamilton* will continue to address air quality issues and their relationships to public health outcomes. *Clean Air Hamilton* will continue to develop relationships with City staff to ensure that air quality goals are integrated into the decision-making processes across divisions within the City. *Clean Air Hamilton* will continue to cultivate partnerships with organizations that have goals that are consistent with those of *Clean Air Hamilton* and the City.

Appendix A: *Clean Air Hamilton* Terms of Reference

Clean Air Hamilton Coordination Committee – Terms of Reference

Mandate:

The Clean Air Hamilton Coordination Committee (CACC) is a voluntary committee established in 1998 to advise on air quality and related issues in the City of Hamilton and provide an authoritative voice and resource on local air quality issues.

Vision:

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.

Goals:

- To improve air quality throughout the City and to meet all ambient air quality criteria;
- To raise *Clean Air Hamilton*'s visibility in the community and to be recognized as the authoritative voice on local air quality issues;
- To galvanize broad-based support for a process and an action plan to improve air quality;
- To provide information and advice that decision-makers value;
- To influence decision-makers to choose sustainable practices and alternatives; and
- To effect behavioural changes to improve air quality.

Functions:

Clean Air Hamilton was established in 1998 as an air quality advisory group to the City of Hamilton following publication in 1997 of the Hamilton Air Quality Initiative report. *Clean Air Hamilton* serves to improve local air quality in Hamilton through:

- Acting as a clearing house for information on local, regional and transboundary air quality issues that impact Hamilton;
- Facilitating information sharing and exchange on local, regional and transboundary air quality issues that impact Hamilton;
- Identifying emerging areas and issues related to local, regional and transboundary air quality issues;
- Undertaking local research to gather information on local air quality and impacts in Hamilton;
- Tracking the annual changes in local air quality and reporting to the City, other levels of government, and the public;
- Providing recommendations to the City of Hamilton to address local air quality issues;

- Identifying and seeking partners and change agents to implement programs and policies that improve local air quality;
- Cultivating partnerships with organizations that have air quality improvement goals that align with those of *Clean Air Hamilton* and the City of Hamilton;
- Educating the public about local air quality and promoting attitudes and actions that promote improvements to local air quality;
- Prepare an annual year-end report documenting the work of the Committee. This report may include recommendations by the Committee on policy issues or related concerns in the implementation of City policies related to air quality and related health and environmental issues. This report is presented to Hamilton City Council and the community every year;
- Endorse City actions to improve local air quality;
- Communicating information on air quality to the public on the Clean Air Hamilton website – www.cleanair.hamilton.ca;
- Hosting the biannual Upwind/Downwind Conference which highlights (a) the latest in air quality research and (b) strategies and activities to improve air quality on a local, regional and national scale, and;
- Developing an annual Work Plan and a Strategic Plan every 3 years that furthers the work of *Clean Air Hamilton*, its vision and its goals.

Roles & Responsibilities:

At the September meeting of each year, the Chair will declare his/her intentions to re-new or resign. CACC will then nominate a Chair.

The Chair is a CACC member and is expected to uphold the same responsibilities as all CACC members.

Chair

Responsibilities of the Chair include:

- Being the public spokesperson for *Clean Air Hamilton*;
- Furthering the Vision and Goals of *Clean Air Hamilton* and promote improved air quality in Hamilton;
- Facilitating information sharing and exchange on programs that address air quality;
- Identifying and seeking partners and change agents to implement programs and policies that improve local air quality;
- Providing input and direction into the *Clean Air Hamilton* Strategic Plan, Work Plan and Annual Reporting on Air Quality, and reviewing *Clean Air Hamilton*'s progress in implementing the goals of *Clean Air Hamilton* and the Strategic Plan;
- Presenting the annual, year-end report documenting the work of CACC to City Council;
- Chairing the meetings of the CACC;
- Co-ordinating meeting agendas and items with the Air Quality Co-ordinator;
- At meetings, the Chair will opening meetings and manage the agenda within the time frame allotted; ensure discussions are focused on critical items; solicit input from all and provide

adequate opportunity for each member to share their views/questions/concerns and close meetings ensuring all items have been discussed, and;
- Reviewing monthly meeting minutes and associated items distributed by E-mail.

Air Quality Co-ordinator

The Air Quality Co-ordinator is a City of Hamilton-funded position and serves to co-ordinate and administers the work of *Clean Air Hamilton* and the Committee. The Air Quality Co-ordinator is a CACC member and is expected to uphold the same responsibilities as all CACC members.

Responsibilities of the Air Quality Co-ordinator include:

- Being the public voice of *Clean Air Hamilton* and/or Chair Committee meetings on behalf of the Chair, where requested;
- Responding to requests for information from members, City Council, and the public on *Clean Air Hamilton* and the Committee;
- Co-ordinating meeting agendas and items with the Chair and CACC members;
- Distributing agendas and items for discussion at meetings to CACC members;
- Recording and distributing minutes of meetings to CACC members.
- Preparing the annual year-end report documenting the work of the Committee;
- Communicating information on air quality to the public on the Clean Air Hamilton website – www.cleanair.hamilton.ca;
- Assisting in the development and management of the biannual Upwind/Downwind Conference;
- Assisting in the development of the Strategic Plan and Work Plan;
- Assisting in the co-ordination of meetings of working groups;
- Seeking out and applying to external funding opportunities for *Clean Air Hamilton*, and;
- Identifying and seeking partners and change agents to implement programs and policies that improve local air quality.

CACC Members

Members are expected to further the Vision and Goals of *Clean Air Hamilton* and promote improved air quality in Hamilton through:

- Facilitating information sharing and exchange on programs of their organizations that address air quality;
- *Clean Air Hamilton* members must attend all meetings – or provide a back-up or notification to the Air Quality Co-ordinator if unable to participate when members cannot attend due to vacations, etc.;
- *Clean Air Hamilton* members who do not attend more than 3 consecutive meetings must contact the Air Quality Co-ordinator and Chair through a written or electronic communication on their absence and intent to continue as a member;
- Work with the Air Quality Co-ordinator to monitor the work of C*lean Air Hamilton*, and work with the Air Quality Co-ordinator and other CACC members between meetings to carry out the business of Clean Air Hamilton;

- Identify and seek partners and change agents to implement programs and policies that improve local air quality;
- Provide input into the *Clean Air Hamilton* Strategic Plan, Work Plan and Annual Reporting on Air Quality, and review *Clean Air Hamilton*'s progress in implementing the goals of *Clean Air Hamilton* and the Strategic Plan;
- Bring forward items for meeting agendas – ensure items and materials are ready for discussion/decision with adequate time for pre-circulation;
- Show up on time for meetings and keep the meeting on track in terms of time
- Keep comments and discussions on-topic at meetings;
- Review monthly meeting minutes and associated items distributed by E-mail, and;
- Input and involvement by some members may be limited for particular topics and decision-making due to their organizational responsibilities outside of CACC. Members are supported in not always providing input for this reason.
- There will be no more than one vote per member organisation.

Memberships:

Clean Air Hamilton is open to anyone who has the time, expertise, experience and interest in air quality issues to work in a committee-based format to find ways to improve air quality in the City through facilitation of solutions, partnerships and educating the public in a voluntary capacity.

Membership should represent a balanced range of disciplines and interests in air quality including, **but not limited to,** health, planning, transportation, engineering, policy, energy, monitoring, research, education, finance, communication and outreach, and community development.

Members also represent key stakeholders or change agents with interest, programs and policies that address air quality. Members include all levels of government (local, provincial and federal), local industry, local utilities, local academics (university and college), non-profits and non-governmental environmental organizations, consultants, and local citizens with an interest and role in improving air quality in Hamilton. CACC members may invite others to join.

There are two levels of membership in *Clean Air Hamilton*:

a. **CACC members**

CACC members are directly responsible for attending monthly meetings, providing advice and input into the *Clean Air Hamilton* Strategic Plan, Work Plan and Annual Reporting on Air Quality, and review *Clean Air Hamilton*'s progress in implementing the goals of *Clean Air Hamilton* and the Strategic Plan. Responsibilities of CACC members are outlined in these Terms of Reference. CACC members attend *Clean Air Hamilton* meetings and are involved in decision-making at meetings as outlined in these Terms of Reference.

b. **Corresponding members**

Corresponding members are individuals interested in keeping informed of the work of Clean Air Hamilton*, events, news and information as it relates to air quality and related health and environmental issues. Corresponding members may attend* Clean Air Hamilton

meetings, but are not involved in decision-making. Correspondence with such members will be electronic.

Interested and invited members should contact the Air Quality Co-ordinator and the Chair to outline their interest in joining the CACC and their potential contributions to furthering the Vision and Goals of *Clean Air Hamilton*. Interested and invited members are required to attend at least two CACC meetings and declare their intent to join. The CACC will confirm membership after two meetings.

Members may resign from *Clean Air Hamilton* through a written or electronic communication to the Chair and the Air Quality Co-ordinator.

Clean Air Hamilton is dependent upon the voluntary contributions of its members to make air quality improvements in Hamilton. *Clean Air Hamilton* supplements the voluntary contributions of members with renewed and ongoing commitments of funding from key stakeholders, including various levels of government, the City of Hamilton, local industries and academic institutions, as well as recruiting new members into the organization.

Operating Budget and Funding:

Clean Air Hamilton's operating budget is administered by the Planning and Economic Development Department and is reviewed annually in consultation with the Committee. *Clean Air Hamilton*'s operating budget, programs and sources of funding are reported on annually through the *Clean Air Hamilton* annual report.

Additional funding for programs that assist in furthering the Vision and Goals of *Clean Air Hamilton* and improved air quality in Hamilton are sought out and communicated with CACC members. Applications for external funding are coordinated between the Air Quality Co-ordinator, the Chair and CACC members.

Any additional funding received outside of the City's annual operating budget for programs are held in the *Clean Air Hamilton*'s operating budget and are administered by the Planning and Economic Development Department in consultation and partnership with *Clean Air Hamilton*, the Chair, and CACC members.

Decision-making:

Principles of Decision-making

1. The Clean Air Hamilton Coordinating Committee (CACC) provides advice.
2. This advice is reached by consensus among its members.
3. Members are expected to be collegial in any discussions and business undertaken by the Committee.
4. To the extent possible, all the applicable sciences are to be represented in the discussions and business undertaken when the Committee develops advice.
5. To the extent possible, evidence-based analysis is to be used in reaching conclusions as to the advice to be given.
6. To the extent possible, opportunity will be afforded to all points of view to be expressed during discussions and business when the Committee develops advice.

The Clean Air Hamilton Coordination Committee (CCAC) meets monthly and members at these meetings make decisions on activities and the work of Clean Air Hamilton. A facilitative process is used to achieve consensus-based decisions and actions. Action items are clearly articulated and assigned during the meeting. Outcomes are recorded in the meeting minutes. These minutes, which list the action items, are distributed to all members of *Clean Air Hamilton* through E-mail. For maximum public transparency, the minutes are also posted on the *Clean Air Hamilton* website.

Conflict of Interest:

Conflicts of interest must be disclosed by CACC members concerning any matter that comes before the Committee and are recorded in the meeting minutes. Any CACC member may raise the question of a conflict of interest and the CACC member in question must satisfy the group that no conflict exists. The Chair may determine a conflict exists and so declare. Where a conflict exists, a CACC member must not take part in any discussions or participate in any decisions on activities or resolutions of the Committee pertaining to the issue.

Meetings:

Clean Air Hamilton meets on a monthly basis on the second Monday of the month from 3pm to 5pm at Hamilton City Hall. Meetings are open to the public. Agendas and any accompanying meeting materials are set and distributed through E-Mail to CACC members by the Air Quality Co-ordinator the week before the monthly meeting. Changes or additions to meeting agendas, meeting locations and meeting times are communicated either at meetings or through E-Mail to all CACC members, the Chair and the Air Quality Co-ordinator. E-mail will be used to communicate ongoing information sharing amongst CACC members between monthly *Clean Air Hamilton* meetings.

Minutes are taken by the Air Quality Co-ordinator during meetings. Meeting minutes are circulated via E-mail to CACC members up to 3 days after meetings and before the following monthly meeting to ensure CACC members have time to review and communicate any errors or need for clarification. Minutes of the previous meeting are reviewed and approved at the monthly meeting. Approved minutes are posted to the *Clean Air Hamilton* website – www.cleanair.hamilton.ca, for the public to view.

Presentations at Meetings:

Any presentations by outside organizations for *Clean Air Hamilton* meetings are arranged through the Air Quality Co-ordinator the month before the *Clean Air Hamilton* meeting at which the presentation will be shown. In cases where presentations have information of an immediate nature, they will be shared via E-Mail to all CACC members. Presentations at monthly meetings will be no more than 30 minutes and allow sufficient time for discussion by Committee members. Copies of presentations will be made available for viewing on the *Clean Air Hamilton* website (www.cleanair.hamilton.ca) with the permission of the presenter and distributed to members of *Clean Air Hamilton*.

Working Groups:

At times, issues or topics identified by the CACC in the *Clean Air Hamilton* Strategic Plan and annual Work Plan or in the research, education and communication work that *Clean Air Hamilton* undertakes in addressing air quality in Hamilton requires the formation of ad hoc working group made up of members of *Clean Air Hamilton*.

Terms of Reference for these working groups will be created to identify the tasks and responsibilities of the working group and circulated to members of *Clean Air Hamilton* for their interest and participation in groups. Working groups may be open to outside agencies/organizations and individuals outside of *Clean Air Hamilton* members who have expertise in the area or issue identified.

Working groups are required to report back to *Clean Air Hamilton* on activities at monthly meetings as set out in their respective Terms of Reference.

Appendix B: 2010-2013 *Clean Air Hamilton* Strategic Plan

CAH = *Clean Air Hamilton*; City = City of Hamilton; EC = Environment Canada; EH = Environment Hamilton; GV = Green Venture; HAMN = Hamilton Air Monitoring Network; HC = Health Canada; Horizon = Horizon Utilities; HSR = Hamilton Street Railway; McMaster = McMaster University; Rotek = Rotek Environmental; MOE = Ministry of the Environment; NRCan = Natural Resources Canada; PH = Public Health; TDM = Transportation Demand Management; UHI = Urban Heat island

Strategic Issue	Activity in the Community	Purpose, Opportunities, Pressures	Proposed Partners	Research	Communication	Actions	2011 Update
Public Health Protection	Heat Alert, Corporate Smog Plan	Concern for the public health in regards to air quality; expand health base for Air Quality Index (AQI)	HC, PH	Air Quality Health Index (AQHI)	How individuals can avoid health problems tie health based AQI	Introduce AQHI to Hamilton	AQHI introduced in 2011
			HC, PH, school boards, Parks & Recreation; GV		Create a standard package for the community and corporate areas so they know what to do to protect health during inversion or smog days	Community Smog Plan	AQHI introduced in 2011
			PH, McMaster, Rotek, MOE, City	Air Quality Health Mapping		Air Quality Health Mapping on website, collaborate data with existing air monitors and mobile monitoring with health qualifiers	2012- 2013
	Health Impacts		HC, PH, McMaster, Hospitals		Special package alerts for physicians and health care providers	Community Smog Plan	AQHI introduced in 2011

Strategic Issue	Activity in the Community	Purpose, Opportunities, Pressures	Proposed Partners	Research	Communication	Actions	2011 Update
			PH, McMaster	Update 2003 CAH Health Study			Completed in 2012
Active & Sustainable Transportation	Smart Commute Hamilton; Transportation Management Association; TDM (City); Active & Safe Routes to Schools (PH); Metrolinx; Events: Open Streets Hamilton, Clean Air Commute, Transportation Fair, Walk and Bike to Work Day, Car Free Day, Carpool Week, Carpool Incentive Program	Encourage the use of active and sustainable means of healthy transportation, reduce emissions from personal transportation, increase the liveability of the city and citizen health by integrating exercise into daily routines through active transportation	Planning & Economic Development, Public Works (TDM), Cycling Committee, Public Health, Metrolinx, Smart Commute, local industry and businesses, local schools, institutional partners: McMaster, Mohawk College, Hamilton Health Sciences, St. Joe's Hospital, as well as: Horizon Utilities, CAA, McMaster Innovation Park, ILR Industries and others.	Bike Share Feasibility Study; Car Share Expansion Program; Feasibility to provide corporate telework; secure bike parking construction, cycling racks & amenities; preferential carpool parking; insurance rate reductions; subsidised transit pass programs; emergency ride home programs; TDM and Land use research and workshops; Environmental Pricing Reform	Event Promotions, Transportation Fair, Community Information Booths, Open Streets Hamilton; Transportation Summit, Cycling workshops/event; overall promotion of sustainable mobility options; education and awareness of single occupancy vehicles, negative environmental impacts; use of the web including the promotion of carpoolzone.ca, emergency ride home program and EC transit pass promotions	Establish a Local TDM Association – Best practices for Hamilton businesses and schools on promoting active and sustainable transportation; Travel Demand Analysis for workplaces using an employee survey and customized demand management plans; Policy Analysis and Advocacy; Events and Programs to reduce SOV use; education programs including Stepping It Up	On-going

Strategic Issue	Activity in the Community	Purpose, Opportunities, Pressures	Proposed Partners	Research	Communication	Actions	2011 Update
		Reduced emissions from driving year round. Prioritize building on success and momentum.	GV, Commuter Challenge participants, Chamber of Commerce, HSR, School boards, GV, EH		Smart driving communication program- EcoDriver	Promote behavioural shift	2010 – 2012
	Cycling	Encourage cycling in Hamilton	Hamilton Cycling Committee, Hamilton Cycling Master Plan, GV, City		Letters of support for cycling lanes implemented under Hamilton Cycling Master Plan	Hamilton Bike Share	2011-2012
	Totally Transit	Transit -change drivers into riders, get young people before they become drivers, make sure riders stay as riders	HSR, School boards, GV, EH			School bus education program at schools; promote behavioural shift	2008 - 2012
	Electric bikes and vehicles	Ebikes and vehicles already coming in the market, but confusion around rules and usage.	Public Works, Province, Hamilton Police, GV	What are electric bikes and vehicles? What are the rules around usage?			2012

Strategic Issue	Activity in the Community	Purpose, Opportunities, Pressures	Proposed Partners	Research	Communication	Actions	2011 Update
Smart Driver	Idling Stinks campaign, NRCan Idle free program, Idle by-law	Reduce unnecessary vehicle idling in Hamilton	GV, City		Information on idling and by-law	Promote behavioural shift. Enforcement needed	On-going
	Drive Clean; Smog Patrol; Mobile Monitoring	Local impacts of diesel truck traffic	MOE, MTO, Public Works	Get data on diesel emissions from vehicles (mobile monitoring)	Outreach with truck industries; Smog Patrol	Smog Patrol Enforcement Blitz, remove diesel engines, have a form of regulation that would not allow dirty diesel engines within city boundaries	On-going
	Eco-driver	Promote green driving habits to drivers	GV, City, Green Communities		Green driving tips	Eco-driver program	2009- 2012

Strategic Issue	Activity in the Community	Purpose, Opportunities, Pressures	Proposed Partners	Research	Communication	Actions	2011 Update
Air Monitoring	HAMN required for industries to monitor industrial area of airshed	All emitting industries should participate in HAMN	HAMN, MOE		Provide HAMN data online via HAMN web site, HAMNair.ca	Encourage MOE to undertake monitoring requirement in CofA	On-going
		Mobile Monitoring	MOE, EC, City	Inversion days, health impacts data, health mapping, construction and fugitive dust		Continue mobile monitoring- health mapping, begin Neighbourhood Air Monitoring 2010-2011 Look into funding for more monitoring.	2004-2008, 2009-2012
	Air Zone Management	Pilot an airshed zone management approach in Hamilton.	MOE, City, Public Health, Public Works			Work with MOE to pilot approach. More air monitors in Hamilton.	2012-2013
Air Quality Communication	CAH Annual Report; CAH website; Upwind Downwind Conference; Displays; brochures	School boards involved; potentially get a representative on CAH committee	School boards, Mohawk, Reedemer	Indicators of local action on air quality that could be reported in addition to air quality parameters	Work that Clean Air Hamilton and partners undertake, air quality data to students for projects.	School board and Mohawk rep on committee. Upwind Downwind 2012	On-going
		Educate the public: what are the problems? How do they affect you? What can you do?	GV				On-going

Strategic Issue	Activity in the Community	Purpose, Opportunities, Pressures	Proposed Partners	Research	Communication	Actions	2011 Update
		CAH is effective and efficient –must maintain support	City, MOE, EC, HC		Meetings, displays, presentations	Seek awards, seek funding, orientate local politicians and councillors of work.	On-going
	CAH website	Update and current, user-friendly and informative	Planning & Economic Development		Update material		On-going
Climate Change	Corporate Air Quality (AQ) & Climate Change (CC) Plan; Climate Challenge (EH)	The linkages to AQ	Environment Canada, MOE, McMaster	Research linkages to AQ (CO, NO_x) and actions	Outreach on AQ & CC linkages	Air Pollutant and GHG Inventory	On-going Inventory undertaken in 2009
		Subcommittee to look at city-wide CC issues	City, McMaster, GV, EH, Conservation Authority		Presentations, Discussion Papers, Meetings with stakeholders.	Create a Community CC Action Plan	Underway 2010-2012

Strategic Issue	Activity in the Community	Purpose, Opportunities, Pressures	Proposed Partners	Research	Communication	Actions	2011 Update
Emissions Reductions		Develop Local Poor Air Quality Notification system that can trigger immediate actions by industries in poor air quality situations; Drive action when needed; Protect health			Local Poor Air Quality Notification System (MOE)	Local Poor Air Quality Notification System (MOE)	On-going; Notification system began in 2010
	Fugitive dust - construction areas	Addressing construction sources and industrial sources of fugitive dust	City, MOE, Rotek, Hamilton Construction and Development Associations	What are others doing? Mobile monitoring	Website	Dust Abatement Workshop II	2012-2013
	Mow down pollution programs, Leaf blower education	Reduce usage of two-stroke engines, tie in with pesticide education	GV, Home Depot, Lowes, Home Hardware	Impacts of small engines	Small engine alternatives	Encourage alternatives to small engines, small engines exchange program	2010- 2012

Strategic Issue	Activity in the Community	Purpose, Opportunities, Pressures	Proposed Partners	Research	Communication	Actions	2011 Update
Energy Conservation	Horizon programs; Energy roundtable	Promotion / energy conservation & alternatives	Public Works, NRCan, Horizon, GV			Promotion / energy conservation & alternatives	On-going
	Energy Audits	Energy conservation and savings (low income neighbourhood)	GV				On-going
Land Use Planning	Urban Official Plan; Provincial Policy Statement; Places to Grow; Greenbelt	Density, infilling, community planning, air quality impacts.	Planning & Economic Development, Public Works, GV	Impacts on air quality of infilling and development		Guidelines, Planning directions for development to mitigate impacts. Require air quality monitors and air quality to be factored into development - industrial, commercial,, residential	2012-2013
	Hamilton Community Energy Collaborative	Energy mapping in the community					2010- 2011 Energy mapping completed 2011

Strategic Issue	Activity in the Community	Purpose, Opportunities, Pressures	Proposed Partners	Research	Communication	Actions	2011 Update
Tree Programs	Numerous tree planting programs in City (Red Hill Valley, Councillors, Street Planting, Earth Day, Ikea), Hamilton ReLeaf Committee	Trees improve air quality, fight climate change, lower heating and cooling costs, reduce water demand and store rainwater, increase happiness, slow traffic	GV, Conservation Authority, Public Works, Earth Day Hamilton, businesses	Develop a tree planting inventory for Hamilton; fill in gaps (i.e., low income neighbourhood)		Develop a tree networking body --Tree Roundtable to consolidate efforts = Hamilton ReLeaf Network	On-going; Hamilton ReLeaf Network formed in 2008

Appendix C: 2011 *Clean Air Hamilton* Financials

In 2010, the Air Quality Budget for the City of Hamilton and *Clean Air Hamilton* was $80,000. In-kind contributions including volunteer time and advisory role of *Clean Air Hamilton* members on programs was $73,900

2011 *Clean Air Hamilton* Financial Report				
Project/Program	**Clean Air Hamilton Contribution ($)**	**Other Contribution ($)**		**Total ($)**
		Financial	**In-Kind**	
Eco Driver	$8,600		$1,200– volunteer time	$9,800
Totally Transit	$2,300		$3150 - Hamilton Street Railway service and $150 - volunteer time	$5,600
Clean Air Hamilton Events and Communications	$9,000		$200 – volunteer time	$9,200
High school Heroes	$6,500		$200 – volunteer time	$6,700
Climate Change Champions	$18,600		volunteer time	$18,600
Advisory			$69,000 – Members	$69,000
TOTALS	**$45,000**	**$0**	**$73,900**	**$118,900**

On February 27 2012, *Clean Air Hamilton* and the City hosted the 2012 Upwind Downwind Conference: Unlikely Partners at the Hamilton Convention Centre. The total cost of the 2012 Upwind Downwind Conference was $24,300 The total revenue was $21,500 which included $9,500 from registration fees and $12,000 from funding (see Table 3). $2,800 was drawn from the $26,00 Upwind Downwind Conference Reserve Fund to cover the financial gap. This Reserve Fund was established for the Conference through revenues from previous Conferences to cover any financial gaps that arose in future Conferences. City of Hamilton provided staff resources to procure sponsorship, coordinate logistics, facilitate meetings, process registrations and promote the Conference agenda ($30,000). Planning Committee members helped confirm speakers and facilitate Conference sessions. Volunteers helped on the registration desk during the conference.

2012 Upwind Downwind Conference Funds/Grants

Organizations	**Amount**
Hamilton Planning Department	$30,000 **in-kind**
Hamilton Public Health Services	$5,000
Mohawk College	$2,500
Health Canada (Exhibitor Booth)	$2,500
Hamilton Industrial Environmental Association (HIEA)	$1,000
McKibbon-Wakefield Inc.	$500
McMaster Institute of Environment and Health	$500
TOTAL – CASH	$12,000
TOTAL – IN-KIND*	$30,000
Total	**$42,000**

The revenues generated at the Upwind Downwind Conference are used in the planning and administration of future conferences organized by *Clean Air Hamilton*.

Appendix D: Air Quality Indicators - Trends & Comparisons over the Past Ten Years

Air Quality Trends in Hamilton

The graphs in this Appendix illustrate trends in key air quality parameters in Hamilton over the past 10-20 years. Earlier long term trends from about 1970 (when air quality was first measured in Hamilton) to the mid-1990s can be found in the 1997 HAQI reports.

For information on Hamilton air quality from 1970 to the mid-1990s, visit:
www.cleanair.hamilton.ca/downloads/HAQI-Environmental-Work-Group-Final-Report-Dec-97.pdf

Since the mid-1990s, the levels of all pollutants in Hamilton (except for the long-range pollutant, ozone) have shown a steady downward trend year over year. The annual percentage decreases over this time are significant in many pollutant categories as measured at the downtown air monitoring site (Station 29000); these decreases include a 3.3% per year reduction in total suspended particulate (TSP) levels, 1.9% per year in inhalable particulate matter (PM_{10}), 3.2% per year in respirable particulate matter ($PM_{2.5}$), 2.7% per year in nitrogen dioxide (NO_2), 2.8% per year in sulphur dioxide (SO_2), 6.5% per year in total reduced sulphur odours, 6.0% per year in benzene and 5.3% per year in PAH (measured by benzo[a]pyrene).

Pollution abatement technologies and strategies continue to be implemented by companies within the industrial sector. *Clean Air Hamilton* strongly recommends that all stakeholders evaluate their air pollution control equipment on a regular basis and make every effort to install the most efficient technologies when upgrading their pollution control equipment, when constructing new facilities or when retrofitting existing facilities. The goal should be to achieve or exceed the highest international standards. *Clean Air Hamilton* recommends that all citizens critically evaluate the fuel and energy efficiencies of any energy-consuming appliances, passenger vehicles and trucks when they are making these purchases.

In most of the graphs in **Appendix D**, one line represents the average ambient air levels in residential areas of the City, based on data from two or more air monitoring stations located at City sites. The other line represents the average ambient air levels near industrial sites, based on data from two or more air monitoring stations located near Industry Sites. Also included are data which compares Hamilton to other cities in Canada and around the world.

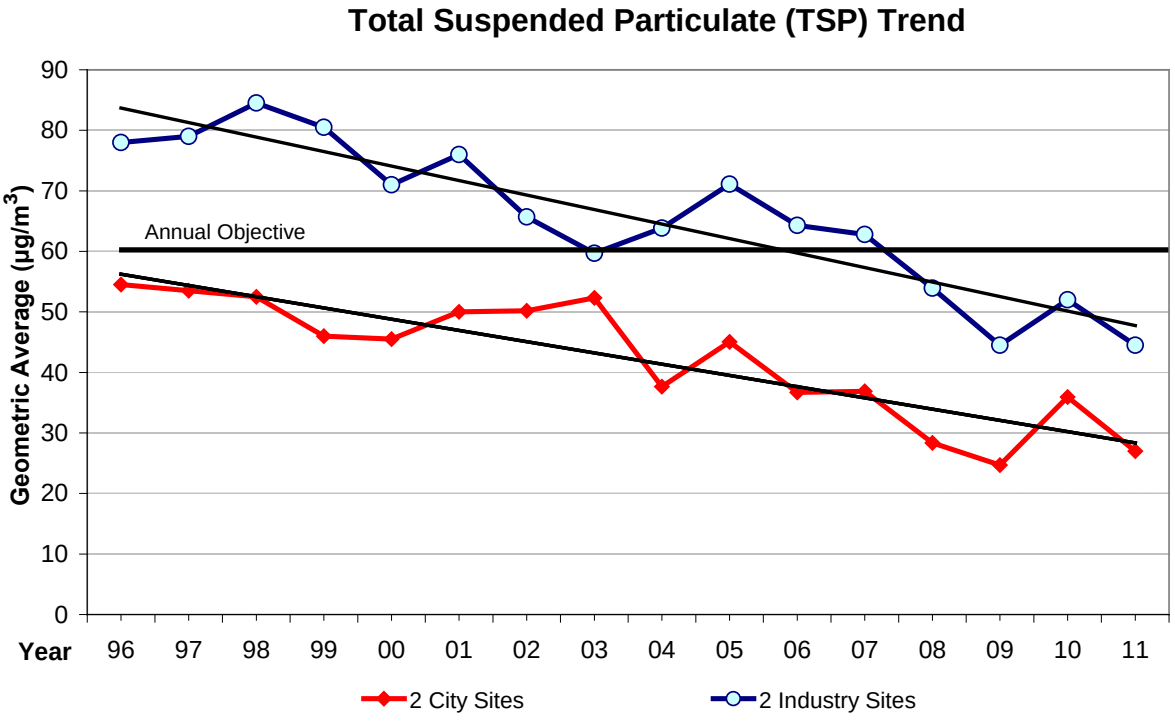
A 2005 report from the Ontario Ministry of the Environment showed the results of modeling estimates of the impacts of U.S. sources on Canada. These estimates were based on the analysis of large-scale weather patterns and detailed estimates of emissions from sources in mid-western U.S. states. These results clearly demonstrated that about 50% of all contaminants in the air in Ontario (and in Hamilton) were the result of long-range transport from sources in the U.S. These sophisticated modeling studies were consistent with the estimates provided in the original HAQI study reports and to estimates done by Clean Air Hamilton more recently.

Particulate Material: Total Suspended Particulate (TSP)

Total suspended particulate (TSP) includes all particulate material with diameters less than about 45 micrometers (µm). A substantial portion of TSP is composed of road dust, soil particles and emissions from industrial activities and transportation sources. TSP levels have been decreasing steadily since the mid-1970s. Over the past decade, the TSP levels have decreased, on average, by about 3 µg/m^3 per year in the industrial areas and by about 2.3 µg/m^3 per year within the City. These decreases correspond to reductions between 40% and 45% over the past decade alone. These reductions have been realized due to a range of activities directed toward the reduction of industrial dusts, road dusts, track out from industries with unpaved sites, etc.

Included within the TSP category are inhalable particulates (PM_{10}) and respirable particulates ($PM_{2.5}$). It is possible to determine the net amount of particulate material in the air with sizes between about 45 µm and either 10 µm or 2.5 µm, by subtracting the PM_{10} or the $PM_{2.5}$ value respectively, from the TSP value. The material in the air with diameters between 10 and 45 µm is due almost exclusively to fugitive industrial emissions and road dust re-entrained by car and truck traffic.

The particulate levels in some cities around the world are significantly higher than Hamilton. For example, the average weekly TSP level at a site in southeastern Beijing between August 2005 and August 2007 was 370 µg/m^3! In the late autumn and winter during the dust storms, the TSP levels averaged about 500 µg/m^3 while the summer had the lowest TSP levels at about 250 µg/m^3. By contrast, Hamilton in 2006 had TSP levels of about 40 and 60 µg/m^3 at the downtown site and at an industrial site, levels that are about 6 and 9-fold lower than the Beijing annual average. The mean annual TSP value in an industrial area of Rio de Janeiro was 87 µg/m^3.

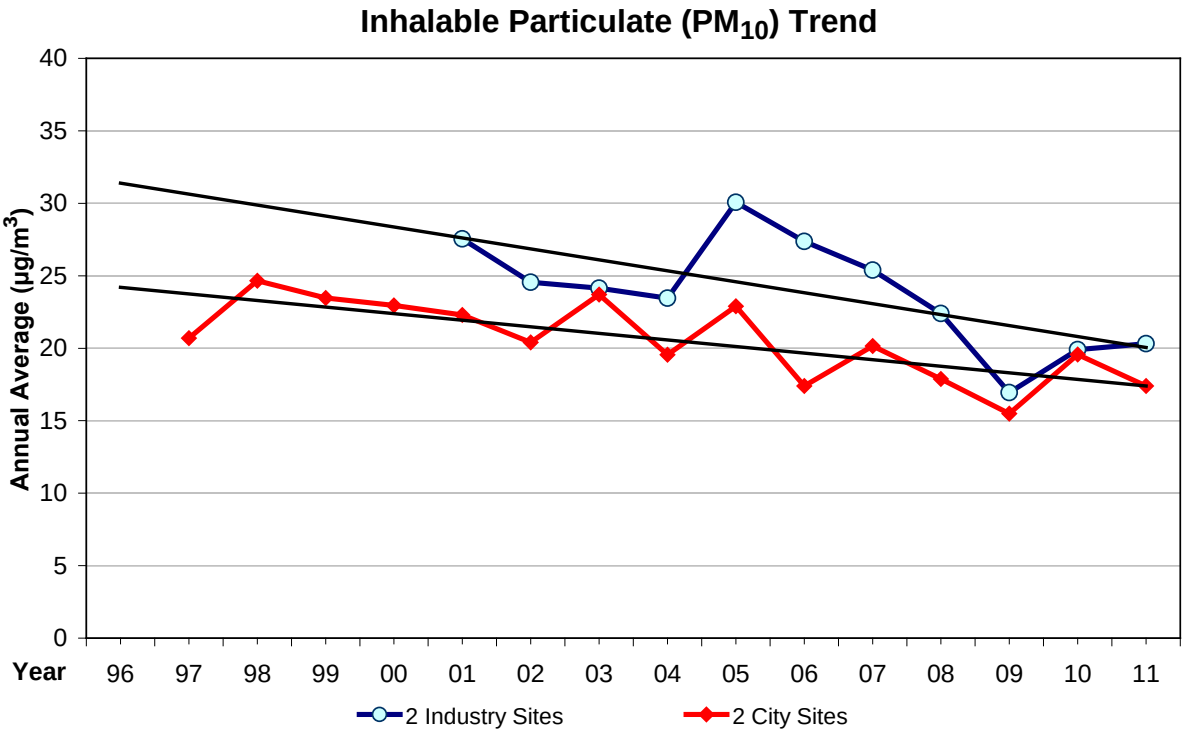


Particulate Material: Inhalable Particulate Matter (PM_{10})

Inhalable particulate matter (PM_{10}), the airborne particles that have diameters of 10 µm or less, is a portion of total suspended particulate (TSP). PM_{10}, which makes up about 40-50% of TSP in Hamilton, has been linked to respiratory, cardiovascular and other health impacts in humans. As with the TSP trend discussed above, ambient levels of PM_{10} at the City sites have decreased about 30% over the past decade, from about 25 µg/m^3 to about 15 µg/m^3. In areas near the industrial sectors, the levels of PM_{10}, while higher than in the downtown area, have shown the same steady decrease areas as in the downtown area.

PM_{10} is derived primarily from vehicle exhaust emissions, industrial fugitive dusts, and the finer fraction of re-entrained road dust. While car and truck traffic counts have remained roughly constant over the past decade the deceasing trend of PM_{10} is likely the result of a combination of better performance of the vehicle fleet, better management of dust track-out by industries, and the use of better street sweepers and street sweeping practices by the City. The vehicle fleet performance will have improved primarily due to lower particulate emissions from modern engines and the removal of some of the worst polluting vehicles under the provincial Drive Clean program. While the impact of the Drive Clean program is difficult to assess from a local emissions perspective, the removal of "smoking vehicles" from the road is one of the expressed goals of the program, in addition to ensuring that the Ontario vehicle fleet is performing efficiently.

As a point of comparison to Hamilton, the PM_{10} levels in non-industrial city of Porto, Portugal in 2004 were reported between 35 and 50 µg/m^3 at four 'urban traffic' and two 'suburban background' sites. These levels are roughly double those in Hamilton; moreover, all site experienced between 73 and 136 days a year when 24-hour PM_{10} levels exceeded 50 µg/m^3.

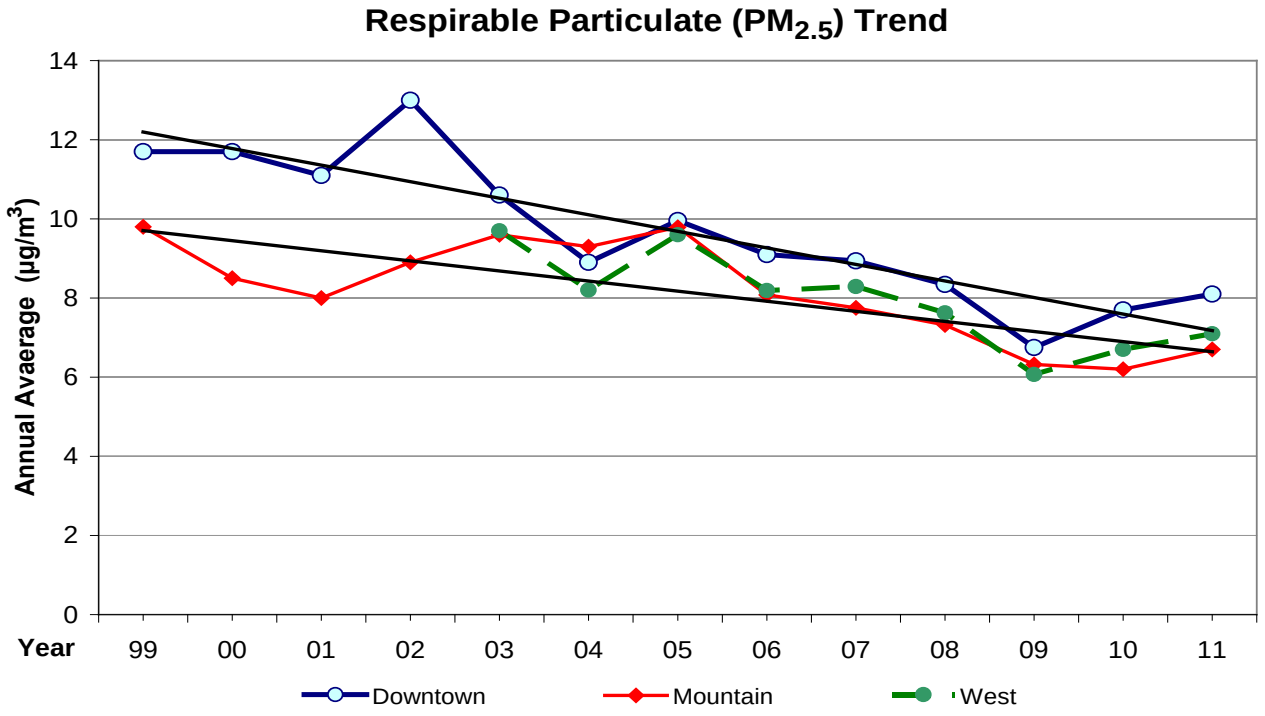


Particulate Matter: Respirable Particulate Matter ($PM_{2.5}$)

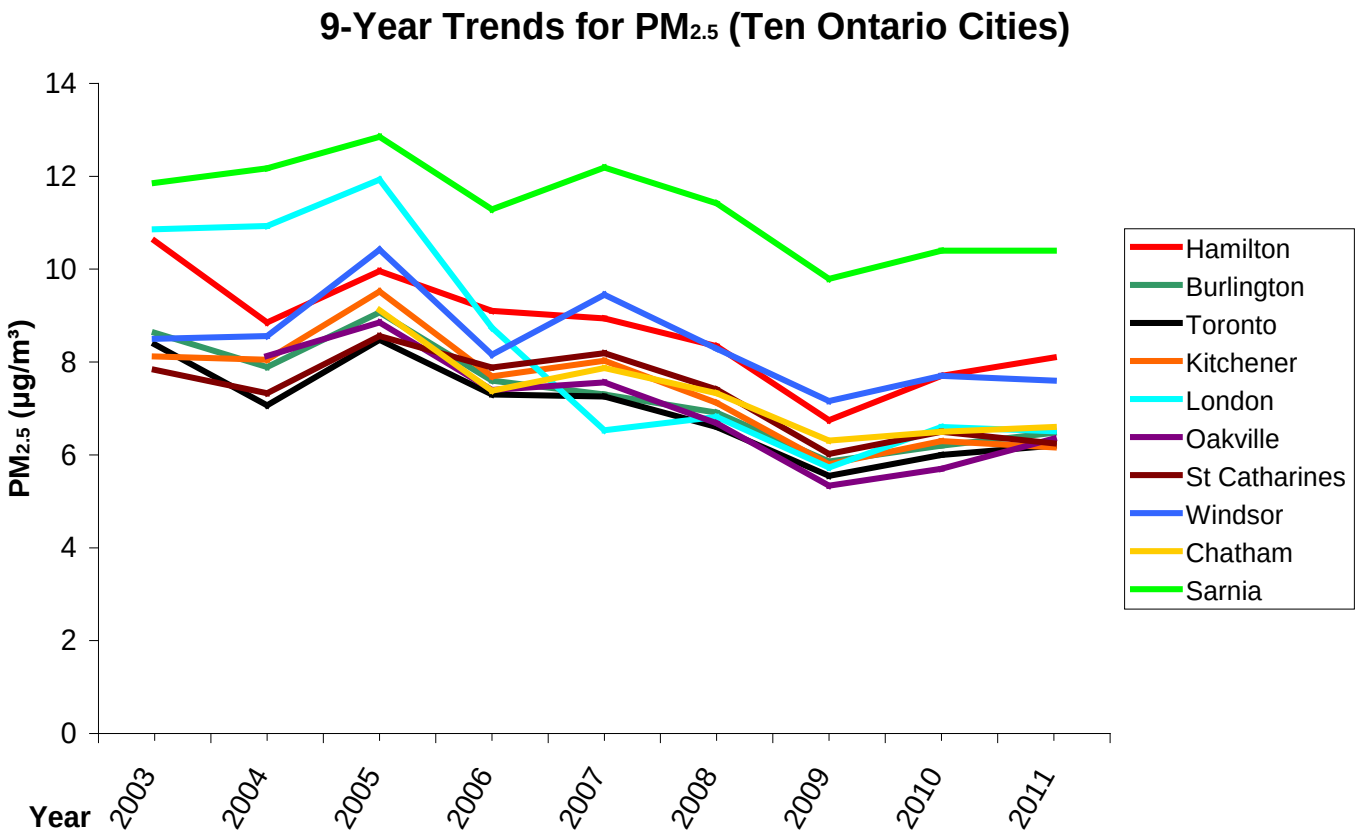
The Province of Ontario monitors respirable particulate matter ($PM_{2.5}$), airborne particles with a diameter of 2.5 µm or less. $PM_{2.5}$, which makes up about 60% of the PM_{10} in the air, has been more strongly linked to health impacts than PM_{10}. The Ontario government started measuring levels of $PM_{2.5}$ across Ontario in 1999; prior to this date there was little data on $PM_{2.5}$. In Hamilton $PM_{2.5}$ data is collected at the three Air Quality Index (AQI) monitoring stations.

The trend in $PM_{2.5}$ has shown a decrease of about 35% since 1999 at the downtown and mountain AQI sites (consistent with the decreasing trends in TSP and PM_{10}), and corresponding to a steady decrease of about 3.5% per year. The $PM_{2.5}$ fraction of air particulate matter is recognized as being responsible for essentially all of the deleterious health effects associated with air particles. $PM_{2.5}$ has been declared a "toxic substance" under CEPA (Canadian Environmental Protection Act). Particulate matter associated with automobile exhaust, diesel exhaust and cigarette smoke have particle sizes between 0.1 and 0.3 µm; vehicle combustion sources constitute about 30-50% of the mass of $PM_{2.5}$.

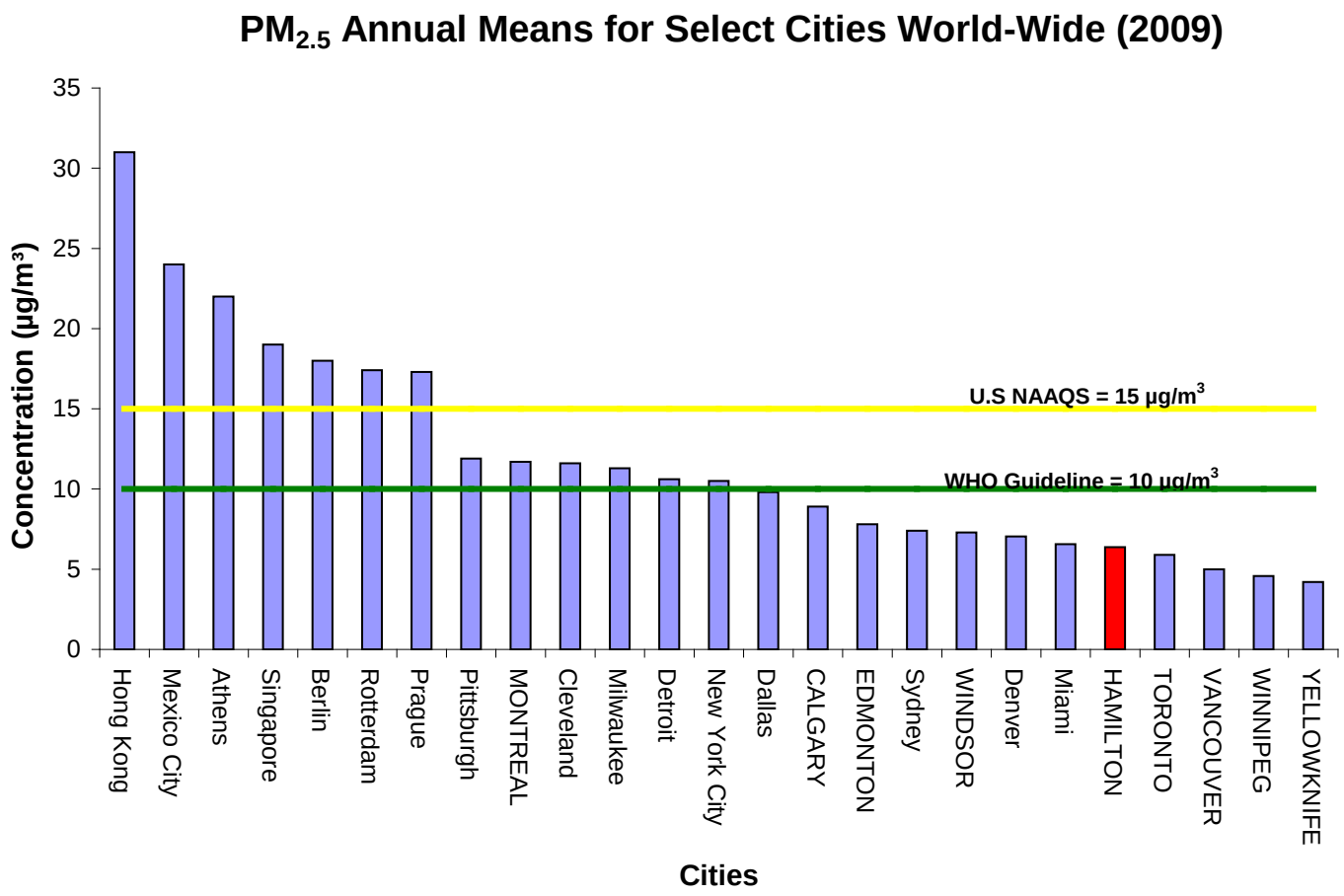
There has been a scientific debate over just what causes the health impacts in humans due to exposure to the $PM_{2.5}$ fraction – the particles themselves or the chemicals on these particles. It is known that the $PM_{2.5}$ fraction contains over 95% of all particle-bound organic compounds in the air along with a substantial burden of metals. Most scientists now agree that exposure to the small particles and the organic substances is the likely cause of the observed respiratory and cardiovascular health impacts attributed to particulate material exposures.



The graph below shows a comparison of nine-year trends in respirable particulate matter ($PM_{2.5}$) levels in ten Ontario cities. The decreasing trend in $PM_{2.5}$ in Hamilton is mirrored at other locations across southern Ontario.



The figure below compares the annual mean levels of $PM_{2.5}$ in Hamilton with 25 other Canadian and global cities for 2009. Of the Canadian cities compared, Hamilton registered the fifth highest $PM_{2.5}$ annual mean reading, with Windsor, Edmonton, Calgary and Montreal registering higher readings. Hamilton's annual mean levels of $PM_{2.5}$ remain below the World Heath Organization (WHO) air quality guidelines and the U.S. National Ambient Air Quality Standards (NAAQS). Out of the 25 cities compared, the five lowest annual mean levels of $PM_{2.5}$ were recorded in Canadian cities including Hamilton. The $PM_{2.5}$ levels in Hamilton and Toronto are comparable, and are about one-half the levels in non-industrial European cities such as Prague and Berlin. The data used for this figure were provided by the Ontario Ministry of Environment.

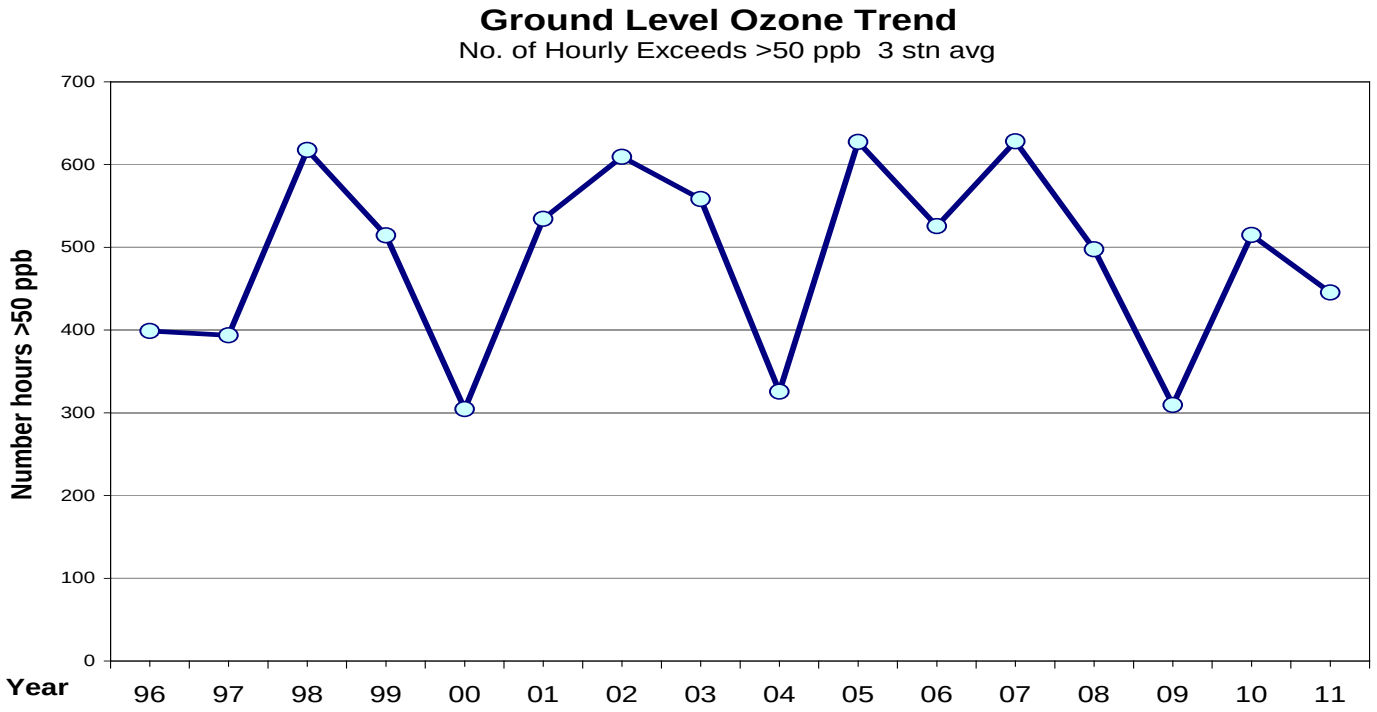

PM2.5 Annual Means for Select Cities World-Wide (2009)
Concentration (µg/m³)
35
30
25
20
15
10
5
0
U.S NAAQS = 15 µg/m3
WHO Guideline = 10 µg/m3
Hong Kong
Mexico City
Athens
Singapore
Berlin
Rotterdam
Prague
Pittsburgh
MONTREAL
Cleveland
Milwaukee
Detroit
New York City
Dallas
CALGARY
EDMONTON
Sydney
WINDSOR
Denver
Miami
HAMILTON
TORONTO
VANCOUVER
WINNIPEG
YELLOWKNIFE
Cities

Ground Level Ozone (O_3)

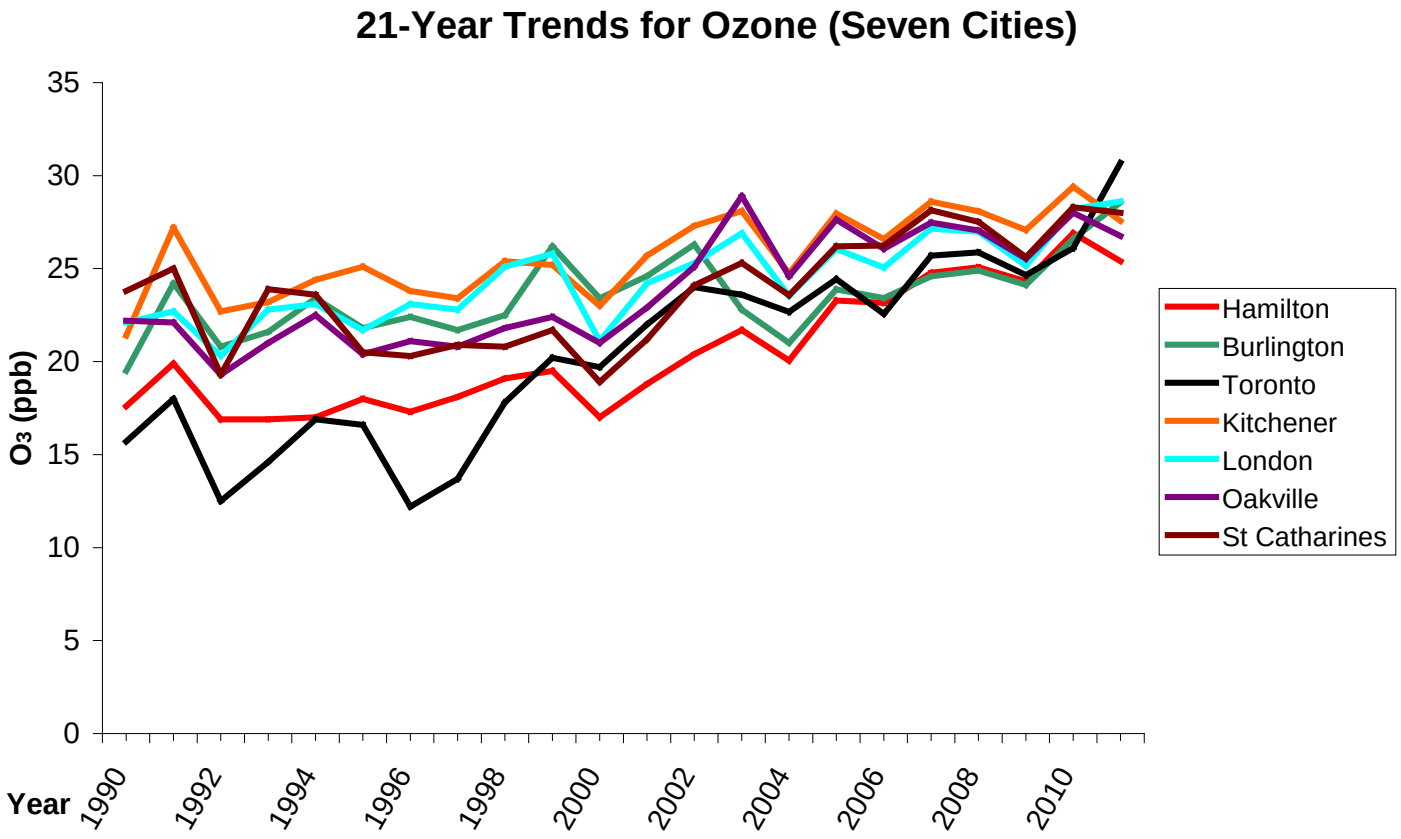
Ground level ozone (O_3 or tropospheric ozone) is formed in the atmosphere when air pollutants such as nitrogen oxides (NO_X) and volatile organic compounds (VOC) react in the presence of sunlight. Air levels of O_3 are higher in warmer seasons than in cooler seasons because the sunlight is more intense in the summer and the temperatures are higher. The trend in O_3 shows an increase has been highly variable over the past 10 years. Overall, the trend line for this period is roughly flat, in contrast to the steadily decreasing trends in the other pollutants.

Unlike all other pollutants none of the O_3 measured in Hamilton was generated from Hamilton-based sources. The formation of O_3 takes several hours once the pollutants have been released to the atmosphere. Thus, the O_3 measured in Hamilton was produced from emissions released from sources upwind of Hamilton. Conversely, emissions from sources within Hamilton will result in the formation of O_3 in areas downwind of Hamilton. A substantial portion of the O_3 that affects southern Ontario during smog episodes in the summer months originates from distant, upwind sources in the United States, including releases from coal-fired power plants, vehicles and urban activities in those regions.

Ground level ozone should not be confused with “stratospheric ozone” or “ozone layer”. The ozone called “stratospheric ozone” is produced and destroyed in the stratosphere at an altitude of 30-60 km above the Earth. The stratospheric ozone is commonly known as the ozone layer because over 91% of the ozone in Earth’s atmosphere is present here. The term “ozone depletion” refers to a decrease in the levels of stratospheric ozone due to man-made emissions, particularly halogenated refrigerants that have now been banned. Stratospheric ozone and changes in the ozone layer have not yet been linked to impacts of combustion emissions.

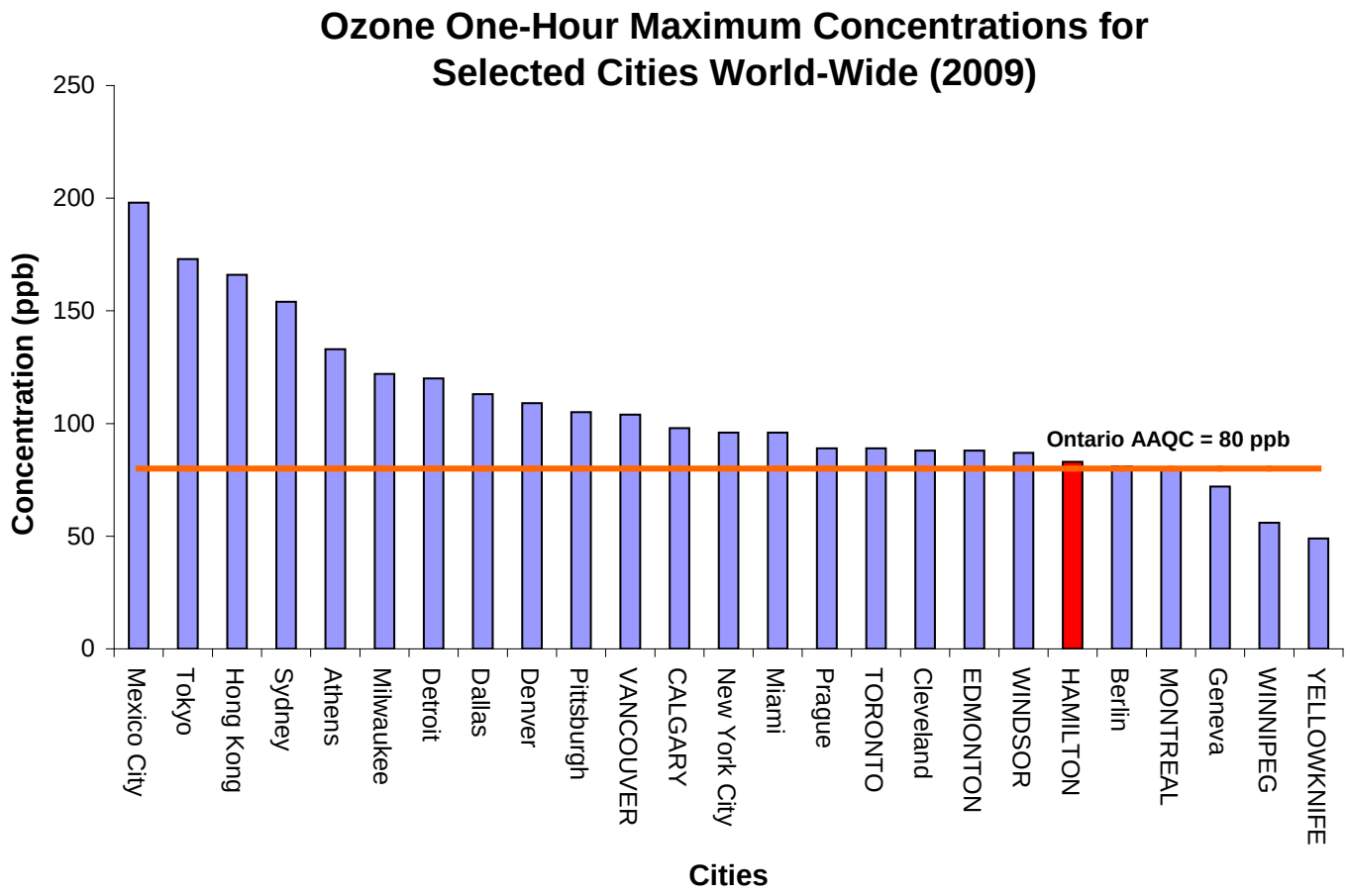


The trend in O_3 in Hamilton is mirrored at other locations across southern Ontario. Over the past 20 years the concentrations of O_3 across southern Ontario have increased between 10 and 30%, depending on the city. The levels of O_3 observed across southern Ontario in recent years are consistently higher and more similar than what was observed one and two decades ago. This trend is somewhat worrisome given the increase in health effects impacts associated with increased O_3 exposures.



As discussed previously, the formation of O_3 results from chemical transformations of pollutants generated outside Hamilton and southern Ontario. Pollutants generated within Hamilton contribute to ozone levels in areas downwind of Hamilton. In the figure below, the cities with higher one-hour maximum ozone concentrations (e.g., Windsor, Detroit, and Cleveland) are located near the Ontario/US border. These higher levels are indicative that transboundary pollution is a significant contributor to O_3 levels in cities and areas proximate to the US border. The Ontario Ambient Air Quality Criteria (AAQC) of 80 ppb for O_3 has been unmet by the three Ontario cities compared below. Only four of the 25 cities compared were able to meet these criteria. Addressing O_3 pollution in cities will be a challenge and will require collaborations between countries.

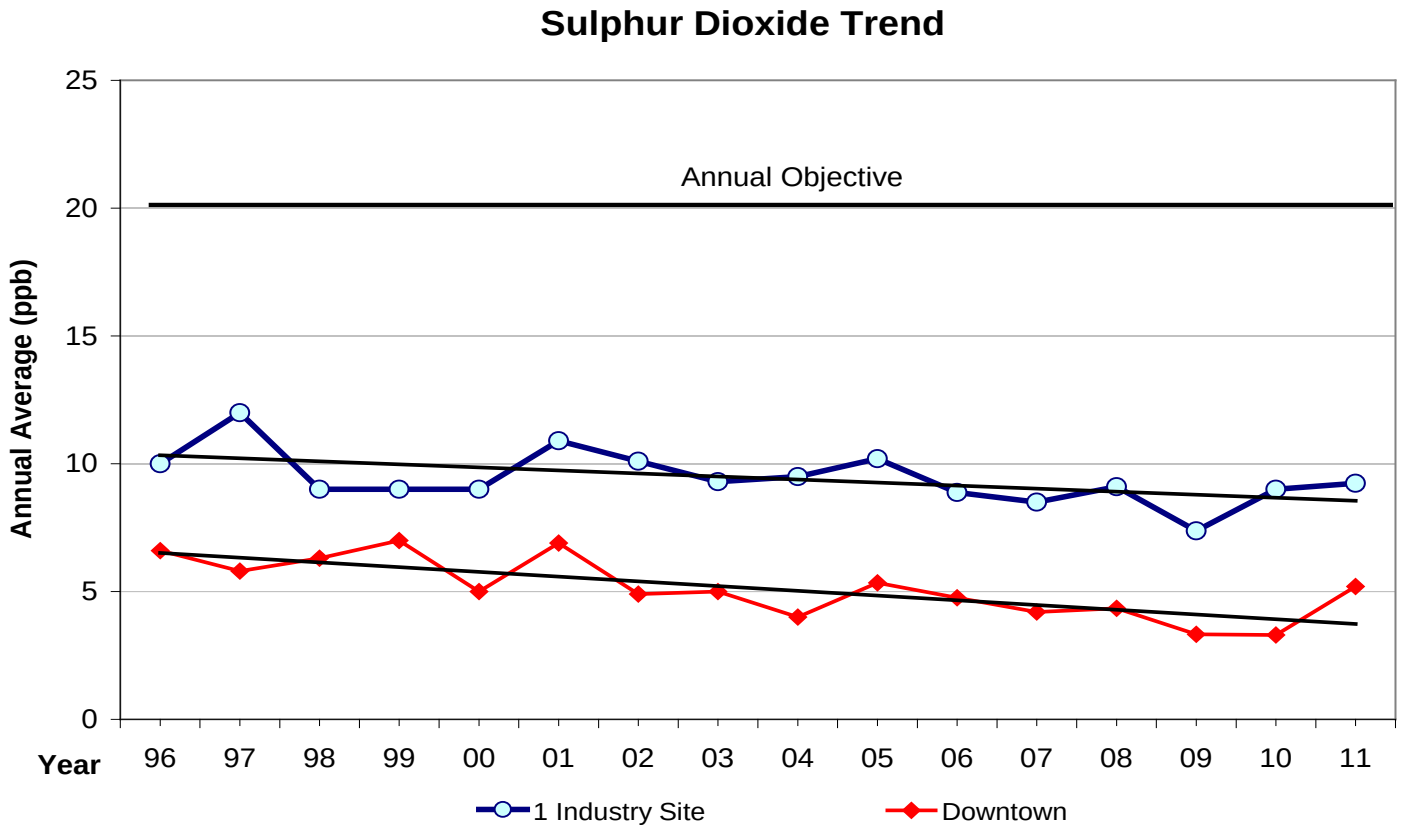
Interestingly, Vancouver, Calgary and Edmonton exceeds the Ontario AAQC guideline; however, all of the O_3 measured in Vancouver and Calgary is generated from local emissions sources, not from long-range- transport. The take-home message for southern Ontario is that about one-half of the O_3 in southern Ontario is generated from local sources, i.e., sources over which we have some control. The data used for this figure was provided by Ontario Ministry of Environment.



Sulphur Dioxide (SO_2)

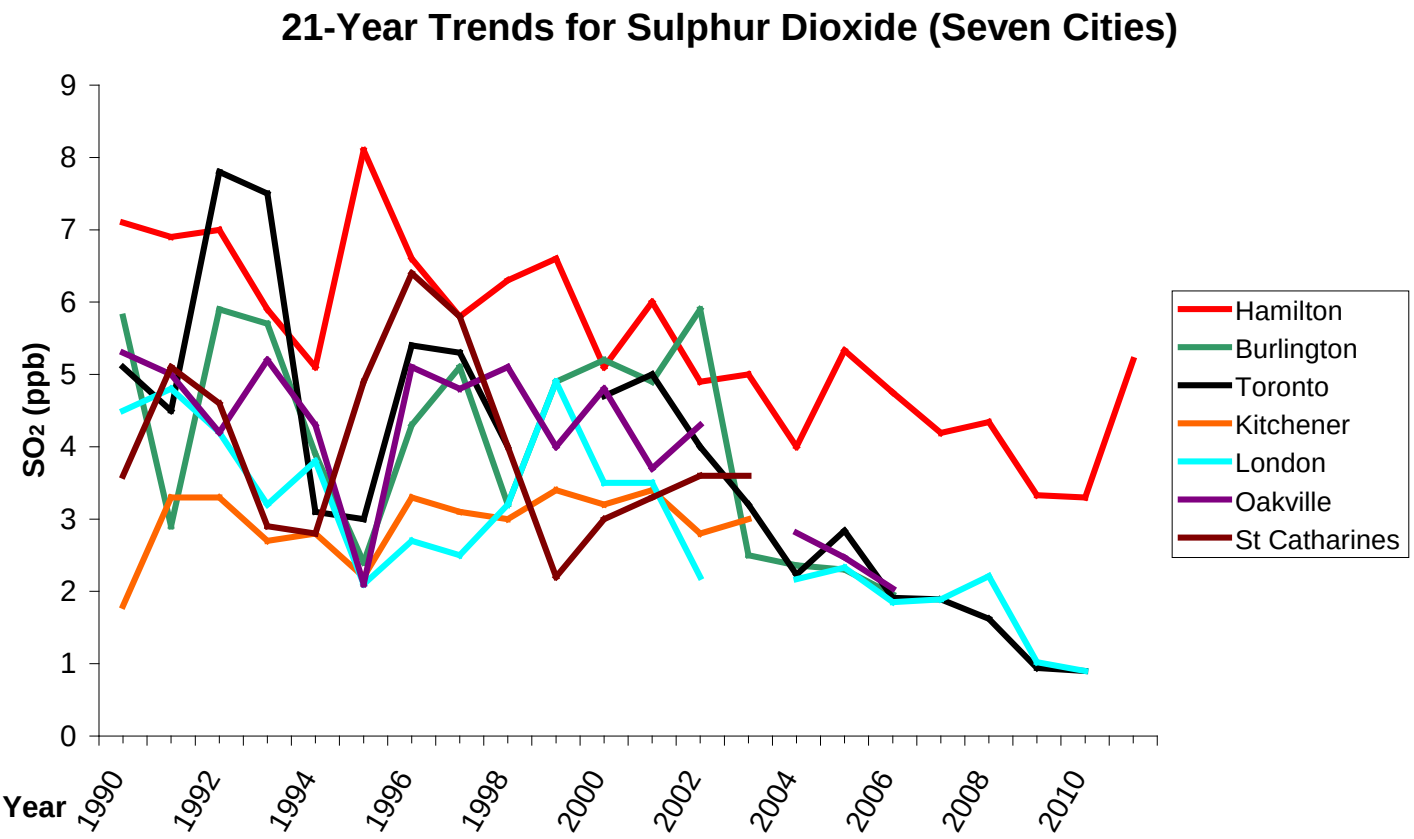
Over 90% of the sulphur dioxide (SO_2) in Hamilton is the result of industrial processes within the City. Significant improvements in air levels of SO_2 were made in the 1970s and 1980s. Since 1998, there has been a gradual and continuous decline in air levels of SO_2. During this period SO_2 levels have decreased by about 40% in the downtown area and by about 30% in the industrial areas. These reductions reflect actions taken to reduce SO_2 emissions from the steel industry. Combustion of fossil fuels (particularly diesel fuel) containing sulphur was a major source of SO_2 in Canada until federal regulations enacted in 2007 reduced the sulphur content in diesel fuel to 15 parts per million (ppm) from the former average sulphur content of about 350 ppm.

Sulphur dioxide is not only a respiratory irritant but this oxide is converted in the atmosphere over several hours to sulphuric acid (H_2SO_4), which is then converted into sulphate particles (SO_4). These particles average about 2 µm in diameter and constitute part of the respirable particulate fraction ($PM_{2.5}$) in the air. These particles tend to be acidic in nature and cause lung irritation when inhaled. Thus, the health concerns associated with SO_2 exposures are linked to the gas itself as well as to the particulate material derived from it. During the summer months, about 25% of the mass of $PM_{2.5}$ in the air in southern Ontario is SO_4.

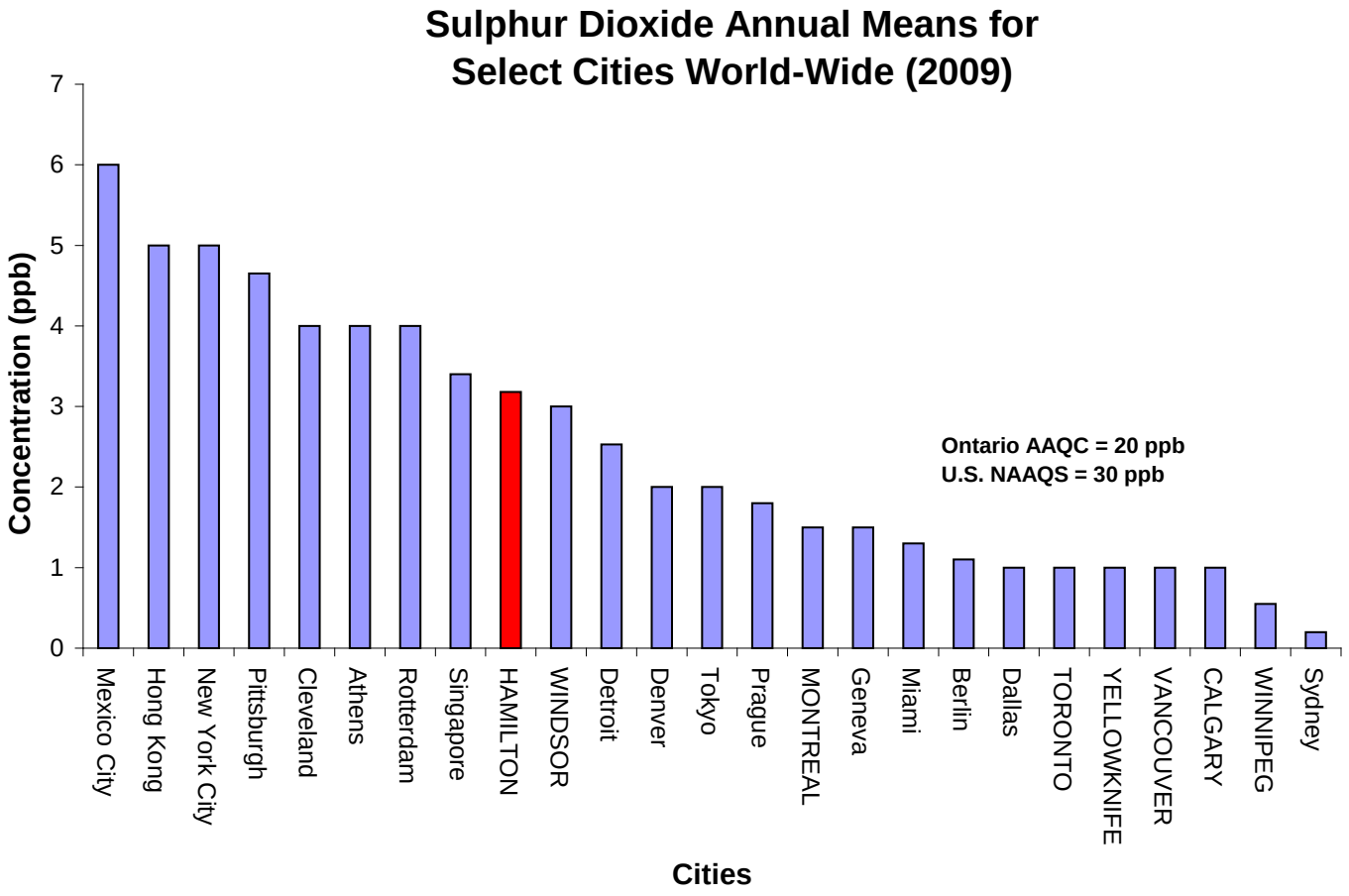


The graph below shows a comparison of the 20-year trends in SO_2 levels in seven southern Ontario cities. There have been dramatic decreases in SO_2 levels across southern Ontario over the past two decades. These reductions reflect the actions to reduce sulphur levels in diesel fuel (since 2007), the closure of local coal-fired power plants and the steady reduction of sulphur in combustion materials. The SO_2 levels in Hamilton are higher than the other southern Ontario cities due to the industrial sources that are unique to Hamilton.

When viewing the figure below, please note that some data points contain values based on a partial year. These data may not be as representative of annual SO_2 levels. Please view this figure as an approximate representation of SO_2 data from these cities.



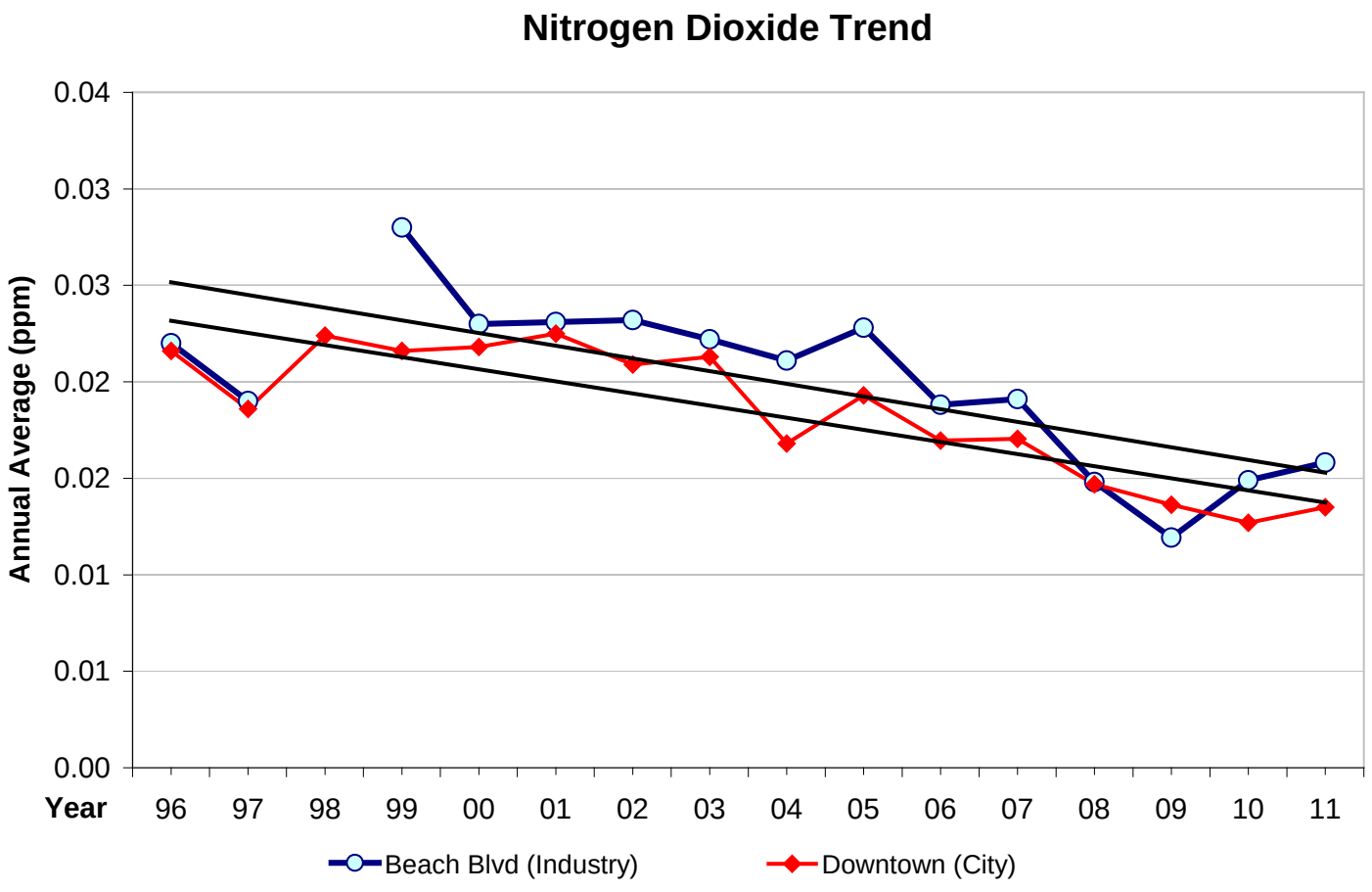
As discussed previously, Hamilton's industrial processes contributed to higher levels of SO_2 in the air. Hamilton recorded the highest annual mean reading of SO_2 in 2009 when compared to the other Canadian cities. Other cities, with a similar industrial base as Hamilton, such as Cleveland, Pittsburgh and Windsor also recorded annual means values which were higher than most of the other cities. This demonstrates the significant effect industrial emissions have on air levels of SO_2. Despite having higher air levels of SO_2 in comparison with other cities, Hamilton's continual improvement in reducing SO_2 emissions have resulted in 2009 air levels of SO_2, which are well below Ontario Ambient Air Quality Criterion of 20 parts per billion (ppb) and even further below the U.S. National Ambient Air Quality Standard of 30 ppb. All 25 cities had 2009 annual means of SO_2 that were considerably below Ontario and U.S. SO_2 ambient air standards.



Nitrogen Dioxide (NO_2)

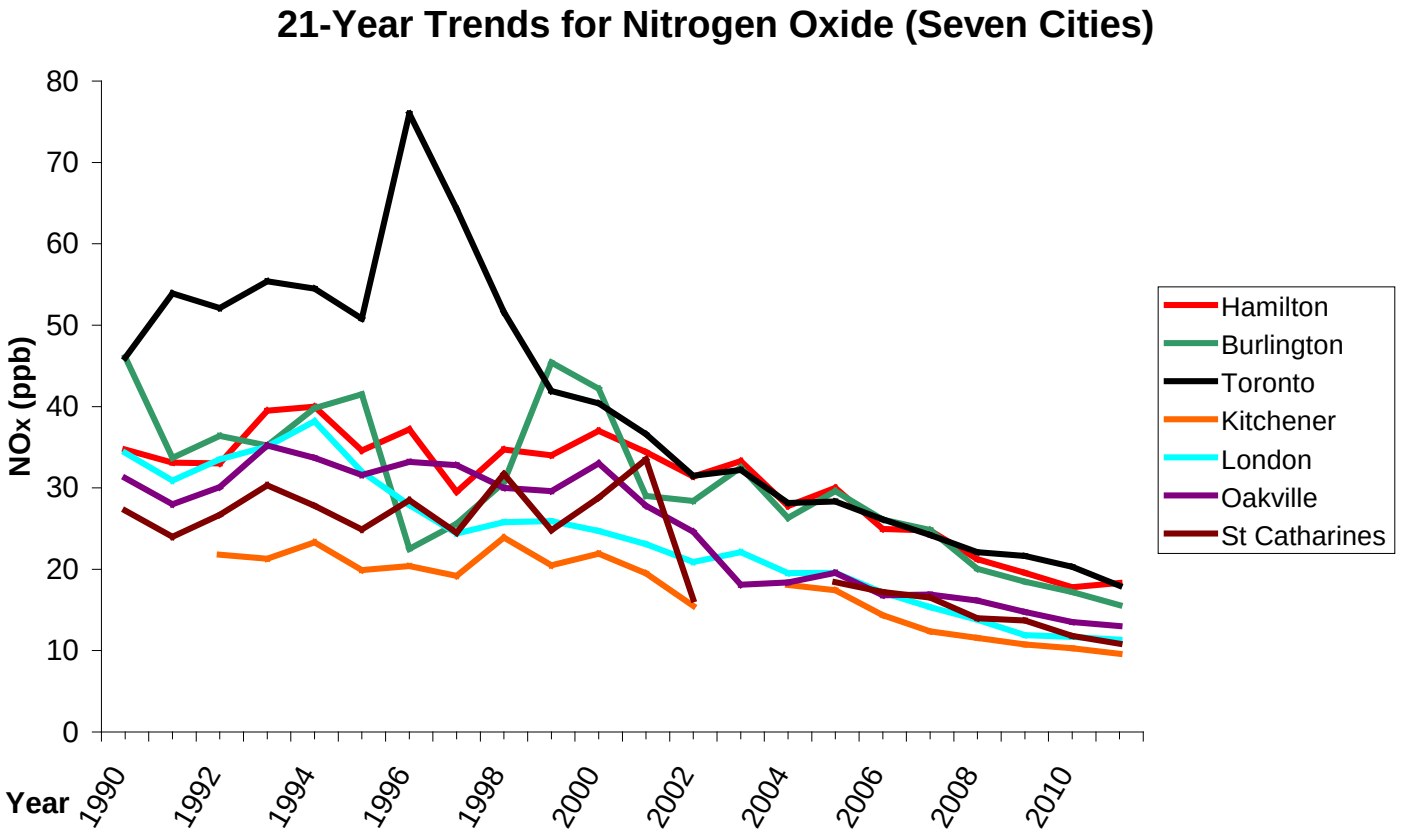
Nitrogen dioxide (NO_2) is responsible for a significant share of the air pollution-related health impacts in Hamilton. NO_2 is formed in the atmosphere from nitric oxide (NO) which is produced during the combustion of fuels such as gasoline, diesel, coal, wood, oil and natural gas. The leading sources of NO_2 in Hamilton are the transportation sector followed by the industrial sector. The level of vehicle use across Hamilton has increased slightly during the past decade, while the overall emissions of NO_2 from new vehicles has decreased.

There has been a steady decline in the annual average levels of NO_2 in Hamilton over the past decade, both at the downtown site and at a site downwind of the industries. Overall, improvements in vehicle emissions performance coupled with better industrial practices have resulted in an overall improvement in NO_2 levels of about 40%. For example, within the City the annual average NO_2 level was 22 parts per billion (ppb) a decade ago; today the annual average is 13 ppb.

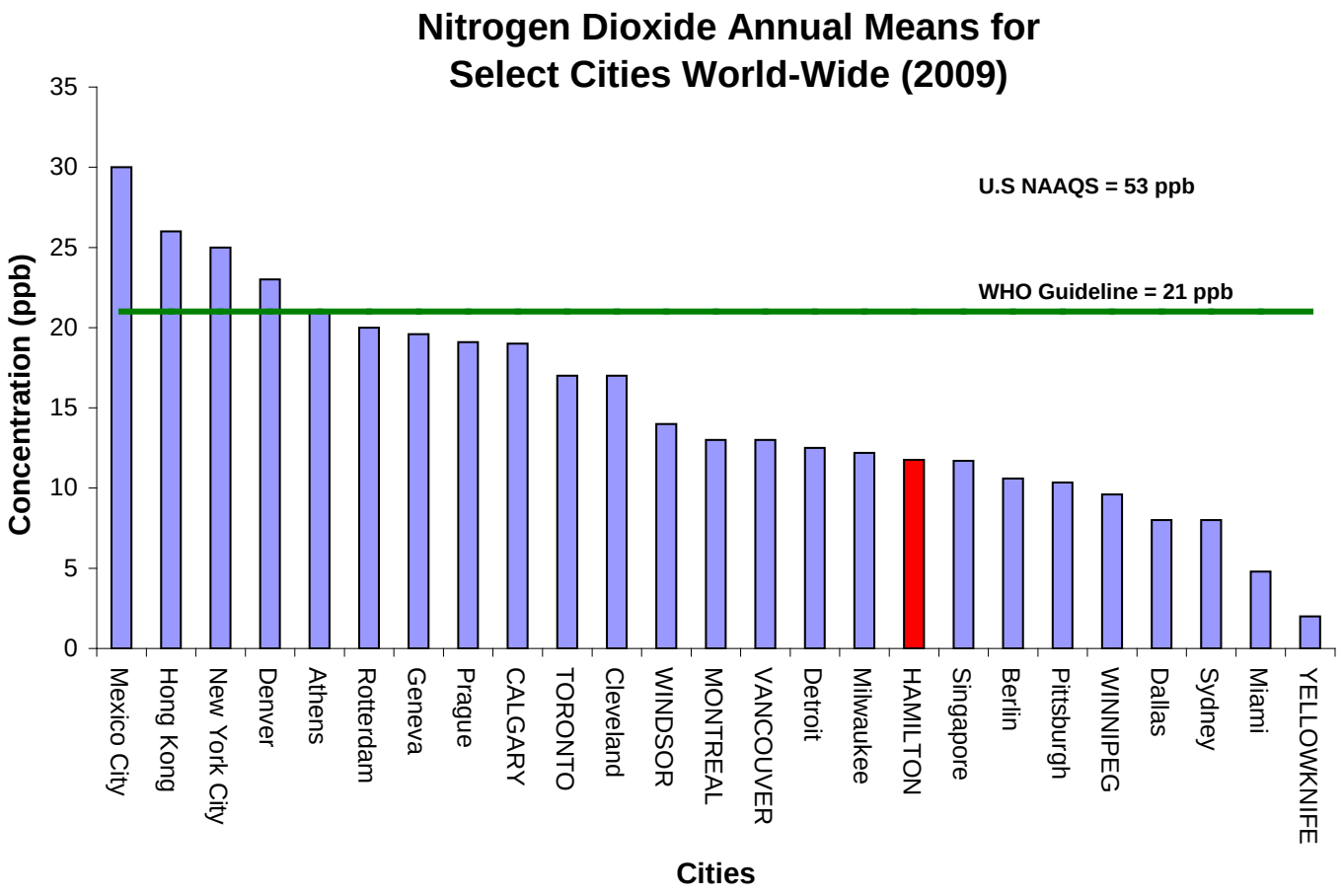


When we compare the 20-year trends in air levels of NO_x in Hamilton to NO_x levels in other Ontario cities we note that all cities have seen a steadily decreasing trend over the past decade. Toronto, which has no significant industrial NO_x contributors but significant vehicular NO_x emissions, has shown the largest decrease. Since the 1990's both Toronto and London have seen reductions in NO_x levels of approximately 60%. Hamilton's NO_x levels have decreased by approximately 46% since 1990. The NO_x levels in Hamilton have decreased more slowly than in cities such as London and Toronto during this period, due presumably to contributions from sources other than vehicles. The NO_x level is the sum of the levels of NO and NO_2. The decrease in the average NO_x levels is a reflection of improvements in emissions performance of the vehicle fleet in Ontario over the past decade.

When viewing the figure below, please note that some data points contain values based on a partial year. This data may not be as representative of annual NO_x levels. Please view this figure as an approximate representation of NO_x data from these cities.



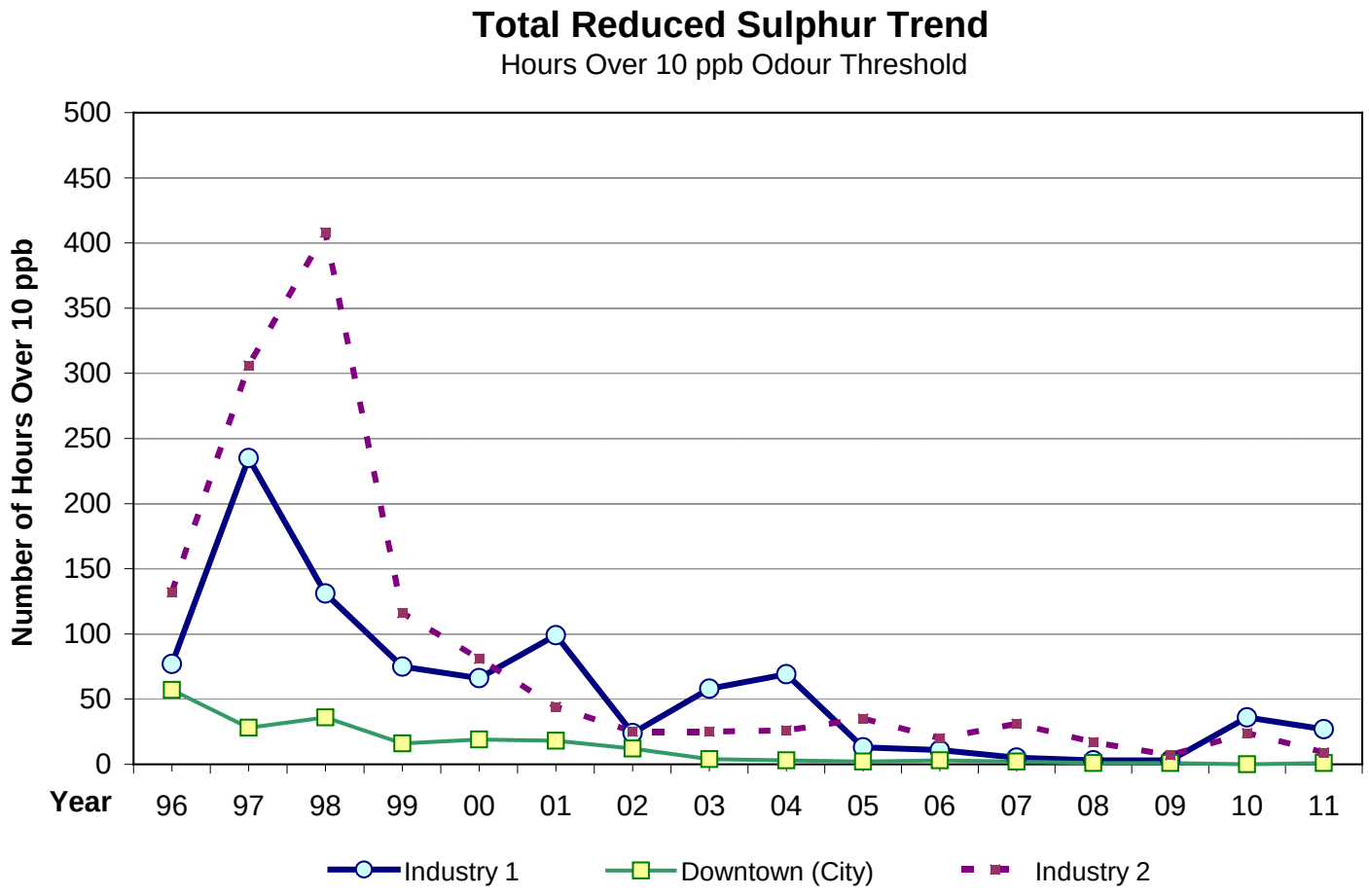
The figure below compares the annual mean levels of NO_2 levels in Hamilton with 25 Canadian and other cities around the world in 2009. Hamilton had the sixth highest NO_2 annual mean reading compared with other Canadian cities. Calgary, Toronto, Windsor, Montreal and Vancouver were the three Canadian cities with higher NO_2 annual mean values. Hamilton's annual mean levels of NO_2 remain below the World Health Organization air quality guidelines and the U.S. National Ambient Air Quality Standards. Despite being below these guidelines, Hamilton has recorded higher NO_2 annual means in comparison with cities with a similar industrial base, such as Milwaukee, Detroit and Pittsburgh.



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, particularly coke oven emissions, blast furnace emissions and slag quenching operations. 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. There is a wide range of sensitivities to odours among the population. A common measure of odour impact on the population is the number of hours per year that TRS levels exceed the 10 ppb threshold level.

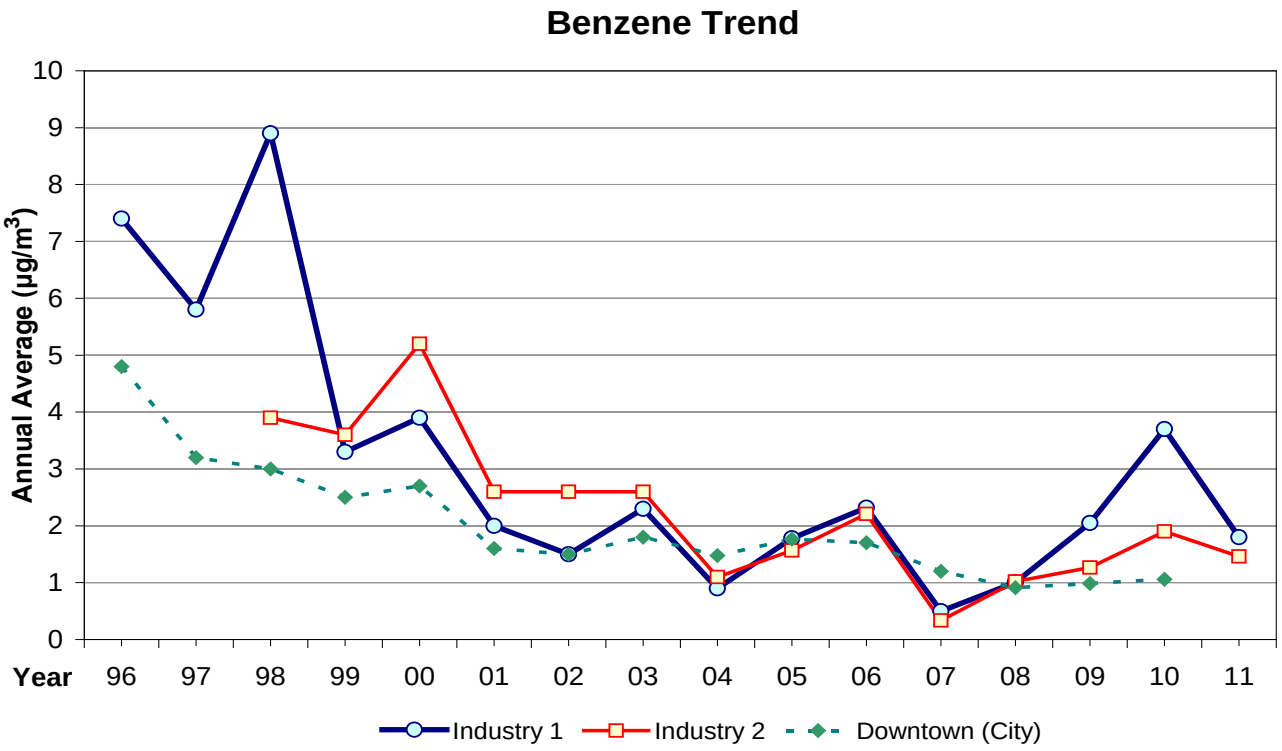
Hourly exceedances of the 10 ppb odour threshold have been reduced by over 90% since the mid-1990s due to significant changes in the management and operation of the coke ovens and blast furnaces. In particular, changes to slag procedures from quenching (using water) to pelletizing (using air cooling) have had a dramatic effect on reducing odour-causing emissions from slag handling operations. Odour threshold exceedances have been below 10 hours per year in the downtown area over the past 8 years.



Benzene

Benzene is a volatile pollutant that is capable of producing cancer in humans. Benzene is emitted from some operations within the steel industry, specifically from the releases of coking ovens and from coke oven by-product plant operations. Air levels of benzene have been reduced dramatically since the late 1990s, due to significant upgrading of the coking plant operations, improved operating procedures at the coke plants, and improved control of release of benzene vapour from the coke by-products plants.

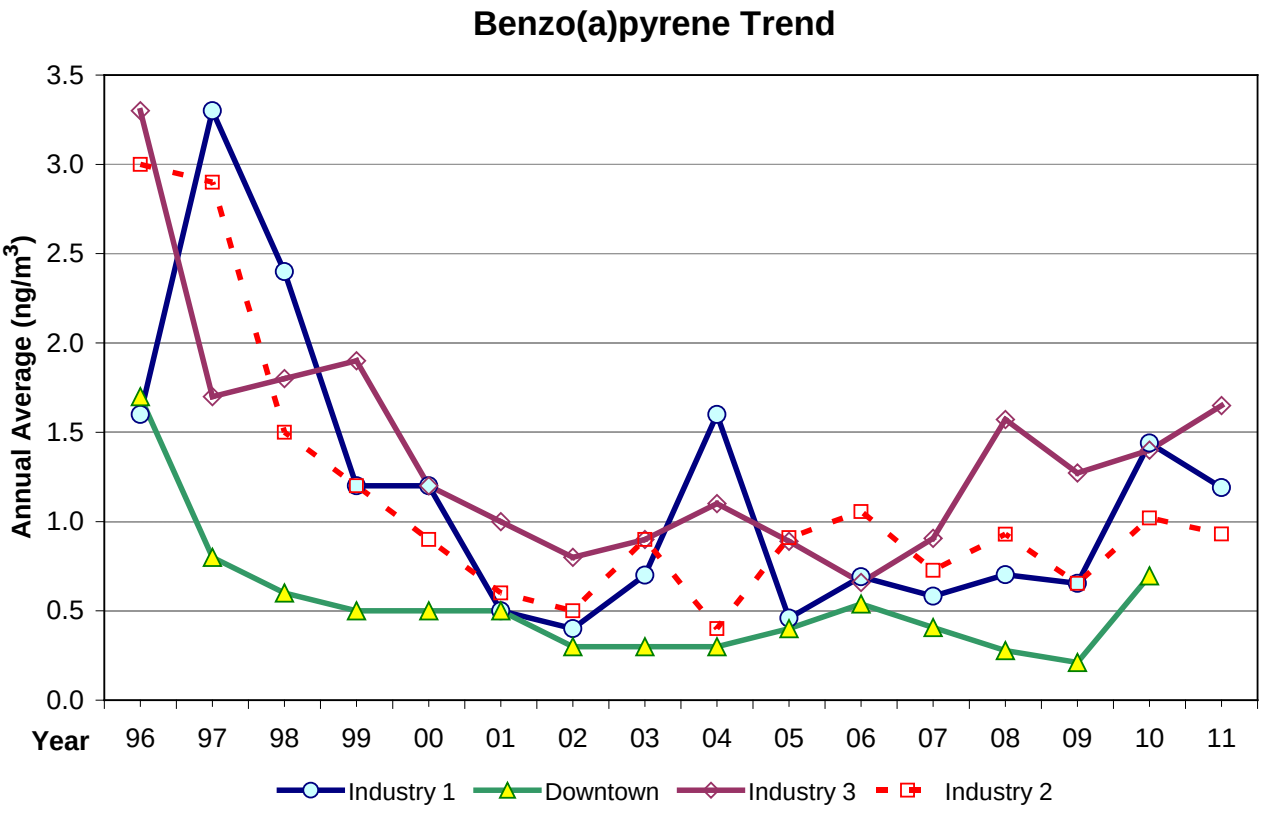
Benzene is also a component of gasoline; benzene concentrations in this fuel can up to 5%. In other words, since benzene is volatile, benzene vapours can be detected in the air in areas where gasoline is pumped and distributed. Thus, all cities in Canada have low but measurable levels of benzene in the air primarily due to the pumping of gasoline; whenever a person fills a gasoline tank, the gasoline vapours in the tank (which contain benzene) are displaced out of the tank into the atmosphere, potentially exposing anyone near the filled tank. The levels of benzene in downtown Hamilton have now dropped to levels comparable to those in other Canadian and Ontario cities of similar size, which do not have coking operations but do pump gasoline.



Benzo[a]pyrene

Benzo[a]pyrene (BaP) is a pollutant capable of causing cancer in animals and humans. BaP is one member of a large class of chemical compounds called polycyclic aromatic hydrocarbons (PAH). PAH are emitted when carbon-based fuels such as coke, oil, wood, coal and diesel fuel are burned. The principal sources of BaP in Hamilton are releases from coke oven operations within the steel industry. The significant decreases in ambient BaP levels since the late 1990s are the result of improvements to the infrastructure of coke ovens themselves and increased attention to the operation and maintenance procedures for proper operation of the coke ovens.

While BaP is only one of many PAH released from coking operations, BaP is undoubtedly the most potent and most studied of all PAH carcinogens (cancer-causing agents) in the scientific literature. As a result of the extensive amount of chemical and toxicological research work and occupational exposure work done with this compound, BaP has become the primary PAH carcinogen by which to compare exposures to many PAH-containing mixtures, such as vehicular emissions, coke oven emissions, barbecued foods, coal tar exposures, etc.



Appendix E: Upwind Downwind Conference 2012

Executive Summary

The 2012 Upwind Downwind Conference was held in Hamilton, Ontario on Monday, February 27th 2012 at the Sheraton Hotel in downtown Hamilton. The Conference recognizes Hamilton as a leader in air, transboundary and climate initiatives, with elements (the conference and the free public talk on Sunday February 26th, 2012) reported in all forms of local media (print, radio, television and Internet). The City of Hamilton and Clean Air Hamilton host the conference every two years.

The Conference generates many ideas and is an excellent opportunity for Hamilton and other communities to share practical solutions for air quality, transboundary and climate problems in the fields of health, planning, municipal action and partnerships. Approximately 148 planners, health promoters, university/college students, environmental consultants, retirees and citizens participated in the one-day 2012 Conference. This resulted in a nice balance between the ages and experiences of the participants at the conference from young professionals and students to retirees and senior professionals.

A free Sunday afternoon talk was also a feature of the 2012 Upwind Downwind Conference. On February 26th, 2012 a free talk by author Jay Walljasper was held at the Art Gallery of Hamilton. The focus of the talk was on the concept of “the commons”. This free public talk attracted 75 individuals.

Introduction

The 2012 Upwind Downwind Conference: Unlikely Partners was the seventh biennial conference focusing on practical solutions to the air quality, transboundary air and climate change issues and impacts facing urban regions. The one-day Conference aimed to provide a forum to enable an improved understanding of these issues in relation to air quality policy and creating partnerships and understanding amongst groups.

Background Information

In the mid-1990s Clean Air Hamilton (formerly known as Hamilton Air Quality Initiative or HAQI) studied the sources and impacts of air pollution in the Hamilton area and found that as much as 70% of the airborne particulates come from sources outside the community. The Conference is a key strategy of Clean Air Hamilton and is designed to promote continued awareness of air quality issues and to address new matters that relate to transboundary air pollution and climate change.

The first Upwind Downwind Conference: *A Practical Conference on Improving Air Quality* was hosted in Hamilton during September 1999 by the former Region of Hamilton-Wentworth. The meeting was followed by a HAQI health assessment replica in Toronto and the establishment of a community network, known as the Southern Ontario Clean Airshed Network Initiative (SOCANI) that exchanges information via workshops, electronic mail, and website links.

In 2002, the City of Hamilton and *Clean Air Hamilton* hosted the second biennial Upwind Downwind Conference: *A Practical Conference on Improving Air Quality* on February 25th and 26th, 2002, at the Hamilton Sheraton Hotel.

In 2004, the City of Hamilton and *Clean Air Hamilton* hosted the third biennial Upwind Downwind Conference: *A Practical Conference on Improving Air Quality* on March 29th and 30th, 2004, at the Hamilton Convention Centre. The Conference brought together 115 delegates, many of them environmental managers, planners, non-profit project managers, citizens from across Southern Ontario, and from the United States.

In 2006, the City of Hamilton, *Clean Air Hamilton* and the McMaster Institute of Environment and Health hosted the fourth biennial Upwind Downwind Conference: *Cities, Air and Health* on February 27th and 28th, 2006, at the Hamilton Convention Centre. The Conference brought together 132 delegates, many of them environmental managers, planners, non-profit project managers, citizens from across Ontario, and from the United States.

In 2008, the City of Hamilton and *Clean Air Hamilton* hosted the fifth biennial Upwind Downwind Conference: *Climate Change & Healthy Cities* on February 25th and 26th, 2008, at the Hamilton Convention Centre. The Conference brought together 288 delegates, many of them environmental managers, planners, non-profit project managers, citizens from across Ontario, and from the United States. In addition, the Conference held its first Clean Air Fair that featured 39 exhibitors in 46 spaces. The Clean Air Fair was an addition to the 2008 Conference in order to attract the general public to the event and to showcase partners, solutions and products that address air quality and climate change.

In 2010, the City of Hamilton and *Clean Air Hamilton* hosted the sixth biennial Upwind Downwind Conference: Air Knows No Boundaries on Monday, February 22nd 2010 at the Hamilton Convention Centre. The Conference brought together 243 delegates, many of them environmental managers, planners, non-profit project managers, high school and university/college students citizens from across Ontario. In addition, the Conference held a two-day Hamilton Green Solutions Marketplace on Sunday, February 21st and Monday, February 22nd 2010 at the Hamilton Convention Centre. The Marketplace was free for the public to attend and featured 53 exhibitors who offered information, products and solutions to issues of air quality and climate change. The Marketplace attracted 745 individuals.

Conference Goals

The goal of a biennial conference is to build on the momentum and strong networks initiated by previous conferences, in order to facilitate continuous discussion and improvements on clean air issues. The 2012 Upwind Downwind Conference aimed to provide an information-sharing forum to enable an improved understanding of air quality and climate change issues and impacts to cities, human health and the economy.

To achieve these goals, the theme of the one-day 2012 Conference was ”Unlikely Partners” to focus on the need for partnerships amongst broad groups to improve air quality and climate change and affect change in policy and action. The speakers for the Conference are listed in **Table 1**.

Table 1: 2012 Upwind Downwind Conference Speakers

Climate Change and Public Health
• John Lewis, Intelligent Futures – Unlikely Partners in Reducing Greenhouse Gas Emissions in Alberta. • Linda Harvey, City of Calgary – Municipal Staff are Unusual Partners – Supporting Peer Learning & Communities of Practice in Local Government • Dr. David Mowat, Region of Peel – Forging New Partnerships for Healthy and Sustainable Communities • Dr. Douglas Chambers, SENES Consulting – Health Exposure to Air Pollution in Hamilton, Ontario – A 2011 Clean Air Hamilton Health Study Update
Municipal Airshed Panel
• Jane Bulloch, Clean Air Sudbury • Marc Gascon, BESTECH • Natty Urquizo, City of Ottawa • Peter Steer, Halton Region Health Department • Beckie Jas, Halton Region Health Department • Jamie Skimming, City of London
Unlikely Partners
• Dr. Denis Corr, Corr Research – Mobile Monitoring of Neighbourhoods in Hamilton: Integrated Health Impacts and What to Do About It • Ed Cocchiarella, Vale Base Metals – Vale Clean Air Emissions Reductions (AER) Project • Fred Eisenberger, Canadian Urban Institute – Unlikely Partners: The Top 3 Areas We Should Pursue and With Whom

Conference Coordination

Conference planning for the 2012 event began in the summer of 2011 with a team of 10 representatives from *Clean Air Hamilto*n, City of Hamilton, Ontario Ministry of the Environment, the City of Burlington, Corr Research, McKibbon Wakefield Inc., and McMaster University (see Table 2). The City of Hamilton's Air Quality Co-ordinator within the Planning and Economic Development Department executed the planning activities. The inaugural meeting of the planning committee occurred on July 27th, 2011.

Table 2: 2012 Upwind Downwind Conference Planning Committee

Organization	Representative	Work Title
Clean Air Hamilton	Brian McCarry	Chair
City of Hamilton	Brian Montgomery	Clean Air Coordinator
	Holly Crawford	Assistant Environmental Planner (Sept. – Dec 2011)
	Brian Lynn	Assistant Environmental Planner (Jan. – April. 2012)
	Sally Radisic	Public Health Services
Ministry of the Environment	Carl Slater	Manager, Technical Support Section, West Central Region
Corr Research.	Denis Corr	Consultant
McKibbon Wakefield Inc.	George McKibbon	Consultant
McMaster University	Velma Grover	Adjunct Professor
City of Burlington	Fleur Storace-Hogan	Sustainability Projects Co-ordinator

Advertising and Promotions

The objectives for the promotion and advertising campaign of the 2012 Upwind Downwind Conference was to expand the number of attendees, and raise awareness of the event as an opportunity for the public and professionals to share best practices, network, learn from others and increase international presence.

In order to catch the attention of potential delegates internationally, nationally and locally, advertising of the Conference began six months in advance of the Conference in September 2011. The advertising campaign included:

- E-mail notifications were sent to previous Conference attendees and potential new attendees, which included members of the Ministry of the Environment, City of Hamilton, City of Burlington, GTA Clean Air Partnership, Southwestern Ontario Clean Air Partnership, the Federation of Canadian Municipalities, Hamilton Chamber of Commerce, the Association of Municipalities of Ontario, members of the Hamilton Community Energy Collaborative, Air and waste management Association, youth groups and, other non-government organizations, industry and government.

- Conference event listings submitted online at: Green pages.ca, Hamilton Eco-Network, People & Planet Friendly, Green Ontario, MyHamilton.ca, Yahoo, Go for Green, Facebook, Linked In, Google, McMaster University, Mohawk College, Canada Events, Halton Environmental Network, Activist Managazine, Craigs List, Partners in Nutrition, Kijiji, and a range of other online sites.
- Colleges and University students in Ontario were notified by email through University Departments, professors, and Green NGO campus groups
- Online notifications were posted on the McMaster University MIEH and Sustainability Office website, Mohawk College Sustainability Website and the City of Burlington's environment website.
- High school students were notified though contacts at the Hamilton-Wentworth Public School Board, the Hamilton-Wentworth Catholic School Board, the Halton District School Board, the Halton Catholic District School Board and the BurlingtonGreen Youth Network.
- City Staff Employee Bulletin at the City of Hamilton
- Media notifications to Hamilton Spectator, the Hamilton Community Newspapers, Cable 14, CHCH News, and the Canadian Newswire
- Advertisements were purchased: 6 ads in the Hamilton Community Newspapers (Stoney Creek News, Ancaster News, Dundas Star News, Flamborough Review, Hamilton Mountain News, and Glanbrook Gazette). These ads ran the weeks of February 15th , 2012 and February 22nd, 2012.
- Conference Planning Committee members delivered 200 posters to various locations including public posting areas in Dundas, Westdale, downtown Hamilton, Hamilton Central Library and the Hamilton Farmers' Market.

Costs and Funding

The total cost of the 2012 Upwind Downwind Conference was $24,300. The total revenue was $21,500 which included $9,500 from registration fees and $12,000 from funding (see Table 3). $2,800 was drawn from the $26,00 Upwind Downwind Conference Reserve Fund to cover the financial gap. This Reserve Fund was established from revenues accrued from previous Conferences and has been used as seed money for conferences and as a source of funds to cover any financial shortfalls that might arise. City of Hamilton provided staff resources to procure sponsorship, coordinate logistics, facilitate meetings, process registrations and promote the Conference agenda (valued as a $30,000 in-kind contribution by the City). Planning Committee members helped identify and contact speakers and facilitate Conference sessions. Volunteers helped on the registration desk during the conference.

Table 3: 2012 Upwind Downwind Conference Funds/Grants

Organizations	Amount
Hamilton Planning Department	$30,000 **in-kind**
Hamilton Public Health Services	$5,000
Mohawk College	$2,500
Health Canada (Exhibitor Booth)	$2,500
Hamilton Industrial Environmental Association (HIEA)	$1,000
McKibbon Wakefield Inc.	$500
McMaster Institute of Environment and Health	$500
TOTAL – CASH	$12,000
TOTAL – IN-KIND*	$30,000
Total	**$42,000**

The cost of the 2012 Upwind Downwind Conference was $24,300 which included Audio Visual, Food, Room Rental, Promotions, Speaker Costs and Conference Materials. Revenue for the Conference was $21,500 which included $12,000 from sponsors and $9,500 from registration fees.

Venue

The 2012 Upwind Downwind Conference was held on the second floor of the Sheraton Hotel in downtown Hamilton. Morning and afternoon presentations were held in the Grand Ballroom (Centre and East Ballroom). Breakfast, Breaks and Lunch were provided in the Ballroom Foyer. The quality food and beverages provided by the Convention Centre was excellent.

About 9 exhibitors had displays for attendees in the Ballroom Foyer. Exhibitors included:

A-MAPs Environmental Inc.
Clean Air Hamilton
Environment Hamilton
Green Venture
Hamilton Climate Change Champions
Hamilton Industrial Environmental Association
Hamilton Public Health Services
Health Canada
Public Works

The Sheraton Hotel in downtown Hamilton was chosen as the official conference hotel. Twelve individuals took advantage of the conference rate offered by the Sheraton.

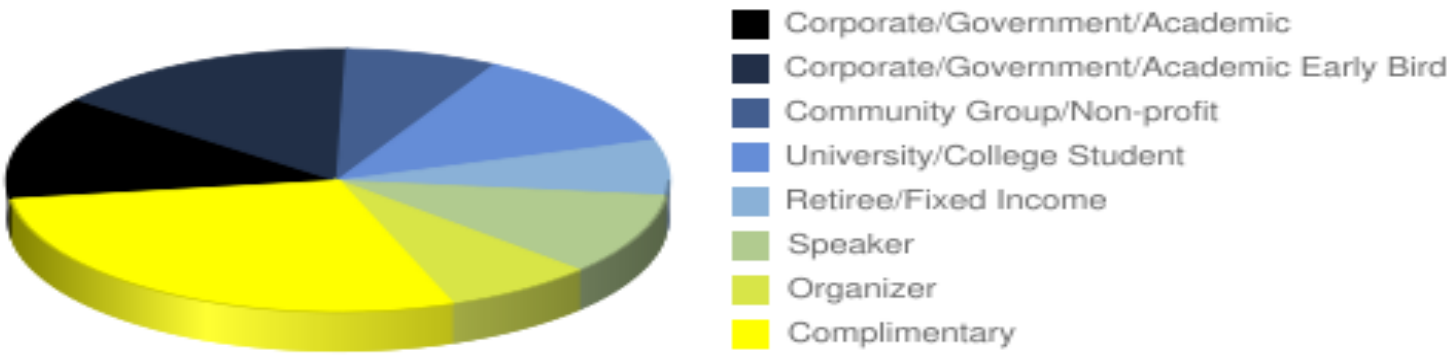
Breakdown of Attendees

Approximately 148 planners, health promoters, university/college students, environmental consultants, retirees and citizens participated in the one-day 2012 Conference. This resulted in a nice balance and mixture between the ages and experiences of the participants at the conference from young professionals and students to retirees and senior professionals.

Table 4: Upwind Downwind 2012 Conference Attendees

Attendee Type	Number of Online Registrants	Number of Onsite Registrants	Total Registrants
Corporate/Government/Academic	15	4	19
Corporate/Government/Academic Early Bird	22	0	22
Community Group/Non-profit	8	3	11
University and College Student	11	8	18
Retiree/Fixed Income	8	1	10
High school students	0	0	0
Speakers	15	0	15
Organizers	11	0	11
Complementary/Sponsors	42	0	42
Totals	**132**	**16**	**148**

Figure 1: Upwind Downwind 2012 Conference Attendees Breakdown



Attendees' Responses

The 2012 Upwind Downwind Conference received very positive feedback (refer to Appendix 1). A total of 44 evaluations were submitted. When asked to rate their overall satisfaction with the conference, 16 individuals chose "satisfied" while 28 picked "very satisfied". Not one individual indicated they were "not at all satisfied". For 40 respondents, the Conference "met their expectations"; 4 delegates did not feel that the Conference met their expectations.

Twenty-one respondents felt the information at the Conference was useful to their work or interest was "very useful", 22 respondents felt it was "somewhat useful".

Appendix F: Glossary of Terms

Abatement – process of putting an end to, or reducing, the amount of harmful substances released into the environment.

Accute effects - An adverse health effect that is caused suddenly, rapidly or within a short timeframe after exposure.

Air Quality Health Index (AQHI) – a national health protection tool designed to help you make decisions to protect your health by limiting short-term exposure to air pollution and adjusting activity levels during episodes of increased air pollution. The AQHI is presented on a scale from 1 to 10+ to indicate the level of health risk associated with air quality. It is calculated based on the relative health risk presented by a mixture of three air contaminants: ground-level ozone, particulate matter, and nitrogen dioxide. The AQHI provides specific advice for at-risk populations as well as for the general public as to what actions they should take based on the value of the AQHI. For more information visit: www.ec.gc.ca/cas-aghi/default.asp?land= En&n=065BE995-1

Air Quality Index (AQI) - an indicator of air quality, based on hourly pollutant measurements of some or all of four air pollutants: sulphur dioxide, ozone, nitrogen dioxide, and fine particulate matter. However, only the highest relative value of one these four pollutants is used to calculate the AQI by the Ministry of the Environment. For more information visit: www.airqualityontario.com or http://www.ene.gov.on.ca/environment/en/subject/air_quality/STDPROD_076121.html

Asthma – a respiratory condition in which the airway constricts when triggered; go to The Asthma Society of Canada at www.asthma.ca / Canadian Lung Association at www.lung.ca for more information.

BaP – See benzo[a]pyrene

Benzene – a volatile organic compound (VOC) found in coke oven emissions and gasoline that is capable of producing cancer in humans.

Benzo[a]pyrene (BaP) – pollutant capable of causing cancer in animals and humans; BaP is one member of a large class of chemical compounds called polycyclic aromatic hydrocarbons (or PAH). BaP and other PAH are products of incomplete combustion of carbonaceous fuels such as wood, coal, oil, gasoline, diesel fuel, etc. BaP and PAH are major constituents of coal tar and coke oven emissions.

Carbonaceous Fuels – fuels that are rich in carbon.

Cardiovascular – refers to the heart and associated blood vessels.

CarShare – a model of car rental where people rent cars for short periods of time, often by the hour. They are attractive to customers who make only occasional use of a vehicle, as well as others who would like occasional access to a vehicle of a different type than they use day-to-day. The organization renting the cars may be a commercial business or the users may be organized as a democratically-controlled public agency, cooperative, or *ad hoc* grouping.

CarPool - is the shared use of a car by the driver and one or more passengers, usually for commuting. Carpoolers use member's private cars, or a jointly hired vehicle, for private shared commuting to and from work or appointments. The vehicle is not used in a general public transport capacity such as in car shares, shared taxis or taxicabs.

Chronic Obstructive Pulmonary Disease (COPD) - a lung disease characterized by chronic obstruction of lung airflow that interferes with normal breathing. The more familiar terms 'chronic bronchitis' and 'emphysema' are no longer used, but are now included within the COPD diagnosis.

Climate Change – refers to the long term change in average weather patterns resulting from the release of substantial amounts of greenhouse gases, such as carbon dioxide, methane, nitrous oxide, etc. into the planet's atmosphere. These emissions alter the chemical composition of the atmosphere, resulting in intensification of the earth's natural greenhouse effect.

CO_2e – stands for "carbon dioxide equivalent"; a unit of measurement used to compare the relative climate impact of the different greenhouse gases. The CO_2e quantity of any greenhouse gas is the amount of carbon dioxide that would produce the equivalent global warming potential.

CO – carbon monoxide; a toxic, colourless, odourless, and tasteless gas; produced as a by-product from the combustion of carbon-containing compounds.

Contaminant – refer to "What is a Contaminant" on page 17.

Criteria Air Contaminant (CAC) – an air pollutant such as PM_{10}, $PM_{2.5}$, SO_x, NO_x, VOC, CO, and NH_3 (Ammonia).

Environmental Registry (EBR) – an electronic filing cabinet (www.ebr.gov.on.ca) containing "public notices" about environmental matters being proposed by all government ministries covered by the Environmental Bill of Rights (i.e., new laws, regulations, programs, proposals, etc.). Each notice allows users to comment. When final decisions are made, the EBR will tell users what kind of comments were made, as well as the impact, if any, the comments had on the decision. The user will also be told whether and how they can appeal and challenge the decision.

Epidemiology - Branch of medicine that deals with the study of the causes, distribution, and control of disease in populations.

Fugitive Dusts – dusts that arise from non-point sources including road dusts, agricultural dusts, dusts that arise from materials handling, construction operations, outdoor storage piles, etc.; fugitive dusts are significant sources of fine particulate matter.

Geographic Information System – a collection of computer hardware, software, geographic data, methods, and personnel designed to efficiently capture, store, update, manipulate, analyze, and display all forms of geographically referenced information.

Global Positioning System – a navigational system involving satellites and computers that can determine the latitude and longitude of a receiver on Earth by computing the time difference for signals from different satellites to reach the receiver.

Greenhouse Gases (GHGs) – gases in the atmosphere that reduce the loss of heat into space and therefore contribute to increasing global temperatures through the greenhouse effect.

Idling – when vehicles are left running while parked; produces pollution, which contributes to problems like climate change and smog.

Micron – shortened term for micrometre; one millionth of a metre, often abbreviated as “µm”.

µg/m^3 – micrograms per cubic metre; a measure of the concentration of a chemical or substance in the air.

Mobile monitoring – air sampling protocol used to make continuous measurements of air levels of contaminants using monitoring equipment that is moveable or mobile. Traditional air monitoring uses air monitoring equipment that is fixed in one location. Mobile monitoring allows measurements of air emissions to be performed at various locations while traveling across a City or parts of a City. The mobile monitoring unit can also be parked to make longer term measurements at one or more locations.

MOE – Ministry of the Environment; for more information visit: www.ene.gov.on.ca

Mobile sources – vehicles (cars and trucks) that emit pollutants into the air.

Morbidity - A measure of illnesses within a geographic area (can be a numerical count or a calculated rate).

Mortality - A measure of deaths within a geographic area (can be a numerical count or a calculated rate).

National Ambient Air Quality Standards (NAAQS) – established by the United States Environmental Protection Agency under authority of the 1970 Clean Air Act that address outdoor air; for more information visit: www.epa.gov/air/criteria.html

National Pollutant Release Inventory (NPRI) – Canada's legislated, publicly-accessible inventory of pollutants released, disposed of and sent for recycling by facilities across the country; for more information visit: www.ec.gc.ca/pdb/npri/npri_data_e.cfm

NO_x – nitrogen oxides; nitrogen dioxide (NO_2) and nitric oxide (NO) are the two nitrogen oxides that are classified as common air contaminants. NO is released directly by vehicles and can be used as a tracer for vehicle combustion emissions. NO is readily converted into NO_2 in the atmosphere.

Non-traumatic mortality - Death not causing, caused by, or associated with trauma and especially traumatic injury.

O. Reg. 419/05 – Ontario Regulation 419/05. In 2005, the Province of Ontario enacted Regulation 419/05 as the new framework for local air quality. This regulation is an ‘effects-based’ standard which incorporated more sophisticated dispersion modeling to determine the health and environmental impacts of a given pollutant source. The regulation replaced Regulation 346. See http://www.ecoissues.ca/index.php/Ontario_Regulation_419/05_%28Air_Pollution_%E2%80%93_Local_Air_Quality%29 for more details.

O_3 – Ground-level ozone; component of smog; severe lung irritant; generated when combustion emissions such as nitrogen oxides and volatile organic compounds react in the presence of sunlight, via a complex set of chemical reactions.

PM_{10} – inhalable particulate; airborne particles that have mean aerodynamic diameters of 10 µm (micrometers) or less; has been clearly and consistently linked to respiratory and cardiovascular health impacts in humans.

$PM_{2.5}$ – respirable particulate; airborne particles with mean aerodynamic diameters of 2.5 µm (micrometers) or less; has been more strongly linked to health impacts than PM_{10}.

PM_1 – very small particulate; airborne particles with mean aerodynamic diameters of 1 µm or less.

$PM_{0.1}$ – ultra-fine particulate; airborne particles with mean aerodynamic diameters of 0.1 µm or less. $PM_{0.1}$ is currently being studied for its links to health impacts.

Point of Impingement – A defined point or points on the ground or on a receptor, such as nearby buildings, set at a defined distance from a facility, located outside a company's property boundaries, at which a specific limit for air pollutants must be met. This term is used in conjunction with Ontario Regulation 419/05.

Polycyclic aromatic hydrocarbons (PAH) – chemical compounds emitted when carbon-based fuels such as coke, oil, wood, coal and diesel fuel are burned. Some PAH are known to be carcinogens. PAH are also major constituents of coal tar and coke oven emissions.

ppb – parts per billion; one part per billion is one weight unit of chemical in one billion (10^9) weight units of water, soil, etc. For example, if you added 10 drops of vodka (40% ethanol) to the water in an average backyard swimming pool (16 feet by 32 feet containing 80,000 litres of water), the concentration of ethanol in the pool when fully dispersed in the pool would be approximately 1 part per billion.

ppm – parts per million; one part per million is one weight unit of chemical in one million (10^6) weight units of water, soil, etc. This is equivalent to one drop added to 50 liters (roughly the fuel tank capacity of a compact car).

Prevailing Winds – trends in speed and direction of wind over a particular point on the earth's surface; upwind is the direction the wind is coming from; downwind is the direction that the wind is blowing toward.

Smog – the brownish-yellow haze that typically hovers over urban areas during the summer. Its two main contaminants are ground level ozone (O_3) and small airborne particles; the word comes from a combination of the words ‘smoke’ and ‘fog’. Smog events can occur during any season of the year particularly due to inversion events.

Smog Advisory – see ‘What is a Smog Advisory?’ on page 19.

Stratospheric Ozone – also known as the ozone layer; see the Ground Level Ozone analysis of Appendix C on page 74.

SO_2 – sulphur dioxide; a respiratory irritant principally emitted by industrial processes that combust sulphur or sulphur-containing compounds.

Temperature Inversion – state in which cooler, denser air underlies warmer, lighter air and is thus prevented by gravity from vertical mixing and dispersion. Such a condition acts to trap air pollutants near the ground.

Total Reduced Sulphur (TRS) – a measure of the sulphur-containing compounds that are the basis of many of the odour complaints related to steel mill operations, particularly coke oven emissions, blast furnace emissions and slag quenching operations. At 10 parts per billion (ppb), most people can detect an odour similar to the smell of rotten eggs.

Total Suspended Particulate (TSP) – includes all particulate material with aerodynamic diameters less than about 45 micrometers (45 µm).

Transboundary air pollution – originating from sources in the mid-western United States, pollutants are brought to Ontario by prevailing winds.

Transportation Demand Management (TDM) – see Section 5.2.1

VOCs – volatile organic compounds; organic chemical compounds, some of which may have long or short-term health effects. Sources of VOCs include solvents in enamel paints, solvents, the contents of spray cans, gasoline, etc.; major natural sources of VOCs are plants and trees.

World Health Organization (WHO) – a United Nations agency to coordinate international health activities and to help governments improve health services. For more information visit: www.who.int/en/

REFERENCES

Air Quality Ontario. (2010). Frequently asked questions. Retrieved from www.airqualityontario.com/press/faq.cfm

Cambridge Systematics, Inc (2009)., Moving Cooler: An Analysis of Transportation Strategies for reducing Greenhouse Gas Emissions, Urban Land Institute.

Canadian Medical Association. (2008). No breathing room; National illness costs of air pollution (NICAP) summary report. Retrieved from www.cma.ca/index.php/ci_id/86830/la_id/1.htm

Center for Science in the Earth System & ICLEI. (2007). Preparing for climate change: A guidebook for local, regional, and state governments. Retrieved from cses.washington.edu/db/pdf/snoveretalgb574.pdf

Chiotti, Q. (2003). *Pollution Probe* (presentation to GTA Clean Air Forum) [PowerPoint Slides]. Retrieved from York University.

Environment Canada (2010). AQHI website. Retrieved from www.ec.gc.ca/cas-aqhi/default.asp?lang=En&n=065BE995-1

Federation of Canadian Municipalities. (2009). Act locally: The municipal role in fighting climate change. Retrieved from www.fcm.ca/CMFiles/FCM_Climate_En_Final1RSG-1272009-2598.pdf

Health Canada (2008). Human Health in a Changing Climate: A Canadian Assessment of Vulnerabilities and Adaptive Capacity. Retrieved from http://hc-sc.gc.ca/ewh-semt/climat/eval/index-eng.php

Ontario Medical Association (OMA). (2005). The illness costs of air pollution (ICAP): 2005-2026 health and economic damage estimates. Retrieved from www.oma.org/health/smog/report/ICAP2005_Report.pdf

Ontario Medical Association (OMA). (2008). Ontario's doctors: Thousands of premature deaths due to smog. Retrieved from http://www.oma.org/media/news/pr080606a.asp

SENES Consulting Ltd. (2011). Health Impacts Exposure to Outdoor Air Pollution in Hamilton, Ontario . Retrieved from www.cleanair.hamilton.ca/downloads/2011%20Clean%20Air%20Hamilton%20-%20Health%20Impacts%20FINAL%20.pdf

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