



2.0 POLYCHLORINATED BIPHENYLS (PCBs)

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Progress Toward Challenge Goals

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.

Canadian Challenge: Seek by 2000, a 90 percent reduction of high-level PCBs (>1 percent PCB) 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.

The U.S. and Canada have both made progress toward reaching the PCB challenge goals outlined in the Strategy. However, as described below, some data gaps exist regarding the amount of PCBs in remaining equipment and storage. Information continues to be gathered and assessed by US EPA and EC to determine whether the U.S. and Canadian PCB challenge goals have been met in their entirety. While the U.S. has made progress in reducing the amount of equipment in service containing >500 ppm PCBs, due to the lack and unavailability of information, they are still unable to determine, with accuracy, the status of progress toward the goal. Based on preliminary data received by EC Headquarters from the Canadian National Inventory system for Ontario, it appears that Canada has achieved a 90.5 percent reduction of high-level PCBs (>10,000 ppm PCB) in storage only for the Province of Ontario. The final national reductions may exceed 90 percent, but EC is still entering recently received inventory data into the National Inventory Database. Canada is unlikely to meet the 90 percent reduction goal for PCBs that are still in service or in use in PCB equipment. Based on preliminary analyses, it appears that approximately 66 to 70 percent of PCBs in use have been eliminated

or destroyed. The 2006 EC inventory data will not be available until mid- to late-2007.

The PCB Workgroup is active and continues to pursue reduction opportunities and outreach activities, and plans to prioritize recommendations developed in the 2006 Management Assessment for PCBs.

The new Canadian PCB Regulations have undergone extensive public consultation and have been approved recently by both Ministers of Environment Canada and Health Canada. The PCB regulations were published in the Canada Gazette 1 on November 4, 2006. Additional information on the new Canadian PCB Regulations is available on EC's PCB website at www.ec.gc.ca/PCB.

Both Canada and the U.S. are evaluating opportunities to comply with the Stockholm Convention (Canada is signatory to the Stockholm Convention), which includes international goals to phase out PCBs.

Ontario: Progress Toward the GLBTS Challenge

Environment Canada continues to update its inventory information annually and will be able to accurately state the percentage reductions achieved through 2006 by mid- to late-2007. The information below summarizes previously compiled and evaluated inventory information through 2004.

According to EC's 2004 PCB Inventory reports, about 89 percent of previously stored high-level PCB wastes had been destroyed (compared to 1993), and the number of PCB storage sites had been reduced to 420 from 1,529 in 1993 (see Table 2-1 and Figure 2-1). However, as described below, some data gaps exist regarding PCBs in remaining equipment that is still in service. In Canada, as of December 2004, there were still approximately 3,086 tonnes (in net tonnes) (6.8 million pounds) of high-level PCBs in use/service that need to be targeted for phase-out. This is a reduction of approximately 36 percent compared to the 1993



inventory and a reduction of approximately 63 percent since 1989 (see Figure 2-2).

Table 2-1. PCB Storage Sites Remaining in Ontario.
Source: Environment Canada, Ontario MOE PCB Database

	Dec. 1994	April 2003	April 2004	Dec. 2004
Federal Sites	109	25	26	21
Non-Federal Sites	1429	530	407	399
Total Sites Remaining	1538	555	433	420

The figures reported for EC are based on historical data recorded in EC's database and should be accurate, with a possible time lag, based on the timing and updating of the received data in the database.

Awareness of the need to reduce PCBs continues to increase due to PCB outreach, the PCB Phase-Out Awards Program (in Canada), sector mail-out of information, and voluntary commitment letters. Newer facilities and options are now available in Ontario for PCB decontamination and destruction, in addition to the Alberta Swan Hills incinerator.

United States: Progress Toward the GLBTS Challenge

US EPA uses two sources of information to evaluate the estimated inventory of PCB transformers remaining in use: 1) annual reports submitted by PCB disposers, and 2) the PCB Transformer Registration Database. Unfortunately, the annual report data has not been compiled since 2003. Based on the annual report data thru 2003, an estimated 113,000 PCB transformers and 1,330,000 large PCB capacitors remained in use at the end of 2003. The estimates for the amount of equipment remaining in use in 2003 were obtained by abstracting the annual disposal data from the 1994 estimated baseline. However, according to the PCB Transformer Registration Database, updated in August 2006, only about 14,700 PCB transformers were registered with US EPA. Since 2000, when about 20,000 PCB transformers were registered with US EPA, the number of PCB transformers registered decreased by 25 percent, or by about 5,000. US EPA will compile PCB disposal information for 2004 and 2005 and, based on the update of the PCB transformer registrations, will re-evaluate the data gaps in the inventory.

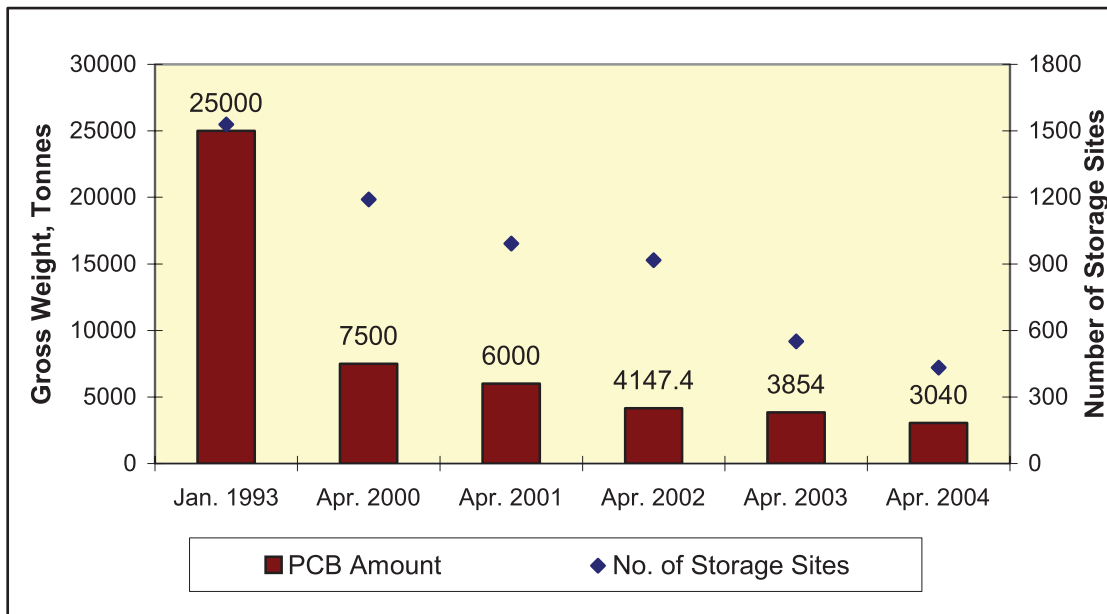


Figure 2-1. High-Level PCBs (Gross Tonnes) in Storage in Ontario.
Source: Environment Canada, Ontario MOE PCB Database

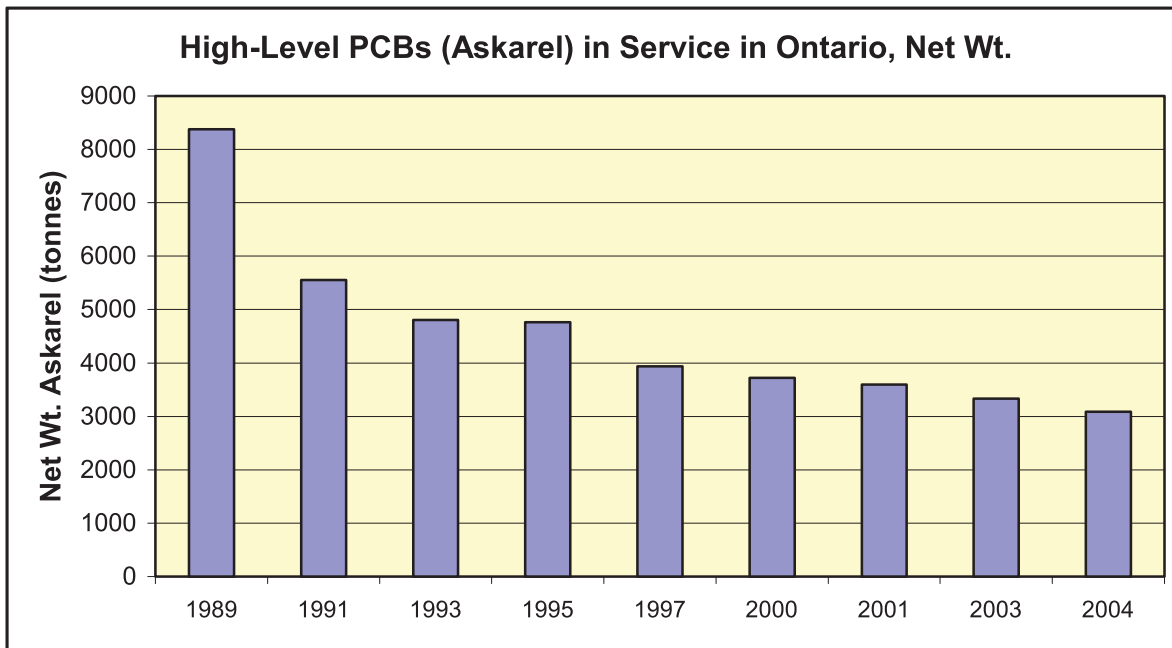


Figure 2-2. Trends in High-Level (Askarel) PCBs (Net Tonnes) in Service in Ontario. Source: Environment Canada

Workgroup Activities

Workgroup Meetings

The PCB Workgroup met on December 6, 2005, in Chicago and on May 17, 2006, in Toronto. The December 2005 PCB Workgroup meeting primarily focused on the continued development of a draft Management Assessment for PCBs. Detailed comments were received on the Management Assessment, and the workgroup plans to respond to these comments and revise the document. A presentation was given on a program to phase out PCB transformers in the Minnesota portion of the Lake Superior Basin. The project involved a detailed survey of all potential PCB owners and the mapping of “PCB density.” Efforts are now being made to target those transformers with the most potential to release PCBs to Lake Superior.

The May 2006 PCB Workgroup meeting in Toronto focused on discussion of the Lake Michigan Mass Balance (LMMB) Study, Canadian PCB regulation updates, and the revised draft Management Assessment for PCBs. A presentation was given on the LMMB Study of PCB deposition on and around Lake Michigan. This study was a multi-million dollar, multi-year project involving an analysis of the deposition of PCBs, mercury, atrazine, and trans-nonachlor on the Lake’s basin. The project specifically:

- Studied the relative loadings of PCBs and other chemicals entering Lake Michigan;
- Determined baseline loading estimates in 1994-1995;
- Predicted environmental benefits of specific load reductions and the time to realize these benefits; and
- Predicted the PCB concentration in Lake Trout through 2052.

Information was provided on PCB concentrations in Lake Michigan trout and various Lake Michigan media from 1930 to beyond 2000. According to the LMMB study and preliminary modeling, even a 100 percent elimination of all air deposition and/or atmospheric loadings of PCBs occurred, PCB levels that would allow unlimited fish consumption would still not be reached until 2039.

Approximately 38,000 multimedia samples (with over 5,000 on PCBs alone) were collected as part of the LMMB study. Some of the main findings were:

- PCB concentrations were declining in all media;
- PCBs volatilize;
- Atmospheric deposition is the major source of PCBs to the Lake(s);



- PCB levels in Lake Trout may not reach the threshold level of 0.5 µg/g for unlimited consumption in Sturgeon Bay until 2039 and Saugatuck until 2044; and
- The Chicago urban area is a major general source of PCBs to the Lake.

A copy of the presentations on the LMMB Study given at the May 2006 PCB Workgroup meeting and the presentation on PCBs, given at the May 17, 2006, stakeholder meeting, can be found at the GLBTS website (<http://www.epa.gov/glnpo/bns/reports/stakemay2006/index.html>).

At the May 2006 PCB Workgroup meeting, Ken De, the Canadian co-chair, gave a presentation about the proposed amendments to the Canadian PCB regulations which were published in the Canada Gazette 1 on November 4, 2006. The new Canadian PCB regulations will replace (with modifications) two previous regulations: 1) Storage of PCB Material Regulations (SOR/92-507), and 2) Chlorobiphenyls Regulations (SOR/91-152). Ken discussed the main features of the proposed new regulations, including permitted and non-permitted activities and mandatory phase-out dates (see the section below under Canadian Regulatory Activities).

The workgroup also discussed the Management Assessment for PCBs at the May 2006 meeting, specifically focusing on:

- Sources of PCBs and data needs (Management Outcome); and
- The identification of activities to continue to pursue (e.g., voluntary reduction and decommissioning and storage disposal sites).

The proposed final management outcomes for PCBs at the conclusion of the May 2006 meeting were:

- Continue active Level 1 status;
- Continue existing programs; and
- Coordinate information gathering and assessment to prioritize sources and determine trends.

PCB Management Framework

The PCB Workgroup continued to work toward finalizing the draft Management Assessment for PCBs in 2006. In addition to discussing the report at the May 17th meeting, an updated draft of the report was circulated to the PCB Workgroup for final review. Comments were specifically sought

regarding a few outstanding issues highlighted within the report. Two sets of comments were received and are addressed in final revisions to the report. The workgroup expects to finalize the Management Assessment for PCBs by the December 2006 workgroup meeting.

U.S. Reduction Activities

U.S. PCB Phasedown Program

In an effort to clarify information in US EPA's PCB Transformer Registration Database, the US EPA contacted up to 2,400 entities that registered PCB transformers with the US EPA. During that effort, many entities indicated that they had already removed their PCB transformers since registering them in 2000. US EPA compiled the information and updated the PCB Transformer Registration Database in August 2006.

U.S. Stakeholders PCB Phase-out Efforts

The Utility Solid Waste Activities Group (USWAG) is committed to promoting, among its members and other users of PCB-containing equipment, voluntary efforts to identify and retire PCB-containing equipment from service. For example, USWAG shares information regarding the potential locations of PCB-containing equipment in service. USWAG is also committed to promoting strategies for members to work with their industrial and commercial customers to provide technical assistance for removing PCBs from service. Many companies have voluntarily removed all known categories of PCBs (e.g., ≥500 ppm) from their systems. Other efforts include procedures to ensure that equipment containing PCBs in concentrations ≥50 ppm that is removed from the field is either disposed of and not returned to service or retrofilled with non-PCB mineral oil before being returned to service.

Since the last update in 2004, electric and gas utility member companies of USWAG have continued with a wide range of voluntary PCB reduction efforts, both within the Great Lakes Basin and in other regions of the country. At the last USWAG PCB Committee meeting in Columbus, Ohio, in April 2006, attendees reaffirmed that most USWAG companies have procedures in place to ensure that virtually all equipment containing PCBs in concentrations >50 ppm, identified during repair/servicing, are disposed and/or retrofilled and not returned to service as PCB-regulated equipment. These reduction efforts, combined with voluntary retrofill/ reclassification programs, are resulting in the continued reduction of



PCB-containing equipment from utility inventories across the country. The achievements of USWAG members are significant because they help demonstrate that the U.S. is fulfilling its anticipated obligations (were it to become a signatory) under the Stockholm Convention on Persistent Organic Pollutants to “make determined efforts” to identify and remove PCB equipment (>500 ppm PCBs) from use by 2025, and to “endeavor to” identify and remove PCB-contaminated equipment (>50 but <500 ppm PCBs) from use by 2025.

In addition to the systematic retirement of PCB-containing equipment identified during repair/servicing, USWAG member companies also undertake, where practical, dedicated efforts to identify and remove PCB-containing equipment from service.

For example, **American Electric Power (AEP)**, with more than 5 million customers and celebrating its 100th anniversary in 2006, continues to achieve excellent PCB use reductions in its 11-state service territory of Arkansas, Indiana, Kentucky, Louisiana, Michigan, Ohio, Oklahoma, Tennessee, Texas, Virginia, and West Virginia. Within the Great Lakes Basin, AEP has no known PCB transformers or large PCB capacitors. In calendar years 2005-2006, AEP removed from its service territories in EPA Regions 3 through 5 the following items: 207 large PCB capacitors, 544 PCB items containing ≥ 500 ppm PCBs (211 being PCB transformers), 3,046 PCB-contaminated articles (between 50 and 499 ppm PCBs), 25,001 non-PCB items, and 896 large non-PCB capacitors (between 2 and 49 ppm PCBs). In its EPA Region 6 territory, AEP removed 586 large PCB capacitors and 132 PCB items containing ≥ 500 ppm PCBs, 618 PCB-contaminated articles, 738 large non-PCB capacitors, and 22,011 non-PCB articles of electric equipment.

Duke Energy, which serves 3.8 million electric customers in North Carolina, South Carolina, Ohio, Kentucky, and Indiana, has implemented a voluntary PCB phase-down program. Duke Energy has tested all large electrical equipment in its substations, power plants, and vaults. Any equipment containing ≥ 50 ppm PCB oil that was identified in these areas has been: removed and replaced with units containing no PCBs; retrofilled to bring the PCB level to <50 ppm PCBs; or upgraded with spill prevention controls to prevent any release to the environment. Because of these efforts, Duke Energy currently has only a few known PCB transformers (≥ 500 ppm) in its system,

and no large PCB capacitors. As a matter of general policy, when Duke Energy identifies any distribution type equipment containing ≥ 50 ppm PCBs, the company either replaces the equipment or retrofills the equipment to bring the PCB level to <50 ppm PCBs as soon as feasible. Further, in Indiana, Duke has tested all transformers on school properties (K through 12th grade), and any transformers containing ≥ 50 ppm found in these areas have been voluntarily removed and replaced with transformers containing no PCBs.

Another USWAG member in the Great Lakes Basin, **Consumers Energy**, has made dramatic progress in voluntarily phasing out PCB-containing equipment. In 1994, Consumers Energy entered into an agreement with EPA Region 5 to phase-out known, large PCB capacitors and large PCB transformers (i.e., substation equipment) by 2005. Consumers Energy achieved this commitment in 2000. During the last 12 years, Consumers Energy has removed from service, detoxified, and reused approximately 347,000 gallons of PCB oil, including approximately 30,900 gallons in 2005. Consumers Energy achieved additional phase-out successes in 2005, including removing 89 distribution transformers, approximately 2,000 gallons of oil containing less than 500 ppm PCBs, 327 ballasts, 336 distribution capacitors, and 33 bushings from service.

We Energies, serving more than 1.1 million electric customers in Wisconsin and Michigan, has conducted a voluntary PCB phase-down program for more than a decade. Due to the successful implementation of this program, the company has just eight known PCB transformers in service in EPA Region 5, all of which are in service at its nuclear plant. This equipment is monitored and periodically reviewed for reclassification or replacement. No other known PCB (≥ 500 ppm) equipment is in service in the We Energies system. Since January 1999, We Energies has removed from service more than 1,300 transformers, large capacitors, and bushings containing ≥ 500 ppm PCBs. It is We Energies' general practice that equipment identified as containing ≥ 50 ppm PCBs is either replaced or is reclassified as non-PCB prior to being returned to service.

Exelon Energy Delivery (EED), through its subsidiaries ComEd and PECO, operates in Northern Illinois and Southeastern Pennsylvania, respectively. EED's phase-out plan for equipment containing PCBs, instituted more than a decade ago, has moved the company from among the largest users of such



equipment to a position of operating only a few pieces. As of November 1, 2006, EED accelerated the PCB phase-out process and removed 880 large PCB capacitors and 59 pieces of PCB or PCB-contaminated equipment from its system. In addition, EED is undergoing a voluntary multi-million dollar project to retire a substation containing PCB equipment. The project was initiated to remove 10 Askarel-filled transformers and regulators in the City of Chicago. This equipment contains approximately 4,350 gallons of Askarel. Through these voluntary efforts, EED has removed or replaced almost all PCB and PCB-contaminated sources, including all known PCB transformers in commercial buildings, all known PCB distribution equipment outside of substations, 71 percent of all PCB capacitors in PECO substations, and 96 percent of all large PCB capacitors in ComEd substations. A limited number of PCB transformers remain in service at several of Exelon's nuclear plants. This equipment is monitored, and most equipment is scheduled to be replaced or retrofilled over the next five years.

USWAG member **Xcel Energy** (Xcel), which serves customers in the northern Midwest, including Michigan, Minnesota, North Dakota, Wisconsin, and South Dakota, also has undertaken voluntary PCB phase-out efforts. During 2006, Xcel removed four known PCB transformers from service. In addition, Xcel removed 39,008 kg of PCB articles, containers, oil and equipment containing ≥ 500 ppm PCBs and 295,785 kg of equipment containing 50 to 499 ppm of PCBs from service.

Northern Indiana Public Service Company (NIPSCO), a subsidiary of NiSource, serves 400,000 customers in Indiana. NIPSCO has continued to implement a voluntary PCB phase-down program that began in 1994. Since the program's inception, NIPSCO has removed over 4,579 pieces of equipment that were suspected to contain PCBs, including 56 distribution transformers since 2004. Additionally, NIPSCO has removed from service over 99.9 percent of the PCB quantity present in its electrical system. NIPSCO continues to address the small number of transformers and capacitors in its system that are known or suspected to have PCB concentrations ≥ 50 ppm. In addition to removal and disposal, NIPSCO enhances its PCB reduction efforts by retrofilling and reclassifying large PCB or PCB-contaminated transformers to non-PCB status.

Detroit Edison, a subsidiary of DTE Energy, serves more than 2.1 million customers in southeastern

Michigan. In 2005, during maintenance calls, storm response, or reliability improvement, Detroit Edison removed and disposed 82 newly identified PCB transformers and 459 pieces of PCB-contaminated equipment from distribution and/or generation facilities. In 2006, Detroit Edison continues to remove and dispose newly identified equipment through these programs. Through the third quarter of 2006, 48 pieces of PCB equipment and 353 pieces of PCB-contaminated equipment had been disposed. Detroit Edison also continues to pursue PCB reduction activities through retrofilling and reclassifying identified PCB-containing equipment.

When **GRE** was formed in 1999, with the consolidation of Cooperative Power Association and United Power Association, much of the PCB (≥ 500 ppm) and PCB-contaminated (≥ 50 to < 499) equipment in the system had already been removed or retrofilled. Since its formation, GRE has continued to evaluate and remove or retrofill PCB and PCB-contaminated equipment in its generation and transmission systems. At this time, GRE has evaluated more than 99 percent of its testable in-service equipment. As of 2005, most of the known PCB and PCB-contaminated equipment in the Minnesota system has been removed or retrofilled. The only remaining PCB and PCB-contaminated equipment in GRE's Minnesota system are 3,099 large capacitors at GRE's DC substation. These capacitors will be removed according to a phase-out plan that is scheduled to begin in 2009 and be completed in 2011.

These PCB reduction efforts are not limited to USWAG members in the Great Lakes Basin. For example, in 2005, New York-based **Consolidated Edison** (ConEd), as part of ongoing maintenance and repair, removed 10,556 pounds of equipment containing ≥ 500 ppm PCBs and 217,054 pounds of equipment containing 50 to 499 ppm PCBs. Through the third quarter of 2006, ConEd completed its five-year phase-down project for rectifiers in Manhattan that formerly contained > 500 ppm PCBs. This final stage removed and disposed of 49,168 pounds of equipment. Additionally, during 2006, as part of ongoing maintenance and repair, ConEd removed 8,325 pounds of equipment containing ≥ 500 ppm PCBs and 53,874 pounds of equipment containing 50 to 499 ppm PCBs.

USWAG member **TXU** has, since the early 1990s, aggressively pursued removal of PCBs from its system and, since 1993, has retired 3,457 pieces of PCB equipment (≥ 500 ppm). With the exception of a



small quantity of specialized equipment, TXU has a policy of retiring all distribution equipment identified for repair or service with PCB concentrations >1 ppm. During 2005, TXU retired 149 pieces of electrical equipment containing ≥ 500 ppm PCBs, 713 pieces of electrical equipment that were PCB-contaminated (50 to 499 ppm PCBs), and 3,717 pieces of equipment containing 1 to 49 ppm PCBs.

National Grid continues with its ongoing efforts to reduce the number of PCB articles in its service territories in Massachusetts, New York, Rhode Island, and New Hampshire. As a result of these efforts, National Grid, whose service territory in New York includes portions of the Great Lakes Basin, has retrofilled or removed from service all known PCB (≥ 500 ppm PCBs) transformers. Additionally, during calendar year 2005, National Grid systematically retired or decommissioned approximately 750 pieces of PCB-contaminated or PCB electrical equipment (≥ 500 ppm) for a PCB reduction totaling over 162,556 kg. National Grid also removed and disposed of approximately 315,088 kg of bulk PCB-contaminated transformer oil.

USWAG member **Entergy** has also invested substantial resources in implementing a successful PCB phase-out program. In 1998, Entergy dedicated approximately \$2 million for the removal of PCB transformers from its fossil generating plants. From 1999 to 2001, Entergy voluntarily opted to phase out all PCB transformers from its fossil fleet. During that span, approximately 105 PCB transformers were removed from service as well as a number of large PCB capacitors. Of Entergy's Fossil Operations in EPA Regions 4 and 6, only 17 large PCB capacitors remain in service. Fossil Operations continues to phase out PCB electrical equipment when possible. Based on analyses of PCB electrical equipment managed for repair or recycle in 2004, approximately 99 percent of this equipment was shown to be non-PCB.

Further, Entergy's Transmission and Distribution system has adopted the policy of many other USWAG members; specifically, no oil-filled electrical equipment brought in for service is returned to operation if it is found to be PCB-contaminated. Entergy's Transmission and Distribution system also has an aggressive program for phasing out large PCB capacitors in its substations. Over the past 10 years, Entergy has replaced all large PCB capacitors in its Arkansas, Texas, and Mississippi substations and has significantly reduced the number in Louisiana.

Entergy's Transmission and Distribution system has replaced or taken out of service all of its known PCB transformers (i.e., containing ≥ 500 PCBs), with the exception of two units in Arkansas. During 2005, Entergy has taken out of service and disposed of 163,011 kg of PCB electrical equipment containing ≥ 50 ppm PCBs.

Vectren Corporation (parent of Southern Indiana Gas and Electric Company), which provides electric service to customers in southwest Indiana, has been phasing PCBs out of its system for over two decades. The majority of substation transformers were retrofilled or replaced between the mid-1980s to the early 1990s. As of November 1, 2006, only three pieces of oil-filled substation equipment (circuit breakers, regulators, capacitors, or transformers) are known to be PCB-contaminated, and they are scheduled to have the oil replaced in early 2007. On the distribution side, steps were taken in the past five years to remove 42 known submersible transformers from the system that typically contained oil in the range of 50-500 ppm PCBs. Two units remain in service due to the property owner's reluctance to allow for the removal, but efforts to gain access are ongoing. It is also the company's practice to not attempt repair on any unit that was manufactured prior to 1980. Any pre-1980 unit that is damaged or otherwise taken out of service is tested to determine the appropriate disposal option.

Kansas City Power and Light (KCP&L) has eliminated all known PCB equipment (≥ 500 ppm) from its plants and transmission and distribution systems. Based on experience from its field work, KCP&L estimates that 5 percent of its distribution equipment may be PCB-contaminated (50 to <500 ppm PCBs). When these devices are found, they are removed from service and disposed. KCP&L has been working to eliminate PCB equipment since 1980 and most recently pushed to remove the few remaining PCB-containing devices from service and inventory. All equipment not designated as non-PCB is tested when taken out of service to determine its reuse or disposal status.

In South Carolina, **South Carolina Electric & Gas** (SCE&G) has an ongoing, voluntary PCB reduction effort to remove PCBs from electrical equipment. SCE&G provides electric service to 620,000 retail and wholesale customers throughout South Carolina. Through the early 1990s, all large power transformers and regulators were retrofilled and reclassified as non-PCB (<50 ppm) or replaced with



non-PCB transformers. All known PCB distribution transformers (≥ 500 ppm PCBs) have been removed from service for disposal.

In addition, all large PCB capacitors in SCE&G's transmission and distribution system have been replaced with non-PCB capacitors. SCE&G also has a long-standing policy to remove from service for disposal all in-stock distribution transformers (small pole and pad mount units) that are identified through testing as PCB-contaminated (≥ 50 to 499 ppm PCBs) and replace the equipment with units containing no PCBs. As a result of SCE&G's commitment to the phase-down policy, through time, SCE&G's inventory of more than 236,822 distribution transformers will contain fewer and fewer "unknown" but assumed to be PCB-contaminated units. In the late 1990s SCE&G had over 70,000 "unknown" transformers in service or in-stock. In 2006, fewer than 53,444 "unknowns" remain in SCE&G's inventory. SCE&G's ongoing efforts to remove PCBs when identified resulted in the disposal of 64 transformers, 54 oil-filled bushings, 60 tar-filled bushings, 12 tar-filled potential transformers, and 3 oil circuit breakers in 2005. In addition, SCE&G manages all leaking and non-leaking "unknown" small capacitors and lamp ballasts as PCB wastes.

Arizona Public Service (APS) is Arizona's largest and longest-serving electric utility, serving more than one million customers in 11 of the State's 15 counties. APS owns, operates, and maintains more than 40,000 miles of transmission and distribution lines throughout Arizona. Over the past seven years, APS has been successful in reducing the use of PCBs in electrical equipment by targeting suspected equipment based on manufacturer name and serial numbers. From 2000 through 2004, APS removed 3,212 pieces of PCB (≥ 500 ppm) or PCB-contaminated (≥ 50 to 499 ppm) equipment from service, resulting in the disposal of 425,336 kg of PCB material. During 2005 and 2006, APS removed an additional 6,615 pieces of PCB-containing equipment from its transmission and distribution system, representing 583,484 kg of disposed material, including the following: 5,983 large PCB capacitors (317,458 kg), 287 PCB-contaminated and PCB bushings (29,965 kg), and 345 PCB-contaminated and PCB transformers (236,061 kg).

Ameren, which serves 2.4 million customers in Missouri and Illinois, has voluntarily removed all large PCB capacitors from its system. Large oil-filled in-service electrical equipment (i.e., substation, network transformers, and generating station

equipment) has been tested for PCB concentration and either replaced or reclassified to at least below 499 ppm PCBs and in most cases below 49 ppm PCBs. Large equipment in-storage for reuse has been reclassified to below 49 ppm PCBs. Large spare bushings have been tested for PCB content, if possible. The majority of the spare bushings with a PCB content over 49 ppm PCBs (both tested and assumed) were sent for disposal. Distribution electrical equipment removed from service is not placed back into service or in-storage for reuse unless it has a manufacturer-certified non-PCB label. Only verified non-PCB distribution equipment is sent for repair.

Central Maine Power Company (CMP) has continued with its voluntary multi-year effort to remove PCB-containing equipment from its system. CMP has removed all of its known PCB transformers and sources of PCB oil ≥ 500 ppm, as well as transformers suspected of being PCB-contaminated (50 to 499 ppm PCBs) near schools and waterways. CMP continues to actively seek out and remove transformers it believes are most likely to be PCB-contaminated. Since 1999, CMP has removed over 11,000 targeted transformers (up from the 7,700 originally planned), of which approximately half were actually PCB-contaminated.

PNM Resources (PNMR), which serves more than 680,000 customers in EPA Region 6 through its subsidiaries Public Service Company of New Mexico and Texas/New Mexico Power, has implemented a voluntary PCB phase-down program since the early 1990s. Since 2000, PNMR has removed the following items from service: three large PCB capacitors, 52 PCB transformers, and 28 other PCB articles (≥ 500 ppm PCBs); 435 PCB-contaminated articles (≥ 50 and < 500 ppm PCBs); and an additional 1,530 pieces of non-regulated PCB-containing equipment (> 2 and < 50 ppm PCBs).

In particular, during 2004, PNMR removed four PCB transformers (≥ 500 ppm PCBs); 38 PCB-contaminated articles (≥ 50 and < 500 ppm PCBs); and an additional 245 pieces of non-regulated PCB-containing equipment (> 2 and < 50 ppm PCBs). During 2005, PNMR removed 11 PCB transformers and one other PCB article (≥ 500 ppm PCBs); 99 PCB-contaminated articles (> 50 and < 500 ppm PCBs); and an additional 191 pieces of non-regulated PCB-containing equipment (> 2 and < 50 ppm PCBs). During 2006, PNMR removed five PCB transformers and one other PCB article (≥ 500 ppm PCBs); 91 PCB-contaminated articles (≥ 50 and < 500 ppm PCBs); and an additional



268 pieces of non-regulated PCB-containing equipment (>2 and <50 ppm PCBs).

Potomac Electric Power Company (Pepco) is engaged in the transmission and distribution of electricity to approximately 747,000 customers in Washington, DC, and major portions of two counties in suburban Maryland. Pepco has approximately 3,300 network transformers in high-density residential areas and approximately 4,000 pad mount transformers located in urban settings. Pepco continues to phase-down PCBs by removing PCB-containing equipment, such as distribution and transmission transformers, oil circuit breakers, bushings, and large PCB capacitors from its substations. Pepco implemented a voluntary program to remove large PCB capacitors from substations and replace them with non-PCB capacitors. Since 1990, Pepco has replaced large PCB capacitors with non-PCB capacitors. There are less than 600 large PCB capacitors at substations, down from approximately 3,600 in 1990. Pepco retrofills and reclassifies PCB and PCB-contaminated transformers to non-PCB status. Pepco has also installed station service transformers containing a non-hazardous seed-based oil.

The information above provided by USWAG is extremely useful in identifying, understanding, and acknowledging efforts that facilities, particularly utilities, voluntarily undertake to remove PCB transformers and capacitors. It is not clear if the information compares to the national inventory estimates used and reported as part of the U.S. PCB challenge. It is assumed that the disposal of the PCB transformers and capacitors by the utilities would be included in the reports made by the PCB disposal companies, and therefore already included in the national estimates. However, there may be instances where this is not the case. For instance, the PCB Workgroup is lacking information on the reclassification of PCB transformers, which is a way of removing a PCB transformer that is not captured in the information submitted by the PCB disposal companies. USWAG may have more information on such activities. In addition, the reports by USWAG may have more up-to-date information on the disposal of PCB transformers that does not yet appear in US EPA's PCB Transformer Registration Database. The PCB Workgroup will evaluate these and other possible additional uses of USWAG's information in the national inventory estimates.

PCB Software – Financial Analysis of PCB Transformer Phase-Outs – A Study on the Costs and Benefits of PCB Phase-Out

Under a grant from US EPA, EMA Research & Information Center, subcontractor to the Tellus Institute, developed a spreadsheet tool to determine and compare the costs of phasing out PCB transformers against the costs of continued use. The tool was developed with the input of industry representatives and was based on actual case study information. US EPA is currently evaluating the spreadsheet tool and will be working with other industry representatives to conduct additional trial case studies on the use of the tool.

Canadian Reduction Activities

Canada has attempted to reduce PCBs in service and in storage through a mix of regulatory and voluntary programs. As described below, new PCB regulations were proposed in November 2006. Many companies have voluntarily undertaken initiatives to eliminate PCBs. To recognize these efforts and to encourage other companies to phase out PCBs, EC has awarded several companies for their efforts. Efforts by Canadian companies to reduce PCBs are presented on the following pages.

Canadian Regulatory Activities

Proposed PCB regulations were published in Canada Gazette 1 on November 4, 2006. The proposed PCB regulations amend the following regulations:

- 1) The Chlorobiphenyl Regulations (1991)
- 2) The Storage of PCB Material Regulations (1992)
- 3) Export of PCB Regulations (1996)
- 4) Federal PCB Destruction Regulations (1989).

The most significant proposed revisions to the regulations are the imposition of strict phase-out dates for certain categories of PCBs. The most important phase-out targets proposed are:

- Phase-out of all in-service high-level PCBs (>500 ppm PCB) by 2009 (except for pole-top transformers and equipment at electrical generation, transmission, and distribution facilities).
- Phase-out of all PCBs in storage sites by 2009.



- Phase-out of all “pad-mounted” (anything that is not pole-mounted) equipment with 50-500 ppm PCB by 2014.
- Phase-out of all pole-mounted transformers and all equipment at electrical generation, transmission, and distribution facilities by 2025.
- Prohibition of re-use of transformer oils with 2-50 ppm PCB (this equipment will not have to be destroyed by any specific date, but removed from service, the oil must be decontaminated to below 2 ppm PCB).

Proposed revisions to the federal PCB destruction regulations would see the strengthening of emissions release provisions to bring the federal regulations in line with existing provincial requirements. More information concerning this regulation can be accessed at: <http://www.ec.gc.ca/CEPARRegistry/regulations/detailReg.cfm?intReg=105>.

Canadian Stakeholder PCB Phase-out Efforts

Commencing in 1999, PCB reduction commitment letters were mailed to priority industry sectors, including school boards and other sensitive sites (food, beverage, hospitals, care facilities, and water treatment industries). Additional letters were sent in 2003 and 2004. From August to November 2005, EC sent over 1,000 letters to PCB owners (of both PCBs in storage and in use) in priority industry sectors for inventory updates. Over 400 inventory updates have been completed, signed, and returned to EC, along with copies of manifests and destruction and inspection reports. EC conducted an analysis to identify priority industry sectors and major sources of high-level PCBs (both in use and in storage). The inventory updates have also been extremely useful in updating the National PCB Inventory Database.

A number of companies in the iron and steel, utilities, pulp and paper, and metals and mining sectors have voluntarily undertaken initiatives to eliminate PCBs, especially high-level PCBs in use and/or storage. EC has held personal meetings with officials of two major steel companies in Ontario (Stelco and Dofasco) and encouraged them to destroy high-level PCBs in storage and decommission PCBs in use. For example:

- 1) As of September 2005, Stelco (Steel Company of Canada) in Hamilton, Ontario, had destroyed 142,687 litres of high-level PCB liquid, with approximately 8,500 litres remaining in storage. However, a substantial amount of PCBs remain

in use (approximately 132 high-level PCB transformers with a weight of 228.5 tonnes).

- 2) Dofasco still has a major amount of high-level PCBs in use (approximately 1,473 tonnes) and approximately 390 tonnes of PCBs in storage for disposal.
- 3) Since 1999, Algoma Steel in Sault Ste Marie, Ontario, has destroyed approximately 75,994 litres of PCBs (with a weight of 121.5 tonnes), leaving little in storage. During 2005, Algoma destroyed 8,943 litres of PCB liquid. However, they still have 71 high-level PCB transformers, 265 high-level capacitors and 1 electromagnet in use, which they plan to eliminate by 2009.

Although the GLBTS target for stored high-level PCBs has been met, PCBs in use for the top six industry sectors are a challenge. These sectors include: 1) Steel, 2) Metals and Metal Mining, 3) Sensitive areas, 4) Utilities, 5) Non-federal governments, 6) and Pulp and Paper and Forestry. Additional companies are being identified as “PCB Free,” and these will be used to update the inventory of “PCB Free” companies.

PCB Phase-out Awards Program (Canada)

The Canadian workgroup has developed a plan of outreach and recognition to try to increase awareness and the rate of PCB phase-out. The main elements of the plan are to:

- Award a plaque to each eligible company that becomes PCB free or reaches a major PCB target (90 percent reduction and above).
- Take a photograph of the award presentation and develop a case study (success story).
- Post the photograph and case study or success story on the website and make copies available for distribution.
- List the names of award winners in GLBTS, International Joint Commission (IJC), government and trade association publications.
- Make presentations at trade association meetings and conferences.

Eight Canadian companies have received PCB Phase-Out Awards to date. Four more companies have been selected to receive awards. Arrangements are being made for a special presentation of the PCB Phase-Out Awards at a breakfast seminar dedicated to PCB management issues.



Environment Canada will continue to target candidates for PCB phase-out programs and PCB awards. The strategy in 2007 will be to identify those companies with the largest PCB inventories, meet with them to discuss their phase-out strategies, explain the GLBTS goals and awards program, and attempt to obtain a commitment for prompt phase-out.

Canadian PCB Success Stories

Case studies have been written for each of the companies that have received Canadian PCB awards. The goal of the case studies is to promote the removal of PCBs by companies that have not yet done so by providing examples of beneficial factors considered when companies decided to remove their PCBs. The case studies will be posted on the GLBTS PCB website. Copies may be requested from Ken De, the Canadian PCB Workgroup co-chair, by e-mail at ken.de@ec.gc.ca or by phone at (416) 739-5870. The following is a summary of each case study.

Hydro One Inc. (formerly Ontario Hydro) is one of the largest electric utility companies in North America, delivering more than 97 percent of the electricity in Ontario and serving approximately 1.2 million retail, 80 large industrial, and some 94 municipal electrical utility customers. Hydro One has eliminated all of its high-level PCBs (those with greater than 10,000 ppm PCBs) in service and in storage, 75 percent of its low-level PCBs (less than 10,000 ppm) in service, and 38 percent of its storage site locations. Between 1995 and 2001, Hydro One shipped approximately 3,200 tonnes of PCB wastes for destruction or decontamination treatment, and chemically decontaminated an estimated 6.5 million litres of low-level mineral oil.

Enersource Corporation (formerly Mississauga Hydro) is a utility company supplying electricity to the City of Mississauga. Enersource's core electricity distribution service provides electricity to 170,000 customers. Enersource had an accumulated PCB inventory of 19,500 kg of askarel fluid, 135,000 kg of contaminated mineral oil, 106,000 kg of contaminated transformer solids, 67,000 kg of capacitors and ballasts, 13,000 kg of contaminated soil, and 1,200 kg of contaminated sludge. In 2000, Enersource conducted a massive campaign to destroy stored PCBs, and this work resulted in the elimination of all high-level PCBs. All that remains in the Enersource network is 4,500 kg of low-level contaminated oil in storage and approximately 250 low-level PCB

contaminated transformers still in service, containing approximately 33,000 kg of PCB contaminated oil.

Stelco Inc. is Canada's largest and most diversified steel producer, with an annual steelmaking capability of 5.9 million tons. Stelco is involved in all major segments of the steel industry through its integrated steel business, mini-mills, and manufactured products businesses. **Stelpipe Ltd.**, a wholly owned subsidiary of Stelco Inc. located in Welland, Ontario, produces tubular steel products primarily for the construction, automotive, mining, distribution, manufacturing, fabricating, and energy market sectors. Stelco's second operating priority behind creating and maintaining healthy and safe workplaces for its people is to preserve and enhance the environment through responsible and environmentally oriented operating practices. Stelpipe successfully remediated aboveground and belowground soil contamination in phases over the period from 1987 to 2002 at a cost exceeding \$6.5 million. In 1998, Stelpipe disposed of PCB cleanup wastes, except for low-level contaminated soils, at a cost of \$1 million. In addition, Stelpipe replaced or eliminated 5 power transformers and 65 lighting and control transformers at a cost exceeding \$0.5 million.

Canadian Niagara Power Inc. (CNP) is an electric distribution company based in Fort Erie, Ontario, that is owned by Fortis Ontario Inc. During the past decade, CNP has endeavored to sample, analyze, inventory, and decommission electrical equipment containing PCBs in concentrations of over 50 ppm. CNP has removed and destroyed 2 askarel transformers, 95 askarel capacitors, 69 contaminated mineral oil transformers, over 10,000 PCB lamp ballasts, and over 2,000 kg of contaminated solids. Some of the equipment was retrofilled with new oil and returned to service. Local industrial customers who owned PCB transformers were also invited to participate in this exercise, and CNP assisted them in transferring their PCB waste to CNP's facility for decontamination. As a result, all PCB electrical equipment, other than PCB streetlight ballast capacitors and fluorescent lighting ballasts within CNP's Fort Erie distribution system, was removed from service.

Slater Steel Inc.'s Hamilton Specialty Bar Division is a major Canadian company serving a broad variety of specialty steel bar markets throughout the world. The Hamilton Specialty Bar Division (HSB) is one of six business units of Slater Steel. The main product of SBD is carbon and alloy steel bars (round and flat)



suited to numerous markets including automotive, heavy truck, off-road, mining, forging, cold finish, and the service sector. Slater's original inventory of PCBs consisted of approximately 25 tonnes of PCB contaminated solids, 16 tonnes of askarel liquid, 1.5 tonnes of contaminated mineral oil, and 7 tonnes of whole capacitors. In 1998, it was decided to completely eliminate PCBs from the facility. All PCBs in service and in storage were sent for destruction. By December of 2001 the facility was certified as PCB-free by both Environment Canada and the Ontario Ministry of the Environment.

The **City of Thunder Bay**, at the northwest end of Lake Superior, has a population of 110,000 and stretches along an arc of some 20 km along the shore of Lake Superior. The City has operated a Household Hazardous Waste Depot since 1995, diverting items such as oils, paints, pesticides, and lead batteries from the landfill. Since 2002, mercury products like thermometers, thermostat switches, and fluorescent bulbs have also been collected at the depot. Thunder Bay's PCB program began in the early 1990s with a goal of inventorying all equipment containing PCBs throughout the corporation. The final objective of the PCB program was to become PCB-free. Between 1994 and 1998, six drums of PCB power capacitors were phased out of use at the sewage treatment plant. In 1997, two barrels of power capacitors were removed from the water treatment plant. In early 2001, the total PCB contents in storage, 85 barrels in all, were sent for destruction. This left the City's facilities, approximately 60 buildings, including plants, arenas, and retirement homes, virtually PCB-free. The only PCB materials remaining are light ballasts.

General Motors of Canada Limited (GMCL) is the largest automobile manufacturer in Canada and has been in business continuously for more than 100 years. GM has numerous parts and assembly plants in Ontario, one of which is located in St. Catharines. The St. Catharines Powertrain Plant has 1.26 million square feet under roof on 22 hectares of land. The plant produces front wheel transmission final drives, differential assemblies, miscellaneous transmission components, radiator assemblies, and forgings for a number of GM vehicles. In 1994, the St. Catharines Ontario Street Plant began an initiative to remove all PCB equipment from the facility. By the end of 1999, all PCB transformers and power-factor capacitors were removed from service, leaving only PCB lighting ballasts in the plant. The transformers were replaced with air-cooled (no liquid) transformers, and the

capacitors were replaced with mineral oil capacitors. The first PCB transformer was removed in 1996, and the remaining PCB transformers were removed by 1999. The St. Catharines plant has now targeted low-level PCB equipment for removal (light ballasts), and as of 2005, this initiative was 40 percent complete. GM and GMCL initiated the PCB phase-out plan as a way to eliminate risk and liability. In addition, the phase-out of PCBs was a Target and Objective of the Environmental Management System (EMS) that was formulated as part of the ISO 14001 certification that the Ontario Street Plant received in December 2001.

Ontario Power Generation Inc. (OPG) is the largest electric generation entity in Ontario. The Nanticoke Generating Station is a coal-fired facility located on the north shore of Lake Erie in Haldimand County, approximately 90 km west of Niagara Falls. In 1997 Nanticoke had 683 tonnes (gross weight) of high-level PCB equipment in service and 66 tonnes (gross weight) in storage. The in-service equipment consisted mainly of transformers (126 askarel transformers) while the in-storage inventory was a mix of bulk askarel liquid in barrels, solid PCB wastes in barrels, and some drained equipment. OPG implemented an aggressive plan to eliminate all high-level PCBs from the station in 1998, and by 2004 all PCBs had been removed and sent for destruction. A small amount of low-level PCB materials (light ballasts, PCB cables) remains at Nanticoke, and this material is being selectively phased-out as well. The elimination of PCBs at the station is driven by the company policy to manage PCBs in an environmentally responsible and cost-effective manner. This was a voluntary program established by OPG, and Nanticoke completed the work before the established target dates.

Figure 2-3 presents photos of company representatives receiving PCB Phase-out Awards from Gary Gulezian (US EPA) and Danny Epstein (EC).

Inventory Improvements

Source Profiles and Emissions of PCBs to Ambient Air from Transformers

A draft report on the study of PCB emissions from in-service PCB transformers was submitted to US EPA. The study, conducted by Dr. William J. Mills of the University of Illinois, collected samples of ambient air around operating PCB Askarel transformers in January and October 2004. A previous draft presentation of the results of the study showed that PCB levels in rooms with transformers were at least 1



Figure 2-3. Representatives of OPG Nanticoke (top left), Canadian Niagara Power (top right), General Motors (bottom left), and City of Thunder Bay (bottom right) Receive PCB Phase-Out Awards. Source: Environment Canada

order of magnitude higher than outside background PCB concentrations, although some interferences were noted, such as wipe samples that found PCBs on the floor.

Canadian PCB Inventory Harmonization

EC's Ontario regional staff are working to improve the quality and update the information in the PCB inventory. PCB Workgroup members have met with the Inspection and Enforcement staff who are responsible for updating and maintaining the Ontario Region's Database, and will continue to meet with them on a regular basis, to share inventory information gathered during meetings with PCB owners and from PCB commitment letters. Once the National PCB Database systems are updated with new inventory information, the PCB Workgroup will be able to provide more accurate and timely inventory information and evaluate progress toward meeting the GLBTS goals.

Next Steps

The workgroup and government agencies plan to continue seeking PCB reduction commitments and evaluate PCB Management Assessment recommendations for implementation.

PCB Reduction Commitments

The PCB Workgroup will continue seeking commitments to reduce PCBs through PCB reduction commitment letters and other PCB phase-out efforts, and to publicize voluntary achievements in PCB reduction.

PCB Management Assessment Recommendations

The Management Assessment for PCBs was presented in final form at the December 2006 GLBTS Stakeholder Forum. The workgroup plans to begin working on the recommendations presented in the report.

Because the workgroup has determined that several data issues exist (e.g., data quality and comparability issues) regarding PCB sources, levels, and trends in



the environment, future workgroup activities will include further evaluation of the available data before final conclusions are made.

At this time, the workgroup recommends that PCBs should continue an active Level 1 status, with initial priority placed on collecting and assessing a more complete set of data on PCB sources and environmental levels. The primary goals of this exercise will be to: (1) prioritize the remaining PCB sources (better defining relative source contributions); (2) clarify PCB trends and impacts on the environment; and (3) assess the ability of the GLBTS to effect further reductions.

Work targeting PCB-containing equipment in service should continue (such as outreach to industry), due to the potential for the equipment to be a source of future releases, and should be coordinated

with other efforts. Work targeting other areas, such as coplanar/dioxin-like PCBs, likely will be most efficiently and effectively addressed through referral to or coordination with other groups, such as the Dioxin Workgroup. The PCB Workgroup is currently working to identify and determine relative contributions of PCBs to the environment from known and potential sources of PCBs. Once sufficient progress on this work is made, a better determination of the activities that can be undertaken, and by whom, to reduce releases from particular sources can be made.



Agasabon River, Ontario
Photograph by Patrick T. Collins,
Minnesota Department of Natural Resources