2010

Progress Review
Technical Summary

Sarnia • Lambton Environmental Association

Industries Working Together

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The Sarnia-Lambton Environmental Association (SLEA) is a voluntary industrial cooperative of 22 operating facilities in Lambton County. Serving for close to 60 years through its predecessors, the St. Clair River Research Committee and the Lambton Industrial Society, the association works to keep its members fully informed about environmental issues. Through third-party experts, the organization operates an extensive network of air and water quality monitoring stations. Extending southward from Sarnia to Courtright and from the St. Clair River eastward across adjacent lands, the network tracks long-term environmental change in the local area.

Public interest is welcomed. Environmental references are maintained at the SLEA's office library and on the Internet at www.sarniaenvironment.com

The day-to-day responsibilities for maintaining the organization's monitoring network and data library for its technical program, as presented in this summary report, rests with the following third-party consultants:

ORTECH Environmental is one of Canada's leading atmospheric science consulting firms, providing technology based consulting services and expertise in environmental science and engineering to government, industrial and financial organizations. Local services are provided through the company's Sarnia office, which has been in operation for over 50 years. A long-time SLEA consultant, ORTECH has been designing, implementing and operating ambient air monitoring networks for industry since the 1950s. In addition to its air program expertise, the company has had 20 years of experience in developing and managing continuous water quality monitoring instrumentation.

Pollutech EnviroQuatics Limited maintains a solid reputation within industry and government for its biological research and laboratory services, which have been operated from its Point Edward facilities since the early 1970s. The firm's analytical laboratory has been performing routine compliance bioassays, as well as developing new and innovative bioassay and biomonitoring techniques for over 20 years. The firm serves private- and public- sector clients locally and across Canada. An environmental advisor to the SLEA on St. Clair River water quality since the early 1970s, Pollutech EnviroQuatics' corporate capabilities also include ambient effects monitoring, zebra mussel control, marine diving and general marine services, as well as geo-environmental engineering and assessment services.

* Our cover photo by the St. Clair Region Conservation Authority (SCRCA)

Continuous improvements founded on sound science

Decades before the environment registered as a public interest, representatives from several local companies were meeting to discuss improvements at their facilities. By 1952, they had formed the St. Clair River Research Committee and were establishing the standards of measure for the continuous improvement of their environmental performance. Today, the 22 member companies of the Sarnia-Lambton Environmental Association (SLEA) continue to evaluate and introduce new technology and practices to further diminish their effect on local air and water quality. Applying sound science, their voluntary cooperative efforts are tracked on what has evolved into one of the most unique environmental tracking networks in existence in the world.

The long-term trends in St. Clair River water and local air quality presented in this progress report document the challenges and successes of member companies. Member companies acknowledge that there are further improvements to be made and continue to investigate further science-based strategies to reduce the size and scope of their environmental footprints.

The SLEA has represented a substantial resource for local industry. During the past 58 years, the organization has provided a central forum for the collection of environmental data and the sharing of information about new emission control technologies and approaches. From an initial focus on surface oils, the organization's interests in St. Clair River water quality have expanded substantially. In 1957, the first sediment benthic studies were undertaken, to allow members to begin to understand the relationship between river water quality and the creatures that live in the riverbed. Throughout the 1970s and '80s, the association's Technical Committee was overseeing research by third-party environmental specialists into studies to assess the health of fish in the river.

The SLEA's Monitoring Network

At the same time, the SLEA's predecessor, the Lambton Industrial Society, conducted a variety of chemical analysis on the river water grab samples it routinely collected. In 1987, the river water quality database expanded substantially with the installation of a continuous volatile organic compounds water analyzer to provide real-time data. The automated water

sampler-analyzer was one of the first (and might still be the only) continuous records of its kind in Canada. Real-time readings continue to be made available directly the Ontario Ministry of the Environment, with the database provided to various others for the purposes of scientific research.

By the 1990s, sophisticated sediment toxicity investigations were being conducted to expand member knowledge of river water quality conditions and to fine tune their plant improvement initiatives.

The creation of an air quality monitoring network also began during 1950s. Computer-driven air sampling technology was added to the network in 1980, along with additional quality parameters. Today, SLEA consultants maintain a network of 10 air quality monitoring stations, which track more than a dozen parameters.

In 2001, the association constructed a mobile air quality monitoring unit. The self-contained trailer can be moved promptly to the scene of an environmental incident, but is most often used by member companies to monitor ambient air quality around their large-scale maintenance and construction projects.

Beyond its environmental monitoring network interests, the organization has served as a platform to encourage and assist its member companies to understand and put into practice the principles of sustainable development. During the past 10 years, the SLEA created new opportunities for local industry representatives to study to best practices for combining their economic, environmental and social interests in a manner that would improve their performance, and offer benefits to the local community without disadvantaging future generations. The organization was instrumental in promoting and supporting the establishment of the Bluewater Sustainability Initiative (bsi.lambton.on.ca). The local private-public partnership continues to offer opportunities for local citizens from all walks of life to come together to learn more about a wide range sustainable development practices and to actively participate in associated improvement projects.

From its offices and resource library in the Suncor Sustainability Centre on the campus of Lambton College, SLEA staff also administers the Chemical Valley Emergency Coordinating Organization (CVECO) for mutual aid and its community information and education arm, the Community Awareness and Emergency Response (CAER) Committee.

In response to the ever-changing dynamics of the Sarnia-Lambton environment and the environmental issues that affect its member companies and host community, the SLEA remains actively engaged in a number of forward-looking initiatives. Through a multi-year program coordinated by local conservation authorities, SLEA leadership contributes to the development of a plan to identify and protect source water areas in the region. In addition, the organization remains an active part of stakeholder roundtable discussion forums, hosted

by the Ontario Ministry of the Environment associated with pending changes to the province's air quality regulations.

No doubt, the company representatives who joined together to pioneer the concept of an environmental cooperative would be pleasantly surprised to learn how their plans have evolved over the past five-plus decades. But, changes aside, the SLEA has been diligent in remaining true to its mission, to be recognized by its members, regulatory agencies and the community for its excellence in promoting and fostering a healthy environment that is consistent with sustainable development.

Member companies accept the ongoing responsibility of achieving the organization's mission by maintain a high level of awareness of environmental management and risk prevention regulations, technologies and procedures. In addition, they work to fully understand the impacts of stressors on the local ecosystem. Through the endeavours of its members, the SLEA continues to strive to be recognized for its competency and reliability, such that regulatory agencies will seek information, expert advice and comment from the association and its members when developing environmental legislation and regulatory programs.

Public information and education remains an important component of the SLEA's annual program. A number of the special information and educational forums provided by the organization are highlighted in the following pages.

The SLEA welcomes members of the community to discover the facts about their local environment and the work of member companies to make further improvements. Further information is available at the SLEA office and resource library, at 1489 London Road, Sarnia, Ontario, Canada N7S 1P6, 519-332-2010, admin@slea.ca. Follow the latest environmental findings on the Internet at www.sarniaenvironment.com.

2010 Member Companies

BP Canada Energy Company
Cabot Canada Ltd.
CF Industries
Clean Harbors Canada, Inc.
E.I. duPont Canada
Enbridge Pipelines
Ethyl Canada Inc.
H.C. Starck Canada Inc.
Imperial Oil Limited
INEOS Styrenics
LANXESS Inc.
NEWALTA Corporation
NOVA Chemicals
Ontario Power Generation
PRAXAIR Canada Inc.
SGS Canada Inc.
Shell Canada Limited
Suncor Energy Products Inc.
Suncor Energy, St. Clair Ethanol
TODA Advanced Materials Inc.
TransAlta Generation Partnership
Waste Management of Canada

Monitoring our Air Quality

2010 Snapshot:

- Local sulphur dioxide levels continue the steady, downward trend recorded since 2000; they are well below Ontario's annual acceptable levels
- Sulphur dioxide levels in 2010 were approximately 50 percent lower than measured 10 years ago, mainly due to industrial emission reduction initiatives
- For the second consecutive year, there was no Lambton Industry Meteorological Alert for sulphur dioxide
- Total reduced sulphur levels, although very low, have continued to decrease over the past 10 years and remain well below acceptable quality limits
- Local ozone concentrations exceeded Ontario's hourly Ambient Air Quality Criterion (80 ppb) 25 times at the SLEA's northerly station, in Sarnia, and 37 times at its southerly monitoring station, near Corunna
- The annual means level of ozone is trending upward, due to a general increase in global background levels, along with reductions in local nitrous oxides emissions
- Over the past 10 years, the maximum 1-hour ozone concentrations continue to decrease; ozone production over the summer months continues to decrease
- Canada-wide Daily Standard for fine particulate matter, 30 micrograms per cubic meter, was exceeded on six days during 2010
- It is estimated that over 50 percent of Ontario's fine particulate matter comes from the United States
- Over the past 10 years, local NO_x levels declined by approximately 50 percent and 30 percent at Sarnia and Corunna monitoring sites, respectively
- During 2010, all concentrations of a pre-defined group of 50 VOCs (except for ethylene) were below all associated Ontario ambient air quality criteria; annual levels have changed little over the last five years
- The annual sum averages of a pre-established group of 50 VOCs (excluding ethylene) have continued in a consistent downward trend over the past 20 years; total levels have dropped by approximately 35 percent since 2000
- The Ontario daily ambient air quality criterion for ethylene was exceeded at the various monitoring locations on 29 days during 2010, although the number of days exceeding the criterion has decreased over the past 10 years due to industrial emission reduction initiatives

Reducing air emissions to levels at, or below government regulated levels is a responsibility that SLEA member companies take most seriously.

Member companies implement a multi-faceted program to control and reduce emission levels from all affected components of their operations. Program components can include employee training in best operating practices, the maintenance of environmental monitors along with associated records and government reports, feed stock management and the introduction of maintenance turnaround work to sustain peak operation conditions, as well as capital development projects to replace older processing and control technology.

The overall goal is to continue to drive emission levels down to their lowest possible levels, thus minimizing the plant site's environmental footprint.

The SLEA's air quality monitoring network plays an important, supporting role in member companies' emission reduction endeavours. Strategically positioned in traditional upwind and downwind locations, the monitoring network provides an overall perspective of ambient air conditions related to the various parameters being measured. Maintaining 10 of its own stations, and with access to two additional monitoring units operated locally by the Ontario Ministry of the Environment, the SLEA network measures airborne compounds typical of the emissions released from the manufacturing processes maintained by its member companies. In addition, the network tracks other environmental factors associated with changes in local air quality. Air quality parameters measured by the SLEA network include : sulphur dioxide, total reduces sulphur, ozone, particulate matter, nitrogen oxides, volatile organic

compounds, ethylene, wind direction/speed, temperature, barometric pressure, solar radiation and humidity.

The following is a summary of the main findings of the SLEA's air quality monitoring program during 2010.

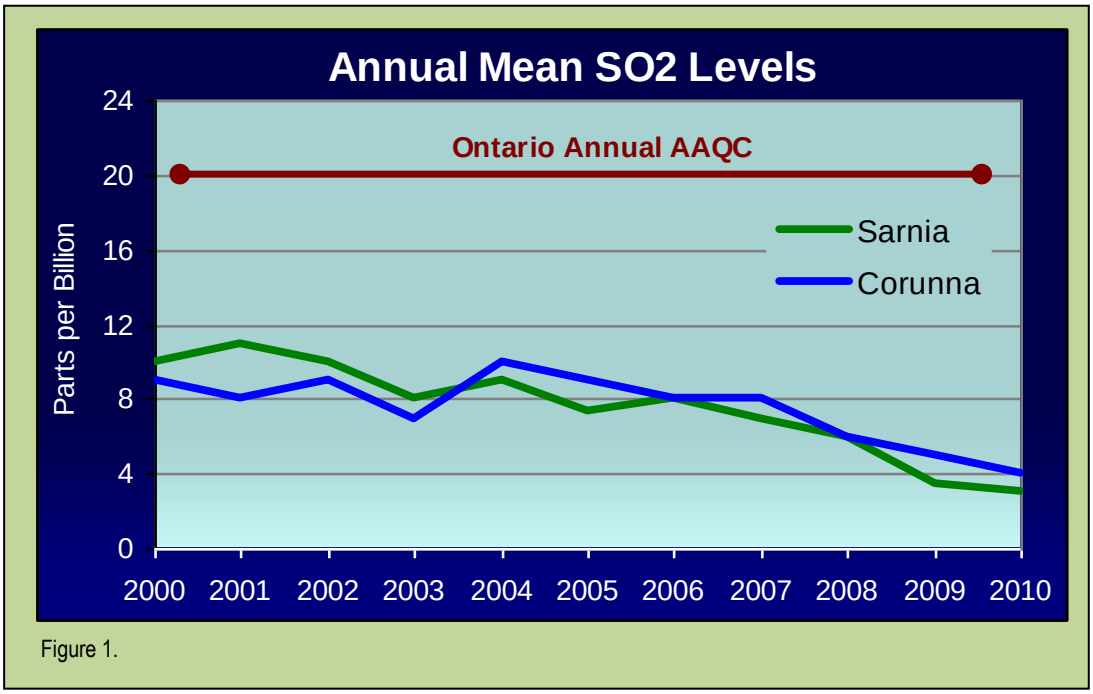


Figure 1.

Sulphur Dioxide (SO_2)

SO_2 is emitted from smelters, petroleum refineries, iron and steel mills and pulp and paper mills. Other sources include residential, commercial and industrial heating and vehicles and equipment with internal combustion engines.

In the Sarnia area, petroleum refineries account for most of the local emissions, although sources extend far beyond Sarnia-Lambton into the U.S. Midwest account for almost half of the levels measured locally. The presence of SO_2 can be detected by its characteristic odour of burned matches. Health effects include breathing problems and respiratory illness. People most sensitive to SO_2 are asthmatics and those with chronic lung disease, or heart disease. SO_2 can be released into the air to form sulphuric acid aerosols and also might form sulphates that contribute to fine particulate matter. Similar to nitrogen dioxide, SO_2 is an acid rain precursor, which might play a role in lake, stream and soil acidification and cause the corrosion of buildings.

Within the SLEA network, SO_2 is measured in the ambient air using continuous monitors.

2010 Results:

SO_2 has been measured continuously by the SLEA for over 45 years at strategically located monitoring stations in Sarnia-Lambton.

Figure 1 illustrates historical annual average levels in at the Sarnia and Corunna monitoring stations. Levels have exhibited a constant downward trend since 2000 and are well below Ontario's annual acceptable levels. The 2010 levels are approximately 50% lower than measured 10 years ago. This is due to industrial emission reduction initiatives.

The Lambton Industry Meteorological Alert (LIMA) regulation provides a local response to help diminish the local effects of SO_2 emissions. The regulation has been in effect for close to 30 years and defines the maximum average daily SO_2 levels that can be reached at the association's LIMA monitoring stations, before participating area industries are advised to switch to lower sulphur fuels, or reduce their production rates to lower emissions.

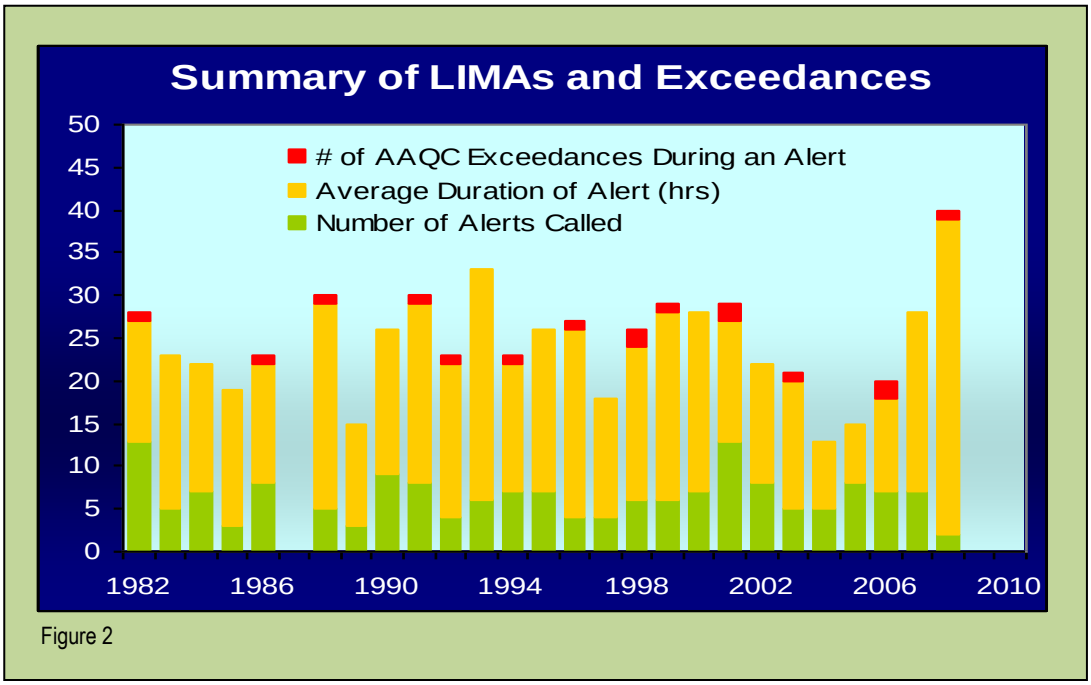


Figure 2

In 2010, there was no LIMA event and the Ontario Daily Criterion (100 ppb) was not exceeded in 2010. This was the second consecutive year of no LIMA or exceedance. The maximum daily mean was reported in Sarnia at Front Street on January 14 under southerly winds. Over the past 29 years, there have typically been six events per year, each of approximately 16 hours in duration. A long-term summary of sulphur dioxide alerts (LIMAs) and daily exceedances is presented in Figure 2.

Total Reduced Sulphur (TRS)

TRS compounds at low concentrations are not normally considered to be a health hazard. However, they produce an offensive rotten egg, or cooked cabbage-like odour, which most people can smell at very low levels (concentrations lower than 10 ppb). As a result, operations possessing source materials must manage them carefully in order to avoid the escape of errant odours, even for short durations. Natural emission sources include swamps, bogs and marshes, along with industrial sources such as oil refineries, pulp and paper mills, steel mills and sewage treatment facilities.

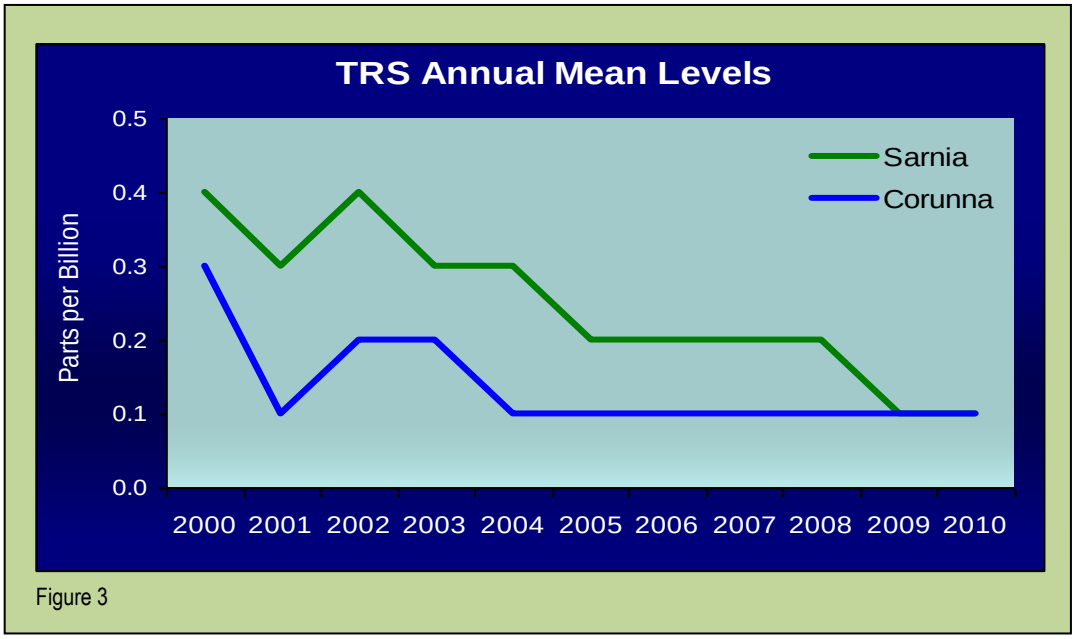


Figure 3

TRS is measured continuously in ambient air, using a technology similar to that applied for monitoring SO_2.

2010 Results

Annual levels of TRS are shown in Figure 3. Even though local levels are already very

low, they have still continued to decrease over the past 10 years.

TRS does not have a 1-hour Ambient Air Quality criterion. For the purposes of comparison, the data has been presented against a measure of 10 ppb, which is the highest value that would receive a 'good' rating under the province's Air Quality Index framework. No value greater than 10 ppb was measured in 2010, with the maximum value of 7 ppb reported at Scott Road in Sarnia.

OZONE (O_3)

Ground-level ozone forms when various precursor compounds, such as nitrogen oxides and volatile organic compounds, react together in the presence of sunlight.

Naturally occurring ozone in the stratosphere provides the Earth with a shield from harmful ultraviolet radiation. But, at ambient levels, O_3 is a colourless, odourless gas that is a major component of smog. The formation and transport of O_3 are dependent on a variety of meteorological factors, including temperature and hours of bright sunshine, as well as wind speed and direction. Elevated O_3 concentrations are normally measured on hot, sunny days during the months of May through September.

Health effects attributed to O_3 include the irritation of the respiratory tract and eyes. It has the greatest effect on children and people with respiratory disorders. In addition, the growth and yield of sensitive agricultural crops, including white beans, potatoes and tomatoes, can be adversely affected by O_3 exposure.

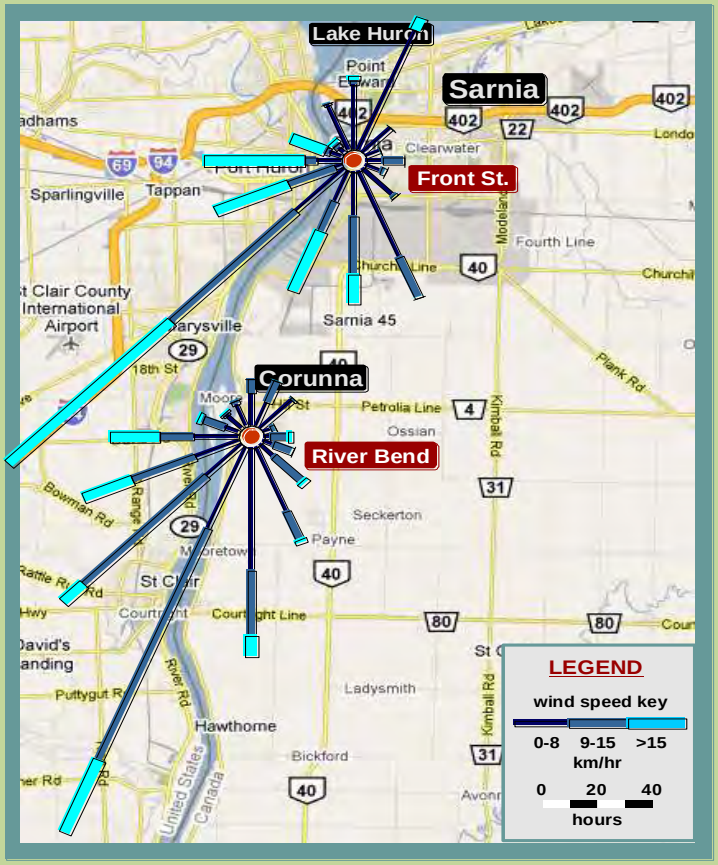


Figure 4

	Front Street			River Bend		
	Ontario		CDN	Ontario		CDN
	AQI 50 ppb	1 hr 80 ppb	8 hr 65 ppb	AQI 50 ppb	1 hr 80 ppb	8 hr 65 ppb
2010	672	25	16	676	37	16
2009	334	7	5	287	6	4
2008	428	7	6	429	4	4
2007	546	58	0	481	43	0
2006	536	24	14	505	33	15
2005	363	11	12	523	64	29
2004	141	3	2	398	41	16
2003	364	41	2	365	38	5
2002	465	76	0	545	138	4
2001	382	35	17	614	81	31
2000	286	10	5	439	23	13
10-Year Avg.	**384**	**27**	**6**	**459**	**47**	**12**

Table 1 Ontario Ambient Air Quality Criteria and Canada-wide Standard Exceedances

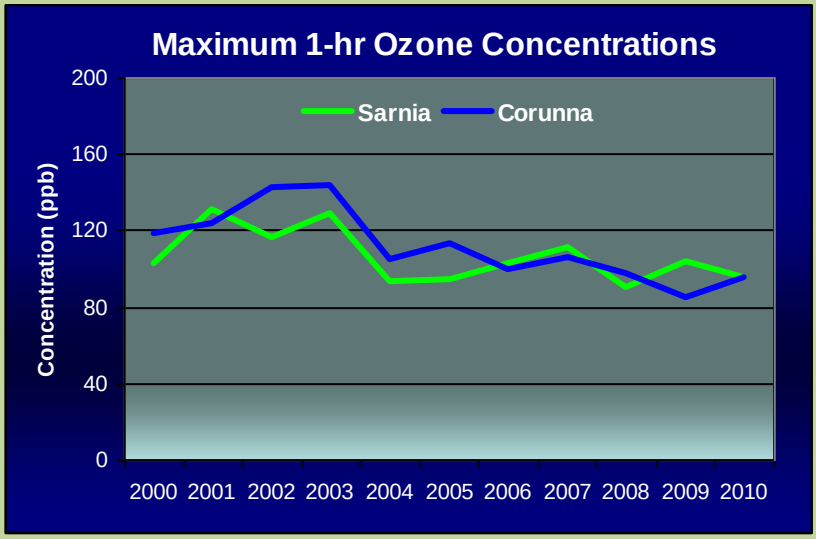


Figure 5

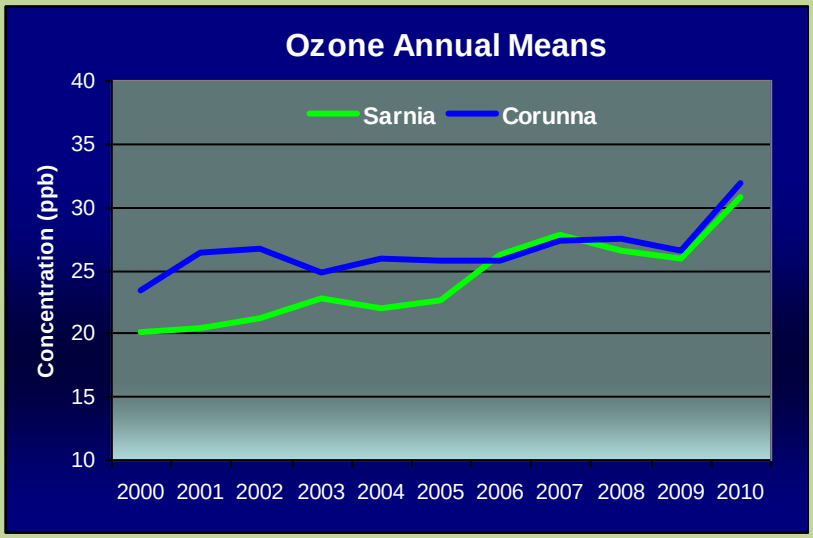


Figure 6

The SLEA measures ozone with continuous analyzers that use ultraviolet light.

2010 Results:

Ozone is monitored at two SLEA sites in the Sarnia-Lambton area: (1. the Front Street site is an urban location in downtown Sarnia, just north of the area's main industrial complex and (2. River Bend is a suburban location on the south side of Corunna, just south of the main industrial complex. Both of the SLEA monitoring sites are impacted by long-range transport of O_3 and its precursors from the United States Midwest. Ontario Ministry of the Environment air quality research has identified that over 50 percent of the province's ground level ozone originates in the United States.

Concentrations are generally lower in urban areas, due to its reduction by reaction with nitric oxides, which are emitted by vehicles and local combustion sources. The highest 2010 hourly concentration was 95 ppb and was measured at River Bend (Corunna) on July 8 under southwesterly winds. Ozone concentrations exceeded Ontario's hourly Ambient Air Quality Criterion (80 ppb) 25 times at Front Street and 37 times at River Bend.

In addition, the Ontario Ministry of the Environment has designated 50 ppb as the Air Quality Index (AQI) trigger level, above which air quality is designated as "poor." Figure 4 illustrates, through a wind directional plot, the annual number of hours greater than 50 ppb in 2010. The highest frequency of hours is from southerly directions supporting the probability of long-range transport of ozone and its precursors from U.S. sources. Exceedances of the Ontario AQI, Ambient Air Quality Criteria and the Canada-wide standard for 2010 and over the past 10 years are shown in Table 1. Figure 5 illustrates the maximum 1-hour O_3 concentrations during the past 10 years. The graph shows a downward trend, which is generally due to a reduction in nitrous oxides emissions in Ontario and the United States. As a result, O_3 production during the summer months also decreases. At the same time, a trend towards increased annual means levels is noted in Figure 6. The upward trend is generally

attributed to rising global background levels of O_3, along with a reduction in local nitrous oxides emission

(local nitrous oxides emissions react with ambient ozone to reduce local O_3 concentrations).

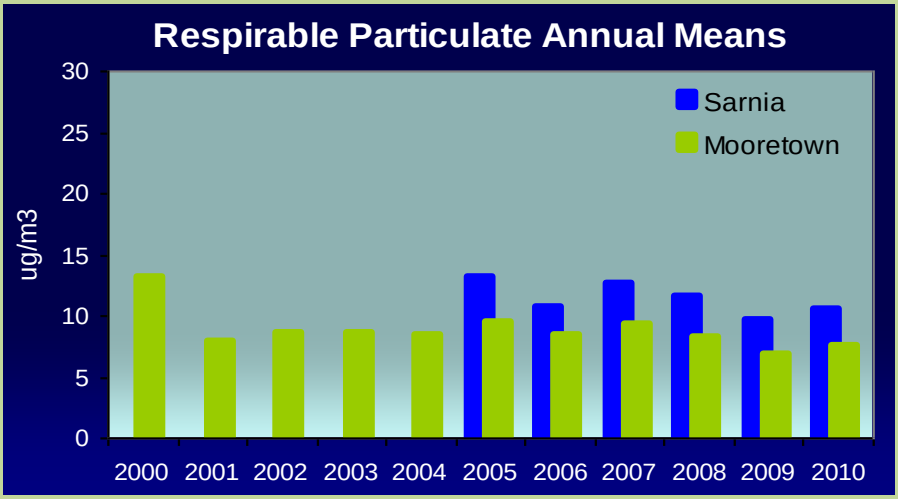


Figure 7

Particulate Matter ($PM_{2.5}$)

Airborne particulate matter is classified according to its aerodynamic size. Fine or respirable particulates ($PM_{2.5}$) refer to particles 2.5 microns or less in diameter, which could penetrate deep into a person's respiratory system. Particulates originate from many different industrial and transportation-related sources, as well as from natural sources. Similar to ozone, fine particulates can be carried on prevailing winds over great distances.

The method for real-time, continuous measurement of $PM_{2.5}$ is relatively new and has been developed and refined over the past 13 years. It is generally used in Canada by Environment Canada and in Ontario by the Ministry of the Environment. SLEA has measured $PM_{2.5}$ since 2000 at Moore Line, to complement the ministry's monitoring activities in Sarnia. A second Sarnia monitor was commissioned by the SLEA at its Front Street site in 2005.

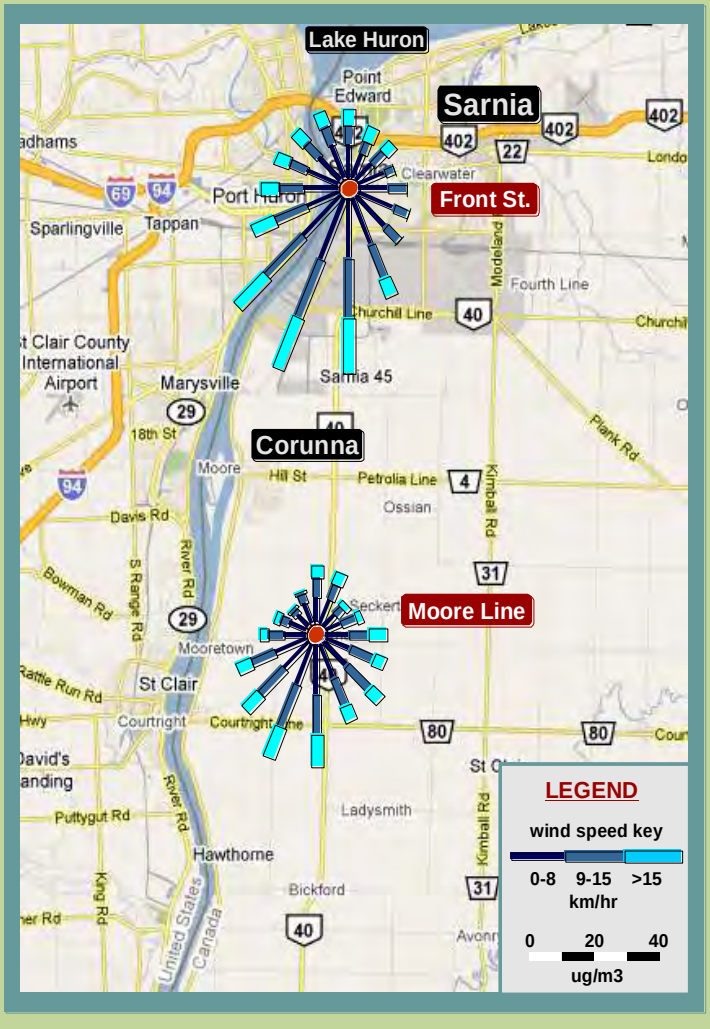


Figure 8

2010 Results

Annual respirable particulate levels are shown in Figure 7. Sarnia is north and Mooretown is south of the main industrial complex, both along the line of prevailing winds. Levels in Sarnia are generally higher than those of Mooretown, due to local industrial activities.

The Canada-wide Daily Standard for $PM_{2.5}$ is 30 micrograms per cubic meter. The standard was exceeded on six days during 2010. The maximum daily average was measured at Front Street – Sarnia on August 14th under southerly winds.

The influence of distant sources can be seen at Mooretown under southerly winds, as shown in Figure 8. It is estimated that over 50 percent of Ontario's $PM_{2.5}$ comes from the U.S.

Nitrogen Oxides (NO_x)

Nitric oxide and nitrogen dioxide, together known as NO_x are colourless-to-reddish-brown gases that convey a pungent and irritating odour. NO_x are released into the atmosphere during combustion processes.

Nitrogen dioxide transforms in air to form gaseous nitric acid and nitrates, which contribute to the formation of fine particulate matter. It also has a major role in the atmospheric reactions that produce ground-level ozone. The largest sources of NO_x are motor vehicles, fossil fuel power generation plants and industrial processes. Monitoring is performed using a method called chemiluminescence.

2010 Results

For over 30 years, NO_x have been monitored by the SLEA at its Sarnia and Corunna sites. Figure 9 illustrates the annual levels at both monitoring sites. Over the past 10 years, local NO_x levels declined by approximately 50 percent and 30 percent at Sarnia and Corunna monitoring sites, respectively. Reductions from local industry and motor vehicles, due mainly to more stringent emission standards, have contributed to the lower levels. The Ontario nitrogen dioxide hourly and daily criteria were not exceeded during 2010.

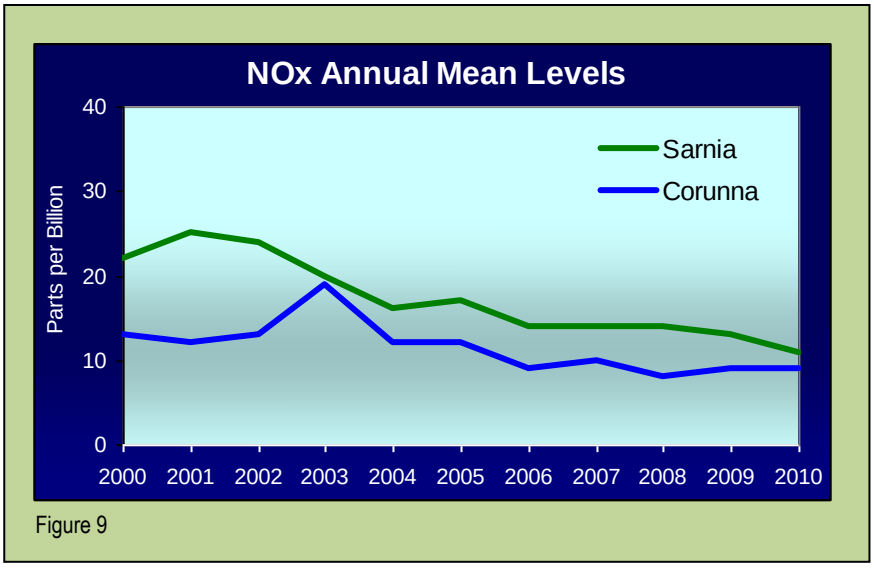


Figure 9

Volatile Organic Compounds (VOCs)

Volatile Organic Compounds (VOCs) are compounds containing carbon, which are gases, or evaporate easily into the atmosphere at normal temperatures. VOCs are contained in a wide variety of materials, including crude oil, that are the basic raw material for many local industries. The compounds contribute to the formation of ground-level ozone and smog, and are a possible health concern.

In operation since 1986, the SLEA's monitoring program for VOCs is implemented in three phases. Initially, a group of 50 VOCs is collected at the Sarnia and Corunna monitoring sites over a 24-hour period once every 12 days and then taken to the laboratory for analysis.

In a sub-group routine introduced in 1994, 11 of the 50 VOCs are measured using an hourly automated sampler at the Sarnia site. Using a third procedure in practice since 1976, the VOC ethylene is monitored separately on a continuous, hourly basis at five monitoring sites.

Ethylene is of particular interest to local industries, as it is a major commodity produced, used and stored in the area.

2010 Results:

The annual sum averages of the group of 50 VOCs (excluding ethylene) continued the downward trend recorded over the past 10 years (see Figure 10). Total levels have dropped by approximately 35 percent since 2000. However, annual levels have not changed much over the last five years. During 2010, all concentrations (except for ethylene) were below all associated Ontario ambient air quality criteria.

The Ontario daily ambient air quality criterion for ethylene was exceeded for a total of twenty-nine days during 2010 at the various monitoring locations (see Figure 11). Generally, the number of days exceeding the criterion has decreased over the past ten years due to industrial emission reduction initiatives.

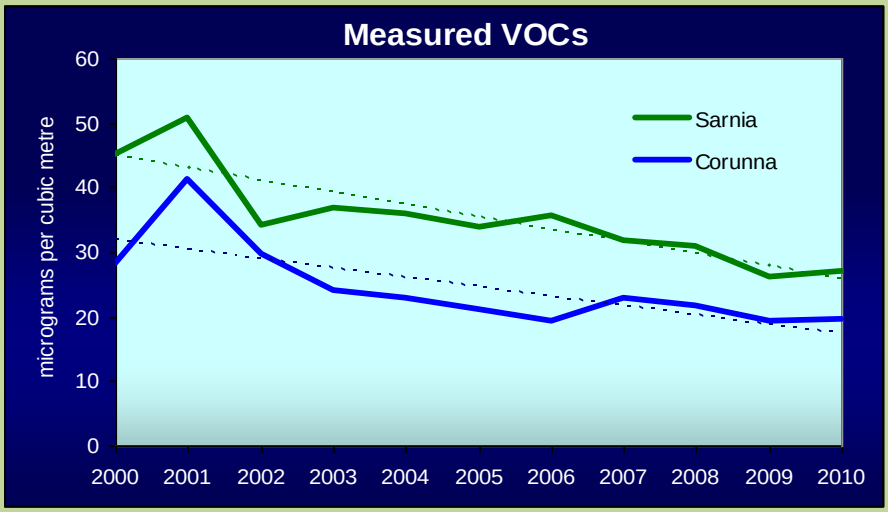


Figure 10

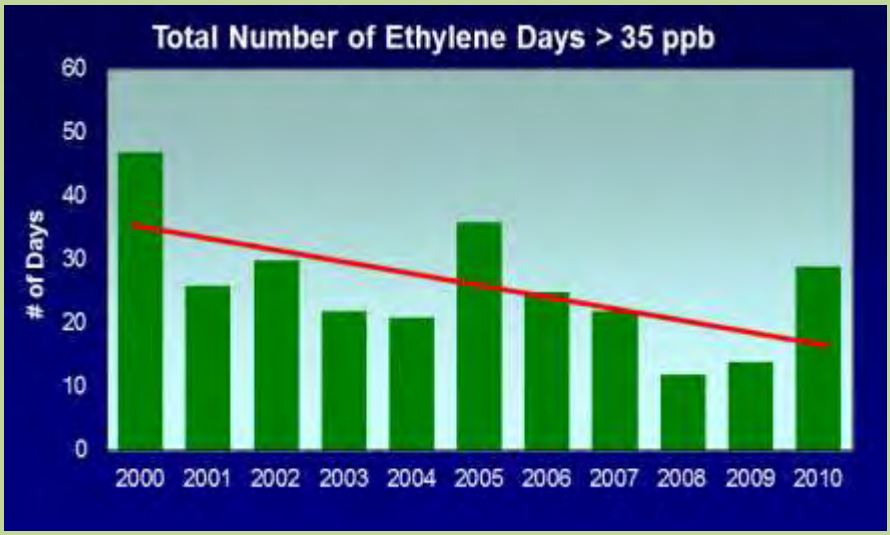


Figure 11

Monitoring our Water Quality

2010 Snapshot:

- Six of the 20 targeted compounds were detected
- Less than 2 percent of the more than 173,000 monitor findings were greater than or equal to the unit's minimum detection limit
- All analyses were below 1 ppb for the fifth consecutive year

With many of Sarnia-Lambton's major industrial facilities operating adjacent to, and integrated with, the St. Clair River, the SLEA's continuous water monitoring program remains as an important component for a number of member companies.

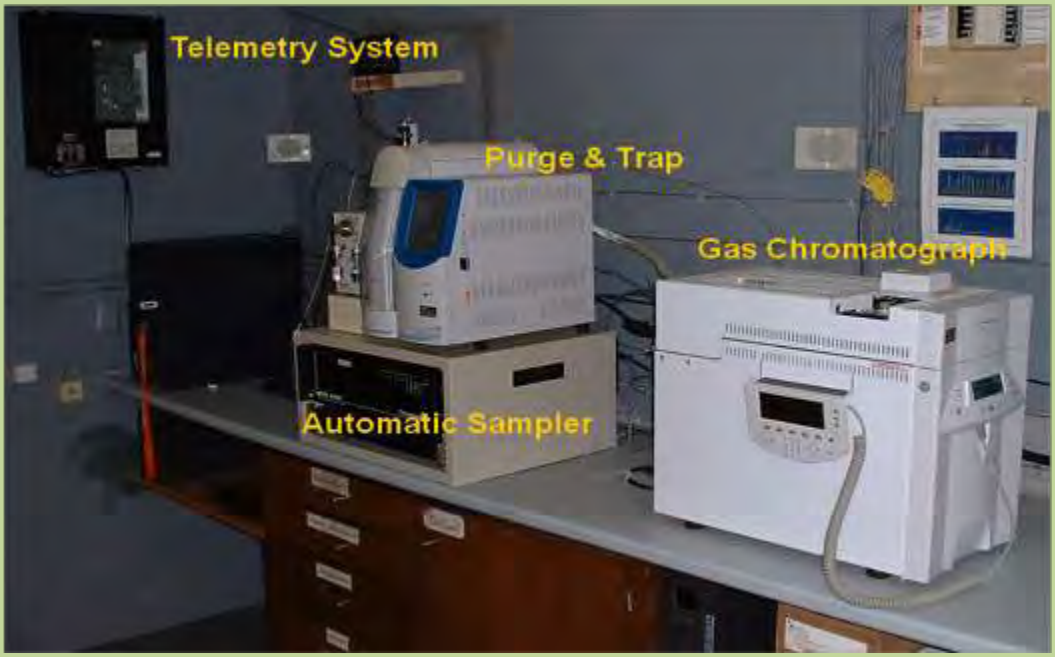


Figure 12

The core of the SLEA's annual water quality program is the continued operation of a St. Clair River monitoring station, strategically located south of Courtright, just downstream of Sarnia-Lambton's main industrial complex. The station is well situated to capture the main flows of the river. Since 1987, the organization has operated a continuous volatile organic compounds monitor, capable of detecting extremely low levels of any targeted chemicals present

The monitoring system (see Figure 12) consists of an automatic stream sampler, which is programmed to collect a river water sample each hour. The system includes a purge and trap sample concentrator, where organic volatiles are purged from the sample. The unit's central component, a gas chromatograph, identifies the chemical composition of the sample, targeting the compounds associated with local industrial process. A telemetry system sends data reports to the network's server for review and archiving by the a third-party technical specialist. Should the targeted chemicals be detected at any time during the routine sampling process, a system of preset alarms is triggered and automatic warnings of potential water quality concerns are relayed to the SLEA, as well as to the Ontario Ministry of the Environment. The extensive database is highly accuracy and extremely reliable, lending substantial credibility to the SLEA's immediate and long-term water quality records.

While the primary role of the monitoring station is to develop long-term trends concerning the water quality of the St. Clair River, the data also serves to challenge the members to meet their ultimate objective of no spills to the river.

2010 Results

Under the SLEA's 2010 continuous water quality monitoring program, nearly 8,700 samples from the St. Clair River were collected and analyzed for compounds commonly associated with local industrial activities. During the year, only six of the SLEA's 20 targeted volatile organic compounds were detected. From a total of 173,300 separate findings, only 2,210 results (1.28 percent) were greater than, or equal to the minimum detection limit established for the precise instruments performing the laboratory tests. For the fifth consecutive year, and the sixth time in eight years, all analyses were below one ppb. A summary of the findings is presented in Table 2.

Compound	Cyclohexane	Benzene	Toluene	Ethylbenzene	m+p-Xylene	o-Xyl/Styrene
Detection Limit (MDL)	0.04	0.05	0.08	0.08	0.16	0.16
Frequency of Detection (%)	0.3	1.4	22.2	0.1	1.5	< 0.1
Number of Analyses	23	121	1926	9	129	2
Average	<mdl	<mdl	<mdl	<mdl	<mdl	<mdl
Minimum	<mdl	<mdl	<mdl	<mdl	<mdl	<mdl
Maximum	0.21	0.13	0.54	0.09	0.32	0.17

Table 2

Figures 13 and 14 show the number of detections of all compounds during the past 10 years of continuous monitoring. In the station's database library, the time scale for each year is further broken into monthly segments, against which the number of detections can be plotted.

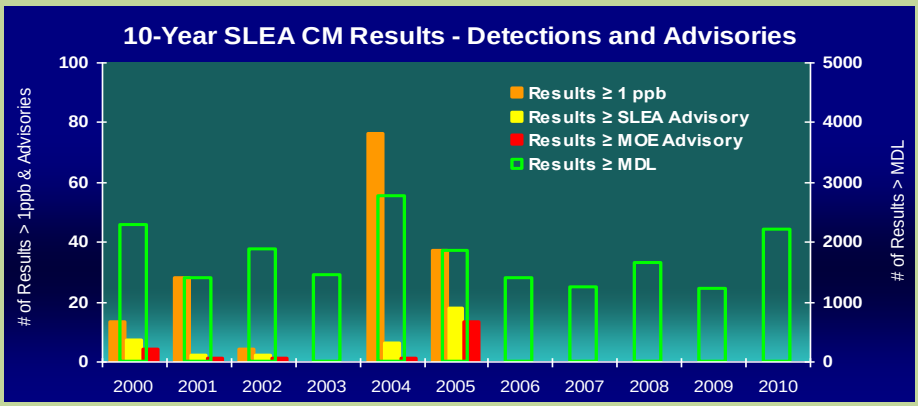


Figure 13

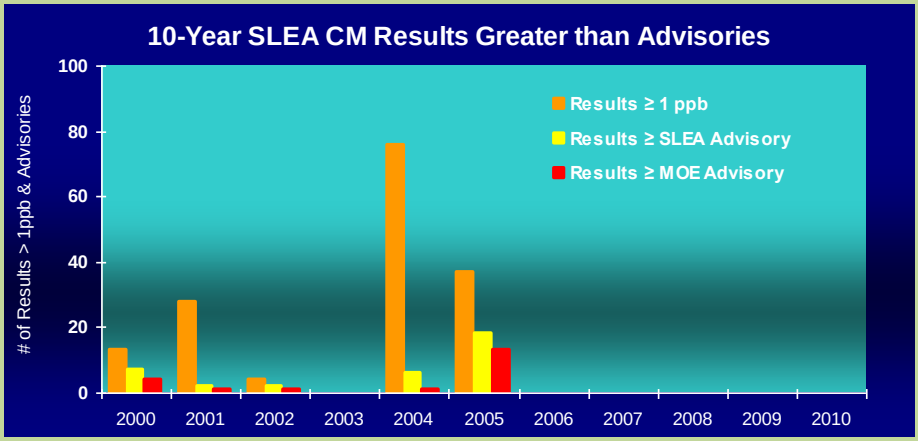


Figure 14

Figures 15 and 16 present the frequency and levels of toluene detections compared to the other targeted compounds. In Figure 15, the dark vertical bands indicate the summer months of June through September.

During the past 10 years,

toluene has been the compound detected most frequently by the monitoring station. The consistency of the characteristics of detection, that is, the season, the day of week and the time of day, prompted further studies. Subsequent investigations pointed to a strong correlation between the elevated levels of toluene and the frequency of pleasure boating traffic in the St. Clair River.

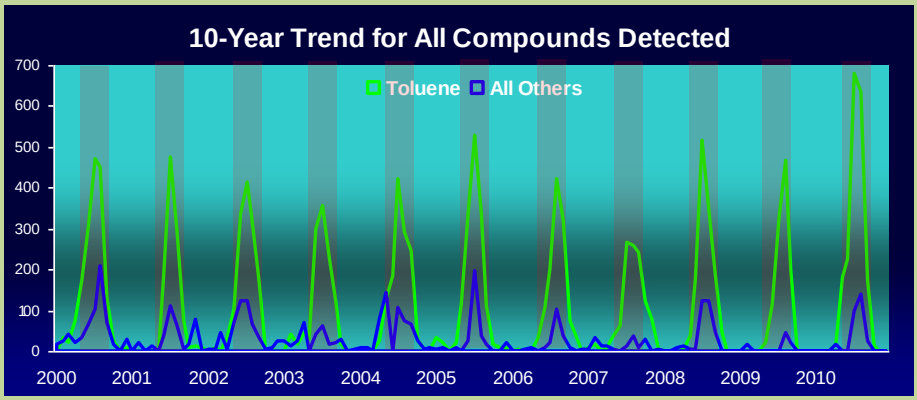


Figure 15

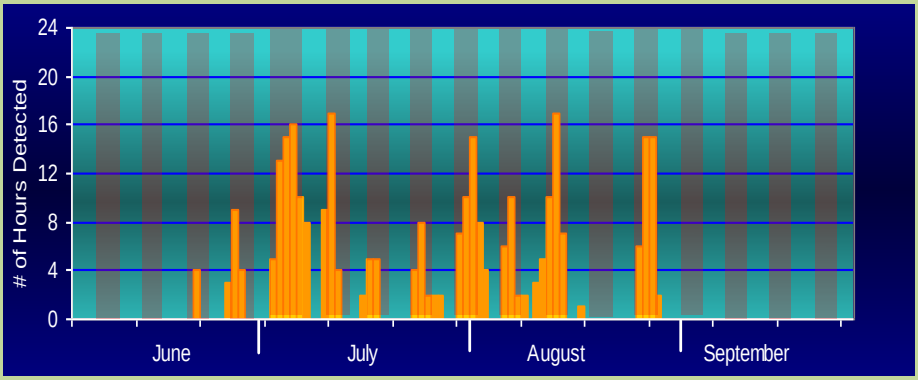


Figure 16

The detection of toluene increases dramatically during the summer months and specifically on weekends, when the weather is conducive to boating activities, as shown in Figure 16. In the lower figure, the dark vertical bands highlight the summer weekends. Other compounds, notably benzene, ethylbenzene and xylenes, were also detected during the same timeframes, although to a much lesser extent. It is worth noting, however, that the compounds make up most of the "All Others" subset in Figure 15. They are all components of gasoline and are emitted to the water from the exhaust of marine vessel engines. Small spills during fuelling may also contribute.

Goal of delisting St. Clair River a step closer

For much of the past three decades, Sarnia-Lambton industries, environmental groups and concerned citizens have worked with their counterparts from neighbouring U.S. shores and federal, provincial and state environment agencies to achieve a single goal: to have the St. Clair River removed as an Area of Concern, under the Canada-U.S. Great Lakes Water Quality Agreement.

By 2010, significant work had been completed to improve the quality of the river water and adjacent lands. Remediation projects have removed several isolated areas of contaminated riverbed sediment, which were the remnants of historical industrial activities on the international waterway. In retrospect, the work is recognized by many as a significant step in the delisting process.

The next critical step forward, planned for October 2011, involves further subterranean investigations on the few remaining pockets of contaminated sediment. The target areas are situated downstream of Sarnia's chemical complex, adjacent to Aamjiwnaang First Nation and St. Clair Township. The geophysical surveys will identify further details about the physical nature of the areas of concern, along with any potential impediments to remediation, such as riverbed pipelines and other natural obstacles.

The planned geophysical surveys will be overseen by project leaders from Environment Canada, the Ontario Ministry of the Environment and their multi-stakeholder forum, the St. Clair River Sediment Committee. The SLEA's Dean Edwardson is a member of the sediment committee. The surveys are intended to accurately define the full extent and characteristics of the contaminated sediment, offer a strategy for conducting the remedial work and provide an associated cost.

Determining the measures needed to clean up several isolated areas of contaminated riverbed sediment is expected to lay important groundwork for delisting the St. Clair River as a government area of environmental concern.

Interested citizens will have an opportunity to consider and comment on the federal and provincial governments' final determinations and proposed remediation measures, when available in 2012. The field work could be undertaken in 2014, following the public input phase and the completion of a detailed action plan.

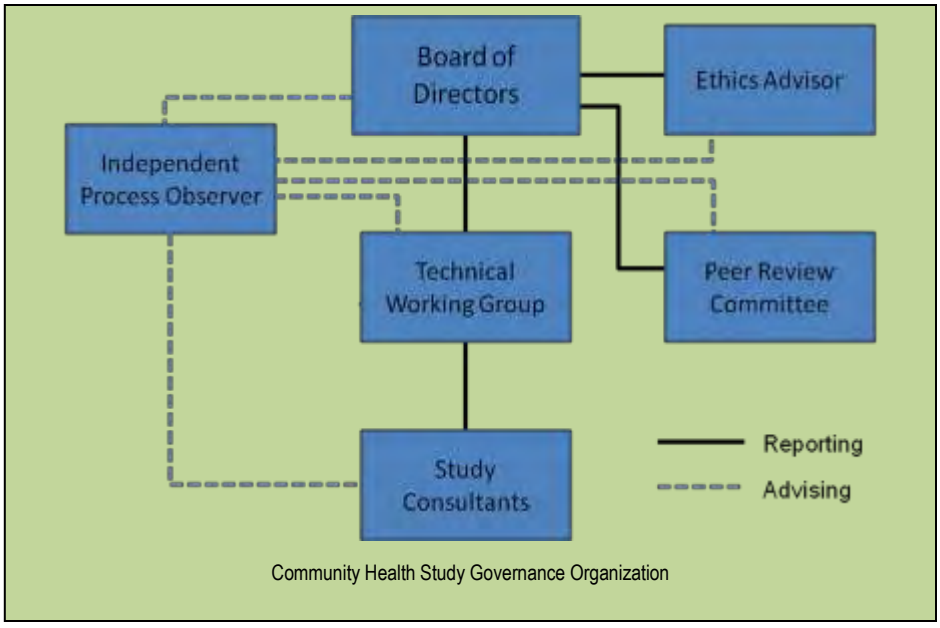
Concurrent with the field preparations and remedial work, federal, provincial and state environmental agency representations will meet to review the condition of the St. Clair River, from its Lake Huron source to its outlet in Lake St. Clair, to determine the need for further, if any, improvements in anticipation of its delisting as an area of concern.

Community health study slowed by lack of funds

A local multi-stakeholder group continues to make progress in its efforts to determine the presence of any interrelation between the health of local residents and the presence of local industry. However, the pace of its progress has been slowed substantially, due to a lack of funding for the project.

The purpose of the study is to determine if there are exposures unique to Lambton County that have caused adverse effects on the health of local residents. The study will involve a science-based and peer-reviewed assessment of community health concerns and actual conditions. Whether or not a connection exists between residents' health and local industry will be determined by comparing the state of the community's health with that of other citizens in the rest of Ontario and Canada.

Funding remains a major impediment for the start of Phase Three, which would include moving the study into the field to collect health data about local residents. The County of Lambton has committed services in kind and both senior levels of government will be approached for their funding assistance. In addition, the board is pursuing possible strategic alliances with a variety of government agencies and research institutions, as a means of advancing the local study. For example, the board is cooperating with the Ontario government, as it conducts a province-wide health study, where common interests might ultimately help advance the local project. Earlier this year, the board formally endorsed the provincial study and was encouraging local residents to participate. Depending on the level of local involvement, it might be possible for Sarnia-Lambton to be selected as one of the locations for further detailed study under the Ontario government's health investigations into chronic disease.



Community Health Study Governance Organization

Phase One of the project, which was completed in mid-2008, saw the establishment of a governance structure for the health study board, ensuring it remained independent, yet accountable to the community. A preferred approach to conducting the science-based study and securing the necessary funding was also developed.

Subsequently, in Phase Two, the board gathered and analyzed study related historical data. Conducted by an independent consultant, the

investigations involved a systematic literature review, along with formal and informal public consultation. The literature review of similar, previously conducted studies did not conclude that there were higher rates of particular illnesses in Sarnia-Lambton due to its proximity of local industry. However, it was instrumental in narrowing the scope of the future, local study to investigate specific forms of health ailments, including several types of cancer and lung conditions in people from various age groups. The review also made it clear that controls for evaluating various kinds of exposure, as influenced by such factors as occupation, lifestyle and socio-economic status, would also need to be incorporated into a future, scientifically sound study.

Public input was accomplished through a series of public meetings, in combination with a Web-based questionnaire and a formal telephone survey. All were conducted between the latter part of 2010 and early 2011. Among the common themes, local residents emphasized that the health study was important to the community and its future. Through the telephone survey it was determined that 88 percent of county residents agreed that the health study needed to be conducted, with approximately half willing to take an active part.

The remaining step in the second phase of the work involves the analysis of the research findings and public input, to develop the most appropriate questions to pose in the upcoming study. Either Health Canada or the Ontario Agency for Health Promotion would assist in formulating the most appropriate questions.

The Lambton Health Study was conceived in 2006, when representatives of organizations from within the community came together, to discuss concerns about the local environment and the potential health effects on the residents of Lambton County. The participants represent First Nations, municipal governments, the Occupational Health Clinic for Ontario Workers, business and industry, labour unions, the community roundtable and Victims of Chemical Valley. To date, funding for the committee's activities has been provided by the Province of Ontario, the County of Lambton, the Sarnia-Lambton Chamber of Commerce and the Sarnia-Lambton Environmental Association. Administration support is provided by Lambton County, with in-kind services having been made available by the federal government.

Local water sources protection proposal receives provincial approval

An assessment of the locations and vulnerability of drinking water source areas in the local St. Clair region was approved by Ontario Ministry of the Environment in early 2011. The report was prepared by the Thames-Sydenham and Region Source Protection Committee.

The approval of the technical document, *The Amended Proposed Assessment Report for the St. Clair Region Source Protection Area*, is an important step by the local grassroots body towards the completion of a comprehensive plan, designed to identify and protect critical drinking water source area across our local watersheds. The assessment report was recently approved by the Ministry of the Environment.

Development of the source protection plan is being coordinated by the committee through a partnership involving the St. Clair Region, the Upper Thames River and the Lower Thames Valley conservation authorities. The responsibility for developing and implementing a drinking water sources protection plan rests with the committee, a multi-stakeholder group. Formed under provincial legislation, the 25-member body brings together a considerable breadth of knowledge and experience to the table,

Members of the Thames-Sydenham and Region Source Protection Committee meet to review their assessment of drinking water source area locations in the local St. Clair region watershed. The multi-stakeholder group, which includes the SLEA as an industry representative, is leading the area initiative to protect important natural drinking water sources.

with representatives from area municipalities, major economic sectors, environmental non-government organizations, recreationalists, academics, property owners and interested individuals. The SLEA's Dean Edwardson represents local industry's environmental interests at the table.

The recently approved assessment report presents the rationale for the development of the source protection plan. It inventories and assesses:

- Municipal drinking water sources
- Types of activities considered as threats within defined vulnerable areas
- Water quality issues associated with the natural, untreated water feeding municipal drinking water systems that could be addressed through source protection planning
- Assessments (called water budgets) of source areas where the quantity of water available for the municipal drinking water source might be stressed, and
- Background data for source protection planning

The source protection plan is to be completed prior to August 2012 and will contain policies to manage existing significant threats to municipal supplies of drinking water and to prevent the emergence of new significant threats. In addition, the source protection committee could develop policies to address moderate and low threats to municipal drinking water sources. Policies to monitor the progress of plan implementation will also be included.

In preparing the proposed assessment report, seven local open houses were held. The forums provided information about the vulnerability and threat assessments of vulnerable areas proposed for designation as "intake protection zones" for Petrolia, Wallaceburg and the Lambton Area Water Supply System. . In addition, information was provided about highly vulnerable aquifers and significant groundwater recharge areas. Close to 4,400 invitations to attend the local open houses were mailed to those living within the proposed intake protection zones, with approximately 120 people attending. Comments received were valuable to the source protection committee in finalizing the proposed assessment report. Initial feedback from the Environment Ministry allowed for further content

revisions, before the document was submitted for approval in February.

In a further positive development during the past year, the Chippewas of Kettle and Stony Point First Nation joined the initiative to protect watershed source areas within its jurisdiction. As an important first step, the band council passed a resolution to have its intake on Lake Huron included in the initiative, under the province's Clean Water Act. The decision prompted a cooperative effort by the local Thames-Sydenham Source Protection Region partnership and its neighbour to the north, the Ausable Bayfield-Maitland Valley Source Protection Region, since the watershed-based jurisdictions of both groups extend over the drainage basins of the First Nation reserve.

Public consultation has been an important and ongoing part of the Thames-Sydenham and Region Source Protection Committee's investigations.

Since receiving the band's resolution in late 2010, staffs from both source protection regions have worked diligently to engage the community and assist local landowners to take part in the Ontario Drinking Water Stewardship Program. The provincial program offers financial assistance to farmers, landowners and small or medium businesses for activities that reduce threats to local drinking water sources. Within just one month, 25 projects had been approved for funding. Across its entire area of interest, the Thames-Sydenham and Region Source Protection Region has seen grants totalling $116,000 approved under the program.

Towards a source protection plan

Following the province's approval of the assessment reports, the Thames-Sydenham and Region Source Protection Committee will proceed with the production of its source protection plan. The process will involve consideration of the many tools that could be used to protect our area's precious drinking water sources. Some threats could be reduced through voluntary action by the property owners, possibly with assistance from subsidy and cost-share programs. Other threats might be reduced or eliminated through targeted educational campaigns. In still other cases, threats might be best handled by means of land use management regulations. Where regulatory tools are needed, proven regulatory processes (such as permits, approvals, zoning bylaws, official plan amendments, etc.) could be applied. In certain other situations, new tools, such as risk management plans, might be required. Risk management plans would allow the municipality and affected landowners to negotiate an approach for meeting the drinking water objectives of the source protection plan.

Throughout the plan preparation process, the source protection committee would remain committed to encouraging extensive public and stakeholder input. Additional information about the committee and its ongoing activities may be obtained at www.sourcewaterprotection.on.ca. Information about committee meetings, including notices, meeting minutes and reports, are also available through the website.

Nature studies still attract attention in local classrooms

If anyone knows what attracts young people's attention these days, it is a teacher. While the popularity of computer-based resources in the classroom grows, many local teachers continue

to recognize the educational impact of two hands-on natural science programs. The in-class activities are presented by the St. Clair Region Conservation Authority (SCRCA), with financial support from the SLEA.

The conservation authority's popular *Go with the Flow* and *River Bottom Critters* classroom programs draw students to natural resources studies using a different approach than that applied by computer-based tools. Skilled and knowledgeable conservation education staff members engage students in hands-on activities and lively discussions that connect them directly to the natural environment in their own school community.

Local students of all ages continue to enjoy and learn from the St. Clair Region Conservation Authority's River Critters nature study program. The popular in-class visits by conservation education specialists give young people a much-appreciated hands-on opportunity to explore the creatures that live in the sediments of the St. Clair River.

Go with the Flow explores the movement of water through the ground beneath the earth's surface, with the assistance of a working groundwater flow model and grade-specific study activities. Rocks and minerals, groundwater flow and uses, alternative energy and climate change investigations sharpen student's skills of observation and broaden their understanding of environmental processes. They also learn to test ideas, gather data, look for patterns in the data and communicate their observations with others. As their skills and awareness develop, the students also gain a greater appreciation for their shared, natural world.

River Bottom Critters gives students a first-hand opportunity to see how animals that live along area streambeds can be used to determine the health of our local aquatic environment. Equipped with a line of investigations and guided by their own curiosity, the students search through actual samples of river bottom sediment to discover the wealth of wriggling and vibrant life forms that thrive in the St. Clair River and its many tributaries.

During 2010, more than 4,300 students from 26 area schools were involved in the two SLEA-sponsored environmental programs.

Linda Banovsky, a local Grade 5/6 teacher who has participated in both SCRCA programs for several years, says the combination of conservation education staff expertise, their methodical teaching approach, the upbeat pace and the associated hands-on activities ensures that every student is engaged fully and

comes away with a practical understanding of the subject matter.

In addition to her teaching duties, Banovsky is the advisor of her school's environmental club. She is eager to have her students share her concern for the health of the global environment and considers the SCRCA's programs to be vital in achieving that end. "The environment is so much a part of their future. But, if the children don't see it first hand, they won't feel as connected to it and realize how important it is to conserve our natural resources."

With funding support from the SLEA, area school students participate in the St. Clair Region Conservation Authority's *Go with the Flow* conservation education program. Using models and class discussions, students are able to visualize the natural flow of groundwater and its importance to local communities.

Demonstrations are a big part of the approach used in the programs. "Without the demonstrations, or the connections that (the conservation education leader) make with our own area, I don't think the program would have had the value that it has," notes Banovsky.

Both programs have been designed to coincide with various components of the school curriculum. The students can link their SCRCA activities to their studies of biodiversity, energy conservation, the food chain and people's place in it, writing, diagramming and artwork.

Carefully worded questions posed throughout the programs challenge the students to look more closely at live samples and hands-on demonstrations, to glean real-life facts and connections to their community's natural environment. "Enquiry based learning is always more effective than any other kind. Children are curious, naturally, and when you engage them effectively, the follow-through is evident in many ways," observes Banovsky.

The students consistently demonstrate the depth of their understandings of the subjects covered by the SCRCA's programs, whether by generating long lists of the specific facts they've learned, or by applying their new-found knowledge in subsequent class exercises.

The feedback from participating teachers, students and parents continues to recognize both programs as valuable, educational tools of high impact. Following the latest Fall 2010 series of classroom visits, a parent wrote: "I just wanted to let you know (child's name) LOVED the bugs/critters. She was talking about them for hours! Thanks so much for such wonderful hands-on learning!"

Banovsky knows she'll have *Go with the Flow* and *River Bottom Critters* back in her classroom next year, because of the positive effect the programs continue to have on all of her students. "I

see students who wouldn't readily participate in class willingly taking part in the hands-on experiments and talking about what they've seen. And by the end of the class, I hear, 'Gee, do we have to go?' and 'Can I stay and look a little longer?' a lot. When you have that reaction from children, you want to encourage it."

Preparing our community to manage adversity effectively

- **Promoting community preparedness**
- **Ensuring an effective response**

For the past two years, the SLEA staff has held the leadership of the Chemical Valley Emergency Coordinating Organization (CVECO) and its community education partner, the Community Awareness Emergency Response (CAER) Committee. The two organizations are part of local industries continuing commitment to operate in the best interests of its host communities.

Each year, local industry and municipal emergency responders participate in the annual Sarnia Area Disaster Simulation exercise, in order to coordinate their response strategies and sharpen their response skills. Over the years, staged incidents have addressed a wide range of emergency scenarios, including tanker truck-automobile accidents, as pictured.

Being prepared to protect lives and properties from incidents associated with natural or human occurrences should be an important part of every work environment. Since no one can predict precisely when an incident might occur, emergency response preparations should also be included in the routine of every home.

Local emergency responders from industry and municipal governments work cooperatively on an ongoing basis to manage the complementary CVECO and CAER components on behalf of local community residents. Through CVECO, a mutual aid emergency response system is maintained, where the resources of all private and public members are ready at hand to respond to an emergency situation.

From police traffic control and public notification through a municipal control group to the activation of full-equipped and highly trained first responders, CVECO's mutual aid participants are well prepared for a wide range of emergencies.

The CAER group encourages community involvement in two critical areas:

- Increasing community awareness about the industrial processes and materials managed by local plants, and
- Encouraging residents to prepare their own *Personal Action Plan* in anticipation of unforeseen events that might threaten them. With resources provided by CAER, family members can prepare their plan in approximately 30 minutes.

The CAER committee's encourages residents to visit its website, at www.caer.ca, for a checklist of home preparation activities and valuable information that can help keep family members safe during a local incident.

Pushing to Learn

What is left as a skills training challenge after you have conducted first response training exercised on a wide range of

emergency simulations involving a variety of plant site, rail yard and highway scenarios?

Member companies and municipalities of the Chemical Valley Emergency Coordinating Organization (CVECO) push the limits of real life to create plausible accident scenarios that will challenge their first response capabilities. The annual training sessions are referred to as the Sarnia Area Disaster Simulation (SADS) exercise. The intensive events typically involve all types of responders, including firefighters, police, emergency medical personnel, news media representatives and event monitors.

Planning for each simulation takes up to year and addresses an array of details, including specific response procedures, an inventory of the response vehicles needed, requirements for personal protective equipment, site access controls and participant tracking and road closures. All details must be worked out before the event can take place. Thanks to the creativity and care of exercise planners, CVECO mutual aid members have achieved considerable practical experience and maintain a high state of readiness for a broad list of potential incidents.

During the 2010 SADS exercise, Bruce Morrison, of LanXess, and John Kingyens, of Sarnia Fire Rescue Services, accepted the challenge of leading the organizing team. The objective of the exercise developed by the team was to pump water through a 5-inch diameter hose from a municipal water supply hydrant to the location of a simulated fire situated 3,300 feet away – close to the distance of 11 football fields placed end zone to end zone.

The exercise was designed to push the limits of the mutual aid organization's pumping equipment and to challenge the practical knowledge of all participating responders.

Under normal circumstances, well-positioned municipal hydrants typically limit the need for fire responders to pump large quantities of water over long distances. However, in emergency incidents where multiple streams are required to suppress or control a fire, or where equipment failures prevent routine relay hose configurations, an extra long water transfer might need to be established from hydrants located a considerable distance from the incident scene. The SADS exercise would prepare the CVECO members for such an unpredictable eventuality.

In addition to the water flow challenge, the exercise would also test the ability of the mutual aid team and its equipment to transfer fire suppression foam over a similar distance. No CVECO member had ever delivered foam in such a manner previously. "We understood the theory and proved on paper that it could be done," noted Morrison. "But, there were some who doubted that it could be put into practice in the field."

In the field, the simulation required establishing and managing a hose relay involving seven fire pumper trucks, which were supplied by Shell, Suncor, LanXess, the City of Sarnia, Nova Chemicals and Imperial Oil. "With pressures within the 5-inch hoses maintained at 100 pounds per square inch over the entire distance, the pumper relay would need to be handled very carefully from start-up to shutdown, to ensure the safety of everyone involved," Morrison said.

Following a pre-event briefing, 75 firefighters helped to establish and maintain the pumper truck relay line. When event observers, safety monitors and news reporters were accounted for, the 6-hour-long SADS event involved a total of 92 people.

From the event, the CVECO members achieved a very satisfactory water outflow rate of 1,500 gallons per minute,

with the prescribed pressure maintained. The outcome could only be achieved through the cooperation of all participants, who carefully followed common protocols for the duration of the entire exercise. Crowning the event, the mutual aid group successfully installed and operated a foam pumper and CVECO's hydro foam nozzle on the source and delivery ends of the 3,300-foot relay.

In assessing the impact of the most recent SADS exercise, Morrison said, "The water relay would have been a very complicated operation to undertake in the field for the first time during an emergency. Our ability to deliver foam over a long distance was a major finding for us.

"The exercise allowed us to resolve a number of questions about equipment compatibility, procedures and vehicle configurations and meet high objectives that had not been previously proven. In the end, the SADS exercise gave us a greater level of confidence in our abilities, which will ultimately keep us out of harm's way and benefit our community significantly."

Promoting the benefits of being prepared

If you're planning to hold a community event that attracts attention, be sure to include the following, proven ingredients.

Start with a core organizing committee of knowledgeable and dedicated representatives from a cross-section of Sarnia-Lambton companies and municipal governments. Position close to 100 seasoned exhibitors, with dozens of unique vehicles and hands-on demonstrations in a community centre. Add close to 1,500 Sarnia-Lambton school students. Your plan should include lots of fire trucks, emergency response vehicles and specialty equipment. Mixing the ingredients in the right measure could gain you a reputation for hosting one of the largest and best run educational exhibitions of its kind in Ontario.

Elementary schools from across Sarnia-Lambton make it a point to attend CAER's annual Emergency Preparedness Day, held each year at Sarnia's Clearwater Arena. During the most recent event, over 1,500 students visited participating emergency responders at 90 exhibits. Exhibitors offered helpful information and interactive experiences involving a wide range of associated activities, vehicles and equipment, including those above presented by the local detachment of the RCMP (left) and Sarnia Police Services.

The plan is a mirror image of the steps developed by the local Community Awareness and Emergency Response (CAER) organization for its highly successful Emergency Preparedness Day, held annually at the Clearwater Arena and grounds, in Sarnia. Chairperson Tom Cooper, a retired fire marshal from Sarnia's Imperial Oil site, and his fellow organizing committee members can attest to the event's ability to attract the attention of local school classes and residents. The event has been instrumental in helping people of all ages to better understand and appreciate the substantial capabilities of their community's emergency response and mutual aid group and CAER's counterpart, called the Chemical Valley Emergency Coordinating Organization (CVECO).

Since CAER's first community education event in 2006, the number of exhibitors and visitors to the preparedness day has almost doubled. "This year," reported Cooper, "we had about 90 exhibitors and almost 1,500 students from area elementary and secondary schools scheduled to attend." The involvement by

secondary schools is a new development, with students seeing the day as a good opportunity to investigate careers with the first response organizations in attendance. In appreciation for the support of local school boards and teaching staff, CAER's organizing committee looks after the scheduling and cost of bussing classes to and from the event. Students from Lambton College's Fire Science Technology Program are also involved, assisting the organizing committee for the entire day.

Emergency Preparedness Day exhibitors are dominated by CVECO member companies and municipalities. However, with the popularity of the event growing each year, police, fire and emergency management services from provincial, national and adjacent U.S. agencies also enjoy attending. During the most recent event, a number of antique fire truck owners also participated for the first time, forming a new exhibit area called Heritage Road.

Planning begins five months in advance of the annual May event, with committee members diligently and enthusiastically managing all aspects of the day. Their assignments are wide ranging and include incorporating improvements over the previous year, sending out school class notices and coordinating bussing, contacting potential exhibitors and ordering supplies for the twoonie hotdog and hamburger concession booth. Community celebrities do the cooking in the food booth, with the proceeds going to a local charity.

"The exhibitors enjoy the day as much as our visitors," observed Cooper. Again this year, booth holders made special presentations that attracted the interest of their visitors.

Throughout the exhibition grounds, students and adults alike could be seen engaged in conversation with exhibit representatives, trying on responders' gear, exploring computer-based simulations, watching demonstrations, climbing into specialized vehicles of all shapes and sizes and gaining first-hand knowledge about injury prevention and staying safe. This year, LanXess sponsored a passport system, which encouraged students to interact one-on-one with the exhibitors who would stamp their cards. When filled, the passports offered four diligent holders the chance to win a gift certificate.

The most recent Emergency Preparedness Day involved an extensive list of large-scale exhibits, including a high-angle rescue demonstration by a team from Nova Chemicals, the Ontario Provincial Police's robotic explosives disposal unit, Suncor's search and rescue team's hazardous material equipment display and Preferred Towing's rotator unit for up-righting overturned tankers. In addition, Sarnia Police Services' Tactical Unit staffed its equipment display and Sarnia Fire Services conducted a fire extinguisher training exercise for interested visitors.

While the interaction between visitors and exhibitors is important, CAER also hopes the local community will appreciate the undertones of the event. "This is the one day, when residents can come out and see the full extent of their community's mutual aid emergency response capabilities and the strong sense of cooperation that exists among the various industry and government responders," noted Cooper. "You would have to go pretty far to find another community that is as well served as Sarnia-Lambton."

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