

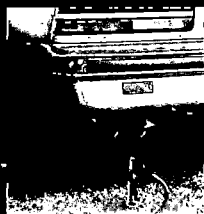


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# CANADIAN IN-USE VEHICLE EMISSIONS REDUCTION PROGRAMS



Ottawa

Canada



SECTOR INITIATIVES DIVISION  
TRANSPORTATION SYSTEMS BRANCH  
ENVIRONMENT CANADA

Canada

## Library and Archives Canada Cataloguing in Publication

Canadian in-use vehicle emissions reduction programs.

Issued also in French under title: Programmes canadiens de réduction des émissions des véhicules en service.

ISBN 0-662-39950-1

Cat. no. En84-18/2005E

1. Motor vehicles – Motors – Exhaust gas – Government policy – Canada – Provinces.
2. Motor vehicles – Motors – Exhaust gas – Government policy – Canada.
3. Motor vehicles – Motors – Exhaust gas – Environmental aspects – Canada – Provinces.
4. Motor vehicles – Motors – Exhaust gas – Environmental aspects – Canada.
5. Transportation, Automotive – Environmental aspects – Canada – Provinces.
6. Transportation, Automotive – Environmental aspects – Canada.
7. Air – Pollution – Government policy – Canada.
8. Air quality management – Canada.
- I. Canada. Environment Canada.
- II. Canada. Air Pollution Prevention Directorate. Sector Initiatives Division.

HC120.E5C32 2005

363.738'7'0971

C2005-902011-3

Additional information can be obtained at Environment Canada's website at [www.ec.gc.ca](http://www.ec.gc.ca) or at the Inquiry Centre at **1-800-668-6767**.





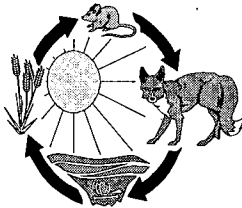
# **Canadian In-Use Vehicle Emissions Reduction Programs**

November 2004

**Sector Initiatives Division  
Transportation Systems Branch  
Environment Canada**

# Canadian In-Use Vehicle Emissions Reduction Programs

November 2004



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## ***Disclaimer***

This report has had a limited technical review by Environment Canada. Its content does not necessarily reflect the views and policies of Environment Canada. Mention of trade names or commercial products does not constitute endorsement for use.

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## ***Acknowledgements***

Doug Cope & D. Cope Enterprises wish to acknowledge, with kind thanks, the information supplied by C. Burelle, M. Thompson, Patrick Cram, L. Durocher, R. Collins, and J.F. Banville of Environment Canada; program managers at Natural Resources Canada and Transport Canada; officials from the AirCare and Drive Clean programs; numerous Internet sources; plus provincial/territorial and municipal contacts throughout Canada who are too numerous to list individually. The information they supplied proved invaluable in the preparation of this report.

# Glossary of Terms

|  |   |
|--|---|
| <b>acceleration simulation mode (ASM)</b>                            | A dynamometer-based steady-state loaded mode emissions test that simulates acceleration.  |
| <b>aftermarket</b>   | Vehicle parts and equipment from companies that do not necessarily supply the parts and equipment installed on the assembly line by vehicle manufacturers. These parts may replace original equipment or enhance performance beyond original equipment specifications.  |
| <b>AirCare</b>   | The inspection and maintenance program in British Columbia.   |
| <b>biodiesel</b>   | Fuel derived from plant oils or animal fat that can be used with, or in place of, conventional petroleum-based diesel fuel.   |
| <b>catalytic converter</b>   | Usually a metal housing filled with a hard material covered with a catalytic compound. Exhaust gases may undergo a reaction within the converter.   |
| <b>catalytic muffler</b>   | <i>See</i> diesel exhaust catalyst.   |
| <b>centralized I/M program and centralized test-only I/M program</b> | An inspection and maintenance (I/M) program in which vehicle inspections are performed in a limited number of centrally located facilities. These facilities are usually operated by or under contract to a government agency. The facilities are usually "test-only," their only function being the vehicle inspection or test. Ownership and operation of these facilities are separate from and not affiliated with the repair industry. |
| <b>contractor-run</b>  | A system run under contract to a government agency.   |
| <b>cutpoints</b>   | Chosen emission levels at which a vehicle passes or fails a test or inspection.   |
| <b>decentralized I/M program</b>                                     | A program in which local garages act as inspection and maintenance (I/M) stations.  |
| <b>decentralized test-and-repair I/M</b>                             | A program in which inspection and maintenance (I/M) stations perform both inspections and repairs at the same location, usually a local accredited garage.  |
| <b>decentralized test-only I/M program</b>                           | A program in which the only function of the inspection and maintenance (I/M) station is to perform the vehicle inspection or test.  |
| <b>diagnostics</b>   | A test run on a system or component to determine whether it is operating according to specifications.   |
| <b>diagnostic trouble code (DTC)</b>                                 | An alphanumeric code that is "set" in a vehicle's on-board computer when a monitor detects a condition likely to lead to (or that has already produced) a component or system failure or otherwise contribute to emissions exceeding standards by 1.5 times the certification standard.   |
| <b>diesel exhaust catalyst (DEC)</b>                                 | A device containing an active catalyst material (often a precious metal) deposited on a support medium. The engine exhaust passes through the device, where the pollutants undergo a catalytic reaction and more environmentally acceptable reaction products are exhausted.  |
| <b>diesel oxidation catalyst (DOC)</b>                               | <i>See</i> diesel exhaust catalyst.   |
| <b>diesel particulate filter</b>                                     | A device that mechanically traps particulate matter (PM) emissions and subsequently oxidizes them. Filters may also employ a catalyst for gaseous   |

|   |  |
|---|--|
| <b>(DPF)</b>                              | emissions control and to enhance the oxidation of the collected PM.  |
| <b>Drive Clean</b>                        | The inspection and maintenance program in Ontario.   |
| <b>dynamometer (dyno)</b>                 | A roller-equipped device for simulating vehicle or engine road operation.  |
| <b>dynamometer – steady-state</b>         | A dynamometer that does not have the capability of simulating vehicle inertia weight beyond the basic inertia value of the rollers and flywheel. Instead, a power absorber is able to apply fixed resisting torque as specified for set or given speeds.                 |
| <b>dynamometer – transient</b>            | A dynamometer with the capability of simulating the forces that act on a vehicle in normal operation on the road. This includes simulation of inertia weight and aerodynamic drag forces proportional to speed.  |
| <b>evaporative emissions</b>              | Emissions resulting from the evaporation of fuel.  |
| <b>excess emissions</b>                   | Emissions greater than an engine's federal certification (Federal Test Procedure) standards.   |
| <b>Federal Test Procedure (FTP)</b>       | Procedures for testing light-duty vehicle and heavy-duty vehicle engines to the federal emissions standards.   |
| <b>government-run</b>                     | An inspection and maintenance program in which inspections are performed by government employees.  |
| <b>greenhouse gases (GHGs)</b>            | Gases in the atmosphere that contribute to the "greenhouse" effect. GHGs inventoried by Environment Canada that are not covered by the Montreal Protocol include carbon dioxide, methane, nitrous oxide, sulphur hexafluoride, perfluorocarbons, and hydrofluorocarbons. |
| <b>gross emitters</b>                     | Generally refers to vehicles with emissions that are well in excess of federal standards or manufacturer specifications.   |
| <b>gross vehicle weight (GVW)</b>         | The maximum total weight that a vehicle is licensed to carry. It includes the tare or empty weight plus the payload weight and may be less than or equal to the gross vehicle weight rating.   |
| <b>gross vehicle weight rating (GVWR)</b> | The maximum design loaded weight of a single vehicle as specified by the manufacturer.   |
| <b>heavy-duty vehicle (HDV)</b>           | For Canadian federal emissions standards: on-road vehicles, both trucks and buses, with a gross vehicle weight rating above 2722 kg (6000 lbs.) up to and including the 1987 model year and above 3856 kg (8500 lbs.) for the 1988 model year and newer.                 |
| <b>idle</b>                               | Refers to when a vehicle is stationary with the engine running and with no external load applied.  |
| <b>idle emissions test</b>                | An emissions test conducted with the engine operating at idle.   |
| <b>I/M (inspection and maintenance)</b>   | A program for the inspection and repair of in-use vehicles.  |
| <b>IM240</b>                              | A dynamometer-based transient emissions test that approximates the first 240 seconds of the Federal Test Procedure.  |
| <b>inspection</b>                         | The examination of a vehicle in an inspection and maintenance program.   |
| <b>in-use vehicle</b>                     | A vehicle that is licensed and operating on the road.  |
| <b>light-duty vehicle (LDV)</b>           | For Canadian federal emissions standards: on-road vehicles with a gross vehicle weight rating below 2722 kg (6000 lbs.) up to and including the 1987 model year and below 3856 kg (8500 lbs.) for the 1988 model year  |



|   |   |
|---|---|
|   | and newer.  |
| <b>maintenance</b>                            | The adherence to the manufacturer's schedule for vehicle upkeep plus the repair of systems or faults that have led to excess emissions.   |
| <b>new vehicle</b>                            | A vehicle as produced by a manufacturer and before first sale.  |
| <b>OBD II</b>                                 | The second-generation on-board diagnostics (OBD) system specified by the U.S. Environmental Protection Agency.  |
| <b>On-Board Diagnostics – OBD (Data Link)</b> | A computer-controlled vehicle information system to monitor selected parameters. The system is installed on-board the vehicle in question.  |
| <b>on-road</b>                                | Vehicles licensed to operate on the roads and highways. The vehicles licensed for road operation may vary by province/territory and may include tracked vehicles and other construction equipment.  |
| <b>owner</b>                                  | Either the person registered as the owner of a vehicle by the provincial/territorial licensing authority or its equivalent in another state, province/territory, or country; or a person shown by the registered owner to be legally responsible for the vehicle's maintenance.                     |
| <b>ozone (O<sub>3</sub>)</b>                  | Gas formed as a result of chemical reactions between nitrogen oxides and volatile organic compounds in the lower atmosphere in the presence of sunlight and heat.   |
| <b>particulate matter (PM)</b>                | Any aerosol that is released to the atmosphere in either solid or liquid form.  |
| <b>readiness monitors</b>                     | In an on-board diagnostics system, indicators used to discover whether emissions control components and systems have been evaluated. If a monitor is set to "ready," the system is tested.  |
| <b>remote sensing device (RSD)</b>            | A system for measuring exhaust emissions that does not require physical contact with the vehicle being tested.  |
| <b>scan tool</b>                              | Computer-based read-out equipment that is designed to interface with a vehicle's on-board computer for the purpose of reading diagnostic trouble codes and readiness monitor status and to display those codes and parameters.  |
| <b>Smog Patrol</b>                            | The mobile vehicle emissions inspection program in Ontario.   |
| <b>steady-state test</b>                      | A test conducted at single or multiple operational modes. Each mode is a defined combination of speed and load that is held fixed or steady throughout the duration of the mode.  |
| <b>tampering</b>                              | The removal, either permanent or temporary, bypass, defeat, or otherwise rendering inoperative (in whole or in part) of any emissions control system that is installed on or in a motor vehicle (or engine), or the modification of the vehicle (or engine) in any way so as to increase emissions. |
| <b>test-and-repair stations</b>               | Inspection and maintenance stations that perform both inspections and repairs at the same location.   |
| <b>test-only stations</b>                     | Inspection and maintenance stations that are permitted only to test or inspect vehicles.  |
| <b>transient test</b>                         | A test that exercises a vehicle or engine over a schedule of varying speed and/or load conditions.  |
| <b>two-speed idle test</b>                    | A stationary vehicle test that combines the idle plus a 2500 rpm (or higher speed) emissions test.  |

## ***Abbreviations and Acronyms***

|                       |   |
|-----------------------|---|
| <b>ACOR</b>           | AirCare On-Road   |
| <b>AMT</b>            | Agence métropolitaine de transport                                |
| <b>AQLPA</b>          | Association québécoise de lutte contre la pollution atmosphérique |
| <b>ASM</b>            | acceleration simulation mode                                      |
| <b>A&amp;SRTS</b>     | Active & Safe Routes to School                                    |
| <b>ATVP</b>           | Advanced Technology Vehicles Program                              |
| <b>BEST</b>           | Better Environmentally Sound Transportation                       |
| <b>CAA</b>            | Canadian Automobile Association                                   |
| <b>CAP</b>            | Clean Air Partnership   |
| <b>CARB</b>           | California Air Resources Board                                    |
| <b>CASA</b>           | Clean Air Strategic Alliance                                      |
| <b>CCME</b>           | Canadian Council of Ministers of the Environment                  |
| <b>CNG</b>            | compressed natural gas  |
| <b>CO</b>             | carbon monoxide   |
| <b>CO<sub>2</sub></b> | carbon dioxide  |
| <b>CPPI</b>           | Canadian Petroleum Products Institute                             |
| <b>CRFA</b>           | Canadian Renewable Fuels Association                              |
| <b>CRTDPF</b>         | Continuously Regenerating Technology Diesel Particulate Filter    |
| <b>CSN</b>            | Car Sharing Network   |
| <b>CTA</b>            | Canadian Trucking Alliance  |
| <b>CUTA</b>           | Canadian Urban Transit Association                                |
| <b>CVMA</b>           | Canadian Vehicle Manufacturers' Association                       |
| <b>DEC</b>            | diesel exhaust catalyst   |
| <b>DLC</b>            | diagnostic (or data) link connector                               |
| <b>DOC</b>            | diesel oxidation catalyst   |
| <b>DPF</b>            | diesel particulate filter   |
| <b>DTC</b>            | diagnostic trouble code   |
| <b>dyno</b>           | dynamometer (may be either a chassis or an engine dyno)           |
| <b>EGR</b>            | exhaust gas recirculation   |
| <b>EPA</b>            | U.S. Environmental Protection Agency                              |
| <b>ERMD</b>           | Emissions Research and Measurement Division (Environment Canada)  |
| <b>FOE</b>            | Friends of the Earth  |
| <b>FTP</b>            | Federal Test Procedure  |
| <b>g</b>              | gram(s)   |
| <b>GHG</b>            | greenhouse gas  |

|                       |  |
|-----------------------|--|
| <b>GTA</b>            | Greater Toronto Area                               |
| <b>GVRD</b>           | Greater Vancouver Regional District                |
| <b>GVTA</b>           | Greater Vancouver Transportation Authority         |
| <b>GVW</b>            | gross vehicle weight                               |
| <b>GVWR</b>           | gross vehicle weight rating                        |
| <b>HC</b>             | hydrocarbon(s)                                     |
| <b>HDV</b>            | heavy-duty vehicle                                 |
| <b>I/M</b>            | inspection and maintenance                         |
| <b>JBF</b>            | Jack Bell Foundation                               |
| <b>kg</b>             | kilogram(s)  |
| <b>lb.</b>            | pound(s)   |
| <b>LDV</b>            | light-duty vehicle                                 |
| <b>MIL</b>            | malfunction indicator light                        |
| <b>MOST</b>           | Moving On Sustainable Transportation               |
| <b>mph</b>            | miles per hour                                     |
| <b>MY</b>             | model year   |
| <b>NCE</b>            | Northern Climate ExChange                          |
| <b>NGV</b>            | natural gas vehicle                                |
| <b>NO<sub>x</sub></b> | oxides of nitrogen (nitrogen oxides)               |
| <b>NOVRAP</b>         | National Old Vehicle Retirement Assessment Program |
| <b>NRCan</b>          | Natural Resources Canada                           |
| <b>OARA</b>           | Ontario Automotive Recyclers Association           |
| <b>OBD</b>            | On-Board Diagnostics (Data Link)                   |
| <b>OBD II</b>         | On-Board Diagnostics II                            |
| <b>OEM</b>            | original equipment manufacturer                    |
| <b>PM</b>             | particulate matter                                 |
| <b>ppm</b>            | part(s) per million                                |
| <b>QA/QC</b>          | quality assurance / quality control                |
| <b>RCL</b>            | repair cost limit                                  |
| <b>ROVER</b>          | Roadside Optical Vehicle Emissions Reporter        |
| <b>rpm</b>            | revolutions per minute                             |
| <b>RSD</b>            | remote sensing device                              |
| <b>S-M-A-R-T</b>      | Save Money and the Air by Reducing Trips           |
| <b>STEER</b>          | Smart Taxis Encouraging Environmental Respect      |
| <b>STM</b>            | Société de transport de Montréal                   |
| <b>STO</b>            | Société de transport de l'Outaouais                |
| <b>SUV</b>            | sport utility vehicle                              |
| <b>TTC</b>            | Toronto Transit Commission                         |

**ULSD**            ultra-low sulphur diesel  
**UTSP**            Urban Transportation Showcase Program  
**VEEU**            Vehicle Emissions Enforcement Unit  
**VOC**             volatile organic compound(s)

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# ***Executive Summary***

In-use vehicles are a source of emissions that contribute to air pollution problems in Canada, and there are a variety of tools or programs that can be employed to reduce in-use vehicle emissions in one way or another. In general, in-use vehicle emissions reduction programs are designed either to reduce the number of vehicles that operate on roads and highways or to improve the emissions performance of the vehicles that are driven.

Once a vehicle or an engine is "in use," its systems are subject to deterioration. Deterioration results from the aging of components, a lack of maintenance, and deliberate tampering. This deterioration can lead to higher emissions, and therefore many in-use vehicles have emissions in excess of their design standards.

Once sold and "in use," vehicle and engine maintenance are in the hands of the owner. A poorly maintained engine can use more fuel and produce higher emissions than one that has been properly maintained. Neglecting to replace worn or deteriorated components can result in poor engine performance, higher fuel consumption, engine damage, and excess emissions.

The inspection and maintenance (I/M) program is an example of one of the tools that is currently being employed in Ontario and British Columbia to improve the overall condition of the in-use vehicle fleet and to reduce emissions. Jurisdictions across Canada are also using a number of other programs to attempt to limit the emissions from the internal combustion engines installed in vehicles operating in urban areas.

In addition to I/M programs, the other types of programs currently in operation in Canada include:

- anti-tampering legislation and enforcement;
- on-road vehicle inspections;
- heavy-duty vehicle (HDV) emissions component retrofit programs;
- scrappage programs;
- idle control bylaws and idle reduction campaigns;
- driver education programs;
- carpool, carpool matching, and car-sharing programs;
- transit improvements and alternative transport campaigns;
- public awareness campaigns;
- voluntary vehicle inspection clinics; and
- fuel efficiency improvement programs.

Of the many types of emissions reduction programs, the greatest increase in recent years has been in the number of idle reduction and vehicle scrappage programs that are now operating across the country.

Idle reduction programs and campaigns have received funding and direction from Natural Resources Canada (NRCan). In addition, a number of non-government organizations, particularly the lung associations in several provinces, have also been instrumental in establishing idle reduction programs, especially in school zones.

At one time, the City of Montreal was the only city in Canada with an in-use vehicle idle control bylaw, but recently a number of communities in Ontario and British Columbia have also developed and implemented idle control bylaws.

The number of in-use vehicle scrappage programs has increased mainly through the encouragement and funding of Environment Canada plus the kidney and lung associations in several provinces.

British Columbia and Ontario continue as the two provinces with in-use vehicle emissions I/M programs, but a third I/M program for HDVs is scheduled to open in Quebec in 2005, and a light-duty vehicle (LDV) program is under study.

The I/M program in British Columbia, AirCare, became one of the most advanced in North America when it switched to IM240 transient emissions testing in 2001. A third phase of AirCare is in the planning stage.

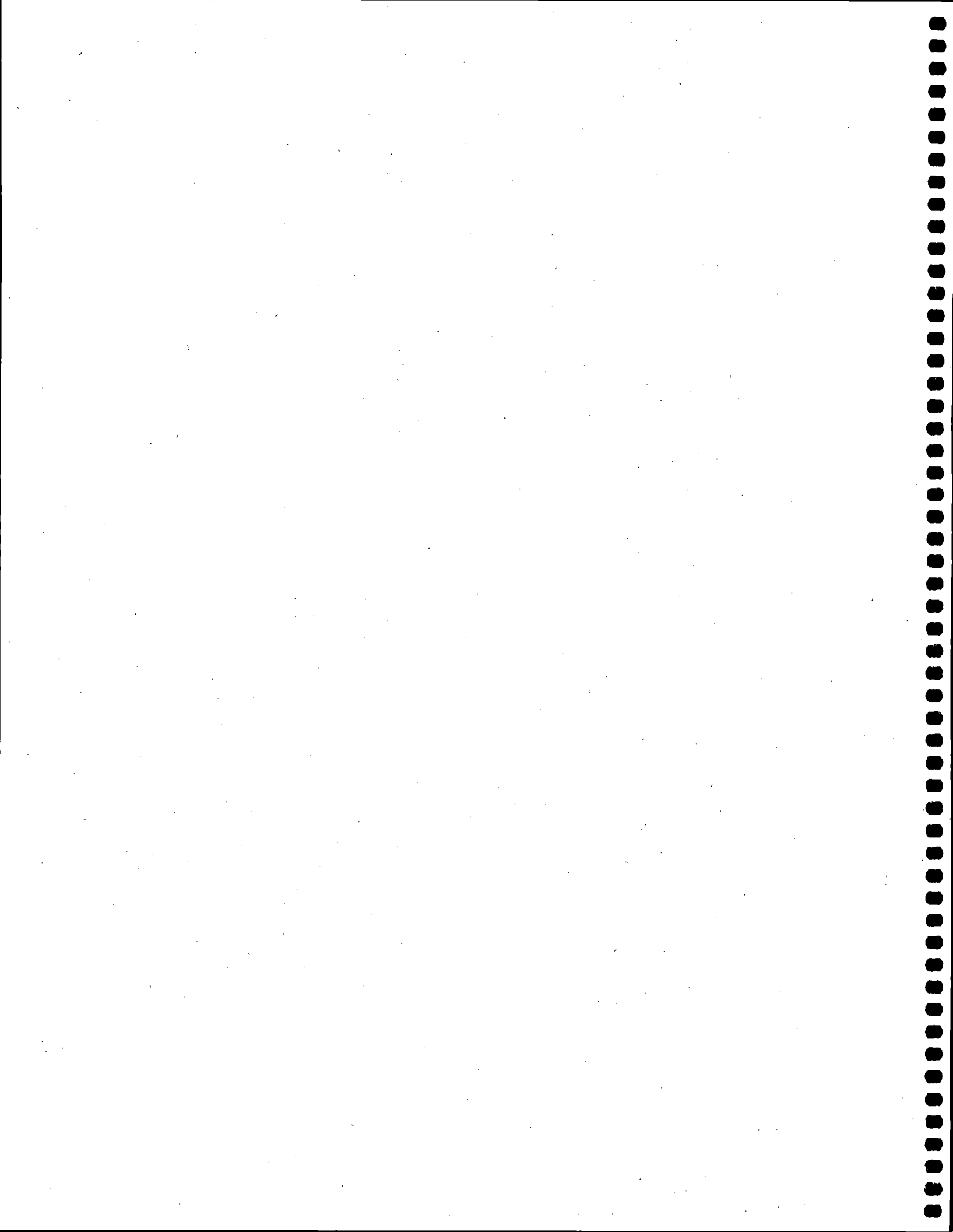
The Drive Clean program in Ontario underwent a major expansion in 2002 and now encompasses virtually all of southern Ontario. The Drive Clean program is the most comprehensive in the country, in that it combines both LDV and HDV mandatory emissions testing with a mobile Smog Patrol.

Nine of the provinces and territories now have a form of anti-tampering legislation. To enforce that legislation, Newfoundland, Prince Edward Island, Nova Scotia, and New Brunswick include an emissions control component inspection as part of their annual vehicle inspection requirement. Both Ontario and British Columbia include a visual inspection of the catalytic converter and the fuel inlet cap as a part of their I/M programs.

In an effort to increase public awareness in regard to potential pollution problems related to the emissions from in-use vehicles, in the last 3 years Environment Canada has greatly expanded the number of LET'S DRIVE GREEN voluntary vehicle inspection clinics that operate each year across the country.

To encourage energy conservation and to reduce emissions, NRCan has implemented several programs that sponsor in-use vehicle fuel efficiency initiatives across Canada. These programs are directed at both LDVs and HDVs, whether in fleets or privately operated.

Transport Canada, through its Urban Transportation Showcase Program, is funding showcase projects across the country that are designed to reduce individual vehicle use and to encourage the use of mass transit.



# 1. Introduction

Hundreds of studies conducted in countries around the world have demonstrated that the poor air quality that results from the burning of fossil fuels can have a profound impact on human health. While air quality is affected by a large number of air pollutants that are interacting synergistically, there are several common air pollutants that have been clearly and consistently linked to human health impacts (CAP 2004).

The fuels burned by motor vehicles contribute large quantities of greenhouse gases (GHGs), particularly carbon dioxide (CO<sub>2</sub>), as well as the ground-level ozone precursors oxides of nitrogen (NO<sub>x</sub>) and volatile organic compounds (VOCs) to the atmosphere. In addition, vehicle-mounted internal combustion engines emit carbon monoxide (CO) and other toxic compounds, plus the fuel burned in vehicle diesel engines produces emissions of particulate matter (PM) and acid aerosols.

Automobiles represent the single largest anthropogenic source of air pollution in Canada, releasing millions of tonnes of pollutants into the atmosphere annually. In an effort to reduce pollution levels for “new” vehicles, federal vehicle emissions regulations were first introduced in 1971. Over the years, these standards have been tightened and are now among the most stringent in the world (Martin et al. 2003).

Federal certification standards apply only to “new” light-duty vehicle (LDV) and heavy-duty vehicle (HDV) engines. In-use vehicle and engine emissions are the responsibility of the provincial/territorial governments. Once vehicles or engines are “in use” on the roads and highways, their systems are subject to deterioration. Deterioration results from the aging of components, a lack of maintenance, and deliberate tampering. This deterioration can lead to considerably higher tailpipe emissions. Many in-use vehicles have emissions in excess of their design standards.

Once sold, vehicle and engine maintenance are in the hands of the owner. A poorly maintained engine can use up to 50% more fuel and can produce 50% more GHG emissions than one that runs properly. Neglecting to replace worn or deteriorated components can result in poor engine performance, higher fuel consumption, engine damage, and excess emissions (Martin et al. 2003; NCE 2004).

The following statements illustrate why LDV and HDV emissions reduction programs are needed:

- On-road vehicles contribute up to 35 per cent of the emissions that are involved in smog formation and 18.5 per cent of Canada’s total greenhouse gas emissions. 10 to 15 per cent of Canada’s fleet are older pre-1988 or poorly maintained vehicles and generate up to 50 per cent of these total emissions. (Martin et al. 2003)
- Small particles, which are both directly emitted from diesel engines and formed from gaseous emissions, can lead to premature death and major respiratory problems. (CCME 2003)

- Cars are a major contributor to air pollution and greenhouse gas emissions, older cars being the worst culprits. A car 13 years or older can emit up to 30 times more air pollutants and 10% more greenhouse gas than a new car. (CAF 2004)
- A recent study of Canadian driving habits and behaviour suggests that in the peak of winter, we voluntarily idle our vehicles for a combined total of more than 75 million minutes a day. This is equal to one vehicle idling for 144 years. Even in summer, we idle more than 46 million minutes a day — equal to one vehicle idling for 89 years. (STEER 2004)

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Jurisdictions across Canada are currently using a variety of in-use vehicle emissions reduction tools and programs in an attempt to limit the excess emissions from the internal combustion engines installed in vehicles operating in urban areas or to reduce vehicle use. A number of statements gleaned from the publications of a number of agencies across the country indicate the concerns in regard to in-use vehicle emissions:

- *Ontario Medical Association*: Smog is the term given to the chemical “soup” that is produced by photochemical reactions between nitrogen oxides and volatile organic compounds on hot, humid days. The main components of smog in eastern North America are elevated concentrations of ground-level ozone and particulates. Together, these contaminants combine to give southern Ontario, or more precisely the Windsor–Quebec corridor, the worst air quality problems in Canada. Other problem areas are the Lower Fraser Valley, B.C. and the South Atlantic provinces region. (MacPhail 2004)
- *Association québécoise de lutte contre la pollution atmosphérique (AQLPA)*: Every year the 4.4 million motorized vehicles on Quebec’s roads [emit] over 14 million tons of pollutants into the atmosphere. Automobiles and trucks produce 38% of all greenhouse gases emitted in the province. (AQLPA 2004)
- *British Columbia AirCare I/M Program*: The emission inventory for the Lower Fraser Valley shows that light-duty vehicles continue to account for more of the total smog-forming emissions released into the region’s air than heavy-duty trucks, aircraft and rail combined. Therefore, Canada’s first LDV I/M [inspection and maintenance] program continues to operate in the Lower Fraser Valley. (Stewart et al. 2001)
- *Northern Climate ExChange, Northern Research Institute, Yukon College*: On average, personal transportation accounts for 50% of our personal greenhouse gas production. One city bus filled with 40 passengers can take 40 vehicles off the road and keep about 50 tonnes of GHGs out of the atmosphere each year. (NCE 2004)
- *The Pollution Probe SMART Movement Manual*: Almost 350,000 car trips are made into downtown Toronto every day, a 150% increase in inbound traffic in the last 15 years. (Pollution Probe 2004)
- *STEER Project in St. John’s*: The average car [emits] over twice its weight in carbon dioxide into the air each year. This carbon dioxide contributes directly to smog, acid rain, and global warming. Winds and weather patterns can move the pollution over hundreds of kilometres to many cities and towns, including St. John’s. (STEER 2004)



The inspection and maintenance (I/M) program is an example of one of the tools that is employed in both Ontario and British Columbia. For LDVs, emissions reduction programs also include the provincial/territorial emissions control component inspections that are integrated with safety inspections and the LET'S DRIVE GREEN voluntary vehicle inspection clinics operated annually across the country by Environment Canada in cooperation with and with the assistance of a variety of groups, including municipal, provincial, and territorial governments, environmental non-government organizations, and educational institutions.

Examples of emissions-related inspection programs for HDVs include the HDV portion of the Ontario government's I/M program plus the HDV roadside emissions spot checks in both British Columbia and Ontario.

The federal government has no authority over vehicles once they are on the road. Consequently, federal programs that deal with the in-use fleet are volunteer programs and focus on increasing awareness related to vehicle fuel efficiency, emissions, maintenance, tampering, and alternative forms of transportation. The federal government also worked with the Canadian Council of Ministers of the Environment (CCME), the provinces and territories, and other stakeholders to develop codes of practice for LDV and HDV emission I/M programs (CCME 1998, 2003).

The purpose of this study is to review the experiences of Canadian jurisdictions in the application of I/M programs and other in-use vehicle emissions reduction programs that are designed to improve the environmental performance of motor vehicles and engines or to reduce their use.

For various jurisdictions across the country, programs designed to improve the environmental performance of in-use vehicles have been identified and brief histories have been provided. The programs identified include anti-tampering legislation and enforcement, I/M programs, inspections as part of periodic safety checks, scrappage programs, idle reduction legislation and campaigns, HDV retrofit programs, commuter programs, and public awareness programs.

## **2. Types of In-Use Vehicle Emissions Reduction Programs**

This chapter provides a brief, generic description of the in-use vehicle emissions reduction programs, policies, laws, and campaigns that are, or that have been, employed in Canada by various levels of government. The assignment of categories has been largely arbitrary, and some of the programs listed may be offshoots or minor variations of others. In addition, no attempt has been made to rank programs in terms of effectiveness or cost. Specific programs are listed and discussed by province/territory in chapter 4. Summary tables are provided in chapter 6.

### **2.1 In-Use Vehicle Inspection Clinics**

Where permanent inspection programs are not in place, agencies can employ temporary in-use vehicle inspection clinics as a public awareness tool and to gather data on in-use vehicles.

Environment Canada, with the cooperation and participation of the provinces and territories, has been operating in-use vehicle inspection clinics across the country since the mid-1980s (see section 5.1.1).

### **2.2 Anti-tampering Inspection Programs**

Excess in-use vehicle emissions can result from neglect or from deliberate tampering with emissions controls and associated systems. In 2002, the tampering related to vehicle emissions control systems was defined as follows:

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Tampering is to remove (permanently or temporarily), bypass, defeat or render inoperative, in whole or in part, any emissions control system that is installed on or in a motor vehicle or to modify the vehicle in any way so as to increase the vehicle's emissions. (Burelle 2002)

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#### **2.2.1 Anti-tampering Legislation**

An enforcement program that is designed to detect tampering and to reduce its effects should be backed by legislation. The legislation usually contains penalty provisions that require the affected vehicles to be repaired and the tampering reversed.

In the United States, the federal government has implemented anti-tampering legislation related to in-use vehicle emissions. In Canada, in-use vehicles are under provincial/territorial jurisdiction; therefore, in order to address the tampering problem, provinces/territories must establish legislation and enforcement related to in-use vehicle emissions control system tampering. The status of provincial and territorial legislation is illustrated in Table 6.3. Additional discussion related to each province/territory may be found in chapter 4.

#### **2.2.2 Anti-tampering Enforcement Programs**

Anti-tampering enforcement programs are designed to detect tampering with the emissions control systems originally installed on vehicles or engines. There are a number of techniques for enforcing anti-tampering legislation. Visual anti-tampering inspections for selected components

are a part of Canada's two current I/M programs, but the most common technique employed in Canada is to include an emissions control component inspection as part of a periodic, usually annual, safety check and/or an inspection on resale.

#### **2.2.2.1 Anti-tampering Enforcement as Part of an I/M Program**

The two provinces that currently operate emissions-related I/M programs in Canada, Ontario and British Columbia, both include a visual inspection of the fuel inlet cap and the catalytic converter as part of their program.

#### **2.2.2.2 Anti-tampering Enforcement as Part of a Safety Inspection Program**

If a jurisdiction has a regular safety inspection requirement for on-road vehicles, it is normal for it to include some provision for a visual inspection of certain emissions control components.

The four Atlantic provinces require annual safety inspections for LDVs and/or HDVs, and all claim that they include an examination of some emissions control components as part of that inspection. However, none of these provinces appears to compile records of those inspections, and the number of incidents of tampering and the corrective actions taken are not known (see chapter 4).

#### **2.2.2.3 Inspection on Vehicle Resale**

An anti-tampering enforcement program may be included as part of the legislated resale requirements for in-use vehicles. For this type of enforcement program, the vehicle involved in the resale must undergo and pass a visual emissions control component inspection before it can be licensed by the new owner for road use.

### **2.3 Inspection and Maintenance (I/M) Programs**

An I/M program, which is a mandatory, periodic emissions test and inspection of on-road vehicles supported by a well-policed repair program, is an effective technique for reducing excess in-use vehicle emissions.

British Columbia began its I/M program, AirCare, in 1992 (see section 4.10.2), and Ontario opened its Drive Clean program in 1999 (see section 4.6.2). An HDV I/M program is to open in Quebec in the fall of 2005 (see section 4.5.2).

In order to support I/M program development and to achieve a measure of uniformity across the country, the CCME developed codes of practice for both LDV and HDV I/M programs:

- Environmental Code of Practice for Light-Duty Motor Vehicle Emission Inspection and Maintenance Programs (CCME 1998); and
- Environmental Code of Practice for On-Road Heavy-Duty Vehicle Emission Inspection and Maintenance Programs (CCME 2003).

I/M programs are described in greater detail in chapter 3.

## 2.4 On-Road Emissions Inspection Programs

A mobile on-road (or roadside) emissions inspection program can be used as a stand-alone enforcement tool or to complement another vehicle emissions reduction program, such as an I/M program. These on-road inspection programs may feature mobile units that are equipped to perform one or more roadside emissions tests and/or inspections, or they may involve observers who order vehicles with visible smoke emissions to inspection stations. Remote sensing devices (RSDs) can also be used as roadside emissions inspection tools.

An emissions control component visual inspection may be added relatively easily to an existing mobile safety inspection program.

## 2.5 HDV Retrofit and Rebuild Programs

In Canada, emissions standards for new HDV engines have been made stricter on a number of occasions since 1987. Unfortunately, the life span of most HDVs and HDV engines is so long that it can take a long time for the impact of new emissions standards to significantly reduce overall fleet emissions. Older HDVs may also have their engines rebuilt to further prolong their useful life. In recent years, retrofit devices for reducing the emissions from older-technology HDVs, particularly diesel-fuelled HDVs, have been perfected and have become readily available.

Both the U.S. Environmental Protection Agency (EPA) and the California Air Resources Board (CARB) have verification programs for HDV retrofit devices and systems. The EPA has a generic verification protocol for diesel exhaust catalysts (DECs), particulate filters, and engine modification control technologies for highway- and non-road-use diesel engines:

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Retrofit mobile source control technologies are principally exhaust treatment emissions control devices and engine modifications. Some require no mechanical changes to engines, while others will involve some modification of the engine or its control system.

Filters for particulate matter (PM) control and diesel exhaust catalysts (DECs) may make use of or require some integration with engines. Engine modifications, in the context of this protocol, refer to pollution reduction technologies integral to the engine or the engine control systems. All these technologies have the potential to affect engine performance, and the concurrence of the engine manufacturer that the changes are compatible with safe, efficient, and reliable operation in the engine is an important element in demonstrating commercial readiness and suitability for Environmental Technology Verification.

Selective Catalytic Reduction (SCR) nitrogen oxides (NO<sub>x</sub>) control technologies, fuels, fuel additives, reformulated fuels, and lubricants are specifically excluded from consideration under this protocol for testing as retrofit emissions control devices. Protocols for these technologies may be developed in the future. (EPA 2004)

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While mandatory HDV retrofit programs have been implemented in the United States, the preferred approach in Canada has been the use of voluntary measures. A number of voluntary retrofit programs have been started in various parts of the country. The most recent is a bus retrofit program that is funded by Environment Canada and overseen by the Canadian Urban Transit Association (CUTA) (see section 5.1.2.2).

Retrofit devices may be described by a variety of names. A DEC may also be labelled by a manufacturer as a diesel oxidation catalyst (DOC), catalyzed converter muffler, catalyst muffler, and/or catalytic exhaust muffler. A catalytic muffler has been described as a DOC within an exhaust muffler. The EPA provides the following description of these retrofit devices:

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DECs are defined as devices made of active catalyst material (often containing precious metal) deposited on a support medium. The engine exhaust passes through the device, where the pollutants catalytically react and more environmentally acceptable reaction products are exhausted. Particulate matter (PM) filters (or diesel particulate filters or DPFs) mechanically trap PM emissions and subsequently oxidize them. Filters may also employ a catalyst for gaseous emissions control and to enhance the oxidation of the collected PM.

Physically, DECs and PM filters have the general appearance of a large muffler and are placed in the engine exhaust at approximately the same location. They are therefore well suited to retrofit applications. No external liquid or gaseous reactants are required for them to function.

DECs have been reported to decrease HC [hydrocarbon] and CO emissions by over 50%. They decrease PM emissions by about 20%. PM filters have been reported to decrease PM and HC emissions by 80% or more and to decrease CO at about the level achieved by exhaust catalysts. NOx emissions may be decreased slightly by exhaust catalysts. (EPA 2004)

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## 2.6 Scrappage Programs

In recent years, vehicle scrappage programs have been implemented in a number of communities to accelerate the removal of older, high-polluting vehicles from the roads and thereby to accelerate the reduction of emissions from the in-use vehicle fleet. These programs offer incentives to owners to encourage them to replace their older vehicles with newer, low-emission vehicles or to use a cleaner form of transportation, such as public transportation, bicycling, or walking (EC 2004).

The main goals of LDV scrappage programs are (EC 2004):

- to improve air quality in Canada;
- to accelerate the permanent removal of older, high-emitting on-road vehicles from operation; and
- to replace these older, high-emitting vehicles with cleaner forms of transportation.

The vehicle recycling process can have numerous environmental benefits, since 76% of an average automobile's content by weight can be recycled. Vehicle reutilization usually comprises three features (CAF 2004):

- *pretreatment*: drainage of the automobile's operating fluids;
- *parts reuse*: dismantling of the automobile's parts and components; and
- *recycling*: recycling of materials.

Vehicles brought in through these programs are recycled according to provincial/territorial environmental guidelines. These include draining the vehicle's fluids and recycling the tires and

batteries before the remaining vehicle is recycled for scrap metal. The recovery of mercury switches is also ongoing in many municipalities (see section 2.11.1).

The scrappage programs that operate (or that have operated) across the country have a common theme: the removal of older, high-polluting vehicles from the roads. However, there are variations in these programs. One variation is the age of the vehicles that are accepted into the program, and another is the type of incentives that are offered to owners to induce them to participate. A third difference is whether the scrappage program allows the wrecking yards that accept the vehicles to resell any of the parts that they recover from the scrapped vehicles.

One can judge the effectiveness of a scrappage program by assembling statistics regarding the number of vehicles scrapped and incentives awarded. These can then be compared with the data from scrappage programs in communities of a similar size. Some scrappage programs have attempted to judge their effectiveness by calculating emissions reductions. However, how does one calculate emissions reductions, since one does not know how often or for how long the vehicle that was scrapped would have been driven had it stayed on the road? Also, overall emissions reductions can vary depending upon the type or mode of transportation that the vehicle owner chooses to replace the scrapped vehicle.

Until 2004, the techniques used to produce emissions reduction estimates for the scrappage programs across Canada varied. However, Environment Canada recently commissioned the development of the National Old Vehicle Retirement Assessment Program (NOVRAP), a universal computer program for estimating emissions reductions from scrappage programs.

NOVRAP has the following features:

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The purpose of this project is to create a methodology and a computer program that will quantify the emissions benefits of existing and future vehicle retirement programs in Canada. The method has been standardized and is flexible to each scrappage program's available data. The program can also make use of all the data that [are] available for a specific program.

The NOVRAP program:

- Accepts data input regarding the retired vehicle and the replacement travel choices, and with reference to an internal matrix of emission data and various defaults, calculates the emission reduction benefits from each retirement, and
  - It outputs a summary of the retired vehicles and of the replacement travel choices, and the total emission reduction benefit achieved. (NOVRAP 2004)
- 

In order to assess the effectiveness of the programs it sponsors, Environment Canada will input 2003 and later scrappage data into NOVRAP. From 2004 onward, all new Environment Canada-funded scrappage program agreements will make it mandatory for the administrators to use NOVRAP to estimate emissions reductions (EC 2004).

## 2.7 Idle Reduction Programs

When motor vehicles are left running while parked or stopped, they produce pollution that contributes to problems such as climate change and smog. Unfortunately, many vehicles are left idling unnecessarily for prolonged periods. It has been found that (NRCan 2004):

- unnecessary idling for more than 10 seconds wastes money and damages the environment;
- unnecessary idling costs Canadians millions of dollars every year; and
- idling is not an effective way to warm up a vehicle, even in cold weather, and excessive idling can actually damage a vehicle engine.

Studies have assessed costs and impacts associated with excess idling:

- It has been estimated that 3% of Ontario's fuel is wasted by idling (CAP 2004).
- An idling diesel engine will burn about 2.5 litres per hour, and an idling gasoline engine will burn about 3.5 litres per hour (CAP 2004).
- Ten seconds of idling uses more fuel than turning off and restarting the engine (CAP 2004).
- According to estimates by the Argonne National Laboratory, about 20 million barrels of diesel fuel are consumed by idling long-haul trucks each year. (ANL 2004).
- According to research conducted by Natural Resources Canada (NRCan), idling a vehicle for 10 minutes a day uses an average of 100 litres of gas a year. If gas costs 70 cents a litre, a driver would save \$70 per year just by turning off his or her engine (NRCan 2004).

Therefore, programs to control or reduce unnecessary idling can reduce emissions.

### 2.7.1 Idling Control Bylaws

A number of communities across the country have enacted bylaws that in some form address the issue of excess idling. These idle control bylaws are intended to reduce unnecessary idling within city limits. A typical idle control bylaw will limit idling to no more than 3 minutes in a given 60-minute period. However, these bylaws usually allow transit vehicles to idle when picking up or discharging passengers and also allow limited idling when transit vehicles are waiting for passengers (CAP 2004).

Note that any vehicle emissions reduction program that requires a vehicle to idle during the emissions test may have to apply for an exemption from a municipality's idle control bylaw in order to operate its program within the law.

### 2.7.2 Fleet Idle Control Policy

Fleet operators and managers can develop idle control policies for the vehicles under their control. Idle control policies can apply to both commercial and government-owned fleets. For example, in Ontario:

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Burlington is piloting an idling control policy that applies to all municipal employees driving city vehicles or their own vehicles while conducting business, limiting their idling to three minutes or less. (CAP 2004) [See section 4.6.5.3]

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### **2.7.3 School Bus No-Idle Policy**

Unnecessary vehicle idling often occurs in and around schools, where school buses and parents' vehicles are frequently left running while waiting to pick up children. The New Brunswick Lung Association indicated to school officials in the province that there is a need to reduce idling time for school buses, since (NB Lung 2004):

- School bus emissions are linked to a dramatic rise in asthma and other chronic respiratory illnesses among children.
- According to one U.S. study, children breathe school bus exhaust about 180 hours a year.
- Bus drivers have high exposure due to the longer time they spend on buses.

In regard to the school buses, many excuses for excess idling have been forwarded. The areas of concern, or the reasons given for not shutting off stationary buses or otherwise reducing idling time, include (NB Lung 2004):

- the need for having safety lights on while the children boarded the buses;
- the drivers' ability to easily restart their buses (especially in cold weather);
- concern that the drivers' windows would fog up; and
- children getting cold if the bus and its heating system were not on.

However, the New Brunswick Lung Association, through intelligent discussion and experiment, addressed these issues, and the concerns were alleviated (NB Lung 2004):

- It was established that the bus safety lights should be able to run off the battery for the relatively short period of time that the bus is waiting.
- If buses are well maintained, there should not be a problem starting them after a waiting time.
- Experiments indicated that the windows at the front of the bus, those most important to the driver, did not usually steam up during a short (5–10 minutes) waiting time.
- Students are usually dressed for the winter weather, so there should not be a problem related to them getting cold.
- If the school bus drivers had a concern with the cold, they could come into the school lobby areas to stay warm while they were waiting.

The New Brunswick Lung Association, as the result of its successful Healthy School Program, has seen 10 school districts in the province implement no-idling school bus policies (see section 4.4.4.1).

### **2.7.4 Idle Reduction Campaigns**

In order to make drivers aware of the environmental and economic impacts of excess idling, communities and organizations can initiate anti-idling or idle reduction campaigns in their areas of influence. A number of these campaigns have been conducted in Canada (see chapter 4). Section 5.2.2 contains information on NRCan's Idle-Free Zone program.



## 2.7.5 Engine Idle Limiters

A proactive technique for reducing the idle time for fleet vehicles is to install devices that will limit the total idle time. These devices can be programmed to shut a vehicle engine off after a set period of idling:

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The main benefits of Engine Idle Limiters are substantial reductions in vehicle/equipment idling, and lower maintenance costs, fuel consumption, and emissions. (Brampton 2004)

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At least one community in Ontario has installed Engine Idle Limiters on a number of its fleet vehicles (see section 4.6.5.5).

## 2.7.6 Silent Witness — Idle Monitoring Computers

The Transportation Division of the Yukon government began an anti-idle campaign in 2000, by monitoring truck idle time through the use of “Silent Witness” computers installed in fleet vehicles (see section 4.11.2.2).

## 2.8 Driver Education Programs

One technique for reducing in-use vehicle emissions is to better train motorists as to how to efficiently operate their vehicles. The training applies to both private and commercial drivers operating both LDVs and HDVs. For example, Alberta Transportation recently worked with the Alberta Motor Association to develop a fuel-efficient driver-training program (CCC 2004).

On its Internet site, the Canadian Automobile Association (CAA) provides access to a number of articles and fact sheets on driver education and reducing vehicle emissions (CAA 2004):

- Climate Change: We’re All Part of the Solution!;
- Fuel-Efficient Driving Helps Prevent Climate Change;
- Transportation Options for a Cleaner Environment;
- Future Fuels and Technologies Hold Promise of Cleaner Transportation;
- Driving for Fuel Efficiency, Safety and a Clean Environment;
- Keeping Your Vehicle Running “Lean and Green”; and
- New Technologies for Today and Tomorrow.

NRCan offers a number of driver education programs, including the FleetSmart Program and the SmartDriver Workshops for commercial vehicle operators (sections 5.2.1 and 5.2.5, respectively) and a number of programs for the general public under its Personal Vehicles Initiative (section 5.2.3).

The federal government (under the guidance of NRCan) has operated the Be Tire Smart campaign since 2003 (section 5.3.3.1.).

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The federal government launched the “Be Tire Smart” campaign in fall 2003. This campaign is a national public outreach and education initiative designed to encourage Canadian motorists to adopt proper tire inflation and maintenance practices in order to improve the fuel efficiency of their vehicles and prolong tire life, both of which save energy and reduce emissions that contribute to climate change. (TC 2004)

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## **2.9 Programs to Reduce Vehicle Usage**

On average, personal transportation accounts for 50% of our personal GHG production. One city bus filled with 40 passengers can take 40 vehicles off the road and keep about 50 tonnes of GHGs out of the atmosphere each year (NCE 2004).

One very obvious way to reduce in-use vehicle emissions is to reduce the amount of personal vehicle usage. In general, this means reducing the use of single-occupant LDVs. A number of techniques have been employed to discourage single-occupant vehicle use and to make the alternatives more attractive.

### **2.9.1 Carpool Matching Programs**

The use of “carpools” has been encouraged by municipalities worldwide for decades. To assist commuters in establishing carpools, a number of organizations have established “carpool matching” services. These services allow individuals who wish to carpool to contact others who have similar ideas. Two national carpool matching services are discussed in this section. Carpool matching services that apply to specific municipalities are discussed in chapter 4.

#### **2.9.1.1 CarpoolTool**

CarpoolTool is advertised as “Canada’s free carpooling service,” which allows people to get into a carpool anywhere in Canada. The CarpoolTool Internet site claims to allow users to find matching commuters by simply (CarpoolTool 2004):

- entering a Canadian postal code for your home and work;
- searching for matching commuters with adjustable search options; and
- emailing matching commuters to suggest a carpool.

#### **2.9.1.2 Commuter Connections**

Commuter Connections in British Columbia is designed (CC 2004):

- to actively promote the development of rideshare programs;
- to promote the responsible use of automobiles by individuals; and
- to raise public awareness of the environmental and economic benefits of rideshare programs.

Commuter Connections began in 1992 by developing employer-based rideshare programs for provincial ministries, Crown corporations, and post-secondary institutions. In January 2000, Commuter Connections received funding from the Climate Change Action Fund to establish the first Internet carpooling site in Canada. The Commuter Connections Internet site states that it has 6639 people registered for “potential” participation in carpools (CC 2004).

### **2.9.2 Commuter-Related Programs**

In addition to the carpool matching services discussed in section 2.9.1, there are a number of other techniques that are being used to reduce vehicle use or to improve commuter services.

### 2.9.2.1 Commuter Challenge

The Go for Green organization established the Commuter Challenge as a friendly competition between Canadian communities to encourage as many people as possible to use sustainable and active modes of transportation during Environment Week — May 30 to June 5, 2004 (Go Green 2004).

In 2004, over 60 000 participants in 128 communities and municipalities across Canada committed to walk, cycle, in-line skate, bus, telework, or carpool to and from work as a way to improve air quality and reduce the risk of climate change. In 2004, five cities were crowned winners of the Commuter Challenge that took place from May 30 to June 5. The winners in each of the population ranges were as follows (Go Green 2004):

| Population base   | Winning city            | Number of participants |
|-------------------|-------------------------|------------------------|
| 1 million or more | National Capital Region | 17 472                 |
| 500 000 – 999 999 | Winnipeg                | 12 692                 |
| 100 000 – 499 999 | Central Okanagan        | 7 716                  |
| 50 000 – 99 999   | Nanaimo                 | 4 893                  |
| Under 50 000      | Whitehorse              | 339                    |

### 2.9.2.2 Car Free Day

In Canada, the Car Free Day program is an initiative of the Sierra Club that is now championed by a wide variety of groups in communities across the country. The main focus of Car Free Day is to encourage and explore alternative forms of transportation and travel other than the use of the private car. In addition, Car Free Day helps to raise awareness and inform residents about the long-term environmental effects of smog and air pollution. One feature of Car Free Day in most communities is the closing of a number of streets to motorized vehicles (Car Free Day 2004).

Car Free Day began in Canada on September 22, 2001, when Toronto became the first city in North America to officially host a Car Free Day. Hamilton and Victoria joined Toronto in 2002. In 2002, over 1400 cities in 38 countries staged a Car Free Day. In September 2003, Canadian events were held in Kitchener, Montreal, Ottawa, Toronto, and Victoria.

### 2.9.3 Car-Sharing Programs

The concept of car-sharing programs has been described as “time-sharing” a car. According to the organizers of one such program, car-sharing is:

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A means of having access to a car when needed, without the burden of ownership, maintenance, insurance, etc. Members pay a small annual or monthly administration fee to cover administrative costs; when a car is used, a low hourly and kilometre trip fee is charged.

For the **Environment**, it means you are using a car only when you **need** to use a car. This means you will drive less, and do so in a very well-maintained car. This helps to improve air quality and eliminates some non-point sources of pollution. (VRTUCAR 2004)

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Cities with car-sharing programs in Canada include (CSN 2004):

- Calgary, Alberta — CATCO;
- Edmonton, Alberta — Carsharing Co-operative;
- Guelph, Ontario;
- Kingston, Ontario;
- Kitchener/Waterloo, Ontario — Peoples' Car Co-op;
- Nelson, B.C. — Nelson Carshare Co-op;
- Ottawa, Ontario — VRTUCAR;
- Quebec City, Montreal, Sherbrooke, and Gatineau, Quebec — under the CommunAuto program;
- Toronto, Ontario — Autosshare;
- Vancouver, Tofino, Nanaimo, and Whistler, B.C. — Cooperative Auto Network; and
- Victoria, B.C. — Victoria Carshare Co-op.

It is reported that Commonweal Carshare Ltd., which once offered cars in the Halifax area, is no longer available (TRAX 2004).

There is also a car-sharing system in Europe, and there are programs operating in over 40 cities across the United States (CSN 2004; VRTUCAR 2004).

Many of the car-sharing programs have similar operating parameters. One example is the car-sharing program in the Ottawa area, VRTUCAR:

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- VRTUCAR is easy to use — cars are booked with a simple phone call.
  - You can reserve a car by the hour, for up to 24 hours, or [as] little as you need.
  - Each member has access to cars 24 hours a day.
  - Members pick up the car and drop it off at the agreed time. The cars are parked conveniently near members' homes or places of work.
  - A trip log in the car is filled out after each trip to track time and distance and to note if any maintenance is required.
  - A monthly itemized bill of your car use is provided, just like a telephone bill.
  - Fuel costs are included! Members refill the gas tank if it falls below "1/2," but with receipt attached, are given a credit on the next monthly invoice.
  - VRTUCAR handles all administration, financing, insurance, maintenance, and vehicle parking.
  - VRTUCAR is your complete mobility service — members also receive discounts through VRTUCAR's partners when renting cars (for special vehicles, longer trips and vacations). VRTUCAR is an OC Transpo ECO PASS vendor.
  - At this time, due to insurance requirements, you must be 25 years of age to join. (VRTUCAR 2004)
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The criteria for becoming a member of VRTUCAR include:

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1. "G" Class Licence
  2. 2 or fewer moving violations within the last 3 years.
  3. No at-fault accidents in the previous 3 years.
  4. No criminal code convictions under the Motor Vehicles Act (DWI, etc).
-

5. Due to insurance requirements, you must be 25 years old. (VRTUCAR 2004)

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In addition to a fee to join, the VRTUCAR system has a rate chart of graduated fees depending upon how frequently a member plans to use the vehicle: Plan A — Frequent, Plan B — Regular, and Plan C — Occasional. Each plan has a different per year or per month fee and a per hour plus per kilometre vehicle use fee (VRTUCAR 2004).

### 2.9.4 Active & Safe Routes to School

Active & Safe Routes to School (A&SRTS) is a national program to encourage the use of active modes of transportation to and from school. Nationally, the A&SRTS program is coordinated by Go for Green. A&SRTS initiatives include (Go Green 2004):

- Walking School Bus, for young children with adult supervision for safety and traffic awareness; and
- Biking School Bus, for older children with adult supervision and a focus on bike safety.

The Walking School Bus initiative encourages parents to organize a walking school bus instead of driving the children to school. The Biking School Bus initiative suggests a similar exercise for older children that involves riding bicycles to school (NCE 2004).

Across Canada, the A&SRTS program is promoted and coordinated by a variety of organizations in each province and territory (NCE 2004):

- *Alberta*: SHAPE (Safe, Healthy, People, Everywhere) Sport and Recreation Branch (Government of Alberta);
- *British Columbia*: Way to Go!, funded by Autoplan Broker Road Safety Program;
- *Manitoba*: Resource Conservation Manitoba;
- *New Brunswick*: Sport, Recreation and Active Living Branch of the Sport & Culture Secretariat (Government of New Brunswick);
- *Newfoundland and Labrador*: Department of Tourism, Culture and Recreation (Government of Newfoundland and Labrador) and the City of St. John's;
- *Northwest Territories*: Sport, Recreation and Youth Division of Municipal and Community Affairs (Government of the Northwest Territories);
- *Nova Scotia*: Ecology Action Centre and the Nova Scotia Sport and Recreation Commission (Government of Nova Scotia);
- *Nunavut*: Recreation and Leisure Division (Government of Nunavut);
- *Ontario*: Greenest City (as of December 1, 2003, Green Communities Association);
- *Prince Edward Island*: Sport and Recreation Division of the Department of Community and Cultural Affairs (Government of Prince Edward Island);
- *Quebec*: Kino-Québec and Vélo-Québec;
- *Saskatchewan*: Saskatchewan Culture, Youth & Recreation Department (Government of Saskatchewan); and
- *Yukon*: Sport and Recreation Unit (Government of Yukon), Recreation and Parks Association of the Yukon.

### **2.9.4.1 International Walk to School Day and Week**

In Canada, the International Walk to School Day event, which was launched in Chicago in 1997, is coordinated nationally by the Go for Green organization, in Ontario by Greenest City, and in British Columbia by the Way to Go! School Program. Go for Green coordinated the event in 2004 for the fourth year, and the event is a component of the national A&SRTS program (Go Green 2004).

The event, designed to promote safety, health, physical activity, and concern for the environment, began in Canada in 1998, when an estimated 16 000 students from 100 schools across five provinces participated. The first International Walk to School Day was in 2000.

On October 8, 2003, students from over 1900 schools in every Canadian province and territory were joined by millions of students, parents, teachers, and community leaders around the world as they walked to school. The countries participating in this event (28 in total) included Canada, the United States, Mexico, Great Britain, Ireland, France, Spain, Sweden, Denmark, Germany, Italy, India, Australia, and New Zealand.

In 2004, International Walk to School Day was on October 6, and International Walk to School Week ran from October 4 to 8.

### **2.9.5 Improvements to Public Transit Systems**

It is generally accepted that one way to reduce overall vehicle emissions is to reduce single-occupant vehicle usage and to encourage the use of public transit systems in an urban environment. One way to encourage greater use of a public transit system is to improve the service provided by the system. Another way to reduce emissions in an urban airshed is to reduce the emissions produced by the public transit vehicles themselves.

Many communities across Canada are engaged in projects that would do both: increase public transit ridership and reduce public transit vehicle emissions. Many of these projects have received funding from Transport Canada (see section 5.3).

## **2.10 Awareness and Outreach Campaigns**

Increasing a motorist's awareness as to the problems caused by and related to in-use vehicle emissions is an important step in any program that is designed to reduce vehicle emissions. Awareness campaigns and outreach programs help to educate vehicle drivers in regard to the unnecessary damage that they may be doing to the environment and to the steps that they may take to reduce emissions. While awareness campaigns are usually directed towards the general motoring public, individual companies can also help reduce emissions by educating their employees.

### **2.10.1 Public Awareness and Outreach Campaigns**

A well-informed public is key to the success of any vehicle emissions reduction program.

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However, although most vehicle owners accept that their driving contributes to air pollution, it is sometimes difficult for them to understand that their own vehicle can make a difference. (Stewart et al. 2001)

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Therefore, it is important to inform the public, both those driving private vehicles and commercial drivers, as to how their actions, in relation to how they use, maintain, and operate their vehicle, can reduce emissions and improve the environment.

All vehicle emissions reduction programs will, to a greater or lesser degree, increase public awareness, and public awareness campaigns and outreach programs are used by various organizations to attempt to boost public interest in the environment. For example, the Canadian Petroleum Products Institute (CPPI) referred to its 2-week idle reduction program in Mississauga as an anti-idling public awareness campaign (see section 4.6.5.2.2) (CPPI 2002).

Environment Canada's "LET'S DRIVE GREEN" voluntary in-use vehicle inspection clinics, held across the country every year, are also an example of a public awareness campaign (see section 5.1.1).

Depending upon the resources available to agencies, public awareness campaigns may be "one shot" efforts, or they may be conducted on a regular basis. For example, the AirCare I/M program in British Columbia conducts an annual awareness campaign to provide information to the public regarding the program:

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This campaign generally runs from June through to September and focuses public attention on the importance of clean air to our health and environment. The AirCare program and its partners announced the winners of a 2004 AirCare AirWaves Radio Scholarship Contest as part of this campaign. (AirCare 2004)

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As part of this awareness program, AirCare also regularly sends out press releases to keep stakeholders, the media, and the public up to date on general AirCare information. They also provide the AirCare E-news, a monthly newsletter created to keep business partners and the general public up to date on AirCare and vehicle emissions-related issues (AirCare 2004).

In Ontario, to increase public awareness, the Drive Clean I/M program maintains an interactive Internet site plus a call centre that features a province-wide toll-free number (see section 4.6.2).

Transport Canada provides funding via the Moving On Sustainable Transportation (MOST) program to support projects that produce and distribute education and awareness information related to transportation issues (see section 5.3.4).

Pollution Probe's "Clean Air Campaign" is an example of a public awareness campaign designed to encourage the use of mass transit (see section 4.6.6.8).

The methods and techniques available for forwarding a message regarding vehicle emission reductions or to promote a program are many and varied. Examples of techniques that have been used during idle reduction campaigns are presented in section 4.6.5.2.

In the modern era, one of the most powerful tools available to agencies wishing to implement a campaign to increase public awareness in regard to the benefits of in-use vehicle emissions

reductions is the Internet. One example of a public awareness campaign via the Internet is found on Environment Canada's Atlantic Region Internet site, which advertises:

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Our automobiles are major contributors to smog, acid rain and global warming. Drive only when necessary: walk, cycle, or use public transit instead. If you drive, arrange a car pool [—] every additional passenger means one less vehicle on the road. (EC 2004)

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### **2.10.1.1 A System for Public Reporting**

One method for encouraging the public to become involved in a program for reducing in-use vehicle emissions is to provide a system for the public to report what they perceive or view as polluting vehicles on local roadways.

This technique, sometimes unkindly referred to as a "snitch line" or a "rat fink" telephone line, can be thought of as an enforcement technique for public awareness campaigns. The AirCare program in Vancouver and the Lower Mainland of British Columbia operates such a system (see section 4.10.6.2), as does the Drive Clean program in Ontario (see section 4.6.9.2).

### **2.10.2 Employee Awareness and Outreach Programs**

Many environmentally responsible companies have developed and implemented in-use vehicle emissions reduction awareness campaigns for their employees. For example, for the Idle Reduction Programs discussed in section 2.7, many of the companies involved, particularly the transit companies, held anti-idling briefings for their drivers.

In April 2004, the Canadian Vehicle Manufacturers' Association (CVMA) reported that member companies communicated to their 50 000 employees the important role that they can individually play in reducing emissions from personal transportation:

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Canada's largest automakers are leading by example and are each encouraging their thousands of employees on Earth Day to step up to Environment Canada's one tonne challenge and make an effort to reduce greenhouse gas emissions by using their vehicles wisely and conserving energy at home.... The message is simple — the more we drive, the more fuel is consumed and that means more greenhouse gases. (CVMA 2004)

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#### **2.10.2.1 S-M-A-R-T Movement Manual**

In 2001, Pollution Probe, with funding from the Government of Canada's Climate Change Action Fund, published the S-M-A-R-T Movement (Save Money and the Air by Reducing Trips) manual:

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The S-M-A-R-T Movement manual is a simple, clearly organized step-by-step resource that guides organizations in reducing employee car trips. (Pollution Probe 2004)

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## **2.11 Other Vehicle-Related Programs**

A number of other types of programs also relate to the reduction of in-use vehicle emissions.



### **2.11.1 Mercury Switch Removal Programs**

Most of the LDVs on the road today contain mercury switches in hood and trunk courtesy lighting, and most of the vehicle scrappage programs in Canada now feature a mercury switch recovery program:

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Mercury is toxic and can accumulate in the tissue of living things. One gram of mercury (about the amount in one vehicle switch) could contaminate 1,000,000 litres of water beyond Health Canada's limit for safe drinking water (0.001 milligrams of mercury per litre) if it were fully diluted. Through the switch recovery program, mercury switches will be removed prior to scrapping the vehicle. This will help to prevent mercury from being released into the environment. (Cram 2003)

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#### **2.11.1.1 Clean Air Foundation Mercury Switch Out Program**

The Clean Air Foundation operates the Switch Out Program, which is designed to collect mercury switches from discarded motor vehicles:

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Switch Out works with over 200 automobile recyclers across Canada to collect highly-toxic mercury switches from end-of-life vehicles. This program is the largest of its kind in North America, targeting the 16 million mercury switches on the road today. (CAF 2004)

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In 2002, Switch Out removed close to 24 000 switches or 24 kg of mercury from old vehicles (CAF 2004).

### **2.11.2 Fuels, Fuel Policy, and Fuel Efficiency Programs**

There are a variety of methods and techniques related to the type of fuel used, fuel purchasing, and fuel consumption that can be employed by vehicle owners, fleets, and agencies in an effort to reduce in-use vehicle emissions. These techniques relate to both LDV and HDV fleets.

#### **2.11.2.1 Programs to Increase Fuel Efficiency**

Under its Motor Vehicle Fuel Efficiency Initiative, Transport Canada has a number of programs that are designed to improve or increase the fuel efficiency of in-use vehicles (section 5.3.3). These programs are to support a government objective:

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The Government of Canada has renewed its commitment to working with automotive manufacturers to develop a new fleet efficiency goal. The government's objective is to improve light-duty vehicle fuel efficiency by 25 per cent by 2010. (TC 2004)

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Similarly, NRCan's FleetSmart Program, Personal Vehicles Initiative, and SmartDriver Workshops contain elements designed to educate vehicle operators in regard to techniques for reducing fuel consumption (see section 5.2). For example, the FleetSmart Program provides a Fuel Management 101 workshop for fleet managers (see section 5.2.1).

#### **2.11.2.2 HDV Weight Reduction Programs**

In Alberta, at least one trucking company that hauls logs has hired a trucking consultant to help keep the company's fleet of HDVs fuel efficient and to increase fuel efficiency. One technique it has used is to decrease overall truck weight:

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In the oversized world of heavy-haul trucking, [one operator] is proving that lighter is better. The Athabasca-based truck owner-operator has significantly reduced the weight of both his rig and fuel bill, while increasing the size of the loads of logs he hauls out of the northern Alberta bush. Five years ago, [the owner-operator] switched from the standard 15-litre engine to a 12-litre model, which has less displacement and horsepower without adversely affecting pulling power. He further lightened his eight-axle truck and trailer by converting to smaller tires, aluminum wheels, a shorter wheelbase, a single exhaust stack and a lighter rear trailer, which he designed himself. As a result of the above changes, his diesel fuel bill is about \$10,000 a year less than the average truck that hauls logs. (CCC 2004)

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### **2.11.2.3 Alternative Fuels Programs**

There are a number of alternatives to gasoline or diesel fuel. The NRCan Internet site contains information related to battery electric/hybrid systems, biodiesel, ethanol, fuel cells/hydrogen, natural gas, and propane, to name just a few (NRCan 2004).

There are programs that seek to reduce in-use vehicle emissions by encouraging the switch from conventional fuels to what are considered more “environmentally friendly” fuels. NRCan’s Natural Gas for Vehicles Program (section 5.2.4) is an example (NRCan 2004).

#### **2.11.2.3.1 E-Buses: A Pilot Project for Ethanol–Diesel or E-Diesel**

The Canadian Renewable Fuels Association (CRFA) promotes renewable fuels (ethanol, biodiesel) for automotive transportation through consumer awareness and liaison with government. At present, the CRFA is collaborating with several partners on a pilot project that will test ethanol–diesel (e-diesel), a renewable fuel technology, and related marketing strategies. The E-buses project involves a team of partners, including NRCan, Sunoco, and Octel Starreon, which will create the largest e-diesel project in the world. The project predicts that with e-diesel, vehicles will emit less GHGs (E-Buses 2004). This program will receive funding from Transport Canada’s MOST project (section 5.3.4).

### **2.11.2.4 Municipal Fuel-Purchasing Policies**

Municipalities can reduce the impact of in-use vehicle emissions by implementing fuel-purchasing policies for their vehicle fleets that specify the use of what are considered “environmentally friendlier” fuels. A study of fuel-purchasing programs (CAP 2004) looked at lowering emissions from three different categories of municipal vehicles:

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#### **Lowering Emissions from Gasoline Fuelled Vehicles**

Two approaches were examined for lowering emissions from gasoline fuelled vehicles:

- a) favouring gasoline with the lowest sulphur levels; and
- b) purchasing E10 (10% ethanol blended with 90% gasoline).

#### **Lowering Emissions from Off-Road Diesel Vehicles**

From a fuels perspective, the biggest air quality impacts can be achieved by shifting away from the use of off-road diesel fuel that contains between 1,300 and 3,700 ppm [parts per million] sulphur. The options considered ... include shifting to:

- a) conventional on-road diesel that contains 278 to 440 ppm sulphur;
- b) ultra low sulphur diesel (ULSD) that contains 15 ppm sulphur; and

- c) B20 (20% biodiesel with 80% on-road diesel) that contains up to 20% less sulphur than conventional on-road diesel.

**Lowering Emissions from On-Road Diesel Vehicles**

With on-road diesel fleets, the options considered ... include:

- a) Selecting conventional diesel with the lowest sulphur levels;
  - b) Retrofitting buses with catalytic exhaust mufflers (CEM);
  - c) Using ULSD in buses and/or the Corporate fleet;
  - d) Using ULSD & retrofitting buses with CEMs,
  - e) Using B20 in buses and/or in the Corporate fleet, and
  - f) Using B100 biodiesel in the Corporate fleet in summer months. (CAP 2004)
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At least three communities in Ontario have implemented fuel-purchasing policies such as noted above (section 4.6.7.1).

## **3. Inspection and Maintenance (I/M) Programs**

The purpose of an I/M program is to counterbalance the excess vehicle emissions that result from a lack of preventative maintenance or the failure of emissions control systems by identifying and repairing vehicles with emissions defects:

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If all vehicle owners conscientiously followed recommended service schedules, and repair facilities were diligent in checking for and correcting any problems found with the engine or emissions controls, there would be no need for an emissions inspection program. However, this is not the case in practice. Often, maintenance is deferred until a serious problem develops. Similarly, causes of high emissions are frequently overlooked as long as the engine has no noticeable performance deficiencies. (Stewart et al. 2001)

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### **3.1 Types and Styles of I/M Program**

Various I/M program types and styles are discussed in detail in the CCME LDV I/M Code of Practice and the accompanying background reports (CCME 1998).

No attempt has been made to rank the various types of I/M programs discussed in this chapter, and it is recognized that certain program types may be more applicable than others under specific regional parameters.

#### **3.1.1 Centralized, Decentralized, Hybrid**

There are three general types of I/M program: centralized, decentralized, and hybrid.

##### **3.1.1.1 Centralized**

A centralized type of I/M program usually comprises a small number of high-volume test-only facilities. The format recommended in the CCME Code of Practice calls for centralized test stations and decentralized certified repair facilities. One or more contractors build, staff, and operate the central test-only inspection stations, and private individuals or companies own and operate the decentralized certified repair facilities. A centralized I/M program, AirCare, is in operation in British Columbia (see section 4.10.2). The advantages of this style of I/M program include the following:

- Large-volume test-only facilities offer a fast throughput rate and hence shorter test time for the motoring public.
- The small number of test facilities simplifies the vital task of quality assurance and quality control (QA/QC) for the program administration.
- This style of I/M program separates the inspection portion of I/M from the repair or maintenance function.

##### **3.1.1.2 Decentralized**

For decentralized programs, a government agency usually contracts with a large number of privately owned garages or service centres to perform I/M tests at new or existing stations. These private certified garages are usually dispersed throughout the program area. The usual format is

for the private certified garages to both test vehicles and perform the necessary repairs on the vehicles that fail. The main advantages of this type of I/M system are as follows:

- New, large-scale test facilities need not be built.
- The program administration is not bound to a long-term contract to run test-only facilities.
- Motorists have a greater choice of more conveniently located test facilities. This style of program allows motorists to take their vehicles to their usual service centre or garage (provided it is certified by the administration).

### **3.1.1.3 Decentralized Hybrid**

While there are a number of possible combinations for hybrid I/M programs, the one envisioned here features a combination of decentralized certified test-only, test-and-repair, and repair-only garages and service centres. In general, the decentralized test-only inspection stations in this system will perform the same function as, but will be smaller than, those envisioned for a fully centralized program. However, the majority of the government-accredited or -certified stations in this style of hybrid program are usually test-and-repair stations that are allowed to both perform I/M tests and repair the vehicles that fail. A smaller number of private stations may choose not to install the equipment to perform the I/M tests but are certified as repair-only facilities and are allowed to repair vehicles that fail. A program similar to this, Drive Clean, is operating in Ontario.

The advantage of this type of hybrid I/M program is that it offers motorists a greater range of options or choices in regard to where to have their vehicles tested.

### **3.1.2 Test-Only, Test-and-Repair, Repair-Only**

These designators for I/M program style or facilities are self-explanatory. A “test-only” facility is only allowed to perform an I/M test. A “test-and-repair” facility, if accredited, is allowed to test vehicles; if the vehicles fail, the same facility can perform the repairs that are necessary in order for the vehicles to pass a retest. An accredited “repair-only” facility can repair vehicles that fail an I/M test, but is not allowed to (and likely does not have the equipment to) perform an I/M emissions test. While any garage or service centre (or individual) may perform repairs, in most I/M programs only repairs performed at facilities that are “accredited” or “certified” by the I/M program administration are eligible for a “conditional” pass if the vehicle fails a retest.

Test-only I/M programs were first introduced in the United States to attempt to avoid the conflict of interest problems that initially plagued decentralized test-and-repair I/M programs in that country. In test-only systems, the I/M companies/contractors involved in the program would usually be prohibited from any vehicle repair or maintenance-related activities associated with the I/M program, thereby eliminating any conflict of interest associated with the repairs.

## **3.2 Periodic Versus Random Testing**

The norm for an I/M program is to require the majority of vehicles in the local in-use fleet to undergo an emissions test on a periodic basis, usually either annually or every 2 years. An alternative is to randomly select vehicles for testing from a registration database. However, a

more common form of random testing is to select vehicles (either by observation or by remote sensing) as they drive along a road or highway (i.e., roadside testing).

### **3.3 Roadside Testing**

Two types of roadside emissions tests are currently employed in North America: pullover testing and remote sensing.

#### **3.3.1 Pullover Roadside Testing**

This type of system employs inspectors who intercept vehicles as they drive along roads and highways. Selected vehicles are ordered to pull over to the side of the road or into a designated area. The roadside test teams may be equipped with a mobile test facility that allows the team to perform some form of emissions test or a visual inspection. Another technique is for the roadside inspectors to make a more simplified visual assessment as to whether a vehicle is emitting visible smoke. Vehicles selected using the latter method are usually ordered to pull over and are subsequently sent to a test facility for further testing.

#### **3.3.2 Remote Sensing Roadside Testing**

For this type of system, a test-only function is achieved using RSDs positioned at strategic locations within an affected urban area. The RSDs may be emissions sensing devices or transponders that monitor vehicle on-board diagnostics (OBD) systems (if and when the latter are available). Vehicles that fail the RSD roadside test are usually “caught” or “captured” via a photograph of the licence plate. Subsequently, the owners of the vehicles that fail are required to take their vehicles for repair and retest at a certified garage or service centre.

The principal advantages of this style of program are that the RSDs can scan a large portion of the in-use fleet at a low per-test cost, and owners of vehicles that pass the RSD test suffer no inconvenience. RSDs can also be used to complement an existing I/M program by capturing high-emitting vehicles in the periods between regularly scheduled, periodic emissions inspections and/or as a program audit tool (CCME 1998).

### **3.4 Fleet-wide Testing and Vehicle Profiling**

The norm for I/M programs in Canada and the United States is for them to apply to all of the fleet of in-use vehicles in a particular area. While newer vehicles are often exempt, this style of I/M program normally applies fleet-wide.

Another technique is to employ “vehicle profiling.” An I/M program that applies this technique would select or otherwise limit the vehicles that require testing. This technique is used in one form or another in most I/M programs. As noted, newer vehicles, usually for the first few years after sale, are exempt, as are “kit cars” and antique vehicles. For example, the Ontario Drive Clean program limits LDV testing to vehicles beginning in the third calendar year after their model year, up to and including the 19th calendar year after their model year (see section 4.6.2.1).

The I/M administration must also design a system that will address the problems associated with the "capture" of vehicles that regularly commute through the designated I/M urban or suburban area but are not registered in that area (CCME 1998).

### **3.5 Component Inspections**

As noted in section 2.2, the usual method of enforcement for emissions control system anti-tampering legislation is some form of visual component inspection. One way to implement such a program is to include a visual component inspection as part of an I/M program test. Another is to add such a component inspection to an existing vehicle safety check program.

### **3.6 Emissions Testing**

The emissions testing portion of an I/M program may include one or more of the following: an idle test, a dynamometer test, remote sensing, one or more of several evaporative emissions tests, emissions control system function tests, plus smoke or opacity tests. These tests are described, as they are applied in provincial programs, in sections 4.6.2 and 4.10.2. Detailed descriptions of the various tests are available in several references (Cope 1994, 1997; CCME 1998, 2003).

### **3.7 Repair**

The importance of repair in an I/M program cannot be overemphasized. The purpose of an I/M program is not to test vehicles but to detect and ameliorate the causes of excess emissions. Vehicles that fail an I/M test must be repaired to reduce emissions or be otherwise removed from the fleet.

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The process of testing vehicles and failing excess emitters does not, in itself, produce any emissions benefit. In order to produce emission reductions, excess-emitting vehicles must be competently repaired. (Stewart et al. 2001)

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The repair or maintenance side of the I/M program is performed at a large number of private, independent local garages or service centres. In most I/M programs, these stations are accredited, certified, or otherwise licensed by the I/M administration. For an I/M program to be successful, the I/M administration must establish criteria for and certify both repair facilities and repair technicians (CCME 1998).

### **3.8 On-Board Diagnostics II (OBD II) Interrogations**

The OBD II information in this section was taken from a recent Environment Canada draft report (Cope 2004).

OBD II systems are designed to reduce in-use vehicle emissions by monitoring for failure and/or deterioration of the powertrain and its emissions control systems on an essentially continuous basis. The EPA defines OBD II as:

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A system of vehicle component and condition monitors controlled by a central, onboard computer running software designed to signal the motorist when conditions exist which could lead to a vehicle's exceeding its emission standards by 1.5 times the standard. (EPA 2001)

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Current OBD II systems monitor the status of up to 11 emissions control-related subsystems by performing either continuous or periodic functional tests of specific components and conditions:

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The three categories monitored on a "continuous" basis are misfire, fuel trim, and comprehensive components. The remaining eight subsystems are only monitored after a certain set of conditions have been met, or periodically. The algorithms for running these eight, "periodic" monitors are unique to each manufacturer and involve such things as ambient temperature as well as driving conditions. Most vehicles will have at least five of the eight monitors: catalyst, evaporative system or leak check, oxygen sensor, heated oxygen sensor, and exhaust gas recirculation (EGR) system. The final three systems are not necessarily applicable to all vehicles: air conditioning, secondary air, and a heated catalyst. (COPE 2004)

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OBD systems featuring OBD II software and hardware have been required on new vehicles sold in Canada since the 1998 model year (MY) (since the 1996 MY in the United States). Therefore, OBD II systems are not futuristic; they have been an integral part of new vehicle operating systems in this country for almost 7 years, 2 years longer in the United States.

Similarly, OBD II system interrogation has been used in LDV I/M programs in Canada and the United States for several years. In the United States, urban centres with serious ambient air pollution problems, so-called "enhanced" I/M program areas, are required by federal regulation to incorporate OBD II testing into their I/M programs (see Appendix B).

From an environmental perspective, the benefit of OBD II over previous OBD systems is that OBD II monitors and reports on the status of most of the systems in a vehicle that relate to emissions and emissions control. Not only are components related to exhaust emissions included in the overall OBD II package, but monitoring the fuel storage tank's ability to maintain pressure or vacuum (i.e., a type of leak check) allows the system to provide a measure of fuel tank evaporative emissions integrity.

Another great benefit of OBD II in regard to testing in an I/M program is that, when compared with most of the latest exhaust emissions tailpipe tests, OBD II testing is relatively simple. OBD II interrogation in an I/M program is not onerous, and the test hardware or instrumentation that is required to conduct an OBD II system interrogation is relatively inexpensive. Scanners for interrogating OBD II systems should be standard equipment in any modern repair facility.

While engine check lights have been installed on vehicles for a long time, the OBD II system malfunction indicator light (MIL) has a new standard application and importance. One of the prime objectives of OBD II is to alert the driver and/or the repair technician that there is a problem with one or more of the vehicle's systems. The first level of alert is achieved via the MIL. While the most common designation is MIL, this indicator has also been referred to as the check engine light and the service engine light.

When the OBD II computer detects a problem, it "sets" and stores a diagnostic trouble code (DTC) or fault code. When a car is taken in for diagnosis or for an annual emissions inspection, the repair technician retrieves any "set" DTCs or fault codes from a vehicle's computer using the "scan tool." There are now over 400 possible trouble codes that can be stored in the OBD II system.



Compared with a dynamometer-based exhaust emissions test, the equipment and the test procedures for an OBD II interrogation are rather simple. In general, there are two basic steps to the OBD test. With the "key on and the engine off," the MIL is checked to verify that the bulb is working. Next, a cable from a "scan tool" is attached to the on-board computer via the diagnostic link connector (DLC), and the scan tool "scans" the software and checks the OBD II system status.

OBD II systems monitor and report on the condition of vehicle emissions control systems. Therefore, as such, OBD II system interrogation has a place in, and should be a benefit to, a modern LDV emissions I/M program.

Experience to date has shown that OBD II systems work. While they are not trouble-free, in general, OBD II systems appear largely to operate as designed. Therefore, in respect to OBD II and OBD II testing in I/M programs, the principal issue is not whether OBD II tests should be employed, but how they should be used.

Regardless, I/M administrators should be aware that OBD II interrogation in an I/M program represents a major change in vehicle emissions control system evaluation and monitoring. Also, OBD II interrogations as a part of an I/M program have caused some controversy.

### **3.8.1 Issues: OBD II Tests in I/M Programs**

Although OBD II interrogation is now required to be included in I/M programs in the United States, there are concerns related to those checks or tests. These concerns relate to:

- the effectiveness of the "pollution prevention" approach of OBD II (this is one major difference between an OBD II interrogation and a tailpipe emissions test);
- evidence that indicates a lack of overlap in some of the vehicles that fail the traditional tailpipe test and those vehicles that fail an OBD II interrogation; and
- OBD II failure criteria that may lead to potentially high failure rates for aging vehicles equipped with OBD II (1996 MY and newer vehicles).

Another concern in regard to OBD II testing in I/M programs is the physical application of the OBD II test related to the operation of the MIL and the interpretation of the readiness monitor codes. Another issue in regard to the use of OBD II in I/M programs concerns possible difficulties in evaluating OBD II test program effectiveness.

In the United States, the EPA has confidence in both OBD and tailpipe testing as vehicle I/M tools, believing OBD to be the most efficient and effective approach to maintaining low emissions levels for the future fleet of vehicles (1996 MY and newer).

However, despite the EPA's strong support of OBD II testing and the penetration of that testing into I/M programs in the United States, at least one state, Colorado, disagrees. After experiencing problems related to the lack of overlap between OBD II and their IM240 test results, the state relegated OBD II testing back to a role of information gathering only. Colorado continues to compare the results of OBD II testing with IM240 tailpipe test results.

Similarly, in Ontario, the Drive Clean program's publicly stated position on OBD II testing is that the technology has not yet matured to the point where a tailpipe emissions test is not required.

The EPA and Ontario positions are examples of the two ends of the spectrum in regard to OBD II testing. However, both contain a certain bias. The EPA wishes to show support for the system that they have regulated into I/M programs, and the Ontario Drive Clean program wishes to support the continued use of dynamometer emissions tests in their decentralized I/M program.

Therefore, the question still remains: is an OBD II interrogation a replacement for a conventional I/M exhaust emissions test in an I/M program? Or conversely, why would it not be considered as a replacement for a tailpipe exhaust emissions test?

The major concerns in regard to OBD II test results appear to be the previously stated lack of total overlap with the previously favoured IM240 emissions test plus some evidence that appears to suggest that an OBD II check may miss certain high-emission vehicles.

However, from the evidence gathered, it appears that much of the lack of overlap that has been detected can be explained. Some lack of overlap is created by the major differences in the design and intent of the two systems, OBD II and the IM240 emissions test. Another portion of this perceived lack of overlap results from OBD II design or system faults attributed to certain vehicle makes and manufacturers. Other problems, such as the issue of high NOx emissions not being detected by OBD II catalyst monitors, are being corrected by the latest regulated changes to OBD II system design.

While additional testing, such as that under way in California, is required, the overall conclusion in regard to the lack of overlap is that the EPA believes in OBD II and its use in I/M programs. Recent test results also appear to indicate that the percentage of high-emission vehicles missed by OBD II systems may be low. Also, a number of the regulated changes to OBD II systems that will be required in the next few years should correct some of the problems that have been experienced to date.

While there are still a number of problems and anomalies related to the issue of tailpipe versus OBD II testing, data submitted by the EPA indicate that failure rates for tailpipe versus OBD II tests in I/M programs are similar. Evidence from ongoing studies and from I/M programs also indicates that perceived problems with OBD II testing may not be as serious as first suspected.

Therefore, it would appear, from the evidence available, that OBD II testing can be used in place of a tailpipe exhaust emissions test for 1998 MY and newer Canadian vehicles. However, this conclusion is not forwarded without some reservations. OBD II systems, like any other complex operating system, are not foolproof. Studies and experience have shown that there are problems with OBD II systems and the application of OBD II testing in I/M programs. In addition, OBD II systems are changing and evolving. The changes that will be incorporated into OBD II systems over the next few model years are designed to solve problems that have been encountered or to add new capabilities.

Therefore, while the general conclusion is that OBD II testing can replace an exhaust emissions test, any agency that adopts such a course of action should be aware of the existing problems and the impending changes. The EPA and CARB are continuing with a number of vehicle studies, and to work with vehicle manufacturers, in an effort to solve problems and anomalies with specific makes and models plus with OBD II systems in general.

The administration of an I/M program that adopts OBD II testing as a replacement for exhaust emissions testing should implement a comprehensive, well-supervised QA/QC program. It is also recommended that the I/M program administration liaise closely with the EPA and CARB regarding changes and developments in OBD II systems. The OBD II test program that is implemented should be flexible enough to adapt to changes in OBD II hardware and software specifications. The administration should ensure that scanners and associated hardware used by the inspectors and repair technicians in its I/M program can be upgraded, quickly and relatively inexpensively, to accept new OBD II specifications and codes as they become available.

The other major issue or question in regard to the application of OBD II interrogations in I/M programs in Canada is whether I/M programs should maintain or implement exhaust emissions tests for non-OBD II-equipped or older OBD II-equipped vehicles?

In the United States, the EPA's position is that traditional tailpipe I/M testing still plays an important role as the means of accurately identifying vehicles that need emissions-related repairs for 1995 MY and older vehicles (that would be 1997 MY and older vehicles in Canada). Overall, the EPA believes that both OBD and tailpipe testing remain important components of I/M programs (EPA 2002).

Currently, in the United States, while OBD II testing is the norm for 1996 MY and newer vehicles, the majority of I/M programs perform some type of tailpipe emissions test on 1995 MY and older non-OBD II-equipped vehicles (see Appendix B).

In regard to the design of I/M programs, one of the historic debates has focused on whether programs should test "newer" vehicles. The argument has been that if evidence shows that older vehicles with older technology are responsible for most of the excess emissions from in-use vehicles in a particular area, then why test newer-technology vehicles? While not all evidence supports this claim, a considerable amount does.

OBD II testing appears to be an ideal solution to this "newer" vehicle testing problem. OBD II provides a rather simple, and comparatively rapid, method for testing the "newer" (1998 MY and newer) vehicles in an I/M program. However, since evidence indicates that "older" vehicles cause much of the "excess" in-use vehicle emissions problem, it is unlikely that an I/M program would drop its tailpipe exhaust emissions test program for older vehicles. A dynamometer emissions test is one of the few proven methods for the detection of emissions problems in 1997 MY and older Canadian vehicles.

The EPA considers the OBD II test to be a replacement for the exhaust emissions tailpipe test for 1996 MY and newer vehicles. However, it also realizes that states that currently operate I/M

programs will need to continue tailpipe testing for 1995 MY and older vehicles for about 7–10 years, until the fleet “turns over” and OBD-equipped vehicles become predominant in the fleet.

Since both of the I/M programs currently operating in Canada test vehicles using a tailpipe emissions test, it would seem logical for them to retain those emissions tests for 1997 MY and older vehicles. However, the continued use of a tailpipe emissions test is a simpler decision for a decentralized than for a centralized I/M program. For a centralized test-only contractor-run program, since the number of vehicles that require a tailpipe emissions test would be drastically reduced if all 1998 MY and newer vehicles were excluded, will the volume of vehicles that remain be capable of sustaining the centralized emissions test-only system at a reasonable cost?

### **3.8.2 OBD Testing in I/M Programs in Canada**

In Vancouver over a decade ago, during the first phase of AirCare, the I/M program included the gathering of OBD information from vehicles so equipped. However, the lack of standardization of those first-generation OBD systems caused testing difficulties. For those early systems, it was often difficult to locate the DLC, and it was found to be impractical to attempt interrogation of the many different OBD systems. Largely for the reasons that OBD II was developed, these early OBD interrogations were dropped because they were too time-consuming and largely unrewarding from an emissions reduction standpoint.

As of January 1, 2001, the second phase of AirCare began OBD II interrogations on 1998 MY and newer vehicles. As of the date of publication, AirCare has accumulated data from close to 200 000 interrogations. However, to date, these OBD II data are gathered for information and advisory purposes only. AirCare is currently involved in an analysis of the various alternatives for the next stage of its I/M program. This analysis includes the possible use of the OBD II test for making pass/fail decisions in regard to the emissions worthiness of a vehicle (AirCare 2004).

The Drive Clean program in Ontario features a check of the MIL for 1998 MY and newer LDVs. If the MIL does not illuminate or stays on, the motorist is advised. Inspectors do not connect a scan tool to the vehicle’s OBD II system.

## 4. Provincial/Territorial, Regional, and Municipal Programs

An attempt has been made in this chapter to briefly describe the vehicle emissions reduction projects that operate (or have operated) in each province and territory.

### 4.1 Newfoundland and Labrador

#### 4.1.1 Anti-tampering Legislation and Enforcement

In Newfoundland and Labrador, the *Highway Traffic Act's* Licensing and Equipment Regulations contain anti-tampering provisions. Enforcement of anti-tampering was once the responsibility of the Environment and Conservation Department, but approximately 10 years ago the mandate was switched to the Government Services and Lands Department. In regard to motor vehicles, the *Highway Traffic Act* regulations contain the following general proviso (Burelle 2002; Newfoundland 2004):

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It is illegal to remove or modify equipment and equipment must be maintained. (Newfoundland 2004)

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The Government Services and Lands Department issues an Inspection Station Manual for its mandatory safety inspections. This manual is:

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Used as the basis for all inspections of light vehicles and commercial vehicles [over 4500 kg]. The manual requires the catalytic converter and the fuel evaporation control system to be functional for all vehicles from 1991 model year forward. (Newfoundland 2004)

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The province has a mandatory annual safety inspection for commercial HDVs. LDVs are inspected at transfer of ownership or on demand. Inspections are performed at approved private inspection stations. To pass the inspection, all items (including the catalytic converter and the fuel evaporative control system) must meet the specifications in the Inspection Station Manual. However, provincial officials report that (Newfoundland 2004):

- They do not monitor or collect data related to these inspections.
- They do conduct roadside inspection of commercial vehicles.
- They do not normally find problems with the catalytic converters or the fuel evaporation control systems on the trucks they check.
- On the very rare occasion that they find a problem, a warning ticket is issued.
- If a vehicle operator receives a warning, the equipment noted on the ticket must be replaced/repaired.
- They do not have data on these systems or the warning tickets issued.

The government of Newfoundland and Labrador participates in Environment Canada's LET'S DRIVE GREEN in-use vehicle emissions inspection clinics that are held in the province.

### **4.1.2 I/M Programs**

The Newfoundland and Labrador Environment and Conservation Department recently updated its Air Pollution Control Regulations in the *Environment Act*. The new provisions in the Act include standards for LDV exhaust emissions and the opacity of HDV exhaust. For both cases, there are no testing protocol or enforcement programs in place. However, the Environment and Conservation Department reports that it is currently working on a framework for the possible introduction of either mobile random or mandatory testing, likely for HDVs (Newfoundland 2004).

### **4.1.3 Idle Reduction Programs**

One idle reduction program is reported as operating in the St. John's area, and another is planned.

#### **4.1.3.1 Anti-idling School Zone Program**

In September 2004, the Lung Association of Newfoundland and Labrador began an Anti-idling School Zone Program in three areas (Newfoundland Lung 2004):

- Mount Pearl Intermediate in Mount Pearl (September 28);
- Villanova Junior High in Conception Bay South (September 29); and
- Baltimore School in Ferryland (September 30).

This program is similar to the projects that were developed and implemented by the New Brunswick Lung Association (section 4.4.4.1).

#### **4.1.3.2 STEER Idle Reduction and Awareness Project**

The STEER or "Smart Taxis Encouraging Environmental Respect" project is an environmental awareness and anti-idling initiative that involves taxis in St. John's. In the fall of 2003, members of the St. John's Taxi Industry partnered with the Newfoundland and Labrador Environment and Conservation Department, the City of St. John's, the Conservation Corps of Newfoundland and Labrador, and the Newfoundland and Labrador Environmental Industry Association to create a committee called STEER. Funded by NRCan, the committee has established the following goals:

- 
1. To develop, for the taxi industry, an education program outlining the issues surrounding greenhouse gas emissions; specific initiatives designed to reduce emissions; and the economic and environmental benefits of an awareness program to their operations
  2. To solicit voluntary participation of taxi industry members in the program
  3. To introduce the general public to the STEER Committee and our objectives and goals. This will create awareness about greenhouse gas emissions.
  4. [To] deliver an education program designed to inform the general public about greenhouse gas emissions, how they can participate in emissions reduction activities and the benefits of participating in these programs. (STEER 2004)
- 

The STEER project encourages members of the taxi industry in St. John's to become members of STEER and provides members with information related to (STEER 2004):

- climate change, cars, and human health;
- the benefits of reducing idling;
- maintenance and cost-saving tips;
- tips related to the benefits of maintaining correct tire pressure;
- driving tips; and
- helpful hints on how to control the costs of operating a vehicle and to minimize the emissions.

#### 4.1.4 HDV Retrofit Project

As discussed in section 5.1.2.2, in February 2004, Environment Canada initiated a transit bus retrofit agreement with the CUTA. The City of St. John's is participating in this project.

##### 4.1.4.1 St. John's Bus DOC Retrofit Project

St. John's Metro Transit will operate 12 buses that are retrofit with DOCs. These 12 buses will be fuelled with the diesel fuel that the company normally uses for its diesel buses.

This project is 1 of the 10 that are being overseen by CUTA and funded by Environment Canada. For additional details, see section 5.1.2.2.

**Table 4.1: St. John's Bus DOC Retrofit Project**

| Transit system           | City       | Quantity | Make | Model   | Engine | Engine year  |
|--------------------------|------------|----------|------|---------|--------|--------------|
| St. John's Metro Transit | St. John's | 12       | MCI  | Classic | 6V92   | 1991 to 1992 |

## 4.2 Prince Edward Island

### 4.2.1 Anti-tampering Legislation and Enforcement

Provincial legislation contains an anti-tampering provision related to the presence of the catalytic converter. The province requires both LDVs and HDVs to undergo an annual inspection. The regulation governing those inspections states that the catalytic converter is one of the components to be inspected annually (Burelle 2002; PEI 2004):

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All vehicles plated in PEI require a valid inspection to operate on the highway. Commercial vehicles (over 4,500 kg) require a valid inspection to operate on the highway in PEI regardless of where plated, i.e. an Ontario plated truck (over 4,500 kg) has to have a valid inspection certificate whereas an Ontario plated car does not. (PEI 2004)

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For the annual motor vehicle inspection program, provincial officials indicate that:

- 
- Ninety thousand inspections are conducted per year.
  - Approximately 200 garages and 400 mechanics have been licensed to perform inspections.
  - Mechanics receive training about the program.
  - Audits of garages and mechanics are done and complaints are followed up.
  - Periodic spot checks of garages and mechanics are done through roadside checks of commercial vehicles and by dropping in on garages unannounced. (Burelle 2002)
-

As part of the annual inspection program, inspectors check for the presence of catalytic converters on 1990 MY or newer vehicles (Burelle 2002; PEI 2004):

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The government of PEI does not record the number of vehicles that fail an inspection because of defective catalytic converters. However they do receive calls from vehicle owners asking why their vehicle failed inspection because of the catalytic converter. (PEI 2004)

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The government of Prince Edward Island also participates in Environment Canada's LET'S DRIVE GREEN in-use vehicle emissions inspection clinics that are held in the province.

## 4.3 Nova Scotia

### 4.3.1 Anti-tampering Legislation and Enforcement

In Nova Scotia, anti-tampering legislation is under the *Motor Vehicle Act* and is the responsibility of Service Nova Scotia and Municipal Relations. The anti-tampering clause under the Standards of Vehicle Equipment Regulations, pursuant to the *Motor Vehicle Act*, states that:

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No person shall remove or modify or allow to be removed or modified any equipment installed in a motor vehicle, of model year 1991 or later, to reduce or eliminate the emission of a contaminant into the environment or in the case of a motor vehicle equipped with a catalytic converter, modify or allow to be modified the opening of the fuel tank or pour leaded gasoline therein. (Nova Scotia 2004)

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A visual inspection of the emissions control components is required as part of an annual mandatory motor vehicle inspection. The department of Service Nova Scotia and Municipal Relations states that:

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Inspection mechanics ensure that pollution prevention devices are on all vehicles. If a mechanic finds that a system has been tampered with, the mechanic will reject the vehicle. If a mechanic finds that a system has been tampered with but he/she approves the vehicle anyway, the owner of the vehicle will be charged and the mechanic's licence will be taken away. (Nova Scotia 2004)

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Service Nova Scotia and Municipal Relations does not compile numbers related to emissions control component inspection failures, but the department does receive many calls regarding tampered vehicles (Nova Scotia 2004).

The government of Nova Scotia also participates in Environment Canada's LET'S DRIVE GREEN in-use vehicle emissions inspection clinics that are held in the province.

### 4.3.2 I/M Programs

In 2003, the Nova Scotia Department of Environment and Labour investigated in-use vehicle emissions I/M programs, but no program has been implemented to date (EC 2004).



### 4.3.3 Scrappage Programs

Since approximately 10% of the fleet of vehicles in Nova Scotia are pre-1987 MY, in 2001, Environment Canada commissioned a feasibility study for a scrappage program in Nova Scotia. The results of the 3-month study indicated significant interest in such a project and that a goal of scrapping 250 vehicles in the first year should be achievable.

The plan was for vehicles to be recycled through the Automobile Recycling Association of the Maritimes, and best recycling practices would be followed. The scrappage program was planned for implementation during the summer of 2003, but since insufficient partners were found to sponsor the program, it was never initiated (EC 2004).

### 4.3.4 Idle Reduction Programs

#### 4.3.4.1 Anti-idling Project of the Ecology Action Centre

From May 15 to August 6, 2002, the Ecology Action Centre conducted an idle reduction campaign in the Halifax area. The principal thrust of the campaign was directed towards motivating local fleet managers to implement programs to reduce idling in their fleets:

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Within the scope of this project, fleet managers and drivers were educated on the negative impacts of vehicle idling, and the best practices and solutions appropriate for tackling idling as an undesirable habit were implemented. (EAC 2002)

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Most of the private commercial fleet managers that were approached in regard to this anti-idling project did not wish to participate. However, four fleets in the Halifax area did cooperate and took part in the campaign. These four represent a combined vehicle fleet of approximately 1800 vehicles (EAC 2002):

- *Emergency Health Services – Emergency Medical Care:* Emergency Medical Care is a private sector firm responsible for the management of the Emergency Health Services ground ambulance service in Nova Scotia. Emergency Health Services uses a total of 140 vehicles to deliver services.
- *Halifax Regional Municipality Metro Transit:* This fleet comprises 148 buses, ranging in age from brand new to 30 years old.
- *Nova Scotia Department of Transportation and Public Works:* This department has a fleet of approximately 1300 vehicles distributed around the province. Most are concentrated at fleet bases in metro Halifax and other regional hubs.
- *Halifax Regional Municipality Shared Fleet Services:* The Shared Fleet Services division of the Halifax Regional Municipality provides fleet service and vehicle provision for the various Halifax Regional Municipality departments. The fleet consists of approximately 200 vehicles, ranging in size from light trucks to dump trucks and loaders.

In addition to the work with these four fleets, the Ecology Action Centre anti-idling project also included a Community Outreach program. The Community Outreach program included an Internet site, announcements in local business newsletters, a television interview during Clean

Air Week, and the distribution of anti-idling information and materials to groups and individuals interested in idle reduction (EAC 2002):

- Information packages consisting of 60 units of outreach material, 10 stickers, and three posters were distributed to four local driving schools.
- A fact sheet on idling was distributed to the approximately 340 drivers who participated in the Vehicle Emissions Testing Clinic in the Halifax Regional Municipality on May 22–23, 2002.
- Information leaflets were distributed to drivers.
- Information packages were mailed to the Bluenose Atlantic Coastal Action Program, serving the LaHave River region and the Atlantic Coastal Action Project, Cape Breton, located in Sydney.

The Ecology Action Centre reported that (EAC 2002):

- The provincial Department of Environment and Labour agreed to inform its workforce using Ecology Action Centre materials on the negative effects of vehicle idling.
- Many fleet managers and drivers were exposed to the ideas and messages of the anti-idling project, including 20–30 drivers and 15–20 managers who received impromptu or scheduled presentations.
- The idea of “training the trainers” or providing fleet managers with materials and information replaced the original scope of the project.
- The Community Outreach program was successful in getting the message out in a variety of forums and community media.

#### **4.3.4.2 Halifax Metro Transit — FleetSmart Program**

The Halifax Regional Municipality Metro Transit has implemented the NRCan FleetSmart Program (see section 5.2.1) and an anti-idling policy that emphasizes a 3- to 5-minute idling maximum.

Even though an idle reduction policy has been implemented by Halifax Metro Transit, it is reported that:

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Despite this laudable effort, numerous people have filed anecdotal evidence about excessive engine idling on the part of Transit drivers, particularly in the hot summer months when idling is superfluous. (EAC 2002)

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### **4.3.5 Programs to Reduce Vehicle Usage**

#### **4.3.5.1 Halifax — Integrated Bus Rapid Transit Project**

In an effort to improve its public transit system, the Halifax Regional Municipality has proposed the implementation of two rapid transit bus corridors and supporting measures to reduce GHG emissions from transportation across the region. This project has received funding under the Transport Canada Urban Transportation Showcase Program (UTSP) (see section 5.3.1).

The project would acquire 18–20 new low-floor hybrid buses, configured with bicycle racks, to provide the bus rapid transit service, and:

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This showcase would result in an estimated reduction in greenhouse gas emissions of 750 tonnes annually (accounting for peak period travel only). This reduction would arise principally from the shift of motorists from private vehicles to transit, cycling and carpooling. (TC 2004)

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### 4.3.6 HDV Retrofit Project

As discussed in section 5.1.2.2, in February 2004, Environment Canada initiated a transit bus retrofit agreement with CUTA.

#### 4.3.6.1 Halifax Bus DOC Retrofit Project

Halifax Metro Transit will operate five buses that are retrofit with DOCs. These five buses will be fuelled with the diesel fuel that the company normally uses for its diesel buses.

**Table 4.2: Halifax Bus DOC Retrofit Project**

| Transit system        | City    | Quantity | Make | Model   | Engine            | Engine year  |
|-----------------------|---------|----------|------|---------|-------------------|--------------|
| Halifax Metro Transit | Halifax | 5        | MCI  | Classic | Detroit 6V92 DDEC | 1991 to 1993 |

## 4.4 New Brunswick

### 4.4.1 Anti-tampering Legislation and Enforcement

Under its *Motor Vehicle Act*, New Brunswick has legislation for the inspection of vehicles that is related to tampering with emissions control systems.

Inspection of the emissions control devices is included as part of an annual safety inspection for LDVs (Burelle 2002).

The government of New Brunswick also participates in Environment Canada’s LET’S DRIVE GREEN in-use vehicle emissions inspection clinics that are held in the province.

### 4.4.2 Awareness Programs — HDV Diesel Emissions

Officials from the New Brunswick Department of the Environment and Local Government report that the department is currently an active member in the Diesel Emissions Working Group under the auspices of the New England Governors and Eastern Canadian Premiers. The Conference directs its Committee on the Environment to (New Brunswick 2004):

- pursue appropriate options to reduce diesel emissions;
- encourage the early introduction of cleaner diesel fuels in the region;
- promote anti-idling initiatives; and
- enhance public education regarding the benefits of diesel clean-up programs.

A working group under the New England Governors and Eastern Canadian Premiers is in the initial stages of preparing a report outlining current knowledge of diesel emissions, their major sources, options for emissions management and reduction, and effects on human health.

### **4.4.3 Scrappage Programs**

#### **4.4.3.1 Fredericton, Moncton, and Saint John Vehicle Scrappage Program**

The New Brunswick Lung Association conducted a pilot Vehicle Scrappage Program in the Greater Fredericton Area for 14 months from program launch on February 4, 2003, to March 31, 2004. The aim of the pilot program was to accelerate the removal of pre-1994 MY vehicles and encourage the use of less polluting means of transportation. The pilot project was also to act as the development stage for a broader-based initiative throughout the province, and the program was expanded into the Moncton and Saint John areas in the fall of 2004 (NB Lung 2004).

Initially, the program accepted only 1987 MY and older vehicles, but the criteria were changed in December 2003 to allow vehicles of 1993 MY or older (NB Lung 2004).

In order for a vehicle to qualify for the program (NB Lung 2004):

- The owner must reside in the Greater Fredericton, Moncton, or Saint John area and be the registered private owner of a 1993 or older car or LDV (not exceeding 2721 kg/6000 lbs.).
- The owner must not have received previous incentive from the program.
- There must be no outstanding liens or encumbrances on the vehicle.
- The vehicle must have been registered and insured in the designated areas for the previous 6 months.
- The vehicle must be roadworthy and have a valid motor vehicle inspection sticker.
- The vehicle must not be used for business or commercial activity.

The incentives offered by the Vehicle Scrappage Program include (NB Lung 2004):

- \$500 off a 1999 MY and newer car; or
- \$300 off a 1996–1998 MY car; or
- a one-year city transit pass; or
- a one-year family membership to the CAA and a free vehicle maintenance inspection.

NB Lung (2004) reports that:

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During the pilot program that operated in Fredericton in the 14 months ending March 31, 2004, a total of 91 vehicles were processed. (NB Lung 2004)

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With respect to the follow-up program in Fredericton:

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Since April 1, 2004, 61 applications have been processed.

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Following each approval, the vehicle owner has two months to turn in the vehicle. An updated list from the local scrap dealer will soon be published. (NB Lung 2004)

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#### **4.4.4 Idle Reduction Programs**

##### **4.4.4.1 Healthy School Program — Idle Reduction Policy**

The New Brunswick Lung Association has been working on idling initiatives with schools in the province for 5 years as part of its Healthy School Program. It initiated the idea of reducing idling times during meetings between school district transportation officials and the New Brunswick Lung Healthy School Steering Committee. As noted in section 2.7.3, concerns in regard to shutting off buses while waiting at schools were alleviated through intelligent discussion and experiment.

The New Brunswick Lung Association has a Healthy School video that addresses the idling issue, and it has prepared signage, vehicle stickers, and bookmarks with idling information available for distribution. As part of its Healthy School Program, the New Brunswick Lung Association addresses school bus driver meetings to explain health benefits, etc. The New Brunswick Lung Association reports that it has also addressed the parental vehicle idling issue, with mixed results.

A “no-idling for school buses” experiment with one school in the Saint John area worked so well that it was extended to the entire school district:

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This district [school district number 6] then brought in a no-idling policy, where there would be no idling during school pick-up in all but extreme cold weather (the transportation supervisor would decide on a case-by-case basis what was considered to be extremely cold weather). (NB Lung 2004)

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The New Brunswick Lung Association has worked with two other school districts, and the no-idling school bus program has been so successful that the association (NB Lung 2004):

- was notified by the head of transportation for the province that there are now 10 school districts in the province with no-idling school bus policies;
- has been contacted by the EPA about its program, and the EPA will be profiling this project in its school materials; and
- has been working with the Newfoundland Lung Association on a school bus idling program (see section 4.1.3.1).

#### **4.4.5 Programs to Reduce Vehicle Usage**

##### **4.4.5.1 Moncton — Looking Beyond the Immediate Program**

The City of Moncton has proposed five strategies to reduce GHG emissions from road and transit operations across the region. This project would reshape much of the local transit system while making the area’s major road system more efficient. The project would involve changes in public transit, road infrastructure, and traffic signals. It would also involve the acquisition of one

hybrid electric vehicle to transport downtown parking meter and enforcement crews and the implementation of an outreach program (TC 2004).

If approved, this program will receive funding from Transport Canada's UTSP and will include three strategic studies to support the development of a more sustainable future transportation system in Greater Moncton (see section 5.3.1):

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This showcase would result in an estimated reduction of 21,100 to 22,400 tonnes in annual greenhouse gas emissions by 2006. The estimated reductions from individual strategies are:

- Public transit — 500 to 600 tonnes
  - Road infrastructure — 700 to 800 tonnes
  - Traffic signal conversion and synchronization — 900 to 1,050 tonnes
  - Methane gas capture from landfill — 19,000 to 20,000 tonnes
  - Hybrid vehicle — 5 to 10 tonnes. (TC 2004)
- 

#### **4.4.5.2 Saint John — Park & Ride and Bike & Walk**

The City of Saint John, in partnership with the municipalities of Greater Saint John, proposes a range of strategies to enhance travel options and reduce GHG emissions from transportation across the community. If approved, this program will receive funding from Transport Canada's UTSP (see section 5.3.1):

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The showcase project would introduce new travel options to the community, generating transit demand where it is currently low. Suburban drivers would be attracted to transit through express routes, park-and-ride lots, rideshare programs and trails. Urban drivers would be attracted by transit service upgrades on selected routes.... This showcase would result in an estimated reduction in greenhouse gas emissions of 610 tonnes annually from peak period commuting travel. Increased transit ridership, carpooling, cycling and walking for other purposes, or at off-peak times, would lead to additional reductions. (TC 2004)

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## **4.5 Quebec**

### **4.5.1 Anti-tampering Legislation and Enforcement**

Quebec anti-tampering legislation is contained in the Règlement sur la qualité de l'atmosphère Q2, r20 (Regulation Respecting the Quality of the Atmosphere) articles 96.1 to 96.2'. This regulation came into force in 1985 and makes it illegal to remove or tamper with emissions control equipment.

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This regulation is currently under revision but no substantial changes to the anti-tampering articles are expected. (Quebec 2004)

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In addition, the projected regulation for an HDV I/M program (see section 4.5.2) contains specific HDV anti-tampering provisions.

At present, enforcement is limited to denunciations and complaints from citizens. The long-range plan is to eventually make anti-tampering enforcement part of an I/M program (Quebec 2004).

The government of Quebec also participates in Environment Canada's LET'S DRIVE GREEN in-use vehicle emissions inspection clinics that are held in the province.

#### **4.5.2 I/M Programs**

The province of Quebec states that it will implement an HDV I/M program and that it is studying LDV I/M programs (Quebec 2004).

##### **4.5.2.1 HDVs**

An I/M program targeting HDVs and based upon roadside inspections was approved by the Quebec Council of Ministers in March 2004. This roadside HDV inspection program is scheduled to begin in October 2005 (Quebec 2004).

The program will apply to HDVs with a "net weight" over 3000 kg, and the targeted territory for the program will be all of Quebec south of the 55th parallel. Inspectors will check HDV opacity levels using the SAE J1667 procedure at random checkpoints (EC 2004).

The HDV I/M plan predicts that it will result in a fleet-wide fuel consumption reduction in the order of 1% (Quebec 2004).

##### **4.5.2.2 LDVs**

While an I/M program for LDVs is in the Quebec government's long-range plan, the LDV I/M program is still under study (Quebec 2004).

#### **4.5.3 Scrappage Programs**

There are 2.2 million LDVs in the Montreal area, representing half of the Quebec total. It is estimated that 10%, or about 220 000, of the vehicles currently in use were built in 1988 or earlier.

##### **4.5.3.1 Scrap-an-Old-Car Pilot Project**

A pilot project (part of the Clear the Air! or Faites de l'air! project) for the voluntary retirement of older vehicles is operating in the Montreal area. The Clear the Air! project, administered by the AQLPA in association with Environment Canada, was launched in June 2003 (AQLPA 2004).

The project aims to convince vehicle owners to voluntarily retire at least 2000 vehicles. The compensation incentives for participating in the program include:

- a free membership to the AQLPA for 1 year; and
- a \$50 tax receipt from the Kidney Foundation of Canada.

The first 500 eligible participants will receive (AQLPA 2004):

- three 1-month public transportation transit passes (total value \$250); or
- a free vehicle inspection at Canadian Tire (total value \$80).

In addition, all participants have the chance to win a trip for two by train to Gaspé or one of several other vacations offered by Via Rail Canada.

While the vehicles that are scrapped as a part of this program are recycled, not all of the recovered parts can be resold. The auto parts not for resale include carbon filters, oxygen sensors, exhaust gas recirculation (EGR) valves, air pumps, catalytic converters, pressure detectors, injectors, cold detectors, spark plugs, wires, and mercury switches.

Phase 1 of this pilot project was limited to Montreal, but phase 2, which will begin soon, will expand to Quebec City (Quebec 2004).

To date, 108 older vehicles have been scrapped (Quebec 2004).

#### **4.5.4 Idle Reduction**

##### **4.5.4.1 Idle Control Bylaw — Montreal**

Since 1970 in Montreal, the idling of vehicles less than 60 m from an opening in a building is prohibited for a period in excess of 4 minutes, except when the motor is necessary for work outside the vehicle or to refrigerate food (CAP 2004; STOP 2004).

The bylaw was passed in response to public complaints about parked idling vehicles and the entry of exhaust into buildings and enclosed spaces (CAP 2004).

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The enforcement of the by-law is through complaints made by individuals or the police department to the City of Greater Montreal (ex-Montreal Urban Community) Environment Department. Air and Water Inspection staff report that by-law compliance and a reduction in unnecessary idling [have] been achieved through an educational approach to enforcement. Figures on the number of complaints normally dealt with on a monthly or annual basis were not available. (CAP 2004)

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##### **4.5.4.2 Quebec City Idle Reduction Program**

NRCan reports that it is currently negotiating to fund an idle reduction program in Quebec City (NRCan 2004).

#### **4.5.5 Programs to Reduce Vehicle Usage**

There are a number of projects under way or planned in Quebec that are designed to reduce vehicle usage and hence overall emissions.

##### **4.5.5.1 CommunAuto Car-Sharing Program**

Montreal is home to CommunAuto, a car-sharing firm with over 4500 regular users. The CommunAuto car-sharing program also operates in Quebec City, Sherbrooke, and Gatineau (CSN 2004).

The operating parameters for a typical car-sharing program are presented in section 2.9.3.



#### **4.5.5.2 Montreal — AMT — Electric Vehicles**

The Transport Canada UTSP is partially funding the Agence métropolitaine de transport (AMT) and its partners, who propose to demonstrate the potential of self-service electric cars and bicycles to reduce GHG emissions from transportation in the Montreal area. This program will be part of the Montreal CommunAuto car-sharing program (see sections 4.5.5.1 and 5.3.1).

The AMT proposes to expand the concept of car-sharing to include electric vehicles, public transit promotion, and the demonstration of advanced technologies (TC 2004).

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The [UTSP] showcase would make electric vehicles available to registered users in two general areas:

- In Montreal — almost 100 electric vehicles in 20 locations, and 50 electric bicycles in two locations
- In Saint-Jérôme — two or three electric vehicles and 10 low-speed vehicles with a top speed of 40 km/h....

This showcase would result in an estimated reduction in greenhouse gas emissions of 500 tonnes annually. Other benefits would include reduced emissions of other air pollutants, and increased transit usage. (TC 2004)

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#### **4.5.5.3 Montreal STM and Gatineau STO — Transit Projects**

The Société de transport de l'Outaouais (STO) and its partner, the Société de transport de Montréal (STM), propose a Transport Canada UTSP showcase that would demonstrate the ability of hybrid diesel-electric buses to reduce GHG emissions from transportation in Gatineau and Montreal (see section 5.3.1) (TC 2004).

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The showcase would run new hybrid diesel-electric buses on designated routes in Gatineau for two years. Twelve standard-length (12-metre) buses with hybrid engines would operate in the Gréber-Fournier-Maisonnette-Portage corridor that links a large suburban area to the downtown cores of Gatineau and Ottawa.... This showcase would result in an estimated reduction in greenhouse gas emissions of 2,100 tonnes annually. (TC 2004)

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#### **4.5.5.4 Quebec — Integrated Management of Travel in Old Quebec**

If it receives funding from the Transport Canada UTSP, the City of Quebec and Réseau de transport de la Capitale (the regional transit agency) project proposes the use of five strategies to strengthen transit service and intermodal connections in reducing GHG emissions from transportation in Old Quebec. The five strategies include eco-minibus routes, walking and cycling facilities, tour bus management, parking lot management, and regulation of truck traffic. This project would include reduced levels of air pollution, noise, and congestion arising from traffic reductions of 10% for cars and trucks and 60% or more for buses (see section 5.3.1) (TC 2004).

#### **4.5.6 HDV Retrofit Projects**

#### 4.5.6.1 Gatineau Catalytic Muffler Demonstration Project

In 2001 and 2002, the transit company (the STO) in Gatineau (formerly Hull) experimented with two different catalytic mufflers that were installed on two diesel transit buses. This was a cooperative study with Environment Canada (see section 5.1.2.1) (Cope 2003).

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The STO (the Société de transport de l'Outaouais) and Environment Canada studied the application of emissions control systems on public transit vehicles. The study concentrated on the effectiveness of installing catalytic mufflers on older buses. (Cope 2003)

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#### 4.5.6.2 Quebec City Bus DOC Retrofit Project

Réseau de transport de la Capitale in Quebec City will operate 20 buses that are retrofit with DOCs. These 20 buses will be fuelled with the diesel fuel that the company normally uses for its diesel buses.

This project is 1 of the 10 that are being overseen by CUTA and funded by Environment Canada. For additional details, see section 5.1.2.2.

**Table 4.3: Quebec City Bus DOC Retrofit Project**

| Transit system                     | City        | Quantity | Make | Model   | Engine | Engine year |
|------------------------------------|-------------|----------|------|---------|--------|-------------|
| Réseau de transport de la Capitale | Quebec City | 20       | MCI  | Classic | 6V92   | 1992        |

## 4.6 Ontario

### 4.6.1 Anti-tampering Legislation and Enforcement

Anti-tampering legislation is contained in the Ontario *Environmental Protection Act*. This legislation was in place prior to the implementation in 1999 of Drive Clean, the province's mandatory I/M program for LDVs and HDVs (see section 4.6.2).

Ontario Regulation 361/98, as amended, sets out the following standards and offences in regard to emissions control system tampering (Drive Clean 2004):

- Section 4 sets out special requirements for emissions control equipment for kit cars, rebuilt cars, and hot rods.
- Section 5 makes it an offence to remove, tamper with, or bypass a catalytic converter; to use leaded gasoline in a vehicle equipped with a catalytic converter; and to operate a vehicle that has been fuelled with leaded gasoline and the converter has not been replaced or repaired.
- Section 6.1 complements section 22(4) of the Act by setting out requirements for replacement or repair of emissions systems and components.
- Section 7 makes it an offence to operate a vehicle with emissions control systems or components that are not capable of performing the function for which they were intended.

In addition, the *Environmental Protection Act*, Part III, Motors and Motor Vehicles, sets out the following standards and offences with regards to anti-tampering (Drive Clean 2004):

- Sections 22(1) and (2) make it an offence to sell or advertise for sale a motor vehicle that does not comply with the regulations (Regulation 361/98).
- Sections 22(3) and (4) make it an offence to remove an emissions system or device from a vehicle, and these sections complement the regulation in setting out standards for replacement systems and devices.

Ontario uses two systems for enforcing its anti-tampering legislation (Drive Clean 2004):

- LDVs registered in a Drive Clean program area (see section 4.6.2) are required to have an emissions test every 2 years and at resale of the vehicle. HDVs require an annual emissions test. The Drive Clean test includes a pre-inspection check to ensure that the vehicle is equipped with a catalytic converter and a functioning fuel inlet cap. A vehicle will not be emissions tested if it does not have a catalytic converter (if originally equipped with a catalytic converter) or a fuel inlet cap. Drive Clean has nearly 2300 privately owned and operated accredited inspection facilities that are equipped to perform these inspections.
- Ontario also has a Smog Patrol (see section 4.6.3) that is responsible for roadside enforcement. The roadside program checks vehicles for signs of visible exhaust emissions and ensures that the emissions control components, as originally installed, are still installed and intact. For HDVs, inspection teams may also perform roadside tests and look for any by-passed components.

An under-hood, emissions control component visual inspection was performed at Drive Clean facilities until early 2003, when it was suspended. With respect to tampering, inspectors now check only for the catalytic converter and for fuel filler integrity.

Under-hood, emissions control component visual inspections were suspended in 2003 when it was determined that (Drive Clean 2004):

- While certified inspectors were performing the anti-tampering inspections at accredited facilities, these inspectors were not required to be licensed mechanics, and therefore some inspectors may have had little prior automotive or mechanical experience. Consequently, some Drive Clean inspectors were not able to easily identify many of the pollution control devices, given the variety and ages of the vehicles on Ontario's roads.
- Many of the newer vehicles were equipped with shrouds in the engine compartment that obscured the emissions control components. These shrouds were often difficult to remove, required special tools, could be damaged in the inspection, and could create a liability issue for the accredited Drive Clean facilities.
- The emissions test, as outlined in procedures, did not allow sufficient time for a thorough visual component inspection, particularly for these newer vehicles.
- There was no verification procedure to ensure that replacement parts were certified.

According to Drive Clean officials:

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For the reasons noted, it was difficult to ensure a high level of quality control for the under-hood, emissions control component visual inspections. Drive Clean data, related to the full anti-

tampering inspections, were found to be inconsistent. The inspection data were reviewed for the period when the emission component visual inspections were required and the information was not found to be useful. (Drive Clean 2004)

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The Drive Clean "Vehicle Inspection Report" still requires an entry for each type of component; however, the pass/fail decision now applies to the results of an exhaust emissions measurement and to the catalytic converter and fuel filler integrity checks.

Smog Patrol officials report that, in regard to the effectiveness of the inspections conducted by their mobile units:

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The Vehicle Emissions Enforcement Unit (VEEU) has proven to be very effective at identifying high emitting and tampered vehicles. Some of the signs that VEEU inspecting officers will look for are visible emissions, exhaust odour, modified vehicles and vehicles that appear to be in a state of disrepair.

- The VEEU has recently introduced the use of "Repair Orders" that can be used in conjunction with other enforcement tools to gain compliance. A "Repair Order" typically requires the repair or replacement of an emissions system or component and confirmation of the work completed within a given time frame.
- Other compliance tools used are Form 1's (orders to report for emission inspection), provincial offence tickets and summons and licence plate and vehicle permit seizures.

These enforcement activities, combined with the high visibility of the VEEU, deter the general public from tampering with or removing emission components. The VEEU also takes part in educational and outreach activities such as trade shows and the officers are available to the public to answer questions about vehicle emission requirements, standards and associated programs. (Drive Clean 2004)

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The government of Ontario also participates in Environment Canada's LET'S DRIVE GREEN in-use vehicle emissions inspection clinics that are held in the province.

#### **4.6.2 Ontario's Drive Clean I/M Program**

In November 1998, a new regulation under the *Environmental Protection Act* and *Highway Traffic Act* set the stage for Ontario's Drive Clean I/M program. The Drive Clean program tests tailpipe emissions from both LDVs and HDVs.

##### **4.6.2.1 LDVs — Drive Clean I/M Program**

For the Drive Clean program, an LDV is a vehicle that weighs 4500 kg or less, and Drive Clean began regular LDV emissions testing in April 1999. For LDVs, Drive Clean regulations require testing every 2 years for vehicles beginning in the third calendar year after their model year, up to and including the 19th calendar year after their model year. A pass certificate is required for resale and expires after 12 months.

In regard to area covered, the LDV program was implemented in three phases. The LDV program area was expanded in 2001 and again in 2002 and now covers the entire southern Ontario smog zone from Windsor to Ottawa.

In 2004, Drive Clean officials reported well over 6 million vehicles in the LDV program area, many of which have been tested two or more times. For additional information on the areas covered by the LDV portion of the Drive Clean program, see Appendix A (Drive Clean 2004).

Drive Clean features a decentralized system that comprises accredited test-only, test-and-repair, and repair-only stations. All three station types are privately owned and operated facilities. Accredited Drive Clean facility owners are obliged to comply with the terms of a performance contract and the standard operating procedures that were established to ensure consistent service throughout the program.

**Table 4.4: Drive Clean Light-Duty Vehicle Facilities (Drive Clean 2004)**

| Station type             | Number | Inspectors                    | Number |
|--------------------------|--------|-------------------------------|--------|
| Test-only stations       | 64     | Inspectors                    | 9 019  |
| Test-and-repair stations | 1 435  | Inspectors/repair technicians | 3 367  |
| Repair-only stations     | 241    | Repair technicians            | 663    |
| Total                    | 1 740  | Total                         | 13 049 |

In order to increase public awareness, Drive Clean makes program information accessible through a web site and the Drive Clean Call Centre (see section 4.6.9.1). Drive Clean also operates and maintains a public reporting system (see section 4.6.9.2) (Drive Clean 2004).

**Drive Clean LDV Program Features:**

- *Registration Renewal:* Most passenger cars, vans, light trucks and sport utility vehicles in the Drive Clean program areas must pass a Drive Clean test to renew the stickers on their licence plates.
- *A Repair Cost Limit:* The Repair Cost Limit (RCL) sets a maximum of \$450 that must be spent on emissions-related diagnostics and repairs (performed at an accredited Drive Clean repair facility), if a vehicle fails its Drive Clean test. This maximum applies throughout the Drive Clean LDV program areas. The RCL was set at \$200 for the first two years in each Drive Clean area. It increases to \$450 in the third year of program operation.
- *Conditional Pass:* A vehicle owner may obtain a Conditional Pass every two years for registration renewal purposes. However, a vehicle will have to meet the requirements for the Repair Cost Limit each and every time. A Conditional Pass cannot be used to license a re-sale vehicle for the road. This is an important consumer protection measure, since a Conditional Pass indicates that a vehicle has ongoing emissions system problems.
- *Testing at Accredited Drive Clean Facilities:* Accredited Drive Clean Facilities are privately operated automotive service centres that meet specific requirements for facility design, for approved equipment and for certified staff. These accredited facilities are subject to ongoing quality assurance and quality control checks.
- *Home Repairs and Non-accredited Repairs Allowed:* However, only vehicle repairs done by an accredited Drive Clean repair facility are eligible for the Repair Cost Limit and the Conditional Pass.
- *Dynamometer Emissions Test:* At an accredited Drive Clean facility, emissions tests are performed while an inspector drives the LDV on a dynamometer. Measurements are made for the concentration of NOx, HC (which includes volatile organic compounds), and CO. An Acceleration Simulation Mode (ASM) 2525 emissions test is employed and the vehicle is

accelerated to a steady speed of 40 km per hour. When the vehicle is returned to idle, the emissions are measured again, in what is called a "curb idle" test. The idle portion of the test measures HC and CO.

- *Visual Component Inspection:* As part of the overall test, the inspector also checks the upper portion of the fuel filler pipe for damage or corrosion. The inspector also performs a visual inspection of the catalytic converter.
- A Gas Cap Pressure Test is performed.
- *OBD II:* If the Malfunction Indicator Light (MIL) on the dashboard is burned out or stays illuminated in 1998 and newer model year vehicles, the owner will be advised that it may indicate a malfunction of one or more of the vehicle's emissions control systems. At present OBD II systems are not interrogated.
- *Other Emissions Tests:* Some vehicles, such as those with full-time all-wheel drive, cannot be tested on a dynamometer. These vehicles receive a two-speed idle test, where emissions of CO and HC are measured at curb idle and 2500 rpm.
- *Light-Duty Diesel Vehicles:* A diesel LDV is visually inspected for smoke emissions as the vehicle idles for five minutes. If more than five consecutive seconds of visible smoke is observed during any one-minute period, the vehicle will fail the emissions test.
- *Emissions Standards:* Test results are compared by a Drive Clean computer to emissions standards for the vehicle and its model year, with an allowance for vehicle deterioration. LDV emissions standards were made stricter as of January 1, 2003 and will become stricter still as of January 1, 2005.
- *Certain Vehicles Are Exempt:* All light-duty commercial farm vehicles and motorcycles are exempt from test requirements.
- *Rejections:* If a vehicle has a problem that would prevent it from being tested safely or releases visible smoke from the tailpipe, it will not be tested until it has been repaired. Such problems could lead to injury and/or malfunctioning of the test equipment.
- *Resale:* Vehicles also require testing for ownership transfer if they are older than the current model year (i.e. model 2003 and older in 2004). (Drive Clean 2004)

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As noted, the Drive Clean program has made improvements by tightening its emissions standards and improving emissions testing for LDVs (Drive Clean 2004):

- The LDV emissions standards were made 11.5% stricter on January 1, 2003.
- A further tightening of the initial LDV standards, by another 11.5%, is to be made on January 1, 2005.
- In 2002, Drive Clean test procedures were improved with the addition of a curb idle test to the standard LDV dynamometer test. This ensures that the vehicle meets emissions standards while it is idling, as well as when it is being driven on the dynamometer.

In order to show a lead to the public, each provincial government-owned LDV in the program area is tested annually rather than every 2 years.

#### **4.6.2.2 HDVs — Drive Clean I/M Program**

HDVs, which weigh 4501 kg or more, are included in the Drive Clean program, and it is reported that there are approximately 180 000 heavy-duty diesel vehicles registered in Ontario (Drive Clean 2004).

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#### **Drive Clean HDV Program Features:**

- *Annual Emissions Tests:* For registration renewal, annual emissions tests are required for heavy-duty diesel trucks and buses registered anywhere in Ontario.
- *Non-diesel HDVs:* HDVs powered by propane, natural gas or gasoline, registered in the southern Ontario smog zone, must also be tested.
- *New HDVs Exempt:* Tests are required for vehicles in the third calendar year after their model year (beginning with 2001 model years in 2004 and 2002 models in 2005).
- *No Maximum Age Limit:* For the HDVs covered by the program there is no maximum age limit, unlike the Drive Clean provisions for cars and light-duty trucks and vans, where the last test is the 19th calendar year after the model year.
- *No Repair Cost Limit:* There is no limit on repair costs. HDVs must be repaired, no matter what the cost, until they pass the test.
- *No Conditional Pass:* There is no Conditional Pass for HDVs.
- *Incentives:* Under new standards introduced in 2004 and effective January 1, 2005, if a diesel HDV passes a new voluntary, stricter opacity standard, it may qualify for an exemption from its next test and follow a biennial test cycle similar to LDVs. This system promotes better maintenance by offering an incentive. The 20% opacity standard incentive will encourage good vehicle maintenance, since heavy-duty diesel vehicle operators will be eligible to have their vehicles tested every two years instead of annually if their vehicle meets the 20% or less opacity reading.
- *Testing at Accredited Drive Clean Facilities:* Vehicles must be tested at Drive Clean facilities or by Drive Clean mobile units that are accredited by the Ministry of the Environment for HDV emissions tests.
- *Resale:* Vehicles also require testing for ownership transfer if they are older than the current model year (i.e. model 2003 and older in 2004).
- *Diesel Emissions Test:* The particulate matter in the emissions of diesel vehicles is measured in accordance with the Society of Automotive Engineers Standard "Snap Acceleration Smoke Test Procedure for Heavy-Duty Diesel-Powered Vehicles" (SAE J1667). The test measures opacity, the amount of light that is blocked by the smoke.
- *Non-diesel Trucks and Buses (powered by gasoline, propane or natural gas):* Must pass a two-speed idle test in which carbon monoxide and hydrocarbons are measured at two pre-determined idle speeds.
- *Data Transmission:* At the accredited Drive Clean facilities, the emissions testing equipment that stores the emissions test data are periodically connected to a central computer to download accumulated test results. For mobile test units, data are transmitted every few days.
- *Motor Homes:* The new emissions standards will apply to large diesel motor homes that require HDV tests. However, since these vehicles are only tested every two years, the new voluntary HDV emissions incentive standard will not apply to them. (Drive Clean 2004)

As noted, the province has introduced new opacity standards for diesel HDVs.

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New, tighter emissions standards for diesel HDVs, reported to be the toughest in North America, were introduced in 2004. The standards will be implemented in two stages, the first stage on April 1, 2004 and the second stage of tighter standards on April 1, 2005. [See Table 4.5]

There are two sets of emissions standards for HDVs, based on their age. However, heavy-duty diesel school buses must meet the more stringent of the two standards no matter the age of the vehicle, in order to reduce the exposure of children to potentially harmful exhaust emissions. (Ontario 2003, 2004)

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**Table 4.5: Drive Clean Heavy-Duty Diesel Opacity Standards**

|                      | 1990 and older models | 1991 and newer models <sup>1</sup> | School buses       |
|----------------------|-----------------------|------------------------------------|--------------------|
| Until March 31, 2004 | 55%                   | 40%                                | Same as other HDVs |
| April 1, 2004        | 45%                   | 35%                                | 35% (all)          |
| April 1, 2005        | 40%                   | 30%                                | 30% (all)          |

<sup>1</sup>New and cleaner diesel engine technology was introduced in 1991.

The new diesel emissions standards contain an incentive for better maintenance (Ontario 2003):

The owners and operators of diesel HDVs will be offered an incentive to keep their vehicles maintained well beyond the requirements needed to meet the new, stricter standards. Currently, these vehicles must be tested annually. Vehicle owners will be able to earn an exemption from the next year's annual test if they meet or surpass a 20 per cent opacity standard. These vehicles will only require testing every two years, as long as their emissions continue to be at an opacity level of 20 per cent or less. Vehicles that register over 20 per cent opacity will still require annual tests. This exemption program for diesel HDVs will be phased in, beginning January 1, 2005. In 2005, heavy-duty diesel vehicles of odd-model years (2001, 1999, 1997, etc.) may be exempted from testing. In 2006, even-model years (2002, 2000, 1998, etc.) may be exempt. (Ontario 2003)

As noted, the new standards also contain special provisions for school buses:

To help protect children from harmful diesel emissions, large diesel school buses must meet the more stringent of the two standards in place for other diesel HDVs each year, no matter the age of the school buses. As of April 1, 2004 large diesel school buses must meet the 35 per cent opacity level and, in 2005, the 30 per cent opacity level. (Ontario 2003)

The emissions test standards for non-diesel HDVs (those powered by gasoline, propane, or natural gas) remain unchanged.

Officials report that Ontario is one of only five jurisdictions (in Canada and the United States) that combine both periodic testing and random roadside inspections for HDVs.

#### 4.6.2.3 Program Effectiveness — Drive Clean I/M Program

The Drive Clean program has published a number of program effectiveness indicators. The Drive Clean Internet site contains a tally of the number of vehicles that pass and fail their inspections. It is reported that these numbers are updated every 5 minutes (Drive Clean 2004).

**Table 4.6: Drive Clean Program Test Results, 1999–2004**

|                                | Pass       | %    | Fail      | %    | Conditional pass | %   | Total      |
|--------------------------------|------------|------|-----------|------|------------------|-----|------------|
| LDV program tests <sup>1</sup> | 10 839 328 | 83.5 | 1 863 777 | 14.4 | 271 943          | 2.1 | 12 975 048 |
| HDV (diesel)                   | 673 639    | 96   | 28 117    | 4    |                  |     | 701 756    |



program tests<sup>2</sup>

|   |        |      |        |      |        |
|---|--------|------|--------|------|--------|
| HDV (non-diesel) program tests <sup>2</sup> | 31 327 | 73.1 | 11 512 | 26.9 | 42 839 |
|---|--------|------|--------|------|--------|

Last update: July 15, 2004 10:20

<sup>1</sup> Actual number of vehicle emissions tests performed at LDV Drive Clean facilities since 1999. Also included are numbers of retests of vehicles that failed a first or subsequent test.

<sup>2</sup> Actual number of tests performed at HDV Drive Clean facilities since 1999. Also included are the numbers of retests of vehicles that failed a first or subsequent test.

**Table 4.7: Drive Clean Inspection Data, 1999–2001 (Drive Clean, 2004)**

| Type         | Year | Inspected | Failed  | Re-inspected | Passed re-inspection | Waived | Failed re-inspection | Initial failure rate (%) |
|--------------|------|-----------|---------|--------------|----------------------|--------|----------------------|--------------------------|
| Phase 1 1999 |      |           |         |              |                      |        |                      |                          |
| - Car        |      | 780 818   | 128 649 | 106 542      | 66 621               | 24 068 | 35 821               | 16.48                    |
| - Truck      |      | 165 660   | 26 269  | 22 860       | 14 448               | 5 038  | 7 531                | 15.86                    |
| - HDV        |      | 3 622     | 1 029   | 896          | 553                  | 207    | 277                  | 28.41                    |
| Total        |      | 950 100   | 155 947 | 130 298      | 81 622               | 29 313 | 43 629               | 16.41                    |
| Phase 1 2000 |      |           |         |              |                      |        |                      |                          |
| - Car        |      | 953 356   | 134 890 | 109 948      | 73 670               | 27 394 | 27 860               | 14.15                    |
| - Truck      |      | 297 481   | 40 053  | 34 157       | 22 708               | 8 776  | 8 283                | 13.46                    |
| - HDV        |      | 4 996     | 1 198   | 1 029        | 682                  | 242    | 277                  | 23.98                    |
| Total        |      | 1 255 833 | 176 141 | 145 134      | 97 060               | 36 412 | 36 420               | 14.03                    |
| Phase 1 2001 |      |           |         |              |                      |        |                      |                          |
| - Car        |      | 928 062   | 117 182 | 88 882       | 64 957               | 17 649 | 23 268               | 12.63                    |
| - Truck      |      | 326 766   | 37 860  | 30 221       | 22 057               | 6 144  | 7 566                | 11.59                    |
| - HDV        |      | 5 173     | 1 117   | 917          | 631                  | 210    | 245                  | 21.59                    |
| Total        |      | 1 260 001 | 156 159 | 120 020      | 87 645               | 24 003 | 31 079               | 12.39                    |
| Phase 2 2001 |      |           |         |              |                      |        |                      |                          |
| - Car        |      | 525 130   | 72 996  | 58 912       | 32 654               | 23 237 | 13 205               | 13.90                    |
| - Truck      |      | 263 745   | 38 603  | 32 254       | 17 697               | 12 889 | 7 209                | 14.64                    |
| - HDV        |      | 4 679     | 1 151   | 943          | 494                  | 368    | 218                  | 24.60                    |
| Total        |      | 793 554   | 112 750 | 92 109       | 50 845               | 36 494 | 20 632               | 14.21                    |

#### 4.6.2.3.1 Emissions Reductions — LDVs

In 2002, the Ontario Ministry of Environment and Energy announced that an analysis had shown that by the end of 2001, the Drive Clean program, as well as vehicle retirement and new technology, had achieved the following (Drive Clean 2004):

- *Phase One area to the end of 2001:* Smog-causing emissions from vehicles in the Greater Toronto Area (GTA) and Hamilton were reduced by 14 800 tonnes or 15.2%. Drive Clean emissions testing began in the GTA and Hamilton (the program's Phase One) in January 1999.
- *Phase Two area to the end of 2001:* Smog-causing emissions were reduced 6.1% in the Drive Clean Phase Two area, or approximately 3500 tonnes. The Phase Two area, where testing began in January 2001, includes urban centres and their commuting zones from Sarnia to Peterborough.
- *Total emissions reductions in Phase One plus Phase Two to the end of 2001:* The main components of smog, NOx and VOCs, were reduced by about 18 300 tonnes in Phase One plus Phase Two (Tables 4.8 and 4.9). The reduction of CO in the Phase One and Two areas was 139 000 tonnes. The reduction of CO<sub>2</sub>, a greenhouse gas, in the Phase One and Two areas was 47 000 tonnes, as a result of improved fuel economy in LDVs.

Drive Clean plans to update its emissions reduction data for 2002 and 2003.

**Table 4.8: Phase One — Overall Emission Reductions, 1999–2001 (Drive Clean 2004)**

|              | CO (tonnes) | HC (VOCs)<br>(tonnes) | NOx<br>(tonnes) | HC + NOx<br>(tonnes) | % change, HC +<br>NOx |
|--------------|-------------|-----------------------|-----------------|----------------------|-----------------------|
| Initial 1999 | 561 039     | 51 514                | 45 637          | 97 151               |                       |
| Final 2001   | 449 953     | 40 532                | 41 852          | 82 384               |                       |
| Reduction    | 111 086     | 10 982                | 3 785           | 14 767               | 15.20                 |

**Table 4.9: Phase Two — Overall Emission Reductions, 2001 (Drive Clean 2004)**

|              | CO (tonnes) | HC (VOCs)<br>(tonnes) | NOx<br>(tonnes) | HC + NOx<br>(tonnes) | % change, HC +<br>NOx |
|--------------|-------------|-----------------------|-----------------|----------------------|-----------------------|
| Initial 1999 | 348 868     | 29 359                | 27 330          | 56 689               |                       |
| Final 2001   | 320 610     | 26 687                | 26 537          | 53 224               |                       |
| Reduction    | 28 258      | 2 672                 | 793             | 3 465                | 6.11                  |

#### 4.6.2.3.2 Emissions Reductions — HDVs

A recent independent analysis of the HDV portion of the Drive Clean program determined that the program:

Had reduced particulate matter (PM) from diesel HDVs registered in Ontario by nearly 1,100 tonnes from 2000 through 2002, almost twice the program target of 660 tonnes. (Ontario 2003).

#### 4.6.3 On-Road Smog Patrol

The Ontario Ministry of the Environment's Vehicle Emissions Enforcement Unit (VEEU) is also known as the Smog Patrol. The current version of the Smog Patrol provides a mobile inspection component to complement the Drive Clean program by:

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Providing on-road enforcement of provisions of the *Environmental Protection Act* against smoking vehicles and vehicles where emissions systems components have been tampered with or removed. (Drive Clean 2004)

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The Smog Patrol began issuing warnings to drivers of vehicles emitting visible smoke from their exhaust pipes in July 1998 in the GTA and Hamilton. As of August 4, 1998, provincial officers working with enforcement agencies began identifying and ticketing drivers of vehicles that did not comply with the regulation.

Currently, there are 24 officers within the VEEU. The officers normally work in teams of two. One vehicle with two officers is considered one test unit. Most of the test units have access to diesel opacity meters that are used for the roadside testing of diesel-fuelled HDVs. All units have access to hard and soft copies of the technical resources required to complete emissions-related inspections. All units are fully mobile. In the near future, the Smog Patrol program plans to employ portable dynamometers to enhance the light- and heavy-duty gasoline vehicle inspection process (Drive Clean 2004).

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In the past the VEEU was divided into heavy- and light-duty vehicle teams. However, the VEEU now has detailed historical information that allows teams to focus on specific sub-sectors within the transportation sector. Examples of sub-sectors are service vehicles (such as taxis, tow trucks and transit vehicles), illegally modified vehicles that are operated on roadways (street racers, off-road truck racers, etc.). There is also a sub-sector that focuses on consumer protection by ensuring that vehicles being sold or advertised for sale at used car dealerships meet Ontario's emission standards. Teams within the VEEU are assigned to sub-sectors on a rotational pattern. (Drive Clean 2004)

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Smog Patrol officials are involved in a number of communication activities to increase the Smog Patrol program awareness and to educate vehicle owners about what they can do to proactively ensure that their vehicles pass roadside emissions inspections (see section 4.6.9.1).

#### **4.6.3.1 LDV Inspections**

When checking LDVs, VEEU officers look for visible emissions from the tailpipe that are emitted for more than 15 seconds in a 5-minute period. They also check to ensure that the vehicles' emissions control systems and components have not been tampered with or removed. Generally, the officers look at the following components: catalytic converters, evaporative emissions system components (fuel tank cap and vapour canister), positive crankcase ventilation systems, air injection systems, oxygen sensors, and EGR systems (Drive Clean 2004).

#### **4.6.3.2 HDV Inspections**

When checking HDVs, officers look for visible emissions and tampering and also conduct roadside opacity inspections, using the SAE J1667 snap idle acceleration test, on diesel HDVs. The Smog Patrol is applying new HDV diesel emissions standards in its on-road enforcement activities (see section 4.6.2.2). The Smog Patrol enforces the standards for all heavy-duty diesel vehicles on Ontario roads, whether they are registered in the province or from out-of-province (Drive Clean 2004).

#### **4.6.3.3 Dealership Inspections**

The VEEU also inspects used car dealers to ensure that vehicles being sold to the public are capable of meeting emissions standards. The officers conduct the appropriate inspection and check for Drive Clean test results.

#### **4.6.3.4 Enforcement Tools**

The VEEU environmental officers have a number of enforcement tools that can be used to achieve compliance with environmental regulations and standards. These include Provincial Officer Orders (Repair Orders), Form 1 Report for Inspection Orders, Provincial Offences Notices, Summonses, and vehicle plate/permit seizure.

The failure of an LDV or HDV roadside inspection can result in a number of educational and enforcement actions. In the last quarter of 2003, the Ontario Ministry of the Environment implemented an Informed Judgement Matrix for the VEEU. The Informed Judgement Matrix is a guideline that describes the type of enforcement action to be taken for certain offences, taking into account the severity of the violation as well as compliance history (Drive Clean 2004):

- Warnings may be issued for any emissions-related offence.
- Repair Orders may be issued to require emissions-related repairs to be done to a vehicle. This type of order may also include a requirement for a pass certificate from Drive Clean.
- Provincial Offence Tickets or Summonses may be issued for any emissions-related offence.
- In severe circumstances, vehicle plates and permits may be seized to prevent the continuation of an offence.

Since a vehicle's emissions system may deteriorate between Drive Clean tests, it is important to note that having a Drive Clean I/M program "pass" does not make a vehicle exempt from enforcement of Ontario's vehicle emissions laws, if intercepted by the Smog Patrol.

#### **4.6.3.5 Program Effectiveness**

Drive Clean officials report that for the Smog Patrol (Drive Clean 2004):

- From 1998 to December 31, 2003, the VEEU completed over 28 000 inspections and issued over 5000 tickets for emissions offences. These data include both LDVs and HDVs.
- During the fiscal year 2003–2004, the VEEU conducted over 9000 LDV inspections, resulting in over 1500 tickets being issued. During the same period, over 1100 HDV inspections were conducted, resulting in over 200 tickets.

#### **4.6.4 Scrappage Programs**

A number of scrappage programs operate (or have operated) in Ontario.

##### **4.6.4.1 Car Heaven, Kidney Car, and ReinCARnate Programs**

Three of the vehicle scrappage programs that operate in Ontario offer similar incentives to those who participate. These programs are interlinked and operate in conjunction with the Ontario Automotive Recyclers Association (OARA).

#### 4.6.4.1.1 Car Heaven Program

The Car Heaven program is administered by the Clean Air Foundation, and vehicles are picked up by OARA member companies. The OARA and its members are committed to the environmentally sound processing of vehicles and their parts, including oil, fluids, and tires (Kassirer 2004).

Motorists donate old cars to Car Heaven and receive a free tow (valued at \$200) and a minimum \$60 charitable receipt for the donated car. The donated cars are recycled, and the proceeds from the sale of the cars' parts support worthy charities. Donated cars are picked up and processed by a local member of OARA in communities throughout Ontario. Members of OARA make bids for cars that are 11 years old or newer. Exotic or low-mileage cars are also open for bid. Cars that are 12 years old or older have a set value of \$60. A minimum tax receipt of \$60 or the bid value of the car, whichever is greater, is issued (CAF 2004; Carheaven 2004).

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In addition, in the London area, London Transit has donated 100 one-month transit passes for giveaway to donors of vehicles that are 1988 or older and in running condition. Autosshare, a car-sharing company in Toronto, is also offering \$100 off the purchase of a membership to all donors to the Car Heaven program. (CAF 2004) [See section 4.6.6.3]

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The Clean Air Foundation's Car Heaven program operates alongside both the Kidney Car and ReinCARnate charity car scrappage programs in Ontario. Car Heaven is reported to cover most areas in Ontario, but its published advertisement indicates that it currently cannot handle requests in some small communities (CAF 2004).

Since its launch in July 2000, Car Heaven has retired over 6800 vehicles (Kassirer 2004):

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Based on donor records, 61% of these vehicles are 1988 and older; 79% had been driven, registered or insured in the last six months before donation to the program. (Kassirer 2004)

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Estimated air pollution reduction associated with this program is 63 tonnes of NO<sub>x</sub>, 42 tonnes of VOCs, and 823 tonnes of CO (CAF 2004).

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Emissions of the retired vehicle are assumed to be equivalent to the EPA Phase 1 IM240 Standard during Phase 1 of Ontario's Drive Clean Program and the appropriate Ontario emission standards. (Carheaven 2004)

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Since their inception, Car Heaven and its partner programs, the Kidney Car and ReinCARnate charity car programs, have retired over 11 000 vehicles (CAF 2004; Kassirer 2004).

#### 4.6.4.1.2 Kidney Car Scrappage Program

This fundraising scrappage project provides a tax deduction for participants and funds for the Kidney Foundation of Canada. This program operates only in Ontario. For those who donate vehicles:

- 
- Your vehicle is towed away free of charge,
  - You receive an income tax receipt, and

- The Kidney Foundation in your community receives the proceeds. (CAF 2004)

#### **4.6.4.1.3 ReinCARnate Vehicle Recycling Program**

The ReinCARnate Vehicle Recycling Program is a Recycling Council of Ontario initiative to protect the environment by recycling old cars. This program has been running in Ontario since July 1996 (CAF 2004).

#### **4.6.4.2 Ottawa — FOE Green Mobility Pilot Project**

The Green Mobility Pilot Project in Ottawa is led by Friends of the Earth (FOE) and was launched in June 2003. The goal of this project is to remove pre-1988 MY cars from the road, while at the same time offering the owners incentives that help them select a sustainable form of transportation, including car-sharing, transit use, or cycling (FOE 2003). FOE set a target of 300 cars to be scrapped.

When an owner of a qualifying pre-1988 car turns it in to FOE, he or she can choose from either of the following incentives:

- a no-cost tow to take away the qualifying old car; or
- if delivered to 417 Auto Parts, a tax-creditable receipt for \$60 from FOE.

In addition, participants can receive one of the following:

- a deep-discounted 6-month transit pass (a \$370 value for \$60); or
- for the first 10 participants, coverage for the \$500 membership fee to join VRTUCAR, Ottawa's chartering business; or
- for the next 90 participants, a contribution of \$200 per year access fee for VRTUCAR.

FOE expects to add a bicycle incentive in the near future.

FOE states that it is committed to best practices in the recycling of vehicles accepted into its Green Mobility Pilot Project.

#### **4.6.4.3 FOE's Vehicle Recycling Program**

FOE, in association with AADCO Vehicle Disposal Service, advertises that it can take your old car off your hands free of charge. The incentives for participating in the program are listed as a tax-deductible receipt for your automobile. Owners can arrange to donate their vehicles on-line (FOE 2003).

#### **4.6.5 Idle Reduction**

In Ontario, several municipalities have enacted idle control bylaws, and there have been a number of extensive public awareness campaigns to promote idle reduction.

##### **4.6.5.1 Idling Control Bylaws**

A number of municipalities in Ontario have idling control bylaws, including Brampton, Caledon, Clearview, Oakville, Richmond Hill, Toronto, and Whitchurch-Stouffville.

#### **4.6.5.1.1 Brampton**

In order to control noise and fumes from an industrial area adjacent to a residential zone, the City of Brampton added an amendment to control vehicle idling to its existing bylaw that regulates the use of highways and parking:

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The amendment to by-law 93-93, a consolidated by-law to regulate the use of highways and parking in Brampton, was approved on August 15, 2001 and signs were installed. (Brampton 2004)

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The portion of the bylaw that relates to vehicle idling states:

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Where signs to that effect are displayed, no person shall cause or permit a vehicle to stop, stand or park while idling for a period exceeding three minutes on any highway and between the limits set out respectively in Columns 1 and 2 of Schedule XXIX of this by-law during the prohibited times or days set out in Column 3 of the said Schedule. (Brampton 2004)

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Municipal officers or police officers can enforce the above section of the bylaw. However, officials of the City of Brampton report that:

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Since the inception of this by-law the factories in this area have managed to persuade truck drivers to stop unnecessary idling. As a result the municipality has not had occasion to enforce this by-law. (Brampton 2004)

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#### **4.6.5.1.2 Town of Caledon**

The Town of Caledon has passed a noise control bylaw that includes a provision applicable to idling vehicles. The bylaw was passed in response to public complaints about noise and fumes from idling trucks outside a lumber plant:

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Section 2.5 of the by-law prohibits the operation of an engine or motor for a continuous period exceeding 5 minutes while a vehicle stands stationary in a residential area. The by-law includes exceptions. (CAP 2004)

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Enforcement of the bylaw is through complaints to the By-law Department. The department estimates that it receives about 20 complaints per year and indicates that compliance with the bylaw and a reduction in unnecessary idling have been achieved through an educational approach to enforcement.

#### **4.6.5.1.3 Township of Clearview**

The Township of Clearview, formerly the Town of Stayner, has passed a bylaw that prohibits parking a vehicle on a highway and leaving it unattended while the motor or engine is in operation. The bylaw was passed in response to public complaints regarding idling vehicles outside a local restaurant (CAP 2004).

Enforcement of the bylaw is through complaints to the Clerk of the Township. Complaints are rare, but the Township has achieved compliance through an educational approach to enforcement. The Township advises that to date, no charges have been laid to enforce the bylaw.

#### 4.6.5.1.4 Oakville

Oakville's Idling Control By-law has been in effect since 2002:

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No person shall cause or permit a vehicle to idle for more than five consecutive minutes. The by-law does not apply to:

- Police, fire or ambulance vehicles while engaged in operational activities, including training activities, except where the idling is substantially for the convenience of the operator of the vehicle,
  - Vehicles assisting in an emergency activity,
  - Mobile workshops while they are in the course of being used for their basic function,
  - Vehicles where the idling is required as part of a repair process or to prepare a vehicle for servicing,
  - Armoured vehicles where a person remains inside the vehicle while guarding the contents of the vehicle or while the vehicle is being loaded or unloaded,
  - Vehicles that remain motionless because of an emergency, traffic or weather conditions or mechanical difficulties over which the driver has no control,
  - Vehicles engaged in a parade or race or any other such event authorized by Council,
  - Transit and passenger vehicles while passengers are embarking or disembarking en route or at terminals,
  - Transit vehicles while at a layover or stopover location, except where the idling is substantially for the convenience of the operator of the vehicle,
  - Vehicles transporting a person where a medical doctor certifies in writing that for medical reasons, the person requires the temperature or humidity to be maintained within a certain range and the idling of the vehicle is necessary to achieve that temperature or humidity level,
  - Vehicles when the ambient outside temperature is more than 27 degrees Celsius (27°C) or less than five degrees Celsius (5°C) and the idling of the vehicle is necessary to the operation of air conditioning or heating equipment respectively. (Oakville 2004)
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The bylaw is enforced on a verified complaint basis only (Oakville 2004).

- In 2003, the By-law Enforcement Office received three complaints that resulted in one charge being laid.
- In 2004 to date, two complaints have been received, but no charges have been laid.

The By-law Enforcement Office reports that while the anti-idling bylaw is enforced in Oakville, the primary focus has been an education campaign for the public and for town employees. They feel that their education program has been quite successful.

#### 4.6.5.1.5 Richmond Hill

The Town of Richmond Hill does not have a special bylaw for idling, but addresses excess idling in its Noise By-law. The community reports that it does not have special officers to enforce these provisions and only responds to complaints about excess idling. The York Regional Police act in regard to complaints. The basic provision of the Richmond Hill noise bylaw that deals with idling does not allow continuous operation of an engine while a vehicle is stationary (Richmond Hill 2004).



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The operation of an engine or motor in, or on, any motor vehicle or item of attached auxiliary equipment for a continuous period exceeding five minutes, while such vehicle is stationary in a residential area or a quiet zone, shall be a contravention. (Richmond Hill 2004)

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The By-law and Licensing Enforcement Office in Richmond Hill does not track the number of warnings, tickets, or other charges for this offence. Officers and police have given numerous warnings, usually in the winter in plazas where trucks have arrived early and are waiting to unload their cargo.

#### 4.6.5.1.6 City of Toronto

The City of Toronto Idling Control By-law No. 673-1998, which was adopted on October 2, 1998 (CAP 2004; Toronto 2004):

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Limits idling to no more than three minutes in a given 60 minute period. The by-law allows transit vehicles to idle when picking up or discharging passengers and also allows limited idling when transit vehicles are waiting for passengers. As well, the by-law provides for idling during extreme outdoor temperatures to ensure heating or cooling inside a vehicle.

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The City of Toronto uses By-law Enforcement Officers to enforce the provisions of the Municipal Code relating to idling, but the City does not have enforcement staff solely dedicated to the enforcement of the idling section of the Code. The City intends to achieve compliance with the bylaw through voluntary measures, and the bylaw provides for a fine of up to a maximum of \$5000 for infractions.

The City of Toronto has conducted one anti-idling “blitz,” and that was to support the 2003 GTA Idle-Free Campaign. The City of Toronto performed this blitz by pulling By-law Enforcement Officers from duties enforcing other sections of the Municipal Code. The “blitz” was conducted during the week of June 2–7, 2003 (CAP 2004).

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12 enforcement officers were assigned to a weeklong “blitz.” Anti-idling blitzes conducted by enforcement officers during the GTA Idle-Free Campaign resulted in 120 tickets, 195 warnings and 3 [summonses]. Ticket fines were set at \$105.00 plus a \$25.00 victim surcharge, for a total of \$130.00 fine. A summons was issued to any driver that drove away when the officer was preparing to write a ticket. A summons has no set fine. It is an order for individuals to appear in court on a scheduled date. (CAP 2004)

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Other than the one “blitz,” the inspection and enforcement undertaken relating to the Idling Control By-law are almost entirely complaint driven. From 1999 to 2003, enforcement of the Idling Control By-law has resulted in the following (Toronto 2004):

- 1999 — 1 ticket issued;
- 2000 — 74 charges and 400 warnings;
- 2001 — 25 charges, 2 summonses, and 150 warnings;
- 2002 — No information available; and
- 2003 — 136 charges, 4 summonses, and 523 warnings.

The City of Toronto also reports that it has:

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An active education program that involves public information pamphlets, Departmental releases, and the posting of "No Idling" signage in problem areas. (Toronto 2004)

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#### **4.6.5.1.7 Whitchurch-Stouffville**

The town of Whitchurch-Stouffville passed an anti-idle bylaw on June 25, 2003. The bylaw states that:

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No person shall idle a vehicle for more than 3 minutes in a 60 minute period in An Idle Free Zone as listed. (Whitchurch-Stouffville 2004)

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The "Idle Free Zones" are municipal buildings and offices, and "no idling" signs have been posted in these areas.

While town officials report that there are no enforcement provisions or fines associated with their idle control bylaw, they claim to have had success with voluntary compliance in the Idle Free Zones. Recently, several schools in the area have asked for the "no-idle" signs to be posted near school property.

#### **4.6.5.1.8 Communities that Are Developing Anti-Idling Bylaws**

During the 2003 GTA Idle-Free Campaign (see section 4.6.5.2.1), it was confirmed that four other cities in the GTA, Markham, Newmarket, Burlington, and Pickering, were developing or were considering developing idle control bylaws (CAP 2004):

- Newmarket has prepared a draft anti-idling bylaw and is currently preparing a public education and awareness program for the bylaw.
- Pickering, Markham, and Burlington are also drafting anti-idling bylaws for Council consideration.
- Peel Region has also recommended that area municipalities consider implementing anti-idling bylaws.

#### **4.6.5.2 Idle Reduction Public Awareness Campaigns**

A number of communities in Ontario have implemented campaigns or programs to attempt to convince motorists to reduce in-use vehicle idling. Note that since the features of most of these programs are similar in nature, only the salient points of each are reported in this section.

Some of the municipalities in the GTA have posted (or are planning to post) permanent metal "anti-idling" signs in their communities to support "Idle Reduction Public Awareness." Those posting permanent metal anti-idling signs include York, Whitchurch-Stouffville, Halton, Burlington, Peel, Mississauga, Durham, and Toronto (CAP 2004):

- Burlington produced and erected 65 metal anti-idling signs at Burlington GO transit stations.
- York Region declared its Administration Centre an "Idle Free Zone" and has produced and displayed some metal signs in various locations. York Region is also considering ways to expand the Idle Free Zone promotion to include other regionally owned facilities.
- Peel Region is preparing to post metal signs at regional buildings.

- Durham Region is currently investigating permanent metal signage for its fleet department facilities and several other locations.

#### 4.6.5.2.1 GTA Idle-Free Campaign

The Clean Air Partnership (CAP) was launched at the Toronto Smog Summit in June 2000. Each year since then, CAP operates a GTA-wide Idle-Free Campaign throughout the month of June. The goal of this public education campaign is to get motorists to turn off their engines when they are parked or stopped for more than 10 seconds, except in traffic. A number of partners assisted with the GTA Idle-Free Campaign (CAP 2004):

- NRCan was the major campaign sponsor, providing resources to develop and implement the campaign.
- The Greenest City organization played a key role in recruitment, coordination, and training of students and volunteers, acting as Idle-Free Ambassadors at participating sites (see section 4.6.5.2.4).
- The CPPI supported the campaign by engaging member companies Petro-Canada, Shell, Esso, Sunoco, and Canadian Tire in public education efforts at the retail site level (see section 4.6.5.2.2).
- GO Transit was also an active participant in the campaign, allowing campaign materials to be posted on site and interventions with ambassadors to take place at several transit pickup locations.

In 2003, the GTA Idle-Free Campaign featured two levels of activities:

- *Tier 1:* a GTA-wide public education/communications program (including radio and newspaper advertising, transit posters, banners in community locations, and a media launch event) to raise awareness of the idling issue; and
- *Tier 2:* local community-based outreach initiatives involving personal contact with drivers by Idle-Free Ambassadors at community locations.

The GTA Idle-Free Campaign involved 18 municipalities and regions, including Ajax, Brampton, Burlington, Caledon, Halton Hills, Markham, Mississauga, Newmarket, Oakville, Oshawa, Pickering, Richmond Hill, Toronto, Whitchurch-Stouffville, Durham Region, Halton Region, Peel Region, and York Region.

In 2003, the campaign ran from June 2 to 30; however, several municipalities continued their anti-idling efforts in their own jurisdictions throughout the summer of 2003, and some into 2004. As noted in section 4.6.5.1, the “anti-idling blitzes” conducted by Toronto’s By-law Enforcement Officers during the 2003 GTA Idle-Free Campaign resulted in 120 tickets, 195 warnings, and 3 summonses and generated substantial media interest (CAP 2004).

In 2003, its organizers claimed that the GTA Idle-Free Campaign was the largest anti-idling campaign of its kind in Canada. A number of measures were used to judge the effectiveness of the GTA Idle-Free Campaign. One of these was the extent of the advertising for the campaign (CAP 2004):

- **Transit Advertising**

Toronto 58 bus shelters plus GO Transit Stations  
York 50 bus interiors  
Brampton 12 bus backs  
Oshawa 20 bus interiors

- **Media Coverage**

In addition to scheduled interviews, there was widespread coverage by print, television, and radio media outlets. Coverage included 11 newspapers and magazines, six television stations, and three radio stations.

- **Events and Interventions**

- Over 1296 interventions between volunteers and motorists
- Over 21 schools in the GTA participated in the campaign
- 49 Idle-Free-related events at 35 locations throughout the GTA
- 27 interventions hosted at 17 fuel service stations.

In total, 962 observations were made of the frequency and duration of idling occurring at intervention sites. The results of these observations were as follows:

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At GO transit stations:

- At locations where interventions occurred, the frequency of idling was reduced by 18% when compared to baseline.
- Interventions were responsible for a 23% reduction in idling frequency when compared to control locations.
- The duration of idling increased at control sites by 15% and at intervention sites (32% when [compared] to baseline and 17% when compared to controls).

At schools:

- At schools where interventions occurred, the frequency of idling was reduced by 35% when compared to baseline.
  - Interventions were responsible for a 39% reduction in idling frequency when compared to control locations.
  - The duration of idling decreased at control sites by 20%, but increased at intervention sites (5% when [compared] to baseline and 25% when compared to controls). (CAP 2004)
- 

Note that some of the programs discussed later in this section may be interlinked with the GTA Idle-Free Campaign.

#### 4.6.5.2.2 Mississauga

In October 2001, Mississauga launched a year-long “Anti-idling Campaign” to encourage its residents to stop unnecessary vehicle idling. The campaign featured (Mississauga 2004):

- newspaper advertisements;
- posters and metal signs posted throughout the city;
- advertisements attached to local transit buses;
- transit shelter advertisements and posters in community locations;

- 30-second radio public service announcements;
- a telephone baseline survey;
- letters to Mississauga organizations, businesses, and industry;
- letters to Mississauga school boards; and
- a web site at 123turnyourkey.com.

In addition, this public awareness campaign included the following (Mississauga 2004):

- A GO Transit media event was held at the Mississauga GO Transit stop.
- Students approached drivers in idling vehicles at eight GO Transit stations, handing out anti-idling information cards and asking drivers to place a decal on their window to indicate a commitment to stop idling their vehicles while parked.
- In the City of Mississauga offices, 5000 employees were supplied with anti-idling information cards and car decals.
- Campaign organizers met with Mississauga Transit fleet managers to explore opportunities to reduce idling.
- The school-based initiative included a media event at a Mississauga elementary school. This event focused on parents idling vehicles when picking up children after classes.

For 2 weeks during the Mississauga Idle Reduction Campaign, the CPPI ran an anti-idling campaign at 50 member gasoline stations and involved the staff of participating companies (CPPI 2002):

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More than 50 Esso, Petro-Canada, Shell, Sunoco, and Canadian Tire stations participated in the two-week campaign, that used posters, banners, cling vinyl window decals, air fresheners and information cards to raise awareness about idling at the gas station level. Student "ambassadors" were on hand at the participating sites to distribute materials and seek commitments from motorists to avoid unnecessary idling. Participating CPPI member companies also introduced the Anti-Idling Campaign to their employees through the distribution of campaign materials, and posting of anti-idling signs at head office locations in the Greater Toronto Area.

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A telephone survey of 150 Mississauga residents was conducted before the campaign launch and repeated 1 year later, after implementation of the citywide campaign.

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*Pre-campaign Survey (September 2001)*

- 90% believe that idling causes unnecessary air pollution.
- 1 in 3 Mississaugans report idling at least once on the last day they drove.
- The average Mississaugan reports idling for 3 to 5 minutes (depending on the location) while waiting in their vehicle.
- 90% agree that "turning my vehicle off when parked is the right thing to do."
- 94% support community action to reduce unnecessary idling.
- 34% have heard of the phrase "idle-free zone."

*Post-campaign Survey (October 2002)*

- 95% believe that idling causes unnecessary air pollution (up 5%).
  - 93% agree that "turning my vehicle off when parked is the right thing to do" (up 3%).
  - 57% have heard of the phrase "idle-free zone" (up 23%). (Mississauga 2004)
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Overall, the campaign reached a large percentage of Mississauga residents.

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A significant 69% claim to have seen, heard or read about the campaign.

Those who were exposed to the campaign:

- say they idle less — about 3–4 times less (depending on location) — than those who have not been exposed.
- report idling for a fraction of the time — just over 1 minute compared to almost 4 minutes for those who have not been exposed.
- are much more likely to change their idling behaviour — 57% say that the campaign will have a strong or moderate impact on whether they will idle in the future. (Mississauga 2004)

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The objective of the year-long GO Transit Initiative portion of the campaign was to generate awareness of the idling issue and reduce unnecessary idling by drivers picking up passengers at all eight GO Transit stations in Mississauga. To achieve this objective, metal signs were erected throughout the community and campaign staff made personal contact with GO Transit drivers at eight passenger pick-up locations in Mississauga. Prior to the campaign, 48% of drivers were observed idling their vehicles while waiting to pick up commuters at GO stations.

Almost 1400 drivers were approached during station visits, with 92% willing to discuss idling issues, 91% taking anti-idling information, 81% taking the windshield decal, and almost 14% posting the decal on the spot (Mississauga 2004). The results of this portion of the program were as follows:

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The percentage of drivers idling increased slightly (48% to 54%) as did the average duration of idling (by about 20 seconds) over the course of the initiative, but this was largely due to a significant drop in average temperature and reduced daylight by the end of the initiative. The initiative undoubtedly prevented greater increases in idling as winter set in. GO Transit installed permanent anti-idling signs at its Mississauga stations after the initiative. (Mississauga 2004)

The organizers of the 2-week CPPI campaign claimed that:

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Overall, the Anti-Idling Campaign reached a large proportion of respondents in the community. In the post-campaign survey, 52% claim to have seen, read or heard promotions related to the issue of vehicle idling on an unaided (47%) and aided (5%) basis. By comparison, 34% of respondents indicated that they were aware of anti-idling promotions in Mississauga in [the] pre-campaign survey. This indicates a 65% increase in public awareness of idling issues as a result of the campaign. (CPPI 2002)

#### **4.6.5.2.3 Sudbury Idle Reduction Campaign**

A 2-year pilot project in Sudbury targeted two forms of idling: the idling that occurs at schools and idling by the general public throughout Sudbury. This project was based upon a City of Toronto pilot project that decreased both the frequency and duration of engine idling. This project was funded by NRCan and was delivered by EARTHCARE Sudbury (NRCan 2004).

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The school-oriented and general public portion of the Idle Reduction Initiative followed the same process. Prior to approaching drivers, baseline information was collected regarding idling frequency and duration. These efforts were followed by an initiative across the City of Sudbury to encourage motorists to not idle their vehicles. Follow-up measures of idling frequency and duration were obtained and random telephone surveys were conducted before and after. (NRCan 2004)

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To test the effectiveness of the campaign, the frequency and duration of idling by school buses and vehicles driven by parents were monitored at 3 of the 49 schools. Conversations regarding idling were initiated with 591 motorists. Following these interventions, idling duration was measured, and fully 96% of those approached were willing to talk to campaign workers. Of those who were willing to talk, 92% agreed to take the information card; of those who took information cards, 85% also took the sticker, and 23% placed the sticker on their window during the conversation (NRCan 2004).

For the school-oriented portion of the campaign, measurements were obtained when parents and bus drivers were picking up children at the end of the school day. In total, 2248 observations were made at the three schools (64% of the motorists were female). In general, the weather was warm (13°C average) and sunny during the duration of the observations.

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#### *Idling Percentage*

Fifty percent of motorists were observed idling their vehicles during the baseline period compared to 33% during the follow-up (a 34% decrease).... The extent of this reduction varied by vehicle type. Drivers of long buses reduced their idling from 57% to 46%.... The drivers of short buses reduced their idling from 72% to 43%. Variability also existed regarding personal vehicles. Parents who drove cars reduced their idling from 30% to 14%, while van drivers decreased from 44% to 32% and truck/SUV drivers from 52% to 30%.

#### *Idling Duration*

Not only did the intervention reduce the frequency of idling, it also dramatically reduced the duration.... Motorists at the three schools idled their vehicles for an average of 220 seconds during the baseline and 150 seconds during the follow-up (a 32% decrease).... The duration of idling varied dramatically by vehicle type. Drivers of both long and short buses significantly reduced their duration of idling (234 seconds to 124 seconds, and 294 seconds to 125 seconds, respectively). In contrast, car drivers reduced their idling more modestly (165 seconds to 138 seconds), while van and truck/SUV drivers actually increased the duration of their idling (199 seconds to 231 seconds, and 202 seconds to 224 seconds, respectively). (NRCan 2004)

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As with the school project, to test the effectiveness of the various idle reduction strategies on the general public, the frequency and duration of idling were monitored at several locations prior to and following the interventions.

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In total, 603 baseline observations were made of motorists' idling, while 205 follow-up observations were made. Seventy-five percent of the motorists were male during the baseline compared to 73% during the follow-up. Fortunately, the average temperature for the baseline and follow-up measures was identical at 13.7°C.

#### *Idling Percentage*

Fifty-nine percent of motorists were observed idling their vehicles during the baseline period compared to 44% during the follow-up (a 26% decrease).... The extent of this reduction varied by vehicle type. Motorists who drove cars reduced their idling from 62% to 44%, while minivan drivers decreased from 60% to 54% and truck/SUV drivers from 46% to 33%.

#### *Idling Duration*

Motorists idled their vehicles for an average of 172 seconds during baseline and 208 seconds during the follow-up.... The duration of idling varied by vehicle type. Car drivers increased their idling from 169 seconds to 228 seconds, while minivan drivers decreased the duration of their idling (168 seconds to 159 seconds). SUV and truck drivers increased their duration of idling from 175 seconds to 207 seconds. (NRCan 2004)

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It was concluded that this anti-idling initiative significantly affected the frequency of idling by the general public and the frequency and duration of idling at schools. Further, it demonstrated that it is possible to deliver an effective campaign to numerous schools and the general public at modest cost. However, while the combination of signs, information cards, and commitment had a substantial impact upon the frequency of idling by the general public, it did not seem to influence the duration of idling (NRCan 2004):

#### *4.6.5.2.4 Southern Ontario — Idle-Free Days*

Greenest City, a Toronto-based environmental group, has also been holding idle-free events in downtown Toronto since 1998. For its campaigns, it uses the community-based social marketing strategy developed by NRCan. Recently, Greenest City orchestrated an idle reduction campaign, called Idle-Free Day, across the GTA on August 21, 2002. Posters were mounted in strategic locations throughout the community, and volunteers approached over 600 motorists and asked them to make a commitment to not idle while parked (GC 2004; NRCan 2004).

In 2003, another Idle-Free Days campaign was held from May 28 to June 18 at schools, gas stations, transit stations, and other idling hotspots across the GTA. The following municipalities in the Toronto area participated in Idle-Free Days in 2003:

- *Halton Region:* Burlington, Halton Hills, and Oakville;
- *Peel Region:* Brampton, Caledon (Bolton), and Mississauga;
- *Toronto Region:* Toronto and Scarborough; and
- *York Region:* Newmarket, Richmond Hill, and Whitchurch-Stouffville.

#### *4.6.5.2.5 Toronto No Idling at School Campaign*

Greenest City launched the No Idling at School Campaign in 1998. That campaign used the community-based social marketing strategy developed by NRCan. In 2000, the "Turn it Off" pilot project (see section 4.6.5.2.9) developed and tested community-based approaches to reduce unnecessary vehicle idling at schools and transit pick-up locations in the City of Toronto. This project marked the first major anti-idling public education and outreach initiative in Canada and illustrated how idling can be substantially reduced through community-based social marketing techniques.

Greenest City claims that the program has prevented the release of 651 tonnes of CO<sub>2</sub> equivalents by approximately 10,500 drivers at 300 Ontario schools (GC 2004).



#### 4.6.5.2.6 Repair Our Air-Fleet Challenge

Fleet drivers can reduce their fuel costs and protect air quality by controlling vehicle idling. To that end, the Repair Our Air organization has developed the “Fleet Challenge” program for fleet owners in the GTA. The challenge is:

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To be the “best in your class” by having the lowest incidence of idling within your fleet category. The fleet categories include municipalities, trucking (light and heavy duty), motor coach and mixed. (ROA 2003)

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Each fleet that joins in the program selects 10 vehicles to participate in the Fleet Challenge. These vehicles may already have measurement technology or can have fleet productivity global positioning systems (GPS) installed on a first-come-first-served basis (ROA 2003). The benefits of participating in the Repair Our Air-Fleet Challenge include the following:

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- Opportunity to improve fuel efficiency by 10–20% in participating vehicles
  - Opportunity to create a business case for the launch of an anti-idling program throughout your fleet
  - Profiling of the fleet manager as a business partner and industry leader
  - Strengthening of the enterprise brand through a measurable contribution to the environmental...
  - Permission for winners to display ... graphics on their vehicles and company letterhead. (ROA 2003)
- 

The 2003 Repair Our Air-Fleet Challenge ran from March to May 31. The municipalities varied significantly in the type of vehicles they assigned to the Fleet Challenge. Oshawa and Hamilton added to the difficulty of their challenge by including garbage trucks and street sweepers. A Fleet Challenge was not run in 2004, but the Repair Our Air organization is hoping to launch an expanded fuel efficiency program in the fall of 2004 in conjunction with NRCan.

**Table 4.10: Commercial Fleets — Results of the 2003 Repair Our Air-Fleet Challenge<sup>1</sup>**

| Type                         | Baseline idling (%) | Final idling (%) | Improvement (%) | Notes   |
|------------------------------|---------------------|------------------|-----------------|---|
| <b>Light-duty short haul</b> |                     |                  |                 |   |
| Bell                         | 12.7                | 3.24             | 9.42            | Bell installed its new GPS Telepod on 200 of its vehicles and entered 10 vehicles into the Fleet Challenge. The company expects to be expanding its fuel efficiency program throughout its very large fleet.  |
| Toronto Hydro                | 2.9                 | 4.6              | 1.7             | Toronto Hydro included 13 vehicles in the Fleet Challenge. One driver idled for 3 hours during a training event in the last week, pushing its score to 4.6%. When this vehicle is excluded, Toronto Hydro realized an impressive 1.4% idling during the last week |

| Type                         | Baseline idling (%) | Final idling (%) | Improvement (%) | Notes   |
|------------------------------|---------------------|------------------|-----------------|---|
| Enbridge                     | 7                   | 8.4              |                 | of the campaign.<br>Enbridge included a number of vehicles with Power Take Off units and was successful at reducing idling within those vehicles by 31%. Participation in the Fleet Challenge has shed light on the importance of tracking Power Take Off idling separately from overall idling and has revealed the opportunity for significant fuel savings through the introduction of new technology. |
| <b>Heavy-duty short haul</b> |                     |                  |                 |   |
| Al's Cartage                 | 7.9                 | 5.1              | 2.8             | This was Al's Cartage's first time participating in an anti-idling campaign, and it did an outstanding job.   |
| J&R Hall Transportation      | 20                  | 10               | 10              | J&R Hall Transportation has also done an outstanding job of reducing idling within its fleet.   |
| <b>Heavy-duty long haul</b>  |                     |                  |                 |   |
| Bison Transport              | 0.51                | 2.17             |                 | Bison purchased Espar heaters 4 years ago; passed a corporate idling policy last year; and conducted an extensive fuel efficiency tracking and education program with its drivers, supervisors, and dispatchers. The results have been impressive.  |
| <b>Motor coach-transit</b>   |                     |                  |                 |   |
| CANAR                        |                     |                  |                 | CANAR had its transit vehicles from the Region of York participate in the Fleet Challenge. Its motor coaches have also completed a very successful campaign in the Niagara Region.  |

<sup>1</sup> Reproduced from the 2003 Repair Our Air-Fleet Challenge Final Report (ROA 2003).

**Table 4.11: Municipal Fleets — Results of the 2003 Repair Our Air-Fleet Challenge<sup>1</sup>**

| Municipality      | Baseline idling (%) | Final idling (%) | Improvement (%) | Notes  |
|-------------------|---------------------|------------------|-----------------|--|
| Town of Newmarket | 4.9                 | 2.5              | 2.4             | The Town of Newmarket had an outstanding campaign with the full participation of Mayor Tom Taylor, who allowed a GEOTAB device to be installed on his company vehicle. |
| City of Toronto   | 9.9                 | 5.9              | 4               | Toronto included 15 vehicles in the  |

| Municipality       | Baseline idling (%) | Final idling (%) | Improvement (%) | Notes   |
|--------------------|---------------------|------------------|-----------------|---|
|                    |                     |                  |                 | Challenge and would have achieved an impressive 2.3% idling by removing the two worst-performing vehicles. Toronto is looking at establishing a "Centre of Excellence" to help continue the greening of Toronto's fleet and has completed an extraordinary employee awareness program around idling.  |
| City of Oshawa     | 11.8                | 7.1              | 4.7             | Oshawa Deputy Mayor Joseph Kolodzie participated in the Fleet Challenge by having a GEOTAB installed on his car. The city ran a particularly challenging campaign by including four waste packers in the vehicles selected to participate in the Challenge. If the waste packers were removed from its statistics, Oshawa would have achieved an amazing 1.1% idling in the remaining six vehicles. |
| City of Burlington | 13.4                | 4.8              | 8.6             |   |
| City of Barrie     | 8.8                 | 6.1              | 2.4             |   |
| Richmond Hill      | 28                  | 11.9             | 16              | Richmond Hill saved 1190 km of driving fuel costs on seven vehicles during the Challenge.   |
| Hamilton           | 23.3                | 21.3             | 2               | Hamilton ran the most mixed equipment of all the participating fleets and helped us understand how idling occurs within the diverse operations of a municipal fleet.  |

<sup>1</sup> Reproduced from the 2003 Repair Our Air-Fleet Challenge Final Report (ROA 2003).

#### 4.6.5.2.7 Waterloo Region — Idling Reduction Education Campaign

The Citizens' Advisory Committee on Air Quality in the Waterloo Region of Ontario held an Idling Reduction Education Campaign. The campaign employed a variety of methods to encourage people to reduce idling. This project was expected to prevent approximately 276 tonnes of CO<sub>2</sub> emissions from entering the atmosphere (NRCan 2004).

#### 4.6.5.2.8 Niagara Parks Commission — Spare the Air Program

The "Spare the Air" program is an air emissions reduction campaign intended to reduce harmful air emissions through public awareness activities that encourage the drivers of motor coaches and transport trucks to turn off their engines when parked in areas under the jurisdiction of the Niagara Parks Commission. As part of an idle reduction campaign, the Niagara Parks

Commission posted “Spare the Air” signs, on a permanent basis, at 27 sites in the Niagara Falls corridor. This initiative was coupled with the distribution of information brochures to company owners and drivers. The Niagara Parks Commission reports that:

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The signs are permanent and we will continue to expand this program each year as other businesses are willing to join us. (NPC 2004)

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The partnership receives technical and funding support from the NRCan FleetSmart Program (see section 5.2.1). In 2004:

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The [Niagara Parks Commission] and its partners expect to continue their existing program and are hoping to introduce a FleetSmart Challenge component to encourage fleet drivers to reduce unnecessary idling. (NPC 2004)

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The Niagara Parks Commission reports that:

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The 2003 Spare the Air program made significant reductions of air emissions. By the end of September 2003, tour bus idling periods reduced from an average of 39 minutes to less than 6 minutes while transport truck idling periods reduced from an average of 21 minutes to less than 8 minutes. The subsequent reductions in air emissions have been estimated at over 2,800 less tonnes of carbon dioxide, 10 less tonnes of nitrogen oxide, 20 less tonnes of carbon monoxide and 3 less tonnes of volatile organic compounds. (NPC 2004)

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#### **4.6.5.2.9 Turn It Off**

The “Turn it Off” idle reduction project was initiated by Environment Canada’s Ontario Regional Office and developed in conjunction with McKenzie-Mohr Associates and the Ontario Ministry of the Environment. Funding for the project came from the federal government’s Climate Change Action Fund, the City of Toronto Atmospheric Fund, the Ontario Ministry of the Environment’s Drive Clean Office, and Environment Canada. Local partners in the project included (NRCan 2004):

- City of Toronto (Works and Emergency Services; Health Department);
- Toronto District School Board;
- Toronto Catholic District School Board; and
- Toronto Transit Commission (TTC).

This idle reduction campaign was staged in the spring of 2000. Idle reduction interventions with vehicle operators were first delivered at schools and then at TTC locations. Follow-up measurements were obtained for 10 days between the last 2 weeks of May 2000 and the third week of July 2000 (NRCan 2004).

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#### ***Baseline Data Collection***

Baseline measures [were] taken for ten days to determine the frequency with which motorists idle their vehicle engines while waiting at 12 locations (6 schools and 6 TTC Kiss and Ride Sites). The duration of idling was also measured. These measurements were taken using random time sampling. Random time sampling involves selecting at random small time intervals (e.g. 30 minutes) during which the behaviour of motorists at parking lots is observed. In identifying time

periods for measurements, consideration was given to times when motorists were most likely to idle their engines (e.g. end of the school day; end of work day at TTC Kiss and Rides, etc.).

#### *Interventions*

Following these baseline measurements, the [idle reduction campaign] techniques were tested.... Two schools and two TTC sites had signs prominently placed in locations where motorists frequently idle (signs only condition). Two schools and two TTC sites also received the signs but in addition commitments were sought from motorists. These motorists also received the information card. Finally, two schools and two TTC sites did not receive signs, commitments or information cards. These four sites served as a control against which changes in the other conditions could be compared. (NRCan 2004)

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The report on the 2000 "Turn it Off" idle reduction project indicated that (NRCan 2004):

- Overall, in the course of this project, 8435 observations of motorists' idling behaviour were made. During the baseline period, 53% of motorists were observed idling.
- The combination of commitment and signs reduced idling by 32% and idling duration by 73%.
- Signs by themselves did not reduce idling incidence or duration.
- Analysis by site location (school or TTC) revealed that the combination of signs and commitment was particularly effective in school settings.
- In total, 2377 observations were made of motorists' idling behaviour at school sites. At school sites, the combination of signs and commitment reduced engine idling by 51% and idling duration by 72%.
- In total, 6058 observations were made of motorists' idling behaviour at the TTC sites,
- At TTC sites, as with the schools, the combination of signs and commitment was the most effective strategy in reducing both idling incidence and duration.
- At TTC Kiss and Ride sites, the combination of signs and commitment reduced engine idling by 27% and idling duration by 78%.

#### **4.6.5.3 Fleet Idle Control Policies**

One outcome of the 2003 GTA Idle-Free Campaign (see section 4.6.5.2.1) was that a number of members of the GTA Clean Air Council reported that they were developing or enforcing internal anti-idling policies for municipal fleets. For example (CAP 2004):

- Burlington is piloting an idling control policy that applies to all municipal employees driving city vehicles or their own vehicles while conducting business, limiting their idling to 3 minutes or less.
- Brampton is reinforcing its existing anti-idling policy for municipal fleet vehicles and is even taking these efforts a step further by installing "Engine Idle Limiters" in a number of fleet vehicles. These devices automatically shut off the vehicle after 3 minutes (see section 4.6.5.5).
- Newmarket will be continuing to support its anti-idling policy for fleets.

#### **4.6.5.4 Ministry of Environment HDV Idle Reduction Strategy**

The Ontario Ministry of the Environment reports that it:

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is in the preliminary stages of a consultation with key stakeholders to develop a strategy to encourage heavy-duty truck and bus owners to limit the amount of time their vehicles are left idling. (Drive Clean 2004)

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#### **4.6.5.5 Brampton Engine Idle Limiters**

The City of Brampton is running a pilot project to reduce fuel consumption and emissions by installing Engine Idle Limiters on a number of fleet vehicles (Brampton 2004).

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Engine Idle Limiters have been installed on six fleet vehicles, and the City will soon install five more. If the initial batch of Engine Idle Limiters continue to work successfully, all Fleet Services vehicles will have them installed within the next couple of years. The City has programmed the engine idle time to shut the engines off after five minutes of idling. The original idea for the Engine Idle Limiter was developed by Ken Dack, Manager of Fleet Services for the City of Brampton. He approached Mobile Power Solutions to manufacture the item for the City's fleet. (Brampton 2004)

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#### **4.6.6 Programs to Reduce Vehicle Usage**

There are a number of programs operating in Ontario that are designed, one way or another, to reduce single-occupant vehicle usage.

##### **4.6.6.1 Toronto Cool Schools Program**

For over 5 years, the Cool Schools Program of CAP has been engaging Toronto students in activities that improve local air quality. Through changes in energy use, travel patterns, and environmental knowledge, schools are leading the way as Toronto works to achieve its ambitious GHG reduction target of 20% by the year 2005. One of the aims of the Cool Schools Program is to:

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Transform our transportation habits. Traveling to school by car not only deprives children of valuable time with their parents and robs them of exercise and fresh air; it generates greenhouse gases and causes smog. But there are other ways to get to school that are healthier, safer and gentler on the environment. Cool Schools encourages students and staff to walk, cycle, use public transit and form carpools as alternatives to driving. (CAP 2004)

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To encourage participation, the Cool Schools Program offers grants of up to \$2000 to Toronto schools to enhance their local environment. One of the enhancement techniques they suggest is to promote alternative transportation options to and from school, such as pedestrian programs (termed Walking Wednesdays), bicycle workshops, and anti-idling campaigns. The walking activities in the Cool Schools Program link to the Greenest City organization's "Walk to School Day" and the A&SRTS program. These programs promote active transportation (walking, biking, in-line skating) to school in communities throughout Canada. School communities organize their own "Walk to School Day" events with organizing support, resource guides, and materials provided by Greenest City (see section 2.9.4).

#### 4.6.6.2 GTA and Hamilton — Smart Commute Initiative

The GTA and the City of Hamilton have proposed a new organization to promote transportation demand management practices and reduce GHG emissions from transportation across the region. This Transport Canada UTSP showcase proposal, if funded, would implement a system of regional and local transportation demand management measures that reduce automobile use and dependency by (see section 5.3.1) (TC 2004):

- improving alternatives to single-occupant vehicle use;
- encouraging the use of less-congested travel times and routes; and
- enabling reductions in trip volumes and lengths.

The project would feature the formation of the “Smart Commute Association” as a new non-government organization to oversee regional activities, while creating a series of 10 Transportation Management Associations to act in local areas. This showcase could result in an estimated reduction in GHG emissions of 20 000 tonnes annually.

#### 4.6.6.3 Car-Sharing Programs

The Car Sharing Network (CSN) reports on a number of car-sharing programs that are operating in communities across southern Ontario. These include programs in Guelph, Kingston, Kitchener/Waterloo (The Peoples’ Car Co-op), Ottawa (the VRTUCAR program), and Toronto (Autoshare) (CSN 2004).

The operating parameters for a typical car-sharing program are presented in section 2.9.3.

#### 4.6.6.4 Waterloo — Central Transit Corridor Express Project

As part of Transport Canada’s UTSP, the Region of Waterloo proposes several strategies to improve transit operations and customer service in a central corridor, increasing ridership and reducing GHG emissions from transportation (see section 5.3.1):

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The Region of Waterloo, comprised of three cities and four townships, is responsible for operating Grand River Transit. Its showcase would establish a high-quality express bus service corridor to attract many new transit riders. The corridor would link major regional destinations and would be complemented by customer service improvements, technological enhancements, intermodal integration, and concentrated marketing and outreach.... This showcase would result in an estimated reduction in greenhouse gas emissions of 1,010 tonnes annually by 2006. (TC 2004)

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#### 4.6.6.5 London — Urban Transportation Program

The City of London proposes a range of strategies to manage transportation supply and demand and reduce GHG emissions from transportation. If approved, this program will receive funding from Transport Canada’s UTSP and will include a range of measures to better manage road operations (see section 5.3.1):

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- *Advanced traffic signal control* — London is already planning to implement a computerized traffic signal control system. The showcase would upgrade the system to make it responsive to varied traffic conditions.

- *High-occupancy vehicle (HOV) lane feasibility study* — The showcase would examine how HOV lanes might be implemented in the Richmond and Oxford Street corridors. The potential impacts on traffic operations, air quality, safety and costs would also be examined....
  - *Intersection improvement program* — The showcase would initiate a program of intersection modifications to make travel by all modes more efficient. Simulation software would be used to assess the impacts of possible changes to traffic signal timing and roadway geometry.
  - Pedestrians, cyclists and traffic mix would all be considered. (TC 2004)
- 

#### **4.6.6.6 Ottawa — Carling Avenue Road and Transit Improvements**

The City of Ottawa proposes a number of strategies to make a conventional arterial road corridor more supportive of walking, cycling, and public transit, encouraging more sustainable travel patterns and reducing GHG emissions from transportation. If approved, this program will receive funding from Transport Canada's UTSP and will (see section 5.3.1):

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Integrate five strategies through a single corridor vision, a multimedia communications plan, and a public outreach strategy to maximize public understanding and involvement. (TC 2004)

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The strategies include transit enhancements, cycling facilities, walking facilities, transportation demand management, and supportive land use (TC 2004).

#### **4.6.6.7 York Region — Yonge Street Transitway**

York Region proposes to implement a transitway to reduce GHG emissions along a major transportation corridor, while protecting and revitalizing the main street of an important heritage district. If approved, this program will receive funding from Transport Canada's UTSP (see section 5.3.1):

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Through an innovative public-private partnership, the showcase would seek to increase transit ridership and efficiency in the corridor by applying low-cost bus rapid transit infrastructure, advanced technologies, sustainable land use policies and integrated communications....

Showcase project benefits would include an expected increase in corridor transit ridership of up to 50 percent, with a corresponding reduction in greenhouse gas emissions of 30,000 tonnes annually. Reductions in several air emissions could be even more significant if clean diesel or hybrid diesel-electric engines are used in the showcase vehicles. (TC 2004)

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#### **4.6.6.8 Pollution Probe Clean Air Campaign**

Pollution Probe has held a Clean Air Campaign for 11 years (Pollution Probe 2004).

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The campaign's focus is inspiring individuals to take action against smog by promoting alternatives to the single occupancy vehicle. (Pollution Probe 2004)

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The main event of the 2004 campaign was a weeklong Clean Air Commute — a workplace event that challenges staff members to choose a cleaner way to commute to work.



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From June 21 to 25, the Commute brought together 127 workplaces in the Greater Toronto Area (GTA) with a total employee base of more than 115,000 individuals....participants learned about vehicle emissions, smog and related health issues. (Pollution Probe 2004)

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Over 7100 employees participated by completing personal diary cards on how they got to work, and the campaign included (Pollution Probe 2004):

- posters on TTC buses, trains, and stations;
- local newspaper and magazine advertisements;
- advertisements on over 10 different television channels;
- advertisements on 140 Famous Player theatre screens;
- posters and promotional materials at 127 workplaces; and
- posters at 600 Liquor Control Board stores across Ontario.

The program was staged during the month of June 2004 and was directed largely at an audience in the GTA. However, the television advertisements connected with the program were available for viewing on several stations that are carried by satellite and cable TV companies across Canada. A similar program is planned for 2005.

#### **4.6.6.9 Brampton Transit Improvement Program**

In 1996, Brampton Transit implemented a program to develop safe, efficient, and appealing commuter services.

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From 1996 to 2001, the City increased ridership by 41 per cent while reducing operating costs for the transit system. By encouraging more people to leave their cars at home in favour of taking the bus, the City is protecting air quality and easing traffic congestion. (Brampton 2004)

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#### **4.6.7 Fuel Policy and Programs**

In Ontario, there are a number of communities that have developed and implemented fuel-purchasing policies for their various fleets in an attempt to reduce vehicle emissions. A number of municipalities are also using alternative fuels in transit vehicles.

##### **4.6.7.1 Fuel Policy**

A study for CAP examined the fuel-purchasing policies of three municipalities in Ontario. These policies were designed to reduce air emissions from their municipal operations (see section 2.11.2.4) (CAP 2004).

###### **4.6.7.1.1 City of Toronto**

In the City of Toronto, the fuel-purchasing practice since 1999 has been designed to favour conventional fuels with lower sulphur levels. This practice includes purchasing on-road diesel for the City's off-road diesel fleet.

It is reported that:

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- This policy has allowed the City to reduce SO<sub>2</sub> emissions from the City's corporate fleet from about 29.5 tonnes per year in 1999 to about 6 tonnes per year in 2003.
  - Over the three years that the City has been purchasing on-road diesel for its off-road fleet, it has paid between 2.7% less and 5.7% more per litre for the red dyed on-road diesel than it would for the cheapest off-road diesel.
  - Overall, however, the City has paid about 1% more each year for its fuel to achieve the emission reductions described above. (CAP 2004)
- 

#### 4.6.7.1.2 Region of Waterloo

In 2003, the Region of Waterloo will begin implementing three of the recommendations contained in the Region's Clean Air Plan by purchasing:

- on-road diesel for the Region's off-road diesel fleet;
- ultra low sulphur diesel (ULSD) for the Region's buses;
- catalytic exhaust mufflers (CEMs) for 86 of the Region's 143 buses; and
- E10 (10% ethanol blended with 90% gasoline) for the Region's gasoline-fuelled fleet.

It is reported that:

- 
- The use of on-road diesel for the Region's off-road fleet is expected to reduce emissions of sulphur oxides (SO<sub>x</sub>) by about 8.5 tonnes per year.
  - The use of ULSD in buses is expected to reduce SO<sub>x</sub> emissions by 2.8 tonnes per year.
  - The retrofitting of buses with CEMs is expected to reduce emissions of CO, VOCs, and PM by about 17 tonnes per year.
  - In 2003, the Region expects to pay about \$0.04 (or 6.5%) more per litre for the ULSD than it would for conventional on-road diesel. (CAP 2004)
- 

#### 4.6.7.1.3 City of Brampton

The City of Brampton began purchasing B20 (20% biodiesel blended with 80% on-road diesel) for use in the City's Corporate on- and off-road diesel fleets in 2002 and plans, in 2003, to use:

- B20 in the City's bus system;
- B100 (100% biodiesel) in on- and off-road diesel fleets during summer months; and
- E10 in the City's gasoline fleet.

It is reported that:

- 
- By using B20 that has been blended with on-road diesel in the City's off-road diesel fleet, it is expected that the City will reduce SO<sub>2</sub> emissions from that fleet by about 88% (or by about 1 tonne per year).
  - The use of B20 in the City's Corporate on-road diesel fleet is expected to reduce SO<sub>2</sub> emissions from that fleet by about 20%.
  - The use of B20 is also expected to reduce emissions of CO, PM and HC.
  - In 2002, B20 cost the City of Brampton about \$0.04 (or 6.5%) more per litre than conventional on-road diesel.
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- In 2003, the City expects the cost differential to increase to as much as \$0.12 per litre (or 20% more). (CAP 2004)
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From June to September 2004, the City used a B50 blend of biodiesel (50% soybean oil and 50% diesel), which reduced vehicle emissions by 50–60%. From October until April, the City switches to a B20 blend (20% soybean oil, 80% diesel) to avoid the fuel gelling in the cold. During the smog alert months of July, August, and September in 2005, the City plans to use B100 fuel (Brampton 2004).

#### **4.6.7.2 Alternative Fuel Programs**

In 2003, CUTA reported on five alternative fuel use projects in Ontario (Cope 2003):

1. *Burlington Transit*: Has incorporated compressed natural gas (CNG)-powered vehicles in its fleets since the early to mid-1990s.
2. *Hamilton Street Railway*: Has incorporated CNG-powered vehicles in its fleets since the early to mid-1990s.
3. *London Transit*: Experimented with both CNG and clean diesel. The transit service has opted to concentrate on clean diesel for the foreseeable future.
4. *TTC*: Has incorporated CNG-powered vehicles in its fleets since the early to mid-1990s. The TTC is also involved in a \$128 million Bus Heavy Rebuild Program.
5. *Transit Windsor*: Between 1991 and 1994, Transit Windsor tested methanol fuel in transit buses, and in May 2002, Sunoco began to supply PuriNOx emulsified fuel to Transit Windsor.

##### **4.6.7.2.1 Brampton Biodiesel Project**

The City of Brampton claims to be the first municipality in Canada to commit to using biodiesel fuel, an environmentally friendly mix of diesel and soybean oil, for its fleet of trucks and small-engine machines. Other municipalities, including Mississauga, Oshawa, Chatham, and York Region, are reported to be exploring biodiesel use (see also section 4.6.7.1) (Brampton 2004).

#### **4.6.8 HDV Retrofit Projects**

In February 2004, Environment Canada initiated a transit bus retrofit agreement with CUTA (see section 5.1.2.2). Three municipalities in Ontario — Windsor, Toronto, and Ottawa — are participating in this project (see sections 4.6.8.3–4.6.8.5).

##### **4.6.8.1 Windsor Air Scavenging System Project**

In January 2003, Transit Windsor announced a pilot project for the use of an Australian retrofit device that is reported to cut diesel emissions by up to 80% (Cope 2003).

- *Description*: Rotec Design Ltd. signed an agreement on January 30, 2003 to run a rebuilt bus in Windsor for the next three years to prove its new FreedomAir Clean Diesel “air scavenging system” to reduce diesel PM and NOx emissions.
- *Participants*: Transit Windsor, the University of Windsor and Rotec Design Ltd.
- *Vehicles*: One Transit Windsor bus will be equipped with the Rotec system.

- *Retrofit Equipment and Fuel Used:* The Rotec Design Ltd. system reduces PM and NOx emissions from diesel engines. The Rotec system is a rather simple cast aluminum bolt-on containing a reciprocating pump that nearly doubles the burn efficiency of diesel.
- *Status:* The project started February 2003 and is to run for three years. By November 2003 alternative fuel experts and students at the University of Windsor's engineering school will be monitoring the performance of a FreedomAir Clean Diesel system in regular service with the city's municipal bus fleet. (Cope 2003)

#### 4.6.8.2 Ottawa — Catalytic Muffler Demonstration Project

In 2001 and 2002, the transit company in Ottawa, OC Transpo, experimented with three different catalytic mufflers that were installed on three diesel transit buses. This was a cooperative study with Environment Canada (Cope 2003).

OC Transpo, in Ottawa (and the STO, the Société de transport de l'Outaouais) and Environment Canada engaged in a study of the application of emissions control systems on public transit vehicles. The study concentrated on the effectiveness of installing catalytic mufflers on older buses. (Cope 2003) [See section 4.5.6.1]

#### 4.6.8.3 Windsor Bus DOC Retrofit Project

Transit Windsor will operate six buses retrofit with DOCs. These six buses will be fuelled with the diesel fuel that the company normally uses for its diesel buses.

This project is 1 of the 10 that are being overseen by CUTA and funded by Environment Canada. For additional details, see section 5.1.2.2.

**Table 4.12: Windsor Bus DOC Retrofit Project**

| Transit system  | City    | Quantity | Make | Model   | Engine  | Engine year |
|-----------------|---------|----------|------|---------|---------|-------------|
| Transit Windsor | Windsor | 6        | MCI  | Classic | DD 6V92 | 1991        |

#### 4.6.8.4 Toronto Bus DOC Retrofit Project

The TTC in Toronto will operate five buses retrofit with DOCs. These five buses will be fuelled with the diesel fuel that the company normally uses for its diesel buses.

This project is 1 of the 10 that are being overseen by CUTA and funded by Environment Canada. For additional details, see section 5.1.2.2.

**Table 4.13: Toronto Bus DOC Retrofit**

| Transit system | City    | Quantity | Make  | Model | Engine | Engine year  |
|----------------|---------|----------|-------|-------|--------|--------------|
| TTC            | Toronto | 5        | Orion | V     | 6V92TA | 1991 to 1992 |

#### 4.6.8.5 Ottawa Bus DOC Retrofit Project

OC Transpo in Ottawa will operate 25 buses retrofit with DOCs. These 25 buses will be fuelled with the diesel fuel that the company normally uses for its diesel buses.

This project is 1 of the 10 that is being overseen by CUTA and funded by Environment Canada. For additional details, see section 5.1.2.2.

**Table 4.14: Ottawa Bus DOC Retrofit**

| Transit system | City   | Quantity | Make | Model   | Engine                | Engine year |
|----------------|--------|----------|------|---------|-----------------------|-------------|
| OC Transpo     | Ottawa | 25       | MCI  | Classic | DD 6V92TA DDECII 6.99 | 1991        |

#### **4.6.9 Public Awareness Activities**

To promote its Drive Clean and Smog Patrol programs, the Ontario government participates in numerous public awareness activities.

##### **4.6.9.1 Drive Clean and Smog Patrol Public Awareness Programs**

###### *4.6.9.1.1 Drive Clean — Public Awareness*

Drive Clean program information is accessible through a web site and a Drive Clean Call Centre. The Drive Clean Call Centre features an Ontario-wide toll-free number that has been widely promoted and publicized.

Brochures available at each accredited Drive Clean facility also outline the program requirements. In addition, affected owners are notified of the emissions test requirements for their vehicles through a vehicle registration package that is mailed to the owners well in advance of their vehicle test date. As part of the Drive Clean vehicle registration package, vehicle owners are also provided with an explanation of the program along with its aims and objectives (Drive Clean 2004).

###### *4.6.9.1.2 Smog Patrol — Public Awareness and Outreach*

The Smog Patrol undertakes a number of communication activities to increase the Smog Patrol program awareness and to educate vehicle owners about what they can do to proactively ensure that their vehicles pass roadside emissions inspections. These activities include (Drive Clean 2004):

- producing a series of six feature articles about the program for News Canada, a source of editorial content for approximately 460 publications and 650 editors in Ontario. These articles were picked up by a number of newspapers in Ontario;
- participating in special events and initiatives that target specific audiences affected by the program. Examples include trade shows, such as the Ontario Transportation Expo, which provides the program outreach to the heavy-duty bus and truck industry, and joint enforcement/education initiatives, such as the ERASE program, which increases awareness in the street racing/modified vehicle community; and
- maintaining good media relations, which is a key to communicating information about the Smog Patrol program. For example, news releases are issued at the beginning of each smog season, and officers are often interviewed while conducting their inspections in an effort to generate and maintain a high media profile for the Smog Patrol program.

#### 4.6.9.2 Drive Clean Public Reporting System

Drive Clean maintains a system for reporting smoking vehicles. Citizens can report smoking vehicles by calling the Drive Clean Call Centre toll-free number. Following a complaint to the Drive Clean Call Centre, vehicle owners are notified by mail that a complaint has been lodged.

### 4.7 Manitoba

#### 4.7.1 Anti-tampering Legislation and Enforcement

At present, although not specific to emissions control equipment anti-tampering legislation, the *Manitoba Highway Traffic Act* does include a section that refers to “standards of vehicle equipment.” At an Environment Canada-convened meeting on in-use vehicle emissions control system tampering in 2002, officials from Manitoba stated that they felt that this section of the Act could be used to regulate the sale of components that do not meet the standard (Burelle 2002; Manitoba 2004).

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Used vehicles, first time registered in the Province of Manitoba, vehicles on resale and any vehicle undergoing a safety inspection must also undergo a visual inspection of the catalytic converter and other emission control equipment. This only applies for vehicles manufactured on or after January 1, 1995. There are no emissions control component inspections of heavy-duty vehicles. (Manitoba 2004)

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Officials in Manitoba feel that their vehicle safety inspection program discourages tampering, since any tampering that is detected could lead to a failure of the safety inspection. Repair or replacement of the tampered component(s) would be required prior to recertification (Manitoba 2004).

In Manitoba, certain vehicles are required to undergo safety inspections:

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When you first register a used vehicle in your name, you need to have a valid vehicle safety inspection certificate....

Mandatory vehicle safety inspections are required:

Every six months for:

- Buses (unless owned by an individual and used only for personal purposes).
- Truck tractors with a gross vehicle weight rating (g.v.w.r) of 21,953 kg or more (unless registered as a farm truck).

Every 12 months for:

- Truck tractors with a g.v.w.r. of less than 21,953 kg;
  - Truck tractors registered for farm use having a g.v.w.r. of 21,953 kg or more;
  - Trucks with a g.v.w.r. of 4,500 kg or more unless registered for farm use;
  - Semi trailers and trailer converter dollies;
  - Trailers with a g.v.w.r. of 4,500 kg or [more] unless recreational or registered farm use;
  - Buses operated by a church/nonprofit organization. (Manitoba 2004)
-

There are approximately 1900 privately owned facilities throughout Manitoba licensed by the province to perform vehicle inspections. Approximately 205 000 inspections are conducted annually at these authorized safety inspection stations. Emissions control components are inspected for presence (not performance) on 1995 MY and newer LDVs (Manitoba 2004).

Also, in July 2004, the provincial government, in conjunction with Environment Canada, ran five LET'S DRIVE GREEN vehicle emissions inspection clinics in The Pas, Dauphin, Brandon, Winnipeg, and Steinbach.

## **4.7.2 Scrapage Programs**

An estimated 12% of the passenger cars in Manitoba are pre-1988 MY (MB Lung 2004).

### **4.7.2.1 Winnipeg — Bye Bye Beaters Program**

The "Bye Bye Beaters" scrapage program began operating in the Winnipeg area in October 2003. The objective of this scrapage program is to remove at least 400 vehicles that are 1987 MY and older from the road. To qualify, the following conditions must be met (MB Lung 2004):

- The owner must be the registered owner of an automobile or light truck that is 1993 MY or older and not more than 2712 kg or 6000 lbs. in weight.
- There can be no outstanding liens or encumbrances on the vehicle.

In addition, the vehicle must have been registered in Manitoba for at least 6 of the last 12 months.

Three options are offered as incentives for participating. They include (MB Lung 2004):

- Option A — A \$500 voucher to be used against the purchase of a 1996 MY or newer vehicle at any one of the participating dealerships;
- Option B — Donate the vehicle and receive a free tow plus a tax receipt for an amount that depends on the vehicle; and
- Option C — Save over 30% (value \$500) on transit fares with a Winnipeg Transit EcoPass.

Vehicles are recycled or shredded. This program has set a proviso that no parts are to be reused or resold. The idea behind this policy of not reselling used parts is that reselling old parts will help to keep older cars on the roads longer.

The Bye Bye Beaters Program has funding to continue until March 2006.

As of the summer of 2004, approximately 140 in-use vehicles had been scrapped in the Bye Bye Beaters Program (MB Lung 2004).

## **4.7.3 Idle Reduction Programs**

In May 2004, the Climate Change Connection organization in Manitoba announced that:

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Five cities, eleven towns, four villages, eleven rural municipalities and regional Manitoba Hydro offices have created 426 "Idle-Free Zones" throughout Manitoba. (Duggan 2004)

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Municipalities from all over the province, including Churchill, Thompson, Brandon, CFB Shilo, and areas in between, are promoting the reduced-idling message by installing aluminum traffic signs promoting the message that "Healthy Communities Don't Idle."

The signs are provided and shipped free-of-charge by Climate Change Connection. As of May 2004, 376 anti-idle signs had been erected (Duggan 2004).

Officials with the government of Manitoba are not aware of any municipal anti-idling bylaws, nor of pending plans by municipalities to institute such requirements (Manitoba 2004).

#### **4.7.4 Programs to Reduce Vehicle Usage**

Winnipeg has a program that is designed to reduce vehicle use on two traffic corridors.

##### **4.7.4.1 Winnipeg — The WinSmart Showcase**

The City of Winnipeg has implemented a wide range of strategies to reduce GHG emissions from transportation in two major corridors. The WinSmart Showcase, part of Transport Canada's UTSP, is focusing on reducing GHG emissions from transportation in two of the capital region's major radial corridors (see section 5.3.1) (TC 2004).

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- The 15-kilometre Pembina corridor runs southwest from downtown along Highway 75, through residential and employment areas including the University of Manitoba. It is slated to host the first leg of the city's planned rapid transit system.
  - The 35-kilometre Selkirk corridor runs northeast from downtown along Highway 9 to Selkirk, serving several rural communities. (TC 2004)
- 

The showcase would include 18 initiatives grouped into five coordinated strategies:

- clean vehicles and fuelling systems;
- efficient automobile use;
- efficient trucking;
- transit, cycling, and walking improvements; and
- policy development through research.

Another initiative, Travel Smart, which would promote travel options through travel diary surveys and one-on-one communications, would support several strategies.

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This showcase would result in an estimated reduction in greenhouse gas emissions of 20,000 to 150,000 tonnes annually by 2006, assuming that rapid transit is implemented in the Pembina corridor. (TC 2004)

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#### **4.7.5 Alternative Fuel Projects**

Winnipeg Transit was involved in an alternative fuel demonstration project in the 1990s and has a current pilot project for an ethanol-diesel fuel blend (Cope 2003).



#### 4.7.5.1 City of Winnipeg Ethanol–Diesel Blend Pilot Project

In 2003, the City of Winnipeg was involved in a pilot project regarding the use of an ethanol–diesel blend in a number of transit buses.

#### 4.7.5.2 Winnipeg Transit Methanol in Large Engines Project

In 1986, Winnipeg Transit and NRCan retrofit two city buses with an early version of Detroit Diesel’s Electronic Controls System to test liquid methanol as an alternative fuel. Two new diesel buses were used as comparison vehicles. The Canadian Oxygenated Fuels Association joined the project in 1991 and incorporated a lubricity additive in the test for the final 2 years of operation. By 1993, the test had shown the limitations of liquid methanol in city transit fleets.

### 4.8 Saskatchewan

#### 4.8.1 Anti-tampering Legislation and Enforcement

As of August 2004, there is no in-use vehicle emissions control system anti-tampering legislation in Saskatchewan (Burelle 2002; Saskatchewan 2004).

While the Saskatchewan government does have a safety check for imported vehicles, that safety check does not include a check of emissions control equipment (Saskatchewan 2004).

The government of Saskatchewan participates in Environment Canada’s LET’S DRIVE GREEN in-use vehicle emissions inspection clinics that are held in the province.

#### 4.8.2 HDV Retrofit Project

Saskatoon Transit will operate eight buses that are retrofit with DOCs. These eight buses will be fuelled with the diesel fuel that the company normally uses for its diesel buses.

This project is 1 of the 10 that are being overseen by CUTA and funded by Environment Canada. For additional details, see section 5.1.2.2.

**Table 4.15: Saskatoon Bus DOC Retrofit Project**

| Transit system    | City      | Quantity | Make | Model   | Engine  | Engine year  |
|-------------------|-----------|----------|------|---------|---------|--------------|
| Saskatoon Transit | Saskatoon | 8        | MCI  | Classic | DD 6V92 | 1990 to 1993 |

#### 4.8.3 Active & Safe Routes to School

A&SRTS is a national program to encourage the use of active modes of transportation to and from school. Nationally, the A&SRTS program is coordinated by Go for Green (see section 2.9.4).

The Government of Saskatchewan has been active in the A&SRTS program; in Saskatchewan, the program is promoted and coordinated by the Saskatchewan Culture, Youth & Recreation Department (Government of Saskatchewan) (Go Green 2004; NCE 2004).

## 4.9 Alberta

### 4.9.1 Anti-tampering Legislation and Enforcement

Currently, the province of Alberta does not have vehicle emissions control component anti-tampering legislation. The Clean Air Strategic Alliance (CASA) has made recommendations to the Alberta Ministry of Transportation to incorporate anti-tampering legislation into the *Alberta Traffic Safety Act*, and this request is currently under active review (Alberta 2004).

For the Breathe Easy scrappage program in Calgary (see section 4.9.3.1), all the vehicles that were scrapped were first inspected for tampering (Burelle 2002):

- There was an overall tampering rate of approximately 21% detected in the pre-1988 vehicles that were scrapped.
- For approximately 25% of the cars so equipped, the catalytic converters were missing.
- Over 43% of the cars so equipped showed evidence of tampering with the thermostatic air cleaner.

**Table 4.16: Breathe Easy Scrappage Program —  
Emissions Control Equipment Tampering (CASA 2003)**

| Device                         | Number equipped | Number tampered | % tampering rate |
|--------------------------------|-----------------|-----------------|------------------|
| Catalytic converter            | 93              | 23              | 24.7             |
| EGR valve                      | 127             | 18              | 14.2             |
| Oxygen sensor                  | 50              | 6               | 12.0             |
| Positive crankcase ventilation | 120             | 18              | 15.0             |
| Evaporative canister           | 112             | 22              | 19.6             |
| Thermostatic air cleaner       | 134             | 58              | 43.3             |
| Air pump                       | 19              | 2               | 10.5             |
| Air pump belt                  | 17              | 0               | 0.0              |
| Air injection system           | 188             | 0               | 0.0              |

The government of Alberta participates in Environment Canada's LET'S DRIVE GREEN in-use vehicle emissions inspection clinics that are held in the province.

### 4.9.2 I/M Programs

Alberta currently does not have an I/M program. However, the province does inspect salvaged and imported vehicles (Alberta 2004).

Also, from October 7 to November 3, 1998, the Alberta ROVER Project used the ROVER (Roadside Optical Vehicle Emissions Reporter) self-contained mobile remote sensing unit to optically measure roadside exhaust emissions (CO and CO<sub>2</sub>) from passing vehicles (ROVER 1999).

- During the Alberta ROVER Project, the ROVER was at 40 different sites located throughout Calgary, Edmonton, Red Deer, and Canmore,
- 42,295 LDVs passed through the optical beam of the ROVER,
- The overall results showed that of all the 42,295 vehicles tested, 34,423 (or 81%) of these LDVs were considered to be clean, as they had CO exhaust emissions of 1% or less, and
- 3,196 (7%) were considered gross emitters with CO readings greater than 3%. (ROVER 1999)

Alberta's CASA may implement a similar remote sensing campaign in the near future.

### 4.9.3 Scrappage Programs

A pilot scrappage program in Calgary ended in 2002. It was followed by the Car Heaven Alberta program in Calgary and Edmonton in 2003.

#### 4.9.3.1 Breathe Easy Pilot Project — Calgary

The Breathe Easy Pilot Project targeted pre-1988 vehicles and operated in Calgary between March 21 and November 30, 2002. Applications were accepted between the launch on March 21 and the close of applications on June 10, 2002 (CASA 2003):

- In total, 782 applications were received between March 21 and June 10, 2002.
- There were 712 approved applications.
- Breathe Easy distributed 351 transit passes and 185 vehicle credits.
- Of the total, 536 vehicles were scrapped.

**Table 4.17: Breathe Easy Incentives Provided (CASA 2003)**

|                                     | Credits | Transit | Total |
|-------------------------------------|---------|---------|-------|
| Scrapped vehicles                   | 185     | 351     | 536   |
| Waiting list                        | —       | 10      | 10    |
| Vehicles disposed of while on list  | —       | 15      | 15    |
| Rejected and withdrawn applications | 48      | 73      | 121   |
| Approved and not scrapped           | 90      | 10      | 100   |
| Applications received               | 323     | 459     | 782   |

The Breathe Easy Pilot Project technical evaluation, prepared by RWDI West Inc., found that over a 3-year period, the program reduced HC, CO, and NOx emissions by approximately 803 tonnes or 1.5 tonnes per vehicle, and it reduced CO<sub>2</sub> emissions by 2889 tonnes or 5.39 tonnes per vehicle (CASA 2003).

Of the Breathe Easy tested vehicles, 67% failed to meet Environment Canada's idle emission limits for passenger vehicles and light duty trucks. (CAA 2003)

**Table 4.18: RWDI West Inc. Analysis of Breathe Easy Data<sup>1</sup>**

|   | Number of incentives | Criteria air contaminant emissions (tonnes) |       |      |      | CO <sub>2</sub> emissions (tonnes) |
|---|----------------------|---|-------|------|------|------------------------------------|
|   |                      | HC  | CO    | NOx  | PM   |                                    |
| Annual offsets from transit pass selectors    | 351                  | 19.9  | 143.1 | 13.6 | -0.1 | 763                                |
| Annual offsets from replacement car selectors | 185                  | 10.5  | 73.4  | 7.4  | -    | 200                                |
| Total annual emissions reductions             | 536                  | 30.4  | 216.5 | 21.0 | -0.1 | 963                                |
| Total emissions reductions over 3 years       | 536                  | 91.1  | 649.4 | 63.0 | -0.4 | 2889                               |

<sup>1</sup> Note that these estimates are based on an assumed 3-year life of scrapped vehicles using a technique developed by RWDI and may differ from those used in other scrappage analyses.

#### 4.9.3.2 Car Heaven Alberta — Calgary and Edmonton

Climate Change Central and the Clean Air Foundation set up the Car Heaven Alberta program, a scrappage program that rewards vehicle owners for donating their vehicles. The program was launched in Calgary on October 15, 2003, and in Edmonton on December 11, 2003. The Car Heaven Alberta program aims to remove 1500 vehicles from Calgary and Edmonton roads. A similar program is operating in Ontario (see section 4.6.4.1) (CCC 2004).

The program offers two tiers of incentives for those who donate, depending upon conditions:

- Is the vehicle being donated 13 years old or older (1991 MY and older)?
- Is the vehicle roadworthy and in running condition (tow-ins are not accepted)?
- Has the vehicle been registered and insured in the Province of Alberta for the past 12 months?
  - If YES to all of the above questions, then the owner qualifies for a Car Heaven Tier 1 incentive, depending on city of residence.
  - If NO to any of the above questions, then the owner qualifies for a Tier 2 incentive.
- At the Tier 1 level, qualified participants are eligible for a limited number of 6-month bus passes or a credit voucher for a bicycle purchase and the possibility of winning a 2004 Ford Focus in a draw from the list of donors to the Car Heaven campaign.
- At the Tier 2 level, cars that do not meet all of the criteria may still be eligible for a \$50 donation receipt from the Kidney Foundation, Alberta Chapter. (CCC 2004)

The campaign will run for 3 years, with plans to expand into other Alberta locations if funds are available (CAF 2004; CCC 2004).

Donated vehicles are dismantled and recycled by a participating member of the Alberta Auto Recyclers and Dismantlers Association (AARDA). Their members are committed to the environmentally friendly processing of vehicles and their parts — including oil, fluids, mercury switches and tires. None of the vehicles donated to the program [is] allowed back out onto the street to continue polluting. (CCC 2004)

Climate Change Central reports that as of August 6, 2004, the Car Heaven Alberta program has scrapped 483 vehicles (CCC 2004):

- Calgary: 337 vehicles (operational since October 15, 2003); and
- Edmonton: 146 vehicles (operational since December 11, 2003).

The average age of the vehicles donated to the program is 19 years.

Although the program has no restrictions in regard to the size of the vehicles that can be donated, Climate Change Central reports that to date they have not received any vehicles larger than a three-quarter-ton pickup truck.

To estimate emissions reductions, Car Heaven Alberta uses the values derived from the emissions testing done in the Breathe Easy Pilot Project (section 4.9.3.1). This method for estimating emissions reductions from a scrappage program assumes that the vehicle is retired 3 years earlier than it would be if the program did not exist. Using these techniques, Climate Change Central estimates that:

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There is an average saving of 5.4 tonnes of CO<sub>2</sub>, and 1.5 tonnes of smog forming pollutants per vehicle scrapped. Therefore the total reductions to date would be 2,608 tonnes of CO<sub>2</sub> and 724 tonnes of smog forming pollutants. (CCC 2004)

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Note that this technique differs from the methods used in NOVRAP (see section 2.6).

#### **4.9.4 Alberta Reduce Idling Campaign**

In September 2003, Alberta Climate Change Central, NRCan, and the Sierra Club of Canada – Prairie Chapter launched a campaign to encourage Alberta drivers to curtail the unnecessary idling of their vehicles (CCC 2004).

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The goal of the month-long “Alberta Reduce Idling Campaign” was to get motorists to turn off their engines when they are parked or stopped for more than 10 seconds, except in traffic. (CCC 2004)

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The Alberta Reduce Idling Campaign used public awareness advertising and events at schools and gas stations that were designed to directly engage drivers. As well, the municipal governments of the cities of Edmonton and Calgary, the Calgary Health Region, Alberta Environment, and Alberta Transportation supported the campaign by undertaking their own initiatives to curb idling.

#### **4.9.5 HDV Retrofit Programs**

For Alberta, information is available regarding two diesel bus retrofit projects.

##### **4.9.5.1 Edmonton CleanBus Project**

The CASA Vehicle Emissions Team and several partners are working together to find ways to reduce vehicle emissions in urban areas. To this end, the CASA Vehicle Emissions Team undertook a demonstration project to test the effectiveness of the Johnson Matthey

“Continuously Regenerating Technology Diesel Particulate Filter” (referred to hereafter as CRTDPF) under cold weather conditions. The project involved a 1-year test of the filter on two diesel buses in Edmonton Transit Service’s fleet between January 2003 and January 2004. The project was partly funded by Transport Canada’s MOST program (section 5.3.4) (CASA 2004).

The project also provided an opportunity to assess the impact of using a low-sulphur diesel fuel:

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Ultra Low Sulphur Diesel (ULSD) fuel is not readily available in Alberta so special batch production was required for the test and was supplied by Shell Canada’s Scotford Refinery. Although at approximately 21 ppm sulphur, the sulphur content was above that of the 2006 mandated level of 15 ppm, it was still acceptable for operation and testing of the [CRTDPF]. (CASA 2004)

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The emissions test results varied:

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Environment Canada’s Emission Research and Measurement Division (ERMD) tested the buses without the filters and then again with the filters using the ERMD on-board testing equipment. Testing was conducted to see if there were significant reductions in the [total hydrocarbon], CO, NOx, and total particulate matter (TPM) emissions while the buses were operated with the filters. (CASA 2004)

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The first round of exhaust emissions testing in January 2003 concluded that:

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Both buses showed decreases in total hydrocarbons between 51–60 per cent, carbon monoxide between 68–80 per cent, and total particulate matter between 60–73 per cent. There was a significant increase in nitrogen oxides (NOx) emissions on one bus, and no statistical difference in NOx emissions on the other bus. The NOx difference was not explained. (CASA 2004)

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After a year of normal operations, the buses were tested for the second time in January 2004.

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The second round of testing indicated decreases in total hydrocarbons between 61–87 per cent, carbon monoxide between 83–89 per cent, and total particulate matter between 73–75 per cent. (CASA 2004)

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The overall conclusions in regard to this HDV retrofit project were as follows (CASA 2004):

- Major reductions in emissions of three pollutants were observed:
  - *Total HCs*: reductions of 51–87%;
  - *CO*: reductions of 67–89%; and
  - *Total PM*: reductions of 60–75%.
- There was no significant change in the emission rate of NOx.
- There was no significant change in fuel consumption.
- The CRTDPF performed effectively even in the very cold weather experienced during the test period.
- There appeared to be no negative effects associated with the use of the CRTDPF.
- The emissions reductions improved over the course of the project.

- The use of the low-sulphur diesel fuel on its own did not show any significant emissions reductions. However, use of the low-sulphur diesel fuel enables the implementation of new advanced emissions control devices, like the CRTDPF.

Increasing public awareness was also a part of this project. CASA and its partners ran advertisements related to the project in a number of magazines that have a wide circulation in Canada.

#### 4.9.5.2 Calgary Bus DOC Retrofit Project

Calgary Transit will operate 20 buses that are retrofit with DOCs. These 20 buses will be fuelled with the diesel fuel that the company normally uses for its diesel buses.

This project is 1 of the 10 that are being overseen by CUTA and funded by Environment Canada. For additional details, see section 5.1.2.2.

**Table 4.19: Calgary Bus DOC Retrofit Project**

| Transit system  | City    | Quantity | Make | Model   | Engine | Engine year |
|-----------------|---------|----------|------|---------|--------|-------------|
| Calgary Transit | Calgary | 20       | MCI  | Classic | 6V92TA | 1991        |

#### 4.9.6 Programs to Reduce Vehicle Usage

CSN reports on two car-sharing programs that are in operation in Alberta (CSN 2004):

- Calgary — CATCO; and
- Edmonton — Carsharing Co-operative.

Operating parameters for a typical car-sharing program are presented in section 2.9.3.

### 4.10 British Columbia

#### 4.10.1 Anti-tampering Legislation and Enforcement

British Columbia has had legislation related to tampering with the emissions control equipment in motor vehicles since 1970. If tampering is detected, the onus for any penalty that is assessed is on the current vehicle owner.

In the Lower Mainland, enforcement of the anti-tampering legislation falls to the I/M program, AirCare. From September 1992 until September 2000, the first phase of AirCare, vehicles that underwent an AirCare test were also subjected to a visual inspection of their emissions control equipment and systems. That emissions control component inspection was advisory for 1987 MY and older vehicles. For 1988 MY and newer vehicles, the results of the visual tampering inspection were a part of the pass/fail decision for the overall I/M test. Since September 2000, all vehicles in the program undergo a visual inspection of the fuel inlet cap, plus 1988 MY and newer vehicles also undergo a visual inspection for the presence of the catalytic converter (AirCare 2004).

For the first phase of AirCare, to assist with component identification in their anti-tampering inspections:

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AirCare created an Emissions Control Systems (ECS) library that lists all of the emissions components that should be on each LDV in Canada. The library also includes photographs of the engine compartment (under hood) that show component location for every type of vehicle sold in Canada. (Burelle 2002)

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With respect to catalytic converter tampering, the AirCare inspections in 2001 found that a total of 189 vehicles failed because the catalytic converter was missing. In 2002, 232 vehicles failed the AirCare test because of a missing catalyst (Gourley 2003).

Currently, AirCare officials report that the most common form of tampering is the removal or breakdown of the thermostatic air cleaner. In the majority of cases, this tampering is not malicious, but rather the component has become clogged or falls apart. AirCare officials also feel that (Burelle 2002):

- Although tampering is not a large problem now, they expect OBD II tampering to be a concern in the future.
- In the future, they expect more and more after-engine components for HDVs and medium-duty vehicles. There will remain an economic incentive for these components to be removed.
- There are also significant tampering issues when engines are converted to other fuels — for example, from gas to propane or natural gas. This conversion usually leads to the removal of the catalytic converter and other control equipment. The converted vehicles have very high failure rates when inspected for emissions.

The government of British Columbia also participates in Environment Canada's LET'S DRIVE GREEN in-use vehicle emissions inspection clinics that are held in the province.

#### **4.10.2 AirCare LDV I/M Program**

Of the numerous vehicle emissions reduction programs under way in British Columbia, the most prominent is the AirCare I/M program. In September 1992, British Columbia became the first province in Canada to introduce a program aimed at reducing harmful motor vehicle emissions through the use of periodic mandatory inspections by establishing the AirCare program. AirCare is currently administered by Pacific Vehicle Testing Technologies Ltd., a subsidiary of TransLink.

The objective of the AirCare program is to significantly reduce air pollution in the Lower Fraser Valley, an area stretching from Lions Bay to Chilliwack. The program currently identifies over 80 000 excess emitting vehicles annually. The program requires emissions repairs to be performed on vehicles that fail the AirCare test prior to relicensing and renewing insurance.

The AirCare program was designed according to a centralized, contractor-operated model. Following an intense selection process, a private company, Ebco-Hamilton Partners (now called Envirotest Canada), was contracted to build, staff, and operate the system that initially had (Stewart et al. 2001):



- 12 inspection centres, located strategically throughout the region;
- a capacity to perform up to 1.2 million inspections per year;
- a total of 42 lanes, each with identical testing equipment and lane operating software; and
- an automated testing process, all test data being transmitted electronically to a central database.

The first AirCare contract was for a period of 7 years and expired on August 31, 1999. A renewal was negotiated with the same company, Envirotest Canada, in 1999. The latest contract expires on August 31, 2006.

The AirCare program has changed with time. The emissions test cutpoints have been tightened, or made stricter, on a periodic basis, and in 2001, the IM240 transient emissions test was introduced to the program.

Most vehicles in the program area with a gross vehicle weight (GVW) of 5000 kg or less require an AirCare inspection prior to relicensing, if the vehicle's last AirCare inspection has expired.

In the first 8 years of the program, 1992–2000, all vehicles required an annual test, and 8 534 984 tests were performed and 1 876 123 individual vehicles were tested at least once. In 2001, the IM240 transient emissions test was introduced for 1992 MY and newer vehicles on a biennial basis. Following the advent of biennial testing for 1992 MY and newer vehicles, 748 068 vehicles were tested in 2001 and 778 521 in 2002 (Stewart et al. 2001; Gourley 2003).

The objective of any I/M program is to reduce emissions through the repair of vehicles with excess emissions (Stewart et al. 2001).

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The process of testing vehicles and failing excess emitters does not, in itself, produce any emissions benefit. In order to produce emission reductions, excess-emitting vehicles must be competently repaired. The designers of the AirCare program were well aware of the importance of the repair industry to its success. Recognizing that effective diagnosis and repair of high-emitting vehicles is the single most important factor in AirCare's success, the program administration created a certification program for auto technicians and auto repair shops. Repairs performed by an AirCare Certified Technician at an AirCare Certified Repair Centre are referred to as "Certified Repairs." (Stewart et al. 2001)

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The AirCare system also features a repair facility monitoring program that was devised and put in place alongside the inspection process.

AirCare I/M program features include the following (Stewart et al. 2001; Gourley 2003; AirCare 2004):

- *Vehicles Included:* Vehicles with a GVW of 5000 kg or less require a test.
- *Test Frequency:* From 1992 through 2000, all vehicles subject to the program were required to undergo an AirCare test every year. Beginning in 2001, all 1992 MY and newer vehicles required a test every 2 years. Annual testing is still required for all 1991 MY and older vehicles.

- *Test Facilities:* Testing is performed at centralized, contractor-run, test-only AirCare facilities.
- *Repair Cost Limit:* The repair cost limit (RCL) is the maximum amount that is required to be spent to qualify for a “conditional pass” and includes any diagnostic fees. RCLs are as follows:

| Model year     | No tampering | Tampering |
|----------------|--------------|-----------|
| 1980 and older | \$300        | Advisory  |
| 1981–1987      | \$400        | Advisory  |
| 1988–1991      | \$500        | No limit  |
| 1992–1998      | \$600        | No limit  |
| 1999 and newer | No limit     | No limit  |

- *Conditional Passes Allowed:* If the necessary emissions repairs are going to cost more than the applicable RCL, once the owner has paid the “limit” in repairs, he or she receives a “conditional pass.”
- *Certified Repair Centres:* Approximately 500 repair shops are AirCare-certified in any given year. From 1992 through 2000, 228 shops in total were certified continuously. Over the first 8 years of the program, the number of active AirCare-certified technicians remained relatively stable at about 1200.
- *Home Repairs Allowed:* However, if repairs are not performed by an AirCare-certified technician, the vehicle will not be eligible for a conditional pass if it fails reinspection.
- *Emissions Test – Dynamometer and Idle Tests:* Vehicles were tested using the ASM and/or an idle test until 2001, when the IM240 transient emissions test was introduced for 1992 and newer LDVs.
  - *IM240* — 1992 MY and newer vehicles (except diesels) are tested using the IM240 transient emissions test. The test measures emission levels for HC, CO, and NOx while the vehicle is driven over a predefined series of accelerations, decelerations, and cruise conditions. The test may last up to 240 seconds depending on how “clean” the vehicle is in the early part of the test.
  - *D147* — All diesel LDVs are tested using an advanced transient opacity test. The test measures smoke opacity levels while the vehicle is driven on a dynamometer over a predefined series of accelerations, decelerations, and cruise conditions. The test may last up to 147 seconds depending on how “clean” the vehicle is in the early part of the test.
  - *High-Speed Idle* — Diesel vehicles that cannot be run on the dynamometer receive a high-idle test. Three high-idles are performed within the normal 147-second measuring period.
  - *ASM/Idle* — 1991 MY and older vehicles (except diesels) are tested on a dynamometer using a less complicated emissions test than the IM240. The test measures emission levels for HC, CO, and NOx while the vehicle is driven at a steady speed of 40 km/h and again while the engine idles. The driving test may last up to 90 seconds depending on how “clean” the vehicle is in the early part of the test.
  - *Idle Test* — An idle emissions test is used to measure levels for HC and CO for all non-diesel vehicles that cannot be dynamometer tested.
- *On-Board Diagnostic (OBD) Test:* For 1998 MY and newer vehicles, connection is made to and the vehicle is inspected using the vehicle’s built-in OBD II monitoring system to ensure that the evaporative control system is not defective. While not currently used for making a

pass/fail decision, the other information downloaded from each vehicle's OBD II system is stored and analyzed.

- *Gas Cap Pressure Test:* Most vehicles also receive a functional inspection of the gas cap to ensure that it does not allow fuel vapours to escape to the atmosphere.
- *Visual Component Tampering Inspection:* All vehicles undergo a visual inspection of the fuel inlet cap. 1988 MY and newer vehicles also undergo a visual inspection for the presence of the catalytic converter.
- *Emissions Cutpoints or Test Standards:* The EPA final IM240 cutpoints are used for the transient test. AirCare-devised limits are used for the ASM and idle tests.
- *Certain Vehicles Exempt:* New vehicles up to 2 years old are exempt.
- *Rejections:* Vehicles with obvious visible smoke are rejected from testing and must be repaired before they are allowed to undergo an AirCare test.
- *Technical Assistance Line:* Expert technical assistance is readily available to all AirCare Certified Repair Centres when they encounter difficulties in diagnosing or repairing vehicles that have failed their AirCare inspection. This is an extremely valuable resource to which non-certified repair shops do not have access.

For the AirCare program, approximately 16% of the vehicles tested fail. Of those that fail (AirCare 2004):

- 70% are repaired and pass a retest;
- 10% are partially repaired and receive a "conditional pass"; and
- 20% are not repaired and in one way or another are retired from the fleet in the program area.

Currently, the AirCare program identifies more than 80 000 vehicles with excess emissions every year and ensures that they are correctly repaired. In its first 10 years, from 1992 to 2002, it is estimated that the AirCare program reduced the total in-use vehicle fleet emissions in the program area by 35% (AirCare 2004).

For 2001 and 2002, the estimated emissions reductions directly related to AirCare repairs are illustrated in Table 4.20 (Gourley 2003).

**Table 4.20: Estimated Emission Reductions Resulting from AirCare Repairs**

|       | 2001               | 2002                 |
|-------|--------------------|----------------------|
| HC    | 13% or 1262 tonnes | 15% or 1338 tonnes   |
| CO    | 8% or 9068 tonnes  | 10% or 10 440 tonnes |
| NOx   | 5% or 506 tonnes   | 7% or 594 tonnes     |
| Total | 10 836 tonnes      | 12 372 tonnes        |

Also for 2001 and 2002:

- Of vehicles tested in 2001, 127,436 (16.4%) failed. Of these, 22,604 vehicles were not brought back for re-inspection.

- Of vehicles tested in 2002, 114,819 (15.3%) failed. Of these, 24,335 vehicles were not brought back for re-inspection.
- An investigation revealed that the majority of the vehicles that did not return for an inspection were removed from the inventory. These vehicles were likely scrapped, placed in storage or removed from the AirCare area.
- For the gas cap pressure test 4.67% failed in 2001 and 3.96% failed in 2002.
- The most common repairs were to oxygen sensors and catalytic converters:  
Catalytic converters replaced in 2001 — 5,779 and in 2002 — 10,678  
Oxygen sensors replaced in 2001 — 8,328 and in 2002 — 11,803. (Gourley 2003)

Many vehicles that fail the AirCare inspection and that are subsequently repaired exhibit improved fuel economy as an added benefit. Although not specifically what AirCare was designed to address, the improved fuel economy that results from AirCare repairs accounts for a significant reduction in the amount of fuel burned by LDVs in the region each year. This translates into a reduction in GHG emissions (AirCare 2004).

Data from the first phase of AirCare, from 1992 through 2000, indicate the following:

- AirCare inspection data confirm an increasing failure rate with vehicle age, ranging from less than 1% for the newest vehicles tested to 30% or more for older vehicles.
- Of the 1,876,123 individual vehicles tested at some point during the review period, there were 509,242 vehicles that failed at least once.
- From 1992 through 2000, each year between 6.5% and 8.5% of failing vehicles did not return for any form of re-inspection. Overall, it is estimated that the number of “disappeared” failing vehicles was 79,000, or 15.5% of the total number of vehicles that failed.
- There were 86,559 vehicles that received a Conditional Pass at some point, representing 17% of all failing vehicles.
  - Most of the vehicles that received a Conditional Pass received only one,
  - Only 1 vehicle received the maximum possible 8 Conditional Passes, and
  - Only 3804 vehicles have received more than 2 Conditional Passes, suggesting that this provision is not widely used as a means of avoiding complete repairs.
- The incremental benefits directly attributable to AirCare repairs in any given year range from 3.33% to 9.72% for HC emissions, 2.65% to 8.98% for CO and 0.91% to 2.20% for NOx.
- By combining the three percentage reductions, weighted by their actual mass assessments in the inventory, it was estimated that the emissions attributable to the light-duty vehicle fleet declined by 57.4% due to fleet turnover, repairs related to AirCare, accelerated vehicle retirement, etc.
- Calculations indicate that in the absence of the AirCare program, the reduction over the same period would have been only 23.7%, indicating a significant benefit due to the program. (Stewart et al. 2001)

It cannot be emphasized frequently enough that the purpose of an I/M program is not to test vehicles but to see that vehicles with excess emissions are repaired or otherwise removed from the program. To that end, AirCare established a system for monitoring the effectiveness of repairs. This system can be considered a measure of program effectiveness (AirCare 2004).

Each and every diagnosis and repair performed by AirCare Certified Repair Centres is monitored and evaluated. The evaluation of repair effectiveness is based on the emissions readings before

repair compared to the emissions readings after the repair. In addition, the details of the diagnosis and repair action are taken into consideration to ensure that unnecessary repairs are not done. These performance evaluations are used both to provide an incentive for better performance and to identify poor performers that may require remedial action. (AirCare 2004)

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#### **4.10.2.1 FIX-IT Pilot Project**

One criticism of I/M programs is the use of the RCL and the conditional pass. If an RCL is used, then many gross emitters are not repaired. While the RCL provides financial hardship aid for the owners of the gross emitting vehicles, it also serves to defeat the main purpose of the I/M program.

Therefore, in an attempt to address the issue of gross emitters and conditional passes, AirCare implemented the FIX-IT Pilot Project:

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During 2003, a project called FIX-IT subsidized the total emissions repair costs on a limited number of vehicles that would have otherwise received a Conditional Pass. Owners of qualified vehicles paid a contribution equal to the applicable Repair Cost Limit for their vehicle, and the remainder of the repair costs were subsidized by the British Columbia Clean Air Research Fund. (AirCare 2004)

---

The FIX-IT project is now in its second phase. If a vehicle is older than 1992 and has previously received a conditional pass and the estimated cost of repair this year is still too high, the vehicle may be eligible for repair cost subsidies. Approximately 20 vehicles will be repaired during this phase of the project.

#### **4.10.3 ACOR — AirCare On-Road for HDVs**

ACOR (AirCare On-Road), the AirCare mobile roadside HDV emissions testing program, began as a pilot project in 1996. ACOR roadside enforcement testing began on May 1, 1999, using two mobile test vans that were each staffed by a peace officer and a technician. These two units performed roadside opacity testing until August 2002, when the program was suspended. Following a review, the ACOR program was restarted in 2004, under the auspices of TransLink and the Ministry of Transportation, using two mobile vans staffed by one peace officer each.

The roadside inspectors performed or tested for (ACOR 2004):

- opacity using the SAE J1667 Snap Acceleration Test Procedure. No other emissions tests were performed. The cutpoints employed were the EPA recommended cutpoints of 55% for 1990 MY and older engines and 40% for 1991 MY and newer engines;
- safety-related visual inspections; and
- a very quick visual inspection for evidence of tampering with emissions control systems or emissions-related systems.

Although all vehicles over the AirCare program's upper weight limit of 5001 kg GVW are considered for roadside pullover, the ACOR mobile units tend to focus on Class 7 and Class 8 trucks, which are typically over 20 000 kg GVW (ACOR 2004).

From May 1, 1999, to August 30, 2002, the ACOR mobile units conducted 1771 tests on HDVs in the Lower Mainland. Of these, 982, or just over 55%, failed the opacity test. For the majority of the vehicles that failed, peace officers issued a safety “Emissions Notice and Order” that required the truck to be reinspected within 30 days.

Of the vehicles that failed, 889 underwent a reinspection, generally following repair. Of these, 844, or 95%, passed the reinspection opacity test, and their average opacity on retest had dropped significantly (ACOR 2004).

**Table 4.21: ACOR Roadside HDV Opacity Testing, 1999–2002 (ACOR 2004)**

|   | Number of HDVs | Opacity |
|---|----------------|---------|
| Total number of emissions tests performed           | 1771           |         |
| Average opacity of all emissions tests              |                | 56.82   |
| Total number that failed emissions test             | 982            |         |
| Mean opacity for failed vehicles                    |                | 77.79   |
| Total number of Emissions Notices and Orders issued | 960            |         |
| Total number of reinspections performed             | 889            |         |
| Average opacity all reinspections                   |                | 28.63   |
| Total number that passed the reinspection           | 844            |         |
| Adjusted opacity for HDVs passing retest            |                | 26.26   |

In 2004 to date, 461 HDVs have been tested, and 49 have failed. The low failure rate in 2004 is attributed to the advent of fleet testing programs in the area and to the new non-targeted, voluntary nature of the restructured ACOR testing program. Also, under its new framework, ACOR officials feel that legislative and regulatory changes are needed if TransLink is to continue to operate the ACOR program. Until those changes are made, the inspectors will not be able to issue “Emissions Notices and Orders.” For the ACOR program to continue, the required changes include a series of regulations and fines (ACOR 2004):

- for failing an ACOR heavy-duty diesel vehicle inspection;
- for operating a non-diesel-powered vehicle producing visible emissions (oil smoke, etc.);
- for failing a tampering inspection;
- for refusing to submit to an inspection; and
- for failing to comply with an ACOR Emissions Notice and Order.

#### **4.10.4 Scrappage Programs**

##### **4.10.4.1 Scrap-It Program — Lower Mainland**

The “Scrap-It Program” began operating in the Lower Mainland (Vancouver and local areas up the Fraser Valley) of British Columbia in 1996. For a vehicle owner to qualify for the Scrap-It Program:

- You must own and currently operate a 1993 or older car or light-duty truck.

- You must have insured your vehicle for the last 12 months continuously in the Lower Mainland AirCare test area.
- Your vehicle must have failed an AirCare test at some point in its history.
- If your vehicle is insured for "Pleasure-use" only, it must have traveled at least 5000 km over the last year. (Scrap It 2004)

The incentives offered to those who participate in the Scrap-It Program include the trade of a qualifying vehicle for one of (Scrap It 2004):

- \$1000 towards a new natural gas vehicle (NGV);
- \$750 towards a new vehicle;
- \$500 towards a 1994 MY or newer used vehicle;
- 50% of the cost of a bicycle up to \$500;
- \$750 towards vanpooling or carpooling;
- a TransLink monthly pass;
- a West Coast Express 28-day pass; or
- a Jack Bell Foundation (JBF) van pool program pass.

Since the Scrap-It Program began as a pilot project (April 1996 to November 1998), over 3200 LDVs have been scrapped. On average, about 400 vehicles have been scrapped per year since 1999 (see Table 4.22). The information in Table 4.22 represents the vehicles processed through the Scrap-It Program as of July 1, 2004 (Scrap It 2004).

**Table 4.22: Scrap-It Program Data Incentives Awarded<sup>1</sup>**

| Year                              | Approved applications | Vehicles scrapped | New | Used | Transit | Bike | WCE | JBF |
|-----------------------------------|-----------------------|-------------------|-----|------|---------|------|-----|-----|
| Pilot: April 1996 – November 1998 | 1234                  | 955               | 264 | 157  | 450     | N/A  | N/A | N/A |
| 1999 (includes December 1998)     | 582                   | 457               | 56  | 37   | 170     | 167  | 1   | 1   |
| 2000                              | 556                   | 399               | 118 | 45   | 150     | 43   | 10  | 0   |
| 2001                              | 594                   | 411               | 123 | 52   | 161     | 36   | 11  | 1   |
| 2002                              | 578                   | 408               | 113 | 31   | 193     | 26   | 7   | 0   |
| 2003                              | 540                   | 403               | 109 | 37   | 179     | 31   | 2   | 0   |
| As of July 1, 2004                | 286                   | 182               | 52  | 13   | 65      | 14   | 3   | 1   |
| Totals                            | 4370                  | 3215              | 835 | 372  | 1368    | 317  | 34  | 3   |

<sup>1</sup> Abbreviations used:

New – credit towards a new vehicle

Used – credit towards a used vehicle

Transit – one of a variety of transit passes

Bike – credit towards the purchase of a bicycle

WCE – pass for the West Coast Express train

JBF – pass for the Jack Bell Foundation van pool program

#### 4.10.4.2 Cash for Clunkers Program — Kelowna

This voluntary program began on November 17, 2003, and is set to run until the end of March 2005. The goal of the program is to improve Central Okanagan air quality by encouraging residents to trade in older, high-polluting vehicles. Vehicles that pre-date 1994 are targeted. Vehicle owners trading in an LDV that meets the Cash for Clunkers criteria are able to choose from the following rewards:

- 
- A two year transit pass (worth \$927)
  - Up to \$350 towards the purchase of a bicycle (the incentive amounts to 100% of the purchase price up to \$350)
  - Up to \$500 towards the purchase of a bicycle (the bicycle incentive amounts to 50% of the purchase price up to a maximum of \$500)
  - Up to \$500 towards the purchase of an electric powered bicycle, vehicle, motorcycle, scooter etc... (the electric device incentive amounts to 50% of the purchase price up to a maximum of \$500)
  - Up to \$250 towards the purchase of up to five pairs of footwear (inline skates, running shoes, skateboard etc....)
  - Footwear and Bicycle Reward Combo — Up to \$150 towards the purchase of up to 5 pairs of footwear and up to \$150 towards the purchase of a bicycle
  - \$750 towards the purchase of a new vehicle with a city fuel consumption rating of 7.1 litres per 100 kilometres\*
  - \$500 towards the purchase of a 1996 or newer used vehicle with a city fuel consumption rating of 7.1 litres per 100 kilometres\*
  - \$250 towards the purchase of a new or used (1994 or newer) vehicle\*
- \*Must be purchased at a participating retailer.

#### Additional Incentives:

In addition to your choice of rewards, other incentives for all qualifying vehicles include:

- Free tow to the scrap yard
  - Vehicle owners will receive a \$50 charitable tax receipt from the Kidney Foundation (Kelowna 2004)
- 

In order to qualify for the program:

- 
- You must reside in the Regional District of the Central Okanagan and be the registered private owner of a 1993 or older car, motorcycle, passenger van or light duty truck (not exceeding 2721 kg/6000 lbs.)....
  - There must be no outstanding liens or encumbrances on the vehicle.
  - The vehicle must be insured or had been insured up to six weeks before applying for this program and registered within the Regional District of the Central Okanagan.
  - The vehicle must be road worthy.
  - The vehicle must have been insured for 6 of the previous 12 months. (Kelowna 2004)
- 

As of July 27, 2004, the “Cash for Clunkers” Clean Air Rewards Program approved 185 applications. Of those, 122 applicants brought their vehicles to the scrap yard for recycling. It is also reported that the program administrators received over 700 phone calls to their hotline in regard to participation in the program (Kelowna 2004).



## 4.10.5 Idle Reduction Programs

A number of municipalities in the Lower Mainland of British Columbia have implemented anti-idling legislation, and idle reduction campaigns have been employed in communities within the Greater Vancouver Regional District (GVRD).

### 4.10.5.1 Anti-idling Legislation

The GVRD Board of Directors recently endorsed a model anti-idling bylaw titled "Not in Motion" that limits idling of vehicles to no more than 3 minutes in a 60-minute period. Municipalities within the GVRD are encouraged to adopt this bylaw (GVRD 2004).

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The by-law is a "model" by-law for member municipalities to adopt individually, if they so desire. The GVRD does not intend to adopt a region-wide by-law. (GVRD 2004)

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Currently, two communities in the Vancouver area have bylaws that address vehicle idling. However, both report that they are considering revising their bylaws to conform to the GVRD model (GVRD 2004).

#### 4.10.5.1.1 District of North Vancouver

In the community of North Vancouver, vehicle idling is addressed in that city's Nuisance Abatement Bylaw (NV 2004).

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Consolidation of Bylaw 7325 up to and including Bylaw 7504 as of September 27, 2004  
The Corporation of the District of North Vancouver Bylaw 7325, a bylaw to prevent, abate and prohibit certain nuisances pursuant to section 725 of the Local Government Act, R.S.B.C. 1996, c323. The Council for The Corporation of the District of North Vancouver enacts the following:

No person shall cause or permit a Motor Vehicle engine to be left in operation for more than three (3) minutes in a sixty (60) minute period while the vehicle is stationary, except:

- i. Motor Vehicles undergoing repairs at a service garage licensed pursuant to the Bylaws of the District of North Vancouver,
  - ii. Emergency Vehicles, or
  - iii. Where the operation of the Motor Vehicle engine is necessary to power equipment ancillary to the Motor Vehicle. (NV 2004)
- 

The penalty for the unnecessary idling of a stationary vehicle is \$50.00.

#### 4.10.5.1.2 City of Vancouver

The current bylaw focuses on the noise associated with diesel engines (excluding regional TransLink buses). However, Vancouver plans to announce a new bylaw in the fall of 2004 to accompany the city's climate change action plan. This new bylaw will be modelled on the GVRD bylaw (Vancouver 2003, 2004; BEST 2004; GVRD 2004).

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Effective December 1, 1998 Parking Enforcement began issuing tickets to non-TransLink buses that are stopped at curbside with their engines idling for more than 3 minutes.

In seeking compliance of the by-law, the goal is to minimize engine noise and exhaust. At many locations where tour buses usually stop, signs are currently posted which inform bus operators to turn off the bus engine. However, the presence of these signs is not required for enforcement to occur. Officers actively monitor bus engine idling as well as responding to resident complaints.

Under Vancouver's Motor Vehicle Noise Abatement By-law No. 4338 Section 3. (e): "The sound of the diesel engine of a bus which has been idling or otherwise running continuously for more than three (3) minutes at the same location except that this clause shall not apply where the bus is located within a garage or depot intended for its long term parking," is in the opinion of the Council of the City of Vancouver, objectionable or liable to disturb the quiet, peace, rest, enjoyment, comfort or convenience of individuals or the public.

"Objectionable noise" as described above is enforced under Section 4 of the by-law. Buses left idling for more than 3 minutes are subject to a \$100.00 fine. (Vancouver 2003)

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The City of Vancouver has used its police force to enforce its bylaw and has issued tickets for violations. The bylaw currently applies to diesel buses only.

#### **4.10.5.1.3 Other Communities**

The Better Environmentally Sound Transportation (BEST) organization reports that it is working with about a dozen municipalities within GVRD to raise awareness about unnecessary vehicle idling (BEST 2004):

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Vancouver, West Vancouver, North Vancouver (District and City), Port Moody, Port Coquitlam, New Westminster, Burnaby, Surrey, Richmond, and Langley (Township) are raising awareness with employees and residents. (BEST 2004)

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#### **4.10.5.2 Idle-Free Workplaces Campaign**

In 2004, in conjunction with GVRD, the BEST organization and the JBF (see section 4.10.7.4) initiated an "Idle-Free Workplaces Campaign" to reduce unnecessary vehicle idling. The campaign is designed to assist businesses and their employees to (BEST 2004):

- avoid idling infractions as GVRD municipalities pass new anti-idling bylaws;
- position employees in front of the idle-free learning curve by proactively raising awareness, creating a plan of action, and measuring results; and
- put together an idling reduction action plan that will save money, increase the corporate responsibility profile, and keep air cleaner for tomorrow.

To accomplish its goals, the Idle-Free Workplaces Campaign created free communication materials, such as posters, information cards, windshield decals, bumper stickers, and presentations.

#### **4.10.5.3 GVRD Idle Reduction Campaign**

GVRD is hoping to launch a second phase of a "Vehicle Idling Reduction Campaign" in 2005 that focuses on parents with idling vehicles at schools and on diesel engines in general. This campaign is intended to last for 2 or 3 years (BEST 2004).

NRCan is currently negotiating a contract with GVRD for an Idle Reduction Campaign in the region. This may be the program referred to by the BEST organization (NRCan 2004).

#### **4.10.6 Public Awareness Campaigns**

Two public awareness campaigns or programs related to in-use vehicle emissions in the Vancouver area are AirCare initiatives.

##### **4.10.6.1 AirCare Public Awareness Campaign**

The AirCare program, in conjunction with other key partner agencies, conducts an annual Public Awareness Campaign. This campaign generally runs from June through to September and focuses public attention on the importance of clean air to our health and environment.

The AirCare Public Awareness Campaign also promotes alternatives to driving a car, promotes idle reduction, and provides driving tips for reducing emissions.

In addition, the AirCare program and its partners — the British Columbia Medical Association, British Columbia Lung Association, David Suzuki Foundation, Environmental Youth Alliance, and Envirotest Canada — also sponsor an annual “AirCare AirWaves Radio Scholarship Contest” (AirCare 2004).

##### **4.10.6.2 AirCare Public Reporting System**

AirCare operates a system by which citizens can report smoking vehicles by calling a government line and reporting the incident. This public reporting line is reportedly achieving results. Since January 1, 2004, AirCare has sent out 410 warning letters to the owners of vehicles that have been reported on their “snitch line” (AirCare 2004):

- Letters went to 310 LDV owners, of which 47 were registered outside the AirCare territory.
- Another 96 letters were sent to HDV owners.
- The final 4 letters were sent to the owners of trailer plates.

#### **4.10.7 Programs to Reduce Vehicle Usage**

There are a number of projects afoot in the province that are designed to reduce vehicle usage and hence reduce emissions.

##### **4.10.7.1 BEST — Sustainable Transportation Programs**

BEST is a Vancouver-based organization that promotes sustainable transportation, land use planning, and pedestrian-, cycling-, and transit-oriented neighbourhoods. BEST began operation on May 22, 1991 (BEST 2004).

In 1991 and 1992, BEST coordinated “Ride for the Environment” events during national Environment Week. In February 1996, BEST broadened its range of activities to include all forms of sustainable transportation in addition to bicycles. “Bike to Work Week” and the “Commuter Challenge” began in 1996 (BEST 2004).

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Both of these public awareness campaigns were aimed at promoting alternatives to the single occupancy vehicle, and getting widespread acceptance of the bicycle as a legitimate mode of transportation. (BEST 2004)

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In 1997, BEST launched “Go Green Choices,” a program designed to promote sustainable transportation choices and to reduce single-occupancy vehicle trips to the workplace. In 2000, “Bike Week” became “Bike Month.”

#### **4.10.7.2 Go Green Choices — Regional Transportation Program**

Go Green Choices is a regional transportation program that is designed to encourage employers to adopt sustainable methods for commuting to the workplace. The Go Green Choices program was developed by BEST and is funded by TransLink. Working in conjunction with employees and management, Go Green Choices provides tailored assistance in the development, design, implementation, and maintenance of work site Go Green programs. The Go Green Choices regional transportation program promotes walking, cycling, transit use, and off-peak travel. The services offered by Go Green Choices include (BEST 2004):

- training employees as Go Green coordinators;
- coordinating quarterly seminars regarding parking management and bicycle facilities in the workplace;
- providing follow-up support for transportation choices program development;
- providing employer outreach and support;
- acting as a local resource for sustainable transportation information, issues, and challenges;
- providing information on and referrals to other transportation service agencies; and
- offering promotional services and incentives by:
  - coordination and staging of worksite transportation fairs and other promotional activities;
  - providing Go Green posters to advertise worksite events;
  - providing prize incentives; and
  - holding commuter cycling workshops.

#### **4.10.7.3 Car-Sharing Programs**

According to CSN, a number of car-sharing programs are operating in communities in British Columbia. These programs include (CSN 2004):

- Nelson — Nelson Carshare Co-op;
- Vancouver, Tofino, Nanaimo, Whistler — Cooperative Auto Network;
- Vancouver — Jack Bell Foundation Vanpool, Carpool Program; and
- Victoria — Victoria Carshare Co-op.

The operating parameters for a typical car-sharing program are presented in section 2.9.3. The JBF car-sharing program is discussed below.

##### **4.10.7.3.1 JBF Vanpool, Carpool Program**

The JBF vehicle program uses “carpool” and “vanpool” in its title, but this system is really a form of car-sharing. The foundation’s vanpool, carpool, and rideshare program started in 1992 in

the Lower Mainland of British Columbia and was modelled after the successful Seattle Metro vanpool-rideshare program. The program now operates in the Lower Mainland and on Vancouver Island. There are over 140 vehicles in the fleet owned and operated by JBF (JBF 2004).

A JBF vanpool is:

- 
- A group of 7 to 8 commuters sharing their ride to work,
  - A minivan with operating costs paid for by The Jack Bell Foundation,
  - Able to take advantage of high occupancy vehicle lanes to avoid freeway traffic and time-consuming snarls, and
  - Driven by one or more riders who receive a reduced fare for driving the van. (JBF 2004)
- 

A JBF carpool consist of three to five people who commute to and from work together:

- 
- Carpool vehicles are supplied by JBF.
  - Carpoolers pay to cover operating costs such as: fuel, maintenance and insurance.
  - Fees are collected by the driver and submitted on a monthly basis to JBF.
  - Monthly vehicle reports are collected by the driver and submitted to JBF.
  - Carpoolers pay the operating costs for their vehicles, [whereas] TransLink and BC Transit [absorb] administration expenses.
  - Drivers are allowed some personal use of the vehicle.
  - Monthly fares are based on the kilometers traveled in that month. (JBF 2004)
- 

#### **4.10.7.4 JBF Rideshare Program — Carpool Matching**

JBF also operates a rideshare, carpool-matching program in the Lower Mainland and on Vancouver Island (see section 2.9.1).

- 
- The Jack Bell Foundation can help you by matching you with one or more commuters.
  - To rideshare you can register with The Jack Bell Foundation free of charge.
  - When you register you will be asked if you prefer to ride in a carpool, or if you might be interested in using your vehicle to carry paying carpool passengers on a full-time or alternating basis....
  - You will also receive a “match list” which is a list of names and phone numbers of commuters who live in your neighborhood, work near you and have similar work schedules. These people have registered with us and they indicated a desire to Rideshare so you don’t have to hesitate to call them.
  - The driver of the carpool determines the cost of carpooling based on kilometers traveled and gasoline used. (JBF 2004)
- 

#### **4.10.7.5 GVTA and GVRD — Sustainable Region Showcase**

The Greater Vancouver Transportation Authority (GVTA) and the GVRD propose six strategies to reduce GHG emissions from transportation across the region. This project is funded in part by Transport Canada’s UTSP (section 5.3.1).

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Main Street is a major arterial road that connects a mix of land uses to the region's core. It carries a high volume of transit users, with 30,000 bus passengers daily. However, traffic congestion causes many buses to run behind schedule and increases passenger delay. To improve service reliability, reduce travel times and make the street more pedestrian-friendly, the showcase would:

- Redesign the street to reduce bus delay, shorten pedestrian crossing times, improve pedestrian safety, and improve the vitality of the streetscape
- Use intelligent transportation system (ITS) technologies to improve transit operating speeds and reliability
- Make transit customers more comfortable and give them real-time information
- Increase transit service levels to reduce waiting and crowding
- Market new and improved transit services to retain and increase ridership....

This showcase would result in an estimated reduction of 8,320 to 12,180 tonnes in annual greenhouse gas emissions by 2006. The estimated reductions from individual strategies are:

- Main Street transit and pedestrian priority — 2,000 to 2,500 tonnes
  - Hybrid bus demonstration — 120 to 180 tonnes
  - Central Valley Greenway — 1,200 to 1,500 tonnes
  - Transit villages — 4,000 to 6,000 tonnes
  - Goods movement efficiency — to be determined
  - TravelSmart household-based marketing — 1,000 to 2,000 tonnes. (TC 2004)
- 

#### **4.10.7.6 Victoria — Community in Motion**

The City of Victoria proposes three major strategies to develop synergies among public transit, cycling, and walking, in order to increase sustainable travel and reduce GHG emissions from transportation across the region. This project has applied for funding from Transport Canada's UTSP (see section 5.3.1) (TC 2004):

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The intention of the proposed showcase is to improve the competitive position of transit, cycling and walking as modes of choice, and to remove barriers to their use. It would also demonstrate how outreach and education could add value to infrastructure improvements....

This showcase would lead to reduced greenhouse gas emissions, including an estimated 1,000 tonnes annually due to the Victoria-Langford bus rapid transit strategy. (TC 2004)

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#### **4.10.8 HDV Retrofit Projects**

##### **4.10.8.1 Cleveland Dam Project — Off-Road Dump Trucks**

Over a 6-month period in the 1990s, eight off-road dump trucks were retrofit with "catalyzed particulate traps" during the construction of an access road to the Cleveland Dam in the Capilano Valley. The retrofit of the traps was mandatory as part of the environmental protection provisions of the contract for the project (Cope 2003).

- 
- *Description:* The purpose of this retrofit project was to reduce PM, soot and odour emissions that could impact on nearby residences during the course of the project. The contractor was asked to use Ultra-Low Sulphur Diesel (ULSD) and catalyzed particulate traps. However,

- following an environment impact analysis, local residents would not approve a diesel storage facility in the valley so the contractor used off the shelf traps with regular diesel fuel.
- *Participants:* Greater Vancouver Regional District (GVRD) and the project contractor.
  - *Funding:* The contractor was required to pay for the particulate traps. The contractor reported the retrofit equipment cost \$15000 per vehicle.
  - *Vehicles:* Eight off-road dump trucks were retrofit during the construction of an access road to the Cleveland Dam over a six-month period.
  - *Engines:* The dump trucks were equipped with Volvo and Caterpillar engines.
  - *Retrofit Equipment and Fuel Used:* The trucks were retrofit with catalyzed particulate traps using regular highway diesel fuel. GVRD performed the SAE J1667 opacity test and all vehicles had very low opacity registering only at a few percent. The trucks were operated on a very heavy-duty cycle and no problems with the traps were reported over the course of the project. However, when some of the same vehicles were subsequently used on another project, where they did not operate on as busy a duty cycle, the traps plugged.
  - *Status:* The project is complete. The HDVs operated during a six month period in the 1990s. (Cope 2003)

#### 4.10.8.2 Vancouver Bus DOC Retrofit Project

The Coast Mountain Bus Company in Vancouver will operate 21 buses that are retrofit with DOCs. These 21 buses will be fuelled with the diesel fuel that the company normally uses for its diesel buses.

This project is 1 of the 10 that are being overseen by CUTA and funded by Environment Canada. For additional details, see section 5.1.2.2.

**Table 4.23: Vancouver Bus DOC Retrofit Project**

| Transit system             | City      | Quantity | Make      | Model | Engine  | Engine year |
|----------------------------|-----------|----------|-----------|-------|---------|-------------|
| Coast Mountain Bus Company | Vancouver | 21       | New Flyer | D40HF | DD 6V92 | 1992        |

#### 4.10.8.3 Victoria Bus DOC Retrofit Project

BC Transit in Victoria will operate 16 buses that are retrofit with DOCs. These 16 buses will be fuelled with the diesel fuel that the company normally uses for its diesel buses.

This project is 1 of the 10 that are being overseen by CUTA and funded by Environment Canada. For additional details, see section 5.1.2.2.

**Table 4.24: Vancouver Bus DOC Retrofit Project**

| Transit system | City     | Quantity | Make | Model   | Engine  | Engine year |
|----------------|----------|----------|------|---------|---------|-------------|
| BC Transit     | Victoria | 16       | MCI  | Classic | DD 6V92 | 1991        |

## **4.10.9 Alternative Fuels Projects**

### **4.10.9.1 Coast Mountain Bus Company — Fuel Cell Demonstration**

In 2000, British Columbia's Coast Mountain Bus Company completed a successful 2-year demonstration project running three Ballard fuel cell-powered low-floor buses in full transit service. The coaches were serviced and fuelled via a hydrogen electrolysis station at a Coast Mountain Bus Company depot. The buses used the phase-three fuel cell engine.

The Ballard Company has a phase four engine. Coast Mountain Bus Company has submitted a funding proposal to the provincial and federal governments to have the three phase-three buses upgraded to the phase-four engine (Cope 2003).

## **4.11 Yukon**

### **4.11.1 Anti-tampering Legislation and Enforcement**

Air Emission Regulations were developed in 1998, and, because of requests to develop controls for in-use vehicles, an anti-tampering clause was included. The anti-tampering clause states that:

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No person shall remove or tamper with or otherwise alter an air emissions control system in such a manner as to render it inoperable or lessen its efficiency. (Yukon 2004)

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The maximum fine for tampering is set at \$200.

The Yukon government participates in Environment Canada's vehicle emissions inspection clinics. In June 2004, LET'S DRIVE GREEN clinics were held in Whitehorse, Haines Junction, and Dawson City (see section 5.1.1).

### **4.11.2 Anti-idling Campaigns**

#### **4.11.2.1 Northern Climate ExChange — Anti-idle Education Program**

The Yukon government and the City of Whitehorse are developing strategies to address climate change. To that end, the Northern Climate ExChange (NCE) is involved in an anti-idling education program. The purpose of the program is to reinforce the anti-idling message and to work with citizens to dispel idling myths and to encourage improved idling practices. This project will receive widespread support from different levels of government and diverse community organizations (Yukon 2004).

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The NCE has partnered with the City of Whitehorse, the Yukon Government, the Energy Solutions Center, the Yukon Science Institute, the Yukon Youth Conservation Corps and the Yukon Conservation Society to develop and launch an anti-idle campaign in the Yukon. Environment Canada's 2004 EcoAction Community Funding Program has provided additional funds for this program.

This project will use a variety of social marketing techniques to reduce idling in Whitehorse. The anti-idle campaign complements the existing public education and outreach activities of NCE.



The newest mascot, "Auntie Idle," developed by a local artist, will join "Bob and Dog Mackenzie" to deliver our climate change "Are you doing your bit?" message in the Yukon.

Anti-idling signs will be designed, produced and placed in parking lots, drop-off zones and delivery areas throughout the Whitehorse area to encourage drivers not to idle. The project will work with schools to provide information and develop Idle Free Zones around schools. The coordinator will use a variety of media articles and community events to educate the public.

The program will use information and resources available from the federal government's anti-idle website as well as publications available from the office of Energy Efficiency. The NWT and Manitoba Public Education and Outreach hubs have been contacted for information and advice based on their successful anti-idle programs. (Yukon 2004)

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#### **4.11.2.2 Territorial Government Fleet Idle Reduction Program**

The Yukon government conducted an in-house idle reduction program with its Transportation Maintenance Division fleet in 2000 (Yukon 2004):

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The Transportation Division of the Yukon Government began an Anti-Idle campaign in 2000, by monitoring their truck fleet idle time through the Silent Witness computers installed in the fleet. Idle times were tracked and the information was disseminated to the users, encouraging them to reduce the idle time of the fleet. This active program ran for approximately a year. The program also used newsletters to encourage all employees of the division to reduce the amount of idle time in all vehicles and to promote active living.

With the use of this initiative, Transportation Maintenance Branch has been able to reduce the idle time in their fleet by approximately 15%.

At present there is no formal anti-idle campaign in effect for the Transportation Maintenance Division, but supervisors continue to monitor idle time in the fleet and report any major discrepancies to the users. (Yukon 2004)

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#### **4.11.3 Programs to Reduce Vehicle Usage**

##### **4.11.3.1 Whitehorse — The Whitehorse Driving Diet**

As part of Transport Canada's UTSP, the City of Whitehorse proposes three complementary strategies to encourage the use of sustainable modes of transportation and reduce GHG emissions from transportation (see section 5.3.1) (TC 2004).

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Whitehorse's showcase would adopt a range of approaches to reducing automobile use, particularly in its downtown area.... The showcase would make a number of changes to transportation infrastructure to enhance active transportation:

- "Road diets" — These would reduce the number of lanes on roads to improve the safety and continuity of walking and cycling routes, while still preserving vehicle mobility. Two four-lane roads would be reduced to two lanes with a centre left-turn lane, and sheltered pedestrian crossings would be added.
- *Walking and cycling network improvements* — Three major multi-use trails between downtown and residential areas would be improved by adding new connections and river crossings, lighting and stairs at steep grades. Trees, lighting, benches, bicycle racks, transit

shelters and transit information would be added in the downtown area to enhance walkability and transit use.

- *Roundabout* — One roundabout would be installed at a major intersection to reduce vehicle speeds and improve the safety of all road users. (TC 2004)
- 

#### **4.11.3.2 Whitehorse — Commuter Challenge**

The City of Whitehorse has participated in the Commuter Challenge program for the last 3 years and won first place in its category in 2004 (see section 2.9.2.1).

### **4.12 Northwest Territories**

#### **4.12.1 Anti-tampering Legislation and Enforcement**

At an Environment Canada-convened meeting on in-use vehicle emissions control system tampering in 2002, officials from the Northwest Territories indicated that there was no current or proposed anti-tampering legislation in the territories (Burelle 2002).

However, although emissions from excessive idling of vehicles, especially in winter, are a concern for the public, the territorial government reports that, at present, it does not have the resources to undertake action on this issue (NWT 2004).

The government of the Northwest Territories does participate in Environment Canada's LET'S DRIVE GREEN voluntary in-use vehicle emissions inspection clinics (see section 5.1.1) (NWT 2004).

#### **4.12.2 Idle Reduction Campaign — Yellowknife**

The Northwest Territories Climate Change Centre held a Commuter Challenge program from June 1 to 7, 2003. This program included an Idle Reduction Campaign in the Yellowknife area.

Windshield decals were handed out to motorists in idling vehicles during random spot checks at more heavily populated drop-off areas. It is reported that, in general, motorists reacted favourably to receiving the windshield decals (NRCan 2004).

Note that the Northwest Territories Climate Change Centre was a pilot project and is currently closed.

#### **4.12.3 Commuter Challenge**

As noted in section 4.12.2, the Northwest Territories Climate Change Centre ran a Commuter Challenge program for communities in the territory for 1 week in June 2003 (see section 2.9.2.1).

## **4.13 Nunavut**

### **4.13.1 Anti-tampering Legislation and Enforcement**

No information was available.

### **4.13.2 Active & Safe Routes to School**

As discussed in section 2.9.4, the A&SRTS is a national program to encourage the use of active modes of transportation to and from school. The Walking School Bus initiative encourages parents to organize a Walking School Bus instead of driving the children to school (NCE 2004).

Across Canada, the A&SRTS program is promoted and coordinated by a variety of organizations. The Northern Climate ExChange, Northern Research Institute, reports that the A&SRTS program is in operation in Nunavut under the auspices of the Recreation and Leisure Division of the Government of Nunavut (NCE 2004).

## 5. Federal Programs

In Canada, the federal government sets emissions standards for new vehicles. However, the emissions from vehicles once they are in use on the roads and highways are the responsibility of the provincial/territorial governments (EC 2004).

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Federal new vehicle emission standards first became law in 1971. Initially, Canadian standards mirrored those of the U.S.A., however, in 1975, less stringent standards were imposed in Canada and those less stringent standards remained in effect through 1987. In 1988, the Canadian standards were once again harmonized with those of the U.S.A. and they have remained essentially identical since that time. (EC 2004)

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Even though in-use vehicle emissions are the purview of the provincial/territorial governments, the Government of Canada is committed to improving air quality across the country and to reducing the health and environmental effects from air pollution. Consequently, a number of federal departments are operating or funding programs that are designed, one way or another, to reduce in-use vehicle emissions (EC 2004).

### 5.1 Environment Canada

Since the federal government has no authority over vehicles once they are sold and are being driven on the roads and highways, federal programs dealing with the in-use fleet are volunteer programs and focus on increasing awareness in regard to vehicle maintenance and tampering.

In addition to providing information via its Internet site, Environment Canada is involved in a number of in-use vehicle emissions reduction programs. The federal government also works with the CCME, private industry, and various government agencies and jurisdictions to develop codes of practice, such as the codes for LDV and HDV emissions I/M programs (CCME 1998, 2003).

#### 5.1.1 LET'S DRIVE GREEN Voluntary Vehicle Inspection Clinics

In 1986, Environment Canada began running voluntary LDV inspection clinics in various communities across the country. The purpose of the clinics was to inform the motoring public as to the importance of proper vehicle maintenance and to generate environmental awareness.

In recent years, the program has taken on a new name, LET'S DRIVE GREEN, and has increased in size and scope. In terms of number of communities visited and number of vehicles tested, 2003 was the most successful year to date. In 2003, clinics were staged in 35 separate locations in 11 provinces and territories across Canada, and 7142 vehicles were run through the inspection process. A summary of the clinic results from 1999 to 2003 is presented in chapter 6.

For the 2003 program (Martin et al. 2003):

- A vehicle inspection consisted of a tire pressure test, a fuel cap pressure test, and a tailpipe emissions analysis.

- In addition, a visual inspection of the emissions control devices was done for those vehicles that failed the emissions test.
- In St. John's, every vehicle was inspected for evidence of tampering.

For the 2003 LET'S DRIVE GREEN program:

- 
- Of the 7142 vehicles that participated this year, 7078 yielded valid emissions test results.
  - 1069 vehicles, or 15.1%, exceeded either the HC and/or CO limits.
  - Approximately 6% of all the vehicles tested doubled or more than doubled the allowable emissions limits of HC or CO, qualifying them as "gross emitters." Therefore, approximately 41% of the vehicles that failed the emissions test were "gross emitters."
  - Of the vehicles that failed the emissions test, 29.6% showed visible signs of tampering with at least one emissions control system component. (Martin et al. 2003)
- 

For the 2002 LET'S DRIVE GREEN program:

- 
- 1170 vehicles were inspected for emissions control device tampering.
  - Of the 1170 vehicles inspected for tampering, 31.0% of them [displayed evidence of tampering with at least one of the emissions control devices].
  - The tampering results indicated a strong tendency for tampering rates to increase with vehicle age. (Martin et al. 2003)
- 

### **5.1.2 Heavy-Duty Diesel Vehicle Retrofit Programs**

The Transportation Systems Branch of Environment Canada is (and has been) involved in a number of retrofit projects as part of the Branch's feasibility study into the potential for diesel HDV retrofit exhaust after-treatment systems to contribute to sustainable transportation in Canada.

Also, in 1999, Environment Canada published a report that proposed a bus engine rebuild program for Canada. The report identified the real and quantifiable benefits towards clean air that can be achieved by retrofitting urban transit buses with EPA-verified DOCs (Patriarche 1999).

This study was followed in 2002 by two more retrofit studies, an overview of HDV retrofit in general, and an inventory of the retrofit programs throughout Canada and the United States (Cope 2003).

#### **5.1.2.1 Gatineau/Ottawa Demonstration Projects**

One demonstration project sponsored by the Transportation Systems Branch in 2001 involved buses from two transit companies in the National Capital Region, OC Transpo (the public transit system that serves Ottawa) and STO (which serves Gatineau, Quebec).

The project involved a study of the effectiveness of installing catalytic mufflers on older transit buses and documented the retrofit process, including purchase, installation, operational changes, complications, and the quantification of any reductions in air pollution (mostly in terms of particulates) (Aubin 2001).

Catalytic mufflers were purchased from different suppliers and installed on the buses, and the emissions were monitored. An industry standard SAE J1667 smoke test was performed on each bus prior to and following the installation of the catalytic mufflers. More extensive tests were performed at Environment Canada's Emission Research and Measurement Division (ERMD) testing laboratory in Ottawa (see sections 4.5.6.1, 4.6.8.2, and 5.1.2.3)

### **5.1.2.2 Canadian Urban Transit Bus Retrofit Project**

On February 9, 2004, Environment Canada signed a contribution agreement with CUTA in the amount of \$320 000 to deliver a national urban transit bus retrofit project (Cram 2004):

- 
- 138 transit buses in Canada will be retrofit with diesel oxidation catalysts (DOCs),
  - 10 transit authorities across the country will help to deliver this program. They include Victoria, Vancouver, Calgary, Saskatoon, Windsor, Toronto, Ottawa, Quebec City, Halifax and St. John's,
  - The DOCs that will be used are verified by the Environmental Protection Agency in the USA to reduce exhaust emissions of PM by 20%, CO by 40% and HCs by 50%,
  - Using a life expectancy of five years for each DOC, reductions in air pollutants of 18 tons of PM, 42 tons of HC, and 182 tons of CO are expected,
  - 1990 to 1993 MY Transit buses have been identified for retrofit,
  - The DOCs were purchased and delivered during the 2003/2004 fiscal year and will be installed during the 2004/2005 fiscal year, and
  - The project will be completed in March 2005. (Cram 2004)
- 

The DOCs that are used in the program are AZ Purimufflers that have been supplied by Engine Control Systems. Each transit authority is continuing to use the diesel fuel that it normally uses for its diesel buses.

### **5.1.2.3 ERMD HDV Retrofit Emissions Measurements**

Environment Canada's ERMD has been involved in numerous programs in Canada, in the United States, and around the world that involve the measurement of emissions from HDVs equipped with emissions retrofit systems and devices (Cope 2003).

The ERMD has become a world leader in the use of on-board portable HDV emissions sampling and measurement systems.

### **5.1.3 Scrappage Programs**

While the federal government does not run a vehicle scrappage program, Environment Canada has funded LDV scrappage programs in several cities across Canada. These voluntary programs are developed and run by local organizations in communities across Canada and supported by a number of partners, including Environment Canada.

In these programs, to be eligible, a vehicle owner must reside in the area where the scrappage programs are operating; the vehicle must have been insured for the past 6–12 months; and the vehicle must be capable of being driven to a recycling contractor's scrap yard. Owners of 1993 MY and older vehicles who qualify can choose to scrap their vehicle in exchange for one of the

incentives offered in their localities. Originally, all of the scrappage programs sponsored by Environment Canada targeted pre-1988 MY vehicles. However, the latest agreements require all programs to target pre-1994 MY vehicles (EC 2004).

Vehicles brought in through these programs are recycled according to provincial/territorial environmental guidelines. This includes draining the vehicle's fluids and recycling the tires and batteries before the remainder is recycled for scrap metal.

Until recently, vehicle scrappage programs in Canada employed a variety of techniques to estimate the emissions reductions that would likely result from scrapping old vehicles. However, through an Environment Canada contract, AirCare staff created a computer program called NOVRAP (see section 2.6). The current plan is for Environment Canada to input data from all of the scrappage programs operating in 2003 and on into NOVRAP. Any new scrappage program agreements that Environment Canada signs with the provinces/territories will make it mandatory for them to use NOVRAP to calculate emissions reductions (EC 2004).

Environment Canada has provided funding to the following in-use vehicle scrappage programs in Canada; information on these programs is provided by province/territory in chapter 4 (Cram 2003):

- Scrap-It Program — Vancouver, British Columbia;
- Breathe Easy Program — Calgary, Alberta;
- Car Heaven — Calgary and Edmonton, Alberta;
- Car Heaven — Ontario;
- Fredericton, Moncton, and Saint John Vehicle Scrappage Program — Fredericton, Moncton, and Saint John, New Brunswick;
- Green Mobility Pilot Project — Ottawa, Ontario;
- Scrap-an-Old-Car Pilot Project — Montreal, Quebec;
- Bye Bye Beaters — Winnipeg, Manitoba; and
- Cash for Clunkers Program — Kelowna, British Columbia.

## **5.2 Natural Resources Canada (NRCan)**

NRCan operates a number of programs that are principally designed to increase fuel efficiency and/or decrease fuel use.

### **5.2.1 FleetSmart Program**

The FleetSmart Program, initiated in 1997, has a goal to improve energy efficiency and reduce operating expenses for fleet owners in Canada. The program offers free practical advice on how energy-efficient vehicles and business practices can reduce fleet operating costs, improve productivity, and increase competitiveness. (Note that several of the initiatives discussed in section 5.2 are interlinked to the FleetSmart Program.) Initiatives that are a part of the overall FleetSmart Program are described below (NRCan 2004).

### 5.2.1.1 Commercial Transportation Energy Efficiency Rebate

As part of the Government of Canada's commitment to improve energy efficiency and reduce GHG emissions that contribute to climate change, funds have been allocated to pay a rebate for the installation of pre-qualified equipment that provides truck cab or bus interior heating and/or cooling. This rebate for fuel-efficient devices is administered by the Transportation Program of NRCan and is a second component of the Commercial Transportation Energy Efficiency and Fuels Initiative of the 2002 Climate Change Plan for Canada (see section 5.3.2).

According to a study by Argonne National Laboratory in the United States, a typical heavy-duty, freight-hauling, Class 8 truck idles about 1840 hours per year when parked overnight.

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A Class 8 truck/bus engine consumes approximately 4 litres of diesel fuel per hour when idling at 900 rpm. Because each litre of diesel fuel consumed by an engine produces 2.8 kilograms of GHGs, one hour of idling by a Class 8 engine produces 11.2 kilograms of GHGs, and one year's worth of idling (1840 hours) produces 20 608 kilograms (20.6 tonnes) of GHGs. (ANL 2004)

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The main reasons for idling heavy-duty trucks and buses are to:

- 
- heat or cool the truck cab and/or sleeper
  - keep the fuel warm in winter
  - keep the engine warm in winter so that the engine is easier to start. (NRCan 2004)
- 

Such engine idling can be avoided by employing devices such as fuel-fired interior heaters, engine coolant heaters with cab or bus interior heating apparatus, and auxiliary power generators (NRCan 2004):

- *Fuel-Fired Interior Heaters* — These run on the vehicle's diesel fuel. For a set level of performance, the Government of Canada will rebate 20% of the purchase price, not exceeding the manufacturer's suggested retail price (uninstalled and before taxes), of a fuel-fired interior heater, up to a maximum of \$350.
- *Engine Coolant Heaters with Cab or Bus Interior Heating Apparatus* — This category includes products that both supply heated air to the cab or bus interior and heat and circulate the engine coolant. The units are fuel-fired, running on the vehicle's diesel fuel. For a set level of performance, the Government of Canada will rebate 20% of the purchase price of an engine coolant heater with cab or bus interior heating apparatus, up to a maximum of \$350.
- *Auxiliary Power Units* — Auxiliary power units consist of a small internal combustion engine (running on the vehicle's diesel fuel). The unit is equipped to provide climate control (heating and air conditioning) to the vehicle interior as well as a generator to provide electricity for electrical appliances, battery charging, and/or engine preheat. For a set level of performance, the Government of Canada will rebate 20% of the purchase price of an auxiliary power unit, up to a maximum of \$1400.

### 5.2.1.2 Quiet Zone Campaign 2004 Be FleetSmart

In conjunction with participating truck stops across Canada from October 4 to December 10, 2004, NRCan will operate the Idle Free Quiet Zone Campaign. The objective of this campaign is to reduce idling by heavy-duty trucks. As of early August 2004, the list of truck stops that had



registered for the Quiet Zone Campaign 2004 included truck stops in nine provinces: Newfoundland and Labrador (1), Nova Scotia (1), New Brunswick (2), Quebec (7), Ontario (36), Manitoba (8), Saskatchewan (7), Alberta (9), and British Columbia (11), for a total of 82 (NRCan 2004).

### **5.2.1.3 Fuel Management 101 Workshop**

NRCan's FleetSmart Program presents a Fuel Management 101 workshop for fleet managers. This workshop is designed to assist fleet managers in preparing a fuel management plan for their company/utility/municipal fleet, implement the plan, and measure and monitor its success.

Fuel Management 101 is a 1-day workshop that will provide fleet managers with many tips, ideas, and a template for creating a fuel management plan for their fleet. The program has four main phases:

- 
- why you should have an energy management plan
  - how to make a plan
  - how to benchmark your fleet
  - how to sell your plan to management, to implement your plan, analyse the results and chart a future direction. (NRCan 2004)
- 

The information in this program applies to fleets of all kinds, including municipal, taxi, trucking, and courier companies.

### **5.2.1.4 Partners with Canadian Trucking Alliance on Energy Efficiency**

In an August 2003 news release, NRCan announced that it had signed an agreement with the Canadian Trucking Alliance (CTA) that will save energy and reduce GHG emissions. Efforts by the CTA and NRCan will focus on (NRCan 2004):

- supporting Canada's commitment to stabilizing emissions;
- heightening CTA members' understanding of how energy efficiency relates to climate change;
- developing cost-effective and flexible voluntary actions;
- implementing a national training and awareness program for trucking companies that emphasizes cooperation and partnerships; and
- working to identify and reduce barriers to more efficient practices.

This agreement, negotiated under the Government of Canada's Action Plan on Climate Change, will be implemented through the FleetSmart Program, and the program will identify economic opportunities to reduce fuel use and track these reductions within fleet sectors through partnerships with industry and provincial and international governments.

Participation in this program is voluntary, in keeping with Canadian industry's request to address climate change in a cost-effective, non-regulatory way.

The CTA is a federation of Canada's regional and provincial for-hire trucking associations representing some 4000 motor carriers from all regions of the country.

### 5.2.1.5 SmartDriver Workshops

These workshops provide training and education for professional drivers (section 5.2.5).

### 5.2.1.6 FleetSmart Program Effectiveness

The effectiveness of the FleetSmart Program is outlined in a number of “success stories” that are described in detail on the FleetSmart Internet site. These include (NRCan 2004):

- highway trucking — 13 companies;
- pickup trucks, vans, and SUVs — 2 companies;
- city transit buses — 3 transit companies;
- school buses — 2 school bus operations;
- highway coaches — 1 bus company;
- municipalities and utilities — 1 municipal fleet, 1 police fleet, and 1 taxi company; and
- forestry — 3 trucking companies.

### 5.2.2 Idle-Free Zone

In 2000, NRCan launched an Internet site that is dedicated to helping Canadians stop unnecessary vehicle idling in their communities. In addition to providing information related to excessive vehicle idling, NRCan provides access via the Internet site to what it refers to as “The Anti-idling Tool Kit.” The tool kit provides materials for individuals or organizations to operate an idle reduction campaign (NRCan 2004):

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Take action to stop unnecessary vehicle idling. Use the tool kit’s free set of ready-to-use graphic images and downloadable materials to launch an anti-idling awareness campaign at your school, at your workplace or a larger scale community awareness and outreach campaign.

#### **Build Your Own Anti-Idling Campaign**

Do you lack the time or resources to develop your anti-idling communications items? Make your own Anti-Idling Toolkit using our free ready-to-use graphic images and materials that you can download. Use as is or adapt for your own anti-idling campaign.

The Tool Kit contains:

- Anti-idling images,
  - Radio scripts/[public service announcement] demo’s,
  - Information card handouts,
  - Brochures,
  - Dialogues for intervention/volunteer staff to approach idling motorists,
  - Sample letters,
  - Example survey templates,
  - Ready-to-use Power Point presentation,
  - Reports/research,
  - Personal 5-Step Action Plan, and
  - Links to other sites and information. (NRCan 2004)
-

NRCan developed this web-based tool kit to assist municipalities and community groups across Canada with taking action to curb unnecessary vehicle idling at the local level. NRCan then asked a number of communities to participate in a test of the tool kit:

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The Federal government has asked the City of Mississauga to participate as a test municipality to pilot the new web-based tool kit...on a City-wide scale...to enhance Mississauga's Local Action Plan for Climate Protection and reduce unnecessary vehicle idling throughout the community.

This pilot project is a year-long campaign to encourage residents to commit to turning off their vehicles when stopped for more than 10 seconds. Natural Resources Canada has provided \$150,000 to fund the various components of the project and City of Mississauga staff are implementing the project with the assistance of other community partners including GO Transit, University of Toronto at Mississauga, and Peel school boards. (Mississauga 2004)

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In addition, the NRCan Internet site provides links to a number of other communities, organizations, and industry groups that are operating anti-idling campaigns. The cities with idle reduction campaigns funded in part by NRCan include Mississauga, Sudbury, and the GTA in Ontario. They have also funded programs in Quebec City and Sherbrooke and provided funding to Climate Change Central in Alberta to launch a public education idle reduction campaign in Edmonton and Calgary (see chapter 4 for additional details).

NRCan is currently negotiating contracts to fund idle reduction programs in Halifax and with the GVRD (NRCan 2004).

### **5.2.3 Personal Vehicles Initiative**

The Personal Vehicles Initiative provides Canadian motorists with helpful tips on buying, driving, and maintaining their vehicles to reduce fuel consumption and GHG emissions. Since reducing fuel consumption means saving money and, more importantly, helping the environment, the Personal Vehicles Initiative Internet site provides an on-line method for comparing the fuel consumption rates for different vehicles (NRCan 2004).

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You can make a significant contribution to reducing greenhouse gas emissions by trading in your vehicle for a more fuel-efficient model. To be environmentally responsible, you should place a high priority on fuel efficiency when selecting a vehicle. (NRCan 2004)

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A resource for vehicle fuel economy ratings is NRCan's EnerGuide, which can be accessed from the NRCan Internet site. Other items available on this site include a Fuel Consumption Guide, the EnerGuide label, a system to find and compare the most fuel-efficient vehicles, driving tips, maintenance suggestions, and buying tips. The Personal Vehicles Initiative also provides information on how to "Build Your Own Anti-Idling Campaign" and the "Anti-Idling Tool Kit." These are part of NRCan's Idle-Free Zone (see section 5.2.2) (NRCan 2004).

The Personal Vehicles Initiative also includes the AutoSmart Student Driving Kit for driver educators. Vehicle energy efficiency information materials are distributed and promoted through a network of private and provincial alliances across Canada (NRCan 2004).

## 5.2.4 Natural Gas for Vehicles Program

The "Natural Gas for Vehicles Program" ended on March 31, 2004. That program offered incentives to reduce the cost of using natural gas for transportation and to develop and demonstrate new technology for NGVs. The program funded public awareness marketing campaigns and cost-shared demonstrations of new technology. The program also supported the expansion of a natural gas fuelling infrastructure by providing funds to help build new fuelling stations for private and commercial fleets and for smaller fuelling units suitable for individual vehicles. The Natural Gas for Vehicles Program, administered by NRCan's Office of Energy Efficiency, offered a program that contributed (NRCan 2004):

- \$2000 to the purchase of a dedicated natural gas or bi-fuel LDV;
- \$3000 to the purchase of a dedicated natural gas or bi-fuel HDV;
- \$500 per vehicle for aftermarket conversions; and
- \$500 to dealerships for each new NGV sold.

The aftermarket vehicle conversion portion of the program offered a contribution of \$500, payable to the owner of the vehicle, to convert vehicles to natural gas operation. The aftermarket conversion program was administered by natural gas companies in Alberta, Saskatchewan, Quebec, and Ontario; over the course of the program, 1400 conversions were performed and funded (NRCan 2004).

### 5.2.4.1 Natural Gas for Vehicles Market Transformation Pilot Project

The Natural Gas for Vehicles Market Transformation Pilot Project is funded by NRCan and sponsored by the Climate Change Initiative. This pilot project encourages the sale of original equipment manufacture (OEM) NGVs in Canada (170 units) and is being assessed for its success (NRCan 2004).

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From October 1, 2003 to December 31, 2004, the pilot project will pay to the eligible beneficiary \$3,000 of the capital cost of buying or leasing a new natural gas vehicle (NGV) with a warranty from a vehicle manufacturer. Utilities and vehicle manufacturers have also agreed to provide additional financial incentives for certain vehicle platforms operating in targeted geographical areas.... All Canadian corporations, individuals and organizations that operate NGVs that are part of a high-fuel-use fleet, including municipal/provincial fleets, utilities fleets and private urban fleets (taxis, rental and courier services, delivery/pick-up services, shuttle services and owner-operators) [are included]. (NRCan 2004)

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In addition to the OEM NGV pilot project, NRCan is conducting discussions with industry regarding the potential for a pilot project for natural gas conversions. If these pilot projects are successful, NRCan will introduce broader programs in 2005 (NRCan 2004).

## 5.2.5 SmartDriver Workshops

NRCan's SmartDriver Workshops are the driver education part of the FleetSmart Program (section 5.2.1). This free service offers training and education for professional drivers. The SmartDriver program will also help fleet managers to (NRCan 2004):

- reduce fuel use and costs;

- improve profits;
- reduce the environmental impact of fleet operations;
- reduce repair and maintenance costs through more efficient use of equipment;
- reduce wear on truck components, leading to a longer life and an increased resale value of the truck; and
- operate more safely.

The SmartDriver Program features workshops geared to HDV drivers in specific industries:

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*SmartDriver for Transit:* Recognizing the widespread benefits, Canada's transit industry has taken a leading role with Natural Resources Canada to introduce SmartDriver for Transit training. Through a unique combination of coaching and on-the-road training, this innovative training module can demonstrate how a driver can reduce fuel consumption significantly.

*Smart Driver for Forestry:* Based on the original version of SmartDriver for Heavy Vehicles and modified in consultation with the forestry industry, SmartDriver for Forestry Trucks is specifically designed to meet the needs of this sector of the transportation industry. The training offers information on energy efficiency to fleet managers, instructors and drivers for all aspects of trucking, from spec'ing vehicles and components to maintenance procedures, conducting haul operations and driving techniques.

*SmartDriver for Heavy Vehicles:* SmartDriver for Heavy Vehicles.... offers fleet managers information on energy efficiency in all aspects of their fleets — spec'ing, maintenance, operations and driving — through an information toolkit, case studies and fleet profiles as well as workshops and technical demonstrations. (NRCan 2004)

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### 5.3 Transport Canada

Transport Canada, like other federal departments, is required to prepare a sustainable development strategy every 3 years. On February 16, 2004, the department's third strategy — Sustainable Development Strategy 2004–2006 — was tabled in Parliament. The third strategy defines 7 challenges and 32 specific commitments for the next 3 years. The programs noted in this section are part of that strategy (TC 2004).

This strategy brings more precision to the concept of sustainability and sets out new targets and performance measures for key sustainable transportation issues. Transport Canada has structured its 2004–2006 Strategy around seven strategic challenges. The seven challenges are to (TC 2004):

1. Encourage Canadians to make more sustainable transportation choices;
2. Enhance innovation and skill development;
3. Increase system efficiency and optimize modal choices;
4. Enhance efficiency of vehicles, fuels and fuelling infrastructure;
5. Improve performance of carriers and operators;
6. Improve decision-making by governments and the transportation sector; and
7. Improve management of Transport Canada operations and lands.

Transport Canada has initiated a number of programs that are designed to support the reduction of GHG emissions. Current programs and initiatives under way include urban and freight transportation, vehicles and fuels, and public education and outreach (TC 2004).

### **5.3.1 Urban Transportation Showcase Program (UTSP)**

Begun in 2001, the UTSP was scheduled as a 5-year program created to demonstrate, evaluate, and promote effective strategies to reduce GHG emissions from urban transportation. The UTSP has been extended and now is slated to run until March 2007 (TC 2004).

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Through this program, Transport Canada will work in partnership with provinces and municipalities, to establish a number of transportation "showcases" in selected cities, for demonstrating and evaluating a range of urban transportation strategies within a broad planning framework. The impacts of these strategies on other urban challenges (such as smog reduction, congestion, infrastructure costs) will also be evaluated. (TC 2004)

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These "showcase" projects are designed to demonstrate practical solutions to the problem of excess emissions from in-use vehicles:

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A two-stage national competition was held to select the showcases to be funded under the program. Following an evaluation by the Selection Committee, 15 finalists were chosen and provided with \$30,000 each to develop detailed proposals.

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The following showcase proposals were funded and are reported to be under way (TC 2004):

- Halifax Regional Municipality;
- AMT, Montreal;
- STO (Gatineau) and STM (Montreal);
- GTA and Hamilton;
- Greater Vancouver Transportation Authority and GVRD;
- Region of Waterloo;
- City of Whitehorse; and
- City of Winnipeg.

Other proposals submitted to the UTSP include ones from the City of London, City of Moncton, City of Ottawa, Quebec City, Saint John Region, City of Victoria, and York Region. These seven programs have yet to receive funding approval. The majority of these projects involve improvements to urban transportation that will in some way result in reduced fuel use. Brief descriptions of these projects are presented by province/territory in chapter 4.

### **5.3.2 Freight Transportation**

In November 2002, the Government of Canada released the Climate Change Plan for Canada. With regards to freight transportation, the Climate Change Plan for Canada called for the creation of the Commercial Transportation Energy Efficiency and Fuels Initiative. It consists of both the Freight Efficiency Program, which will be administered by Transport Canada, and the Commercial Road Transportation Program, which will be administered by the Office of Energy Efficiency at NRCan (see section 5.2) (TC 2004).

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The new Freight Efficiency Program will provide financial incentives for the purchase and installation of energy efficiency enhancing equipment in the air, marine and rail modes; and education and awareness to support improved decision-making by shippers. (TC 2004)

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### **5.3.2.1 Freight Efficiency Program**

The Freight Efficiency Program is a 4-year initiative that aims to reduce GHG emissions by Canada's freight transportation sector. The Freight Efficiency Program is a component of the Commercial Transportation Energy Efficiency and Fuels Initiative, a 4-year, \$32.2 million program that complements existing energy efficiency efforts under Transport Canada's Freight Efficiency and Technology Initiative (TC 2004).

### **5.3.2.2 Freight Efficiency and Technology Initiative**

The freight initiative is expected to result in a 2-megatonne GHG emissions reduction by 2010. Transport Canada is leading the \$14 million initiative with the cooperation of NRCan. Transport Canada's Freight Efficiency and Technology Initiative is subdivided into three components (TC 2004):

- Freight Sustainability Demonstration Program;
- voluntary performance agreements; and
- training and awareness.

#### **5.3.2.2.1 Freight Sustainability Demonstration Program**

The Freight Sustainability Demonstration Program is a 5-year, \$4.5 million program designed to encourage the take-up of technologies or best practices that can reduce GHG emissions from all freight modes. To achieve this goal, the program provides funding through a competitive process to companies and not-for-profit organizations that plan to undertake a freight-related demonstration project of an existing or new technology or best practice in the aviation, marine, rail, truck, or intermodal sectors. The Freight Sustainability Demonstration Program is currently in the process of conducting its fifth round of funding recommendations. To date, 20 projects have been awarded funding, with an aggregate price tag of approximately \$1.9 million. A number of these projects relate to in-use road vehicles (TC 2004):

- Bowater Forest Products of Canada Inc. — Driver Education Program;
- Espar Products Ltd. — Demonstration of Cab Heater;
- Forest Engineering Research Institute of Canada — Dual Commodity Trailer Demonstration;
- Big Freight Systems Inc. — Fuel Usage Reduction Project;
- Canadian Waste Services Inc. — FleetRoute Project;
- Enbridge Gas Distribution — Heavy-duty truck demonstration using liquefied natural gas and Westport-Cycle technology;
- Groupe Énerstat inc. — On-road demonstration of the Novacab system;
- Forest Engineering Research Institute of Canada — Evaluation of Tire Inflation System;
- J.D. Smith and Sons Limited — Project "GREEN": Greatly Reduced Engine Emissions; and
- RST Industries — Reduction of Fuel Consumption with New Tire Technology.

#### **5.3.2.2.2 Voluntary Performance Agreements**

Under this component, voluntary performance agreements will be established between the federal government and industry associations within each mode — rail, marine, aviation, and trucking — to outline concrete initiatives for reducing GHG emissions. Agreements will include an emissions reduction target and an action plan to achieve that target. No projects were listed.

#### **5.3.2.2.3 Training and Awareness**

None of the programs as currently listed applies to in-use on-road vehicles.

### **5.3.3 Motor Vehicle Fuel Efficiency Initiative**

To assist consumers in making the best environmental choices, Transport Canada has made an effort to enhance public information programs.

#### **5.3.3.1 Be Tire Smart Campaign**

In the fall of 2003, Transport Canada launched the “Be Tire Smart” campaign (TC 2004).

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This campaign is a national public outreach and education initiative designed to encourage Canadian motorists to adopt proper tire inflation and maintenance practices in order to improve the fuel efficiency of their vehicles and prolong tire life, both of which save energy and reduce emissions that contribute to climate change. (TC 2004)

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#### **5.3.3.2 Climate Change Transportation Table**

The Climate Change Transportation Table has conducted studies of the potential for fuel economy improvements using technologies that are commercially available or that could reasonably be expected to be commercially available by 2010 (TC 2004).

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The studies, which included representatives of the Canadian Vehicle Manufacturers Association (CVMA), concluded that a 25% reduction on fuel consumption over a 1998 base was feasible by 2010. The cost of doing so would be substantially less with U.S. harmonization, as compared to a “Canada alone” approach. (TC 2004)

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#### **5.3.3.3 Advanced Technology Vehicles Program**

Transport Canada’s Road Safety and Motor Vehicle Regulation Directorate has managed the Advanced Technology Vehicles Program (ATVP), a major part of the Motor Vehicle Fuel Efficiency Initiative, since its inception in June 2001 (TC 2004).

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Advanced technology vehicles are vehicles with available, or soon to be available, technologies able to improve fuel efficiency, reduce air emissions and contribute to the development of cleaner, sustainable transportation systems. These vehicles are being evaluated to determine their impact on fuel efficiency, safety and the environment. At the end of 2003, the ATVP fleet included 87 vehicles. The fuel efficiency, emissions and safety performance of these vehicles are being assessed through a comprehensive program of on-road evaluation, instrumented track tests and formal laboratory tests. (TC 2004)

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As part of the ATVP, a program of special events has been undertaken to showcase advanced technology vehicles and to raise the awareness of the public towards advanced technology



vehicles and the role that these vehicles can play in a sustainable future. It is estimated that 1.7 million Canadians have been reached through these events.

### **5.3.4 Moving On Sustainable Transportation (MOST)**

Transport Canada has established the MOST program to support projects that produce the kinds of education, awareness, and analytical tools that we need if we are to make sustainable transportation a reality. The MOST program will provide funding to help support projects that will (TC 2004):

- provide Canadians with practical information and tools to better understand sustainable transportation issues;
- encourage the creation of innovative ways to promote sustainable transportation; and
- achieve quantifiable environmental and sustainable development benefits.

There are five project proposal categories under which organizations can apply for funding from the MOST program (TC 2004):

- studies or analyses that contribute to a greater understanding of sustainable transportation issues;
- development of new and innovative sustainable transportation tools and practices;
- pilot projects that test new sustainable transportation approaches or alternatives;
- workshops and information sessions to support new sustainable transportation ideas or approaches; and
- education and outreach programs that inform the Canadian public about sustainable transportation.

Since 1999, the MOST program has funded over 50 projects. The MOST Internet site provides brief descriptions of each of these projects. Note that many of the projects discussed in other portions of this report have received MOST funding.

## 6. Summary Tables

This chapter contains tables that summarize information related to various vehicle emissions reduction programs in Canada. Details related to the programs listed are presented in chapters 4 and 5.

### Summary Tables

- Table 6.1: "LET'S DRIVE GREEN" Inspection Clinics
- Table 6.2: Types of Vehicle Emissions Reduction Programs
- Table 6.3: In-Use Vehicle Anti-tampering Legislation or Measures
- Table 6.4a: Inspection and Maintenance (I/M) Programs
- Table 6.4b: Estimated Emissions Reductions Related to I/M Programs
- Table 6.5: Scrappage Programs
- Table 6.6: Idle Reduction Programs
- Table 6.7: HDV Retrofit Programs

**Table 6.1: "LET'S DRIVE GREEN" Inspection Clinics**

| Year | Number of clinics | Total number of vehicles attending clinic | Number of valid emissions tests performed | Number of vehicles that failed HC or CO tests | % of vehicles that failed HC or CO tests |
|------|-------------------|---|---|---|--|
| 1999 | 12                | 3515                                      | 3298                                      | 587   | 17.8                                     |
| 2000 | 10                | 2690                                      | 2628                                      | 441   | 16.8                                     |
| 2001 | 14                | 3676                                      | 3637                                      | 567   | 15.6                                     |
| 2002 | 30                | 5914                                      | 5662                                      | 829   | 14.6                                     |
| 2003 | 35                | 7142                                      | 7078                                      | 1069  | 15.1                                     |

Table 6.2: Types of Vehicle Emissions Reduction Programs

| Type                       | Federal | NF   | PE  | NS  | NB   | QC   | ON  | MB  | SK  | AB    | BC  | YT  | NT  | NU  |
|----------------------------|---------|------|-----|-----|------|------|-----|-----|-----|-------|-----|-----|-----|-----|
| Vehicle clinics            | yes     | yes  | yes | yes | yes  | yes  | yes | yes | yes | yes   | yes | yes | yes |     |
| Anti-tampering legislation | no      | yes  | yes | yes | yes  | yes  | yes | yes | no  | study | yes | yes | no  |     |
| Anti-tampering enforcement | no      | yes  | yes | yes | yes  | plan | yes | no  | no  | no    | yes | no  | no  |     |
| I/M program                |         | no   | no  | no  | no   | plan | yes | no  | no  | no    | yes | no  | no  | no  |
| On-road inspection         |         | yes  |     |     |      | plan | yes |     |     |       | HDV |     |     |     |
| HDV retrofit               | yes     | yes  |     | yes |      | yes  | yes |     | yes | yes   | yes |     |     |     |
| Scrappage                  | fund    |      |     | no  | yes  | yes  | yes | yes |     | yes   | yes |     |     |     |
| Idle control bylaws        |         |      |     |     |      | yes  | yes |     |     |       | yes |     |     |     |
| Fleet idle policy          |         |      |     | yes |      |      | yes |     |     |       |     | yes |     |     |
| School bus idle policy     |         | plan |     |     | yes  |      |     |     |     |       |     |     |     |     |
| Anti-idle campaign         | fund    | yes  |     | yes | yes  | plan | yes | yes |     | yes   | yes | yes | yes |     |
| Driver education program   | fund    |      |     | yes |      |      | yes |     |     |       | yes | yes |     |     |
| Carpool matching           |         |      |     |     |      |      |     |     |     |       | yes |     |     |     |
| Commuter program           |         |      |     |     |      |      | yes |     |     |       | yes | yes | yes |     |
| Car-sharing program        |         |      |     |     |      | yes  | yes |     |     | yes   | yes |     |     |     |
| Active routes to school    |         | yes  | yes | yes | yes  | yes  | yes | yes | yes | yes   | yes | yes | yes | yes |
| Transit improvement        | fund    |      |     | yes | plan | yes  | yes | yes |     |       | yes |     |     |     |
| Public awareness           | fund    |      |     | yes | plan |      | yes |     |     | yes   | yes | yes | yes |     |
| Public report system       |         |      |     |     |      |      | yes |     |     |       | yes |     |     |     |
| Employee awareness         | fund    |      |     | yes |      |      | yes |     |     |       | yes | yes |     |     |
| Emissions standards        |         | yes  |     |     |      |      | yes |     |     |       | yes |     |     |     |

| Type                    | Federal | NF  | PE  | NS  | NB   | QC  | ON  | MB  | SK  | AB  | BC  | YT  | NT  | NU  |
|-------------------------|---------|-----|-----|-----|------|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Mercury switch          |         | yes | yes | yes | yes  | yes | yes | yes | yes | yes | yes | yes | yes | yes |
| Fuel efficiency program | fund    |     |     |     |      |     | yes |     |     |     |     |     |     |     |
| Weight reduction        |         |     |     |     |      |     |     |     |     | yes |     |     |     |     |
| Alternative fuels       | fund    |     |     |     | plan |     | yes | yes |     |     | yes |     |     |     |
| Fuel purchase policy    |         |     |     |     |      |     | yes |     |     |     |     |     |     |     |

Table 6.3: In-Use Vehicle Anti-tampering Legislation or Measures

| Province/<br>territory     | Anti-tampering legislation or other measures  | Anti-tampering enforcement programs   |
|----------------------------|---|---|
| Newfound-<br>land          | Regulated under the <i>Highway Traffic Act</i> .<br>It is illegal to remove or modify equipment, and equipment must be maintained.  | Commercial HDVs undergo an annual safety check, and LDVs may be intercepted in roadside checks.   |
| Prince<br>Edward<br>Island | Under the <i>Highway Traffic Act</i> , the Registrar is authorized to suspend, cancel, or revoke a registration permit if the vehicle has not been inspected in accordance with the Motor Vehicle Inspection Regulation. The Act states that the catalytic converter must be on all 1990 MY and newer vehicles. | An annual safety inspection is required for all motor vehicles and trailers. All commercial vehicles over 4500 kg must have a valid inspection. A check is made for the catalytic converter on 1990 MY and newer models.          |
| Nova Scotia                | Under the "Standards of Vehicle Equipment Regulations," pursuant to the <i>Motor Vehicle Act</i> , there is an anti-tampering clause that applies to 1991 MY and newer motor vehicles. The <i>Motor Vehicle Act</i> is the responsibility of Service Nova Scotia and Municipal Relations.                       | A visual inspection of the emissions control components is required as part of the annual motor vehicle inspection.   |
| New<br>Brunswick           | Under the <i>Motor Vehicle Act</i> , there is legislation for the inspection of vehicles and for tampering.   | Inspection of the emissions control devices is included as part of an annual safety inspection for LDVs.  |
| Quebec                     | Since 1985, legislation has made it illegal to remove or tamper with emissions control equipment.   | At present, enforcement is limited to denunciations and complaints from citizens. HDV anti-tampering enforcement will be part of a future HDV I/M program.  |
| Ontario                    | Tampering is regulated under the <i>Environmental Protection Act</i> . Specific provisions are made for the catalytic converter and other emissions control systems and equipment. Ontario Regulation 361/98, as amended, sets out standards and offences with regards to anti-tampering.                       | The Drive Clean I/M program checks catalytic converter and fuel cap integrity.<br>The on-road Smog Patrol also performs visual inspections of LDVs and HDVs.  |
| Manitoba                   | The <i>Manitoba Highway Traffic Act</i> includes a section that refers to "standards of vehicle equipment." This section of the Act could be used to regulate the sale of components that do not meet the standard.   | Used vehicles, first time registered in the Province of Manitoba, vehicles on resale, and any vehicle undergoing a safety inspection must also undergo a visual inspection of the catalytic converter and other emissions control |

| Province/<br>territory | Anti-tampering legislation or other measures   | Anti-tampering enforcement programs  |
|------------------------|--|--|
| Saskatchewan           | No provincial legislation.   | —  |
| Alberta                | No provincial legislation.   | —  |
| British Columbia       | Regulated under the <i>Motor Vehicle Act</i> .   | The AirCare I/M program requires a visual inspection of the fuel inlet cap on all vehicles in the program plus an inspection of the catalytic converter on 1988 MY and newer vehicles. |
| Yukon                  | Air Emission Regulations were developed in 1998. An anti-tampering clause was included, and it is illegal to remove, tamper with, or alter any air emissions control system. | —  |
| Northwest Territories  | No territorial legislation.  | Air quality legislation specifically exempts emissions from vehicles such as cars.   |
| Nunavut                | No information available.  | —  |

**Table 6.4a: Inspection and Maintenance (I/M) Programs**

| Province         | City                             | Program name | LDV/<br>HDV | Start date | Type          | Frequency   | Emissions tests  | OBD II                                | Gas cap pressure test | Visual component inspection      |
|------------------|----------------------------------|--------------|-------------|------------|---------------|---|--|---------------------------------------|-----------------------|----------------------------------|
| British Columbia | Lower Mainland, British Columbia | AirCare      | To 5000 kg  | 1992       | Centralized   | 1992 MY and newer: every 2 years<br>1991 MY and older: every year | IM240 on 1992 MY and newer<br>Diesel transient opacity<br>ASM on 1991 MY and older<br>Two-speed idle for non-dyno                    | Evaporative only and information only | Yes                   | Catalytic converter and fuel cap |
| Ontario          | Most of southern Ontario         | Drive Clean  | Both        | 1999       | Decentralized | LDV: every 2 years<br>HDV: every year                             | LDV:<br>ASM dyno<br>diesel visible smoke<br>Two-speed idle for non-dyno<br>HDV:<br>diesel – snap idle<br>non-diesel – two-speed idle | MIL advise driver if on               | Yes                   | Catalytic converter and fuel cap |

**Table 6.4b: Estimated Emissions Reductions Related to I/M Programs<sup>1</sup>**

| Province         | Program name | Year      | Number of tests performed   | Overall failure rate (%) | CO (tonnes) | NOx (tonnes) | HCs (tonnes) |
|------------------|--------------|-----------|-----------------------------|--------------------------|-------------|--------------|--------------|
| British Columbia | AirCare      | 1992–2000 | 8 534 984                   |                          |             |              |              |
|                  |              | 2001      | 748 068                     | 16.4                     | 9 068       | 506          | 1 262        |
|                  |              | 2002      | 778 521                     | 15.3                     | 10 440      | 694          | 1 338        |
| Ontario          | Drive Clean  | 1999–2004 | LDV 12 975 048; HDV 744 595 |                          |             |              |              |
|                  |              | 1999      | LDV 946 478; HDV 3 622      | 16.4                     |             |              |              |
|                  |              | 2000      | LDV 1 250 837; HDV 4 996    | 14.0                     |             |              |              |
|                  |              | 2001      | LDV 2 043 703; HDV 9 852    | 13.1                     |             |              |              |
|                  |              | 1999–2001 |                             |                          |             | 139 344      | 4 578        |

<sup>1</sup> Note that these emissions reductions were calculated using different parameters and techniques.



Table 6.5: Scrappage Programs

| Province/territory | City        | Program name or status       | LDV/HDV           | Date                           | Number of vehicles scrapped | Estimated emissions reductions (tonnes) <sup>1</sup> |     |            |       |
|--------------------|-------------|------------------------------|-------------------|--------------------------------|-----------------------------|--|-----|------------|-------|
|                    |             |                              |                   |                                |                             | CO   | NOx | VOCs or HC | Other |
| Nova Scotia        |             | Feasibility study only       |                   |                                |                             |  |     |            |       |
| New Brunswick      | Fredericton | Vehicle Scrappage Program    | LDV up to 1993 MY | February 2003 to present       | 91                          |  |     |            |       |
| New Brunswick      | Moncton     | Vehicle Scrappage Program    | LDV up to 1993 MY | October 2004 to present        |                             |  |     |            |       |
| New Brunswick      | Saint John  | Vehicle Scrappage Program    | LDV up to 1993 MY | October 2004 to present        |                             |  |     |            |       |
| Quebec             | Montreal    | Scrap-an-Old-Car Pilot       | LDV               | June 2003 to present           | 108                         |  |     |            |       |
|                    | Quebec City | Scrap-an-Old-Car Pilot       | LDV               | Planned                        |                             |  |     |            |       |
| Ontario            |             | Car Heaven                   | LDV               | June 2000                      | 6800                        |  | 63  | 42         | 823   |
| Ontario            |             | Kidney Car and ReinCARnate   | LDV               | 1996                           | 4200                        |  |     |            |       |
| Ontario            | Ottawa      | Green Mobility Pilot Program | LDV up to 1987 MY | June 2003 to ?                 |                             |  |     |            |       |
| Ontario            | FOE         | Vehicle Recycling Program    |                   |                                |                             |  |     |            |       |
| Manitoba           | Winnipeg    | Bye Bye Beaters              | LDV up to 1987 MY | October 2003 to March 2006 (?) |                             |  |     |            |       |

| Province/territory | City               | Program name or status     | LDV/HDV               | Date                        | Number of vehicles scrapped | Estimated emissions reductions (tonnes) <sup>1</sup> |                       |            |                         |
|--------------------|--------------------|----------------------------|-----------------------|-----------------------------|-----------------------------|--|-----------------------|------------|-------------------------|
|                    |                    |                            |                       |                             |                             | CO   | NOx                   | VOCs or HC | Other                   |
| Alberta            | Calgary            | Breathe Easy Pilot Project | LDV up to 1987 MY     | March to June 2002          | 536                         | 649.4  | 63.0                  | 91.1       | 2889 (CO <sub>2</sub> ) |
| Alberta            | Calgary            | Car Heaven Alberta         | All 1991 MY and older | October 2003 to 2006        | 337                         |  | 724 (smog pollutants) |            | 2608 (CO <sub>2</sub> ) |
| Alberta            | Edmonton           | Car Heaven Alberta         | All 1991 MY and older | December 2003 to 2006       | 146                         |  | Included in Calgary   |            | Included in Calgary     |
| British Columbia   | Kelowna            | Cash for Clunkers          | LDV up to 1994 MY     | November 2003 to March 2005 | 122                         |  |                       |            |                         |
| British Columbia   | Vancouver and area | Scrap-It Program           | LDV up to 1987 MY     | 1996 to present             | 3215                        |  |                       |            |                         |

<sup>1</sup> Note that the same method has not been used by the different programs to estimate these emissions reductions.

**Table 6.6: Idle Reduction Programs**

| Province/<br>territory | City             | Program name                   | LDV/<br>HDV | Duration | Dates                        | Audience/comments   |
|------------------------|------------------|--------------------------------|-------------|----------|------------------------------|---|
| Newfoundland           | St. John's       | School Bus Idle                | Both        | Ongoing  | September 2004               | School bus drivers and parent motorists   |
| Newfoundland           | St. John's       | STEER Anti-idling              | LDV         | Ongoing  | Fall of 2003                 | Taxis   |
| Nova Scotia            | Halifax          | Anti-idling Project            | Both        | 3 months | May to August 2002           | Municipal fleets and general public   |
| Nova Scotia            | Halifax          | FleetSmart Program             | HDV         | Ongoing  |                              | Transit bus fleet   |
| New Brunswick          | Saint John       | Healthy School Program         | Both        | Ongoing  |                              | School bus drivers and parent motorists   |
| Quebec                 | Montreal         | Idle Control Bylaw             | Both        | Ongoing  |                              | All motorists   |
| Quebec                 | Quebec City      | Idle Reduction Program         |             | Planning |                              |   |
| Ontario                | 7 cities         | Idle Control Bylaw             | Both        | Ongoing  |                              |   |
| Ontario                | GTA              | GTA Idle-Free Campaign         | Both        | 1 month  | Every June since 2000        | All motorists   |
| Ontario                | Toronto          | No Idling School Campaign      | Both        |          | 1998                         | School bus drivers and parent motorists   |
| Ontario                | Toronto          | Idle-Free Days                 | LDV         | 1 day    | 1998 to 2002                 | Motorists at schools, gas stations, transit stations, and other idling hotspots |
| Ontario                | Mississauga      | Idle-Free Zone Campaign        | Both        | 1 year   | October 2001 to October 2002 | School bus drivers, school parent motorists, transit drivers, general public    |
| Ontario                | Mississauga      | CPPI Mississauga campaign      | LDV         | 2 weeks  | August 2002                  | Motorists at 50 gasoline stations plus staff at 5 oil company offices in GTA    |
| Ontario                | Southern Ontario | Repair Our Air-Fleet Challenge | HDV         | 3 months | March to May 2004            | Municipal and private fleets  |
| Ontario                | Sudbury          | Idle Reduction Campaign        | Both        | 2 years  | October 2001 to              | School bus drivers, parent motorists,   |

| Province/<br>territory | City                                  | Program name                             | LDV/<br>HDV | Duration | Dates            | Audience/comments   |
|------------------------|---------------------------------------|--|-------------|----------|------------------|---|
|                        |                                       |  |             |          | November 2002    | public  |
| Ontario                | Waterloo                              | Idling Reduction Campaign                |             |          | 2004             | General public  |
| Ontario                | Niagara                               | Spare the Air Program                    | HDV         | Ongoing  | 2003 to present  | Flyers distributed and reduce idle signs posted at 27 sites               |
| Ontario                | Toronto                               | Turn It Off                              | Both        | 2 months | May to July 2000 | School bus and transit drivers, general public                            |
| Ontario                | GTA                                   | Fleet Idle Control Policies              | Both        | Ongoing  |                  | Municipal fleets  |
| Manitoba               | 31 communities                        | Idle-Free Zone                           | Both        | Ongoing  | 2004             | All vehicles at selected locations  |
| Alberta                | Calgary                               | Reduce Idling Campaign                   | Both        | 1 month  | September 2003   | General public  |
| Alberta                | Edmonton                              | Reduce Idling Campaign                   | Both        | 1 month  | September 2003   | General public  |
| British Columbia       | GVRD<br>Vancouver and North Vancouver | Idle Control Bylaw                       | Both        | Ongoing  |                  | General public  |
| British Columbia       | Vancouver                             | Idle-Free Workplaces                     | Both        |          | 2004             | Company and employee vehicles   |
| British Columbia       | GVRD                                  | Idle Reduction Campaign                  | Both        | Planning | 2005             | School buses and parents plus diesels                                     |
| Yukon                  | Whitehorse                            | Anti-idling Campaign                     | Both        | Ongoing  | 2004             | General public plus schools   |
| Yukon                  | Government vehicles                   | Government Fleet Idle Reduction Campaign | Both        | 1 year   | 2000             | Installed Silent Witness computers on fleet vehicles to monitor idle time |
| Northwest Territories  | Yellowknife                           | Commuter Challenge                       | LDV         | 1 week   | June 2003        | Motorists during random spot checks                                       |

Table 6.7: HDV Retrofit Programs

| Province/<br>territory | City           | Program name or<br>agency                       | Number<br>of<br>HDVs | Status                                | Retrofit<br>device                | HDV<br>make | Model   | Engine                   | Engine<br>year  |
|------------------------|----------------|---|----------------------|---------------------------------------|-----------------------------------|-------------|---------|--------------------------|-----------------|
| Newfoundland           | St. John's     | Bus DOC Retrofit<br>Project                     | 12                   | Started<br>2004                       | DOC                               | MCI         | Classic | 6V92                     | 1991 to<br>1992 |
| Nova Scotia            | Halifax        | Bus DOC Retrofit<br>Project                     | 5                    | Started<br>2004                       | DOC                               | MCI         | Classic | Detroit 6V92<br>DDEC     | 1991 to<br>1993 |
| Quebec                 | Quebec<br>City | Bus DOC Retrofit<br>Project                     | 20                   | Started<br>2004                       | DOC                               | MCI         | Classic | 6V92                     | 1992            |
| Ontario                | Windsor        | Bus Demonstration<br>Project                    | 1                    | 2003 - 3<br>years                     | Air<br>scavenge                   |             |         |                          |                 |
| Ontario                | Ottawa         | Bus Demonstration<br>Project                    | 3                    | 2001 and<br>2002                      | Catalytic<br>mufflers             |             |         |                          |                 |
| Ontario                | Windsor        | Bus DOC Retrofit<br>Project                     | 6                    | Started<br>2004                       | DOC                               | MCI         | Classic | DD 6V92                  | 1991            |
| Ontario                | Toronto        | Bus DOC Retrofit<br>Project                     | 5                    | Started<br>2004                       | DOC                               | Orion       | V       | 6V92TA                   | 1991 to<br>1992 |
| Ontario                | Ottawa         | Bus DOC Retrofit<br>Project                     | 25                   | Started<br>2004                       | DOC                               | MCI         | Classic | DD 6V92TA<br>DDECII 6.99 | 1991            |
| Saskatchewan           | Saskatoon      | Bus DOC Retrofit<br>Project                     | 8                    | Started<br>2004                       | DOC                               | MCI         | Classic | DD 6V92                  | 1990 to<br>1993 |
| Alberta                | Edmonton       | CleanBus Project                                | 2                    | January<br>2003 to<br>January<br>2004 | DPF                               |             |         |                          |                 |
| Alberta                | Calgary        | Bus DOC Retrofit<br>Project                     | 20                   | Started<br>2004                       | DOC                               | MCI         | Classic | 6V92TA                   | 1991            |
| British<br>Columbia    | Vancouver      | Cleveland Dam<br>Off-Road Dump<br>Truck Project | 8                    | 6 months<br>1990s                     | Catalyzed<br>particulate<br>traps |             |         |                          |                 |

| Province/<br>territory | City      | Program name or<br>agency   | Number<br>of<br>HDVs | Status          | Retrofit<br>device | HDV<br>make  | Model   | Engine  | Engine<br>year |
|------------------------|-----------|-----------------------------|----------------------|-----------------|--------------------|--------------|---------|---------|----------------|
| British<br>Columbia    | Vancouver | Bus DOC Retrofit<br>Project | 21                   | Started<br>2004 | DOC                | New<br>Flyer | D40HF   | DD 6V92 | 1992           |
| British<br>Columbia    | Victoria  | Bus DOC Retrofit<br>Project | 16                   | Started<br>2004 | DOC                | MCI          | Classic | DD 6V92 | 1991           |

## **7. Discussion and Observations**

One of the actions in the battle to reduce in-use vehicle emissions is the implementation and enforcement of anti-tampering legislation. Nine of the provinces and territories have some form of legislation, but for most, enforcement is limited, and records of the incidents of tampering are not available.

Canada has lagged behind the United States in regard to the implementation and encouragement of HDV emissions control component retrofit programs. However, Environment Canada recently provided funding for 138 transit buses from 10 transit authorities across Canada to be retrofit with DOCs.

One observation from the review of the many programs currently in operation across Canada is the need for improved communication and cooperation between the various agencies and governing bodies. For example, although scrappage and idle reduction programs are in operation in many municipalities, it is common for there to be no mention of these programs on a municipality's Internet site.

Also, in regard to Internet sites, many private agency, federal, provincial/territorial, and municipal Internet sites contain outdated information. It would seem that the impact of many of the vehicle emissions reduction programs that are now operating in Canada would be heightened if the public were able to obtain up-to-date information on these programs from the associated web sites.

As noted in the text, until recently, the methods employed to derive emissions reduction estimates for vehicle scrappage programs differed. This should not be an issue in the future, since Environment Canada now employs a universal program to calculate emissions reductions.

A philosophical difference was observed between certain jurisdictions in regard to the fate of parts recaptured from vehicles that are scrapped in scrappage programs. Some programs do not allow recaptured parts to be resold. The reasoning behind this rule is that the use of recycled parts encourages owners to keep older vehicles on the road for a longer period.

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# Appendix A: Ontario Drive Clean Program — Additional Information

## Drive Clean Program Areas

The areas covered by the LDV portion of the Drive Clean program include the following:

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### Phase 1 Area (as of April 1999)

The Greater Toronto Area (the City of Toronto and Regional Municipalities of York, Durham, Peel and Halton), and the City of Hamilton (the former regional municipality of Hamilton-Wentworth).

### Phase 2 Area (as of January 1, 2001)

The following communities are included in the Program Area .... Peterborough, Barrie, Guelph, Kitchener, Waterloo, Cambridge, Brantford, Niagara Falls, Welland, St. Catharines, London, Sarnia - Clearwater - Point Edward, Windsor.

The following areas have been defined as *commuting zones* (some of these areas are also defined as commuting zones to municipalities already in the Drive Clean program, in the Phase 1 area): County of Simcoe,... County of Peterborough,... County of Dufferin,... County of Oxford,... County of Wellington,... Regional Municipality of Waterloo,... County of Victoria,... County of Perth,... County of Northumberland,... County of Middlesex,... County of Lambton,... County of Essex,... County of Elgin,... Regional Municipality of Haldimand-Norfolk,... Regional Municipality of Niagara,... and County of Brant....

### Phase 3 Area (as of July 1, 2002)

Those parts of the following counties not already included in Drive Clean: Haldimand, Norfolk, Dufferin, Elgin, Lambton, Middlesex, Northumberland, Perth, Peterborough and Simcoe;

All of the following: Ottawa, Kawartha Lakes and Chatham-Kent and the counties of Hastings, Prince Edward, Lennox and Addington, Frontenac, Lanark, Wellington, the United Counties of Leeds and Grenville, the United Counties of Prescott and Russell and the United Counties of Stormont, Dundas and Glengarry. (Drive Clean 2004)

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## The Repair Cost Limit

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The Repair Cost Limit sets a maximum of \$450 that must be spent on emissions-related repairs if a vehicle fails its Drive Clean test. This maximum applies throughout the Drive Clean light-duty vehicle program area, the southern Ontario smog zone.

The RCL was set at \$200 for the first two years in each Drive Clean Phase area, and then increased to \$450. In Drive Clean's Phase 3 area, where mandatory emissions testing began on July 1, 2002, the increase took effect July 1, 2004. Phase 3 covers eastern Ontario and centres such as Ottawa, Kingston and Cornwall, and part of southwestern Ontario, including Chatham-Kent.



The RCL rose from \$200 to \$450 in the Greater Toronto Area and Hamilton (Phase 1) on June 30, 2001 and in urban centres and their commuting zones in central and southwestern Ontario (Phase 2) on January 1, 2003. (Drive Clean 2004)

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### **Aftermarket Catalysts**

If a vehicle's catalytic converter has been removed, it must be replaced with a new original equipment manufacturer unit or with a U.S. EPA-approved aftermarket replacement unit before the vehicle can be tested. It is an offence in Ontario, under the *Environmental Protection Act*, to operate a vehicle if the factory-installed catalytic converter has been removed. (Drive Clean 2004)

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### **Vehicles that Require a Test**

Most passenger cars, vans, light trucks and sport utility vehicles in the Drive Clean program area must pass a Drive Clean test to renew the stickers on their licence plates.

Drive Clean regulations require testing every two years for vehicles beginning in the third calendar year after their model year, up to and including the 19th calendar year after their model year.

The test requirements for 2004 and 2005 are set out below.

#### **Model years to be tested in 2004**

1985 1987 1989 1991 1993 1995 1997 1999 2001

#### **Model years to be tested in 2005**

1986 1988 1990 1992 1994 1996 1998 2000 2002 (Drive Clean 2004)

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### **Testing on Resale**

Passing an emissions test is also required to transfer ownership and licence a vehicle for the road under new ownership, if the transfer requires a safety certificate. This testing requirement begins in the first calendar year after the model year and continues until the 19th calendar year after the model year. In 2004, this applies to model years 2003 to 1985 inclusive. In 2005, it applies to model years 2004 to 1986 inclusive. (Drive Clean 2004)

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## Appendix B: I/M Programs and OBD II

I/M programs in Canada and the United States that feature OBD II testing are provided below. This list was last updated in early 2004.

**Table B.1: Data Related to Current I/M Programs that Feature OBD II<sup>1</sup>**

|    | State or province <sup>2</sup>             | OBD II check <sup>3</sup>                 | IM240                  | Other dyno test  | Other tests   |
|----|--|---|------------------------|--|---|
| C1 | British Columbia – centralized             | Yes – information only, 1998 MY and newer | Yes, 1992 MY and newer | ASM 1991 and older   | Gas cap test 1972 to 1995 MY  |
| C2 | Ontario – decentralized                    | MIL check only                            | No                     | ASM 25/25 – 20 years old and newer   |   |
| 1  | Alaska                                     | Yes                                       | No                     | No   | 1996 MY and newer: also visual component + function tests, must pass all three tests<br><br>1968 to 1995 MY: visual, function, plus BAR-90 two-speed idle tests |
| 2  | Arizona – centralized                      | Yes                                       | No                     | IM147 – 1981 to 1995 MY; steady-state loaded and idle – 1967 to 1997 MY in Tucson and 1967 to 1980 MY in Phoenix | Visual tampering plus evaporative system integrity (pressure) test  |
| 3  | California – centralized and decentralized | Yes                                       | No                     | BAR-97 loaded-mode ASM 50/15 and 25/25 dynamometer test – all vehicles   | Visual, functional, and gas cap pressure tests – all vehicles   |
| 4  | Connecticut – decentralized                | Yes                                       | No                     | ASM 25/25 – 1980 to 1995 MY  | Two-speed idle test – certain 1980 to 1995 MY   |
| 5  | Delaware – centralized                     | Yes                                       | No                     | No   | Idle test – 1968 to 1980 MY<br><br>Two-speed idle test – 1981 to 1995 MY<br><br>Gas cap and evaporative   |

|    | State or province <sup>2</sup> | OBD II check <sup>3</sup>   | IM240                                 | Other dyno test   | Other tests   |
|----|--------------------------------|---|---------------------------------------|---|---|
| 6  | Washington, DC – centralized   | Information since 2002; started February 2004   | Yes 1981 to 1995 MY                   | No  | tests<br>Idle test – 1968 to 1980<br>Gas cap pressure test – all MY   |
| 7  | Georgia – decentralized        | Yes   | No                                    | ASM 25/25 + 50/15, 1979 to 1995 MY                                  | Two-speed idle test if fail OBD test<br>Catalytic visual – 1979 to 1995 MY<br>Fuel cap – 1979 MY and newer              |
| 8  | Idaho – decentralized          | Yes   | ?                                     | ?   | Idle test – 1965 MY and newer<br>Visual tampering – 1984 MY and newer   |
| 9  | Illinois – centralized         | Yes   | Yes – 1981 to 1995 MY                 | No  | Idle test – 1968 to 1980 MY<br>Gas cap pressure test – all 1971 MY and newer  |
| 10 | Indiana – centralized          | Yes   | No                                    | IM93 – transient 0 to 30 mph for up to 93 seconds – 1981 to 1995 MY | Idle test – 1976 to 1980 MY<br>Catalytic visual – 1981 to 1995 MY<br>Gas cap pressure test – 1981 to 1995 MY            |
| 11 | Kentucky – centralized         | Yes, Louisville program closed January 2004; yes, if fail other tests in North Kentucky | Yes, second-chance test in Louisville | No  | Visual inspection – 1975 MY and newer<br>Idle test – 1968 MY and newer<br>Evaporative pressure test – 1981 MY and newer |
| 12 | Louisiana – decentralized      | Yes   | No                                    | No  | Visual catalytic inspection – 1980 MY and newer<br>Gas cap pressure test – 1980 MY and newer                            |
| 13 | Maine – decentralized          | Yes   | No                                    | No  | Visual inspection – 1983 MY and newer<br>Gas cap pressure test –  |

|    | State or province <sup>2</sup>             | OBD II check <sup>3</sup>              | IM240  | Other dyno test   | Other tests  |
|----|--|--|--|---|--|
| 14 | Maryland – centralized                     | Yes                                    | Yes – 1984 to 1995 MY and all 1996 MY and newer 8501–10 000 lbs. | No  | 1974 MY and newer<br>Idle test – 1977 to 1983 MY<br>Gas cap pressure test – all MY   |
| 15 | Massachusetts – decentralized              | Yes for “fast pass” until January 2004 | No   | Mass-99/BAR-31 – 1984 to 1995 MY and 1996 and newer if they fail OBD                | Two-speed idle – if cannot be dyno tested<br>Gas cap integrity test  |
| 16 | Missouri – centralized                     | Yes                                    | Yes – 1981 to 1995 MY; second-chance test 1996 MY and newer      | No  | Vehicles can pass remote sensing test and avoid other tests<br>Idle test – 1971 to 1980 MY<br>Gas cap pressure test                    |
| 17 | Nevada – decentralized                     | Yes                                    | No   | No  | Two-speed idle test – 1968 to 1995 MY  |
| 18 | New Hampshire – decentralized              | Mid-2004                               | No   | No  | Tampering inspection – 1980 MY and newer   |
| 19 | New Jersey – centralized and decentralized | Yes                                    | No   | ASM 50/15 – 1981 MY and newer   | Idle test – pre-1981 MY<br>Gas cap pressure test – all MY<br>Visual catalytic – 1975 MY and newer                                      |
| 20 | New Mexico – decentralized                 | Yes – in 2004 in Albuquerque           | No   | No  | Two-speed idle test – 1975 to 1995 MY<br>Visual inspection – 1975 to 1995 MY for catalytic converter, smoke, and gas cap pressure test |
| 21 | New York – decentralized                   | Yes                                    | No   | Yes – New York short transient test – 1981 MY and newer in New York City Metro area | Idle test – 1981 MY and older<br>Gas cap check – all MY<br>Visual tampering – all MY   |

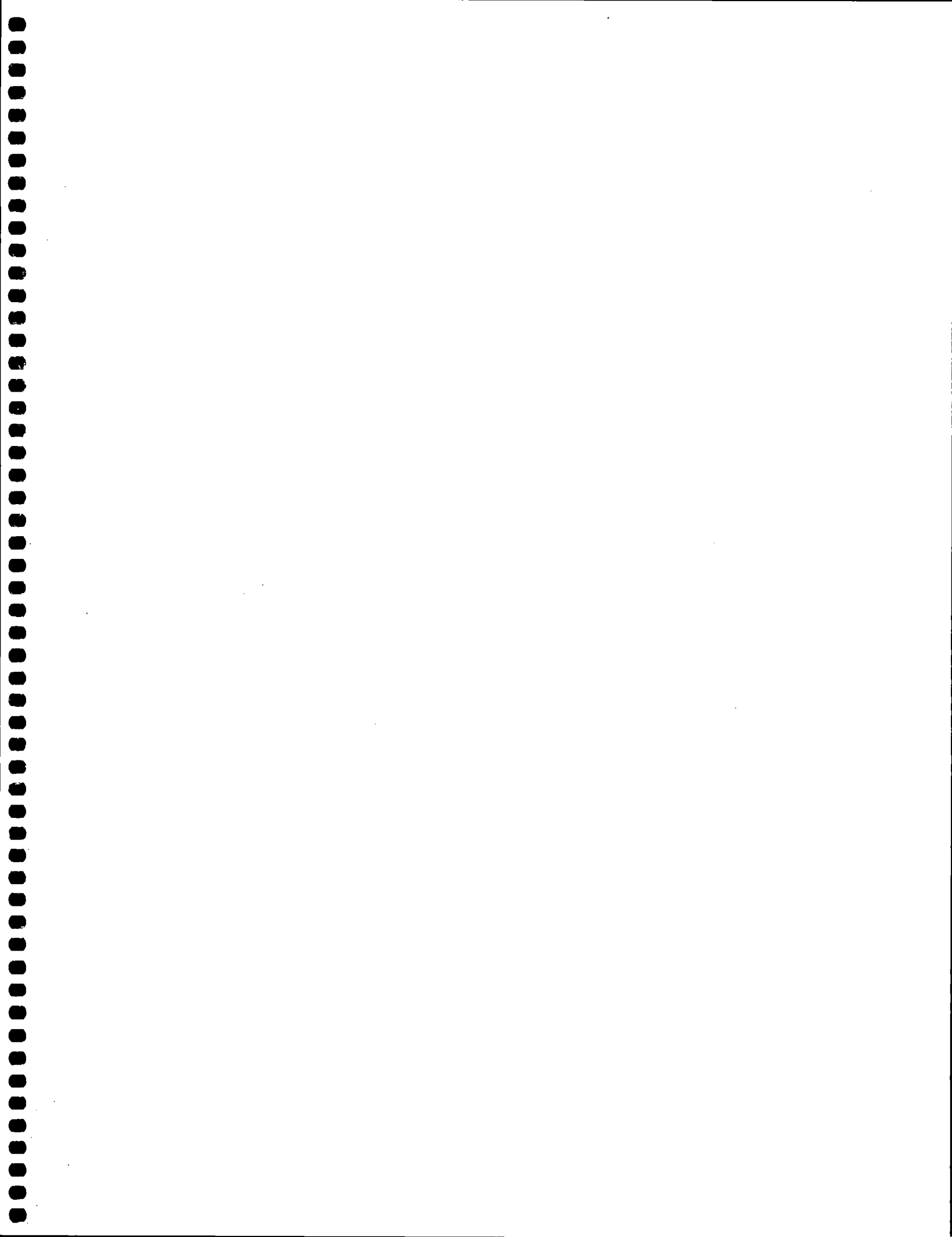
|    | State or province <sup>2</sup>        | OBD II check <sup>3</sup> | IM240               | Other dyno test   | Other tests  |
|----|---------------------------------------|---------------------------|---------------------|---|--|
| 22 | North Carolina – decentralized        | Yes                       | No                  | No  | Idle test – 25 years old up to 1995 MY   |
| 23 | Ohio – centralized                    | Yes                       | No – to ASM in 2001 | ASM 25/25 – last 25 MY  | Idle test – if cannot dyno test<br>Gas cap pressure test – all MY  |
| 24 | Oregon – centralized                  | Yes                       | No                  | Enhanced BAR-31 transient test – 1981 to 1995 MY                            | Two-speed idle test – 1975 to 1980 MY  |
| 25 | Pennsylvania – decentralized          | Yes                       | No                  | ASM test – 1981 to 1995 MY in the Philadelphia region                       | Two-speed idle test – Pittsburgh<br>Evaporative system function – 1981 to 1995 MY<br>Gas cap pressure test – 1975 MY and newer<br>Visual tampering – 1975 to 1995 MY |
| 26 | Rhode Island – decentralized          | Yes                       | No                  | RI2000 test (3 BAR-31 transient) – 25 years old to 1995 MY – owners' choice | Gas cap pressure test – all MY<br>Two-speed idle test if cannot be dyno tested   |
| 27 | Tennessee – centralized               | Yes                       | No                  | No  | Two-speed idle test – 1975 to 1995 MY<br>Gas cap leak – 1996 MY and newer<br>Visual catalytic, restrictor, gas cap – 1995 MY and older                               |
| 28 | Texas – centralized and decentralized | Yes                       | No                  | ASM2 – 1995 MY and older  | Two-speed idle test – El Paso<br>Visual catalytic – all MY<br>Gas cap pressure test – all MY   |
| 29 | Utah – decentralized                  | Yes                       | No                  | ASM2 in Salt Lake county; DC98 in Davis county                              | Two-speed idle test – Weber and Utah counties on 1995 and older MY   |
| 30 | Vermont – decentralized               | Yes                       | No                  | No  |  |

|    | State or province <sup>2</sup>           | OBD II check <sup>3</sup> | IM240                   | Other dyno test               | Other tests  |
|----|--|---------------------------|-------------------------|-------------------------------|--|
| 31 | Virginia – decentralized                 | Yes                       | No                      | ASM 15/25 – 1981 to 1995 MY   | Two-speed idle test – 1980 MY to 25 years old<br>Gas cap pressure test – all MY<br>Visual tampering – all MY |
| 32 | Washington – centralized                 | Yes                       | No                      | ASM 25/25 – 1995 MY and older | Two-speed idle – if cannot be dyno tested – 1995 and older MY<br>Gas cap pressure test – all MY              |
| 33 | Wisconsin – centralized                  | Yes                       | Yes – 1968 to 1995 MY   | No                            | Idle test + 9-point component if IM240 cannot be done<br>Gas cap pressure test – 1971 MY and newer           |
| a  | Colorado – centralized and decentralized | Yes – information only    | Yes – 1982 MY and newer | No                            | Two-speed idle test – 1981 MY and older  |
| b  | Michigan                                 | Cancelled program         |                         |                               |  |

<sup>1</sup> Tests refer to gasoline-fuelled vehicles unless otherwise noted.

<sup>2</sup> Not all programs are statewide. Test requirements may vary by region. The most demanding set of tests is listed.

<sup>3</sup> OBD II checks are on 1996 MY and newer vehicles unless otherwise noted.



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