



Health Santé  
Canada Canada

# **Evaluation of Health Canada's Border Air Quality Strategy**

## **Final Report**

Approved by

Departmental Executive Committee on  
Finance, Evaluation and Accountability (DEC-FEA)  
Health Canada

February 7, 2008

Canada 



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**Management Action Plan for the final report of the Evaluation of Health Canada's Border Air Quality Strategy**

**Final Report of the Evaluation of Health Canada's Border Air Quality Strategy**



## Management Action Plan - Evaluation of Health Canada's Border Air Quality Strategy

Note: All management action items outlined below are specifically related to Border Air Quality Strategy initiatives.

Recommendations (pp.23-24 of evaluation report)	Management Action Items	Contact person, Office of primary interest	Completion Date
<p>A. <b>Leverage</b> – Given the potential benefits to provinces involved in such pilot initiatives, federal tax payers might expect that federal resources will be better levered in support of the project objectives. Future similar undertakings should establish specific objectives with respect to cash and in-kind leverage, and the department should take steps to actively track such contributions.</p>	<p>Where appropriate in terms of shared objectives and benefits, Health Canada will pursue involvement of other parties (e.g. provinces) in future undertakings;</p> <p>Health Canada will take steps to actively track cash and in-kind contributions to and from provinces:</p> <ul style="list-style-type: none"> <li>- by establishing specific objectives at the planning stage with respect to potential cash and in-kind contributions in future, similar type projects;</li> <li>- by identifying potential cash and in-kind contributions as a performance measurement indicator in future, similar type projects to allow for tracking of these contributions.</li> </ul>	<p>John Cooper, Director, Water, Air and Climate Change Bureau (WACCB), Safe Environments Program (SEP), Health Canada</p>	

<b>Recommendations (pp.23-24 of evaluation report)</b>	<b>Management Action Items</b>	<b>Contact person, Office of primary interest</b>	<b>Completion Date</b>
<p>B. <b>Appropriate time-frames</b> – Health Canada BAQS participants were universal in suggesting that a four year time frame for research work, from project concept to peer reviewed output, was too short. Most suggested a period of at least 5 years, and preferably six, is necessary for this process. It is acknowledged that this recommendation is in conflict with the reality of federal budget cycles and election timeframes that do not allow for more than a 4 year funding timeframe / cycle. In the future, it will be important to recognize this conflict in establishing targets for similar initiatives.</p>	<p>Health Canada will take steps to ensure adequate time frames are identified for the complete life cycle of research work:</p> <ul style="list-style-type: none"> <li>- by including in future requests for funding and budget allocations, project reporting timelines, and clearly indicating whether or not reporting periods extend beyond the funding period;</li> <li>- if reporting outside funding periods, then clear plans on how this will be managed and resourced will be developed and approved at an appropriate level</li> <li>- by establishing milestones both within and outside the funded period;</li> <li>- by ensuring that the timing of mandated reporting requirements is included in Health Canada’s annual departmental evaluation reporting cycle report.</li> </ul>	<p>John Cooper, Director, Water, Air and Climate Change Bureau (WACCB), Safe Environments Program (SEP), Health Canada</p>	

<p align="center"><b>Recommendations (pp.23-24 of evaluation report)</b></p>	<p align="center"><b>Management Action Items</b></p>	<p align="center"><b>Contact person, Office of primary interest</b></p>	<p align="center"><b>Completion Date</b></p>
<p><b>C. Collaborative communities of practice</b> – Developing ‘Communities of Practice’, as was done by HC in BAQS, provides an important mechanism for ensuring project outputs are well-aligned with end user needs and expectations, increasing the likelihood that the outputs will be used as intended and the expected results achieved. In the future, it will be important to develop these communities with other federal partners and the relevant US agencies to achieve long term results.</p>	<p>Health Canada will continue to support collaborative communities of practice:</p> <ul style="list-style-type: none"> <li>- by providing resources when appropriate;</li> <li>- by actively seeking opportunities to connect ‘communities of practice’ agendas to Health Canada’s long term results in order to engage in joint activities and discussions, and share information in an effort to help each other find workable solutions to problems, share best practices, and for practitioners to learn from each other;</li> <li>- by actively supporting linkages with other federal partners and relevant US agencies.</li> </ul>	<p>John Cooper, Director, Water, Air and Climate Change Bureau (WACCB), Safe Environments Program (SEP), Health Canada</p>	
<p><b>D. Management and Performance Reporting</b> – Strong and dedicated management / oversight structures and a performance monitoring system are necessary and should be put in place to protect against project risks and to increase the likelihood that outputs will materialize as intended. A Senior Management oversight structure is especially important in restructuring projects to achieve intended results when unexpected issues or resource reallocations need to be addressed. Engagement of Senior Management also helps to ensure outputs can contribute to decision-making and receive ongoing support, and can support program transition (i.e., from a pilot to an ongoing program). A solid tracking and</p>	<p>Health Canada will improve the likelihood of a project’s successful outcome:</p> <ul style="list-style-type: none"> <li>- by establishing a governance mechanism which includes senior management to make decisions and ensure monitoring and performance processes are in place and effective;</li> <li>- by identifying the manager or team accountable for the outputs of the project and who are dedicated to providing clear and quick decisions in the event of unforeseen barriers to the success of the project;</li> <li>- by allocating specific resources (FTEs and O&amp;M) to developing and implementing a performance measurement strategy.</li> </ul>	<p>John Cooper, Director, Water, Air and Climate Change Bureau (WACCB), Safe Environments Program (SEP), Health Canada</p>	

<b>Recommendations (pp.23-24 of evaluation report)</b>	<b>Management Action Items</b>	<b>Contact person, Office of primary interest</b>	<b>Completion Date</b>
<p>reporting system, with clear indicators of progress that show how expenditures and activities are contributing towards results, would support and inform such a management structure, and build the framework for ongoing program delivery.</p>	<ul style="list-style-type: none"> <li>- by ensuring Logic Models for similar type projects include tracking and reporting of indicators of progress that would show how expenditures and activities are contributing towards results in order to make appropriate adjustments / restructuring;</li>   <li>- by ensuring the tracking and progress reports are used to inform senior management to assist them in sound decision making with respect to ongoing programs / launching new pilots.</li> </ul>		



# Evaluation of Health Canada's Border Air Quality Strategy

**Final Report**

**March 30, 2007**

Prepared for:

Health Canada  
Safe Environments Programme

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**Acronyms used in the report**

AQI	Air Quality Index
AQHI	Air Quality Health Index
BAQS	Border Air Quality Strategy
BC CDC	British Columbia Centre for Disease Control
EC	Environment Canada
US EPA	United States Environmental Protection Agency
HC	Health Canada
IJC	International Joint Commission
MOU	Memorandum of Understanding
PM	Particulate Matter
UBC	University of British Columbia
UVic	University of Victoria
UWashington	University of Washington

**Acknowledgments**

The evaluation team would like to thank the numerous individuals who provided assistance to this project, including:

- Health Canada personnel in the Safe Environments Programme who led the delivery of the BAQS in Health Canada and provided coordination, support and oversight for the delivery of this evaluation;
- Other Health Canada personnel, in the National Capital region, Ontario region, and Pacific region who participated in the interview process;
- Project partners in Environment Canada, in other jurisdictions (Ontario, British Columbia, United States) as well as project researchers at the University of Windsor, University of British Columbia, University of Victoria, and the University of Washington, all of whom provided their insights on the accomplishments and challenges in implementing BAQS; and
- All departmental personnel and project partners and researchers who responded to our inquiries and requests for documentary evidence, and provided detailed insights and comments crucial to the development of this report.

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## **EXECUTIVE SUMMARY**

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### **Evaluation Overview**

The purpose of this summative evaluation is to assess and determine Health Canada's progress in delivering identified outputs and achieving the anticipated results related to their responsibilities under the four-year Border Air Quality Strategy (BAQS) which ran from 2003/04 to 2006/07. Ultimately, the objective of the evaluation is to make a conclusion with respect to the overall "value for money" provided through the department's delivery, to date, of the BAQS.

This independent evaluation is "evidence-based." That is, its conclusions and recommendations are based on objective and documented evidence to the fullest extent possible. All findings from this evaluation were validated with the responsible Health Canada managers. The conduct of the evaluation involved multiple perspectives across two major lines of inquiry, including:

- **Document Review:** An extensive catalogue of documentation was reviewed to generate evidence to support findings and conclusions with respect to the relevance of the initiative and the extent to which planned activities and outputs were delivered; and
- **Interviews** to solicit evidence with respect to the efficiency of program delivery and the effectiveness of the program outputs in making a contribution to the expected results of the Health Canada BAQS initiative.

### **Conclusions**

The following conclusions have been drawn with respect to the specific objectives established for this evaluation:

- **Relevance** - Health Canada's components of the Border Air Quality Strategy were, and continue to be, directly relevant to and aligned with the priorities of the federal government, the mandate of Health Canada, and the needs of Canadians.
- **Economy** - tax payer resources were well-utilized during the execution of the initiative. However, a small portion (10%) of the resources assigned to the initiative were allocated to Health Canada priorities outside of the BAQS and the evaluators are unable to reach conclusions on the resultant utility and accomplishments of those allocations. In addition, a number of additional (internal and external) challenges arose resulting in some outputs not being delivered within the original timeframes planned.
- **Efficiency** – the planned outputs associated with Health Canada's component of BAQS have been, or will be, delivered in an affordable manner and in accordance with the project budgets established.
- **Effectiveness** – the work of Health Canada as part of BAQS will contribute to the expected outcomes articulated in the Clean Air Logic Model, many of which are likely to be achieved. The Air Quality Health Index (AQHI) activities are capable of making a direct contribution to realizing the associated intermediate (2010) outcomes of better informing Canadians and assisting them in reducing the health impacts of air pollution. While they have made an important contribution in their own right, the health studies contribution to realizing the expected outcomes (by 2010) of "reducing transboundary flows of air pollution" and "improving (bilateral and

Canada Wide Standards) targets” are less direct and their achievement will require more than just these research initiatives (as originally intended).

✓ *In summary, value for money was provided through the resources that reached the Health Canada BAQS initiative*

- It was highly relevant, efficient and effective, but its performance was partially impaired due to a range of factors, not all of which were within the control of the responsible Health Canada BAQS managers.

### **Recommendations**

The Health Canada's Component of BAQS formally ends, with sun-setting funding, on March 31, 2007. It is anticipated, however, that relevant activities may be undertaken in the near future and in response to the federal government's continuing priority on reducing the human health impacts of poor air quality. As such, this evaluation makes a number of recommendations to strengthen and support the delivery of any future relevant and similar activities, including:

- **Leverage** – Future similar undertakings should establish specific objectives with respect to cash and in-kind leverage, and the department should take steps to actively track such contributions.
- **Appropriate time-frames** – A period of at least 5 years, and preferably six is necessary to move from project concept through to the completion of published, peer reviewed research in initiatives such as the Health Canada BAQS. However, this research timeframe conflicts with the regular policy and government budget cycles, which typically are only able to provide funding commitments over much shorter periods. In the future, it will be important to recognize this conflict in establishing targets for similar initiatives.
- **Collaborative communities of practice** – Developing ‘Communities of Practice’, as was done in HC with BAQS, provides an important mechanism for ensuring project outputs are well-aligned with end user needs and expectations, increasing the likelihood that the outputs will be used as intended and the expected results achieved. In the future, it will be important to develop these communities with other federal partners and the relevant US agencies to achieve long term results.
- **Management and Performance Reporting** – Strong and dedicated management / oversight structures and a performance monitoring system are necessary and should be put in place to protect against project risks and to increase the likelihood that outputs will materialize as intended, and program transition can occur smoothly.

## 1 INTRODUCTION

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### 1.1 Evaluation Purpose and Objectives

This assessment was undertaken to respond to a commitment to Treasury Board Secretariat to conduct a summative evaluation upon completion of Health Canada's activities undertaken through the four year (2003/04-2006/07) Border Air Quality Strategy (BAQS).

The purpose of this summative evaluation is to respond to this commitment and assess and determine Health Canada's<sup>1</sup> progress in delivering identified outputs and achieving the anticipated results related to their responsibilities under the Border Air Quality Strategy over this period.

Ultimately, the objective of the evaluation is to make a conclusion with respect to the overall "value for money" provided through the department's delivery, to date, of the Health Canada's component of BAQS.

### 1.2 Report Overview

This document contains the results of the "Evaluation of Health Canada's Border Air Quality Strategy." It is organized into five main sections:

- **Section 1** outlines the purpose and objectives of the evaluation, identifies the authorities for undertaking the Health Canada BAQS initiative and provides an introduction to the Border Air Quality Strategy and related activities;
- **Section 2** provides a summary of the evaluation methodology;
- **Section 3** provides a summary of the detailed evaluation findings;
- **Section 4** provides conclusions and an overall determination of the "value for money" provided by delivery of the Health Canada BAQS initiative; and
- **Section 5** provides recommendations for consideration in undertaking future similar or related activities.

In addition, the report includes:

- An **Annex**, providing a comprehensive summary of the hard evidence gathered and analysed in support of the evaluation findings; and
- A number of **Appendices** including details such as:
  - The interview guide employed during those interviews;
  - The assessment framework developed to guide the conduct of the evaluation and ensure its findings and conclusions are relevant to the stated purpose and objectives; and
  - A list of the documentation consulted in support of the evaluation.

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<sup>1</sup> The broader Border Air Quality Strategy was led by Environment Canada, and also included contributions by other federal departments. This evaluation considers only resources and responsibilities allocated to Health Canada under the BAQS.

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### **1.3 Overview of the Border Air Quality Strategy**

#### **1.3.1 Program Authorities**

In 2000, the federal government negotiated the Ozone Annex to the 1991 Canada-US Air Quality Agreement. This Annex was negotiated to reduce the transboundary movement of smog-causing pollutants to better protect human health and the environment. The Ozone Annex commits both Canada and the United States to control and reduce emissions of nitrogen oxides (NO<sub>x</sub>) and volatile organic compounds (VOCs), which are precursors of ground-level ozone, a key component of smog over major regions in North America.

In 2001, federal ministers approved a 10 year “Clean Air Agenda” to address the human health and environmental risks of air quality and position Canada to continue negotiations with the US to reduce transboundary flows of pollution. At that time, the Government of Canada made an initial investment towards priority actions in the Agenda, but the full agenda was not funded. Subsequently, in December 2002, a request for additional support towards elements of a Border Initiative, led by Environment Canada, was prepared to further advance the Clean Air Agenda. That proposal included a request to support Health Canada’s efforts to:

1. Introduce a national Air Quality Index to support improved Air Quality Forecasting.
2. Build the science and socio-economic evidence base upon which to set a new generation of bilateral air quality agreements with the US, including an information base to support negotiation of a PM (Particulate Matter) Annex.
3. Complete science and health studies to support regional efforts under two regional airshed projects (the Georgia Basin / Puget Sound International Airshed Strategy and the Great Lakes Basin Strategy) on two regions of the country where the majority of Canada’s population lives and whom are at most risk from poor air quality.
4. Undertake a “Multi-city Children’s Health Initiative” to determine the effects of longer term exposures to low levels of air pollutants.

#### **1.3.2 Program Summary**

In early 2003, funding was made available to support delivery of some aspects of the original proposal. The Border Air Quality Strategy (BAQS) component within Health Canada was provided \$23.5 million over the four year period covering fiscal 2003 through fiscal 2006.

In response to the available funding levels, Health Canada adjusted the scope of its contribution, dropping the “Multi-city Children’s Health Initiative” and scaling back activities in the remaining areas. Table 1, below provides an overview of the funded Health Canada activities and the anticipated outputs associated with those activities.



**Table 1: Health Canada Border Air Quality Strategy Logic Model**

Profile of Health Canada (HC)'s Border Air Quality Strategy Program					
AIR QUALITY FORECASTING					
Program Element	Activity	Output	Intermediate Outcomes (2010)	Responsible Authority in HC, and Partners	Allocated Funds
Sub-element 1.5: Health Studies Engagement	1. Conduct an analysis and evaluation to support new health-based multi-pollutant air quality index formulation.	Revise the Air Quality Index (AQI) and forecasting in light of the lack of an apparent health effects threshold and simultaneous effects of multiple pollutants.	<b>Canadians understand how to interpret air quality information and are aware of actions they can take.</b>	HC - Environmental Contaminants Bureau, Air Health Effects Division <sup>2</sup>  The initiative was co-led with EC, and other key partners were represented on the AQHI Management Committee: NB Lung (co-chair), Provincial Environment & Health departments, Municipal representatives, Pollution Probe	\$2,100,000
	2. Establish indicators of health impacts of long term air quality changes.	Further develop and apply methodologies for reporting on indicators of long term changes in population exposure and reduced health risks.	Canadians have better access and make better use of information and tools to interpret air pollution information and the impact on their health and on the health of vulnerable populations.		
	3. Engage key agencies, health professionals, high risk groups, general public on AQI messaging content.	Engage health communities, Environmental Non-Governmental Organizations and other groups to assist in developing effective and targeted messaging on the human health impact of air pollution.	Canadians modify their daily activities according to AQHI to reduce exposure to air pollution. <sup>5</sup>		
	<p>A number of specific projects supported the sub-element activities:</p> <ol style="list-style-type: none"> <li>1. Public opinion research (via Environics) to assess public awareness, understanding and use of air quality indices.</li> <li>2. Provincial Air Quality Health Index Pilots (AQHI) (e.g., "Airplaytoday.org" - with the BC Ministry of the Environment).</li> <li>3. Focus groups to test the proposed AQHI elements.</li> <li>4. Annual workshops/conferences with stakeholders to help guide the development of the AQHI.</li> <li>5. Compilation and analysis of Canadian air pollution time series data and health endpoints to construct the AQHI.</li> <li>6. Development of the Air Quality Benefits Assessment Tool (AQBAT) - a computer simulation tool designed to estimate the human health and welfare benefits or damages associated with changes in Canada's ambient air quality.</li> </ol>				

<sup>2</sup> This Bureau has since been reorganized in HC.

Profile of Health Canada (HC)'s Border Air Quality Strategy Program WESTERN AIRSHED PILOT					
Program Element	Activity	Output	Intermediate Outcomes (2010)	Responsible Authority in HC, and Partners	Allocated Funds
Sub-element 2.4: Western Health Initiatives	1. Undertake health risk assessments and health impact economic analyses for the airshed. This requires establishment of expert scientific health panels and peer review on specific issues including point source, PM characterization, impact assessment and risk analysis.	Produce advanced health reviews and assessment on emerging evidence on particle and source specific toxicity.	<p><b>Transboundary flows of air pollution are reduced.</b></p> <p><b>Targets are continuously improved.</b></p> <p>Commitments to reduce air pollution are implemented per negotiated agreements between Canada and the U.S.</p> <p>Canada Wide Standards (CWS) for PM and Ozone are reviewed and revised according to new health and risk assessment information.</p>	British Columbia Centre for Disease Control (coordinator), under contract to HC - Environmental Contaminants Bureau & HC – BC Region, and the Universities of British Columbia, Victoria and Washington. <sup>3</sup>	\$8,200,000
	2. Examine region specific issues of concern to health, including transportation emissions, seasonality (i.e. the extent to which effects occur in all seasons equally), and unique regional exposures, with focus on particulate matter (PM).	Produce information on the health effects of region specific air pollution mixtures to support further development and application of the Canada-Wide Standards (CWS). Health exposure modelling will provide support for the development of airshed air quality management and mitigative measures.			
	3. Initiate health studies to examine the effects of short and longer-term exposure and pollutant interactions. This can include the establishment of a population based study group to estimate the effects of longer-term exposure to air pollutants (including examination of susceptible sub-populations, i.e. children, the elderly).	Develop health databases, and address knowledge gaps of health effects of air pollution (especially traffic-related air pollution) on birth outcomes, children's respiratory disease, and cardiovascular disease in older adults			
<p>A number of specific health impact research projects supported the sub-element activities:</p> <ol style="list-style-type: none"> <li><a href="#">Establishment of a Childhood Respiratory Disease Cohort using the BC Linked Health Database</a> (UBC &amp; UWashington)</li> <li><a href="#">Analysis of Birth Outcomes in the Greater Vancouver Regional District using the BC Perinatal Database Registry and the BC Linked Health Database</a> (UBC &amp; UWashington)</li> <li><a href="#">Consolidation and Evaluation of Existing Geographic Data for the Georgia Basin/Puget Sound International Airshed</a> (UBC &amp; UVic)</li> <li><a href="#">Enhanced Assessment of Exposure to Traffic and Wood Smoke and Incorporation of Meteorology</a> (UBC, UVic &amp; UWashington)</li> <li>Bronchiolitis and fine particulate air pollution in Puget Sound and Georgia Air Basin - Children's case control (UBC &amp; UWashington)</li> <li>Otitis media study using linked database (UBC)</li> <li>Personal exposure of pregnant women (UBC)</li> <li>Cardiovascular cohort study to assess risk of cardiovascular disease among older adults associated with residential air pollution levels (UBC)</li> <li>Walkability study/index (UBC)</li> </ol>					

<sup>3</sup> Funding transfers for Years 1 & 2 activities were governed by a Memorandum of Understanding. Year 3 transfers through a Letter of Agreement and Year 4 transfers were coordinated through PWGSC.

Profile of Health Canada (HC)'s Border Air Quality Strategy Program GREAT LAKES BASIN AIRSHED PILOT					
Program Element	Activity	Output	Intermediate Outcomes (2010)	Responsible Authority in HC, and Partners	Allocated Funds
Sub-element 3.4: Eastern Health Initiatives	1. Conduct health characterization and health impact cost/benefit analysis for Great Lakes Basin focussing primarily on transboundary air pollution and PM.	Undertake region specific human health analysis and assessment of transboundary air pollution given the specific nature of the PM problem in south-western Ontario. The evidence from this region will support negotiations with the US on a PM Annex and support requirements under the CWS.	<p><b>Transboundary flows of air pollution are reduced.</b></p> <p><b>Targets are continuously improved.</b></p> <p>Commitments to reduce air pollution are implemented per negotiated agreements between Canada and the U.S.</p> <p>CWS for PM and Ozone are reviewed and revised according to new health and risk assessment information.</p>	<p>HC - Environmental Contaminants Bureau (ECB)</p> <p>Internal partners included: HC – Environmental Health Sciences Bureau (EHSB) and Economic Analysis and Evaluation Division for the economic analyses</p> <p>External partners included Environment Canada, the US EPA and the University of Windsor's, with regional coordination of the health research by the Centre for Environmental Health of Ontario</p>	\$13,200,000
	2. Undertake quantitative human exposure studies and population exposure modelling focussing on transportation source and transboundary pollutants, jointly with the U.S. Environmental Protection Agency (EPA).	Complete a multi-year exposure study, which will enable the collection of a larger more extensive exposure and health impacts database.			
	3. Initiate health studies to examine short and long-term PM exposure of susceptible populations, jointly with the US EPA.	Provide evidence on specific health outcomes such as asthma, circulatory effects and cancer in the context of the region specific air pollution mix, to support further development and application of CWS.			
	<p>Several health impact research projects supported the sub-element activities:</p> <ol style="list-style-type: none"> <li>1. <a href="#">Exposure Assessment using Spatial Variability Studies</a> (ECB)</li> <li>2. <a href="#">Personal, Indoor, and Outdoor Exposure Studies</a> (ECB)</li> <li>3. <a href="#">Windsor Children's Respiratory Health Study</a> (ECB)</li> <li>4. <a href="#">Air Pollution and the Effects on Pregnant Women</a> (ECB)</li> <li>5. <a href="#">Evaluation of the Toxicity of Particulate Matter on Cultured Human Cells</a> (EHSB)</li> <li>6. <a href="#">Adverse Cardiovascular Effects of Windsor Air Pollution on Diabetic Patients</a> (ECB)</li> <li>7. <a href="#">Time-series Studies on Mortality and Hospital Admissions in Windsor, Sarnia and London</a> (ECB)</li> <li>8. <a href="#">Population-based Health Studies of the Great Lakes Basin Regional Airshed</a> (EHSB)</li> <li>9. Adverse health effects of Air Pollution on Cardiovascular System of Seniors in Windsor (ECB)</li> </ol>				

## **2 Evaluation Approach and Methodology**

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### **2.1 Evaluation Approach**

The evaluation is summative in nature. It measures the extent to which planned activities were conducted, planned outputs were delivered and planned outcomes were achieved. It also assesses the relevance and cost effectiveness of the work. This evaluation is “evidence-based.” That is, its conclusions and recommendations are based on objective and documented evidence to the fullest extent possible.

The conduct of the evaluation involved multiple perspectives across two main lines of inquiry:

1. **Document Review:** An extensive catalogue of documentation (see Appendix C) was reviewed to generate evidence to support findings and conclusions with respect to the relevance of the initiative and the extent to which planned activities and outputs were delivered. Annex I provides a summary of the evidence captured against each of the main Health Canada BAQS activity areas; and
2. **Interviews:** 21 interviews were conducted to solicit evidence with respect to the efficiency of program delivery and the effectiveness of the program outputs in making a contribution to the expected results of the Health Canada BAQS initiative. Interviewees included:
  - Program managers and staff in Health Canada;
  - Policy and risk managers and staff in Health Canada;
  - Participating scientists from Health Canada, University of Windsor, University of British Columbia, and University of Victoria;
  - Project partners and beneficiaries in other jurisdictions, including Ontario, British Columbia and the United States; and
  - Environment Canada personnel responsible for overall coordination of the BAQS initiative on behalf of the federal government.

### **2.2 Evaluation Work Plan**

The evaluation was conducted in accordance with the work plan described in the Evaluation Plan prepared by Health Canada and consisted of six distinct project tasks:

1. An initial project meeting to review and confirm the project methodology, deliverables and scoping considerations;
2. Initial document review and development and testing, with program managers, of a Program Profile covering all BAQS activities conducted by HC, and in any partnership with other departments;
3. Information collection and analysis, including a comprehensive document collection and review exercise (see Appendix C) and interviews with 21 stakeholders (see Appendix A);
4. Development of a Draft Evaluation Report;
5. Presentation and validation of Draft Evaluation Findings with the responsible Health Canada managers; and
6. Preparation of the Final Evaluation Report.

### 2.3 Assessment Framework

A comprehensive assessment framework was developed in response to the terms of reference established for the evaluation. The framework was to guide the conduct of the evaluation and to assist in making a determination of “value for money”. This assessment framework is included as Appendix B to this report.

In December 2006, Treasury Board released its preliminary [“Value for Money Profile Tool.”](#) which is presently under going testing in a number of federal departments. Within that profile tool, the term “value for money” is defined as a means to assess two areas of inquiry: program **relevance and performance**. The assessment framework for this evaluation expanded on these two areas of inquiry, and established four specific assessment criteria:

1. **Relevance:** *Are we doing the right thing?*
2. **Performance:** *Are we achieving value?*
  - a. *Economy:* Are tax payer resources well utilized?
  - b. *Efficiency:* Are outputs achieved in an affordable manner?
  - c. *Effectiveness:* Were objectives and results achieved as intended and in manner that minimizes costs?

The evaluation findings and conclusions respond directly to these criteria and the more detailed questions included in the assessment framework (see Appendix B).

### 2.4 Limitations

There are two specific limitations associated with this evaluation and which could not be overcome through alternative methodologies or approaches:

1. *Key activities remain underway and outstanding* – At the time of conducting this evaluation, all, or nearly all data gathering and analysis activities had been completed and preliminary research findings generated. However, many of the outputs remain under development prior to being submitted for peer review and submitted for publication. The evaluation team has been provided assurances that those activities will be undertaken in the coming months, despite the sun-setting of funding on March 31, 2007. As a result, conclusions have had to be reached on the assumption that these activities will be completed as planned in the coming months.
2. *Reliance on stakeholder views to ascertain eventual impacts.* The evaluation does not evaluate actual policy, environmental, or human health outcomes associated with the Health Canada Border Air Quality Strategy as the activities and outputs conducted are only now being finalized. Moreover, the Health Canada BAQS activities and outputs represent just one contribution, among many, that will need to be in place before conclusions can be reached with respect to whether the initiative, taken as a whole, will achieve expected outcomes associated with it before 2010. As a result, the determination of the effectiveness and impact of the BAQS delivery was developed on the basis of inputs from stakeholders representing multiple views (managers, delivery agents, partners, beneficiaries, interested parties) of the initiative.

### 3 FINDINGS BY KEY PROGRAM COMPONENT

This section provides evaluation findings for each key component of the assessment framework:

1. **Relevance:** *Are we doing the right thing?*
2. **Performance:** *Are we achieving value?*
  - a. *Economy:* Are tax payer resources well utilized?
  - b. *Efficiency:* Are outputs achieved in an affordable manner?
  - c. *Effectiveness:* Were objectives and results achieved as intended and in manner that minimizes costs?

#### 3.1 Relevance Findings: Did we do the right thing?

Area of Inquiry	Assessment Questions	Information sources
<b>Relevance:</b> <i>Did we do the right thing?</i>	<ul style="list-style-type: none"> <li>• Does the program address a demonstrable need among Canadians?</li> <li>• Is it an appropriate role for the federal government?</li> <li>• Is it consistent with and relevant to the department's mandate? and</li> <li>• Is it responsive to and aligned with the federal government's priorities?</li> </ul>	<ul style="list-style-type: none"> <li>• Foundational documents (MCs, Treasury Board Submission)</li> <li>• Interviews with Sr. Managers, project partners, and intended beneficiaries</li> </ul>

##### 1. *Health Canada's component of BAQS represents an appropriate role for the Government of Canada.*

- As signatories to the bilateral Canada-US Air Quality Agreement, the federal government has a responsibility to ensure that commitments made under that agreement are acted upon. The Border Air Quality Strategy, and Health Canada's contribution to it was designed to enable Canada to engage the US administration in transboundary air quality cooperation in a way that supports Canada's domestic Clean Air Agenda.
- As a Party to that Agreement, the federal government is also obligated to ensure that its negotiating positions are informed by a strong and sound knowledge base. Health Canada's activities under the BAQS were expected to make significant contributions to supporting the science and policy framework for reviewing and strengthening the Ozone Annex in 2004, and negotiating a Particulate Matter Annex at a later date.
- The Health Canada BAQS activities were also expected to make an important contribution to establishing the policy and science framework for assisting Canadian governments (federal and provincial) in meeting the Canada-wide standards for Particulate Matter and Ozone, by 2010, as agreed by the Canadian Council of Ministers of Environment. Health Canada's component of BAQS was also intended to respond to federal government obligations under the CCME process, where, among other things, it was assigned lead responsibility for

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enhancing and strengthening the science base related to PM and Ozone.<sup>4</sup>

**2. *Health Canada's component of BAQS is well aligned to past and current federal priorities.***

- The Clean Air Agenda (May 2001) outlined a comprehensive ten-year program to address air quality in Canada. The BAQS represented a key element in response to that Agenda, with each element of the BAQS initiative providing a direct contribution to achieving the intermediate (2010) outcomes of the Clean Air Agenda (See Table 1).
- With a significant portion of ground level ozone and particulate matter in Canada originating from US-based sources, BAQS makes a contribution to establishing cooperative efforts with US authorities, ultimately contributing to the goal of reducing transboundary flows of pollution.
- The positioning of the BAQS, and the broader Clean Air Agenda, as priorities for the Government of Canada were communicated within the 2002 Speech from the Throne – which committed the government to working cooperatively with the US, and through the granting of spending authorities targeting implementation of the Clean Air Agenda and BAQS.
- More recently, in the 2007 Speech from the Throne and through the tabling of Bill C-30 (Canada's Clean Air Act), the Government of Canada has reconfirmed that the federal government continues to place high priority on protecting human health and the environment from the effects of air pollution.
- While the BAQS initiative itself will not continue post-2007, the pilot activities undertaken through Health Canada's component of BAQS are expected, in large part, to inform and lead to new initiatives being planned to reduce the effects of air pollution on human health and the environment with a more regulatory focus.

**3. *BAQS activities are consistent with and relevant to Health Canada's mandate***<sup>5</sup>.

- Health Canada is the federal department responsible for helping the people of Canada maintain and improve their health. Among the department's documented objectives are expectations that the department will:
  - Prevent and reduce risks to individual health and the overall environment;
  - Provide health information to help Canadians make informed decisions.
- One of the department's key roles is to act as an "Information Provider" to support the preventative approach by "performing high quality science and research, support(ing) policy development ... and through research and surveillance, provide information that Canadians can use to maintain and improve their health".
- Health Canada's part in the BAQS makes a direct contribution to the Health Canada Strategic Result related to "Reduced Health and Environmental Risks from Products and Substances, and Safer Living and Working Environments".
- Health Canada's part in BAQS also responds directly to a commitment in the Department's Sustainable Development Strategy, calling on it to work in conjunction with other federal

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<sup>4</sup> See Government of Canada's "Interim Plan 2001 on Particulate Matter and Ozone", prepared in response to the CCME process ([http://www.ec.gc.ca/cleanair-airpur/CAOL/air/interim2001/science\\_e.html](http://www.ec.gc.ca/cleanair-airpur/CAOL/air/interim2001/science_e.html))

<sup>5</sup> See the Health Canada Report on Plans and Priorities 2006-2007

departments, to reduce cross-border air pollution by undertaking pilot projects that enable greater opportunities for coordinated air quality management between Canada and the United States.

- Prior to the Health Canada BAQS initiative, limited capacity existed in Canada to undertake health research with respect to the impacts of air pollution. BAQS made a contribution to building the necessary capacities, within Health Canada and the external research community, to address relevant issues. With little data on the health effects of air pollution in Canada available, where pollutants arise from different sources and are generally found in lower concentrations than in other well studied jurisdictions (e.g. California), Health Canada's component of BAQS also made an important contribution in initiating data sets that can support longer-term epidemiological research and investigations.

#### 4. *Health Canada's component of BAQS responds to a demonstrable need among Canadians.*

- Health Canada, along with the World Health Organization, has identified the environment as "a key determinant of health" for all Canadians. Recent studies demonstrate that environmental factors contribute to a number of health problems, with some Health Canada studies suggesting that air pollution is a factor in 5,900 +/- 2,900 premature deaths annually in 8 Canadian cities.<sup>6</sup>
- The knowledge derived from the Health Canada activities under the two BAQS regional pilot studies is expected to provide the basis for further action on air pollution by undertaking relevant health studies in key regions of the country subject to transboundary air emissions (Great Lakes Basin and Lower Fraser Valley).
- The development of the Air Quality Health Index is meant, in conjunction with air quality forecasting activities, to provide Canadians in all regions with the information necessary to reduce health risks from air pollution at any particular place or time. The new Air Quality Health Index is intended to overcome key limitations with previously existing Air Quality Indexes in place in Canadian jurisdictions, including:
  - Existing indices are not nationally consistent;
  - Existing indices do not consider effects of multiple pollutants; and
  - Existing indices are not adequately informed by actual health risks.
- Health Canada's component of BAQS is intended to be responsive, foremost to the health needs of vulnerable populations (children, pregnant women, asthmatics, etc) whom are at highest risk from poor air quality. The AQHI, in particular, aims to provide vulnerable Canadians with the information they need to protect their health from the affects of poor air quality.
- While, Health Canada's component of BAQS was focussed on specific geographic areas, it should be understood that the initiative was envisioned as a pilot exercise, where the models and methodologies developed could be replicated to support similar relevant studies in the remaining areas of the country. In that regard, the initiative has the potential to make a contribution to all Canadians, over time.

<sup>6</sup> Health Canada, 2005. "Factsheet: How would eliminating air pollution from human activities affect mortality rates in Canada? See [http://www.hc-sc.gc.ca/ahc-asc/media/nr-cp/2005/2005\\_32bk1\\_e.html](http://www.hc-sc.gc.ca/ahc-asc/media/nr-cp/2005/2005_32bk1_e.html)



**3.2 Performance Findings: Are we achieving value?**

**3.2.1 Economy Findings – Were Tax Payer Resources Well Utilized?**

Area of Inquiry	Assessment Questions	Information sources
<p><b>Economy:</b> <i>Were tax payer resources well utilized?</i></p>	<ul style="list-style-type: none"> <li>• Was the project plan ‘doable’ from the beginning?                             <ul style="list-style-type: none"> <li>○ Were resource commitments clearly linked to definable outputs with a clear audience and intended use?</li> <li>○ How were the resource requirements determined in the first place? What expertise was sought in designing the program to achieve maximum value with the resources available? Was the program design informed by any previous experiences or best practices in similar areas?</li> <li>○ Was the program assigned to staff members and partners with demonstrable willingness and capabilities to execute the project as planned?</li> </ul> </li> <li>• To what extent were federal resources used as leverage to secure commitment from beneficiaries?</li> <li>• Were appropriate management and oversight structures put in place to oversee the expenditure of resources and delivery of results?</li> <li>• Were resource expenditures tracked and adjusted as necessary?</li> </ul>	<ul style="list-style-type: none"> <li>• Program design documents, briefing notes etc.</li> <li>• Letters of commitment from partner organizations</li> <li>• References / supporting documents from partner organizations</li> <li>• Leveraged resources</li> <li>• Evidence of an appropriate work plan and budget</li> <li>• Evidence of management structures, including regular reports and minutes of meetings</li> <li>• Financial reports / variance reports.</li> <li>• Interviews with staff, management and partner organizations</li> </ul>

**1. Health Canada’s component of BAQS, as initially designed, was largely ‘doable. Nevertheless, the program faced some initial challenges in getting launched.**

- Within Health Canada’s component of BAQS, resource commitments were clearly linked to definable outputs, with an intended audience and use (see Table 1). The intended audience for the initiative varied, to some degree, by key element but consisted of:
  - Vulnerable populations for the AQHI activities;
  - Scientists and researchers for all the health investigations undertaken; and
  - Risk managers and policy makers, at the federal and provincial levels, for the pollution-source / health outcome related activities and those relating to the costs and frequency of air pollution incidents.
- Through various mechanisms, each of these audience groups had some opportunity to participate in the initial scoping and implementation of the initiative.
- Health Canada’s component of BAQS was a first for Canada. With respect to work on the AQHI index, this work represented a leading edge practice globally. With respect to the health studies, limited capacity existed in Canada to undertake health research with respect to the impacts of air pollution, and little if any epidemiological data existed with respect to the specific pollutant sources and concentrations found in Canada.
- Despite these limitations, Health Canada’s BAQS initiative employed several techniques to ensure the program was well designed and economical. For the Western pilot, Health Canada partnered with the BC Centre of Disease Control (BC CDC), and world-class scientists from three Universities to design and deliver the pilot. By contracting through the BC CDC, Health

Canada avoided the need to pay overhead fees, which are normally assigned to externally-funded undertakings completed through the provincial universities. For the Eastern Pilot, Health Canada selected the well-qualified Centre for Environmental Health at the University for Windsor as the project partner. The multi-stakeholder Management Committee for the AQHI initiative helped to ensure that the design and implementation of that undertaking was appropriately informed by knowledgeable practitioners.

- Another key contributor to ensuring economic outcomes was Health Canada's engagement of highly willing and motivated partners. Each of these partners participated voluntarily and visibly, associating their organizations and personnel with the Health Canada's component of BAQS in a very public way. This helped to ensure ownership over the activities and outputs, and provided a key means for ensuring high quality and timely delivery.
- While externally-oriented activities were clearly assigned to willing and capable partners, internally-focussed activities had some challenges in quickly placing appropriate personnel in the program. Shortly after the approval of BAQS funding, the responsible division lead within Health Canada left the project, and other key project positions changed hands during BAQS delivery. As well, delays were encountered in filling the new Health Canada positions funded through BAQS. This especially impacted the delivery of the Eastern-pilot, which was led by Health Canada, resulting in that pilot being somewhat delayed and behind schedule vis-à-vis the Western pilot which already had an established framework to build from.

**2. *Federal resources were only partially leveraged to secure commitment from beneficiaries.***

- Despite making significant contributions to areas of relevance to provincial public policy development, Health Canada was not obligated to leverage federal contributions when designing and delivering the Health Canada component of BAQS.
- Nevertheless, project beneficiaries did make significant 'in-kind' contributions. This included provinces, which participated in the AQHI development work, and British Columbia and Nova Scotia, which pilot tested the AQHI. It also included those civil society organizations that were active in support of the AQHI initiative. Likewise, the Province of British Columbia, through the Centre for Disease Control, and the Greater Vancouver Regional District each made important contributions to support the Western pilot. As well, the City of Windsor, and the Province of Ontario provided important in-kind support to the delivery of the Great Lakes pilot.
- Individual researchers did use Health Canada's BAQS resources to further lever additional, external resources in support of the research and the BAQS objectives.
- The extent of this leveraging was not reported, however, and Health Canada lacks the mechanisms to determine the extent to which the federal contributions were levered.

**3. *Management and oversight structures were present at the "sub element" level Health Canada's component of BAQS.***

- Each of the three pilot initiatives - the AQHI activities and the Eastern and Western pilots - benefited from some kind of established, externally oriented oversight body.
- The oversight structures to support the development of the Air Quality Health Index were in place prior to the initiation of the Health Canada's Component of BAQS. Prior to 2001, a multi-stakeholder "management Committee" consisting of federal, provincial and civil society

organizations was established to determine the need for and subsequent development of an Air Quality Health Index for Canada and improved Air Quality Forecasting.

- Through contractual arrangements with the BC Centre for Disease Control, an external body was assigned responsibility for overseeing the delivery of the Western pilot.
- To coordinate efforts with Environment Canada (the lead for BAQS overall), Health Canada used a number of approaches. The work of the AQHI was coordinated with EC through the established Management Committee and shared implementation of the secretariat function. For the regional pilots, work with EC was initially coordinated via the Canada-US BAQS committees noted below.
- Being a 'border initiative', HC's work on BAQS was initially guided by the overarching Canada-US Air Quality Committee Structures and coordinated via the Airshed Management Frameworks established for both regional pilots (which included HC, EC, USEPA, Provinces and Municipalities). A US-Canada BAQS Pilot Project Great Lakes Basin Airshed Management Framework SE Michigan/ SW Ontario was established with an oversight committee and working groups to support the Great Lakes Pilot. Similarly, a Georgia Basin-Puget Sound International Airshed Strategy (IAS) Coordinating Committee and working groups were established to provide a forum for air quality managers and scientists from different agencies in the to meet and discuss issues of mutual interest. This Coordinating Committee served as the implementing body for the Western Border Air Quality Strategy pilot project. These Canada-US structures were in place only for the first 2 years of BAQS (corresponding to the timing of US involvement). No similar structure was established for the AQHI, as this work was primarily national in scope. At the project level, Health Canada researchers had regular discussions with the U.S. EPA researchers via meetings to exchanges project designs, practice and experiences (e.g., HC researchers gave presentations to the International Joint Commission to provide updates on ongoing research in Windsor).

**4. *No evidence of formal management structures, oversight mechanisms, or ongoing financial reporting was identified for the initiative as a whole within Health Canada. Evidence was found that a small portion of the assigned resources were not expended on specific Health Canada's BAQS activities as intended.***

- Limited evidence exists of any overarching and ongoing management processes concerning the whole of the BAQS implementation within Health Canada. No evidence of any meetings of a purposeful management committee to consider, review and direct BAQS activity regularly within Health Canada was provided, though the initiative did report annually through the annual Departmental Performance Report.
- Key informants noted a number of contributing factors that led to the program being implemented without such structures, including departure of some personnel early in the project and the need to quickly start spending the allocated resources and initiate activities to complete BAQS work within the allocated timeframe.
- In addition, during BAQS implementation, there was no formal Results Based Management System in place in the Safe Environments Programme to provide an integrated oversight and management structure. In fiscal year 2006-2007, the Safe Environments Programme

implemented a Balanced Scorecard and Results-Based Budget (RBB) framework to better link resources to results. The RBB framework maps out strategic elements (from sub-activities to desired outcomes), which aligns to the Balanced Scorecard. Current and future air programs will be managed under this system. BAQS activities in HC best align under Objective 1 of the RBB: “Canadians make informed decisions regarding their exposure to environmental contaminants”, under the sub-activity related to “air”.

- As a pilot project consisting largely of externally funded research and activities, there is a certain justification for the “loose” oversight encountered for BAQS in HC, with an emphasis on activity level management. Nevertheless, most key informants noted the absence of effective and appropriate management structures as a risk, suggesting that these need to be put in place if any similar activities are to be undertaken at the broader / national, rather than pilot / regional levels.
- As discussed (point 3 above), the Health Canada's Component of BAQS resources were managed and controlled largely at the level of each of the three main program elements. Once budget levels were assigned, program leads had the authorities to oversee and adjust expenditures. Managers employed a number of methods to ensure resources reaching their initiatives were used economically, including:
  - Withholding funding subject to receipt of satisfactory quarterly reports;
  - Discontinuing funds to non-performing activities; and
  - Requiring annual reapplication for funding from project researchers.
- No evidence of regular financial oversight (e.g. quarterly or annual notes of meeting, variance reports, etc.) was identified, however, for the Health Canada's Component of BAQS initiative as a whole. The degree to which expenditures were fully and adequately tracked at the program element and sub-element throughout the initiative is unclear.
- As seen in Table 2, about 90% of the intended resources were expended on BAQS related activities. While some BAQS funds were allocated to corporate taxes and program levies, these supported corporate and administrative functions (e.g., legal, informatics, publishing, communications, etc.) that were provided to help deliver both BAQS and other SEP programs. Offsetting this, additional A-base resources in HC were allocated to BAQS (in terms of salary) to enhance the departments level of effort towards BAQS specific activities. However, a portion (about 10%) of the intended and approved funding did not reach specific BAQS initiatives. It is not clear where these resources were allocated within HC. However, there is some evidence that insufficient resources required two sub-elements – the development of long-term trends and the project on male fertility – to be dropped.

Table 2: Health Canada BAQS Expenditures (2003-2007)

<b>ALLOCATION OF FUNDS</b>					
<b>(Thousand \$)</b>	<b>2003-2004</b>	<b>2004-2005</b>	<b>2005-2006</b>	<b>2006-2007</b>	<b>Total</b>
Health Canada					
FTEs	8	14	18	18	58
Total Salaries incl. EBP	720	1,260	1,620	1,620	5,220
Total O&M	3,702	4,104	4,705	5,205	17,715
Total Funding to HC after accomodation	<b>4,422</b>	<b>5,364</b>	<b>6,325</b>	<b>6,825</b>	<b>22,935</b>
minus Corporate Taxes	-284	-376	-445	-440	-1,544
Net after Corporate Taxes	<b>4,138</b>	<b>4,988</b>	<b>5,880</b>	<b>6,385</b>	21,390
Branch and Programme levies	-511	-673	-353	-513	-2,050
% of total funds to HC	11.6%	12.6%	5.6%	7.5%	8.9%
Total Program Level funding	<b>3,627</b>	<b>4,314</b>	<b>5,527</b>	<b>5,872</b>	<b>19,340</b>
Net allocation for Operating	<b>2,907</b>	<b>3,054</b>	<b>3,907</b>	<b>4,252</b>	<b>14,120</b>
<b>EXPENDITURES</b>					
<b>O&amp;M, incl. minor capital</b>					
Western Pilot	683	742	1085	1185	3,695
Eastern Pilot	1879	1657	2128	2485	8,149
Air Quality Health Index (AQHI)	304	590	440	540	1,874
<b>Total operating applied to BAQS</b>	<b>2866</b>	<b>2989</b>	<b>3653</b>	<b>4210</b>	<b>13,718</b>
<i>Lapsed O&amp;M</i>	<i>41</i>	<i>65</i>	<i>254</i>	<i>42</i>	<i>402</i>
<b>Allocation of FTEs</b>					
Western Pilot	0.8	2.0	2.3	2.6	7.8
Eastern Pilot	3.4	10.5	11.4	13.3	38.6
Air Quality Health Index (AQHI)	0.4	2.5	2.2	2.4	7.5
	<b>4.6</b>	<b>15.0</b>	<b>15.9</b>	<b>18.3</b>	<b>53.8</b>
BAQS salary incl. EBP	339.6	1071.6	1364.4	1528.2	4,304
ABASE Salary applied to BAQS incl. EBP	648	672	684	708	2,712
<b>Total salary applied to BAQS</b>	<b>987.6</b>	<b>1743.6</b>	<b>2048.4</b>	<b>2236.2</b>	<b>7,016</b>
<b>TOTAL RESOURCES APPLIED TO BAQS (exclusive of levies and corporate taxes)</b>					
<b>(Thousand \$)</b>	<b>2003-2004</b>	<b>2004-2005</b>	<b>2005-2006</b>	<b>2006-2007</b>	<b>Total</b>
<b>O&amp;M</b>	<b>2,866</b>	<b>2,989</b>	<b>3,653</b>	<b>4,210</b>	<b>13,718</b>
<b>BAQS salary</b>	<b>340</b>	<b>1,072</b>	<b>1,364</b>	<b>1,528</b>	<b>4,304</b>
<b>ABASE salary</b>	<b>648</b>	<b>672</b>	<b>684</b>	<b>708</b>	<b>2,712</b>
	<b>3,854</b>	<b>4,733</b>	<b>5,701</b>	<b>6,446</b>	<b>20,734</b>
<b>Percent of total funding to HC</b>	<b>87%</b>	<b>88%</b>	<b>90%</b>	<b>94%</b>	<b>90%</b>

**Notes concerning Table 2:**

1. FTEs and operating costs for risk assessments and program support are divided equally between the western and eastern pilots and the AQHI.
2. Branch levies are used to cover various costs to support (BAQS) employees. Critical support was provided to BAQS in legal services and communications advice. Other costs covered here include branch curriculum, postage, publishing services, telecommunications charges and IT management. A smaller Programme levy provided contingency reserves.
3. First year funding was not received until August 2003, accounting for lapse of approximately half the allocated salary during the first year.
4. Final year salary and operating expenditures are estimates as of March 15, 2007.

**3.2.2 Efficiency Findings – Were Outputs Achieved in an Affordable Manner?**

Area of Inquiry	Assessment Questions	Information sources
<b>Efficiency:</b> <i>Were outputs achieved in an affordable manner?</i>	<ul style="list-style-type: none"> <li>▪ Were the planned outputs delivered? Are they complete?</li> <li>▪ Were the outputs produced in accordance with the forecasted budget?</li> <li>▪ Were the proposed project management and oversight structures used? Is there any evidence of ongoing project and expenditure and program management to ensure delivery of outputs and to maximize efficiency and utility?</li> </ul>	<ul style="list-style-type: none"> <li>▪ Review of outputs</li> <li>▪ Evaluators judgment</li> <li>▪ Interviews</li> <li>▪ Partners judgment</li> <li>▪ Policy advisors judgment</li> <li>▪ Annual work plans / budgets / variance reports</li> </ul>

**1. Most of Health Canada's BAQS planned activities were undertaken and the planned outputs are in the process of being completed.**

- Annex I documents evidence supporting this finding that the planned activities and outputs with respect to each of the three main components of Health Canada involvement in BAQS were undertaken as intended.
- The “Final Report on the Air Quality Health Index”, developed by Health Canada, the “Report on Progress of Environment Canada and Health Canada Activity Related to the Border Air Quality Strategy Investments in the Air Quality Forecast Program and the Air Quality Health Index”, the Interim Reports on the [Great Lakes Basin Pilot](#), and the [Georgia Basin Puget Sound Pilot](#), and the UBC [webpage for the Western Pilot](#) each provide additional details and evidence of the progress made against plans for the three core activity areas under Health Canada's Component of BAQS.
- Table 1 and Annex I indicate that all planned and funded activities were initiated through the Health Canada's component of BAQS. The only key change related to ‘establishing indicators of health impacts of long term air quality changes’ (see Table 1). HC had a relatively small role in the work, which was led by EC, but did do some initial work on indicator development (as the science work required contributed both the AQHI and the indicators), however, this work was overtaken by new funding provided through the Canadian Environmental Sustainability Indicators Program which is currently underway.<sup>7</sup>
- Within the remaining activity areas, all planned activities have been pursued as intended across the four years of the project, with a couple of small exceptions. One project, on synoptic air

<sup>7</sup> Health Canada's involvement in this work is relatively small and the work is at the end of year two of the four years of funding. No evaluation has been undertaken yet,

conditions and health impacts, was discontinued after its initial year of funding because the researcher used an analytical method that was not extensively recognized in conventional air health biostatistical analysis. Also, the toxicology studies did not receive continued funding as no outputs were provided after the initial year.

- While all field activity and research associated with the Health Canada's Component of BAQS regional air shed pilots activities have been undertaken, the majority of planned outputs are not yet complete. Although some preliminary presentations and analysis have been conducted, the completion and peer review of analyses will not be complete until late 2007, or early 2008. Several factors were identified as contributing to those delays, including:
  - An initial six-month delay in releasing approved funds to the program;
  - A lengthy contracting approval, as well as ethics approval processes, which took 3-5 months to complete;
  - Challenges and delays in staffing Health Canada-funded positions;
  - Delays resulting from the need for research scientists to reapply for funding every year;
  - A view that, despite these factors, a four year timeframe is insufficient to successfully complete peer reviewed research. Experienced researchers universally argued that a minimum of six years is necessary to undertake, complete, and eventually publish peer-reviewed research projects.
- While the Health Canada BAQS funding formally ends on March 31, 2007, participants and researchers have indicated that they are committed to completing the work and pursuing publication of peer-reviewed results despite the absence of ongoing funding.
- With respect to the Air Quality Health Index, Health Canada BAQS activities have been completed, a final report is under development and will be ready for March 31, and a joint Health Canada / Environment Canada progress report is also being developed.

3. ***Health Canada BAQS outputs were completed within the scheduled budget.***

- Overall, the activities were undertaken, and the planned outputs should (eventually) be delivered in accordance with the established budget. Table 2 provides a summary of Health Canada BAQS expenditures against plans over each of the four years of the initiative.
- From the information provided, however, the evaluators are unable to determine whether the individual sub activities of each Health Canada BAQS element were each completed in accordance with the established budget.

4. ***Some elements of the Health Canada's Component of BAQS benefited from dedicated oversight structures and some evidence exists of ongoing project and expenditure and program management to ensure delivery of outputs and to maximize efficiency and utility existed.***

- The AQHI multi-stakeholder "Management Committee" continued to meet regularly during the implementation of Health Canada's Component of BAQS and oversaw the development and pilot testing of the AQHI. The Committee continues to meet and is overseeing the development of the AQHI Final Report, which includes recommendations for strengthening the index and rolling it out to other jurisdictions not covered by the pilot testing.
- The Western pilot also benefited from the functioning of its oversight mechanism, coordinated

through the BC Centre for Disease Control. This organization took responsibility for implementing the Western pilot in a cost effective manner and ensuring that all activities and outputs were delivered as intended. One key approach to ensuring effectiveness involved requirements for quarterly reporting. Only upon satisfactory reviews of quarterly reports were additional funds advanced to support on-going activities.

- In addition to quarterly reporting by externally-funded researchers, Health Canada contributed to interim progress reports on each of the two regional pilots, and to a Final Report on the Air Quality Forecasting initiative. These reporting activities also acted to demonstrate a certain degree of Health Canada oversight and controls over their portion of the initiative.
- While there were individual oversight mechanisms established for each sub-element, (as noted above), no formal management and oversight structures were established to guide the overall implementation of BAQS within Health Canada, and only recently has there been a formal performance measurement and reporting system for BAQS related activities put in place. While outputs and intended results were articulated in the initial planning documents, there was no evidence of tracking progress against performance indicators to demonstrate efficiency and utility throughout the 4 years.

**3.2.3 Effectiveness Finding: Were objectives and results achieved as intended and in manner that minimizes costs?**

Area of Inquiry	Assessment Questions	Information sources
<p><b>Effectiveness:</b> <i>Were objectives and results achieved as intended and in manner that minimizes costs?</i></p>	<ul style="list-style-type: none"> <li>▪ What is the quality of the outputs delivered? Are they capable of standing up to peer review?</li> <li>▪ What was accomplished through the initiative? Did the anticipated demand for the outputs materialize from the intended audience? Have they been / will they be used? How? When?</li> <li>▪ Any evidence of Sr. Management oversight / interest in the project and its outputs?</li> <li>▪ Any best practices to be communicated and integrate into future activities?</li> </ul>	<ul style="list-style-type: none"> <li>▪ Evaluators judgment</li> <li>▪ Interviews</li> <li>▪ Partners judgment</li> <li>▪ Policy advisors judgment</li> <li>▪ Sr. Mangers judgment</li> <li>▪ Briefing decks and notes</li> <li>▪ E-mail communications</li> </ul>

**1. The outputs delivered to date are of a high quality. It is anticipated that all health-research activities undertaken through the pilot will, within the next year, withstand formal peer review processes.**

- As noted within the AQHI Final Report and Report on Progress documents, the AQHI outputs were pilot tested in two locations, British Columbia and Nova Scotia. These pilot tests involved the target audience of eventual future beneficiaries of the AQHI and Air Quality forecasting activities – Canadian citizens, vulnerable populations and care-givers / civil society agents for vulnerable populations. Focus group testing and polling done in support of the pilots suggest that these end users found the tool to be of high quality and value. The widespread interest partners demonstrated in rolling out the AQHI and Air Quality Forecasting nationally, in the coming years, also attest to the high quality of the AQHI-related outputs.
- With respect to the health related studies conducted under the Eastern and Western pilots, all data



collection and preliminary analysis have been completed and some preliminary results have been presented at professional and international seminars and conferences. Within the next year, it is anticipated that all research activities will be subjected to peer review, as they will not otherwise be useful in informing the positions advocated by the department's risk and policy managers.

**2. *The outputs of the AQHI-related activities are already having an impact. It is anticipated that these outputs will contribute to a national AQHI and Air Quality forecasting system to better inform Canadians and assist them in reducing the health impacts of air pollution***

- Work undertaken through the AQHI is expected to contribute, by 2010, to Canadians understanding how to interpret air quality information and being aware of actions they can take. The results of the AQHI and Air Quality forecasting pilot testing show / suggest that this outcome can be realized, if the pilot system is rolled out on a national scale. The Management Committee established to oversee the AQHI has prepared a final report, noting that the AQHI as developed conforms to the aim, goals, vision and attributes proposed by the Committee at the initiation of the exercise. Interview results indicate that most Canadian jurisdictions, with the current exception of Alberta, are supportive of and are preparing to participate in such a national system.
- The expected results, however, are unlikely to be realized unless additional funding is provided over the 2007 – 2010 period to support the rollout of a national system.

**3. *Health Canada outputs from the Eastern and Western regional pilots are not yet complete. However, it is expected that these outputs will play a role, along with other factors, in informing risk and policy managers on air quality measures required.***

- The results of the health studies are expected to be especially important in informing high level managers involved in future negotiations under the Canada-US Air Quality Agreement, especially aspects related to a future PM (Particulate Matter) Annex.
- These health studies were relatively unique in Canada and were seen to have made important contributions in:
  - Building capacities of Canadian researchers;
  - Contributing to an active community of practice among researchers interested in the health effects of air pollution;
  - Building linkages between American and Canadian researchers, and between Canadian researchers and municipal and provincial health officials;
  - Establishing baseline data sets and cohorts that can be tracked to better understand the long-term effects of exposure to air pollutants;
  - Providing an opportunity to gather evidence on health impact of air pollution on vulnerable populations, e.g. children, diabetes and seniors; and
  - Testing and improving methodologies and approaches to the conduct of health studies related to air pollution in Canada, where emission sources and concentrations are unique in comparison to other better-studied jurisdictions.
- The degree to which these studies will make a significant contribution, however, to the expected results (by 2010) of reducing transboundary flows of air pollution and improving (bilateral and

CWS) targets are not yet known. Policy and risk management decisions are informed by several factors, health studies such as those undertaken through the Health Canada's Component of BAQS being just one such factor. As well, though intended to operate as a cooperative and collaborative bilateral "border strategy", Health Canada's component of BAQS actually had limited active engagement of US federal and state authorities.<sup>8</sup> Most participants have suggested that the health studies will, ultimately, play a greater role in informing domestic decision making and will likely have limited impact on transboundary flows of air pollution.

- As with the AQHI, additional resources will need to be dedicated to relevant initiatives over the 2007-2010 period, if the objectives related to cleaner air are to be realized.

**4. *Little evidence of Sr. Management oversight / interest in the project.***

- Health Canada BAQS managers noted that the department's Senior Management were generally supportive, but did not take an active and ongoing interest in the Health Canada BAQS initiative. As a result of other, higher profile and higher priority issues within the department, such as "wait times" and health transfers to the provinces.
- More recently, with higher federal priority on "Clean Air", and the AQHI Management Committee calling for a national roll out of the index and forecasting system, there is a more sustained interest and priority in Health Canada's Component of BAQS.

**5. *A number of best-practices were identified through the Health Canada's Component of BAQS activities and can be emulated in future relevant and similar undertaking, including:***

- Working with external researchers at Universities and the US EPA;
- Working with non-governmental organizations such, such as the Centre for Environmental Health;
- Working with Universities, making cost-effective use of supervised graduate students to undertake field work and other relevant tasks;
- Using pre-existing external organizations, such as the BC Centre for Disease Control, to coordinate and deliver external research in an effective, efficient and economical manner;
- Establishing multi-stakeholder communities of practice, such as the AQHI Management Committee, to oversee activities and ensure outputs are developed with the needs and expectations of end users firmly in mind;
- Coordinating multi-party workshops, such as the *Health Effects Institute Annual Air Quality science meeting*; and
- Developing end of project reports, as was done for the AQHI, to capture accomplishments, lessons-learned and to inform future undertakings.

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<sup>8</sup> Interviewees indicated that US participation in BAQS was only through the use of existing funding authorities (no additional funding was provided in the US). In addition, the US was only engaged in BAQS for the first 2 years and was initially resistant to having health as a key component of BAQS. These factors limited resources collaboration between the US and Health Canada however, key efforts and contacts with US (particularly via the Eastern pilot) did enhance US interest and engagement in the health aspects of air quality.

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#### 4 Conclusions: Assessing the Value for Money of Health Canada's BAQS

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The following conclusions have been drawn with respect to the specific objectives established for this evaluation:

- **Relevance** - Health Canada's components of the Border Air Quality Strategy were, and continue to be, directly relevant to and aligned with the priorities of the federal government, the mandate of Health Canada, and the needs of Canadians.
  - **Economy** - tax payer resources were well-utilized during the execution of the initiative. However, a small portion (10%) of the resources assigned to the initiative were allocated to Health Canada priorities outside of the BAQS and the evaluators are unable to reach conclusions on the resultant utility and accomplishments of those allocations. In addition, a number of additional (internal and external) challenges arose resulting in some outputs not being delivered within the original timeframes planned.
  - **Efficiency** – the planned outputs associated with the Health Canada's component of BAQS initiative have been, or will be delivered in an affordable manner and in accordance with the project budgets established. Activities were undertaken in an efficient manner, which included some leveraged in-kind contributions from program beneficiaries and which demonstrated some best-practices that can be emulated in future activities of a similar nature.
  - **Effectiveness** – the work of Health Canada as part of BAQS will contribute to the expected outcomes articulated in the Clean Air Logic Model, many of which are likely to be achieved. The Air Quality Health Index (AQHI) activities are capable of making a direct contribution to realizing the associated intermediate (2010) outcomes of better informing Canadians and assisting them in reducing the health impacts of air pollution. While they have made an important contribution in their own right, the health studies contribution to realizing the expected outcomes (by 2010) of “reducing transboundary flows of air pollution” and “improving (bilateral and Canada Wide Standards) targets” are less direct and their achievement will require more than just these research initiatives (as originally intended).
- ✓ ***In summary, value for money was provided through the resources that reached the Health Canada BAQS initiative.*** Health Canada's Component of BAQS was highly relevant, effective and efficient, but its contribution was somewhat limited due to a range of factors, not all of which were within the range of control of the responsible Health Canada BAQS managers. Ultimately, Health Canada BAQS practitioners have demonstrated that they have the capacities to make good use of the resources that were provided to them, although strengthened oversight systems to support planning, coordination and ongoing resource management will likely be required if larger allocations are provided in the future.

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#### 5 Recommendations

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The Health Canada's Component of BAQS formally ends, with sun-setting funding, on March 31, 2007. It is anticipated, however, that relevant activities may be undertaken in the near future and in response to

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the federal government's continuing priority on reducing the human health impacts of poor air quality. As such, this evaluation makes a number of recommendations to strengthen and support the delivery of any future relevant and similar activities, including:

- **Leverage** – Given the potential benefits to provinces involved in such pilot initiatives, federal tax payers might expect that federal resources will be better levered in support of the project objectives. Future similar undertakings should establish specific objectives with respect to cash and in-kind leverage, and the department should take steps to actively track such contributions.
- **Appropriate time-frames** – Health Canada BAQS participants were universal in suggesting that a four year time frame for research work, from project concept to peer reviewed output, was too short. Most suggested a period of at least 5 years, and preferably six, is necessary for this process. It is acknowledged that this recommendation is in conflict with the reality of federal budget cycles and election timeframes that do not allow for more than a 4 year funding timeframe / cycle. In the future, it will be important to recognize this conflict in establishing targets for similar initiatives.
- **Collaborative communities of practice** – Developing 'Communities of Practice', as was done by HC in BAQS, provides an important mechanism for ensuring project outputs are well-aligned with end user needs and expectations, increasing the likelihood that the outputs will be used as intended and the expected results achieved. In the future, it will be important to develop these communities with other federal partners and the relevant US agencies to achieve long term results.
- **Management and Performance Reporting** – Strong and dedicated management / oversight structures and a performance monitoring system are necessary and should be put in place to protect against project risks and to increase the likelihood that outputs will materialize as intended. A Senior Management oversight structure is especially important in restructuring projects to achieve intended results when unexpected issues or resource reallocations need to be addressed. Engagement of Senior Management also helps to ensure outputs can contribute to decision-making and receive ongoing support, and can support program transition (i.e., from a pilot to an ongoing program). A solid tracking and reporting system, with clear indicators of progress that show how expenditures and activities are contributing towards results, would support and inform such a management structure, and build the framework for ongoing program delivery.

**Annex I: Summary of Evidence Collected to Support Findings**

Evidence of Health Canada Activities and Outputs under the Border Air Quality Strategy			
Element	Activities Planned	Outputs Planned	Evidence of Accomplishments
Air Quality Forecasting			
Sub-element 1.5: Health Studies Engagement	Conduct an analyses and evaluation to support new health-based multi-pollutant air quality index formulation.	Revise the Air Quality Index (AQI) and forecasting in light of the lack of an apparent health effects threshold and simultaneous effects of multiple pollutants	<p><b>Deliverables:</b></p> <ul style="list-style-type: none"> <li>• Conducted research to determine the health risk-based AQI formulation This included cutting edge epidemiological research as foundation for new health risk based index (by Dr.s Burnett &amp; Steib); and compilation and analysis of large datasets of Canadian air pollution data and health endpoints to construct risk estimates. Some key documents include:                             <ul style="list-style-type: none"> <li>○ Stieb DM, Smith-Doiron M, Blagden P, Burnett RT. 2005. <i>Estimating the public health burden attributable to air pollution: An illustration using the development of an alternative air quality index. J Toxicol Environ Health</i> 68(13):1275–1288.;</li> <li>○ Stieb DM, Burnett RT, Smith-Doiron M, Chen Y, Goldberg M, Cakmak S, Dales RE, Dann T, Brook JR. 2003a. <i>Air Pollution, Mortality and Cardiorespiratory Hospital Admissions in 11 Canadian Cities, 1998–2000: Application to a Reformulated Air Quality Index. Report to the AQI Management Committee.</i></li> <li>○ Stieb DM, Judek S, Burnett RT. 2003. <i>Meta-analysis of time-series studies of air pollution and mortality: Update in relation to the use of generalized additive models. J Air Waste Manage Assoc</i> 53:258–261.</li> <li>○ Ramsay T, Burnett RT, Krewski D. 2003. <i>Underestimation of standard errors in generalized additive models linking mortality to ambient particulate matter. Epidemiol</i> 14:18–23.;</li> <li>○ Dominici F, McDermott A, Zeger SL, Samet JM. 2002. <i>On generalized additive models in time series studies of air pollution and health. Am J Epidemiol</i> 156:193–203.)</li> </ul> </li> <li>• Developed new proposed AQHI tool and graphic –the <i>first</i> air-quality <i>health</i> risk index of its kind in the world - easier to understand, multi-pollutant (additive effects), health-based, more accurate, proposed to be nationally consistent. Underwent 3 rounds of peer review. (<i>Backgrounder. AQHI. Tonya Bruin, HC</i>).</li> <li>• Developed AQBAT – Air Quality Benefits Assessment Tool – a computer simulation tool designed to estimate the human health and welfare benefits or damages associated with changes in air quality. Allows for a wide range of specific scenario models linking</li> </ul>

Evidence of Health Canada Activities and Outputs under the Border Air Quality Strategy			
Element	Activities Planned	Outputs Planned	Evidence of Accomplishments
			<p>pollutants, health endpoints, geo areas and years (<i>Introduction to the AQBAT. HECSB, HC (Stan Judek and Dave Stieb). Oct 2006</i>). This tool helped establish the number of premature deaths associated with air pollution (conservative estimate).</p> <p><b>Work Outstanding:</b></p> <ul style="list-style-type: none"> <li>All development, testing and evaluation work associated with the AQHI has been completed.</li> <li>A summary report – the AQHI Guidance Document – is being drafted for completion by March 2007.</li> </ul> <p><b>Next Steps:</b></p> <ul style="list-style-type: none"> <li>The new index aims to be adopted nationally with a consistent name and presentation format, including category names, ranges and associated health messages, throughout the country. It should be noted that jurisdictions issuing the index will ultimately make the decisions concerning all aspects.</li> <li>The health science behind the index will continue to be improved and enhanced (e.g., how to reflect the health concerns associated with those pollutants of local concern but not found within the index; appropriately reflecting health risks in rural areas; <i>substituting the highest relative health risk of PM<sub>10</sub> for PM<sub>2.5</sub></i>, etc.).</li> </ul>
	Establish indicators of health impacts of long term air quality changes.	Further develop and apply methodologies for reporting on indicators of long term changes in population exposure and reduced health risks.	<p><b>Deliverables:</b></p> <ul style="list-style-type: none"> <li>This activity area was initiated under BAQS but taken over and enhanced by a new initiative. The Government of Canada decided to pursue a larger Indicators Initiative following the publication of the National Round Table on Environment and Economy Report. A separate MC was approved and funded (led by EC and StatsCan) to establish national indicators and HC's contribution to establish indicators of health impacts was included. (<i>Source: Interviews with HC</i>).</li> <li>The science, modelling and data used to support the AQHI were also used to support the indicators work (<i>Source: Interviews with HC</i>).</li> </ul> <p><b>Work Outstanding:</b></p> <ul style="list-style-type: none"> <li>This separate initiative is currently in its second year of a four year program.</li> </ul> <p><b>Next Steps:</b></p> <ul style="list-style-type: none"> <li>The first use of these indicators will be in National Reporting Dec. 2007. This will include a trend analysis that combines levels of air pollution with mortality risks.</li> </ul>

Evidence of Health Canada Activities and Outputs under the Border Air Quality Strategy			
Element	Activities Planned	Outputs Planned	Evidence of Accomplishments
	Engage key agencies, health professionals, high risk groups, general public on AQI messaging content.	Engage health communities, ENGOs and other groups to assist in developing effective and targeted messaging on the human health impact of air pollution.	<p><b>Deliverables:</b></p> <ul style="list-style-type: none"> <li>• Management Committee set up pre-BAQS with national air quality stakeholders (HC and EC, Provincial and Municipal government agencies, health and environmental groups) to manage, in a transparent fashion, the development of a health risk based Canadian Air Quality Index. Secretariat support from EC MSC and AHED of HC. (<i>Terms of Reference. Management Committee for the Development of a Canadian Health Risk Based Air Quality Index Draft 26/08/05 approved</i>). All provinces, except AB, engaged and in agreement with new AQHI.</li> <li>• Research was undertaken, through Environics, to assess Health Professionals' Information Needs.</li> <li>• Management Committee provided consensus communication objectives and characteristics ("attributes") of an improved AQI (<i>Aim, Goals, Vision and Attributes for a Health Risk Based AQHI. Summary from Management Committee. Ottawa, May 2002</i>).</li> <li>• Annual workshops/conferences with Management Committee to help guide AQHI (<i>AQHI Management Committee summary meeting minutes, milestones and presentations, 2003-2007. <a href="http://www.msc-smc.ec.gc.ca/CAQI/wn-qn_e.cfm">http://www.msc-smc.ec.gc.ca/CAQI/wn-qn_e.cfm</a></i>).</li> <li>• Along with the AQHI, advisories and health messages were developed with information for both the general public and vulnerable populations so that they can decide how to reduce their health risks (<i>AQHI Health Messages. Tonya Bruin, HC. Dec 2006</i>).</li> <li>• To develop relevant and timely health messages, significant research was conducted and consultations were held to determine awareness levels, attitudes, beliefs and behaviours related to AQI; current messages and information needs; and attitudes and expectations for future messaging. These studies included:                         <ul style="list-style-type: none"> <li>▪ A National Survey in 2001 (<i>Air Pollution – Information Needs and the Knowledge, Attitudes and Behaviour of Canadians. Environics Research Group. Jan. 2002</i>);</li> <li>▪ Public Opinion Research in 2004 with (1) Post air quality event surveys; (2) Autumn 2004 national survey; and (3) qualitative assessment of new AQI communications concepts (focus groups) (<i>Development of a Health-based AQI for Canada. Public Opinion Research 2004-05. Environics Research Group. May 2005</i>)</li> <li>▪ Assessment of perceptions of air quality (<i>Summary of Findings from Application of Mental Models Approach to Health Risk Communications for AQIs. DecisionRisk Consultants Inc. Feb 2005</i>).</li> <li>▪ <i>Health Professionals' Information Needs: Air Quality Health Index – 2006 Research through Environics.</i></li> </ul> </li> <li>• The AQHI and health messages were pilot tested twice in BC in 2005 and 2006 (14 locations) and in NS in 2006. In addition, an investigation to provide the AQHI over community radio was carried out in the city of Kamloops (<i>AQHI Final Report – Airplay</i></li> </ul>

Evidence of Health Canada Activities and Outputs under the Border Air Quality Strategy			
Element	Activities Planned	Outputs Planned	Evidence of Accomplishments
			<p><i>Pilot Research Report. Feb 2006; AQHI BC Pilot 2006. Jan 2007; Environics AQHI Pilot Testing in BC: Qualitative Research. Dec 2006; Environics AQHI Pilot Testing in BC: Quantitative Research. Jan 2007; AQHI Pilot Testing in Nova Scotia: Qualitative Research, Environics Research Group. Nov 2006).</i> Most participants who took part in the AQHI pilot projects, both in Nova Scotia and British Columbia, feel that the AQHI is valuable, not only as a personal health protection tool, but also as a means to educate and promote awareness of air quality issues, and to encourage action to improve air quality and the environment.</p> <p><b>Work Outstanding:</b></p> <ul style="list-style-type: none"> <li>All development, testing and evaluation work associated with the AQHI has been completed.</li> <li>A meeting is planned for March 2007 in Kamloops to summarize the 2006 Pilot initiatives and next steps.</li> </ul> <p><b>Next Steps:</b></p> <ul style="list-style-type: none"> <li>The new AQHI will be made available to jurisdictions in spring 2007 for consideration towards national adoption. HC and EC will encourage and support transition to a national index.</li> <li>Pilots of the AQHI continue to be planned and implemented across the country, with a focus on Vancouver, Toronto and Montreal but also in Windsor, Ottawa, NS and NB (<i>Resource Needs for Windsor Pilot. March 2006; Resource Needs for NB Pilot May 2005</i>).</li> <li>National branding for the index and associated outreach activity will be investigated and propagated as the Index rolls out.</li> <li>A new group will be formed to oversee and provide input on the outreach and marketing aspects of the AQHI (<i>Outreach and Marketing/Promotions Committee for the AQHI. Terms of Reference. Feb 2007</i>).</li> </ul>
Western Airshed Pilot			
Sub-element 2.4: Western Health Initiatives	Undertake health risk assessments and health impact economic analyses for the airshed. This requires establishment of expert	Produce advanced health reviews and assessment on emerging evidence on particle and source specific toxicity.	<p><b>Deliverables:</b></p> <ul style="list-style-type: none"> <li>Launched the Georgia Basin-Puget Sound pilot launched in June 2003. The pilot's objectives were to: i) develop the Georgia Basin-Puget Sound International Airshed Strategy (IAS); ii) enhance information exchange on air pollution and related impacts (health and ecosystem); improve knowledge of regional air quality that may have transboundary impacts; implement emission reduction efforts; and examine policy options for improved collaboration and management in the region (<i>Source: Final Summary Report (2005) and Interim Progress Reports 2004, 2005</i>).</li> </ul>



Evidence of Health Canada Activities and Outputs under the Border Air Quality Strategy			
Element	Activities Planned	Outputs Planned	Evidence of Accomplishments
	scientific health panels and peer review on specific issues including point source, PM characterization, impact assessment and risk analysis.		<ul style="list-style-type: none"> <li>• A summary report prepared and submitted in 2005.</li> <li>• Established an IAS Coordinating Committee and scheduled meetings every 6 months. Committee membership included individuals from federal/national, provincial/state, local and aboriginal representatives.</li> <li>• Developed sub-working groups to address specific issues (e.g. transboundary science).</li> <li>• Carried out activities/conducted research in the following areas (<i>Source: Final Summary Report 2005</i>):</li> </ul> <ol style="list-style-type: none"> <li>1. Establishment of a childhood respiratory disease cohort using the BC Linked Health Database; Activities included:                             <ul style="list-style-type: none"> <li>• reporting and mapping describing geographic distribution of births within the Georgia Basin Airshed;</li> <li>• Map of socioeconomic indicators and housing characteristics based on Census data;</li> <li>• Assessment of the reliability of the residential history data from the client data available for children compared with data from the Vital Statistics Database Registry;</li> <li>• Assessment of the feasibility of adding additional information stored at hospitals on PDR forms;</li> <li>• Compiled summary statistics of 2 years of follow-up of respiratory outcomes discharges of the 1999/2000 births</li> </ul> </li> <li>2. Analysis of birth outcomes in the GVRD using the BC Perinatal Database Registry and the BC Linked Health Database; Activities included:                             <ul style="list-style-type: none"> <li>• Compiled summary statistics of preterm births and low birth weight births, and Intrauterine growth retardation in GVRD ('99-02) from BC Vital Statistics, linked to BCLHD and to BC Perinatal Database;</li> <li>• Mapped all births by cases referenced in bullet above</li> <li>• Summarized statistics of enhanced risk factors from Perinatal Database in GVRD by case/control status;</li> <li>• Prepared a summary report describing logistic regression analysis of association between estimated exposures and low birth weight/preterm birth/IUGR in GVRD</li> </ul> </li> <li>3. Data inventory and Consolidation, evaluation of existing GIS data for GB-PS Airshed;                             <ul style="list-style-type: none"> <li>• Developed a consolidated geodatabase that contained data required for the cohort studies</li> <li>• Developed a data inventory and utility report;</li> <li>• Provided specialized data products required for other projects</li> </ul> </li> </ol>

Evidence of Health Canada Activities and Outputs under the Border Air Quality Strategy			
Element	Activities Planned	Outputs Planned	Evidence of Accomplishments
			<p>4. Enhanced assessment of exposure to traffic and woodsmoke and incorporation of meteorology; Activities included:</p> <ul style="list-style-type: none"> <li>• Developed a map of housing with fireplaces/woodstoves</li> <li>• Developed predictive models of woodsmoke as function of residential land use, housing stock and temperature</li> <li>• Prepared a map of density of estimated ambient woodsmoke concentrations</li> <li>• Developed maps of estimated local traffic emissions; and</li> <li>• Prepared a report that described the validation of woodsmoke spatial map based on mobile measurements</li> </ul> <p>5. Children's case control study. Activities included:</p> <ul style="list-style-type: none"> <li>• Conducted a study that tested whether infants residing near busy highways (in the Seattle area) or in areas impacted by woodsmoke are more likely to be hospitalized for bronchitis w/i their first year</li> </ul> <p><b>Work Outstanding:</b></p> <ul style="list-style-type: none"> <li>• The field data collection component for the pilot study has been completed (<i>Source: Interviews with HC and universities</i>).</li> <li>• Analysis of the data remains to be completed (<i>Source: Interviews with HC and universities</i>).</li> </ul> <p><b>Next Steps:</b></p> <ul style="list-style-type: none"> <li>• Full scale analysis is planned for the immediate future at no cost to Health Canada.</li> <li>• Write and publish peer review papers based on data collection findings.</li> <li>• Conduct a workshop in February 2007 that brings together all partners involved with the pilot studies</li> </ul>
	Examine region specific issues of concern to health, including transportation emissions, seasonality (i.e. the extent to which effects	Produce information on the health effects of region specific air pollution mixtures to support further development and application of the Canada-Wide Standards (CWS).	<p><b>Deliverables:</b></p> <ul style="list-style-type: none"> <li>• Assessed the relationship between an Air Pollution Exposure Model and the GVRD Birth Cohort</li> <li>• Conducted research on air pollution impacts and Bronchitis in Puget Sound and in the Georgia Air Basin</li> <li>• Developed air quality data for traffic and woodsmoke-related pollution exposure</li> </ul>

Evidence of Health Canada Activities and Outputs under the Border Air Quality Strategy			
Element	Activities Planned	Outputs Planned	Evidence of Accomplishments
	occur in all seasons equally), and unique regional exposures, with focus on PM.	Health exposure modelling will provide support for the development of airshed air quality management and mitigative measures.	<p>modelling in Seattle</p> <ul style="list-style-type: none"> <li>Conducted studies on the affects of woodsmoke on air quality in CRD and GVRD</li> <li>Carried out land use regression modelling of nitrogen oxides and fine PM in the GVRD</li> <li>Conducted studies to better understand the correlation between co-exposures to noise and air pollution from traffic sources</li> <li>Assessed traffic-related pollution exposure with land-use regression and GIS in Seattle – a study aimed at assessing local pollution levels in order to assess chronic exposure</li> <li>Used property assessment data to develop high resolution spatial estimates of ambient regional and indoor air pollution</li> </ul> <p><i>(Source: Miscellaneous presentations and posters submitted as part of the document review)</i></p> <p><b>Work Outstanding:</b></p> <ul style="list-style-type: none"> <li>Analysis of the data remains to be completed <i>(Source: Interviews with HC and universities)</i>.</li> </ul> <p><b>Next Steps:</b></p> <ul style="list-style-type: none"> <li>Conduct outreach initiatives with targeted audiences that will present findings to communities, physicians, etc.</li> <li>Write and publish peer review papers based on data collection findings</li> <li>Present findings to regional policy makers</li> </ul>
	Initiate health studies to examine the effects of short and longer-term exposure and pollutant interactions. This can include the establishment of a population based study group to estimate the effects of longer-term exposure to air pollutants (including examination of	Address the knowledge gap of the effects of seasonality on health responses of short term exposures to air pollutant through characterizing the health impacts of seasonal variation.	<p><b>Deliverables:</b></p> <ul style="list-style-type: none"> <li>Developed a spatial exposure simulation model</li> <li>Developed an ambient infiltration model</li> <li>Conducted a NO<sub>2</sub> surface evaluation</li> <li>Completed a pregnancy, health and air pollution exposure study</li> <li>Developed a walkability index tool</li> <li>Completed neighbourhood level exposure assessments using GIS/RS</li> <li>Used spatial air pollution monitoring to address long-term affects on mortality, morbidity, and pregnant women</li> <li>Completed a birth cohort pregnancy outcomes analysis</li> <li>Completed a study on acute Otitis media and exposure to air pollution in young children</li> <li>Developed high resolution spatial estimates of ambient regional and indoor air pollution</li> <li>Developed source area models for estimating population exposure to air pollutants at small spatial scales</li> <li>Evaluation of a land use regression model to assess exposure to air pollution during pregnancy</li> <li>Assessed the risk of exposure to traffic-related air pollution in working and non-working</li> </ul>

Evidence of Health Canada Activities and Outputs under the Border Air Quality Strategy			
Element	Activities Planned	Outputs Planned	Evidence of Accomplishments
	susceptible sub-populations, i.e. children and the elderly).		<p>populations</p> <ul style="list-style-type: none"> <li>Completed research to identify PM 2.5 exposure and risk of hospitalization for infant bronchiolitis <i>(Source: : Miscellaneous presentations and posters submitted as part of the document review)</i></li> </ul> <p><b>Work Outstanding:</b></p> <ul style="list-style-type: none"> <li>Completed data collection for health assessments including the development of several rich databases that can provide a source for additional information.</li> <li>Link databases and make them available to the public <i>(Source: Interviews with HC and Universities)</i></li> </ul> <p><b>Next Steps:</b></p> <ul style="list-style-type: none"> <li>Conduct outreach initiatives with targeted audiences that will present findings to communities, physicians, etc.</li> <li>Write and publish peer review papers based on data collection findings</li> </ul>
Great Lakes Basin Airshed Pilot			
Sub-element 3.4: Eastern Health Initiatives	Conduct health characterization and health impact cost/benefit analysis for Great Lakes Basin focussing primarily on transboundary air pollution and PM.	Undertake region specific human health analysis and assessment of transboundary air pollution given the specific nature of the PM problem in south-western Ontario. The evidence from this region will support negotiations with the US on a PM Annex and support requirements under the CWS.	<p><b>Deliverables:</b></p> <ul style="list-style-type: none"> <li>Launched the Great Lakes Basin Airshed Management Framework Pilot Project in June 2003 (Source: Can-US Air Quality Agreement – <a href="http://www.epa.gov.airmarkets/usca/glb.pdf">www.epa.gov.airmarkets/usca/glb.pdf</a>)</li> <li>Created a Steering Committee to provide oversight, leadership and guidance</li> <li>Created four working groups (i.e. Airshed Characterization; Policy Needs; Voluntary Early Action; Communications and Outreach).</li> <li>Performed new research studies to try and better understand potential air pollutant exposures (including PM) and the factors that influence these exposures (initiative with the US EPA)</li> <li>Completed a study that questioned whether people with diabetes are more susceptible to air pollution-related cardiovascular and respiratory morbidity and mortality than the general population. The study was conducted in Windsor, ON.</li> <li>Conducted research to determine the synergistic and differential impacts of extreme temperatures and air pollution on hospital admissions in Ottawa, Toronto, London, Windsor <i>(Source: Interim Project Reports 2004, 2005)</i></li> <li>Conducted a study to examine the effects of indoor and outdoor air pollution on seniors' health in Windsor Ontario.</li> <li>Ling Liu, Terrence Ruddy, Mary Dalipaj, Mieczyslaw Szyszkowicz, Hongyu You, Raymond Poon, Amanda Wheeler, Robert Dales. Influence of personal exposure to</li> </ul>

Evidence of Health Canada Activities and Outputs under the Border Air Quality Strategy			
Element	Activities Planned	Outputs Planned	Evidence of Accomplishments
			<p>particulate air pollution on cardiovascular physiology and biomarkers of inflammation and oxidative stress in subjects with diabetes. <i>J. Occup. Environ. Med.</i> 2007. In press.</p> <p><b>Work Outstanding:</b></p> <ul style="list-style-type: none"> <li>Completed all planned activities</li> <li>Collaborations with the US EPA are in the initial stage</li> <li>Develop major findings from the data collection phase</li> <li>Could not gather enough information on individuals and metal substances because of the lack of available technology</li> </ul> <p><b>Next Steps:</b></p> <ul style="list-style-type: none"> <li>Publish peer review reports that highlight key findings and major achievements</li> <li>Continue to strengthen the relationships with the US EPA</li> </ul>
	Undertake quantitative human exposure studies and population exposure modelling focussing on transportation source and transboundary pollutants, jointly with the US EPA.	Complete a multi-year exposure study, which will enable the collection of a larger more extensive exposure and health impacts database.	<p><b>Deliverables:</b></p> <ul style="list-style-type: none"> <li>Conducted quantitative research on the effects of air pollution and cardio vascular health (<i>Source: HC Interviews</i>)</li> <li>Conducted quantitative research on the effects of air pollution on children (<i>Source: HC Interviews</i>)</li> <li>conducted a study to examine the effects of indoor and outdoor air pollution on seniors' health in Windsor Ontario</li> <li>Completed a study that investigated health effects in the Eastern Canada Regional Airshed. The study focused on cancer incidence and mortality for the years 1986-1999 (<i>Source: Health Canada, 2004 and 2005a</i>)</li> <li>Developed a cohort study to evaluate the relationship between exposure to outdoor air pollution and cancer incidence and causes of death in 10 Ontario urban areas. The study included a cohort of 540,000 randomly sampled individuals who resided in one of ten cities between 1982-86</li> <li>Researched the short-term effects of weather conditions on daily mortality in Montreal (<i>Source: Goldberg, 2005</i>)</li> </ul> <p><b>Outstanding Work:</b></p> <ul style="list-style-type: none"> <li>Completed all planned activities</li> <li>Develop major findings from the data collection phase</li> </ul> <p><b>Next Steps:</b></p>

Evidence of Health Canada Activities and Outputs under the Border Air Quality Strategy			
Element	Activities Planned	Outputs Planned	Evidence of Accomplishments
			<ul style="list-style-type: none"> <li>• Publish peer review reports that highlight key findings and major achievements</li> <li>• Continue to strengthen the relationships with the US EPA</li> </ul>
	Initiate health studies to examine short and long-term PM exposure of susceptible populations, jointly with the US EPA.	Provide evidence on specific health outcomes such as asthma, circulatory effects and cancer in the context of the region specific air pollution mix, to support further development and application of CWS.	<p><b>Deliverables:</b></p> <ul style="list-style-type: none"> <li>• Performed new research studies to try and better understand potential air pollutant exposures (including PM) and the factors that influence these exposures (initiative with the US EPA) (<i>Source: Interviews with HC and EC</i>)</li> <li>• Completed research to better understand the effects of PM on public health</li> <li>• Adopted the US EPA's Detroit Exposure and Aerosol Research Study to carry out similar work in the Windsor area to better understand exposure issues (<i>Source: Interview with US EPA</i>)</li> </ul> <p><b>Outstanding Work:</b></p> <ul style="list-style-type: none"> <li>• Work on PM has only scratched the surface. Need to conduct more research in this area (<i>Source: Interviews with Health Canada</i>)</li> <li>• Continued need to better understand the local Detroit-Windsor airshed (<i>Source: Interview with US EPA</i>)</li> <li>• Carry out analysis on data</li> </ul> <p><b>Next Steps:</b></p> <ul style="list-style-type: none"> <li>• Maintain collaborative working relationship with US EPA</li> <li>• Publish findings in peer reviewed journals</li> </ul>

## Appendix A: Interview Guide

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### Questions for Health Canada BAQS Activity Area Leads (HQ)

#### Introduction

1. What is your role in the program? How long have you been in this position?

#### Part 1. Relevance:

2. What was the rationale for HC's involvement in BAQS? Why were these activities needed?
3. Is there are continued need for these activities? What is the rationale?
4. Does the BAQS continue to be in line with HC's mandate and priorities?
5. How does BAQS relate to the Clean Air Agenda referred to in the 2003 RMAF?

#### Part 2. Success:

6. What has been accomplished under the BAQS activity areas (reference your activity area in Table 1)? What have been the key outputs (provide key documents that support these outputs)? What was not accomplished and why?
7. Who is the audience or intended target for these outputs? Were they effectively reached? If not, why? How should the program be adjusted to improve reach? **Please be as specific as possible.**
8. Was this work completed within the allocated budget? If not, why?
9. What else will be delivered by March 2007?
10. What were the key roles for your activity area (who did what – both in HC and with others)?
11. What was the key governance/administration/coordination mechanism in HC to ensure BAQS was managed and delivered in an effective and coordinated manner? How did HC coordinate with EC on delivering BAQS? How well did this work?
12. The Department's resources were intended to primarily address human health effects of air pollution in two regional pilots. In addition, the health promotion impacts of the air quality index, air quality forecasting and health advisories messages were to be assessed. To what extent were these particular outcomes achieved? In your view, what will be the overall impact of BAQS? Will it meet its original intent and expected results? Please explain.
13. Have or should the expected results/outcomes be amended? If so, how? If not, what remains to be done to achieve the expected results? In your view, what should be the priority for moving forward?

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**Please be as specific as possible (for e.g., if additional financial, human resources or time are needed, please specify, to the extent possible, how much and what results can be achieved).**

14. Are you aware of similar undertakings in other jurisdictions? If so, what were the related activities and results?

### **Part 3. Program Implementation**

15. Were the BAQS activities designed appropriately for effective delivery? Which areas or processes worked best, which need adjustment?
16. What were the major external and internal forces influencing the performance of the BAQS in HC? What changes in program design/delivery should be considered?
17. Given that all funding for BAQS was not received by the program how was prioritization of activities, outputs and outcomes achieved? Was the prioritization appropriate?

### **Part 4. Cost effectiveness:**

18. In your opinion, how cost-effective is the current approach of BAQS compared to other related programs?

### **Part 5. Lessons learned:**

19. What lessons were learned with this pilot that should be considered for future delivery?
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## **Questions for HC Air Quality Forecasting Contacts**

### **Introduction**

1. What is your role in the Air Quality Forecasting component? How long have you been in this position?

### **Part 1. Relevance:**

2. What was the rationale for HC's involvement in the Air Quality Forecasting? Why were these activities needed?
3. Is there are continued need for these activities? What is the rationale?
4. Does the Air Quality Forecasting work continue to be in line with HC's mandate and priorities?
5. How does the work of Air Quality Forecasting relate to the Clean Air Agenda referred to in the 2003 RMAF?

### **Part 2. Success:**



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6. What has been accomplished with the Air Quality Forecasting? (reference sub-element 1.5 in Table 1)? What have been the key outputs (provide key documents that support these outputs)? What was not accomplished and why?
    - a. What was the rationale for not undertaking the indicators work? What impact has this had on the overall expected results for Air Quality Forecasting? What has been the progress on this via other means (e.g., new MC)?
  7. Who is the audience or intended target for these outputs? Have they been effectively reached? If not, why? How should the program be adjusted to improve reach? **Please be as specific as possible.**
  8. Was this work completed within the allocated budget? If not, why?
  9. What else will be delivered by March 2007?
  10. What were the key roles for your activity area (who did what – both in HC and with others)?
  11. How did HC coordinate with EC, NGOs, Provincial and Municipal environment and health departments on delivering Air Quality Forecasting? Is the Management Committee established in 2001 still active? How well did this work?
  12. The Department's resources were intended to assess the health promotion impacts of the air quality index, air quality forecasting and health advisories messages. To what extent were these particular outcomes achieved? In your view, what will be the overall impact of the Air Quality Forecasting work? Will it meet its original intent and expected results? Please explain.
  13. Have or should the expected results/outcomes for Air Quality Forecasting be amended? If so, how? If not, what remains to be done to achieve the expected results? In your view, what should be the priority for moving forward? **Please be as specific as possible (for e.g., if additional financial, human resources or time are needed, please specify, to the extent possible, how much and what results can be achieved).**
  14. Are you aware of similar undertakings in other jurisdictions? If so, what were the related activities and results?

### **Part 3. Program Implementation**

15. Were the Air quality forecasting activities designed appropriately for effective delivery? Which areas or processes worked best, which need adjustment?
16. What were the major external and internal forces influencing the performance of HC in Air Quality Forecasting? What changes in program design/delivery should be considered?

17. Given that all funding for BAQS was not received by the program, how was prioritization of activities, outputs and outcomes achieved? Was the prioritization appropriate?

**Part 4. Cost effectiveness:**

18. In your opinion, how cost-effective is the current approach to Air Quality Forecasting compared to other related programs?

**Part 5. Lessons learned:**

19. What lessons were learned with this initiative that should be considered for future delivery?
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**Questions for External Stakeholders**

**Introduction:**

1. What was your involvement in BAQS?

**Part 1. Relevance:**

2. Why did you choose to be involved in BAQS? What specific need(s) was the work addressing for your organization?
3. How well did the BAQS work meet your expectations and needs? Does your organization have a continued need for this work? Why?

**Part 2. Success:**

4. What have been the main accomplishments due to the BAQS pilot? (reference the areas you are involved with in Table 1)? What have been the key outputs (provide any documents that support these outputs)? What was not accomplished and why?
5. In your view, are there any weaknesses or areas that require immediate attention?
6. Health Canada's resources were intended to primarily address human health effects of air pollution in two regional pilots. In addition, the health promotion impacts of the air quality index, air quality forecasting and health advisories messages were to be assessed. To what extent were these particular outcomes achieved? In your view, what will be the overall impact of BAQS? Will it meet its original intent and expected results? Please explain.
7. Who is the audience or intended target for these outputs? Were they effectively reached? If not, why? How should the program be adjusted to improve reach? **Please be as specific as possible.**

8. Did your organization allocate any resources (people or money) in support of the BAQS pilot? If so, how much and could the results have been attained without your contribution?
9. What remains to be done to achieve the expected results? In your view, what should be the priority for moving forward? **Please be as specific as possible (for e.g., if additional financial, human resources or time are needed, please specify, to the extent possible, how much and what results can be achieved).**
10. What were the major external and internal forces influencing the performance of BAQS?

**Part 3. Program Implementation:**

11. How well did the various partners fulfill their roles on BAQS? Was the work well designed, managed and coordinated? Were the terms and conditions clearly defined?

**Part 4. Cost effectiveness:**

12. In your view, were the BAQS activities designed appropriately for cost-effective delivery? Do you know of comparable programs or means of achieving the same results (if so, please describe)?

**Part 5. Lessons learned:**

13. How could BAQS have been improved? What were the key lessons learned?

**Appendix B: Value for Money Assessment Framework**

Area of Inquiry	Assessment Questions	Information sources
<b>1. <u>Relevance: Are we doing the right thing?</u></b>		
<b>1.1 Relevance:</b> <i>Are we doing the right thing?</i>	<ul style="list-style-type: none"> <li>▪ Does the program address a demonstrable need among Canadians?</li> <li>▪ Is it appropriate role for the federal government?</li> <li>▪ Is it consistent with and relevant to the department's mandate? and</li> <li>▪ Is it responsive to and aligned with the federal government's priorities?</li> </ul>	<ul style="list-style-type: none"> <li>• Foundational documents (MCs, Treasury Board Submission)</li> <li>• Interviews with Sr. Managers, project partners, and intended beneficiaries</li> </ul>
<b>2. <u>Performance: Are we achieving value?</u></b>		
<b>2.1 Economy:</b> <i>Are tax payer resources well utilized?</i>	<ul style="list-style-type: none"> <li>▪ Was the project plan 'doable' from the beginning?</li> <li>▪ Were resource commitments clearly linked to definable outputs with a clear audience and intended use?</li> <li>▪ How were the resource requirements determined in the first place? What expertise was sought in designing the program to achieve maximum value with the resources available? Was the program design informed by any previous experiences or best practices in similar areas?</li> <li>▪ Was the program assigned to staff members and partners with demonstrable willingness and capabilities to execute the project as planned?</li> <li>▪ To what extent were federal resources used as leverage to secure commitment from beneficiaries?</li> <li>▪ Were appropriate management and oversight structures put in place to oversee the expenditure of resources and delivery of results?</li> <li>▪ Were resource expenditures tracked and adjusted as necessary?</li> </ul>	<ul style="list-style-type: none"> <li>• Program design documents, briefing notes etc.</li> <li>• Letters of commitment from partner organizations</li> <li>• References / supporting documents from partner organizations</li> <li>• Leveraged resources</li> <li>• Evidence of an appropriate work plan and budget</li> <li>• Evidence of management structures, including regular reports and minutes of meetings</li> <li>• Financial reports / variance reports.</li> <li>• Interviews with staff, management and partner organizations</li> </ul>
<b>2.2 Efficiency:</b> <i>Are outputs achieved in an affordable manner?</i>	<ul style="list-style-type: none"> <li>▪ Were the planned outputs delivered? Are they complete?</li> <li>▪ Were the outputs produced in accordance with the forecasted budget?</li> <li>▪ Were the proposed project management and oversight structures used? Is there any evidence of ongoing project and expenditure and program management to ensure delivery of outputs and to maximize efficiency and utility?</li> </ul>	<ul style="list-style-type: none"> <li>• Review of outputs</li> <li>• Evaluators judgment</li> <li>• Interviews</li> <li>• Partners judgment</li> <li>• Policy advisors judgment</li> <li>• Annual work plans / budgets / variance reports</li> </ul>
<b>2.3 Effectiveness:</b> <i>Were objectives and results achieved as intended and in manner that minimizes costs?</i>	<ul style="list-style-type: none"> <li>▪ What is the quality of the outputs delivered? Are they capable of standing up to peer review?</li> <li>▪ What was accomplished through the initiative? Did the anticipated demand for the outputs materialize from the intended audience? Have they been / will they be used - how? When?</li> <li>▪ Any evidence of Sr. Management oversight / interest in the project and its outputs?</li> <li>▪ Any best practices to be communicated and integrate into future activities?</li> </ul>	<ul style="list-style-type: none"> <li>• Evaluators judgment</li> <li>• Interviews</li> <li>• Partners judgment</li> <li>• Policy advisors judgment</li> <li>• Sr. Managers judgment</li> <li>• Briefing decks and notes</li> <li>• E-mail communications</li> </ul>

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**Appendix C: List of Documentation Obtained and Consulted**

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**Health Canada BAQS Evaluation  
List of Relevant Documents found on the Internet****Press Releases and Online Notices**

Canada – United States Border Air Quality Strategy (Accessed January 5, 2007):  
[http://www.ec.gc.ca/cleanair-airpur/Pollution\\_Issues/Transboundary\\_Air/Canada\\_-\\_United\\_States\\_Border\\_Air\\_Quality\\_Strategy-WSD6F2B21E-1\\_En.htm](http://www.ec.gc.ca/cleanair-airpur/Pollution_Issues/Transboundary_Air/Canada_-_United_States_Border_Air_Quality_Strategy-WSD6F2B21E-1_En.htm)

Canada-United States Border Air Quality Strategy: Great Lakes Basin Airshed Management Framework (Accessed January 5, 2007): [http://www.hc-sc.gc.ca/ewh-semt/air/out-ext/border\\_air\\_e.html](http://www.hc-sc.gc.ca/ewh-semt/air/out-ext/border_air_e.html)

Canada-United States Border Air Quality Strategy: Georgia Basin Puget Sound International Airshed Strategy (Accessed January 5, 2007): [http://www.hc-sc.gc.ca/ewh-semt/air/out-ext/georgia\\_basin\\_e.html](http://www.hc-sc.gc.ca/ewh-semt/air/out-ext/georgia_basin_e.html)

Canada-United States Border Air Quality Strategy (Accessed January 5, 2007): [http://www.hc-sc.gc.ca/ewh-semt/air/out-ext/border\\_air\\_e.html](http://www.hc-sc.gc.ca/ewh-semt/air/out-ext/border_air_e.html)

Canada and the United States Launch Air Quality Projects Under the Border Air Quality Strategy (Accessed January 5, 2007): [http://www.ec.gc.ca/press/2003/030623\\_n\\_e.htm](http://www.ec.gc.ca/press/2003/030623_n_e.htm)

Canada-United States Border Air Quality Strategy – Border Projects (Accessed January 5, 2007): [http://www.ec.gc.ca/press/2003/030623-2\\_b\\_e.htm](http://www.ec.gc.ca/press/2003/030623-2_b_e.htm)

**General Documents, Reports, and Presentations**

Canada-United States Air Quality Agreement (2005). Maintaining Air Quality in a Transboundary Air Basin: Georgia Basin-Puget Sound. Available at: [http://www.ec.gc.ca/cleanair-airpur/caol/canus/georgiabasin/BAQS\\_report\\_e.pdf](http://www.ec.gc.ca/cleanair-airpur/caol/canus/georgiabasin/BAQS_report_e.pdf)

Canada-United States Air Quality Agreement (2005). Great Lakes Basin Airshed Management Framework Pilot Project. Available at: <http://www.epa.gov/airmarkets/usca/glb.pdf>

**Air Quality Forecasting Documents**

A Health-based National Air Quality Index (Accessed January 29, 2007): [http://www.hc-sc.gc.ca/ewh-semt/air/out-ext/border\\_air\\_e.html](http://www.hc-sc.gc.ca/ewh-semt/air/out-ext/border_air_e.html)

Air Pollution – Information Needs and the Knowledge, Attitudes and Behaviour of Canadians. Environics Research Group. January 2002.

Development of a Health-Based Air Quality Index for Canada. Public Opinion Research 2004-05. Environics Research Group. May 2005.

Introduction to the Air Quality Benefits Assessment Tool. Health Environment and Consumer Safety Branch, Health Canada (Stan Judek and Dave Stieb). October 2006.

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Aim, Goals, Vision and Attributes for a Health Risk Based AQI. Summary from Management Committee. Ottawa, May 2002.

Backgrounder – Air Quality Health Index. Health Canada (Tonya Bruin).

### **Great Lakes Airshed Pilot Documents, Reports, and Presentations**

Goldberg, Mark (2005). The Short-Term Effects of Weather Conditions on Daily Mortality in Montreal. McGill University.

Health Canada (??). Canada-US Border Air Quality Strategy: Population-Based Health Studies of the Eastern Canada Regional Airshed. Part 2: Analysis by Exposure to Total Suspended Particles and Sulphur Dioxide: Mortality 1986-1999, Windsor.

Health Canada (2004). Interim Progress Report on the relationships between weather typing and air pollution concentrations for Toronto, Ottawa, London and Windsor for the period June 1 – October 31, 2004.

Health Canada (2005a). Interim Progress Report on the relationships between weather typing and air pollution concentrations for Toronto, Ottawa, London and Windsor for the period November 1, 2004 – March 15, 2005.

Health Canada (2005b). MOU between Health Canada and the Small Area and Administrative Data Division of Statistics Canada.

Health Canada (2005) Health Canada Components Canada-US Border Air Quality Strategy – Great Lakes Basin Airshed.

Healthy Environments and Consumers Safety Branch (2005). Air Health Effects Division, Health Canada. Available at: <http://www.epa.gov/dears/international/wheeler.pdf>

Health Canada and the University of Ottawa Heart Institute (??). Influence of personal exposure to particulate air pollution on cardiovascular physiology and biomarkers of inflammation and oxidative stress in subjects with diabetes.

Modeling Residential Indoor Ambient PM2.5 (No Author, no date)

### **Georgia Basin Airshed Pilot Documents, Reports and Presentations**

Health Canada (2005c). Final Report for the Border Air Quality Strategy – Western Pilot. Submitted March 30, 2005.

Health Canada (2006a). Workshop Report on the Progress of GB-PS Research Activities Under Canada-US Border Air Quality Strategy. June Submission.

Health Canada (2006b). Workshop Report on the Progress of GB-PS Research Activities Under Canada-US Border Air Quality Strategy. January Submission.

Brauer, Mike & Elizabeth Nethery (no date). Pregnancy, Health and Air Pollution Exposure: Where and How Much?

Health Canada and BC Centre for Disease Control (no date). Air Pollution Impacts on Birth Outcomes in the Greater Vancouver Regional District.

Health Canada and BC Centre for Disease Control (no date). Air Pollution Impacts on Bronchiolitis in the Georgia Air Basin.

Health Canada and BC Centre for Disease Control (no date). Air Pollution Impacts on Birth Outcomes in the Greater Vancouver Regional District.

Henderson, Sarah (2005) Land Use Regression Modeling of Nitrogen Oxides and Fine Particulate Matter in the Greater Vancouver Regional District.

Nethery, Elizabeth (2006) Pregnancy, Health and Air Pollution Exposure Study.

University of British Columbia (2005). Wood Smoke in the GVRD and CRD: Measurements and Models.

University of British Columbia (2006). Border Air Quality Strategy Project #4 Progress Report.

University of British Columbia (no date). School of Occupational & Environmental Hygiene Component Progress Report.

University of British Columbia (no date). A simple source area model for estimating population exposure to air pollutants at small spatial scales.

University of British Columbia (no date). Enhanced Air Pollution Data.

University of British Columbia and University of Victoria (no date). Woodsmoke from residential heating in the CRD.

University of Victoria (no date). Spatial Exposure Simulation Model, Ambient Infiltration Model, and Woodsmoke Model Evaluation.

University of Victoria (no date). Modeling Residential Ambient PM<sub>2.5</sub> Infiltration.

University of Victoria (no date). BAQS Project Overview.

University of Victoria (no date). Using Property Assessment Data to Develop High Resolution Spatial Estimates of Ambient Regional and Indoor Air Pollution.

University of Washington (2006). Air Quality Data for Traffic and Woodsmoke Related Pollution Exposure Modeling: The Seattle Situation.

University of Washington (no date). New Wood Smoke Results in the GVRD.

University of Washington (no date). Impact of Ambient Air Pollution on Infant Bronchiolitis in Puget Sound.

University of Washington (no date). Seattle Exposure Update.

University of Washington (no date). Border Air Quality Study: Puget Sound Component.

University of Washington and University of British Columbia (no date). Impact of Ambient Air Pollution on Infant Bronchiolitis in Puget Sound and the Georgia Air Basin.

University of Washington and University of British Columbia (2005). Acute Otitis Media and Exposure to Air Pollution in Young Children.

University of Washington and University of British Columbia (2005). Wood Smoke in the GVRD and CRD: Measurements and Models.

Universities of British Columbia, Victoria and Washington (2006). Investigation of Air Pollution and Otitis Media in a Population-Based Birth Cohort.

Universities of British Columbia, Victoria and Washington (2006). Simulating Risk of Exposure to Traffic-Related Air Pollution in Working and Non-Working Populations.

Universities of British Columbia, Victoria and Washington (2006). Predicting Ambient PM<sub>2.5</sub> Infiltration for Individual Residences at a Regional Scale.

Universities of British Columbia, Victoria and Washington (2006). Accounting for Intra-urban Variability in Outdoor Air Concentrations: Estimating Exposures Using Monitoring Station Data and Land-Use Regression Models.

Universities of British Columbia, Victoria and Washington (2006). PM<sub>2.5</sub> Exposure and risk of hospitalization for infant bronchitis.

Universities of British Columbia, Victoria and Washington (2006). A Spatial Model of Urban Winter Woodsmoke Concentrations.

Universities of British Columbia, Victoria and Washington (2006). Mobile Monitoring of Particulate Black Carbon Concentrations in an Urban Area: A Fast and Easy Basis for Land-use Regression.

Universities of British Columbia, Victoria and Washington (2006). A GIS Spatio-temporal Model of Ambient Air Pollution Exposure.

Universities of British Columbia, Victoria and Washington (2006). Evaluation of a Land Use Regression Model to Assess Exposure to Air Pollution During Pregnancy: Use of GPS Tracking and Personal Monitoring.

Universities of British Columbia, Victoria and Washington (2006). Correlation between co-exposures to noise and air pollution from traffic sources.

Universities of British Columbia, Victoria and Washington (no date). A Cohort Study of Air Pollution Impacts on Birth Outcomes.

Universities of British Columbia, Victoria and Washington (no date). Spatial Modeling of exposure to traffic-related air pollution and application to birth cohorts in the Georgia Basin – Puget Sound International Airshed.

University of Washington and University of British Columbia (no date). Assessing Traffic-Related Pollution Exposure with Land-Use Regression and GIS: A Seattle Case Study.



