

**CANADA-WIDE STANDARDS FOR PM AND OZONE  
STATUS OF JURISDICTIONAL IMPLEMENTATION ACTIVITIES  
“MANITOBA”  
FIVE-YEAR REPORT (2001-2005)**

**I. INTRODUCTION**

Winnipeg is Manitoba’s only Census Metropolitan Area (CMA)<sup>1</sup>, with a population of 690,000 or about 62% of Manitoba’s population. The next largest community is Brandon with a Census Agglomeration (CA) population of about 41,000 (3.7% of the total population). Air quality data for Brandon are included in this report for information only.

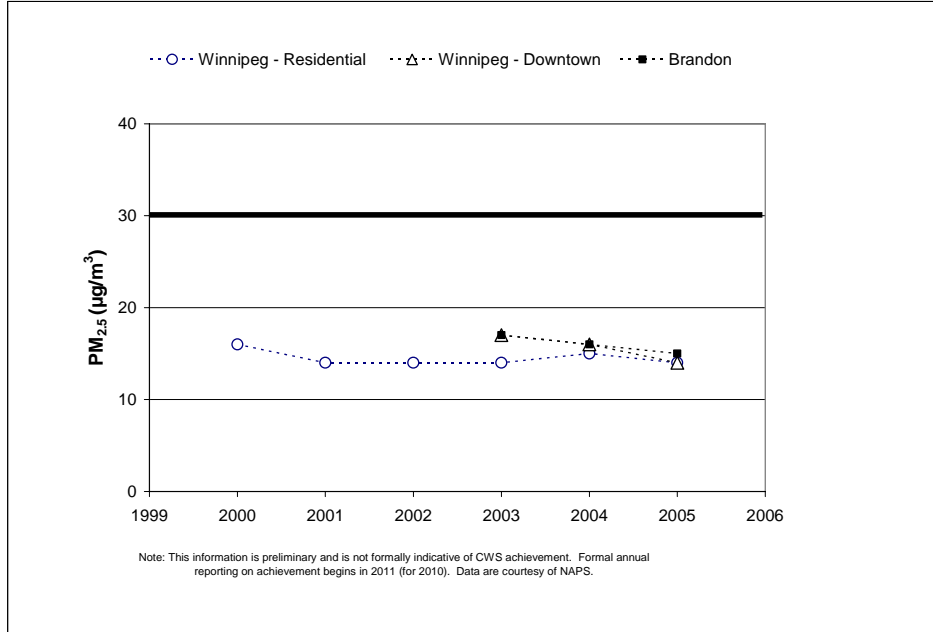
The provincial monitoring network has been expanded in recent years, but the available ambient data for PM<sub>2.5</sub> are still limited to a few locations and a relatively limited time period. For ozone, data are available for Winnipeg since 1976.

PM<sub>2.5</sub>: Limited continuous monitoring data in Winnipeg at two sites (located in a downtown area since November 2000 and in a residential area since September 1997) and long-term non-continuous sampling at the downtown site indicate that Winnipeg is currently in compliance with the future Canada-Wide Standard (CWS). Monitoring has been undertaken in an industrial area of Brandon since 2001. PM<sub>2.5</sub> monitoring began in April 2002 in the Flin Flon area and in September 2004 in Thompson. Data from these two sites will be provided in future reports, for information purposes only, once sufficient data are available to calculate the CWS metric.

<b>Value of the PM<sub>2.5</sub> CWS metric (µg/m<sup>3</sup>) in Manitoba from 2000 to 2005</b>						
<i>Indicated values are the required 3-year averages</i>						
<b>Year</b>	<b>2000</b>	<b>2001</b>	<b>2002</b>	<b>2003</b>	<b>2004</b>	<b>2005</b>
<b>Winnipeg - Residential</b>	16	14	14	14	15	14
<b>Winnipeg -Downtown</b>				17	16	14
<b>Brandon</b>				17	16	15

PM<sub>2.5</sub> CWS: 30 µg/m<sup>3</sup> as 24-hour average; 98<sup>th</sup> percentile ambient measurement annually, averaged over three consecutive years

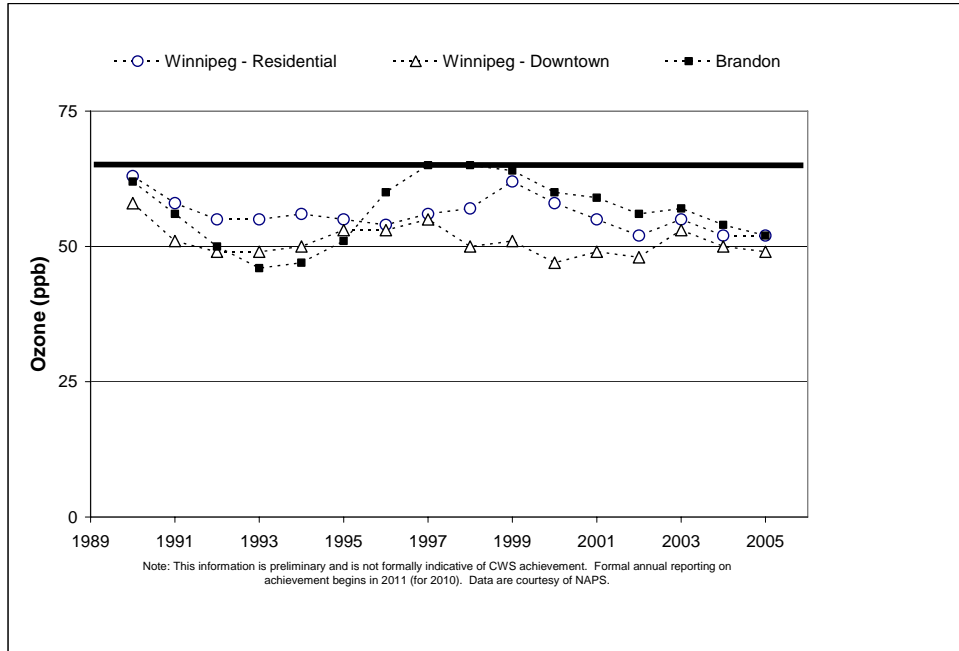
<sup>1</sup> Census metropolitan area (CMA): large urban centre (population of 100,000 or more in its urban core)  
Census agglomeration (CA): smaller urban centre (population of at least 10,000 but less than 100,000 in its urban core)



Ozone: Based on long-term continuous monitoring at the two urban sites in Winnipeg, the future CWS is currently being achieved. The CWS is also being achieved at the monitoring location in the smaller community of Brandon.

<b>Value of the ozone CWS metric (ppb) in Manitoba</b>																
<i>Indicated values are the required 3-year averages</i>																
<b>Year</b>	<b>1990</b>	<b>1991</b>	<b>1992</b>	<b>1993</b>	<b>1994</b>	<b>1995</b>	<b>1996</b>	<b>1997</b>	<b>1998</b>	<b>1999</b>	<b>2000</b>	<b>2001</b>	<b>2002</b>	<b>2003</b>	<b>2004</b>	<b>2005</b>
<b>Winnipeg - Residential</b>	63	58	55	55	56	55	54	56	57	62	58	55	52	55	52	52
<b>Winnipeg - Downtown</b>	58	51	49	49	50	53	53	55	50	51	47	49	48	53	50	49
<b>Brandon</b>	62	56	50	46	47	51	60	65	65	64	60	59	56	57	54	52

Ozone CWS: 65 ppb as 8-hour average; 4<sup>th</sup> highest measurement annually, averaged over three consecutive years



Transboundary pollution and urban smog issues have historically not been of concern in Manitoba.

Using the Guidance Document on Achievement Determination, jurisdictions are in the process of implementing and designating their monitoring stations and reporting areas for CWS achievement determination. The air quality information presented for PM<sub>2.5</sub> and ozone in this report should not be construed as official achievement of the CWS, since the CWS for particulate matter and ozone is to be achieved by 2010. This comprehensive report for the year 2005 is meant to assess progress on all provisions of the CWS, including assessment of ambient levels and identification of communities where ambient levels are exceeding or approaching the CWS levels. Annual reporting on achievement of the CWS begins in 2011.

## II. AIR QUALITY OVERVIEW

The most recent information on the jurisdictional emissions of PM<sub>2.5</sub>, SO<sub>x</sub>, NO<sub>x</sub> and VOC's is part of the preliminary 2002 national criteria air contaminant (CAC) inventory which is expected to be published in 2006. The most recent published inventory is for the year 2000. These inventories, however, provide information on the total provincial emissions rather than on emissions specifically within or in the vicinity of the Winnipeg CMA.

The complete 2000 and 2002 criteria air contaminant inventories for Manitoba are included in Appendix B.

In the "Open Source" category, forest fires can be a significant contributor to PM<sub>2.5</sub>, NO<sub>x</sub>, and VOC emissions. This sector, however, is highly variable from year to year. In the 20-year period from 1985 to 2004, the area of forest burned in Manitoba has varied from a low of 10,342 hectares in 1986 to a high of 3,567,947 hectares in 1989. Over this time period, the average

annual forest fire area was 457,515 ha. However, forest fire smoke only infrequently affects air quality in the Winnipeg CMA.

### Manitoba Emissions of PM<sub>2.5</sub> and Precursors of PM<sub>2.5</sub> and Ozone

Pollutant	Sectoral Contribution to Total Provincial Emissions (tonnes)	Year 2000	Year 2002 (Preliminary)
PM <sub>2.5</sub>	Pulp and Paper Industry	1,868	455
	Other Industries	2,428	2,856
	Residential Fuelwood Combustion	2,461	2,265
	Transportation	4,560	4,222
	Other	1,441	1,439
	Open Sources	45,615	54,247
	<b>Total (without Open Sources)</b>	<b>12,727</b>	<b>11,237</b>
	<b>Total (with Open Sources)</b>	<b>58,342</b>	<b>65,484</b>
SO <sub>x</sub>	Non-ferrous Mining and Smelting	353,000	374,306
	Transportation	1,933	2,056
	Other Industries	3,944	3,568
	Electricity	2,563	1,102
	Other	414	71
	Open Sources	10	23
	<b>Total (without Open Sources)</b>	<b>361,855</b>	<b>381,104</b>
	<b>Total (with Open Sources)</b>	<b>361,864</b>	<b>381,126</b>
NO <sub>x</sub>	Transportation	71,673	70,754
	Upstream Oil and Gas	267	1,735
	Commercial and Residential Fuel Combustion	2,868	2,425
	Electric Power Generation (Utilities)	2,136	1,287
	Other Industries	3,431	3,884
	Other	1	1
	Open Sources	4,305	6,781
	<b>Total (without Open Sources)</b>	<b>80,377</b>	<b>80,729</b>
	<b>Total (with Open Sources)</b>	<b>84,682</b>	<b>87,510</b>
VOCs	General Solvent Use	9,733	7,282
	Residential Fuelwood Combustion	3,580	3,295
	Transportation	40,758	38,500
	Other Industries	435	7,977
	Other	4,892	4,405
	Upstream Oil and Gas	4,432	4,644
	Fuel Marketing	3,663	3,654
	Open Sources	38,827	55,182
	<b>Total (without Open Sources)</b>	<b>67,493</b>	<b>69,758</b>
<b>Total (with Open Sources)</b>	<b>106,320</b>	<b>124,939</b>	

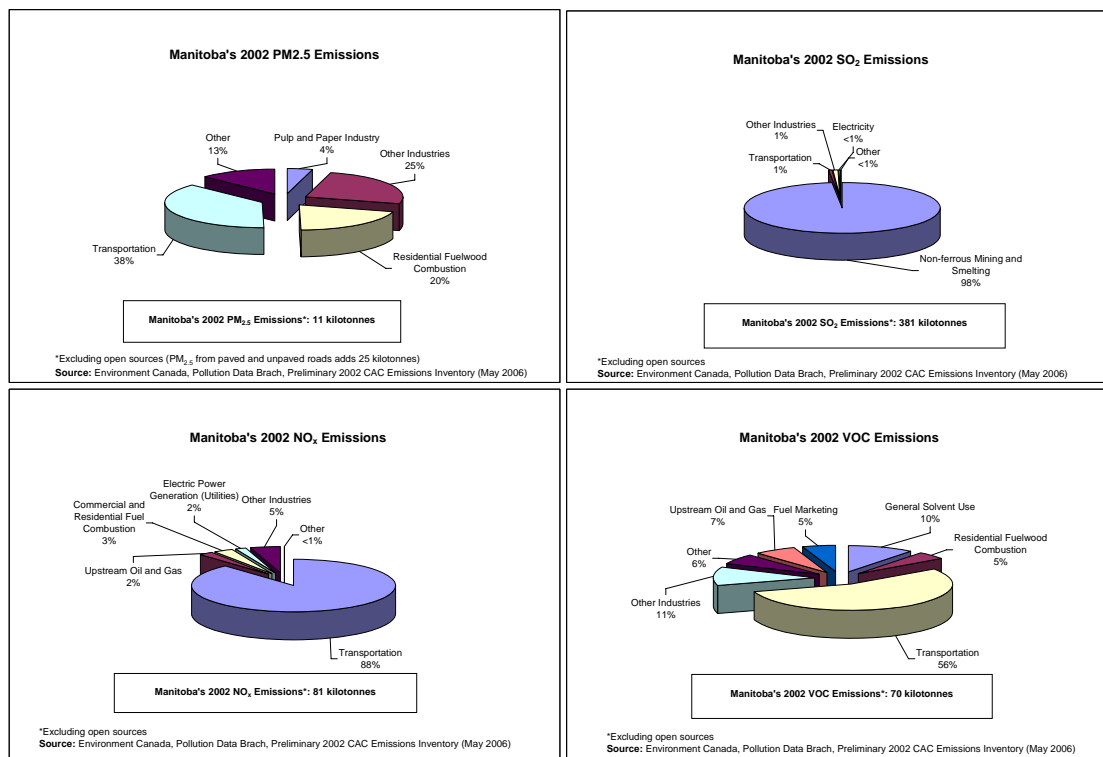
Open Sources: sources which emit air contaminants over large geographical areas, primarily in a stationary non-point source manner, and are diffuse in nature (*e.g.*, forest fires, road dust, *etc.*).

PM<sub>2.5</sub>: particulate matter less than 2.5 µm in diameter

SO<sub>x</sub>: sulphur oxides

NO<sub>x</sub>: nitrogen oxides

VOC: volatile organic compounds



### III. STATUS OF ACTIVITIES RELATED TO PM AND OZONE IMPLEMENTATION

Given Manitoba's compliance with both the PM<sub>2.5</sub> and ozone CWS, the focus of Manitoba's implementation plan has been and will continue to be on "Keeping Clean Areas Clean".

Since the CWS for PM<sub>2.5</sub> and ozone was signed in June 2000, Manitoba Conservation has undertaken diverse actions to maintain the province's air quality. Some examples of these actions, which are designed to either improve our knowledge or reduce ambient PM<sub>2.5</sub> and ozone concentrations, include:

- upgrading and expanding the provincial ambient air quality monitoring network at urban sites in Manitoba, including the installation of a PM<sub>2.5</sub> monitor in Flin Flon and PM<sub>10</sub> and PM<sub>2.5</sub> monitors in Thompson
- undertaking shorter-term, special air quality monitoring projects in selected urban areas in Winnipeg to better define the spatial and temporal distribution of ambient PM<sub>2.5</sub> levels
- as part of the environmental licensing process, working with and encouraging significant provincial sources to reduce emissions of all pollutants. Examples of specific projects have included:
  - Hudson Bay Mining and Smelting spill gas collection program in Flin Flon
  - Tembec conversion to a thermomechanical pulping facility in Pine Falls
  - Manitoba Hydro conversion of the Selkirk generating station from coal- to natural gas-fired

- phasing out the three wood waste conical combusters in Manitoba that have been in use at some sawmills
- requiring VOC reduction plans or source sampling at various facilities, including manufacturer's of transit buses, hydraulic cylinders and pumps, composite stone from waste granite, and pharmaceuticals.
- assisting in the development of a provincial climate change strategy and providing funding (Manitoba Climate Change Action Fund) to support actions that respond to the climate change issue

Many of the current and proposed programs in Manitoba's Climate Change Action Plan<sup>2</sup> have the potential to concomitantly reduce particulate matter and VOC emissions from various sectors. In most of these cases, the emission reductions arise from the reduced need to burn fossil fuels. Examples of just a few of the programs include:

- Manitoba Hydro's Wuskwatim Hydro Generation Project in Northern Manitoba
- Manitoba Hydro's Power Smart conservation programs
- Manitoba Hydro's landfill gas utilization study and wind monitoring study
- City of Winnipeg's demonstration project using ethanol-blended diesel fuel in 10 transit buses
- Red River College's new downtown campus which incorporated improvements in energy efficiency.

Actions undertaken by other Manitoba government departments will also likely have an effect on PM<sub>2.5</sub> or ozone levels in Manitoba. Examples of these actions include:

- Manitoba Highways and Government Services: implementation of a "Community Main Access Gravel Road Stabilization Program"
- Manitoba Health/Manitoba Conservation: development of an implementation plan to deal with the province's biomedical waste incinerators
- Manitoba Industry, Economic Development and Mines: amendments to the "Drilling and Production Regulation" under *The Oil and Gas Act*
- Manitoba Agriculture, Food and Rural Initiatives: promotion of methods to reduce soil loss
- Manitoba Agriculture, Food and Rural Initiatives/Manitoba Conservation: on-going delivery and enforcement of a program to manage crop residue burning in southern Manitoba with the goal of reducing the exposure to smoke (particulate matter emissions).

Manitoba is also implementing a mandate requiring that 85% of the gasoline sold in Manitoba be blended with 10% ethanol. This mandate will have the effect of reducing particulate emissions from individual vehicles by between 25% and 32%, depending on the vehicle. Manitoba has also announced an action plan to promote the development of biodiesel. Compared with petroleum diesel, emissions of hydrocarbons and particulate matter are reduced when using biodiesel.

In 2005, the Manitoba government formally released a green strategic framework which will guide the province in its efforts to preserve and protect the environment, promote the health and

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<sup>2</sup> Province of Manitoba, "Kyoto and Beyond: A plan of action to meet and exceed Manitoba's Kyoto targets", October 2002.

well-being of Manitoba families, and stimulate and manage sustainable economic growth.<sup>3</sup> Among the seven priorities identified are “acting on energy and climate change”, “growing a sustainable, prosperous economy”, and “greening the provincial government”. A key component common to these three priorities is the reduction in fossil fuel use, with a concomitant decrease in emissions of particulate matter and ozone precursors. Reduced fossil fuel use will be achieved through the development and promotion of alternative energy sources (*e.g.*, wind, geothermal, hydroelectricity) and increases in energy efficiency.

#### **IV. NEXT STEPS (Path Forward)**

Manitoba is currently in compliance with the CWS for both PM<sub>2.5</sub> and ozone. Consequently, Manitoba Conservation is focusing on “Keeping Clean Areas Clean” through continuation of the initiatives and activities noted in Section III as well as the development of new initiatives, where appropriate. Another key aspect of the province’s activities is the continued cooperation with other provincial and federal departments in addressing PM<sub>2.5</sub> and ozone issues.

**Manitoba Conservation**  
**June 6, 2006**

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<sup>3</sup> Province of Manitoba, “Green and Growing: Building a Green and Prosperous Future for Manitoba Families”, December 2005.

## Appendix A - The Canada-wide Standards Numeric Targets and Statistical Forms

The Canada-wide Standards (CWS) provisions include numeric targets for PM<sub>2.5</sub> and ozone, and their associated statistical forms. The numeric targets are:

**PM<sub>2.5</sub>:** 30 µg/m<sup>3</sup>, 24-hour (midnight to midnight) averaging time

**Ozone:** 65 ppb, 8-hour averaging time

The statistical forms of the numeric targets are:

**PM<sub>2.5</sub>:** 98th percentile ambient measurement annually,  
averaged over three consecutive years

**Ozone:** 4th highest measurement annually,  
averaged over 3 consecutive years

To facilitate the communication and data presentation in relation to the statistical forms, the above statistical forms are referred to as the *PM<sub>2.5</sub> CWS metric* and the *ozone CWS metric* respectively. Table A-1 below provides an outline of the computation procedure of the CWS metrics for a single site.

**Table A-1:** Sample calculations for the CWS metric.

Annual 98 <sup>th</sup> percentile of the daily PM <sub>2.5</sub> levels (µg/m <sup>3</sup> )			Value of the PM <sub>2.5</sub> CWS metric for the year 2000 (µg/m <sup>3</sup> )
1998	1999	2000	
35	25	40	33

Annual 4 <sup>th</sup> highest of the daily maximum 8-hour ozone levels (ppb)			Value of the ozone CWS metric for the year 2000 (ppb)
1998	1999	2000	
65	70	50	62

## Appendix B – Criteria Air Contaminant Inventories for Manitoba

**Table B.1 2000 Criteria Air Contaminant Emissions Inventory (tonnes)**

SECTOR	PM2.5	SO <sub>x</sub>	NO <sub>x</sub>	VOC
<b>INDUSTRIAL SOURCES</b>	<b>4,296</b>	<b>356,944</b>	<b>3,699</b>	<b>4,867</b>
Abrasive Industry	0	0	0	0
Aluminum Industry	0	0	0	0
Asbestos Industry	0	0	0	0
Asphalt Paving Industry	183	10	24	14
Bakeries	0	0	0	106
Cement and Concrete Industry	43	2	2	0
Chemical Industry	28	223	454	8
Clay Products Industry	0	0	0	0
Coal Industry	13	0	0	0
Ferrous Foundries	214	7	16	8
Grain Industries	174	0	0	0
Iron and Steel Production	18	51	126	78
Iron Ore Mining and Beneficiation	0	0	0	0
Mining and Rock Quarrying	41	3	41	1
Non-Ferrous Mining and Smelting	798	353,000	0	0
Oil Sands	0	0	0	0
Other Petroleum and Coal Products	0	0	0	0
Paint and Varnish Manufacturing	0	0	0	0
Petrochemical Industry	0	0	0	0
Petroleum Refining	0	0	0	0
Plastics and Synthetic Resins Industry	0	0	0	0
Pulp and Paper Industry	1,868	3,141	793	8
Upstream Oil and Gas Industry	39	291	267	4,432
Wood Industry	336	106	43	181
Other Industries	540	110	1,933	30
<b>NON INDUSTRIAL FUEL COMBUSTION</b>	<b>3,054</b>	<b>2,977</b>	<b>5,003</b>	<b>3,794</b>
Commercial Fuel Combustion	157	358	1,525	73
Electric Power Generation	309	2,563	2,136	58
Residential Fuel Combustion	127	23	1,115	83
Residential Fuelwood Combustion	2,461	33	228	3,580
<b>TRANSPORTATION</b>	<b>4,560</b>	<b>1,933</b>	<b>71,673</b>	<b>40,758</b>
Air Transportation	24	110	1,767	535
Heavy-duty diesel vehicles	532	205	16,999	717
Heavy-duty gasoline trucks	14	27	1,347	652
Light-duty diesel trucks	34	16	294	123
Light-duty diesel vehicles	4	2	41	13
Light-duty gasoline trucks	59	202	6,987	10,731

SECTOR	PM <sub>2.5</sub>	SO <sub>x</sub>	NO <sub>x</sub>	VOC
Light-duty gasoline vehicles	26	177	7,722	10,318
Marine Transportation	2	13	45	6
Motorcycles	0	0	27	52
Off-road use of diesel	3,281	781	26,675	3,458
Off-road use of gasoline	367	38	1,901	13,757
Rail Transportation	158	363	7,867	397
Tire wear	59	0	0	0
<b>INCINERATION</b>	<b>0</b>	<b>0</b>	<b>1</b>	<b>0</b>
Cremation	0	0	1	0
Industrial and Commercial Incineration	0	0	0	0
Municipal Incineration	0	0	0	0
Other Utilities	0	0	0	0
<b>MISCELLANEOUS</b>	<b>818</b>	<b>0</b>	<b>0</b>	<b>18,074</b>
Cigarette Smoking	26	0	0	0
Dry Cleaning	0	0	0	27
Fuel Marketing	0	0	0	3,663
General Solvent Use	0	0	0	9,733
Marine Cargo Handling Industry	0	0	0	0
Meat Cooking	46	0	0	0
Pesticides and Fertilizer Application	286	0	0	0
Printing	0	0	0	1,241
Structural Fires	460	0	0	496
Surface Coatings	0	0	0	2,914
<b>OPEN SOURCES</b>	<b>45,615</b>	<b>10</b>	<b>4,305</b>	<b>38,827</b>
Agriculture	2,294	0	0	20,103
Agricultural Operations	3,235	0	0	0
Construction	3,886	0	0	0
Dust from Paved Roads	7,943	0	0	0
Dust from Unpaved Roads	16,664	0	0	0
Forest Fires	11,488	10	4,305	18,535
Landfill Sites	4	0	0	190
Mine Tailings	101	0	0	0
Prescribed Burning	0	0	0	0
<b>TOTAL WITH OPEN SOURCES</b>	<b>58,342</b>	<b>361,864</b>	<b>84,682</b>	<b>106,320</b>
<b>TOTAL WITHOUT OPEN SOURCES</b>	<b>12,727</b>	<b>361,855</b>	<b>80,377</b>	<b>67,493</b>

PM<sub>2.5</sub>: particulate matter less than 2.5 µm in diameter

SO<sub>x</sub>: sulphur oxides

NO<sub>x</sub>: nitrogen oxides

VOC: volatile organic compounds

Open Sources: sources which emit air contaminants over large geographical areas, primarily in a stationary non-point source manner, and are diffuse in nature (*e.g.*, forest fires, road dust, *etc.*).

Source: Environment Canada, Pollution Data Branch, 2000 CAC Emissions Inventory version 4 (May 2006)

**Table B.2 Preliminary 2002 Criteria Air Contaminant Emissions Inventory (tonnes)**

<b>SECTOR</b>	<b>PM<sub>2.5</sub></b>	<b>SO<sub>x</sub></b>	<b>NO<sub>x</sub></b>	<b>VOC</b>
<b>INDUSTRIAL SOURCES</b>	<b>3,311</b>	<b>377,874</b>	<b>6,262</b>	<b>12,621</b>
Abrasive Industry	0	0	0	0
Aluminum Industry	0	0	0	0
Asbestos Industry	0	0	0	0
Asphalt Paving Industry	134	0	0	0
Bakeries	0	0	0	106
Cement and Concrete Industry	93	0	0	0
Chemical Industry	13	967	1,123	18
Clay Products Industry	0	0	0	0
Coal Industry	9	0	0	0
Ferrous Foundries	272	7	17	23
Grain Industries	225	0	0	0
Iron and Steel Production	34	54	252	51
Iron Ore Mining and Beneficiation	0	0	0	0
Mining and Rock Quarrying	22	0	0	1
Non-Ferrous Mining and Smelting	1,320	374,306	0	0
Oil Sands	0	0	0	0
Other Petroleum and Coal Products	0	0	0	0
Paint and Varnish Manufacturing	0	0	0	39
Petrochemical Industry	0	0	0	0
Petroleum Refining	0	0	0	0
Plastics and Synthetic Resins Industry	0	0	0	0
Pulp and Paper Industry	455	709	643	514
Upstream Oil and Gas Industry	54	306	1,735	4,644
Wood Industry	284	420	270	1,367
Other Industries	394	1,105	2,222	5,858
<b>NON INDUSTRIAL FUEL COMBUSTION</b>	<b>2,701</b>	<b>1,173</b>	<b>3,712</b>	<b>3,452</b>
Commercial Fuel Combustion	124	15	1,100	56
Electric Power Generation	186	1,102	1,287	18
Residential Fuel Combustion	127	26	1,115	83
Residential Fuelwood Combustion	2,265	30	210	3,295
<b>TRANSPORTATION</b>	<b>4,222</b>	<b>2,056</b>	<b>70,754</b>	<b>38,500</b>
Air Transportation	18	83	1,311	501
Heavy-duty diesel vehicles	441	200	16,398	635
Heavy-duty gasoline trucks	14	26	1,368	621
Light-duty diesel trucks	32	15	298	127
Light-duty diesel vehicles	4	1	41	13
Light-duty gasoline trucks	51	192	6,844	9,784
Light-duty gasoline vehicles	24	160	6,935	9,059
Marine Transportation	1	6	20	3
Motorcycles	1	1	46	90

SECTOR	PM <sub>2.5</sub>	SO <sub>x</sub>	NO <sub>x</sub>	VOC
Off-road use of diesel	3,021	939	26,308	3,167
Off-road use of gasoline	381	36	1,976	14,068
Rail Transportation	174	397	9,208	433
Tire wear	60	0	0	0
<b>INCINERATION</b>	<b>11</b>	<b>0</b>	<b>1</b>	<b>1</b>
Cremation	0	0	1	0
Industrial and Commercial Incineration	0	0	0	0
Municipal Incineration	0	0	0	0
Other Utilities	11	0	0	1
<b>MISCELLANEOUS</b>	<b>992</b>	<b>0</b>	<b>0</b>	<b>15,184</b>
Cigarette Smoking	20	0	0	0
Dry Cleaning	0	0	0	10
Fuel Marketing	0	0	0	3,654
General Solvent Use	0	0	0	7,282
Marine Cargo Handling Industry	0	0	0	0
Meat Cooking	320	0	0	0
Pesticides and Fertilizer Application	268	0	0	0
Printing	0	0	0	2,028
Structural Fires	383	0	0	413
Surface Coatings	0	0	0	1,796
<b>OPEN SOURCES</b>	<b>54,247</b>	<b>23</b>	<b>6,781</b>	<b>55,182</b>
Agriculture	3,172	0	0	25,771
Agricultural Operations	3,322	0	0	0
Construction	4,212	0	0	0
Dust from Paved Roads	8,198	0	0	0
Dust from Unpaved Roads	17,198	0	0	0
Forest Fires	17,973	15	6,736	28,999
Landfill Sites	4	0	0	190
Mine Tailings	50	0	0	0
Prescribed Burning	118	7	44	222
<b>TOTAL WITH OPEN SOURCES</b>	<b>65,484</b>	<b>381,126</b>	<b>87,510</b>	<b>124,940</b>
<b>TOTAL WITHOUT OPEN SOURCES</b>	<b>11,237</b>	<b>381,104</b>	<b>80,729</b>	<b>69,759</b>

PM<sub>2.5</sub>: particulate matter less than 2.5 µm in diameter

SO<sub>x</sub>: sulphur oxides

NO<sub>x</sub>: nitrogen oxides

VOC: volatile organic compounds

Open Sources: sources which emit air contaminants over large geographical areas, primarily in a stationary non-point source manner, and are diffuse in nature (*e.g.*, forest fires, road dust, *etc.*).

Source: Environment Canada, Pollution Data Branch, 2002 CAC Emissions Inventory (May 2006, Draft)