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Great Lakes Water Quality Board

November 29, 2001

Mr. Tom Baldini, Chair, U.S. Section, International Joint Commission
Ms. Mary Gusella, Chair, Canadian Section, International Joint Commission

Tom and Mary:

On behalf of the Great Lakes Water Quality Board, we are pleased to provide the attached review of the Canada-United States Great Lakes Binational Toxics Strategy. We believe that its advice and recommendations will contribute to achievement of the goals of the Great Lakes Water Quality Agreement.

We wish to highlight the close interaction that took place throughout the review between the Board's Progress Review Work Group and those charged with implementation of the Strategy. Because of their ongoing dialogue, the Parties were in a position to give timely consideration to the Work Group's advice. The Parties' commentary (Appendix B) on the report's recommendations clearly reflects their responsiveness to, and early adoption of advice arising from the review.

Thank you for the opportunity to assist and advise the Commission.

John Mills	David Ullrich
Canadian Co-Chair	U.S. Co-Chair

Windsor * Ottawa * Washington

Great Lakes Regional Office
100 Ouellette Avenue
8th Floor
Windsor, Ontario N9A 6T3

Bureau regional des Grands Lacs
100, avenue Ouellette
8ieme etage
Windsor (Ontario) N9A 6T3

Great Lakes Regional Office
P.O. Box 32869
Detroit, Michigan 48232

(519) 257 - 6700, or/ou (313) 226 - 2170. Fax/Telecopieur (519) 257 - 6740 **www.ijc.org**

REVIEW

**OF PROGRESS UNDER THE
CANADA-UNITED STATES
GREAT LAKES
BINATIONAL TOXICS STRATEGY**

**A Report to the
Great Lakes Water Quality Board
by the Progress Review Work Group**

November 13, 2001

International Joint Commission
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*The views and opinions expressed in
this report are not necessarily those
of the International Joint Commission*

TABLE OF CONTENTS

LIST OF TABLES

INTRODUCTION AND BACKGROUND

The 1978 Great Lakes Water Quality Agreement committed Canada and the United States to virtually eliminate inputs of persistent toxic substances to the Great Lakes system in order to protect human health and to ensure the continued health and productivity of living aquatic resources and their human use. On April 7, 1997, Environment Canada and the United States Environmental Protection Agency (EPA) signed the Great Lakes Binational Toxics Strategy. The purpose of the Strategy

"is to set forth a collaborative process by which Environment Canada and the U.S. Environmental Protection Agency, in consultation with other federal Departments and agencies, Great Lakes states, the Province of Ontario, Tribes, and First Nations, will work in cooperation with their public and private partners toward the goal of virtual elimination of persistent toxic substances resulting from human activity, particularly those which bioaccumulate, from the Great Lakes Basin, so as to protect and ensure the health and integrity of the Great Lakes ecosystem. ... An underlying tenet of this Strategy is that governments cannot by their actions alone achieve the goal of virtual

elimination. This Strategy challenges all sectors of society to participate and cooperate to ensure success."

The Strategy provides a framework to achieve specific actions - presented as 13 challenges - between 1997 and 2006 for 12 Level I and 14 Level II substances or families of substances. The Level I contaminants are presented in Table 1 and the 13 challenges in Table 2. The Strategy is available on the web at http://www.epa.gov/glnpo/bns/index.html . The web site also contains information which describes the Strategy's organization as well as numerous reports prepared by the Strategy's Integration Group and its seven substance-specific work groups, to which the reader is referred for details.

TABLE 1. LEVEL I CONTAMINANTS

Aldrin/dieldrin
Benzo(a)pyrene [B(a)P]
Chlordane
DDT (+ DDD + DDE)
Hexachlorobenzene [HCB]
Alkyl-lead
Mercury and mercury compounds
Mirex
Octachlorostyrene
Polychlorinated Biphenyls [PCBs]
PCDD [Dioxins] and PCDF [Furans]
Toxaphene

In late 1999, the International Joint Commission asked its Great Lakes Water Quality Board to assess progress made under the Strategy and the contribution of the Strategy toward achievement of the Agreement's virtual elimination goal. To carry out this charge, the Board convened a Progress Review Work Group. The Work Group contracted with Thompson Gow & Associates (TGA) with a mandate to review:

TABLE 2. BINATIONAL TOXICS STRATEGY CHALLENGES

UNITED STATES	CANADA
Pesticides and Octachlorostyrene	
Confirm by 1998 that there is no longer use or release from sources that enter the Great Lakes Basin of five bioaccumulative pesticides (chlordane, aldrin/dieldrin, DDT, mirex, and	Report by 1997, that there is no longer use, generation or release from Ontario sources that enter the Great Lakes of five bioaccumulative pesticides (chlordane,

toxaphene), and of the industrial byproduct/contaminant octachlorostyrene. If ongoing, long-range sources of these substances from outside of the U.S. are confirmed, work within international frameworks to reduce or phase out releases of these substances.	aldrin/dieldrin, DDT, mirex, and toxaphene), and of the industrial byproduct/contaminant octachlorostyrene. If ongoing, long-range sources of these substances from outside of Canada are confirmed, work within international frameworks to reduce or phase out releases of these substances.
Alkyl-Lead	
Confirm by 1998, that there is no longer use of alkyl-lead in automotive gasoline. Support and encourage stakeholder efforts to reduce alkyl-lead releases from other sources.	Seek by 2000, a 90 percent reduction in use, generation, or release of alkyl-lead consistent with the 1994 COA [Canada Ontario Agreement].
Polychlorinated Biphenyls (PCBs)	
Seek by 2006, a 90 percent reduction nationally of high-level PCBs (>500 ppm) used in electrical equipment. Ensure that all PCBs retired from use are properly managed and disposed of to prevent accidental releases within or to the Great Lakes Basin.	Seek by 2000, a 90 percent reduction of high-level PCBs (>1 percent PCBs) that were once, or are currently, in service and accelerate destruction of stored high-level PCB wastes which have the potential to enter the Great Lakes Basin, consistent with the 1994 COA.
Mercury	
Seek by 2006, a 50 percent reduction nationally in the deliberate use of mercury and a 50 percent reduction in the release of mercury from sources resulting from human activity. The release challenge will apply to the aggregate of releases to the air nationwide and of releases to the water within the Great Lakes Basin. This challenge is considered an interim reduction target and, in consultation with stakeholders, will be revised, if warranted, following completion of the Mercury Study Report to Congress.	Seek by 2000, a 90 percent reduction in the release of mercury, or where warranted the use of mercury, from polluting sources resulting from human activity in the Great Lakes Basin. This target is considered as an interim reduction target and, in consultation with stakeholders in the Great Lakes Basin, will be revised if warranted, following completion of the 1997 COA review of mercury use, generation, and release from Ontario sources.
Dioxins, Furans, Hexachlorobenzene (HCB), and Benzo(a)pyrene (B(a)P)	
Seek by 2006, a 75 percent reduction in total releases of dioxins and furans (2,3,7,8-TCDD toxicity equivalents) from sources resulting from human activity. This challenge will apply to the aggregate of releases to the air nationwide and of releases to the water within the Great Lakes Basin. Seek by 2006, reductions in releases, that are within, or have the potential to enter the Great Lakes Basin, of HCB and B(a)P from sources resulting from human activity.	Seek by 2000, a 90 percent reduction in releases of dioxins, furans, HCB, and B(a)P, from sources resulting from human activity in the Great Lakes Basin, consistent with the 1994 COA. Actions will focus on the 2,3,7,8 substitute congeners of dioxins and furans in a manner consistent with the TSMP [Toxic Substances Management Plan].
Level II Substances Promote pollution prevention and the sound management of Level II substances, to reduce levels in the environment of those substances nominated jointly by both countries, and to conform with the laws and policies of each country, including pollution prevention, with respect to those substances nominated by only one country. Increase knowledge on sources and environmental levels of these substances.	
Atmospheric Inputs	

Assess atmospheric inputs of Strategy substances to the Great Lakes. The aim of this effort is to evaluate and report jointly on the contribution and significance of long-range transport of Strategy substances from world-wide sources. If ongoing long-range sources are confirmed, work within international frameworks to reduce releases of such substances.
Contaminated Sediment Complete or be well advanced in remediation of priority sites with contaminated bottom sediments in the Great Lakes Basin by 2006.

- The Strategy's purpose - "to set forth a collaborative process."
- The Strategy's four steps (Table 3):
    - Information gathering.
    - Analysis of regulations, initiatives, and programs which manage or control substances.
    - Identification of cost-effective options to achieve further reductions.
    - Implementation of actions to work toward the goal of virtual elimination.

- The Strategy's 13 challenges.

TGA undertook both a quantitative and a qualitative review. Their quantitative assessment is based exclusively on the contents of the Strategy's various written reports. The purpose of the quantitative assessment was to determine the adequacy of the information base and ascertain measures undertaken to fill information gaps. Specifically, this portion of the review focused on the availability of information to characterize and quantify contaminant sources, uses, and loadings and whether the information was sufficient to establish a baseline as a point of departure for the Strategy's substance-specific challenges, establish reduction targets, and measure progress toward those targets.

The qualitative assessment consisted of in-depth interviews with 25 individuals involved with Strategy activities. The purpose of the interviews was to glean people's perceptions about the Strategy and its success.

TGA's detailed findings and assessment are presented in Appendix C. The Work Group believes that their advice and 45 recommendations will contribute to the increased effectiveness of the Strategy.

In this report to the Board, we present:

- A summary assessment of the Strategy and its contribution toward achievement of virtual elimination of persistent toxic substances.
- Issues, areas, or directions that the Parties to the Strategy, and their partners, could take to achieve additional progress toward virtual elimination.
- Ten specific recommendations.

The Work Group's intent is to provide constructive and insightful advice. It is also important to recognize that the work of the Strategy is ongoing, with a ten-year (1997-2006) mandate, and that this review is a snapshot in time.

PARTIES' REVIEW OF REPORT

The Work Group presented its report to the Board on August 22, 2001. The Board, in turn, requested that the Parties review the report prior to its submission to the Commission. That request and the Parties' response are presented in Appendix B.

TABLE 3. FOUR-STEP ANALYTICAL FRAMEWORK

1. Information gathering.

Identify to the extent feasible, the full range of sources, both point and non-point, within and outside the Basin which release the selected substances, by economic sector, and examine which sector(s) may be contributing to the presence of the substance in the Basin. Within each source, identify why and how the substance is used or released, e.g., used as a product or released as a byproduct. This step may include examining the entire life cycle of the substance, from initial decision to use through eventual disposal. Also, specific characteristics of a substance such as whether it is naturally occurring, or whether its release results from human use, will be considered. Information gaps and uncertainties as to sources, multi-media loadings and associated impacts of specific substances will be identified and actions recommended to address them.

2. Analyze current regulations, initiatives and programs which manage or control substances.

Assess how existing laws, regulations and programs influence the presence of these substances in the Basin, and their long-range transport across states, provinces, regions and international borders. Identify the gaps in these regulations, programs and initiatives that offer opportunity for the most effective and appropriate reductions of these substances.

3. Identify cost-effective options to achieve further reductions.

Identify options that may offer opportunities for new or modified measures, including emission trading schemes, pollution prevention, or other alternative approaches, which may speed up the pace or increase the level of reductions, taking into account cost effectiveness.

4. Implement actions to work toward the goal of virtual elimination.

Using cost-effective measures, recommend and implement actions that work toward the goal of virtual elimination, consistent with the approach outlined in this Strategy.

WHAT IS THE STRATEGY?

TGA's assessment revealed that people hold different perceptions of the Strategy and that those perceptions temper their opinion of its relative success. Some hold that the Strategy is a process, others that it is action oriented. The Strategy's four steps, given in Table 3, reveal that the Strategy is both. Initially, much of the emphasis was on process (Steps 1 - 3) but, during the past year, emphasis has shifted more toward action (Step 4).

The Strategy's title may be confusing. The Strategy is not a comprehensive initiative to deal with all aspects of the persistent toxic substance issue but is one among many. [(1)] Given the range of perceptions, the Strategy's contribution to resolution of the persistent toxic substance issue may require clarification.

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1. Among the array of programs and initiatives that address persistent toxic substances are:

- The Agreement's Remedial Action Plans and Lakewide Management Plans.
- The U.S. PBT (Persistent Bioaccumulative Toxics) initiative, NPDES (National Pollutant Discharge Elimination System), Superfund, Project XL, TRI (Toxics Release Inventory), and the MACT (maximum achievable control technology) program.
- Canada's NPRI (National Pollutant Release Inventory) and ARET (Accelerated Reduction/Elimination of Toxics).
- Ontario's MISA (Municipal Industrial Strategy for Abatement) program.
- The Centre for Environmental Cooperation's NARAP (North American Regional Action Plan).
- The United Nations Environment Program's POPs (Persistent Organic Pollutants) Protocol.

STRATEGY ASSESSMENT

Has the Strategy Achieved its Purpose?

The injury caused by persistent toxic contaminants has long been recognized, but efforts to achieve their virtual elimination, over more than a quarter century, have proved to be a seemingly intractable challenge. The Strategy was intended to help surmount this barrier. TGA's assessment concludes that the Strategy has achieved its purpose, presented above, "to set forth a collaborative process," engaging stakeholders and partners to address the 13 challenges. In so doing, the Strategy has helped maintain an essential focus on Level I substances.

Has the Strategy Fulfilled its Four Steps?

Step 1. Information Gathering

Step 1 commits U.S. EPA and Environment Canada, in cooperation with their partners, to gather information. The Strategy's work groups have gathered extensive information on uses, loadings, sources, and pathways of Level I contaminants. This information is helping in the development of initiatives, both through the Strategy and other mechanisms, to manage releases from selected sources. The Strategy's work illustrates the formidable task of assessing information so that appropriate response can be developed.

Some information gaps were identified or reconfirmed. TGA's assessment was, however, not designed to provide a comprehensive assessment of those gaps.

TGA found that some source categories are not under active consideration within the Strategy. This may be due to the fact that information is not yet available regarding the presence or absence of Level I contaminants in those sources and, if present, quantification of their release. Thus, there may be major contaminant sources or source categories that are not being addressed. Other sources are believed to be insignificant, and filling those data gaps may have been deemed a low priority.

Work is under way to fill some information gaps, especially to confirm whether certain sources or source categories contribute Level I contaminants and, if so, how much. This information is necessary in order to identify and implement measures to achieve further reductions. As additional information is acquired about sources, uses, and releases of Level I contaminants, some redirection or refocusing within the Strategy may be necessary.

Step 2. Analysis of Regulations, Initiatives, and Programs

Step 2 commits to the analysis of current regulations, initiatives, and programs which manage or control substances. TGA's assessment confirmed that regulations, initiatives, and programs were identified and analyzed. However, the scope of TGA's review was not intended to evaluate the Strategy's analysis or the success of individual options but, rather, only to determine whether analyses were done.

Step 3. Options for Further Reductions

Step 3 commits to the identification of cost-effective options to achieve further reductions. TGA's review confirmed that the Strategy work groups have completed or partially completed identification of cost-effective options. The review was designed to determine whether options were identified, not whether these were necessarily the right options. Notably, although considerable Canadian information has been developed for HCB, B(a)P, PCBs, and mercury, the information was not included in Strategy reports.

Step 4. Implementation of Actions

Step 4 commits to implementation of actions to work toward the goal of virtual elimination. TGA's analysis revealed that a wide range of actions have been undertaken to further reduce the use and/or release of Level I contaminants, and presumably detailed plans will be developed to implement additional actions.

There is clearly a need for more emphasis on Step 4 and, given the array of programs and initiatives in both countries, [1] to clarify the specific contributions that the Strategy can make. Recognizing the varied mandates among these programs and the need for coordination, an accountability framework may be useful to improve delivery of tangible reductions in the use and/or release of contaminants and achieve improvements in environmental quality. Such a framework should define roles and responsibilities of stakeholders, provide

performance or reporting benchmarks, as well as feedback and assessment mechanisms.

Have the Strategy's Specific Challenges Been Met?

TGA has provided detailed assessment, advice, and recommendations for the Strategy's 13 challenges. Rather than discussing the details here, we urge U.S. EPA, Environment Canada, and their partners to evaluate the insight presented in Appendix C. We discuss here a number of broader considerations.

Time Frame

The base year for the challenges go as far back as 1988. For some contaminants, notably alkyl lead and pesticides, the challenges were met, in whole or in part, based on actions taken and largely or fully completed prior to the Strategy's signing in 1997. This raises the question of what contribution the Strategy made and the rationale for including such challenges in the first place.

Baselines and Targets

Some of the Strategy's 13 challenges, in whole or in part, lack quantitative baselines and/or targets, e.g. for dioxins / furans and octachlorostyrene in the U.S. and PCBs in Canada; consequently, it is difficult or impossible to gauge progress. In addition, some of the Strategy's progress reports present percentage reductions, but without supporting quantitative baseline or current-year information, e.g. B(a)P.

Scope

The wording of some of the Strategy's challenges lacks specificity, e.g. "assess atmospheric inputs of Strategy substances to the Great Lakes." Although such wording ensures that activity can be demonstrated, the lack of specific targets prevents quantification of progress toward virtual elimination.

A number of the substance-specific challenges address only selected portions of the issue related to that Level I substance, e.g. the PCB challenges consider only selected contaminant concentrations and uses. It is unclear whether there are gaps in the overall array of programs necessary to achieve virtual elimination, in particular, programs related to contaminated sediment, atmospheric inputs, and groundwater.

Contaminated Sediment

According to the Commission's 10 th Biennial Report, released in July 2000, "The persistent toxic substances found in contaminated sediment are the dominant issue in the Areas of Concern." Although the magnitude of the issue has been well recognized for many years, the Commission reported that only a very small percentage of known contaminated sediment by volume has been remediated in both countries.

The Strategy's Integration Group undertook the sediment challenge, which reads, "Complete or be well advanced in remediation of priority sites with contaminated bottom sediments in the Great Lakes Basin by 2006." In the Strategy's progress report for 2000, a reporting format was presented "to track sediment remediation activities occurring in the Great Lakes Basin." The progress report also summarized sediment issues in Canadian AOCs.

Other than tracking and reporting, the Strategy's contribution to date to help resolve the contaminated sediment issue is not evident. None of the step reports mention remediation of contaminated sediment in AOCs. Some interviewees expressed the opinion that active involvement is an inappropriate Strategy role, while others felt otherwise. There is a need to clarify the Strategy's role. If there is an active contribution to be made, the challenge should be quantified and made explicit. If there is no role for the Strategy other than tracking and reporting, then the Parties and jurisdictions need to actively remediate contaminated sediment through other available mechanisms.

Atmospheric Inputs

The Commission's International Air Quality Advisory Board has firmly established the significance of atmospheric transport and deposition of contaminants into the Great Lakes basin, and the Board has contributed to the identification and quantification of emission sources to the atmosphere. The atmospheric challenge, while not quantitative, has contributed to maintaining a focus on the atmospheric pathway and an impetus to identify, quantify, and control emission sources through other mechanisms available to the Parties and jurisdictions.

The Integration Group, which undertook the atmospheric challenge, has considered some links between the Strategy and other specific air deposition efforts. Nonetheless, the Parties and jurisdictions should investigate whether the Strategy can make a more direct contribution with consideration to such activities as emission source reduction and elimination, for example, from fossil fuel combustion; stack and fugitive emissions testing; and modeling of contaminant transport, dispersal, and deposition.

Has the Strategy Contributed to Achievement of Virtual Elimination?

TGA's interviews yielded a range of opinions. Some felt that the Strategy has contributed to achieving the virtual elimination goal by spurring existing programs and spawning new initiatives, as well as stimulating work to fill information gaps. Examples of specific contributions are given in Appendix C.

Others were less certain of the Strategy's impact. The Strategy is but one initiative in a panoply of interconnecte$ initiatives and programs, [1] many of which were well under way when the Strategy was signed in 1997. The Strategy may have had a direct or indirect influence on these, but a cause-effect relationship cannot necessarily be established.

Strengths and Weaknesses

The Strategy's strengths and benefits, described in some detail in Appendix C, should be encouraged, promoted, and expanded. To highlight, the Strategy:

- Contributes to the assembly and expanded use of extant information, as well as the development of additional information, for example, stack emissions testing and modeling.
- Helps develop networks to engage industry, trade and professional associations, and others, enabling voluntary action to achieve reductions beyond regulatory requirements.
- Provides coordination and collaboration for the sharing of information and experiences and the transfer of programs from one jurisdiction or locale to another, for example, mercury use elimination initiatives.
- Contributes to keeping the persistent toxic substances issue on the radar screen, to stimulate and "validate" initiatives, particularly by the states and province.
- Promotes linkages, and thus support, for the conduct of other enabling mechanisms at the regional, national, and international scales.
- Contributes to reduction of areal sources, such as burning, an area that many be unfamiliar to some and which leads to consideration of behavior of individuals.

Among the Strategy's weaknesses are:

- Organization. There appears to be a problem with coordination and oversight of Strategy activities and a question about ultimate responsibility. The Strategy's Integration Group and the substance-specific work groups appear to be too diffusely focused. Their roles and responsibilities, including the Integration Group's support to the substance-specific work groups, should be defined and confirmed.
- The work appears to be bilateral rather than binational, i.e. Canada and the United States conduct separate rather than joint programs and reporting.
- Information management. The Strategy's web site is seriously outdated, with the notable absence of Canadian information sources.
- Reporting. The Strategy's challenge and step reports do not necessarily indicate which information inventories are being used, and some are not linked to the Strategy's web site or are not publicly available. In addition, it is unclear how top sources for certain Level I substances were identified. The Strategy's progress reports in some cases lack quantitative baseline and current-year information, present incomplete information, or lack Canadian information. With progress not clearly expressed or substantiated, one can question, rightly or wrongly, whether there indeed has been progress.
- Profile. The Strategy could be used to greater advantage if its profile were raised and its opportunities actively promoted.

The voluntary nature of the Strategy is perceived as both an asset and a liability. On the one hand, it facilitates stakeholder opportunities and participation in activities beyond regulatory requirements. On the other hand, some people believe that, given limited resource availability, regulatory

programs and requirements should take precedence over voluntary initiatives such as the Strategy. Further, the Strategy is but one of many initiatives competing for time and resources.

FUTURE DIRECTIONS AND RECOMMENDATIONS

The Work Group has considered the direction(s) that the Strategy could follow for the remainder of its mandate. Its work to date is to be commended and activities presently under way - including the assembly of quantitative source, use, and release information and the implementation of Step 4 actions - are beneficial and should continue. We offer the following suggestions to extend and expand the use of the Strategy and its contribution to virtual elimination.

TGA's Findings, Advice, and Recommendations

TGA's detailed assessment of the Strategy is presented in Appendix C, along with 45 detailed recommendations. The Work Group commends their assessment to the Strategy's Integration Group and substance-specific work groups. TGA's advice and recommendations will contribute to the increased effectiveness of the Strategy for the remainder of its mandate. The Work Group recommends that:

1. The Strategy's Integration Group and substance-specific work groups review and consider the advice and recommendations presented in the Thompson Gow & Associates Report.

Focus

The Work Group recognizes that application of a range of tools and techniques is necessary to achieve virtual elimination. However, to ensure that Level I substances are not produced or used in the first place, the Work Group recommends that:

2. The Strategy's priority firmly remain on pollution prevention.

The need is to develop and apply tools, incentives, and partnerships that will get those who produce and/or use persistent toxic substances to take ownership of the problem and be motivated to actively contribute to its solution. Dedication of sufficient human and financial resources to develop and apply pollution prevention solutions is essential. Among the solutions is active promotion and application of "clean" technology over end-of-pipe controls. With active commitment by all stakeholders, the Strategy's Step 4 actions can be more fully realized.

Publicity

The Work Group recommends that:

3. The Strategy actively publicize the persistent toxic substance issue.

Convincing the Great Lakes community that the benefits of virtual elimination outweigh the costs is perhaps "the" challenge. Publicity should emphasize the impact on human and ecosystem health, including the economic, social, and other costs associated with not taking timely action. By also publicizing the advantages and benefits of virtual elimination and the opportunities available, the Strategy can garner support and prompt behavior change among both the general public and all sectors of the Great Lakes community. Implicit in its publicity, the Strategy should improve the quality of its step and progress reports and the currency of information posted on its web site.

Partnerships

Building upon the Strategy's voluntary approach - a complement to the regulatory approach of the Parties and jurisdictions - the Work Group recommends that:

4. The Strategy actively promote broader awareness, engagement, and participation of the Great Lakes community.

Community partners include:

- The public - their role in the production, use, and/or release of persistent toxic substances and their active support to drive reduction initiatives by governments, industry, and others.
- Environmental non-government organizations - to take advantage of their grass-roots linkages and opportunities to undertake pilot and demonstration projects.
- Tribes and First Nations - to implement programs within territory under their jurisdiction.
- State, provincial, and local governments - to tap their expertise and networks, in order to create further awareness and support, leading to development and implementation of additional programs.
- Federal governments - to ensure high-level political and policy support, leading to provision of sufficient human and financial resources to undertake Strategy work, especially Step 4 actions, including scale-up of pilot work, jurisdictional program and technology transfer, and program expansion to other jurisdictions.
- Industry and trade associations - to reach a broader spectrum of companies and business sectors. Larger companies and trade associations can provide leadership and outreach to small- and medium-sized enterprises, through such means as active promotion of a life-cycle approach, supply chain initiatives, extended producer responsibility, end-of-use product takeback and, most importantly, the development and implementation of alternative processes that avoid the generation, use, and release of Level I substances.

In its approach to the Great Lakes community, the Strategy should promote options to strengthen integration and to expand coordination, cooperation, and partnerships including, but not limited to additional voluntary measures, education, training, economic incentives, and financial inducements.

Sector-Based Initiatives

The Work Group recommends that:

5. The Strategy develop sector-based initiatives that deal with more than one contaminant at a time.

The Strategy should promote the potential savings and efficiencies of such an approach, for both remediation and pollution prevention.

Stockpiled and Stored Contaminants

The Air Board has reported that PCBs volatilize from landfills and storage yards, and recent studies confirm that mercury can methylate in, and volatilize from landfills. The Work Group recommends that:

6. The Strategy actively address the destruction of stockpiled and stored persistent toxic substances.

For contaminants such as mercury, which cannot be destroyed, stocks should be immobilized in a chemically inert form and stored so as to prevent any release to the environment.

Relationships with Other Programs

The Strategy is one of many programs and initiatives designed to address components of the persistent toxic substance issue. [1] Clear coordination and effective linkages are essential. The Strategy's relationship with RAPs and LaMPs is particularly unclear. Is the Strategy relying on these Annex 2 requirements as mechanisms to deliver on selected challenges, especially in regard to contaminated sediment and atmospheric transport, or are the RAPs and LaMPs awaiting active leadership from the Strategy? The Work Group recommends that:

7. The Strategy clarify its relationship to RAPs and LaMPs.

8. The Strategy clarify its linkages to, and coordination with other contaminant reduction and elimination initiatives.

9. The Strategy clarify its role in the remediation and clean-up of contaminated sediment, land, and soil.

Groundwater

Some of the Strategy's work groups have considered contaminant loss from landfills and underground storage tanks. However, the Strategy has no stated role in regard to remediation and protection of groundwater. This issue cannot be avoided. Groundwater poses a significant challenge to the restoration and protection of the Great Lakes. There may be gaps in the programs of the Parties and jurisdictions to contain the movement of, and remediate contaminated groundwater, and to prevent further contamination from such

sources as landfills, underground storage tanks, and land-use practices, such as pesticide application. The Work Group recommends that:

10. The Parties explore potential Strategy contributions to groundwater restoration and protection.

APPENDIX A. MEMBERS - PROGRESS REVIEW WORK GROUP

Ms. Adriane Blaesing (nee Esparza)
Director
Northwest Regional Office
Indiana Department of Environmental Management
504 North Broadway -- Suite 418
Gary, Indiana 46403

Mr. George Elmaraghy
Assistant Chief
Division of Surface Water
Ohio Environmental Protection Agency
P.O. Box 1049
Columbus, Ohio 43216-1049

Mr. Harold T. Garabedian
Deputy Director
Vermont Agency of Natural Resource
103 South Main Street
Waterbury, Vermont 05671-0402

Dr. Isobel W. Heathcote
Dean, Graduate Studies
Faculty of Graduate Studies
Professor, School of Engineering
Faculty of Environmental Sciences
University of Guelph
Guelph, Ontario N1G 2W1

Mr. John Jackson
17 Major Street
Kitchener, Ontario N2H 4R1

Ms. Sally Lerner
Associate Professor
Environment and Resource Studies
University of Waterloo
Waterloo, Ontario N2L 3G1

Mr. J. Craig Mather
Chief Administrative Officer
Metro Toronto & Region Conservation Authority
5 Shoreham Drive
Downsview, Ontario M3N 1S4

Mr. John Mills (Chair)
Regional Director General
Environment Canada, Ontario Region

4905 Dufferin Street
Downbsview, Ontario M3H 5T4

Mr. Dale K. Phenicie
Environmental Affairs Consulting
402 Lighthouse Lane
Peachtree City, Georgia 30269

Mr. Jay P. Unwin
National Council of the Paper Industry for Air and
Stream Improvement, Inc.
Central-Lake States Regional Center
Western Michigan University
2041 McCracken Hall
Kalamazoo, Michigan 49008-3844

Former Members

Wayne Draper
Environment Canada

Vic Shantora (Chair)
Environment Canada

E. Tony Wagner

Secretary

Marty Bratzel.
Great Lakes Regional Office
International Joint Commission
100 Ouellette Avenue -- 8 th Floor
Windsor, Ontario N9A 6T3

APPENDIX B. PARTIES' REVIEW OF WORK GROUP REPORT

Request to the Parties - October 23, 2001

and

Reply from the Parties - November 8, 2001

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Great Lakes Water Quality Board

Memorandum

October 23, 2001

To:
Gary Gulezian, Director, Great Lakes National Program Office, U.S. EPA
Danny Epstein, Regional Director, Environmental Protection Branch, Environment Canada

From:
Marty P. Bratzel, Secretary, Great Lakes Water Quality Board

Subject: Review of Report on the Great Lakes Binational Toxic Strategy

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This request is sent on behalf of David Ullrich and John Mills, co-chairs of the Commission's Great Lakes Water Quality Board.

On August 22, the Board received, from its Progress Review Work Group, a report that assessed progress under the Great Lakes Binational Toxic Strategy. That report, accompanied by a report prepared by the consultant, Thomson Gow & Associates, has already been provided to you.

The Board considered the Work Group's report at its most recent meeting on October 17. The Board finds that the report contains useful information. However, since the Work Group's assessment draws, in part, upon people's perceptions about the Strategy, the Board believes that the report would benefit from your review, as the Parties' representatives responsible for implementation of the strategy.

The Board would appreciate your clarification and verification of the material of the report, so that the Work Group's advice and recommendations will be more beneficial and useful to all concerned. Any additional information would also be appreciated. Please direct your response, in electronic format, to me at bratzelm@windsor.ijc.org (.)

Our request for your assistance pertains only to the Work Group's report, not the report prepared by TGA.

The Board intends to provide its advice about the Strategy for the Commission to consider at its next meeting on December 4-6, 2001. In order to allow sufficient time for the Work Group to consider your response and, in turn, advise the Board, we would appreciate receiving your reply no later than Friday, November 2, 2001.

If you have any questions, please contact me at 519.257.6701. Thank you.

cc: John Mills, David Ullrich

Great Lakes Regional Office
100 Ouellette Avenue
8th Floor
Windsor, Ontario N9A 6T3

Bureau regional des Grands Lacs
100, avenue Ouellette
8ieme etage
Windsor (Ontario) N9A 6T3

Great Lakes Regional Office
P.O. Box 32869
Detroit, Michigan 48232

(519) 257 - 6700, or/ou (313) 226 - 2170. Fax/Telecopieur (519) 257 - 6740 **www.ijc.org**

Great Lakes Binational Toxics Strategy

Environment Canada
Environmental Protection Branch
4905 Dufferin Street
Downsview, ON M3H 5T4
Canada

U.S. Environmental Protection Agency
Great Lakes National Program Office
77 West Jackson Boulevard, G-17J
Chicago, Illinois 60604
USA

November 8, 2001

Mr. David Ullrich , U.S. Co-Chair, Water Quality Board

Mr. John Mills, Canadian Co-Chair, Water Quality Board

Gentlemen:

Thank you for the opportunity to review the Water Quality Board (WQB) Workgroup's draft review of the Great Lakes Binational Toxics Strategy (GLBTS) Report. As co-chairs of this important work, we welcome the opportunity to provide you with clarification and verification of the material contained within this report.

We would like to commend the workgroup members for the effort they have put into the review. From our perspective, the work within the GLBTS is at a critical point. We have completed most of Stage 1 through 3 and are developing implementation strategies. As such, many of the issues identified in the report are issues we have been discussing internally with our staff, as well with the GLBTS Integration Workgroup. From this perspective, the WQB's report has the potential for being a very supportive document.

We would also like to take this opportunity to provide further clarity with respect to the Integration Workgroup and all of the Substance Workgroups. We believe the roles and responsibilities of the Integration Workgroup and the Substance Workgroups are well defined and not diffusely focused as suggested in the report. The Substance Workgroups have taken their direction directly from the 4-step analytical framework as defined in the Strategy. The Integration Workgroup responsibilities were developed in a GLBTS Stakeholder meeting held on June 26, 1997, where a GLBTS implementation plan was developed. This plan has been the guiding principles for GLBTS group activities.

With respect to the specific recommendations, we are providing the following comments for your consideration:

Recommendation #1: The Strategy's Integration and substance- specific work groups review and consider the advice and recommendations presented in the Thompson Gow & Associates Report.

We agree that a closer review of the Thompson Gow Report is likely to provide some additional insight when implementing actions in support of Strategy Challenges. The report will be shared with the Workgroups and Integration Group.

Recommendation #2: The Strategy's focus firmly remains on Pollution Prevention.

The Strategy actively promotes the application of clean technology over end-of-pipe controls and will continue to do so. The Strategy is currently engaged in a process on how to institutionalize innovative approaches as another tool in achieving challenge goals. The Strategy is committed to addressing all feasible options, including pollution prevention, emission trading schemes, phase-outs and bans or other alternative approaches, which may speed up the pace or increase the level of reductions, taking into account cost effectiveness.

It is recognized that no one single tool will result in the virtual elimination of PBT's. The Strategy will continue to utilize all tools and techniques available to achieve its Challenges

Recommendation #3: The Strategy actively publicizes the persistent toxic substance issue.

Publicizing the persistent toxic substance issue is of paramount importance to the Strategy. The Strategy's primary publication is the GLBTS Annual Progress Report and through workgroup information updates and fact sheets. In addition, many programs already in place on both sides of the border are also actively publicizing the persistent toxic substance issue. Some of these programs include the Great Lakes Action Plan, (including actions being undertaken by the LaMPs and RAPs), and progress reporting under the Canada-Ontario Agreement, and through the implementation of the Canada Wide Standards on the Canadian side; the Persistent Bioaccumulative Toxics Initiative, Great Lakes Strategy, Pollution Prevention Roundtable on the U.S. side.

Recommendation #4: The Strategy actively promote broader awareness, engagement, and participation of the Great Lakes community.

As the Strategy works through the implementation phase it will more actively promote itself to the Great Lakes community and seek additional engagement and participation. We believe the Strategy has to become more proactive when communicating reduction achievements during its implementation phase. The Strategy is currently exploring how best to utilize the Strategy's existing linkages with ENGO's, industry and trade associations, and pollution prevention organizations such as the Canadian Centre for Pollution Prevention and how to develop and exploit new linkages within existing Great Lakes

programs such as the LaMPs and RAPs. In addition, Environment Canada and the Great Lakes National Program office recently announced its development of the Binational.net which will be the future host of both U.S. and Canadian GLBTS activities.

Recommendation #5: The Strategy develop sector-based initiatives that deal with more than one contaminate at a time.

From the earliest stages of the GLBTS, it was recognized that a sectoral approach might be an effective and efficient way of achieving reductions for multiple strategy substances. However, it was also recognized that information to be gathered in the first three steps of the analytical process would be crucial to selecting appropriate sectors and formulating an effective multi-substance sectoral approach. With the completion of the substance-specific Step 3 reports in the past year, assessment of cross-substance sector activities was possible and has begun. At its May 18, 2001 meeting, the Integration Workgroup established an interim subgroup to explore and develop options for a sectoral approach to achieve reductions in multiple strategy substances. Representatives from industry and environmental groups volunteered to participate as members of the sector subgroup, led by Environment Canada and the Great Lakes National Program Office.

While the substance-specific workgroups have been engaging sectors on a substance-by-substance basis since the inception of the Strategy, it is anticipated that this new pilot sector approach will look at possible synergies through the engagement of other government programs and initiatives such as LaMPs. It is hoped that interest from a sector may kindle a desire to look for opportunities that go beyond compliance and will have a positive effect on the sector's bottom line. The sector pilot approach meets the original intent of the Strategy and is more likely to result in an impact on suppliers and other related sectors.

From the government's perspective, a multi-substance approach may be more comprehensive and efficient with respect to the allocation of limited monetary and human resources. A sector approach also promotes learning and information technology transfer across a sector, may allow for additional flexibility when implementing actions, and may result in leveraging with other multi-substance efforts for achieving reductions that one couldn't achieve with the independent GLBTS single chemical effort. This approach may also provide an opportunity to focus in on the applicability of other innovative approaches to toxic reductions that may not have been evident in the Step 3 reports.

We recognize that increased coordination with other Great Lakes groups will be imperative to the success of our future efforts. The more we can work with state and provincial governments, Lakewide management teams, and grassroots organizations, the more progress we will all make towards virtual elimination of persistent, bioaccumulative, toxic substances from the Great Lakes Basin. Therefore, the sector approach will only be pursued if after

analyses, we are convinced that it will add value to our efforts to achieve the goals of the Great Lakes Binational Toxics Strategy.

Recommendation #6: The Strategy actively address the destruction of stockpiled and stored persistent toxics substances.

The Strategy has been attuned to this issue for the past few years. Further, Environment Canada commissioned a technical assessment for elemental mercury retirement options. The study has been completed and the results of the report will be tabled and discussed at the November 14 th, 2001 Mercury Workgroup meeting in Chicago.

Similar assessments for the destruction of stockpiled and stored persistent toxic substance for those Level 1 substances, that have not already been addressed through legislation or do not have retirement programs, is a worth while exercise.

Recommendation #7: The Strategy clarify its relationship to RAPs and LaMPs.

The Strategy has recognized that a closer liaison between itself and the LaMPs would benefit the delivery against reduction targets in both programs. To this end the Strategy is hosting a workshop for all of the LaMP and GLBTS co-chairs and a number of LaMP critical pollutant sub-committee members representative of all the Great Lakes on both sides of the border on November 16 th, 2001 in Chicago, Illinois. It is hoped that this will be the first of many LaMP/GLBTS meetings searching for program delivery synergies.

Recommendation #8: The Strategy clarify its linkages to, and coordination with other contaminant reduction and elimination initiatives.

In the past, the Strategy has maintained linkages to, and coordination with, other contaminant reduction and elimination initiatives, both national and international, in the following ways:

- Through interchange of presentations at meetings. For example, representatives from the Commission for Environmental Cooperation in North America, UNEP POPs negotiations, U.S. national PBT Initiative; Canada Wide Standards (CWS) program and Strategic Option Process (SOP), as well as the IJC, have all made presentations at, and participated in, GLBTS meetings. Likewise, GLBTS representatives have made many presentations on the Strategy and opportunities for partnerships throughout North America.

- Involvement of GLBTS personnel on other key initiatives. Workgroup leaders and other staff intimately involved with implementation of the GLBTS have volunteered and become key participants in other important initiatives. U.S. workgroup leaders have served as members, and in some cases as chairpersons, of workgroups under the U.S. National PBT Strategy to develop national action plans for Level 1

substances. Likewise, Canadian workgroup leaders have been intimately involved in CWS and SOP initiatives.

- Where possible, GLBTS representatives have lobbied to have GLBTS goals included or referenced in other initiatives. For example, the US PBT Strategy incorporates the goals of the GLBTS directly, and builds upon the Strategy challenge goals in its national strategy. Likewise, in Canada the Great Lakes Action Plan and the Canada Ontario Agreement deliver on the reduction commitments found in the Strategy.

- Coordination with national efforts in defining roles and responsibilities for specific reduction activities. The GLBTS has worked closely with both Canadian and US national efforts in coordinating work. The alkyl-lead, pesticides, and dioxin workgroups have all worked closely with national efforts, in some cases taking leadership on certain information-gathering efforts (such as burn barrel information for the dioxin workgroup) and in other cases taking advantage of national leadership (such as on PCP options from Canada's SOP or alkyl-lead reductions in race car fuel from the US national PBT strategy).

Recommendation #9: The Strategy clarify its role in the remediation and clean-up of contaminated sediment, land and soil.

By 1998, the governments determined that there were other existing programs in place, at all levels of government, to deal with the issue of contaminated sediment remediation. With this determination, the governments' direction to the Integration Workgroup and the Substance-specific Workgroups, was to not include contaminated bottom sediments in substance-specific inventories. Further, it was recommended that the GLBTS should track progress being made to clean up contaminated bottom sediment in the Great Lakes basin by both countries. In accepting this recommendation, the GLBTS has become the vehicle to track and compile information for all sediment clean-ups conducted in both the U.S. and Canada. This tracking is conducted on an annual basis, with final summary figures provided by June of the following year and reported annually in the GLBTS Progress Report. Aside from tracking volume information alone, any chemical specific mass removal information is provided, where available. Actions to reduce the use and release of PBT will help prevent future contamination of the sediment, land and soil. On the U.S. side there are specific programs to address contaminated land and soil (for example CERCLA, RCRA.)

Recommendation #10: The Parties explore potential Strategy contributions to groundwater restoration and protection.

The issue of groundwater restoration and protection is of great concern. The Strategy, however, was not mandated to address this issue directly. We feel that all actions being taken to meet the Strategy challenges are in support of the Great Lakes Water Quality Agreements' overall goal of virtual elimination and therefore contributes to groundwater protection. The parties in both the U.S. and Canada have specific programs for the protection and restoration of

groundwater, such as Underground and Leaking Underground Storage Tank regulations and cleanup programs.

Again, thank you for the opportunity to review the WQBs Report. If you need additional information or clarification, please don't hesitate to contact us.

Sincerely,

Danny Epstein
Regional Director
Environmental Protection Branch Ontario Region

Gary Gulezian
Director
Great Lake National Program Office

APPENDIX C. THOMPSON GOW & ASSOCIATES REPORT TO THE PROGRESS REVIEW WORK GROUP

EVALUATION OF THE CANADA-UNITED STATES GREAT LAKES

BINATIONAL TOXICS STRATEGY

FINAL REPORT

Prepared for the

Binational Toxics Strategy Progress Review Work Group

and

International Joint Commission

July 12, 2001

Prepared by

Thompson Gow & Associates

Disclaimer: The views and opinions expressed in Appendix B are those of Thompson Gow & Associates and not necessarily those of the International Joint Commission.

TABLE OF CONTENTS

Part I

Consolidated Report

I. Background

The Canada-United States Strategy for the Virtual Elimination of Persistent Toxic Substances in the Great Lakes, or Binational Toxics Strategy (BTS), was signed by the federal governments of Canada and the United States on April 7, 1997. The purpose of the Strategy is "to set forth a collaborative process by which Environment Canada (EC) and the United States Environmental Protection Agency (USEPA), in consultation with [partners], [(1)] will work in cooperation with their public and private partners toward the goal of virtual elimination of persistent toxic substances ... from the Great Lakes Basin." The virtual elimination of Strategy substances, particularly those which bioaccumulate, focuses on releases resulting from human activity. Moreover, the virtual elimination of these substances will protect and ensure the health and integrity of the Great Lakes ecosystem. An underlying tenet of the Strategy is that governments cannot by their individual actions alone achieve the goal of virtual elimination and that all sectors of society are challenged to

participate and cooperate to ensure success. The goal of virtual elimination is to be achieved through a variety of programs and actions, primarily through pollution prevention. Both regulatory and non-regulatory programs are to be considered in reaching the goal of the virtual elimination of persistent toxic substances.

Recognizing the long-term nature of virtual elimination, the Strategy provides a framework to achieve specific actions from 1997 to 2006. These actions and goals represent milestones along the path to virtual elimination. Seven substance-specific workgroups [(2)] were formed under the BTS, each of which brings together stakeholders to seek voluntary reduction efforts toward virtual elimination. These substance-specific workgroups are focused on "Level I" substances, the primary focus around which the governments will concentrate and lead actions and efforts:

- Mercury
- Polychlorinated biphenyls (PCBs)
- Dioxins / Furans
- Benzo(a)pyrene (B(a)P)
- Hexachlorobenzene (HCB)
- Octachlorostyrene (OCS)
- Pesticides (aldrin, dieldrin, chlordane, DDT (plus metabolites DDE and DDD), mirex, and toxaphene)
- Alkyl-lead

EC and U.S. EPA, in cooperation with their partners agreed to work toward meeting the Strategy's challenges as specific milestones on the path toward virtual elimination. These milestones are to be achieved by implementing voluntary efforts and through regulatory actions under environmental laws in both countries to achieve reductions of Level I substances. Baselines for the milestones were set by each country, using the best available data.

II. Evaluation of the Strategy by Thompson Gow & Associates

In early 2001, the International Joint Commission (IJC) contracted Thompson Gow & Associates (TGA) to evaluate the progress made under the Canada - United States Great Lakes Binational Toxics Strategy and the contribution of the Strategy toward achievement of the Great Lakes Water Quality Agreement's virtual elimination goal. TGA's consulting mandate is to review:

(1) The Strategy's purpose - "to set forth a collaborative process."

(2) The Strategy's four steps:

- Information gathering;
- Analysis of current regulations, initiatives and programs which manage or control substances;
- Identification of cost-effective options to achieve further reductions; and
- Implementation of actions to work toward the goal of virtual elimination.

(3) The Strategy's specific challenges.

The evaluation of the Strategy consisted of both quantitative and qualitative analysis. First, TGA conducted a review of a wide range of documents and reports to determine the estimated quantities of contaminants currently in the Great Lakes and the various pathways (water, air, sediment, etc.) of new contaminant loadings to the lakes. This "context document" (Part II -- Quantitative Report) also summarizes the sources / sectors from which these contaminants are released, both within and outside the Great Lakes basin. It organizes results that these various reports have provided and is meant to provide a summary of the strengths and gaps in quantitative information on Level I substances. This quantitative analysis was undertaken to determine whether there was sufficient information available for evaluating progress in achieving the reduction targets for each level I substance.

Second, Thompson Gow conducted in-depth interviews with 25 strategically chosen individuals who are involved in efforts related to the Binational Toxics Strategy (Part III -- Qualitative Report). These interviews were undertaken because it was recognized that evaluating the progress in meeting numerical targets was only one criterion for determining the relative success of the Strategy and that other process-related criteria were also important. Part III also provides in-depth findings and observations about the Strategy.

It is important to note that all information provided in this report is based on either the information provided by interviewees or on the document review. Many of the interviewees provided examples of initiatives undertaken for the reduction of the use or release of mercury, which indicates that there is a higher level of awareness of the work that has been done by the mercury workgroup. Interviewees offered fewer examples of initiatives undertaken for other Level I substances.

The evaluation and report only addresses Level I substances since these substances are considered a priority under the Binational Toxics Strategy. The Strategy developed targeted challenges for these substances and most of the work that has been undertaken has been around Level I substances.

Appendix C is a matrix of sources / sectors and level I substances, which shows where there may be opportunities for multi-pollutant initiatives. A bibliography of documents reviewed is presented in Appendix B.

In TGA's considered view, on balance, the Binational Toxics Strategy has been successful in fulfilling its purpose "to set forth a collaborative process" and has engaged many stakeholders and partners in participating in activities to achieve the Strategy's goal to meet the challenges to reduce Level I substances. Also, the Strategy has been successful in maintaining focus on Level I substances, which has helped to focus industry and government on a manageable group of priority substances.

Many of the reductions made in releases of Level I substances cannot be attributed to the Strategy unequivocally because there are a myriad of interconnected toxic reduction programs that have been developed over the last twenty years and new ones continue to be developed and implemented. It is clear that many toxic reduction initiatives have been developed as a result of the Strategy. However, it is not clear what quantities of toxics have been reduced as a result of these Strategy-driven initiatives.

There are a number of areas where the Strategy can build on its strengths and improve on its weaknesses so that accelerated progress will be made in the remaining years of its mandate (until 2006).

Part I provides consolidated observations, with corresponding recommendations, from Parts II and III. Parts II and III of the report provide a myriad of in-depth, detailed findings from our document review and interviews with Strategy participants.

III. Findings / Observations and Recommendations

1. What the BTS Is and What It Should Be

It is important to note that as our evaluation of the Strategy progressed, TGA observed that, depending on who we spoke to, there were different views on what the BTS is and what the Strategy should be. Furthermore, these different underlying assumptions about the Strategy tempered the perception of the Strategy's success or failure. For example, if people defined the BTS as "action-oriented," then they tended to perceive that little or no progress had been made. However, if people defined the Strategy as a "process," then they were more likely to say it was making good progress in meeting its goals.

Recommendation 1: *The Strategy participants have spent most of their time and effort gathering information and assessing options to further reduce releases of Level I substances. It is important for the Strategy to shift toward taking greater action now that the information has been gathered. The workgroups should engage stakeholders and partners in the development and implementation of initiatives, many of which were identified as options in the Step 3 reports.*

2. Participation in the Strategy

The Strategy appears to have fulfilled its purpose "to set forth a collaborative process." The main strength of the BTS, according to interviewees, is the

information sharing and collaboration among various stakeholders that occurs, the latter of which was said to be a unique aspect of the Strategy when compared to other Great Lakes fora.

One major strength of the Strategy is the focus and direction that the Strategy provides to toxic reduction initiatives undertaken by industry and by state / provincial and federal governments. Interviewees argued that, without the Strategy, there would be various, unrelated efforts on different substances, without any coordinated or cohesive effort. Moreover, some argued that without the Strategy, substances that are banned or heavily regulated, such as PCBs and Level I pesticides, may have "dropped off the radar screen" in terms of finding ways to further reduce potential releases.

The BTS also appears to validate other initiatives to reduce PBTs, particularly for state / Ontario government organizations. For example, a state agency can use the Strategy (an international agreement) as additional justification to push / engage industry to take further action to reduce toxics or even as further justification to strengthen emissions limits or other standards. It appears that the principles of the BTS drive state / provincial toxic reduction and pollution prevention programs.

Recommendation 2: *The workgroups need to build on the example / strength of the mercury workgroup in engaging the states / provinces in discussions, which have led states / provinces to develop initiatives to reduce Level I substances through the replication of initiatives begun in other jurisdictions.*

There are several gaps in stakeholder participation in the BTS. Interviewees suggested that greater involvement is needed by state / Ontario government officials as well as a broader range of industry sectors, particularly small- and medium-sized enterprises (SMEs) and companies that use mercury in their products. We were also told that more involvement by environmental organizations, particularly in the substance-specific workgroups, is also needed. Tribal and First Nations were also mentioned as not being currently involved in the BTS effort.

Recommendation 3: *The Strategy achieved a great deal of success through collaboration of partners to gather information and understanding on Level I substances and their sources. Strategy participants should build on these successful partnerships and further engage federal, state / provincial, and local government agencies and departments; smaller companies; users of mercury; and other organizations.*

Recommendation 4: *The Integration Group and / or workgroups should develop strategies for engaging smaller companies in efforts to reduce the release of Level I substances. One option might be to engage smaller companies through supply-chain management initiatives led by larger companies to which they supply services and goods. Another option might be to develop supplier outreach programs, in partnership with large companies and state / provincial and municipal governments.*

Recommendation 5: *The public was identified as a group that needs to be engaged to understand their role in producing toxic substances. In particular, the HCB / B(a)P and dioxin / furan workgroups should engage the public, through education campaigns and other initiatives, to educate them about their role in potentially releasing Level I substances. Another option might be to develop a communications strategy to improve public awareness, which could be delivered through partnerships with local municipal and environmental organizations.*

Recommendation 6: *Environmental organizations and state / provincial governments should be involved in the substance-specific workgroups. This participation would allow environmental organizations and state / provincial agencies to become aware of, develop, and / or participate in pilot projects to reduce Strategy substances. Moreover, environmental groups could utilize their grass-roots linkages to mobilize local efforts as well as educational campaigns. One option would be for the Parties to provide grant money for travel so that a representative from each Great Lake state / Ontario can attend one substance-specific meeting per year. Environmental organizations should also have the opportunity to apply for grant money to travel to substance-specific workgroups. Another option would be for the Integration Group and workgroups to consider having rotating meetings in the Great Lakes states / Ontario so that less travel is incurred by organizations not based near Chicago, Detroit, or Toronto.*

Recommendation 7: *Environmental organizations and states / provinces are keen to develop initiatives and pilot projects that demonstrate different ways of reducing Level I releases into the environment. Their ideas and suggestions on the development of new initiatives to reduce toxic releases and their suggestions on how to improve or expand projects would be very useful. The Parties should encourage these organizations to engage sources of Level I releases and to develop initiatives that support the goals of the Strategy. One option might be for the Parties to provide grants to fund these types of initiatives. In return, the environmental organizations and state / provincial governments would document the progress made, the hurdles encountered and how they were overcome, the lessons learned, etc., which would be shared with the members of the workgroups.*

Recommendation 8: *The Strategy participants should enter into discussions with Tribal and First Nations organizations to discuss ways in which they could participate in Strategy goals. One option might be to work in partnership with them to develop initiatives that could be delivered by the tribal / First Nations groups directly.*

It appears that the Strategy is unevenly linked or coordinated to other efforts to reduce toxics in the Great Lakes basin. For example, the Strategy appears to be linked to the Lake Superior, Lake Michigan, and Lake Ontario (U.S. side) Lakewide Management Plans (LaMPs). However, there is disagreement among participants on the linkages between the Strategy and the LaMPs in general. Similarly, there is disagreement on how well the Strategy is linked to the Remedial Action Plans (RAPs) for Great Lakes Areas of Concern.

However, most perceived that better coordination between the Strategy and the LaMPs would be desirable.

Recommendation 9: *Workgroups should develop ways to share and coordinate efforts to reduce toxic substances with participants in the LaMP and RAP processes.*

3. Progress Toward Meeting Challenges

There appears to have been good progress in meeting the challenge to "assess atmospheric inputs of the Strategy substances to the Great Lakes." All of the substance-specific workgroups have focused on atmospheric emissions in their step reports and have identified atmospheric transport as an area for further study.

The workgroups have all identified the atmosphere as the most significant pathway for Level I substances entering the Great Lakes. Further, the Strategy appears to have impacted toxic reduction efforts at the national, hemispheric, and international levels. For example, U.S. EPA's Persistent Bioaccumulative Toxic, or PBT Initiative, is a national cross-office, multi-media initiative that has a very strong link to the Binational Toxics Strategy. An example of a hemispheric initiative impacted by the Strategy is the Commission for Environmental Cooperation's North American Regional Action Plans (NARAP), which also target Level I substances such as mercury, DDT, and PCBs. At the international level, the Strategy appears to have assisted the U.S. and Canadian stance on the United Nations Environmental Programme's Persistent Organic Pollutants, or POPs, Protocol.

Recommendation 10: *All of the substance-specific workgroups have identified the atmosphere as the most significant pathway for Level I substance loadings to the Great Lakes. Building on this strong base, the Parties should continue in their efforts to work within hemispheric and international frameworks to push for the global reduction of Level I emissions.*

There appears to have been little work undertaken to meet the challenge of completing or being well advanced in remediating priority sites with contaminated bottom sediments in the Great Lakes. None of the workgroup step reports mention remediation issues. Moreover, some of the interviewees said that it was either inappropriate for the Strategy to consider contaminated sediments or that contaminated sediments had not been addressed (and should be). There appears to be a conflict over the importance and / or the very validity of this challenge.

Recommendation 11: *Contaminated sediment leads to the uptake of some Level I substances - in particular, mercury, PCBs, and pesticides -- by fish, wildlife and, ultimately, humans. Since the Parties made a commitment under the Strategy to meet the challenge to remediate priority sites with contaminated bottom sediments, the Strategy participants need to address this challenge. The Parties should appoint a task group, or ask the Integration Group, to discuss practical ways that the Strategy could assist in meeting this*

challenge. This may involve coordinating efforts with other federal departments that are responsible for cleaning up contaminated sites or with Remedial Action Plans.

Recommendation 12: *Additional effort is required to clean up contaminated sites, which is also a dominant exposure pathway for fish, wildlife, and humans. In the future, the Parties should make the challenge for contaminated sediment clearer, with specific time frames and reduction targets, so that a clear goal and direction is provided to Strategy participants. The Parties may also wish to consider the appropriate venue for remediation actions to occur, whether it is the BTS, the RAPs, or the directly responsible federal organizations.*

Most interviewees agreed that pollution prevention initiatives were the focus of discussions in workgroups, with only a couple of people disagreeing. A few argued that pollution prevention staff in government agencies were involved in Strategy efforts. One concern expressed is the additional effort needed to phase out the use of Level I substances in products, particularly mercury.

Recommendation 13: *The workgroups should continue to focus on pollution prevention opportunities for reducing the release of Level I substances. Where Level I substances are still being used, additional effort is needed to engage companies to use alternative, non-Level I substances in their products.*

Canadian Challenges

Canada has not met the challenge targets for B(a)P, HCB, mercury, dioxins / furans and OCS. Canada has made good progress in meeting its 90 percent challenge to reduce mercury emissions, achieving a 77.5 percent reduction between 1988 to 2000. This is also the case for dioxins / furans, where Canada has reduced dioxins / furans by 79.6 percent between 1988 and 2000 (90 percent target). It is unknown whether Canada has met its PCB reduction challenge, considering the baseline information for PCBs in 1988 is unknown (see "Substance-Specific Findings," below).

United States

The U.S. has made some initial progress in meeting its 50 percent reduction challenge in the use of mercury, achieving an 18.6 percent decrease in use between 1995 and 1999. The U.S. has also made some progress in meeting its challenge to reduce U.S. mercury emissions by 50 percent, achieving a 25 percent reduction between 1990 and 1994. The U.S. appears to have made excellent progress toward meeting its 90 percent reduction target for PCBs; it has achieved a nearly 90 percent reduction in the number of PCB transformers between 1994 and 1998. Reduction targets were not specified for B(a)P or HCB in the U.S. For B(a)P, it is not known what reductions have been achieved. According to the Toxics Release Inventory (TRI), there has been a 71 percent reduction in HCB releases between 1990 and 1997, which indicates good progress (see "Substance-Specific Findings," below).

Baseline Data

The baseline data are unknown or incomplete for dioxins / furans and octachlorostyrene in the U.S. and for PCBs in Canada. The lack of estimated quantities for the base years of these Level I substances makes it difficult to evaluate the progress that has been made toward meeting the Strategy's challenges. TGA cannot confirm that the challenges for these Level I substances have been met (see "Poor Information Management and Availability," below).

Canada and the U.S. have met the challenges for alkyl-lead and Level I pesticides; both countries have reported reductions in the emissions of alkyl-lead beyond those stated in their respective challenges. Also, both countries have confirmed that level I pesticides are no longer manufactured or used in their respective countries.

4. BTS Drives / Assists other Toxics Reduction Initiatives

Although it is not clear what reduction results the BTS can take credit for, the assumption that a cause-effect relationship can be made for an individual toxic reduction initiative or Strategy is flawed. Many of the regulations, pollution prevention initiatives, voluntary efforts, and monitoring programs that began in the 1980s and 1990s target persistent, bioaccumulative, toxic substances and continue to play an important role in reducing ambient levels of these pollutants in the Great Lakes, in biota, and in sediment. Anecdotal evidence suggests that the indirect influence that the BTS has on existing initiatives, and the development of new ones, has been largely unrecognized and undervalued.

There are many examples of initiatives that are either directly or indirectly assisted by the Strategy, e.g. the work done on backyard burn barrels; the mercury pollution prevention initiative with three Indiana steel mills; the work done with hospitals to reduce mercury-containing hospital equipment / instruments; and efforts to deal with mercury-containing switches in automobiles, among others. Most of the examples relate to mercury reduction efforts.

The Strategy has played an important role, either directly or indirectly, in impacting or focusing state / provincial initiatives in reducing Level I substances, particularly mercury, although this is less true for Ontario. The Strategy helps the state / provincial agency engage industry; indirectly drives programs; helps keep a focus on mercury issues; and helps the state / province go further in its efforts to reduce mercury.

Information sharing is a major strength of the Strategy. The substance-specific workgroups have generated excellent opportunities to share information on, and become aware of, toxic reduction projects that could be replicated in other jurisdictions. There are many examples of projects that had begun in one state / province and had been, or are going to be, replicated in another. In addition, the networking that occurs at meetings allows participants to get to know who is working on a particular project, so that state / provincial government

officials know who to call when they want guidance and information for replicating the project.

There are several examples of "pilot projects" that have been replicated in another jurisdiction or expanded to a larger region, including the mercury pollution prevention agreement involving three Indiana steel mills; the wood burning stove change-out program; the health care without harm initiative; the mercury thermometer exchange program; the clean car campaign; and the backyard burn barrel initiative. Most examples are projects to reduce mercury, although projects related to incineration (backyard burn barrel and wood burning stoves) target more than one substance (e.g. dioxins / furans, hexachlorobenzene, and benzo(a)pyrene).

Other examples of initiatives linked to the BTS include the Canada Ontario Agreement, which focused on the same substances and had almost identical targets and reduction dates. In addition, the changes under the Emergency Planning and Community Right-to-Know Act (EPCRA) seem to be linked to the Strategy; it will require lower reporting thresholds under the TRI for certain persistent bioaccumulative toxic chemicals, which have been added to the TRI list of toxic chemicals.

The cause-effect relationship between the Strategy and the reductions of PBTs in the basin is difficult to quantify. There are various initiatives to reduce releases of toxics and it is nearly impossible to attribute which reductions are the result of the Strategy as opposed to regulations, manufacturing process changes, voluntary initiatives, or other management programs. In addition, there is a great deal of disagreement among participants as to whether or not toxic reduction initiatives are related to the Strategy. Nonetheless, there appear to be more people that believe the BTS influences initiatives, either directly or indirectly, than those who do not.

Recommendation 14: *As Level I substances, such as pesticides, PCBs, and mercury, are collected or taken out of products, the storage and / or destruction of these substances will need to be considered. Pollution prevention is the main focus for reducing the release of Level I substances, but for substances that have a long history of use - or cannot be destroyed, like mercury - the issue is becoming one of how to safely store or dispose of these highly toxic, bioaccumulative, and persistent substances. The Strategy may be able to provide some leadership in this regard, based on its success in collaborating on research and information sharing. One option may be to set up a task group made up of members of the mercury, PCBs, and pesticides workgroups, among others, to consider this emerging issue.*

BTS Drives Inventory and Research Initiatives

The BTS had played a significant role in driving inventory research initiatives (e.g. modeling, research, stack testing, etc.) undertaken by Great Lakes states / Ontario, industry, and federal governments. It appears that, without the Strategy, much of the inventory work done on Level I substances would not have occurred.

Moreover, the inventory work that has come out of the Strategy has provided additional focus to industry and other government organizations and has ensured there is good information on the sources of releases and pathways of the Strategy substances. Further, the 4-step process of the BTS is seen as a considerable strength because it focuses on finding the information about the sources and pathways of the substance first, then identifying the "owner" of the problem and, finally, prompting the owner to take action in solving the problem.

5. The Workgroups

The most active substance-specific workgroup has been the mercury workgroup; most activities driven by the Strategy have been concerned with reducing the use and release of mercury. The PCBs and dioxin / furan workgroups have been moderately active, while the remaining workgroups (OCS, HCB / B(a)P, alkyl-lead, and pesticides) have been less active (see the substance-specific findings, below).

Recommendation 15: *For the alkyl-lead and OCS workgroups, the Parties should determine what more can be done in each of these workgroups and whether the time has come to suspend these workgroups temporarily until there has been greater technological progress or more data available on other potential sources for these substances.*

Recommendation 16: *The Integration Group should, in consultation with the workgroups, consider developing sector-based initiatives that could potentially target more than one Level I substance. One option might be for each of the workgroups to provide the Integration Group with a list of their priority sources (e.g. top three or top five sources). The Integration Group could examine these lists and look for potential cross-cutting sectors for Level I substances. Out of this examination, the Integration Group could engage stakeholders to potentially develop sector-based reduction programs.*

Recommendation 17: *The roles and responsibilities of the Integration Group need to be defined. It appears that, to some extent, the Group is attempting to be all things to all people participating in the meetings, which may be one reason why attendance, by some stakeholder groups, may be diminishing. A temporary task group / committee should be set up to formally confirm or enhance the Group's roles and responsibilities (i.e. terms of reference). The task group should be made up of individuals from all stakeholder groups and should also include persons that participate outside of the Integration Group. Moreover, the participants in the substance-specific workgroups should be consulted about what they need from the Integration Group to help support them in their work.*

Information Gathering

Workgroups have identified many information gaps that need to be filled in order to have a complete picture of the Level I Strategy substances. There appears to be incomplete loadings information for all of the Level I substances,

particularly for atmospheric, groundwater, and sediment pathways. However, in the case of sediment information, there is a great deal of information on substances found in contaminated sediment, but the quantity of each substance is not broken down - nor do we suggest that it should be. Although there are information gaps for some pathways and media, it appears that the workgroups have taken measures to identify these information gaps and have recommended ways to fill them.

The substance-specific workgroups also spent a great deal of time and effort evaluating available quantitative information for their respective substance(s) and, in some cases have changed baseline and source information as new scientific information became available. In some cases, baseline information is not available (e.g. U.S. dioxin / furan inventory), which makes it difficult to evaluate progress toward meeting the BTS challenge. Nonetheless, the absence of data does not necessarily mean that the BTS is a failure but rather illustrates the formidable task that each workgroup had to undertake with, in some cases, sparse premium scientific information.

Workgroups have also identified ongoing and new initiatives to fill in some of the gaps that exist for quantifying the releases of substances from various sources. The inventories are not perfect, but there appears to have been a great deal of effort spent in seeking quality information, which will lead the workgroups to target the largest sources and develop initiatives to reduce releases from these sources in the future.

Recommendation 18: *The workgroups should prioritize the options for filling in information gaps. The workgroups should also develop a strategy for filling those gaps, in collaboration with relevant partners, such as government scientific research and monitoring organizations, states / provinces, and industry.*

Pathways and Sources

The atmosphere appears to be the predominant pathway for all of the Level I substances entering the Great Lakes. The substance-specific workgroups have undertaken significant work to identify the main pathways and sources of their respective Level I substances. Generally, there is a great deal of information on atmospheric pathways of pollutant loadings of Level I substances to the lakes. There are downward trends in releases of substances; companies are phasing out the use of PBT substances in products; and temporal trends show decreasing levels of PBTs in fish tissue, water columns, sediment, wildlife tissue, ambient air, and other pathways.

There are few or no data for groundwater or sediment loadings to the lakes for most Level I substances. Likewise, there is little or no information on the amount of Level I substances that may be entering the lakes through runoff or atmospheric cycling from contaminated soil. The workgroups have found that contaminated soil may serve as a source of pesticides, mercury, and PCBs into the atmosphere or may enter the lakes through runoff. The main pathway for

PCB loadings to the Great Lakes is environmental sinks (contaminated sediment) and environmental cycling.

There are considerable uncertainties in emissions estimates for all sectors considered for B(a)P and HCB. Moreover, there is little or no source information for OCS. Further information is needed on the uses of Level I pesticides outside of the U.S. and Canada as well as the quantities of pesticides possibly stockpiled within the two countries. Almost all workgroups have identified further areas for undertaking research on possible or potential sources of their respective substances. For example, sources and magnitude of long-range transport need to be assessed through monitoring and modeling for B(a)P.

Recommendation 19: *The BTS should play a role in recommending areas that the Parties can focus on to learn about the dominant pathways for substances entering the lakes. The role of atmospheric pathways appears to be a more significant contributor to loadings in the Great Lakes than previously thought. Although efforts must continue to focus on sources within the basin, the Parties should also consider additional efforts to control out-of-basin sources of atmospheric deposition of Level I substances in the Great Lakes.*

6. The Four-Step Process

It appears that almost all of the workgroups have partially or fully completed three of the Strategy's four steps, with few exceptions. All of the workgroups have gathered extensive information on the available inventories on sources and have analysed regulations and initiatives for each of the Level I substances. All of the workgroups identified information gaps. However, unlike the other workgroups, the PCBs and pesticides workgroups did not suggest options for filling these gaps.

The step three reports for HCB / B(a)P, PCBs, and mercury do not contain Canadian information, which may mean that step three reports have not been completed on the Canadian side. Only the alkyl-lead and pesticides workgroups have completed "challenge reports," indicating that all of the Strategy steps have been completed and that their respective challenges have been met.

Recommendation 20: *The lack of a report identifying Canadian options for reducing Level I substances suggests, rightly or wrongly, that the Canadian government has not identified cost effective options to further reduce Level I substances. The Canadian government should ensure that information about Ontario is included in the Step 3 reports or that a Canadian Step 3 report is made publicly available on the BTS web site.*

7. Voluntary Nature of the Strategy

The voluntary nature of the Strategy is seen as both a strength and a weakness. On the one hand, the voluntary nature of the Strategy is seen as a good way to engage industry and to enable companies to take action on reducing toxics on

their own terms. In this respect, some Level I substances are not regulated and that any effort to reduce them was worthwhile. On the other hand, the voluntary nature of the Strategy is seen as a poor incentive to engage industry because companies already participate in many toxic reduction initiatives and the BTS represents just one more program that competes for the company's time and resources. Since it is not a mandatory program, many companies may not feel that they need to participate.

Recommendation 21: *Voluntary initiatives play an important role in giving industry the opportunity to reduce its releases of contaminants in a flexible and cost-effective way. Although industry is voluntarily participating in these non-regulatory initiatives with good will, there needs to be a mechanism for altering the initiative if release reductions are no longer being achieved. A committee of representatives, perhaps the Integration Group, should make recommendations to the Parties when a voluntary initiative is no longer making progress (e.g. need to engage more companies; "low-hanging fruit" has been picked; scope of the project needs to be expanded from one region to a larger geographical area; etc.). The committee could recommend that the Parties take specific actions; estimate additional resources (financial and staff) that may be required; the anticipated reduction results based on successes already achieved; and the proposed partners who would take part in the expanded project (state, province, industry, environmental organizations, etc.) and their respective roles and responsibilities.*

8. Government Support for the Binational Toxics Strategy

There is a perception that there is a lack of resources (staff and funding) to do the work required to reduce toxic substances under the Strategy. For example, scaling up pilot projects, undertaking work under the Strategy, and developing initiatives are hindered by a lack of resources. There is also a perception that the Strategy has little support or awareness from the national headquarters of the U.S. EPA and Environment Canada since the Strategy is led by regional offices (U.S. EPA Region 5, the Great Lakes National Program Office, and Environment Canada's Ontario Region).

Recommendation 22: *The Strategy's profile needs to be increased among officials within EC and EPA headquarters, so that the required resources and commitment to undertake work to support the goals of the Strategy are obtained. The Integration Group, in cooperation with workgroup participants, should develop a strategy for sharing the successes of the Strategy with the Parties.*

9. The Need to Take Action

People participating in the Strategy appear to be anxious to embark on step four of the Strategy's four-step process. Many participants feel that it is a proper role for the Strategy workgroups to explore and discuss the need to explore economic and other incentives to spur action; costs of taking action; and new or alternative technologies.

Recommendation 23: *The workgroups need to explore and develop innovative initiatives, such as economic incentives, product take-back or extended producer responsibility initiatives, and other projects that could persuade the public, smaller companies, and other sources to change their behaviour and thus reduce releases of Level I substances.*

There is a perception by participants that there are occasions where excessive debates and "foot dragging" occurs, which impeded decision-making and taking action. Some participants identified a need for some type of mechanism, such as an accountability framework, to keep people moving along and in the same direction. Some also argued that there is a need for greater focus in workgroup discussions since there are times when issues are discussed too broadly, or in too much detail, which also impedes decision-making. Nonetheless, there were also individuals who believed a broader focus was needed to better deal with long-range air pollution and other global issues.

Recommendation 24: *The workgroups should consider developing an accountability framework, considering the number and variety of stakeholders, including different levels of government and varied government offices and agencies as well as industry, environmental organizations, and other stakeholders. An accountability framework would clearly define and describe participants' roles and responsibilities as well as their mutual obligations; set out clear expectations for the objectives of the workgroup; establish credible reporting and agree upon performance expectations; establish a reasonable review and adjustment process, focusing on improving performance through supportive assessment and feedback; and demonstrate to others the level of performance achieved.* [(3)]

10. Poor Information Management and Availability

There is a significant problem with the Binational Toxics Strategy's main web site, which is seriously outdated and contains largely American data and information. For example, many of the workgroup web sites post reports on the sources of releases of their respective substances, but it is primarily U.S. data that are presented. TGA was e-mailed electronic reports containing Canadian data on sources; many of these reports are not available to the public.

There were many inventories used by the workgroups to determine the sources and pathways of their respective substances. The problem is not that there are different or many inventory sources used for each of the substances but, rather, that it is not always clearly indicated in the challenge and step reports which inventories are being used. Moreover, these inventories are not available on the BTS web site. In some cases, if the inventory report's URL had not been e-mailed to us, we would not have been able to locate it.

Recommendation 25: *The workgroups should better explain how the top sources for their respective substances were identified, including the documents to which they referred the inventory used to derive their baseline estimates (and their hyperlinks).*

If the public were to make any conclusions based on the BTS web site, they would likely think that the web site is either greatly out of date (between eight months and two years in some cases) or that there has been little action taken by the workgroups. Some of the most recent workgroup reports are not available on the web site.

Not only are data out of date and hard to find, the division of Canadian and American reports seems opposed to the intent of the Binational Toxics Strategy. One of the main purposes of the BTS was for Canada and the United States to better coordinate their toxics initiatives in order to have a binational, rather than national or federal-state / provincial, effort. Most of the workgroup reports present either Canadian or American information but not for both countries in the same report.

Recommendation 26: *The Strategy's web site needs to be regularly updated. The site needs to include the most recent workgroup documents, reports, and updates. At a minimum, hyperlinks to Canadian information and reports should be provided on the web site. In addition, the source inventories used by each of the workgroups for their respective substance(s) should be hyperlinked on the web site.*

Recommendation 27: *The Strategy's main strength is its collaborative approach to sharing information and discussing issues with other participants involved in reducing Level I substances. Strategy participants should consider setting up an Internet discussion forum (real-time) or newsgroup (Internet bulletin board) so that information can be exchanged easily between participants. This type of information exchange may already be occurring in related areas, which participants may wish to tap in to.*

Recommendation 28: *Canada should make efforts to ensure that Ontario information is reflected in workgroup step reports.*

11. Poor Reporting in BTS Progress Reports

There are significant problems with the progress reports on the Strategy produced by the Parties. The progress reports generally do a poor job of providing quantitative information regarding progress in meeting the BTS challenges. Although percentage reductions may be provided for some substances, the current year and baseline year quantities are not, which would assist readers in fully understanding the quantity reduction of these substances since the base year. Sometimes the report is not clear about how much progress has been made in reducing the releases of some substances. Sometimes progress (percentage reductions) toward meeting a reduction challenge is given for one country but not for the other. Moreover, the majority of initiatives to reduce mercury that are reported in the progress report are American examples rather than Canadian ones, which suggests, rightly or wrongly, a possible lack of action by the Canadian government. Examples of incomplete reporting in the progress report raise questions about the actual progress that has been made under the Strategy.

Recommendation 29: *The annual performance reports on the Strategy's progress need significant improvement. For example, quantities for the base year and most recent year should be provided along with statements of reduction achievements. Moreover, Canada's continued progress toward meeting the challenges should be included in reports (even though the Canadian target year has passed).*

12. Substance-Specific Findings

Pesticides

Canada Challenge: Report by 1997, that there is no longer use, generation or release from Ontario sources that enter the Great Lakes of five bioaccumulative pesticides (chlordane, aldrin / dieldrin, DDT, mirex, and toxaphene), and of the industrial byproduct / contaminant octachlorostyrene. If ongoing, long-range sources of these substances from outside of Canada are confirmed, work within international frameworks to reduce or phase out releases of these substances [no base year].

U.S. Challenge: Confirm by 1998 that there is no longer use or release from sources that enter the Great Lakes Basin of five bioaccumulative pesticides (chlordane, aldrin / dieldrin, DDT, mirex, and toxaphene), and of the industrial byproduct / contaminant octachlorostyrene. If ongoing, long-range sources of these substances from outside of the U.S. are confirmed, work within international frameworks to reduce or phase out releases of these substances [no base year].

There is sufficient information to conclude that the pesticides challenge has been met. Both Canada and the U.S. began phasing out the uses of Level I pesticides in the 1970s and most were banned by the 1990s.

There appears to be full information on the possible pathways and sources of Level I pesticides, with the exception of uses outside of the U.S. and Canada and the quantity of pesticides stockpiled.

Although environmental concentrations of Level I pesticides have been generally declining for the past 20 years, concerns remain because the substances persist and bioaccumulate in fish and wildlife. In addition, more effort is needed to deal with concentrations of toxaphene in lake trout in Lake Superior, which are not decreasing.

Since Level I pesticides were either phased out or banned by the 1990s, and 1997 and 1998 were the challenge target dates for Canada and the U.S. respectively, then one could argue that the pesticide challenge was already met by the time the BTS was signed in 1997. Moreover, the Canadian challenge report was published in October 1996, which is before the Strategy was signed. [(4)] The Strategy's contribution to the reduction of potential releases (e.g. historical stockpiles) appears to be minimal, considering that many of the "clean sweeps" conducted by states and by Ontario began before 1997. If there is any additional value that the BTS has provided to reducing Level I

pesticides, then it may be an indirect reminder to governments that there is a continued need to manage potential releases of these banned pesticides.

Recommendation 30: *There appears to be a need for the Parties to determine what issues the workgroup should focus on now that the Strategy challenges have been met. Although environmental concentrations of Level I pesticides have been generally declining for the past 20 years, concerns remain because the substances persist and bioaccumulate in fish and wildlife. Some options to consider include focusing on understanding why environmental levels of toxaphene do not seem to be decreasing and focusing on Level II pesticides.*

Recommendation 31: *The Parties should encourage Great Lakes states / Ontario to continue conducting "clean sweeps" to remove stock piles of Level I pesticides.*

Recommendation 32: *TGA agrees with U.S. EPA that monitoring of various media is an activity that should continue in order to track the progress of Level I pesticides. In addition, more effort should be taken to address the possible releases from contaminated sites. Working with partners to clean up contaminated sites may be one option that the Parties need to consider implementing.*

Alkyl-lead

Canada Challenge: Seek by 2000, a 90 percent reduction in use, generation, or release of alkyl-lead consistent with the 1994 Canada Ontario Agreement (COA) [1988 base year].

U.S. Challenge: Confirm by 1998, that there is no longer use of alkyl-lead in automotive gasoline. Support and encourage stakeholder efforts to reduce alkyl-lead releases from other sources [no base year].

Sufficient information appears to be available to indicate that the Strategy's challenge has been met. Both countries have reported reductions in the emissions of alkyl-lead beyond those stated in their respective challenges. However, like the challenge for Level I pesticides, the challenge for alkyl-lead appears to have been met prior to the signing of the 1997 Strategy. The phase out of lead in gasoline occurred in the 1970s and 1980s and lead was banned in gasoline in Canada in 1990 and in the U.S. in 1995.

An area where the BTS appears to have contributed is in encouraging the Parties to look at other sources of alkyl-lead use. Both countries have identified the high-performance piston-engine aircraft as the largest source of alkyl-lead emissions, followed by competition vehicles. Moreover, it appears that both countries have engaged these sectors in reducing emissions of alkyl-lead. Unfortunately, there currently exists no alternative to using leaded gasoline in aircraft.

The workgroup has identified areas where more information is needed on alkyl-lead emission. For example, the U.S. has found that sufficient data are

not available to develop emissions estimates for operation of aircraft, operation of nonroad vehicles, or alkyl-lead production. Also, other than aviation gasoline, very little data exist on current levels of the legal use of leaded gasoline (racing cars, off-road and non-road vehicles). Canada has found that the number, age, and condition of underground fuel storage tanks at airports are unknown and it has been recommended that an inventory of fuel storage facilities in Ontario airports be conducted. Canada and the U.S. have identified the level of exposure to alkyl-lead as a monitoring need.

Recommendation 33: *The Strategy has identified data gaps that need to be filled for alkyl-lead. After additional information has been collected, more effort may be needed to deal with the non-automotive sources of alkyl-lead.*

Benzo(a)pyrene / Hexachlorobenzene

Canada Challenge: Seek by 2000, a 90 percent reduction in releases of HCB and B(a)P from sources resulting from human activity in the Great Lakes Basin, consistent with the 1994 COA [1988 base year].

U.S. Challenge: Seek, by 2006, reductions in releases that are within, or have the potential to enter the Great Lakes Basin, of HCB and B(a)P from sources resulting from human activity [no base year].

Since there was no challenge target specified for the U.S., any reductions made for these substances can be considered a "success." The U.S. reports that it has achieved a 71 percent reduction in releases of HCB between 1990 and 1997. One could argue that significant reductions were made before the Strategy was signed in 1997 since there are no quantities for HCB releases that have been reported more recently.

The most recent BTS progress report states that B(a)P has been reduced by 65 percent from coke ovens between 1988 and 2000. However, there is no baseline information nor quantities given that would make the reporting for this sector more transparent. Moreover, there is no information on other release reductions from other B(a)P sources, such as petroleum refining or residential wood combustion.

Canada has not met the 90 percent reduction challenge target for either HCB or B(a)P. Releases of HCB were reduced by 67 percent between 1988 and 2000 while B(a)P releases were reduced by 44 percent during the same time frame.

There is a considerable challenge in achieving further reductions of B(a)P because the workgroup needs to deal with area sources, such as residential wood-burning, wildfires, open trash burning, and residential coal and oil combustion. These sources are not monitored like point sources are. Moreover, changes in individual, rather than industrial, behaviour are required to achieve reductions in B(a)P for these sources. This will require innovative approaches, including education, incentives, and voluntary actions, some of which have been initiated recently.

The workgroup has identified many information gaps that need to be filled in order to effectively reduce B(a)P releases. For example, there is still considerable uncertainty in emissions estimates for B(a)P due to a lack of reliable emission factors for many sectors. Also, comprehensive stack and fugitive emissions testing combined with environmental monitoring is required. The workgroup also recognizes that sources and magnitudes of long-range transport need to be assessed through monitoring and modeling.

Although decreasing trends have been demonstrated for HCB levels in environmental media of the Great Lakes over the last 10-20 years, the region remains an area of particularly high contamination for fish and wildlife. Although HCB-contaminated sediment is known to exist at a number of hot spots within the lakes or tributaries, the amount of HCB in these sediments and how much is being released to each of the lakes is not known. The workgroup has identified that more research on long-range-transport modeling of HCB is required to gain a better understanding of this loading pathway.

In terms of information gaps for sources, Environment Canada notes that due to limited data from all sectors considered in the inventory, there is considerable uncertainty in the numbers. Numerous sectors have been designated as unlikely HCB sources. Thus, additional information is needed to improve the inventory.

The Strategy's main value, in this regard, has been in gathering and sharing information on the sources of B(a)P and HCB. Traditionally, B(a)P and HCB have not been monitored, so there was not much information available. For instance, since B(a)P occurs in a mixture of other PAHs, monitoring and reduction efforts are typically aimed at a broader group of PAHs. However, there are currently efforts to fill some of these information gaps. For example, Canada's National Pollutant Release Inventory (NPRI) has been revised to include HCB and B(a)P release reports, beginning in June 2001. Moreover, voluntary stack testing of two facilities (base-metal smelter and hospital incinerator) was initiated and set to be completed in spring 2001. Other examples of significant initiatives to gather and share information include sources that release HCB, B(a)P, and dioxins / furans. For example, the wood-stove changeout program has targeted citizens and encouraged them to replace their more polluting wood stoves with newer, less polluting ones. Moreover, the dioxin / furan workgroup has formed an open barrel / backyard burning subgroup to deal with this source of B(a)P, HCB, and dioxin / furan emissions.

Recommendation 34: *The challenge for achieving further reductions of B(a)P is to deal with area sources, such as residential wood-burning, wildfires, open trash burning, and residential coal and oil combustion. More effort is required to engage the public to change their behaviours so that reductions in releases can be achieved. The workgroup should engage partners such as states / provinces, municipalities, environmental organizations, companies, and other local organizations to educate the public on these sources of pollution.*

Recommendation 35: *The woodstove changeout program should be expanded to all of the Great Lakes states and Ontario. The HCB / B(a)P and dioxin /*

furan workgroups should collaborate on this initiative and should also engage local partners (states / provinces, municipalities, environmental organizations, companies, etc.) to assist in implementing these changeouts.

Recommendation 36: *The long-range transport of HCB is a significant issue and the workgroup has identified that more research on long-range-transport modeling of HCB is required to gain a better understanding of this loading pathway. The Parties should research, monitor, and develop models to better understand this loading pathway.*

Recommendation 37: *In future incarnations of the Strategy, there should be numerical challenge targets for HCB / B(a)P for the United States.*

Octachlorostyrene

Canada Challenge: Report by 1997, that there is no longer use, generation or release from Ontario sources that enter the Great Lakes of five bioaccumulative pesticides (chlordane, aldrin / dieldrin, DDT, mirex, and toxaphene), and of the industrial byproduct / contaminant octachlorostyrene. If ongoing, long-range sources of these substances from outside of Canada are confirmed, work within international frameworks to reduce or phase out releases of these substances [no base year].

U.S. Challenge: Confirm by 1998 that there is no longer use or release from sources that enter the Great Lakes Basin of five bioaccumulative pesticides (chlordane, aldrin / dieldrin, DDT, mirex, and toxaphene), and of the industrial byproduct / contaminant octachlorostyrene. If ongoing, long-range sources of these substances from outside of the U.S. are confirmed, work within international frameworks to reduce or phase out releases of these substances [no base year].

It is unclear whether the BTS challenge has been met since there are few or no source data on OCS because neither Canada nor the U.S. test for OCS in their air emissions testing. Nonetheless, there is a wealth of environmental monitoring data for OCS, which shows a massive temporal decline of the substance. The main pathway for OCS appears to be through local dispersion. Environmental data tend to suggest that local sources are gone.

It does not appear that the BTS had any effect on the reductions in environmental levels of OCS. However, the BTS may have assisted in keeping pressure on the U.S. and Canada to examine possible sources and to confirm monitoring data. Some claim that the Strategy brought attention to octachlorostyrene, which may not have occurred otherwise.

There are still information gaps that need to be filled to determine whether any sources of OCS can be found. For example, OCS was added to the U.S. EPA Toxics Release Inventory with a reporting threshold of 10 pounds per year and became effective January 1, 2001. The workgroup has made recommendations for improving the emissions inventory.

Recommendation 38: *There are still information gaps that need to be filled to determine whether any sources of OCS can be found. The workgroup has made recommendations to improve the emissions inventory. Additional work confirming source releases should be conducted in partnership with the B(a) P / HCB workgroup, considering that sources also need to be confirmed for these substances and that OCS and HCB are thought to be formed under similar conditions.*

Dioxins / Furans

Canada Challenge: Seek by 2000, a 90 percent reduction in releases of dioxins and furans from sources resulting from human activity in the Great Lakes Basin, consistent with the 1994 COA. Actions will focus on the 2,3,7,8 substitute cogeners of dioxins and furans in a manner consistent with the TSMP [Toxic Substances Management Plan] [1988 base year].

U.S. Challenge: Seek by 2006, a 75 percent reduction in total releases of dioxins and furans (2,3,7,8-TCDD toxicity equivalents) from sources resulting from human activity. This challenge will apply to the aggregate of releases to the air nationwide and of releases to the water within the Great Lakes Basin [1987 base year].

Although Canada has not met the 90 percent reduction challenge for dioxins / furans, it has made good progress toward this goal, having achieved a 72.8 percent reduction between 1988 and 2000.

The workgroups claims that the U.S. is "clearly on track" to meeting its Strategy challenge to reduce dioxins / furans. [(5)] However, until the Dioxin Reassessment Report has been finalized, there is not enough information to determine whether the U.S. has met its 75 percent reduction challenge.

The workgroup has also identified the need for additional information for several targeted sectors, including waste incineration, backyard trash / open barrel burning, residential wood combustion, PCP-treated wood, steel electric arc furnance (EAF), secondary copper smelting, and landfill fires. "In certain cases (i.e. steel manufacturing, secondary copper smelting, and landfill fires), these information gaps precluded the assignment of a GLBTS priority level to a given sector. Therefore addressing these information needs will be a key focus of the dioxin workgroup." [(6)] U.S. EPA has also identified that it does not have good quantitative information on the overall relationship between reservoir [(7)]

and contemporary sources. Recent research suggests that reservoir sources are likely to be an important contributor to dioxin / furan levels in the environment, with sediments serving as a primary reservoir source.

The dioxins / furans workgroup prioritized sectors through a decision-tree process, which will assist the workgroup in focusing their efforts on four main sectors rather than a dozen or more.

As mentioned under the HCB / B(a)P workgroup findings, the Strategy has made a significant contribution to gathering and sharing information on open barrel / backyard burning as a major source of dioxins / furans and several other Level I substances.

Recommendation 39: *Workgroup members need to gather more information on sources of dioxin / furan releases so that priority levels can be assigned to the remaining potential sources.*

Recommendation 40: *The workgroup, in cooperation with the HCB / B(a)P workgroup, needs to engage the public to educate them on their impact in producing releases of Level I substances through their personal behaviour. This should be done through local partnerships with state / provincial governments, municipalities, business, environmental groups, and other local organizations.*

PCBs

Canada Challenge: Seek by 2000, a 90 percent reduction of high-level PCBs (>1 percent PCBs) that were once, or are currently, in service and accelerate destruction of stored high-level PCB wastes which have the potential to enter the Great Lakes Basin, consistent with the 1994 COA [1988 base year].

U.S. Challenge: Seek by 2006, a 90 percent reduction nationally of high-level PCBs (>500 ppm) used in electrical equipment. Ensure that all PCBs retired from use are properly managed and disposed of to prevent accidental releases within or to the Great Lakes Basin [1994 base year].

Canada has not met its 90 percent reduction challenge for high-level PCBs. The most recent BTS progress report claims that Canada has achieved a 70 percent reduction of high-level PCB wastes and approximately a 25 percent reduction of low-level PCB wastes. However, this reduction achievement is suspect since there are no quantitative data to support it. The 1988 baseline quantity is unknown and there are no recent measure quantities of PCBs. The only year that quantities are reported is for 1994.

The United States appears to have made excellent progress toward meeting its 90 percent reduction challenge for high-level PCBs by 2006. As of 1998, there were 20,700 transformers compared to 200,000 transformers in 1994, which is nearly a 90 percent reduction. One might argue that the Strategy challenge for PCBs was already met at the time of the signing in 1997.

The Strategy has helped to maintain a focus on PCB reduction efforts. For example, the U.S. "Big Three" automobile manufacturers committed to achieve a 100 percent removal of their PCB transformers, in response to PCB commitment letters mailed out by the workgroup in 1999.

Recommendation 41: *The PCB workgroup should continue to engage companies to educate them about PCB-containing electrical equipment and to also educate smaller companies about potential PCB-containing products.*

Recommendation 42: *Since a major source of PCBs is environmental cycling of PCBs previously introduced into the environment, the workgroup should consider focusing its efforts on engaging and working with partners to clean up contaminated land and sediment. The PCB workgroup may wish to consider working together with the pesticides workgroup on this matter.*

Recommendation 43: *Canada needs to provide an update of its base year quantities for PCBs, so that the reduction achievements can be substantiated.*

Mercury

Canada Challenge: Seek by 2000, a 90 percent reduction in the release of mercury, or where warranted the use of mercury, from polluting sources resulting from human activity in the Great Lakes Basin. This target is considered as an interim reduction target and, in consultation with stakeholders in the Great Lakes Basin, will be revised if warranted, following completion of the 1997 COA review of mercury use, generation, and release from Ontario sources [1988 base year].

U.S. Challenge: Seek by 2006, a 50 percent reduction nationally in the deliberate use of mercury [1995 base year] and a 50 percent reduction in the release of mercury from sources resulting from human activity [1990 base year]. The release challenge will apply to the aggregate of releases to the air nationwide and of releases to the water within the Great Lakes Basin. This challenge is considered an interim reduction target and, in consultation with stakeholders, will be revised if warranted, following completion of the Mercury Study Report to Congress.

Canada appears to have made good progress in reducing mercury emissions, based on quantitative information. Although the Strategy's challenge is to reduce mercury releases by 90 percent between 1988 and 2000, Canada has achieved a 77.5 percent reduction over that period.

The United States appears to have made some progress in meeting its 50 percent reduction target in the use and release of mercury. However, more effort is needed to reduce the use of mercury. Between 1990 and 1995, there was nearly a 25 percent reduction in national mercury emissions and an 18.6 percent reduction in mercury use between 1995 and 1999.

The workgroup has identified several information gaps that need to be filled. For example, emissions estimates are needed for wood and wood-waste combustion; mobile sources; landfilled products containing mercury; and demolition debris.

The Strategy has assisted in reducing mercury releases through the development of several initiatives. For example, the BTS has either driven or served to support programs to remove mercury in school labs; mercury pollution prevention efforts in the steel industry; the mercury manometer exchange program; initiatives targeting mercury switches in cars; and the chlor-alkali industry agreement.

There are several examples of "pilot projects" that have been replicated in another jurisdiction or expanded to a larger region, including the mercury pollution prevention agreement involving three Indiana steel mills; the health care without harm initiative; the mercury thermometer exchange program; and the clean car campaign.

The Strategy's most significant contribution to any of the Level I substances is through the mercury workgroup. As mentioned earlier, the Strategy has provided both an indirect and direct impact on state / provincial initiatives and programs. The Strategy is often as an additional reason to compel sources / sectors to reduce the use and release of mercury.

Recommendation 44: *The mercury workgroup needs to take more effort to reduce the use of mercury in products. The workgroup needs to engage the sectors that use mercury in their products and find ways to reduce its use. Canada should consider expanding its mercury challenge to include uses of mercury.*

Recommendation 45: *The mercury workgroup needs to engage sources of mercury emissions in order to reduce releases of mercury, particularly from large sources. The Step 3 report identified many options for undertaking emissions reduction initiatives. It is particularly important to reduce emissions of mercury since many fish consumption advisories are due to mercury contamination, not only in the Great Lakes but also in inland lakes.*

IV. Consolidated Recommendations

1. What the BTS Is and What It Should Be

Recommendation 1: *The Strategy participants have spent most of their time and effort gathering information and assessing options to further reduce releases of Level I substances. It is important for the Strategy to shift toward taking greater action now that the information has been gathered. The workgroups should engage stakeholders and partners in the development and implementation of initiatives, many of which were identified as options in the Step 3 reports.*

2. Participation in the Strategy

Recommendation 2: *The workgroups need to build on the example / strength of the mercury workgroup in engaging the states / provinces in discussions, which have led states / provinces to develop initiatives to reduce Level I substances through the replication of initiatives begun in other jurisdictions.*

Recommendation 3: *The Strategy achieved a great deal of success through collaboration of partners to gather information and understanding on Level I substances and their sources. Strategy participants should build on these successful partnerships and further engage federal, state / provincial, and local government agencies and departments; smaller companies; users of mercury; and other organizations.*

Recommendation 4: *The Integration Group and / or workgroups should develop strategies for engaging smaller companies in efforts to reduce the release of Level I substances. One option might be to engage smaller companies through supply-chain management initiatives led by larger companies to which they supply services and goods. Another option might be to develop supplier outreach programs, in partnership with large companies and state / provincial and municipal governments.*

Recommendation 5: *The public was identified as a group that needs to be engaged to understand their role in producing toxic substances. In particular, the HCB / B(a)P and dioxin / furan workgroups should engage the public, through education campaigns and other initiatives, to educate them about their role in potentially releasing Level I substances. Another option might be to develop a communications strategy to improve public awareness, which could be delivered through partnerships with local municipal and environmental organizations.*

Recommendation 6: *Environmental organizations and state / provincial governments should be involved in the substance-specific workgroups. This participation would allow environmental organizations and state / provincial agencies to become aware of, develop, and / or participate in pilot projects to reduce Strategy substances. Moreover, environmental groups could utilize their grass-roots linkages to mobilize local efforts as well as educational campaigns. One option would be for the Parties to provide grant money for travel so that a representative from each Great Lake state / Ontario can attend one substance-specific meeting per year. Environmental organizations should also have the opportunity to apply for grant money to travel to substance-specific workgroups. Another option would be for the Integration Group and workgroups to consider having rotating meetings in the Great Lakes states / Ontario so that less travel is incurred by organizations not based near Chicago, Detroit, or Toronto.*

Recommendation 7: *Environmental organizations and states / provinces are keen to develop initiatives and pilot projects that demonstrate different ways of reducing Level I releases into the environment. Their ideas and suggestions on the development of new initiatives to reduce toxic releases and their suggestions on how to improve or expand projects would be very useful. The Parties should encourage these organizations to engage sources of Level I releases and to develop initiatives that support the goals of the Strategy. One option might be for the Parties to provide grants to fund these types of initiatives. In return, the environmental organizations and state / provincial governments would document the progress made, the hurdles encountered and how they were overcome, the lessons learned, etc., which would be shared with the members of the workgroups.*

Recommendation 8: *The Strategy participants should enter into discussions with Tribal and First Nations organizations to discuss ways in which they could participate in Strategy goals. One option might be to work in partnership with them to develop initiatives that could be delivered by the tribal / First Nations groups directly.*

Recommendation 9: *Workgroups should develop ways to share and coordinate efforts to reduce toxic substances with participants in the LaMP and RAP processes.*

3. Progress Toward Meeting Challenges

Recommendation 10: *All of the substance-specific workgroups have identified the atmosphere as the most significant pathway for Level I substance loadings to the Great Lakes. Building on this strong base, the Parties should continue in their efforts to work within hemispheric and international frameworks to push for the global reduction of Level I emissions.*

Recommendation 11: *Contaminated sediment leads to the uptake of some Level I substances - in particular, mercury, PCBs, and pesticides -- by fish, wildlife and, ultimately, humans. Since the Parties made a commitment under the Strategy to meet the challenge to remediate priority sites with contaminated bottom sediments, the Strategy participants need to address this challenge. The Parties should appoint a task group, or ask the Integration Group, to discuss practical ways that the Strategy could assist in meeting this challenge. This may involve coordinating efforts with other federal departments that are responsible for cleaning up contaminated sites or with Remedial Action Plans.*

Recommendation 12: *Additional effort is required to clean up contaminated sites, which is also a dominant exposure pathway for fish, wildlife, and humans. In the future, the Parties should make the challenge for contaminated sediment clearer, with specific time frames and reduction targets, so that a clear goal and direction is provided to Strategy participants. The Parties may also wish to consider the appropriate venue for remediation actions to occur, whether it is the BTS, the RAPs, or the directly responsible federal organizations.*

Recommendation 13: *The workgroups should continue to focus on pollution prevention opportunities for reducing the release of Level I substances. Where Level I substances are still being used, additional effort is needed to engage companies to use alternative, non-Level I substances in their products.*

4. BTS Drives / Assists other Toxics Reduction Initiatives

Recommendation 14: *As Level I substances, such as pesticides, PCBs, and mercury, are collected or taken out of products, the storage and / or destruction of these substances will need to be considered. Pollution prevention is the main focus for reducing the release of Level I substances, but for substances that have a long history of use - or cannot be destroyed, like mercury - the issue is becoming one of how to safely store or dispose of these highly toxic, bioaccumulative, and persistent substances. The Strategy may be able to provide some leadership in this regard, based on its success in collaborating on research and information sharing. One option may be to set up a task group made up of members of the mercury, PCBs, and pesticides workgroups, among others, to consider this emerging issue.*

5. The Workgroups

Recommendation 15: *For the alkyl-lead and OCS workgroups, the Parties should determine what more can be done in each of these workgroups and whether the time has come to suspend these workgroups temporarily until there has been greater technological progress or more data available on other potential sources for these substances.*

Recommendation 16: *The Integration Group should, in consultation with the workgroups, consider developing sector-based initiatives that could potentially target more than one Level I substance. One option might be for each of the workgroups to provide the Integration Group with a list of their priority sources (e.g. top three or top five sources). The Integration Group could examine these lists and look for potential cross-cutting sectors for Level I substances. Out of this examination, the Integration Group could engage stakeholders to potentially develop sector-based reduction programs.*

Recommendation 17: *The roles and responsibilities of the Integration Group need to be defined. It appears that, to some extent, the Group is attempting to be all things to all people participating in the meetings, which may be one reason why attendance, by some stakeholder groups, may be diminishing. A temporary task group / committee should be set up to formally confirm or enhance the Group's roles and responsibilities (i.e. terms of reference). The task group should be made up of individuals from all stakeholder groups and should also include persons that participate outside of the Integration Group. Moreover, the participants in the substance-specific workgroups should be consulted about what they need from the Integration Group to help support them in their work.*

Information Gathering

Recommendation 18: *The workgroups should prioritize the options for filling in information gaps. The workgroups should also develop a strategy for filling those gaps, in collaboration with relevant partners, such as government scientific research and monitoring organizations, states / provinces, and industry.*

Pathways and Sources

Recommendation 19: *The BTS should play a role in recommending areas that the Parties can focus on to learn about the dominant pathways for substances entering the lakes. The role of atmospheric pathways appears to be a more significant contributor to loadings in the Great Lakes than previously thought. Although efforts must continue to focus on sources within the basin, the Parties should also consider additional efforts to control out-of-basin sources of atmospheric deposition of Level I substances in the Great Lakes.*

6. The Four Step Process

Recommendation 20: *The lack of a report identifying Canadian options for reducing Level I substances suggests, rightly or wrongly, that the Canadian government has not identified cost effective options to further reduce Level I substances. The Canadian government should ensure that information about Ontario is included in the Step 3 reports or that a Canadian Step 3 report is made publicly available on the BTS web site.*

7. Voluntary Nature of the Strategy

Recommendation 21: *Voluntary initiatives play an important role in giving industry the opportunity to reduce its releases of contaminants in a flexible and cost-effective way. Although industry is voluntarily participating in these non-regulatory initiatives with good will, there needs to be a mechanism for altering the initiative if release reductions are no longer being achieved. A committee of representatives, perhaps the Integration Group, should make recommendations to the Parties when a voluntary initiative is no longer making progress (e.g. need to engage more companies; "low-hanging fruit" has been picked; scope of the project needs to be expanded from one region to a larger geographical area; etc.). The committee could recommend that the Parties take specific actions; estimate additional resources (financial and staff) that may be required; the anticipated reduction results based on successes already achieved; and the proposed partners who would take part in the expanded project (state, province, industry, environmental organizations, etc.) and their respective roles and responsibilities.*

8. Government Support for the Binational Toxics Strategy

Recommendation 22: *The Strategy's profile needs to be increased among officials within EC and EPA headquarters, so that the required resources and commitment to undertake work to support the goals of the Strategy are obtained. The Integration Group, in cooperation with workgroup participants, should develop a strategy for sharing the successes of the Strategy with the Parties.*

9. The Need to Take Action

Recommendation 23: *The workgroups need to explore and develop innovative initiatives, such as economic incentives, product take-back or extended producer responsibility initiatives, and other projects that could persuade the public, smaller companies, and other sources to change their behaviour and thus reduce releases of Level I substances.*

Recommendation 24: *The workgroups should consider developing an accountability framework, considering the number and variety of stakeholders, including different levels of government and varied government offices and agencies as well as industry, environmental organizations, and other stakeholders. An accountability framework would clearly define and describe participants' roles and responsibilities as well as their mutual obligations; set out clear expectations for the objectives of the workgroup; establish credible reporting and agree upon performance expectations; establish a reasonable*

review and adjustment process, focusing on improving performance through supportive assessment and feedback; and demonstrate to others the level of performance achieved.

10. Poor Information Management and Availability

Recommendation 25: *The workgroups should better explain how the top sources for their respective substances were identified, including the documents to which they referred the inventory used to derive their baseline estimates (and their hyperlinks).*

Recommendation 26: *The Strategy's web site needs to be regularly updated. The site needs to include the most recent workgroup documents, reports, and updates. At a minimum, hyperlinks to Canadian information and reports should be provided on the web site. In addition, the source inventories used by each of the workgroups for their respective substance(s) should be hyperlinked on the web site.*

Recommendation 27: *The Strategy's main strength is its collaborative approach to sharing information and discussing issues with other participants involved in reducing Level I substances. Strategy participants should consider setting up an Internet discussion forum (real-time) or newsgroup (Internet bulletin board) so that information can be exchanged easily between participants. This type of information exchange may already be occurring in related areas, which participants may wish to tap in to.*

Recommendation 28: *Canada should make efforts to ensure that Ontario information is reflected in workgroup step reports.*

11. Poor Reporting in BTS Progress Reports

Recommendation 29: *The annual performance reports on the Strategy's progress need significant improvement. For example, quantities for the base year and most recent year should be provided along with statements of reduction achievements. Moreover, Canada's continued progress toward meeting the challenges should be included in reports (even though the Canadian target year has passed).*

12. Substance-Specific Findings

Pesticides

Recommendation 30: *There appears to be a need for the Parties to determine what issues the workgroup should focus on now that the Strategy challenges have been met. Although environmental concentrations of Level I pesticides have been generally declining for the past 20 years, concerns remain because the substances persist and bioaccumulate in fish and wildlife. Some options to consider include focusing on understanding why environmental levels of toxaphene do not seem to be decreasing and focusing on Level II pesticides.*

Recommendation 31: *The Parties should encourage Great Lakes states / Ontario to continue conducting "clean sweeps" to remove stock piles of Level I pesticides.*

Recommendation 32: *TGA agrees with U.S. EPA that monitoring of various media is an activity that should continue in order to track the progress of Level I pesticides. In addition, more effort should be taken to address the possible releases from contaminated sites. Working with partners to clean up contaminated sites may be one option that the Parties need to consider implementing.*

Alkyl-lead

Recommendation 33: *The Strategy has identified data gaps that need to be filled for alkyl-lead. After additional information has been collected, more effort may be needed to deal with the non-automotive sources of alkyl-lead.*

Benzo(a)pyrene / Hexachlorobenzene

Recommendation 34: *The challenge for achieving further reductions of B(a)P is to deal with area sources, such as residential wood-burning, wildfires, open trash burning, and residential coal and oil combustion. More effort is required to engage the public to change their behaviours so that reductions in releases can be achieved. The workgroup should engage partners such as states / provinces, municipalities, environmental organizations, companies, and other local organizations to educate the public on these sources of pollution.*

Recommendation 35: *The woodstove changeout program should be expanded to all of the Great Lakes states and Ontario. The HCB / B(a)P and dioxin / furan workgroups should collaborate on this initiative and should also engage local partners (states / provinces, municipalities, environmental organizations, companies, etc.) to assist in implementing these changeouts.*

Recommendation 36: *The long-range transport of HCB is a significant issue and the workgroup has identified that more research on long-range-transport modeling of HCB is required to gain a better understanding of this loading pathway. The Parties should research, monitor, and develop models to better understand this loading pathway.*

Recommendation 37: *In future incarnations of the Strategy, there should be numerical challenge targets for HCB / B(a)P for the United States.*

Octachlorostyrene

Recommendation 38: *There are still information gaps that need to be filled to determine whether any sources of OCS can be found. The workgroup has made recommendations to improve the emissions inventory. Additional work confirming source releases should be conducted in partnership with the B(a) P / HCB workgroup, considering that sources also need to be confirmed for*

these substances and that OCS and HCB are thought to be formed under similar conditions.

Dioxins / Furans

Recommendation 39: *Workgroup members need to gather more information on sources of dioxin / furan releases so that priority levels can be assigned to the remaining potential sources.*

Recommendation 40: *The workgroup, in cooperation with the HCB / B(a)P workgroup, needs to engage the public to educate them on their impact in producing releases of Level I substances through their personal behaviour. This should be done through local partnerships with state / provincial governments, municipalities, business, environmental groups, and other local organizations.*

PCBs

Recommendation 41: *The PCB workgroup should continue to engage companies to educate them about PCB-containing electrical equipment and to also educate smaller companies about potential PCB-containing products.*

Recommendation 42: *Since a major source of PCBs is environmental cycling of PCBs previously introduced into the environment, the workgroup should consider focusing its efforts on engaging and working with partners to clean up contaminated land and sediment. The PCB workgroup may wish to consider working together with the pesticides workgroup on this matter.*

Recommendation 43: *Canada needs to provide an update of its base year quantities for PCBs, so that the reduction achievements can be substantiated.*

Mercury

Recommendation 44: *The mercury workgroup needs to take more effort to reduce the use of mercury in products. The workgroup needs to engage the sectors that use mercury in their products and find ways to reduce its use. Canada should consider expanding its mercury challenge to include uses of mercury.*

Recommendation 45: *The mercury workgroup needs to engage sources of mercury emissions in order to reduce releases of mercury, particularly from large sources. The Step 3 report identified many options for undertaking emissions reduction initiatives. It is particularly important to reduce emissions of mercury since many fish consumption advisories are due to mercury contamination, not only in the Great Lakes but also in inland lakes.*

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1. The partners include other federal departments and agencies, Great Lakes states, the Province of Ontario, and Tribes and First Nations.

2. Benzo(a)pyrene and hexachlorobenzene have been included in one workgroup.

3. Office of the Auditor General of Canada, *Elements of Effective Accountability Arrangements* , Ottawa, 1996.

4. Environment Canada, *Canada-Ontario Agreement Objective 2.1: Priority Pesticides. Confirmation of No Production, Use, or Import in the Commercial Sector in Ontario* , October 1996.

5. *Great Lakes Binational Toxics Strategy: PCDD (Dioxins) and PCDF (Furans): Sources and Regulations* , May 26, 2000.

6. Ibid., p. 34.

7. A reservoir source is one in which previously formed PCDDs and PCDFs may have the potential for redistribution and circulation into the wider environment. Potential reservoirs include soils, sediments, biota, water and some anthropogenic materials. Reservoir sources are not included in the quantitative inventory of contemporary sources because they do not involve original releases but, rather, the recirculation of past releases. While the potential exposure pathways and the resulting environmental significance of reservoir sources are uncertain, they can pose an ongoing risk to the environment and to human health.

Part II

Quantitative Report -- "Context Document"

Section 1. Context Document and Analysis of Information

I. Background

As an initial phase of our review of the Binational Toxics Strategy, TGA conducted a comprehensive review of a large number documents and reports in an effort to determine the estimated quantities of contaminant loadings to the Great Lakes via various pathways (water, air, sediment, etc.) as well as estimated release inventories of sources within and outside the Great Lakes basin. This "context document" was undertaken to determine whether there is sufficient quantitative information available for evaluating progress in achieving the reduction targets for each Level I substance. Another reason for the context document was to identify any information gaps and determine whether measures had been taken to fill them, which also assisted us in evaluating Step 1 of the Strategy's four-step process.

The other three steps of the four-step process were evaluated based on the document review and the evaluation is largely based on compliance. For example, was an analysis of current regulations, initiatives and programs that manage or control substances conducted by the workgroup (Step 2)? The review was not able to evaluate whether the right choices were made by workgroup members for any of the steps in the Strategy's process since a file review was not conducted and the interview questions (see Part III) did not cover this aspect.

Part II organizes results that these various documents have provided. It is meant to provide a summary of the strengths and gaps in quantitative information on Level I substances.

II. Methodology

TGA contacted the co-chairs of each BTS substance-specific workgroup, requesting documentation that would help to identify quantitative data respecting (1) the loading levels of their respective substance(s) in each of the Great Lakes; (2) the sources (e.g. industrial) of the substance(s); and (3) the major pathway (air, water, etc.) of the substance(s) into the Great Lakes. In addition, the IJC provided TGA with relevant publications to assist us in the preparation of the context piece. Thompson Gow & Associates reviewed over 70 documents in the preparation of this report (see Appendix B).

Following TGA's submission of a draft report to the IJC's Progress Review Work Group in mid-March 2001, the U.S. and Canadian co-chairs of the substance-specific workgroups were again contacted to provide comments regarding the sections and tables, concerning their specific substance. Valuable feedback on the substances was provided by these co-chairs, who were able to clarify, and in some cases amend, information that had been reported about the sources and pathways of their respective substance(s).

In cases where the baseline data were not available through our review of documents, TGA also requested that the co-chairs of the substance-specific workgroup provide baseline information (quantities and years) on their respective substance(s).

III. Findings / Observations

1. Categorizing Workgroup Activity

The substance-specific workgroups have varying levels of activity and have been focused on different efforts. The level of activity and area of focus of the workgroups can be categorized in one of three ways: (1) workgroups that have been actively engaged in information gathering and developing inventories of sources; (2) workgroups that have been taking action and developing initiatives because more is understood about the substance and there are opportunities to further reduce; and (3) workgroups that have taken little action because there is already a good understanding of the sources of the substance, temporal trends have shown declining quantities in the environment, and there are few, if any, opportunities to reduce releases of the substance further.

1. Workgroups that have been actively engaged in information gathering and developing inventories of sources

The workgroups for dioxins / furans, hexachlorobenzene / benzo(a)pyrene, and OCS (somewhat) appear to fit under this category. All of these workgroups have been active in identifying, reviewing and developing inventories of sources releasing their particular substance(s). The dioxins / furans workgroup

has been unique from the other workgroups in that there are a multitude of sources in various sectors - including societal behaviours - that produce the substances. The workgroup has been active in identifying the estimates of releases for these vast sources and has also developed a decision-tree process to prioritize the sources that the workgroup should do further work on. The HCB / B(a)P workgroup has also been active in identifying sources of releases, particularly for B(a)P, since there is limited monitoring / stack testing of the substance. The OCS workgroup has undertaken activities that fall under both category 1 and category 3 (and is discussed further in category 3). The workgroups for HCB / B(a)P and dioxins / furans have cross-cutting issues that need further investigation, such as potentially similar sources, which either requires coordination between the two workgroups or consolidation of the workgroups into one (see Appendix C).

2. Workgroups that have been taking action and developing initiatives because more is understood about the substance and there are further opportunities to reduce

The workgroups for mercury, PCBs, and pesticides appear to fit under this category. For Level I pesticides, although it has been concluded that virtual elimination has nearly been achieved for sources within the basin, there is evidence that more needs to be done outside of the basin. All three substances have shown temporal, environmental declines and there exist opportunities to reduce them. Although the use of PCBs and pesticides has been either banned or severely restricted, opportunities exist to remove them through "clean sweeps" (pesticides) or retirement of PCB capacitors / transformers, etc., so that these sources of potential releases are reduced. Unlike PCBs and pesticides, mercury is still commonly used in products and is released from many industry sectors, so there are even more opportunities to reduce this substance than the others.

3. Workgroups that have taken little action because there is already a good understanding of the sources of the substance, temporal trends have shown declining quantities in the environment, and there are few, if any, opportunities to reduce releases further.

The workgroups for alkyl-lead and OCS (somewhat) appear to fit under this category. It has been concluded that octachlorostyrene (OCS) releases have been virtually eliminated from entering the Great Lakes. Alkyl-lead was phased out of automotive gasoline [in the 1970s / 1980s] and the remaining primary source, airplane gasoline, has no alternative for airplanes to use. Both substances have shown temporal, environmental declines and there are few, if any, opportunities to further reduce the substances, with the exception of global efforts.

The OCS workgroup has undertaken activities that fall under both category 1 and category 3. The workgroup has focused on reviewing industry sectors that might be potential sources of OCS. For the two sources that have been identified, electrolytic magnesium factories (one facility in Utah), which generate OCS, HCB, PCBs, and dioxins / furans, and the production of

titanium (Nevada and Oregon), the workgroup is proposing the development of best management practices for those sectors.

2. Gathering Information

It appears that workgroups have undertaken significant work to identify the main pathways and sources of their respective Level I substances. Although there are information gaps for some pathways and media, it appears that workgroups have taken measures to identify these information gaps and to recommend ways to fill them. It is important to note that the Parties are responsible for identifying priorities for their various environmental monitoring programs; the BTS has neither the budget nor the staff resources to undertake this type of activity and can only recommend areas that need further investigation. Gathering additional data on the various pathways that substances follow to enter the lakes can help the Parties in setting national priorities as well as in international negotiations - particularly for long-range transport of air pollutants from global sources.

The workgroups have also made progress in identifying the main sources of their respective substances and there exist estimated quantities for most sources. There also appears to be ongoing and new initiatives to fill in some of the gaps that exist for quantifying the releases of substances from various sources. The inventories are not perfect, but there appears to have been a great deal of effort spent in seeking quality information, which will lead the workgroups to target the largest sources and develop initiatives to manage releases from these sources.

The first four years of the BTS has been marked by reviewing and gathering information by the workgroups. Although some participants may feel that this activity has been long and drawn-out, most workgroups appear to be at a stage where initiatives can be developed to take further action on Level I substances. The challenge for many workgroups will be to maintain the momentum from the stage of information gathering to the stage of implementing projects. For the alkyl-lead and OCS workgroups, the Integration Group should determine what more can be done in each of these workgroups and whether the time has come to temporarily suspend these workgroups until there has been greater technological progress or more data on possible sources for these substances. For the pesticides workgroup, there also appears to be a need for the Integration Group to determine what issues the workgroup should focus on. The workgroup can continue to provide focus to Great Lakes states and Ontario, who continue to conduct "clean sweeps" to remove stock piles of Level I pesticides. The next phase for the pesticide workgroup may be to focus on understanding why environmental levels of toxaphene do not seem to be decreasing as well as beginning to focus more on Level II pesticides.

3. Information Management and Availability

There is a significant problem with the Binational Toxics Strategy's main web site, which is seriously outdated and contains largely American data and information. For example, many of the workgroup web sites post reports on

the sources of releases of their respective substances, but it is primarily U.S. data that are presented. The substance co-chairs e-mailed TGA electronic reports containing Canadian data on sources; many of these reports are not available to the public. For example, neither of the reports [(1)] posted on the mercury workgroup web site contain any information on Ontario sources or reduction options. This is also the case for the web pages for the HCB / B(a)P, pesticide, and OCS workgroups. The alkyl-lead web page provides both Canadian and American reports on sources and options for reduction. The workgroup report for dioxins / furans is unique in that it provides both Ontario / Canadian and U.S. activities in the same document.

There were many inventories used by the workgroups to determine the sources and pathways of their respective substances. Inventories used include the *Great Lakes Regional Air Toxic Emissions Inventory Report* (1993), [(2)] the *1996 Inventory of Toxic Air Emissions* , [(3)] the Toxic Release Inventory (TRI), the National Toxics Inventory (NTI), the *Third Great Waters Report to Congress* (2000), each of the Lakewide Management Plan (LaMP) reports, etc. For example, the HCB / B(a)P workgroup uses the Great Lakes Toxics Inventory (1996) for B(a)P emissions sources; the 1996 NTI for HCB air emissions information; and the 1998 TRI data for sources of water releases. For pathways and loadings information to the lakes, the HCB / B(a)P workgroup uses IADN [(4)] information, and Cohen et al. 1995. [(5)] The problem is not that there are different or many inventory sources used for each of the substances but rather that it is not always clear, based on the challenge and step reports, which inventories are being used. Moreover, these inventories are not linked on the BTS web site. For example, Canada's *Inventory of Releases of PCDDs / PCDFs* is available at the Environment Canada web site but one would not know this if s/he were perusing the BTS web site. In some cases, if the inventory report's URL had not been e-mailed to us, we would not have been able to locate it.

If the public were to make any conclusions based on the BTS web site, they would likely think that the web site is either greatly out of date (between eight months and two years in some cases) or there has been little action taken by the workgroups, e.g. the latest *Binational Toxics Strategy Progress Report* (February 2001) refers to a revised version of the *Hexachlorobenzene (HCB): Sources and Regulations Report* , which was distributed to the workgroup in May 2000. However, this report is not available on the web site. Another example is the most recent report for OCS. TGA was provided with an electronic version of U.S. Environmental Protection Agency's *Great Lakes Binational Toxics Strategy Octachlorostyrene (OCS) Report, Stage 3* (September 21, 2000), which is also unavailable on the BTS web site. The most recent OCS document on the web site is dated December 22, 1998.

Not only are data out of date and hard to find, the division of Canadian and American reports seems opposed to the intent of the Binational Toxics Strategy. One of the main purposes of the BTS was for Canada and the United States to better coordinate their toxics initiatives in order to have a binational, rather than national or federal-state / provincial, effort. For example, there is

no information on the Canadian mercury sources and regulations in the Step 3 report, with limited information provided on the mercury workgroup web site (http://www.epa.gov/Region5/air/mercury/mercury.html). Most of the workgroup reports present either Canadian or American information but not for both countries in the same report, with the exception of the dioxin / furan workgroup.

4. Progress Reports

The Binational Toxics Strategy progress reports generally do a poor job of providing quantitative information regarding progress in meeting the BTS challenges. Although percentage reductions may be provided for some substances, the current year and baseline year quantities are not provided, which would assist readers in fully understanding the quantity reduction of these substances since the base year. For example, the 2001 BTS progress report claims that the U.S. is "on track" to meet its 75% reduction challenge for dioxins / furans based on the "1998 Draft Inventory." U.S. EPA's web site, "dioxin and related compounds" mentions three draft dioxin / furan inventories dated 1994, August 2000, and March 2001 but not one from 1998. Perhaps this 1998 document is not publicly available. Nonetheless, since there are no final data on the quantitative baseline for dioxins / furans, it is not apparent how the 2001 BTS progress report calculated the 75 percent reduction claim. [(6)] These examples of incomplete reporting in the progress report raise questions about the actual progress that has been made under the Strategy. It is not enough for the progress reports to give percentage reductions without providing evidence on how the percentage reduction was calculated.

Sometimes progress (percentage reductions) is given for one country but not for the other. For example, the most recent BTS progress report (February 2001) reports that there has been a 25% reduction between 1990 and 1995 of mercury emissions in the U.S. but does not provide any information on Canadian progress in meeting its challenge. Moreover, the majority of initiatives to reduce mercury that are reported in the progress report are American examples rather than Canadian ones, which suggests, rightly or wrongly, a possible lack of action by the Canadian government in reducing toxic substances.

Sometimes the progress report is not clear about how much progress has been made in reducing releases of some substances. For example, the 1999 BTS progress report reported that Canada had achieved a 61% reduction in HCB releases. Similarly, we calculated that there had been a 67% reduction in releases in HCB between 1988 and 2000, which is within the range reported in 1999. The 2001 BTS progress report states that the Canadian government has achieved a 60-90% reduction in HCB releases, which seems to be a rather large range considering the other two figures are in the 60-70% range. What does this range mean? Has there been a 90 percent reduction in HCB releases in certain sectors? Are there new data that are indicating there has been a huge reduction in the quantity of HCBs released in the last 2 years?

Although the Canadian challenges were to have been met by 2000, there is still more effort required. For example, Canada has achieved a 77% reduction in mercury emissions between 1988 and 2000, which is lower than its challenge target of 90% by 2000. In addition, the Canadian challenge of reducing dioxins / furans by 90% by 2000 has not yet been met; there has been a 73% reduction in dioxins / furans between 1988 and 2000. Although the challenges were not all met by Canada (the U.S. has until 2006 to meet its challenges), this does not mean that the BTS has failed. As our interviews with 25 key people reveal, the BTS has been positive in other qualitative measures (see Part III: Qualitative Report).

5. Progress Toward Meeting Challenges

The baseline data are unknown or incomplete for dioxins / furans and octachlorostyrene in the U.S. and for PCBs in Canada. The lack of estimated quantities for the base years of these Level I substances makes it difficult to evaluate the progress that has been made toward meeting the Strategy's challenges.

In general, the challenge year targets are 2000 for Canada and 2006 for the U.S. Thus, it is important to note that the U.S. still has five years to meet its challenges.

Canada and the U.S. have met the challenges for alkyl-lead and Level I pesticides; both countries have reported reductions in the emissions of alkyl-lead beyond those stated in their respective challenges. Also, both countries have confirmed that level I pesticides are no longer manufactured on used in their respective countries.

Canada has not met the challenge targets for B(a)P, HCB, mercury, dioxins / furans, and OCS. It is estimated that Canada has achieved a 44 percent decline in B(a)P emissions between 1988 and 2000 (90 percent target). For HCB, Canada has achieved a 67 percent reduction in HCB emissions over the same time period (90 percent target). It is estimated that there has been an 87 percent reduction in OCS emissions from 1988 to 2000.

Canada has made good progress in meeting its 90 percent challenge to reduce mercury emissions, achieving a 77.5 percent reduction between 1988 to 2000. This is also the case for dioxins / furans, where Canada has reduced dioxins / furans by 79.6 percent between 1988 and 2000 (90 percent target).

It is unknown whether Canada has met its PCB reduction challenge considering the baseline information for PCBs in 1988 is unknown.

The U.S. has made some progress is meeting its 50 percent reduction challenge in the use of mercury, achieving an 18.6 percent decrease in use between 1995 and 1999. The U.S. has also made some progress in meeting its challenge to reduce U.S. mercury emissions by 50 percent, achieving a 25 percent reduction between 1990 and 1994.

The U.S. appears to have made excellent progress toward meeting its 90 percent reduction target for PCBs; it has achieved a nearly 90 percent reduction in the number of PCB transformers between 1994 and 1998.

Reduction targets were not specified for B(a)P or HCB in the U.S. For B(a)P, it is not known what reductions have been achieved. According to TRI, there has been a 71 percent reduction in HCB releases between 1990 and 1997, which indicates good progress.

There is no baseline information for OCS for the U.S., so it is unclear what release reductions have occurred.

6. The Four-Step Process

It appears that almost all of the workgroups have partially or fully completed three of the Strategy's four steps, with few exceptions. All of the workgroups have gathered extensive information on the available inventories on sources and have analysed regulations and initiatives for each of the Level I substances. All of the workgroups identified information gaps. However, unlike the other workgroups, the PCBs and pesticides workgroups did not suggest options for filling these gaps.

The step three reports for HCB / B(a)P, PCBs, and mercury do not contain Canadian information, which may mean that step three reports have not been completed on the Canadian side. Only the alkyl-lead and pesticides workgroups have completed challenge reports, indicating that all of the Strategy steps have been completed and that their respective challenges have been met.

7. Pathways and Sources

The atmosphere appears to be the predominant pathway for all of the Level I substances entering the Great Lakes.

There are little or no data for groundwater or sediment loadings to the lakes for most Level I substances. Likewise, there is little or no information on the amount of Level I substances that may be entering the lakes through runoff or atmospheric cycling from contaminated soil. The workgroups have found that contaminated soil may serve as a source of pesticides, mercury, and PCBs into the atmosphere or may enter the lakes through runoff. The main pathways for PCB loadings to the Great Lakes are environmental sinks (contaminated sediment) and environmental cycling.

There are considerable uncertainties in emissions estimates for all sectors considered for B(a)P and HCB. Moreover, there is little or no source information for OCS. Further information is needed on the uses of Level I pesticides outside of the U.S. and Canada as well as the quantities of pesticides possibly stockpiled within the two countries. Almost all workgroups have identified further areas for undertaking research on possible or potential sources of their respective substances. For example, sources and magnitude of

long-range transport need to be assessed through monitoring and modeling for B(a)P.

There appears to have been little progress in achieving the challenge to complete or be well advanced in the remediation of priority sites with contaminated bottom sediments in the Great Lakes. None of the workgroup step reports mention remediation issues.

There appears to have been good progress in meeting the challenge to "assess atmospheric inputs of the Strategy substances to the Great Lakes" since all of the substance-specific workgroups have focused on atmospheric emissions in their step reports and have identified atmospheric transport as an area for further study.

Section 2. Context Document

I. BTS Challenges

The challenges for each of the Level I substances are presented in Table 1.

It is important to note that the U.S. challenges apply to national sources of releases while the Canadian challenges apply to Ontario sources of releases, which is reflected in their respective inventories. Other distinctions between the American and Canadian challenges include different reduction target years and different percentage reduction amounts. For example, the United States has no specific reduction targets for hexachlorobenzene, benzo(a)pyrene, while Canada does. Moreover, the Canadian PCB reduction challenge concerns tonnes of PCB waste while the U.S. PCB reduction challenge concerns numbers of transformers and capacitors. We recognize that these different challenge targets reflect the different government and regulatory structures of the two countries.

This context document provides a narrative of the information as well as a series of tables summarizing quantities based on our review of documents.

II. Progress Toward Meeting Targets

Baseline data for each of the Binational Toxic Strategy challenges are presented in Table 2. Percentage reductions of releases are provided in square brackets in cases where the base year and recent-year estimated quantities are known. The baseline data are incomplete for dioxins / furans and octachlorostyrene for the U.S. while, in Canada, the baseline information is incomplete for PCBs. The lack of estimated quantities for the base years of these Level I substances makes it difficult to evaluate the progress that has been made toward meeting the Strategy's challenges.

It is important to note that the baseline quantities are measured in a variety of units, including tonnes, short tons, pounds (lbs), kilograms, litres, and numbers (e.g. numbers of transformers). Although it is recognized that the challenges under the Binational Toxics Strategy are country-specific, these different units make it difficult to compare Canada and the United States in terms of their respective baseline quantities. Therefore, TGA converted all baseline quantities into tonnes (except for the Canadian baseline for alkyl-lead, which is measured in litres).

The workgroups have almost completed three of the Strategy's four steps. All of the workgroups have gathered extensive information on the available inventories on sources and pathways for each of the Level I substances. The workgroups have identified information gaps and suggested options for filling those gaps. TGA assumes that detailed plans for implementing information-gathering projects will be developed.

In terms of the second step, it appears that the workgroups have analysed current regulations, initiatives, and programs which manage or control Level I substances. Since Thompson Gow & Associates did not review files, workgroup meeting minutes, or interview stakeholders from each of the workgroups, we can only base our conclusion on what is written in the workgroup reports. The workgroups have identified the regulations and programs currently covering the top sources of their respective substances.

All of the workgroups have either completed or partially completed the third step: to identify cost effective options to achieve further reductions. For example, the B(a)P workgroup developed a report examining options for the U.S. side of the basin; a step three report was not provided to the consultants for the Canadian side. Options to reduce B(a)P emissions from the major sources were identified, such as voluntary programs, financial and other incentives, educating the public, training staff, and developing regulations. As a next step, TGA assumes that workgroups will be developing detailed plans for implementing reductions (step 4 of the Strategy).

III. Sources and Pathways of Level I Substances

The atmosphere appears to be the predominant pathway for most Level I pollutants into the Great Lakes Basin. Approximately 75 percent of deposition to the Great Lakes from air pathways originate from within the Great Lakes states and province of Ontario. [(7)] Atmospheric deposition seems to be the dominant loading pathways for substances into Lake Superior while atmospheric deposition appears to be a smaller contributor of substances to Lake Erie and Lake Ontario (see Table 3).

Furthermore, deposition of pollutants via air pathways is a significant challenge in efforts to reduce toxics levels in the Great Lakes. For example, the Lake Huron Initiative reports that although Lake Huron has a large surface area and relatively few local contaminant point sources, loadings to Lake Huron from water sources are lowest of all the Great Lakes but air sources are the highest. [(8)]

A summary of Level I substances released by sector is provided in Appendix C. The sources listed in Appendix C are based on the source inventories for each of the Level I substances. [(9)] TGA recognizes that each of the substance workgroups has prioritized sources based on various criteria and that all of the sources listed in Appendix C include both priority and non-priority sources. Appendix C is not meant to duplicate the efforts of the workgroups but rather to examine whether there may be opportunities for sector-based approaches that could potentially deal with one or more substances at the same time and hence provide potential efficiencies in developing initiatives for certain sectors. In this way, one program rather than several programs could potentially be developed for one sector and may ease a company's data collecting, reporting, and other administrative costs.

Two sources / sectors release four Level I substances or more: backyard trash / open burning and utilities / electric power generation. For example, backyard trash / open burning releases dioxins / furans, mercury, HCB, B(a)P and, potentially, PCBs and octachlorostyrene. Incineration of wastes (medical, municipal, hazardous, and federal facilities) is also an area where there are several Level I substances that are emitted: dioxins / furans, HCB, and mercury. Because of various documents produced by the different sector-specific workgroups, some source sectors were classified differently so there may be some overlap between sectors. For example, "municipal waste combustion," "solid waste incinerators" and refuse systems (waste incineration)" may all be the same or similar source sectors.

IV. Level I Substances

1. Benzo(a)pyrene

1.1 Information Gathering

Pathways

Atmospheric deposition is, in general, the main source of B(a)P to surface waters (see Table 4) [(10)] , with lesser amounts contributed by industrial effluents, municipal waste water, urban storm water runoff, road runoff, and oil spills.

There is quantitative information for the atmospheric pathway of B(a)P loadings but the information is limited for Lake Huron. The most complete data for atmospheric loadings of B(a)P are for Lakes Superior and Erie. B(a)P may potentially enter the Great Lakes from outside the Great Lakes Basin. [(11)] There are no data for groundwater or sediment loadings to the lakes. [(12)]

In addition to information on atmospheric deposition of B(a)P, there is quantitative information for the substance in soil. For example, in 1991, the Ontario Ministry of the Environment initiated an extensive province-wide sampling program to determine soil background concentration for some 115 substances for a variety of land use and receptor categories. The Ontario typical range (OTR) soil concentration (background) for B(a)P is 0.10 ug/g (agricultural land use) and 0.49 ug/g (all other land uses). [(13)]

Sources

Two of the top three sources of B(a)P releases, residential wood combustion and the steel sector, are the same for Ontario and the United States. One major difference between the U.S. and Ontario inventories is the estimated B(a)P release from POTWs (often called "sewage treatment plants" or STPs in Canada). Sampling in 1997 and 1998 of 21 Ontario municipal sewage treatment plants (representing over 50% of Ontario's STP capacity within the Great Lakes basin) indicated that wastewater discharges from this sector were not a major B(a)P loading source (estimate is less than 0.3 tonnes), with B(a)P being detected in the effluent from only one plant of the 21 plants sampled. [(14)] This one plant is involved in the treatment of wastewater from the steel sector, and B(a)P loadings discharged to this particular plant were found to be in the order of 2 tonnes with an effluent loading of less than 10 kg. U.S. and Ontario sources of B(a)P are presented in Table 5.

The regeneration of catalyst from the catalytic cracking units at petroleum refineries has been identified as a major source of B(a)P, although a set of test results indicates that this may be a much smaller source than is reflected in the inventory. [(15)] B(a)P loadings are dependent on the combustion efficiency of these regeneration facilities, with significant B(a)P releases occurring in partial burn combustion regenerators, and no release with complete combustion regenerators (B(a)P is a product of incomplete combustion).

Information Gaps

In terms of information on B(a)P loadings to each of the Great Lakes, more information is needed on atmospheric pathways, particularly for Lake Huron. Moreover, there is little information on the potential loadings of B(a)P to the lakes via groundwater or sediment. Even though there are information gaps on

loadings to each of the lakes, since the atmosphere is the major pathway of B (a)P to the lakes, many U.S. national / Ontario emissions estimates exist.

Because B(a)P is a member of a class of compounds known as polycyclic aromatic hydrocarbons (PAHs), and PAHs generally occur as complex mixtures and not as single compounds, B(a)P emissions are not typically reported alone but are often reported with a class of PAHs.

For the Canadian side of the basin, the workgroup has identified that considerable uncertainties in the emission estimates exist due to a lack of reliable emission factors for all sectors considered. (16) Since B(a)P occurs in a mixture of other PAHs, monitoring and reduction efforts are typically aimed at a broader group of PAHs. The exclusion of several source categories from the Great Lakes inventory of B(a)P emissions is likely due to a lack of available emissions data from those source categories rather than from the absence of those sources in the Great Lakes basin.

Environment Canada has also found that, ultimately, to evaluate the success of B(a)P and PAH emission reduction programs, comprehensive stack and fugitive emissions testing combined with environmental monitoring are required. Significant challenges lie ahead if important reductions in B(a)P and PAHs are to be realized early in the new millennium. Alternatives to the use of creosote for railway ties will be required for the wood preservation sector. Public education, outreach and incentive programs should be implemented for residential wood combustion, wildfires, and open burning. Some may already have been initiated under the CWS for dioxins and furans and particulate matter and ozone.

A portion of the B(a)P and PAHs present in the environment may be related to sources outside the Great Lakes basin as these substances can be transported over long distances in the atmosphere. Sources and magnitude of long-range transport need to be assessed through monitoring and modeling, while programs should be implemented to minimize this occurrence. Some action is being taken under IADN and international initiatives. However, the workgroup suggests that a more focused effort may be warranted.

For the American side of the basin, the workgroup has acknowledged that several source categories have been excluded due to a lack of available emissions data for those source categories (e.g. open trash burning, scrap tire burning, and commercial meat charbroiling) rather than from the absence of those sources in the Great Lakes basin. (17) For example, the U.S. has also identified that more information is needed on the level of B(a)P emissions from petroleum refining, the effect of the maximum achievable control

technology (MACT) in reducing B(a)P emissions, and whether further reductions are achievable. [(18)]

Some examples of efforts to better determine sources of B(a)P include:

- New mandatory 17-PAH reporting requirements under Canada's NPRI for the year 2000. A 50-kg reporting threshold has been set for the sum of 17 PAHs but each individual PAH substance is required to be reported separately.
- Environment Canada's Voluntary Air Emissions Testing Framework. This BTS initiative focuses on stack emission testing and is designed to close data gaps for targeted BTS substances such as B(a)P and PAHs.
- The mandatory monitoring and reporting initiative recently proposed by the Ontario government requiring 22 PAHs including B(a)P to be reported individually when any one of them exceeds 5 kg.

1.2 Progress Toward Meeting the Challenges

Since the challenge target for U.S. reductions of B(a)P was not specified, any reductions achieved for this substance can be considered a "success." The 2001 BTS progress report provides B(a)P reduction information for only one sector, stating that B(a)P has been reduced by 65 percent from coke ovens. However, baseline information and quantities are not given, which would make the reporting of this success more transparent. The estimated U.S. national emissions of B(a)P in 1993 was 72.7 tonnes (or 160,357.8 pounds). [(19)]

According to quantitative data, Canada has not met the 90 percent challenge target for reducing B(a)P. B(a)P emissions were estimated to be 27 tonnes per year in 1988 and 15 tonnes per year in 2000, resulting in a decline of 44% over this period. [(20)]

The workgroup has identified area sources of B(a)P, such as residential wood burning, wildfires, open trash burning, and residential coal and oil combustion, as a future challenge to overcome to reduce B(a)P emissions. [(21)] These area sources result from the behaviour of individuals rather than corporations, which means that more innovative approaches may be required to reduce emissions, including education, incentives, and voluntary actions as opposed to regulations.

2. Hexachlorobenzene

2.1 Information Gathering

Pathways

Quantitative data are available for both atmospheric and water loadings of hexachlorobenzene (HCB) for each of the Great Lakes (see Tables 6 and 7). Long-range air transport and deposition is a far greater source of HCB loading

to the Great Lakes than are direct discharges to the lakes. [(22)] For example, the atmosphere is a major source of HCB loading to Lake Michigan. [(23)] In the Ontario portion of the Great Lakes, the highest levels of HCB are present in the St. Clair and Niagara Rivers, particularly near point sources. [(24)]

Although HCB-contaminated sediment is known to exist at a number of hot spots within the lakes or tributaries, the amount of HCB in these sediments and how much is being released to each of the lakes is not known. [(25)] Environment Canada's draft Report, *Hexachlorobenzene Sources, Regulations and Programs for the Ontario Great Lakes Basin 1988, 1998, and 2000* , states that

HCB has rarely been detected in suspended solids collected at upstream stations of the St. Clair and Niagara Rivers, but is routinely detected downstream. Because the majority of point source releases to the river have been eliminated, the presence of some HCB is likely the result of the resuspension of previously contaminated sediment. Concentrations in the lower lakes are at or below the detection limit of 0.04 ng/L or, due to analytical improvements, 0.02 ng/L in Lake Superior (p. 5).

In the past, industrial landfill sites were used to dispose of HCB-contaminated wastes and, in some cases, these sites have resulted in contaminated groundwater (e.g. Dow Sarnia's former landfill site, now closed and rehabilitated to contain and treat contaminated groundwater). Although chlorinated solvent contamination of groundwater has been also recognized as a major problem in certain locations (associated with former disposal sites), to date, HCB groundwater problems have not been a concern in Ontario.

In terms of information on HCBs in soils, one soil study in the Great Lakes region (1989-1990) from 24 locations in the Windsor and Essex County area found HCB soil concentrations to be all below the detection limit (1 to 2 ng/g for chlorinated aromatic hydrocarbons). Also, a Health Canada exposure assessment study in 1998 has assumed an average concentration of HCB in soil from the Great Lakes basin at 0.8 ng/g.

Sources

Many of the top HCB sources in the U.S. inventory are not top sources in the Ontario inventory because the top U.S sources are generally associated with

the production of chlorinated substances - processes which are no longer carried out in Ontario (see Table 8).

For example, Ontario is not producing chlorinated pesticides, chlorinated solvents, pentachlorophenol, or HCl as a byproduct from the manufacture of chlorinated organic chemicals or incineration or chlorinated organic wastes (all identified as major HCB sources in the U.S. inventory). The industry began replacing the graphite anodes in the early 1970s and there are currently no chlor-alkali facilities using this technology on both the Canadian and U.S. sides of the Great Lakes basin. [(27)] Furthermore, Ontario's ethylene dichloride / vinyl chloride production operations, linked to past HCB releases, have been shut down. [(28)]

HCB source sectors that are common in the U.S. and Ontario inventories are: pesticide use / application, publicly owned treatment works (POTWs), waste incineration, and cement kilns. [(29)] The data in Table 8 also indicate that three of top five sources of HCB releases are the same for the U.S. and Ontario: pesticide application - which is the top source of HCB releases for both jurisdictions - along with POTWs and waste incineration. [(30)] It is important to note that the U.S. inventory for sources of HCB is for air emissions only while the Ontario inventory contains information for all types of source releases (air, water, land, etc.). The *Great Lakes Binational Toxics Strategy Draft Report for Hexachlorobenzene (HCB) Reduction Options* (June 15, 2000) provides water release information for two sources of HCB: chemical manufacturing (alkalies and chlorine) and pesticides manufacturing. The chemical manufacturing sector reported 113 kg (250 lbs) of HCB releases to water in 1997 and the pesticides manufacturing sector reported 14.1 kg (31 lbs) for air and water releases combined.

HCB sources that may potentially enter the Great Lakes that are from outside the Great Lakes basin include chlorinated solvents production, chemical manufacturing (alkalies and chlorine), waste incineration, open trash burning, among other possible sources. [(31)] Current evidence suggests that HCB undergoes long-range transport and that international sources contribute to HCB levels in the Great Lakes basin. The BTS *Draft Report for Hexachlorobenzene (HCB) Reduction Options* (June 15, 2000) cites a 1995 study by Cohen et al. in which measured concentrations of HCB in ambient air in the Great Lakes were found to be higher than values computed from local sources by an air transport / deposition modeling program. However, since the amount of HCB contributed from foreign sources is currently unknown, quantitative estimates of reductions from actions aimed at reducing foreign releases of HCB are unknown.

Information Gaps

The workgroup notes that more work needs to be undertaken to identify and estimate long-range transport sources. A complete picture of HCB releases and atmospheric processes is not clear. [(32)] Although some activities are being conducted through IADN and international initiatives, a more focused effort may be warranted. Other pathways of potential HCB loadings to the lakes, such as via sediment and groundwater are not known.

Due to limited data from all sectors considered in the inventory, there is considerable uncertainty in the numbers. Numerous sectors have been designated as either "unlikely" or "potential" HCB sources. [(33)] However, additional testing data are needed for most of these sectors before they can be eliminated from further consideration.

The Canadian HCB sources report [(34)] identifies several recent initiatives that provide opportunities to acquire new HCB testing data, including:

- New mandatory HCB reporting requirements under NPRI for the year 2000. Targeted potential HCB-emitting sectors include waste incineration, cement manufacturing, iron sintering and electric arc furnace steel manufacturing, secondary lead smelting, secondary aluminum smelting, and base metal smelting. A number of HCB sources that have been designated in this report as unlikely sources are also being targeted: generation of electric power using fossil fuel, combustion of fuel in Kraft liquor boilers, and magnesium production.

- CWS process for dioxins and furans, mercury, particulate matter and ozone, and benzene. Targeted sectors that are also potential HCB-emitting include iron and steel manufacturing, waste incineration, residential wood combustion and base metal smelting.

- Voluntary Air Emissions Testing Framework. This BTS initiative focuses on stack emission testing and is designed to close data gaps for targeted BTS substances such as HCB.

In addition, other recommendations were made for acquiring potentially new HCB testing data. U.S. EPA did not identify any recommendations for acquiring new HCB emissions information in their step reports. [(35)]

2.2 Progress Toward Meeting the Challenges

Although decreasing trends have been demonstrated for HCB levels in environmental media of the Great Lakes over the last 10-20 years, the region remains an area of particularly high contamination for fish and wildlife. Monitoring data from IADN stations in the Great Lakes indicate that the net movement of HCB involves volatilization out of the water. Soils and sediments at several sites in the Great Lakes basin are also contaminated with HCB.

Since there was no challenge target specified for the U.S., any reductions made for this substance can be considered a "success." The most recent BTS

progress report provides HCB reduction information for two sources (pesticides and chlorinated solvent production), stating that a 90 percent reduction has been achieved for these two sources. However, since no baseline information or quantities for other sources are given, it is difficult to gauge the actual reductions of HCB achieved. HCB air and water releases reported to TRI were 0.7 tonnes (or 1,592 pounds) in 1990 and 0.2 tonnes (or 430 pounds) in 1997, resulting in a 71 percent reduction over this period. [(36)]

Canada has not met the 90 percent reduction challenge target for HCB. HCB emissions in Ontario have declined by 67 percent from 46.4 to 15.3 kg/year over the period of 1988 to 2000. [(37)]

3. Octachlorostyrene

3.1 Information Gathering

Pathways

The main pathway for OCS appears to be via the atmosphere through local dispersion. There is a wealth of environmental monitoring data, which show massive temporal decline in environmental levels of OCS and that local sources of OCS are gone.

Sources / Information Gaps

Historically, because there has been little or no testing of OCS air emissions in both the U.S. and Ontario, an accurate emissions inventory in the Great Lakes cannot be established. Nonetheless, there is a substantial body of scientific literature to suggest past and potential current circumstances that generate OCS, though none are known to be near to the Great Lakes. Although potential sources of OCS have been identified by the workgroup, all require testing data to confirm or refute their status as potential OCS emitters.

Octachlorostyrene is formed under similar conditions as HCB as well as dioxins / furans, although less closely for the latter. Since HCB and dioxins / furans are monitored more often than OCS, they can provide a good indicator of possible OCS release sources. The workgroup has determined that in addition to obtaining additional environmental monitoring data, future OCS reduction efforts will be linked to reduction efforts focused on HCB and / or dioxin.

On the basis of process similarities, approximations of OCS emissions have been derived from emissions estimates for HCB and dioxin. These data are only a tentative gauge of OCS emissions for several potential sources and are presented only for discussion purposes. This estimate suggests a potential emission rate of 1.81 tonnes (or 4,000 pounds) of OCS per year in the U.S. This estimate does not include emissions from several known sources of OCS. [(38)] Emission estimates for these known sources could not be quantified because these sources are not included in either the HCB or dioxin inventories.

Environment Canada has suggested that a review of scientific literature regarding manufacturing processes that yield chlorinated hydrocarbon byproducts may be warranted. [(39)] Current initiatives that are underway to gather new information on OCS include the following:

- EC is funding a Voluntary Air Emissions Testing Framework in an effort to fill current data gaps and correct or update data found to be nonrepresentative. With respect to OCS, the priority areas include secondary copper and aluminum smelting and waste incineration. To date, facilities in the medical waste incineration and base metal smelting sectors are taking advantage of this initiative.

- New mandatory HCB reporting requirements under NPRI for the year 2000. Targeted HCB-emitting sectors, which are also potential OCS sources, include waste incineration, cement manufacturing, base metal smelting, secondary lead smelting, and secondary aluminum smelting.

- OCS was added to the U.S. EPA Toxics Release Inventory (TRI) with a reporting threshold of 10 pounds per year and became effective January 1, 2000.

Further recommendations for improving the emissions inventory are provided in an Environment Canada report [(40)] as well as in the U.S. PBT program's OCS workgroup report. [(41)]

3.2 Progress Toward Meeting the Challenges

It is unclear whether the BTS challenge has been met since there are little or no source data on OCS because neither Canada nor the U.S. test OCS in its air emissions testing. Nonetheless, there is a wealth of environmental monitoring data for OCS, which show a massive temporal decline of the substance.

The baseline data for OCS on the Canadian side of the basin were based on HCB emissions rather than actual OCS emissions: Environment Canada determined OCS emissions to be 1.5 kg in 1988 and 0.2 kg in 2000, which works out to an estimated reduction of 87 percent over the same time period. [(42)]

The most recent BTS progress report (2001) notes that "[o]ther than obtaining additional environmental monitoring data, which can be used to assess the need for further action, future OCS reduction efforts will be linked to reduction efforts focused on HCB and / or dioxin." It has been decided that the OCS workgroup is no longer needed. [(43)]

4. Alkyl-lead

4.1 Information Gathering

Pathways

There is no information on releases or loads of alkyl-lead to each of the Great Lakes. However, information on sources of alkyl-lead shows that the main pathway of the substance is through the air.

Alkyl-lead itself is not a persistent environmental compound. However, it breaks down in the environment (or is emitted following combustion) to other forms of lead which are much more persistent, eventually forming stable inorganic lead compounds such as lead phosphates. Airborne lead particles (such as those emitted as exhaust) may remain airborne for about 10 days and, therefore, may be transported far from the original source. [(44)]

Sources

Formerly, the largest emissions of alkyl-lead came from automobiles that used leaded gasoline. Leaded gasoline for automotive vehicles was phased out in the 1970s and 1980s and, as a result, trend data indicate that levels of alkyl-lead have declined considerably. The largest remaining sources of alkyl-lead emissions are from general aviation high-performance piston-engine aircraft and non-road vehicles (including automotive racing vehicles) that use leaded gasoline. However, these amounts make up only a fraction of the former releases of alkyl lead in gasoline from automobiles. Currently, there are no safe technological alternatives to using leaded gasoline in general aviation high-performance piston-engine aircraft.

Information Gaps

The U.S. has identified several data gaps associated with identifying cost effective options for reducing alkyl-lead. [(45)] For instance, although EPA's 1990 Clean Air Act (CAA) Inventory of Section 112 (c) (6) Pollutants estimates national alkyl-lead emissions for source categories accounting for not less than 90 percent of the aggregate emissions of alkyl-lead, sufficient data were not available to develop emissions estimates for operation of aircraft, operation of nonroad vehicles, or alkyl-lead production. In particular, Section 112 (c) (6) of the CAA requires emissions inventories from oil refineries, but gross estimates are currently used that do not provide a clear picture of the production and release quantities.

In addition, other than aviation gasoline, very little data exist on current levels of leaded gasoline use. Since 1991, the Department of Energy (DOE) stopped tracking information on the production of leaded gasoline for non-aviation uses. Consequently, there is no readily accessible information on how much leaded gasoline is being produced for the continued, legal use of alkyl-lead in racing cars, off-road and non-road vehicles.

Environment Canada reported that there is no information to determine whether there is increased risk of lead exposure to at-risk populations (especially children) living in the vicinity of race tracks or general aviation airports, spectators at racing events or air shows, and fuel handlers (aviation or racing crews). [(46)] Both Canada and the U.S. have identified the level of exposure to alkyl-lead as a monitoring need. Moreover, Environment Canada

notes that the number, age, and condition of underground fuel storage tanks at airports are unknown and has recommended that an inventory of fuel storage facilities in Ontario airports be undertaken. Environment Canada also recommends that a small survey be conducted to give an indication of the fuel mix currently used by general aviation aircraft; that since federal / provincial jurisdiction is unclear at airports in Ontario, the level of monitoring and enforcement at airports under provincial regulations should be determined as well as a review of the relative application of federal and provincial tank registration requirements; and measurements of alkyl-lead in soil and air near small airports should be conducted. [(47)] Other recommendations are also included in the report.

4.2 Progress Toward Meeting the Challenges

Both Canada and the United States have reported reductions in the emissions of alkyl-lead beyond those stated in their respective challenges. Sufficient information appears to be available to indicate that the BTS challenge for alkyl-lead has been met. The U.S. has confirmed that it has met the first portion of the alkyl-lead challenge: that there is no longer use of alkyl-lead in automotive gasoline. [(48)] However, U.S. EPA notes that further confirmation should be sought by collecting up-to-date leaded gasoline production data. Environment Canada reported that the Canadian challenge of reducing alkyl-lead by 90 percent between 1988 and 2000 has been exceeded. [(49)] By 1997, leaded gasoline sales in Ontario had declined from about 3 billion litres in 1988 to roughly 33 million litres - a reduction of almost 99 percent.

5. Level I Pesticides

5.1 Information Gathering

Pathways

Environmental concentrations of Level I pesticides in the Great Lakes basin are affected by atmospheric transport through environmental cycling of legacy Level I pesticide contamination. The quantities of Level I pesticides remaining in Great Lakes water is provided in Table 9. There is also some quantitative information on the amount of pesticides in sediment for Lakes Michigan, Ontario, and Superior but none for Lakes Erie and Huron.

Recent data show that the water concentrations of the Level I pesticides in all lakes to be well below drinking water standards. However, in several lakes, the concentrations of DDT, dieldrin and toxaphene exceed the Water Quality Guidelines for the Great Lakes, which is due to the bioaccumulative nature of the chemicals that results in much higher concentrations in aquatic life, hence requiring fish consumption advisories for sport and commercial fish in the

Great Lakes. Quantities of some Level I pesticides in biota (fish and avian eggs) are available for all of the Great Lakes, with DDT (and its metabolites) appearing to be present in the largest quantities.

Sources / Information Gaps

Although Level I pesticides are no longer manufactured or used in Canada and the United States, it is recognized that there may be unused stockpiles of pesticides as well as pesticide contamination on contaminated sites. For example, persisting soil residues containing chlordane and DDT continue to serve as sources into the atmosphere as well as runoff into surface water. (50) More information is required on the quantity of pesticides stockpiled. Some states regularly conduct "clean sweeps" of stockpiled pesticides and the amount of pesticides collected in these clean-sweep programs far exceeds the amount currently estimated to be in the waters of the Great Lakes (with the exception of toxaphene and mirex).

More information is also needed on the uses of Level I pesticides outside of the U.S. and Canada. For example, chlordane and DDT are still used in other parts of the world. Long-range transport of Level I pesticides acts as a source into the Great Lakes. (51)

Through our document review, trend data show that Level I pesticide levels are declining, with the exception of toxaphene. Despite the fact that toxaphene is no longer used, measurable amounts of toxaphene are still found in the air, water, sediment, and soil in and around Lake Michigan. (52) It has also been found that concentrations of toxaphene in Lake Superior lake trout are not decreasing. The 13,500 kg of toxaphene calculated to be in Lake Superior accounts for about 77 percent of the toxaphene calculated to be in all five Great Lakes combined. Long-range atmospheric transport from the southern U.S. has been identified as a major pathway of toxaphene input to the Great Lakes basin. (53)

5.2 Progress Toward Meeting the Challenges

There appears to be sufficient information to conclude that the pesticides challenge has been met. Canada reported that it had fulfilled its pesticide challenge in 1996. The Canadian report concluded that within the commercial sector of Ontario there is effectively zero use and stock availability of the Level I pesticides as commercial pesticides. However, the Strategy challenge includes not only reporting that there is no longer use of Level I pesticides, but also no generation or release from Ontario sources. Environment Canada has acknowledged that quantities (appropriate for domestic uses) of Level I pesticides may be inadvertently retained by homeowners as household hazardous waste, but that this source that is believed to be minor. (54)

U.S. EPA has stated that, "we believe that the United States has met the principal intent of the Challenge, even though the statement '□ no longer use or release □' can not be confirmed as long as unused stocks and contaminated

sites exist." [55] EPA notes that the options of site remediation, waste pesticide collection, and monitoring are in place and on-going, which will help to further reduce potential releases from stockpiles and contaminated sediment resulting from past use.

Although environmental concentrations of Level I pesticides have been generally declining for the past twenty years, concerns remain because the substances persist and bioaccumulate in fish and wildlife. There continue to be fish consumption advisories based on unacceptable levels of these pesticides in sport and commercial fish.

The persistence of Level I pesticides indicates that greater efforts need to be taken to deal with international sources that use, generate, and release these substances. U.S. EPA recognizes that continued monitoring of various media is an activity that should continue in order to track the progress of Level I pesticides.

Contaminated sites and sediment containing Level I pesticides are still potential sources / pathways for entering the lakes. One option that the workgroup has identified for further reductions is the remediation of sites with contaminated soils and sediments under the U.S. Superfund Program. [56]

6. Mercury

6.1 Information Gathering

Pathways

It is estimated that the main pathway for mercury into the Great Lakes basin is through the atmosphere. For example, preliminary results from the Lake Michigan Mass Balance project suggest that approximately 84 percent of the total mercury input to Lake Michigan is contributed by atmospheric deposition (wet and dry deposition and air-water exchange), whereas tributary inputs of mercury accounted for 16 percent of the total mercury input to the lake. [57] Quantitative information on quantities of mercury entering each of the Great Lakes is provided in Table 10 , with the most complete information available for atmospheric deposition. Information on atmospheric releases is provided for Lakes Michigan, Huron and Ontario with the quantity for air / water releases combined for Lake Superior. There is no quantitative information for mercury entering Lake Erie.

The only information on tributary loadings of mercury is for Lake Michigan. There is information on quantities of mercury discharged for only one lake - Lake Ontario. The quantity of mercury in landfills / soils is provided for Lake Superior only. There is no information on quantities of mercury in contaminated sediment for any of the Great Lakes, with the exception of Lake Michigan, which Mason&Sullivan estimate contributes 0.05 kmol/yr to Lake Michigan, out of a total loading of 5.85 kmol/yr. [58]

There is little or no information on the amount of mercury in groundwater that is entering the Great Lakes. It is estimated that less than one percent of total mercury input into Lake Michigan is from groundwater. (59)

Currently, one of the major sources of mercury is environmental cycling of mercury previously introduced into the environment. Volatilization of mercury from land and water surfaces into the atmosphere can result in subsequent air deposition and then revolatilization. (60) Mercury contaminated sediments may resuspend mercury compounds in the water, allowing for bioaccumulation in the food web. Mercury contamination is the most frequent basis for fish advisories issued by states, provinces and tribes. Thirty-nine states have issued fish consumption advisories in one or more water bodies, and ten states have issued statewide mercury advisories. (61)

Sources

The top sources of mercury releases are coal-fired power generation and incineration sources, including incineration from municipal waste, medical waste, hazardous waste, and sewage sludge. Table 11 shows that there is a great deal of quantitative data on the sources of mercury releases.

It is important to note that Ontario data include all releases of mercury (water, air, land) while the American national data report on air emissions only. For the Lake Superior basin, there are quantitative data for various sources of mercury released to water and air; the largest source of mercury identified is from the mining sector. It is estimated that 15 percent of all sources of mercury to air and water in the Lake Superior basin stems from re-emission. There is no comparable information on quantities of mercury to the other Great Lakes.

In terms of quantities of mercury being used, national data for the United States show that mercury is used in the manufacture of chlorine and caustic manufacturing and in such products as wiring devices and switches, dental equipment, measuring and control instruments (e.g. thermometers). Uses of mercury represent potential releases of mercury as opposed to actual releases.

Information Gaps

U.S. EPA has identified several information gaps for many potential sources of mercury: (62)

- Studies have shown that wood and wood waste contain mercury and therefore may release mercury upon burning. However, insufficient data are available to estimate these amounts.

- A very limited number of studies have been conducted of mobile sources [(63)] of mercury emissions and all have contained inconsistent or questionable results.

- Mercury emissions from wastes that are not incinerated, but rather landfilled or recycled, are less well characterized than emissions from incinerators. Such emissions, from landfills, product breakage, processing, storage and transportation of wastes, and from recycling of metal scrap, could be substantial.

- Demolition debris is another potential source of mercury. Buildings are equipped with numerous mercury-containing devices, such as thermostats and fluorescent lamps. If these devices are not removed prior to demolition, emissions can result if these devices are broken. There are no estimates available for mercury emissions from this source.

- Mercury enters directly into water and wastewater from a number of small diffuse sources. Landfills leach mercury, which is then carried by runoff into water systems. Homes, small laboratories, medical offices and clinics, and commercial / industrial sites dispose of mercury-containing products such as reagents, cleaning solutions, and medicines, and clean-up from small spills and broken products such as thermometers, directly down the drain. These discharges are not monitored and usually end up in water treatment plants.

6.2 Progress Toward Meeting Challenges

Canada appears to have made progress in reducing mercury emissions, based on quantitative information. Although the BTS challenge target of a 90 percent reduction between 1988 and 2000 has not been met, mercury releases were 3.0 tonnes in 2000 compared to 14.2 tonnes in 1988, which accounts for a 77.5 percent reduction. [(64)] More effort will be required to meet the 90 percent reduction challenge.

The United States appears to have made some progress is meeting its 50 percent reduction challenge in the use and release of mercury. The U.S. appears to have made good progress in reducing mercury emissions but greater effort is needed to reduce the use of mercury. Between 1990 and 1995, 179.6 tonnes (or 198 short tons) were released in 1990 while 135.2 tonnes (or 149 short tons) were released in 1994, which accounts for a nearly 25 percent reduction in national mercury emissions. [(65)] Mercury use has decreased 18.6 percent between 1995 and 1999, with 433.6 tonnes (478 short tons) and 352.9 tonnes (389 short tons) used respectively. [(66)]

7. Polychlorinated Biphenyls

7.1 Information Gathering

Pathways

The main pathway for PCB loadings to the Great Lakes is environmental sinks (contaminated sediments already in the Great Lakes) and environmental cycling of PCBs previously introduced into the environment, which are then transported through the air. [(67)] In many respects, sources and pathways of PCBs are the same because of historical contamination from uses of PCBs and because of the persistence of the substance. For example, PCB-contaminated sediments may re-suspend PCBs in the water, which can allow for bioaccumulation in the food web. [(68)] All of the Great Lakes - as well as numerous inland lakes - have fish consumption advisories as a result of PCB contamination.

The major source of PCBs to the atmosphere is volatilization from sites where they have been stored, disposed, or spilled. Lakes Erie and Ontario appear to have the highest loading rates (volatilization) to the air. Similarly, the authors of the *Lake Superior LaMP* found that volatilization of PCBs from soils and sediments is a significant contributor to PCBs in the water column and the biota. The major source categories of PCB loadings to Lake Ontario are the other Great Lakes, the Niagara River and atmospheric deposition (see Table 12).

For the data on atmospheric pathways (emissions, atmospheric deposition, etc.) there are also problems with comparing the quantities from different studies. For example, one study estimates that total emissions for all of the lakes is about 16 kg while another study estimates that the atmospheric emissions for Lake Michigan alone is 1,536 kg. Also, some of the ranges of quantities seem quite large. For example, it is estimated that between 16 kg and 1,100 kg of PCB loadings to Lake Michigan is through dry deposition and that Lake Huron receives between 50 kg and 500 kg of PCB loadings from atmospheric emissions. Some factors which contribute to the differences include environmental conditions (time of year, weather); location of samples, proximity to sources; sampling and laboratory equipment used; sampling and laboratory procedures used. However, despite potential difficulties in comparing the data, the data are useful for many purposes, such as determining baselines, progress, potential loadings, sources, and effects, and identifying issues associated with the use of the data.

The focus of contamination of the lakes has been the concentration of contaminants in the water, sediments, and biota in the lakes and the air above the lakes. Although data for these media exist, the data are not always presented in PCB workgroup documents. [(69)] U.S. EPA reports provide

quantitative information on the volume of sediment and the highest concentration found of a particular contaminant (e.g. PCBs, mercury, etc.) by Area of Concern (AOC) rather than on a lake-wide basis. Nonetheless, scientific data show that contaminated sediment is a problem. For example, PCBs are present in the sediment of the Lake Michigan AOCs. There are no quantitative data for PCBs in groundwater nor from non-point sources (except for the U.S. side of the Lake Superior basin).

Different documents provide different data for point and non-point source information. For example, the *Lake Ontario LaMP* (1998) provides an estimate for the quantity for both non-point and point source pollution entering the lake while the *PCB Sources & Regulations Background Report* (1999) provides data for point source water discharges only. The *Third Great Waters Report to Congress* (2000) provides an estimate of the quantity of PCBs in runoff to Lake Superior, but not for any of the other lakes. Moreover, much of the quantitative information on point and non-point source pollution is for the U.S. side of the Great Lakes basin and the Canadian side seems to be missing.

Sources

The main industrial sources contributing PCBs via releases to the air include emissions from electrical equipment, combustion / incineration, releases from contaminated and storage sites, some inadvertent generation, some effluent, and long-range transport. Other major sources of PCBs include incineration of PCB-containing products and, to a lesser extent, PCB formation during production processes. [(70)] However, there are very little quantitative data on releases of PCBs. There are quantitative estimates of PCB emissions through combustion of PCB-containing materials in the U.S. (national data) but there does not appear to be any information for the Ontario side of the basin.

The largest remaining use of PCBs is as a fluid in transformers and capacitors. Utility companies own the majority of transformers but it is not certain which sector owns the majority of PCB capacitors. There are quantitative data on emissions of PCBs by point and area sources by each Great Lake state and the province of Ontario (see Table 13).

Quantitative estimates are available for sources of PCB release entering Lake Superior. Although the quantity of PCBs in use in the Lake Michigan basin is available, the quantity by source is not provided. [(71)] U.S. EPA's PCB Transformer Registration Database [(72)] contains information on the amount of PCBs in use in PCB transformers, which can be broken down per basin, using the information on the actual locations of the transformers included in the database. In the Great Lakes states, there are 5,840 transformers containing approximately 22,417,777 pounds of PCBs.

According to the U.S. EPA Transformer Database, 28 percent of the total number of PCB transformers in the United States are in the Great Lakes states, which accounts for 20 percent of the quantity (pounds) of PCBs in the U.S. The majority of PCB transformers are owned by utilities. [(73)] The number of

PCB transformers in Canada is not provided in the documents reviewed, with the exception of the *Lake Superior LaMP* (1999).

Levels of PCBs in the environment have decreased in response to the banning and phasing out of the various uses of PCBs.

Information Gaps

The Canadian baseline for PCBs is unknown. There are several documents with conflicting or confusing information, which makes it difficult to know what the baseline year and quantity is, and how reduction achievements are calculated. For example, the BTS mentions that 1988 is the baseline year for the PCB reduction target while the three Canada Ontario Agreement (COA) progress reports use 1994 as the base year. The quantity for the 1988 base year has never been provided in the BTS progress reports.

7.2 Progress Toward Meeting Challenges

There is not enough information to determine whether Canada has met its BTS challenge to reduce PCBs. Although the most recent BTS progress report (2001) claims that Canada has achieved a 70 percent reduction of high-level PCB wastes and approximately 25 percent reduction of low-level PCB wastes, neither the baseline quantities nor the most recent measured quantities are provided.

The United States appears to have made excellent progress toward meeting its challenge to reduce high-level PCBs by 90 percent by 2006. As of 1998, there were 20,700 transformers compared to 200,000 transformers in 1994, which is nearly a 90 percent reduction. [(74)]

8. Dioxins / Furans

8.1 Information Gathering

Pathways

The major pathway for dioxins and furans entering the Great Lakes is through atmospheric deposition. The quantities and percentage contribution from atmospheric sources and waterborne inputs of dioxins / furans appear to be complete for each of the Great Lakes (see Table 14). It appears that waterborne inputs of dioxins / furans are a larger problem for Lakes Erie and Ontario than for the other Great Lakes, which are dominated by atmospheric sources of the substance. For example, approximately 80 to 100 percent of the dioxins / furans entering Lake Superior are from atmospheric deposition. [(75)]

Modeling results estimate that approximately 75 percent of deposition to the Great Lakes from air pathways originates from within the Great Lakes states and provinces. (76)

In considering sources of atmospheric deposition of dioxin to Lake Ontario, approximately 50 percent appears to originate from sources in close proximity to the lake, while the balance occurs from sources at a much greater distance (400-1500 km). For Lake Superior, transport of dioxin from outside the region is relatively more important (40 percent of deposition from sources between 400-700 km), since there are few immediately adjacent upwind sources. This finding is also applicable to Lake Huron. (77)

Six of the Great Lakes states make the top 10 list of dioxin-emitting states, with Pennsylvania, New York, Ohio, Illinois, Michigan and Indiana ranking third, fourth, fifth, sixth, eighth and tenth respectively. (78)

Sources

Of the total estimated emissions of dioxins / furans to air, five source categories (municipal solid waste incineration; medical waste incineration; cement kilns burning hazardous waste; forest, brush, and straw fires; and secondary copper smelting) are estimated to account or 90 percent of the emissions. (79) Table 15 also shows major source emissions of dioxins / furans are from open burning (backyard trash), utility coal combustion, iron sintering, and vehicle fuel combustion (diesel).

The manufacture of pentachlorophenols appears to be the largest source of product releases in the U.S. (and largest release by media). Water and land releases are also provided in the table, though the quantities are smaller than for air emissions. The U.S. notes that data to characterize water releases are still lacking from the following sources: publicly owned treatment works (POTWs), urban runoff, and potential industrial or commercial sources. (80) However, new preliminary estimates of reservoir source releases to water from urban runoff and rural soil erosion suggest that, on a U.S. nationwide basis, total nonpoint / reservoir releases of dioxin-like compounds to waterways are significantly larger than point source dioxin releases. (81) U.S. EPA has also identified other potential sources of dioxin / furan releases. (82) However, the data are either insufficient for making quantitative emission estimates or the confidence in the emission factor estimates and / or activity level estimates is so low that the estimates are too uncertain to include in the inventory including, for example, ferrous foundries, (83) electric arc furnaces, (84) coke production, (85) barrel burning, and petroleum refining, among many others.

The dioxins / furans workgroup designated sectors as high, medium, or low priority through the development of a "decision tree" process. This process allowed the workgroup to assign a BTS priority level to each sector amongst the major targeted sectors (see Table 16). Priority level designation was based on consideration of available source and release information and regulatory and programmatic frameworks. The primary goals of this ranking process were to define priority areas for initial workgroup focus and to determine if the BTS workgroup could potentially provide any added value (i.e. by designating a sector as high priority) to reduction processes already in place for a given sector. The decision tree analysis was used by the workgroup to assign a priority ranking of high, medium, or low to each candidate sector as well as to identify significant information gaps that needed to be filled before a final ranking could be assigned. (86)

The two high priority sectors determined by the workgroup are open burning (backyard trash) and residential wood combustion. There is a lack of data for releases of dioxins / furans from steel manufacturing (U.S.), secondary copper smelting (Canada), and landfill fires (U.S. and Canada), which are sources that the workgroup have identified for further workgroup actions.

Information Gaps

There is a degree of uncertainty associated with the source inventory estimates. The workgroup has identified the need for additional information for several targeted sectors, including waste incineration (ash disposal), backyard trash / open barrel burning (prevalence and factors), residential wood combustion (dioxin emissions from wood stoves), PCP treated wood (disposal fate of utility poles), steel EAF (emissions in the U.S.), secondary copper smelting (emissions in Canada), and landfill fires (activity levels). The workgroup reported that:

In certain cases (i.e. steel manufacturing, secondary copper smelting, and landfill fires), these information gaps precluded the assignment of a GLBTS priority level to a given sector. Therefore addressing these information needs will be a key focus area of the dioxin workgroup. (87)

8.2 Progress Toward Meeting Challenges

Judging by the available quantitative data, Canada has not met the 90 percent reduction challenge for dioxins and furans. However, Canada has made good

progress toward this goal. In 1988, Ontario released 265 g TEQ/year, which fell to 54.3 g TEQ/year in 2000, which is a decrease of 79.6 percent in dioxin / furan releases. [(88)] Canada needs to do more to achieve its reduction challenge for dioxins and furans, and there is every indication that Environment Canada recognizes that more effort is needed.

The draft report, *Great Lakes Binational Toxics Strategy: PCDD (Dioxins) and PCDF (Furans): Sources and Regulations* (May 26, 2000) argues that the U.S. is clearly on track to meet the BTS challenge goal by 2006. The report states that there is evidence that mid-range estimates of total releases to air have dropped from 11,274 g TEQ/yr in 1987 to 2,745 g TEQ/yr in 1995 and mid-range estimates of total releases to water have decreased from 356 g TEQ/yr in 1987 to 20 g TEQ/yr in 1995. [(89)] However, a quantitative assessment of exactly where the U.S. stands with regard to the challenge goal is still dependent upon the final inventory, which may include additional information that will impact the evaluation of progress on the challenge goal and new developments regarding the impact of what are currently listed as "preliminary order of magnitude" emissions. Thus, until the Dioxin Reassessment Report has been finalized, there is not enough information to determine whether the U.S. has met its 75 percent reduction challenge.

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1. *Draft report Mercury Sources and Regulations* (1999 Update) and the *Draft Report on Mercury Reduction Options* (September 2000).

2. Great Lakes Commission, *Great Lakes Regional Air Toxic Emissions Inventory Report: Initial Inventory Using 1993 Data* , U.S. EPA under the Clean Air Act Sections 112(c), 112 (k), and 112(m), March 1999.

3. Great Lakes Commission, *1996 Inventory of Toxic Air Emissions: Part II: Mobile Source* , February 2000.

4. Environment Canada and the US EPA, *Atmospheric Deposition of Toxic Substances to the Great Lakes: IADN Results to 1996* , 2000.

5. Although we did not review this document, for further information see Cohen et al., Quantitative Estimation of the Entry of Dioxins, Furans, and Hexachlorobenzene into the Great Lakes from Airborne and Waterborne Sources, Centre for the Biology of Natural Systems, Flushing, NY, 1995.

6. According to one report, it is estimated that a total of 3,044 g TEQ/yr of dioxins were released to air, water, and land in the U.S. in 1995, which is approximately a 75% reduction from the 12,829 g TEQ/yr released in 1987. Is this how the 2001 progress report calculated the American progress in reducing dioxins / furans? See U.S. EPA, *Report on the Peer Review of the Dioxin Reassessment Documents: Toxicity Equivalency Factors for Dioxin and Related Compounds (Chapter 9) and Integrated Risk Characterization Document* , Final Report, Online: http://www.epa.gov/ncea/pdfs/dioxin/final.pdf http://www.epa.gov/ncea/pdfs/dioxin/final.pdf , August 2000.

7. Data from 1995/ 1996. See International Air Quality Advisory Board, *1997-1999 Priorities Report* , July 1999.

8. Michigan Department of Environmental Quality, *Lake Huron Initiative Action Plan* , March 2000, Chapter 3.

9. The inventories were confirmed by the substance-specific workgroup co-chairs. Source information was supplemented by the "Sources and Regulations" reports or the "Options for Reducing" (Step 3) reports.

10. Battelle Memorial Institute, *Benzo(a)pyrene (B(a)P: Sources and Regulations . Draft Report September 10, 1999,* Prepared for U.S. EPA, November 1999.

11. Ibid.

12. According to one of the workgroup co-chairs, extensive water quality monitoring has been or is being carried out on the Niagara, St. Clair, and St. Lawrence rivers, as well as in the open lakes for BTS substances. Personal e-mail communication with Darryl Hogg, Environment Canada, April 17, 2001.

13. Personal e-mail communication with Darryl Hogg, Environment Canada, April 17, 2001. See Ministry of the Environment, *Guideline for Use at Contaminated Sites in Ontario* , (June 1996), Appendix 2: Summary of Soil, Groundwater and Sediment Criteria, Online: http://www.ene.gov.on.ca/envision/decomm/guide_e.pdf http://www.ene.gov.on.ca/envision/decomm/pubs.htm , Appendix (Revised September 1998), p. A39, Online: http://www.ene.gov.on.ca/envision/decomm/append_e.pdf .

14. Personal written communication from Darryl Hogg, Environment Canada, April 17, 2001. No report cited.

15. Benazon Environmental Inc. *Benzo(a)pyrene and Polycyclic Aromatic Hydrocarbons Sources, Regulations and Programs for the Ontario Great Lakes Basin 1988, 1998, and 2000* . Draft Report (No. 1). Prepared for Toxics Prevention Division, Environmental Protection Service - Ontario Region, July 13, 2000.

16. Ibid.

17. Battelle Memorial Institute, *Report for Benzo(a)pyrene (B(a)P): Reduction Options* , Draft report, June 2000.

18. Ibid.

19. Great Lakes Commission, *Great Lakes Regional Air Toxic Emissions Inventory Report* , *Initial Inventory Using 1993 Data,* Submitted to the U.S. Environmental Protection Agency, March 1999, p. 16.

20. Benazon Environmental Inc. *Benzo(a)pyrene and Polycyclic Aromatic Hydrocarbons Sources, Regulations and Programs for the Ontario Great Lakes Basin 1988, 1998, and 2000* . Draft Report (No. 1). Prepared for Toxics Prevention Division, Environment Canada-Ontario Region. July 13, 2000.

21. Ibid., and Battelle Memorial Institute, *Report for Benzo(a)pyrene (B(a)P): Reduction Options* , Draft report, June 2000.

22. U.S. Environmental Protection Agency, *Lake Michigan Lakewide Management Plan 2000,* April, 2000, Chapter 5, p. 5-99.

23. Ibid.

24. Benazon Environmental Inc., *Hexachlorobenzene Sources, Regulations and Programs for the Ontario Great Lakes Basin 1988, 1998, and 2000* , Draft Report (No. 1), Prepared for Toxics Prevention Division, Environmental Protection Service - Ontario Region, Environment Canada, July 13, 2000, p. iii.

25. According to one of the workgroup co-chairs, extensive water quality monitoring has been or is being carried out on the Niagara, St. Clair, and St. Lawrence rivers, as well as in the open lakes for BTS substances. Personal e-mail communication with Darryl Hogg, Environment Canada, April 17, 2001.

26. Cohen et al., Quantitative Estimation of the Entry of Dioxins, Furans, and Hexachlorobenzene into the Great Lakes from Airborne and Waterborne Sources, Centre for the Biology of Natural Systems, Flushing, NY, 1995.

27. Benazon Environmental Inc., *Hexachlorobenzene Sources, Regulations and Programs for the Ontario Great Lakes Basin 1988, 1998, and 2000* ., Draft Report (No. 1), Prepared for Toxics Prevention Division, Environmental Protection Service - Ontario Region, Environment Canada, July 13, 2000, p. 14.

28. Ibid.

29. One of the co-chairs that we spoke to said that the HCB source sectors which are thought to be common in the U.S. and Ontario inventories are: secondary aluminum processing, open trash burning, wood preservation, publicly owned treatment works (POTWs), and iron & steel.

30. Another sector that may be common is the chemical and allied products sector. Personal e-mail communication with Darryl Hogg, Environment Canada, April 17, 2001.

31. U.S. EPA, *Great Lakes Binational Toxics Strategy Draft Report for Hexachlorobenzene (HCB) Reduction Options* , June 15, 2000.

32. See also, Scholtz, Trevor and Bill Van Heyst, Canadian Ortech Environmental, *Long-range Transport of Persistent Toxic Substances to the Great Lakes: Review and Assessment of Recent Literature* , Submitted to Environment Canada, March 27, 2000; and U.S. EPA and Environment Canada, *Draft Report for Hexachlorobenzene (HCB): Sources and Regulations* , November 1999.

33. Benazon, *HCB Sources, Regulations, and Programs for the Ontario Great Lakes Basin - 1988, 1998, and 2000,* Draft Report, July 13, 2000; and U.S. EPA and Environment Canada, *Draft Report for Hexachlorobenzene (HCB): Sources and Regulations* , November 1999.

34. Benazon, *HCB Sources, Regulations, and Programs for the Ontario Great Lakes Basin - 1988, 1998, and 2000,* Draft Report, July 13, 2000.

35. U.S. EPA and Environment Canada, *Draft Report for Hexachlorobenzene (HCB): Sources and Regulations* , November 1999; and U.S. EPA, *Great Lakes Binational Toxics Strategy, Draft Report for Hexachlorobenzene (HCB): Reduction Options,* June 15, 2000.

36. U.S. EPA and Environment Canada, *Draft Report for Hexachlorobenzene (HCB): Sources and Regulations* , November 1999. The release information provided by the TRI is not the definitive baseline but rather provided as an indication of the progress achieved to reduce HCB under the BTS. The U.S. co-chair explained that the most appropriate way to establish a reasonably accurate 1990 inventory is to use the 1996 NTI, work back to 1990, and then supplement this with the Toxic Release Inventory (TRI), which is something that U.S. EPA will be doing as sources of the 1996 NTI are reviewed. Personal e-mail communication written by Steven Rosenthal, March 12, 2001.

37. Benazon Environmental Inc., *Hexachlorobenzene Sources, Regulations and Programs for the Ontario Great Lakes Basin 1988, 1998, and 2000* , Draft Report (No. 1), Prepared for Toxics Prevention Division, Environment Canada -Ontario Region, July 13, 2000.

38. Battelle Memorial Institute, *Great Lakes Binational Toxics Strategy Octachlorostyrene (OCS) Report: A Review of Potential Sources* , Draft, Prepared for U.S. EPA, December 22, 1998.

39. Benazon Environmental Inc., *Octachlorostyrene Sources, Regulations, and Programs for the Province of Ontario 1988, 1998, 2000* , prepared for Environment Canada, July 2000.

40. Ibid.

41. *Draft PBT National Action Plan for Octachlorostyrene* , prepared by U.S. EPA Persistent, Bioaccumulative, and Toxic Pollutants (PBT) OCS Workgroup (June 22, 2000).

42. Benazon Environmental Inc., *Octachlorostyrene Sources, Regulations, and Programs for the Province of Ontario 1988, 1998, 2000* , prepared for Environment Canada, July 2000.

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45. U.S. EPA, *Great Lakes Binational Toxics Strategy. Report on Alkyl-lead: Sources, Regulations and Options,* June 2000.

46. Environment Canada, *Alkyl-lead Inventory Study. Sources, Uses and Releases in Ontario, Canada: A Preliminary Review* , January 1999.

47. Ibid.

48. U.S. EPA, *Great Lakes Binational Toxics Strategy. U.S. Challenge on Alkyl-lead: Report on Use of Alkyl-lead in Automotive Gasoline,* June 2000, p. 12.

49. Environment Canada, *Alkyl-lead Inventory Study. Sources, Uses and Releases in Ontario, Canada: A Preliminary Review* , January 1999, p. i.

50. U.S. Environmental Protection Agency, *Lake Michigan Lakewide Management Plan 2000,* April, 2000, Chapter 5, p. 5-75, 5-79.

51. Ibid. See also, The Four Parties, *Lake Ontario Lakewide Management Plan, Stage 1: Problem Definition,* May 1998, p. 59.

52. U.S. Environmental Protection Agency, *Lake Michigan Lakewide Management Plan 2000,* April, 2000, Chapter 5, p. 5-100.

53. Ibid.

54. Environment Canada, *Canada-Ontario Agreement Objective 2.1: Priority Pesticides. Confirmation of No Production, Use, or Import in the Commercial Sector in Ontario* , October 1996.

55. Battelle Memorial Institute, *Great Lakes Binational Toxics Strategy: The Level I Pesticides in the Binational Strategy,* Prepared for U.S. EPA, March 1, 2000.

56. Ibid.

57. U.S. Environmental Protection Agency, *Lake Michigan Lakewide Management Plan 2000,* April, 2000, Chapter 5, p. 5-45. Other estimates suggest that the mercury input into Lake Michigan through atmospheric deposition is even higher (between 95 and 99 percent), which includes both mercury deposition that is loaded directly into the lakes as well as mercury loaded into the watershed, which then enters the lake through tributaries. Personal communication with mercury co-chair Alexis Cain (February 27, 2001). It is estimated that approximately 90% of mercury releases in Ontario come from air emissions. Personal communication with mercury co-chair Robert Krauel (March 8 and April 16, 2001).

58. Personal communication with mercury co-chair Alexis Cain (February 27, 2001). See Mason, R.P. and K.A. Sullivan, "Mercury in Lake Michigan," *Environmental Science & Technology* , 1997, 31:942-947. For an abstract of the article, see U.S. Environmental Protection Agency, Lake Michigan Mass Balance Publications, Online: http://www.epa.gov/glnpo/lmmb01/pubs.html#Mason97 .

59. U.S. Environmental Protection Agency, *Lake Michigan Lakewide Management Plan 2000,* April, 2000, Chapter 5, p. 5-87.

60. Ibid. See also Scholtz, Trevor and Bill Van Heyst, Canadian Ortech Environmental, *Long-range Transport of Persistent Toxic Substances to the Great Lakes: Review and Assessment of Recent Literature* , Submitted to Environment Canada, March 27, 2000.

61. Ross & Associates, *Binational Toxics Strategy Draft Step 3 Report: Options for Reducing PCBs* , July 14, 2000, p. 1.

62. U.S. Environmental Protection Agency and Environment Canada, *Draft Report on Mercury Sources and Regulations, 1999 Update* , November 1999.

63. Mobile sources are defined as diesel- and gasoline-powered, on-road, light-duty vehicles, with gasoline-powered vehicles making up the most significant emissions.

64. Mercury inventory. Summary - progress report. Electronic document e-mailed from Robert Kraul, March 8, 2001.

65. US EPA and Environment Canada, *Draft Report Mercury Sources and Regulations, 1999 Update* , November 1, 1999.

66. Alexis Cain, Progress Update: Mercury Use Reduction Challenge, Online: http://www.epa.gov/glnpo/bns/mercury/progress.html http://www.epa.gov/glnpo/bns/mercury/progress.html , August 15, 2000 Update.

67. U.S. Environmental Protection Agency, *Lake Michigan Lakewide Management Plan 2000,* April, 2000, Chapter 5, p. 5-57.

68. Ibid.

69. For example, the U.S. EPA reports, *Moving Mud: Remediating Great Lakes Contaminated Sediments* , A Report on the Sediment Assessment and Remediation Program in the Great Lakes Basin (1997) and *Realizing Remediation: A Summary of Contaminated Sediment Remediation Activities in the Great Lakes Basin* (1998).

70. U.S. Environmental Protection Agency, *Lake Michigan Lakewide Management Plan 2000,* April, 2000, Chapter 5, p. 5-58. See also Lake Superior Binational Program, *Lake Superior Lakewide Management Plan 2000,* April 2000, Chapter 4, p. 4-21.

71. It is important to note that the quantity of PCBs in use represents potential releases, as opposed to actual releases.

72. The PCB Transformer Registration Database, as of December 1999, was provided to the consultant by Anton Martig, U.S. EPA, April 20, 2001.

73. U.S. EPA and Environment Canada, *PCB Sources & Regulations Background Report* , Draft, October 25, 1999. One of the co-chairs added that, in addition to utilities, other primary owners of PCB transformers are companies associated with steel and metal production and the federal government. Comments provided by Anton Martig, U.S. EPA, April 20, 2001.

74. Ross & Associates, *Binational Toxics Strategy Draft Step 3 Report: Options for Reducing PCBs* , July 14, 2000, p. 5.

75. Lake Superior Binational Program, *Lake Superior Lakewide Management Plan 2000,* April 2000, Chapter 11, p. 11-8.

76. Ibid., p. 11-8 - 11-9. See also Michigan Department of Environmental Quality, *Lake Huron Initiative Action Plan* , March 2000, Chapter 3.

77. Lake Superior Binational Program, *Lake Superior Lakewide Management Plan 2000,* April 2000, Chapter 11, p. 11-8 - 11-9. See also Michigan Department of Environmental Quality, *Lake Huron Initiative Action Plan* , March 2000, Chapter 3.

78. Meyer, Debra M. and Christina Caplan, *Identifying Source Regions of Selected Persistent Toxic Substances in the United States* , Third Progress Report prepared for the IAQAB, Draft document, Online: http://www.ijc.org/rel/boards/iaqab/meyer/index.htm www.ijc.org/rel/boards/iaqab/meyer/dioxin.htm , September 1999.

79. Battelle Memorial Institute *, Great Lakes Binational Toxics Strategy: PCDD (Dioxins) and PCDF (Furans): Sources and Regulations* , Draft Report, Prepared for US EPA, May 26, 2000, p. 9.

80. Ibid., p.11.

81. Ibid., p. 6.

82. Ibid., pp. 9-13.

83. Estimated release in Ontario is 0.44 g TEQ/yr. See Environment Canada, *Canadian Inventory of Releases of PCDDs / PCDFs: Updated Edition* , February 2001.

84. Estimated release in Ontario is 3.66 g TEQ/yr. See Environment Canada, *Canadian Inventory of Releases of PCDDs / PCDFs: Updated Edition* , February 2001.

85. Estimated 1998 release in Ontario is 1.23 g/year. See "Draft Technical Background Paper - Dioxin / Furan Emissions - Steel Sector", September 30, 1999 prepared for Environment Canada Minerals and Metals Division by Charles E. Napier Company Ltd.

86. For more information on the development of the decision tree analysis process, its intended purpose, and how decisions were made to determine priority designation for each

sector, see Battelle Memorial Institute , *Great Lakes Binational Toxics Strategy: PCDD (Dioxins) and PCDF (Furans): Reduction Options* , Report for External Review, Prepared for U.S. EPA, September 27, 2000.

87. Battelle Memorial Institute , *Great Lakes Binational Toxics Strategy: PCDD (Dioxins) and PCDF (Furans): Sources and Regulations* , Draft Report, Prepared for U.S. EPA, May 26, 2000, p. 34.

88. *Dioxin / Furan Ontario Reductions - Baseyear 1988 to Year 2000* , April 2001. Spreadsheet e-mailed from Anita Wong, May 1, 2001.

89. The *Great Lakes Binational Toxics Strategy: PCDD (Dioxins) and PCDF (Furans): Reduction Options* (September 27, 2000) provides an update of these estimated water and air releases. The report estimates that total national releases of dioxins / furans from quantifiable sources are 12,800 g I-TEQ in 1987 and 3,000 g I-TEQ in 1995.

Part III

Qualitative Report

Section 1. Analysis of Interview Results

I. Methodology

The second phase of the review involved conducting 25 [(1)] interviews with individuals - including representatives from the U.S. and Canadian federal governments, the eight U.S. Great Lakes states and the province of Ontario, industry, and environmental organizations - who have been involved in the efforts related to the Strategy. Of the 25 people interviewed, five were from the federal government (U.S. and Canada); nine from each of the Great Lakes states and the province of Ontario (one person from each jurisdiction); four from environmental organizations; and seven from industry. Of those interviewed, six represented Canadian organizations and 19 represented American ones.

II. Findings / Observations

1. What the BTS Is and What It Should Be

It is important to note that as our evaluation of the Strategy progressed, TGA observed that, depending on who we spoke to, there were different views on what the BTS is and what the Strategy should be. Furthermore, these different underlying assumptions about the Strategy tempered the perception of the Strategy's success or failure. For example, if people defined the BTS as "action-oriented," then they tended to perceive that little or no progress had been made. However, if people defined the Strategy as a "process," then they were more likely to say it was making good progress in meeting its goals. Our findings are written with these underlying assumptions in mind.

As a precursory step before presenting our findings, TGA felt it was important to analyse the different definitions of the Strategy and explore why these

different definitions might exist. Although TGA did not formally ask this question, it became clear early on in the interviews that there were different descriptions or definitions of the Strategy. The interviewee's perception of success or progress made by the Strategy appeared to be a consequence of their particular definition of the Strategy. Participants tended to define the BTS in one of four ways:

(1) An information-sharing forum;

(2) A process: multi-stakeholder, step-by-step, decision-making process;

(3) A coalescing force that serves to focus U.S. and Canadian efforts on particular substances in a particular region (i.e. the Great Lakes); and

(4) Linked to other toxic reduction initiatives, either as an umbrella encompassing other initiatives or merely one of many initiatives.

Most interviewees described the Binational Toxics Strategy as an information-sharing forum. This description correlates to the wording provided in the Strategy document itself, which states that the purpose of the BTS is to

set forth a collaborative process [illegible] in consultation with other federal departments and agencies, Great Lakes states, the Province of Ontario, Tribes, and First Nations, will work in cooperation with their public and private partners toward the goal of virtual elimination of persistent toxic substances resulting from human activity.

For many, this consultative, cooperative process has become the "raison d'être" of the Strategy, which is understandable because the process is driven by a consultative approach. The Strategy has become an information-sharing process, with "process" being the operative word, linking closely to the second definition of the Strategy.

The other two definitions - coalescing force / focus and link to other initiatives - are also found in the language used to describe the intent of the Strategy as well as the actions that the Strategy is to influence. The Strategy states that "the goal of virtual elimination will be achieved through a variety of programs" and "acknowledges and builds on the existing Canadian and U.S. regulatory programs which address the targeted substances." Moreover, the Strategy document argues that "both countries acknowledge that more needs to be done," and explicitly states that

[M]ore strategic and coordinated interventions are required at various geographic scales, from the local watershed / AOC to the lakewide, basin-wide, national, and international arenas. [illegible] The Strategy is intended to encourage ongoing programs or emerging initiatives to better address toxic releases; to provide a context of basin-wide goals for localized actions; and to provide "out of basin" support to Great Lakes Basin programs such as LaMPs and RAPs.

Therefore, the Strategy is defined as a "process" and as a "mechanism for action." Neither type of definition is right or wrong but, in TGA's opinion, it must be recognized that these different definitions drive the expectations of stakeholder participants and influence their personal assessment of the success or progress made by the Strategy.

As an aside, it may not be unusual for many people to see the Binational Toxics Strategy as an information-sharing process since most of the workgroups have been immersed in the first three steps, which are concerned with gathering and analysing information:

Step 1: Gathering information;

Step 2: Analysis of current regulations, initiatives and programs which manage or control substances;

Step 3: Identification of cost effective options to achieve further reductions; and

Step 4: Implementation of actions to work toward the goal of virtual elimination.

Most of the substance-specific workgroups are either finished or partially finished step 3. The next step of the Strategy - implementation of actions - will require that workgroups be more action-oriented rather than process-oriented.

2. Participation / Involvement in BTS

Most of the people we interviewed have been involved in more than one substance-specific workgroup, either in the past or currently. However, most people attend the mercury workgroup meetings and the Integration Group meetings, but do not necessarily attend both. The people who attend the substance-specific workgroups tended to have different, and more favourable, views of the BTS than those who only attend the Integration Group.

Most interviewees (14 of the 25 or 56%) agreed that there was a need for more state / Ontario involvement in the Binational Toxics Strategy. Eleven people, or almost half (44%), thought that more industry sectors needed to be engaged in the BTS. Of those eleven, seven thought that more industry groups in general should be involved (four of the seven mentioned users of mercury) and four mentioned the need to engage smaller companies (SMEs). Six of the interviewees expressed a desire for more involvement by environmental organizations, particularly in the substance-specific workgroups. Five individuals thought that tribal and First Nations groups should be involved in BTS effort, although it was not known what their role might be since these groups cannot reduce releases per se but are an at-risk population because of their increased exposure to many of these substances.

People who only participate in the Integration Group had stronger perceptions of low state / Ontario involvement than those involved in the substance-

specific workgroups. Nonetheless, most agreed that states needed to be more involved in the BTS and there was strong recognition that, in many cases, state budgets and staff resources were too small to participate in BTS workgroups.

3. BTS Drives / Assists other Toxics Reduction Initiatives

Interviewees were asked whether the BTS had driven or assisted toxics reduction initiatives. Participants mentioned many examples of initiatives that they felt had been either directly or indirectly assisted by the Strategy. Many mentioned the work done on backyard burn barrels; the mercury pollution prevention initiative with three Indiana steel mills; the work done with hospitals to reduce mercury-containing hospital equipment / instruments; and efforts to deal with mercury-containing switches in automobiles, among others. Most of the examples related to mercury reduction efforts.

An unanticipated answer to this question came from state / Ontario representatives interviewed; almost all said that the BTS has helped to push state / provincial programs, particularly on mercury. Responses included statements that the BTS helps the state / provincial agency engage industry; indirectly drives programs; helps keep a focus on mercury issues; and helps the state / province go further in its efforts to reduce mercury.

When asked about the strengths of the BTS, respondents overwhelmingly answered that information sharing was a major strength. Many people told us that the workgroups, particularly the substance-specific workgroups, provided an excellent opportunity to share information on, and become aware of, projects that could be replicated in other jurisdictions. Many individuals provided examples of projects that had begun in one state / provincial organization and had been, or are going to be, replicated in another jurisdiction. In addition, the networking that occurs at meetings allows participants to get to know who is working on a particular project, so that state / provincial government official knows who to call when they want guidance and information for replicating the project.

A second major strength of the Strategy is the focus and direction that the Strategy provides to the initiatives undertaken by industry, state and federal governments. Interviewees argued that, without the Strategy, there would be various, unrelated efforts on different substances, without any coordinated or cohesive effort. In addition to the Strategy's contribution to focusing and providing direction, interviewees told us that the BTS provides validation of other initiatives to reduce PBTs, particularly for state / Ontario government organizations. For example, a state agency can use the Strategy (an international agreement) as additional justification to push / engage industry to take further action to reduce toxics or even as further justification to strengthen emissions limits or other standards. Many representatives from state / Ontario organizations told us that the principles of the BTS drive their toxics and pollution prevention programs.

A few individuals also argued that the BTS had impacted toxic reduction efforts at the national, hemispheric, and international levels. For example, U.S.

EPA's Persistent Bioaccumulative Toxic, or PBT Initiative, is a national cross-office, multi-media initiative that has a very strong link to the Binational Toxics Strategy. An example of a hemispheric initiative impacted by the Strategy is the Commission for Environmental Cooperation's North American Regional Action Plans (NARAP), which also target Level I substances such as mercury, DDT, and PCBs. At the international level, the Strategy appears to have assisted the U.S. and Canadian stance on the United Nations Environmental Programme's Persistent Organic Pollutants, or POPs, Protocol. Interviewees argued that many of the Strategy substances were also targeted by these initiatives.

Interviewees provided specific examples of "pilot projects" that have been replicated in another jurisdiction or expanded to a larger region. The projects cited by most included the mercury pollution prevention agreement involving three Indiana steel mills, U.S. EPA, and the Indiana Department of Environmental Management; the wood-burning stove change-out project; and the health care without harm initiative. Others mentioned the mercury thermometer exchange program; the clean car campaign; and the backyard burn barrel initiative. Most people identified examples of projects to reduce mercury, although projects related to incineration (backyard burn barrel and wood burning stoves) target more than one substance (e.g. dioxins / furans, hexachlorobenzene, and benzo(a)pyrene). [(2)]

When interviewees were asked whether the Strategy was linked or coordinated to other efforts to reduce toxics in the Great Lakes basin, such as the Lakewide Management Plans (LaMPs) or the Remedial Action Plans (RAPs) for Areas of Concern, we received conflicting answers. Ten interviewees said that the BTS was well linked to the LaMPs, while another two said that a stronger link was required. For the ten interviewees that said that the LaMPs were well-linked, five did not specify which lake while two identified the Lake Superior LaMP, two identified the Lake Michigan LaMP, and one said that the Lake Ontario LaMP was used to implement the BTS on the U.S. side of the basin. The two people that said that a stronger link was needed did not specify the LaMP(s). Eight interviewees said that there was no link between the Strategy and LaMPs, with one of the eight specifying that there were no links between the Lake Superior LaMP and another saying that none of the Canadian LaMPs were linked. The six others that said that the BTS was not linked to the LaMPs did not identify any specific LaMPs. Likewise, the perceptions of the Strategy's links to the RAP process were also mixed. Six people said that the Strategy was well linked to the RAPs while another six said it was not linked. One person said that the Strategy needs to be better linked to the RAPs. Most perceived that better coordination between the Strategy and the LaMPs and RAPs would be desirable.

Since there are five different LaMP processes, with different participants in each, some LaMPs may be more integrated with the Strategy than others, which may explain the differences in perception. Moreover, some of the interviewees had little knowledge of the LaMPs while others participate in both the LaMP and BTS processes. Similarly, the 42 Areas of Concern

(AOCs) have their own RAPs and there may be different activities for each and different levels of awareness by the interviewees. It appears that the BTS is well integrated with the Lake Superior, Lake Michigan and the Lake Ontario (U.S. side only) LaMPs, either directly (LaMP is one of tools used to implement BTS) or indirectly (same people attending BTS meetings attend LaMP or RAP meetings). Further, because there are similar numbers that disagree about whether there are linkages between the BTS and RAPs / LaMPs or not, this leads us to conclude that better coordination between these programs is required.

There appears to have been little work undertaken to meet the challenge of completing or being well advanced in remediating priority sites with contaminated bottom sediments in the Great Lakes. Moreover, some of the interviewees said that it was either inappropriate for the Strategy to consider contaminated sediments or that contaminated sediments had not been addresses (and should be). There appears to be a conflict over the importance and / or the very validity of this challenge.

Other examples of initiatives linked to the BTS included the Canada Ontario Agreement, which focused on the same substances and had almost identical targets and reduction dates. A couple of interviewees also noted that changes under the Emergency Planning and Community Right-to-Know Act (EPCRA) seemed to be linked to the Strategy. Starting this year, lower reporting thresholds under the Toxic Release Inventory (TRI) are required for certain persistent bioaccumulative toxic chemicals and certain other PBT chemicals have been added to the TRI list of toxic chemicals.

Although many interviewees were able to provide examples of initiatives to reduce toxics that were related to the Strategy, many acknowledged that the cause-effect relationship between the Strategy and reductions of toxics in the basin is impossible to quantify. There are various initiatives to reduce releases of toxics and it is nearly impossible to attribute which reductions are the result of the Strategy as opposed to regulations, manufacturing process changes, voluntary initiatives, or other management programs. Moreover, there is a great deal of disagreement among participants as to whether or not toxic reduction initiatives are related to the Strategy, which has led us to conclude that this issue cannot be resolved. For example, as noted above, many interviewees said that the BTS drove the mercury health care initiative, inventory research work, and mercury projects in general while other interviewees also cited these same three initiatives as ones that were not related to the BTS. Whether the BTS drives or causes programs or not seems to be in the eye of the beholder. Nonetheless, there appear to be more people that believe the BTS influences initiatives, either directly or indirectly, than those who do not.

Many people interviewed argued that better coordination of information about substances and better coordination with other toxics programs was needed.

4. BTS Drives Inventory and Research Initiatives

Interviewees also said that the BTS had played a significant role in driving inventory research initiatives (e.g. modelling, research, stack testing, etc.) undertaken by states / Ontario, industry, and federal governments. These comments appear to suggest that participants are strongly committed to the BTS step-by-step process / philosophy: that it is important to understand the sources and pathways of Level I substances as a fundamental step in the decision-making process. Some participants argued that, without the Strategy, much of the inventory work done on substances would not have occurred.

Moreover, the inventory work that has come out of the Strategy has provided additional focus to industry and other government organizations and has ensured there is good information on the sources of releases and pathways of the Strategy substances. Further, the process of the BTS (4-step process) was cited as a considerable strength of the BTS because it focuses on finding the information about the sources and pathways of the substance first, then identifying the "owner" of the problem and, finally, prompting the owner to take action on the problem.

Several interviewees also remarked that more information is needed to further understand substances, particularly the long-range transport of pollutants.

5. Voluntary Nature of the Strategy

The voluntary nature of the Strategy is seen as both a strength and a weakness. On the one hand, the voluntary nature of the Strategy is seen as a good way to engage industry and to enable companies to take action on reducing toxics on their own terms. In this respect, some Level I substances are not regulated and that any effort to reduce them was worthwhile. On the other hand, the voluntary nature of the Strategy was seen as a poor incentive to engage industry because companies already participate in many toxic reduction initiatives and the BTS represents just one more program that competes for the company's time and resources. Since its not a mandatory program, many companies may not feel that they need to participate.

6. Government Support for the Binational Toxics Strategy

Interviewees identified that a major weakness of the Strategy was the lack of resources (staff and funding) to do the work required to reduce toxic substances. For example, people argued that additional funding is required for scaling up pilot projects and for developing initiatives. Moreover, some interviewees questioned whether there was enough staff to undertake the work needed under the Strategy. These perceptions were also related to the apparent lack of support that the Strategy had from the national headquarters of U.S. EPA and Environment Canada. Since the Strategy is led by regional offices (U.S. EPA Region 5, Great Lakes National Program Office, and Environment Canada's Ontario Region), interviewees questioned whether there was enough political awareness and support of the Strategy. In addition, may interviewees thought that the Strategy's results needed to be better publicized in order to raise the level of public awareness of the BTS.

7. Pollution Prevention

Most interviewees agreed that pollution prevention initiatives were the focus of discussions in workgroups, with only a couple of people disagreeing. A few argued that pollution prevention staff in government agencies were involved in Strategy efforts. One concern expressed is the additional effort needed to phase out the use of Level I substances in products, particularly mercury.

8. The Need to Take Action

Another area of weakness identified under the Strategy is the lack of workgroups in exploring economic and other incentives to spur action; costs of taking action; and new or alternative technologies. Many participants felt that a proper role for the Strategy was to explore and discuss these issues.

A significant weakness was the perception that there are instances where excessive debates and "foot dragging" occur, which impedes decision-making and taking action. Some participants identified a need for some type of mechanism, such as an accountability framework, to keep people moving along and in the same direction. Some also argued that there is a need for greater focus in workgroup discussions since there are times when issues are discussed too broadly, or in too much detail, which also impedes decision-making. Nonetheless, there were also individuals that believed a broader focus was needed to better deal with long-range air pollution and other global issues.

Some argued that a mechanism was needed for change to the Strategy, e.g. so that substances could be added or taken off the list.

Section 2. Binational Toxics Strategy - Interview Answers [(3)]

1. Are there any key organizations (industry sectors / sources of PBTs and community / tribal / environmental) that have not yet been engaged under the BTS? What have been the impediments / challenges?

✍ New York and Pennsylvania ✍ Chemical industry (e.g. American Chemical Association) does not show up to meetings; although very solid reductions in PBTs. ✍ Many states may not come because of lack of money. Need Great Lakes states at meetings; same old people at meetings. May need travel / board budget to states or have rotating meetings.
✍ States (with exception of Region 5 states). Need more resources to states so can participate more; travel to meetings ✍ Incinerators and product manufacturers (mercury)

✍ Wanted to send people to each workgroup but the state doesn't have the staff. ✍ Because the Strategy is voluntary, some industry organizations do not feel compelled to participate.
✍ Smaller companies. Harder to get awareness of the BTS to SMEs ✍ State regulatory people
✍ State and municipal governments ✍ Industry involvement is spotty ✍ Spotty ENGO participation; need grassroots ENGOs. ENGOs don't get a picture of the BTS "on the ground" at substance-specific workgroup meetings. Because ENGOs are not involved in these workgroups, they don't see the work being done. ✍ Industry doesn't like ENGO input ✍ If there were more hands-on negotiating of agreements with industry, then more ENGOs would participate.
✍ State cannot participate in meetings because of resource / staff issue. However receives information on BTS issues through distribution lists and interaction with respective EPA region.
✍ First Nations / tribes (exposure issue) ✍ Multistakeholder approach means that building consensus takes a lot of time, which is more of a reality rather than an impediment.
✍ Good participation from all stakeholder groups
✍ ENGOs need to be more involved in substance-specific workgroups, which are the "nuts and bolts" sessions. ENGOs add a moral tone so are needed. Have strong grassroots networks so could help with outreach. ✍ VE has been polarizing groups who have opposing views (see VE as absolute versus see VE as goal to aspire to).
✍ Smaller companies ✍ Non-point sources (e.g. agriculture)
✍ Industry and ENGO participation dropping off (e.g. CELA, CIELAP, Ecology Centre in Ann Arbor, Greenpeace, TEA were initially involved but not anymore). ✍ First Nations / tribes ✍ There are concerns by ENGOs that the BTS deals only with reductions rather than VE goals.

✍ Voluntary aspect is a question; there is no back up system if actions are failing. ✍ ENGOs don't like the way workgroups work or the direction they are going; ENGOs prefer to conduct workshops themselves. ✍ ENGOs don't have lots of resources so if initiative isn't moving fast, then don't want to participate. ✍ Tribal groups want to be treated as government not stakeholder.
✍ ENGO participation has dropped off.
✍ States (with exception of Indiana, Michigan, Minnesota, Wisconsin). Lack of staff time is a barrier for states to participate in the BTS. ✍ Product manufacturers (mercury) ✍ Some industry representatives show up but do nothing ✍ First Nations / tribes ✍ Because the BTS is voluntary, doesn't compel industry to participate. Laws and rules are also negotiated agreements - but they compel people. ✍ Tribal / First Nations groups do not have travel money to participate; also, see themselves as sovereign government so are philosophically against idea of being seen as a stakeholder.
✍ States / Ontario. Not good state representation at Integration Group meetings; U.S. EPA has to drag states there. ✍ Resources are federally driven so there is not a lot of state participation. ✍ Because the BTS is voluntary, this means that industry can walk away if it wants to.
✍ ENGOs don't travel to meetings because of a lack of resources (e.g. Pollution Probe, TEA, pesticides groups). ✍ Limited involvement from Ontario; does not participate except for mercury workgroup. Recently began attending Integration Group meetings. Lack of funding is a big issue. ✍ Five or six industry groups seem to come and go; more U.S. industry than Canadian industry involvement. ✍ Canadian government doesn't push BTS stuff so much, e.g. less awareness of mercury issue than in U.S. U.S. PBT initiative and U.S. NPDES are stringent programs. Canada doesn't have these types of regulations, which would bring industry to the table.

✍ Some industries keep silent on the work they are doing to reduce toxics because don't want to publicize that they release toxics.
✍ Some mercury users / emitters industry sectors, e.g. switch manufacturers, need to be further engaged; haven't been able to change behaviour.
✍ Smaller companies. Small companies are hostile to the concept of virtual elimination: when are you are zero? ✍ Larger companies are aware and are contributing to Strategy; harder to get smaller companies aware of the BTS.
✍ States (except for Wisconsin and Minnesota). Interviewee's state doesn't have time / budget to work on BTS; staff over-extended; no mandate. Thus, little effort.
✍ Ontario and states (with the exception of Michigan and Illinois) need to be involved in the Integration Group. ✍ There is a great deal of state involvement in the mercury workgroup. ✍ Industry tries to keep BTS constrained; reins BTS in while ENGOs want more fundamental approaches (e.g. industrial ecology). Want to keep everybody at the table; don't want to lose either ENGOs or industry. ✍ Initially, U.S. EPA was very involved in Strategy, but with budget cuts, they have reduced involvement. ✍ Brutally competitive environment for environmental initiatives. There are many initiatives out there that compete for people's time and resources (ENGOs and industry).
✍ ENGOs in substance-specific workgroups.
✍ Municipal representatives never show up. ✍ States (with exception of mercury workgroup). ✍ Stakeholder process is set up as a revolving door. Need to have a beginning and end to involvement with stakeholders. ✍ Industry needs to get engaged. Also, federal facilities and mobile sources.
✍ U.S. states (uneven involvement in workgroups); states are nonexistent unless have specific agenda items. ✍ CGLI does a good job of getting industry involved. However, need more sectors and smaller companies. ✍ There are four utilities in Minnesota but only two are involved in BTS.
✍ States (with the exception of Michigan).

✍ Indian tribes are not participating although have a strong interest in the toxics issue. However, there is an issue of capacity, as well as a political issue, to resolve. How big of a role should tribes have? ✍ P2 staff in government agencies are not directly involved in BTS (refuted by another interviewee).
✍ U.S. states not as involved as could be (e.g. Michigan but not others). Some states involved in specific project efforts (e.g. Indiana). Most states do not know about the BTS. Strategy needs to be played out at state / provincial level. ✍ Some industry sectors (not specific) ✍ Most ENGOs have abandoned the substance-specific workgroups because they didn't see any progress.
✍ First Nations / tribes are not involved. What can these groups do to help accomplish reductions? What would be their role in Strategy? ✍ Major stakeholders have been involved. ✍ Need to evaluate relationships with U.S. government agencies / stakeholders, e.g. ENGOs contribute by critiquing - not developing programs. Need to understand why ENGO participation has fallen off in workgroups.
✍ First Nations / tribes

2. Have the groups / sectors that are currently participating in the BTS been effectively engaged to take action toward achieving the BTS goals? How have companies been engaged (through association or individually)? What have been the incentives (carrots / sticks) for companies to take action?

✍ CGLI and American Iron and Steel Institute have helped engage companies. ✍ Generally, groups have been well represented. ✍ BTS has allowed for voicing and listening to different viewpoints; awareness of other stakeholders. ✍ Mercury voluntary program pushed some companies to start. BTS provides a way for companies to get started and provides recognition. ✍ Dollar impacts of decisions are discussed.

- BTS has allowed companies to do something unique and voluntary.

- Because is voluntary, reaches more industry players; more imaginative solutions versus strict regulatory compliance.

- Orderly way of motivating action; BTS is a dialogue to achieving objectives, which helps the Strategy gain credibility with industry.

- Provides opportunities for industry to do things on its own terms. Information is out there (steps 1 to 3 of Strategy) to do regulations now (incentive)?

- Trade associations are aware of the Strategy and aware of activities they have with members as they relate to the BTS; however, the BTS doesn't drive these programs.

- The Level I substances targeted are not produced by industry, so they are not engaged. P2 initiatives are already being done by industry; there are so many other existing initiatives e.g. reporting mechanisms like NPRI and NERM (Responsible Care). It's hard for a company to be involved in all initiatives.

- CGLI is a good forum for cross-border activities; encourage and communicate on Great Lakes initiatives.

- Allows organizations to apply for grants; strengthens organization's proposal.

- Voluntary initiatives engage industry; beneficial for companies because get good PR.

- BTS has increased the number of organizations / stakeholders involved in reduction efforts; some organizations would not have come to table without the BTS.

- Letters has been written to get industry to the table, e.g. National Electrical Manufacturers' Association to attend mercury workgroup, but they haven't attended.

- Company became involved because of CGLI. Trade associates decided to support CGLI in its efforts.

- BTS provides a home for anyone who wants to contribute; very inclusive.

- It's not a matter of carrots and sticks but rather a question of how well companies are doing at internalizing environmental issues. That is, are the values in place? If so, then people will do things.

- Industry has become more involved due to enthusiasm of CGLI and other industry members.

- BTS helped with Minnesota's work with utilities; voluntary reduction agreements in Minnesota so are not attending BTS meetings.

✍ Wisconsin had a white paper process which got people involved in the BTS.
✍ Because the BTS is voluntary, it brings in industry.
✍ CGLI is not good at engaging companies to participate in BTS; CGLI sees its role at the table as a gatekeeper (guarding the door). CGLI keeps the BTS and government from thinking strategically about the goals. ✍ Industry jumps all over principles like "phase-out," "ban," and "virtual elimination." ✍ CGLI does not represent the most pro-active companies, e.g. clean car campaign works with other groups like the recycling and design people at Ford and the American Scrap Recycling Association.
✍ Public expectations of companies have changed / increased; industry understands now. Public expectations serve as incentive to get industry engaged. ✍ Voluntary nature of BTS attracts companies. BTS focuses attention on certain substances.
✍ There has not been effective engagement. CGLI offers nothing to the Strategy; thwarts efforts rather than dealing with toxics; lots of talk and no action. It is CGLI's responsibility to take leadership. ✍ Antagonism between the stakeholders, e.g. industry is often dragging its feet. ✍ Projects are small, boutique efforts; no one is talking about ramping up.
✍ Companies need financial incentives (state government) to participate in actions, e.g. for every $1 spent on removing PCBs, a company pays $2 in taxes. ✍ States need to engage companies; it's not the role of industry association to bring others on. ✍ CGLI does a great job in providing information.
✍ U.S. EPA has shown there are easy ways to deal with mercury that may be costly up front but cheaper in the long run that, e.g. if there were a mercury spill. ✍ Steel mills are active in BTS (not all mills involved in agreement and coal is excluded). ✍ Being a good corporate citizen and good public relations are incentives for companies to participate.
✍ Industry groups have paid attention to this process and have been engaged.

✍ Both associations and companies have been involved in the BTS. At least 2-3 people from companies attending these meetings. ✍ Incentives to be involved are that the Strategy uses real, quality data and moves in a stepwise manner to make progress. Strategy provides an arena to organize people and to get them engaged. ✍ More and more industry involvement as the Strategy goes on.
✍ Fairly good engagement by all stakeholders. Huge group of stakeholders; hard to engage all. BTS has tried to get a representative group. ✍ An incentive to participate is the opportunity to influence an outcome and create good public policy. ✍ Also, it's good PR and community relations for industry. ✍ BTS results and strategies will be more effective (and cost effective) than regulations.
✍ Industry representatives have been active in workgroup; major input into lack of data.

3. How have the attitudes of the groups / sectors that are currently participating in the BTS changed as a result of the Strategy?

✍ Industry has woken up over the past 30 years and realized that it is good to be environmentally friendly; not polluters. ✍ Regulations have pushed this thinking but there has also been recognition by companies that they should do the right thing.
✍ Some industries have been reducing toxics; it is unlikely the BTS prompted them to do this.
✍ At beginning of process, there was a polarization between industry and ENGOs but now we've been able to bridge that, although strains still exist.
✍ Utilities have been involved in state effort in Michigan and participate in BTS. BTS has kept utility industry moving forward on efforts; focusing on use but not emissions.
✍ We are a much more cohesive structure now (trade associations and companies). Recognition that we are involved in more binational issues occurred around the same time we became involved in BTS. ✍ Champions have been identified; support of champions in leveraging action; assisting companies to leverage action.

✍ Voluntary approach gets industry engaged. ✍ BTS gets industry to report on what they are doing and focuses industry. ✍ Voluntary approach shows that regulations do not capture everything. ✍ Regulators and industry have been brought together.
✍ There has been no shift in thinking from CGLI.
✍ There is too much bickering by industry in the BTS; industry is not creative. They try to shape Strategy so as to minimize industry's role and to minimize the importance of toxics.
✍ Industry has become more engaged over time. Helps organize and engage people in reducing PBTs.
✍ Industry is more inclined to participate in a BTS type of process. Common Sense Initiative (1993-1994) laid the groundwork for this type of stakeholder process.
✍ There has been a shift in the iron and steel sector.

4. Have specific programs been developed / expanded / changed in direct response to the Strategy? If so, which ones? Have budgets increased?

✍ Helps state to engage industry to reduce toxics, e.g. mercury collection program and annual pesticide sweeps. Gives state a more compelling reason to take action on these programs.
✍ Inventorying / sharing information (e.g. states share information). ✍ Drove chlor-alkali industry agreement, which is a national program. ✍ Helped wood stove changeout, steel mills, and mercury-free health care initiatives. ✍ There also seems to be work going on without the BTS (e.g. the mercury workgroup and U.S. EPA's GLNPO programs), e.g. mercury-free medicine and the clean car campaign are GLNPO programs, which also get money from private funds.
✍ Drove mercury voluntary program (steel) ✍ Helped keep focus on PCBs reduction efforts
✍ State has not established specific programs for the BTS; however, incorporates principles of BTS into its programs, e.g. water quality programs (e.g. NPDES) now focus on all BTS Level 1 and Level 2 substances; also

sampling and data collection to determine sources and loadings focuses on Level 1 substances.
✍ Drove work on burn barrels and work on mercury. ✍ Woodstove changeout pilot program ✍ Has a contaminated sediments focus; LRTAP will provide a focus in future (CEC and others like the UNEP POPs Protocol)
✍ Strategy helped GLU to do workshops with hospitals ✍ Budgets have decreased overall in both U.S. EPA and EC.
✍ Helped ENGO do workshop on extended producer responsibility. BTS can help ENGOs to raise awareness and promote alternatives.
✍ Chlor-alkali industry agreement to reduce mercury by 50% ✍ BTS led to letters to auto and steel industries re: PCB reductions. ✍ National PBT initiative; adopted PBT substances from Strategy.
✍ Helps to focus and drive state's initiatives to reduce PBTs. ✍ Has driven more modeling and air monitoring programs.
✍ Provides national direction (e.g. U.S. PBT initiative)
✍ Drove wood stove change-out program. ✍ Steel industry voluntary mercury reduction program. ✍ Although there were several, the BTS was the catalyst that galvanized the U.S. national PBT Strategy
✍ Strong synergy between BTS and national PBT initiative ✍ BTS drove steel industry and hospital partnerships.
✍ Drove scientific work on HCB (+ OCS somewhat) ✍ Has led to greater understanding of sources of substances. ✍ BTS burn barrel activities have synergies with federal and state work. ✍ U.S. preparation / stance on POPs negotiations.
✍ Indirectly drives state's programs ✍ Dioxin workgroup did major work on backyard barrel burning as a source of dioxins. ✍ Indirectly drives state programs (trickle down effect), e.g. Hg is top issue for BTS, and then EPA Region 5, and then state environmental agency.

✍ Drove work on burn barrels; an example of educating and involving public to make a big reduction in toxics emissions. ✍ In U.S., BTS has been integrated into national priorities. ✍ Our industry sector is organized around the BTS (e.g. looking at dioxins and PCBs). Tries to relate actions they are taking to the BTS.
✍ Helps keep a focus on mercury initiatives. ✍ Hasn't triggered new initiatives, with the exception of mercury switches. ✍ BTS forces governments to do inventory work because have to report against targets. Also, new initiatives developed to get data (especially for the steel sector), e.g. stack testing.
✍ Impacts our state's mercury programs (e.g. thermometers). ✍ Networks formed at BTS helped push many state initiatives.
✍ Mercury manometer exchange program (adopted by other states), e.g. Minnesota started program, shared its experiences at BTS meeting and now Michigan has started a similar project. ✍ Mercury switches in cars (adopted by other states). ✍ U.S. EPA MOU with the American Hospital Association to reduce mercury uses (specific goals). ✍ Auto industry letters to phase out use of PCBs. ✍ Assisted burn barrel initiative (dioxins) ✍ BTS fed into the U.S. national PBT initiative (Oregon and California have PBT initiatives)
✍ Drove chlor-alkali industry, health care, and steel agreements. ✍ Hg inventories ✍ National PBT initiative, state work on Hg, and research on long-range transport of air toxics.
✍ Cannot separate state programs from BTS; some programs were set up under BTS, others were not. ✍ Strategy has helped state go further in its mercury reduction programs. ✍ Thermometer recycling program has been replicated in several states; BTS is forum for exchanging this information. A thermostat sub-group was set up under the mercury workgroup.
✍ Planted the seed for the PBT Initiative

✍ Influenced U.S. policy approach to international POPs agreement.
✍ Complements other toxics programs rather than driving them; helps focus programs; ensures substances remain a priority.

5. Are there any specific local or "pilot" initiatives to reduce toxic substances that should be expanded / changed in scale (national, regional, lakewide, etc.)?

✍ Mercury initiative (steel) should be expanded nationally; mercury is a national issue.
✍ Wood burning stoves, steel mills, mercury thermostats, clean car campaign, HCWH = projects that should be expanded.
✍ Woodstove change-out program and burn barrel programs.
✍ Manometer exchange pilot program should be expanded. ✍ Mercury switches in cars in auto salvage yards
✍ Burn barrel initiative should be expanded.
✍ Western Lake Superior - mercury and PCB reduction ✍ Utilities - Lake Michigan
✍ Thermometer exchange and products (e.g. drugs) that contain mercury (e.g. Eli Lilly). This is low hanging fruit, however. State cannot buy thermometers so needs partners to remove. Several states have replicated thermometer recycling program
✍ Wisconsin's Hg in Schools program is being developed in Minnesota. Michigan has legislation to ban mercury in schools by 2004. ✍ Hg fever thermometers work. New Hampshire and other states have development sales bans. ✍ Utilities and Hg session in Nov. 1998 looked at monitoring Hg releases, looking at processes, research directions, etc.
✍ Auto mercury reduction program pilot. How can we make pilots like these larger in scope?
✍ P2 Partnership with Paper Council has been very effective and could be expanded to a larger scale. ✍ Lake Superior project is being expanded to outside of basin
✍ Health Care Without Harm is expanding to Canada (TEA and CAPE); still needs to be further expanded in U.S.

✍ GLU wrote a Hg white paper for Clean Car Campaign; hopes to do white papers on lead, dioxins / furans and eventually all PBTs in cars. ✍ In order to expand pilot projects, more resources are needed ✍ Have been pilots to retire PCB transformers but preferred way of destroying them is through burning rather than other methods. ✍ For Hg, long-term storage is needed (as opposed to landfilling).
✍ Indiana mercury steel sector agreement has expanded in scope.
✍ Steel industry partnership in Indiana B steel industry is beginning to expand effort nationally themselves. ✍ HCWH has expanded nationally. ✍ Pockets of activity in greening supply chain and greening of federal facilities. ✍ The ultimate goal is to change behavior of people. Wood stoves, home fires, barrel burning also release PBTs. Changing behavior of individuals is bigger challenge than with industry.

6. How has the BTS linked to other initiatives related to the Great Lakes Water Quality Agreement (e.g. LaMPs, RAPs, contaminated sediments, airborne toxic substances, etc.)? Have any of these initiatives expanded / changed because of the Strategy?

✍ BTS is somewhat linked to the LaMPs and RAPs; but not very well ✍ Not as well linked to LaMPs and RAPs as could be. ✍ Contaminated sediments should not be dealt with under BTS; PCB workgroup has avoided contaminated sediments issue. BTS should be proactive rather than retrospective
✍ There are synergies between BTS and RAPs. ✍ Low visibility of activity going on in LaMPs. Lake Superior LaMP has gotten out of control.
✍ Linked to LaMPs and RAPs, which are discussed in Integration Group meetings.
✍ PCB contaminated sites are dealt with in RAPs / AOC. But historical contamination has not been resolved by RAPs / AOC nor by BTS

✍ Not well linked with RAPs, but after learning about dioxin burn barrel initiative from last Integration Group, will share information at next RAP (Presque Isle Bay has sediment containing dioxins).
✍ Links to LaMPs (share information through reporting processes) and RAPs (AOCs), e.g. Lake Ontario LaMP is effective umbrella for incorporating BTS; only dealing with Level I substances. BTS helps us within our LaMP: airborne deposition of PCBs; programmatic initiative to work with other states and Ontario (e.g. what can be done; monitoring); source loading model (including Ontario and other states).
✍ BTS is not linked to the LaMPs. State environmental agency dismantled LaMP and RAP programs and AOC (formerly had 7 persons working on these issues but now only one).
✍ Well linked to other Great Lakes programs.
✍ Many of same people attend LaMP and RAP meetings; informal link to BTS.
✍ RAPs and LaMPs tend to cover different substances than the BTS.
✍ Is the Strategy a guiding document, or are RAPs and LaMPs outside of the BTS?
✍ Not linked well to RAPs / LaMPs because not much linkage to toxics in these programs.
✍ Links to Canada Ontario Agreement. COA is up for renewal and the BTS has featured large in these negotiations. ✍ RAPs are not linked closely to the BTS but rather to their own plan. ✍ Strategy is referenced under LaMPs but does not drive LaMPs ✍ Constant point of reference in SOLEC discussion of indicators.
✍ Not well linked to LaMPs and RAPs.
✍ Good coordination between LaMPs and BTS, e.g. Lake Superior LaMP. BTS people prepare briefings for LaMPs. Lakes Erie, Michigan, and Superior LaMPs look to BTS to deliver reductions. ✍ RAPs tend to focus more on local issues and contaminated sediments - not BTS link. BTS is not designed to deal with contaminated sediments; committed to publicly track inventory of significant sites and show progress.
✍ BTS links to LaMPs and RAPs. Trying to avoid toxic-centric theme but it's there (along with habitat and invasive species).
✍ LaMPs are not supposed to be looking at long-range transport of toxics issues because BTS is. LaMP could be implementation vehicle for Strategy but links are not being made.
✍ Well coordinated with LaMPs and RAPs. Lakes program is highly integrated (3 components, of which BTS is part of one).

✍ Contaminated sediments is a focus for the BTS.
✍ LaMPs and BTS need to be better coordinated.
✍ Good links to LaMP (Lake Michigan)
✍ Linked to LaMPs; LaMPs reference BTS in their documents. ✍ Lake Superior LaMP has its own goals for reducing toxics. Concern from LaMPs about BTS initially because had their own numbers, etc.
✍ BTS and Lake Superior LaMP are linked. Lake Superior LaMP is very cognizant of Strategy; trying to be consistent in application of programs in the Great Lakes.

1. How has the BTS linked to U.S. or Canadian initiatives to reduce toxics (national, state or provincial) [e.g. TRI, NPRI, MACT, etc.]? Have any of these initiatives expanded / changed because of the BTS?

✍ SARA 313 - lowering of thresholds for reporting quantities of Level 1 (PBT toxics like mercury and dioxin) substances will take effect this year.
✍ Variety of Hg reduction initiatives, e.g. developed a handbook / guide for dental wastes and amalgams containing mercury; collecting auto mercury-containing switches through auto salvage yards. ✍ Programmatic initiative to work with other states and Ontario to determine what more can be done, such as monitoring, source / loading modeling, source characterization & trackdown.
✍ Has helped with national efforts in Canada, such as CWS for Hg.
✍ In U.S., Honeywell developed Hg switch program; Canadian arm of Honeywell in final stages of developing one in Canada. ✍ BTS provides information sharing, e.g. Pollution Probe pushes U.S. initiatives into Canada, e.g. Hg switches at steel plants and Hg emissions inventories at steel plants. ✍ COA and BTS are almost identical. ✍ Ontario works on Hg issues on state-to-Ontario basis; ad hoc group on Hg (outside of BTS) where information is shared.
✍ BTS is linked to the international POPs treaty.
✍ BTS is a layer, or another cut, of environmental activity, e.g. SOPs and COA include PBTs that are unique to steel sector, e.g. PAHs, benzene, dioxins / furans. Also at the time, water agenda was unfolding in Ontario - MISA; water discharge regulations wrap up into BTS.

✍ Not fully integrated with other toxic reduction programs, e.g. water and air divisions of agencies. BTS does not seem to be linked to larger scale programs, e.g. NAFTA (SMOC).
✍ CEC SMOC initiative (NARAPs); looked at BTS to develop NARAPs. ✍ International global POPs was influenced by BTS. ✍ CGLI plays a really positive role to get industry engaged. ✍ Brutally competitive environment for resources within U.S. EPA. Strategy's binational aspect helps in obtaining funding.
✍ Information sharing on airborne toxics (e.g. IADN) data. ✍ Strategy impacted PBT initiative
✍ BTS serves as a reference point and / or validates other activities going on to prevent, reduce, and remediate toxic substances.
✍ Strategy makes it easier to gain support from U.S. for bigger policy perspective of PBTs (e.g. national focus). ✍ TRI threshold limit reduction (linking standards to reinforce each other).
✍ Well linked to hemispheric programs like NARAP. ✍ Impacted global POPs agreement.
✍ U.S. national PBT action plans for Hg, HCB, OCS are result of work done by EPA Region 5. EPA headquarters built on work already done through BTS.
✍ Helps states promulgate regulations, e.g. medical waste incinerators
✍ Added more focus / profile to COA programs. Explicit linkages between BTS and EC's planning structures. ✍ Should look at contaminated sites / LRTAP but only in exploratory way. Can open up issues and look at what governments are doing.

8. Is there adequate information to evaluate the progress made by voluntary programs (baseline data, quantitative information)?

✍ There have been problems with data collection / integration, which means it has been difficult to measure progress. However, Strategy's baseline data are good enough to track progress.
✍ Strategy's baselines have been difficult to get but they are good enough to evaluate progress.

✍ State governments, Canada / U.S. federal governments have different databases. Need to compile into one or coordinate so can determine if meeting goals. Need to improve inventory and baselines.
✍ Currently working on discrepancies between the HCB and dioxins inventories. Process to resolve data inventories is good. Inventories are good (right numbers are there). ✍ There are enough data to evaluate the BTS.
✍ Information is spotty; need a way to pull information together across sectors / substances. Need more simplified information in a more simplified fashion.
✍ On way to approach data is to have a benchmark to measure progress (time frame to compare). Another way is to not worry about the amount and get people to turn in mercury (benefit but not quantified). Thus, need data to focus and, in some instances, to measure progress.
✍ We can measure progress by looking at how things are working, e.g. how effective are our relationships with stakeholders and how effective are stakeholders in contributing to the goal? ✍ The units you choose to measure in are an issue but the important thing is to see trends (e.g. NPRI / TRI show that companies are using less and emitting less of these substances - cannot really quantify these things). Baselines help but are not a make-or-break issue.
✍ Myriad of different data sources to sort through and to make sense out of it, e.g. long and tedious process to identify sources of emissions in HCB / B(a)P workgroup. Reduced thresholds for TRI (SARA 313 process) will mean that there will be better data and more recent, etc.
✍ Hard to quantify Strategy's baselines (sources, media, etc.) but good work done.
✍ There aren't data in many cases (or aren't reliable data). Can use environmental indicators as a baseline (e.g. decline of pesticides in the Great Lakes). Also, there are emissions measures; reducing entry into the system. ✍ Changing people's behaviour is the ultimate goal.

9. Has pollution prevention [the use of processes, practices, materials, products or energy that avoid or minimize the creation of pollutants and waste, and reduce overall risk to human health or the environment] been a focus for actions / initiatives taken to meet the challenges under the Strategy?

✍ Pollution prevention has been a focus for the BTS; gives recognition to companies that go out and that could be improved upon.
✍ Pollution prevention is not a focus under the Strategy.
✍ Pollution prevention is a focus; P2 goes beyond compliance
✍ P2 represents 80 percent of programs; 20 percent is regulatory processes.
✍ Priority on P2 generally, end-of-pipe controls are not discussed.
✍ Good P2 approach under Strategy; phase-out approach.
✍ Pollution control versus P2 and clean production is still an on-going debate.
✍ P2 deeply embedded concept in BTS; P2 is one of many tools to use.
✍ Strong P2 focus. Industry recognizes it is beneficial to look at P2 in addition to regulations.
✍ P2 focus in BTS
✍ Pollution prevention is a focus rather than end-of-pipe.
✍ Focuses on end-of-pipe controls rather than P2
✍ Focuses on pollution prevention and end-of-pipe tools.
✍ P2 is the focus of initiatives under the BTS.
✍ State's efforts are pollution prevention focus, as are national efforts. Also, trying to get mercury out of the system through recycling. BTS has helped the pollution prevention focus.
✍ P2 is main approach; end-of-pipe treatment is too expensive (e.g. POTWs).
✍ Pollution prevention principle is not the focus of the BTS.
✍ P2 is well-integrated into BTS, e.g. P2 people in EC are involved.
✍ P2 focus in BTS.

10. Have the initiatives to reduce PBTs under the Strategy been effective / successful? Examples? What other types of initiatives should be utilized under the BTS? Are new / different types of programs needed (e.g. extended producer responsibility)?

✍ BTS is looking at incentives. ✍ Any incentives would help.

- Settlement for environmental violators - supplemental projects. U.S. EPA gives no credit for things that companies are going to do or have just done.

- Mercury is a big issue; more awareness and outreach is needed. This outreach should be done by a combination of government and stakeholders working together.

- Need life cycle perspective - ongoing sources; long-range transport; the water-air interface is not well understood; sediment, water, shoreline interaction is not well understood (need more information).

- BTS should have a role in pushing stricter regulations; would be a helpful role.

- An awards program might help.

- Pollution prevention strategies, e.g. Dow Chemical Company / Natural Resources Defense Council worked on the Michigan Source Reduction Initiative (MSRI); however, it is very labour intensive to develop a P2 Strategy.

- Need to change people's behaviour; need more outreach (e.g. woodstove changeout program).

- Should develop a "model facility" for each industry - using P2 and end-of-pipe controls to help set emissions - to develop an industry standard.

- Limited tool kit right now; initiatives mostly voluntary. Need to broaden tool kit, which could be done faster if there were more capacity and resources.

- Beginning to look at economic incentives. Emissions trading may be explored further through BTS.

- Information needs to get disseminated out to public; they also impact environment.

- Need to focus on long-term rather than short-term.

- Need to look at new technologies / new concepts and push them (e.g. clean coal technologies).

- Need broader state participation - outside of Great Lakes states - to reduce PBTs nationally. Also need continental push to reduce toxics.

- Need to better educate / define issues; raise public awareness (e.g. HCBs, dioxin, mercury, pesticides (atrazine)). Environmental impacts of consumer goods.

- Private industry doesn't get recognition for the work it does.

- Stock-piling of mercury is an issue - recycling? Sell it back?

✍ Need innovation and new techniques in an era of reduced funding.
✍ May not be enough staff for all workgroups. ✍ Need better communication on what stakeholders are doing (collecting data and reporting). ✍ Need to better communicate what the Strategy is and what it is doing, as well as what society can collectively do to participate.
✍ Need to have follow-up of utilities and mercury meetings from November 1998. ✍ Perhaps IJC needs to be more involved rather than just having monitoring role.
✍ Need more discussions about Clean Production and P2 (design for recycling, material substitutions, etc.). ✍ Workgroups appear to be avoiding confrontation with responsible players. Concern that initiatives are targeting citizens rather than looking at industry (e.g. burn barrel initiative rather than incinerators / MACT).
✍ Need a strategy for taking action; strategic planning is missing. BTS has merely provided information. BTS will fail unless has these strategic discussions. ✍ Need a clear plan; perhaps a charter that all stakeholders agree to; and outline who is going to do what (clear roles) rather than just talk about issues. ✍ Need to outreach through other networks and vehicles. ✍ Research on pollutants, reduction strategies, etc. should be by sector rather than by substance. Different strategies will be needed to reach different sectors.
✍ Should explore economic and other incentives / tools and link to BTS. Regulations and good behaviour can only go so far. ✍ Need to explore life-cycle management, EPR, and public awareness.
✍ Need communications to engage broad range of industry (particularly SMEs and broader range of trade associations / companies). ✍ Strategy may need to address / add other substances. ✍ Strategy needs to come down from high-brow federal statements to enable a broader range of companies to be aware of the Strategy. ✍ Should be looking at how the Strategy will have long-term benefits beyond the current short-term focus on Level I substances.

- Clean production principles need to be accepted by Strategy participants. However, this hasn't worked out.

- Need to do more work on EPR. Need to look are the impact of EPR on labour; types of jobs created; what EPR would produce; etc.

- Need to look at other PCB destruction methods (chemical, biological, thermal) as opposed to incineration. These other technologies need government investment to be tested and to make more affordable

- TRI doesn't capture PBTs because of high reporting thresholds.

- Dioxin workgroup used MACT rules and CWS as excuse to take medical waste incinerators off source list; not good idea; MACT rules, which are not that good, will cause sectors to invest in end-of-pipe controls.

- BTS is getting to the point where new sectors are needed.

- Need to capitalize on opportunities identified through step processes.

- Need strong outreach to source categories to get more reductions.

- Need to determine how to tailor information to public (e.g. burn barrels).

- Better coordination (of resources too)

- Should be focused or dedicated funding for activities to reduce toxics.

- Need to educate those industries that don't have capability to attend meetings.

- Other substance workgroups have not been as successful in reducing as the one for Hg, but this is not a fault of BTS. Next big substance for our state to deal with is dioxins.

- Need an ability to amend the Strategy on a more dynamic basis (e.g. targets).

- Need public participation; need to be engaged / educated about role in producing / emitting PBTs.

- Need recognition from U.S. side that approach to reducing substances requires targeted legislation - not from a regulatory standpoint but rather tax incentives (e.g. to get PCB transformers out of service).

- Another type of incentive may be to have a "performance track" that invites companies with good records and provides them with recognition.

- Need to develop technologies to get mercury out of the system; stop using it and recycling it.

- PBTs are the "new radiation"; what do you do with collected PBTs?

11. What have been the impediments, if any, to making faster / better progress in meeting the BTS challenge targets?

✍ U.S. EPA keeps wanting more regulations, which interferes with voluntary programs; interferes with dollars.
✍ Needs to focus on specific industries (e.g. power plants, incinerators, steel, auto, chlor-alkali) ✍ Needs to focus on scaling up successful pilots, which takes money and staff.
✍ BTS needs to have a checkpoint; there is no hammer if goals are not being met, although this might not be appropriate within BTS since goals are not similar by nation. Perhaps need review group that recommends to governments laws that they may want to consider.
✍ BTS needs to gain support from national headquarters of environmental departments / agencies of both countries; Great Lakes region needs more national attention from U.S. EPA. Hopefully BTS won't be killed. ✍ Lack of funding to expand pilot programs. ✍ Workgroups take sources off the list prematurely, e.g. dioxin workgroup used the fact that there is going to be MACT and that there are going to be Canada-wide standards (CWS) to take medical waste incinerators off the source list
✍ Having no state support is a barrier to reducing toxics. ✍ There are no financial incentives to reduce toxics.
✍ There has been more time taken on measuring percentages and progress rather than implementing programs.
✍ Some workgroups might be short of staff.
✍ A broader engagement of stakeholders means that things get slowed down. However, get a better result in the end.
✍ Some agencies have the attitude that if there are no data, then they don't have to take action. However, if there are data, then the agency has to deal with this source or issue, e.g. evidence that large municipal airports are a major source of dioxins but no data exist. Diesel emissions are dioxins source - information was sat on for 10 years - only now becoming available. ✍ BTS has no budget, which is a big weakness.
✍ We are beginning to find other areas to explore, such as looking at sector approaches to getting at other substances.

✍ The broader issue: are the right people involved; people who can move the Strategy further? e.g. the right people are not there yet to provide broad communication of the Strategy.
✍ Has had visibility in U.S. EPA but is not attracting enough resources. There is also a shortage of people.

12. What human and financial resources (for your particular organization) have been specifically devoted to the Strategy?

Many interviewees did not know the answer to this question since they work on many toxics programs, which overlap.

✍ Used to spend a lot of time on BTS. Six people went to each meeting and meetings in between.
✍ Canadian government: direct support to BTS = about 2PYs plus additional CDN$125,000 / year (e.g. travel to meetings, etc.).
✍ Used to attend another substance-specific workgroup but found that it was too much work; was spread too thin. Just attends one substance-specific workgroup now.
✍ GLU receives some funding from EC to participate in BTS (about $20k/year for last 3 years), which is used for specific programs, e.g. Hg in autos EPR workshop.
✍ There have been no budget increases, which is part of the problem. ✍ Right now, everyone "volunteers" to work on BTS issues.
✍ 25-30% of time is spent on Great Lakes issues and about half of this time is somewhat related to BTS, SOLEC and IJC biennial.
✍ Work on BTS about 20-25% of time (human / financial resources). About 2 staff members that work on BTS initiatives about half of their time. 3 board members are also involved in BTS.
✍ U.S. government: P2 budget about US$500,000, which goes to grant program, contractor support program, and travel. U.S. funding to BTS over last 4 years has mainly consisted of small grants to ENGOs and CGLI. ✍ No official resources tied to BTS; might have been beneficial to help fund participation.
✍ Organization has no direct funding for dealing with BTS; Strategy is piggy-backed on to other initiatives.

✍ Actions to reduce Hg in state are largely funded by the state rather than federal government. However, U.S. EPA has grants to provide incentives to states (e.g. P2 grants).
✍ BTS is another thing interviewee has to do; no resource commitment for Strategy. However, BTS is an important issue for our industry.
✍ The right people have been there - but there are never enough people or money. All of U.S. EPA's key toxics people are heavily involved.
✍ BTS (and LaMPs) look for volunteer labour; just one more thing to do in a list of many.
✍ Not sure about resources but would guess about $125k CDN per year in direct support to the BTS (in addition to salary of at least 2 full time PYs). Direct support = travel flying people in to task groups and meetings, etc.).
✍ Devotes about 5% of time towards the BTS.

13. Has the Strategy made a difference in making progress toward virtual elimination? If so, how and by how much? Please provide examples. If not, why not? How can the Strategy be improved to make more effective progress toward virtual elimination?

✍ BTS is influencing toxics reductions; voluntary efforts are the way to do this. ✍ VE is laudable ultimate goal; need to recognize that get to goal in step-by-step manner.
✍ Hard to determine whether BTS has contributed toward VE; so many other initiatives going on. Unlikely that BTS has caused companies to reduce toxics. ✍ Most successes seem to be successes not associated with the Strategy, including the mercury workgroup. ✍ VE is step-by-step targets using current technology.
✍ Cause-effect relationship is difficult to determine. ✍ Different perspectives from stakeholders on VE; debate.
✍ BTS has been effective in reducing toxics; is a driving force; coalesces states. Without it, states would be in all directions. ✍ VE provides good basis for bringing people together; but what does VE mean? Debate definition.

✍ Hard to quantify BTS's impact on reductions; states are doing a lot so it helps to facilitate efforts. ✍ The VE concept is seen as extreme by industry; if VE is put in the context of man-made emissions and put in a positive sense, then it is accepted more. ✍ VE has created a bit of a wedge between groups. ✍ VE is still an issue. Goal of VE but through interim goals.
✍ Has been effective in reducing toxics (along with other programs like the Strategic Options Process, COA, CCPA's Responsible Care, etc.). ✍ It's hard to measure the success of the Strategy. Do we measure success of Strategy by the number of people involved? Is the decision-making process getting better? ✍ VE has created real problems. VE assumes that you can NOT create these PBTs, which is wrong, e.g. we will always create dioxins / furans. There are no strong scientific legs under this philosophical idea.
✍ VE is an unrealistic term as is the term "zero discharge." Nonetheless, progress is being made to reduce toxics despite this unrealistic end point.
✍ VE is helpful concept; cannot lose sight of this ultimate goal. But need people to celebrate gains that have been made.
✍ Industry has little difficulty with the concept of VE if it is presented as an aspiring goal to achieve in the future (not short-term) rather than zero.
✍ BTS has made progress in reducing toxics in the Great Lakes but is nowhere near finishing its work; could argue the work has only just begun. ✍ Some use VE as smokescreen. Let's just go for reductions and not quibble about VE.
✍ VE issue is not resolved. ✍ Can't measure progress of reductions because governments don't have staff to go out and audit companies' claims. Need to make sure that reductions are actually happening. Lack of clear measurement.
✍ Some people do not want VE.
✍ Cannot evaluate reductions caused by BTS; need to evaluate all toxics reduction tools in each jurisdiction.
✍ VE concept is useful as a guide to everyday decisions / action but not when presented as an absolute. Industry is comfortable with this concept in an abstract way. ✍ Cause-effect relationship is difficult to make. Great Lakes Initiative, GLWQA, BTS, POPs, regulations (e.g. NPDES permits) - all contribute to reducing PBTs in the Great Lakes.

✍ BTS is working very well, e.g. OCS seems to be virtually eliminated.
✍ BTS has made progress toward VE; many chemicals are banned so they shouldn't be in use. Any efforts to reduce these chemicals are beneficial. ✍ VE is defined differently by different organizations so difficult to define what it really means. Not practical to think we can reach VE, e.g. we will always use chlorine (drinking water). ✍ Considering the small amount of money spent on the BTS, there has been a good return on investment.
✍ Not an effective job in reducing PBTs in Great Lakes; share information on "business as usual" rather than develop new initiatives. ✍ Industry accepts VE goal of BTS for some substances.
✍ BTS has made a little bit of progress in outreach and brought in some source sectors. ✍ Strategy helps to keep the goal of virtual elimination alive, which is unique from other initiatives.
✍ Trend data show that levels in fish and water are decreasing; inventory work (PCBs, Hg, and dioxins) are all going down. Who knows whether BTS influenced this or not? Question becomes irrelevant in this networked type of world. Cause-and-effect linkage cannot be documented. ✍ Want to avoid issue of ultimate definition of VE. Pragmatically accomplish within a certain time frame.
✍ BTS has led to reductions in toxics. ✍ VE / zero discharge are great terms but, in reality, will never happen; VE creates barrier to move forward.
✍ Environmental Council of States (ECOS) agreed to a resolution on VE definition to mean "substantially reducing." Will never meet VE for mercury if still use coal - and we will probably still use coal for quite a while longer.
✍ VE concept raises concerns because not tangible (how far do you reduce?). Step-by-step approach (quantifiable goals on the way to VE) is an approach that industry prefers than VE.
✍ Would have had more tangible results sooner but investment was made to engage people. ✍ Chlor-alkali agreement has done well (50% reduction target and have already achieved 42%). ✍ VE is impediment rather than help. Serves as a lightening rod (zero releases) for industry.
✍ VE philosophy / concept can serve as a barrier or can mask progress. Achievement of VE may not be in our control.

✍ BTS initiatives are becoming successful. ✍ VE is difficult concept because don't know what term "virtual" means; not possible to get to zero.
✍ Although hard to quantify, has been effective in reducing toxics; states are doing a lot to reduce toxics so BTS helps facilitate efforts.

Other Comments / Information Provided by Interviewees

Interviewee's Involvement in BTS Workgroups

✍ Involved in PCB workgroup. ✍ Mercury workgroup (on and off); dioxins workgroup (in the past).
✍ Mercury workgroup. ✍ Somewhat in pesticides and dioxins workgroups.
✍ Plans to begin attending Integration Group meetings starting in May 2001.
✍ Not involved in workgroups.
✍ Not involved in workgroups; receives information on BTS issues through distribution lists and interaction with EPA region.
✍ Integration Group.
✍ Integration Group and mercury workgroup.
✍ Mercury workgroup; recently started attending Integration Group meetings.
✍ HCB / B(a)P workgroup.
✍ Infrequently involved in dioxins workgroup.
✍ Mercury workgroup.
✍ Not involved in workgroups.
✍ Has attended all stakeholder meetings; was active member of pesticides workgroup; monitors PCB and dioxins workgroups.
✍ Integration Group.
✍ A couple of Integration Group meetings; some teleconferences on dioxin burn barrel issue.
✍ Mercury workgroup (attended dioxins workgroup a couple of times).

✍ Initially involved in Integration Group but not involved since. Attended last Integration Group meeting.
✍ Integration Group, mercury workgroup, and PCB workgroup.
✍ Integration Group.
✍ Mercury workgroup.
✍ Integration Group.
✍ None (PBT initiative).
✍ None.
✍ Mercury workgroup and Integration Group.
✍ Integration Group.

What is the BTS? [(4)]

✍ Umbrella framework encompassing many operational programs.
✍ Coalescing force (different views, different programs, etc.)
✍ Information-sharing forum
✍ Coalescing force for state programs ✍ Information-sharing forum
✍ Information-sharing forum
✍ Locus for leadership; focuses on problems
✍ Information-sharing forum and networking
✍ Strategy, not a program; one element of an overarching program to deal with Great Lakes.
✍ Focuses both countries toward reducing toxics in the Great Lakes
✍ Not a stand-alone program; one of many. ✍ Orderly way of motivating action; dialogue to achieving objectives.
✍ Information-sharing forum
✍ A way of getting at long-term discussions on how to reduce toxics
✍ Information-sharing forum and networking ✍ Focuses both countries toward reducing toxics in the Great Lakes
✍ Information-sharing forum and networking

✍ Information-sharing forum and networking
✍ Should be an umbrella encompassing other projects
✍ Unique forum because binational and focuses on the Great Lakes
✍ A particular process, not an umbrella of other programs.

Strengths of the BTS

✍ Voluntary approach ✍ Information sharing
✍ Substance inventory work has been moderately successful. ✍ Information sharing and networking; unique forum
✍ Opportunity for ENGOs and industry to exchange information
✍ Provides forum for dialogue ✍ Raises level of awareness ✍ Helps participants decide on what to do; influences decision-making ✍ Brings various stakeholders to the table.
✍ Provides networking opportunity and information sharing. ✍ Provides opportunity for stakeholders to influence direction of BTS.
✍ Valuable forum for exchanging information. ✍ Has helped to focus state's efforts on P2 to reduce mercury.
✍ Bridging mechanism for regulatory and non-regulatory measures
✍ "Virtual office" BTS model is way of the future: gather together for as long as need to and then move to another issue.
✍ Calls attention to air deposition ✍ Creates opportunities for information exchange between U.S. states and Canadian organizations. Opens up communications between regulators and regulated. ✍ BTS starts things happening, keeps it building, maintains momentum by promoting a life-cycle approach to PBT reduction. ✍ Highlights importance of Level 1 substances and continued need to reduce

✍ Allows government organizations in applying for grants; strengthens organization's proposal ✍ Creates opportunities to focus information exchange between U.S. states and Canadian organizations by "speaking a common language".
✍ Binational aspect helps BTS get funding; competitive environment for attracting resources within federal government agency / department. ✍ Helps scale things up - national, hemispheric, international initiatives. ✍ Has developed information
✍ Networking between various offices occurs; good forum for sharing information.
✍ Information sharing is great but need to better integrate / coordinate information. ✍ Serves as a locus for leadership, focus on problems; template for national / global initiatives.
✍ Helps organize and engage people in reducing PBTs. ✍ Decision-tree work is great benefit. Helps everyone prioritize; make intelligent decisions. ✍ In U.S., BTS has been integrated into national priorities.
✍ Takes advantage of expertise of key people. ✍ Focuses both countries on reducing PBTs in Great Lakes; visible commitment.
✍ Broad participation - academia, federal government (U.S. and Canada), etc. ✍ Information-sharing forum ✍ Increases awareness of mercury emissions sources. ✍ Helps to focus and drive state's initiatives to reduce PBTs. ✍ Effective in reducing toxics because acts as a driving force; coalesces efforts by Great Lakes states. ✍ Has driven modeling; air monitoring programs.
✍ Shows U.S. and Canadian governments' public commitment to VE ✍ Maintains efforts to keep moving on VE; reminds people PBTs are still an issue (e.g. PCBs).

✍ Information sharing; not a lot of fora for sharing ideas around Great Lakes anymore.
✍ Process is good, i.e. determine if there is a problem, then who "owns" problem and can take action. Decision tree process is great tool. ✍ Has brought people together to build relationships and work on specific issues, i.e. reducing PBTs in the Great Lakes. ✍ Voluntary approach.
✍ Information sharing - discuss new ideas, tackle new issues - people can take these ideas back to their home state and do things legislatively. ✍ Because an international agreement, serves as moral persuasion; helps push action with industry. ✍ Forum for people to meet and make contact ✍ Good research on inventories / baselines, e.g. good process for this type of work and similar to CEC process.
✍ Sharing of information and successes is very valuable. ✍ Have learned a great deal on ambient monitoring and stack testing from other agencies. ✍ Specific goals; the direction / path is set out in the Strategy. ✍ Because the BTS is an international strategy, helps state justify further reductions, e.g. emission limits for permits.
✍ Has brought attention to toxics ✍ Tries to get a buy-in from many different groups ✍ Increases awareness
✍ Unique forum because is binational and focuses on Great Lakes ✍ Governments and multi-stakeholder participation ✍ Provides information
✍ Information sharing and cross-border transfer of information. Enables learning and networking. ✍ Multi-jurisdictional and multi-stakeholder approach; transparent and open; various perspectives. ✍ Provides focus; common targets and schedules
✍ Provides a point of focus for all stakeholders.

✍ BTS issue is unique, special process; engages industry. Process is inclusive enough for issues to get resolved (i.e. decision tree process). ✍ Focuses on need to develop technologies to reduce toxics. ✍ Useful vehicle for dialogue across the border (company to company; association to association; and country to country)

Weaknesses of the BTS

✍ Data important to focus efforts, and in some cases, measure progress. Much of the available information is fragmented (although good information sharing) ✍ State doesn't have time / budget to work on BTS; staff over-extended. ✍ Budget for BTS might be good only if good management and budget used efficiently.
✍ Need more industry outreach / awareness (especially SMEs) ✍ Need more state involvement ✍ Need to better investigate cost impacts of options to manage toxics; incentives to take action ✍ Recognition needs to be important
✍ Voluntary; no threats / sticks to get industry to take action. ✍ Need better / more coordination. ✍ Now is the time to figure out things and take action
✍ Information is spotty; need a way to pull information together across sectors / substances. Need a more simplified way of reporting information.
✍ Needs stronger sticks (i.e. regulations) to push people to take action. ✍ Ineffective job in reducing PBTs; share information on "business as usual" rather than develop new initiatives. ✍ Does not seem to be binational; not joint Canada-U.S. effort ✍ BTS needs budget / office so someone can mediate / transmit information
✍ Challenge is to maintain momentum (bureaucratic issue).
✍ Need 50 000-ft. view, sometimes become too focused on details.

✍ Too many fora dealing with PBTs; duplication; resources too thin to participate in all
✍ Budget is small; BTS needs more funding. ✍ GLWQA needs to be used in discourse of both countries.
✍ Limited funding opportunities through the BTS. ✍ Federal legislation is a stronger driver than voluntary initiatives.
✍ Should make BTS into formal umbrella for other toxics strategies, e.g. water and air divisions of agencies. Also, not linked to larger scale programs, e.g. CEC NARAPs. ✍ Needs an office / budget
✍ Strategic planning effort is missing in the BTS. ✍ Internet side of information sharing is not regularly updated.
✍ Need to look at economic costs related to reducing toxics of the larger point sources.
✍ Need mechanism to remove substances from the lists. ✍ Need public engagement; educate public about its role in producing / emitting PBTs.
✍ Need to prioritize; sometimes lose focus
✍ Voluntary initiatives play a role but in some cases, need to develop regulations. BTS should play a stronger role in pushing stricter regulations. ✍ Need to make sure that right people (industry) are involved and how to get them involved. ✍ Budget to help states and other stakeholders attend meetings (e.g. travel costs, awards program).
✍ Substance-specific workgroups are not going in the right direction. ✍ Lack of clear measurement; need to ensure reductions are occurring. ✍ Lack of backup to voluntary initiatives. ✍ Reducing substances rather than virtual eliminating them. ✍ BTS seems to avoid confrontation with responsible sources, e.g. burn barrel initiative targets citizens rather than looking at industry. ✍ Clear goals are needed. ✍ The BTS has no budget or office.

✍ Need higher up political support for BTS (higher levels of EC and U.S. EPA).
✍ On plus side, BTS has self-directed, team operation drawing on existing experts and resources. Down side is that BTS is not as visible and not funded well.

Other Toxics Initiatives that are not related to BTS

Some interviewees argued that the Strategy had not impacted any of the toxic substance reduction initiatives with which they were involved. These interviewees gave examples of toxic reduction initiatives that were not related to the BTS.

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✍ Mercury reduction and collection programs (began through WLSSD); annual chemical sweeps; clean sweeps of school labs.
✍ Mercury switches in automobiles (clean car campaign) ✍ In Canada, Pollution Probe is involved in project to reduce mercury use in hospitals. ✍ Efforts to get mercury out of hospitals, dental offices, schools, etc.
✍ Great Lakes Commission (GLC) has helped engage western U.S. states in reducing mercury, e.g. ECOS workshop; trying to push, nationally, the need for education, continued concern / focus on mercury and other PBTs. ✍ Great Lakes states work together to reduce PCBs and Hg in high school labs ✍ Great Waters Program has focused on voluntary initiatives but will shift to a more regulatory focus soon. ✍ Clean sweeps - pesticides (e.g. DDT) ✍ GLC's RAPIDS inventory. ✍ U.S. EPA's Great Lakes Initiative, New Source Performance Standards, MACT standards. ✍ AHA and [state] Hospital Association - state rules on hospital incineration units. ✍ Industry has developed efforts on its own to reduce mercury, e.g. Thermostat Recycling Corporation; battery redesign; etc.

✍ Mercury P2 efforts, e.g. wastewater treatment plants had to go through P2 assessment to identify sources; initiative with hospitals has reduced mercury. ✍ State air division, through stack testing, has identified EAFs as major source of mercury
✍ Health Care Without Harm tries to get rid of mercury-containing products in hospitals.
✍ Mercury reduction projects at the municipal and state levels. ✍ Clean sweeps of agricultural chemicals
✍ Energy efficiency work with industrial boilers

Section 3. Interview Questions [(5)]

Collaborations

1. Are there any key organizations (industry sectors / sources of PBTs and community / tribal / environmental) that have not yet been engaged under the BTS? What have been the impediments / challenges?

2. Have the groups / sectors that are currently participating in the BTS been effectively engaged to take action toward achieving the BTS goals? How have companies been engaged (through association or individually)? What have been the incentives (carrots / sticks) for companies to take action?

3. How have the attitudes of the groups / sectors that are currently participating in the BTS changed as a result of the Strategy?

Programs / Activities [please provide examples of initiatives]

4. Have specific programs been developed / expanded / changed in direct response to the Strategy? If so, which ones? Have budgets increased?

5. Are there any specific local or "pilot" initiatives to reduce toxic substances that should be expanded / changed in scale (national, regional, lakewide, etc.)?

6. How has the BTS linked to other initiatives related to the Great Lakes Water Quality Agreement (e.g. LaMPs, RAPs, contaminated sediments, airborne toxic substances, etc.)? Have any of these initiatives expanded / changed because of the Strategy?

7. How has the BTS linked to U.S. or Canadian initiatives to reduce toxics (national, state or provincial) [e.g. TRI, NPRI, MACT, etc.]? Have any of these initiatives expanded / changed because of the BTS?

8. Is there adequate information to evaluate the progress made by voluntary programs (baseline data, quantitative information)?

Binational Toxics Strategy

9. Has pollution prevention [the use of processes, practices, materials, products or energy that avoid or minimize the creation of pollutants and waste, and reduce overall risk to human health or the environment] been a focus for actions / initiatives taken to meet the challenges under the Strategy?

10. Have the initiatives to reduce PBTs under the Strategy been effective / successful? Examples? What other types of initiatives should be utilized under the BTS? Are new / different types of programs needed (e.g. extended producer responsibility)?

11. What have been the impediments, if any, to making faster / better progress in meeting the BTS challenge targets?

12. What human and financial resources (for your particular organization) have been specifically devoted to the Strategy?

13. Has the Strategy made a difference in making progress toward virtual elimination? If so, how and by how much? Please provide examples. If not, why not? How can the Strategy be improved to make more effective progress toward VE?

Section 4. Individuals Interviewed

Doug Bley
Bethlehem Steel
Burns Harbor, Indiana

Tim Brown
Delta Institute
Chicago, Illinois

Andrew Buchsbaum
National Wildlife Federation
Ann Arbor, Michigan

Kelly Burch
Pennsylvania Department of Environmental Protection
Meadville, Pennsylvania

James Downes
Solutia Inc.
St. Louis, Missouri

John Estenik
Ohio Environmental Protection Agency
Columbus, Ohio

John Gilkeson
Minnesota Office of Environmental Assistance
St. Paul, Minnesota

Stéphane Gingras
Great Lakes United
Montréal, Québec

Gary Gulezian
U.S. Environmental Protection Agency - Region 5
Chicago, Illinois

Keith Hanson
Minnesota Power
Duluth, Minnesota

Tim Huxley
Stelco Inc.
Hamilton, Ontario

Allan Jones
Canadian Chlorine Coordinating Committee
Burlington, Ontario

John Mills
Environment Canada - Ontario Region
Downsview, Ontario

Joy Taylor Morgan
Michigan Department of Environmental Quality
Lansing, Michigan

Hank Naour
Illinois Environmental Protection Agency
Springfield, Illinois

Sam Sasnett
U.S. Environmental Protection Agency
Washington, D.C.

Jerry Schwartz
American Forest and Paper Association
Washington, D.C.

Ian Smith
Ontario Ministry of the Environment
Toronto, Ontario

Jim Smith
Environment Canada - Ontario Region
Downsview, Ontario

Paula Smith
Indiana Department of Environmental Management
Indianapolis, Indiana

Joseph Stearns
Chlorine Chemistry Council
Arlington, Virginia

Susan Sylvester
Wisconsin Department of Natural Resources
Madison, Wisconsin

David Ullrich
U.S. Environmental Protection Agency - Region 5
Chicago, Illinois

Margaret Wooster
Great Lakes United
Buffalo, New York

Donald Zelazny
New York State Department of Environmental Conservation
Buffalo, New York

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1. Thompson Gow conducted 26 interviews but it became clear during one interview that the interviewee had not been involved in efforts related to the Binational Toxics Strategy, which was the main criteria for selecting people to interview. TGA did not include this person's interview notes as part of our analysis.

2. The reason that many mercury projects were identified may stem from the fact that most of the interviewees are involved in the mercury workgroup and would therefore be more aware of mercury reduction initiatives rather than other Level I substance reduction projects.

3. Effort was taken by TGA to remove any references to a state or other organizational name to ensure that comments cannot be attributed to any particular individual. In addition, comments are listed in random order from one question to the next (e.g. the first comment under each question does not belong to the same individual).

4. Although TGA did not formally ask this question, some interviewees offered their interpretations of what the Strategy is. The range of interpretations was very informative, particularly because the definition held by one individual reveals their expectations of what the BTS is supposed to do and whether the Strategy has been successful in achieving its goals.

5. Interview questions were developed in consultation between TGA and the Binational Toxics Strategy Progress Review Work Group.

APPENDICES

Appendix A. U.S. National Mercury Quantities

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APPENDIX C. SOURCE CATEGORIES

P = potential release

x = U.S. or Canadian inventory release from source

D/F = Dioxins / Furans

Hg = mercury

HCB = hexachlorobenzene

OCS = octachlorostyrene

B(a)P = benzo(a)pyrene

* sources include utilities, automotive, and steel manufacturing, among other sectors.** including in service utility poles and railway ties; out of service utility poles (landfilled).

POTWs = Publicly owned treatment works

APPENDIX D. ACRONYMS

1. The Four Parties are Environment Canada, US EPA, New York State Department of Environmental Conservation, and the Ontario Ministry of the Environment.