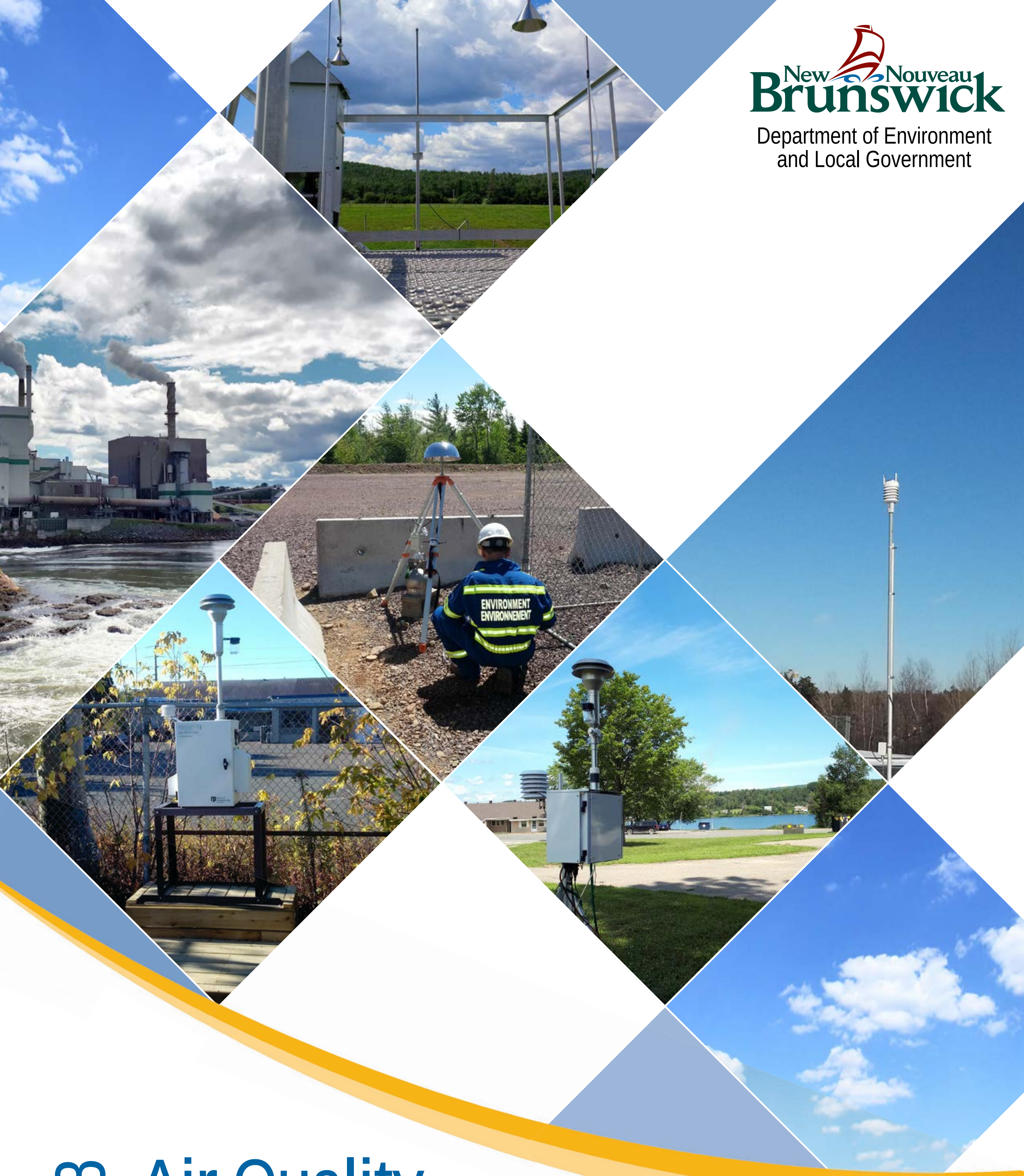
New Nouveau Brunswick
Department of Environment and Local Government



2018 Air Quality Monitoring Results

Contents

Air Quality Monitoring in New Brunswick

This report provides an overview of air quality in the province of New Brunswick for the year 2018. General information about air quality science and the province's monitoring networks is also provided.

Air quality monitoring in New Brunswick is a partnership between the Federal Government (Environment and Climate Change Canada) and the Provincial Department of Environment and Local Government (DELG). This partnership has been formalized under a long-standing National Air Pollution Surveillance (NAPS) Agreement.


A typical air quality monitoring station (Bathurst).

Through the NAPS agreement, Environment and Climate Change Canada provides the necessary monitoring equipment and a centralized national database for the air quality information collected. It is the Province's responsibility to deploy and maintain the equipment, operate the stations, perform necessary calibrations, and otherwise ensure that the data is accurate.

In 2018 the provincial network included 11 air quality monitoring stations and 5 acid rain monitoring stations. There was a total of 42 instruments collecting data at these stations.


Air quality monitoring equipment. A Volatile Organic Compound (VOC) sampler (left/near-field), and a Particulate Matter monitor ($PM_{2.5}$) (right/far-field).

The stations and monitors have been established for a number of purposes:

- to detect and quantify impacts from regulated sources of pollution;
- to assess and track ambient background levels of various pollutants;
- to monitor transboundary migration of pollution into New Brunswick; and,
- to provide real-time data to public health reporting systems such as the Air Quality Health Index.

As a condition of regulatory approval under the *Clean Air Act*, the Province also requires the operators of large industrial facilities to participate in air quality monitoring. During the 2018 reporting year there were 32 industry-operated stations, with 55 instruments, dedicated to continuously monitoring the ambient concentrations of industry-specific contaminants in nearby communities.

Each air quality monitoring station is different, with monitors set up to target the pollution sources in that particular area. Site maps and monitor inventories are provided on pages 5 and 6.

Understanding Air Pollution

Air quality is constantly changing from season to season, and year to year. It is affected by a wide variety of factors, including the weather, long range movements of air from other parts of the world, natural events, industry cycles, and other human activities.

Below, we look at some of the more common air pollutants: what they are, where they come from, and how they can affect our environment and our health.

Overview of Key Air Pollutants - Sources and Effects		
Air Pollutant	**What is it?**	**What does it do?**
Sulphur Dioxide (SO_2)	A colourless gas with a sharp odour, like that of a struck match. It is produced by the burning of sulphur-bearing fuels such as oil and coal.	SO_2 can irritate the eyes, throat, and lungs. It is a major contributor to acid rain, which impacts sensitive lakes and rivers. At very high concentrations it can also damage plants, and corrode metals.
Reduced Sulphur Compounds (Total Reduced Sulphur - TRS)	A group of gases with a characteristic “rotten egg” odour. These are produced by the natural decay of dead plants and animals (e.g. in marshes and tidal flats), and by certain industrial processes (e.g. kraft pulp mills, and oil refineries).	They cause a variety of nuisance odours, which can be very unpleasant, even at extremely low concentrations. At much higher levels they can cause respiratory irritation and related health concerns. They also contribute to acid rain.
Nitrogen Dioxide (NO_2)	A reddish-brown gas with a sharp odour. It is generated through combustion, especially motor vehicle exhaust and the burning of fossil fuels for electrical power generation.	Similar to SO_2, high concentrations can harm plants, corrode metals, and cause irritation to the eyes, throat, and lungs. It also contributes to acid rain, and can contribute a reddish haze to smog. NO_2 also reacts with other pollutants to cause the formation of ground level ozone.
Carbon Monoxide (CO)	A colourless, odourless and tasteless gas. It is produced by the incomplete burning of carbon-containing materials such as coal, oil, gasoline, wood, or natural gas. Forest fires, industrial activity, and home heating systems also contribute significantly. Motor vehicles are also a source of CO.	CO interferes with the blood’s ability to carry oxygen to vital organs and tissues. Exposure to higher concentrations can be fatal.
Ground Level Ozone (O_3)	Ozone is invisible and odourless at typical ground level concentrations. It is formed through chemical reactions between a variety of “ozone precursor” pollutants, which are released by industrial facilities and motor vehicles. Most of New Brunswick’s ground level ozone is carried here by air masses originating in the United States and central Canada.	Irritates the lungs and makes breathing difficult. Also damages plants, weakens rubber, and attacks metals and painted surfaces.

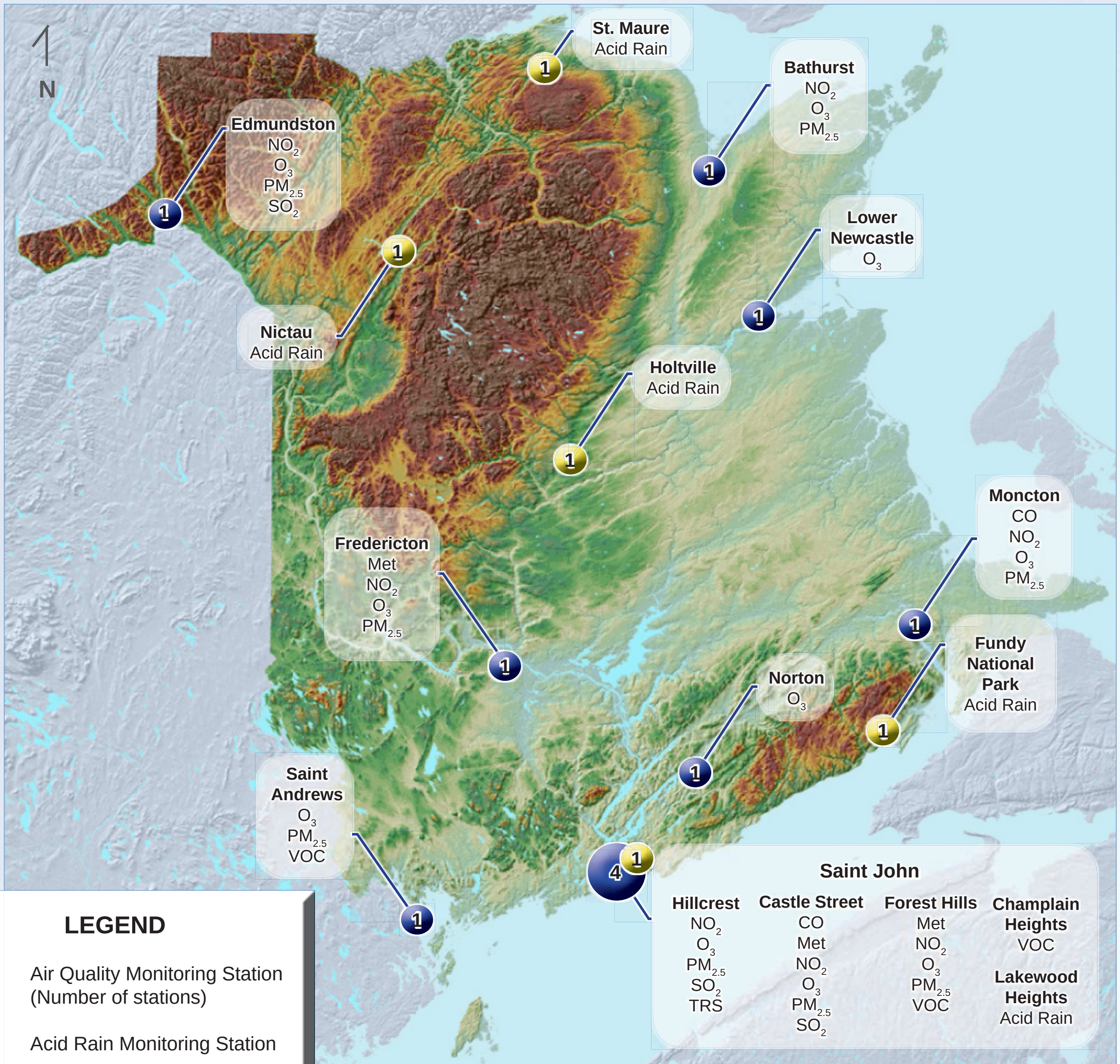
Overview of Key Air Pollutants - Sources and Effects

Air Pollutant		What is it?	What does it do?
Volatile Organic Compounds (VOCs)		VOCs are a group of carbon-containing substances that can quickly evaporate at room temperature. They are produced through combustion and the evaporation of paint, solvents and other surface coatings. Also, some are naturally released from plants.	They can contribute to smog, the depletion of Earth's ozone layer, and toxic air pollution. These pollution issues are correlated with a broad range of adverse health and environmental effects.
Important VOC Subgroups	"Smog Forming" VOCs	A group of VOCs that when combined with nitrogen compounds can accelerate the formation of Ground Level Ozone and Smog. Smog formation is reliant on heat and sunlight so it can be of particular concern in the summer months.	Smog is a yellow/brown haze or a thick fog of air pollution. It reduces visibility and can cause numerous respiratory problems. It can also cause damage to crops and vegetation.
	"Air Toxic" VOCs	A class of organic compounds that are directly harmful to most living things, including humans. This group contains some well known VOCs such as Benzene and Formaldehyde.	Many compounds in this category can cause eye and respiratory irritation, dizziness, nervous system damage, and some are also known carcinogens.
	Ozone Depleting Substances	Ozone-depleting substances (ODS) generally contain chlorine, fluorine, bromine, carbon, and hydrogen in varying proportions. Although largely eliminated now, in the past they were widely used in refrigerators, air conditioners, fire extinguishers, cleaning solvents, and electronic equipment.	Although stable and non-toxic in the lower atmosphere, they are able to float up to the stratosphere and destroy ozone molecules, which make-up the protective ozone layer. This layer protects us from harmful ultraviolet radiation.
Particulate Matter (PM)		Particulate matter is made up of solid or liquid matter, including dust, ash, soot, smoke or tiny particles of pollutants.	Can cause a variety of respiratory problems, reduce visibility, damage vegetation, and creates nuisance dust.
Important PM Subgroups	Fine, 2.5 microns in diameter or less ($PM_{2.5}$)	Tiny (invisible) airborne specks of solid or liquid material (i.e. dust & soot). It is generated by natural sources (e.g. wind-blown dust and forest fires), and through fuel burning (especially fossil fuels and wood).	Causes and aggravates a variety of human breathing ailments (e.g. asthma, lung disease, and bronchitis). It also contributes to haze.
	Total Suspended (TSP)	Tiny airborne particles suspended in the air with no defined size limit. All particle sizes are included. They can come from natural sources, such as pollen and spores, as well as particles from vehicles or smokestacks.	The health effects may include damage to the respiratory and cardiovascular systems (smaller particles). The key issue for larger particles is the nuisance of dust accumulation and reduced visibility.

In addition to the key pollutants described above, there are a variety of other air pollutants that can be monitored on a case-by-case basis, depending on local emission sources.

The Provincial Air Quality Monitoring Network

Stations Operated by the Province



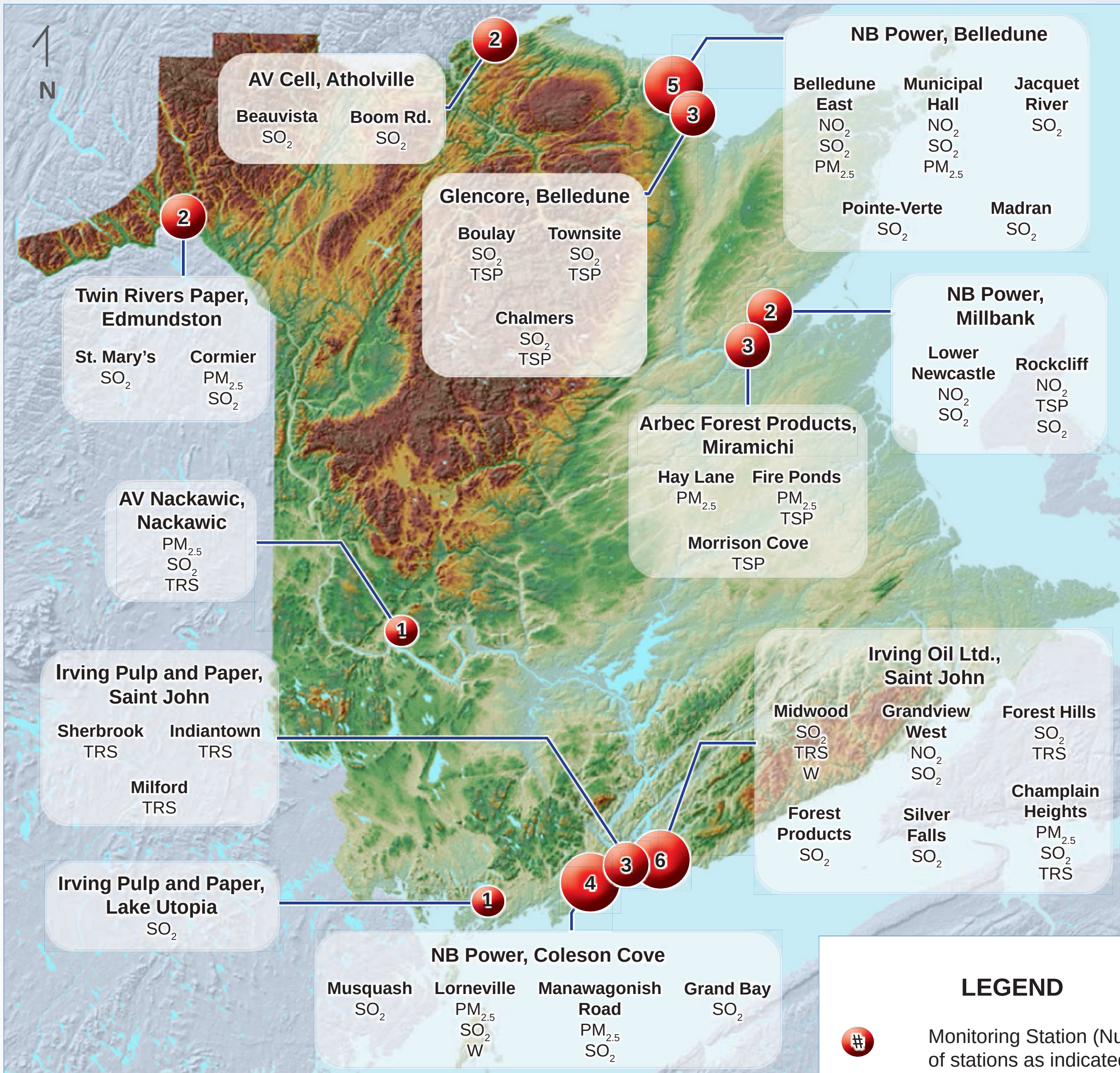
LEGEND

(#)	Air Quality Monitoring Station (Number of stations)
(#)	Acid Rain Monitoring Station
CO	Carbon Monoxide
Met	Meteorology (Wind Speed, Wind Direction, Temperature, Relative Humidity, Barometric Pressure)
NO_2	Nitrogen Dioxide
O_3	Ozone
$PM_{2.5}$	Fine Particulate Matter
SO_2	Sulphur Dioxide
TRS	Total Reduced Sulphur
VOC	Volatile Organic Compounds

New Brunswick's provincial air quality monitoring stations collect data continuously, year-round. For most monitors the collected data is transmitted to a central data management system in real time. The operation and oversight of the network and the associated data management system requires the constant attention of a team of dedicated air quality personnel.

Most of the stations are also audited by Environment and Climate Change Canada to ensure that monitors are appropriately maintained and data is accurate. Since the beginning of the program in the early 1970s these audits have consistently confirmed the high quality of the Province's reported data.

Stations Operated by Industry



LEGEND

#	Monitoring Station (Number of stations as indicated)
NO_2	Nitrogen Dioxide
$PM_{2.5}$	Fine Particulate Matter
SO_2	Sulphur Dioxide
TRS	Total Reduced Sulphur
TSP	Total Suspended Particulate
W	Wind Speed & Direction

As with provincial stations, New Brunswick's industry-operated stations are also operated continuously, year-round. Some of this data is submitted to DELG hourly via an automated system, but most is submitted at year-end.

Just as Environment and Climate Change Canada audits DELG stations, the industry-operated sites are audited by DELG to ensure accuracy of the reported data. Data quality problems are rare, but when issues do occur they are addressed immediately.

Provincial Air Quality Objectives

One of the main goals of this report is to describe the Province's success in achieving the provincial air quality objectives (listed below), which were established under the *Clean Air Act* in 1997.

The provincial air quality objectives apply to ambient air. That is, the normal outdoor air that is generally available for use by people and the environment. They are not meant to apply indoors, nor directly at the end of a chimney or smokestack.

The air quality objectives are described in units of "micrograms" (i.e. millionths of a gram) per cubic meter (µg/m³). In the table to the right, most are also provided in the somewhat more common "parts per million" (ppm) or "parts per billion" (ppb) units.

As reflected in the table to the right, there are two or more objectives for each pollutant, each with an associated "averaging period". This is to ensure that the objectives properly address a variety of exposure scenarios, including short term peaks, long term exposure to lower levels, and potential combinations.

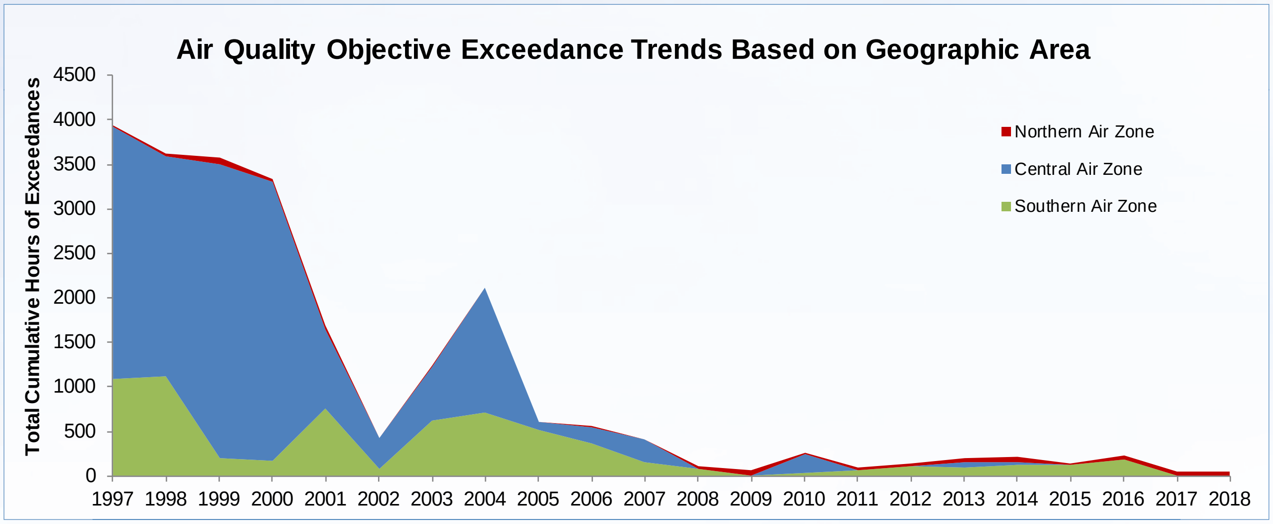
New Brunswick Air Quality Objectives

Pollutant	Averaging Period			
	1 Hour	8 Hour	24 Hour	1 year
Carbon Monoxide	35,000 µg/m³ (30 ppm)	15,000 µg/m³ (13 ppm)		
Hydrogen Sulphide	15 µg/m³ (11 ppb)		5 µg/m³ (3.5 ppb)	
Nitrogen Dioxide	400 µg/m³ (210 ppb)		200 µg/m³ (105 ppb)	100 µg/m³ (52 ppb)
Sulphur Dioxide*	900 µg/m³ (339 ppb)		300 µg/m³ (113 ppb)	60 µg/m³ (23 ppb)
Total Suspended Particulate			120 µg/m³	70 µg/m³

* The objective for sulphur dioxide is 50% lower in Saint John, Charlotte, and Kings counties.

Long Term Trend

There have been tremendous improvements in accomplishing our air quality objectives since they were first established in 1997. As seen in the graphic below, the provincial network recorded 56 cumulative hours of exceedances (across all stations) in 2018, down from 3,931 hours in 1997. This represents a 99% improvement on this metric since the creation of the *Clean Air Act.*



Accomplishing Our Air Quality Objectives

The table below summarizes the exceedances of the provincial air quality objectives that occurred in 2018. Province-wide, there were 10 exceedance events, which resulted in the 56 cumulative hours of exceedances previously noted (page 7). All of the events were very short-lived.

Air Quality Objective Statistics for 2018			
Parameter	**Number of Exceedance Events**	**Location**	**Comments**
Carbon Monoxide	0	-	None
Hydrogen Sulphide (as Total Reduced Sulphur)	3	Nackawic	The one hour objective was exceeded three times at the Caverhill Road station (AV Nackawic Ltd.), with each event lasting one hour on May 26, July 21, and August 30, 2018. The first two incidents were investigated by the mill, but the cause could not be identified. The latter event was determined to be related to a fail-safe mechanism within a black liqour tank that results in required venting to the atmosphere.
	2	Saint John, East	The one hour objective was exceeded twice on August 25 and October 10, 2018 at the Midwood Avenue station (Irving Oil Ltd.). Each event lasted one hour. No operational issues were recorded at the refinery during this episode. Emissions from a nearby wastewater treatment plant and/or adjacent tidal flats may have contributed.
Nitrogen Dioxide	0	-	None
Sulphur Dioxide	1	Edmundston	The one hour objective was exceeded once on December 12, 2018 at the Cormier station (Twin Rivers Paper). The event lasted one hour. An investigation by the mill found that the exceedance was caused by a digestor off gas meter malfunction. The incident was reported to DELG and emergency protocols were followed.
	2	Belledune	The one hour objective was exceeded twice (April 11 and July 16, 2018) at the Townsite station (Glencore). Each event lasted one hour. The cause is undetermined, and no action was taken by the smelter due to the short-lived nature of the event.
Total Suspended Particulate	2	Belledune	The 24 hour objective was exceeded on 2 occasions. Both occuring at the Townsite station (Glencore) on May 8 and September 17, 2018. In both cases, further analysis of dust from the filters suggests that the smelter was not likely to have been the source. The cause is undetermined.

Air Quality Management System Reporting

In 2012, the Canadian Council of Ministers of Environment (CCME) introduced a new Air Quality Management System (AQMS) for Canada. The AQMS provides a common approach for all Canadian jurisdictions to measure, manage, and report on air quality. The following sections (pages 9 through 15) provide New Brunswick's required annual reporting with respect to the CCME commitment.

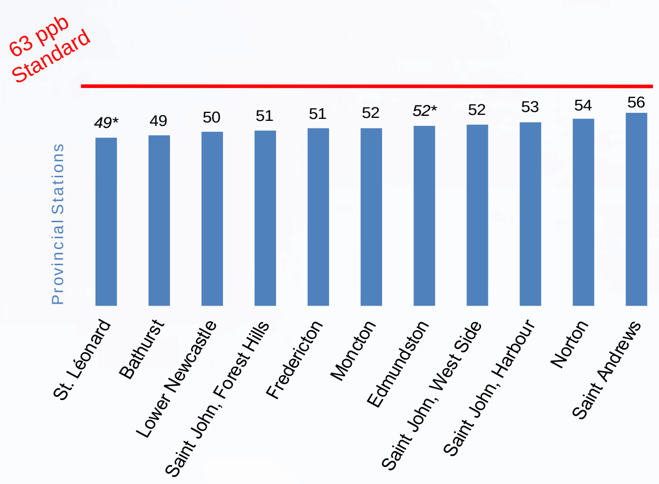
Canadian Ambient Air Quality Standards

The key "drivers" for air quality improvement in the AQMS are the Canadian Ambient Air Quality Standards (CAAQS). The adoption of CAAQS by the CCME provides a common benchmark for air quality in all Canadian jurisdictions. As of 2018, CAAQS have been adopted for two air pollutants: fine particulate matter ($PM_{2.5}$) and ground level ozone. Development work toward CAAQS for additional pollutants is ongoing through the CCME.

2018 Achievement Status

New Brunswick's 2018 achievement status for the current CAAQS targets is illustrated below and on page 10. Please note that each CAAQS is presented in the form of a simple concentration limit, which gives the appearance that they are similar to "traditional" air quality standards (e.g. hourly average concentration limits). However, this is not the case, as the CAAQS are more complex. The CAAQS require a large amount of data (3 years), and it must be sorted and analyzed in a variety of different ways. A brief overview of the purpose of each standard, and the calculations involved, is also provided.

Ground Level Ozone
8-Hour Metric



Values marked with "*" are based on only one year of valid data (a minimum of 2 years is required per CCME guidelines)

Understanding the Metric

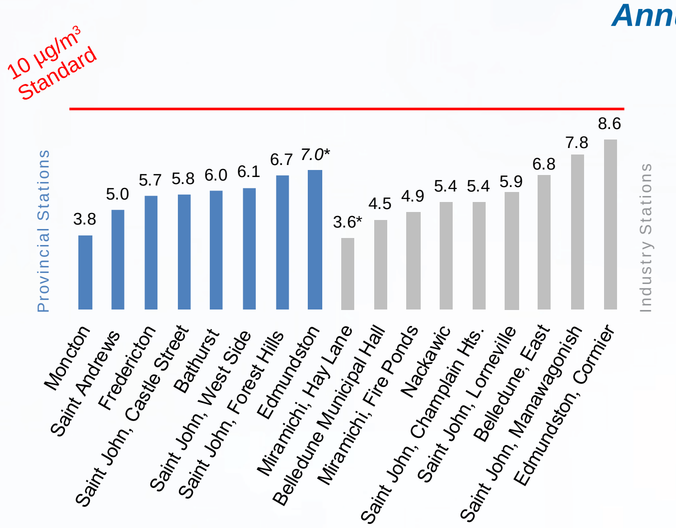
The ozone 8-hour metric provides a standard against which a location's poorer air quality days may be judged (i.e. how many "bad air quality days" does the area have, and how bad are they *usually*?)

The Calculation:
An ozone monitor records a 1-hour average concentration every hour for a year. From these values, 8-hour averages are calculated for every 8-hour period in the year.

The highest 8-hour average for each day of the year is then selected. These "daily 8-hour maximum" values are ranked from best to worst and the 4th worst value is selected for that year.

This is repeated for three years, and the three values averaged together. This three-year average is the value that is compared to the CAAQS target.

Fine Particulate Matter ($PM_{2.5}$)
Annual Metric



Values marked with "*" are based on only one year of valid data (a minimum of 2 years is required per CCME guidelines)

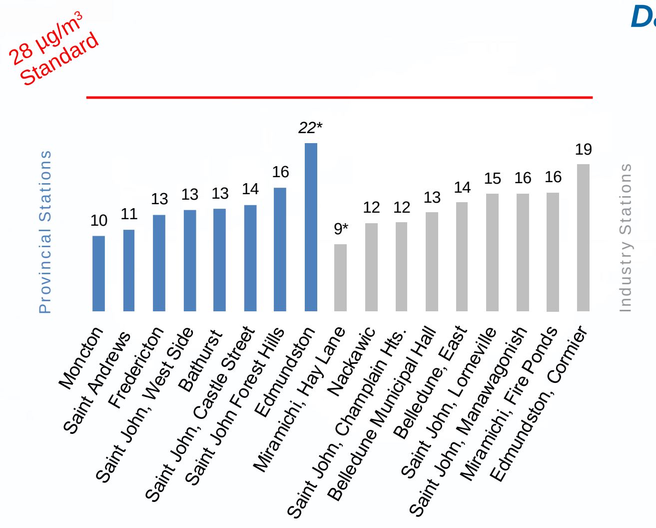
Understanding the Metric

The fine particulate matter "annual metric" is the simplest of the CAAQS calculations, and provides a standard for truly average conditions over long time periods.

The Calculation:
A fine particulate matter monitor records a 1-hour average concentration every hour for a year. All of these values are then averaged together to create one annual average for that location.

This is repeated for three years, and the three values averaged together. This three-year average is the value that is compared to the CAAQS target.

Fine Particulate Matter ($PM_{2.5}$)
Daily Metric



Values marked with "*" are based on only one year of valid data (a minimum of 2 years is required per CCME guidelines)

Understanding the Metric

The fine particulate matter "daily metric" is similar to the ozone "8-hour metric" and serves a similar purpose.

The Calculation:
A fine particulate monitor records a 1-hour average concentration every hour for a year. From these, a daily average (24-hour average) is calculated for each day of the year. These daily averages are then ranked from best to worst and the 98th percentile (approximately the 7th or 8th worst) value is selected as the "daily value" for that year.

This is repeated for three years, and the three values averaged together. This three-year average is the value that is compared to the CAAQS target.

Provincial Air Zones

In addition to the CAAQS, the Air Quality Management System also includes guidance with respect to the management of air quality by the provinces. This is known as the Air Zone Management Framework (AZMF). Under the AZMF, each province is divided into a number of "Air Zones", which are geographic areas that have similar air quality profiles and challenges. These divisions have no legal significance, but help to guide management actions by highlighting regional issues and opportunities. New Brunswick has established three provincial air zones, as illustrated and described below.

Northern Air Zone

The northern air zone is situated along New Brunswick's northern coastline and includes most of the province's border with Quebec. The area is largely rural, but contains a number of towns and villages. The largest community is Bathurst, with a population of approximately 12,000.

Because there are no major urban centers in the northern air zone, it does not experience many of the air quality issues associated with big cities (such as smog from heavy traffic).

The air zone is home to major industrial emitters in Atholville (AV Group Pulp Mill), and Belledune (NB Power Belledune Generating Station, and Glencore Brunswick Lead Smelter). These facilities emit a variety of air contaminants including sulphur dioxide, nitrogen dioxide, and fine particulate matter, which can impact air quality in nearby communities and the broader region.

The Glencore smelter in Belledune is the largest sulphur dioxide emitter in the province, and the NB Power Belledune Generating Station is the second largest.

Central Air Zone

The central air zone is the largest of the three provincial air zones, and occupies New Brunswick's middle latitudes. It encompasses five of New Brunswick's major population centers: Moncton, Dieppe, Fredericton, Miramichi, and Edmundston. Although small by international standards, these cities can experience "big city" air quality issues (that is, the combined impact from many small pollution sources in close proximity - vehicles, homes, businesses, etc.).

There are also several major emitters in this area, including an AV Group pulp mill in Nackawic, the Twin Rivers Paper Company pulp mill in Edmundston, and the Arbec Forest Products oriented strand board mill in Miramichi. Emissions from these facilities can include sulphur dioxide, nitrogen dioxide, fine particulate matter, reduced sulphur compounds, and volatile organic compounds. These facilities can impact air quality at both the local and regional scale.

Southern Air Zone

The southern air zone includes a large portion of New Brunswick's southern coastline along the Bay of Fundy, and borders the State of Maine in the west. It is home to the City of Saint John, which is the province's second largest city (population 68,000).

The City of Saint John is a major industrial center for the province. It hosts a variety of industrial emitters, including Canada's largest oil refinery (Irving Oil Ltd.), and the Irving Pulp and Paper Ltd. mill. The city also experiences air quality impacts from ship traffic via its active industrial port and its cruise ship terminal. Together, these sources emit fine particulates, sulphur dioxide, nitrogen dioxide, reduced sulphur compounds, and volatile organic compounds.

The air zone is also impacted by major emitters at Coleson Cove (NB Power Coleson Cove Generating Station) and Lake Utopia (Lake Utopia Paper mill).

Common Challenges

All New Brunswick air zones experience local (small) scale air quality impacts from various smaller industrial and commercial emitters (e.g. fish plants, commercial boilers, pits and quarries, paint shops, etc.).

New Brunswick's large forested areas can generate pollen events during warmer seasons, and are also vulnerable to forest fires. Both can impact air quality at the local and regional scale.

Wood burning for residential heat is popular throughout New Brunswick, which can result in wood smoke issues during the colder seasons. Also, outdoor burning (e.g. campfires) is popular in the summer months, and can similarly affect local air quality.

All New Brunswick air zones receive long range pollutants (such as fine particulate matter and ozone) from other parts of the World.

Air Zone Management

Each year, CAAQS values for each air zone are graded against a colour-coded system of "Management Levels". Under the system, "green" is best, "yellow" and "orange" are progressively poorer, and "red" (CAAQS exceedance) is worst.

The purpose of the rating system is to guide government with respect to appropriate regulatory and management options. Generally, poorer air quality is intended to trigger more aggressive action to improve air quality.

Management Levels are based on the CAAQS metric values, but may be adjusted to remove the influence of exceptional events (e.g. forest fires). No such adjustments were necessary for 2018.

2018 Management Levels

New Brunswick's 2018 CAAQS Management Levels are illustrated below and on page 14. The three-year averages used for each metric include data from 2016, 2017, and 2018. Additional information about the CAAQS and AZMF are available via the CCME web site: *www.ccme.ca*

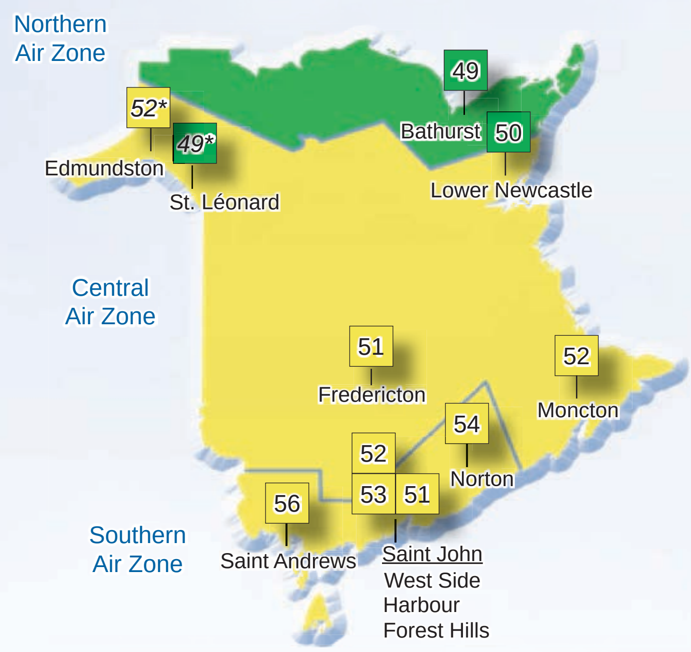
Guide to Interpretation

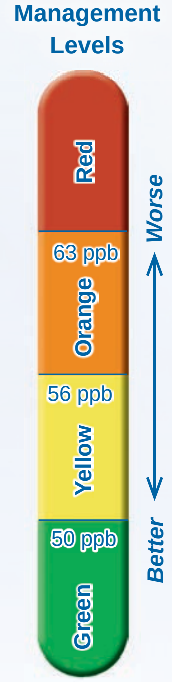
In the illustrations that follow, each signpost represents the calculated 2018 Management Level value for the specified CAAQS metric at that monitoring station. Note that values appearing in *italics* and marked with an "*" are based on only one year of data, whereas a minimum of two years is required by the CCME guidelines.

The colour of each signpost indicates the Management Level for that location.

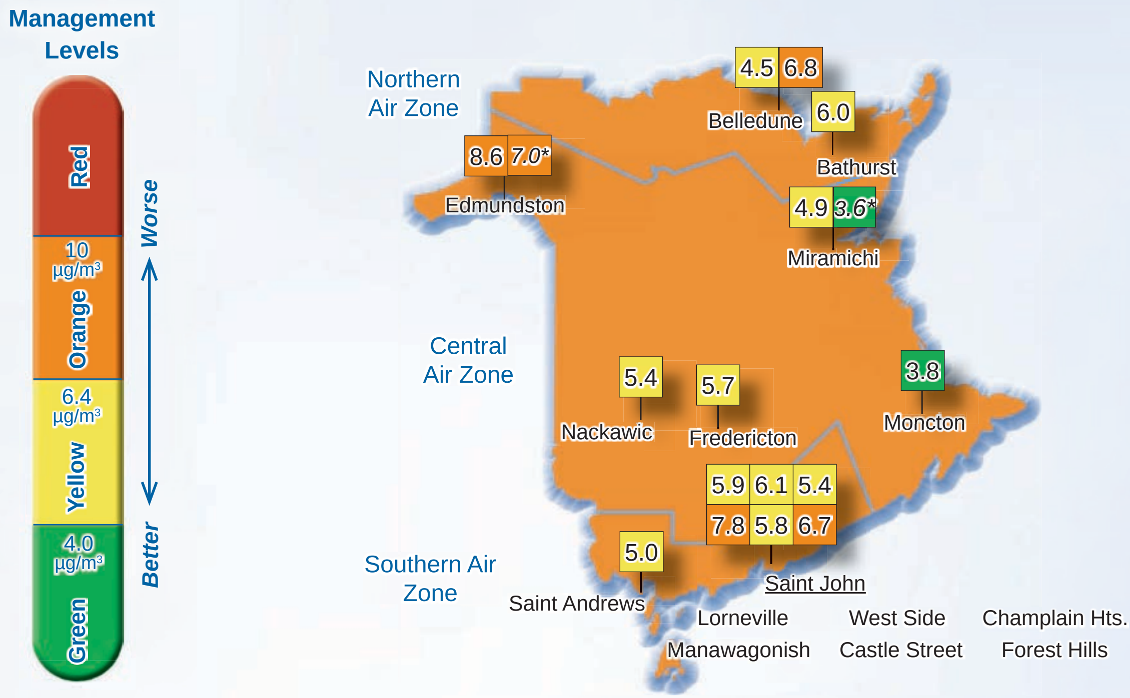
The colour of the map indicates the Management Level for the air zone, which corresponds to the "poorest" values measured in that air zone. Please note that for pollutants with two CAAQS metrics (i.e. fine particulate matter) only one managment level is determined, which is based on the poorer of the two calculated values. Consequently, the management level maps for the two fine particulate matter CAAQS are coloured the same.

Ground Level Ozone
8-Hour Metric

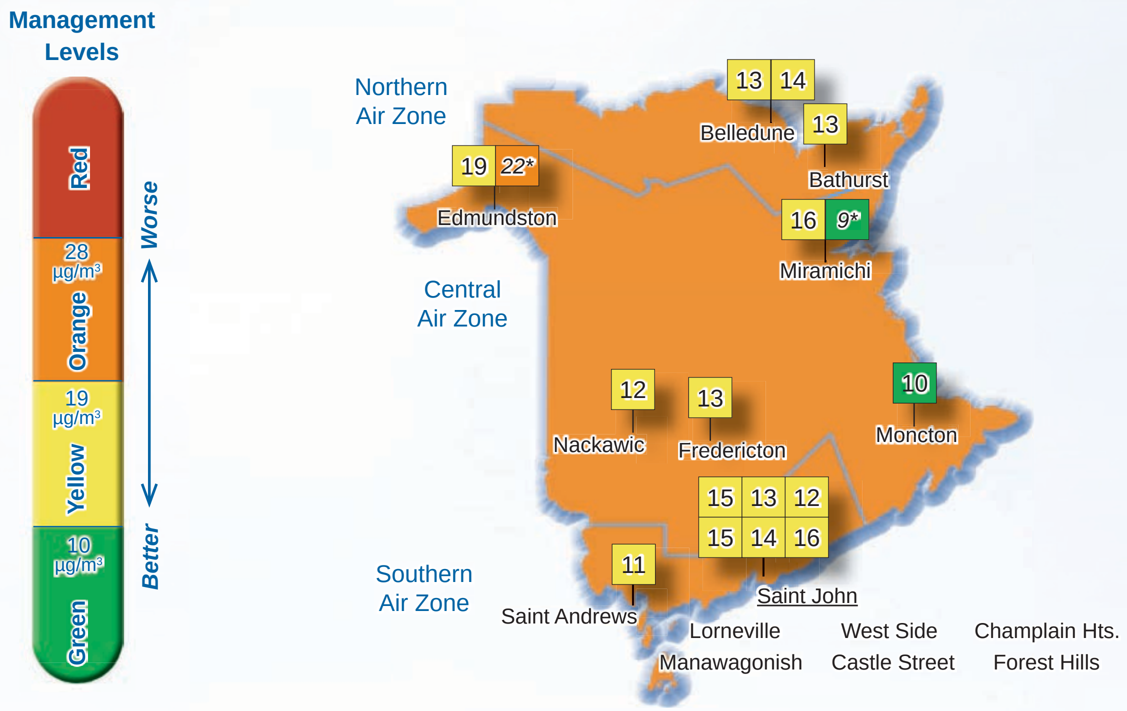




Fine Particulate Matter ($PM_{2.5}$)
Annual Metric



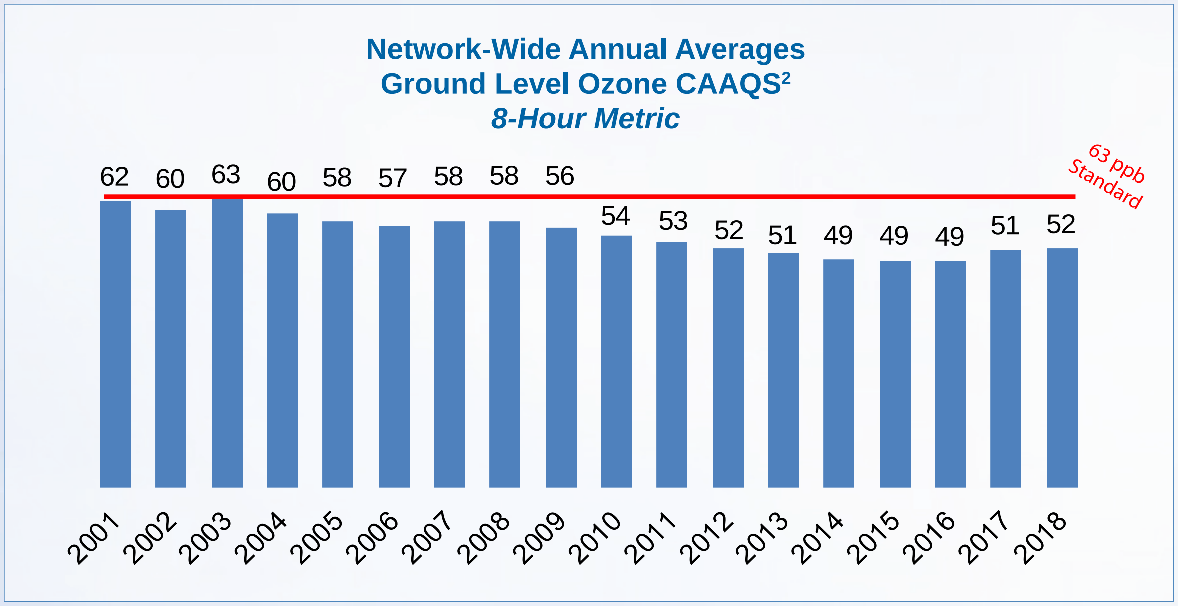
Fine Particulate Matter ($PM_{2.5}$)
Daily Metric

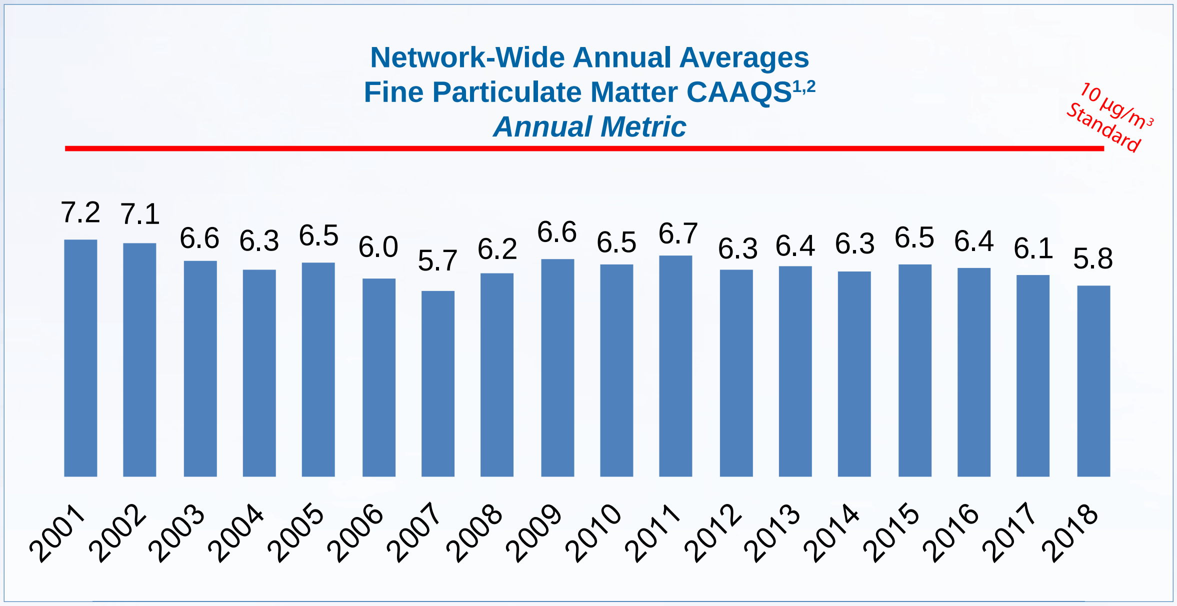


Particulate Matter and Ozone Trends

The previous illustrations provide a detailed, station-by-station view of CAAQS achievement status for a single year (2018) but do not describe longer term trends with respect to the levels of these contaminants in our air. The graphs below are included to provide this historical context.

These graphs are based on the CAAQS calculations previously described (see pages 9 and 10), with the added step of averaging all of the CAAQS values from all sampling stations in New Brunswick for each year. In so doing, they reveal the 18-year network-wide trends for these contaminants.





[1] Due to changing technologies, more recent values may not be directly comparable to those measured with older instruments.
[2] The number and location of sampling stations has varied throughout the period represented.

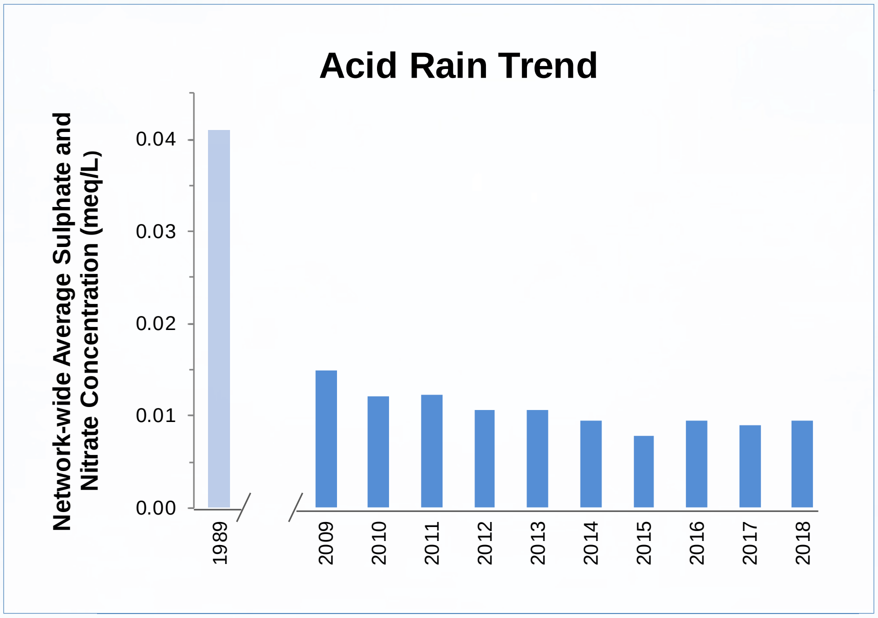
Acid Rain Monitoring

Some air pollutants can be transformed in the atmosphere into acidic particles that ultimately fall out as acid rain (or snow, hail, etc). The emissions that cause acid rain typically travel long distances, hundreds or even thousands of kilometers, before returning to the surface as rain or snow.

The adverse impacts of acid rain have been recognized since the early 1980s. Acid rain harms sensitive ecosystems by changing the chemistry of lakes, streams, and forest soils. It can also damage trees and agriculturally important plants. Infrastructure is also impacted by acid rain, as it can degrade paints and protective coatings, which accelerates corrosion.

Measures to reduce the emissions that contribute to acid rain have been undertaken in North America since the late 1980s. Most recently, this has included commitments to reduce emissions under the Canadian Council of Ministers of Environment's "Post-2000 Canada-wide Acid Rain Strategy". Over the past two decades emissions from major sources within New Brunswick have been reduced significantly.

DELG has operated an acid precipitation (rain and snow) monitoring network since the early 1980s. The map on page 5 shows the location of the 5 acid precipitation monitoring sites in New Brunswick. Samples are collected at each of these sites by a local site operator every day and sent to the provincial laboratory for analysis. DELG staff coordinate the monitoring program, perform data quality assurance, and maintain the official data archive.

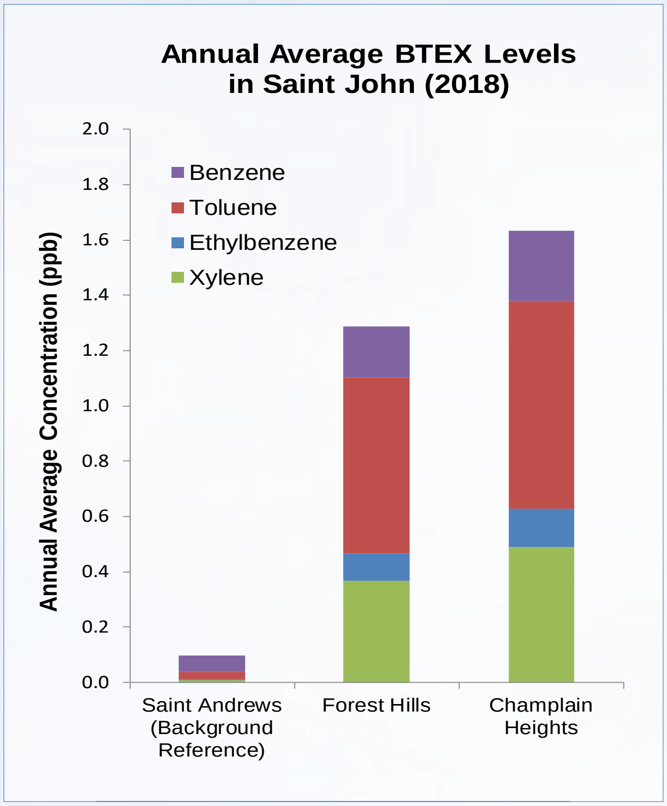


The key indicators for acid rain are sulphate and nitrate concentration. Each of these parameters has a slightly different effect on acidity, but can be combined and expressed as "milliequivalents per litre" (meq/L). As reflected in the chart to the left, peak levels occurred in 1989. Emission reduction strategies have reduced sulphate and nitrate concentrations by approximately 76% since then.

Although levels have declined, acid rain monitoring remains important to ensure that our most sensitive lakes and rivers are provided with long-term protection from acid damage.

Volatile Organic Compounds in the Saint John Region

The City of Saint John is home to a variety of industries, including a large oil refinery with its supporting facilities such as the Marine Terminal located at canaport as well as a marine loading and rail offloading terminal in east Saint John. The types of industrial activities at these facilities (fuel burning, petrochemical storage, refining, etc.) can result in the emission of a variety of Volatile Organic Compounds (VOCs). Consequently, VOCs are monitored by DELG in the Saint John region, and have been on an ongoing basis since 1992.



Within the city, VOC data is being collected in Forest Hills and Champlain Heights. Background data is also being collected west of the city at Saint Andrews. All samples are analyzed for more than 100 VOC compounds.

For many of the VOC compounds monitored, the primary interest is their impact on the formation of ground level ozone. However, some carry other environmental and human health risks.

In consideration of the petrochemical industry in Saint John it is worthwhile to consider a group of four VOCs that are commonly associated with this sector: benzene, toluene, ethylbenzene, and xylene. This group, which is collectively abbreviated as “BTEX”, can serve as an indicator of petrochemical industrial activity (refining, petroleum product storage, and fuel burning) in an area.

A comparison of BTEX levels between monitoring locations in the Saint John region is provided in the graph to the right. As indicated, levels are highest at the location nearest to the refinery (Champlain Heights).


SUMMA canisters for sampling VOCs

VOC Sampling Technology

Unlike most other parameters in the provincial network, VOCs are not monitored continuously. Rather, air samples are collected in stainless steel canisters, which are shipped to an Environment and Climate Change Canada laboratory for analysis. Results are returned at a later date. For this reason, VOC data is not available in real-time.

Key Pollutant: Benzene

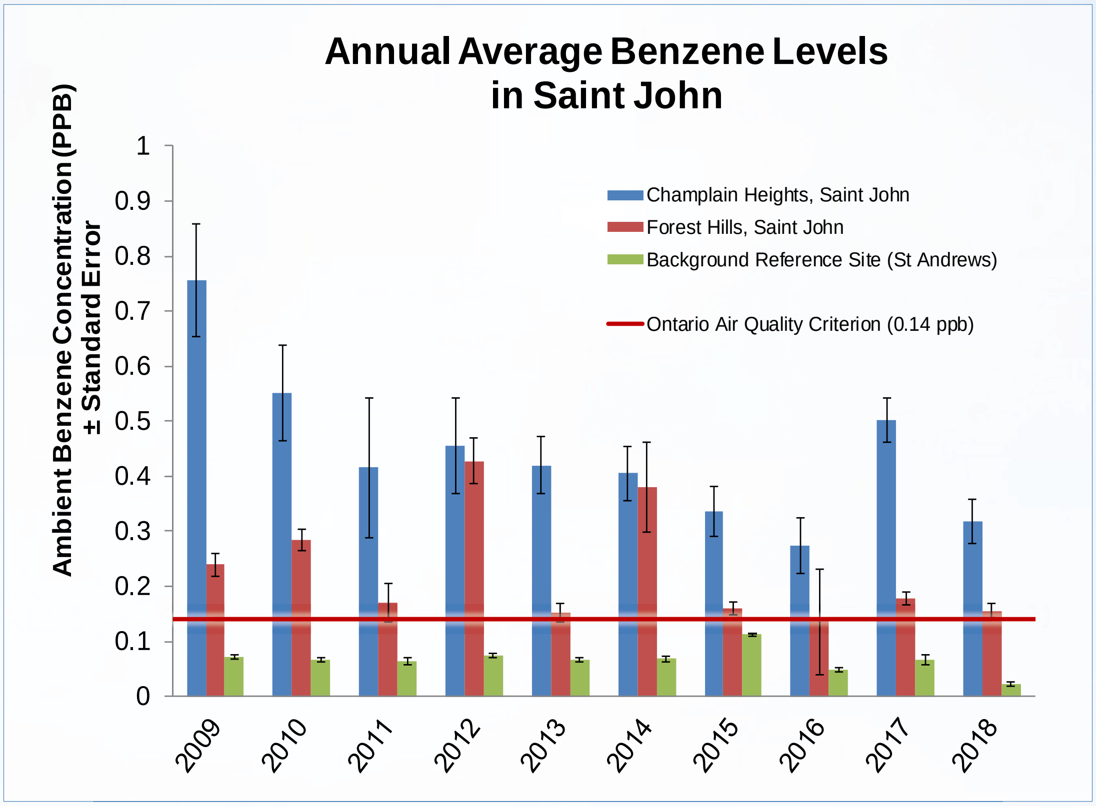
One particular BTEX VOC, benzene, receives special attention as it is recognized as cancer-causing by the World Health Organization and the United States Environmental Protection Agency. As such, it has been the target of emissions reduction efforts all over the world.

Major sources of benzene include evaporation from petroleum fuels and solvents, and combustion of petroleum products (especially gasoline), as well as other types of combustion. There are also natural sources (e.g. volcanoes and forest fires).

New Brunswick has not developed a provincial standard for benzene, but instead measures its progress against Ontario's provincial criterion for benzene, which is the most stringent currently available in the World.

The ten-year trends for benzene values in Saint John are illustrated in the graph below. As indicated, the target value for benzene has not been reached.

Also notable in the graph below are the substantial year to year differences in levels measured at the Champlain Heights and Forest Hills locations. A detailed review of the data indicates that this is due to annual variations in wind direction.



Note: the black error bars on the graph represent the "Standard Error" of the average. This is a statistical tool meant to illustrate the variability of the data that contributed to each average value. Wider error bars indicate a larger amount of variability.

Special Air Quality Studies

In addition to its fixed network of permanent air quality monitoring stations, since 2001 DELG has operated a mobile air quality monitoring unit that can be moved from place to place throughout New Brunswick to carry out special monitoring projects.

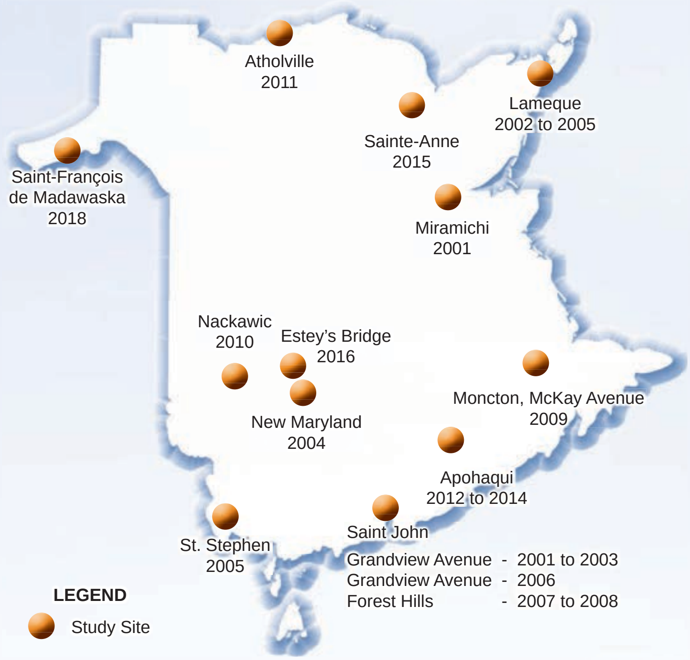
The mobile air quality monitoring unit is deployed as needs arise. Typical uses include:

- Assessing air quality near pollution sources.
- Evaluating potential sites for permanent monitoring stations.
- Verifying air quality modelling predictions.
- Measuring background (baseline) air quality levels prior to a development.

Results from special studies may be included in the annual air quality monitoring results report for the year in question. Alternatively (or in addition), results may be reported in separate stand-alone reports.

DELG's mobile air quality monitoring unit.

Special Air Quality Study Sites (2001 - 2018)



Common Study Parameters

The DELG mobile air quality monitoring unit (pictured above) is typically equipped with monitors for:

- Sulphur dioxide
- Nitrogen oxides
- Ground level ozone
- Carbon monoxide
- Fine particulate matter
- Total reduced sulphur
- Meteorology (wind speed, wind direction, temperature,and barometric pressure)

The unit can also be equipped with a variety of other sensors and sampling equipment when needed (*e.g.* total suspended particulate, volatile organic compounds, and metals).

Special Study: Saint-François de Madawaska

Background

In 2018 the mobile unit was deployed to the Saint-François de Madawaska area of the Rural Community of Haute-Madawaska, in New Brunswick's Northwest.

Haute-Madawaska is home to many large poultry farms, which generate a substantial volume of organic waste. This waste (a mixture poultry manure and wood shavings) is commonly spread on farm fields to enrich the soil.

Since 2003 a local company has been converting some the area's poultry waste into a dried, pelletized, fertilizer product. In 2016 government began receiving complaints from area residents about excessive odour (that was suspected to be from the the fertilizer plant), and related health concerns.

In response to the reports from the community, the Department of Health initiated a health risk investigation, which was supported by DELG. This included an ambient air quality evaluation using the mobile air quality monitoring unit.

Studied Parameters

The mobile unit was outfitted with its typical suite of parameters (see previous list) plus monitors for "respirable particulate" (PM_{10}), Total Suspended Particulate (TSP), and Ammonia.

The study also included logging of citizen complaints throughout the study period, and the collection of additional fine particulate, respirable particulate, and TSP data by the fertilizer plant's monitors, which are located at the facility's property line.

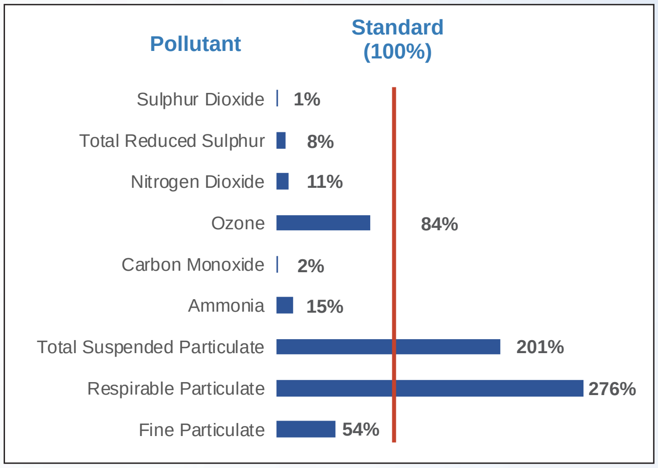
Study Period

Monitoring began at the study site on April 6, 2018 and continued into 2019.

Initial Results

Although the project continued beyond the 2018 reporting year, an interim report for the April to September (2018) period was prepared and has been published as a stand-alone report. The following is a brief summary of the key findings at that time:

- For most pollutants no issues were found.
- Particulate levels (TSP and PM_{10}) exceeded standard (or guideline) values on several occasions.
- The chart below compares the measured pollutant concentrations (the highest values detected) to the relevant associated standard as a percentage of the acceptable value.



- The highest particulate values were associated with dust from road resurfacing near the monitoring site.
- Citizen complaints were closely associated with times when the fertilizer plant operated.

Although the key complaint from the area was related to odour, the study focused on common contaminants related to human health. This work does not fully address the odour issue.

Final Results

As previously noted, the study continued into the 2019 monitoring year. As such, final conclusions will be included in future reporting.

Local Air Quality Information
When You Need It

Although daily fluctuations in ambient pollution levels may pass unnoticed by many, for people with reduced lung function from respiratory disease and similar sensitivities, such changes can have significant impacts on their daily lives. Recognizing this, the following tools have been developed to provide timely information to the public about current and forecasted pollution levels in different areas of the province.

Air Quality Data Portal

New Brunswick operates an online Air Quality Data Portal to provide near real-time access to monitoring results at each of the provincially operated monitoring stations (see map on page 5). This service is available at:

www.elgegl.gnb.ca/AirNB

Public Advisories

Air quality data and pollution forecasts are continually monitored by DELG, the Department of Health, and Environment and Climate Change Canada. Whenever air quality objectives are exceeded or are forecasted to be exceeded, advisories are issued to the media (via the Department of Health) to provide timely notice to the public. These notices include health-related messaging to advise at-risk groups about the level of risk and appropriate precautions that they should take. **One air quality advisory** was issued in 2018, on August 24, with respect to smoke from forest fires in Western Canada travelling at high altitude crossing over the maritime provinces. Also of important note, was an explosion at the Irving Oil Refinery, that occured on October 8th, 2018. However, there were no ground level air quality impacts observed in the monitoring network in relation to this event.

Air Quality Health Index

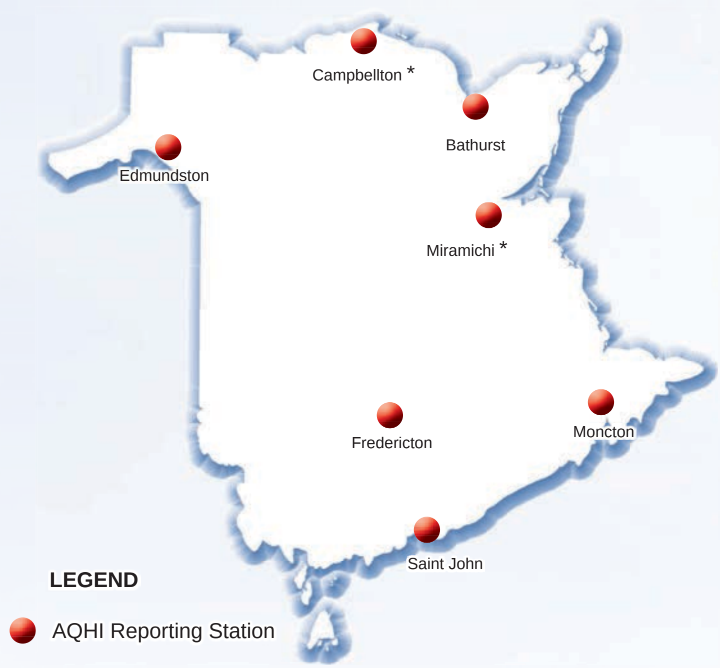
The Air Quality Health Index (AQHI) is a numbered scale that was designed by Health Canada to help communicate air quality information. It converts air quality data for key air pollutants into a single, easy to understand, number.

Health Canada also provides health-related messaging to accompany the AQHI values to aid the public in understanding what the numbers mean in terms of health risks, and how best to respond to those risks to avoid health problems.

AQHI values and forecasts are reported through a variety of media outlets via television and the Internet. Current AQHI values and related information are available via the following national website:

www.weather.gc.ca

2018 AQHI Coverage



* Index values for these locations are modelled

Conclusion

As reflected in this report, air quality in New Brunswick is very good, and the province continues to benefit from ongoing air quality initiatives such as the Canada - US Air Quality Agreement, the Canada-Wide Acid Rain Strategy for Post 2000, and the Canadian Council of Ministers of Environment's Air Quality Management System.

The New Brunswick Department of Environment and Local Government remains committed to air quality surveillance throughout the province, and comprehensively reporting air quality information to New Brunswickers.

Learn More About Air Quality

In addition to this overview, complete site-specific monitoring results are available in the "Air Quality Monitoring Results - Supplementary Data 2018" companion document, which is available electronically via the DELG website, which can be accessed at:

www.gnb.ca/environment

Feedback...

We are interested in your feedback on this report. All suggestions will be considered, and if possible, incorporated in future reports. Please forward any comments to:

Air and Water Sciences Branch, Department of Environment and Local Government (DELG)

e-mail: *elg/egl-info@gnb.ca*

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