Clean Air pur Sudbury

April 2005

Air Quality Trends in Sudbury

What is in Sudbury's Air?

Sulphur Dioxide (SO_2)

Sulphur dioxide (SO_2) is a colourless gas that is created naturally from volcanoes, forest fires and oceans. In Ontario, more than two thirds of the sulphur dioxide emitted annually comes from smelters, utilities and petroleum refineries, with smelters being the largest source both province-wide and in Sudbury. Other sources include steel mills, pulp and paper mills, and residential, commercial and industrial heating.

Nitrogen Oxides (NOx)

Nitrogen oxides (NO_x) are a family of reactive gases containing nitrogen and oxygen. One of these compounds — nitrogen dioxide (NO_2) plays a major role in the atmospheric reactions that produce ground-level ozone (smog). Almost 90% of all nitrogen oxide emissions in Sudbury come from vehicles, with 7% coming from the industrial sector and 3% from fuel combustion.

Ground-Level Ozone (O_3)

Ozone (O_3) is a colourless gas that occurs naturally in the upper atmosphere, where it shields the earth from the sun's harmful UV radiation. Ground-level ozone is found at the earth's surface and is the prime ingredient in the eye and lung irritating mix we call "smog". It is formed in the lower atmosphere when nitrogen oxides react with volatile organic compounds in the presence of sunlight. More than half of our O_3 comes from the United States.

Update Coming Soon!

Clean Air Sudbury is in the process of updating the 2005 Air Quality Trends in Sudbury report. A public release of this report is expected in 2009.

Particulate Matter (PM)

Particulate matter (PM) is the mixture of solid particles found in air, ranging in size from less than 0.1 micron to over 100 microns (a human hair is 50 microns thick).

PM is classified by size fractions:

TSP (total suspended particulates) = particles <100 microns

PM_{10} = particles ≤ 10 microns $PM_{2.5}$ = particles ≤ 2.5 microns

In Sudbury, 78% of PM comes from "open sources", such as construction, unpaved roads, forest fires, mine tailings and eroding soil. About 20% is contributed by industrial sources and the rest comes from vehicle exhaust and fuel combustion. It is estimated that over half of the $PM_{2.5}$ in Sudbury is transported long range from the United States.

Air Quality Index

The Air Quality Index (AQI) was developed by the Ontario Ministry of Environment in 1988 as a way of providing information on a range of common air pollutants. The index translates concentrations of various pollutants into a sliding scale of air quality (from very poor to very good). From 1989 to 2001, the AQI measurements were very good or good 94% of the time in Sudbury. Very poor ratings were never recorded. The predominant cause of moderate/poor ratings in Sudbury and throughout Ontario is ground-level ozone.

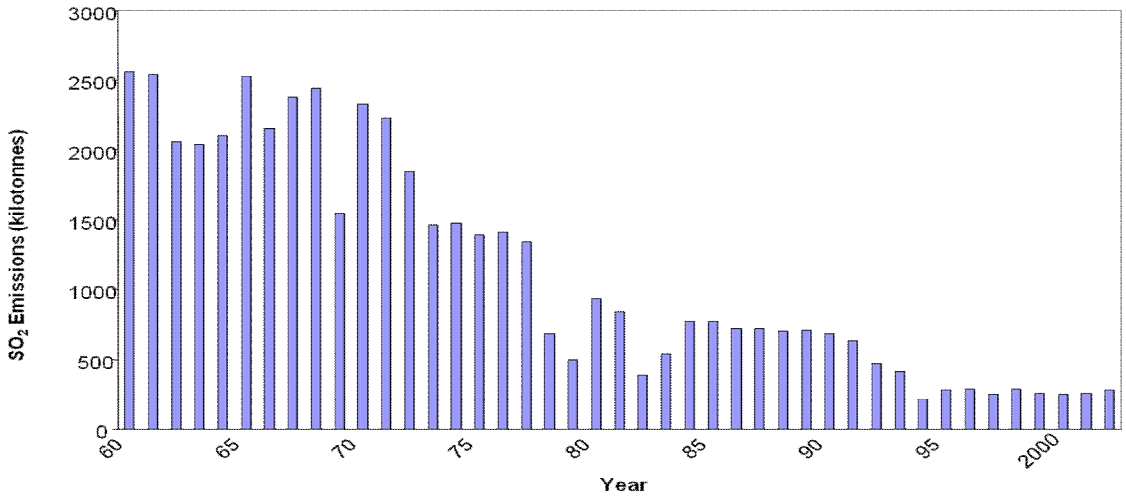
AQI values are available to the public at:

www.airqualityontario.com

Sulphur Dioxide

Sudbury's smelters have developed extensive programs to reduce their emissions of sulphur dioxide. These actions have resulted in an 88% percent reduction in annual emissions between 1960 and 2002. Further reductions will be made in the future to meet new Ministry of Environment limits. Sulphur dioxide concentrations still occasionally exceed the provincial 1-hour criterion as a result of local weather conditions which occasionally cause the sulphur dioxide emitted from the stacks to drop down to the ground (called the "looping plume" phenomenon).

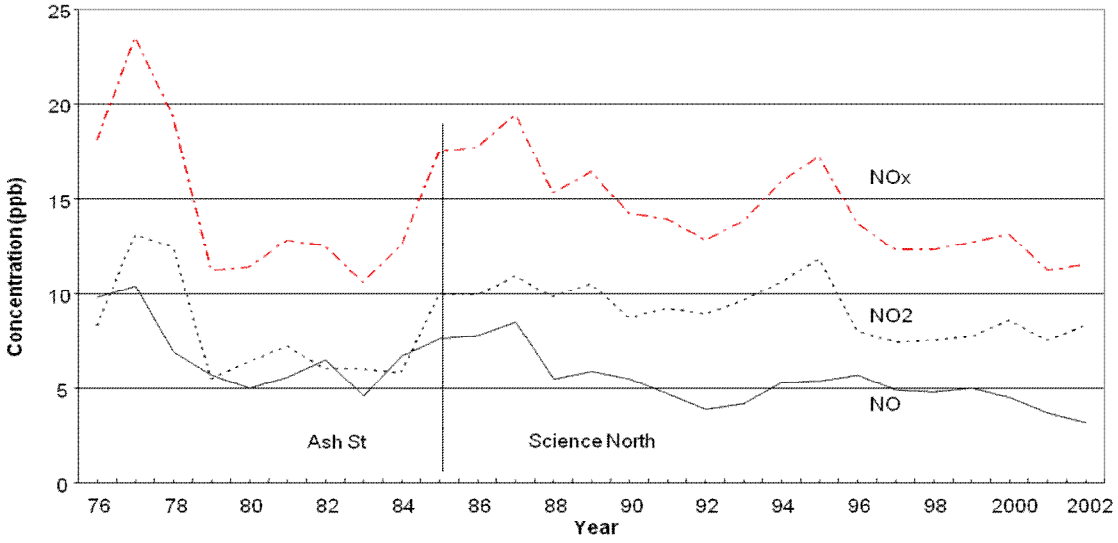
Sulphur Dioxide Emissions from Sudbury Area Smelters (1960-2002)



Nitrogen Oxides

Since the late 1980s, nitrogen oxide concentrations have steadily declined. The reductions are attributed to stricter emission controls on automobiles. From 1976 to 2002, the 24-hour ambient air quality criterion has never been exceeded in Sudbury.

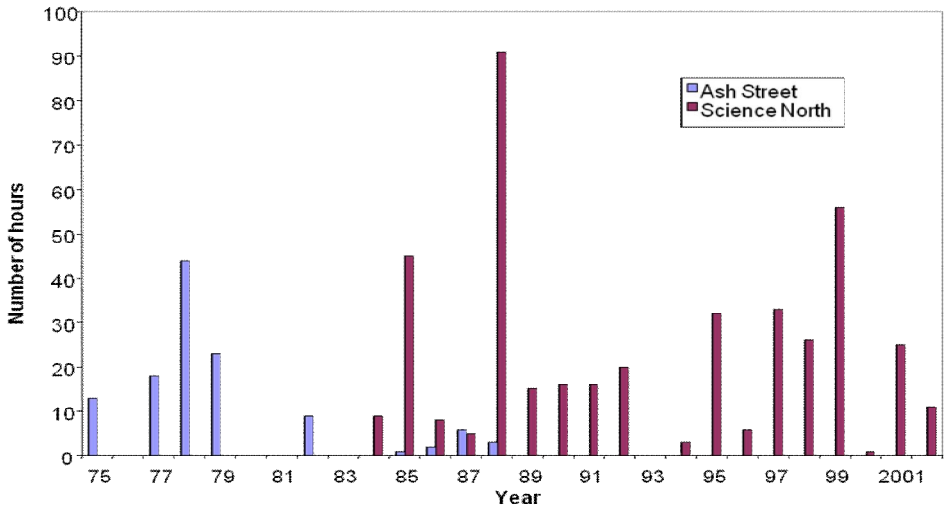
Nitrogen Oxides Concentrations (1976-2002)



Ground-Level Ozone

Analysis of average annual concentrations of ground-level ozone shows no definitive trend. The frequency of exceedances of the 1-hour ambient air quality criterion for ozone (80 ppb) is quite variable, as it is strongly dependent on weather conditions.

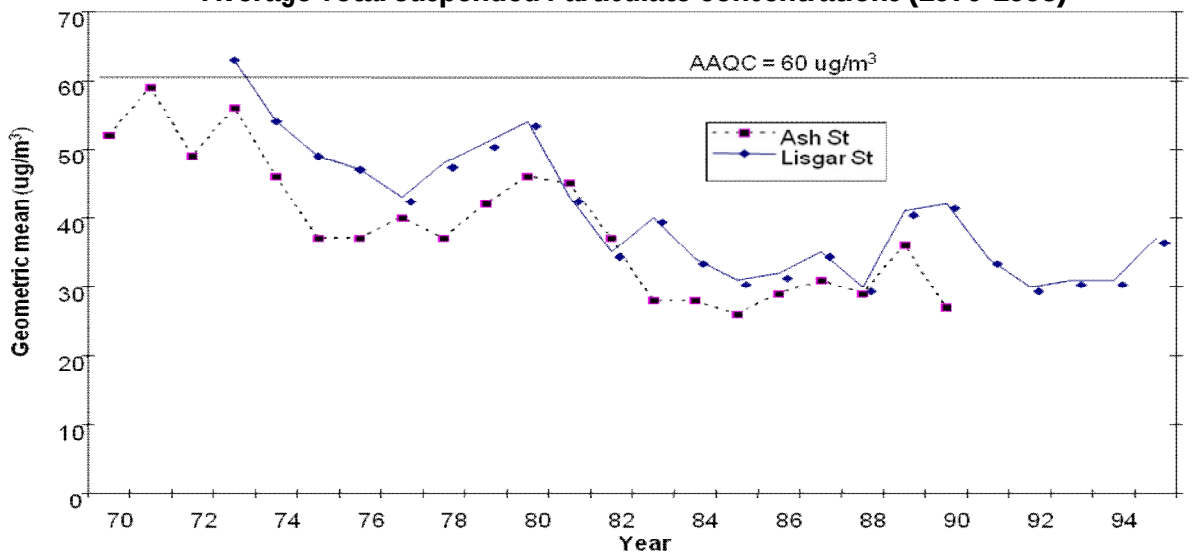
Frequency of Exceedance of 1-hour Ozone Criterion (1975-2002)



Particulate Matter

Average annual concentrations of total suspended particulates are much less than the provincial criterion and have been decreasing since the mid-1970s. This trend is attributed to reductions in emissions from smelting operations and improved management of road dust, wind blown soil and mine tailings. Concentrations of PM_{10} (inhalable particulate) have only been monitored since 1991. PM_{10} concentrations rarely exceed the interim 24-hour criterion.

Average Total Suspended Particulate Concentrations (1970-1995)



How Does Sudbury Compare to Other Cities?

Sudbury's air quality from 1990 to 2002 was compared to other Ontario cities, including Hamilton, Ottawa, Sault Ste. Marie, Thunder Bay, Toronto and Windsor. Relative rankings are shown below, where "1" indicates the best air quality and "7" indicates the worst air quality. For a number of pollutants, Sudbury ranks at or very near the top of these Ontario cities in terms of good air quality.

Ground-level ozone and sulphur dioxide continue to be areas of concern.

Although Sudbury has the highest annual average concentrations of ground-level ozone, Sudbury experiences lower concentrations in the summer and higher concentrations in the winter. For this reason, we experience far fewer "smog" days in the summer than southern Ontario.

Notable progress has been made in reducing emissions of sulphur dioxide and further improvements are expected.

Pollutant/Index	Ranking	Description	Number of Exceedances of Air Quality Criteria
Sulphur dioxide (SO_2)	4	4th lowest annual average	only city with exceedances
Nitrogen oxides (NO_x)	1	lowest annual average	none
Carbon monoxide (CO)	1 2	lowest 1-hr maximum 2nd lowest annual average	none
Total reduced sulphur (TRS)	2	2nd lowest annual average	none
Ground-level ozone (O_3)	7	highest annual average	4th highest
Total suspended particulate (TSP)	3	3rd lowest annual average	none
Particulate matter (PM_{10})	1	Lowest annual average	lowest
Air Quality Index (AQI)	6	Second highest (AQI = moderate to poor)	-

Other Air Pollutants

Carbon Monoxide (CO): Virtually all (99.6%) of the emissions of CO in Sudbury comes from vehicles. Since monitoring began in 1976, CO has never exceeded the provincial criteria.

Total Reduced Sulphur (TRS): These are sulphur-containing gases that produce an offensive odour. There are no significant sources of TRS compounds in Sudbury. Since monitoring began in 1984, the provincial criterion has never been exceeded.

Clean Air Sudbury's mission is to provide up-to-date information on air-related issues in Greater Sudbury, offer public education and outreach programming and provide opportunities for the public to get involved in air quality improvements.

This pamplet was prepared by:

Clean Air pur Sudbury

For a copy of the complete report, visit our website at www.cleanairsudbury.ca

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