REPORT for 2009

New Brunswick Air Quality Monitoring Results

Environmental Reporting Series

New Nouveau Brunswick

NEW BRUNSWICK

AIR QUALITY MONITORING RESULTS

FOR THE YEAR

2009

New Brunswick Environmental Reporting Series

State of the Environment Branch
New Brunswick Department of Environment
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EXECUTIVE SUMMARY

This report summarises air quality monitoring data in New Brunswick for 2009. The report is intended to provide a convenient summary of air quality results for general public information, with emphasis on air quality assessment in relation to existing air quality standards and objectives. Long-term trend data are also presented for representative sites.

Air quality has been monitored in New Brunswick since the 1960s, when several short-term studies were carried out in Saint John. Since that time, the size of the air quality monitoring network has grown as interest in air quality has increased and monitoring technologies have improved. This Report presents summary statistics from instruments at 57 monitoring sites in the province, with additional statistical data (in chart form) in an Appendix. The report also includes results from the acid rain network of 12 sites and monitoring of volitile organic compounds (VOCs). Details are also provided in the report on the quality assurance procedures used in the provincial air quality system.

In 2009, DENV brought online a new state of the art data aquisition system. This new system will maximize the efficiency of data collection, data quality assurance, data storage and data sharing in the future.

There were no exceedances of New Brunswick air quality objectives for nitrogen dioxide or carbon monoxide at any of the provincial monitoring sites in 2009. Exceedances of the 1-hour standard for sulphur dioxide were lower in Saint John than in 2008, and very infrequent elsewhere. There was one exceedance of the 1-hour National Ambient Air Quality Objective for ozone at the Hillcrest site. The number of exceedances of total reduced sulphur (TRS) in Nackawic and Saint John increased slightly in 2009 compared to 2008, but remained low. Levels of $PM_{2.5}$ and ozone remained below the Canada-wide Standards (with the exception of the Fundy site), in advance of the 2010 achievement date.

Although acid deposition has generally declined since the early 1990s, its effects continue to be of concern in the province, particularly in the south-west, which is the area of the province that is most sensitive to the effects of acid rain. At all of the sites in the network, acid deposition values in 2009 were lower as compared to 2008. Concentration levels in 2008 and 2009 have been the lowest recorded concentrations to date. The trend overall is downward since 1989.

An examination of air quality trends at sites with long records indicates that since the late 1970s and 1980s, air quality has improved for all pollutants currently being measured, with the possible exception of ground level ozone, for which no clear trend is apparent. Annual average levels of sulphur dioxide have decreased significantly over the past 15-20 years. The long term levels of carbon monoxide and nitrogen dioxide have also decreased.

Annual average total volatile organic compounds (VOCs) concentration continued to decline at Forest Hills in 2009 as it has since 2005. At Champlain Heights, there was a decrease in total VOCs concentration between 2008 and 2009.

Feedback

We are interested in your opinions and feedback on this report. All suggestions will be considered, and if possible, incorporated in future reports. You may contact the State of the Environment Branch at (506) 457-4844, by fax at (506) 453-2265 or by e-mail at stephanie.macdougall@gnb.ca with any comments. The layout and some sections of text contained in this report are courtesy of previous annual reports prepared by Rob Hughes.

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List of Acronyms and Abbreviations

DENV	Department of Environment
ppb	Parts per billion
ppm	Parts per million
$\mu g/m^3$	Micrograms per cubic meter
CO	Carbon monoxide
SO_2	Sulphur dioxide
NO_2	Nitrogen dioxide
O_3	Ozone
TRS	Total reduced sulphur
H_2S	Hydrogen Sulphide
NO_x	Nitrogen oxides
TSP	Total suspended particles
VOCs	Volatile organic compounds
$PM_{2.5}$	Fine particulate matter
BAM	Beta attenuation mass
TEOM	Tapered element oscillating microbalance
IQUA	Index of the Quality of the Air
AQHI	Air Quality Health Index
CWS	Canada-wide Standard
NAPS	National Air Pollution Surveillance
PAH	Polycyclic Aromatic Hydrocarbons

1. INTRODUCTION

This report summarizes air quality information gathered during 2009 at monitoring locations across New Brunswick. A summary of data from the provincial acid precipitation monitoring network is also included. The report focuses on ambient (i.e. outdoor) air, which provides an indication of environmental quality in terms of air pollution.

Air quality objectives used in New Brunswick are listed on page three of this report. Additional information on air quality standards and objectives, sources and effects of air pollutants, climate change and air quality may be found on the Department of Environment (DENV) web site at:

http://www.gnb.ca/0009/0010-e.asp

2. MONITORING NETWORKS

Compliance with air quality objectives or regulatory standards is determined by monitoring, for the most part on a continuous basis.

Monitoring locations are selected so that they will provide information that is representative of the surrounding area. In cases where there is a known pollutant source, monitors are often distributed in locations where the impact is expected to be greatest. Such locations are typically selected based on the results of computer dispersion models, local knowledge and DENV staff consultations. These are computer programs which simulate the behaviour of plumes, or discharge streams of gases as they are released from smokestacks. Such models take into account the complete variety of weather conditions which may be experienced in the area where the stack is located, as well as the nature of the local landscape.

In New Brunswick, large industrial emission sources, such as electricity generating stations or pulp mills, are legally required by the DENV to carry out ambient air quality monitoring as prescribed in their Approvals to Operate under the Clean Air Act. Such Approval conditions also detail the required equipment specifications, locations and reporting frequency. In such cases, the monitoring equipment and maintenance procedures are checked periodically by DENV staff or independent auditors, to ensure the required standards for operation and technical accuracy are being met.

In the case of air pollutants which are transported long distances, and which may be found in rural, as well as urban areas, DENV establishes and operates its own monitoring sites. The Department also maintains sites in areas where there are multiple large industrial emission sources, such as greater Saint John.

In 2009, DENV brought online a new state of the art data acquisition system. The Envista ARM software suite will enable the Department to collect accurate and real time data more efficiently. This new system will allow DENV to share information via modern computer communication protocols, which will facilitate website application for future use.

Additionally, there are 12 provincial acid precipitation monitoring sites augmented by one federally-operated site in New Brunswick (at Harcourt, in eastern New Brunswick). The operation of these monitoring stations is prescribed in the Approvals to Operate for the NB Power generating stations at Belledune and Coleson Cove.

Federal support is also provided for the operation of several other air quality monitoring sites across the province (through the National Air Pollution Surveillance (NAPS) program).

The locations of air quality monitoring sites in New Brunswick are shown in Figure 1. More detail on the exact location of each site is provided in the following sections.

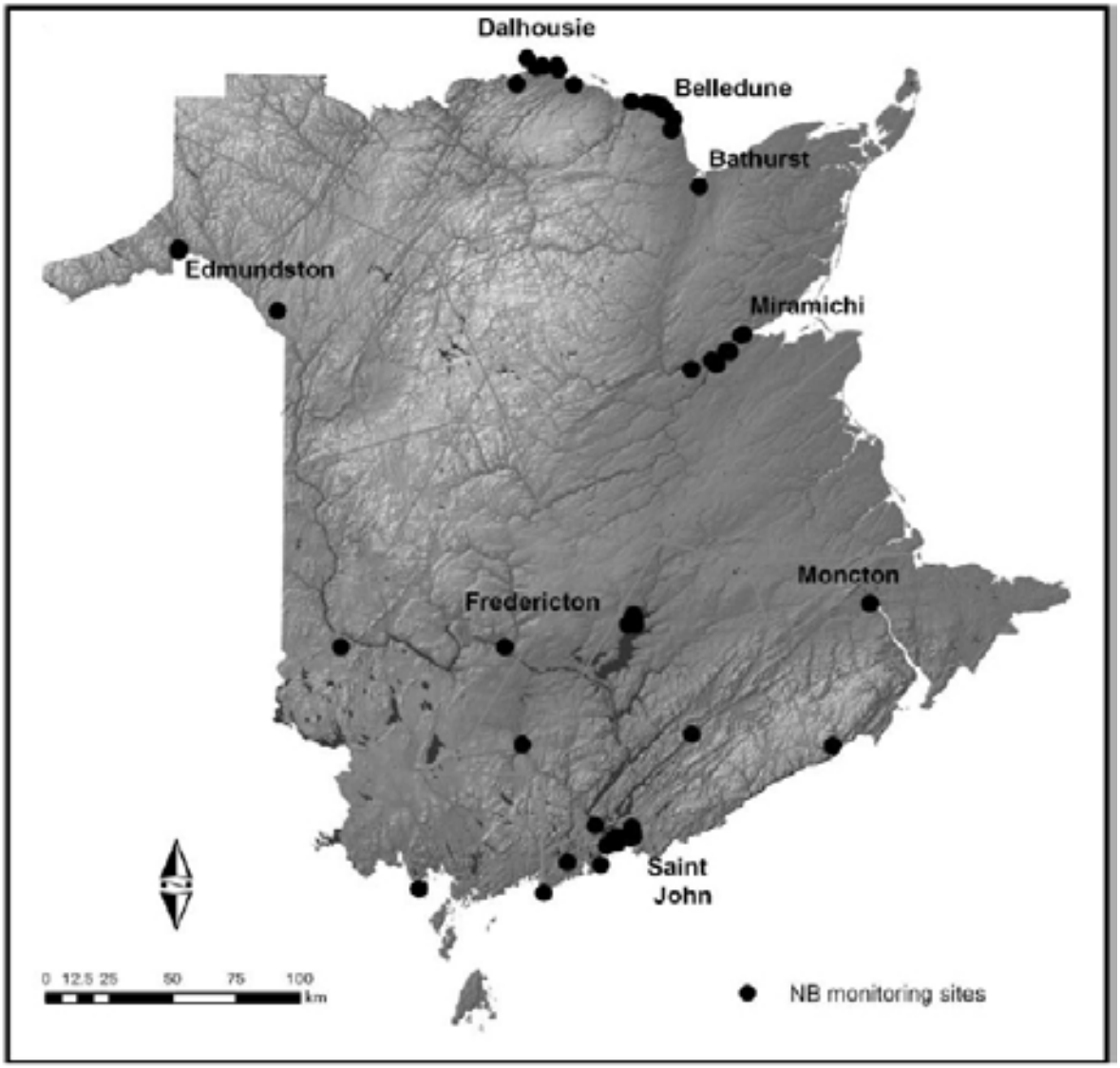


Figure 1. Locations of air quality monitoring sites in New Brunswick, 2009.

The following table lists the New Brunswick Air Quality Objectives for five air pollutants: carbon monoxide (CO), hydrogen sulphide (H_2S), nitrogen dioxide (NO_2), sulphur dioxide (SO_2) and total suspended particulate (TSP). These Objectives are established under the Clean Air Act that includes a provision for required annual reporting to the Legislative Assembly on achievement of air quality objectives.

New Brunswick Air Quality Objectives				
Pollutant	Averaging period			
	1 hour	8 hour	24 hour	1 year
Carbon monoxide	30 ppm	13 ppm		
Hydrogen Sulphide	11 ppb		3.5 ppb	
Nitrogen dioxide	210 ppb		105 ppb	52 ppb
Sulphur dioxide*	339 ppb		113 ppb	23 ppb
Total suspended particulate			120 µg/m^3	70 µg/m^3

* The standards for sulfur dioxide are 50% lower in Saint John, Charlotte, and Kings counties.

As there is no New Brunswick Air Quality Objective for ozone (O_3), the National Objectives for ozone are included below.

Elsewhere in the report, reference is made to other air quality standards or objectives from other jurisdictions (provincial, national or international) to aid in the interpretation of air quality conditions in New Brunswick.

Determining compliance with the Canada-wide Standard (CWS) for $PM_{2.5}$ (fine particulate) of 30 µg/m^3 (not required before 2010) is a complex calculation derived from the 98th percentile of daily averages in each year, averaged over three consecutive years. In the absence of another benchmark for $PM_{2.5}$, and for purposes of this report, $PM_{2.5}$ values are compared to the CWS level of 30 µg/m^3.

National Ambient Air Quality Objectives for Ozone (ppb)			
Averaging period	Desirable Level	Acceptable Level	Tolerable Level
1 Hour	51	82	153
24 hours	15	25	-
Annual	-	15	-

3. AIR QUALITY MONITORING RESULTS FOR 2009

Results are presented for each monitoring network in the Province. The locations of the monitoring sites are shown on regional scale maps. Results are summarized in tables, and further details in chart form appear in Appendix 1. Explanatory notes are provided on each network, and a discussion of the results for each network is included.

A. SAINT JOHN

The greater Saint John area has the longest history of air quality monitoring in New Brunswick, beginning in 1961. Since that time, air quality has been monitored at more than 30 different locations in the city and surrounding area. There were a total of 16 air quality monitoring sites that were active in 2009. Identification of the various pollutants that were monitored at each of these sites, and ownership (DENV or industry) is shown in Table 1. Figures 2 and 3 show the locations of these sites, with figure 3 showing four sites established in connection with the Coleson Cove generating station.

Most of these sites are electronically linked to a central computer system at the DENV central office in Fredericton. The system communicates with the monitors a minimum of once each hour and obtains the latest readings. The readings are then added to the existing data archive and some are used to prepare public information messages (i.e. Air Quality Health Index). Also, the information may initiate abatement actions required by industries and/or advisories by the Medical Officer of Health if concentrations rise above pre-determined trigger values.

A.1 Carbon Monoxide

This pollutant is monitored at the Customs Building site to provide data representative of the Saint John centre. Peak hourly values in any month seldom exceeded 1.0 ppm, and thus were well below the applicable objective of 30 ppm in 2009. In addition, there were no exceedances of the 8-hour objective of 13 ppm.

Table 1. Site locations and pollutants monitored in the Saint John Area, 2009.

Site	Pollutant							
	CO	TRS	SO_2	O_3	$PM_{2.5}$	NO_2	VOC	Other
Grand Bay			I					
Musquash			I					
Manawagonish Rd			I		I			
Lomeville			I		I			
Hillcrest		E	E	E	E	E		
Sherbrooke St.		I						
Milford		I						
Indiantown		I						
Customs Building	E		E	E		E		
Castle St					E			
Midwood Ave.		I	I					
Grandview West			I			I		
Forest Products Irving			I					
Champlain Heights School		E	E		I	E	E	
Irving Silver Falls			I					
Forest Hills		E	E	E	E	E	E	E
Totals	**1**	**7**	**12**	**3**	**6**	**5**	**2**	**1**

I = Industrial Site E = Department of Environement Site

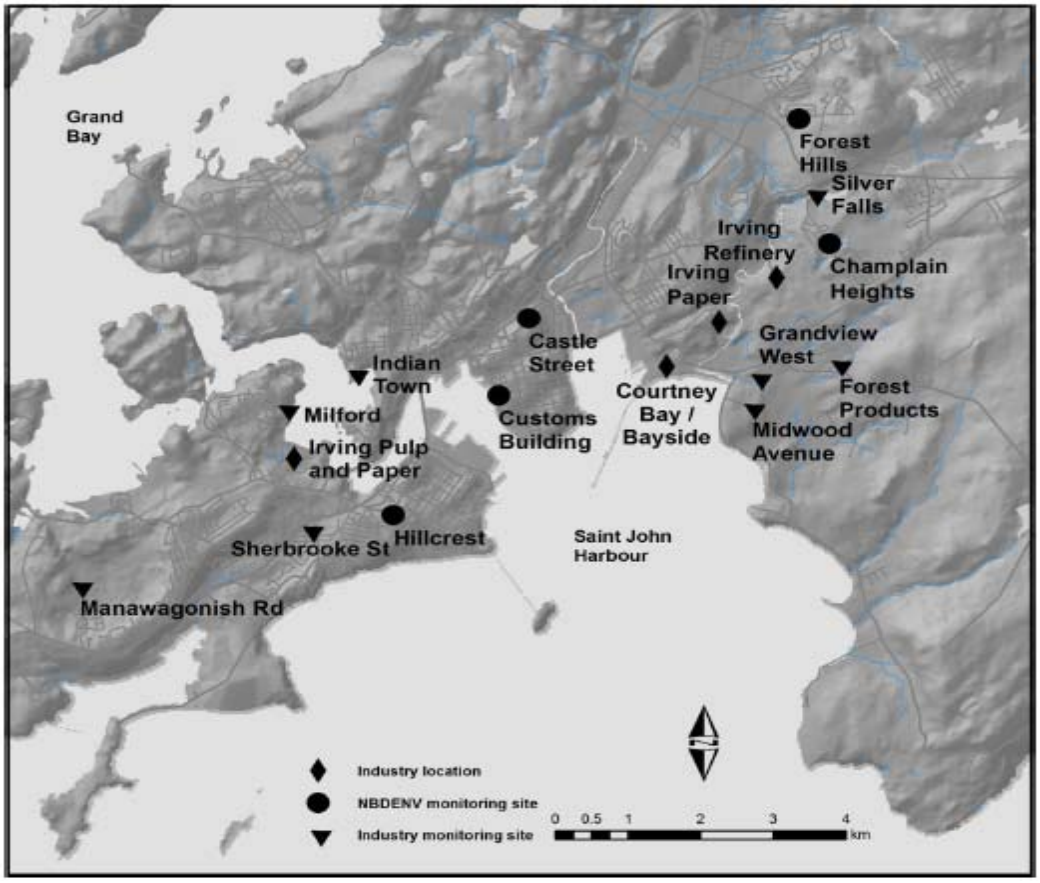


Figure 2. Air quality monitoring sites in Saint John, New Brunswick, 2009.

A.2 Nitrogen Dioxide

There were no exceedances of the 1-hour objective of 210 ppb at any site (Forest Hills, Customs Building, Champlain Heights School, Grandview West or Hillcrest) during 2009. There were also no exceedances of the 24-hour objective (105 ppb) or the annual objective (52 ppb).

A.3 Sulphur Dioxide

The total number of exceedances of the air quality objective for sulphur dioxide in Saint John in 2009 was the lowest on record. The 1-hour objective of 170 ppb was exceeded for three hours total on two separate days in February 2009 at the Grandview West monitoring site. No other exceedances of SO_2 in the area, including the Coleson Cove network, were recorded during the year.

Overall, SO_2 levels have improved greatly at the Grandview West site since the commissioning of the new Hydrogenation Amine Tail Gas Unit (HATGU) at the Irving refinery in April 2008.

A.3.1 Sulphur Dioxide Episode Control

An episode control program is in place to prevent ambient SO_2 reaching undesirably high levels in Saint John. Control actions are initiated by major industries in the city in response to measurements made at the fixed monitoring sites.

These control actions are made mandatory by being incorporated into the relevant Approvals to Operate issued by DENV. The episode control plans themselves are subject to continual review. DENV meets regularly with staff of the major industries in the city to review compliance with respect to SO_2.

All exceedance events are examined in detail and any shortfalls in the nature and extent of response actions are addressed. DENV staff sometimes

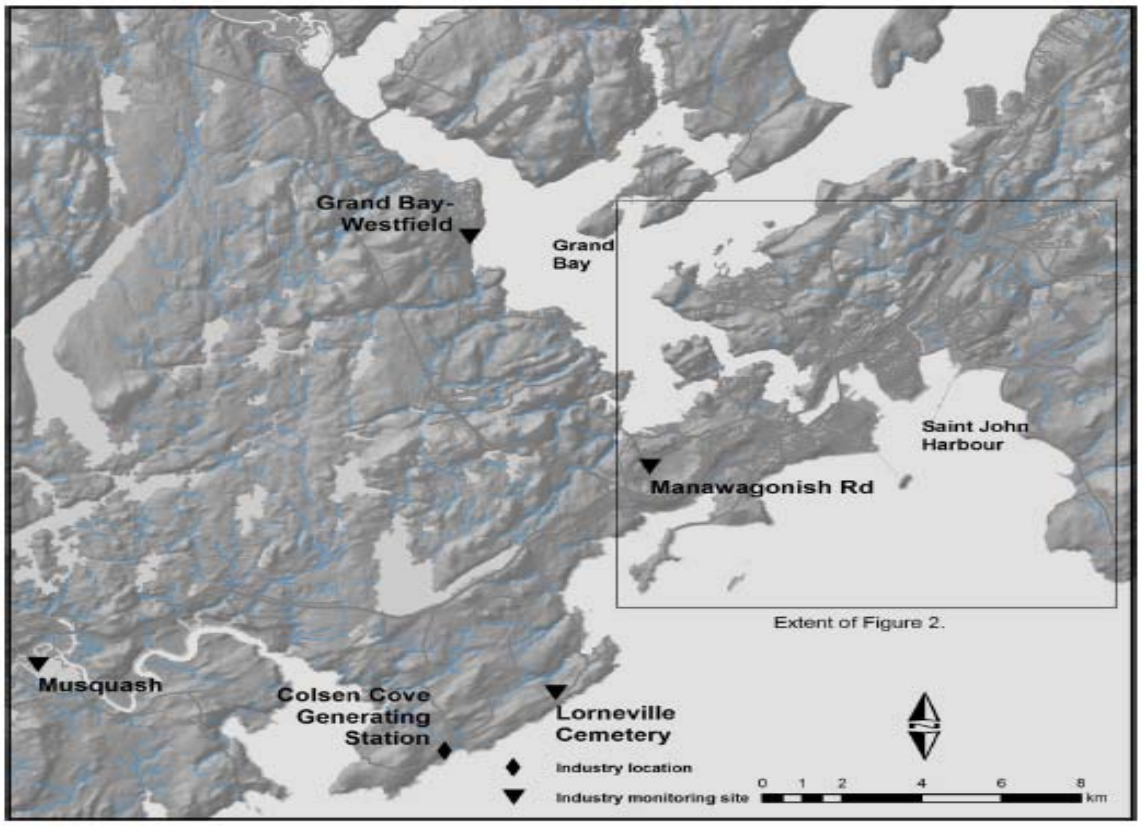


Figure 3. Locations of NB Power Coleson Cove network air quality monitoring sites in New Brunswick, 2009.

request emission control actions separate from, or in addition to, those specified in the episode control plans. Such action may be warranted due to unusual conditions, such as poor dispersion, weather related incidents, or during periods when smog advisories are in effect.

Some of the ways in which industries respond to rising levels of SO_2 include switching to lower or near-zero sulphur fuels, and reducing production rates or electricity generating rate. Response action is initiated when concentrations reach 80 ppb, approximately half the 1-hour objective of 170 ppb.

A.4 Fine Particulate Matter

$PM_{2.5}$ is measured at six sites in the Saint John area using BAM monitoring technology. Three of these sites are maintained by DENV, one by Irving Oil Ltd., and two are maintained by NB Power as part of their Coleson Cove monitoring network. Results are summarized in Table 3.

In 2009, the annual average value for $PM_{2.5}$ ranged from 5.2 µg/m^3 to 10.2 µg/m^3 at these sites. The Lorneville site had the greatest 24-hour average 98th percentile value at 22.9 µg/m^3. The results also show there were a few days when the daily average $PM_{2.5}$ levels exceeded 30 µg/m^3. This is also reflected in a larger number of exceedances of the running 24-hour average. Most of these exceedances were associated with a regional air quality event between August 17-19, 2009 when elevated levels of both $PM_{2.5}$ and ground level ozone were recorded at several monitoring stations in New Brunswick. Preliminary study of this event suggests it was transboundary in nature and affected areas of New Brunswick and adjacent provinces (Environment Canada, 2011).

Table 2. Exceedances of provincial objectives for SO_2, Saint John, 2000-2009.

	Midwood Avenue	Champlain Hts	Customs Building	Forest Hills	Forest Products	Hillcrest	Grandview West 1	Silver Falls
1 HOUR OBJECTIVE								
2009	0	0	0	0	0	0	3	0
2008	0	0	0	1	0	0	10	0
2007	0	0	0	5	0	0	11	0
2006	2	1	0	0	0	0	61	0
2005	0	3	0	1	0	0	135	4
2004		0	2	0	0	0	153	2
2003		1	0	1	2	0	153	10
2002		0	0	0	0	0		0
2001		1	0	0	0	0		4
2000		4	3	1	1	2		3
24-HOUR OBJECTIVE								
2009	0	0	0	0	0	0	0	0
2008	0	0	0	0	0	0	68	0
2007	0	0	0	35	0	0	13	0
2006	19	0	0	0	0	0	255	0
2005	0	0	0	0	0	0	331	16
2004		0	0	0	0	0	504	31
2003		47	0	23	3	0	429	117
2002		0	0	0	0	23		14
2001		4	0	0	0	0		47
2000		35	0	0	0	0		0

Table 3. Monitoring results for $PM_{2.5}$, Saint John Network, 2009.

	Forest Hills	Hillcrest	Champlain Heights	Castle St.	Lorneville*	Manawagonish Rd.*
Annual average ($\mu g/m^3$)	5.7	5.2	7.9	7.9	10.2	8.5
98^{th} percentile value (CWS)	16.5	14.2	13.1	18.6	22.9	17.9
Days when daily average was >30 $\mu g/m^3$	0	0	0	1	5	2
Hours when running 24-hour average was >30 $\mu g/m^3$	6	12	0	20	126	53

* Coleson Cove Network

A.5 Ground Level Ozone

O_3 was monitored at three sites in the city during 2009: Forest Hills, Customs Building and in West Saint John at Hillcrest Church. Results are summarized in Table 4. During 2009, there was one exceedance (83 ppb) of the 1-hour National Ambient Air Quality Objective for O_3 of 82 ppb at the Hillcrest site. Statistics were also calculated in reference to the Canada-Wide Standard for O_3, which considers the 4th highest daily maximum 8-hour value in a year, and is set at 65 ppb. Although there were two days at Forest Hills and Hillcrest when the daily maximum 8-hour value exceeded 65 ppb, the highest value in terms of CWS metric was 54.9 ppb at Forest Hills.

Further details on ground level O_3 follow in section 8, where additional results for all O_3 monitoring sites are summarized.

A.6 Total Reduced Sulphur

TRS is monitored at Champlain Heights, Hillcrest and Forest Hills by DENV, as well as three sites operated by Irving Pulp and Paper (Milford, Indian Town and Sherbrooke St.) and one site by Irving Oil at Midwood Avenue.

In 2009, four exceedances of the 1-hour objective were recorded at monitoring sites in east and west Saint John. Exceedance occurrence since 2000 are summarized in Table 5 and further information on TRS levels in 2009 can be found in Appendix 1.

Note: for evaluation of TRS data, and in the absence of a specific objective for TRS, reference is made to the provincial objectives for hydrogen sulphide.

Table 4. Monitoring results for Ozone, Saint John Network, 2009.

	Forest Hills	Hillcrest	Customs Building
Annual average (ppb)	28.0	27.3	24.6
4th highest daily maximum 8-hour average (CWS)	54.9	54.5	51.0
Days when daily maximum 8-hour average was >65 ppb	2	2	0

Table 5. Exceedances of provincial objective for TRS (as H_2S) in Saint John, 2000-2009.

		Forest Hills	Champlain Hts	Midwood Avenue	Hillcrest	Indian Town	Milford	Sherbrooke St.
2009	1-hour	1	0	0	1	2	0	0
2008	1-hour	0	1	0	0	1	1	0
2007	1-hour	7	2	0*	0	3	2**	0**
2006	1-hour		7		M	0	0	0
2005	1-hour		2		0	0	3	0
2004	1-hour		3		M	0	0	0
2003	1-hour		0		0	0	0	1
2002	1-hour				0	2	0	0
2001	1-hour				0	0	1	9
2000	1-hour				3	2	0	4
2009	24-hour	0	0	0	0	0	0	0
2008	24-hour	0	0	0	0	0	0	0
2007	24-hour	33	14	0*	0	0	0**	0**
2006	24-hour		21		0	0	0	0
2005	24-hour		0		0	0	22	0
2004	24-hour		0		M	0	19	0
2003	24-hour		0		0	0	0	0
2002	24-hour				0	11	0	0
2001	24-hour				0	0	5	684
2000	24-hour				18	47	12	29

M = missing data

* Monitoring began in October

** Not monitoring from January-April

A.7 Volatile Organic Compounds (VOCs)

VOCs have been measured at Forest Hills and Champlain Heights in east Saint John since 1992 and 2000 respectively. Measurements at Point Lepreau, approximately 40 km southwest of the city, began in 1992. The Lepreau site is predominantly upwind of Saint John and serves as a control or reference site, representative of rural southern New Brunswick. The monitoring program for VOCs is a collaborative one between DENV and Environment Canada. DENV staff maintain the monitoring sites and set up the equipment to take samples (normally every 6 days). Environment Canada performs the analyses on the collected air samples.

Sites in Saint John collect one 24-hour sample every 6 days and the rural site at Point Lepreau collects a 4-hour sample beginning at noon, every three days. All samples are analysed for over 150 compounds, which include VOCs which are involved in the formation of O_3, as well as VOCs which may be of interest for other reasons. For example, they may be indicators of various kinds of industrial activity, or they may be of concern in their own right (for example, substances which are known to be carcinogenic, such as benzene). Some of the other VOCs which are measured are found at similar concentrations regionally or even globally (such as several CFC compounds). These substances are of key interest in atmospheric research.

There are no national ambient air quality standards for VOCs in Canada. Results can be compared against guidelines published by other agencies, and examined over time to look for trends, as well as differences between sites.

Table 6 lists results for 2009 for selected VOCs, compared with 24-hour and annual average guidelines recommended by various agencies. This subset of VOCs contains compounds which have traditionally been classified as “air toxics”, and which are considered potentially harmful to human health. The first line of the results table also shows the average concentration taking into account all VOCs measured at each site (total VOC).

The monitoring equipment at Point Lepreau was moved to Moncton for 2009 to support a special study in that city. See Section 7 of this report for further information.

For the selected VOCs for which guidelines could be referenced, concentrations at both monitoring sites were found to be substantiallly below these targets, in most cases by a substantial margin. The annual guideline for benzene published in the United Kingdom (5 ppb) has a long-term target of 1 ppb (EPAQS, 1994; HMSO, 2000). The Swedish guideline is 1.5 ppb with a compliance date of 2010 (Swedish EPA, 2003). Benzene is emitted from motor vehicles and is a component of gasoline. In Saint John, the petroleum refinery and other industries would also contribute to ambient concentrations. Additional analysis of VOC data is included in section 8.

Table 6. Monitoring results for Volatile Organic Compounds, 2009.

VOC	Max 24-hour averages (ppb)		24-hour guidelines (ppb)	Annual averages (ppb)			Annual Guidelines (ppb)
	Forest Hills	Champlain Hts		Forest Hills	Champlain Hts	#Point Lepreau	
Total VOC	123.33	271.00		27.38	71.86	--	
1,3 butadiene	0.22	0.09		0.03	0.02	--	1 (UK)
Benzene	1.21	3.77		0.24	0.76	--	1.5 (UK, (Sweden)
Toluene	2.32	7.37	63* (WHO) 106 (AB) 24 (ON)	0.46	1.52	--	10-100 (Sweden)
Ethylbenzene	0.96	3.39	4464* (WHO) 227 (ON)	0.15	0.56	--	
Xylenes	0.41	1.94	1013 (WHO) 161 (AB) 522 (ON)	0.07	0.27	--	
Styrene	0.49	0.06	56* (WHO) 94 (MB) 93 (ON)	0.02	0.00	--	
Chloromethane	0.74	0.68	3344 (ON)	0.63	0.59	--	
Vinyl chloride	0.00	0.00	0.4 (ON)	0.00	0.00	--	
1,1 dichloroethylene	0.00	0.00		0.00	0.00	--	
Dichloromethane	0.27	0.18	792 (WHO) 62 (ON)	0.06	0.06	--	100-250 (Sweden)
1,2 dichloroethane	0.02	0.05	159 (WHO)	0.02	0.02	--	100-150 (Sweden)
Carbon tetrachloride	0.10	0.11	0.4 (ON)	0.08	0.09	--	
1,2 dichloropropane	0.00	0.00		0.00	0.00	--	
Trichloroethylene	0.01	0.00	21 (ON)	0.00	0.00	--	100-200 (Sweden)
1,1,2 trichloroethane	0.00	0.00		0.00	0.00	--	
Ethylene dibromide	0.05	0.10	0.4 (ON)	0.01	0.01	--	
Tetrachloroethylene	0.05	0.08	34 (WHO)	0.01	0.01	--	
1,1,2,2 tetrachloroethane	0.00	0.00		0.00	0.00	--	
Formaldehyde	0.57	2.81	52 (ON)	0.38	0.99	--	
Acetaldehyde	0.29	1.14	274 (ON)	0.19	0.54	--	
MTBE	0.00	0.00		0.00	0.00	--	

Notes: The guidelines marked with an asterisk (*) are for a weekly period. AB =Alberta; ON = Ontario; MB = Manitoba. Sources: WHO (World Health Organisation): 1987, 1994,1996 & 1997; Swedish standards: OECD, 1995; Swedish EPA, 2003. UK standards: HMSO, 2000. Alberta, Ontario, and Manitoba : Provincial Environment Departments. Data at Point Lepreau is marked with "--" as there was insufficient data to report. The other sites are based on 24-hour samples every 6th day.

A.8 Index of the Quality of the Air (IQUA)

The IQUA system has been used in Saint John for over 25 years to help make air quality monitoring results easier to understand. Results for each pollutant measurement are expressed on a scale from 1-100+, and classed as “good” (index 0 to 25), “fair” (26 to 50), “poor” (51 to 100) or “very poor” (over 100). Each of the categories is based on the National Air Quality Objectives. IQUA information is available via the DENV web site:

http://www1.gnb.ca/0355/0003/0000.asp

For each hour, the IQUA index is computed for each pollutant measured at the site. The value reported is the highest of each of the individual values. For example, if two pollutants are in the “good” range and one is in the “poor” range, then the index for the hour would be reported as “poor”. In addition, the pollutant responsible for determining the overall index value is usually identified.

Summary statistics are given in Table 7 for the three designated IQUA sites in Saint John: Customs Building (uptown), Forest Hills (east) and Hillcrest (west). Table 7 shows the percentage of time logged in each IQUA category. For the largest majority of the time, air quality was in the “good” category during 2009 (more than 98% of the time).

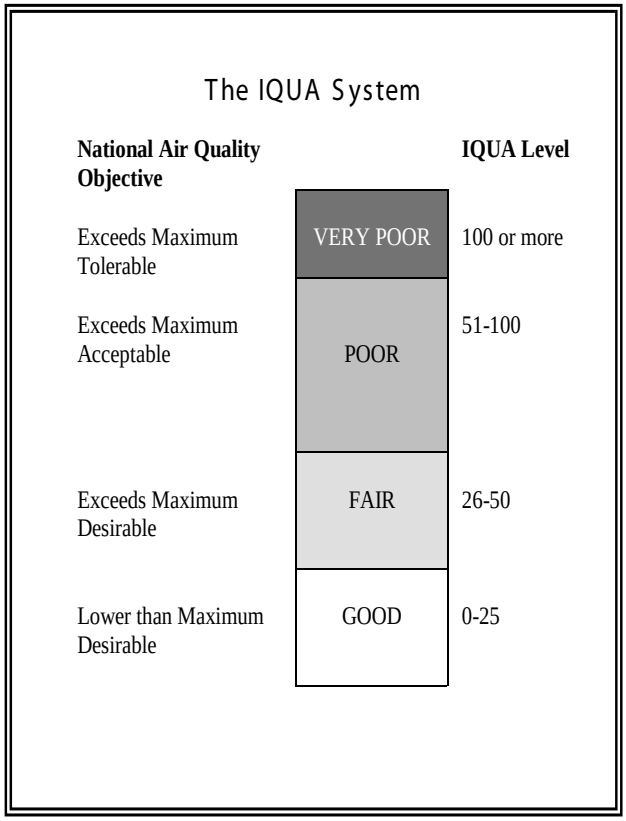


Table 7. Percentage of time in each IQUA Category for Saint John sites, 2009.

	Good (0-25)	Fair (26-50)	Poor (51-100)	Very Poor (over 100)	No Data Available
Forest Hills	97.5	1.6	0.0	0.0	0.9
Customs	99.5	0.5	0.0	0.0	0.0
Hillcrest	96.9	0.8	0.0	0.0	2.3

A.9 Air Quality Health Index (AQHI)

The AQHI offers a new approach to describing air quality conditions. Developed in Canada, this new national index is designed to more accurately describe the relationship between air quality conditions and associated health risks. The index provides specific advice for people that are especially vulnerable to the effects of air pollution as well as advice for the general public.

The index is on a scale of 1-10+ and the higher the number, the greater the health risk and the need to take precautions. There are four categories of risk, low (1-3), moderate (4-6), high (7-10) and very high (>10). Each category has suggestions for individuals to reduce exposure, depending upon their sensitivity to air pollution.

The AQHI was officially introduced to Saint John on June 15, 2008. Each hour an index value is calculated for the entire city by averaging results of air quality monitoring conducted at the Customs Building, Castle Street, Forest Hills and Hillcrest monitoring sites. Results from for 2009 are summarized in Figure 4. The vast majority of this period was represented by the low risk category.

The AQHI for Saint John is available via the following national websites: www.airhealth.ca or www.weatheroffice.ec.gc.ca. Information is also available by phone by calling toll free in New Brunswick: 1-888-484-AQHI (2744).

Compared to IQUA, the AQHI is considered to be a better personal health protection tool and plans are being made to expand the AQHI to other communities in New Brunswick in 2010. Eventually, as people become familiar with the AQHI, the IQUA program will be terminated.

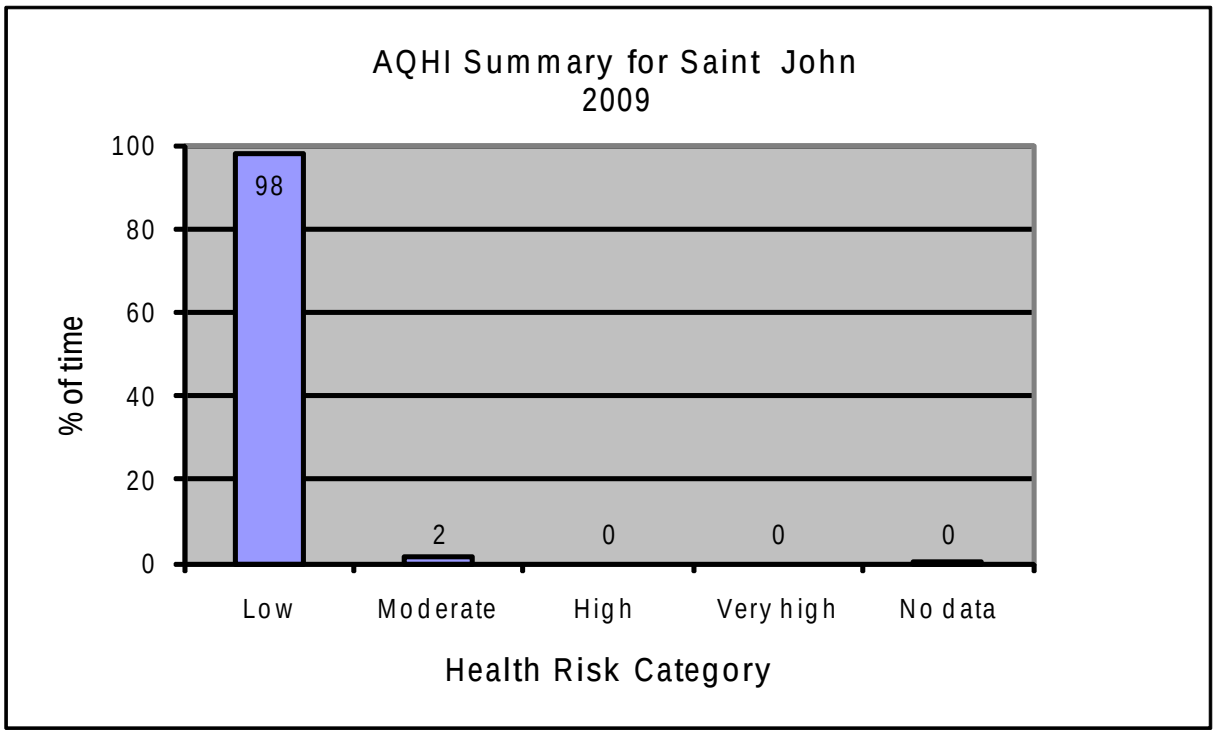


Figure 4. AQHI Summary for Saint John, 2009.

B. MIRAMICHI - NB POWER

Figure 5 shows the locations of the two monitoring sites for NB Power's Millbank gas turbine sub-network. The pollutants monitored include SO_2, NO_2 and TSP (Rockcliff only).

Since 1997, there have been no exceedances for SO_2, NO_2 or TSP logged in this network. Monthly results are shown in Appendix 1.

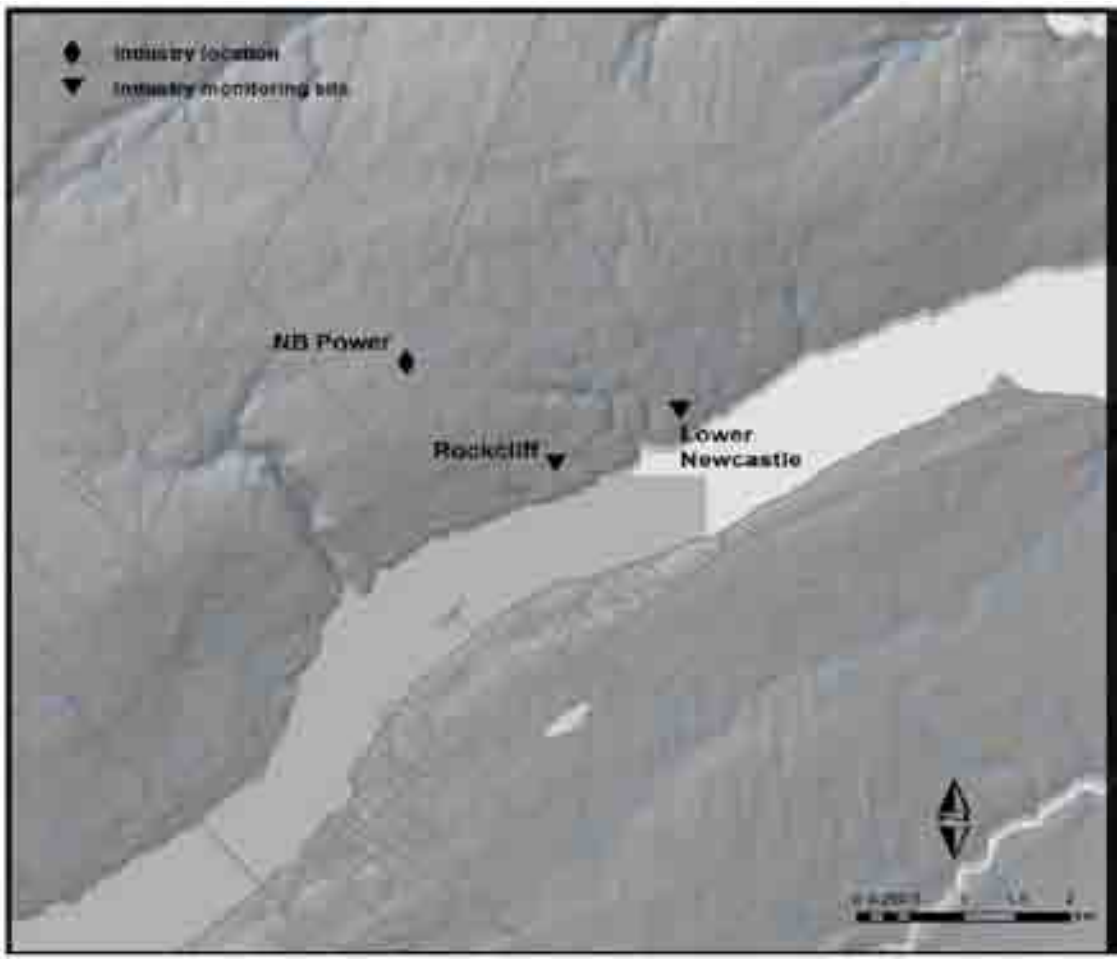


Figure 5. Air quality monitoring sites in the Miramichi Region, 2009.

C. GRAND LAKE - NB POWER

Figure 6 shows the locations of the four monitoring sites in this network. These are sited to monitor the effects of the Grand Lake coal-fired electrical generating station and associated activities. The four monitoring sites are operated by NB Power and each measures SO_2 and TSP.

C.1 Sulphur Dioxide

In 2009, there was one exceedance of the 1-hour and the 24-hour objective for SO_2 at at the Flower's Cove site. Compliance statistics for SO_2 since 2000 are shown in Table 8.

C.2 Total Suspended Particulate

In 2009, there were no exceedances of the 24-hour standard of 120 µg/m^3 in this network. Complete results are given in Appendix 1. Compliance statistics for TSP since 2000 are shown in Table 9.

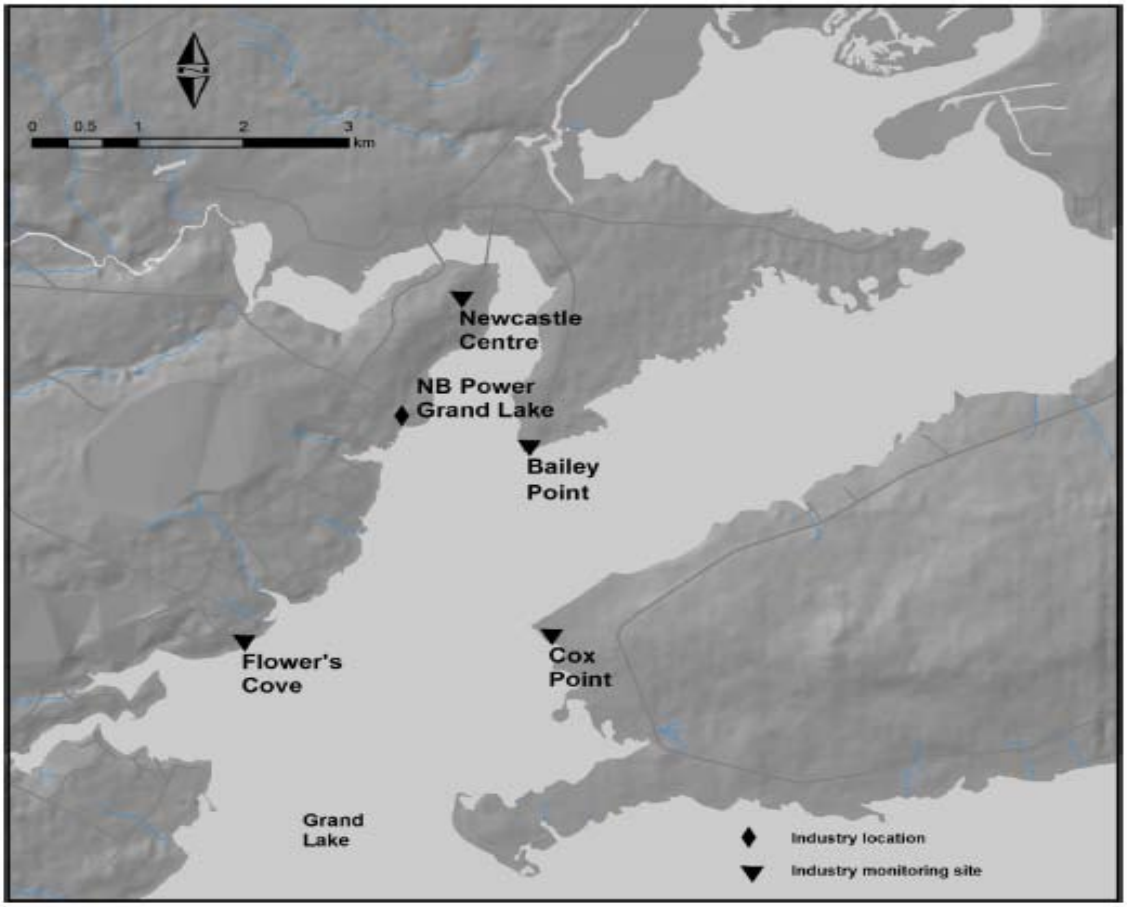


Figure 6. Air quality monitoring sites in the Grand Lake Network, 2009.

Table 8. Exceedances of provincial objectives for SO_2, NB Power Grand Lake Network, 2000-2009.

		Bailey Pt.	Cox Pt.	Flower's Cove	Newcastle Centre
2009	1-hour	0	0	1	0
2008	1-hour	0	0	0	0
2007	1-hour	2	0	0	4
2006	1-hour	0	0	0	0
2005	1-hour	0	0	0	1
2004	1-hour	1	0	1	6
2003	1-hour	1	0	2	5
2002	1-hour	0	0	3	3
2001	1-hour	0	2	0	0
2000	1-hour	0	0	0	2
2009	24-hour	0	0	1	0
2008	24-hour	0	0	0	0
2007	24-hour	0	0	0	0
2006	24-hour	0	0	0	0
2005	24-hour	0	0	0	0
2004	24-hour	0	0	0	0
2003	24-hour	0	0	0	0
2002	24-hour	0	0	0	0
2001	24-hour	0	0	0	0
2000	24-hour	0	0	0	0

Table 9. Exceedances of provincial objective for TSP, NB Power Grand Lake Network, 2000-2009.

		Bailey Pt.	Cox Pt.	Flower's Cove	Newcastle Centre
2009	24-hour	0	0	0	0
2008	24-hour	0	0	0	0
2007	24-hour	0	0	0	0
2006	24-hour	0	0	0	0
2005	24-hour	0	0	0	0
2004	24-hour	0	0	0	0
2003	24-hour	0	0	0	0
2002	24-hour	0	0	0	0
2001	24-hour	0	0	0	0
2000	24-hour	0	0	0	0

D. LAKE UTOPIA PAPER (J.D. IRVING)

There were no exceedances reported for the 1-hour objective of 170 ppb or the 24-hour objective of 56 ppb for SO_2 in 2009 at the Lake Utopia Irving Paper Station (see Appendix 1). Lake Utopia Paper is located in Charlotte County where the SO_2 objective is half of the provincial objective.

E. EDMUNDSTON – FRASER PAPERS INC.

Figure 7 shows the locations of the monitoring sites, located to monitor the impacts of the Fraser Papers Inc. pulp mill.

E.1 Sulphur Dioxide

In 2009, there were two exceedances of the 1-hour SO_2 objective at the Cormier School site. Compliance statistics for SO_2 since 2002 are shown in Table 10.

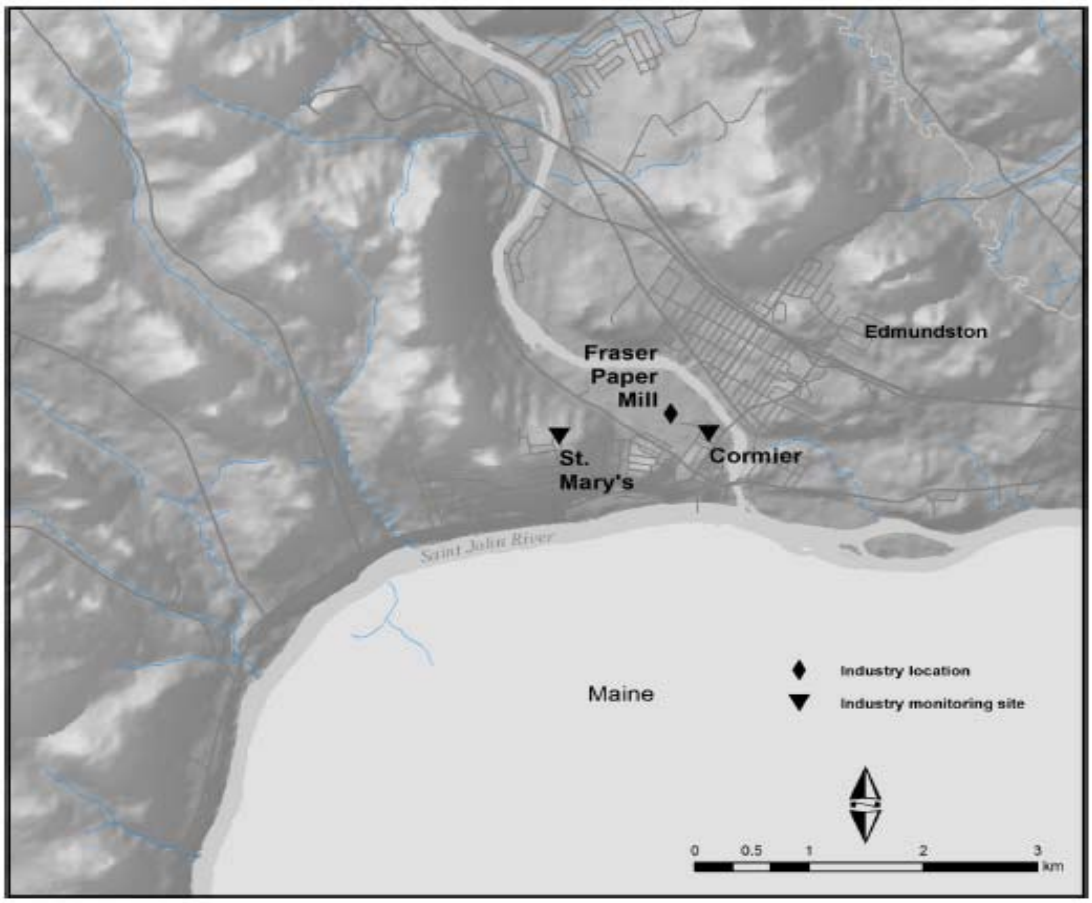


Figure 7. Air quality monitoring sites in Edmundston, 2009.

Table 10. Exceedances of provincial objectives for SO_2, Fraser Papers Inc. Edmunston Network, 2002-2009.

		Cormier School	St. Mary's
2009	1-hour	2	0
2008	1-hour	1	0
2007	1-hour	0	0
2006	1-hour	0	0
2005	1-hour	0	0
2004	1-hour	0	0
2003	1-hour	0	0
2002	1-hour	0	0
2009	24-hour	0	0
2008	24-hour	0	0
2007	24-hour	0	0
2006	24-hour	0	0
2005	24-hour	0	0
2004	24-hour	0	0
2003	24-hour	0	0
2002	24-hour	40	0

E.2 Fine Particulate Matter

Table 11 summarizes results for $PM_{2.5}$ measurements at the Cormier School site in 2009. This site employs TEOM technology for measuring $PM_{2.5}$.

There were no instances where the daily average value exceeded 30 µg/m^3 and the annual average was 7.5 µg/m^3. Additional results are shown in Appendix 1.

As noted in Section 9 of this report, the TEOM instrument at this site failed the audit that took place on September 9, 2009. The data for the year are being presented as submitted by the industry. Comparisons to data from previous years at this site and to 2009 regional data suggest that no notable discrepancies are apparent. However, it should be noted that the data have not been appropriately QA/QC'd.

Table 11. Monitoring results for $PM_{2.5}$ (TEOM), Fraser Papers Inc., Edmunston, 2009.

	Cormier
Annual average (µg/m^3)	7.5
98th percentile value (CWS)	18.4
Days when daily average was >30 µg/m^3	0
Hours when running 24-hour average was >30 µg/m^3	0

F. BELLEDUNE

There are a number of monitoring sites in the Belledune region. Three of these are located for the assessment of emissions from the Xstrata complex. A further five monitors are operated for the assessment of NB Power's coal-fired electrical generating station.

Figure 8 shows the locations of all the monitoring sites in the region.

F.1 Xstrata

All sites in the Xstrata network monitor SO_2 and TSP.

F.1.1 Sulphur Dioxide

In 2009, there was one exceedance of the 1-hour objective at the Boulay station and two at the Townsite station. Compliance statistics for SO_2 since 2000 are shown in Table 12.

F.1.2 Total Suspended Particulate

In 2009, there was one exceedance of TSP at the Boulay station and one at the Townsite station. Compliance statistics for TSP since 2000 are shown in Table 13.

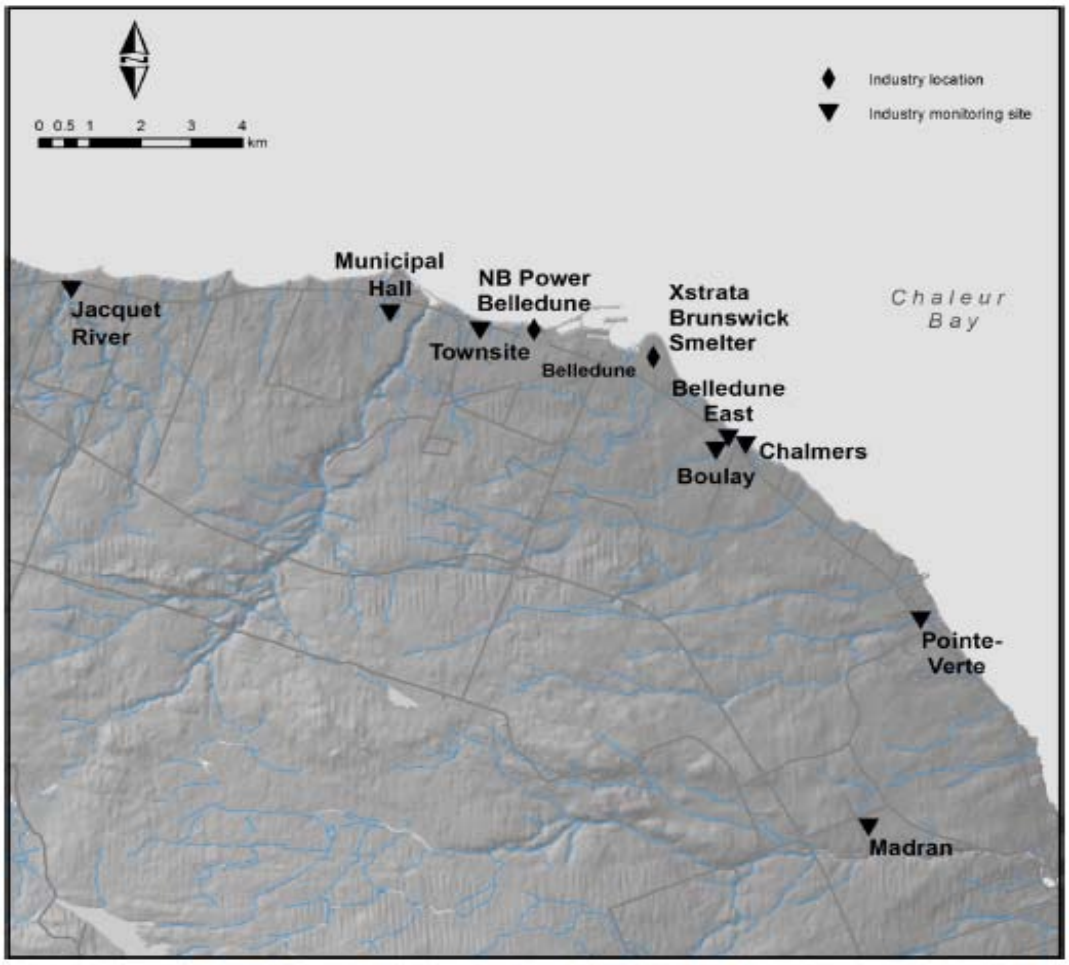


Figure 8. Air quality monitoring sites in the Belledune Network, 2009.

Table 12. Exceedances of provincial objectives for SO_2, Xstrata, 2000-2009.

Year	Objective	Boulay	Chalmers	Townsite
2009	1-hour	1	0	2
2008	1-hour	2	0	0
2007	1-hour	0	0	0
2006	1-hour	1	0	1
2005	1-hour	0	1	1
2004	1-hour	0	0	0
2003	1-hour			
2002	1-hour	1	3	0
2001	1-hour	4	2	0
2000	1-hour	2	1	1
2009	24-hour	0	0	0
2008	24-hour	0	0	0
2007	24-hour	0	0	0
2006	24-hour	0	0	0
2005	24-hour	0	0	0
2004	24-hour	0	0	0
2003	24-hour			
2002	24-hour	0	0	0
2001	24-hour	0	0	0
2000	24-hour	0	0	0

Note: In 2003, data were available only for the period January-June.

Table 13. Exceedances of provincial objective for TSP, Xstrata, 2000-2009.

Year	Objective	Boulay	Chalmers	Townsite
2009	24-hour	1	0	1
2008	24-hour	0	0	1
2007	24-hour	0	0	0
2006	24-hour	0	0	0
2005	24-hour	0	0	0
2004	24-hour	0	0	0
2003	24-hour			
2002	24-hour		0	0
2001	24-hour		0	0
2000	24-hour		0	1

F.2 NB POWER

There are five sites in this network (see Table 14), all of which monitor SO_2. Belledune East and Municipal Hall also monitor NO_2.

F.2.1 Sulphur Dioxide

During 2009, there were no exceedances of the 1- hour SO_2 objective. Compliance statistics for SO_2 since 2000 are shown in Table 14.

F.2.2 Nitrogen Dioxide

This contaminant is measured at Belledune East and Municipal Hall. There were no exceedances of the applicable 1-hour or 24-hour objectives in 2009 at either location. There have been no exceedances of NO_2 recorded in this network since 1999.

Table 14. Exceedances of provincial objectives for SO_2, NB Power Belledune Network, 2000-2009.

Year	Objective	Belledune East	Jacquet River	Madran	Municipal Hall	Pointe Verte
2009	1-hour	0	0	0	0	0
2008	1-hour	1	0	0	0	0
2007	1-hour	0	0	0	0	0
2006	1-hour	1	0	0	1	0
2005	1-hour	0	3	0	0	0
2004	1-hour	0	0	0	0	0
2003	1-hour	3	0	0	1	0
2002	1-hour	4	0	0	0	1
2001	1-hour	2	0	0	1	0
2000	1-hour	2	0	0	1	0
2009	24-hour	0	0	0	0	0
2008	24-hour	0	0	0	0	0
2007	24-hour	0	0	0	0	0
2006	24-hour	0	0	0	0	0
2005	24-hour	0	0	0	0	0
2004	24-hour	0	0	0	0	0
2003	24-hour	0	0	0	0	0
2002	24-hour	0	0	0	0	0
2001	24-hour	0	0	0	0	0
2000	24-hour	0	0	0	0	0

G. DALHOUSIE – NB POWER

Figure 9 shows the locations of the sites in the Dalhousie region. The sites in this region are operated to monitor the effects of the NB Power Dalhousie electrical generating station. Six sites measure SO_2. One of these sites also monitors TSP, and there is one additional TSP site, for a total of seven sites. Because of potential pollution transport across the Bay of Chaleur, one of the stations is located in the province of Québec.

G.1 Sulphur Dioxide

Compliance with the applicable 1-hour, 24-hour and annual objectives was 100% at all sites in 2009, although there was no data available at the Mobile site from July through October. Detailed summaries are given in Appendix 1. There have been no exceedances of SO_2 recorded in this network since 1998.

G.2 Total Suspended Particulate

TSP was measured at the Coal Berm and Dalhousie Tower sites. Results are shown in Appendix 1. None of the individual readings obtained was above the 24-hour objective of 120 µg/m^3 in 2009, and the annual geometric means for the Coal Berm and Tower sites were 14 and 15 µg/m^3 , respectively (the standard is 70 µg/m^3). There have been no exceedances of TSP recorded in this network since 1998.

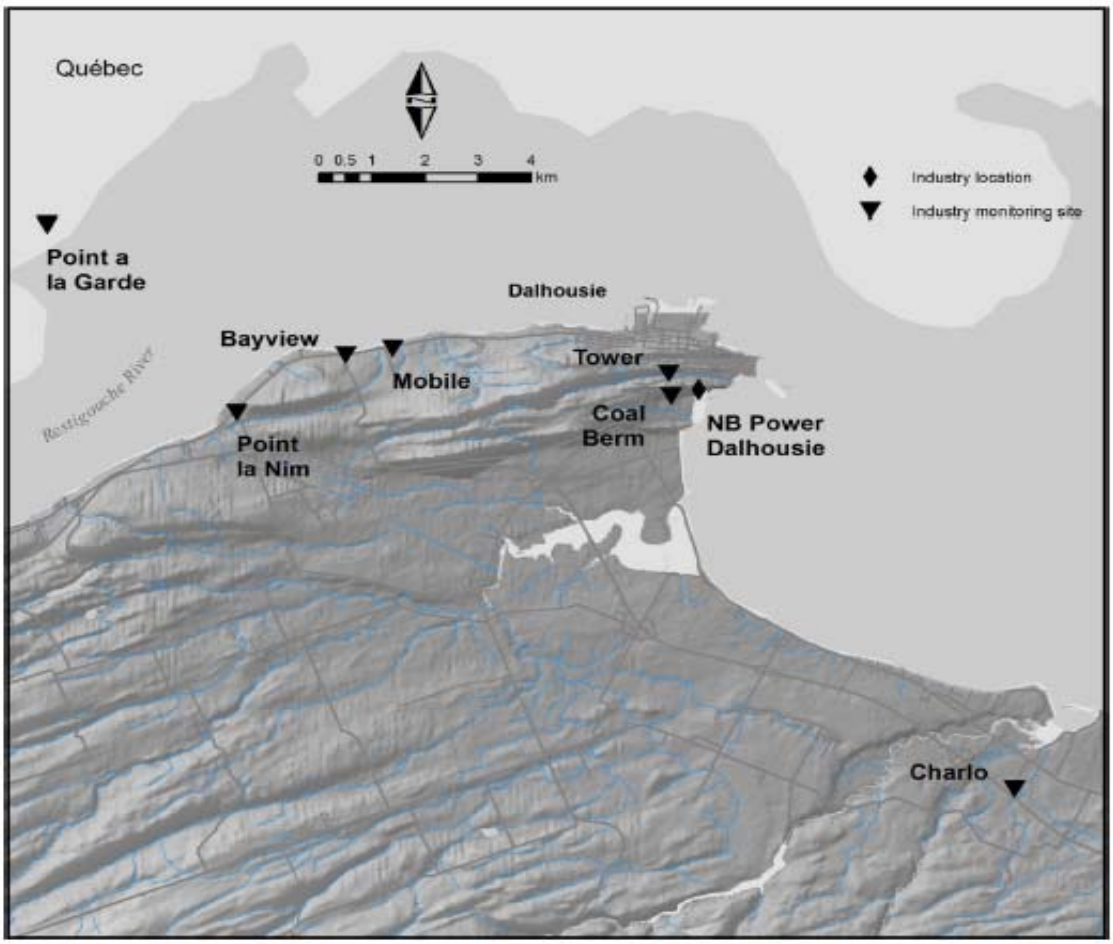


Figure 9. Air quality monitoring sites in the Dalhousie Network, 2009.

H. ATHOLVILLE - AV CELL INC.

H.1 Sulphur Dioxide

AV Cell Inc. operates a pulp mill in Atholville, and maintains two associated ambient air monitoring sites, Boom Road (to the west of the mill) and Beauvista (east). Sulphur dioxide is measured at both sites.

In 2009, there was one exceedance of the 1-hour objective (340 ppb) reported at the Beauvista monitoring site. Compliance statistics for SO_2 since 2000 are shown in Table 15.

Table 15. Exceedances of provincial objectives for SO_2, AV Cell Inc. Network, 2000-2009.

Year	Objective	Boom Rd (W)	Beauvista (E)
2009	1-hour	0	1
2008	1-hour	0	0
2007	1-hour	0	0
2006	1-hour	0	0
2005	1-hour	0	0
2004	1-hour	0	0
2003	1-hour	0	0
2002	1-hour	0	0
2001	1-hour	0	0
2000	1-hour	1	0
2009	24-hour	0	0
2008	24-hour	0	0
2007	24-hour	0	0
2006	24-hour	0	0
2005	24-hour	0	0
2004	24-hour	0	0
2003	24-hour	0	0
2002	24-hour	0	0
2001	24-hour	0	0
2000	24-hour	0	0

I. BATHURST

I.1 Ground Level Ozone

There were no exceedances of the national 1-hour objective for ozone during 2009.

I.2 Fine Particulate Matter

Levels of fine particulate remained below the CWS value of 30 µg/m^3 in 2009. The annual average was 6.9 µg/m^3. Results are summarized in Table 16.

Table 16. Monitoring results for $PM_{2.5}$, Bathurst, 2009.

	Rough Waters Drive
Annual average (µg/m^3)	6.9
98th percentile value (CWS)	17.0
Days when daily average was >30 µg/m^3	0
Hours when running 24-hour average was >30 µg/m^3	0

J. FREDERICTON

The Fredericton site is on Aberdeen Street, in an area representative of the "downtown" residential and business district. This site is also considered representative of a wider geographical area for pollutants, such as ozone, which are regional in nature.

J.1 Carbon Monoxide

No exceedances of the 1-hour or 8-hour objectives (30 ppm and 13 ppm respectively) were recorded. There have been no exceedances of CO at this site since it was established in 1999.

J.2 Nitrogen Dioxide

No exceedances of the 1-hour or 24-hour objectives (210 ppb and 105 ppb respectively) were recorded. There have been no exceedances of NO_2 at this site since it was established in 1999.

J.3 Ground Level Ozone

There were no exceedances of the national 1-hour objective for ozone during 2009. There is additional discussion of data from the ozone network in section 8.

J.4 Fine Particulate Matter

Fine particulate matter ($PM_{2.5}$) was measured at the Aberdeen Street site. Data obtained during 2009 indicated relatively low particulate concentrations. Data are summarized in Table 17.

J.5 Index of the Quality of the Air

Results for 2009 showed air quality in the "good" category for 98.6% of the time, with 1.3% in the "fair" range. Ozone was responsible for the small number of hours in the fair range. Results were made available hourly via recorded voice message at (506) 451-6000.

Table 17. Monitoring results for $PM_{2.5}$, Fredericton, 2009.

	Aberdeen St.
Annual average (µg/m^3)	3.8
98th percentile value (CWS)	15.6
Days when daily average was >30 µg/m^3	0
Hours when running 24-hour average was >30 µg/m^3	0

K. NACKAWIC

Nackawic is home to the AV Nackawic Bleached Kraft Pulpmill. Sulphur dioxide, total reduced sulphur and total suspended particulate as well as wind speed and direction are measured at the Caverhill Road site.

The only exceedance recorded in 2009 was for the 1-hour TRS objective at the Caverhill Road site.

The compliance history for TRS since 2001 is shown in Table 18. In regards to SO_2 and TSP, no exceedances were recorded at this site during 2009. Complete results are shown in Appendix 1.

Table 18. Exceedances of provincial objectives for TRS (as H_2S), Nackawic Network, 2001-2009.

Year	Objective	Caverhill Road
2009	1-hour	1
2008	1-hour	0
2007	1-hour	1
2006	1-hour	1
2005	1-hour	M
2004	1-hour	6
2003	1-hour	1
2002	1-hour	6
2001	1-hour	0
2009	24-hour	0
2008	24-hour	0
2007	24-hour	181
2006	24-hour	0
2005	24-hour	M
2004	24-hour	19
2003	24-hour	0
2002	24-hour	0
2001	24-hour	0

Note: results for 2004 based on 8 months of operation. The Nackawic mill was shut down in September 2004 and was reopened under new ownership in January 2006.
M= missing data.

L. MONCTON

The Moncton air quality monitoring site is situated at the Highfield Street water pumping station. The site location was chosen to provide readings representative of the central city. In addition, this site is influenced by emissions from vehicles or institutional heating systems, as well as regional pollutants such as ozone.

L.1 Carbon Monoxide

Readings remain well below air quality objectives for carbon monoxide with no exceedances of hourly or 8-hourly objectives for carbon monoxide occurring during 2009.

L.2 Nitrogen Dioxide

No exceedances of hourly or 24-hour standards for nitrogen dioxide were recorded during 2009. No exceedances of NO_2 objectives have been recorded since monitoring began in 1998.

L.3 Ground Level Ozone

There were no exceedances of the hourly objective for ozone (82 ppb). More discussion of ozone data may be found in the section on long term trends.

L.4 Fine Particulate Matter

Levels of fine particulate are, on average, moderately higher at this site than at the Fredericton site. Data are summarized in Table 19. In 2009 there were two days when the daily average $PM_{2.5}$ levels exceeded 30 µg/m^3, which is also reflected in a larger number of exceedances of the 24-hour running average. These exceedances were associated with a regional air quality event between August 17-19, 2009. Preliminary study of this event suggests it was transboundary in nature and affected areas of New Brunswick and adjacent provinces (Environment Canada, 2011). Complete results are shown in Appendix 1.

L.5 Index of the Quality of the Air

Hourly IQUA reports are generated for the Moncton site and made available via recorded message at (506) 851-6610. Summary statistics for 2009 indicated that good air quality was recorded for 98.9% of all hours, and fair for 1.0%.

Table 19. Monitoring results for $PM_{2.5}$, Moncton, 2009.

	Highfield St.
Annual average (µg/m³)	6.7
98th percentile value (CWS)	16.9
Days when daily average was >30 µg/m³	2
Hours when running 24-hour average was >30 µg/m³	42

M. ST. ANDREWS

The St. Andrews monitoring station is located on the grounds of the Huntsman Marine Science Centre (H.M.S.C.).

M.1 Fine Particulate Matter

In 2009 there were two days when the daily average $PM_{2.5}$ levels exceeded 30 µg/m³, which is also reflected in a larger number of exceedances of the 24-hour running average. These exceedances were associated with a regional air quality event between August 17-19, 2009. Preliminary study of this event suggests it was transboundary in nature and affected areas of New Brunswick and adjacent provinces (Environment Canada, 2011). Data are summarized in Table 20. Complete results are shown in Appendix 1.

M.2 Ground Level Ozone

There were no exceedances of the national 1-hour objective for ozone during 2009. There is additional discussion of data from the ozone network in section 8.

Table 20. Monitoring results for $PM_{2.5}$, St Andrews, 2009.

	H.M.S.C.
Annual average (µg/m³)	6.3
98th percentile value (CWS)	16.3
Days with daily average >30 µg/m³	2
Hours with running 24-hour average >30 µg/m³	46

4. RURAL OZONE NETWORK

Figure 10 shows the locations of the sites which monitor ground level ozone in New Brunswick. This network is operated to assess the impact of long-range transport. It focuses on the southern portion of the province, which is the region most affected by long range transport, as shown by special short-term monitoring studies and trajectory analyses (e.g. Fuentes and Dann, 1994; Tordon et al., 1994; Multistakeholder NOx/VOC Science Program, 1997a, 1997b).

There was one exceedance of the 1-hour objective of 82 ppb in 2009. On May 21, 2009 a value of 83 ppb was recorded at the Hillcrest site in Saint John. No other exceedances were recorded elsewhere in the network.

Results are summarized in Table 21. Monthly means and extremes for each site are shown in Appendix 1.

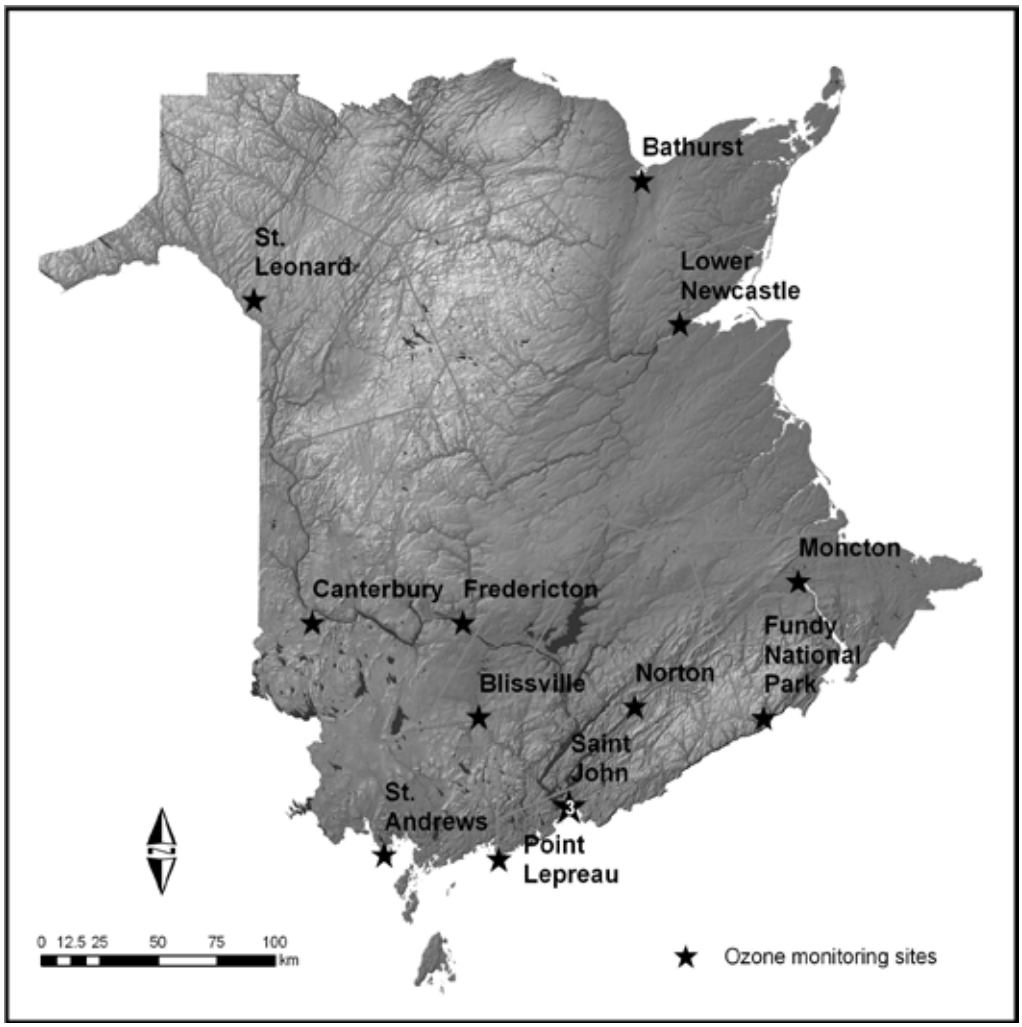


Figure 10. Locations of ozone monitoring sites in New Brunswick, 2009.

A. Air quality Advisories

DENV works with Environment Canada and the Department of Health and Wellness in the preparation and dissemination of daily forecasts of ozone. DENV maintains the monitoring network and supplies real-time data to Environment Canada forecasters, who issue twice-daily forecasts of ozone concentrations. When forecast data indicate that the 1-hour Air Quality Objective for ozone will be exceeded or closely approached, air quality and health advisories are issued to the media to provide advance notice to the public. Advisories may be issued for specific regions of the province.

In recent years, air quality advisories may also be issued when levels of fine particulate ($PM_{2.5}$) are expected to rise above 30 µg/m^3 for an extended period. For example, when smoke from forest fires within the region are forecasted to affect air quality in New Brunswick.

There were no smog advisories issued by Environment Canada in 2009.

Table 21. Exceedances of the 1-hour ozone objective (number of hours), 2009.

Site	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Blissville	--	--	--	--	--								0
Canterbury													0
Customs													0
Forest Hills													0
Fredericton													0
Fundy Park	--	--	--	--	--								0
Hillcrest					1								1
Lower Newcastle													0
Moncton													0
Norton													0
Pt. Lepreau													0
St. Andrews													0
St Leonard													0
Total	0	0	0	0	1	0	0	0	0	0	0	0	0

The 1- hour National Objective is 82 ppb.

-- = missing data.

5. CANADA-WIDE STANDARDS (CWS)

A. Canada-wide Standard for Ozone

Figures 11 and 12 show Canada-wide Standard values from 2005 to 2009. Each plotted point is calculated as the average of three years ending at that time, i.e. the point for 2009 is the average for the years 2007-2009. The CWS for ozone is 65 ppb. Figure 11 shows results for urban stations and results for rural sites are shown in Figure 12.

In 2009, all sites were at or below the standard. It should be noted that the Canterbury, Fundy and Blissville statistics were averaged over a two year period rather than a three year period, as there was insufficient data in 2007, 2009 and 2009 respectively. Also, at an elevation of 338 meters above sea level, Fundy is the highest ozone monitoring site in the province.

The compliance date for achieving the Canada-wide Standards for ozone and $PM_{2.5}$ is 2010.

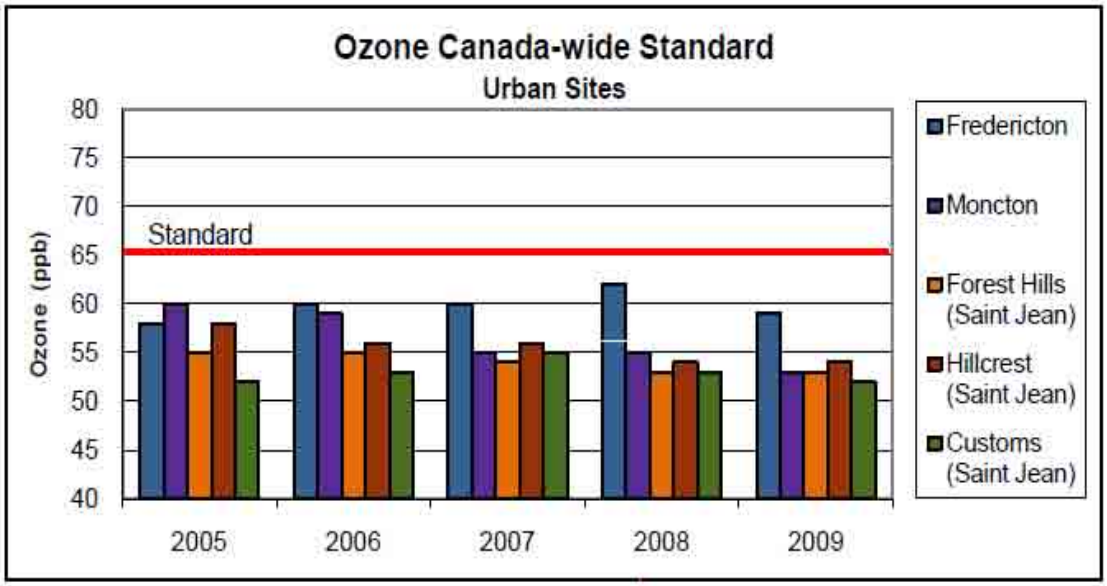


Figure 11. Canada-wide Standard results for ozone at urban sites, 2005-2009.

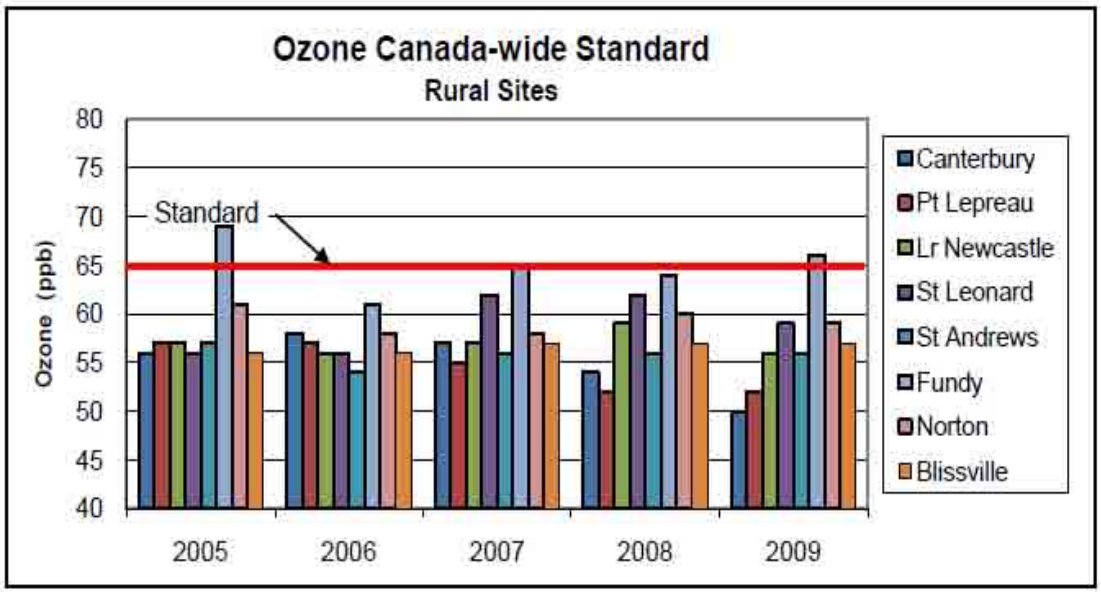


Figure 12. Canada-wide Standard results for ozone at rural sites, 2005-2009.

B. Canada-wide Standard for $PM_{2.5}$

Figures 13 and 14 show CWS results for $PM_{2.5}$. Figure 13 shows results for various sites in New Brunswick and Figure 14 shows results for stations in Saint John. The CWS for $PM_{2.5}$ is 30 µg/m³. As with the ozone CWS charts, each plotted point is a three-year average. The period of record varies between sites. Results at all stations have remained below the CWS levels to date.

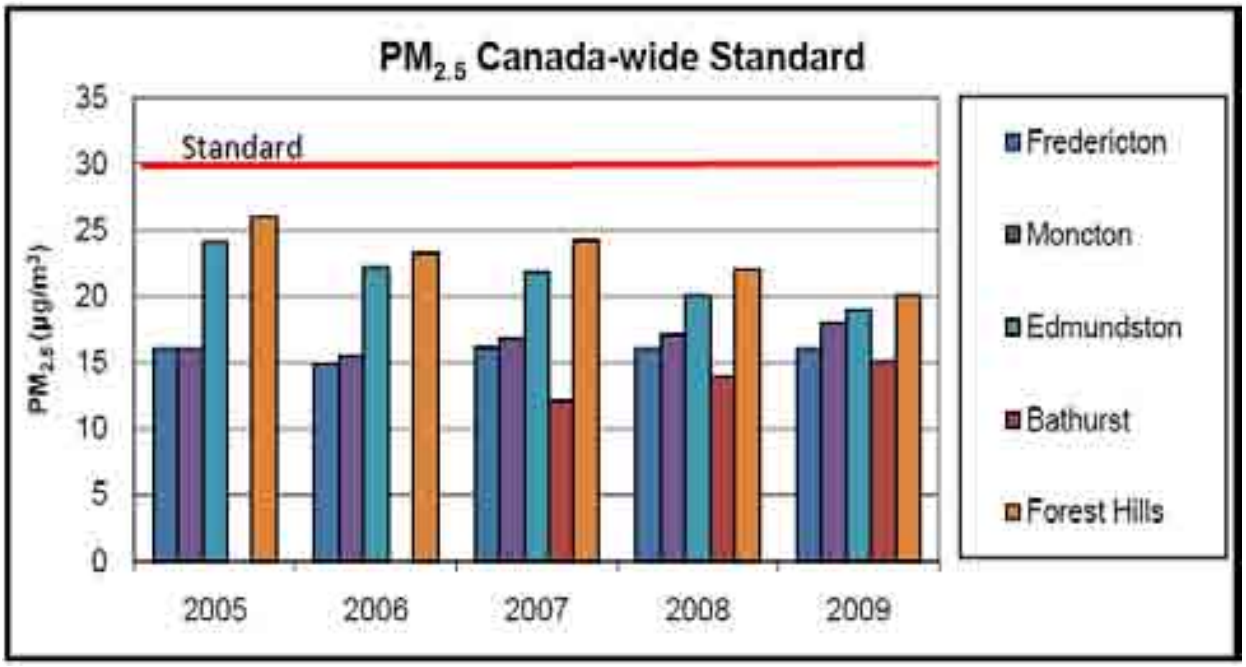


Figure 13. Canada-wide Standard results for $PM_{2.5}$, 2005-2009.

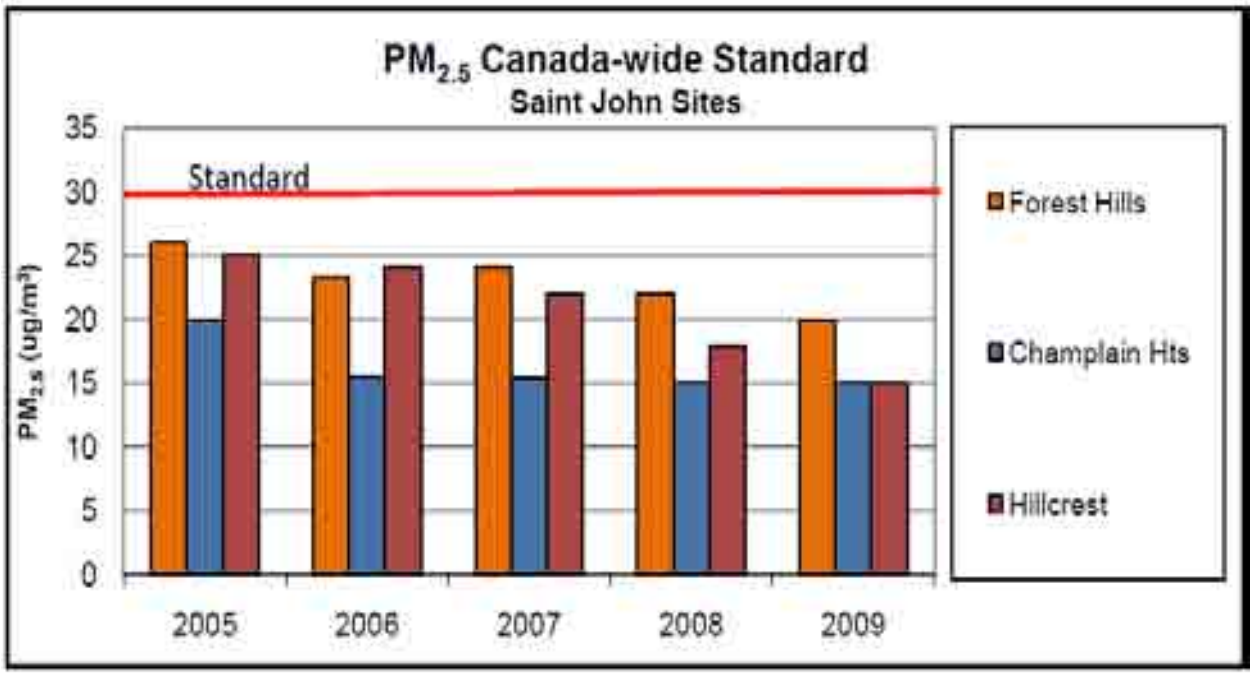


Figure 14. Canada-wide Standard results for $PM_{2.5,}$ Saint John sites, 2005-2009

6. ACID PRECIPITATION NETWORK

Emissions of sulphur dioxide and nitrogen oxides can be transformed in the atmosphere to acidic particles which ultimately fallout as acid deposition, in both wet and dry form. Acid precipitation, or acid rain, refers to the wet form of acid deposition.

The potentially adverse impacts of acid precipitation have been recognized since the early 1980's. Acid precipitation effects occur at a broad regional level, not just close to the sources of the contaminants themselves. The emissions which cause acid precipitation typically travel long distances, hundreds or even thousands of kilometers, before returning to the surface as rain or snow. In New Brunswick, acid deposition is affected by local emissions and the emissions from several large industrial regions which are located upwind, including the American Midwest, southern Ontario and Québec, and the Washington-Boston region. The same emissions also contribute to regional haze and fine particulate pollution.

Consequently, measures to reduce emissions that contribute to acid rain have been underway in North America since the late 1980's. Over the past two decades sulphur dioxide emissions from major sources within New Brunswick have been reduced significantly including commitments to reduce emissions under the Canada-wide Acid Rain Strategy for Post-2000.

New Brunswick has operated an extensive acid precipitation (rain and snow) monitoring network since the early 1980s. Since 1987, this has been a partnership effort with logistical and financial support from NB Power. In 2009, DENV took over the logistical operation of the entire network with NB Power continuing with its financial support. All precipitation samples are analyzed at the DENV laboratory, and DENV staff co-ordinate the monitoring program, perform data quality assurance, and maintain the official data archive. There were 12 acid precipitation

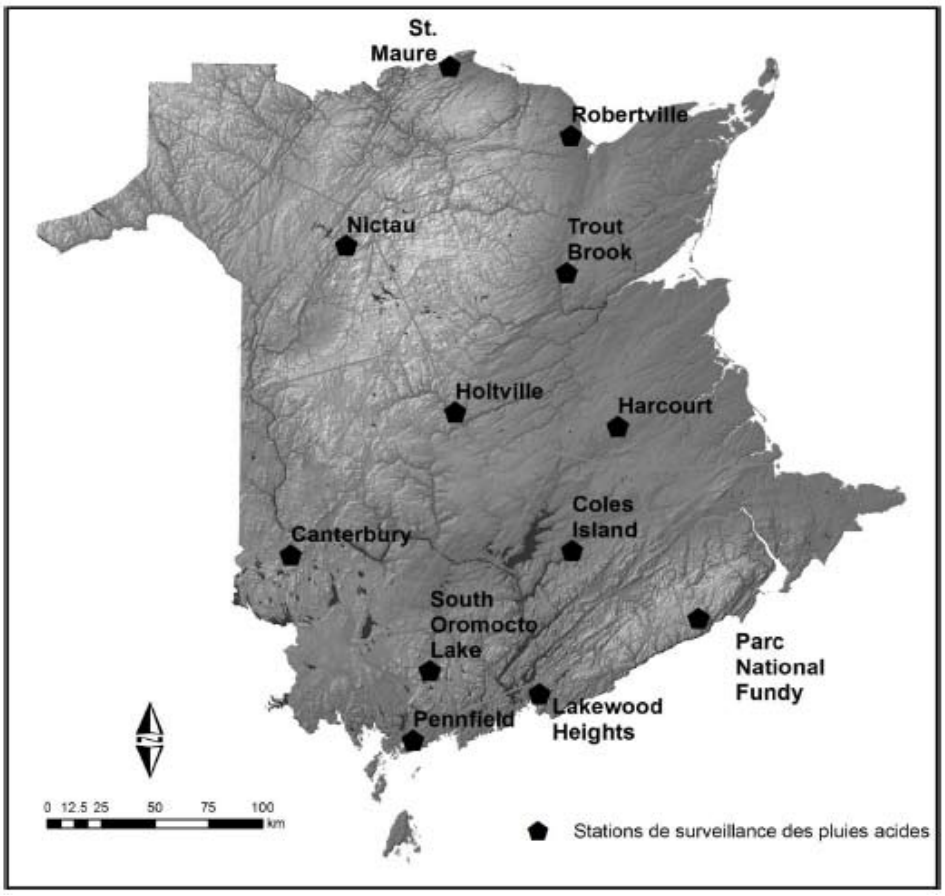


Figure 15. Location of acid rain monitoring sites in New Brunswick, 2009.

monitoring stations in operation in 2009. These sites are predominantly located in remote rural areas. Figure 15 shows the location of the acid precipitation monitoring sites in New Brunswick.

The severity of acid rain impact is generally measured by computing how much sulphate (a measure of sulphuric acid) falls on each hectare of land over one year. In Canada, critical loads are defined as the level of acidic deposition that a specific area can tolerate without harm. Critical loads take into account the nature of individual watersheds and their susceptibility to the effects of acidification. Critical loads for acidification in New Brunswick range from less than 8 up to 11 kg/ha/yr of acid sulphate deposition. The lowest values of less than 8 kg/ha/yr are designed to protect the most sensitive areas that typically have granite bedrock (e.g. areas of southwestern and central northern New Brunswick), and 11 kg/ha/yr for most of the rest of the Province.

Sulphate wet deposition for the 10 year period of 2000-2009 is shown in Table 22. At all of the sites in the network, acid deposition values in 2009 were lower as compared to deposition levels in 2008. Acid rain deposition in 2009 ranged from as low as 6.25 kg/ha/yr in Nictau to as high as 12.21 kg/ha/yr in Pennfield.

The amount of acid precipitation is a naturally variable indicator of acid deposition because it is closely associated with the amount of precipitation that falls during the course of the year at a given monitoring site. As a result, there will always be significant variability in annual deposition values as a function of rain and snow levels each year.

2009 was a very wet year, with total annual precipitation above normal over most of the Province. Only the northwestern area and a small area along the east coast were in the normal range. Southwestern NB received the greatest amount of precipitation recording a surplus of over 400 mm for the year. Further information can be found at:

http://www.gnb.ca/0009/0371/0007/0006-e.asp

Table 22. Sulphate wet deposition (kg/ha/yr) at New Brunswick monitoring sites, 2000-2009

Site	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
St. Maure	9.73	7.14	8.08	8.53	7.77	10.63	10.54	10.16	10.49	7.31
Robertville	9.48	7.98	10.08	7.25	7.48	11.36	12.13	9.08	9.40	7.33
Petit Paquetville	8.89	8.33	7.64	7.24	7.11	10.07	10.86	8.79	8.10	--
Nictau	---	9.367	9.59	7.08	8.00	9.31	11.47	7.68***	7.94	6.25
Trout Brook	8.36	9.89	9.12	9.04	6.42	10.74	10.83	8.73	7.86	6.46
Holtville	11.48	8.94	10.58	10.75	8.29	12.01	12.21	8.81	10.92	8.40
Harcourt	9.82	7.50	10.00	9.81	7.27	9.50	10.31	8.09	10.17	7.86
Canterbury	10.49	8.46	10.47	9.58	7.32	13.53	---	---	9.43	6.88
Fundy	19.04	10.62	15.07	13.23	12.66	15.43	16.69	12.09	12.87	11.93
South Oromocto Lake	13.17	9.60	10.95	11.14	---	---	11.71	10.68	10.62	8.97
Lakewood Heights	16.36	10.17	14.94	16.89	12.83	13.01**	14.49	11.62	11.98	11.84
Pennfield	14.20*	10.49	13.30	12.03	12.12	16.45	15.53	11.45	13.47	12.21
Coles Island	12.28	7.44	10.84	10.62	8.28	9.20	9.07	8.95	7.79	7.00

--- insufficient data
* 41 Weeks reporting
** 48 Weeks reporting
*** 49 Weeks reporting

Another useful indicator of acid deposition is the average annual sulphate concentration in precipitation, averaged across all sites operating in each year. The results are shown in Figure 16, which also shows the number of sites that were in operation for at least a portion of each year. The trend overall is downward since 1989, with the last two years (2008 and 2009) having the lowest recorded concentrations to date. The downward trend strongly suggests that reductions in sulphur dioxide emissions in New Brunswick, elsewhere in eastern Canada and the United States have had a beneficial effect on acid rain in the province.

Although Canada and US emissions of sulphur dioxide and nitrogen oxides have continued to decline since 1990 (Canada-United States Air Quality Agreement: 2008 Progress Report), the acid rain issue remains important for New Brunswick because critical loads for acid deposition continue to be exceeded, especially in southern NB. As a result, more effort to reduce emissions is still required to ensure that the more sensitive lake and river ecosystems are provided with long-term protection from acid damage.

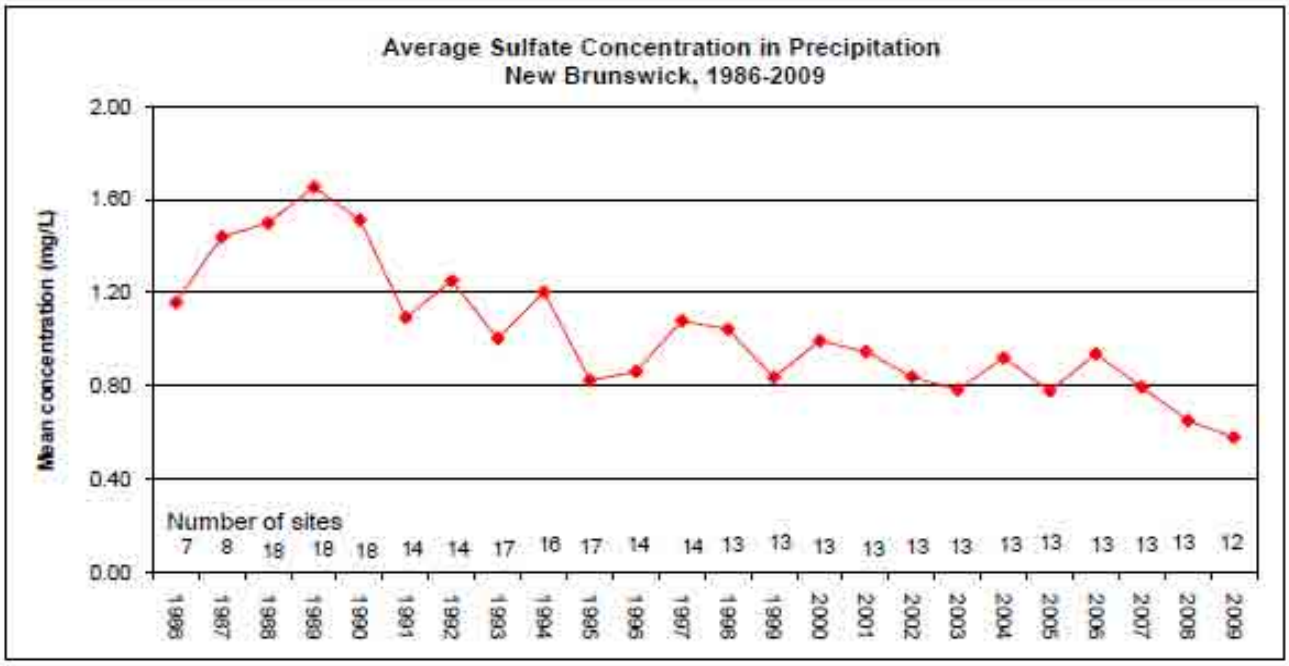


Figure 16. Network-wide mean annual sulphate concentration in precipitation in New Brunswick, 1986-2009.

7. MOBILE AIR QUALITY MONITORING TRAILER

To help in evaluating air quality in New Brunswick, the DENV acquired a new stand-alone trailer from the National Air Pollutant Surveillance (NAPS) program in 2007 (Figure 17). It augments monitoring carried out at established monitoring sites and can be moved to vaious areas of the province, fulfilling temporary monitoring needs. The vehicle is presently able to measure the following pollutants: sulphur dioxide, nitrogen oxides, ozone, total reduced sulphur (including hydrogen sulphide), fine particulate matter ($PM_{2.5}$) and carbon monoxide (added in 2009). The trailer is also fitted with a retractable 10-metre mast with wind speed and wind direction instruments.

2009 Operations

From February 25 to December 15, 2009 the monitoring trailer was used to evaluate air quality concerns in the MacAleese Lane area of Moncton. Results from the monitoring program were reported previously and the final report is available on the Department's website at:

www1.gnb.ca/0009/airQuality/0001-e.pdf

Figure 17. Mobile Air Quality Monitoring Trailer, 2009.

8. LONG TERM AIR POLLUTION TRENDS

In addition to examining air quality monitoring results for a given year, it is often informative to compare annual results to previous years, and consider longer term trends. This provides information on how air quality may be changing over the years, and whether emission control measures as applied to industrial operations and consumer products (notably vehicles and fuels) are positively impacting long-term environmental quality. As mentioned in the introduction, air quality monitoring has been ongoing in parts of the province since the 1970s, especially in the Saint John region. In this section, data for key locations with long-term records are presented to provide information on air quality trends.

Instrument readings at these low concentrations are generally considered to be backgound levels.

A. Carbon Monoxide

Customs Building

Carbon monoxide levels at the Customs Building site are predominantly influenced by motor vehicle emissions. Figure 18 shows the monitoring results of the 20 year period from 1990 to 2009. Average carbon monoxide levels have improved over this period. The data is beginning to reflect tighter vehicle emission manufacturing standards resulting in lower emissions.

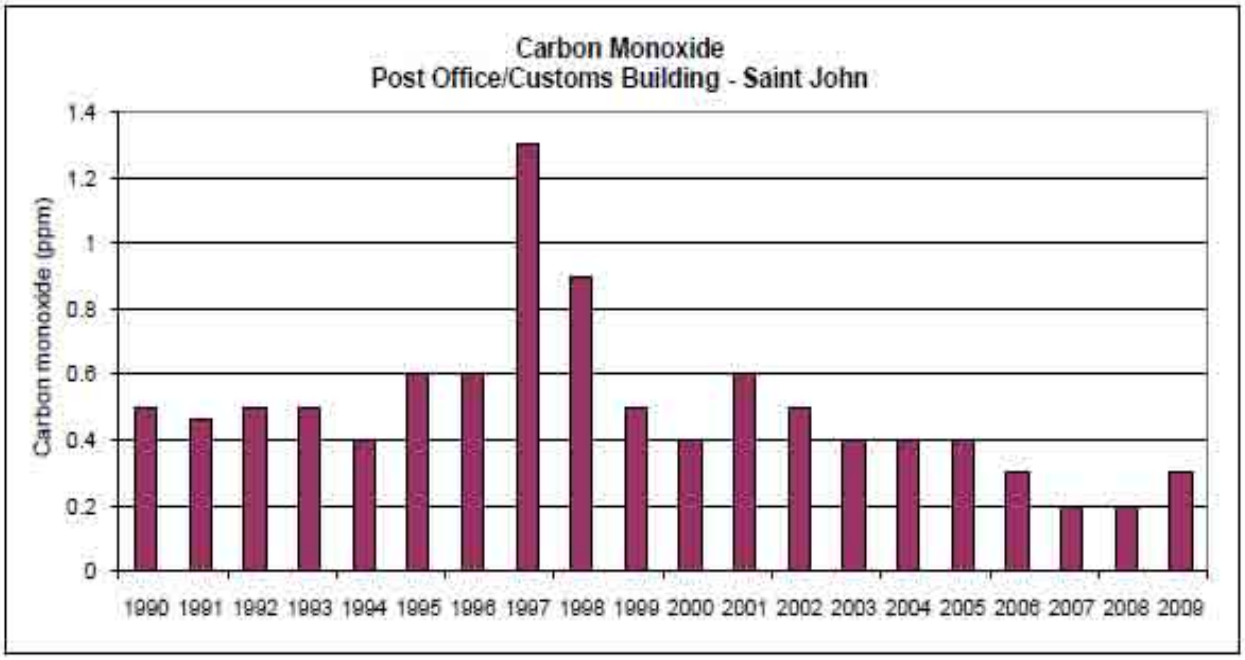


Figure 18. Annual mean carbon monoxide, Post Office/Customs Building, Saint John, 1990-2009.

Fredericton and Moncton

The record to date at these stations shows similar improvement over the long term, as recorded at the Saint John-Customs location. As seen in Figure 19, average carbon monoxide levels at these two sites have fluctuated between 0.1 and 0.3 ppm in recent years.

In recent years, at all three sites measuring CO, instruments have been reading at values which are consistent with backgound levels.

B. Nitrogen Dioxide

Forest Hills

NO_2 is another key pollutant emitted by motor vehicles, as well as industrial sources. Figure 20 shows that the overall NO_2 trend at this site has been downward since 2001.

Forest Hills is influenced by emissions from local industries as well as the more diffuse sources such as vehicles.

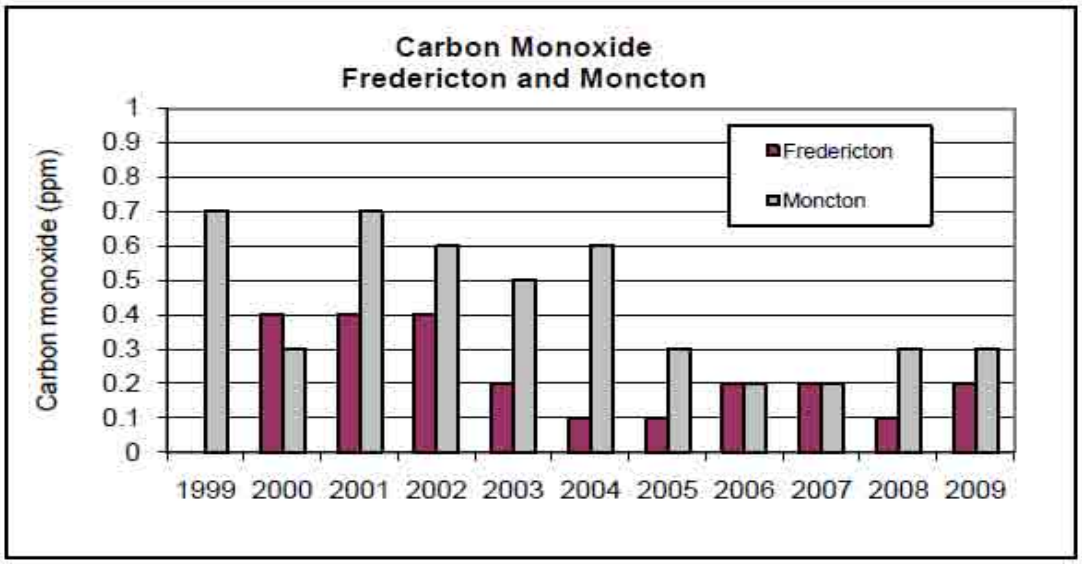


Figure 19. Annual mean carbon monoxide, Fredericton and Moncton, 1999 -2009.

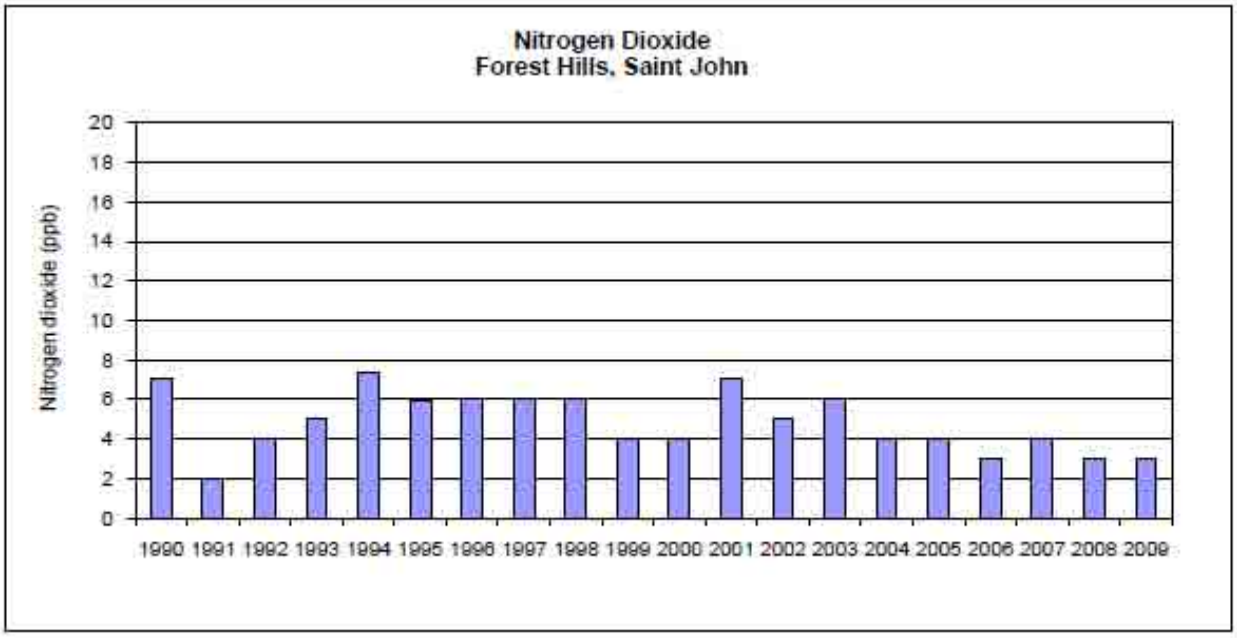


Figure 20. Annual mean nitrogen dioxide, Forest Hills, Saint John, 1990-2009.

Customs Building

The 20 year record for the monitoring of NO_2 at the customs building in Saint John is shown in Figure 21. In 2009, the annual mean continued a downward trend of recent years and stood at 4 ppb.

Fredericton and Moncton

The 10 year record of monitoring for NO_2 in Frederiton and Moncton is shown in Figure 22. Annual average levels have varied between 3 and 5 ppb.

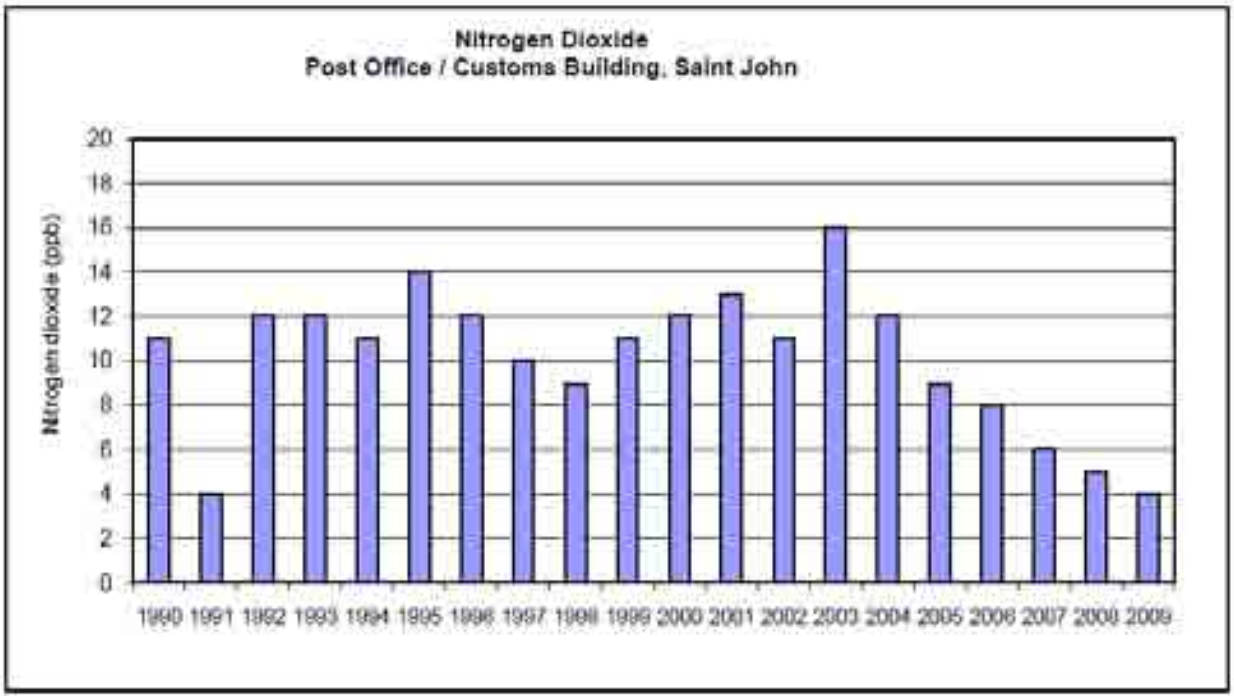


Figure 21. Annual mean nitrogen dioxide, Customs Building, Saint John, 1990-2009.

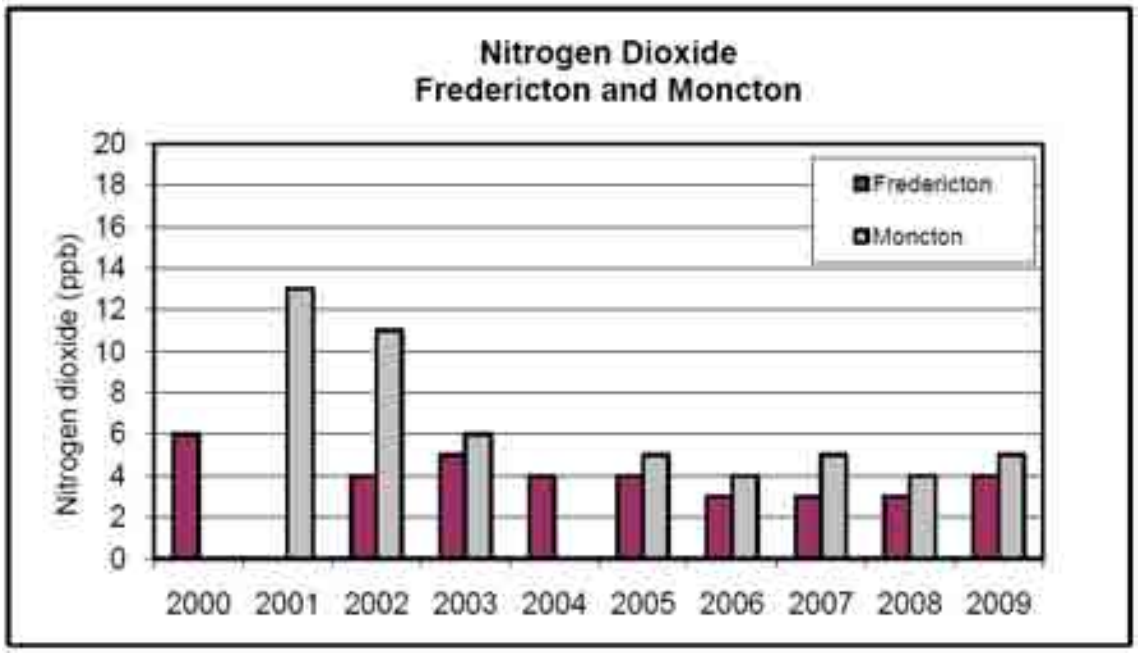


Figure 22. Annual mean nitrogen dioxide, Fredericton and Moncton, 2000-2009

C. Sulphur Dioxide

Forest Hills

Figure 23 shows dramatic improvement in average SO_2 levels at Forest Hills over the 20 year period from 1990-2009. This reflects emission reductions that have been achieved by several local industries including power generating stations, the pulp and paper industry and an oil refinery. In 2009, the annual average SO_2 concentration was 2 ppb.

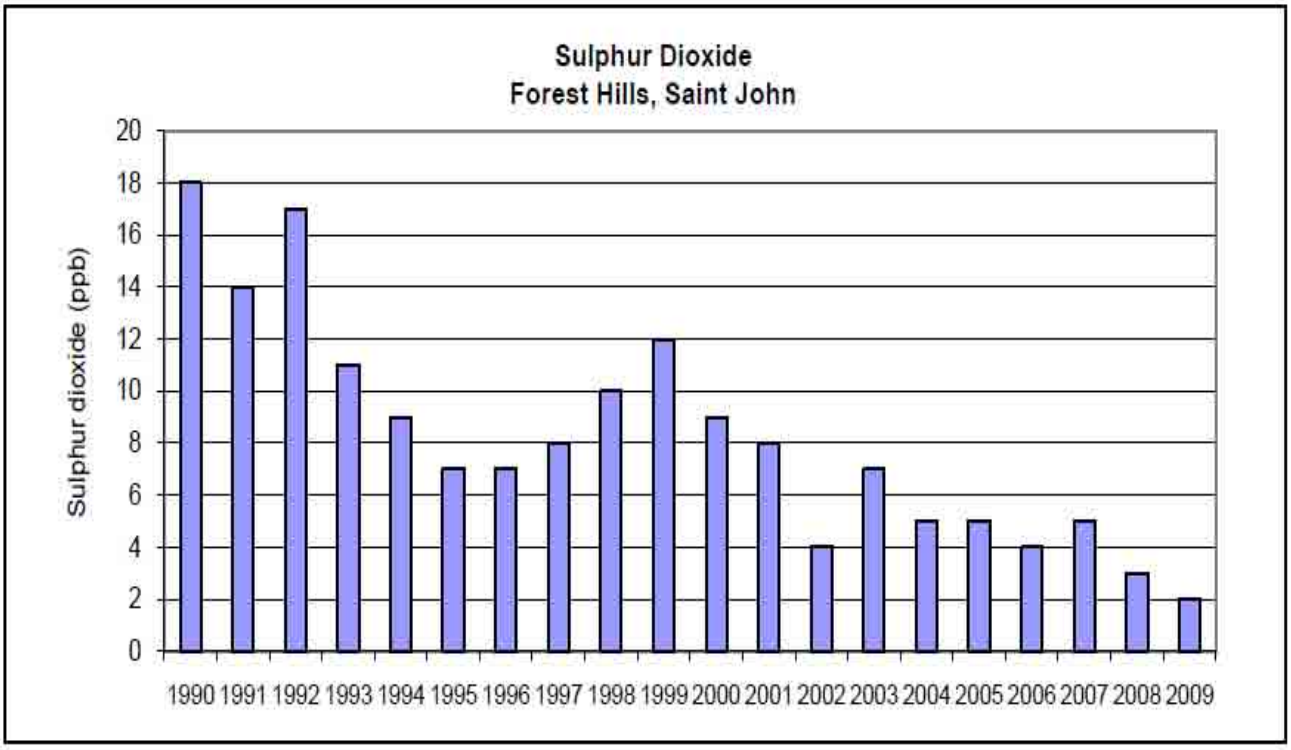


Figure 23. Annual mean sulphur dioxide, Forest Hills, Saint John, 1990-2009.

Customs Building

In uptown Saint John, as represented by records from the Post Office and Customs Building sites, the SO_2 trend has been downward since the 1990s. Decreasing concentrations in this part of the city are probably due to a variety of reasons, including reduced emissions from the Reversing Falls pulp and paper mill, which fell by about 70% from 1980 to 1995. Reduced emissions from the NB Power Courtenay Bay generating station (down 74% from 1990 to 1995) may also be partly responsible. Other reasons include the closure of the Lantic sugar refinery in 2002, new regulations reducing the sulphur content of gasoline, and the increased use of natural gas.

The annual mean in 2009 was 1 ppb (Figure 24).

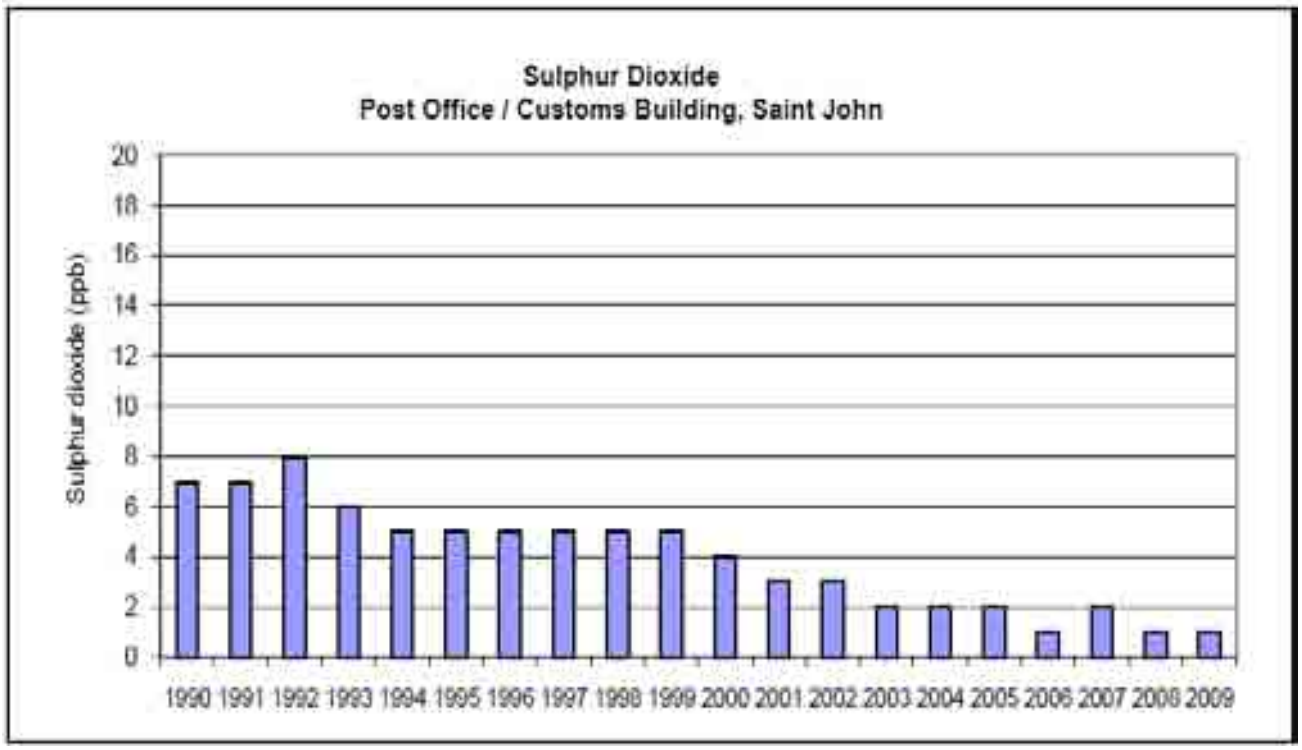


Figure 24. Annual mean sulphur dioxide, Post Office/Customs Building, Saint John, 1990-2009.

Hillcrest

This site in west Saint John is influenced by several sources of SO_2, including the Reversing Falls pulp and paper mill and the Moosehead Brewery. Since 1992, the data show a rising trend until 1997 and then falling thereafter. In 2009, the annual mean was 2 ppb (Figure 25).

Saint John – 3 Site Average

To examine the long term trend on a city-wide basis, a composite annual average of three sites (Hillcrest, Forest Hills and the Customs Building) operated by the DENV in the Saint John area was calculated. The trend is shown in Figure 26.

The results show average SO_2 level of 6-7 ppb during the 1990s, after which they began to decline to the point where in recent years the city wide average for SO_2 has been less than 4 ppb.

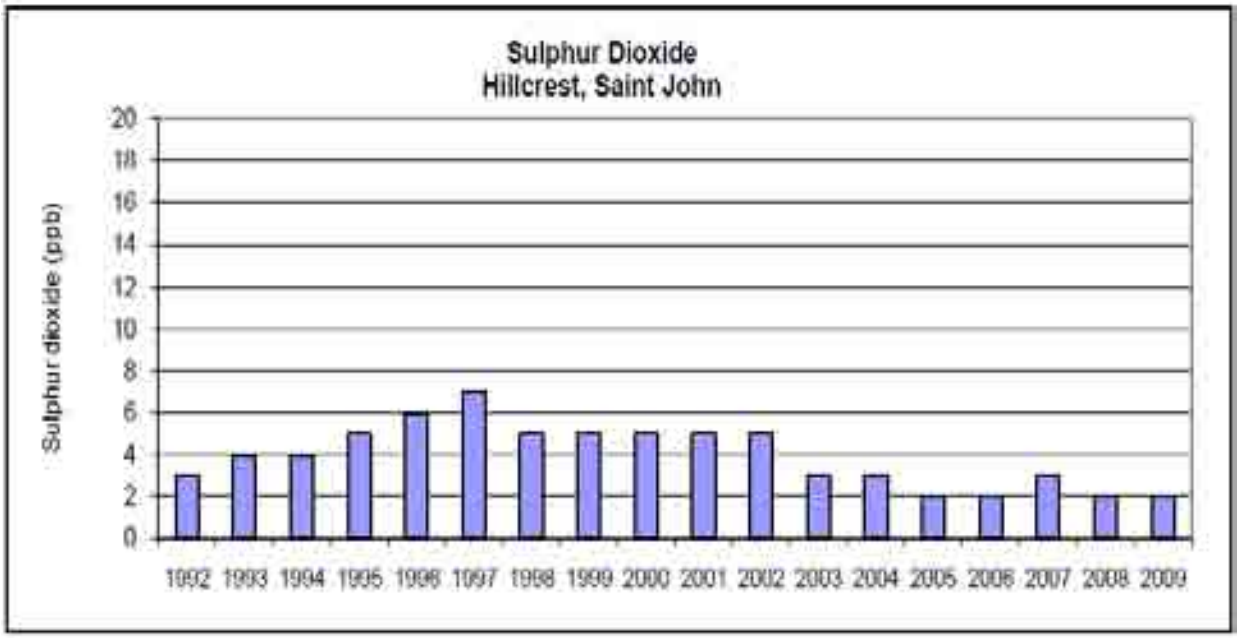


Figure 25. Annual mean sulphur dioxide, Hillcrest, Saint John, 1992-2009.

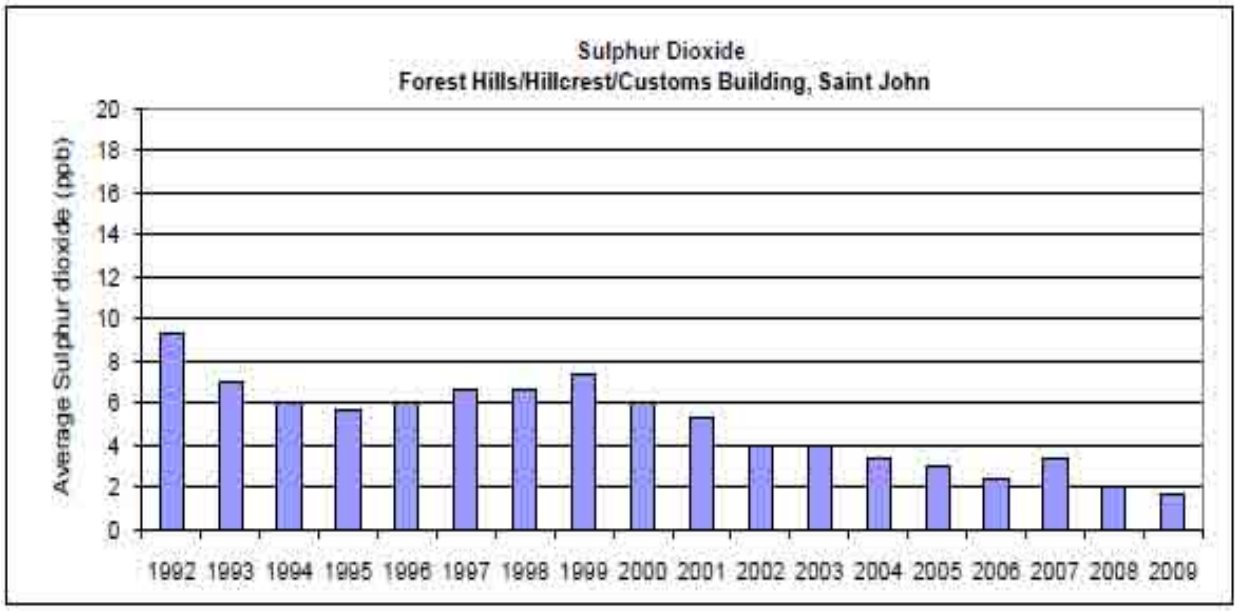


Figure 26. Trend in sulphur dioxide in Saint John, 3 site composite average, 1992-2009.

D. Ground Level Ozone

As explained in section 4, O_3 is a regionally transported pollutant which is not emitted directly from smokestacks or tailpipes, but which forms in the air when other pollutants mix and react with each other in the presence of high temperatures and sunlight. As such, trends in O_3 are due to changing emissions of the pollutants that lead to O_3 formation (NO_x and VOCs) originating in heavily populated regions of central Canada and the northeastern United States. Seasonal weather, especially summer conditions, also has a major influence on the amount of O_3 affecting New Brunswick.

Forest Hills

During the 1990s, average ozone levels at Forest Hills varied between 16 and 26 ppb; whereas since 2003, average levels have been maintained at above 25 ppb (Figure 27).

Customs Building

At the Customs site, no clear trend is apparent. However, average levels in recent years have been close to 25 ppb (Figure 28).

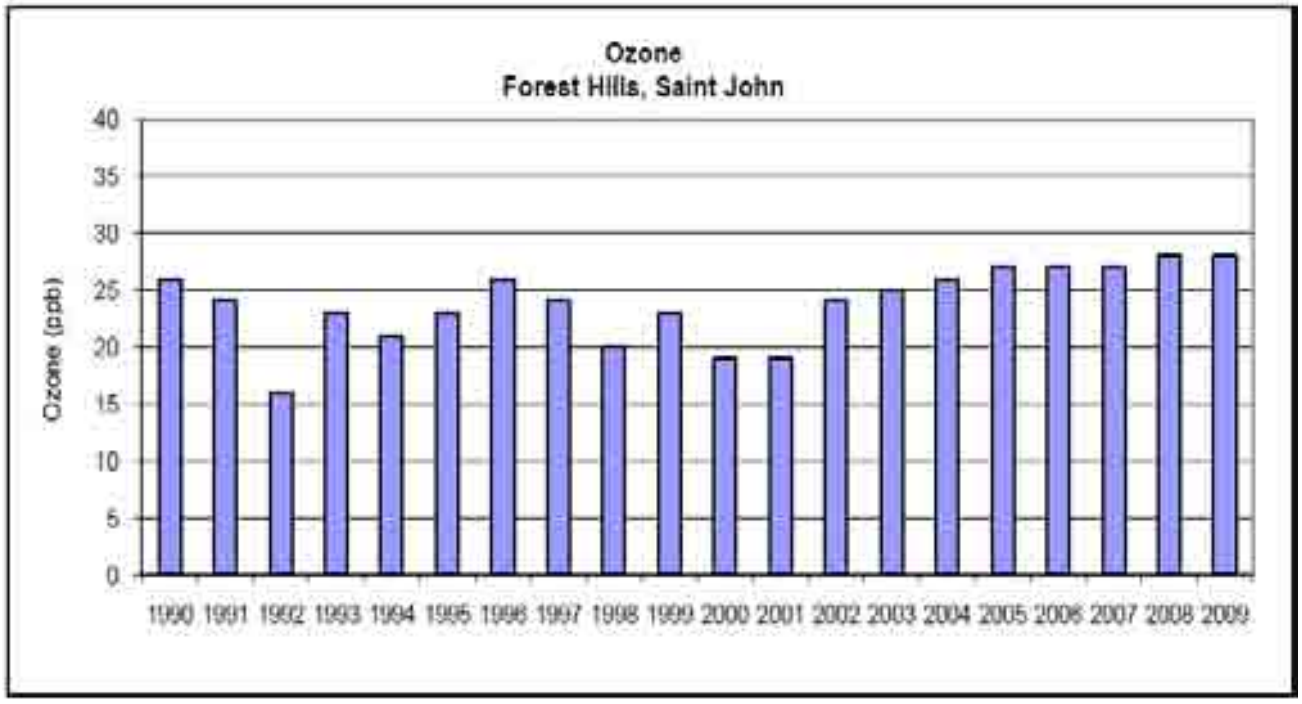


Figure 27. Annual mean ozone, Forest Hills, Saint John, 1990-2009.

Data for this site are included to provide a perspective from a rural location which is almost always upwind of major sources of air pollutants in southern New Brunswick. This indicates that the majority of the O_3 measured at this site comes from outside the province. Annual O_3 levels are usually somewhat higher than those seen in the Saint John area (Figure 29). This is because urban sites typically have higher levels of traffic that emit concentrations of pollutants that can react with and break down O_3.

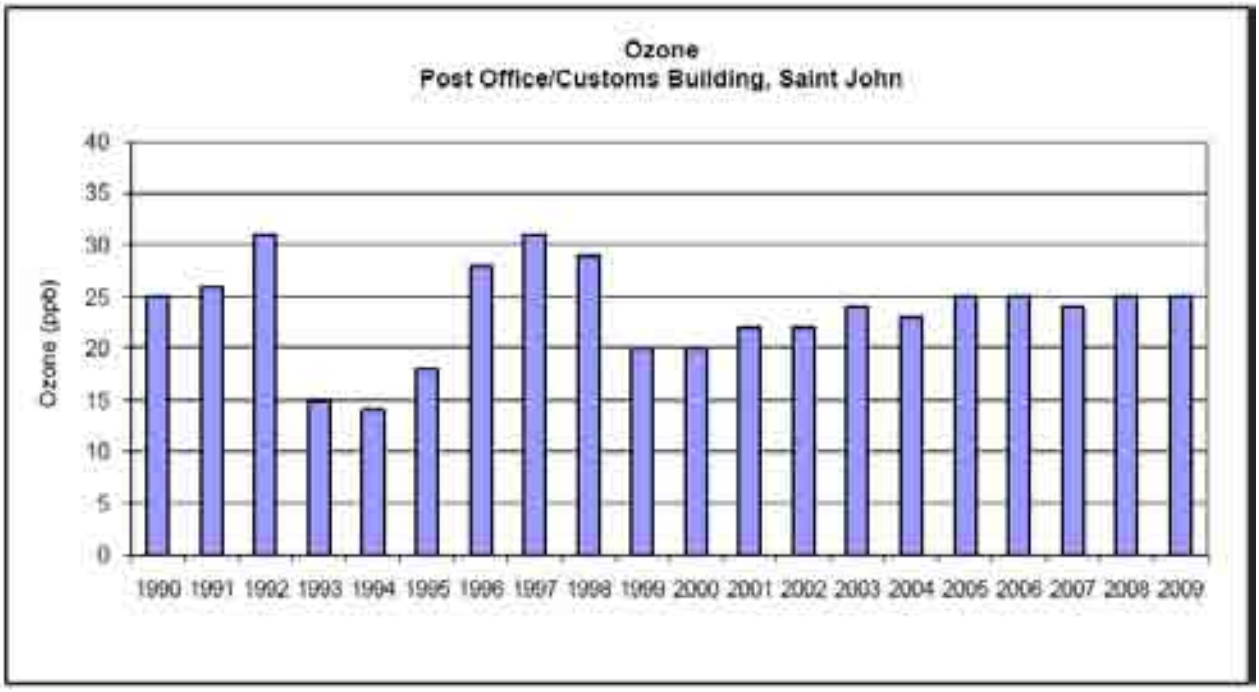


Figure 28. Annual mean ozone, Post Office/Customs Building, 1990-2009.

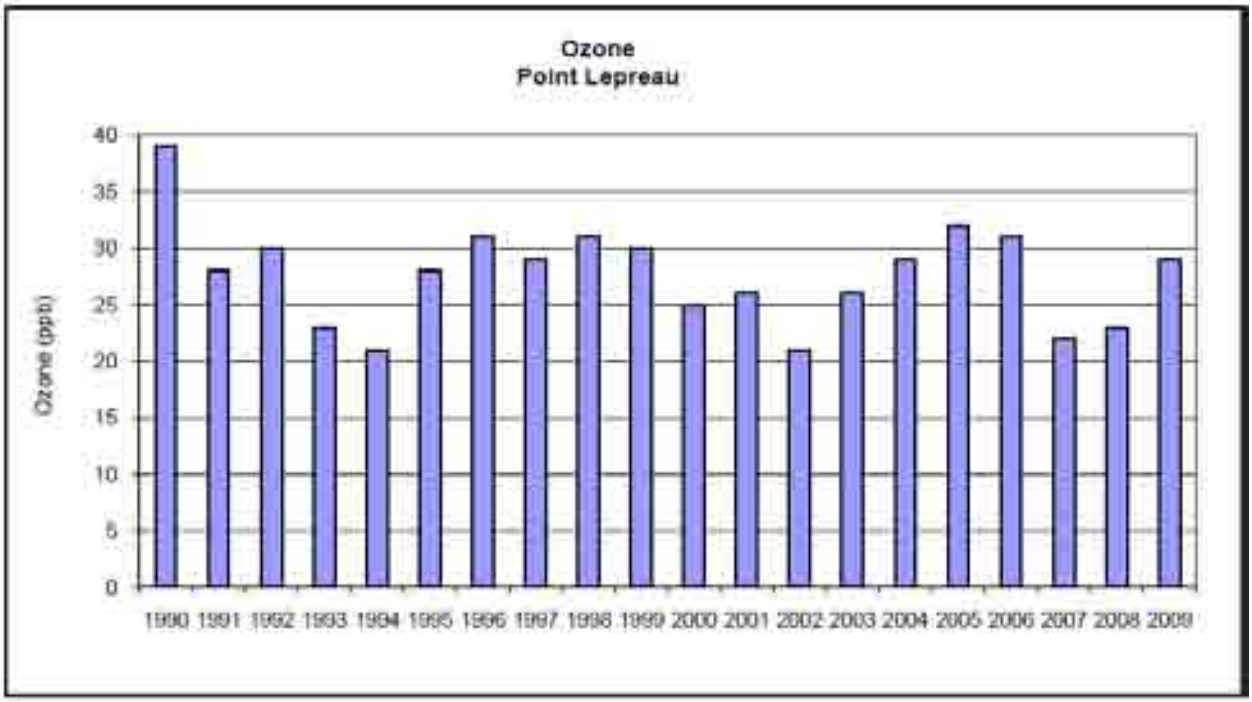


Figure 29. Annual mean ozone, Point Lepreau, 1990-2009.

Provincial Ozone Trends

Figure 30 shows a composite trend based on all O_3 sites in the province. The number of sites has increased substantially over the period of record, from three initially, to 14 in 2009. The latter half of the record is therefore more meaningful because there is greater spatial coverage and more data available.

Examining the record since 1990, a linear trend line indicates no change in the province-wide O_3 average.

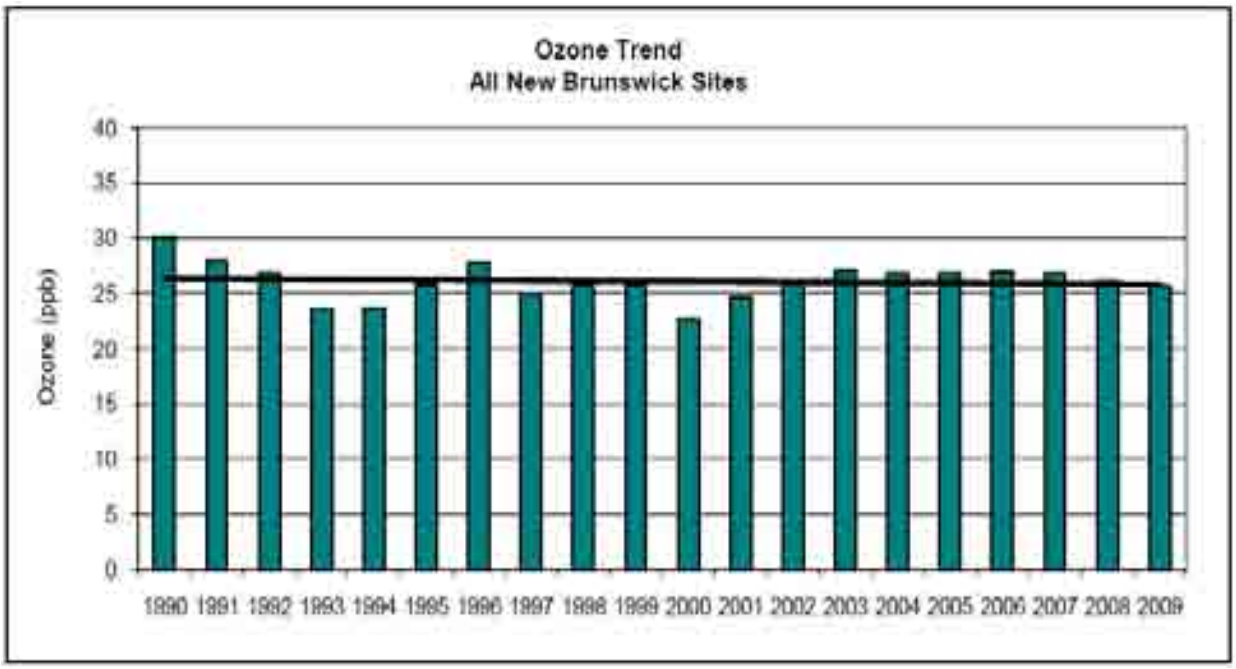


Figure 30. Trend in ozone, composite average of all New Brunswick sites, 1990-2009.

E. Volatile Organic Compounds

VOCs have been measured at two locations (Forest Hills and Point Lepreau) since 1992, as noted in Section 3. Routine analyses provide results for over 150 VOCs. In July 2000, sampling began at Champlain Heights School, a site within 0.5 kilometers of the Irving Oil refinery complex in east Saint John. Trends for selected VOCs are presented in this section.

One clear finding from the VOC sampling program is that concentrations of most VOCs are found to be higher at Forest Hills and Champlain Heights than at Point Lepreau. This is consistent with the location of Forest Hills and Champlain Heights in an industrial/urban setting and Point Lepreau in a relatively remote, rural setting.

Figure 31 shows trends in average total VOC concentrations for all sites since 2000.

These results clearly show differences in average VOC levels between the three sites. There has been relatively little change at Point Lepreau. There were no results available from Point Lepreau in 2009, as the equipment was temporarily reassigned for a special study (see Section 7). At Forest Hills, annual average total VOC concentration was the same in 2009 as it was in 2008. There has been a modest improvement in annual average total VOC concentration since 2000. At Champlain Heights, the proximity of that site to the refinery complex is reflected in higher and more variable total VOC concentrations. There was a slight decline in total VOCs between 2008 and 2009. VOC monitoring will continue at these sites to further assess long term trends.

Compounds such as butane and isopentane (Figure 32), which are major volatile components of gasoline, generally reflect the total VOC trend at the two Saint John sites.

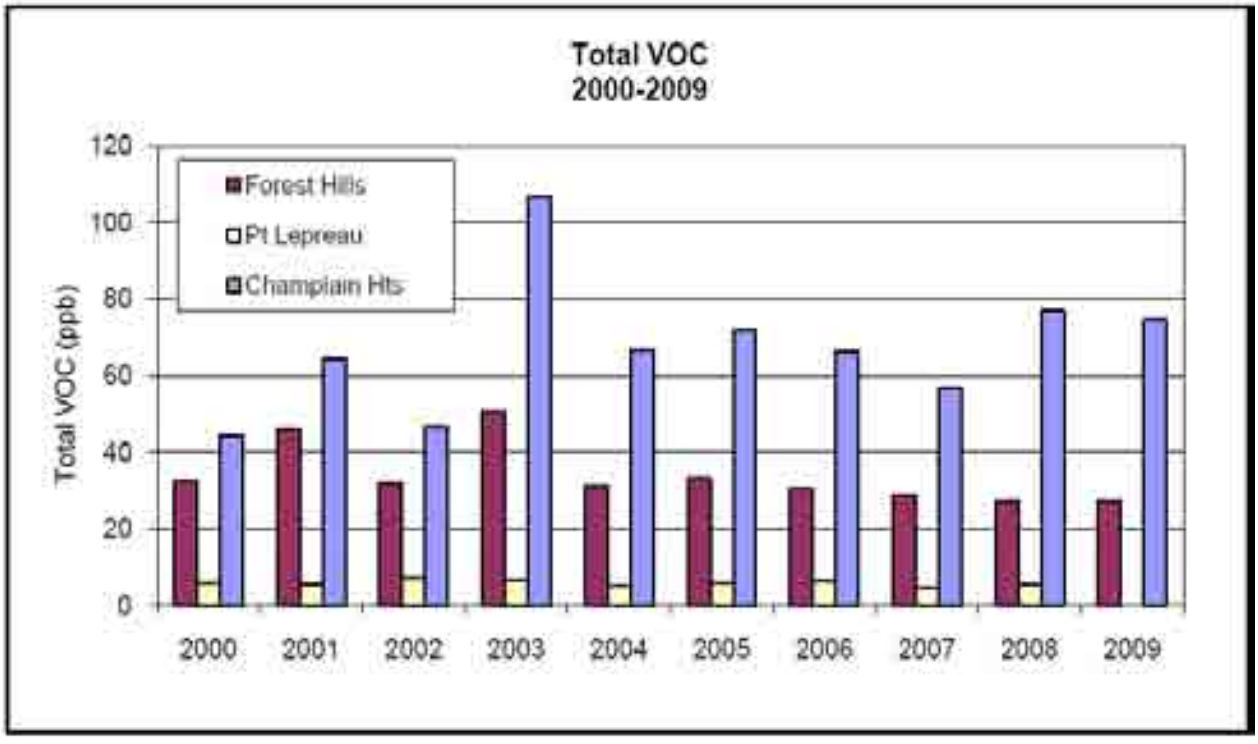


Figure 31. Average total VOC concentration at provincial VOC monitoring sites, 2000-2009.

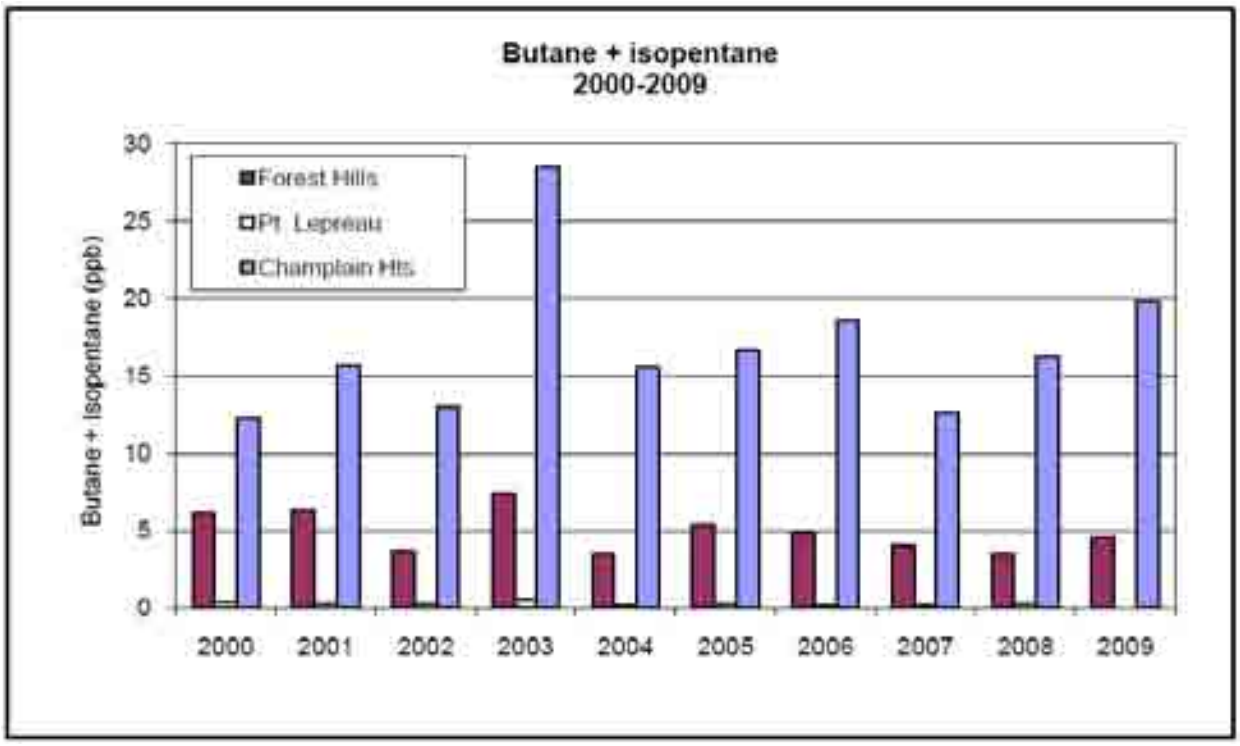


Figure 32. Annual average concentration of butane plus isopentane at provincial VOC monitoring sites, 2000-2009.

Annual average concentrations of potentially toxic VOCs since 2000 are shown in Figures 33-35. Figure 33 shows the trend for benzene, Figure 34 for butadiene and Figure 35 for xylenes.

As with total VOC concentrations, levels of these specific VOCs have shown modest improvement at Forest Hills while the results at Champlain Heights are more variable from one year to the next.

Benzene is an important component of gasoline. Even though there was a slight increase in 2009 at both urban sites, benzene levels have not changed appreciably in the past three years at either site.

Butadiene is emitted during petroleum refining and subsequent handling, as well as from internal combustion engines (e.g. CARB, 1992). Butadiene concentrations appear similar at both urban sites and some improvement is apparent since 2000.

Xylenes are associated with vehicle exhaust (Multistakeholder NOx/VOC Science Program, 1997a). There was a decrease in the level of xylenes sampled at both urban sites in 2009.

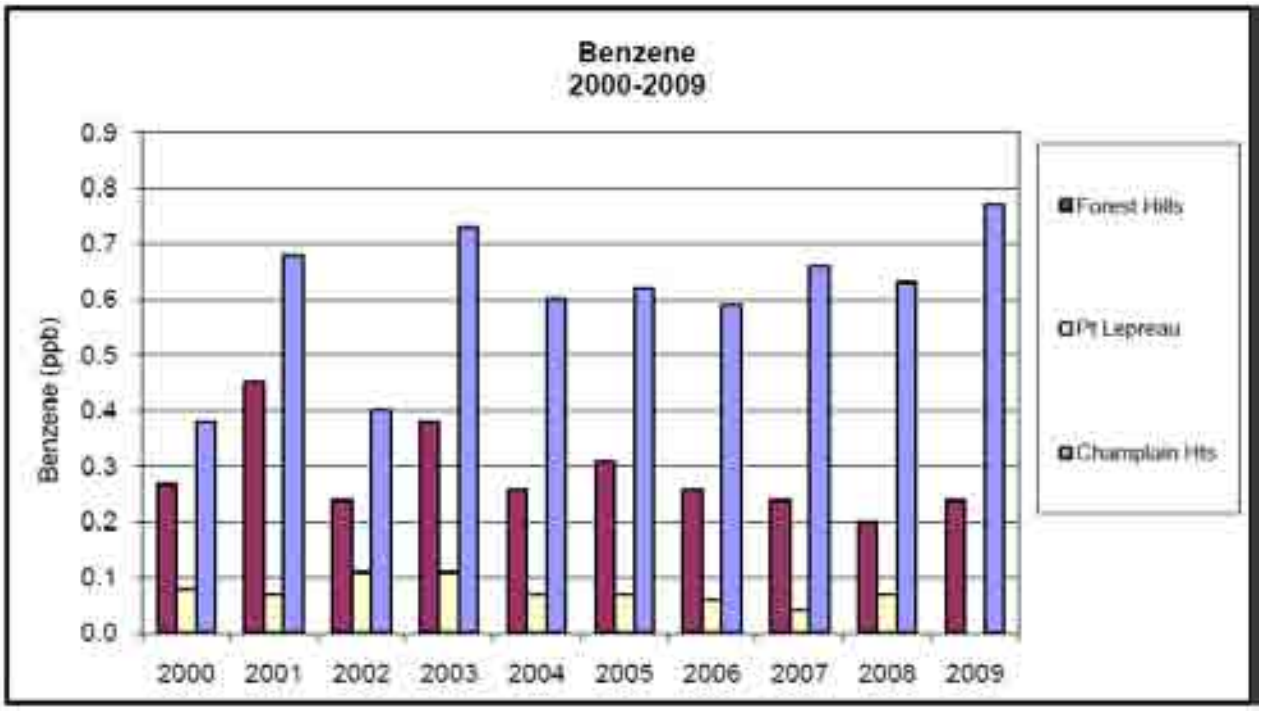


Figure 33. Annual average concentration of benzene at provincial VOC monitoring sites, 2000-2009.

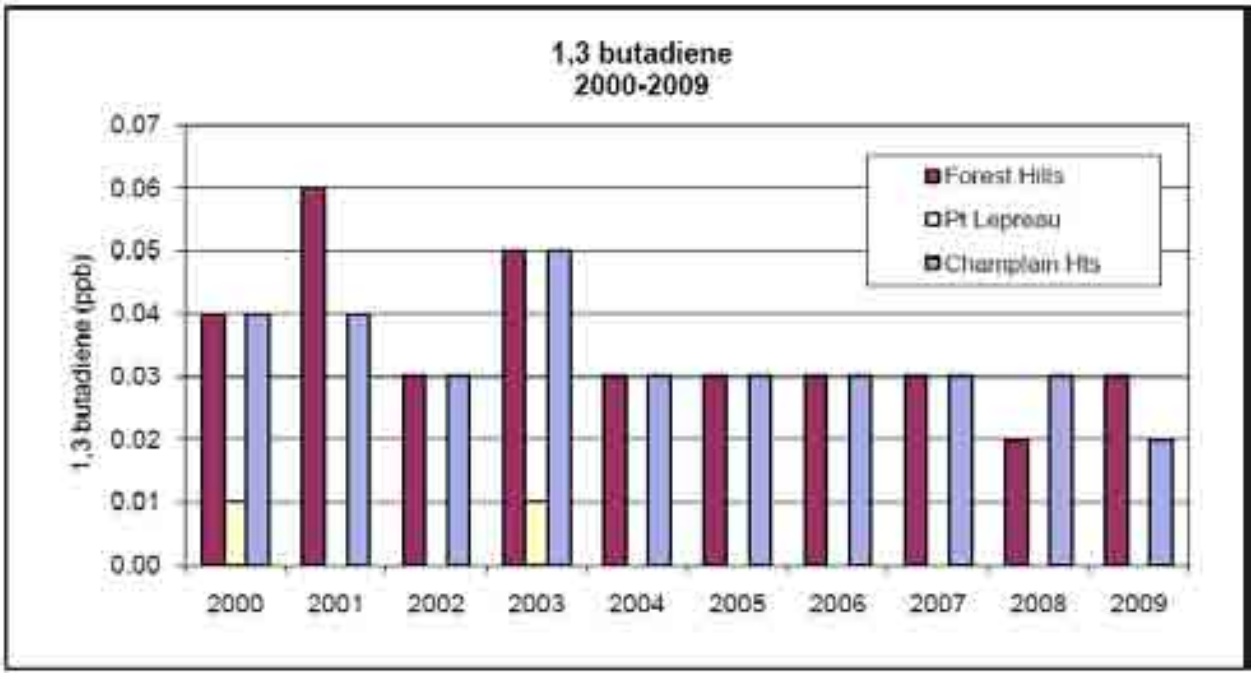


Figure 34. Annual average concentration of 1,3 butadiene at provincial VOC monitoring sites, 2000-2009.

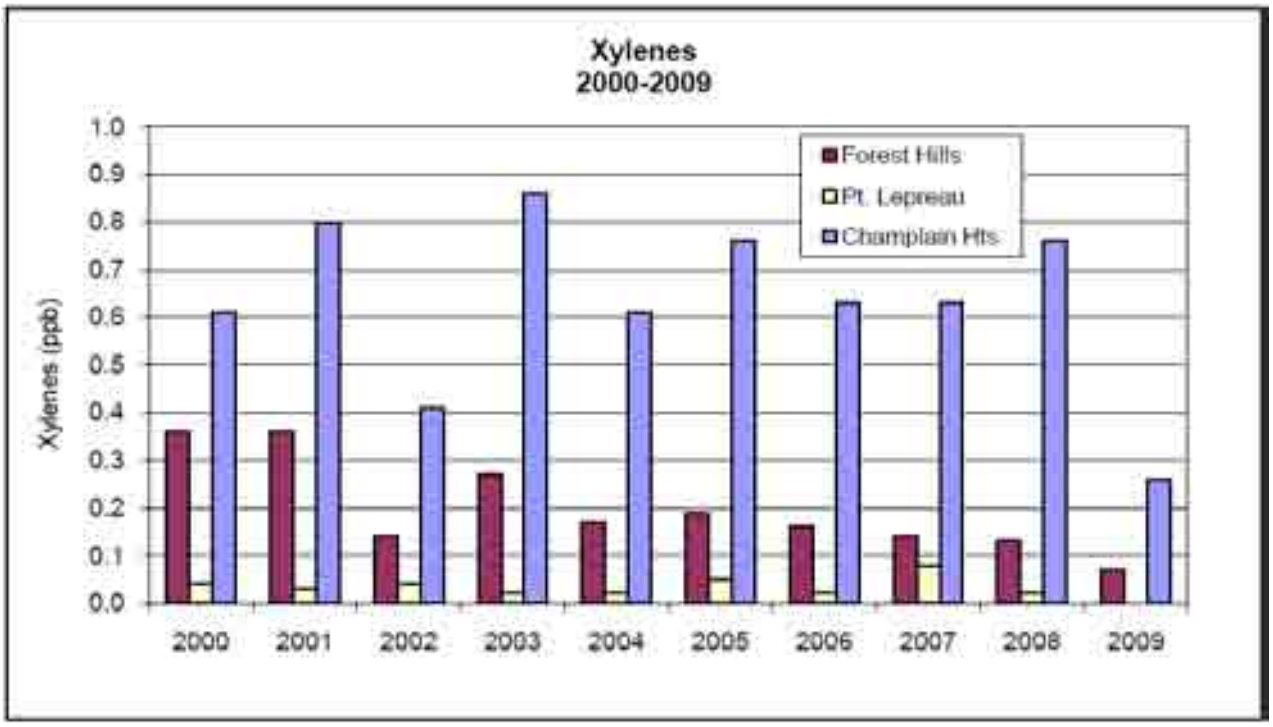


Figure 35. Annual average concentration of xylenes at provincial VOC monitoring sites, 2000-2009.

9. QUALITY ASSURANCE

The provincial air quality network quality assurance program consists of a number of components, with input and responsibility from both DENV and Environment Canada. Sites managed by DENV are operated according to procedures and methods endorsed by the National Air Pollution Surveillance (NAPS) program, headquartered in Ottawa.

The objective of quality assurance procedures is to provide accurate, representative, comparable, high quality data using consistent operational protocols and standards. The NAPS agency provides calibration, reference standards, and technical support to DENV. Calibration gases are certified for accuracy and are either "primary reference standards" or are traceable to primary standards maintained by the National Institute of Standards and Technology (NIST) in Maryland.

Instrumentation technologies used in both the provincial and industry networks must satisfy the requirements of the United States Environmental Protection Agency (EPA) as equivalent or reference method for ambient air monitoring. Methods not yet certified by the EPA are used if approved and tested by the NAPS agency.

Quality assurance tasks in the operation of monitoring stations include regular site inspections, instrument response verifications and analyzer calibrations, as well as data review.

Air quality monitoring analysers are specialised instruments, requiring regular maintenance to ensure acceptable operation. In addition, calibration procedures are necessary to ensure accurate results are obtained. For instruments measuring pollutants in gas form, calibration involves introducing known concentrations of the pollutant gas to the analyser, and monitoring the response. Three or four concentration values are used when performing such a "multipoint" calibration. Certified flow, temperature and pressure standards are used for equipment which measures particulate matter.

Audits of sites operated by DENV are performed by Environment Canada on randomly selected sites within the provincial network. These audits are completed every two years to ensure acceptable data quality. An interlaboratory testing program is also conducted annually. This consists of the analysis of gases supplied "blind" (i.e. with no information on the true concentration) by the NAPS laboratory. DENV technicians analyze the blind test gas using their calibration equipment and send the results to NAPS, who return a report on performance to the province. This serves to standardize the performance of calibration systems within the province and across the country.

Industry network audits are performed by DENV every one or two years, using NAPS certified standards (see the following section).

After data have been acquired, they are validated by DENV. This involves examining results, taking into account instrument records, especially "zero and span drift" (measures of internal instrument changes), other site records, maintenance procedures, calibration of the analyzers, adjustments made to operating settings, performance and history of the analyzers, seasonal conditions, and changes and levels of other pollutants during a given time frame.

Audits of Industry-Operated Sites

To ensure data quality, DENV staff visit the monitoring sites operated by industries in New Brunswick, and perform independent site audits. Audits help identify and solve problems, prevent problems from developing, and assure data quality within the provincial monitoring system. It is the goal of the Province to have every industrial monitoring site audited on a two year cycle.

Results of air quality monitoring audits completed in 2009 are summarized in Table 23. A total of 12 instrument audits were carried out in 2009. The number of audits completed was down substantially compared to 2008. This was as a result of prior commitments of Department staff. Figure 36 illustrates audit results from 1998 to 2009. As shown, there has been substantial improvement in the amount of failed audits over this time period, as related to the industry network.

Table 23. Air quality site audits, 2009.

Industry	Site	Instrument	Date	Absolute difference from standard (%)	Pass/Fail
AV Cell Inc. - Atholville	Boom Rd.	SO_2	9-Dec.-09	3.0	P
	Beauvista	SO_2	9-Dec.-09	19.4	F (Note 1)
Fraser Papers Inc. - Edmundston	Cormier School	SO_2	9-Sept.-09	0.5	P
		TEOM - $PM_{2.5}$	9-Sept.-09	>10	F (Note 2)
	St. Mary's	SO_2	9-Sept.-09	8.1	P
NB Power Millbank	Rockcliff	NO_x	22-Oct.-09	2.4	P
		SO_2	22-Oct.-09	4.3	P
NB Power Belledune	Municipal Hall	NO_x	11-Dec.-09	0.5	P
		SO_2	11-Dec.-09	3.0	P
Xstrata – Brunswick Smelter	Chalmers	SO_2	10-Dec.-09	0.6	P
	Boulay	SO_2	10-Dec.-09	1.9	P
	Townsite	SO_2	10-Dec.-09	0.4	P

Note 1: Data corrected to reflect instrument drift.
Note 2: Data presented as submitted by the industry. See explanation in Section 3.E.2.

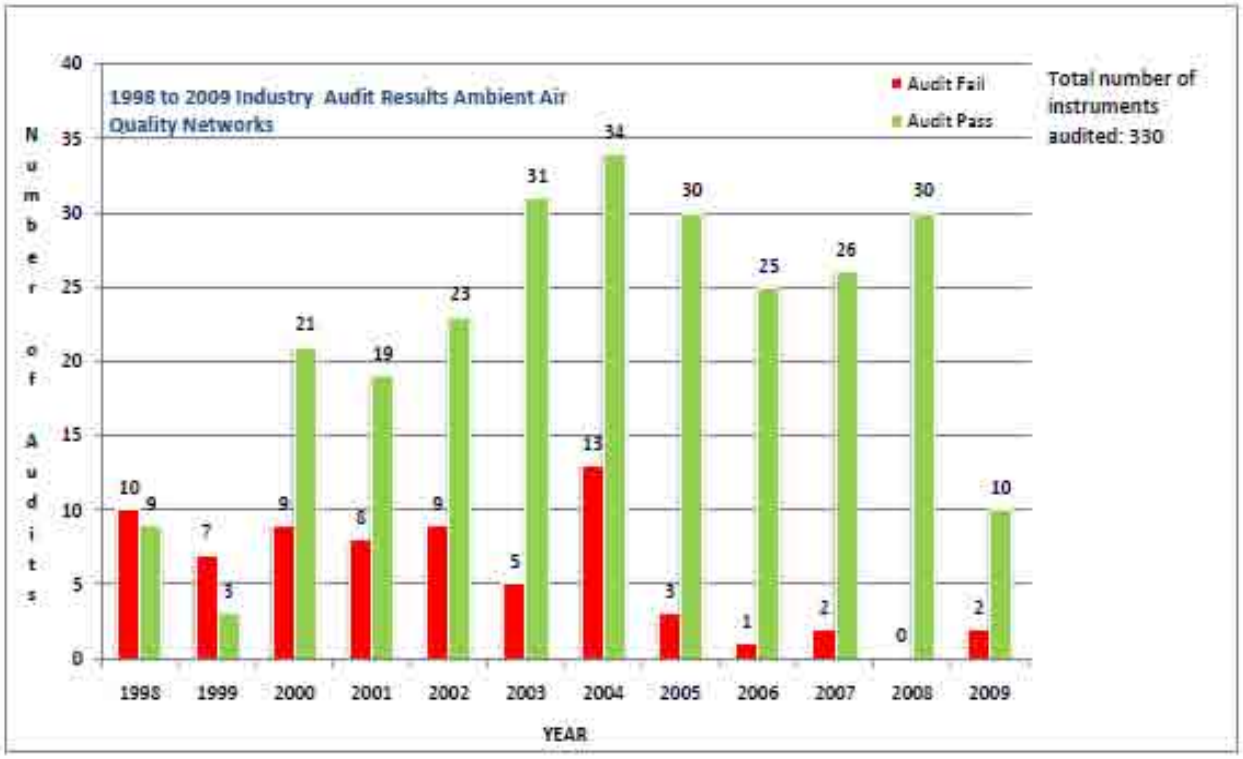
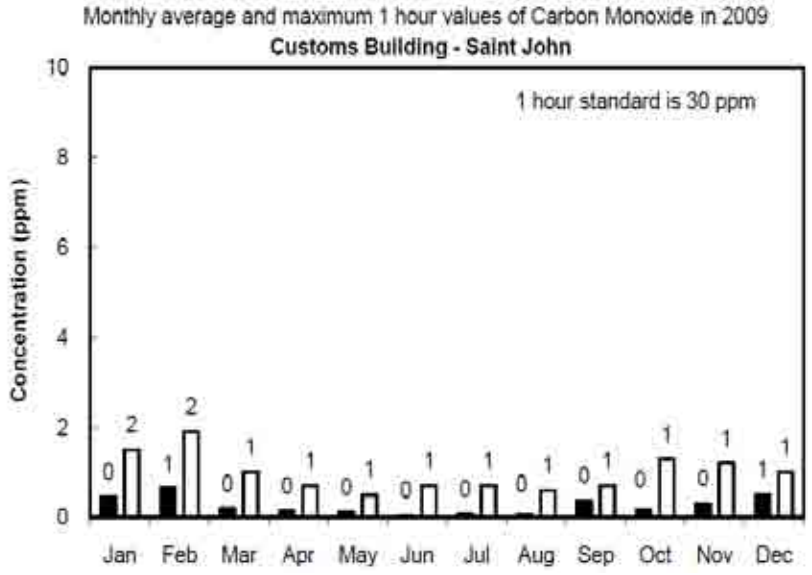
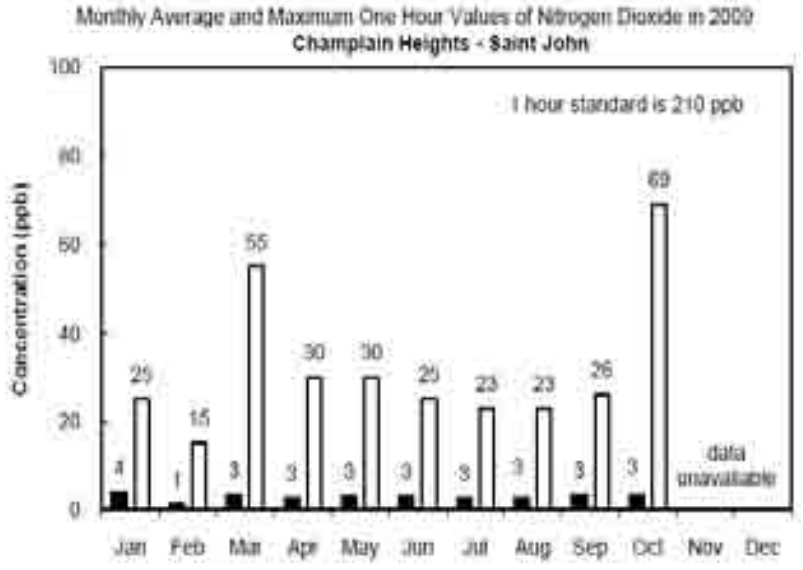
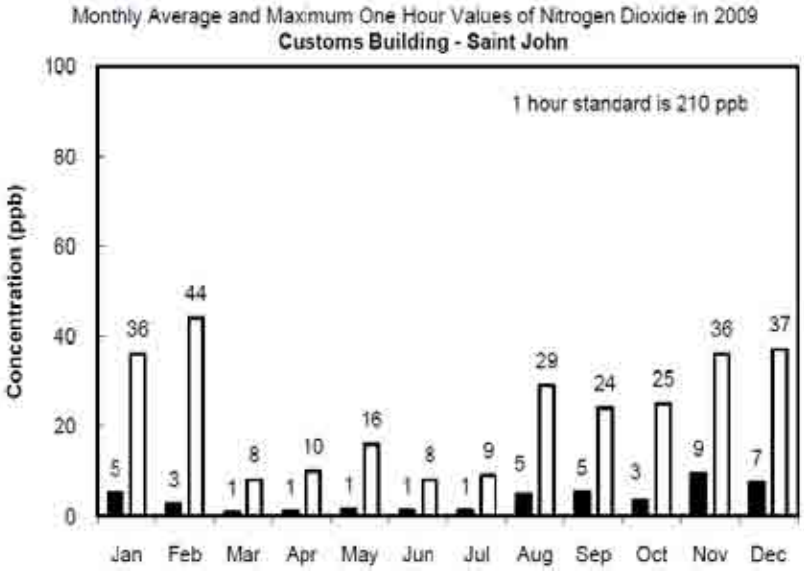


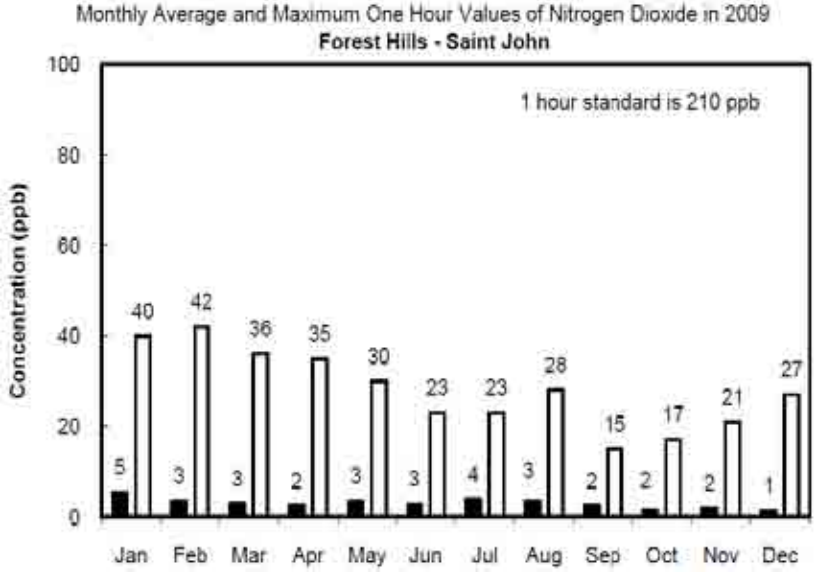
Figure 36. Industry Audits Passed and Failed for the years of 1998-2009.

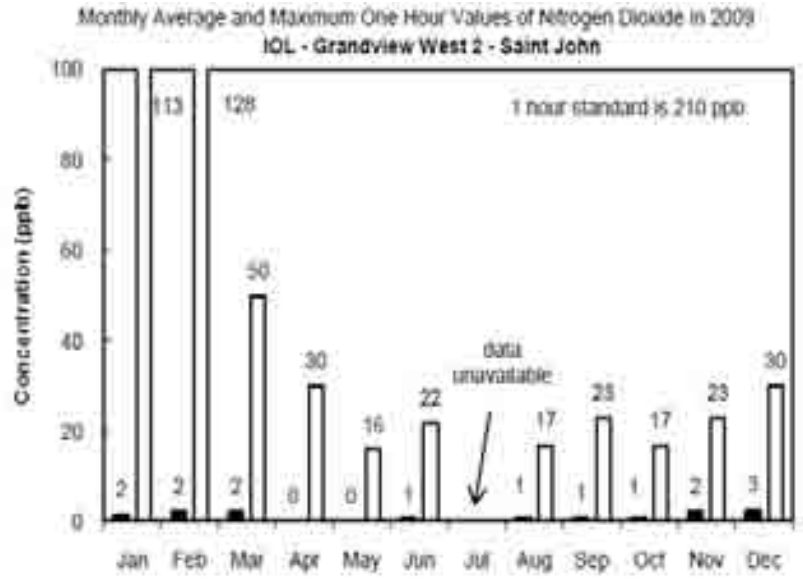
APPENDIX 1:
DETAILED MONTHLY MONITORING
RESULTS FOR 2009

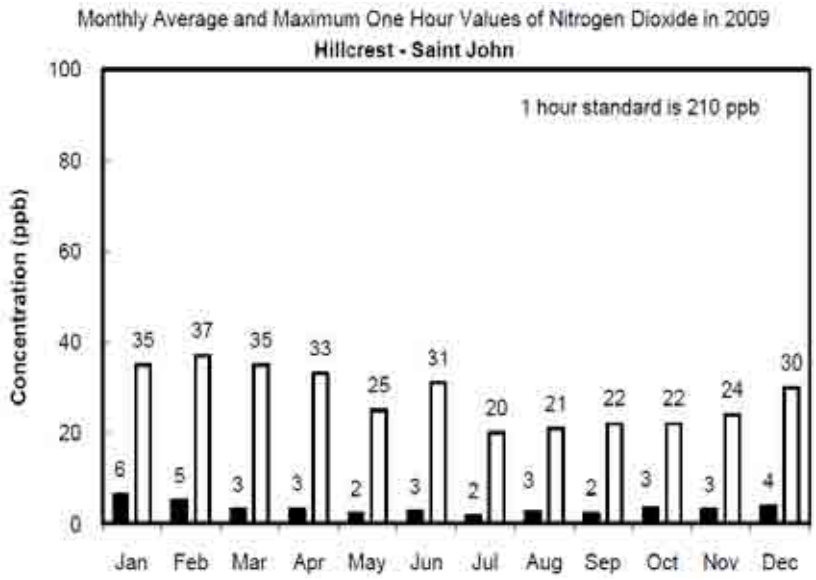

Monthly average and maximum 1 hour values of Carbon Monoxide in 2009
Customs Building - Saint John
1 hour standard is 30 ppm
Concentration (ppm)
10
8
6
4
2
0
0 2 1 2 0 1 0 1 0 1 0 1 0 1 0 1 0 1 0 1 1 1
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec

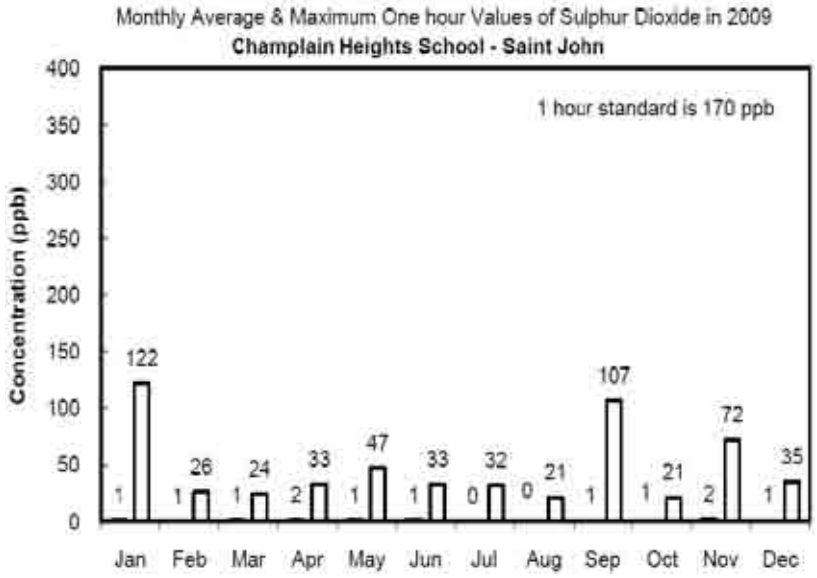

Monthly Average and Maximum One Hour Values of Nitrogen Dioxide in 2009
Champlain Heights - Saint John
1 hour standard is 210 ppb
Concentration (ppb)
100
80
60
40
20
0
4 25 1 15 3 55 3 30 3 30 3 25 3 23 3 23 3 26 3 69
data unavailable
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec

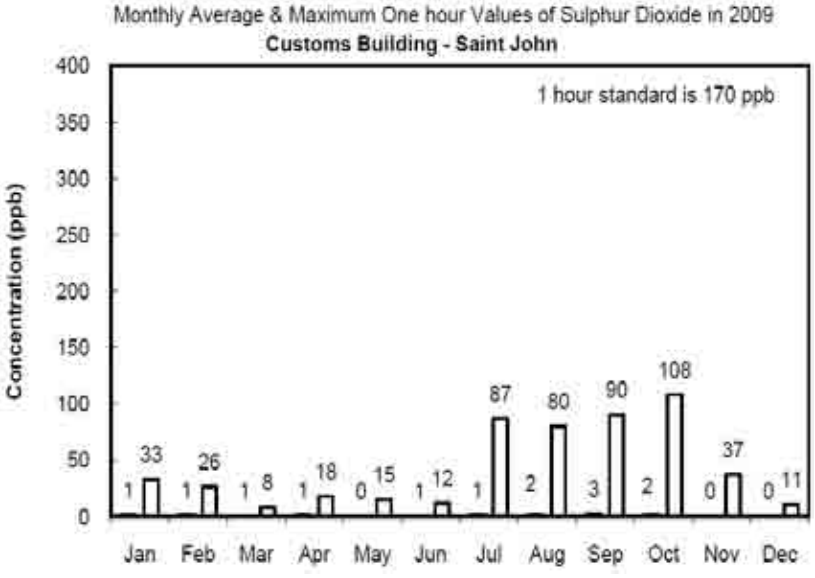

Monthly Average and Maximum One Hour Values of Nitrogen Dioxide in 2009
Customs Building - Saint John
1 hour standard is 210 ppb
Concentration (ppb)
100
80
60
40
20
0
5 36 3 44 1 8 1 10 1 16 1 8 1 9 5 29 5 24 3 25 9 36 7 37
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec

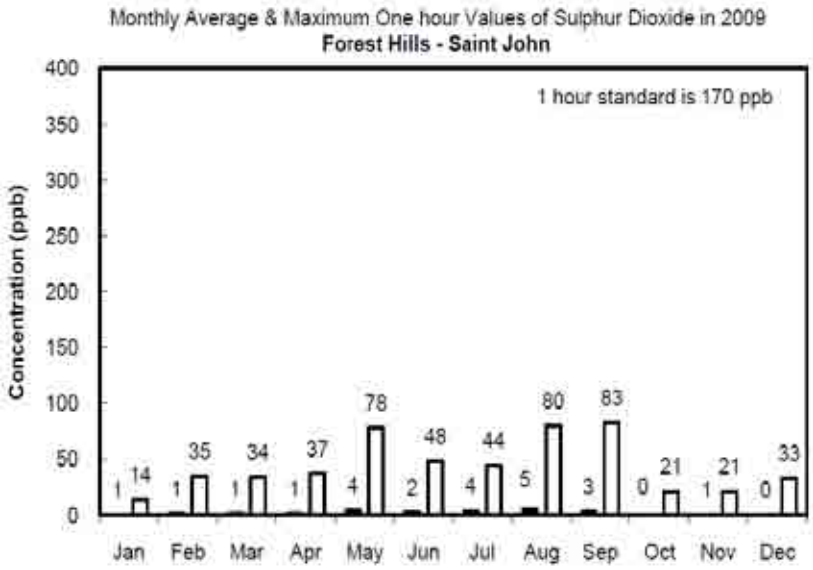

Monthly Average and Maximum One Hour Values of Nitrogen Dioxide in 2009
Forest Hills - Saint John
1 hour standard is 210 ppb
Concentration (ppb)
100
80
60
40
20
0
5 40 3 42 3 36 2 35 3 30 3 23 4 23 3 28 2 15 2 17 2 21 1 27
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec

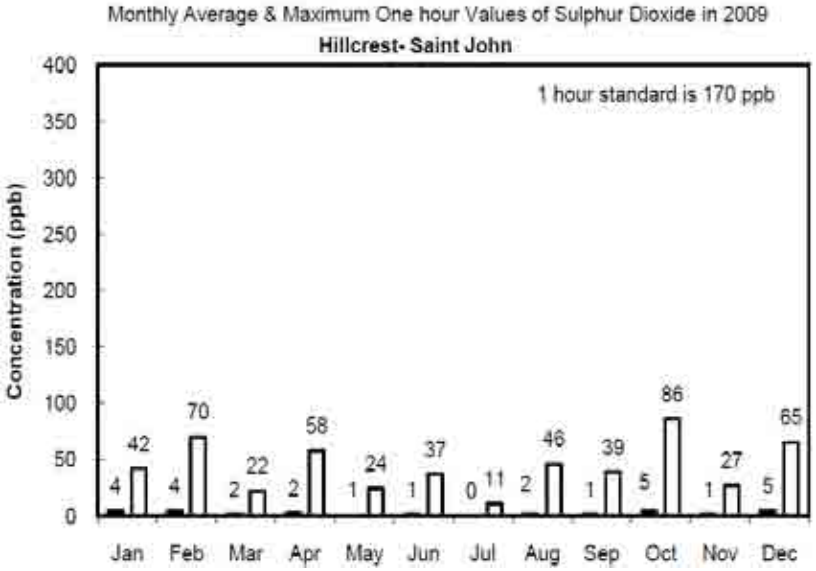

Monthly Average and Maximum One Hour Values of Nitrogen Dioxide in 2009
IOL - Grandview West 2 - Saint John
1 hour standard is 210 ppb
Concentration (ppb)
data unavailable
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec

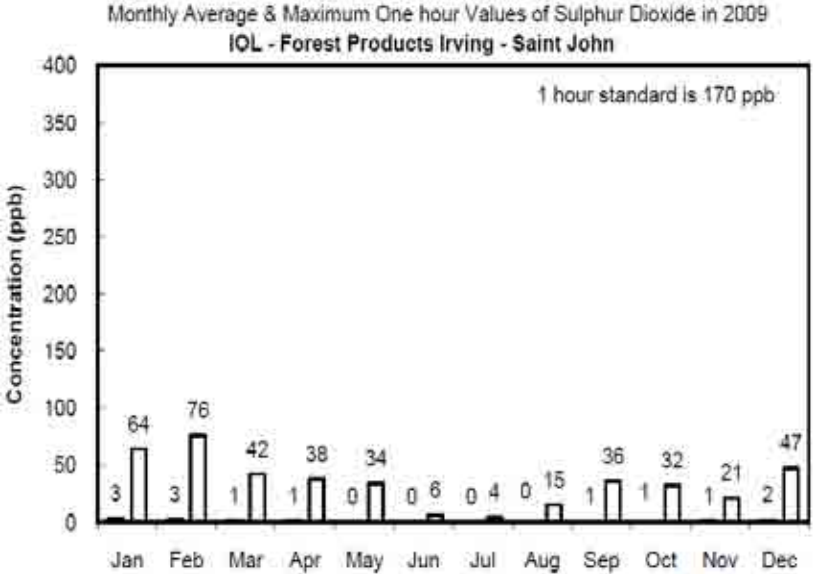

Monthly Average and Maximum One Hour Values of Nitrogen Dioxide in 2009
Hillcrest - Saint John
1 hour standard is 210 ppb
Concentration (ppb)
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec

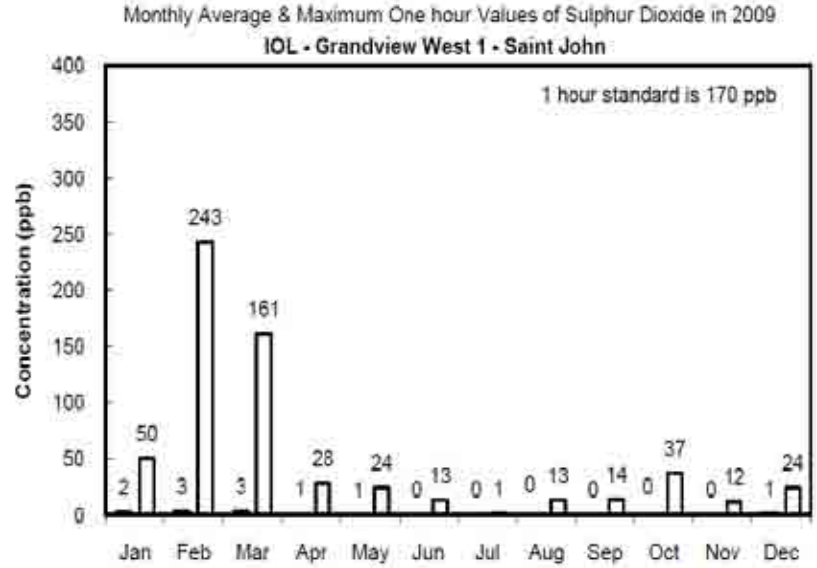

Monthly Average & Maximum One hour Values of Sulphur Dioxide in 2009
Champlain Heights School - Saint John
1 hour standard is 170 ppb
Concentration (ppb)
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec

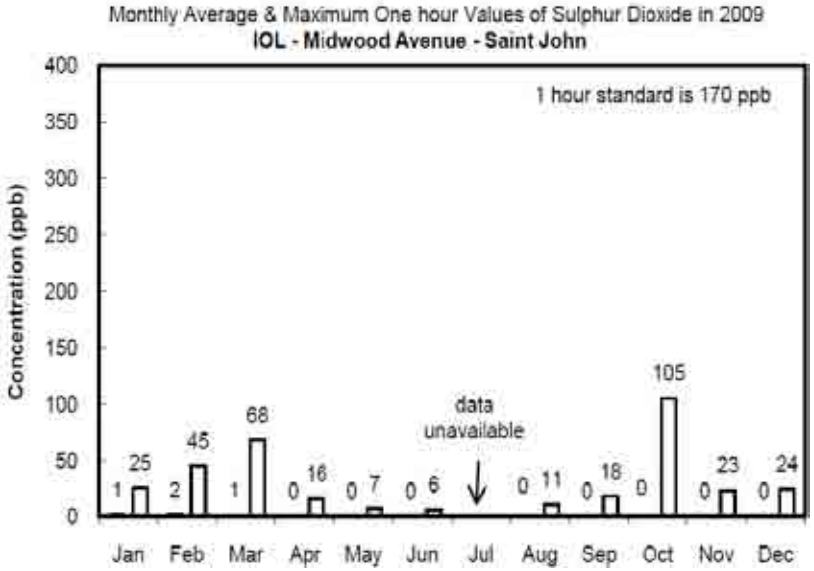

Monthly Average & Maximum One hour Values of Sulphur Dioxide in 2009
Customs Building - Saint John
1 hour standard is 170 ppb
Concentration (ppb)
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec

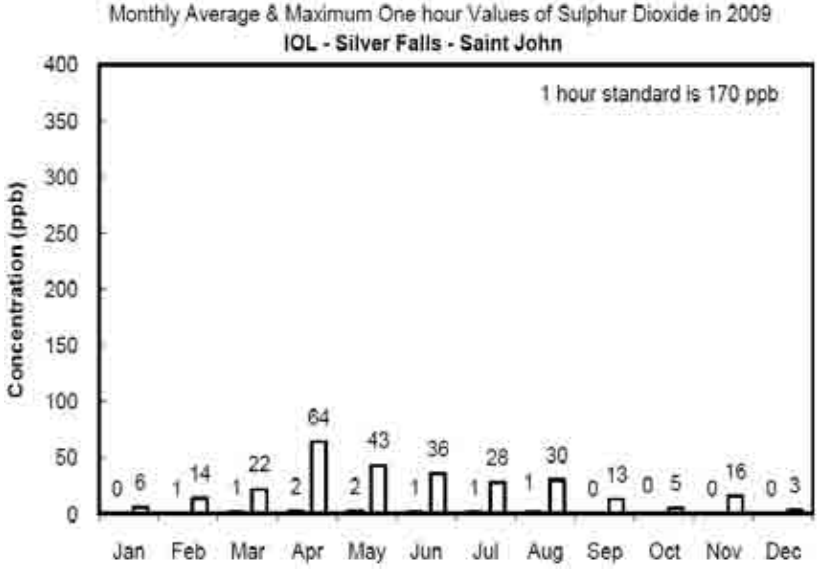

Monthly Average & Maximum One hour Values of Sulphur Dioxide in 2009
Forest Hills - Saint John
1 hour standard is 170 ppb
Concentration (ppb)
0
50
100
150
200
250
300
350
400
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
1 14 1 35 1 34 1 37 4 78 2 48 4 44 5 80 3 83 0 21 1 21 0 33

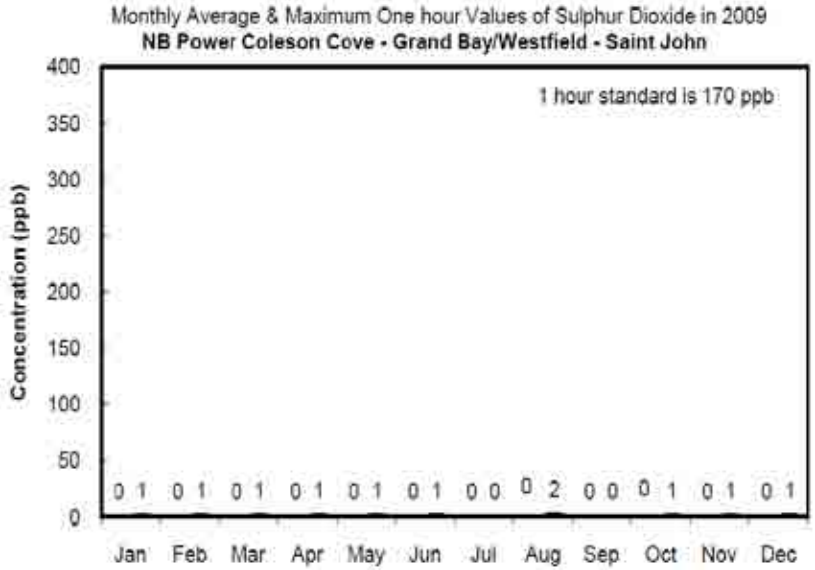

Monthly Average & Maximum One hour Values of Sulphur Dioxide in 2009
Hillcrest- Saint John
1 hour standard is 170 ppb
Concentration (ppb)
0
50
100
150
200
250
300
350
400
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
4 42 4 70 2 22 2 58 1 24 1 37 0 11 2 46 1 39 5 86 1 27 5 65

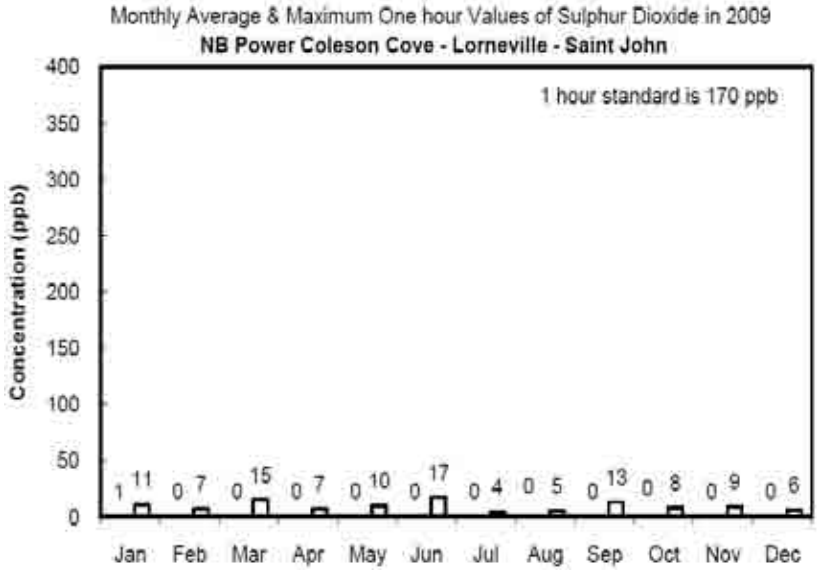

Monthly Average & Maximum One hour Values of Sulphur Dioxide in 2009
IOL - Forest Products Irving - Saint John
1 hour standard is 170 ppb
Concentration (ppb)
0
50
100
150
200
250
300
350
400
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
3 64 3 76 1 42 1 38 0 34 0 6 0 4 0 15 1 36 1 32 1 21 2 47

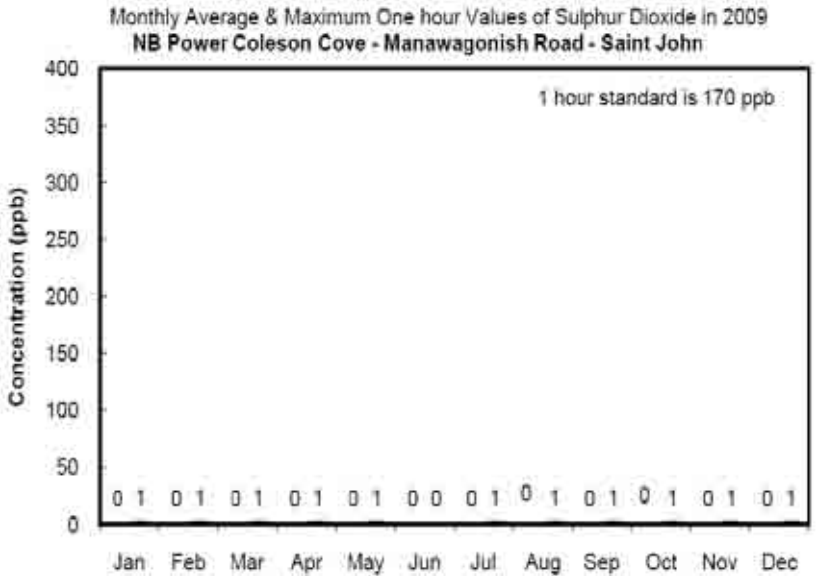

Monthly Average & Maximum One hour Values of Sulphur Dioxide in 2009
IOL - Grandview West 1 - Saint John
1 hour standard is 170 ppb
Concentration (ppb)
0
50
100
150
200
250
300
350
400
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
2 50 3 243 3 161 1 28 1 24 0 13 0 1 0 13 0 14 0 37 0 12 1 24

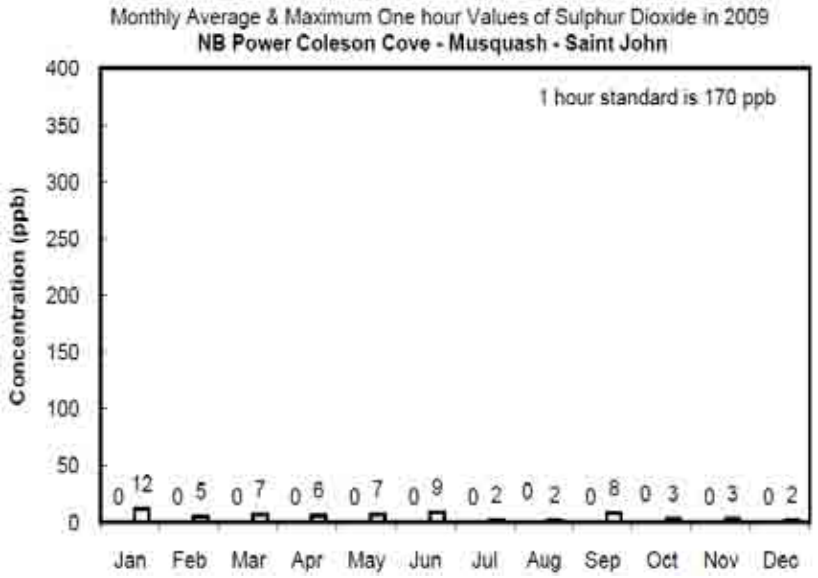

Monthly Average & Maximum One hour Values of Sulphur Dioxide in 2009
IOL - Midwood Avenue - Saint John
1 hour standard is 170 ppb
Concentration (ppb)
data unavailable
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec

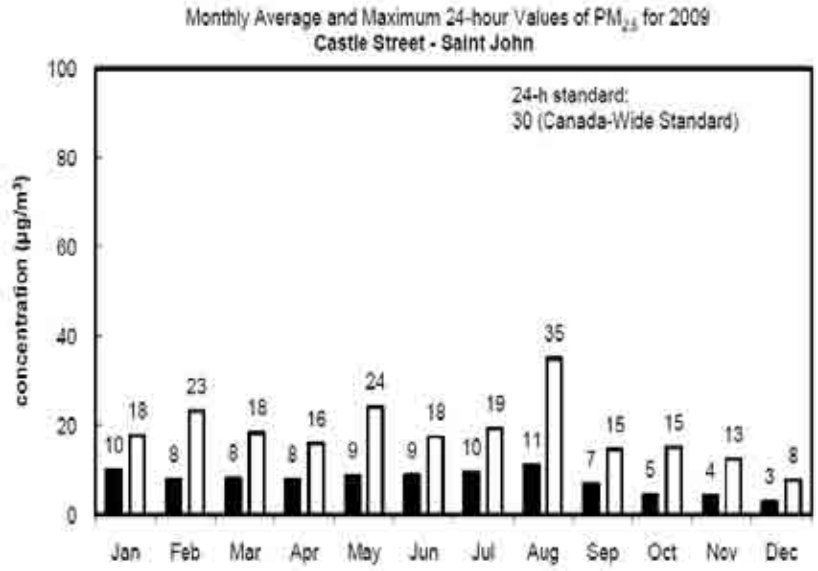

Monthly Average & Maximum One hour Values of Sulphur Dioxide in 2009
IOL - Silver Falls - Saint John
1 hour standard is 170 ppb
Concentration (ppb)
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec

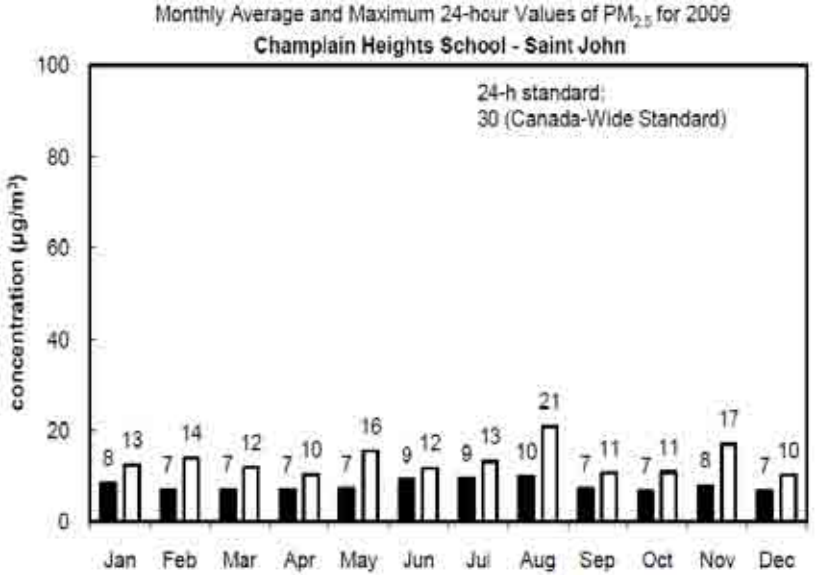

Monthly Average & Maximum One hour Values of Sulphur Dioxide in 2009
NB Power Coleson Cove - Grand Bay/Westfield - Saint John
1 hour standard is 170 ppb
Concentration (ppb)
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec

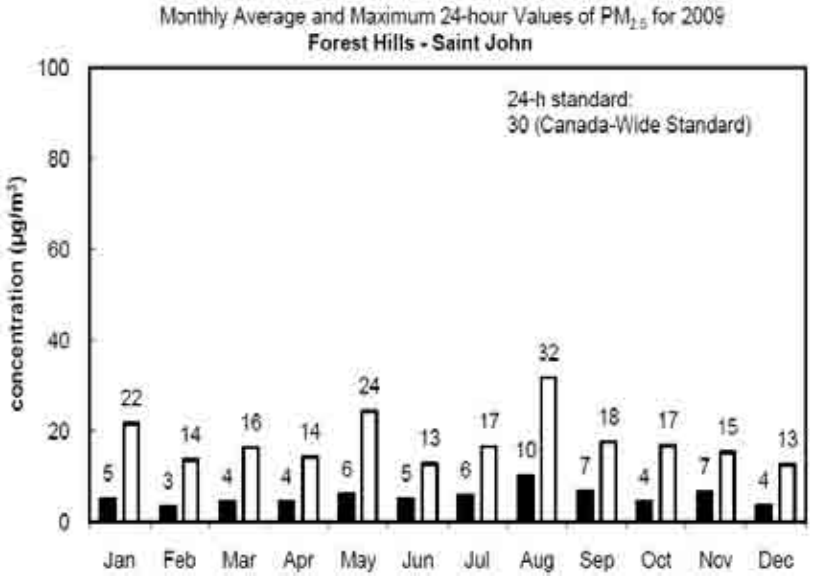

Monthly Average & Maximum One hour Values of Sulphur Dioxide in 2009
NB Power Coleson Cove - Lorneville - Saint John
1 hour standard is 170 ppb
Concentration (ppb)
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec

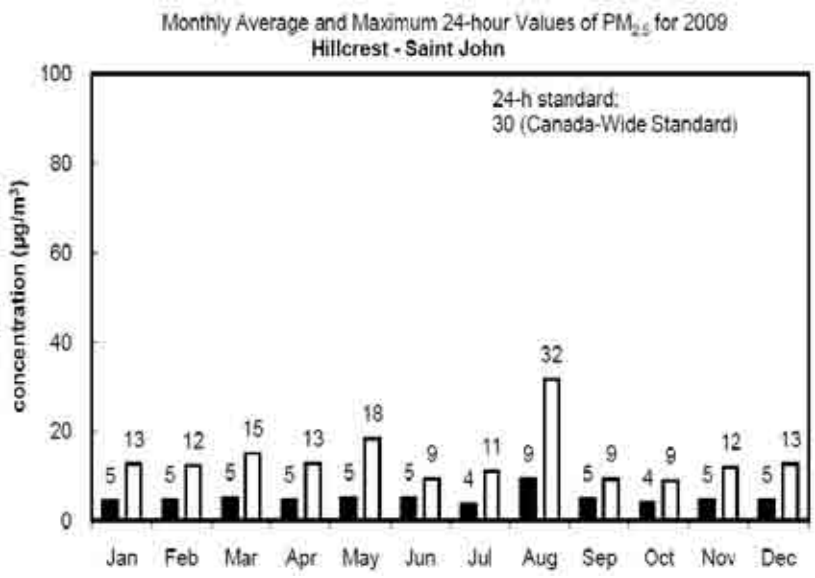

Monthly Average & Maximum One hour Values of Sulphur Dioxide in 2009
NB Power Coleson Cove - Manawagonish Road - Saint John
1 hour standard is 170 ppb
Concentration (ppb)
400
350
300
250
200
150
100
50
0
0 1 0 1 0 1 0 1 0 1 0 0 0 1 0 1 0 1 0 1 0 1 0 1
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec

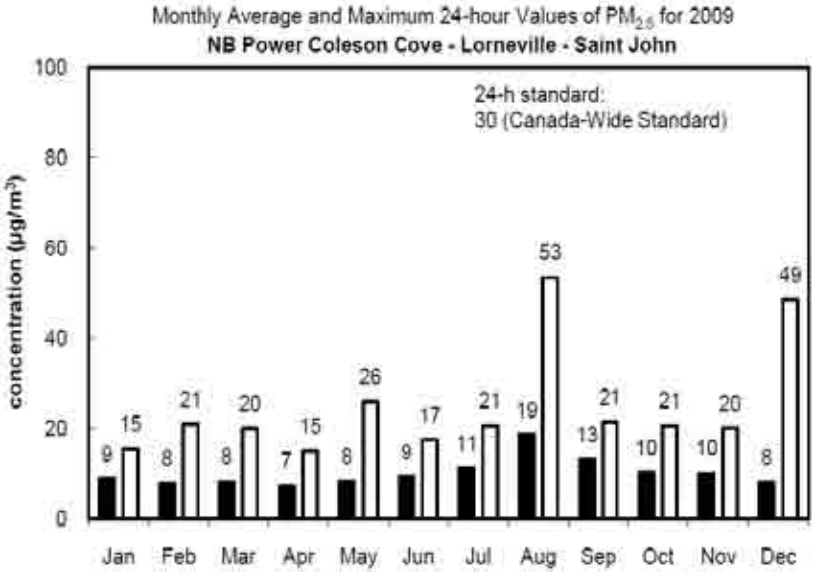

Monthly Average & Maximum One hour Values of Sulphur Dioxide in 2009
NB Power Coleson Cove - Musquash - Saint John
1 hour standard is 170 ppb
Concentration (ppb)
400
350
300
250
200
150
100
50
0
0 12 0 5 0 7 0 6 0 7 0 9 0 2 0 2 0 8 0 3 0 3 0 2
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec

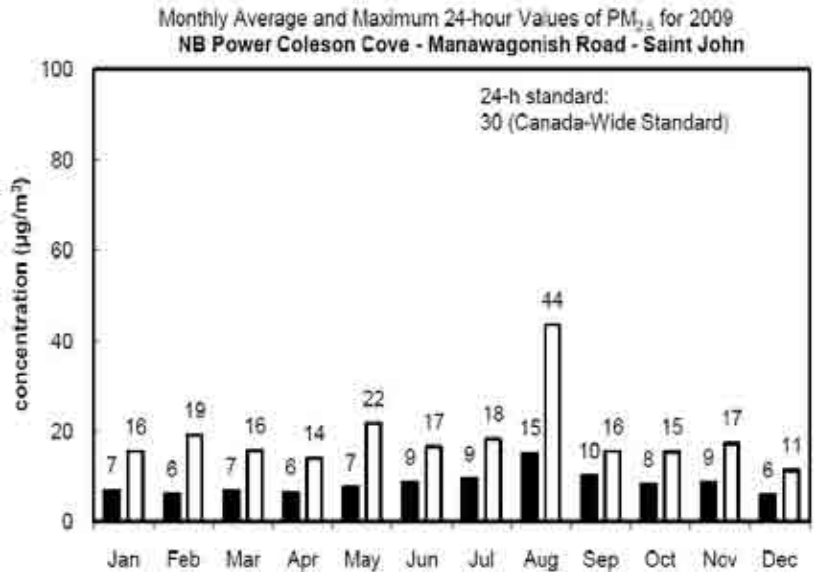

Monthly Average and Maximum 24-hour Values of PM2.5 for 2009
Castle Street - Saint John
24-h standard:
30 (Canada-Wide Standard)
concentration (µg/m³)
100
80
60
40
20
0
10 18 8 23 8 18 8 16 9 24 9 18 10 19 11 35 7 15 5 15 4 13 3 8
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec

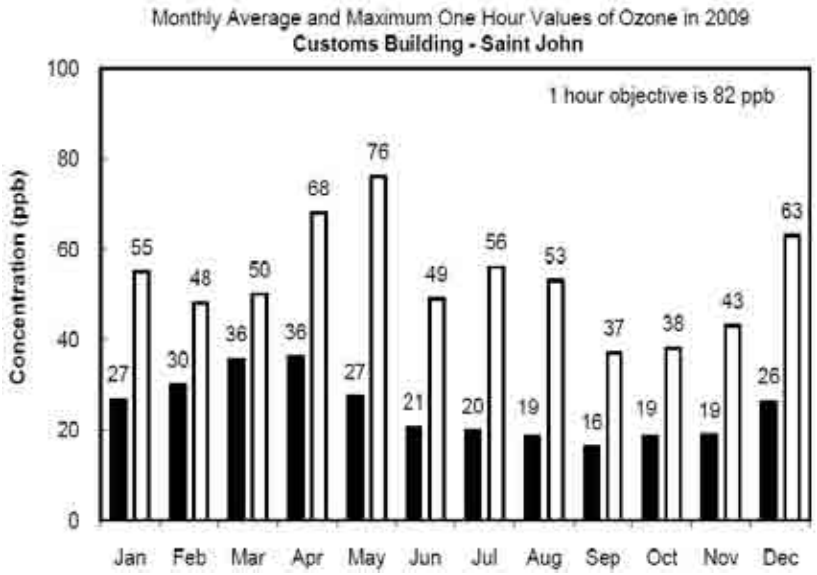

Monthly Average and Maximum 24-hour Values of PM2.5 for 2009
Champlain Heights School - Saint John
24-h standard:
30 (Canada-Wide Standard)
concentration (µg/m³)
100
80
60
40
20
0
8 13 7 14 7 12 7 10 7 16 9 12 9 13 10 21 7 11 7 11 8 17 7 10
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec

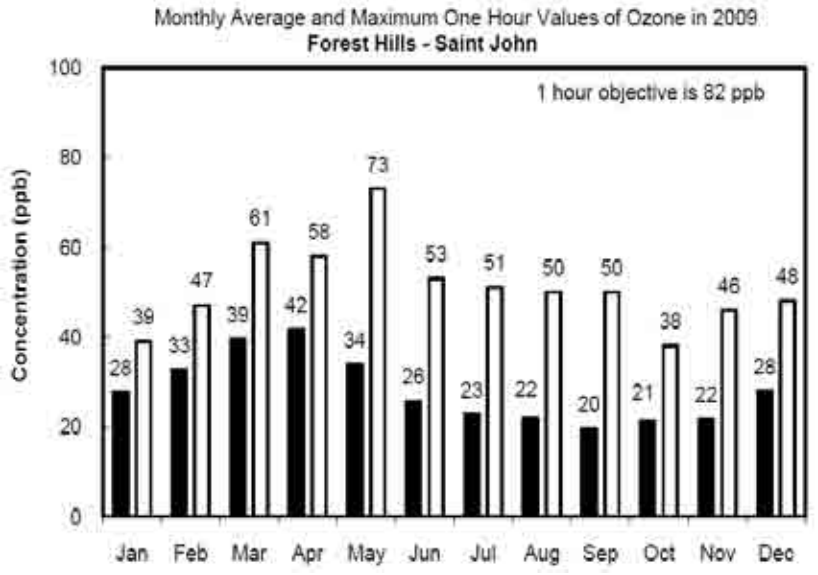

Monthly Average and Maximum 24-hour Values of PM2.5 for 2009
Forest Hills - Saint John
24-h standard:
30 (Canada-Wide Standard)
concentration (µg/m³)
100
80
60
40
20
0
Jan 5 22
Feb 3 14
Mar 4 16
Apr 4 14
May 6 24
Jun 5 13
Jul 6 17
Aug 10 32
Sep 7 18
Oct 4 17
Nov 7 15
Dec 4 13

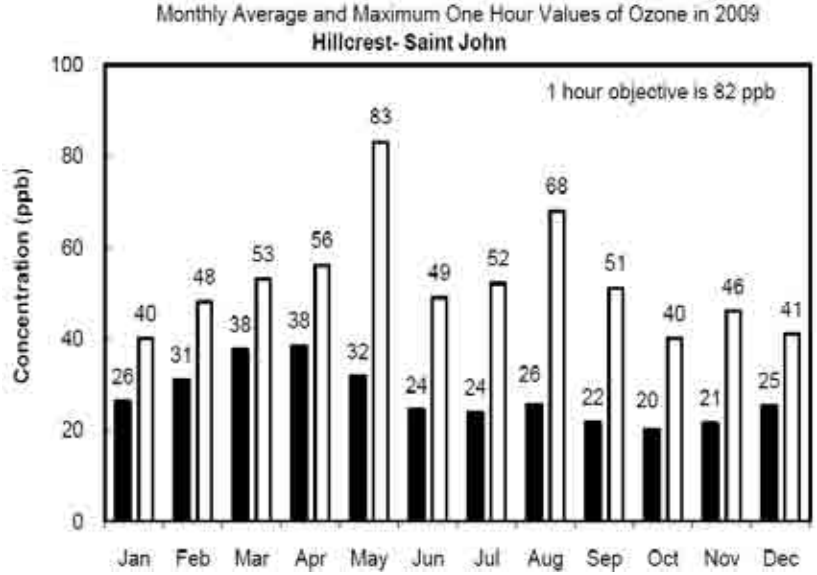

Monthly Average and Maximum 24-hour Values of PM2.5 for 2009
Hillcrest - Saint John
24-h standard:
30 (Canada-Wide Standard)
concentration (µg/m³)
100
80
60
40
20
0
Jan 5 13
Feb 5 12
Mar 5 15
Apr 5 13
May 5 18
Jun 5 9
Jul 4 11
Aug 9 32
Sep 5 9
Oct 4 9
Nov 5 12
Dec 5 13

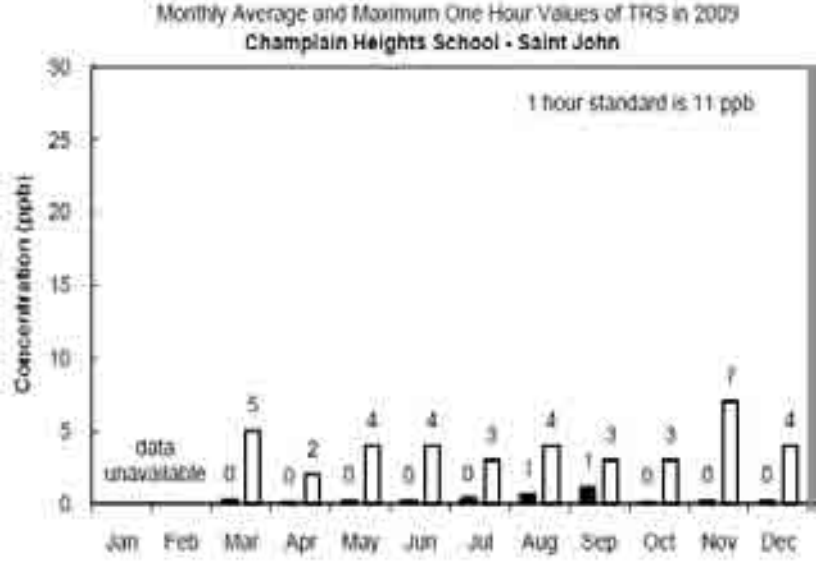

Monthly Average and Maximum 24-hour Values of PM2.5 for 2009
NB Power Coleson Cove - Lorneville - Saint John
24-h standard:
30 (Canada-Wide Standard)
concentration (µg/m³)
100
80
60
40
20
0
Jan 9 15
Feb 8 21
Mar 8 20
Apr 7 15
May 8 26
Jun 9 17
Jul 11 21
Aug 19 53
Sep 13 21
Oct 10 21
Nov 10 20
Dec 8 49

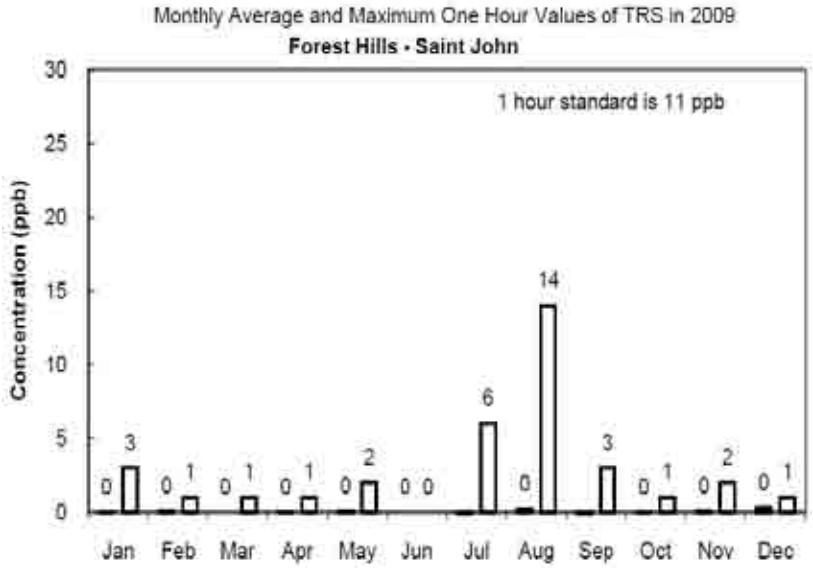

Monthly Average and Maximum 24-hour Values of PM2.5 for 2009
NB Power Coleson Cove - Manawagonish Road - Saint John
24-h standard:
30 (Canada-Wide Standard)
concentration (µg/m³)
100
80
60
40
20
0
Jan 7 16
Feb 6 19
Mar 7 16
Apr 6 14
May 7 22
Jun 9 17
Jul 9 18
Aug 15 44
Sep 10 16
Oct 8 15
Nov 9 17
Dec 6 11

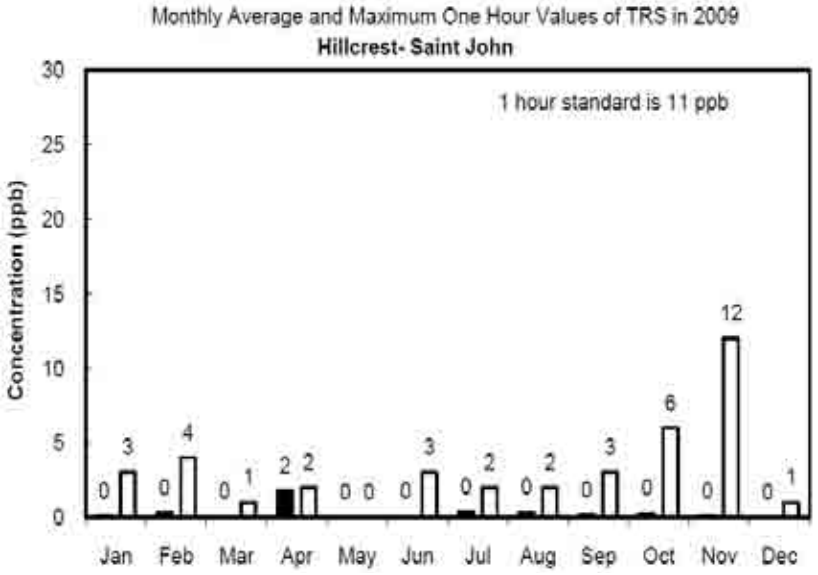

Monthly Average and Maximum One Hour Values of Ozone in 2009
Customs Building - Saint John
1 hour objective is 82 ppb
Concentration (ppb)
100
80
60
40
20
0
27 55
30 48
36 50
36 68
27 76
21 49
20 56
19 53
16 37
19 38
19 43
26 63
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec

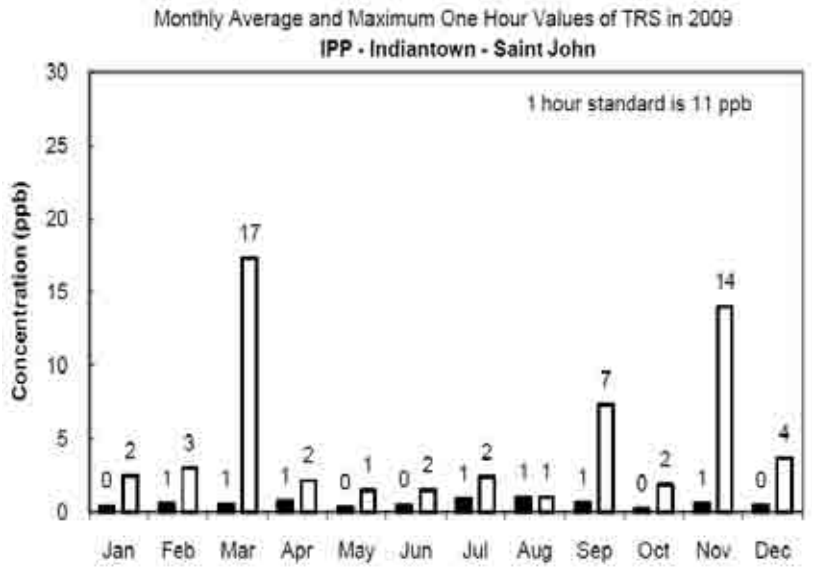

Monthly Average and Maximum One Hour Values of Ozone in 2009
Forest Hills - Saint John
1 hour objective is 82 ppb
Concentration (ppb)
100
80
60
40
20
0
28 39
33 47
39 61
42 58
34 73
26 53
23 51
22 50
20 50
21 38
22 46
28 48
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec

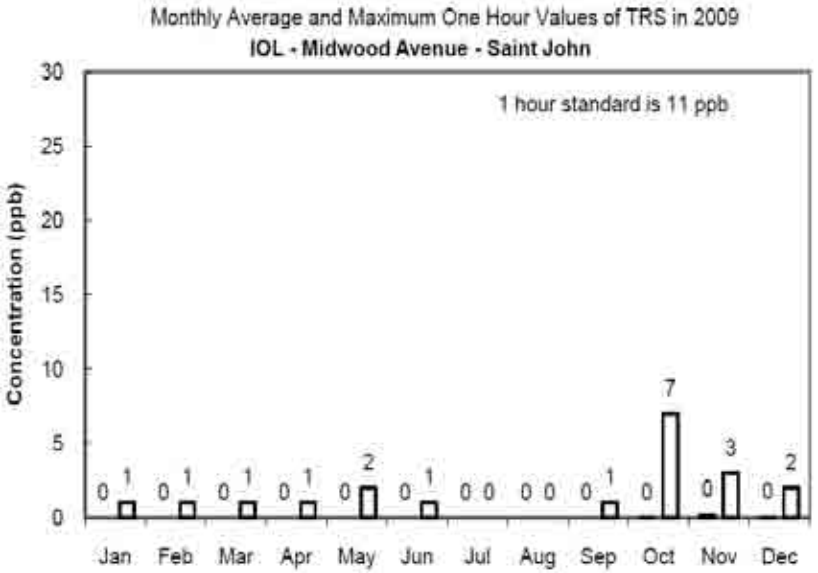

Monthly Average and Maximum One Hour Values of Ozone in 2009
Hillcrest- Saint John
1 hour objective is 82 ppb
Concentration (ppb)
100
80
60
40
20
0
26 40
31 48
38 53
38 56
32 83
24 49
24 52
26 68
22 51
20 40
21 46
25 41
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec

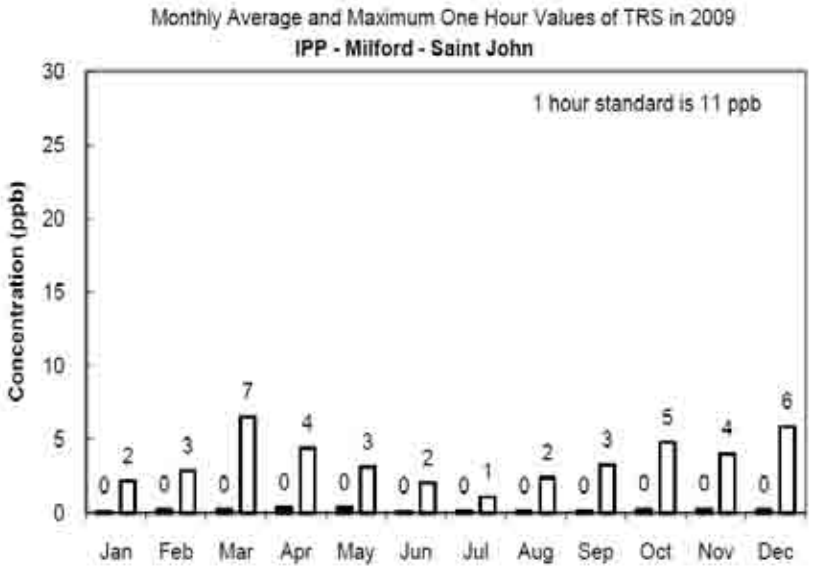

Monthly Average and Maximum One Hour Values of TRS in 2009
Champlain Heights School - Saint John
1 hour standard is 11 ppb
Concentration (ppb)
30
25
20
15
10
5
0
data unavailable
0 5
0 2
0 4
0 4
0 3
1 4
1 3
0 3
0 7
0 4
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec

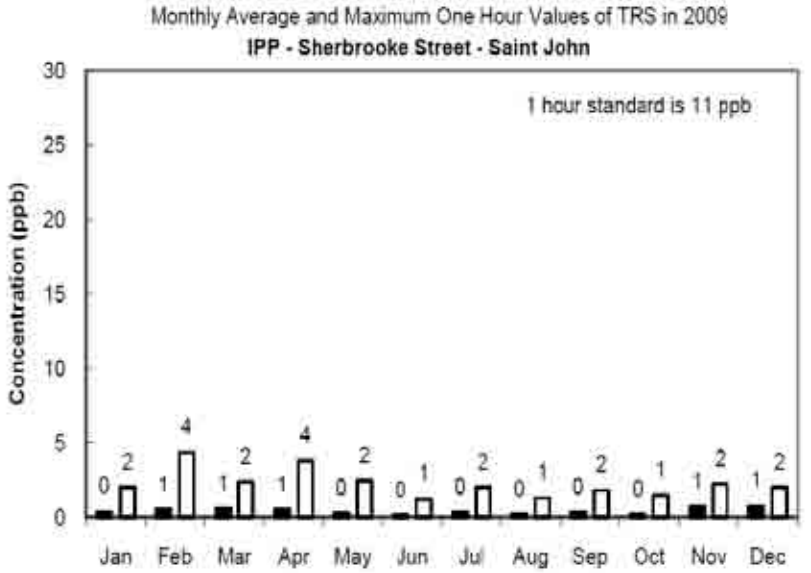

Monthly Average and Maximum One Hour Values of TRS in 2009
Forest Hills - Saint John
1 hour standard is 11 ppb
Concentration (ppb)
0 5 10 15 20 25 30
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
0 3 0 1 0 1 0 1 0 2 0 0 6 0 14 0 3 0 1 0 2 0 1

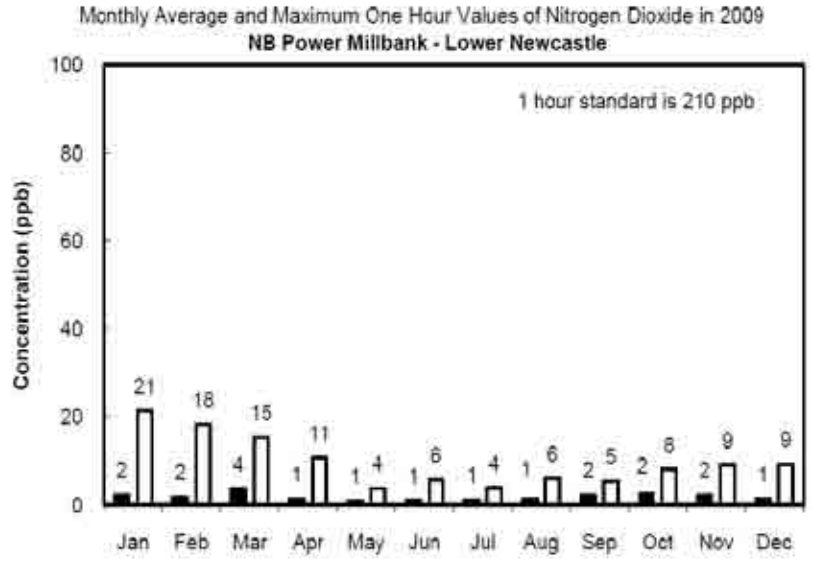

Monthly Average and Maximum One Hour Values of TRS in 2009
Hillcrest- Saint John
1 hour standard is 11 ppb
Concentration (ppb)
0 5 10 15 20 25 30
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
0 3 0 4 0 1 2 2 0 0 0 3 0 2 0 2 0 3 0 6 0 12 0 1

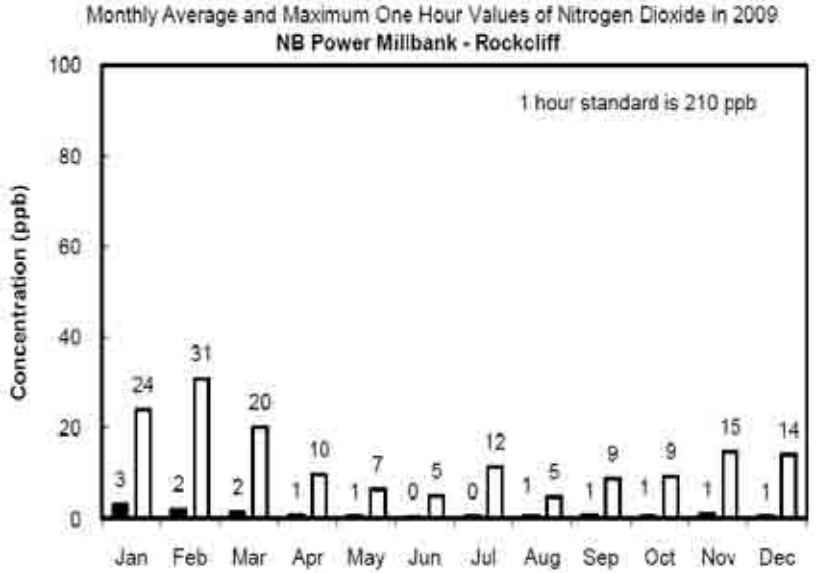

Monthly Average and Maximum One Hour Values of TRS in 2009
IPP - Indiantown - Saint John
1 hour standard is 11 ppb
Concentration (ppb)
0 5 10 15 20 25 30
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
0 2 1 3 1 17 1 2 0 1 0 2 1 2 1 1 1 7 0 2 1 14 0 4

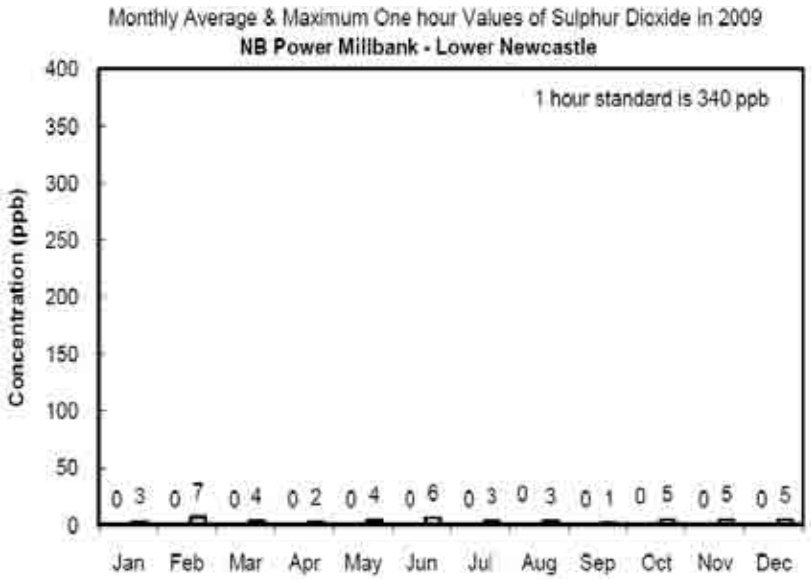

Monthly Average and Maximum One Hour Values of TRS in 2009
IOL - Midwood Avenue - Saint John
1 hour standard is 11 ppb
Concentration (ppb)
0 5 10 15 20 25 30
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
0 1 0 1 0 1 0 1 0 2 0 1 0 0 0 0 0 1 0 7 0 3 0 2

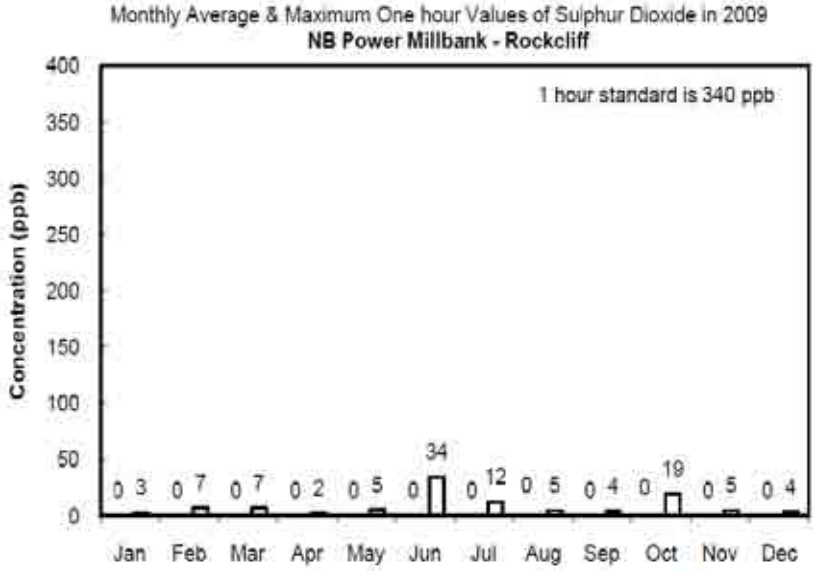

Monthly Average and Maximum One Hour Values of TRS in 2009
IPP - Milford - Saint John
1 hour standard is 11 ppb
Concentration (ppb)
0
5
10
15
20
25
30
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
0 2 0 3 0 7 0 4 0 3 0 2 0 1 0 2 0 3 0 5 0 4 0 6

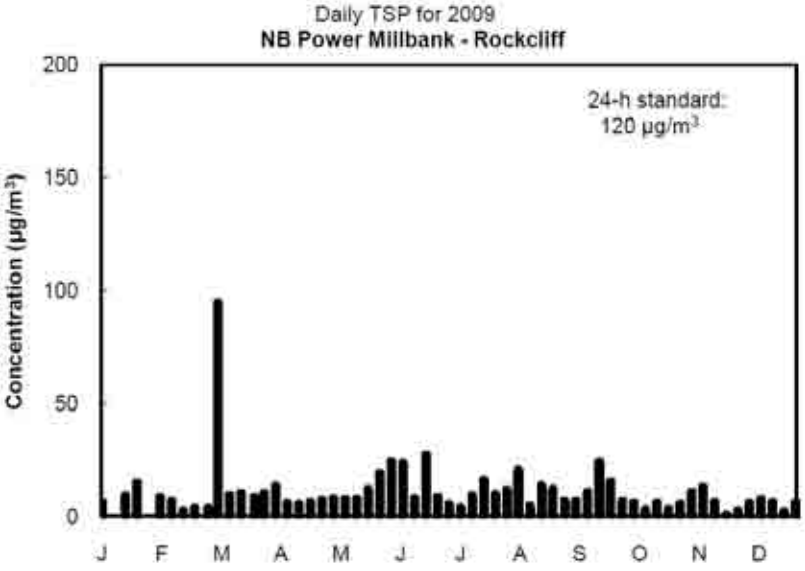

Monthly Average and Maximum One Hour Values of TRS in 2009
IPP - Sherbrooke Street - Saint John
1 hour standard is 11 ppb
Concentration (ppb)
0
5
10
15
20
25
30
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
0 2 1 4 1 2 1 4 0 2 0 1 0 2 0 1 0 2 0 1 1 2 1 2

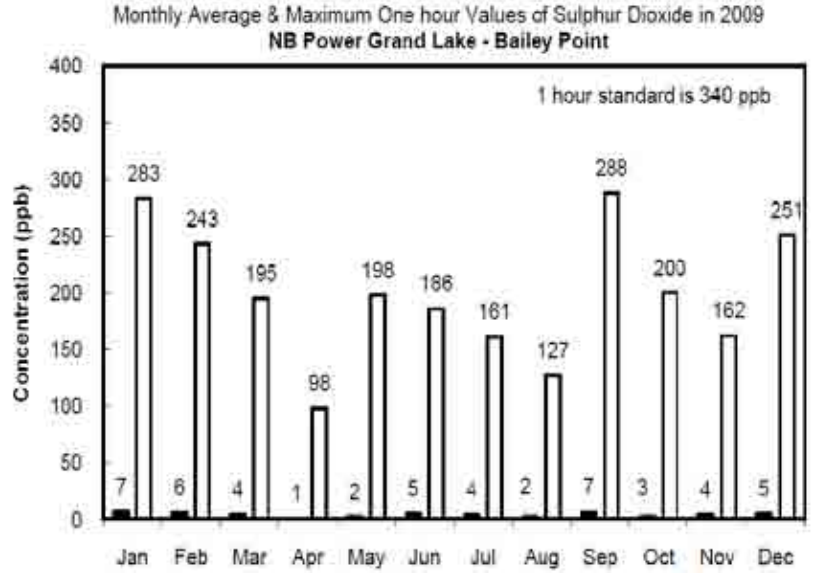

Monthly Average and Maximum One Hour Values of Nitrogen Dioxide in 2009
NB Power Millbank - Lower Newcastle
1 hour standard is 210 ppb
Concentration (ppb)
0
20
40
60
80
100
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
2 21 2 18 4 15 1 11 1 4 1 6 1 4 1 6 2 5 2 6 2 9 1 9

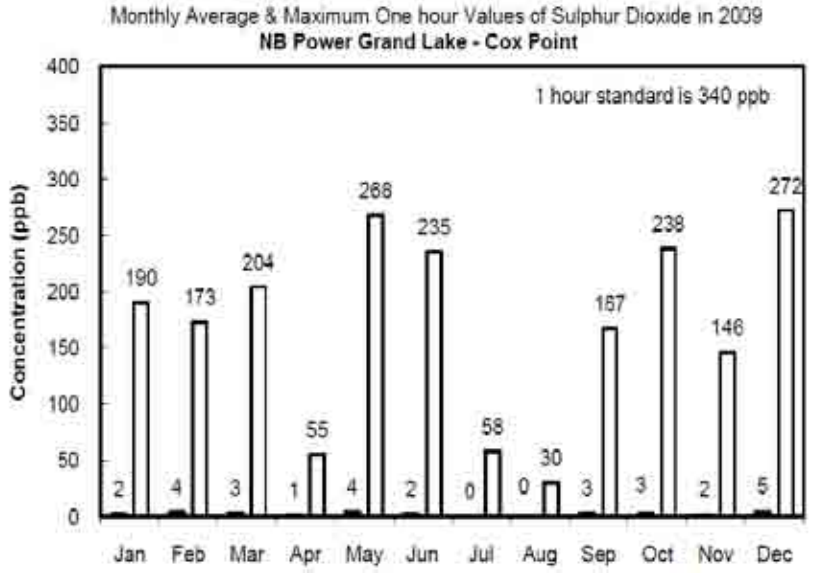

Monthly Average and Maximum One Hour Values of Nitrogen Dioxide in 2009
NB Power Millbank - Rockcliff
1 hour standard is 210 ppb
Concentration (ppb)
0
20
40
60
80
100
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
3 24 2 31 2 20 1 10 1 7 0 5 0 12 1 5 1 9 1 9 1 15 1 14

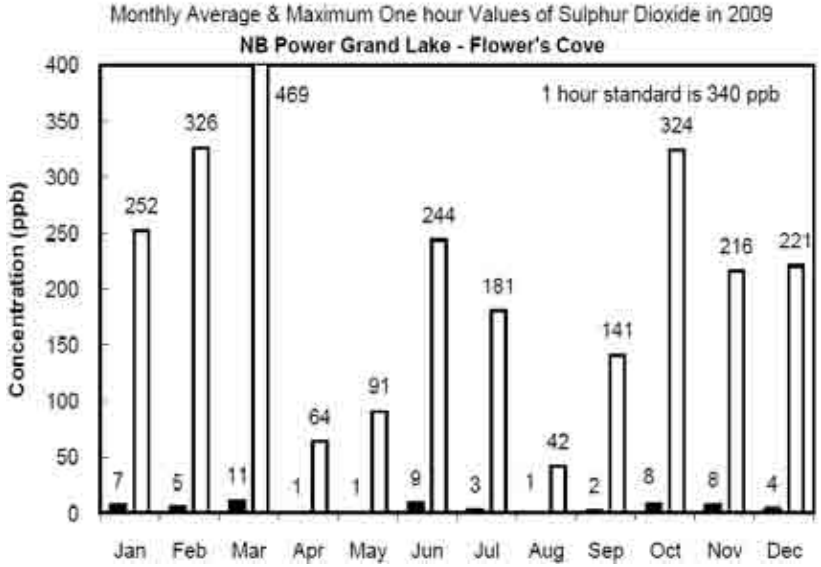

Monthly Average & Maximum One hour Values of Sulphur Dioxide in 2009
NB Power Millbank - Lower Newcastle
1 hour standard is 340 ppb
Concentration (ppb)
0 50 100 150 200 250 300 350 400
0 3 0 7 0 4 0 2 0 4 0 6 0 3 0 3 0 1 0 5 0 5 0 5
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec

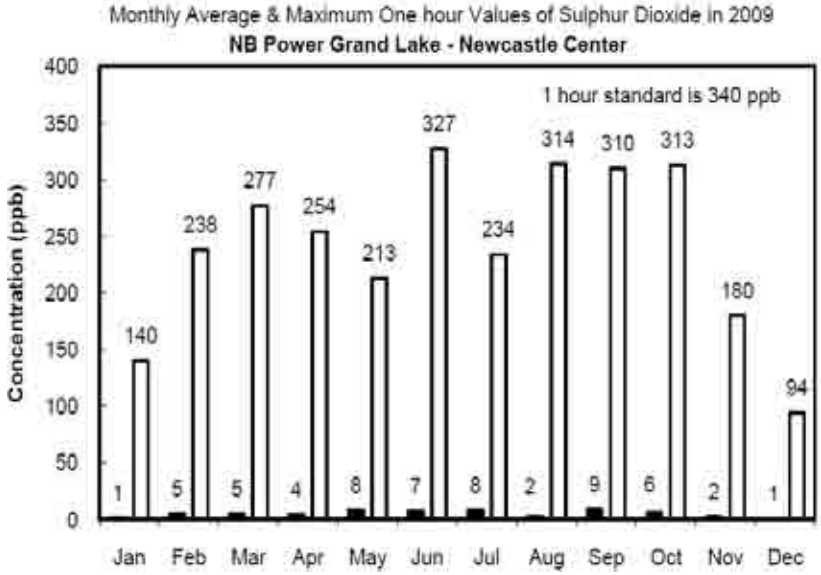

Monthly Average & Maximum One hour Values of Sulphur Dioxide in 2009
NB Power Millbank - Rockcliff
1 hour standard is 340 ppb
Concentration (ppb)
0 50 100 150 200 250 300 350 400
0 3 0 7 0 7 0 2 0 5 0 34 0 12 0 5 0 4 0 19 0 5 0 4
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec

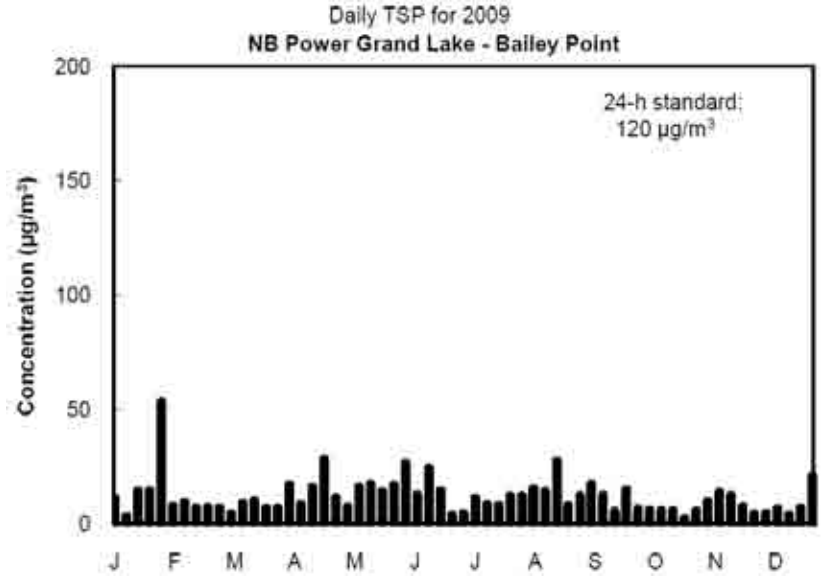

Daily TSP for 2009
NB Power Millbank - Rockcliff
24-h standard:
120 µg/m3
Concentration (µg/m3)
0 50 100 150 200
J F M A M J J A S O N D

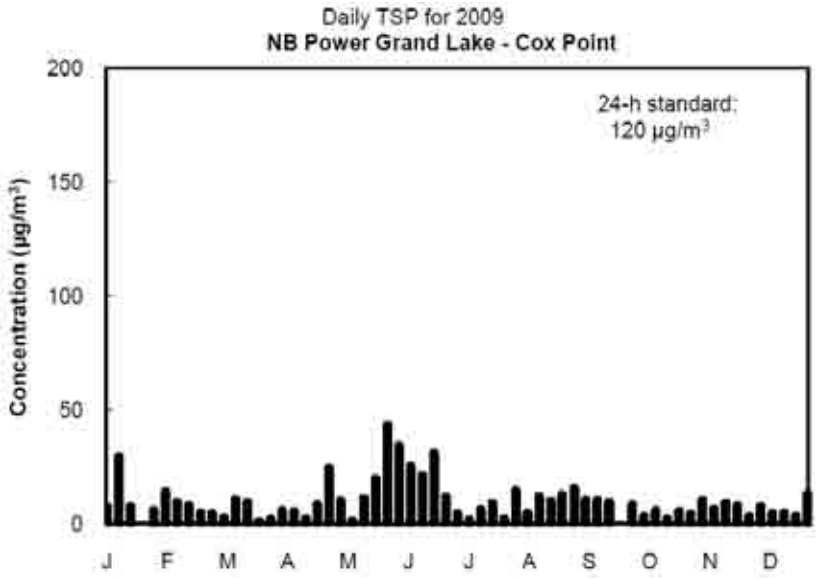

Monthly Average & Maximum One hour Values of Sulphur Dioxide in 2009
NB Power Grand Lake - Bailey Point
1 hour standard is 340 ppb
Concentration (ppb)
0 50 100 150 200 250 300 350 400
7 283 6 243 4 195 1 98 2 198 5 186 4 161 2 127 7 288 3 200 4 162 5 251
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec

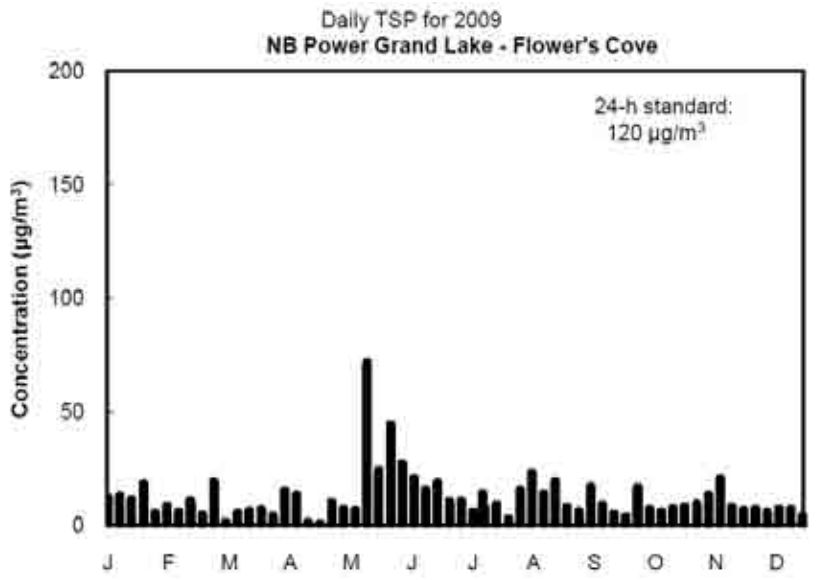

Monthly Average & Maximum One hour Values of Sulphur Dioxide in 2009
NB Power Grand Lake - Cox Point
1 hour standard is 340 ppb
Concentration (ppb)
0
50
100
150
200
250
300
350
400
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
2 190 4 173 3 204 1 55 4 268 2 235 0 58 0 30 3 167 3 238 2 146 5 272

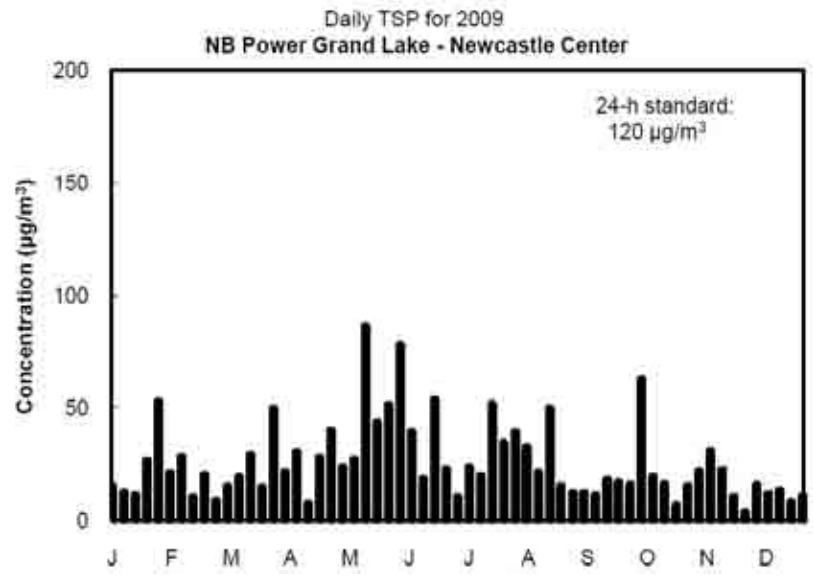

Monthly Average & Maximum One hour Values of Sulphur Dioxide in 2009
NB Power Grand Lake - Flower's Cove
1 hour standard is 340 ppb
Concentration (ppb)
0
50
100
150
200
250
300
350
400
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
7 252 5 326 11 469 1 64 1 91 9 244 3 181 1 42 2 141 8 324 8 216 4 221

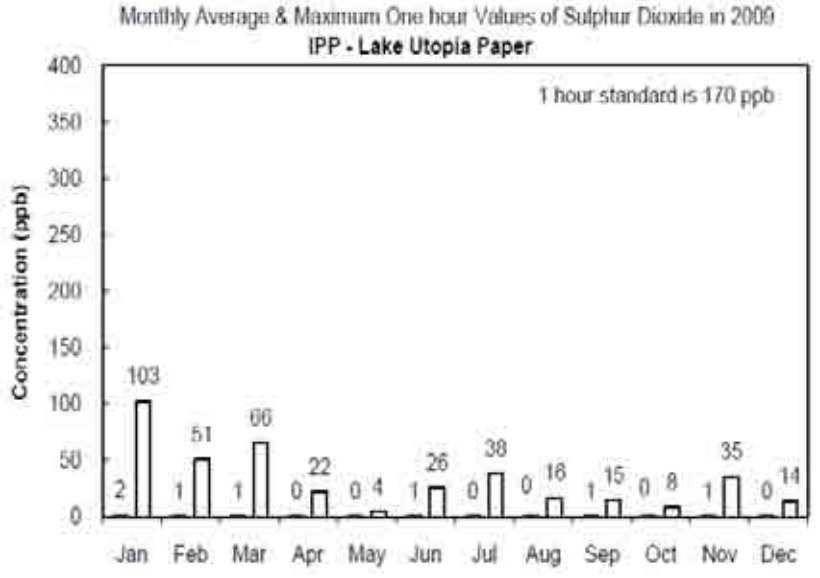

Monthly Average & Maximum One hour Values of Sulphur Dioxide in 2009
NB Power Grand Lake - Newcastle Center
1 hour standard is 340 ppb
Concentration (ppb)
0
50
100
150
200
250
300
350
400
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
1 140 5 238 5 277 4 254 8 213 7 327 8 234 2 314 9 310 6 313 2 180 1 94

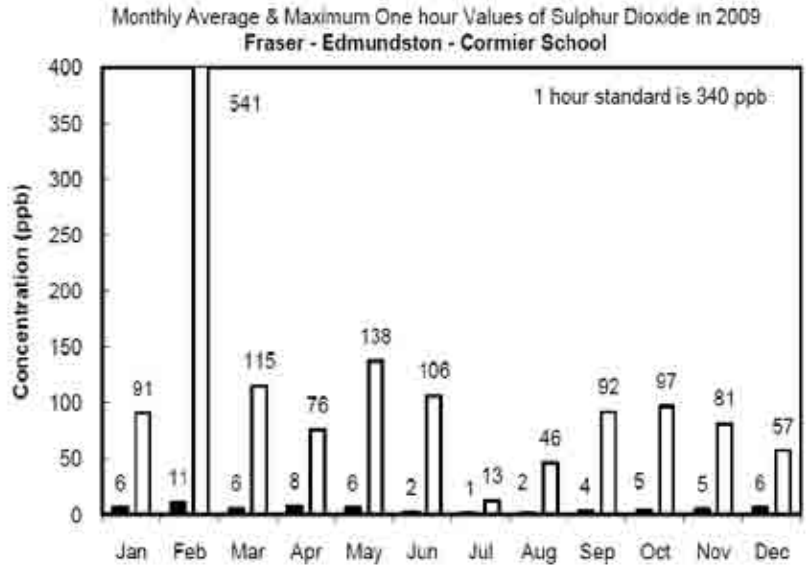

Daily TSP for 2009
NB Power Grand Lake - Bailey Point
24-h standard:
120 µg/m3
Concentration (µg/m3)
0
50
100
150
200
J F M A M J J A S O N D

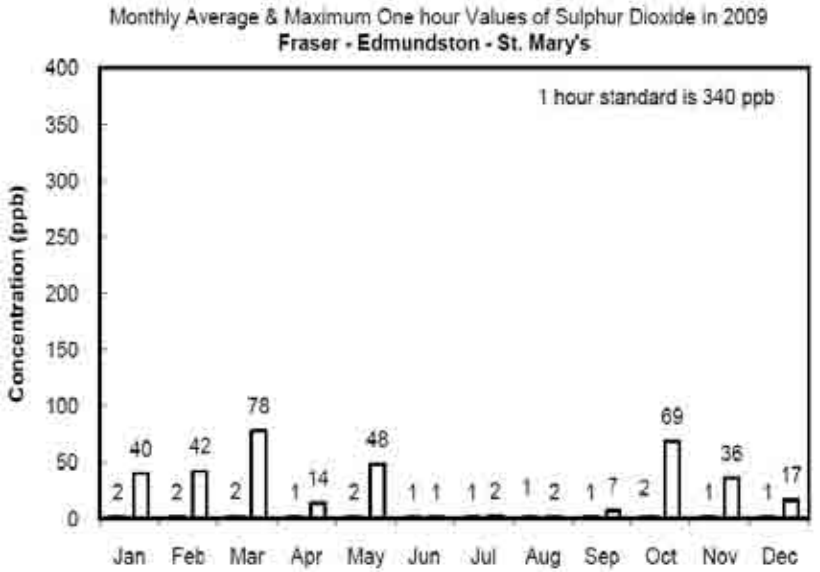

Daily TSP for 2009
NB Power Grand Lake - Cox Point
24-h standard:
120 µg/m³
Concentration (µg/m³)
200
150
100
50
0
J F M A M J J A S O N D

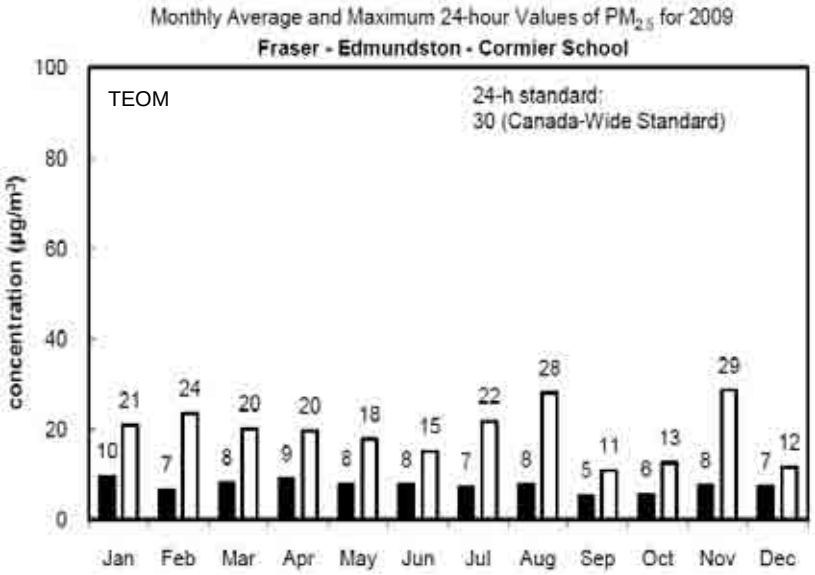

Daily TSP for 2009
NB Power Grand Lake - Flower's Cove
24-h standard:
120 µg/m³
Concentration (µg/m³)
200
150
100
50
0
J F M A M J J A S O N D

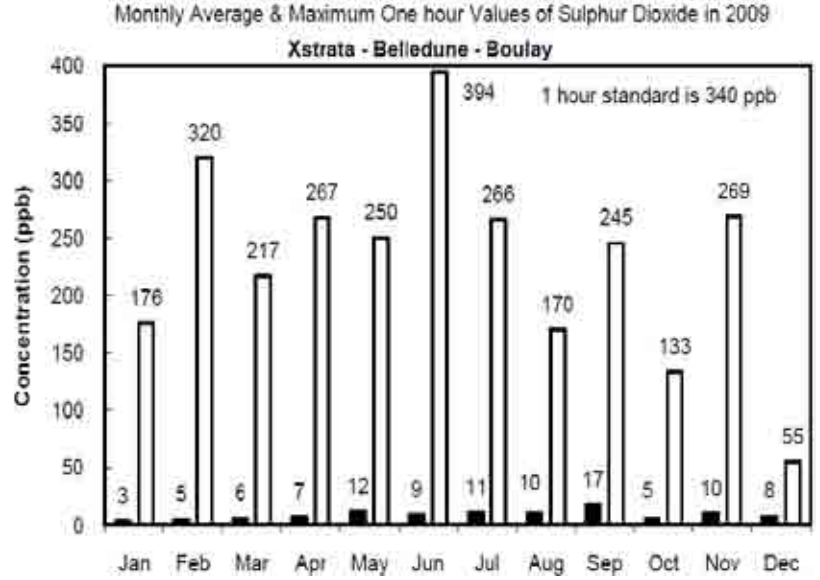

Daily TSP for 2009
NB Power Grand Lake - Newcastle Center
24-h standard:
120 µg/m³
Concentration (µg/m³)
200
150
100
50
0
J F M A M J J A S O N D

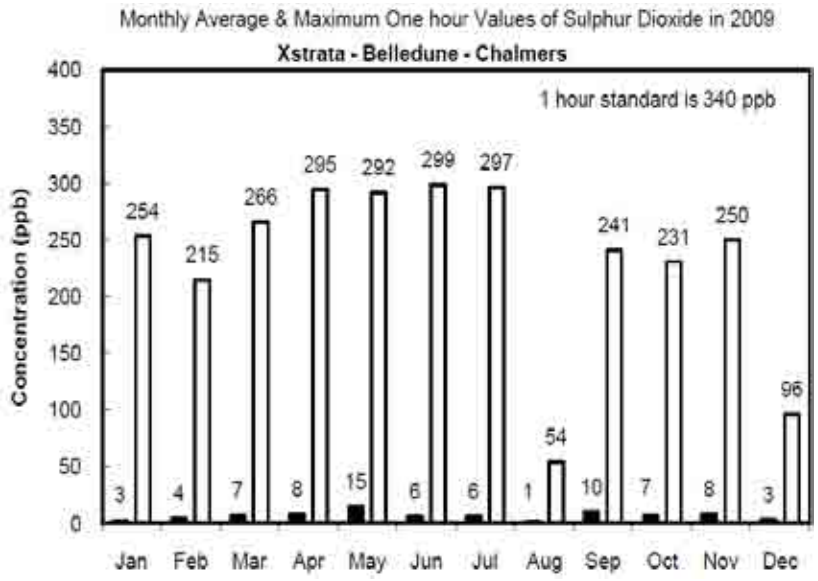

Monthly Average & Maximum One hour Values of Sulphur Dioxide in 2009
IPP - Lake Utopia Paper
1 hour standard is 170 ppb
Concentration (ppb)
400
350
300
250
200
150
100
50
0
2 103 1 51 1 66 0 22 0 4 1 26 0 38 0 16 1 15 0 8 1 35 0 14
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec

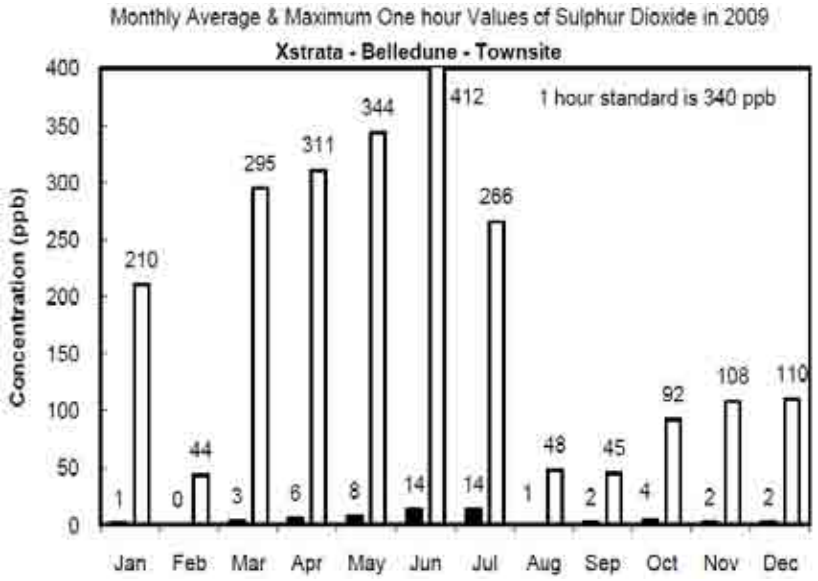

Monthly Average & Maximum One hour Values of Sulphur Dioxide in 2009
Fraser - Edmundston - Cormier School
1 hour standard is 340 ppb
Concentration (ppb)
0
50
100
150
200
250
300
350
400
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
6 91 11 541 6 115 8 76 6 138 2 106 1 13 2 46 4 92 5 97 5 81 6 57

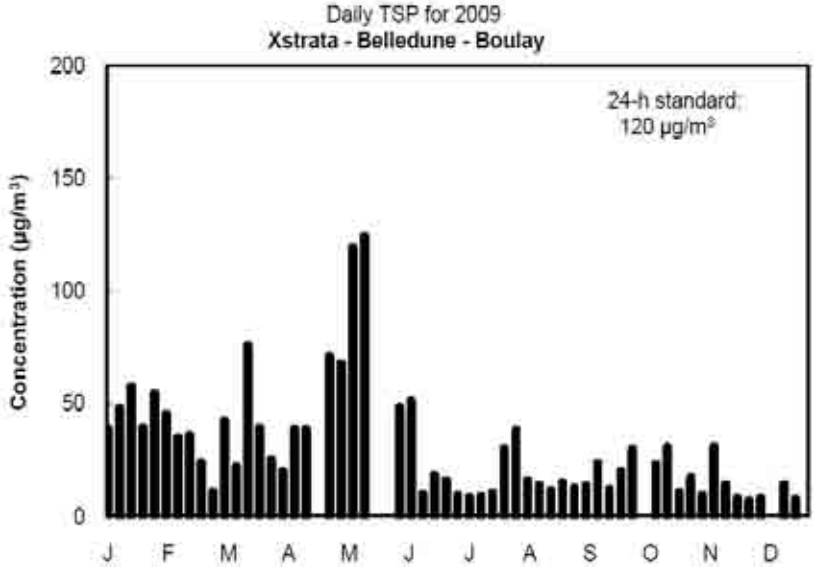

Monthly Average & Maximum One hour Values of Sulphur Dioxide in 2009
Fraser - Edmundston - St. Mary's
1 hour standard is 340 ppb
Concentration (ppb)
0
50
100
150
200
250
300
350
400
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
2 40 2 42 2 78 1 14 2 48 1 1 1 2 1 2 1 7 2 69 1 36 1 17

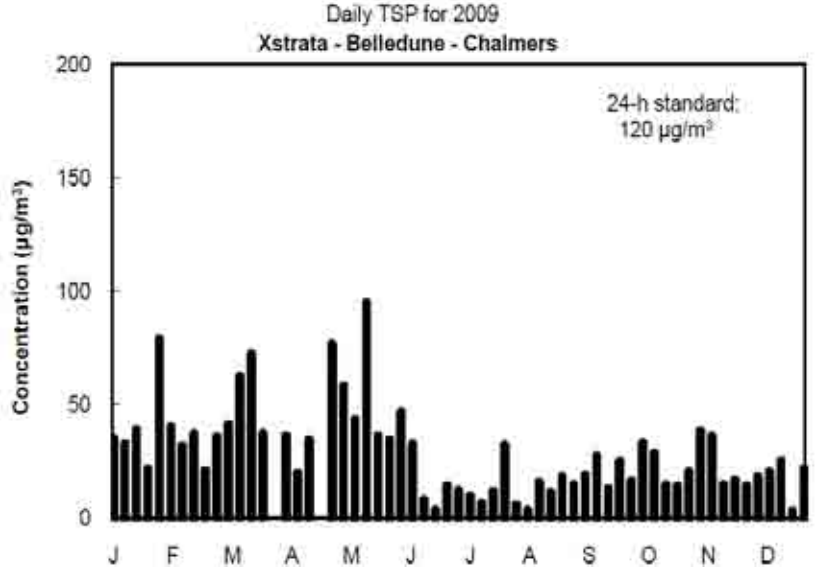

Monthly Average and Maximum 24-hour Values of PM2.5 for 2009
Fraser - Edmundston - Cormier School
TEOM
24-h standard:
30 (Canada-Wide Standard)
concentration (µg/m³)
0
20
40
60
80
100
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
10 21 7 24 8 20 9 20 8 18 8 15 7 22 8 28 5 11 6 13 8 29 7 12

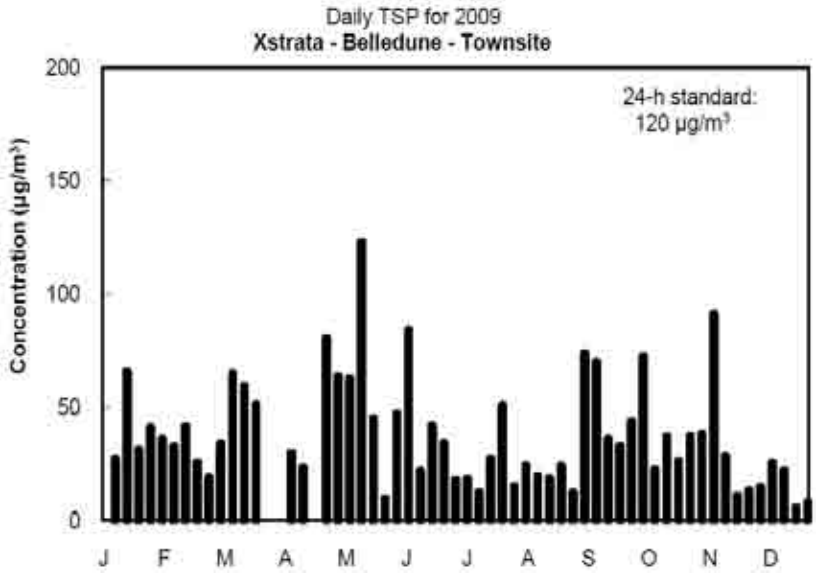

Monthly Average & Maximum One hour Values of Sulphur Dioxide in 2009
Xstrata - Belledune - Boulay
1 hour standard is 340 ppb
Concentration (ppb)
0
50
100
150
200
250
300
350
400
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
3 176 5 320 6 217 7 267 12 250 9 394 11 266 10 170 17 245 5 133 10 269 8 55

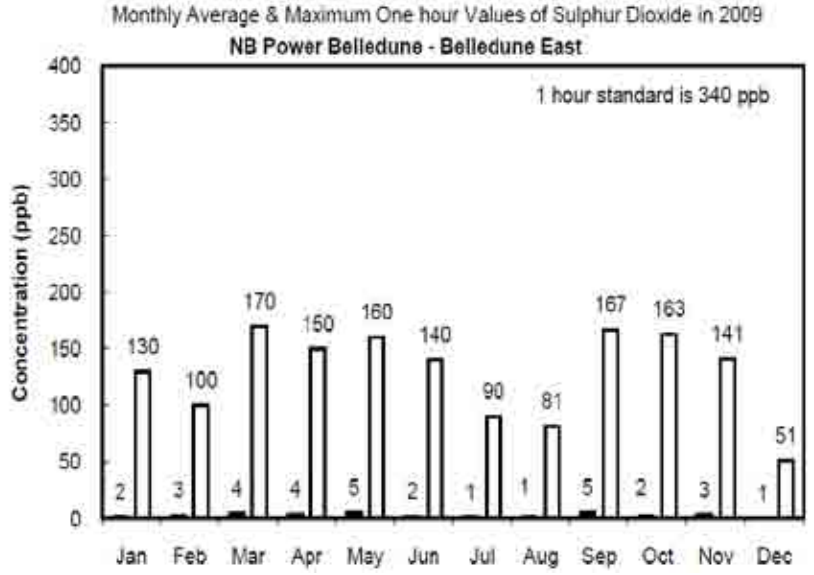

Monthly Average & Maximum One hour Values of Sulphur Dioxide in 2009
Xstrata - Belledune - Chalmers
1 hour standard is 340 ppb
Concentration (ppb)
400
350
300
250
200
150
100
50
0
254
215
266
295
292
299
297
54
241
231
250
96
3
4
7
8
15
6
6
1
10
7
8
3
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec

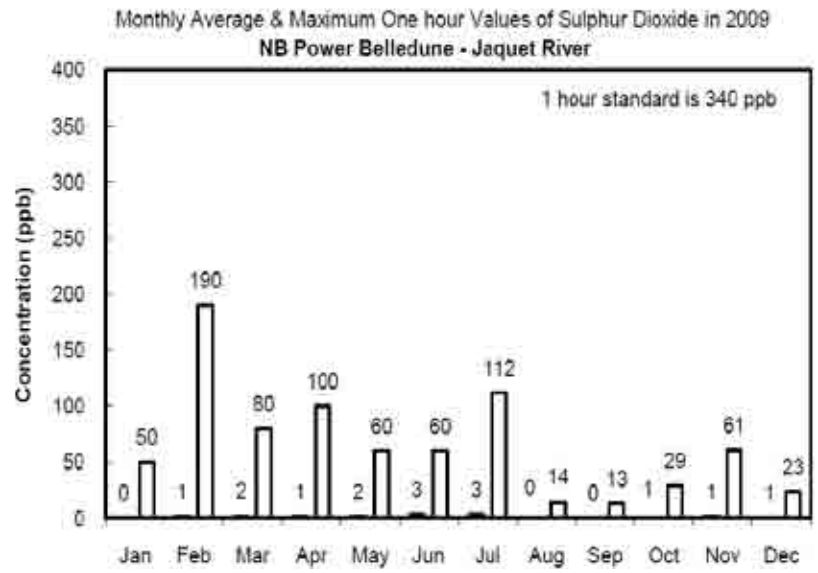

Monthly Average & Maximum One hour Values of Sulphur Dioxide in 2009
Xstrata - Belledune - Townsite
1 hour standard is 340 ppb
Concentration (ppb)
400
350
300
250
200
150
100
50
0
210
44
295
311
344
412
266
48
45
92
108
110
1
0
3
6
8
14
14
1
2
4
2
2
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec

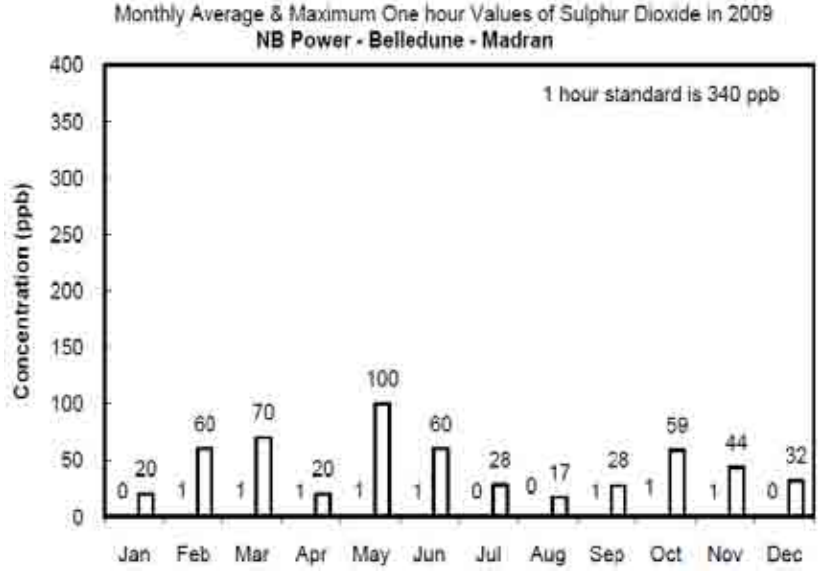

Daily TSP for 2009
Xstrata - Belledune - Boulay
24-h standard:
120 µg/m³
Concentration (µg/m³)
200
150
100
50
0
J
F
M
A
M
J
J
A
S
O
N
D

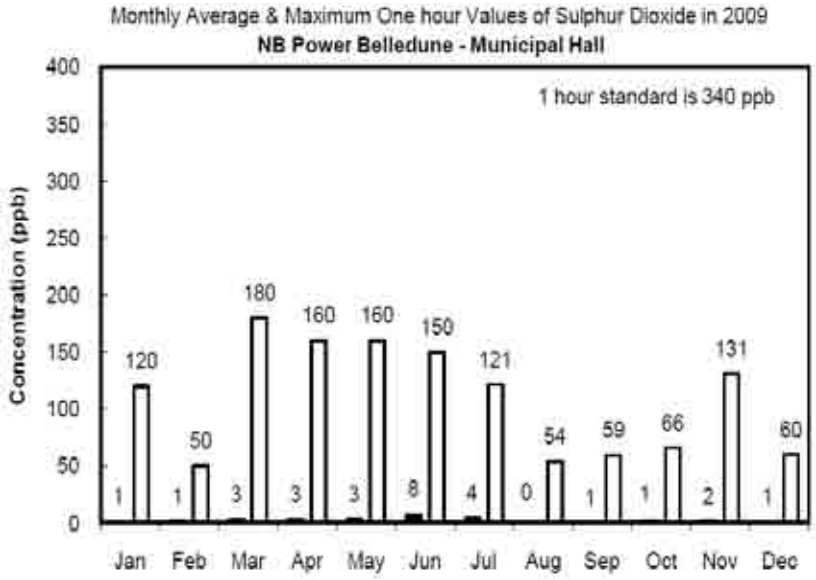

Daily TSP for 2009
Xstrata - Belledune - Chalmers
24-h standard:
120 µg/m³
Concentration (µg/m³)
200
150
100
50
0
J
F
M
A
M
J
J
A
S
O
N
D

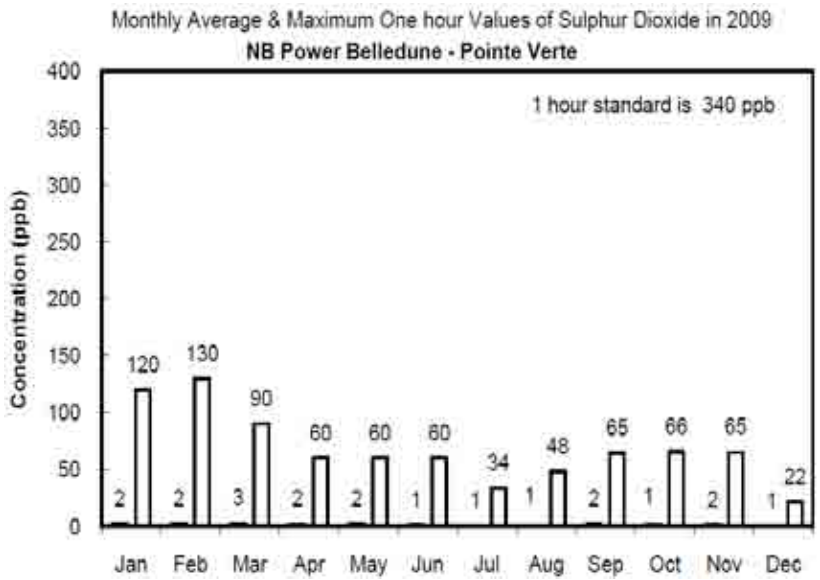

Daily TSP for 2009
Xstrata - Belledune - Townsite
24-h standard:
120 µg/m³
Concentration (µg/m³)
200
150
100
50
0
J F M A M J J A S O N D

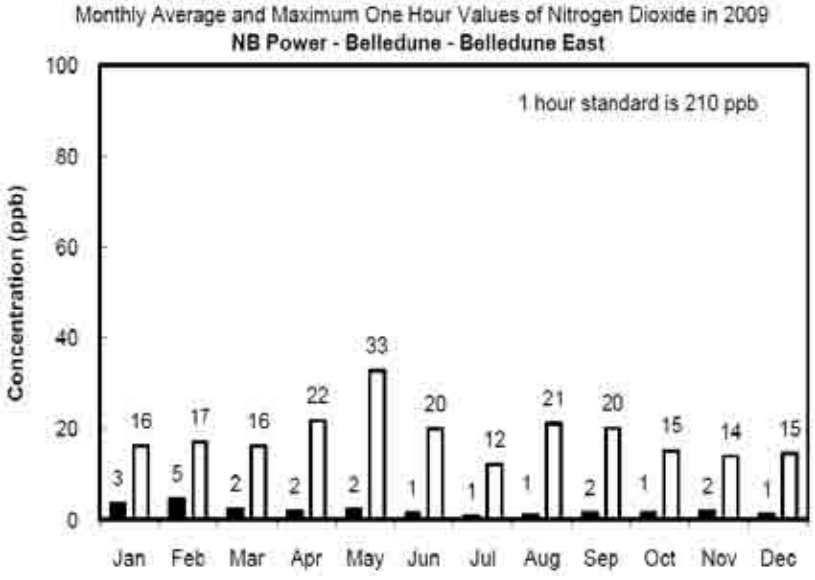

Monthly Average & Maximum One hour Values of Sulphur Dioxide in 2009
NB Power Belledune - Belledune East
1 hour standard is 340 ppb
Concentration (ppb)
400
350
300
250
200
150
100
50
0
2 130
3 100
4 170
4 150
5 160
2 140
1 90
1 81
5 167
2 163
3 141
1 51
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec

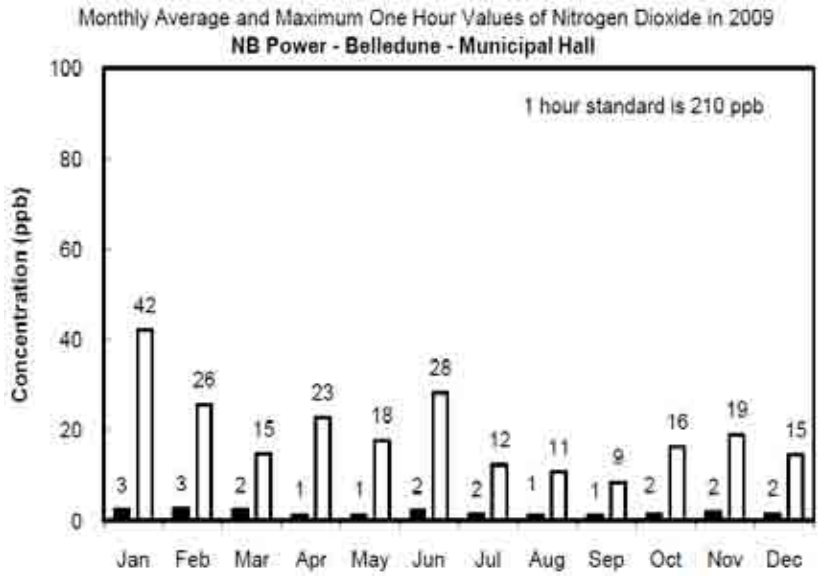

Monthly Average & Maximum One hour Values of Sulphur Dioxide in 2009
NB Power Belledune - Jaquet River
1 hour standard is 340 ppb
Concentration (ppb)
400
350
300
250
200
150
100
50
0
0 50
1 190
2 80
1 100
2 60
3 60
3 112
0 14
0 13
1 29
1 61
1 23
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec

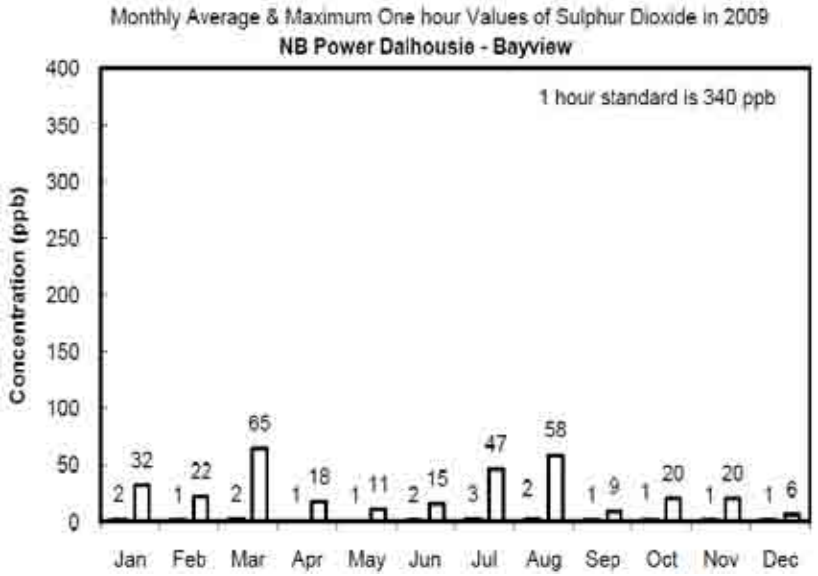

Monthly Average & Maximum One hour Values of Sulphur Dioxide in 2009
NB Power - Belledune - Madran
1 hour standard is 340 ppb
Concentration (ppb)
400
350
300
250
200
150
100
50
0
0 20
1 60
1 70
1 20
1 100
1 60
0 28
0 17
1 28
1 59
1 44
0 32
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec

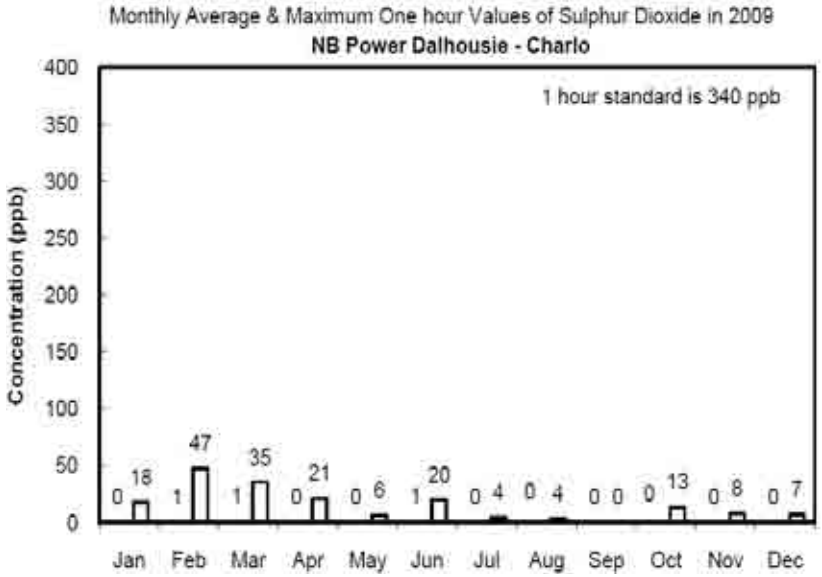

Monthly Average & Maximum One hour Values of Sulphur Dioxide in 2009
NB Power Belledune - Municipal Hall
1 hour standard is 340 ppb
Concentration (ppb)
0
50
100
150
200
250
300
350
400
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
1 120 1 50 3 180 3 160 3 160 8 150 4 121 0 54 1 59 1 66 2 131 1 60

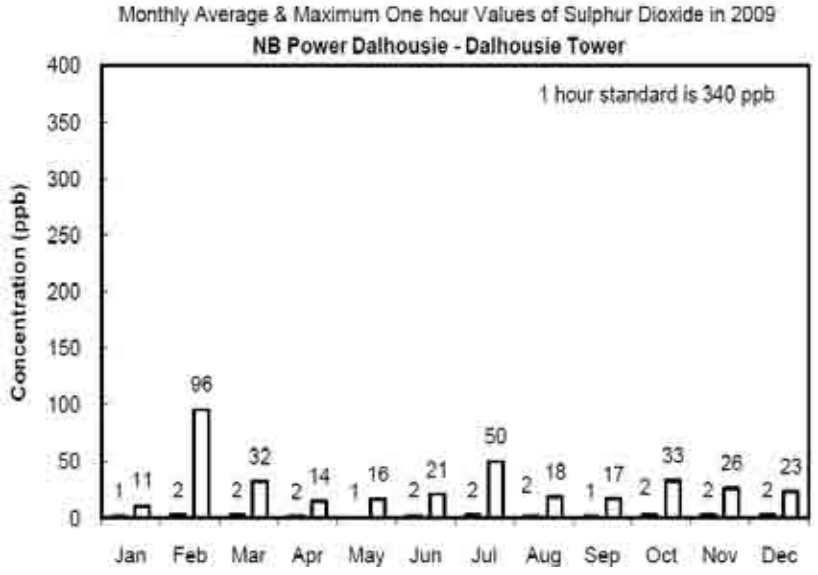

Monthly Average & Maximum One hour Values of Sulphur Dioxide in 2009
NB Power Belledune - Pointe Verte
1 hour standard is 340 ppb
Concentration (ppb)
0
50
100
150
200
250
300
350
400
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
2 120 2 130 3 90 2 60 2 60 1 60 1 34 1 48 2 65 1 66 2 65 1 22

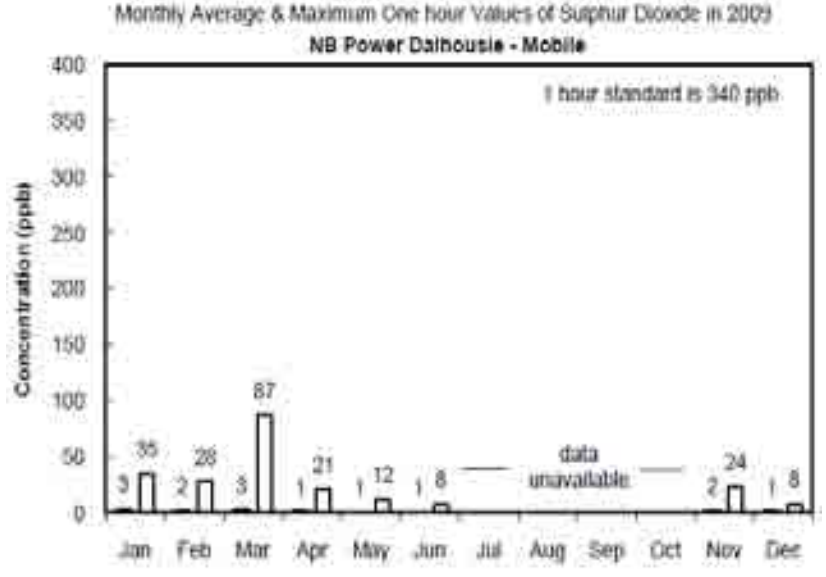

Monthly Average and Maximum One Hour Values of Nitrogen Dioxide in 2009
NB Power - Belledune - Belledune East
1 hour standard is 210 ppb
Concentration (ppb)
0
20
40
60
80
100
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
3 16 5 17 2 16 2 22 2 33 1 20 1 12 1 21 2 20 1 15 2 14 1 15

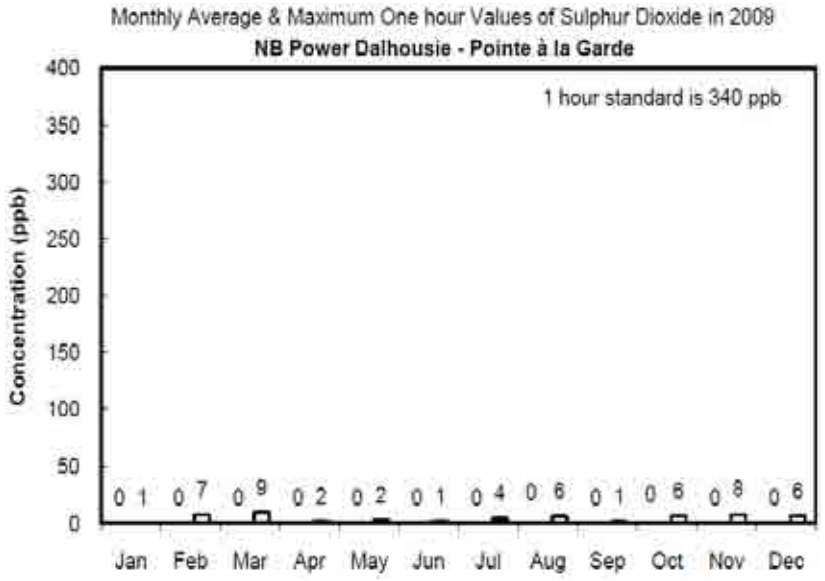

Monthly Average and Maximum One Hour Values of Nitrogen Dioxide in 2009
NB Power - Belledune - Municipal Hall
1 hour standard is 210 ppb
Concentration (ppb)
0
20
40
60
80
100
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
3 42 3 26 2 15 1 23 1 18 2 28 2 12 1 11 1 9 2 16 2 19 2 15

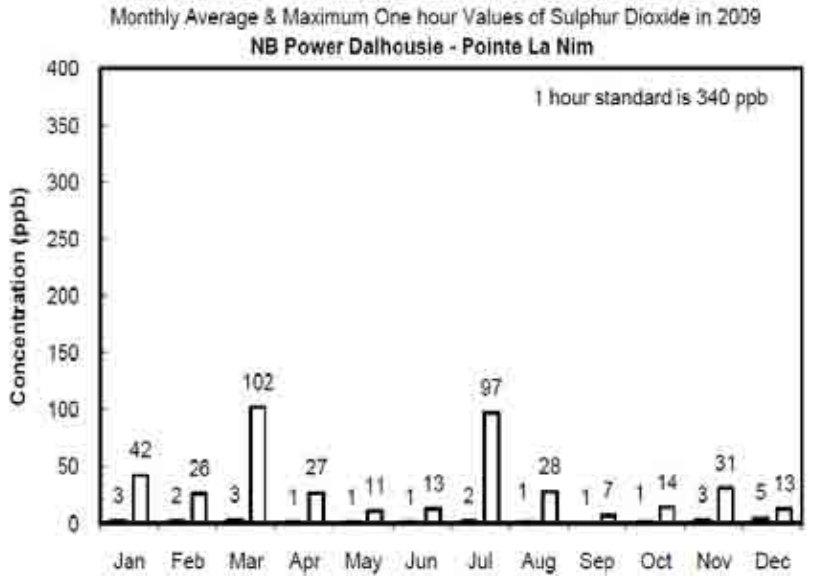

Monthly Average & Maximum One hour Values of Sulphur Dioxide in 2009
NB Power Dalhousie - Bayview
1 hour standard is 340 ppb
Concentration (ppb)
400
350
300
250
200
150
100
50
0
2 32
1 22
2 65
1 18
1 11
2 15
3 47
2 58
1 9
1 20
1 20
1 6
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec

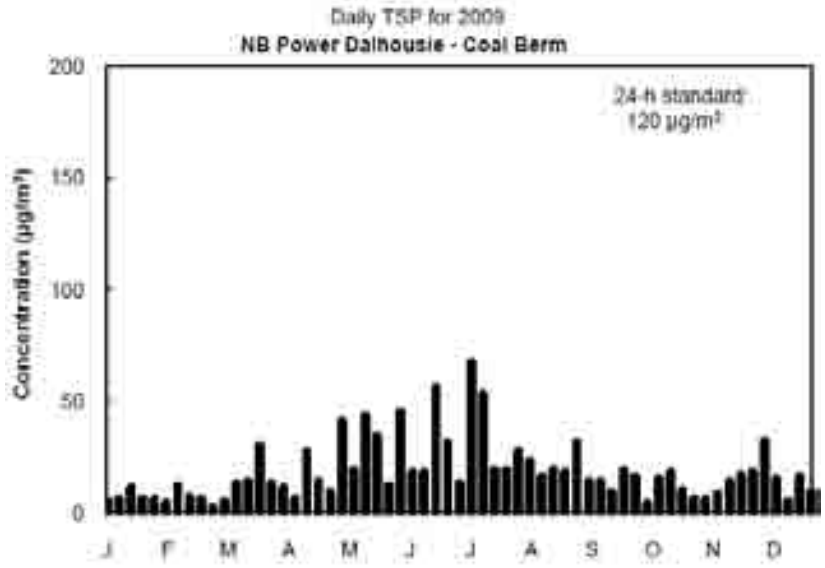

Monthly Average & Maximum One hour Values of Sulphur Dioxide in 2009
NB Power Dalhousie - Charlo
1 hour standard is 340 ppb
Concentration (ppb)
400
350
300
250
200
150
100
50
0
0 18
1 47
1 35
0 21
0 6
1 20
0 4
0 4
0 0
0 13
0 8
0 7
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec

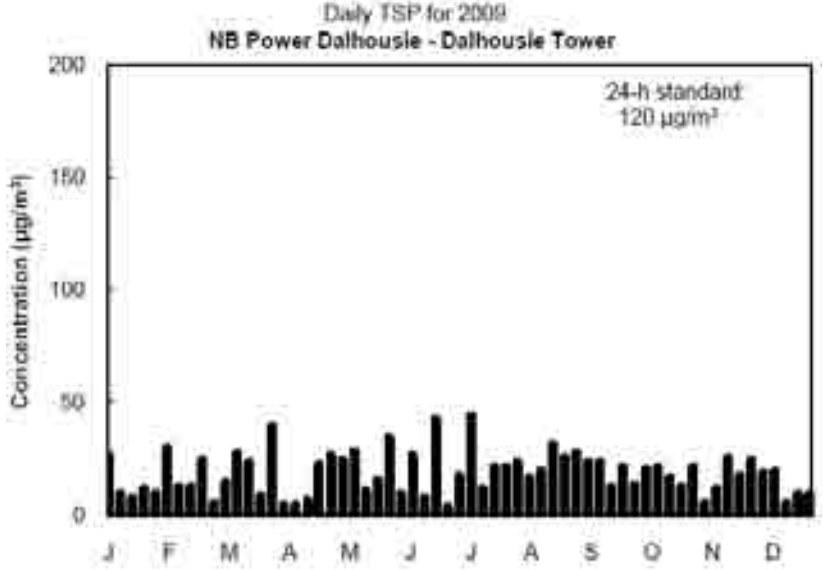

Monthly Average & Maximum One hour Values of Sulphur Dioxide in 2009
NB Power Dalhousie - Dalhousie Tower
1 hour standard is 340 ppb
Concentration (ppb)
400
350
300
250
200
150
100
50
0
1 11
2 96
2 32
2 14
1 16
2 21
2 50
2 18
1 17
2 33
2 26
2 23
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec

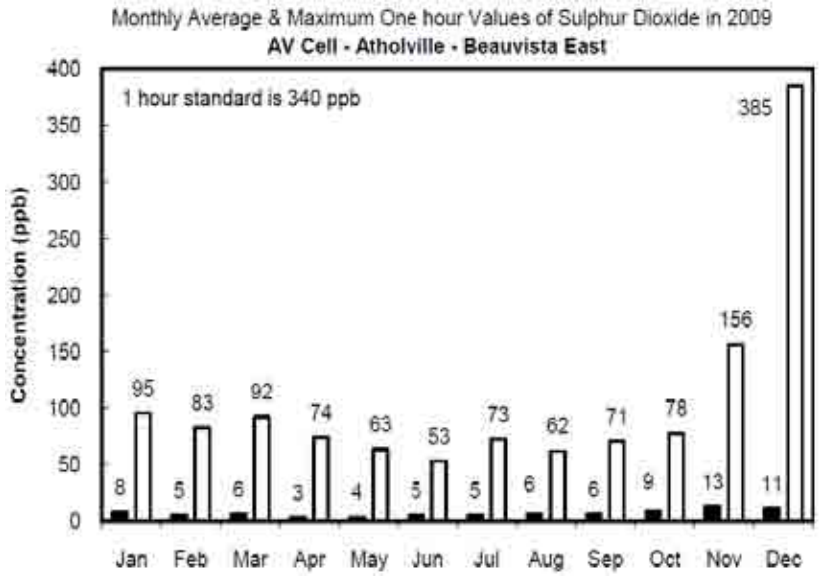

Monthly Average & Maximum One hour Values of Sulphur Dioxide in 2009
NB Power Dalhousie - Mobile
1 hour standard is 340 ppb
Concentration (ppb)
400
350
300
250
200
150
100
50
0
3 35
2 28
3 87
1 21
1 12
1 8
data unavailable
2 24
1 8
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec

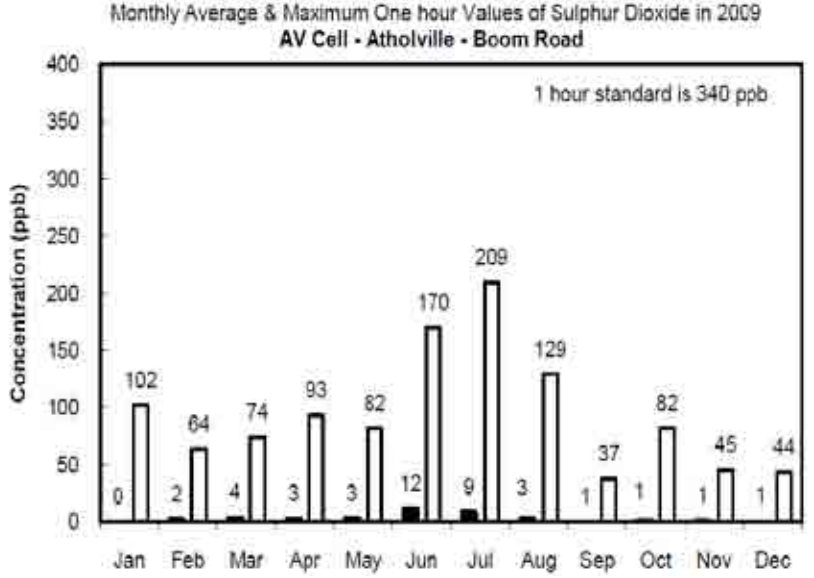

Monthly Average & Maximum One hour Values of Sulphur Dioxide in 2009
NB Power Dalhousie - Pointe à la Garde
1 hour standard is 340 ppb
Concentration (ppb)
0 1 0 7 0 9 0 2 0 2 0 1 0 4 0 6 0 1 0 6 0 8 0 6
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec

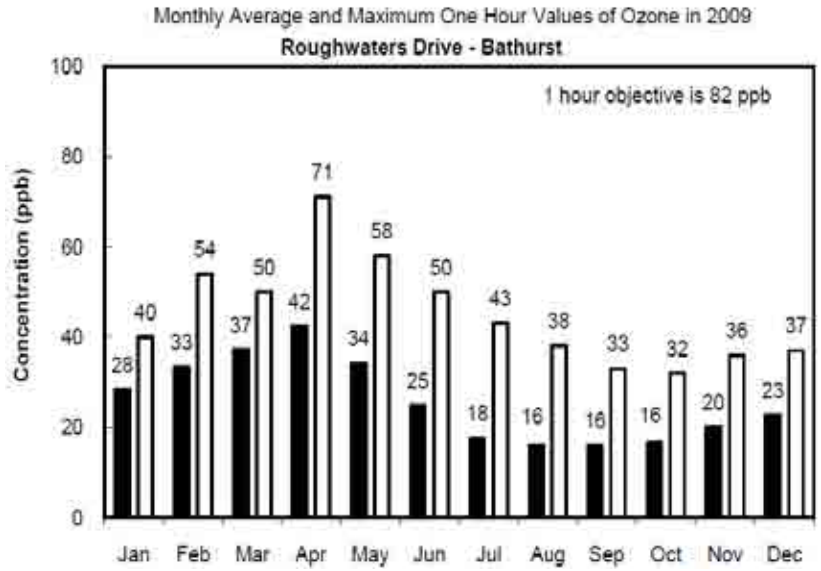

Monthly Average & Maximum One hour Values of Sulphur Dioxide in 2009
NB Power Dalhousie - Pointe La Nim
1 hour standard is 340 ppb
Concentration (ppb)
3 42 2 26 3 102 1 27 1 11 1 13 2 97 1 28 1 7 1 14 3 31 5 13
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec

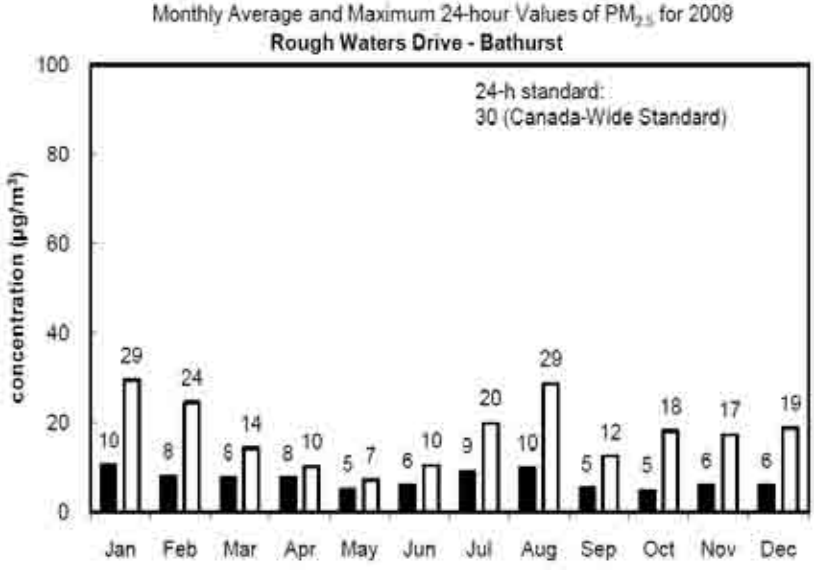

Daily TSP for 2009
NB Power Dalhousie - Coal Berm
24-h standard
120 µg/m³
Concentration (µg/m³)
J F M A M J J A S O N D

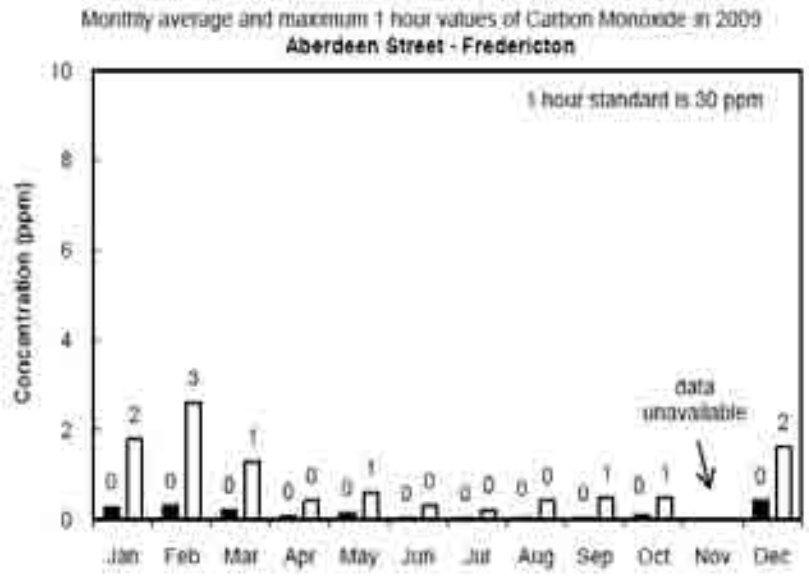

Daily TSP for 2009
NB Power Dalhousie - Dalhousie Tower
24-h standard
120 µg/m³
Concentration (µg/m³)
J F M A M J J A S O N D

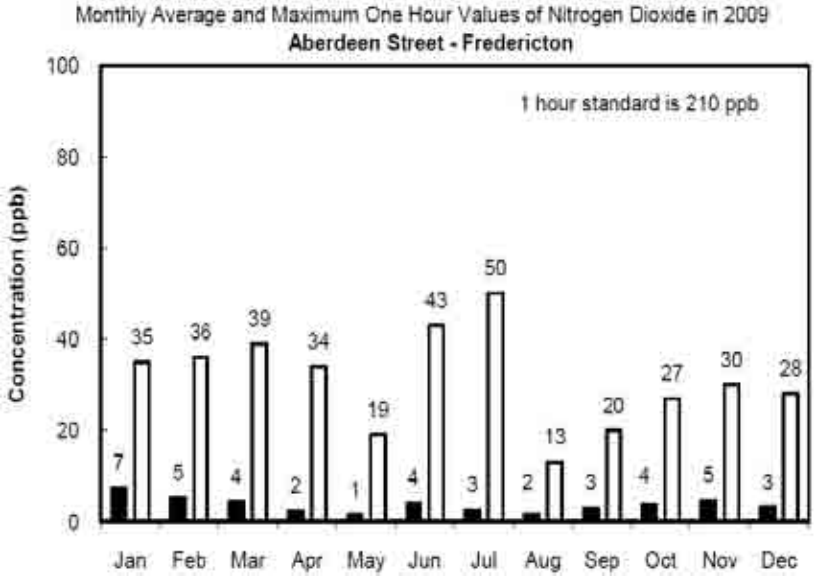

Monthly Average & Maximum One hour Values of Sulphur Dioxide in 2009
AV Cell - Atholville - Beauvista East
1 hour standard is 340 ppb
Concentration (ppb)
0
50
100
150
200
250
300
350
400
8
95
5
83
6
92
3
74
4
63
5
53
5
73
6
62
6
71
9
78
13
156
11
385
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec

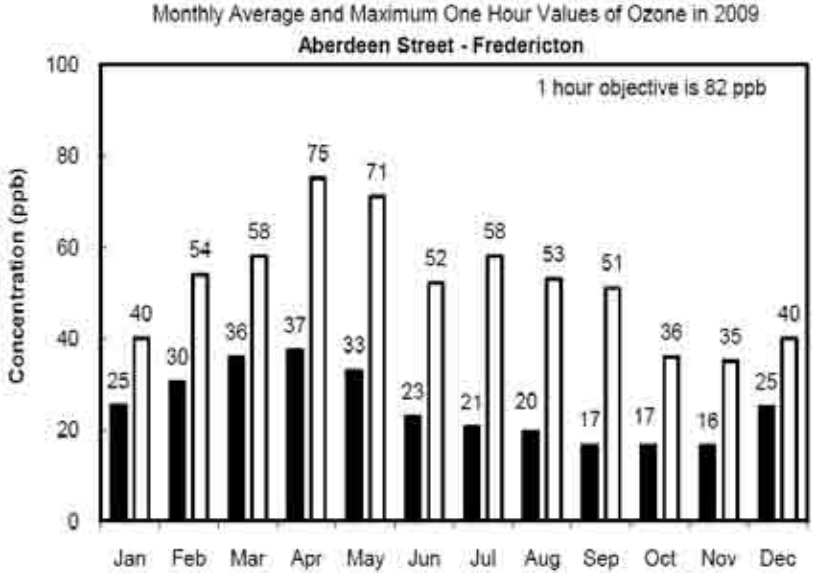

Monthly Average & Maximum One hour Values of Sulphur Dioxide in 2009
AV Cell - Atholville - Boom Road
1 hour standard is 340 ppb
Concentration (ppb)
0
50
100
150
200
250
300
350
400
0
102
2
64
4
74
3
93
3
82
12
170
9
209
3
129
1
37
1
82
1
45
1
44
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec

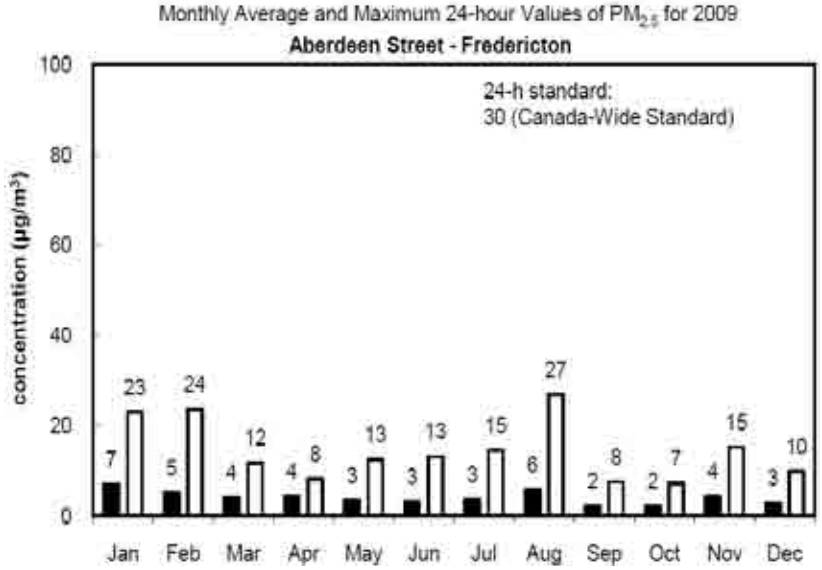

Monthly Average and Maximum One Hour Values of Ozone in 2009
Roughwaters Drive - Bathurst
1 hour objective is 82 ppb
Concentration (ppb)
0
20
40
60
80
100
28
40
33
54
37
50
42
71
34
58
25
50
18
43
16
38
16
33
16
32
20
36
23
37
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec

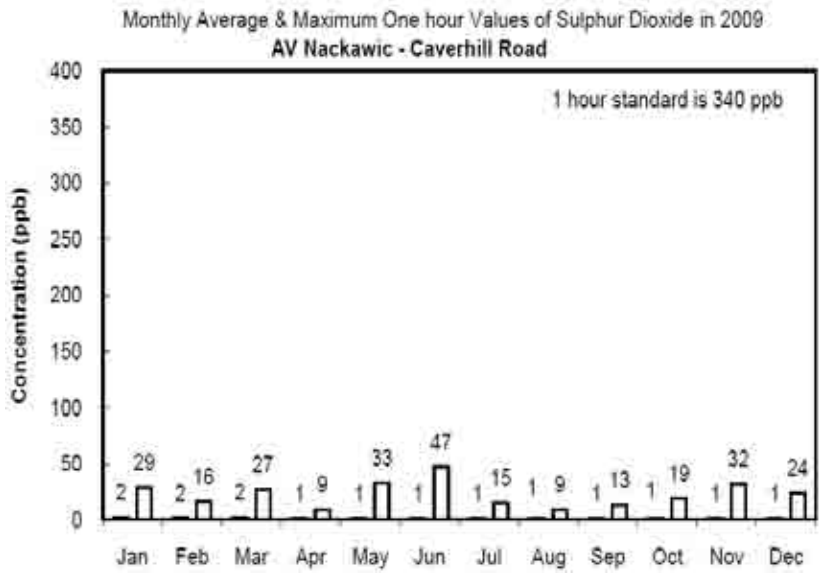

Monthly Average and Maximum 24-hour Values of PM2.5 for 2009
Rough Waters Drive - Bathurst
24-h standard:
30 (Canada-Wide Standard)
concentration (µg/m³)
0
20
40
60
80
100
10
29
8
24
9
14
8
10
5
7
6
10
9
20
10
29
5
12
5
18
6
17
6
19
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec

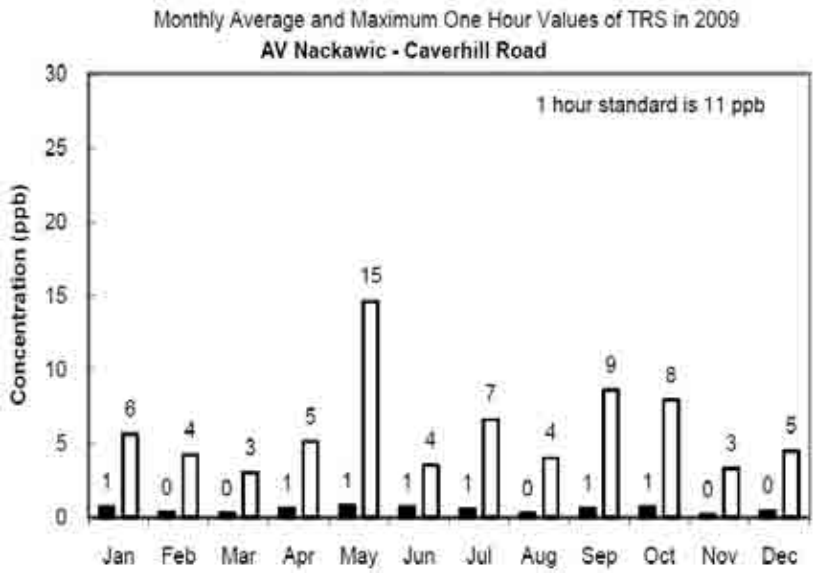

Monthly average and maximum 1 hour values of Carbon Monoxide in 2009
Aberdeen Street - Fredericton
1 hour standard is 30 ppm
Concentration (ppm)
data unavailable
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec

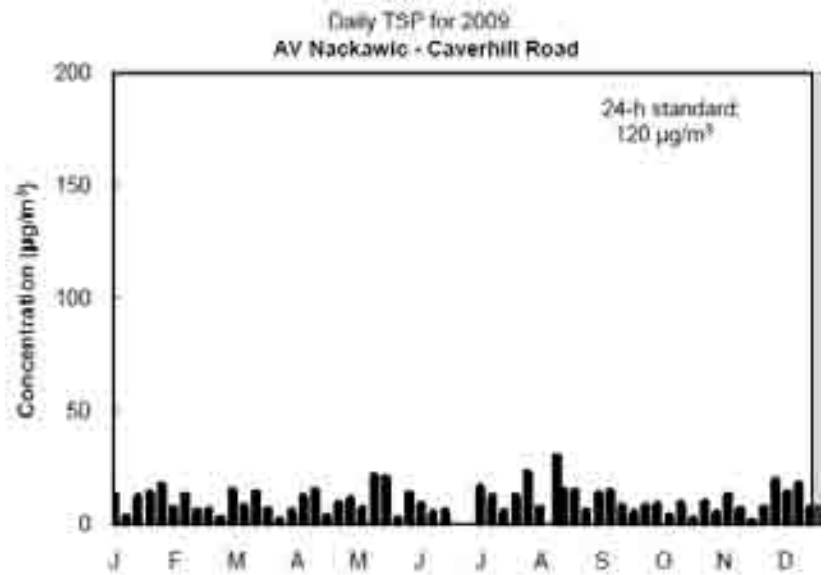

Monthly Average and Maximum One Hour Values of Nitrogen Dioxide in 2009
Aberdeen Street - Fredericton
1 hour standard is 210 ppb
Concentration (ppb)
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec

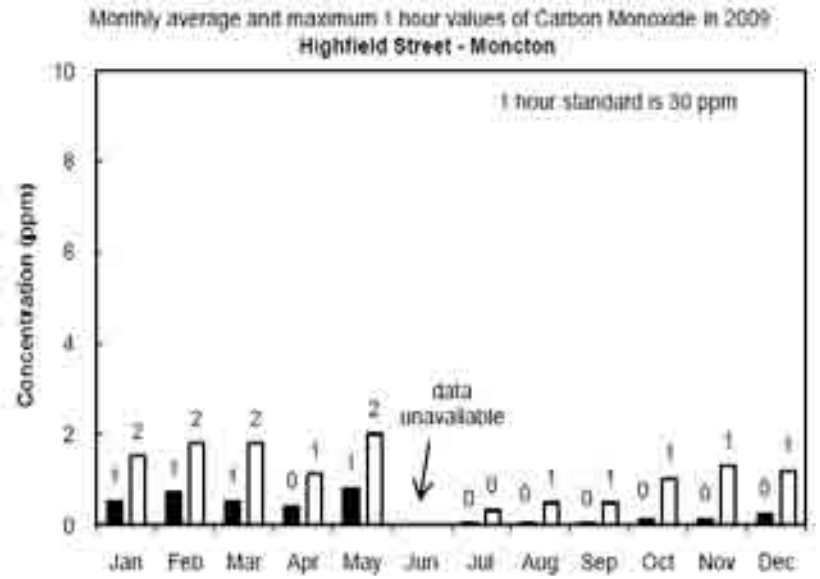

Monthly Average and Maximum One Hour Values of Ozone in 2009
Aberdeen Street - Fredericton
1 hour objective is 82 ppb
Concentration (ppb)
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec

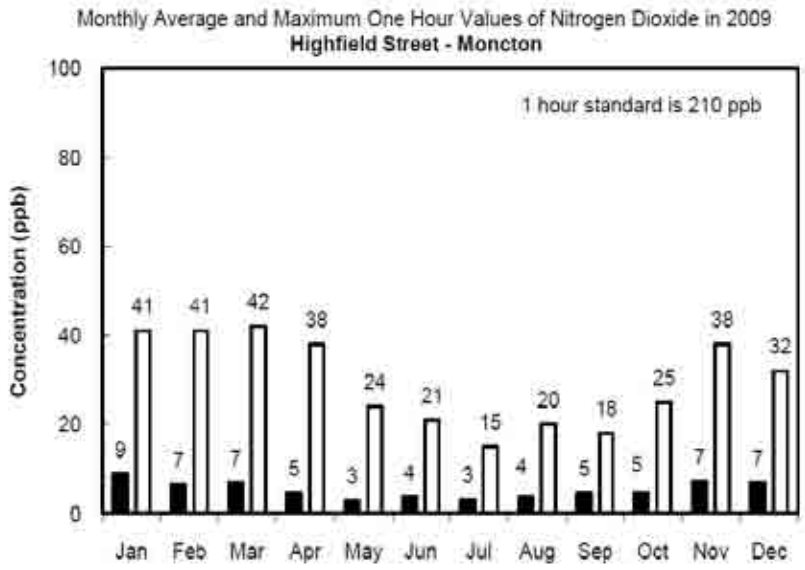

Monthly Average and Maximum 24-hour Values of PM2.5 for 2009
Aberdeen Street - Fredericton
24-h standard:
30 (Canada-Wide Standard)
concentration (µg/m³)
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec

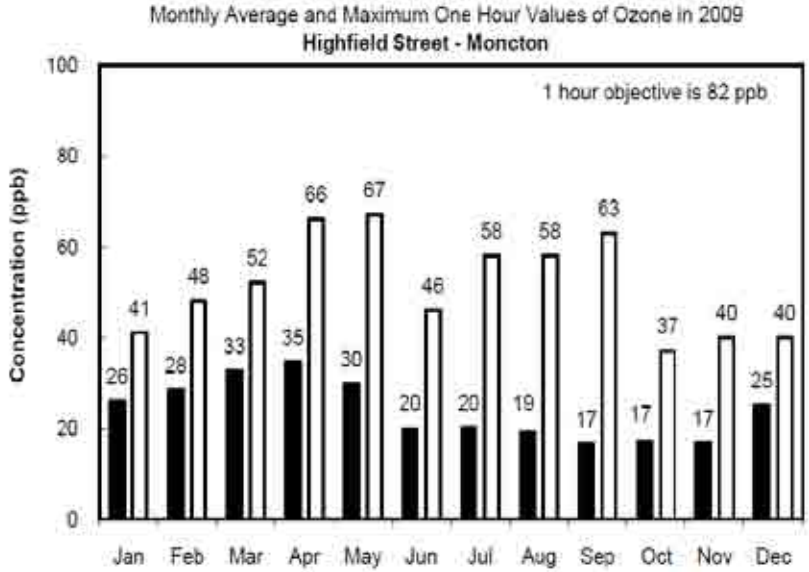

Monthly Average & Maximum One hour Values of Sulphur Dioxide in 2009
AV Nackawic - Caverhill Road
1 hour standard is 340 ppb
Concentration (ppb)
400
350
300
250
200
150
100
50
0
2 29
2 16
2 27
1 9
1 33
1 47
1 15
1 9
1 13
1 19
1 32
1 24
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec

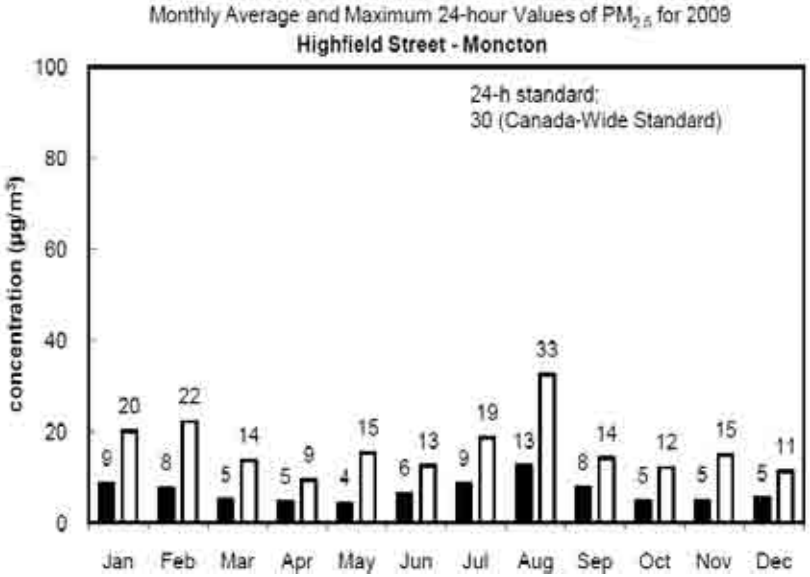

Monthly Average and Maximum One Hour Values of TRS in 2009
AV Nackawic - Caverhill Road
1 hour standard is 11 ppb
Concentration (ppb)
30
25
20
15
10
5
0
1 6
0 4
0 3
1 5
1 15
1 4
1 7
0 4
1 9
1 8
0 3
0 5
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec

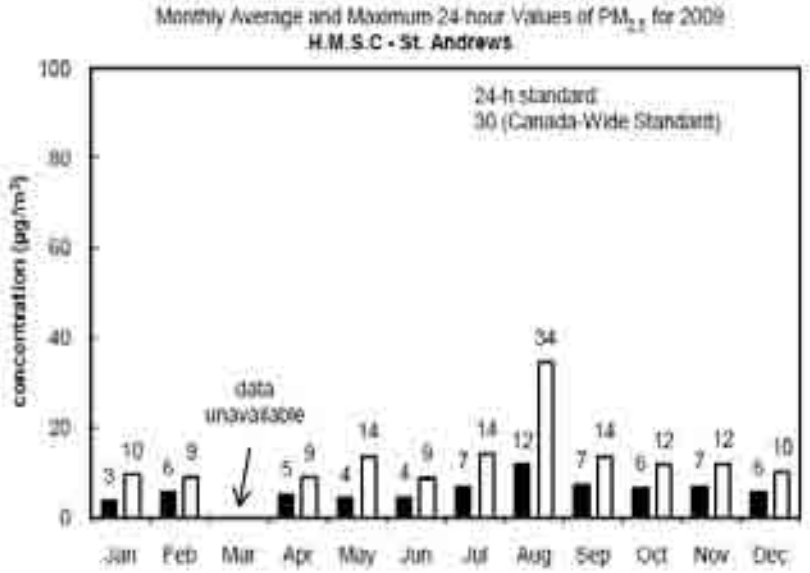

Daily TSP for 2009
AV Nackawic - Caverhill Road
24-h standard:
120 µg/m³
Concentration (µg/m³)
200
150
100
50
0
J F M A M J J A S O N D

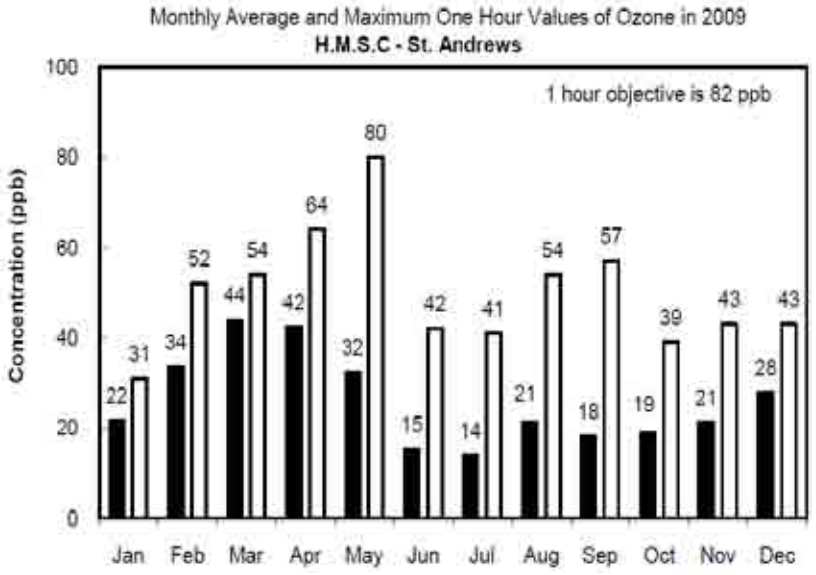

Monthly average and maximum 1 hour values of Carbon Monoxide in 2009
Highfield Street - Moncton
1 hour standard is 30 ppm
Concentration (ppm)
10
8
6
4
2
0
1 2
1 2
1 2
0 1
1 2
data
unavailable
0 0
0 1
0 1
0 1
0 1
0 1
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec

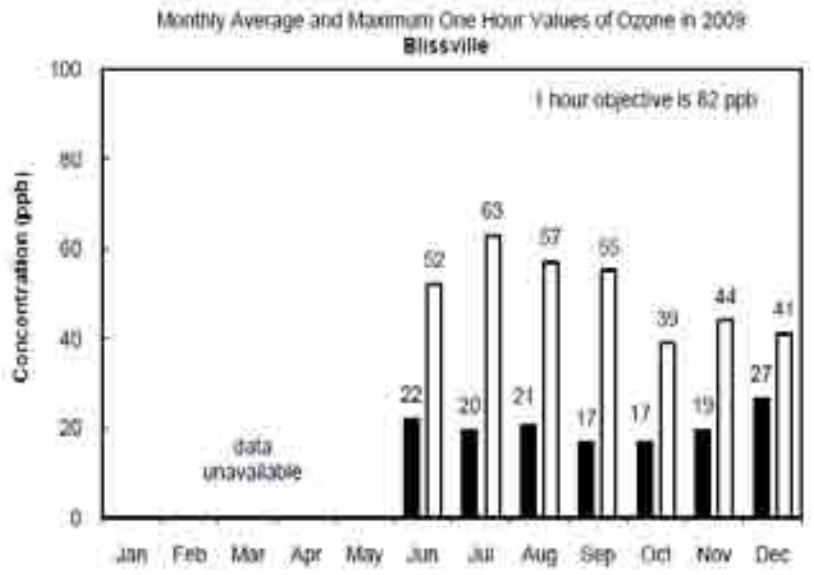

Monthly Average and Maximum One Hour Values of Nitrogen Dioxide in 2009
Highfield Street - Moncton
1 hour standard is 210 ppb
Concentration (ppb)
0
20
40
60
80
100
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
9 41
7 41
7 42
5 38
3 24
4 21
3 15
4 20
5 18
5 25
7 38
7 32

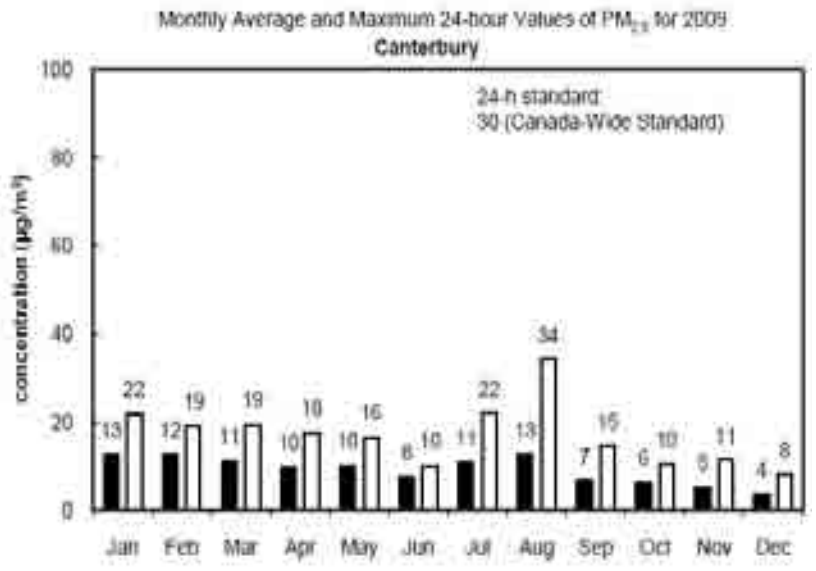

Monthly Average and Maximum One Hour Values of Ozone in 2009
Highfield Street - Moncton
1 hour objective is 82 ppb
Concentration (ppb)
0
20
40
60
80
100
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
26 41
28 48
33 52
35 66
30 67
20 46
20 58
19 58
17 63
17 37
17 40
25 40

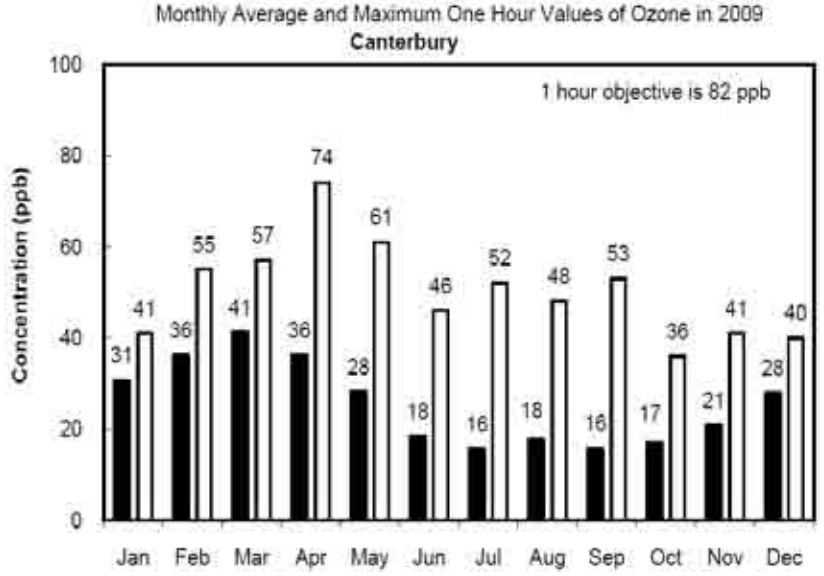

Monthly Average and Maximum 24-hour Values of PM2.5 for 2009
Highfield Street - Moncton
24-h standard:
30 (Canada-Wide Standard)
concentration (µg/m³)
0
20
40
60
80
100
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
9 20
8 22
5 14
5 9
4 15
6 13
9 19
13 33
8 14
5 12
5 15
5 11

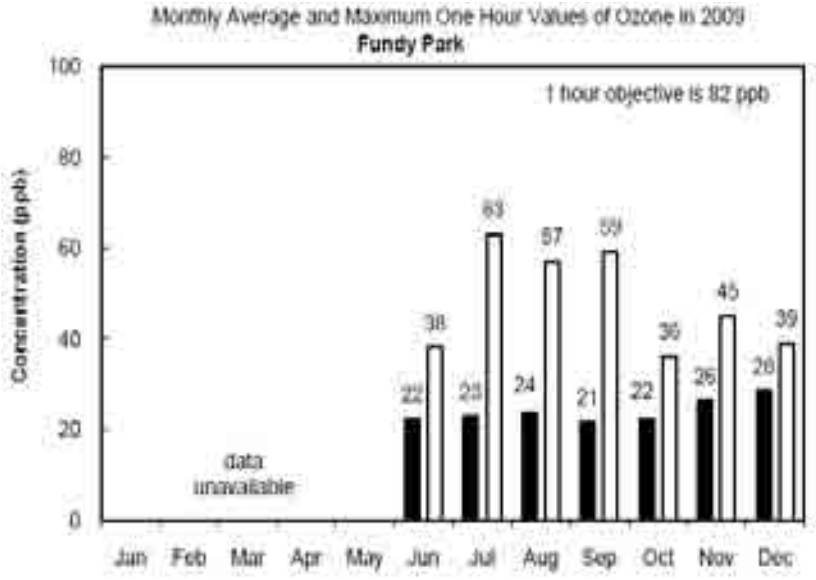

Monthly Average and Maximum 24-hour Values of PM2.5 for 2009
H.M.S.C - St. Andrews
24-h standard:
30 (Canada-Wide Standard)
concentration (µg/m³)
0
20
40
60
80
100
data unavailable
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
3 10
6 9
5 9
4 14
4 9
7 14
12 34
7 14
6 12
7 12
6 10

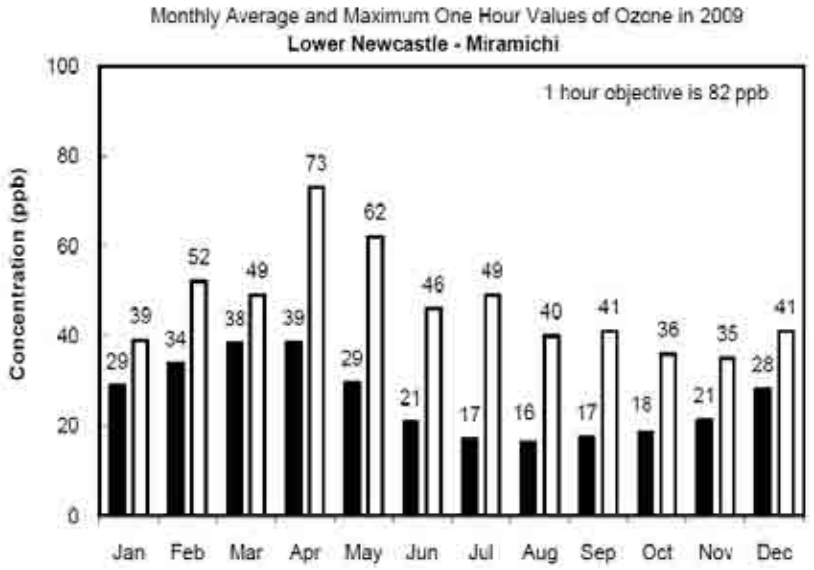

Monthly Average and Maximum One Hour Values of Ozone in 2009
H.M.S.C - St. Andrews
1 hour objective is 82 ppb
Concentration (ppb)
0
20
40
60
80
100
22 31
34 52
44 54
42 64
32 80
15 42
14 41
21 54
18 57
19 39
21 43
28 43
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec

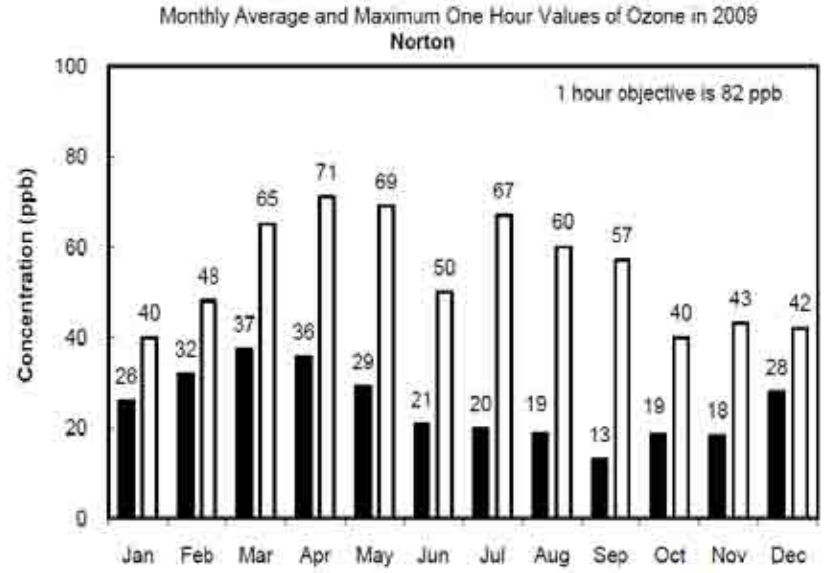

Monthly Average and Maximum One Hour Values of Ozone in 2009
Blissville
1 hour objective is 82 ppb
Concentration (ppb)
0
20
40
60
80
100
data unavailable
22 52
20 63
21 57
17 55
17 39
19 44
27 41
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec

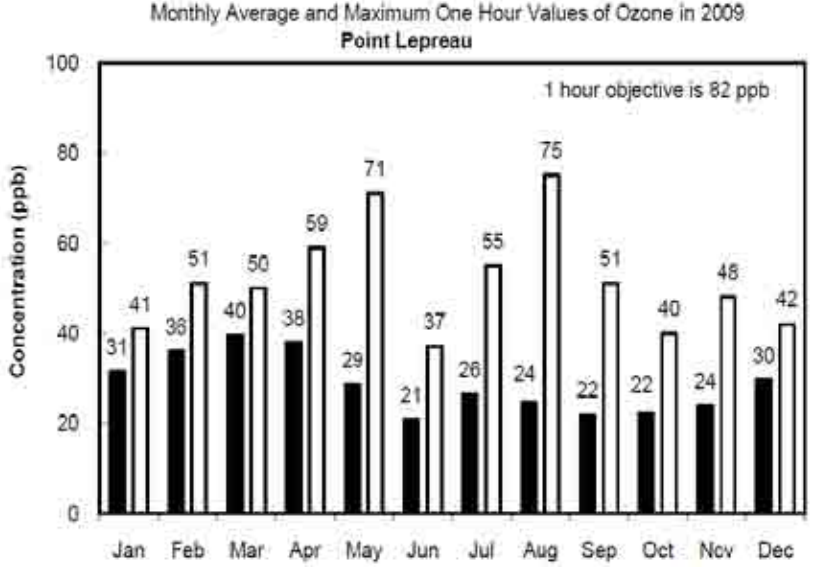

Monthly Average and Maximum 24-hour Values of PM2.5 for 2009
Canterbury
24-h standard
30 (Canada-Wide Standard)
concentration (µg/m³)
0
20
40
60
80
100
13 22
12 19
11 19
10 16
10 16
8 10
11 22
13 34
7 15
6 10
9 11
4 8
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec

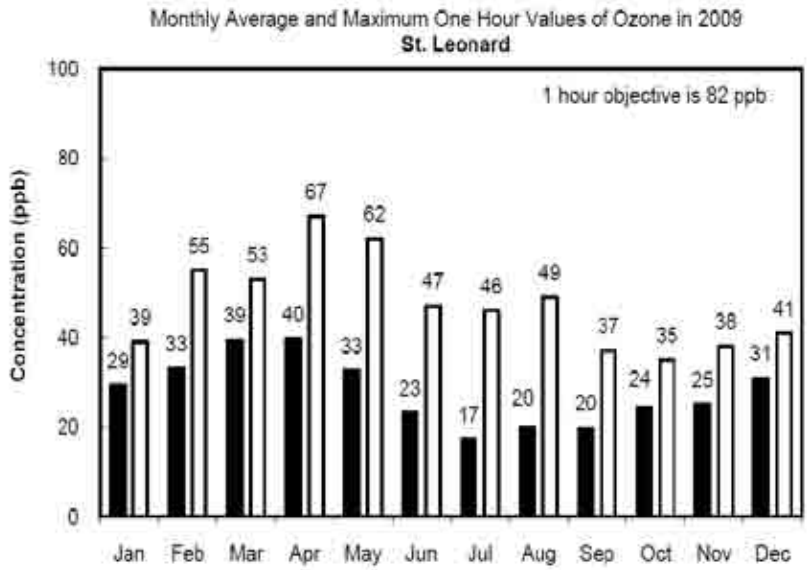

Monthly Average and Maximum One Hour Values of Ozone in 2009
Canterbury
1 hour objective is 82 ppb
Concentration (ppb)
0
20
40
60
80
100
31 41
36 55
41 57
36 74
28 61
18 46
16 52
18 48
16 53
17 36
21 41
28 40
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec


Monthly Average and Maximum One Hour Values of Ozone in 2009
Fundy Park
1 hour objective is 82 ppb
Concentration (ppb)
data unavailable
Jun 22 38
Jul 23 63
Aug 24 57
Sep 21 59
Oct 22 36
Nov 26 45
Dec 28 39
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec


Monthly Average and Maximum One Hour Values of Ozone in 2009
Lower Newcastle - Miramichi
1 hour objective is 82 ppb
Concentration (ppb)
Jan 29 39
Feb 34 52
Mar 38 49
Apr 39 73
May 29 62
Jun 21 46
Jul 17 49
Aug 16 40
Sep 17 41
Oct 18 36
Nov 21 35
Dec 28 41


Monthly Average and Maximum One Hour Values of Ozone in 2009
Norton
1 hour objective is 82 ppb
Concentration (ppb)
Jan 28 40
Feb 32 48
Mar 37 65
Apr 36 71
May 29 69
Jun 21 50
Jul 20 67
Aug 19 60
Sep 13 57
Oct 19 40
Nov 18 43
Dec 28 42


Monthly Average and Maximum One Hour Values of Ozone in 2009
Point Lepreau
1 hour objective is 82 ppb
Concentration (ppb)
Jan 31 41
Feb 38 51
Mar 40 50
Apr 38 59
May 29 71
Jun 21 37
Jul 26 55
Aug 24 75
Sep 22 51
Oct 22 40
Nov 24 48
Dec 30 42


Monthly Average and Maximum One Hour Values of Ozone in 2009
St. Leonard
1 hour objective is 82 ppb
Concentration (ppb)
100
80
60
40
20
0
29
39
33
55
39
53
40
67
33
62
23
47
17
46
20
49
20
37
24
35
25
38
31
41
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec

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