



Monitoring Air Quality in Lambton County

This monograph, one in a series of single issue documents dealing with Lambton County environment, has been prepared by the Sarnia-Lambton Environmental Association in co-operation with the School Boards of Lambton Kent.

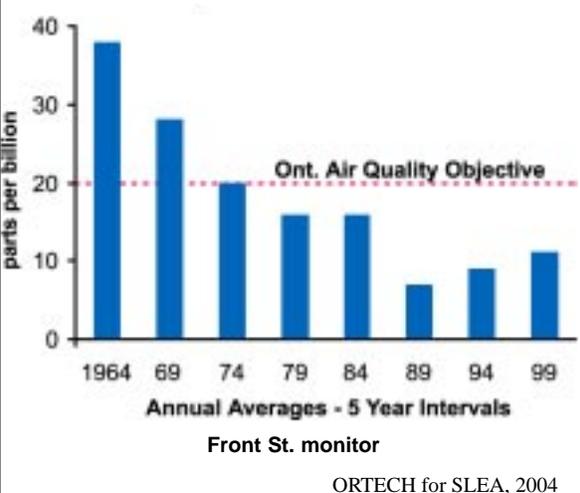
Introduction

A system of seven monitoring stations is operated by the Sarnia-Lambton Environmental Association; these stations analyze local air quality in a 20 km. corridor which extends from Pt. Edward to Courtright. The Ontario Ministry of Environment also operates four monitoring stations in Lambton County and one in Kent County. Monitoring results are helpful in assessing the extent to which air quality is affected by pollutants from industry, from the Lambton community itself and from distant sources. **Such monitoring results assist in developing ways to reduce pollution.**

“Good” to “Very Good” Air Quality Indices (AQI) were recorded 90% of the time at monitoring stations across Ontario throughout 2003.

MOE, 2003, page 26

Facts

<i>Sulphur Dioxide (SO₂), 1964 - 04</i>	<i>Air Quality In Lambton County:</i>
 <p>parts per billion</p> <p>Ont. Air Quality Objective</p> <p>Annual Averages - 5 Year Intervals</p> <p>Front St. monitor</p> <p>ORTECH for SLEA, 2004</p>	<ul style="list-style-type: none"> • Lambton’s air quality compares favourably with that of other cities • Ozone accounts for most AQI exceedances • More than 50 volatile organic compounds (VOCs) are monitored at the Association’s air stations; all are well below Ontario’s ambient air quality standards • Wind, temperature, precipitation, and sunshine influence air quality; these are also monitored • Monitoring programs help give definition to potential problems and track progress towards their resolution

Key Words

Air Quality Index (AQI)

- a measure of air quality based on continuous monitoring of six urban air pollutants

photochemical reactions

- these are influenced or initiated by light, particularly ultraviolet light

total reduced sulphur

- primarily a measure of hydrogen sulphide (rotten egg odour) and a few other sulphur bearing compounds such as mercaptans (a mercaptan is added in trace amounts to give natural gas a recognizable odour)

An Air Monitoring Station

Front Street at Davis Street, Sarnia

Anemometer
Wind speed/direction

PM_{2.5}
Respirable Particulate Matter
These particles are less than 2.5 microns; they enter deeply into the lungs; they are monitored at Moore Line and Centennial Park.

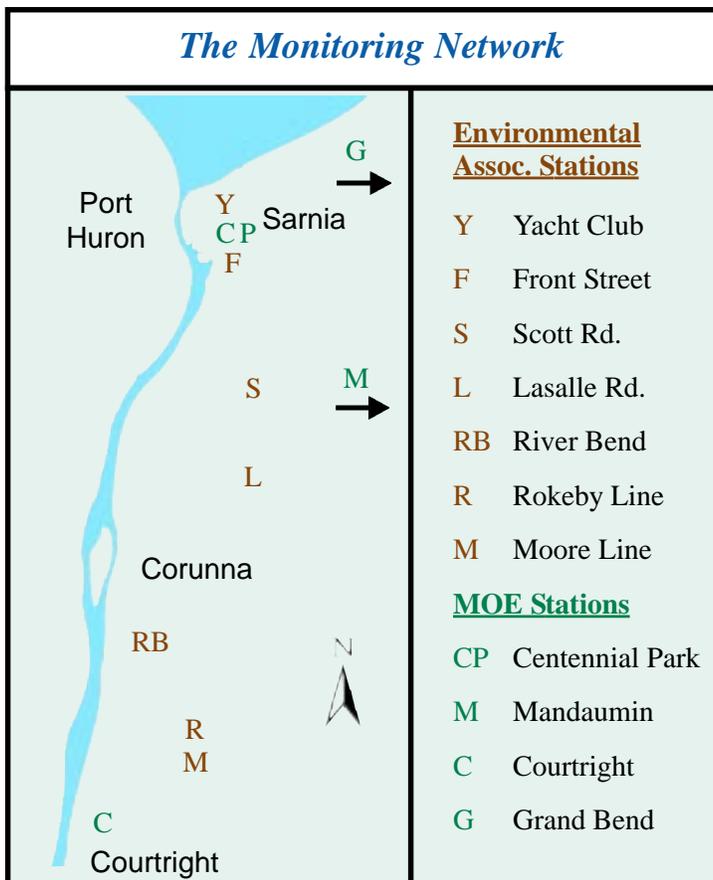
Air Inlet
A continuous flow of air is directed to the analyzers.

$$*1 \text{ micron} = \frac{1}{1,000,000} \text{ metre}$$



Ten stations, including the one pictured, analyze and record hourly averages for eight substances. This system was introduced over 40 years ago.

Telemetry
Collects monitoring results; these are directed to a central computer.



O₃
Ozone
A component of smog

SO₂
Sulphur Dioxide
An acid rain component

NO_x
Nitrogen Oxides
React in the atmosphere to form smog

Calibrator
Instruments are checked daily to ensure accuracy

VOCs
Volatile Organic Compounds
React in the atmosphere, contributing to smog formation

Total Reduced Sulphur, Ethylene, PM_{2.5} are monitored at other stations.



Further Monitoring Information

- The eight substances described on this page are monitored continuously; intermittent sampling/analyses are also done for additional VOCs and for particulate matter.
- Temperature, precipitation and solar radiation are also measured.

Ontario's Air Quality Index

Introduced Province-Wide in 1988; There Are now 37 Sites in 24 Major Cities and 7 Rural Areas.

- Air quality assessments are based on concentrations of the six most common air pollutants.
- Air quality is recorded on a scale that ranges from 0 to 100 plus; as air quality deteriorates the index increases.
- AQI sub-indices for each of the six pollutants are recorded hourly; the highest of these sub-indices in a given hour becomes the AQI for that hour.

Air Quality Index Contaminants and Their Impacts

Index	Category	Ozone (O3)	Fine Particulate Matter (PM 2.5)	Nitrogen Dioxide (NO2)	Carbon Monoxide (CO)	Sulphur Dioxide (SO2)	Total Reduced Sulphur (TRS) Compounds
1 – 15	Very good	No known harmful effects	Sensitive populations may want to exercise caution	No known harmful effects	No known harmful effects	No known harmful effects	No known harmful effects
16 – 31	Good	No known harmful effects	Sensitive populations may want to exercise caution	Slight Odour	No known harmful effects	Damages some vegetation in combination with ozone	Slight odour
32 – 49	Moderate	Respiratory irritation in sensitive people during vigorous exercise; people with heart/lung disorders at some risk; damages very sensitive plants	People with respiratory disease at some risk	Odour	Blood chemistry changes, but no noticeable impairment	Damages some vegetation	Odour
50 – 99	Poor	Sensitive people may experience irritation when breathing and possible lung damage when physically active; people with heart/lung disorders at greater risk; damages some plants	People with respiratory disease should limit prolonged exertion; general population at some risk	Air smells and looks brown. Some increase in bronchial reactivity in people with asthma	Increased symptoms in smokers with heart disease	Odorous; increasing vegetation damage	Strong odour
100-over	Very poor	Serious respiratory effects, even during light physical activity; people with heart/lung disorders at high risk; more vegetation damage	Serious respiratory effects even during light physical activity; people with heart disease, the elderly and children at high risk; increased risk for general population	Increasing sensitivity for people with asthma and bronchitis	Increasing symptoms in non-smokers with heart diseases; blurred vision; some clumsiness	Increasing sensitivity for people with asthma and bronchitis	Severe odour; some people may experience nausea and headaches

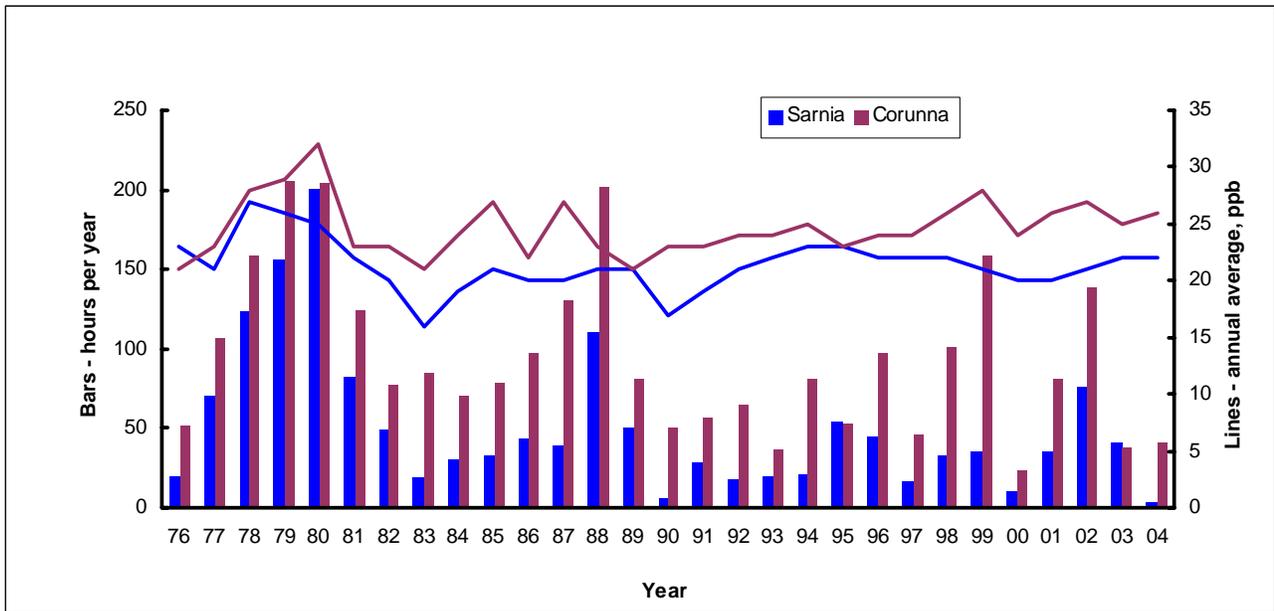
Ozone - A Summertime Problem

Warm sunlight drives ozone-producing reactions, which involve products of combustion such as nitrogen oxides and volatile organic compounds. Air masses, which travel from the U.S. mid-west contribute over one-half of our local ozone; this makes resolution of the problem particularly difficult.

High ozone concentrations at the Corunna station generally tend to occur when winds are out of the south; this indicates that ozone is carried by air currents from sources in the U.S.

Ozone that is transported into the area is reduced through reaction with local nitrogen oxide emissions - thus the lower ozone levels in Sarnia.

Ozone Trends - Sarnia & Corunna



***Comparison of 2003 Average Contaminant Levels
with Previous 5 Years (ppb)***

Seven contaminants are continuously monitored by the Sarnia Lambton Environmental Association

Annual mean values are tabled below:

	2004	2003	2002	2001	2000	1999
Sulphur Dioxide						
Front Street (LIMA Site)	9	8	10	11	10	11
LaSalle Road	5	5	5	5	5	6
River Bend (LIMA Site9)	9	10	7	9	8	9
Total Reduced Sulphur						
Scott Road	0*	0	0.4	0.3	0.4	0.5
River Bend	0	0.2	0.2	0.1	0.3	0.3
Ozone						
Front Street	22	22	21	20	20	21
River Bend	26	25	27	23	24	28
Nitric Oxide						
Front Street	4	5	7	7	7	7
River Bend	3	3	2	2	3	3
Nitrogen Dioxide						
Front Street	12	15	17	18	15	13
River Bend	9	16	11	10	10	10
Ethylene						
Scott Road	9	7	9	9	11	8
LaSalle Road	4	4	4	7	5	7
River Bend	2	6	6	6	5	5
Moore Line	4	4	7	5	8	5
Rokeby Line	6	5	8	7	7	7
PM_{2.5}						
Moore Line	8	9	9	8	10	--

ORTECH, 2004, page 14

* The minimum detection level for Total Reduced Sulphur is 1 ppb.

The average mean is less than 1 ppb.

-- not measured.

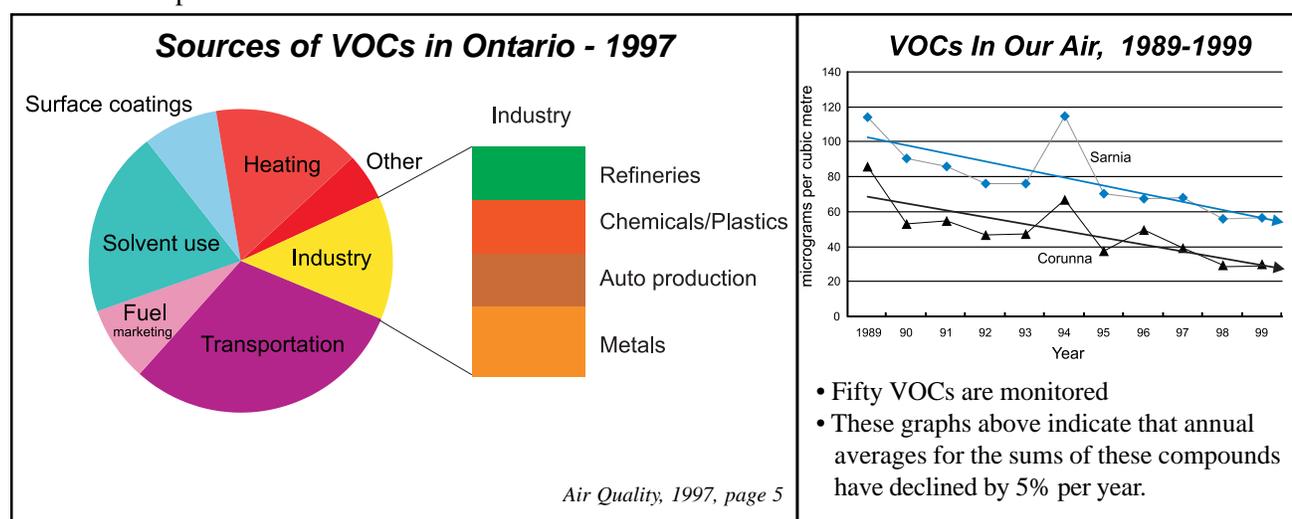
LIMA Site - see Air Quality - Air Monitoring and Info.

Volatile Organic Compounds

Organic Compounds - molecules of these compounds contain carbon atoms. Carbon atoms bond well with each other to form molecular chains; they also bond with other atoms, mainly hydrogen, nitrogen, oxygen and sulphur to form a great variety of compounds. Some of the compounds have low boiling points causing them to evaporate readily; these are called Volatile Organic Compounds (VOCs).

VOCs and Health - some VOCs are injurious to health; they also react with other chemicals in the air to produce ozone and other pollutants.

VOC Examples	
<i>All are found in or are produced from crude oil</i>	
benzene	a primary building block used to make many chemical compounds
ethylene	the basis for many chemical compounds including polyethylene
toluene	a solvent for paints, a component of gasoline, used to make explosives



Conclusion

Monitoring helps to determine sources and magnitudes of contaminants; knowing these, corrective actions can be introduced and success rates measured. Monitoring systems in Lambton County continue to be instrumental in guiding actions that are geared to minimize environmental stresses which we individually and collectively impose upon the atmosphere.

References

- Air and Waste Management Assoc., 1995, Particulate Matter: Health and Regulatory Issues
- CCME (Can. Council of Ministers of Env.) 1990, Management Plan for Nitrogen Oxides and Volatile Organic Compounds
- Environment Canada, 1993, Programs/Strategies to Minimize and Prevent Benzene Releases
- MOE (Ontario Ministry of Environment) 2003, Air Quality in Ontario
- ORTECH, Sarnia Air Monitoring Program, Annual Report to the Lambton Industrial Society, 1967 - 97
- Sarnia Lambton Environmental Association, 2003, Annual Progress Report

Information Compiled by:
Tom Hamilton, teacher, retired

- * materials from this monograph may be reprinted
- * references available in our resource centre
- * additional copies of this monograph are available from the Sarnia-Lambton Environmental Association or on-line at <http://www.sarniaenvironment.com>

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Sarnia-Lambton Environmental Association
Suite 111, 265 Front St. N
Sarnia ON N7T 7X1
519-332-2010
email: admin@sarniaenvironment.com