



Beachville Area Air Quality Assessment

Oxford County Public Health
February 6, 2015



In partnership with Public Health Ontario and The University of Guelph



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Location

- Beachville area

Partners

- Public Health Ontario (PHO)
- Department of Population Medicine, University of Guelph

Stakeholders

- Industry (Carmeuse, Federal White, LaFarge, IKO)
- Ministry of the Environment and Climate Change
- Members of the community (citizen groups and individual residents)

Funding type

Public Health cost-shared, with in-kind contributions from Public Health Ontario and University of Guelph

Project period

July 1, 2014 to January 31, 2016

II. EXECUTIVE SUMMARY

Oxford County Public Health & Emergency Services (Public Health) is committed to preventing and reducing the burden of illness from health hazards in the physical environment. A group of concerned citizens of the Beachville area has requested that comprehensive air monitoring and an air quality study of the Beachville area be conducted to support efforts to improve local air quality.

This request was echoed during a Public Information Session held on July 23, 2014 at the Beachville Colombo Club, and is also consistent with responses received through the Citizen's Survey administered by Oxford County Public Health to the Beachville area community following that event.

Public Health staff has determined that further monitoring and improvement efforts are warranted. The *Beachville Area Air Quality Assessment* is underway to provide information on which to base risk management decisions about air quality in the Beachville area. It consists of three components including:

- a literature review;
- monitoring and measuring air quality in selected locations across the Beachville area; and
- the development of a communications and engagement plan.

The assessment involves extensive collaboration with Public Health Ontario (PHO), a Crown corporation dedicated to protecting and promoting the health of all Ontarians. PHO staff scientists provide the assessment with expertise in the fields of environmental health, toxicology and epidemiology. Additional academic expertise is being provided through partnership with the Department of Population Medicine, University of Guelph.

The assessment is further enriched through engagement and consultation with representatives of the aggregate industries, members of the community, and the Ministry of Environment and Climate Change (MOECC).

A preliminary report summarizing progress in the assessment to-date will be released in January 2015. An interim report summarizing findings in the work completed by spring of 2015 will be available for public release in the summer of 2015. A final report summarizing all observations and findings in the study, along with how this information will inform next steps, will be released to the community and interested stakeholders in January of 2016.

Issues statement

Oxford County Public Health & Emergency Services is committed to preventing and reducing the burden of illness from health hazards in the physical environment. A group of concerned citizens of the Beachville area has requested that a comprehensive air monitoring and air quality study of the Beachville area air-shed be conducted to support efforts to improve local air quality. Public Health staff has determined that further monitoring and improvement efforts are warranted. The *Beachville Area Air Quality Assessment* is underway to provide information on which to base risk management decisions about air quality in the Beachville area.

III. BACKGROUND

Aggregate industry and health impacts

Oxford County is characterized by significant reserves of mineral aggregates. Extensive thick deposits of high calcium limestone in the Zorra and South-West townships are of primary importance because they contain the most uniform and the purest limestone found in Ontario. Situated near the Beachville area are three industrial quarrying operations: Carmeuse (Beachville) Lime Limited, Federal White Cement, and Lafarge Canada Incorporated. IKO Industries Ltd. operates a separate aggregate operation within the Lafarge site.

From these sites, cement and lime are manufactured using high quality limestone. Extraction and manufacturing activities include drilling, blasting, excavation, loading, hauling, crushing, screening, material handling, processing, stockpiling and storing. These processes contribute to aerosolizing particles made up of limestone, dust, and organic matter. Airborne particles include minute dust, as well as organic and inorganic materials that combine to produce what is known as particulate matter. Structurally, particulate is composed of a solid core, frequently with a liquid covering, and its composition varies with place, season, and weather conditions.

Particulate matter is characterized according to size because of the different health and environmental effects associated with particles of different diameters (*Cheng et al. 2014, Dockery et al. 1993, Grantz et al. 2003, Jones et al. 2014, Miller et al. 1979, Samet et al. 2000, Toren et al. 2007*). Particles with a diameter greater than 10 µm have a relatively small suspension half-life and are largely filtered out by the nose and upper airway.

Researchers define a diameter between 2.5µm and 10µm as “coarse,” and less than 2.5 µm as “fine.” Fine particulate matter (PM_{2.5}), also known as respirable particles, can penetrate the respiratory system further than larger particles (Miller et al. 1979). Numerous studies have linked exposure to particulate matter to aggravated cardiac and respiratory diseases such as asthma, bronchitis, emphysema, and cardiovascular disease; increased hospitalizations; and premature mortality (*Cheng et al. 2014, Dockery et al. 1993, Miller et al. 1979, Ruckerl et al. 2006, Samet et al. 2000, Toren et al. 2007, Yorifuli et al. 2014*).

People with asthma, cardiovascular or lung disease, as well as children and elderly people, are considered to be the most sensitive to the effects of fine particulate matter. Environmental effects, such as corrosion, soiling, damage to vegetation, visibility deterioration, and regional haze can also be attributed to particulate matter (*Grantz et al. 2003, Jones et al. 2014*). **This demonstrates that risk mitigation strategies by public health are warranted when elevated levels of particulate matter are present.**

Air monitoring to date

In 2003, the Ministry of the Environment released a report titled, “A Summary of Air Monitoring in the Beachville area,” which outlined the history of local air emissions and reported that ambient air quality criteria (AAQC) for PM₁₀ and PM_{2.5} in the Beachville area were being exceeded more frequently than in most other locations in Southwestern Ontario. The report also identified quarrying operations and the manufacturing of lime and cement as the main sources of particulate pollution in the Beachville area (*Parker et al. 2003*).

An Action Plan (Part 3 of the report) was detailed to be implemented by the Ministry and local industry/stakeholders to move forward with continuous improvements in local air quality. The Action Plan included:

- Ministry pro-active inspections;
- Implementation of Best Management Practices to Reduce Fugitive Emissions; and the
- Implementation of an ambient air monitoring program maintained by local industry.

Components of the Action Plan have been implemented with varying degrees of success. For example, the Best Management Practices and inspections components were carried out as expected, but the Ministry acknowledges concerns about the air monitoring data collected and possible issues with the reliability of the data collected through the industry-led Source Emissions Monitoring Program between 2003 and 2013. As a result, the Ministry undertook additional Ministry-led air quality monitoring beginning in 2013.

Citizen advocacy

A group of concerned citizens of the Beachville area, supported by the Oxford Coalition for Social Justice, has requested a comprehensive air quality impact assessment of the Beachville area air-shed to support efforts to improve local air quality. This request was echoed during a Public Information Session held on July 23, 2014 at the Beachville Colombo Club and is consistent with responses received through the Citizen's Survey administered by Oxford County Public Health to the Beachville area community following that event (Appendix I).

Much of this work was expected to be carried out as a result of Parker et al.'s 2003 report, particularly with respect to the implementation of the Ministry's Source Emissions Monitoring Program between 2003 and 2013 (See "Released" Report No. CAO (CS) 2014-08). Specifically, the community has requested:

- a comprehensive ambient air monitoring program;
- the timely analysis and reporting of data, and
- an objective overview of the impacts of air emissions and particulate matter on human health.

Public Health staff has determined that further monitoring to support air quality improvement efforts in the Beachville area is warranted.

As detailed in the Ontario Public Health Standards, Oxford County Public Health & Emergency Services is committed to preventing and reducing the burden of illness from health hazards in the physical environment. Air quality improvement efforts in the Beachville area are currently being steered by the *Beachville Area Air Quality Assessment* as part of this commitment.

The assessment involves extensive collaboration with Public Health Ontario (PHO), a Crown corporation dedicated to protecting and promoting the health of all Ontarians. PHO staff scientists provide the assessment with expertise in the fields of environmental health, toxicology and epidemiology. Additional academic expertise is being provided through partnership with the Department of Population Medicine, University of Guelph. The assessment is further enriched through engagement and consultation with representatives of the aggregate industries, members of the community, and the Ministry of Environment and Climate Change (MOECC).

IV. PURPOSE AND OBJECTIVES

The purpose of the assessment is to provide information on which to base risk management decisions about air quality in the Beachville area. The assessment aims to:

- i. Assess particulate information that reflects current environmental conditions across Beachville area;
- ii. Compare observed particulate matter levels to Ministry standards, ambient air quality criteria (AAQC), interim guidelines, and Canada-wide standards;
- iii. Identify possible short-term trends in local particulate matter concentrations;
- iv. Review evidence concerning the potential human health impacts of nearby community exposure to particulate matter generated by aggregate operations; and
- v. Increase public engagement in practices and activities that support air quality improvement efforts in the Beachville area.

V. METHODOLOGY

The purpose of the assessment is to provide information on which to base risk management decisions about air quality in the Beachville area. It consists of three components including:

- a literature review;
- monitoring and measuring air quality in selected locations across the Beachville area; and
- the development of a communications and engagement plan.

Literature Review

In collaboration with the PHO Shared Library Services Librarian for Oxford and the Department of Population Medicine, University of Guelph, a literature review is underway to examine evidence about the potential human health effects of nearby community exposure to particulate matter generated by aggregate operations, with a focus on coarse (PM₁₀) and fine (PM_{2.5}) particulate matter.

At a minimum, the following electronic databases will be searched: Medline (Ovid) and Pubmed. All database searches will be completed in English and no time restriction will be used. Searches will not be limited by study design. The search is designed to answer the following research question:

What are the potential health effects of nearby community exposure to dust generated from aggregate operations, including coarse and fine particulate matter (i.e. PM₁₀ and PM_{2.5})?

A summary of the literature review will be prepared and shared broadly with the community and interested stakeholders as part of a communication and engagement campaign.

Local air monitoring

Public Health is engaging the services of PHO in the collection, analysis and interpretation of new local air quality data. These data will be used to assess particulate information that reflects current environmental conditions across Beachville area and to identify possible short-term trends in local particulate matter concentrations.

The Environmental and Occupational Health (EOH) Team at PHO maintains air sampling instruments that are available for temporary loan to public health units in Ontario. PHO also provides scientific, technical advice and field support related to air pollution. Other environmental factors known to impact on air quality will be considered. Information gathered will advance Public Health's understanding of the Beachville area air-shed and be used to assess the need for new air quality management and/or mitigation strategies.

Sampling and field work involve observations of the property characteristics, the measurement and recording of physical observations relevant to particulate matter, and the concurrent collection of ambient outdoor air. This will require coordination and cooperation among the property owners, Public Health, and PHO. Air sampling will be conducted using TSI DustTrak analyzers. TSI DustTrak monitors are used by PHO for particulate matter assessments because of their ability to provide reliable data on particulate matter concentration with portability and relative ease in operation and maintenance compared to other measurement methods.

An important advantage of this instrument is the continuous, direct reading capabilities, which allow for the determination of short-term temporal variation and spatial variation in different areas. The instrument is not as accurate as gravimetric monitors and is not approved by the U.S. Environmental Protection Agency under its Federal Reference Methods for PM_{2.5} concentrations. Because the MOECC is transforming the environmental approvals program to a risk-based environmental process that is consistent with leading jurisdictions across Canada, the U.S. and abroad, the values collected with this instrument will not be used for compliance assessment. However, the DustTrak measurements will provide useful information for community risk management and exposure information in different areas of the community. The DustTrak will be calibrated against gravimetric methods in Beachville area, which will improve the quality of data captured.

Field work began in September 2014, was conducted until the end of October 2014, and will continue throughout the spring and summer of 2015. Unfortunately, field work cannot be conducted in the winter due to the vulnerability of the equipment to damage and unreliable measurement in cold weather (*Chung et al. 2001, Kingham et al. 2006*).

The EOH Team at PHO has provided 2 TSI DustTrak DRXs and 2 Kestrel Weather Meters for the assessment. The DustTrak monitors measure levels of particulate matter (PM) in select locations in the Beachville area. Based on information reviewed about quarry operations, PM₁₀ and PM_{2.5} are the fractions of interest for emissions from geological matter. The DustTraks are capable of simultaneously capturing both of these fraction measurements.

This dust data will be paired with wind direction and wind speed data gathered on the Kestrel Weather Meter. The goal of this paired assessment will be to better characterize dust levels and the source directions as they are experienced in the Beachville area on a day-to-day basis. One of the TSI DustTrak/Kestrel meter pairs is housed in the EOH air sampling van, while the other DustTrak will be housed in an outdoor environmental enclosure with the Kestrel set adjacent to the enclosure. The DustTraks log data every 2 minutes and are auto-zeroed (a type of calibration) hourly. The van is parked on the street while the outdoor enclosure is setup in a volunteer backyard. AC power for the DustTrak is provided by the volunteer sites.

Site measurements are taken in 24-hour blocks. Additionally, real-time data are monitored to help assess and report short-term elevations in dust levels. Sites were selected and sampled two at a time with the paired DustTrak and Kestrel equipment.

From the locations volunteered by the community, sites were chosen based on their proximity to the source of interest and the site characteristics. Preference was given to unobstructed sites. Two to three weeks of air sampling data are collected at each pair of sites. Afterward, another two locations were selected for air monitoring for 2-3 week periods.

This cycle continued until the end of October, when the outdoor temperature became too cold for operation of the DustTrak. These point-in-time data will be used to refine methods for the spring and may be useful for reporting on levels of dust exposure as they occurred in Beachville area in the fall of 2014.

Analysis and interpretation of data collected through air monitoring will be a collaborative effort between Public Health and PHO.

Community relations and engagement campaign

An extensive communication and engagement campaign is underway to keep the community and interested stakeholders informed of Public Health's ongoing activities related to air quality improvement efforts. Activities that are part of the awareness building phase have included:

- **Online "hub."** A dedicated section on *Speak Up, Oxford!*, the County's "online town hall," was established to keep people up to date on activities related to the assessment, link to resources, and submit comments or questions.
- **Public meeting.** A Public Information Session held on July 23 at the Colombo Club in Beachville to explain the framework of the assessment. The session was part of a first step in gathering feedback and information from the community. The issue will be part of a second meeting on community issues to be held February 11, 2015 in the same location.
- **Media relations, social media and advertising.** The assessment was launched through a news release to the community, with social media serving to keep people updated at key milestones. Advertising in local media was undertaken as part of the public meetings.
- **Community presentations.** Presentations open to the public were made at Oxford County Council and Township of Zorra Council.
- **Air monitor hosting by residents.** Public Health sought local residents who are able to host temporary air monitoring equipment on their properties in the Beachville area. The monitors collect information about local exposure to particulate matter in the air and represent an opportunity to directly involve affected residents in the assessment. Interested residents were asked to contact Public Health.

Further communication and engagement strategies will be developed in the coming months to foster ongoing public engagement in practices and activities that support air quality improvement efforts guided by this work. In particular, Public Health would like to know how Beachville area residents adjust their feelings, attitudes and beliefs based on how the assessment unfolds. Keeping abreast of this information will include postings and responses to social media, news releases, additional public information sessions, Q&As and reports to County Council.

VI. REPORTING

A preliminary report summarizing results of the citizen's survey and assessment progress to-date will be released in January 2015. An interim report summarizing the observations, data, and findings of the work completed by spring of 2015 will be prepared and shared with PHO for review before public release in the summer of 2015.

A final report summarizing all observations and findings, and how this information will inform next steps, will be released to the community and interested stakeholders in January of 2016. This will allow sufficient time for a full review of the information collected. Public reporting of the assessment's findings will occur through County Council.

VII. DISCUSSION OF REPORTING OUTCOMES AND POSSIBLE ACTIONS

Oxford County Public Health will use information collected through the assessment to support the development of a long-term air quality improvement program in Beachville area. Public Health will build a risk mitigation strategy that includes a recommendation process in collaboration with the MOECC, the lead government agency with primary responsibility for enforcing the Environmental Protection Act.

Public Health has a responsibility to increase public awareness of health risk factors associated with health hazards that pose a risk to human health and to assist community partners in developing healthy public policies related to reducing exposure to health hazards. Local risk mitigation strategies that support this responsibility and will be informed through the assessment include:

- a. Establishing an alert/warning system based on air monitoring data and accepted threshold criteria;
- b. Developing a communications and engagement plan for activities that support air quality improvement efforts.

Making or acting on risk management decisions does not imply the presence of unacceptable conditions of exposure or actual risk, but rather are decisions to manage potential risk to human health erring on the side of caution.

VIII. LEGAL AUTHORITY

This assessment is executed under the authority of the *Health Protection and Promotion Act*, specifically the *Ontario Public Health Standards, Environmental Health Program Standard, 2008*, which requires Oxford County Public Health to:

- Conduct surveillance of the environmental health status of the community;
- Implement control measures to prevent or reduce exposure to health hazards;
- Identify and assess the relevant hazards and risks to the public's health; and
- Interpret and use surveillance data to communicate information on risks to relevant audiences.

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OPERATIONAL PLAN | Beachville Area Air Quality Assessment

ACTIVITY	TIMELINE	DETAILS	OUTPUTS	EXPECTED OUTCOMES
Ambient Air Monitoring	Fall 2014 Spring-Summer 2015	<ol style="list-style-type: none"> 1. <i>PHO Beachville Area Air Monitoring</i> (DustTrak): air sampling, methodological refinement, and field work (completed) 2. <i>PHO Beachville Area Air Monitoring</i> (DustTrak): air sampling, and field work, with correction factors 	Supplemental technical document, with correction factors	Air quality information that reflects current environmental conditions across the Beachville area
Literature Review	Fall 2015	<ol style="list-style-type: none"> 1. <i>Literature review</i>: In collaboration with PHO and University of Guelph, a literature review will examine evidence about potential human health effects of nearby community exposure to particulate matter generated by aggregate operations, with a focus on PM_{2.5} and PM₁₀. 	Literature Review Report	Enhanced understanding of potential health impacts of nearby community exposure to particulate matter generated by aggregate operations
Community Relations	Ongoing	<ol style="list-style-type: none"> 1. Create online information hub (completed; continues to be updated) 2. Public information meetings (2014 completed; 2015 scheduled). Further information sessions to be held at key points in the assessment 3. Conduct a survey of residents' perceptions of the air quality in the Beachville area air-shed (completed in summer 2014) 4. Explore ongoing citizen engagement strategies throughout the assessment process 5. Support materials such as news releases/announcements, Q&A, etc. 	Public meetings, reports and communication materials	Increased transparency, accountability, and citizen representation, and better understanding of the issue and the assessment process
Reporting	Winter 2014-15 Winter 2014-15 Spring 2015 Summer 2015 January 2016	<ol style="list-style-type: none"> 1. MOECC to compile the historical and current air (August 2013 to July 2014) quality monitoring data for Public Health's review 2. Public Health Preliminary Report to County Council: Citizen's Survey and progress to date (completed) 3. PHO Interim Response to Air Monitoring Data 4. Public Health Interim Report to County Council 5. PHO and Public Health Final Report to County Council 	Report Update(s) Preliminary Report Interim Report Final Report	A comprehensive body of information on which to base risk management decisions about air quality in the Beachville Area