

**St. Louis River Watershed
TMDL Pilot Project:**

**Mercury Reductions via
Public/Consumer
Outreach**

Prepared for the

St. Louis River



PARTNERSHIP

September 16, 2003



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Completed by:



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Mercury Reductions via Public/Consumer Outreach

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Key Abbreviations and Terms

Hg	Mercury
HHW	Household Hazardous Waste
LaMP	Lake Superior Lakewide Management Plan
MnDNR	Minnesota Department of Natural Resources
MnTAP	Minnesota Technical Assistance Program
MOEA	Minnesota Office of Environmental Assistance
MPCA	Minnesota Pollution Control Agency
MSW	Municipal Solid Waste
VSQG	Very Small Quantity Generator
WDNR	Wisconsin Department of Natural Resources
WLSSD	Western Lake Superior Sanitary District
WWTP	Wastewater Treatment Plant

1.0 Introduction

1.1 Project Overview

Currently, many waters within the Lake Superior watershed, including the St. Louis River, have fish consumption advisories due to mercury. A number of projects aimed at reducing mercury use and release in the St. Louis River and Lake Superior Basins have been implemented or are currently underway. Although many of these have been highly effective at reducing mercury releases, additional efforts are needed to get the mercury reduction message to more residents and industries in these areas.

The Western Lake Superior Sanitary District (WLSSD) serves as the main coordinator for the St. Louis River TMDL Partnership (Partnership). The Partnership is a diverse set of stakeholders representing environmental organizations, industries, academia, the public, and municipalities within the Lake Superior Basin. WLSSD, on behalf of the Partnership, has been awarded grants from the Environmental Protection Agency (EPA) and Minnesota Pollution Control Agency (MPCA) to take on a project intended to work toward the goal of zero discharge for mercury, focusing on mercury releases in the Lake Superior Basin caused by improper use or disposal of mercury-containing products. The goal of this project is to reduce the amount of mercury released to the environment by decreasing the sale and use of mercury-containing products and reducing improper disposal of mercury wastes in wastewater or solid waste. The ultimate goal is to reduce the potential human health effects of mercury by reducing levels of mercury found in fish. WLSSD has contracted with Barr Engineering to assist with the project.

In addition to the two project objectives listed here, there is also a third, underlying goal: to make it as easy as feasible for people to do the right thing.

The objectives of this project are to maximize the effectiveness of existing programs and implement new gap-filling programs, especially those that can quickly move from planning to implementation. The project will also make use of the leadership and area contacts of Partnership members. The area to be covered by these efforts is the Lake Superior Watershed in Minnesota, which includes the St. Louis River Watershed, as well as the

portion of the St. Louis River Watershed that lies within Wisconsin (shown in the graphic at right).

The first phase of this project consisted of four steps. Before taking action to propose and develop new programs, existing programs were identified and evaluated. Then the apparent gaps in those existing programs were assessed. In addition to determining who uses mercury products and may benefit from additional efforts, the analysis identified geographical gaps in mercury reduction efforts. After identifying programs and gaps, WLSSD and the Partnership Steering Committee presented findings to the



MPCA and the full Partnership Board as well as other interested persons and developed strategies to fill gaps and build on and improve the effectiveness of existing programs. Finally, a monitoring program was prepared to help gauge the effectiveness of efforts that will be implemented in Phase II of the project. This report contains the results of these four steps: existing program identification, gap analysis, strategy development, and plans for monitoring program effectiveness.

The next phase of the project calls for implementing the selected strategies and monitoring their effectiveness. The Partnership intends to prepare project update reports, including results of monitoring activities, on an annual basis in 2004 and 2005.

1.2 Approach to Evaluating Existing Programs

The first step, an evaluation of existing programs, was completed in three stages.

- 1.) A list of known mercury reduction programs in the project area was created. The list includes 27 local, state, regional and national efforts that are currently in use, have been recently used or are well along in planning stage. It is presented in Table 1. The list was created by Barr Engineering using the knowledge of Barr project participants and other contacts in the region who work with issues related to mercury and was reviewed by the Partnership Steering Committee before interviews began.
- 2.) Once the list of programs was established, Barr collected information on these existing programs, mainly by interviewing program managers. For some programs, information was gathered mainly from web sites or documents. Twelve of the programs were selected for in-depth interviews, while a shorter list of information was collected for the remaining programs. The questions asked and notes taken during the in-depth interviews are presented in their entirety in Appendix A of this report.
- 3.) The third step was for Barr to create a summary table for each of the programs. A long form was used to summarize information where in-depth interviews were collected, and a shorter format was used for programs where information was gathered via other means. The interviews included identifying the mercury sources that existing programs address and their geographic coverage, as well as collecting information regarding the effectiveness of each program and what could be done to improve that effectiveness. The signs of effectiveness often varied by project depending on the data available and included considering how much mercury has been collected or the degree of increased awareness achieved through an educational outreach program. Discussions with coordinators of programs helped us to understand the existing mercury collection infrastructure and get a better idea of primary communication channels that have been or could be used to disseminate information and conduct similar programs in other locations.

Program managers that Barr interviewed were also asked for suggestions regarding what the Partnership may be able to do to help improve the effectiveness of existing programs, implement a

similar program in a different location, or address a different source group or mercury product. Suggestions that were received are also part of the summary tables in Appendix A.

1.3 County-Level Efforts

The project area encompasses five counties: Carlton, Cook, Lake, and St. Louis in Minnesota and Douglas in Wisconsin. Our existing program analysis found some focused mercury reduction programs offered in Douglas, St. Louis, and Carlton counties, though we did not discover evidence of special initiatives in Lake or Cook counties, other than household hazardous waste collection days that include mercury wastes. We also discovered that county level staff have varying amounts of knowledge and financial resources to carry through with these initiatives.

Douglas County – Mary Klun of Douglas County reported that the county holds pick-up events in Superior, Maple, and Solon Springs each June to take in HHW. Residents of Superior can also bring their HHW to WLSSD’s facility at any time. Jane Schlichting of the City of Superior also shared information about a number of programs that are in place in the city. Some of those programs are offered throughout Douglas County.

- Auto Switch-the-Switch program (#5)
- HHW and CleanSweep collections (#8)
- Thermostat Recycling Program (part of the nationwide program highlighted in #18)
- Fluorescent light recycling (program #19)
- Thermometer exchanges (#20)
- Mercury-Free Schools program, which covers 10 counties in northern Wisconsin (#22)
- Camp Thermometer Replacement Program, also called “On the Trail for Mercury” – a program aimed at youth camps in the 10 Wisconsin counties that comprise the Lake Superior watershed. (#23)
- Dental Amalgam BMP Project (#26)

Carlton County – Joan Weyandt-Fulton coordinates the water plan and recycling areas for Carlton County. Joan was involved in mercury reduction efforts during her tenure at WLSSD and has continued that work since moving to Carlton County. She spoke about some of the mercury reduction work there.

- The county has a satellite HHW facility that is open from May through October. They take any sort of HHW from households (including mercury) at no charge when the facility is in operation (see program #8). Businesses that call to inquire about disposing of their hazardous waste are referred to WLSSD’s Clean Shop program.
- The schools in Carlton County are largely mercury free—an effort that was launched while Joan was still on staff at WLSSD. She says to her knowledge, there is one mercury barometer in one school, but other items have been removed from all other secondary schools in the county.

- They do thermometer exchanges as they are able and have resources available. She reports that she collects a lot of mercury thermometers when she speaks to senior citizens' groups and is concerned that there are still many more that need to be collected from that population group. She also does thermometer exchanges and mercury awareness as part of the solid waste/recycling display at the Carlton County fair.
- She has worked with county public health staff to visit clinics one at a time. She believes all the medical clinics in Carlton County are mercury free except one.
- She surveyed some nursing homes in the county and found that most were mercury free. She has not had an opportunity to contact all of them, however.
- She has not had a chance to contact veterinarians or ambulance crews and sees that as another gap worth pursuing.

Cook County – Tim Nelson, Cook County Solid Waste Manager, reports that the county does not have any specific mercury reduction efforts sponsored at the county level, nor have they sponsored any reduction efforts in the past. He believes MOEA organized some mercury reduction efforts in the region several ago that targeted schools and hospitals in an attempt to get them to exchange mercury-containing thermometers and other lab equipment. The county does not have a HHW facility, but they do offer local collections for households and VSQGs twice a year through WLSSD. They also have a locker that they use for emergency storage of household hazardous waste in between local collection days.

Lake County – Lake County Solid Waste Manager Curt Gadacz shared information about some current mercury reduction initiatives in Lake County.

- MPCA's Mercury-Free School Zone Program - Two of the four schools in the county have signed the mercury-free pledge and have done an audit of mercury-containing items in their facilities. Mr. Gadacz said the audits were done in conjunction with MPCA and OEA staff.
- The county's household hazardous waste facility accepts bulk mercury and mercury-containing items such as thermometers, thermostats, switches, lamps, and ballasts. Lake County has a contract with WLSSD to accept and properly dispose of the HHW that they collect at their facility (see program #8)
- Some local hardware stores accept fluorescent lamps for a \$1 per lamp fee.
- John's Sanitation of Silver Bay collects lamps and ballasts and turns the items over to Mercury Technologies of Pine City, Minnesota.
- The Louisiana-Pacific facility in Two Harbors also has a contract with Mercury Technologies to accept their mercury-containing items
- The county has not launched any specific PR campaigns aimed at mercury reduction, but they do try to get an article in the Lake County paper about once a year outlining what types of things residents can bring to the county's HHW facility and encourage residents to use the facility.

St. Louis County – Chip Lewis reports that the county’s HHW facilities in Virginia and Hibbing (program #8) accept all forms of household hazardous waste, including mercury-containing items. The county also has an appliance scrap recycling program where mercury-containing switches are removed from appliances for proper disposal (program #9). The county solid waste department has also actively participated in the Mercury Reduction Task Force established by the City of Hibbing as part of their Pollutant Minimization Plan (#25).

Table 1: Mercury Reduction Programs, Northeast Minnesota and Northwest Wisconsin

* next to program number indicates programs that were researched in greater detail.

Program Name	Coordinated by	Audience	Product/source
1.* Dental Outreach and Education, including bulk mercury collection	WLSSD	Dental	Dental amalgam, bulk Hg
2.* “Blueprint for Mercury Elimination”	WLSSD	WWTP, industries	All
3.* Household Hazardous Waste Collection and Thermometer Swap Program	WLSSD	Households	All
4.* Clean Shop Program	WLSSD	Businesses & industries	All
5.* Switch-the-Switch Program (auto switches)	Superior, Wisconsin WWTP	All	Switches (auto)
6.* Health Care Without Harm	Institute for a Sustainable Future	Medical	All
7.* Fluorescent Bulb Recycling Program	Minnesota Power	Households and businesses	Lamps
8.* County Household Hazardous Waste Options (Douglas, Carlton, St. Louis, Lake, and Cook)	County solid waste staff	Households	All
9.* St. Louis County Appliance Collection Program	St. Louis County Solid Waste Department	Businesses, schools, and non-profits	Switches (appliance)
10.* Mercury-Free Zone and Clancy the Mercury-Sniffing Dog	MPCA (co-sponsored by Xcel Energy and MOEA)	Schools (K-12) + general public via publicity	All
11.* Seminars for Veterinarians and other medical facilities	Superior WWTP	Medical facilities, especially small offices, nursing homes, and veterinarians	All, especially Medical equip.

Program Name	Coordinated by	Audience	Product/source
12. Construction and Demolition Education	MPCA	Construction and demolition contractors	Switches and relays, measurement & control devices
13.* Program for Scrap Yards	MPCA	Scrap yards	Switches (auto)
14. Agricultural Clean Sweep program	EPA Region V and state agriculture departments	Farms and other users of pesticides	Mercury and mercury-based pesticides
15. Dairy Manometer Replacement Program	MN Dept of Ag, WDNR, WI Dept of Ag	Dairy Farms – working and abandoned	Mercury pumps, valves, manometer gauges
16. Hospitals for a Healthy Environment (H2E)	EPA, AHA	Medical	All, especially Medical equip
17. Voluntary Agreements (under MPCA's Mercury Contamination Reduction Initiative) (In northeastern Minnesota, Hibbing Taconite, EVTAC, LTV Steel—now idled, Minnesota Power, National Steel Pellet Company—now Keewatin Taconite, Northshore Mining, and WLSSD participate)	MPCA oversees the program	Industries (especially large coal-fired power plants, taconite facilities, and refineries); some agreements address other audiences too	All, especially measurement and control devices, switches, relays, fluorescent lamps
18. Thermostat Recycling Corporation (TRC) programs	TRC	Construction and demolition contractors	Thermostats
19. Fluorescent Lamp Recycling Program	Superior, Murphy Oil and Superior Water Light and Power	Households and small businesses	Lamps
20. Thermometer Exchange Program	Superior WWTP	Households, schools, day care centers	Thermometers
21. General Public Education and Promotional Items	Superior WWTP	General public, school children, and teachers	All

Program Name	Coordinated by	Audience	Product/source
22. Northwest Wisconsin Mercury-Free Schools Program	Superior WWTP	Schools	All
23. Camp Thermometer Replacement Program	Superior WWTP	Camps for kids	Thermometers
24. Minnesota Dental Association program	MDA	Dental offices	Dental amalgam and bulk Hg
25. Mercury Pollutant Minimization Program (PMP) – Hibbing, Minnesota (required by NPDES rules for sources in the Great Lakes basins)	MPCA, WDNR, other state agencies; cities with WWTP that discharge to Great Lakes watersheds	Dentists, households, industries, schools, others that discharge to WWTPs	All, especially dental amalgam, caustic soda and other Hg likely to go to a WWTP
26. Dental Amalgam BMP Project	City of Superior	Dental practices in Douglas County, Wisconsin	Dental amalgam and bulk mercury
27. Abandoned White Goods Collection	MOEA, MPCA	Volunteers and basin residents	Abandoned white goods

2.0 Information Gathering Summary

Barr analyzed 27 different programs for this project as summarized below. Information from more in-depth interviews with program leaders for several programs can be found in Appendix A.

Program name	1. WLSSD Dental Outreach and Education
Start date(s), Status	1991-1992: Ongoing
Coordinated by	Western Lake Superior Sanitary District (WLSSD)
Contact person	Tim Tuominen – 218-722-3336, ext. 315 – tim.tuominen@wlssd.duluth.mn.us
Products or sources addressed	Primarily amalgam, some bulk mercury
LaMP 2000 Action #	101 – Partner with Dental Associations (MN Level 1)
Target audience(s)	Dentists and dental assistants
Geographic region	Mainly the WLSSD service area, though they have received broader exposure through work with area dental associations
Program description	<p>This is a long-term program with many components. Through building trust and a rapport with area dentists, WLSSD has been able to educate dental practices in their service area and beyond about mercury reduction and disposal. Projects have included:</p> <ul style="list-style-type: none"> – Establishing longer term relationships with dentists through participation in dental association meetings, gatherings, and conferences – Visiting practices to see how they manage and dispose of dental waste, then creating a brochure to explain how to properly dispose of the waste – Securing grant funds to test three different types of collection units at various practices to see which one(s) best capture amalgam sediment – Acting as an educational resource for dentists in the region
Effectiveness	The program has reached approximately 100 dentists in the WLSSD service area as well as dental practices outside the area; WLSSD estimates that 60 pounds of bulk mercury have been collected, and each dentist collects an average of one pound of amalgam waste per year. On a recent WLSSD survey of dentists in their service area, 100% of respondents said they recycle mercury through the Clean Shop program or a private hauler. Dentists turn to program coordinator Tim Tuominen for information and advice about proper collection and disposal methods.
Cost	Cost for specific initiatives decreases as they are repeated. In 10 years, approximately 10-15% of Tim’s time has been spent on the dental program.
Suggestions for program improvement or use in other areas:	Program is going well on its own and dentists have learned to trust WLSSD staff working with the program. Perhaps additional useful information could be derived from studying vaporization rates of waste amalgam under different media used by dentists and others in an effort to prevent vaporization (i.e. glycerin, fixative, water, and oil). This information could be used to improve handling and storage of waste amalgam and elemental mercury and potentially reduce exposure for dental office staff.

Program name	2. Blueprint for Mercury Elimination
Start date(s), Status	1995-1997, Updated and reprinted as needed and as funds allow
Coordinated by	Western Lake Superior Sanitary District (WLSSD)
Contact person	Tim Tuominen – 218-722-3336, ext. 315 – tim.tuominen@wlssd.duluth.mn.us
Products or sources addressed	Primarily business and industry uses such as industrial laundries, hospitals, dental clinics, veterinary clinics, pulp & paper producers
LaMP 2000 Action #	148 – Toxic Reduction Plans (MN Level 1)
Target audience(s)	Wastewater treatment plant staff, their customers, educational facilities, solid waste managers
Geographic region	Intended for the Great Lakes region because that was the grant focus, but information has been shared with entities as far away as South America and Europe.
Program description	WLSSD obtained a grant to document possible sources of mercury in their sanitary system and put together a comprehensive document for wastewater treatment plants.
Effectiveness	WLSSD printed and distributed 6,000 copies of the document and has since printed an additional 2,000 copies. Interest in the document and the project has remained high.
Cost	Approximately \$140,000
Suggestions for program improvement or use in other areas:	The information in the completed document could potentially be used to promote similar pollution prevention efforts in other areas. The document could also be used in conjunction with small grants (e.g. those in the \$5,000 range) to assist other WWTPs in the basin with mercury reduction activities and treatability studies.

Program name	3. Household Hazardous Waste Collection and Thermometer Swap
Start date(s), Status	HHW program – ongoing program Household thermometers – 1999 (short-term emphasis) Thermometers and other Hg-containing equipment from schools - 2000-2001 (short-term emphasis)
Coordinated by	Western Lake Superior Sanitary District (WLSSD)
Contact person	Heidi Ringhofer – 218-722-3336 – heidi.ringhofer@wlssd.duluth.mn.us
Products or sources addressed	HHW accepts any mercury-containing items, though the focus of the thermometer swap was mercury thermometers from households and educational facilities.
LaMP 2000 Action #	32 – Collections (MN Level 2)
Target audience(s)	Households and schools within the WLSSD service area
Geographic region	Northeastern Minnesota (WLSSD service area)
Program description	The District accepts mercury-containing items at their household hazardous waste facility.

Program description (continued)	<p>Specific thermometer swaps were conducted in cooperation with MPCA in an effort to collect thermometers and properly dispose of them. WLSSD staff estimate that thermometer exchanges began in about 1998, when Jamie Harvie and Healthcare without Harm conducted exchanges with healthcare facilities in the area.</p> <p>The household thermometer swap was publicized in newspapers and through word of mouth when it was offered in roughly the fall of 1999.</p> <p>The school collection was started when MPCA awarded grants to schools in the WLSSD service area to clean out old laboratory chemicals, and the mercury collection followed from there. WLSSD worked with the school program in 2000 and 2001 and believe that they have collected the majority of mercury-containing items from school labs in the district's service area. The MPCA has expanded the program to collect mercury from schools outside the service area. While WLSSD staff collected mercury-containing items from schools in the service area, MPCA collected from some schools outside the service area and brought the materials to WLSSD's HHW facility.</p>
Effectiveness	<p>Thermometers collected by WLSSD, 1998-2001:</p> <p>1998 – 4.25 pounds</p> <p>1999 – 1,525 thermometers</p> <p>2000 – 2,447 fever thermometers; 683 lab thermometers</p> <p>2001 – 857 fever thermometers; 1,422 lab thermometers</p>

Program name	4. Clean Shop Program
Start date(s), Status	Ongoing program
Coordinated by	Western Lake Superior Sanitary District (WLSSD)
Contact person	Heidi Ringhofer – 218-722-3336 – heidi.ringhofer@wlssd.duluth.mn.us
Products or sources addressed	Clean Shop collects hazardous waste, including mercury
LaMP 2000 Action #	32 – Collections (MN Level 2)
Target audience(s)	Businesses and industries that generate a relatively small amount of hazardous waste, known as very small quantity generators (VSQGs)
Geographic region	The program primarily serves the WLSSD service area but also offers Clean Shop collection days in St. Louis County under contract with the St. Louis County solid waste department.
Program description	This is a disposal option for businesses that generate a small amount of hazardous waste (VSQGs). The businesses pay for disposal and a small amount of overhead costs. In Duluth, the permanent facility is open by appointment. WLSSD also does some mobile collection.
Effectiveness	<p>Pounds of mercury collected by WLSSD, 1998-2001:</p> <p>1998: 1,051.80 lb 1999: 250.3 lb</p> <p>2000: 645.65 lb 2001: 968.06 lb</p>

Program name	5. Auto Switch-the-Switch
Start date(s), Status	November 2001; Ongoing program
Coordinated by	City of Superior Wastewater Treatment Plant
Contact person	Jane Schlichting – 715-394-0392 – schlichtingj@ci.superior.wi.us
Products or sources addressed	Auto switches used in trunk and hood convenience lighting
LaMP 2000 Action #	32 – Collections (WI Level 1)
Target audience(s)	New car dealers in Superior, Wisconsin
Geographic region	Superior, Wisconsin
Program description	Car dealers exchange mercury switches for non-mercury ball bearing switches.
Effectiveness	As of late 2002, 120 switches had been removed from new cars. The City's fleet is mercury-free, but the program is not as effective at reaching older vehicles.
Cost	Low – \$0.40 per switch; advertising, staff time
Suggestions for program improvement or use in other areas	A budget allowing for cash incentives and for additional promotion and advertising would be helpful. A plan for reaching small car dealerships would help the program to increase its effectiveness.

Program name	6. Healthcare Without Harm
Start date(s); Status	Ongoing
Coordinated by	Institute for a Sustainable Future
Contact person	Jamie Harvie – 218-525-7806
Products or sources addressed	Medical devices and products, household mercury thermometers
LaMP 2000 Action #	100 – Healthcare P2 (MN and WI Level 1)
Target audience(s)	Health care industry
Geographic region	Local, national, international
Program description	Healthcare Without Harm works to educate and engage the health care industry in pollution prevention initiatives, including the phase-out of mercury containing medical devices and products.
Effectiveness	Over 600 health care facilities have made Hg-free pledges 70% of pharmaceutical chains committed to Hg-free products Hundreds of facilities/companies signed Hg-free purchasing policies
Suggestions for program improvement or use in other areas	More effort to influence mercury legislation is needed. Community sign-ons for local businesses to commit to mercury reduction and mercury free practices would be helpful. There may be a good fit with a proposed LaMP project to bundle existing mercury exposure and source info and distribute the package with a goal of raising awareness about the dangers of mercury exposure in the home, school and workplace.

Program name	7. MP Fluorescent Bulb Recycling Program
Start date(s); Status	1999: Ongoing
Coordinated by	Minnesota Power
Contact person	Al Lian – 218-722-5642 – alian@mnpower.com
Products or sources addressed	Fluorescent bulbs
LaMP 2000 Action #	22 – Promote energy conservation (MN Level 1); 32 – Collections (MN Level 2)
Target audience(s)	Businesses, households
Geographic region	Northeastern Minnesota (Minnesota Power’s service territory)
Program description	Recycling program; offers coupons for money off recycling fees; selected local-business retailers serve as collection centers for bulbs
Cost	Low – recruit stores, produce signage materials and mailings

Program name	8. County Household Hazardous Waste Options (Douglas, Carlton, St. Louis, Lake, and Cook)
Start date(s); Status	Varied, all active
Coordinated by	Solid waste staff in individual counties
Contact persons	Douglas (Wisconsin) – Mary Klun – 715-395-1293 Carlton – Joan Weyandt-Fulton – 218-384-9178 St. Louis – Chip Lewis – 218-741-8831 Lake – Curt Gadacz – 218-834-8300 Cook – Tim Nelson – tim.nelson@co.cook.mn.us
Products or sources addressed	All mercury-containing products, as well as other forms of household hazardous waste (HHW)
LaMP 2000 Action #	32 – Collections (MN Level 2)
Target audience(s)	Households
Geographic region	The five-county project area
Program description	The programs accept HHW from county residents on varying schedules. Douglas –HHW collection days (Clean Sweeps) are held in June in Maple, Solon Springs, and Superior. Clean Sweeps are sponsored by Wisconsin DNR and implemented by the Northwest Regional Planning Commission of Spooner, Wisconsin. The City of Superior has an agreement with WLSSD that allows those residents to bring household items to WLSSD’s HHW facility at any time. Carlton – The County has a satellite household hazardous waste (HHW) facility that is open from May through October. They take any sort of HHW from households (including mercury) at no charge when the facility is in operation. Businesses that call to inquire about disposing of their hazardous waste are referred to WLSSD’s Clean Shop program. St. Louis – Items are collected at a facility near Virginia two days a week, and a new facility in Hibbing accepts the items one day each week. St.

	<p>Louis County mobile community HHW collection will also accept these items.</p> <p>Lake – There is a HHW facility that accepts bulk mercury and mercury-containing items such as thermometers, thermostats, switches, lamps, and ballasts. Lake County has a contract with WLSSD to accept and properly dispose of the HHW that they collect at their facility</p> <p>Cook – The County does not have a HHW facility, but they do offer local collections for households and Very Small Quantity Generators (VSQGs) twice a year through WLSSD. They also have a locker that they use for emergency storage of household hazardous waste in between local collection days.</p>
Effectiveness	<p>St. Louis County collected 19,849 fluorescent tubes from 1993-1999. At 0.03 g/lamp (approximate input per lamp for 1995), this totals 595 g or 1.3 lbs. Twenty lbs of liquid mercury, along with other mercury items were collected in 1998 and 1999.</p>
Suggestions for program improvement or use in other areas	<p>More awareness among local businesses regarding the Clean Shop program and collection dates could improve participation. Dental waste could be addressed within the counties and outside WLSSD.</p>

Program name	9. St. Louis Co. Scrap Appliance Program
Start date(s); Status	1990; Ongoing
Coordinated by	St. Louis County Solid Waste Department
Contact person	Chip Lewis – 218-741-8831
Products or sources addressed	Mercury switches in scrap appliances
LaMP 2000 Action #	32 – Collections (MN Level 2)
Target audience(s)	Households
Geographic region	St. Louis County, Minnesota
Program description	<p>The program accepts appliances from residents of St. Louis County at 17 county designated solid waste sites. A contractor removes all hazardous materials, including mercury switches, from the appliances before sending them for recycling. The county will accept two appliances per visit at no charge.</p>

Program name	10. Mercury-Free Zone (Schools) Program & Clancy the Dog
Start date(s); Status	Pilot project September 2000 - January 2001; statewide program and use of Clancy began in September of 2001; Ongoing
Coordinated by	Minnesota Pollution Control Agency (MPCA)
Contact person	Chris Butler – chris.butler@pca.state.mn.us – 218-723-2358
Products or sources addressed	All, especially lamps, thermometers (lab and fever), blood pressure cuffs, bulk Hg, barometers, and other science lab equipment
LaMP 2000 Action #	73 – Seek and destroy mercury in schools (MN Level 1); 77 – Mercury dog (MN Level 2)
Target audience(s)	Schools (K-12), students and the general public via media coverage
Geographic region	Minnesota
Program description	Schools are asked to sign a mercury-free pledge, then work to identify and remove mercury from the school. MPCA helps by supplying Hg-free alternatives, facilitating and paying for Hg disposal, and providing information and onsite presentations, including visits by Clancy, a dog that can identify mercury by scent. The program’s mission is to 1) get mercury out of schools 2) identify old spills that have left residual mercury contamination and 3) educate kids, faculty, and the general public.
Effectiveness	As of May of 2003, the program had collected approximately 550 pounds of mercury, 176 of 1,800 Minnesota schools have signed the pledge and completed Hg elimination efforts, and Clancy and his handler have assessed 75 schools, educating nearly 9,000 students and staff
Cost	Time for two MPCA staff, \$50,000 for program help from Institute for a Sustainable Future, \$30,000-\$40,000/year for free replacement equipment, \$35,000/year for disposal, and \$1,500/year for dog food, medical monitoring, and training. One-time training cost was more than \$3,000.
Suggestions for program improvement or use in other areas	Help recruit more schools to participate Think of ways to secure funding that is needed to continue to be able to offer free replacement equipment and Hg disposal to the schools Transfer the mercury-free pledge concept to another mercury source group or industry. MPCA has drafted a “generic” pledge. Assisting educational groups with mercury curriculum.

Program name	11. Seminars for Veterinarians and Other Medical Facilities
Start date(s); Status	Seminars conducted in 1998 and 2000; no plans for additional seminars at this time.
Coordinated by	City of Superior Wastewater Treatment Plant
Contact person, phone/e-mail	Jane Schlichting - 715-394-0392 ext. 136 – schlichtingj@ci.superior.wi.us
Products or sources addressed	Mercury-containing medical equipment: thermometers, blood pressure cuffs, and other devices
LaMP 2000 Action #	100 – Healthcare P2 (WI Level 1)
Target audience(s)	Large hospitals, clinics, veterinarians, nursing homes, small health-care facilities
Geographic region	Superior, Ashland, and Spooner, WI; Duluth and Two Harbors, MN
Program description	Seminars were held in 1998 and 2000. Their purpose was to raise awareness among healthcare workers about where mercury is found in their facilities and how it can be disposed of properly.
Effectiveness	The seminar held in 1998 had a better turnout because the subject was a relatively new issue.
Cost	Costs for the seminars included several mailings and lunch for more than 60 people. The cost for various presenters can also have a large effect on event cost.
Suggestions for program improvement or use in other areas	Expand on the subject matter to include waste reduction and other issues of concern to the facilities Allow for roundtable discussions

Program name	12. Building Demo Program and Labeling Law
Start date(s)	Building Pre-Demolition Hazardous Materials Removal Program and Mercury Disposal Ban and Labeling Law Enforcement, started in 1995
Status: (Ongoing, still in use, etc.)	Ongoing
Coordinated by	MPCA (with involvement by staff in the St. Paul as well as regional offices)
Contact person	Jeff Connell – 651-296-7271 – jeff.connell@pca.state.mn.us
Products or sources addressed	Various, especially thermostats, fluorescent and other mercury-containing lamps, switches and relays, batteries, manometers, gauges and other measurement and control devices
LaMP 2000 Action #	71 – Demo contractor training (MN Level 1)
Target audience(s)	Demolition contractors, developers, architects, and other people that are in a position to remove or require removal of mercury products prior to demolition (e.g, as part of project specifications)
Geographic region	State of Minnesota
Description	The MPCA added mercury to the existing asbestos program that applies to building demolition or reconstruction. The MPCA form “Notification of

	<p>Intent to Perform a Demolition” includes the statement that mercury-containing material must be removed from a building prior to demolition and requests the name, address, and phone number of the mercury remover. This document is available at http://www.pca.state.mn.us/publications/w-sw4-21.pdf . The MPCA also provides a pre-demolition environmental checklist with a list of some common mercury products found in buildings at http://www.pca.state.mn.us/publications/w-sw4-20.pdf.</p> <p>The main focus of the program is education to make people more aware of products that contain mercury, the need to remove and properly dispose of them, and the law that bans disposal of mercury-containing products in solid waste (Minn. Stat. 115A.932; http://www.revisor.leg.state.mn.us/stats/115A/932.html). The main educational effort has been via an annual demolition conference (now held as part of MPCA’s annual waste conference in February). Conference invitations target everyone that sends in notices for demolition activities, excavators, local government staff, etc. MPCA also provides education through inspections.</p> <p>In addition, MPCA staff pursues cases where laws requiring that certain mercury-containing products be labeled are not followed as resources allow.</p>
<p>Effectiveness</p>	<p>Jeff Connell believes that the program has been successful in educating building demolition contractors and others about removing mercury products prior to demolition.</p> <p>MPCA staff have pursued a number of cases where rules requiring that certain mercury-containing products be labeled were not followed. In each case, the manufacturer discontinued use of mercury in the product.</p>
<p>Suggestions for program improvement or use in other areas</p>	<p>When asked whether the educational message is getting out to all contractors statewide, Jeff reported that they do get statewide participation, with less attendance by smaller outstate contractors because they are less likely to attend events outside their area. Since many events are held in the Twin Cities, outstate attendance is low. They had good attendance when they held an educational conference in St. Cloud.</p> <p>Their current focus is on port authorities, developers, architects, and other designers who need to incorporate time and funding in their plans and specifications to remove mercury products from buildings before demolition/remodeling. Otherwise demolition contractors that are aware of the laws and do include the cost of mercury product removal in their bids lose out to those that do not. The MPCA has contacted the General Contractors’ Association, Construction Managers’ Association, and other groups, but developers do not appear to have any such group. The Partnership may be able to help identify local developers and others in the project area that need to receive this information.</p> <p>MPCA staff generally don’t have sufficient time to look for products that do not comply with labeling laws. They rely on others to watch for these items and let them know.</p>

Program name	13. Program for Scrap Yards
Start date(s); Status	1994; State program has ended effective 2002
Coordinated by	MPCA
Contact person	John Ikeda was program contact
Products or sources addressed	Mercury switches, especially in automobiles
LaMP 2000 Action #	69 – Recycler and auto salvage training (MN Level 1)
Target audience(s)	Scrap yard owners and operators
Geographic region	State of Minnesota
Program description	MPCA Fact Sheet dated November 2001 “End of the MPCA’s Salvage Yard Program,” available at www.pca.state.mn.us/publications/changes/salvageyards.pdf The program aimed to help salvage yards follow environmental Best Management Practices (BMPs) to lower concentrations of contaminants flowing offsite in storm water runoff. It helped salvage yards to remove and recycle auto mercury switches before sending the autos for recycling.
Effectiveness	Over 300 of the state’s 500 salvage yards received site visits. MPCA conducted more than 25 workshops around Minnesota for salvage yard owners and operators and local units of government. Estimates were that the program prevented 200 pounds of mercury from being released to the environment each year, decreasing over time as fewer cars contain mercury switches.
Cost	Between 2 ½ and 3 staff worked on the program
Suggestions for program improvement or use in other areas	Encourage salvage yards to recycle switches and not reduce their efforts just because the MPCA program ended. Work with counties to enact and enforce related ordinances. St. Louis County enacted an ordinance that MPCA staff uses as a good example. The Partnership could check to see if Lake, Cook and Carlton counties have also taken steps.

Program name	14. Agricultural Clean Sweep Program
Start date(s), Status	1990, Ongoing – Minnesota and Wisconsin are funded for this program
Coordinated by	Minnesota and Wisconsin departments of agriculture
Contact persons	Minnesota Stan Kaminski Agronomy and Plant Protection 651-297-1062 Stan.Kaminski@state.mn.us Wisconsin Dale Cardwell 608-294-5358 or general info 608-224-4545
Products or sources addressed	Agricultural pesticides and waste chemicals, including many that contain mercury
LaMP 2000 Action #	32 – Collections (WI Level 1, MN Level 2)
Target audience(s)	Anyone who has grown or is growing agricultural commodities is eligible,

	including owners and tenants of abandoned farms
Geographic region	All Minnesota and Wisconsin; counties are scheduled for collections on an every other year basis. Those interested in participating can call for a collections schedule: Minnesota 1-800-657-3986 Wisconsin 608-224-4545
Effectiveness	Since 1990, Ag Clean Sweeps have collected more than 1.5 million pounds of pesticides and waste chemicals. In Minnesota, 6,500 people have participated in the program.

Program name	15. Dairy Manometer Replacement Program
Start date(s), Status	1997, ended in July 2001
Coordinated by	Minnesota Department of Agriculture, Wisconsin Department of Natural Resources (WDNR), Wisconsin Department of Agriculture In Minnesota, the effort was assisted by MOEA, the Minnesota Technical Assistance Program, MPCA, and Wabasha County. Minnesota's program was funded by a grant from the Legislative Commission on Minnesota Resources In Wisconsin, the WDNR partnered with the Dept of Ag to organize manometer recycling through the use of the Agricultural Clean Sweeps.
Contact person	Jerry Rodenberg – (608) 266-7715 – rodenj@dnr.state.wi.us
Products or sources addressed	Mercury pumps, valves, manometer gauges
LaMP 2000 Action #	32 – Collections (WI Level 1, MN Level 2)
Target audience(s)	Dairy farms
Geographic region	Statewide in Wisconsin and Minnesota
Effectiveness	The Wisconsin program replaced 1,353 manometers with non-Hg gauges and removed 1,134 lbs of potentially hazardous mercury from farms. The program has been very successful around the Great Lakes area in Wisconsin mainly because dairy equipment dealers have monthly contact with their customers during equipment checks so they have been able to notify most farmers about the program. A manometer bounty was a large reason for this program's success. Dairy equipment dealers were given a \$200 rebate for every Hg manometer replaced and \$100 for every manometer they simply removed. When the dealer passed the rebate along, the dairy farmer in effect saw a \$200 discount on the purchase of the digital manometer.

Program name	16. Hospitals for a Healthy Environment (H2E)
Start date(s), Status	June 1998, Ongoing
Coordinated by	EPA, AHA (American Hospital Association) Other contributors included the American Nurses Association, Health Care Without Harm, state and local government agencies (including MPCA and the Minnesota Technical Assistance Program or MnTAP), state and metropolitan health care associations, health care environmental services professionals, health care materials managers, physicians, nurses, waste management industry representatives, and product manufacturers
Contact person	In Minnesota: Catherine Zimmer at MnTAP and Emily Moore (OEA) 800-657-3843 National Program Leads: Laura Brannen 603-795-4040
Products or sources addressed	Medical devices and equipment
LaMP 2000 Action #	100 – Healthcare P2 (MN and WI Level 1)
Target audience(s)	Health care facilities – large and small
Geographic region	National, with various state and local efforts
Effectiveness	Locally, a number of medical facilities have signed pledges to support H2E. Partners who have made pledges in Minnesota include: <ul style="list-style-type: none"> • Duluth Clinic Health System – Duluth, MN • St. Luke’s Hospital & Regional Trauma Center – Duluth, MN • Mercy Hospital & Health Care Center – Moose Lake, MN • Redwood Area Hospital – Redwood Falls, MN • St. Joseph’s Medical Center – Brainerd, MN • First Care Medical Services – Fosston, MN • Northfield Hospital and Skilled Nursing Facility – Northfield, MN • Ridgeview Medical Center – Waconia, MN • *St. Mary’s Hospital – Superior, WI
Suggestions for program improvement or use in other areas (how can the SLRP help?):	Thermometer exchanges have been successful in the past, but many Hg thermometers remain in homes. Veterinary practices could be targeted more, as could dairies that use dairy manometers in the Great Lakes region of Minnesota. Scrap yards (automotive and appliance) could be targeted more to prevent cars from being crushed without first removing switches. Emily suggests humor as a hook. She also advises that multiple tactics are needed to gain the public’s attention. One problem is that the people who attend the seminars provided by this program are not medical staff who make these decisions. Attendees’ ideas and suggestions are easily overridden by the choices of the medical staff.

Program name	17. Voluntary Agreement Program
Start date(s), Status	1999, Ongoing—new sources may choose to develop a voluntary agreement, and existing agreements will be amended over time as appropriate
Coordinated by	MPCA
Contact person	Ned Brooks, MPCA Agency Wide Policy & Stakeholder Unit Division Policy & Planning Phone 651-296-7242 Fax 651-297-7709 Email ned.brooks@pca.state.mn.us
Products or sources addressed	Various, but especially measurement and control devices, switches and relays, and fluorescent lamps as well as other mercury-containing products and incidental emissions from processes like burning coal
LaMP 2000 Action #	1 – Voluntary Agreements (MN Level 1)
Target audience(s)	Various, but mainly industrial
Geographic region	State of Minnesota; see below for northeastern Minnesota companies that are participating in the program
Description	<p>The MPCA voluntary agreement program challenges mercury sources in the state to design and carry out their own creative, cost-effective mercury reduction plans. Such agreements may contain plans to reduce a facility's own mercury releases or releases from other sources. MPCA's role is to provide technical assistance, verify results, and report progress. In northeastern Minnesota the companies shown below have prepared and signed written voluntary agreements. The information provided below regarding efforts related to mercury-containing products was taken from voluntary agreements prepared in 2000. Please refer to the voluntary agreements for more details and information regarding other mercury reduction activities. Voluntary agreements can be viewed at http://www.pca.state.mn.us/air/mercury-mn.html#agreements</p> <ul style="list-style-type: none"> • EVTAC Mining: EVTAC will inventory all mercury-containing process materials and equipment to determine a plan to reduce mercury emissions associated with these items. Purchasing practices will be examined to avoid unnecessary purchase of mercury or mercury-containing devices or products. EVTAC, through the Iron Mining Association (IMA), will continue to work on community reduction programs. • Hibbing Taconite Company: Hibbing Taconite's agreement calls for implementing a purchasing policy, inventorying mercury products, and removing/replacing mercury products that are at high risk for environmental release. The company also will continue efforts to educate employees to ensure they are aware of the importance of managing mercury products in the correct manner. On December 1, 2000, Hibbing Taconite started to operate an onsite Mercury

	<p>Recycling Center for employees to recycle their mercury products. Mercury device swaps (e.g., thermometers) may be implemented.</p> <ul style="list-style-type: none"> • Ispat Inland Mining Company: Ispat is in the process of changing its method of doing iron assays to eliminate mercuric chloride from the test. Ispat began replacing mercury products with non-mercury alternatives in the late 1980's and will continue this process. Remaining mercury products will be inventoried, labeled and replaced if possible. In particular, all mercury thermometers and thermostats will be replaced. Mercury vapor lights will be replaced with low mercury high pressure sodium lights. • LTV Steel Mining Company: LTV Steel began a Mercury Elimination Program at the Taconite Harbor Power Plant in 1991, and began recycling batteries and fluorescent lamps in 1992. This facility is now idled. • Minnesota Power: MP operates a fluorescent bulb recycling program for customers (see separate program description) and is in the process of inventorying, labeling and/or recycling mercury and mercury-containing products at MP facilities. MP plans to update its previously established purchasing program to avoid purchasing mercury-containing products. MP's voluntary agreement also calls for meeting with relevant entities in the MP service territory to determine whether there are gaps in the infrastructure for mercury-containing product waste management and will evaluate the cost-effectiveness of filling those gaps. MP will use available communication devices such as billing stuffers to inform the public on proper use and management of mercury-containing products. • National Steel Pellet Company (now Keewatin Taconite): NSPC committed to conducting an inventory and, where feasible, labeling mercury products. NSPC will provide information regarding mercury products to its 550 employees. NSPC will work with IMA, WLSSD and others to identify gaps in existing community programs. • Northshore Mining: Northshore's voluntary agreement says that Northshore will work with Lake County to publicize current programs available and to make them more effective by increasing publicity regarding products that contain mercury and their proper handling and by making it easy for local citizens to dispose of these materials correctly. Northshore proposes to accept fluorescent lamps from citizens and local business. This service would be completely free for citizens, while businesses would pay the cost of recycling but not storage or shipping. Northshores also proposes to work with Lake County on a publicity campaign to promote awareness of mercury around the home and in appliances. If assistance is needed, these efforts can be extended to Cook County. Northshore has a policy of removing and replacing mercury switches, relays and other closed devices; roughly 5 pounds of such devices are recycled each year. Equipment is searched for mercury switches prior to being scrapped. • Western Lake Superior Sanitary District: WLSSD proposes to continue to work with the public, business and industrial customers to reduce use and disposal of mercury products.
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<p>Effectiveness</p>	<p>The following information regarding reductions achieved is reported in the voluntary agreements:</p> <ul style="list-style-type: none"> • Hibbing Taconite on average recycles 735 pounds (1700 4' lamps) of fluorescent bulbs and 440 pounds (500 lamps) of HID lamps per year. Assuming 45 mg Hg/lamp in 1990, this is nearly 3 lbs of Hg/year. In addition, Hibbing Taconite has collected 45 pounds of mercury over nine years from mercury-containing products. • LTV Steel began a Mercury Elimination Program at the Taconite Harbor Power Plant in 1991. Switches, scales, manometers, and flow meters containing a total of 476 pounds of mercury have been replaced. At LTV's Hoyt Lakes plant, mercury collected from devices such as switches, scales, manometers and flow meters resulted in removing 964 pounds of mercury from the waste stream since 1990. • Minnesota Power (MP) reports that between 1990 and 1999, MP sent approximately 600 pounds of bulk mercury and 3,000 pounds of materials like thermometers and switches that contain mercury were sent to recyclers. In addition, MP recycles 10,000 fluorescent bulbs each year. • National Steel Pellet Company (NSPC) recycled approximately 9,877 pounds of mercury-containing lamps during period from 1994 to 1999. In 1999, NSPC recycled approximately 4.25 pounds of Hg devices like switches and batteries. In 2000, the company removed mercury from two out of service Merrick scales and a scale maintenance kit resulting in approximately 50 pounds of bulk mercury removed from the site. (The two remaining Merrick scales were to be replaced with mercury-free Ramsey scales.) This plant is now called Keewatin Taconite and is owned by U.S. Steel. • Northshore Mining estimates that 400 fluorescent lamps are collected for recycling every year in Silver Bay and the surrounding communities. In 1994, Northshore quit using mercuric oxide in their lab method for assaying ore and pellets for iron, eliminating 15-20 pounds of mercury-containing waste per year. Since 1990 Northshore has collected and shipped over 900 pounds of elemental mercury used to run instruments such as manometers for recycling. An estimated 0.3 pounds per year of mercury is kept from being released to the environment due to Northshore's fluorescent lamp recycling program. Mercury reductions due to relamping (replacing 230 mercury vapor lamps at the Babbitt mine with high-pressure sodium lamps) is expected to reduce the amount of mercury in lamps at the plant by 0.06 pounds and reduce mercury emissions from coal-fired electricity production by 0.05 lb/year due to greater energy efficiency of the new lamps.
<p>Suggestions for program improvement or use in other areas:</p>	<p>N/A; information was obtained from the voluntary agreements and other documents</p>

Program name	18. Thermostat Collection Program
Start date(s), Status	1998, Ongoing
Coordinated by	Thermostat Recycling Corporation (TRC)
Contact person	Information in this summary was taken from the web at http://www.nema.org/index_nema.cfm/664/ Ric Erdheim – 703-841-3249 ric_erdheim@nema.org
Products or sources addressed	The program is for wall-mounted, mercury switch thermostats only
LaMP 2000 Action #	32 – Collections (WI Level 1, MN Level 2)
Target audience(s)	HVAC wholesalers and contractors—if a homeowner brings a thermostat to an HVAC wholesaler, the TRC encourages them to accept that as well.
Geographic region	The continental U.S.
Description	The Thermostat Recycling Corporation (TRC) helps heating, ventilation and air conditioning (HVAC) equipment wholesalers to collect all brands of used, wall-mounted mercury-switch thermostats from contractors. TRC has expanded its program of recycling used mercury-switch thermostats to include all the states in the continental U.S. Under the program, mercury is removed from the thermostats and recycled. TRC is a not-for-profit private corporation originally established by thermostat manufacturers Honeywell, General Electric, and White-Rodgers. All costs, including shipping, are paid for by the TRC except for a one-time fee of \$15 for a collection container.
Effectiveness	In 2001, the TRC collected 48,215 thermostats and processed 402 pounds of mercury altogether. In Minnesota, the program collected 51 lb of Hg (7107 thermostats) in 1998, 63 lb (8739 thermostats) in 1999, 47 lb (7170 thermostats) in 2000, and 68 lb (10,237 thermostats) in 2001. In Wisconsin, thermostats are collected at Hardware Hank stores in Superior and Poplar, as well as at Campbell Lumber. Each of those stores has received acknowledgement from the Wisconsin DNR for being an environmental partner, and Honeywell transports and recycles all the returned thermostats.
Suggestions for program improvement or use in other areas:	It appears that the availability of drop off locations in the project area is limited and, if possible, should be expanded. Of the 42 HVAC wholesalers that are participating collection facilities in Minnesota, only three are located in northeastern Minnesota and all of those are in Duluth. In Wisconsin, there are four facilities listed with the 715 (northwestern Wisconsin) area code. Two are in Superior, one is in Poplar, and one is in Plover, WI. A list of all participating wholesalers is available on the TRC web site.

Program name	19. Fluorescent Lamp Recycling Program
Start date(s), Status	Nov. 2001; Ongoing collection
Coordinated by	City of Superior, Murphy Oil, and Superior Water Light & Power
Contact person, phone/e-mail	Jane Schlichting – 715-394-0392 – schlichtingj@ci.superior.wi.us
Products or sources addressed	Fluorescent bulbs/lamps
LaMP 2000 Action #	22 – Promote energy conservation (WI Level 1), 32 – Collections (WI Level 1)
Target audience(s)	Households and small businesses
Geographic region	Open to anyone—collection/drop-off sites are located at Hardware Hank stores (Bingham Hardware, East End Hardware and Poplar Hardware)
Program description	<p>The city of Superior passed an ordinance that bans putting fluorescent bulbs into the landfill. This went into effect July 1, 2002. This affects residents in Superior and all of Douglas County because they use the landfill.</p> <p>In late June of this year, Steve LaValley of WDNR and Jane Schlichting applied for a grant from the EPA to help promote fluorescent lamp recycling among the industrial and commercial users.</p>
Effectiveness	1,400 bulbs had been recycled as of September of 2002. At 25 mg/bulb average mercury content, this is roughly 35 grams or 0.08 pounds of mercury.
Suggestions for program improvement or use in other areas:	A coupon that offers the recycler \$1 off the recycling fee has been helpful. It also allows the coordinator to track who is exchanging the lamps, what type they are exchanging, and how they heard about the program.

Program name	20. Thermometer Exchange Program
Start date(s), Status	1999, Ongoing collection and events held
Coordinated by	Superior WWTP
Contact person	Jane Schlichting – 715-394-0392 – schlichtingj@ci.superior.wi.us
Products or sources addressed	Mercury thermometers
LaMP 2000 Action #	32 – Collections (WI Level 1)
Target audience(s)	Primarily households, schools, and day care centers but the program is open to all. Each participant receives a digital fever thermometer to replace any mercury thermometer or any other mercury containing item (except bulbs). They are also targeting new parents with the recent purchase of several dozen digital fever thermometer pacifiers. With this type of thermometer, a baby's temperature can be taken in less than two minutes.

Geographic region	Open to all—the primary exchange location is the Superior WWTP, although they have also held exchanges at the courthouse, City Hall, Mariner Mall, local schools and banks, health department offices, and the UW Extension Office.
Effectiveness	An average of 40-50 thermometers are turned in and replaced at each event.

Program name	21. General Public Education and Promotional Items
Start date(s), Status	Ongoing displays and promotional item distribution (frisbees, yo-yos, buttons, etc.)
Coordinated by	Superior WWTP
Contact person	Jane Schlichting – 715-394-0392 – schlichtingj@ci.superior.wi.us
Products or sources addressed	All
Target audience(s)	General public, school children and teachers
Geographic region	Superior
Program description	<p>The city has created display boards that address issues like burn barrels, mercury in the home, mercury contamination in fish, and stormwater. The displays are interchangeable and rotated from one location to another. They have been displayed at health fairs, home fairs, youth jamborees, workshops, and the local Head of the Lakes Fair. These displays have been borrowed by other groups and set up on display where this specific information is required.</p> <p>Three wood display cases have been set up on a permanent basis at the Superior Public Library, Superior City Hall, and in the Mariner Mall. The messages are rotated periodically.</p> <p>Two PowerPoint presentations were created and are distributed – “Mercury in Your Environment” and “Slow Death By Fire.” The mercury presentation has been used at area schools and teachers’ conventions.</p>
Effectiveness	Difficult to measure

Program name	22. NW Wisconsin Mercury-Free Schools Program
Start date(s), Status	Fall 2000, Ongoing
Coordinated by	Superior WWTP Other contributors include the Northwest Regional Planning Commission, WI Rural Development Association, WDNR, and USEPA.
Contact person	Jane Schlichting – 715-394-0392 – schlichtingj@ci.superior.wi.us
Products or sources addressed	Thermometers, elemental lab mercury, blood pressure gauges, thermostats, barometers, and switches.
LaMP 2000 Action #	73 – Seek and destroy mercury in schools (WI Level 1)

Target audience(s)	Schools and households
Geographic region	NW Wisconsin – participating schools are located in Superior, Glidden, Park Falls, Bruce, Medford, Poplar, Maple, Shell Lake, Prentice, Siren, Washburn, Webster, Ladysmith, Ashland, Brule, and Bayfield.
Effectiveness	In 2000, 32 schools participated in a Mercury Shakedown. In 2001-2002, three more schools signed the mercury-free pledge, 14 participated in milk runs for mercury items, 17 requested the mercury curriculum, 17 thermometer exchanges were initiated, and 830 students were educated about mercury. Over 150 lbs of mercury-containing waste was collected. There are still around 100 schools in the district that are now being asked to participate in the program.
Suggestions for program improvement or use in other areas (how can the SLRP help?):	Teacher notification and participation are vital. Notifications may be more effective if directly sent with a name of a science teacher/nurse rather than to a school's administration.

Program name	23. Camp Thermometer Replacement Program
Start date(s)	Spring 2002
Status: (Ongoing, still in use, etc.)	Still in use
Program description	The program encourages youth camps to exchange their mercury thermometers for non-mercury band-aid type thermometers. Notices and band-aid thermometers are sent to kids' camps. Self-stamped mailing containers are also sent to camps so that they can place their mercury thermometers in them and send them back to the wastewater treatment plant.
Coordinated by	Superior WWTP
Contact person, phone/e-mail	Jane Schlichting – 715-394-0392 – schlichtingj@ci.superior.wi.us
Products or sources addressed	Mercury thermometers
LaMP 2000 Action #	73 – Seek and destroy mercury in schools and 32 – Collections (both WI Level 1)
Target audience(s)	Camps
Geographic region	The ten counties of the Lake Superior Watershed – from Superior to Michigan and as far south as Rice Lake, WI
Effectiveness	Jane sent out 100 surveys in May 2002; 15 were returned by September.
Suggestions for program improvement or use in other areas:	Finding an address to target the right people has been the biggest obstacle, since many places depend largely on seasonal staff.

Program name	24. MDA Dental Outreach and Education
Start date(s), Status	1990s for BMP education and research; 2002 for Amalgam Recovery Program
Coordinated by	Minnesota Dental Association (MDA)
Contact person	Dick Dierks, Executive Director
Products or sources addressed	Dental amalgam
LaMP 2000 Action #	101 – Partner with Dental Associations (MN Level 1)
Target audience(s)	Dentists
Geographic region	State of Minnesota
Program description	The Minnesota Dental Association (MDA) has created a video to educate dentists and their staff about Best Management Practices (BMPs) intended to capture and recycle as much amalgam waste as possible. The Amalgam Recovery Program encourages all Minnesota dentists to voluntarily install an approved amalgam separator. Information about the program can be found at http://www.mndental.org/professionals/amalgam_recovery/
Effectiveness	Many BMP videos have been distributed. No data is available regarding the new program that is under development. Based on past studies, existing chair side traps and vacuum pump filters prevent an average of 60% of mercury amalgam from entering wastewater. Use of additional separators could help collect 95% or more of the amalgam not currently being captured.
Suggestions for program improvement or use in other areas:	<ul style="list-style-type: none"> • Cover the cost of purchasing new amalgam separation equipment (~\$500/office) to for dentists that take action within a certain time frame to encourage them to take action sooner than later. This would be similar to the program offered by WLSSD in the Duluth area using a \$5000 grant. • Help to make sure that all dentists are aware of the existing MDA program that encourages dental offices to capture and recycle amalgam waste by following BMPs.

Program name	25. Mercury Pollutant Minimization Program (Hibbing, Minnesota)
Start date(s); Status	January 2001, Ongoing
Coordinated by	City of Hibbing, with assistance from Barr Engineering
Contact person	John Suihkonen, Hibbing City Engineer, 218-262-3486, ext. 122 jsuihkonen@ci.hibbing.mn.us ; Paula Jackson, Barr Engineering, 800-225-1966, pjackson@barr.com
Products or sources addressed	All

LaMP 2000 Action #	148 – Toxic Reduction Plans (MN Level 1)
Target audience(s)	City wastewater system users
Geographic region	Hibbing, Minnesota
Program description	<p>The City of Hibbing developed a pollutant minimization plan (PMP) as a requirement of their newest NPDES permit. The purpose of the plan is to help the City reduce mercury inflow to the wastewater treatment plant as well as mercury releases to the environment in general. The PMP includes several strategies for reducing mercury, but the largest focus is on pollution prevention techniques that can achieve reductions without shifting the problem from one media to another. Current program work includes:</p> <ul style="list-style-type: none"> • Sampling at various manhole locations around the city to try to understand where the highest concentrations of mercury are coming from • Working with a group of leaders and resource people from entities that are likely to use mercury or mercury-containing items to raise awareness, reduce mercury use, and promote proper storage and disposal of these items • Furthering ongoing efforts to reduce mercury levels in influent, effluent, and sludge
Effectiveness	Difficult to judge at this point, though mercury levels in the wastewater effluent at the South Plant have gone down since January of 2002
Suggestions for program improvement or use in other areas:	This is the first mercury PMP completed in Minnesota, so there are things from this first-time effort that could be noted and shared with other municipalities that will have to draft similar plans in the coming years.

Program name	26. Dental Amalgam Best Manufacturing Practices (BMPs)
Start date(s), Status	June 2002, Ongoing
Program description	<p>In early June 2002, the City of Superior started to develop a Best Management Program (BMP) for dental amalgam based work that was done in Minnesota. Information was collected and they received approval to distribute the flyer that was used as part of a similar effort in Minnesota. Starting in fall of 2002, members of the City of Superior's solid waste/recycling staff visited dental offices in Douglas County and give presentations about BMP for amalgam waste.</p> <p>The presentation will include the MDA BMP video, an informational presentation about mercury, and a simple test that will allow dental office staff to receive a continuing education certificate. Each office will also receive a promotional item and brochures that can be displayed for patient information.</p>
Coordinated by	Superior wastewater treatment plant

Contact person, phone/e-mail	Jane Schlichting – 715-394-0392 – schlichtingj@ci.superior.wi.us
Products or sources addressed	Dental amalgam and bulk mercury
LaMP 2000 Action #	101 – Partner with Dental Associations (WI Level 1)
Target audience(s)	Dental practices
Geographic region	Douglas County, Wisconsin

Program name	27. Abandoned White Goods Collection
Start date(s), Status	October 2002, Dependent on additional funding
Program description	MOEA and MPCA approached Northeast Minnesota with offers to provide financial assistance to counties to clean up abandoned white goods and other abandoned household waste. Counties will find volunteers (preferably recreation groups) and forego disposal fees. Minnesota Power is also exploring the possibility of assisting with a collection on their property with volunteers from a local snowmobile club.
Coordinated by	MOEA, MPCA
Contact person, phone/e-mail	Hank Fisher, OEA – 218-529-6265 – henry.fisher@moea.state.mn.us
Products or sources addressed	Abandoned white goods
LaMP 2000 Action #	32 – Collections (MN Level 1), 34 – Abandoned white goods (MN Level 3)
Target audience(s)	Volunteers and basin residents
Geographic region	St. Louis County and Lake County
Suggestions for program improvement or use in other areas:	This is a pilot project that will produce a report of lessons learned in cooperation with advice from the Fond du Lac and Grand Portage tribes on their white goods collection efforts. A successful pilot could lead to additional collections in Minnesota, Wisconsin, Michigan, and Ontario.

3.0 Existing Program Conclusions

From conducting this analysis, we discovered that there are more programs aimed at reducing mercury in the region than initially thought. The project budget was established assuming there would be roughly 12 programs to analyze. Once 12 programs had been researched, remaining funds were used, at the Steering Committee’s request, to look at additional programs in varying levels of detail. In the end, 27 different programs were analyzed. We believe that this list is fairly complete, but it is possible that other mercury-reduction programs exist in the area, especially in Wisconsin

We found at least one program to address virtually every type of mercury use covered by this project. We did not find one specifically aimed at the chlor-alkali products, though those could be considered part of WLSSD’s Blueprint for Mercury Elimination (program #2) because that addressed mercury-containing process chemicals. The chlor-alkali products may also be covered by some voluntary agreements (#17). Other observations:

- Not surprisingly, program density tends to follow population density—the Duluth-Superior area has largest number of available programs and disposal opportunities by far, with more options also available in larger cities throughout the area (Hibbing, Cloquet, Virginia)
- County-level awareness and activity varies, likely leaving a number of households unreached or under-informed in some counties.
- Some sectors that are substantial contributors of mercury to the environment have made notable strides in the recent past (dental practices and schools, for instance) while others remain under-served in this area (e.g. automotive).

Mercury reduction programs are more prevalent in densely populated portions of the project area. Because mercury reduction activity varies on community and county levels, many people are still under-informed about mercury.

Some sectors that contribute mercury to the environment have made significant strides toward properly capturing mercury and in some cases phasing it out. Other sectors within the project area have much work yet to do in this regard.

4.0 Gap Analysis

4.1 Introduction

As noted in the previous section, even though several audiences within the project area have already received information or assistance to prevent improper use and disposal of mercury, many have not been adequately targeted by existing programs. Gaps were identified to assist the Partnership in developing strategies to address the gaps and continue to work toward zero discharge of mercury to the environment.

To identify gaps in existing programs, the analysis considered several questions:

- Which products appear likely to contribute the most mercury to the environment?
- Which mercury products do not appear to be adequately covered by existing programs? What is the nature of the deficiencies—education, collection facility availability, affordable disposal options, or others?
- Which users of mercury-containing products are receiving the information that they need to properly dispose of them? Which are not?

4.2 Which Products Contribute the Most Mercury to the Environment?

Before looking at individual gaps, considering which products appear to be most likely to release significant quantities of mercury to air and water was assessed to help the Partnership develop strategies that will achieve the greatest benefit by targeting larger contributors. Although the mercury-containing products covered by this assessment account for less than 50% of the mercury released to the environment (currently coal-fired power plants are the largest source of air emissions in Minnesota), it is still important to target these intentional use applications and encourage proper disposal.

In 2001, Barr Engineering conducted a study for the MPCA that estimated how much mercury 14 different groups of products contribute to releases to air, land, and water in Minnesota. Estimates were made for three different years (1990, 2000, and 2005). The estimates considered the approximate quantity of the product in use or discarded by consumers and the form that the mercury is in. For example, mercury in products like fever thermometers and lamps that are easily broken was considered more likely to be released to air and water during product use, processing, or transit than mercury that is encased with more protection and less likely to break.

Results of the study showing the relative contributions of each product group to air and water are summarized in Table 2 and Table 3. The complete results of this study, including discussion and mercury fate flow diagrams for each product group can be found on the MPCA's website at <http://www.pca.state.mn.us/publications/hg-substance.pdf>. A paper authored by Barr Engineering and MPCA staff that offers a condensed description of the study can be found at <http://www.barr.com/PDFs/Papers/HgFate.pdf>. Due to limited data availability, the estimates of mercury releases presented in the study should be considered rough estimates of the relative contribution of various product groups.

Table 2. Relative Comparison of Estimated Mercury Emissions to Air in Minnesota

Estimated Emissions	1990	2000	2005
More than 500 kg Hg/year	Batteries Latex paint Fungicides		
100 to 500 kg/yr	Dental amalgam Relays and switches Measurement & control devices Fluorescent lamps Fever thermometers	Dental amalgam Relays and switches Measurement & control devices	Dental amalgam Relays and switches Measurement & control devices
20 to 100 kg/yr	Thermostats HID and other lamps	Thermostats Fluorescent lamps Fever thermometers	Fluorescent lamps Fever thermometers
2 to 20 kg/yr	Automobile switches Bulk liquid mercury	Automobile switches HID and other lamps Bulk liquid mercury Batteries	Automobile switches Thermostats HID and other lamps Bulk liquid mercury Batteries
Less than 2 kg/yr	Pharmaceuticals Caustic soda use	Pharmaceuticals Caustic soda use Latex paint Fungicides	Pharmaceuticals Caustic soda use Latex paint Fungicides

Table 3. Relative Comparison of Estimated Mercury Emissions to Water in Minnesota

Estimated Emissions	1990	2000	2005
More than 50 kg Hg/year	Batteries Latex paint Fungicides		
10 to 50 kg/yr	Dental	Dental	Dental
2 to 10 kg/yr	Relays and switches Measurement and control devices Fluorescent lamps Fever thermometers Chlor-alkali facility products	Relays and switches Measurement and control devices Fever thermometers Chlor-alkali facility products	Relays and switches Measurement and control devices Fever thermometers Chlor-alkali facility products
Less than 2 kg/yr	Automobile switches Thermostats HID and other lamps Bulk liquid mercury Pharmaceuticals	Automobile switches Thermostats HID and other lamps Bulk liquid mercury Batteries Fluorescent lamps Pharmaceuticals Fungicide Latex Paint	Automobile switches Thermostats HID and other lamps Bulk liquid mercury Batteries Fluorescent lamps Pharmaceuticals Fungicide Latex Paint

As shown in Table 2, the products that are expected to contribute the most mercury to air based on estimates for 2000 and 2005 are dental amalgam, measurement and control devices, and relays and switches. According to Table 3, dental amalgam was predicted to be the largest contributor of mercury to water, followed by fever thermometers, products from chlor-alkali plants that use the mercury process, measurement and control devices, and relays and switches. Numbers from the study include all of Minnesota, but because roughly 5% of the Minnesota residents live in Carlton, St. Louis, Lake, and Cook counties¹, mercury usage figures for this area can be approximated accordingly. Slightly less than 1% of Wisconsin residents live in Douglas County².

¹ U.S. Census Bureau, www.census.gov, 2000 data

² Ibid.

Dental Amalgam

Barr estimated that Minnesota dental offices will use approximately 926 kg (2,040 lb) of mercury in dental amalgam in 2005. Roughly 80% of each amalgam capsule leaves the dental offices with patients as fillings, while the rest becomes waste. In that same year, dental offices will take in approximately 858 kg (1900 lb) from removed fillings.

In estimating mercury releases to wastewater, Barr assumed that by 2005 10% of dentists would use amalgam separation equipment in addition to existing equipment such as chair side traps and vacuum filters to achieve an overall capture of 99%, while the average collection efficiency for other offices would be 60%. The assumed percentage of dentists achieving high collection efficiencies does not take into consideration recently launched efforts by the Minnesota Dental Association that should increase the percentage of dental offices installing high efficiency collection units.

The rate of mercury release from amalgam depends on many factors. The high heat of waste incinerators and crematoria would release mercury from amalgam nearly completely, while much slower rates of release would result from land spreading sewage sludge or volatilization from sewer pipes, dental offices, and patients with amalgam fillings.

Measurement and Control Devices

This broad product category includes items such as manometers, barometers, and thermometers. Industrial and household measurement and control devices that contain mercury include:

- Automatic dairy milking systems
- Sphygmomanometers (blood pressure cuffs)
- Diffusion pumps
- Steam flow meters
- Thermometers
- Gas meter pressure-safety devices
- Airflow measurement devices
- Carburetor adjusting devices
- Sling psychrometers
- Flame sensors

Note that fever thermometers, which were separately analyzed as part of the study, are a subset of this product category. Some people believe that the majority of measurement and control devices are likely to be found in industrial settings rather than homes.

According to data from the U.S. Bureau of Mines, 108 metric tons (108,000 kg) of mercury were used in the production of measurement and control devices in the U.S. in 1990.³ In addition, 1,000,000 kg of mercury were stored in measurement and control device manufacturing plants and installed measurement and control devices. Of that amount, 60,000 kg were removed from service and recycled, and 47 metric tons were incinerated or disposed in a landfill.⁴ Based on this

³ Jasinski, S.M., *The Materials Flow of Mercury in the United States*, (1994)

⁴ Sznoppek, J.L. and Goonan, T.G., *The Materials Flow of Mercury in the Economies of the United States and the World*, (1999)

information, Barr estimated that in Minnesota approximately 600 kg (1,320 lb) of mercury will be contained in measurement and control devices purchased in 2005, 4,700 kg (10,300 lb) will be in storage or installed, and 1,550 kg (3,400 lb) of mercury in contained measurement and control devices will be discarded.

Switches and Relays

Switches are used to open and close electrical circuits. They are activated by a change in temperature, pressure, position, or motion. In industries and households, items that may contain mercury switches include:

- Furnaces
- Thermostats
- Washing machines
- Outboard motors
- Building security devices
- Film editing equipment
- Refrigerators and freezers
- Space heaters
- Clothes irons
- Sump pumps
- Bilge pumps
- Automobiles
- Electrical heaters and coolers
- Rectifiers
- Oscillators
- Reactor vessels

Note that thermostats and mercury switches in automobiles, which were separately analyzed as part of the study, are subsets of this product category.

Relays are one tool used on switches to convert output from control devices into production by opening or closing electrical contacts in a circuit. Mercury-wetted “reed” relays are used to reliably switch wide ranges of signals and power levels, because the load does not affect either contact life or performance as no solid metal-to-metal contact occurs. They are primarily used in test, calibration, and measurement equipment where stable contact resistance over the life of the product is necessary. Wetted reed relays are also used mostly for specialty equipment produced in relatively small quantities, rather than for mass-production applications. Displacement/plunger relays are generally used for high-current, high-voltage applications, resistance heating, welding, lighting, power supply switching, and industrial process controllers.

Switches tend to have long life spans. Ten percent of switches are discarded after 10 years, an additional 40% after 30 years, and the remaining 50% after 50 years.⁵ According to the U.S. Bureau of Mines, 70 metric tons (70,000 kg) of mercury were used in the production of wiring devices and switches in the U.S. in 1990, and less than one metric ton of this was lost to the environment.⁶ In addition, 1,500 metric tons (1,500,000 kg) of mercury were stored in wiring device and switch-manufacturing plants and in installed wiring devices and switches. Of that amount, 36 metric tons

⁵ Jasinski, S.M., *The Materials Flow of Mercury in the United States*, (1994)

⁶ Ibid.

(36,000 kg) were removed from service and recycled and 62 metric tons (62,000 kg) were incinerated or disposed of in a landfill.⁷ Based on this information, Barr estimated that in Minnesota approximately 1,024 kg (2,250 lb) of mercury will be contained in switches and relays purchased in 2005, 48,000 kg (106,000 lb) will be in storage or installed, and 577 kg (1,270 lb) of mercury in contained switches and relays will be discarded.

There are many non-mercury alternatives available for switches and relays, although mercury-containing switches are still used in critical applications and where a high degree of accuracy is needed.

Fever Thermometers

Fever thermometers contain an average of 0.7 grams of mercury per thermometer. Estimates of thermometer sales and discards in Minnesota were based on nationwide estimates and then extrapolated for 2005. Barr estimated that in 2005 roughly 284 kg (625 lb) of mercury would be discarded via thermometers in Minnesota, and only 30 kg/year of mercury in fever thermometers would go to consumers via new purchases in 2005, based on the assumption that future sales of mercury thermometers would approach zero after Minnesota's legislative ban on sales of mercury thermometer took effect in 2002. The actual rate of sales after 2002 will depend on the degree of education and enforcement used to implement the ban.

Chlor-Alkali Plant Products

The chlor-alkali industry produces chlorine, caustic soda, and hydrogen gas. It is the largest user of mercury in the U.S. and perhaps globally. On July 10, 1997, the Chlorine Institute, on behalf of its members, committed to reducing mercury use 50% by 2005. Mercury can adhere to caustic soda, resulting in a product that contains traces of mercury. The concentration of residual mercury in caustic soda has been reported to range from 0.02 parts per million (ppm) to 0.2 ppm, with a median of 0.1 ppm.⁸ However, another source reported the expected maximum concentration from the mercury-cell process to be 0.5 ppm, compared to the membrane process that has a maximum of 0.01 ppm mercury, and the diaphragm process, which has a maximum concentration of 0.005 ppm (for 50% caustic soda).⁹ Barr estimated that products of chlor-alkali plants do not contribute significant quantities of mercury to air. However, because they are relatively likely to be discharged to

⁷ Sznoppek, J.L. and Goonan, T.G., *The Materials Flow of Mercury in the Economies of the United States and the World*, (1999)

⁸ Kohlasch, F. *Mercury Grade Caustic Soda Report*. June 1, 2000. p 2. The actual reference for these concentrations is not cited in the report but follows a reference to estimated 1997 production by the Chlorine Institute

⁹ Ross & Associates Environmental Consulting, Ltd. *Great Lakes Binational Toxics Strategy Draft Report for Mercury Reduction Options*. September 1, 2000. Table 9, p 56

wastewater, these products were identified as one of the more significant potential sources of mercury to water.

4.3 Which Products Are Not Adequately Addressed by Existing Programs?

Table 4 is a matrix that shows the mercury programs that were studied in the existing programs task and the audiences and products that they address. In the region covered by this project, there is at least one existing program that addresses each of the major mercury product source categories in some section of the project area. However, few projects cover the entire area, and it is unlikely that any of the programs lead to 100% capture of the targeted product. To fully assess which products are not adequately targeted, it would be useful to know how much mercury is properly and improperly disposed of in each product group. Unfortunately, such comprehensive data is not available.

In the five-county area covered by this project, there is at least one program that addresses each major mercury category in some section of the project area. However, few projects cover the entire area, and it is unlikely that any of the programs lead to 100% capture of the targeted product.

One type of data that provides a rough indication of which mercury product users release the most mercury comes from sampling within wastewater collection systems. Both WLSSD and the City of Hibbing have conducted testing at different points in their collection system to try to pinpoint mercury sources. This testing found that mercury levels in wastewater generated in residential areas are typically relatively low, compared to wastewater generated by industrial or commercial sources. In particular, wastewater from areas with many dental practices was often found to contain very high concentrations of mercury. Based on this data, it appears that the greatest reductions in mercury releases, at least to wastewater, can be obtained by focusing largely on dentists, then medical facilities and industries, other non-residential sources such as educational facilities, and finally residential sources. Although the residential sources appear to be the lowest contributor of mercury to wastewater, the overall educational value that comes from focusing on the general public and households should not be underestimated.

Table 4 –Existing Mercury Programs and Audiences/Products Addressed

Programs	Audiences								Products						
	Dental	Healthcare	Education	Transportation	Automotive	Household	Construction/ Demolition	Industrial	Amalgam Waste	Measurement/ Control Devices	Switches/ Relays	Thermometers	Bulk Mercury	Fluorescent Bulbs	Chlor-Alkali Products
1. WLSSD Dental Outreach & Education	•								•						
2. Blueprint for Mercury Elimination		•	•				•	•	•	•	•	•	•	•	•
3. WLSSD HHW Collection & Thermometer Swap						•					•	•		•	
4. WLSSD Clean Shop (applies to VSQGs)	•	•	•	•	•		•	•	•	•	•	•	•	•	•
5. Switch-the-Switch					•						•				
6. Healthcare Without Harm		•								•	•				
7. MP Fluorescent Bulb Recycling						•								•	
8. County HHW Programs						•					•	•		•	
9. St. Louis Co. Appliance Collection						•					•				
10. MPCA Mercury Free Zone & Clancy			•							•		•			
11. Seminars for Medical Facilities		•								•	•	•			
12. Building Demo and Labeling Law							•			•	•			•	
13. Program for Scrap Yards					•						•				
14. Agricultural Clean Sweep								•							•
15. Dairy Manometer Replacement								•		•					
16. Hospitals for a Healthy Environment		•								•	•	•			
17. Voluntary Agreements								•		•	•	•	•	•	•
18. Thermostat Collection							•				•				

Programs	Audiences								Products						
	Dental	Healthcare	Education	Transportation	Automotive	Household	Construction/ Demolition	Industrial	Amalgam Waste	Measurement/ Control Devices	Switches/ Relays	Thermometers	Bulk Mercury	Fluorescent Bulbs	Chlor-Alkali Products
19. Fluorescent Lamp Recycling – NW WI						•								•	
20. Thermometer Exchange – NW WI			•			•					•				
21. General Public Education/Promo			•			•					•		•		
22. NW WI Mercury-free Schools		•								•	•	•	•		
23. Camp Thermometer Replacement			•								•				
24. MDA Dental Office Outreach	•								•						
25. City of Hibbing Mercury PMP	•	•	•		•	•	•	•	•	•	•	•	•	•	•
26. Dental Amalgam BMP	•								•				•		
27. Abandoned White Goods Collection						•					•				

Several factors may impact whether a mercury product is adequately addressed by existing programs. Geographic coverage and other factors that may influence effectiveness are discussed in the following sections.

Geographic Coverage

The existing programs that have been identified cover various portions of the project area. Some are local programs, such as those operated by cities, industries, or WLSSD. A number of programs have been implemented on a statewide basis in Wisconsin or Minnesota, while others are national or even international in scale. To assess where the programs overlap and look for gaps, the coverage areas of existing programs have been mapped as shown on Figures 1 through 13 in Appendix B. Gaps in geographic coverage have been identified as described below.

- **Dental amalgam**—Three programs highlighted in the first part of this report are specifically aimed at improving collection of dental amalgam. One of these, WLSSD’s program (program #1), is aimed at practices within their service area, although some dentists outside the service area have been exposed to the message through the work that WLSSD staff people have done

with the Northeast Minnesota Dental Association. Programs offered by the Minnesota Dental Association (MDA) (program #24), encourage proper management of mercury that is collected in existing traps and filters. A newer focus of this program takes the effort a step further and strongly encourages all Minnesota dentists to install an approved high efficiency amalgam separator. In Wisconsin, the City of Superior recently developed Best Manufacturing Practices (BMPs) for dental amalgam, based on work done in Minnesota (#26). In the fall of 2002, city staff began visiting dental practices in Douglas County to discuss BMPs for amalgam waste. The presentation includes a video, an informational presentation about mercury, and a small test that allows dental office staff to receive a continuing education certificate. Each office also receives a promotional item and brochures that can be displayed for patients.

- **Measurement and control devices**—Many programs have been designed to address one or more measurement and control devices, and many of them cover large areas. However, because most programs address specific products or audiences, it is necessary to look more closely at the programs to determine where gaps exist.
- **Switches and relays**—As noted for measurement and control devices, most programs for switches and relays address a specific product and/or audience. It appears that gaps may exist for:
 - *Auto switches*: Other than Superior’s “Switch-the-Switch” program (#5), most of the project area is without an existing program to encourage or allow vehicle owners to replace mercury switches in automobiles. Although many scrap yards have mercury switch removal programs that would properly manage the mercury switches prior to disposal, not all do, and some switches may be broken or discarded before the vehicle is scrapped. The estimated amount of mercury that these switches add to the environment is relatively modest¹⁰, but the program is easily transferable and could also offer a good opportunity for educating the general public.
 - *Thermostats*: The Thermostat Recycling Corporation (TRC) program (# 18) covers the entire project area. However, that program only applies to contractors. Programs that educate homeowners about how to properly dispose of old mercury thermostats are usually part of general public education, which is not provided consistently throughout the project area. The availability of convenient drop-off locations for homeowners is also inconsistent.
- **Lamps**—Opportunities for lamp disposal seem to be fairly widespread, with the possible exception of a residential program in Cook County, which appears to be beyond Minnesota Power’s service area. Although sites for disposal are available throughout the area, there is room for greater participation. Education about drop-off site locations and the importance of proper disposal may be a gap to note.

¹⁰ The study by Barr for the MPCA on which Tables 2 and 3 are based estimated releases to air and water in Minnesota from automotive switches as relatively small sources. However, on a national level, emissions from electric arc furnaces where scrap cars are processed are projected to be the fourth-largest source of mercury to air. See <http://www.cleancarcampaign.org/pdfs/emissionsbystate.pdf>, which is based on data and estimates provided by the EPA.

- **Bulk mercury**—Schools and dental offices are common places to find bulk mercury. There are region-wide programs intended to help schools and dental offices with reduction efforts. Some industries also store bulk mercury to replace mercury lost from measurement and control devices. It is likely that there are a number of industrial users that still may have large quantities of mercury stored at their facilities. Gaps may exist in:
 - *Dental practices* outside the WLSSD service area, though the new MDA program should help to fill the gap for Minnesota counties
 - *Schools* that have not yet signed the mercury-free pledge and removed the mercury from their facilities
 - *Industries* that may not be aware of the potential hazards of mercury use or disposal options that are available to them
- **Fever thermometers**—Although mercury fever thermometers can no longer be sold in Minnesota, it is likely that many are still in use, especially in households. It looks as if mercury thermometers have been removed from many larger health facilities throughout the area, though it may still be an issue in smaller facilities and other healthcare applications such as ambulances, youth camps, nursing homes, and veterinary practices. Greater effort may be needed to educate people about the importance of proper disposal and to ensure that they are no longer in use in the project area.

Other Factors that Influence Effectiveness

Many factors may impact effectiveness of mercury reduction efforts:

- Whether educational efforts reach their intended audience
- If educational materials are understandable and motivate their audience to take appropriate action
- Whether approaches are used that effectively motivate people (e.g., offering free non-mercury products in exchange for turning in mercury products)?
- Whether programs make it easy for people to properly manage their mercury products or take other requested actions. For example, are collection locations and operating hours convenient?

Reaching Intended Audiences

For some of the existing programs reviewed, program coordinators were able to share data that indicates how many targeted groups they had reached compared to the total number in existence (e.g., the number of schools participating in the Mercury-Free Zone program or the number of scrap yards visited). They also shared ideas about what could be done to reach more people. To determine whether intended audiences are being reached, it would be most helpful to survey randomly selected members of that audience to check their awareness level regarding mercury and to see what, if any, mercury reduction programs have reached them with information.

Effectiveness of Educational Materials

Barr Engineering identified and reviewed a number of educational materials used for the various programs, including written brochures and fact sheets, videos and folders of information distributed at conferences. It appears that the materials are very well designed and provide the information needed to understand why mercury is a concern, what products contain mercury, and how to properly manage them. Lack of quality materials does not appear to be a gap.

Providing Motivation

Many of the programs provide some type of motivation beyond just “doing the right thing.” For example, a number of programs offer free replacement of mercury-containing products or discounts on disposal/recycling of mercury products. Some program managers, including the manager of MPCA’s Mercury Free Zone project, noted that the ability to provide free replacements is dependent on obtaining additional funding.

Ease of Taking Action

One of the critical components of effective programs is that they make it easy for someone to take action, such as recycling their fluorescent lamps instead of putting them in the trash. Ease of taking action is likely to be influenced both by cost and availability of mercury product recycling services. In addition to making recycling services available at convenient times, they must also be available at convenient locations. The figures in Appendix B include the location of drop-off centers for a number of existing programs. A number of programs, including the scrap yard program, Mercury Free Zone, TRC, and camp thermometer replacement either pick up collected mercury products or provide free containers and mailing.

4.4 Which Audiences Need More Information?

Audiences that may not be adequately addressed by the existing programs:

- Rail and shipping industries
- Industries or businesses that are likely to use significant numbers of measurement and control devices or switches and relays
- Medical facilities and operations such as smaller clinics, chiropractors, ambulances, youth camps, and veterinary practices
- Automotive dealers and scrap yards that may not remove or properly dispose of mercury switches in vehicles
- Household users, especially senior citizens, because some program coordinators have found that older adults in particular

In addition to the audiences that may need more information (shown at left), some audiences may have received the needed information but need greater encouragement or incentive to act, including:

- ***Schools that have not gone mercury free***
- ***Healthcare operations that have not replaced their mercury-containing equipment***
- ***Dental practices that have not installed high-efficiency amalgam waste collection units***

are more likely to have several mercury thermometers in their homes.

- Outlying areas—It appears that there has been considerably more exposure to mercury reduction programs in the WLSSD service area and Superior with slightly increased visibility in Hibbing, but outlying areas of the project region may be lacking information. This appears to be especially true in Lake and Cook counties.

In their September 26, 2002 meeting, the members of the St. Louis River Partnership TMDL board noted these additional target areas and potential gaps:

- Gas transmission pressure regulators
- Entities with limited budgets, such as churches or small private schools, because they often lack sufficient staff or volunteer resources to take care of tasks such as properly disposing of fluorescent bulbs, and funds to exchange mercury-containing items are often not available.
- Rifle scopes—There is a type of Italian rifle sold in the U.S. (and in the project area) that has 20-30 ounces of mercury in the scope. The mercury is enclosed in the rifle scope but would pose a hazard if the scope was cracked or broken.
- Burn barrel education
- Closed schools—Board members wondered whether a mercury survey in a closed school is as common as an asbestos survey. According to discussions between Barr and MPCA staff, mercury is included with asbestos in the potential hazards assessed in buildings before demolition—see existing program #12.)
- Education aimed at small- to mid-sized businesses to help them understand the importance of proper disposal and using mercury-free alternatives where they are available

4.5 Gap Analysis Conclusions

- **High-efficiency mercury amalgam collection equipment is widely available but not necessarily widely used.** It appears likely that the WLSSD service area is the only community in the project area where dental amalgam waste is collected to nearly the greatest degree possible (95% or better). In other areas where best management practices (BMPs) are followed, amalgam waste collected by chair side traps and other existing equipment results in a collection efficiency of up to ~70%. WLSSD's project has demonstrated that affordable and effective sedimentation equipment can collect 95% or more of the mercury amalgam waste not currently captured. Given that dental amalgam is one of the largest remaining intentional uses of mercury and known to be a significant source to wastewater, priority should be given to making sure that all dental offices both follow BMPs and install high-efficiency collection systems as soon as possible. However, in an effort that began at approximately the same time that the gap analysis was conducted, the Minnesota Dental Association officially began an extensive outreach program to their members. Those efforts appear to be closing this gap in Minnesota. Efforts by city of Superior staff are helping to make inroads at dental practices in Northwestern Wisconsin. Additional encouragement for dental practices to participate and funding for the high efficiency collection equipment may help to get to 100% participation.

- **Many industrial facilities that use mercury-containing equipment may not have any knowledge of those uses, how to prevent and manage spills, how to properly dispose of mercury and mercury-containing products, and the need to avoid continuing to purchase mercury products where adequate alternatives exist.** After dental amalgam, it appears that the next most significant use of mercury is in two groups of products: measurement and control devices and switches and relays. Gaps pertaining to these products can be traced back to audiences that have not been targeted at all and the inability of existing programs to reach their intended audience with enough information and motivation to take action.
- **Projects undertaken through the voluntary agreement program (#17) have demonstrated that very large quantities of mercury are often in use at industrial facilities and sometimes include stores of bulk mercury used to replace mercury lost from equipment.** Although mining and power are two of the largest industries in the project area, it is likely that there are many other industrial facilities that may not be aware which equipment contains mercury and therefore may not be taking appropriate action such as replacement or labeling to ensure that those products are properly retired. Existing programs that target industries are only in use in selected geographic areas. These include the guidance in the Blueprint for Mercury Elimination (#2), and implementation of a Pollutant Minimization Plan for mercury (#25) via a community task force in Hibbing that includes a number of local industries. Depending on the industry and location, the WLSSD Clean Shop program (#4) may provide a disposal opportunity for mercury, but the industry must first be aware of where they have mercury that requires proper disposal and the disposal options such as the Clean Shop.
- **There are very effective existing programs that remove mercury from schools and provide public education leading to reduced use of mercury at home, but they have not yet reached all schools.** The ability to reach the target audience and especially to motivate them to take action is a challenge for all pollution prevention projects, including the existing mercury reduction programs. One gap identified is the number of schools in Minnesota that are not yet participating in the MPCA's Mercury Free Zone program (#10). The program has demonstrated a high degree of success in removing significant quantities of mercury from participating schools and educating students and faculty (and sometimes parents) about mercury. Northwest Wisconsin also has a good program aimed at schools (#22). Given the potential for these programs to be highly effective in removing mercury from both schools and homes (via education), until 100% of schools are mercury-free, this may be considered a gap worth addressing.
- **Given the high potential for direct exposure (inhalation and/or dermal) to mercury caused by certain uses like fever thermometers and school lab equipment, until all such uses have been eliminated, there should be assumed gaps in the existing programs that target them.** Certain mercury uses have a greater likelihood of causing direct human exposure to significant quantities of mercury. Based on reports of spills and documented cases of mercury poisoning, thermometers, other breakable school laboratory equipment containing mercury, and bulk mercury appear to be the greatest culprits in cases of mercury spills that may lead to direct

exposure and costly clean-up. Although there are a number of products in homes that may contain mercury, getting all mercury fever thermometers out of homes should be a priority.

5.0 Strategies: New or Expanded Programs

The last step of the project was to select strategies that would allow the Partnership to encourage reduction and continued efforts toward zero discharge.

Because the Partnership is such a diverse group of volunteers with different areas of expertise and varying resource availability, strategies were drafted by Barr in a variety of topic areas so that Partnership board members and member organizations could review them and select areas in which they would like to act. Options were prepared in a sort of “menu” format and categorized according to the approximate amount of mercury that could be removed as a result of the effort. Items that were estimated to remove relatively modest amounts of mercury were listed as “appetizers” on the menu, while actions that could remove larger amounts were called lunch, dinner, or even “dinner for a crowd.”

Menu items include a variety of section headings:

- **Prepare** – Preliminary research needed to carry out the strategy
- **Cook it Up** – Complete the steps needed implement the mercury reduction strategy
- **Utensils** – Resources that are available to help with the effort
- **Restaurant Review** – An evaluation that will help the Partnership to track items that have been done and assess how effective the efforts were.

One of the first steps the Partnership will take in Phase II (implementation) will be to prioritize areas for action and recommend specific strategies to be implemented in an approximate order. Phase II will also include a monitoring program, as described in Part 6 below.

The strategies that have been developed are outlined in the remainder of this section.

Aperitif – Funding

An opportunity for the particularly grant-savvy person

Cook It Up

Using the resources at your disposal, compile a comprehensive list of potential funding sources where members of the Partnership might request funding for some of these implementation efforts. Try to include things like the name of the grant, sponsoring organization, information about the funding cycle, any special requirements, and contact information. If the grant is specific to any one audience (such as medical facilities), please note that. Share your findings with fellow Partnership board members as soon as it is ready.

Utensils

- The EPA’s updated Catalog of Federal Funding for Watershed Protection provides information for watershed practitioners and others on 84 Federal funding sources that may be available to help fund various watershed-related projects. The site covers much more than mercury, but it may serve as a useful starting point. The catalog can be found at www.epa.gov/watershedfunding

Appetizer – Future Health Care Workers

A lighter portion

Prepare

Research the types of programs offered by colleges and technical schools in the project area (St. Louis, Lake, Cook, and Carlton counties in Minnesota and Douglas County in Wisconsin). Look for programs that train people for careers where mercury may be used.

Examples include:

- Nursing programs – Hibbing Community College, WITC
- Dental Hygiene – Lake Superior College
- Health Education (community health emphasis) – UMD
- Healthcare Informatics – St. Scholastica
- Corporate and Community Health – UWS

Cook It Up

Contact instructors or administrators connected with each program to find out:

- If mercury and the hazards of mercury use are discussed as part of the program curriculum
- If not, can you persuade them to commit to including some education on the mercury topic? Offer to provide resources for this learning in the form of fact sheets, videos, or in-person speakers.
- It may be helpful if you can also coordinate with the team working on the task to expand the Mercury-Free Schools participation. If you are contacting colleges that have not signed the mercury-free pledge, you and the members of that team may consider working together. As of late March, St. Scholastica, Lake Superior College, Fond du Lac Tribal and Community College, and Mesabi Community & Technical College had all signed the mercury-free pledge.

Utensils

- Written resources:
 - Section One of the Wisconsin Mercury Sourcebook offers a good overview. Section Three offers information for specific audiences, including healthcare-related ones. The sourcebook can be found at <http://www.epa.gov/glnpo/bnsdocs/hgsbook/index.html>
 - Healthcare Without Harm (#6) and Hospitals for a Healthy Environment (#16) also offer materials for healthcare-related audiences. See www.h2e-online.org/tools/mercury.htm or <http://www.noharm.org/mercury/issue>
 - WLSSD’s web page has some resources that should also be noted. Their Blueprint for Mercury Elimination (#2) and “Mercury, Get Mad Now, Not Later” brochure can be found by going to <http://www.wlssd.duluth.mn.us> and clicking on Publications (near the bottom of the screen).
 - The MPCA website offers a number of resources.

- * Their main mercury page is at <http://www.pca.state.mn.us/air/mercury.html>
- * Frequently asked questions about mercury are at <http://www.pca.state.mn.us/air/mercury-faq.html>
- Videos:
 - The Minnesota Office of Environmental Assistance (OEA) has a “Mercury and the Healthcare Professional” video. This 15-minute video is available from the OEA's Education Clearinghouse for a free, two-week loan. Contact the Clearinghouse at 800-877-6300 for more information or to borrow videos.
- Speakers:
 - There are a number of people on the Partnership Board who have experience in this area and would likely be good speaker choices. Other options include:
 - * Tim Tuominen of WLSSD – Tim has a lot of experience with mercury issues as they relate to the dental industry. (Phone 218-722-3336, ext. 315 or e-mail tim.tuominen@wlssd.duluth.mn.us)
 - * Jane Schlichting of the City of Superior Wastewater Treatment Plant (Phone 715-394-0392, ext. 136 or e-mail schlichtingj@ci.superior.wi.us). She has a PowerPoint presentation that she is willing to present or share.
 - * Jamie Harvey of the Institute for a Sustainable Future and H2E (Phone 218-525-7806)
- Related Existing Programs:
 - #1 – WLSSD Dental Outreach and Education
 - #6 – Healthcare Without Harm
 - #10 – Mercury-Free Schools Zone
 - #11 – Seminars for Veterinarians and Other Medical Facilities
 - #16 – Hospitals for a Healthy Environment (H2E)
 - #22 – Northwestern Wisconsin Mercury-Free Schools Program
 - #24 – MDA Dental Outreach and Education
 - #26 – Dental Amalgam Best Manufacturing Practices (BMPs)

Restaurant Review

Summarize your learning in writing for the Partnership Board. This step is crucial in order to capture what you learned, track where efforts have been made, and determine what further efforts are needed to continue to work toward the zero mercury goal. A restaurant review form is included in Appendix C.

Gaps Addressed

Healthcare workers

Appetizer – Household Users/General Public

A PR smorgasbord

In earlier Steering Committee and Partnership Board meetings, a number of ideas were raised for reaching the general public and household users. If you have skills in this area or your business has in-house resources that can help, select any of these options:

- Do some research to find out what it would take to have a common page about mercury and disposal options in telephone books throughout the project area. What would the cost be of running a similar page in several books?
 - Once this is determined, secure a sponsor or sponsors to finance one or more pages. Other funding options may be found at www.epa.gov/watershedfunding or in the information compiled as part of the funding research task (page 48). Have someone with skill in publishing and layout create a page that can be adapted with disposal information appropriate to different communities. It may be a good idea to have the page reviewed by members of the Partnership Steering Committee prior to printing. Run the pages in as many telephone books as funding will allow. When possible, acknowledge the sponsor on the page.
- Plan, publicize, and hold a mercury collection and swap day in your community. Try to schedule it in conjunction with other household hazardous waste or Clean Shop collection efforts. Check funding options at www.epa.gov/watershedfunding, in the information compiled as part of the funding research task (page 48), or secure sponsors to provide things like mercury-free thermometers or containers for storing fluorescent bulbs.
- Speak to solid waste staff with responsibility for hazardous waste disposal (including mercury) in Carlton, Cook, Lake, and St. Louis Counties in Minnesota and Douglas County in Wisconsin (contact information is given in Program #8 in the existing programs section) and try to arrange a meeting in which representatives of these counties get together to discuss ways that they can work together on mercury awareness and collection efforts.
- Create a generic newspaper advertisement and ask newspapers in the project area to donate space to run the ad/information as a public service.
- Create audio and/or video public service announcements (PSAs) to run on radio, TV, and public access TV (where available) stations throughout the project area
- Create and staff an informational mercury display at your county's fair or at a home show in your community. Secure sponsors or seek funding for a mercury-free thermometer swap or giveaways at the show
- Even though mercury thermometers are no longer widely available, many older adults still have mercury fever thermometers in their homes. Secure sponsorship or funding for mercury-free replacements, ask to speak to senior citizens groups or church groups in your community about mercury, and ask the planners to let group members know ahead of time that you will collect their mercury thermometers and offer mercury-free replacements.

Utensils

- Healthcare Without Harm has a 16-page document on their website outlining how to plan a mercury fever thermometer exchange. You can find the document at www.noharm.org/mercury/resources
- WLSSD and Barr Engineering (for the City of Hibbing) have both created materials for dissemination to the general public. WLSSD's brochure can be found at <http://www.wlssd.duluth.mn.us/mercury.htm> and a copy of the brochure created for the City of Hibbing can be obtained by contacting Paula Jackson at pjackson@barr.com or (218) 262-8660.
- Related Existing Programs:
 - #3 – Household Hazardous Waste Collection and Thermometer Swap
 - #7 – Minnesota Power Fluorescent Bulb Recycling Program
 - #8 – County HHW Options
 - #21 – General Public Education and Promotional Items

Gaps Addressed

- Household user knowledge and awareness
- County level awareness and coordination

Restaurant Review

Summarize your learning in writing for the Partnership Board. This step is crucial in order to capture what you learned, track where efforts have been made, and determine what further efforts are needed to continue to work toward the zero mercury goal. A restaurant review form is included in Appendix C.

Lunch – Voluntary Agreements

Leverage your community presence and in-house knowledge

Background: Many industries in northeastern Minnesota have submitted voluntary agreements to the MPCA. The MPCA has the voluntary agreement program in place to promote reduced use and release of mercury from industries that are mercury sources. These reductions may occur at the industry or at other locations through efforts sponsored or otherwise supported by the industry. Goals and level of detail in the agreements vary but include things such as conducting mercury mass balances to identify the sources and fate of mercury at a facility, inventorying and working to replace mercury-containing equipment, attempting to reduce mercury emissions, and serving as collection sites for employees and/or community members to drop off household items containing mercury. While many of these actions have been implemented, some others have not yet been put into action.

Cook It Up

If your organization has submitted a voluntary agreement to the MPCA, review it to see if the items set forth in the agreement have been implemented. If there are items that are not yet in place, work with your employer to launch those efforts.

Review other voluntary agreements at <http://www.pca.state.mn.us/hot/legislature/reports/2002/mercury-att2-appendix-d.pdf>. This is a good place to find out what mercury reduction steps the industry may already be taking. For instance, Hibbing Taconite and Minnesota Power already accept fluorescent bulbs from their employees, and MP accepts them from customers.

Contact the appropriate person at other businesses with voluntary agreement to discuss the efforts they have made to reduce mercury use and find out if there are ideas that you can share or ways that you can work together to continue to reduce mercury. Local organizations with voluntary agreements with the MPCA are shown below. Those not represented on the Partnership board are marked with an asterisk (*).

- EVTAC Mining
- Hibbing Taconite
- * Ispat-Inland Steel
- Minnesota Power
- * National Steel (now Keewatin Taconite)
- Northshore Mining
- WLSSD

Utensils

- A number of mercury recycling companies can provide storage and shipping containers for fluorescent lamps and other mercury-containing products. A list of recyclers that accept fluorescent and HID lamps can be found in MPCA waste factsheet #4.21 at <http://www.pca.state.mn.us/waste/pubs/4-20.pdf>. The Minnesota Office of Environmental Assistance also lists information about mercury recyclers at <http://www.moea.state.mn.us/markets/bulbs9-26-00.pdf> and <http://www.moea.state.mn.us/markets/Metals9-26-00.pdf>
- Related Program – #17 – Voluntary Agreements

Gaps Addressed

- Industrial users

Restaurant Review

Summarize your learning in writing for the Partnership Board. This step is crucial in order to capture what you learned, track where efforts have been made, and determine what further efforts are needed to continue to work toward the zero mercury goal. A restaurant review form is included in Appendix C.

Lunch – Automotive

Expand the national Switch the Switch program that was offered in Superior.

Background: Automakers have voluntarily phased out the use of mercury in convenience light switches and Antilock Braking System (ABS) g-sensor switches in new motor vehicles. The last use of a mercury switch was to be phased out by the end of 2002.¹¹ However, some newer vehicles may have mercury in their headlights. Additionally, there are many, many vehicles currently in service that still use mercury switches. The switches are usually encased in steel so they pose a limited risk of exposure or leakage until the car is scrapped. The City of Superior's experience with the Switch the Switch program was that scrap yards weren't interested, even when offered \$.50 for turned in switches but that car dealerships with onsite garages were much more receptive to the idea.

Prepare

Make a list of the new and used dealers, auto repair shops, and auto salvage operations in your area.

Cook It Up

Make an appointment to visit the owner or manager at each dealership and shop to talk about mercury switches in vehicles. Try to find out:

- If they are aware which vehicles mercury switches in them and where they are (convenience lighting, anti-lock braking system, etc.)
- Do they currently remove mercury switches? If so, how do they dispose of the removed switches?
- North Star Steel in St. Paul has provided a bounty for switches removed from cars sent to their facility. Find out where scrapped cars in the project area go and whether the receiving facilities offer a bounty for mercury switches.
- If they do not current remove them, what would spur them to do so and dispose of them properly? Mercury-free replacement switches, a modest bounty for turning in mercury switches, ease of disposal, positive publicity?
- If we wanted to reach out to a large group of dealers or repair shops, what would they suggest as the best way to target them? Is there a club or trade organization that meets periodically that we could connect with, or is there a trade publication or a convention that we could work with?

Super Size

- Identify business and organizations in your area that have fleets of vehicles (e.g. construction companies, law enforcement agencies, counties, other units of government) and approach them with the same questions outlined above.
- Plan a mercury switch-out day. Advertise a specific date and location (e.g. a Saturday morning) where volunteer automotive mechanics (or students from a technical school automotive program) will

¹¹ Michigan Mercury Switch Study, December 19, 2002, <http://www.deq.state.mi.us/documents/deq-ess-p2-mercury-michiganswitchstudy.pdf>, page 7

be on hand to look for mercury switches in personal vehicles and exchange them for mercury-free replacements.

Utensils

- The Switch the Switch program that was implemented in Superior (program #5) was part of a nationwide program by the same name. Information about the national program is available at http://www.cleancarcampaign.org/switch_the_switch.shtml
- Special offer: Jane Schlichting of the City of Superior wastewater treatment plant says she has a number of mercury-free switches left from their Switch-the-Switch efforts, and she is willing to share with local planners who need them to implement any of these activities. You can contact her at 715-394-0392, ext. 136 or e-mail schlichtingj@ci.superior.wi.us
- Mercury-free switches can be purchased from Comus Corporation – 454 Alwood Road – Clifton, NJ 07012-1706 – Phone 973-667-6200
- In December of 2002, a task force made up of people from automobile manufacturers, part manufacturers, environmental groups, and the State of Michigan released a mercury switch study. The study can be found at <http://www.deq.state.mi.us/documents/deq-ess-p2-mercury-michiganswitchstudy.pdf>
- Until the program ended in 2002, the MPCA operated a mercury switch program that provided information, free shipping, and disposal so that mercury-containing switches could be sent to scrapyards (#13).
- The MPCA has a “Managing Mercury Switches” factsheet (#4.26) that can be found at http://www.pca.state.mn.us/waste/pubs/4_26.pdf pdf .

Gaps Addressed

Auto switches – this is the only program aimed at this product. Holding switch-the-switch events for the general public could also help with the awareness for that audience.

Restaurant Review

Summarize your learning in writing for the Partnership Board. This step is crucial in order to capture what you learned, track where efforts have been made, and determine what further efforts are needed to continue to work toward the zero mercury goal. A restaurant review form is included in Appendix C.

Dinner – Shipping

An audience with several unknowns

Prepare

Speak to staff at the Duluth Seaway Port Authority about how we can locate appropriate staff at shipping companies to find out about their mercury usage, spill prevention and control practices, and awareness and use of proper disposal channels for mercury.

Cook It Up

Contact individual shipping companies to assess their mercury uses, need for educational information, and potential for reducing mercury use and/or releases. Follow up by providing appropriate information to them.

Super Size

Provide assistance in the form of staff time, expertise, and/or funding to help individual shipping companies properly dispose of unneeded mercury or replace mercury-containing products with mercury-free alternatives.

Utensils

- The Wisconsin Mercury Sourcebook offers a good overview of mercury issues. It can be found at <http://www.epa.gov/glnpo/bnsdocs/hgsbook/index.html>
- WLSSD's web page has some resources that should also be noted. Their Blueprint for Mercury Elimination (program #2) and "Mercury, Get Mad Now, Not Later" brochure can be found by going to <http://www.wlssd.duluth.mn.us> and clicking on Publications (near the bottom of the screen).
- Information about disposal options can be obtained by contacting the WLSSD Clean Shop program at (218) 726-1602 or e-mail hhwclnsh@wlssd.duluth.mn.us. You can also find information online by going to www.wlssd.duluth.mn.us (click on Environmental Services then Business Hazardous Waste). In Wisconsin, contact Jane Schlichting to find out about Clean Sweep collection dates and sites. Clean Sweep dates and locations will be posted on the City of Superior's website (<http://www.ci.superior.wi.us/>).
- A list of recyclers that accept fluorescent and HID lamps can be found in MPCA waste factsheet #4.21 at <http://www.pca.state.mn.us/waste/pubs/4-20.pdf>. MPCA factsheet #6.11 also lists some companies that may accept mercury and mercury-containing items. (See <http://www.pca.state.mn.us/publications/w-hw6-11.pdf>)
- The Minnesota Office of Environmental Assistance also lists information about mercury recyclers at <http://www.moea.state.mn.us/markets/bulbs9-26-00.pdf> and <http://www.moea.state.mn.us/markets/Metals9-26-00.pdf>
- The MPCA website offers a number of resources.
 - Their main mercury page is at <http://www.pca.state.mn.us/air/mercury.html>
 - Frequently asked questions about mercury are at <http://www.pca.state.mn.us/air/mercury-faq.html>

Gaps Addressed

Rail/shipping industries

Restaurant Review

Summarize your learning in writing for the Partnership Board. This step is crucial in order to capture what you learned, track where efforts have been made, and determine what further efforts are needed to continue to work toward the zero mercury goal. A restaurant review form is included in Appendix C.

Dinner – Schools

An opportunity for many Partnership members to make one or two local contacts

Prepare

See Appendix C for the latest list of Mercury-Free Schools to see which schools in your area have and have not signed a pledge to be mercury free. Secondary schools and colleges (highlighted on the spreadsheet) are the biggest targets because they tend to use more mercury-containing equipment in their science labs. Schools have already been contacted by the Mercury-Free Zone program in Minnesota (#10) and Northwest Wisconsin Mercury-Free Schools Program (#20). Your job here is to add your encouragement and support in your area and provide fill-in resources as needed, especially at schools that have not taken any action.

Cook It Up

Make personal contact at the schools in your area to:

- Find out if they have heard of the Mercury-Free Zone program
- Confirm whether or not they are mercury free
- Speak to them about the importance and benefit of a mercury free commitment
- Offer resources and information to help them consider making a commitment to go mercury free
- Follow up after providing the information to see if they are ready to commit

Utensils

- The Mercury-Free Zone webpage is at <http://www.pca.state.mn.us/programs/mercury-free/index.html>
- Chris Butler is the MPCA's coordinator for the Mercury-Free Zone program (#10). He can be reached at (218) 723-2358, (800) 657-3864, or chris.butler@pca.state.mn.us
- Jane Schlichting is familiar with the program in Northwestern Wisconsin (#22). She can be reached at (715) 394-0392, ext. 136 or schlichtingj@superior.ci.wi.us

Restaurant Review

- Summarize your learning in writing for the Partnership Board. This step is crucial in order to capture what you learned, track where efforts have been made, and determine what further efforts are needed to continue to work toward the zero mercury goal. A restaurant review form is included in Appendix C.

Dinner – Dentists

A chance to support existing efforts

Background: The Minnesota Dental Association (MDA) is working with all Minnesota dentists to encourage them to select, install, and properly maintain amalgam waste separator equipment. According to MDA’s website, “The goal of this voluntary program is the achievement of 100% participation before the end of 2004.” Tim Tuominen of WLSSD and Jane Schlichting of the Superior Wastewater Treatment Plant have also been working with dentists in their respective areas to give them information about installing high-efficiency amalgam waste collection equipment. The topic is likely not new to dentists in the area, though not all of them have taken action yet.

Prepare

Collect information about funding sources once the funding menu item is completed or use your own knowledge of potential funding sources to secure funding for high-efficiency amalgam waste collection equipment in dental practices. The funding could come from foundations or groups that award grants for environmental efforts such as mercury reduction or from any individuals or businesses in the project area willing to help with this item, or a Partnership member may elect to provide the funding. The estimated cost to install high-efficiency amalgam collection equipment as recommended by the MDA is estimated to be approximately \$500.

Cook It Up

Contact dental practices in your area via telephone or mail to let them know of the availability of funding to help them install high-efficiency amalgam waste collection equipment. To distribute the funds, you could:

- Offer it as a reimbursement for practices that have not yet installed the high-efficiency equipment.
- Offer it to underwrite the entire cost of the equipment or a certain portion of the cost
- Offer it to the first “x” number of practices that turn in a receipt for equipment purchased after you contacted them

Utensils

- Read about the MDA’s voluntary program at http://www.mndental.org/newsletter/features/article_1/index.html
- Tim Tuominen of WLSSD has worked extensively with dentists throughout northeastern Minnesota on the mercury issue for many years (program #1). He has formed trusting relationships with many of the dentists and is a good resource for selecting equipment. There are many vendors out there with varying opinions about things like cost and effectiveness, but Tim believes a decent high-efficiency amalgam waste collection system can be purchased for about \$500 (for either wet or dry vacuum systems). You can contact Tim at 218-722-3336, ext. 315 or e-mail tim.tuominen@wlssd.duluth.mn.us

- Jane Schlichting of the City of Superior began approaching dentists in northwestern Wisconsin with similar information in the fall of 2002 (program #26). You can check on progress in that region by contacting her at (715) 394-0392, ext. 136 or e-mail schlichtingj@ci.superior.wi.us. She also has a PowerPoint presentation on amalgam best manufacturing practices (BMPs) that she will send to anyone who is interested.

Restaurant Review

Summarize your learning in writing for the Partnership Board. This step is crucial in order to capture what you learned, track where efforts have been made, and determine what further efforts are needed to continue to work toward the zero mercury goal. A restaurant review form is included in Appendix C.

Dinner for a Crowd – Healthcare

A larger-scale, important effort for a determined person or group of people

Prepare

Identify all the facilities that provide health-related services in your area. In addition to hospitals and clinics, **make sure to include chiropractors, veterinarians, ambulances, and nursing homes.** (Schools will be covered under a separate menu item.)

Make personal contact with each one to determine if the facility has gone mercury free, if they are working on it, or haven't started. In larger facilities, it's often a Health & Safety person who deals with this.

Cook It Up

For those facilities that have not yet gone mercury-free, try to determine:

- Whether they have received information encouraging them to become a mercury-free facility
- If you can provide any information to help them consider a mercury-free commitment
- What barriers prevent them from becoming mercury free

Super Size

Identify and approach health-related facilities outside your home area. Recruit others interested in the mercury issue to help such as co-workers, friends, family members, or members of similar groups or boards.

Utensils

- See www.h2e-online.org/tools/mercury.htm or <http://www.noharm.org/mercury/issue> for additional resources for facilities that need more information
- The Wisconsin Mercury Sourcebook is a very comprehensive resource that offers information about a wide range of audiences that typically use mercury and mercury-containing items. Section One of the sourcebook gives an overview of the mercury issue, Section Two is aimed at communities developing mercury reduction plans, and Section Three has materials for very specific audiences, including hospitals and clinics, nursing homes, and veterinary practices. This document is very large but can be downloaded in pieces. The book is located at <http://www.epa.gov/glnpo/bnsdocs/hgsbook/index.html>
- If they need information about disposal options, contact the WLSSD Clean Shop program at (218) 726-1602 or e-mail hhwclnsh@wlssd.duluth.mn.us. You can also find information online by going to www.wlssd.duluth.mn.us (click on Environmental Services then Business Hazardous Waste)
- Sources for mercury-free thermometers include:
 - RG Enterprises, Inc. – Contact: Ed Holter – eholter@rgmd.com - 888-596-9498, ext. 203
 - Physician Sales and Service – 141 Cheshire Lane, Suite 700 – Minneapolis, MN 55441 Phone 763-559-3333

- Hospitals for a Healthy Environment (H2E) has a pledge that healthcare facilities can review and sign if they have not already done so. The pledge can be found at <http://www.h2e-online.org/pubs/partner-reg.pdf>.

Restaurant Review

Summarize your learning in writing for the Partnership Board. This step is crucial in order to capture what you learned, track where efforts have been made, and determine what further efforts are needed to continue to work toward the zero mercury goal. A restaurant review form is included in Appendix C.

6.0 Monitoring Plan

6.1 Executive Summary

The purpose of this monitoring plan is to track the effectiveness of the project's mercury reduction efforts within the Lake Superior Watershed in Minnesota, which includes the St. Louis River Watershed and the portion of the St. Louis River Watershed that lies within Wisconsin. This plan identifies the parameters selected for use as part of the project, discusses those that have been considered for use but rejected, and presents data that provides an indication of baseline conditions.

The following parameters, summarized in Table 5, are recommended indicators of the effectiveness of mercury reduction efforts:

- The concentration of mercury in wastewater treatment plant sewage sludge—influent and effluent and the trends at each plant over time
- The type and amount of mercury-containing products collected by publicly and privately operated collection programs
- The percentage of all schools in the project area that have signed the mercury-free pledge for the mercury-free schools programs in Minnesota and Wisconsin and the percentage of schools that have actually done a sweep to identify and remove mercury products
- The percentage of all dental offices in the project area that have installed high-efficiency amalgam separation devices that also properly dispose of all mercury-containing wastes
- The prevalence of products containing mercury that are currently for sale
- The prevalence of improperly disposed mercury-containing products
- The general public's awareness level regarding which household and/or industrial products may contain mercury and how to properly dispose of mercury

The goal of this project is to reduce the amount of mercury released to the environment by decreasing the sale and use of mercury-containing products and reducing improper disposal of mercury wastes in wastewater or solid waste. The ultimate goal is to reduce the potential human health effects of mercury by reducing levels of mercury found in fish. Specific goals such as collecting over 1,000 pounds per year of mercury or getting all sludge concentrations below a selected concentration have not been set. Rather, it is the overall trends that will be assessed for most parameters.

This monitoring plan will focus largely on trends in mercury awareness and use rather than goals related to collecting specific amounts of mercury in a given period.

This monitoring plan does not call for collecting data on environmental indicators such as mercury levels in lake and river sediments or fish tissues because these parameters would not provide as direct an indication of the success of the mercury reduction efforts as the recommended parameters. Such

data is being collected and considered as part of other projects. The general environmental indicators that are not included are also more apt to be influenced by mercury sources outside the watershed.

Implementation of this plan will begin with collecting baseline data, starting within six months of the plan's approval by the Partnership Board. The frequency at which data will be collected for each parameter is presented in Table 5. At this time the Partnership envisions compiling annual monitoring reports in 2004 and 2005, after which time the frequency may be reduced, e.g., to every other year.

6.2 Background

As stated in the 2001 application for grant funding to the Minnesota Pollution Control Agency (MPCA) for this project, the purpose of the monitoring plan is to track the effectiveness of mercury reduction efforts within the target area. Examples of monitoring activities that may be called for include wastewater treatment sludge analysis and tracking and aggregating data on the total quantity of mercury collected by mercury reduction efforts. Existing data (e.g., sludge mercury concentrations) will be used and initial monitoring will be conducted as necessary at selected locations to determine baseline conditions.

The project and associated monitoring efforts are aimed at reducing mercury that comes from intentional uses. It does not address releases incidental to various industrial processes or mercury that comes from sources outside the St. Louis River basin.

As noted by members of the Partnership Steering Committee, the monitoring program must identify parameters that can be measured year after year and must be affordable as well. The Partnership's Steering Committee also discussed the importance of keeping in mind that this project is aimed at reducing mercury released from intentional uses and does not address mercury released incidental to processes such as combusting coal or processing iron ore, nor does it address mercury that comes into the St. Louis River Basin from sources outside the basin. As a result, indicators that are used to track the change in mercury levels in the environment, such as concentrations of mercury in sediment or fish, do not necessarily reflect the success of reduction efforts undertaken as part of this project.

6.3 Recommended Monitoring Parameters

Table 5 provides a summary of the types of data recommended for use in assessing the impact of additional efforts aimed at reducing the use and improper disposal of mercury-containing products. The table lists the parameters to be tested, who will collect the data, who will aggregate the data and how, and provides some notes regarding test methods and costs. Specific monitoring and collection activities are described below.

Wastewater Quality

- Collect sludge data that may be used to look for trends within each wastewater treatment plant (comparing between plants is complicated by differences such as sludge solids content). Expand the

number of wastewater treatment plants (WWTPs) that routinely test for mercury to include at least the ten plants in Minnesota that were tested by the MPCA in 1998 and the Superior WWTP. Encourage monthly or at least quarterly testing OR test during the same time frame (ten weeks during August and September) that was used for the 1998 study. The August-September time frame was selected to include the “tourist influence.” Refer to the Quality Assurance Project Plan (QAPP) for the 1998 project for further information regarding the study.

- Collect WWTP influent and effluent data. Expand the number of WWTP that test for mercury as described above for sludge.
- Collect other relevant WWTP data such as results of monitoring within the wastewater collection system (as has been done by WLSSD and Hibbing).
- Where possible, integrate testing with MPCA requirements. Operating permits for a number of WWTPs in the Basin currently contain mercury testing requirements. Mercury monitoring will be required at other WWTPs in the future as well.¹²

Solid Waste

- Use qualitative approaches to monitoring the quantity of mercury products in municipal solid waste (MSW). For example, interview state and county MSW and hazardous waste inspectors. (The MPCA inspector who visits hazardous waste generators in Northeastern Minnesota has noted that disposal of fluorescent lamps in MSW was a common rule violation in 2002.)
- Track changes in the number of products that contain mercury or that phase out use of mercury.

Results of Mercury Collection Efforts

- Collect data from WLSSD and the Superior WWTP annually. Encourage all programs to track the amount of mercury collected in a consistent fashion, and ensure that the Carlton County collection program is included.
- Establish a system for obtaining data from the privately run collection systems.

Other Indicators

- General awareness level – this could be tracked most accurately via surveys. However, indicators such as the number of attendees at bi-national workshops and related workshops (e.g., Thunder Bay, June 2003) may also be used. The cost for conducting a survey such as WLSSD’s Burn Barrel survey that contacted 760 residents was about \$8,200.¹³ MPCA staff, noting that some citizens have

¹² Interim MPCA Mercury Policy – Staff Draft. MPCA. Revised July 2001.
<http://www.pca.state.mn.us/air/pubs/mercury-policy01.pdf>

¹³ Email from Doug Fairchild, WLSSD Environmental Program Coordinator to Paula Jackson, Barr Engineering dated August 5, 2003

commented that they've been "surveyed to death," recommended trying to add questions regarding mercury to another survey program.

- Some of the strategies lend themselves to direct monitoring of effectiveness, e.g., by tracking the percentage of schools that have conducted sweeps for mercury or the percentage of dental offices that have installed high-efficiency amalgam separation equipment.

6.4 Baseline Conditions

To be able to assess the impact of any new programs, it is necessary to have data that provides an indication of the effectiveness of existing mercury reduction programs, i.e., baseline conditions. Barr has identified the following data that provides an indication of baseline conditions. Much data already exists, but there are a few parameters for which additional effort is necessary to provide a complete baseline picture.

Wastewater

- The concentration of mercury in municipal wastewater influent, effluent and sludge from WLSSD and the City of Hibbing collected over a number of years (see Figures 14 through 20 and Table 6)
- The concentration of mercury in wastewater effluent for the City of Virginia, two industrial wastewater treatment plants (Northshore Mining and Northwoods Peat) as well as WLSSD and Hibbing South Plant data, as aggregated by MPCA staff (see Table 7)
- The mercury concentration in sludge at 10 wastewater treatment plants located in northeastern Minnesota, collected by MPCA staff in 1998 as part of a project specifically intended to generate baseline data for the Lake Superior Basin (see Table 8)

Mercury Product Collection

There is a network of collection programs for mercury-containing products that are run by both private and public entities. This includes household hazardous waste facilities run by counties and the Western Lake Superior Sanitary District (WLSSD) as well as efforts by cities and a number of industries.

- Data regarding the types and amount (weight) of products collected by WLSSD's household hazardous waste and Clean Sweep collection programs (see Tables 9 and 10)¹⁴
- Data collected by other programs that collect mercury-containing products, including fluorescent bulb recycling programs, auto switch collection programs, collections conducted by companies participating in the MPCA Voluntary Agreement program, and the WLSSD Clean Shop program that serves small industrial customers. Some of this data was collected as part of the assessment of existing programs and is included with that portion of the project final report. However, additional

¹⁴ Jane Schlichting, Superior WWTP, reported that they also routinely track similar information; Barr has requested a copy

effort is needed as part of the first stage of monitoring plan implementation to collect and aggregate this information.

General Public Awareness

No baseline data was found that may be used to quantify or judge the general public awareness level of mercury contamination and mercury-containing products. If this parameter is to be used, collection of some baseline data will be necessary.

6.5 Parameters Considered but Not Included

Mercury Concentrations in the Environment

The Partnership Steering Committee discussed the possibility of including a number of parameters in this monitoring plan, such as mercury concentration in the St. Louis River water column, fish and/or sediments that fall under the category of “environmental indicators” of mercury contamination. The Partnership will want to keep informed regarding changes in these types of indicators over time. However, they do not help to answer the question "Have the strategies implemented under this particular project made a difference?" because they are impacted by so many other factors, including regional and global mercury releases from all sources. Therefore only those parameters that are more directly impacted by the project efforts are included in this plan. This will allow the monitoring program to be as focused as possible and to make the best use of limited funding.

Concentration of Mercury in Solid Waste

The concentration of mercury in solid waste is an excellent indicator of the effectiveness of programs aimed at collected mercury-containing products and preventing improper disposal in solid waste. Unfortunately, data that would indicate the quantity of mercury in solid waste in the project area does not appear to be available. Two methods that may be used to assess mercury content of solid waste are not applicable or available at this time as discussed below.

MSW incinerator testing can indicate mercury content of waste. In the past, some area waste was burned at the WLSSD municipal waste combustor. However, because waste in the project area is all currently landfilled, waste combustor data does not appear to be a useful indicator for this project. Also, because the WLSSD facility was a resource-derived fuel (RDF) plant that sorted and removed some waste prior to burning, mercury data from the incinerator stack emissions and ash would only provide a partial picture of the amount of mercury in the waste.

Waste sorts would provide the most accurate information about the mercury content of solid waste and which products are most often improperly disposed. However, waste sorts are complicated and an expensive undertaking. Waste sorts were conducted by MPCA in the past, but no sorts are planned for the future at this time.