

**MEMORANDUM OF UNDERSTANDING
BETWEEN
HER MAJESTY THE QUEEN IN RIGHT OF CANADA AS REPRESENTED BY
THE MINISTER OF THE ENVIRONMENT WHO IS RESPONSIBLE FOR
ENVIRONMENT CANADA AND THE MINISTER OF TRANSPORT,
INFRASTRUCTURE AND COMMUNITIES WHO IS RESPONSIBLE FOR
TRANSPORT CANADA
AND
THE RAILWAY ASSOCIATION OF CANADA**

1.0 OBJECTIVES

This Memorandum of Understanding (“Memorandum”) establishes a framework through which the Railway Association of Canada (RAC), its member companies (Annex 1), Environment Canada (EC), and Transport Canada (TC) will address emissions of criteria air contaminants (CAC) and greenhouse gases (GHG) from railway locomotives operated by Canadian railway companies in Canada.

This Memorandum:

- recognizes the successes of the predecessor 1995-2005 Memorandum of Understanding (MOU) between the RAC and EC respecting the control of emissions of nitrogen oxides (NO_x) produced by locomotives during rail operations in Canada (Annex 2); and,
- includes measures, targets and actions which will further reduce emissions from rail operations and help protect health and environment for all Canadians as well as address climate change; and,
- reflects targets and action plans from the rail industry’s emission reduction and fleet renewal strategies for the period 2006-2015.

2.0 DURATION OF THE MEMORANDUM

This Memorandum will come into force upon signing by the duly authorised representatives of the RAC, EC and TC, and will endure until December 31st 2010, unless it is terminated at an earlier date. The party that is terminating the Memorandum will give six months prior formal written notice to the other two parties.

3.0 CRITERIA AIR CONTAMINANT EMISSIONS

Air pollution represents a serious threat to human health and the environment. Air quality issues, such as smog and acid rain, result from the presence of, and interactions between, a group of pollutants known as criteria air contaminants (CACs) and related pollutants (Annex 3).

The federal government has taken action to reduce air pollution from on-road and off-road vehicles and engines. This Memorandum builds upon the previous MOU that was signed in 1995. Despite major growth in rail traffic, NOx emissions averaged below the 115 kilotonnes “cap” that was set in the MOU. Further reductions in CAC emissions are expected to be achieved under this Memorandum.

3.1 CAC Commitments by the RAC

It is recognised that, during the life of this Memorandum, the U.S. Environmental Protection Agency (EPA) may introduce new emissions standards for locomotives. The RAC will encourage all of its members to conform to all applicable emission standards, including any updated EPA emissions standards respecting new and in-service locomotives manufactured after 1972.

For the same period, the RAC will also encourage its members to adopt operating practices aimed at reducing CAC emissions.

3.2 CAC Commitments by the Major Railway Companies

Canadian National, Canadian Pacific, VIA Rail and GO Transit will, during this Memorandum:

- Acquire only new and freshly manufactured locomotives¹ that meet applicable EPA emissions standards;
- Retire² from service 130 medium-horsepower locomotives³ built between 1973 and 1999.
- Upgrade, upon remanufacturing, all high-horsepower locomotives⁴ to EPA emissions standards; and
- Upgrade to Tier 0, upon remanufacturing, all medium horsepower locomotives built after 1972 beginning in 2010.

1 New and freshly manufactured locomotives, Tier 0 and remanufacturing are defined in Title 40, chapter I, subchapter C, part 92 of the US Code of Federal Regulations.

2 These retired locomotives are generally offered for sale, traded for other power or stripped of parts.

3 Medium-horsepower locomotives: locomotives with power between 2000 hp and 3000 hp.

4 High-horsepower locomotives: locomotives with power greater than 3000 hp.

4.0 GREENHOUSE GAS EMISSIONS

Climate change is a major challenge for transportation, as it is for all other sectors of the Canadian economy. In 2002 railways accounted for 6 megatonnes, or 3 percent of total Canadian transportation GHG emissions (Annex 4).

4.1 GHG Commitments by RAC

For the duration of the Memorandum, the RAC will encourage all of its members to make every effort to reduce aggregate GHG emissions from railway operations. The 2010 GHG emission targets for the rail industry are:

Class 1 Freight	16.98 kg CO ₂ eq per 1,000 revenue tonne-kilometres (RTK)
Short Lines	15.38 kg CO ₂ eq per 1,000 RTK
Intercity Passenger	0.12 kg CO ₂ eq per 1,000 passenger-km
Commuter	1.46 kg CO ₂ eq per 1,000 passengers

- 4.2 For the same time period, the RAC will prepare, in cooperation with all of its members, an Action Plan for reducing GHG emissions within six months of signing of the Memorandum. The Action Plan will set out actions that the RAC and its members will undertake to attain the GHG emission targets. Examples of possible actions are listed in Annex 5.

5.0 REPORTING

- 5.1 Annual Reporting: The RAC will prepare an annual report by December 31st of each year which will describe the performance under this Memorandum and will contain:

- the information described in section 5.2;
- a summary of the actions undertaken by the RAC's members to conform with all applicable EPA emission standards and to adopt operating practices that reduce CAC emissions;
- a summary of the actions undertaken by the RAC to inform its members about practices or technologies that reduce emissions of CACs and GHGs; and,
- a summary of the annual progress that the RAC and its members have made towards meeting targets in GHG emissions as set out in Section 4.1.

Each annual report will be approved by the Management Committee (Section 6.1). Each annual report shall be published jointly by the parties to the Memorandum and released to the public as soon as possible once approved, including publication on EC, TC and the RAC websites. RAC will be the copyright holder of all rights in and to the annual report. EC and TC will be the licensees of any

copyright held by RAC in the annual report. The first report will be for calendar year 2006 and the last report will be for the year 2010.

5.2 Data:

5.2.1 The emissions inventory in each annual report will be prepared in accordance with the methodologies described in "Recommended Reporting Requirements for Locomotive Emissions Monitoring (LEM) Program, September, 1994" and/or as recommended by the Management Committee.

5.2.2 The annual report will contain the following information:

- the names of the Canadian railway companies that reported under the Memorandum, and their provinces of operation;
- a table describing locomotives that meet the EPA emissions standards;
- the composition of the locomotive fleet by model, year of manufacture, horsepower, engine model, and duty type;
- the gross tonne-kilometres, revenue tonne-kilometres and total fuel consumption data for railway operations during the reported calendar year;
- estimates of the annual emissions of nitrogen oxides (NO_x), hydrocarbons (HC), sulphur oxides (SO_x), particulate matter (PM), carbon monoxide (CO), nitrous oxide (N₂O), methane (CH₄), carbon dioxide (CO₂), and CO₂ equivalent, emitted during all rail operations in Canada; and,
- fuel consumption and emissions data will be listed separately and aggregated as follows -- passenger, freight, and yard switching services.

5.3 Third Party Verification: A qualified auditor will be given access, each year, or periodically but not more frequently than once a year, to audit the processes and supporting documentation pertaining to the Memorandum. Parties to the Memorandum will select the appropriate auditor capable of independently verifying the reports and will share audit costs. The mandate of the auditor will be decided by the Management Committee.

6.0 **MANAGEMENT OF THE MEMORANDUM**

6.1 The Memorandum will be governed by a Management Committee comprising senior officials from the parties to the Memorandum and a representative of an environmental non-governmental organization.

The Director General, Energy and Transportation Directorate of Environment Canada, the Director General of the Office of Environmental Affairs of Transport Canada and the Director General of Rail Safety of Transport Canada, or their delegates will represent the federal government. The RAC and its member companies will be represented by the RAC's Chair of the Environment Committee, and its Vice-President, Operations and Regulatory Affairs, or their delegates.

The environmental non-governmental organization representative will be selected by the RAC, TC and EC prior to the first meeting of the Management Committee.

The Management Committee will meet at least once a year.

6.2 The Management Committee will:

- review the annual report before its publication;
- conduct, as necessary, a review of the Memorandum to assess any significant changes to the Canadian rail industry or the Canadian economy in general that can have an impact on the ability of the RAC and its member companies to respect the terms of the Memorandum;
- make recommendations that it deems necessary to improve the Memorandum; and
- at its discretion create, schedule, and oversee the work of a Technical Review Committee (Section 6.3).

6.3 The functions of the Technical Review Committee may include the following:

- oversee reporting and verification activities;
- review and verify annual data submitted to EC and TC by the RAC;
- review as necessary the methodology used for estimating emissions and recommend changes, when appropriate;
- review actions undertaken to achieve the goals of the Memorandum; and
- undertake any other activities as requested by the Management Committee.

7.0 SUPPORTING THE MEMORANDUM

7.1 EC and TC will work with the RAC in support of the RAC's implementation of measures to reduce emissions of CACs, by providing technical advice on emission reduction technologies and best practices;

7.2 TC will work with the RAC in support of the RAC's implementation of the Action Plan for reducing GHG emissions, including such programs and initiatives as may be established in support of the government's environmental agenda.

7.3 EC and TC will make reasonable efforts to consult with the RAC on the inclusion of rail related research in departmental research and development plans.

7.4 EC and TC will organize and convene jointly with the RAC, a conference or seminar on emissions reduction and environmental best practices in the railway industry.

7.5 EC and TC will recognize, as appropriate, progress achieved by the RAC and its members towards meeting or exceeding emissions reduction objectives. EC and TC will choose the time and manner of any public acknowledgement of the RAC's and its members' achievements.

- 7.6 EC and TC will share information with the RAC respecting how emissions reduction actions may be credited in accordance with any such mechanisms as may be established for this purpose.
- 7.7 EC and TC will use best efforts to work with the RAC to address barriers that may impede emission performance in the railway industry.

8.0 GENERAL PROVISIONS AND SIGNATURES

This Memorandum is a voluntary initiative that expresses in good faith the intentions of the Parties. It is not intended to create nor does it give rise to legal obligations of any kind whatsoever. As such, it is not enforceable at law. The government reserves the right to develop and implement regulatory or other measures it deems appropriate to achieve clean air and climate change goals. Nothing in this Memorandum will constrain the Parties from taking further actions relating to CAC and GHG emissions or fuel use that are authorized or required by law.

The parties recognize that the information provided pursuant to the Memorandum will be governed by the applicable legislation concerning protection and access to information.

Dated at Ottawa this 15th day of May 2007



Minister of the Environment



Minister of Transport Infrastructure and Communities



President, Railway Association of Canada

ANNEX 1
RAC MEMBER COMPANIES

November 2006

Agence métropolitaine de transport	Ontario Northland Transportation Commission
Alberta Prairie Railway Excursions	Ontario Southland Railway Inc.
Amtrak	Ottawa Central Railway Inc.
Arnaud Railway Company	Ottawa Valley Railway
Athabasca Northern Railway Ltd.	Québec Cartier Mining Company
Barrie-Collingwood Railway	Québec Gatineau Railway Inc.
BNSF Railway Company	Québec North Shore and Labrador Railway Company Inc.
Burlington Northern (Manitoba) Ltd.	Roberval and Saguenay Railway Company
Canadian Heartland Training Railway	The Romaine River Railway Company
Canadian Pacific Railway	Savage Alberta Railway Inc.
Cape Breton & Central Nova Scotia Railway	SOPOR
Capital Railway	South Simcoe Railway
Carlton Trail Railway	Southern Manitoba Railway
Central Manitoba Railway Inc.	Southern Ontario Railway
Charlevoix Railway Company Inc.	Southern Railway of British Columbia Ltd.
Chemin de fer de la Matapédia et du Golfe Inc.	St. Lawrence & Atlantic Railroad (Québec) Inc.
Canadian National Railway Company	Sydney Coal Railway
CSX Transportation Inc.	Toronto Terminals Railway Company Ltd.,
Essex Terminal Railway Company	The Trillium Railway Co. Ltd.
GO Transit	Tshietin Rail Transportation Inc.
Goderich-Exeter Railway Company Ltd.	VIA Rail Canada Inc.
Great Canadian Railtour Company Ltd.	Wabush Lake Railway Company Ltd.
Great Western Railway Ltd.	West Coast Express Ltd.
Hudson Bay Railway	White Pass & Yukon Route
Huron Central Railway Inc.	Windsor & Hantsport Railway
Kelowna Pacific Railway Ltd.	
Kettle Falls International Railway, LLC	
Montréal, Maine & Atlantic Railway Ltd.	
New Brunswick East Coast Railway Inc.	
New Brunswick Southern Railway Company Ltd	
Norfolk Southern Railway	
Okanagan Valley Railway	

ANNEX 2
1995 – 2005 MOU REGARDING LOCOMOTIVE EMISSIONS

MEMORANDUM OF UNDERSTANDING
Between
ENVIRONMENT CANADA
And The
RAILWAY ASSOCIATION OF CANADA

PART 1 - INTRODUCTION

The purpose of this document is to set out the principles of the basic agreements reached among The Railway Association of Canada (RAC), The Canadian Council of Ministers of the Environment (CCME) and Environment Canada (EC) with respect to the control of emissions of oxides of nitrogen (NOx) produced by locomotives during all rail operations in Canada.

The MOU has been developed from the recommendations contained in the joint Environment Canada and Railway Association of Canada (EC/RAC) report entitled "Recommended Reporting Requirements for the Locomotive Emissions Monitoring (LEM) Program".

PART 2 - BACKGROUND

The Railway Association of Canada, being an association of environmentally concerned corporations doing business in Canada, proposed, to the Canadian Council of Ministers of the Environment (CCME), a voluntary cap on the total emissions of oxides of nitrogen from locomotive engines in Canada of 115 kilotonnes per year. The RAC proposal for a voluntary cap on NOx emissions has been included in the CCME NOx/VOC Management Plan and is officially validated by this MOU.

PART 3 - THE PROGRAM

Between January 1, 1990 and December 31, 2005 the RAC will endeavour to collect all data necessary to calculate the total amount of emissions of oxides of nitrogen (NOx) produced during all rail operations in Canada and, if necessary, take whatever action is necessary to avoid exceeding the agreed maximum NOx emissions of 115 kilotonnes per year.

RAC will make every effort to report once per year to Environment Canada in the manner described below. The data collected should represent the activity of all RAC members and the RAC will endeavour to encourage Associate members of the RAC and non-members to participate in the data reporting.

The RAC also agrees to monitor developments in railway operations technology and encourage member railways to implement new cost effective technologies that will reduce the NOx emission from their new equipment.

PART 4 - REPORTS

As outlined in the joint EC/RAC report entitled "Recommended Reporting Requirements for the Locomotive Emissions Monitoring (LEM) Program", the RAC will make every effort to submit to Environment Canada annual reports containing the following information;

1. A list of the Gross-Ton-Miles (GTM), Net-Ton-Miles and total fuel consumption data for railway operations plus estimates of the emissions of nitrogen oxides (NOx), hydrocarbons (HC), sulphur oxides (SOx), particulate matter (PM), carbon monoxide (CO) and carbon dioxide (CO₂) using the RAC emission factors as corrected in Table 9 of the Report referenced above. All fuel consumption and emissions data will be listed separated with respect to passenger, freight and yard switching services. These data will be submitted for the reporting year and will include revised projections for years 1995, 2000, and 2005;
2. In addition to the national aggregate figures, fuel consumption and emissions should be provided for each Tropospheric Ozone Management Area (TOMA) as geographically defined in the NOx/VOCs Management Plan (CCME, 1990);

3. The emissions data for the TOMA's should be further separated into two additional categories: the Winter Months and the Critical Ground Level Ozone Forming Months of May, June, July, August and September;
4. Updated information should be provided about the composition of the locomotive fleet by year of manufacture, horsepower, engine model, duty type and railway company;
5. A brief written update should be provided on the progress of the railway industry in introducing new, more NOx efficient operating procedures and/or technology in rail operations;
6. Companies should submit a report on any emissions control systems, hardware or techniques installed or implemented during an engine rebuild program which would effect NOx emissions;
7. A report should be provided on new emissions performance data and new emissions factors for locomotives operated by the railways obtained from the AAR, the manufacturers or other agencies;
8. Information should be provided about changes in the properties of diesel fuels used when the properties significantly depart from those specified in the Canadian General Standards Board Specifications CAN/CGSB-3-18-92, entitled Diesel Fuel for Locomotive Type Medium Speed Diesel Engines. Data should be reported from any tests on the sensitivity of emissions from various locomotive engines to fuel quality or to alternative fuels; and
9. A brief report should be provided on the progress and success of any other emissions reduction initiatives or changes in operational procedure, as well as any major changes in the type of duty cycles or service that would significantly affect emissions and their relative percentage of the overall railway operation.

The RAC will make every effort to submit an annual report containing all of the information indicated above by June 30th of the year following the report year. The first report covered by this MOU will be for the year 1990 and the last report under this MOU will be for the year 2005.

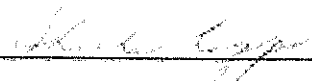
PART 5 - GENERAL

The baseline of 115 kilotonnes per year for locomotive NOx emissions is based upon the best technical information that was available by the end of 1989 and on projections for traffic increases. It is understood that, if new emissions factors significantly departing from those used to determine the baseline are developed as a result of advanced research on engine emissions or if the rail traffic growth rate is significantly impacted by a shift of traffic from or to another mode of transport, a new environmental review will be initiated.

Although both of the parties hereto have indicated by their signature, acceptance of the principles set out herein, this Memorandum of Understanding (MOU) is not intended to create a legally binding agreement and shall not be construed as creating enforceable contractual obligations among the parties hereto.

DATED at this day of 1995

MINISTER OF THE ENVIRONMENT



THE RAILWAY ASSOCIATION OF CANADA



ANNEX 3 CRITERIA AIR CONTAMINANTS

Air pollution is linked to respiratory diseases (e.g. asthma and chronic obstructive pulmonary disease), cardiovascular disease, allergies, and neurological effects. Air pollution can also prejudice the quality of soil and water resources.

The most important Criteria Air Contaminants (CAC's) produced by locomotives include:

- Sulphur Oxides (SO_x);
- Nitrogen Oxides (NO_x);
- Particulate Matter (PM);
- Hydrocarbons (HC); and
- Carbon Monoxide (CO).

NO_x and HC contribute to the formation of ground-level ozone, which is a respiratory irritant and one of the major components of smog. Smog has been identified as a contributing factor in thousands of premature deaths across the country each year, as well as increased hospital visits, doctor visits and hundreds of thousands of lost days at work and school. Environmental problems attributed to smog include effects on vegetation, structures, and visibility and haze (mainly due to fine PM).

Acid deposition, which is a more general term than acid rain, is primarily the result of emissions of SO₂ and NO_x that can be transformed into secondary pollutants. Damage caused by acid deposition affects lakes, rivers, forest, soils, fish and wildlife populations and buildings.

ANNEX 4 GREENHOUSE GASES

The greenhouse effect is the term used to describe the role of the atmosphere in insulating the planet from heat loss. Greenhouse gases (GHG) are gases in the atmosphere that give rise to this greenhouse effect. This "natural greenhouse effect" is an important phenomenon to biological life on Earth.

Climate change occurs when the total amount of the sun's energy absorbed, does not equal the amount of energy released, causing an imbalance in the radiative exchange. Consequently, humans can also cause temperatures and the climate system to change. Human activities such as the burning of fossil fuels, deforestation or land surface change, industrial processes, etc., are increasing the concentration of GHGs in the atmosphere. This additional increase of GHG is known as the "enhanced greenhouse effect", where more incoming energy is trapped within the atmosphere. This can have serious impacts on the physical and chemical processes, and biological life on Earth.

There are some GHGs that are present in the atmosphere due to both natural processes and human activities. The most significant GHGs produced by locomotives include:

- Carbon dioxide (CO₂)
- Methane (CH₄)
- Nitrous oxide (N₂O)

For estimating the emissions from the transportation sector, the CO₂ and other GHG emissions depend upon the amount of fuel consumed, the carbon content of the fuel, and the fraction of the fuel oxidized. The emissions factors have been obtained and developed from a number of studies conducted by Environment Canada, the U.S. Environmental Protection Agency (EPA), and other organizations, both domestic and international.

The CO₂ equivalent is the sum of the constituent greenhouse gases expressed in terms of their equivalents to the Global Warming Potential of CO₂. The CO₂ equivalent is estimated with the following equation:

$$\text{CO}_2 \text{ e} = (\text{CO}_2 \text{ emissions} * 1) + (\text{CH}_4 \text{ emissions} * 21) + (\text{N}_2\text{O emissions} * 310)$$

ANNEX 5

REDUCTION OF GREENHOUSE GAS EMISSIONS FROM THE RAIL SECTOR

The Action Plan for Reducing GHG Emissions may include the following kinds of elements:

Operational Improvement

- Consolidation of cars with similar destination into blocks: This step reduces delays at intermediate locations by simplifying process for employees, eliminating the duplication of work and helping to ensure fluid rail yards and terminals. It also reduces transit time for shipments throughout the network and increases car availability for customers.
- Scheduling: There are methods to improve the scheduling of trains with other railways and develop systems designed to share advanced information to thereby improve service.
- Distributive power: It enables the placement of locomotives at different locations throughout a train, as opposed to placing all the locomotives at the front of the train. This allows for improved acceleration, braking and overall control of the train especially where severe grades and curvature exist. Better rail-wheel adhesion and improved application of available motive power increases fuel efficiency, and improved train handling capabilities improves throughput and reduces costs.
- Code for best practices: The development and promotion of a code will allow the sharing of best practices amongst all railways and increase the use of such best practices thereby generating additional fuel savings for the industry.

Technology / Equipment Upgrades

- Anti-idling devices and strategies: Studies show that idling locomotives consume approximately four per cent of the total volume of fuel consumed in railway operations. Technologies such as automatic stop/start systems and hybrid switching locomotives as well as operational changes can potentially reduce idling significantly and generate important fuel savings.
- Equipment: Equipment upgrades include using improved steel wheel tread profiles, lightweight rail cars, and the introduction of "steering trucks" on rail cars. These new materials and designs reduce the weight of freight cars and their rolling resistance, enabling to haul more cargo per unit of energy used.

Greater participation in federal programs

Examples of federal programs include:

- Freight Technology Demonstration Fund: Under this program, Transport Canada is funding projects that can demonstrate and encourage the take-up of technologies and best practices that can reduce both CAC and GHG emissions from any freight mode.
- Freight Technology Incentives Program: The program provides financial incentives for the purchase and installation of efficiency enhancing and emissions reduction technologies and equipment in any freight mode.