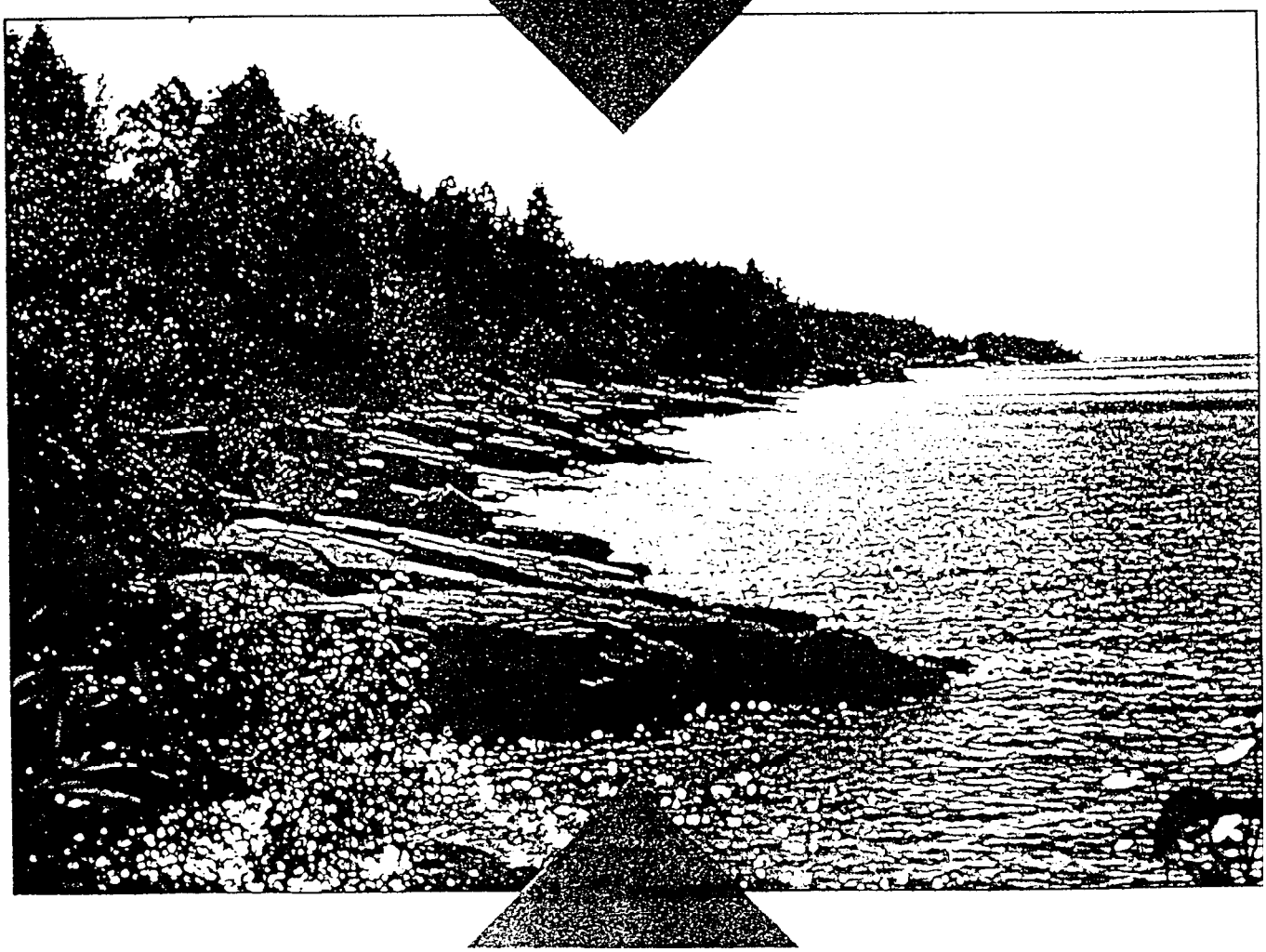
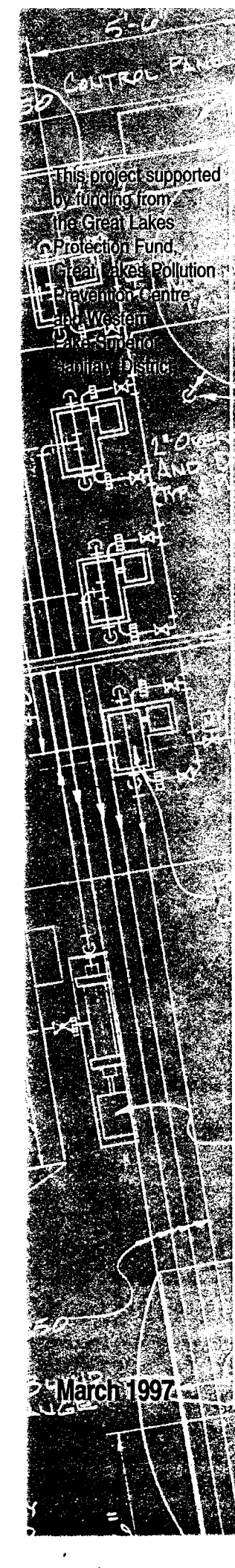
Blueprint FOR MERCURY ELIMINATION



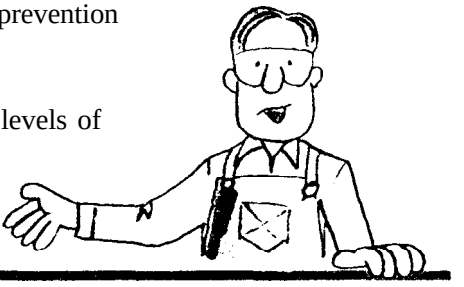
Mercury Reduction Project Guidance
for Wastewater Treatment Plants



This project supported by funding from the Great Lakes Protection Fund, Great Lakes Pollution Prevention Centre and Western Lake Superior Sanitary District

March 1997

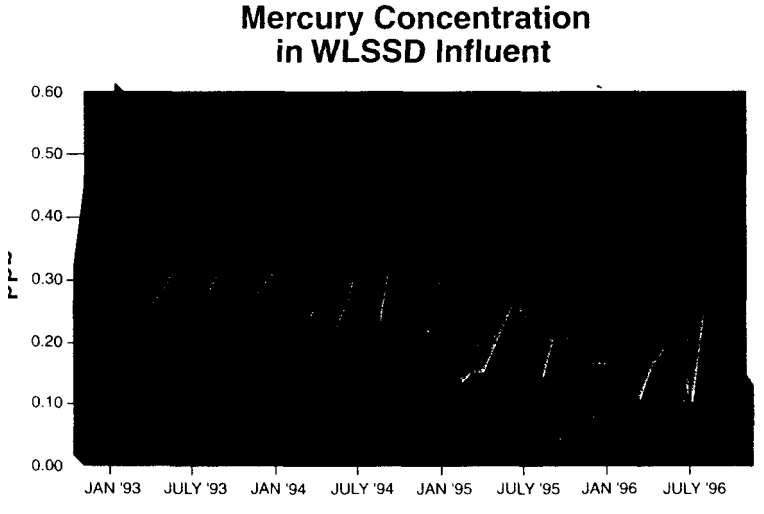
The Western Lake Superior Sanitary District (WLSSD) was created by the Minnesota Legislature in 1971 to deal with pollution in the lower St. Louis River. Today, the WLSSD is the largest point source discharger on the U.S. side of Lake Superior. Its primary mission is to protect the environment. Because of the plant's impact on Lake Superior, pollution prevention takes on special importance at the WLSSD.



WLSSD staff began to address mercury issues following reports of high levels of mercury in fish in the St. Louis River in 1989. Initial efforts focused on internal practices, such as scrubber water management, and evolved into a broader examination of mercury contributions from the community at large. Under its current National Pollutant Discharge Elimination System (SPDES) permit, the WLSSD must meet an effluent mercury limit of 0.03 parts per billion (ppb). New regulations adopted under the Great Lakes Water Quality Initiative (GLI) propose even more stringent water quality criteria for mercury. After evaluating the costs involved to meet the proposed limits with end-of-pipe technology, WLSSD staff concluded that pollution prevention is preferable.

Follow Ed, our treatment plant operator; and learn how to create and implement your own mercury reduction project.

With support from the Great Lakes Protection Fund, the WLSSD conducted a two-year Mercury Zero Discharge Project to examine the sources of mercury to its wastewater treatment plant and to determine how to reduce or eliminate those sources. This project included cooperative initiatives with industries known to be discharging mercury, programs aimed at specific uses of mercury, a monitoring program to identify additional sources and a public awareness campaign. In addition to these external programs, WLSSD also examined its own facilities and practices. WLSSD has seen a reduction in mercury concentration in their influent during this project. (See graph at left.) This document shares the findings of the WLSSD Mercury Zero Discharge Project.



This Blueprint is a guide to assist wastewater treatment plant staff with creating and implementing their own mercury reduction projects. It includes information on sources of mercury, successful reduction strategies and case studies, and suggestions for implementing a program. Whether you work with a small treatment plant or a large wastewater utility, you'll find the information here useful.

Mercury in the Environment

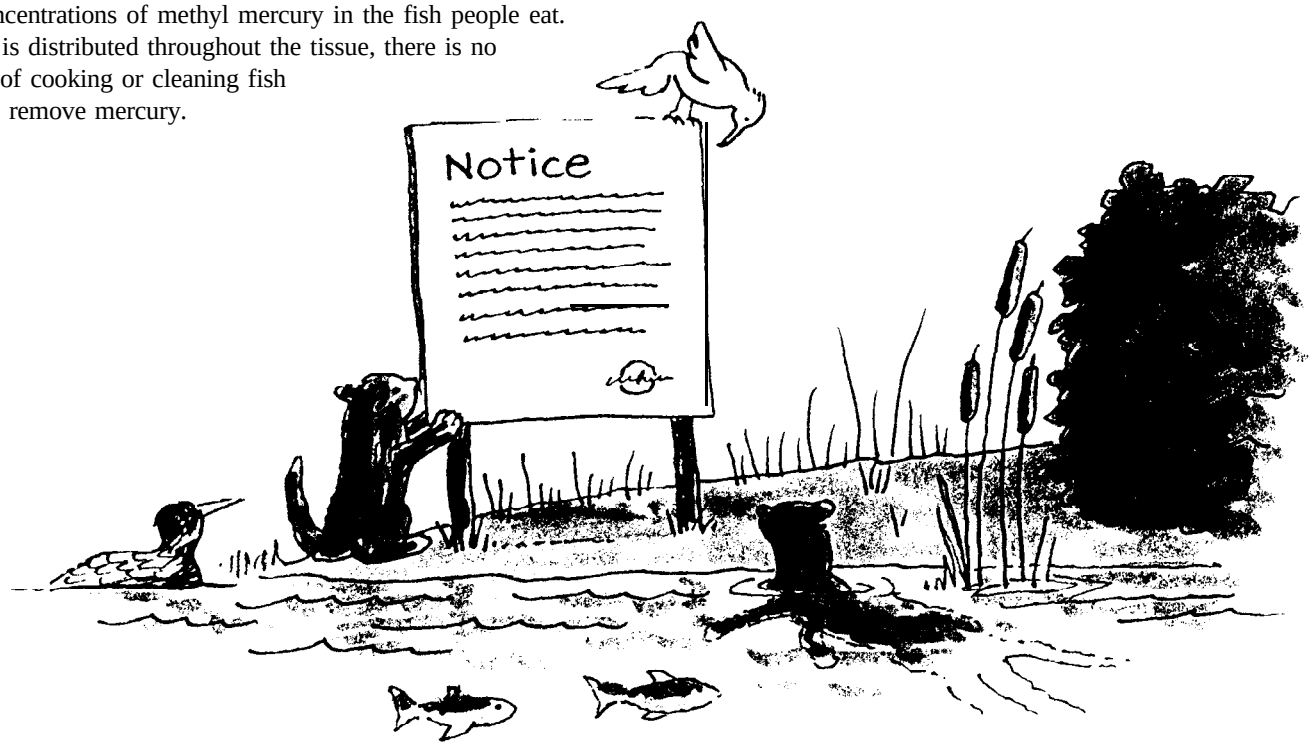
Mercury is a naturally occurring element found everywhere in the environment. It can become airborne from natural processes. such as soil decomposition and volcanic eruption and fall back to earth in dust, rain or snow. Human activities that release mercury to the environment include mining and smelting; burning fossil fuels and wood; cement and lime kiln production; crematories; petroleum refining; and incinerating solid waste or sludge. Mercury does not break down; once it enters the environment from any source, it remains there.

Lakes and rivers are contaminated when there is direct discharge of mercury-containing industrial or municipal wastewater to them. In the water, mercury is converted to methyl mercury by bacteria or by chemical reactions. Tiny aquatic organisms absorb methyl mercury. Fish absorb methyl mercury from the organisms they eat. It builds up to high levels in predatory fish at the top of the aquatic food chain. Bioaccumulation produces high concentrations of methyl mercury in the fish people eat. Since it is distributed throughout the tissue, there is no method of cooking or cleaning fish that will remove mercury.

Mercury does not break down; once it enters the environment from any source, it remains there.

Methyl mercury is neurotoxic; it affects the brain and spinal cord. In the brain, methyl mercury interferes with the way nerve ceils function. High levels of mercury in infants can cause mental and physical retardation. Many states have developed guidelines for how often fish from the Great Lakes can be safely eaten.

Wildlife such as loons, eagles, otters, mink and ospreys eat large quantities of fish and incidentally consume mercury. It appears that loons are accumulating mercury to the point that reproduction is impaired. Body tissues in mink and otter populations also contain elevated mercury levels. An excess of mercury can lead to neurological impairment, especially damaging for predators who rely on speed and coordination to obtain food. Unfortunately, wildlife cannot change their eating habits in order to avoid mercury contamination.



The Role of Wastewater Treatment Plants

Wastewater treatment plants have an important role to play in reducing mercury and other toxic discharges to receiving waters. Like industry, wastewater treatment plants are required to meet specific discharge limits contained in their permits. They are unique in that all of the discharges from the plant, except for chemicals used in the treatment process, come from users of the system. The wastewater treatment plant manufactures no product; its primary goal is to provide clean water and a healthy environment.

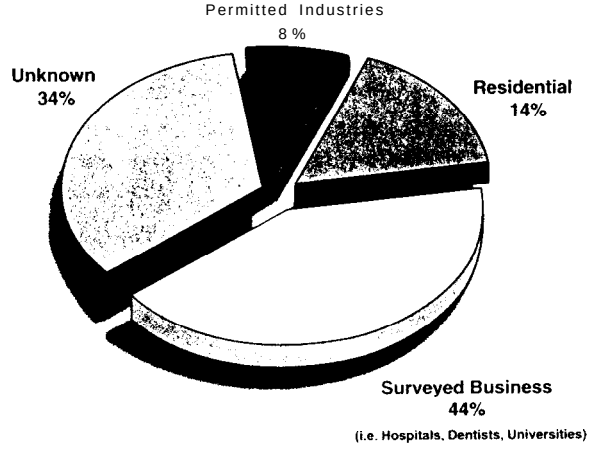
Mercury reaches the wastewater treatment plant from users of the system. Most of it concentrates in wastewater sludge, which is land applied or burned. The remainder is discharged in the effluent. Mercury concentrations for sludge may range from l-2 parts per million (ppm) on a dry weight basis to as high as 1.5 ppm. Generally, sludge mercury concentrations above 3 ppm indicate there are significant sources of mercury that can be reduced through pollution prevention.

Your treatment plant may not currently have problems meeting effluent limitations for mercury. However, more stringent discharge limitations are expected as the Great Lakes states incorporate the provisions of the *Great Lakes Water Quality Guidance.* That guidance seeks to establish consistent water quality standards throughout the Great Lakes Basin. It will require states to establish water quality criteria for mercury and other bioaccumulative pollutants based on bioaccumulative effects in fish and wildlife. Prohibitions on mixing zones for these pollutants will also be required. Some states. like Michigan. already require treatment plants with stringent water quality-based effluent limitations for mercury to develop and implement mercury minimization plans.

Concerns about mercury in the environment are not limited to the Great Lakes region. In other parts of the United States, such as the Pacific Northwest and Florida, states are taking similar steps to address mercury concerns in fish and wildlife. Mercury reduction programs will continue to grow in importance as the federal government implements air emission requirements for sludge incinerators, solid waste incinerators and other incinerators.

Wastewater treatment plant staff are in a unique position to work with their users to identify sources of mercury and reduce or eliminate its discharge. Often the best local source of expertise on water quality issues, treatment plant staff can play an important leadership role in addressing mercury pollution prevention.

WLSSD Wastewater Mercury Sources



We don't have a problem with mercury in our plant...or do we?

Every wastewater treatment plant receives and discharges [illegible] mercury. Monitoring and analysis conducted for [illegible] done by the WLSSD found [illegible] entering the plant from many unremarkable [illegible] levels undetectable with conventional [illegible] Some permitting authorities consider [illegible] mercury levels below the EPA [illegible] of 0.2 parts per billion (ppb) to [illegible] effluent limit requirements. Under the [illegible] Water Quality Initiative, even these facilities [illegible] mercury reduction strategies.

[illegible] community has a dentist, a medical facility, a high [illegible] even a college. Many businesses and industries [illegible] chemicals that contain mercury. WLSSD found mercury [illegible] the sewer from all of these sources. All these small [illegible] of mercury become a big problem in the [illegible]

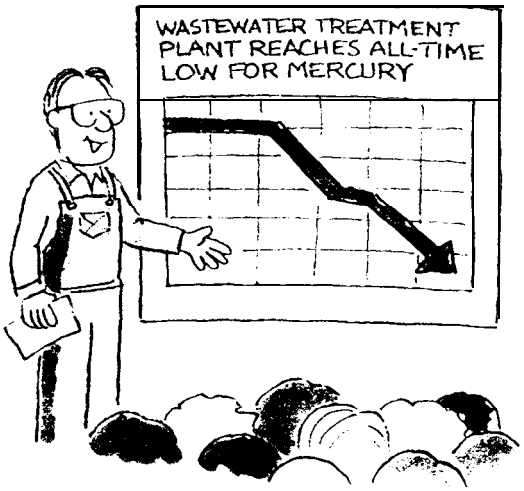
Pollution Prevention

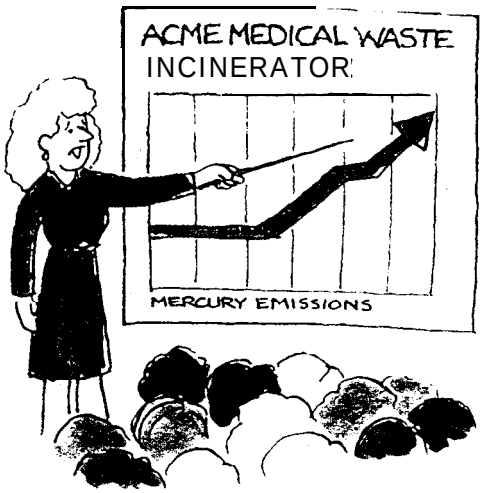
Traditional approaches to pollution control emphasize treating waste after it is generated. Often these treatment processes simply move pollutants around, creating hazardous residues that require disposal. Pollution prevention is based on a simple but powerful idea. It makes more sense to stop producing waste than to develop treatment and disposal technologies to manage it. Pollution prevention strategies focus on changing existing processes and replacing hazardous chemicals with alternatives to reduce the discharge of toxics to the environment.

There is no treatment method that can completely remove mercury from the wastewater. Mercury control technology merely transfers the pollutant from wastewater to sludge, ash or into the air. Incineration, land application or landfilling of mercury-bearing sludge or ash results in a transfer of mercury to the environment. Pollution prevention is the best approach to achieving reductions in the release of mercury and other persistent toxic chemicals that do not break down in the environment.

It is important to consider the potential for cross-media transfer when designing a mercury reduction program. Changes in practices that move wastes from one place to another are not pollution prevention. The goal is to eliminate mercury discharges, not transfer them from wastewater to solid waste, air or other media.

In most cases. pollution prevention is less expensive than end-of-pipe treatment for mercury removal. In addition, pollution prevention changes behavior and practices, which result in the elimination of mercury discharges.





It makes more sense to stop producing waste than to develop treatment and disposal technologies to manage it.

Mercury Use - Current and Historical

Mercury has many useful properties and has been widely used in household, medical and industrial products. A liquid at room temperature, it expands and contracts evenly with temperature changes and combines readily with other metals. This section provides an overview of the uses of mercury in both consumer products and raw materials. For more information, refer to the mercury use tree in Appendix A.

Products in Which Mercury is Deliberately Used

This category consists of products in which mercury serves a specific purpose. Examples include chemical reagents, amalgam used to fill dental cavities, biocides in paper and paints, and pigments. Most purposeful use of mercury in the United States is being phased out as more information on the dangers of mercury in the environment becomes available.

Batteries: Use of mercury in batteries is declining rapidly, although it continues to have specialized applications. Some states have banned the use of mercury in alkaline batteries, but mercury-containing batteries are still entering the waste stream. Use of mercury in button batteries is expected to decline to zero by the year 2000. Button batteries are found in toys, greeting cards, watches and games.

Fluorescent Light Tubes: Mercury is highly conductive to the flow of electrical current. Its conductivity and ready dispersibility make it an essential element in fluorescent and high intensity discharge (HID) lamps. These lamps require 75 percent less energy than incandescent bulbs and reduce mercury emissions from fossil fuel-fired power plants. Disposal of fluorescent lamps is regulated in a few states, including Minnesota and Florida. Mercury recycling programs are established in these states, but recyclers may be difficult to find in other areas.

Mercury-Containing Devices: Mercury is used in a wide array of devices for measuring temperature, pressure and vacuum. These include instruments such as thermostats, thermometers, barometers, manometers, vacuum gauges, switches, relays and sensors. Breakage of these devices and disposal down the drain discharges mercury to the wastewater treatment plant.

Dental Amalgam: Dental amalgam contains approximately SO percent mercury, along with varying amounts of silver, tin and copper. Most dentists practicing today use a prepared amalgam. A small percentage of the dental community uses bulk mercury to prepare amalgam. The use, removal and improper disposal of amalgam can be a significant mercury contribution to a wastewater treatment plant.

Pigments: Mercury-containing pigments have been used in paints, coatings and plastics, particularly for reds and oranges. Some of these are still produced, but cadmium has largely replaced mercury in pigments.

Laboratory Processes: Mercury is contained in many laboratory chemicals, and the use of chemical reagents varies with the type of laboratory. Wastewater labs, for example, commonly use mercury-containing reagents for determining total Kjeldahl nitrogen, chemical oxygen demand and chlorides.

Pesticides: Mercury has been used as a fungicide for seeds and to control disease on turf grasses. Mercury-containing pesticides are no longer available for purchase in the United States. However, other countries continue to use these products. Old products containing mercury may still be in circulation and can find their way into landfills and sewer systems through improper disposal.

Pharmaceuticals: Mercury use in pharmaceuticals has declined greatly. At this time, mercury compounds are used as preservatives in some ophthalmic products, nasal sprays, topical anti-microbial products (tincture of merthiolate), and vaccines for both humans and animals.

Preservatives: Mercury has been used to prevent mildew in paints and coatings, as a preservative in textiles and as a biocide in papermaking. The United States has discontinued all of these uses. Mercury is present in latex paint manufactured before 1990 and may be found in textiles imported from other countries. Laundering these textiles releases mercury to wastewater.

Mercury as an Unwanted Contaminant

Mercury can be found as a contaminant in chemicals or materials used in manufacturing processes. Raw materials manufactured by processes that involve mercury, such as the mercury-cell process used by chlor-alkali plants, contain small amounts of mercury. Although the mercury concentrations in raw materials may be low, the mass of mercury reaching the treatment plant can be large. The amount of the chemical used and the wastewater flow from the industry determines the mercury loading.

Chemicals manufactured using the mercury-cell process include caustic soda (sodium hydroxide), potassium hydroxide, chlorine and muriatic acid. Widely used in manufacturing processes, these chemicals may in turn be used to make other products, such as household bleach and reagent grade chemicals, cosmetics and pharmaceuticals.

They are used to treat drinking water and in the production of paper and food products. Caustic soda is also used in boiler feedwater treatment systems and in cooling towers to adjust the pH of water. All of these chemicals can be made using a mercury-free process. The ion-exchange membrane-cell and porous diaphragm-cell process are two examples of technologies that do not use mercury.

The Mercury-Cell Process

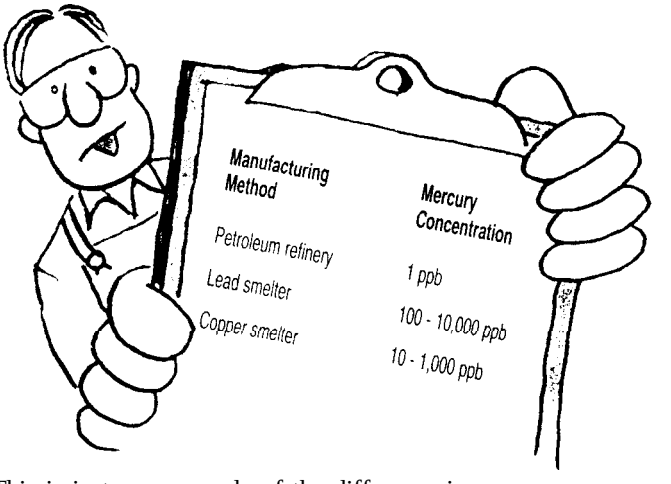
[illegible] used in manufacuring and other industrial [illegible] made using the mercury-cell process. The [illegible] sodium chloride solution takes place in an [illegible] In this process, liquid mercury floats [illegible] the cell to act as a cathode. Chlorine [illegible] the anode. Sodium cations reduce to sodium [illegible] an amalgam with the mercury. The amal- [illegible] decomposer where the sodium reacts with [illegible] sodium hydroxide and hydrogen gas. [illegible] recycled back into the process.

[illegible] relatively high volatility, it can become [illegible] both product and waste throughout the entire [illegible] chemical plants in the United States [illegible] cell process.

WLSSD found the following large differences in mercury concentrations in a sampling of chemicals produced by the mercury-cell and an alternative process:

	Mercury Cell	Membrane Grade
Caustic Soda	10-300 ppb	less than 1 ppb
Potassium Hydroxide	7 ppb	less than 1 ppb

Mercury is found as an unwanted contaminant in sulfuric acid. Industrial processes. including lead and copper smelting and petroleum refining, produce sulfuric acid as a byproduct The table below provides an example of the range of mercury concentrations in sulfuric acid found by one WLSSD customer. Note the different manufacturing methods.



This is just one example of the difference in mercury concentration found in one sample of raw materials. It is important to test your own chemicals or request information from your supplier.

Mercury levels in raw materials can vary depending upon the source. Sources for raw materials vary from one region of the country to another. Industries should specify low-mercury chemicals and request certificates of analysis from all chemcal suppliers when purchasing materials. The certificate of analysis should list mercury content in parts per billion (ppb), not as a percentage. A Material Safety Data Sheet is not equivalent to a Certificate of Analysis (See Appendix C and D).

These practices are pollution prevention in action and will help to create demand for low-mercury chemicals. Increased demand for low-mercury products will accelerate the chemical industry's move away from mercury-containing chemicals.

Contributions of Mercury to a Wastewater Plant

There are certain mercury contributors common to any community. Based on a literature review and WLSSD investigations, the following list of mercury contributors was developed to help begin a mercury elimination project.

Common Mercury Contributors

Hospitals: Historic and current breakage of mercury-containing equipment contributes mercury to wastewater. Additional major sources include mercuric oxide batteries and mercury-containing laboratory reagents such as Zenker's Solution and B5 (mercuric chloride). WLSSD found mercury concentrations to wastewater ranging from 0.3 ppb to 5.4 ppb.

Dentists: Dental contributions are due to mercury-containing amalgam. Some of this mercury may be transformed into a bioavailable form during wastewater treatment. Most of it concentrates in wastewater sludge, which is land applied or incinerated. WLSSD investigations revealed an average mercury contribution to wastewater from 0.1 - 0.3 grams/dentist/day.

Sewer Cleaning Practices: Mercury collects in the sediments in sewer lines because it is much heavier than water. Sewer cleaning practices send a significant amount of mercury to a plant through flushing of the lines. Alternative cleaning methods, such as removing sediment with a bucket, or vacuuming sewer lines, should be considered for use below facilities with current or historic uses of mercury..

Septic Haulers: WLSSD found an average mercury concentration of 62 ppb when sampling septic hauler discharge. The total volume of septage is low compared to other sources. Calculate a mass-loading estimate to assess the importance of the contribution to your facility. WLSSD estimates 1.6 percent of influent mercury is from septage. Septage was also found to be high in lead.

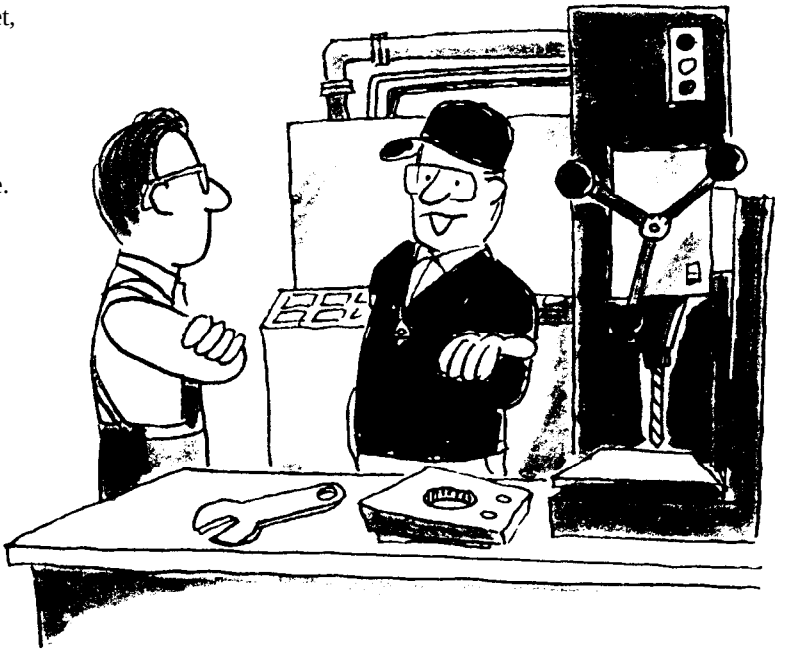
Residential Wastewater: WLSSD found an average mercury concentration of 0.1 ppb when sampling sewer lines from residential neighborhoods. Calculate a mass loading estimate for the known residential flow.

Unique Mercury Contributors

Differences in local economies create mercury contributors unique to each community. Following are a few examples:

Industrial Laundries: Research from WLSSD and the Detroit Water and Sewerage District suggest that the contribution from industrial laundries can be significant. The potential source of mercury is chemicals used in the cleaning process, such as caustic soda or bleach, or simply the dirt, grease and oil in clothing. Some studies indicate that mercury may come from dyes or preservatives in clothing, particularly imported clothing. Sampling at one facility during the WLSSD project found a concentration of 0.7 ppb in effluent.

Laboratories: Mercury discharges are due to use of mercury-containing equipment and reagents. WLSSD found discharges as high as 5 ppb for one lab in the service area. Reagent use varies with the type of lab. Examine all labs individually.



Veterinary Clinics: Sources include mercury-containing reagents and measuring devices. Staff at one clinic in the WLSSD service area reported that thermometer breakage is common when working with dogs and cats. It may be important to encourage use of an alternative type of thermometer by veterinarians.

Printing Industry: Mercury is discharged to sewers from inks or special paper coatings. WLSSD found no detectable mercury at a detection limit of 0.2 ppb.

Pottery and Arts: Mercury is discharged to sewers from pigments in art materials. WLSSD found concentrations up to 0.31 ppb in the discharge from a local arts center. Testing of individual ceramic glazes found mercury concentrations up to 41 ppb.

Automobile Service: Mercury is present in dirt and oil. In some instances, automobile service industries discharge mercury and contribute lead and other metals to the wastewater.

Painting and Paint Stripping: Mercury has been banned from latex paint since 1990. An average mercury concentration of 250 ppb was found in latex paint analyzed by the South East Pollution Control Plant in San Francisco, Cal. Old latex paint from their household hazardous waste collection facility had an average mercury concentration of 125,000 ppb. Sources of mercury in storage of old paint in some businesses may need to be addressed.

Scrap Dealers: Vehicles, appliances and other devices (light fixtures, gauges) contain mercury components. Mercury components can be a significant contribution depending on how the scrap dealer processes material. Most processes do not involve the use of water.

Landfill Leachate: Leachate characteristics vary widely depending on the type of landfill and the waste in it. According to the MPCA *Strategies for Reducing Mercury in Minnesota*, mercury levels range from 0.7 ppb to 2.0 ppb in the leachate at municipal solid waste landfills. WLSSD found a very low concentration of <O.O5 ppb in leachate from its industrial landfill.

Pollution Control Devices: Facilities that use wet scrubbers may contribute large amounts of mercury if the scrubber water is not pretreated before discharge to the sewer. The average mercury concentration in WLSSD scrubber water was 200 ppb before treatment, decreasing to 20 ppb after treatment.

A Guide to

Launching A Mercury Reduction Project at Your Treatment Plant

Planning the Project

Gaining Support

Teamwork

Lead by Example

Before approaching wastewater customers, start by implementing a mercury reduction effort in your plant. It is very instructive for your pollution prevention team and will allow them to:

1. Identify internal mercury sources.

Educate plant staff on the effects of mercury on the environment. Prepare a checklist identifying possible sources of mercury in the plant. Operations and maintenance staff should complete the checklist for each area of the plant. The pollution prevention team provides guidance and investigates questionable sources. See Appendix G for the sample WLSSD Operations and Maintenance Hazardous Waste Checklist.

2. identify key players or departments necessary for the success of any reduction effort.

Working with plant staff to identify mercury sources allows the pollution prevention team to identify areas that may have similar contributions in other industries. Work with the purchasing department to develop purchasing procedures for low-mercury products.

3. Gain experience in project implementation.

Many of the barriers and pitfalls of a project will be identified within your own plant. The experience of overcoming these barriers in the plant will improve your chances of success outside the plant.

4. Identify and improve on the strengths and weaknesses of proposed solutions.

Implementing proposed strategies in the plant will bring credibility to proposed strategies within the community.

Evaluating Your Wastewater Customers

Look at the makeup of your community. Create a list of wastewater dischargers that you suspect contribute mercury to your plant. Monitoring programs may have already identified some likely mercury contributors in your community.

Check out:

- Dental offices
- Hospitals and other medical facilities
- Industries that use large volumes of caustic soda or acids
- Laboratories

The case studies at the end of this guidebook provide detailed examples of reduction projects that have been successful in the WLSSD.

Prioritize your list of mercury contributors according to their discharge of mercury. Work with the largest contributors first. It is important to consider the following:

- The loading to the plant from each contributor
- The range of mercury concentrations
- The number of each type of contributor in your community

Calculate mercury loading from a contributor using the following formula:

Mercury concentration (ppb) X
3.78 X flow (million gallons/day) =
Mercury loading (grams/day)

WLSSD wastewater monitoring revealed the following:

	Concentration (ppb)	Flow (mgd)	Mercury loading (grams/day)	Quantity	Total loading from specific contributor (grams/day)
Laboratory	1.87	0.019	0.134	1	0.134
Permitted Industry	0.6	15	34	1	34
Dentist	33.7	0.001	0.127	75	9.53

The data show that the industry was contributing 250 times more mercury to the treatment plant than the laboratory or the individual dentist, even though the concentration of mercury in its wastewater was the lowest measured. When prioritizing pollution prevention activities, it is important to measure or estimate flow and not to rely strictly on concentration data.

Calculate the total loading from a specific type of contributor by multiplying flow by the number of that type of contributor. This gives you a rough estimate of the mercury loading from many similar, but low-level sources in your community. In this example, the data show the dentists contributing a significant portion of the total mercury loading to the plant.

Depending on your community, other groupings of mercury contributors may include hospitals, art studios, laboratories or auto repair facilities.

This approach can be used to prioritize groups of facilities within your community. The pollution prevention team should consider the relative ease or difficulty of working with each specific group. Dentists typically have a local professional organization, which makes a large group easy to work with. Auto repair facilities may not have such an organization, so it may be necessary to approach individual facilities.

How Important is Monitoring?

Monitoring is not absolutely necessary in order to have a successful mercury reduction project. [illegible] data can be used to identify the most likely mercury contributors to wastewater treatment plants. If [illegible] circumstances allow you to monitor, the information you gather can be used in a number of ways:

- [illegible] and prioritize mercury sources
- [illegible] customers that they are a source of mercury
- [illegible] mercury reductions

[illegible] to monitor depends on the availability of funds and the assessment of the need for this [illegible] your pollution prevention program. If your program does not provide for monitoring, [illegible] manual to prioritize activities. Success can be documented by describing how [illegible] and product usage have changed as a result of the mercury reduction project.

[illegible] laboratories will analyze wastewater samples for mercury using the EPA approved cold vapor [illegible] Method 245.1 for about $30 per sample. This method has a mercury detection limit of [illegible] Some of the sources described in this booklet can be assessed with this technique.

[illegible] necessary to test a wastewater discharge below 0.2 ppb, an alternative method is required. This [illegible] uses cold vapor atomic fluorescence with gold trap amalgamation and requires clean [illegible] and laboratory techniques. This method of testing has a detection limit of less than .001 ppb. [illegible] this type of analysis is about $100 per sample. Low-level methods are commonly used for [illegible] purposes, but they are not yet approved by the EPA. They can, however, be useful to monitor [illegible] mercury reduction efforts when working with low-mercury discharges.

Working with Customers

Now that you have prioritized mercury sources, it's time to approach your customers. If you are viewed as a regulatory agency in your community, you may need to invest time in developing partnerships with customers. Enlist help in approaching customers if necessary. Some industries may be more receptive to technical assistance agencies than to treatment plant staff.

Start with a company that you have a good working relationship with and emphasize a cooperative, non-adversarial approach. Contact the environmental manager or someone who deals with environmental issues for the company. Many companies have employee committees that deal with waste reduction and other internal issues such as health and safety. If you are focusing on a group, such as dentists, find out if they have a local professional organization and work through this channel to gain support.

Be sure to explain why mercury is a concern and the benefits of pollution prevention over pollution control. If you have monitoring data, present it during your meeting to illustrate the problem. Use information about successful mercury reduction programs in similar facilities, like that contained in this report.

Always remember to keep the emphasis on cooperation. Work with customers to set up pilot or demonstration projects for mercury reduction in their facilities. Document all mercury-containing products in use and look for alternatives. Internal audits, wastewater monitoring and laboratory testing of feedstocks may all be helpful in this process. Don't forget to educate the employees about the project. Keep track of all steps along the way and keep participants informed of the progress you are making.

Public Education

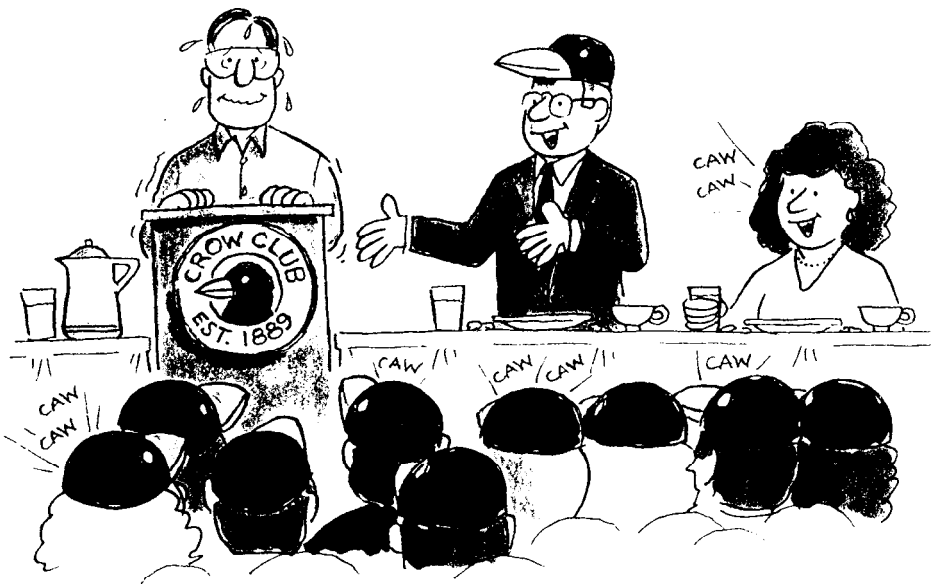
A mercury reduction program has two objectives: proper disposal of mercury waste and reduction of mercury discharges. A public education campaign can help raise awareness in the community about mercury pollution. Creating awareness will build community support and allow customers to make informed choices about mercury disposal and reduction. Your mercury reduction program will have a greater chance of succeeding if you invite the community to work with you as partners. Here are some examples of ways to build community support for mercury pollution prevention and develop opportunities for education.

Building community support

- Provide tours of your facility.
- Become involved with community activities in your neighborhood.
- Support science education in the schools and in the community by serving on school committees and providing information on waste management and environmental issues.
- Support community environmental activities.

Opportunities for education

- Write a news release to let the public know you're undertaking a mercury reduction project and to give them information about how they can participate. (See Appendix B)
- Work with your area household hazardous waste program or health department. Distribute information at household hazardous waste collection events.
- Speak to local service groups and community clubs.



- Place an informational flyer or brochure in utility bills.
- Develop a fact sheet or brochure to distribute where mercury-containing items are purchased or at health-care offices and clinics.
- Write articles for employee newsletters.
- Develop educational displays or posters and make them available for public events or retail outlets.
- Work with your extension service to connect your program and issues with their environmental programs.
- Develop and conduct or sponsor teacher workshops on waste management issues.
- Meet with representatives from your local newspaper, radio and television station to educate and encourage them to cover mercury-related issues. Provide a tour of your facility and information on the wastewater treatment process. Update these media contacts as your program develops.
- Work with your public television station to develop a program on reducing mercury pollution.
- Develop public service announcements for radio and television.

A public education campaign can be simple or elaborate. Education materials on mercury reduction are available from WLSSD and many other agencies in the Great Lakes states. These materials can be easily modified for any program.

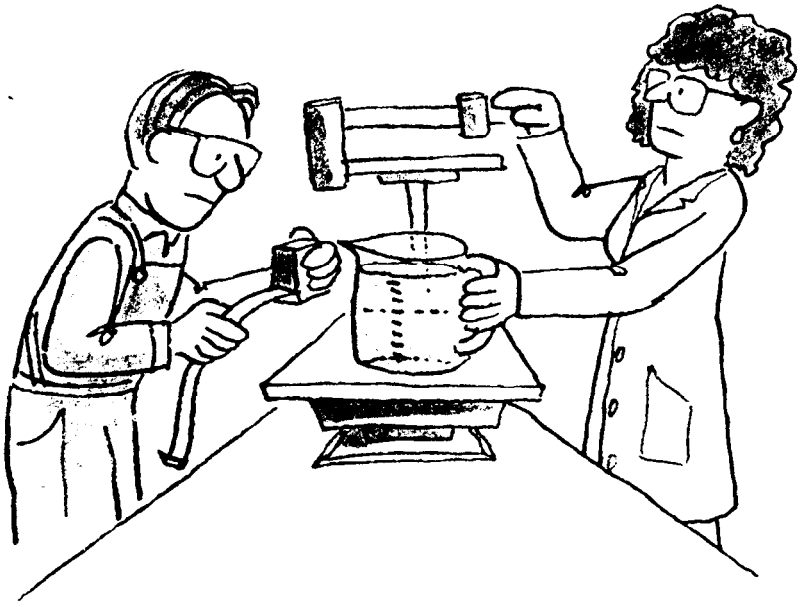
Measuring Results

Measuring results is important for evaluating the effective ness of your program. Both qualitative and quantitative methods can be used to measure progress. If your program includes a monitoring component. such data can be very useful in demonstrating progress over time. Local industries may have monitoring data to share as well. Tabulating the amount of mercury waste collected and recycled is another quantitative way to record progress.

Monitoring isn't the only way to show that you are making headway. Some other ways to measure effectiveness include:

- Measure the number of contacts made with industry.
- Measure the number of participants working with you to reduce mercury.
- Measure the number of pollution prevention programs implemented.
- Record quantities of brochures distributed, or other educational contacts.
- Measure public awareness about mercury pollution - record the number of calls received for more information.
- Survey industry for changes in practices, for example, how many dentists are recycling amalgam from chairside traps?

Set goals for your program and evaluate progress against those goals. Goals can be tailored to fit with the measurement methods available.



Program Support

The WLSSD has been fortunate to find a receptive audience for pollution prevention programs in its community. We attribute our success to having good relationships with our customers and the environmental community and a long-standing reputation as a leader on environmental issues.

In addition, the Minnesota Legislature has contributed to the WLSSD'S success in mercury pollution prevention by banning certain uses of mercury and regulating disposal of products containing mercury. These initiatives have helped to create institutional support for mercury reduction programs in Minnesota.

MPCA Special Hazardous Waste Pilot Project

In 1993, the Minnesota Pollution Control Agency implemented a Pilot Project for the management of special hazardous waste. The project allows the use of reduced management standards for those companies or organizations that generate, transport or collect special wastes in order to promote the establishment of easily accessible and economical collection systems. Mercury and mercury-bearing waste products are considered special wastes. This pilot project extends through 1997.

Minnesota Mercury Legislation

Mercury Reduction

Mercury in thermostats, thermometers, electric switches, appliances and medical or scientific instruments must be reused or recycled.

A medical facility may not routinely distribute thermometers containing mercury.

A person may not sell a toy or game that contains mercury, or an item of clothing or wearing apparel that contains an electric switch that contains mercury.

Mercury Prohibition

A person may not place mercury or a thermostat, thermometer, electric switch, fluorescent or high-intensity discharge lamp, appliance or medical or scientific instrument from which the mercury has not been removed for reuse or recycling:

- in solid waste; or
- in a wastewater disposal system.

General and Special Purpose Battery Requirements

A manufacturer may not sell, distribute or offer for sale in this state an alkaline manganese battery, except an alkaline manganese button cell, that contains mercury.

Toxics in Specified Products

No person may distribute for sale or use in this state any ink, dye, pigment, paint or fungicide into which mercury has been intentionally introduced.

Addressing Sources of Mercury: Success Stories

This section is a collection of case studies on mercury reduction efforts carried out by WLSSD staff in cooperation with customers.

The case studies illustrate the different types of customers contributing mercury to the waste-water treatment plant, how a mercury reduction effort was undertaken with the customer, and the outcome of the effort.

Success Story #1:

Mercury in Dental Amalgam

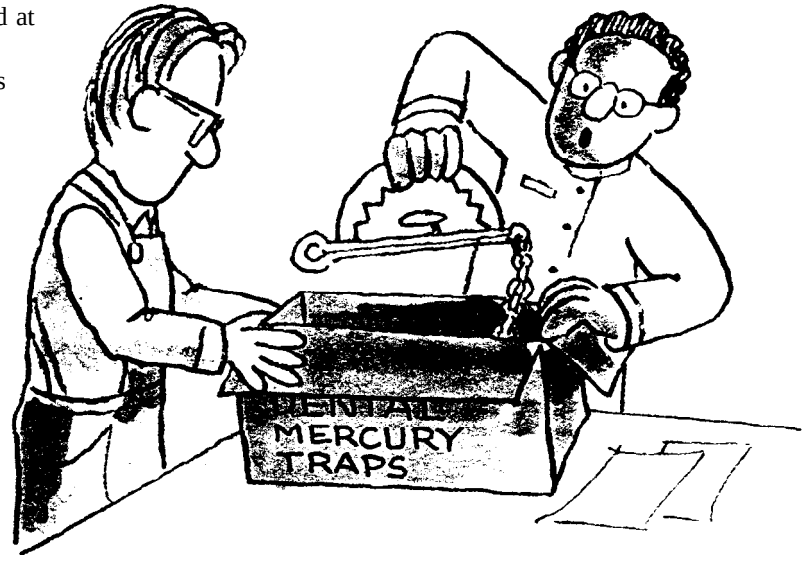
Mercury-containing amalgam is used by dentists as a filling material for teeth. Waste amalgam sometimes is disposed of down the drain. Alternative filling materials are becoming increasingly available, but mercury amalgam remains in use because it is versatile, inexpensive and easy to use.

In 1993, WLSSD staff sampled the wastewater discharge from a medical building housing several dental practices and found a mercury concentration of 35 ppb. This represented approximately 0.3 grams of mercury discharged by each dentist each day. Staff approached the local professional organization, the Northeast District Dental Society, and suggested that they work together to raise awareness in the profession and keep mercury out of the wastewater, The focus was on capturing mercury instead of allowing it to be flushed down the drain.

With assistance from the Dental Society, WLSSD staff produced a manual of best management practices with information on proper disposal of mercury, amalgam and other dental office wastes. This manual was distributed to all dentists in the WLSSD service area. Subsequent. monitoring of the same building in 1995 found the effluent mercury concentration reduced to 0.086 grams of mercury per dentist per day. This reduction was attributed to the outreach program and changes in waste handling practices at the dental offices.

In 1995, WLSSD staff returned to the dentists to conduct waste audits (see appendix H). These audits disclosed that while amalgam waste captured in chair-side traps and vacuum pump traps was no longer being disposed down the drain, it was still being placed in the solid waste or medical waste container. Solid waste is burned at the WLSSD facility and medical waste is routinely incinerated in Minnesota, so this disposal practice still creates mercury pollution. This is an example of cross-media transfer of a pollutant from the wastewater to the solid waste stream. WLSSD staff worked with medical waste contractors in the region and a mercury recycling firm to set up a pilot program to collect chairside traps for recycling. This program was announced in September 1996, and an accompanying insert for the manual was distributed through the Dental Society.

Several dentists agreed to work with WLSSD staff to field test equipment designed to remove amalgam from the wastewater generated from the dental vacuum systems. Properly designed amalgam separation units are 80-99 percent effective at removing mercury from dental wastewater. There are presently no standards for this type of equipment and the units WLSSD tested varied widely in effectiveness. The waste collected in these units consists of fine amalgam particles. WLSSD staff are working on recycling options for this material. This technology appears promising, but problems



with noise, leakage, cost and effectiveness of the units must be addressed by manufacturers before this becomes a widely accepted solution.

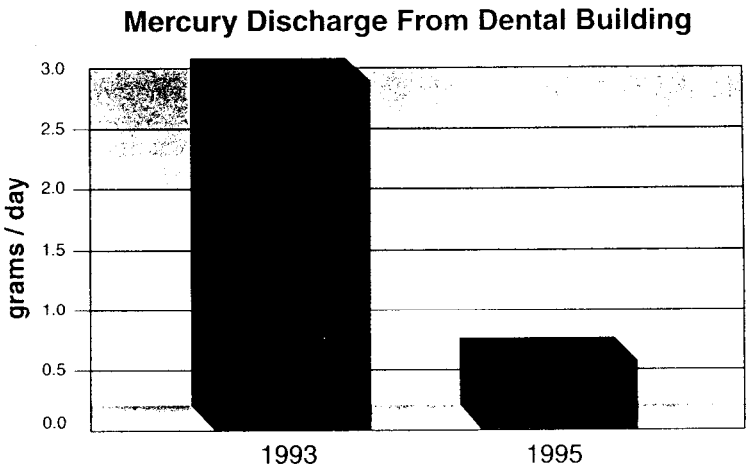
Cooperation between WLSSD staff and the Dental Society has been the key to this project's success. District staff have attended professional meetings to discuss the mercury issue, and drafts of all findings and documents were reviewed by the dental community. The WLSSD continues to work with the Dental Society to evaluate the cost of amalgam recycling, to evaluate amalgam removal equipment currently on the market, to further develop the recycling program and to provide ongoing pollution prevention education for the dental community.

WLSSD staff recommend that dental pollution prevention programs address all five mercury-bearing waste streams that may be generated from dental offices. These are:

- Elemental or bulk mercury
- Unused amalgam
- Used amalgam caught on the chair-side trap
- Amalgam sludge that settles in vacuum pump traps
- Wastewater discharged from vacuum systems

Chair-side traps, in combination with amalgam separation units, have the potential to capture virtually all of the mercury waste discharged from dental offices, but recycling markets for the material collected are limited at present.

Continued updates and education with dental offices must include hygienists, assistants and other office staff as well as the dentist, since it is usually the staff who are responsible for waste management.



Success Story #2:

St. Mary's Medical Center

St. Mary's Medical Center is a 326-bed hospital located in Duluth. WLSSD staff began the mercury reduction project by meeting with hospital management to ensure their interest and commitment. Once support was assured, an existing team of hospital employees worked with WLSSD staff on the project.

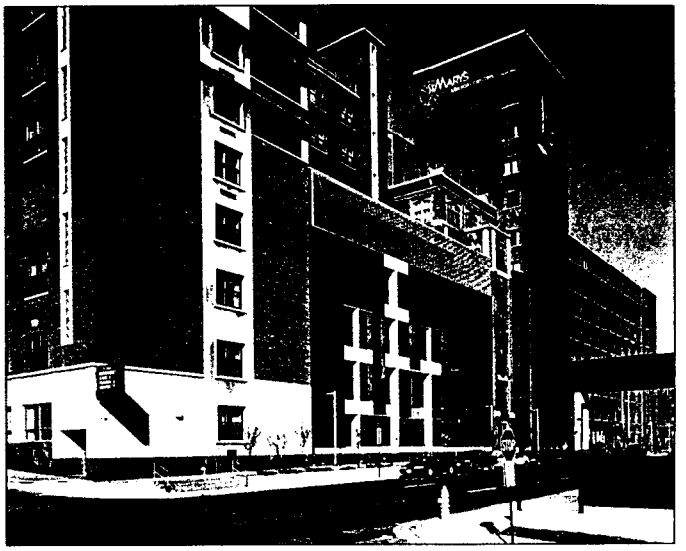
Representatives from maintenance and purchasing were particularly important to the team. The maintenance staff is familiar with the inner workings of the hospital, which is helpful when conducting monitoring. Purchasing department involvement is necessary because toxics reduction projects often involve changes in the types of products purchased and used.

As a first step, the mercury reduction team completed a survey on mercury use provided by WLSSD (Appendix F). The survey disclosed that St. Mary's had already replaced some mercury-containing items, such as thermometers and blood pressure cuffs, with alternative electronic devices. In addition, mercuric chloride, a common reagent used in the pathology lab, was being captured and handled as hazardous waste instead of being flushed to the wastewater treatment plant.

A wastewater monitoring plan was then developed to try to pinpoint mercury sources within the hospital. Older buildings like hospitals often have several discharge points to the sanitary sewer system. Meeting with maintenance staff to review old blueprints is essential before beginning a monitoring program. The use of dye tablets may be needed to verify sewer flow and route connection information, especially in facilities that have undergone expansion.

Monitoring results found mercury concentrations varying from 0.3 ppb to 1.2 ppb. The monitoring also identified days on which mercury concentrations were high, and where it came from in the hospital. In this case, the information was valuable in educating the reduction team. The team felt they had already solved their mercury problem and didn't anticipate additional discharges. Once they saw the numbers, however, a "can do" attitude quickly developed.

At this time, the mercury in the wastewater appears to be coming from the hospital laboratories and laundry services. Reagents and bleach are the suspected sources. These products are being investigated and, where possible, alternatives will be substituted.



Historic sources are also under investigation. Mercury from items such as broken thermometers may have been disposed of down the drain in older buildings. The mercury accumulates in waste traps and discharges in small amounts each time water is used. Traps in nursing stations and in the labs are being cleaned and inventoried as part of the reduction effort.

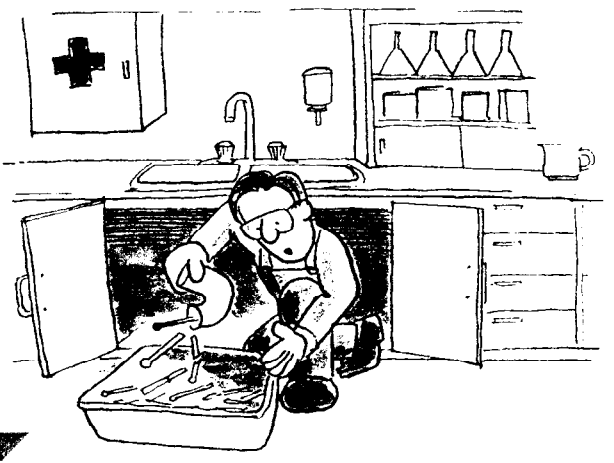
WLSSD continues to work with St. Mary's on mercury reduction and has initiated similar projects with the other hospitals in Duluth. These following actions are essential first steps for any hospital beginning a mercury reduction project:

1. Discontinue the purchase of mercury-containing equipment such as thermometers, sphygmomanometers and gastrointestinal equipment, and substitute mercury-free alternatives for existing equipment.

2. Discontinue the policy of sending mercury thermometers home with new parents (this practice is illegal in Minnesota).

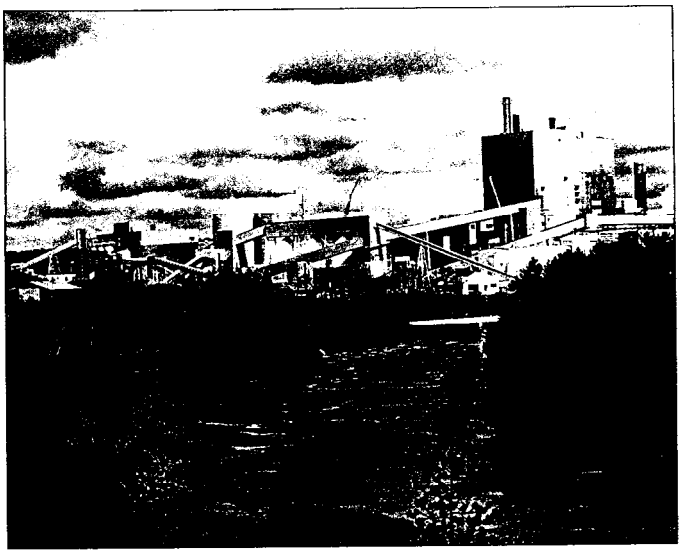
3. Institute recycling programs for mercury-containing lamps and batteries.

4. Implement a mercury-free purchasing policy and request all vendors to disclose mercury concentration on a Certificate of Analysis. Products with no, or low mercury, can then be selected for purchase.



Success Story #3:

Potlatch Corporation



Potlatch Corporation operates an integrated pulp and paper mill in Cloquet, Minnesota, that produces fine coated printing papers. After primary treatment, it discharges its effluent to WLSSD for secondary treatment. In mid-1994, the mill and WLSSD identified mercury spikes as high as 1 ppb in wastewater from the mill. Potlatch accounts for about 35 percent of the flow to the WLSSD's treatment plant, so this amount of mercury was a significant contribution. A pollution prevention assessment team consisting of Potlatch and WLSSD staff, along with chemical engineering students from the University of Minnesota-Duluth, was formed to identify the source of the mercury. Potlatch had previously implemented a pollution-prevention program that included extensive use of mercury-free alternatives and a mercury recycling program. Potlatch had also investigated sewer lines to ensure that mercury was not trapped in sewers where it could be released into the wastewater during high flow conditions.

The assessment team focused on mercury as a contaminant in raw materials. Rather than analyzing every feedstock chemical individually, wastewater effluent analysis was used to locate mercury sources within the manufacturing process. The mercury was traced to the bleaching process, and the feedstock chemicals analyzed for mercury included sodium hydroxide (caustic soda), sulfuric acid and chlorine dioxide. Based on these analyses, along with telephone surveys of chemical suppliers, the source was determined to be sulfuric acid. The mill was receiving sulfuric acid from a lead smelter and its mercury content was significantly higher than would normally be expected, as high as 10,000 ppb. As a result of switching to an alternative source of sulfuric acid, the mercury concentration in the mill's effluent was reduced by 98 percent.

Potlatch recommends the following pollution prevention procedures for products and feedstock chemicals:

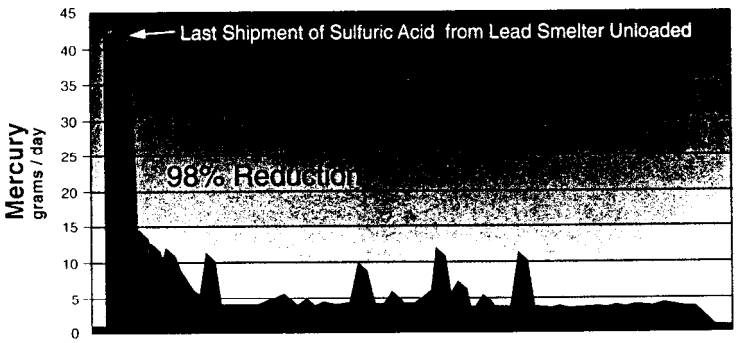
1) Inform chemical suppliers about the concern for mercury contamination in feedstock chemicals. Because mercury is not listed on an MSDS request, the mercury content, expressed in parts per billion, is included on a Certificate of Analysis (see example appendix C). Mercury content expressed as a percentage is not adequate.

2) Implement a chemical management program that includes prepurchase review and approval by environmental staff.

3) Require that all engineering projects be reviewed by environmental staff in order to discuss potential environmental impacts specific to mercury or other chemicals of concern.

4) Practice the basics of pollution prevention: a) know where mercury is found; b) use mercury-free alternatives; c) properly recover and recycle elemental mercury and mercury-containing products.

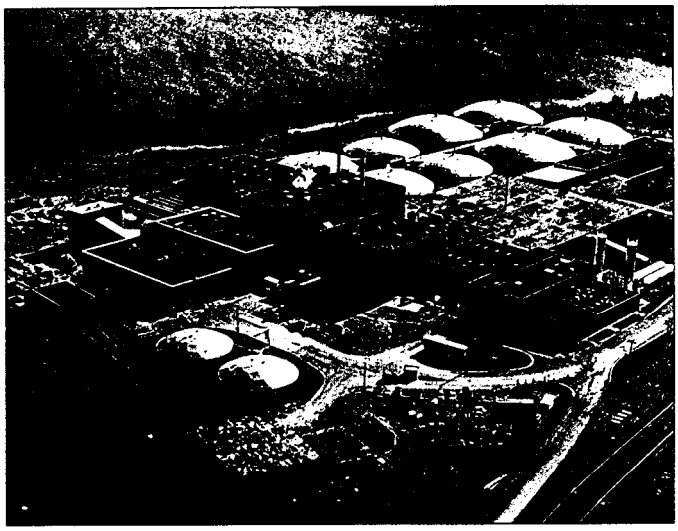
Mercury Mass Flow in Primary Wastewater Effluent



January thru September 1995

Success Story #4:

Western Lake Superior Sanitary District



The Western Lake Superior Sanitary District provides wastewater treatment and solid waste management services to a 500-square-mile area including Duluth, Minnesota. The 43-million-gallon-per-day wastewater treatment plant utilizes advanced secondary wastewater treatment to serve 10 municipalities with a total population of 130,000. The WLSSD also processes solid waste to manufacture a refuse-derived fuel (RDF), which is used to incinerate sludge from the wastewater treatment process.

Major industries discharging to WLSSD are the pulp, paper and wood products industries. Others include chemical manufacturing, metal finishing, a foundry, a steam plant and a research laboratory. The WLSSD is the largest point source discharger on the U.S. side of Lake Superior.

District staff became concerned about effluent mercury in 1989, following reports of high levels of mercury in fish in the St. Louis River. The WLSSD integrated facility receives both wastewater and solid waste, so both systems have been examined for mercury-reduction opportunities.

WLSSD pollution control equipment includes a wet scrubber which removes particulates, heavy metals and other pollutants from the incinerator emissions. Mercury and other metals condense and become concentrated in the scrubber water. Prior to 1990, the scrubber water was recirculated back to the head of the plant for treatment. carrying its load of metals with it. This process was modified to separate the scrubber water from the plant influent. Scrubber water is now pretreated and largely contained within a closed loop system, resulting in a reduction in mercury loading to the plant.

Improvements in the solid waste processing system implemented in 1995 have resulted in the production of a cleaner fuel, with an associated decrease in mercury content. A higher percent of ferrous metals are removed from the solid waste processing stream through improvements to the magnetic separator. Staff training has improved the on-line process of removing problem materials. The changes in scrubber water management and fuel processing have also contributed to a reduction in mercury air emissions from the incinerator.

Process chemicals were sampled for mercury contamination. Samples of caustic soda, sulfuric acid. ferric chloride, polymer and defoamant were analyzed for mercury content.

Mercury concentration in caustic soda was found to be as high as 100 ppb, in sulfuric acid as high as 10,000 ppb and in ferric chloride as high as 8,000 ppb. Polymer and defoamant were not found to be sources of mercury.

A checklist and survey was prepared for operations and maintenance staff to use in identifying sources of mercury in their work areas (See Appendix G). Staff safety meetings were used to educate employees about mercury in the workplace, including proper management and pollution prevention techniques.

Other pollution prevention measures implemented at the WLSSD include screening process chemicals for mercury levels. review of the chemical purchasing procedure to insure that new chemicals meet specifications, and a review of laboratory procedures to modify those that involve mercury.

MercAlert

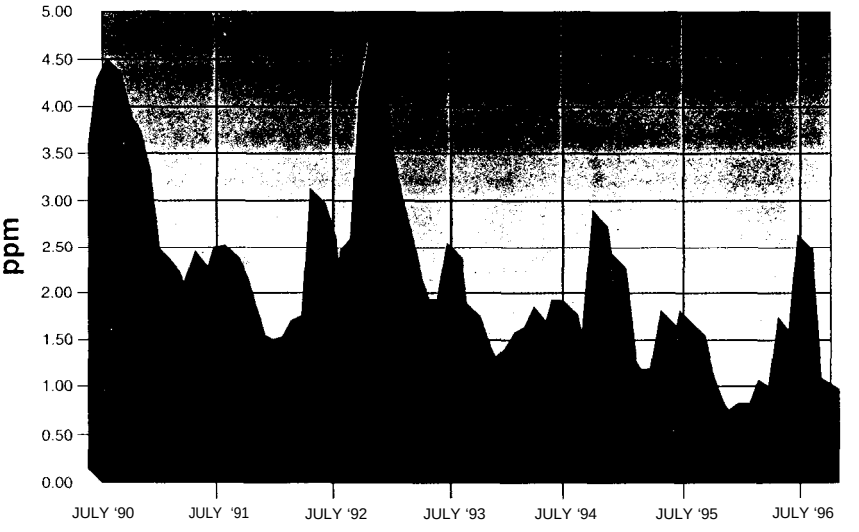
WLSSD Public Education Campaign

In addition to process changes within the plant, another component of the WLSSD program focused on reducing mercury contributions to solid waste and wastewater by raising public awareness. The MercAlert Program was developed to raise public awareness about mercury in the environment and to promote alternatives to mercury-containing products and proper disposal of mercury-bearing wastes. This ongoing

program was initiated in 1992 with grant assistance from the Minnesota Office of Environmental Assistance.

WLSSD staff first worked with a public relations firm to develop a recognizable logo for the campaign. WLSSD contracted with a local public television station to film a short documentary about household products containing mercury and proper disposal. The program aired several times in a format which allowed viewers to call in with questions. A slide program for general audiences and brochures on mercury and household batteries were also produced.

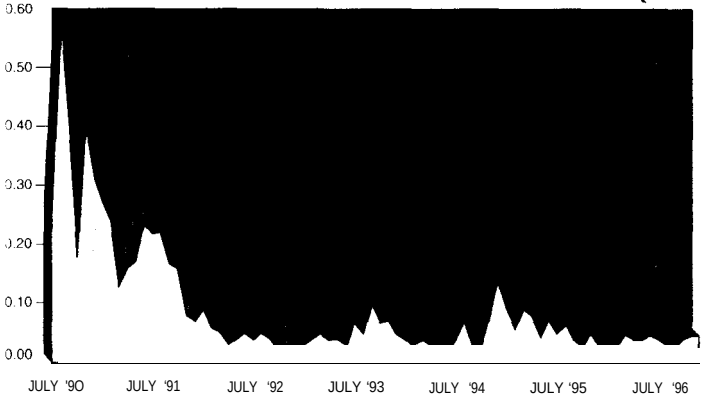
Mercury Concentration in WLSSD Dry Sludge



An intern worked with local retail outlets to set up a collection program for button batteries. These batteries are recycled through the WLSSD household hazardous waste facility. The MercAlert program collected over I75 pounds of mercury batteries between I993 and 1996. All types of mercury waste are accepted from homeowners at no charge through the WLSSD household hazardous waste program.

The WLSSD cooperated with the Minnesota Pollution Control Agency (MPCA) on a bounty program to collect liquid mercury in 1995. The event brought in 217 pounds of mercury from 13 businesses and 27 households. Businesses were offered one-time free disposal for their mercury and homeowners received mercury-free thermometers. The MPCA paid for disposal of the mercury, which was collected through the WLSSD household hazardous waste program.

Mercury Concentration in WLSSD Effluent



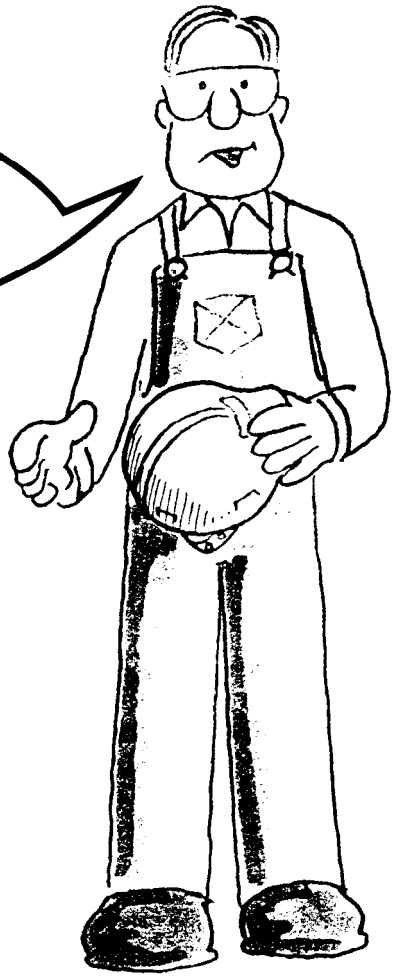
The WLSSD worked with a local private school to host a mercury fever thermometer roundup. This one-day event collected 105 mercury fever thermometers from families, teachers and the school nurse. WLSSD provided recycling for the mercury and a nonmercury fever thermometer for each participant. This program collected 167.56 grams of mercury.

Other MercAlert projects include a battery-education campaign for high school students, teacher workshops on mercury, and promoting disposal of mercury-containing fungicides through waste pesticide collection programs to users of these products. The MercAlert program has been the model for similar educational campaigns in other states and is credited with helping to achieve substantial reductions in WLSSD mercury emissions.

As a result of in-house process changes and this ongoing public awareness program, WLSSD has seen a reduction of mercury in dry sludge from 4.50 ppm in 1990 to 1.15 ppm in 1996. During the same time period, effluent mercury levels decreased from 0.58 ppb to 0.015 ppb.

Our Experience

The WLSSD Mercury Zero Discharge Project has demonstrated that significant mercury reductions can be achieved in municipal wastewater discharges through cooperative partnerships with industry public education, and disposal opportunities.



Some suggestions for communities embarking on mercury reduction projects:

- It is not enough to talk about proper management of mercury wastes. In order to be truly effective, communities must be prepared to support collection and disposal programs for household mercury wastes and to research mercury recycling opportunities for commercial wastes.

- A mercury reduction program that focuses on recognized contributors, such as dentists, hospitals and specific industries, will be most effective. Use the resources in this document to choose a starting place in your community. Concentrate your energies on willing partners and the more reluctant parties will climb on the bandwagon as you make progress.

- Some sources of mercury are more easily dealt with than others. For example, industrial laundries have been found to be sources of mercury discharge in Detroit, Chicago and Duluth. However, it appears that much of this mercury is contained either in the clothing dyes or the dirt in the clothing. An industrial laundry's only pollution prevention action may be to initiate customer awareness programs to identify and limit mercury in soiled garments.

- Share what you learn by compiling project results and reporting them through trade journals, professional organizations, employee newsletters and formal presentations. An industry that has successfully implemented a pollution prevention program will be an invaluable resource for others. Share success with the community through news releases, awards or other public acknowledgments. Monitoring programs can help make your progress visible over time.

- It will take time for the results of your efforts to become apparent. Industries and businesses need to train employees and work through internal channels before implementing programs. This is a necessary step in the process. Pollution prevention staff should be prepared to spend time guiding and providing encouragement in the early stages.

- The progress you observe will be gradual. Occasional setbacks or surprises can be expected when industries change processes or substitute materials. Remember that pollution prevention is an ongoing, long-term commitment to examine practices, educate customers and share experience and information.

Mercury Zero Discharge Project Collaboration Committee

A 25-member advisory committee composed of representatives from industry, environmental organizations and government agencies with expertise in dealing with mercury issues guided the Mercury Zero Discharge Project. The advisory committee assisted WLSSD staff in designing, implementing and tracking the project.

Ray Boivin
Lake Superior Programs Office
Thunder Bay, ON

Kelly Burch
Pennsylvania Dept. of Environmental Protection
Meadville, PA

Janeth Campbell
FL Dept. Environmental Protection
Tallahassee, FL

Jan Conley
MN Mercury Network
Superior, WI

Dick Diercks and Claudia Kauter
Minnesota Dental Association
St. Paul, MN

Peter Dunn and Wayne Poole
Environmental Services Region Of Hamilton Wentworth
Hamilton, ON

Lois Epstein, PE.
Environmental Defense Fund
Washington, DC

Matt Gluckman and Steve Jann
U.S. Environmental Protection Agency-Region 5
Chicago, IL

Leo Hermes
Metropolitan Council, Environmental Services
St. Paul, MN

Thomas Hersey
Erie County Department of Environment & Planning
Buffalo, NY

Beverly Ingram and Joan Hughes
Detroit Water and Sewerage District
Detroit, MI

Kevin Kangas
Potlatch Corporation
Cloquet, MN

Richard Lanyon
Chicago Metropolitan Water Reclamation District
Chicago, IL

Carri Lohse-Hanson
Minnesota Pollution Control Agency
St. Paul. MN

Charles Olson and Kim Huber
Wisconsin Department of Natural Resources
Bride, WI, and Madison, WI

Michael Schifano
Monroe County Department of Environmental Services
Rochester, NY

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Water Pollution Control Division
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Milwaukee, WI

Baz Stevens and Rick Renaud
King County Department of Metropolitan Services
Seattle, WA

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John D. Thompson
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Guy Williams
National Wildlife Federation
Ann Arbor. MI

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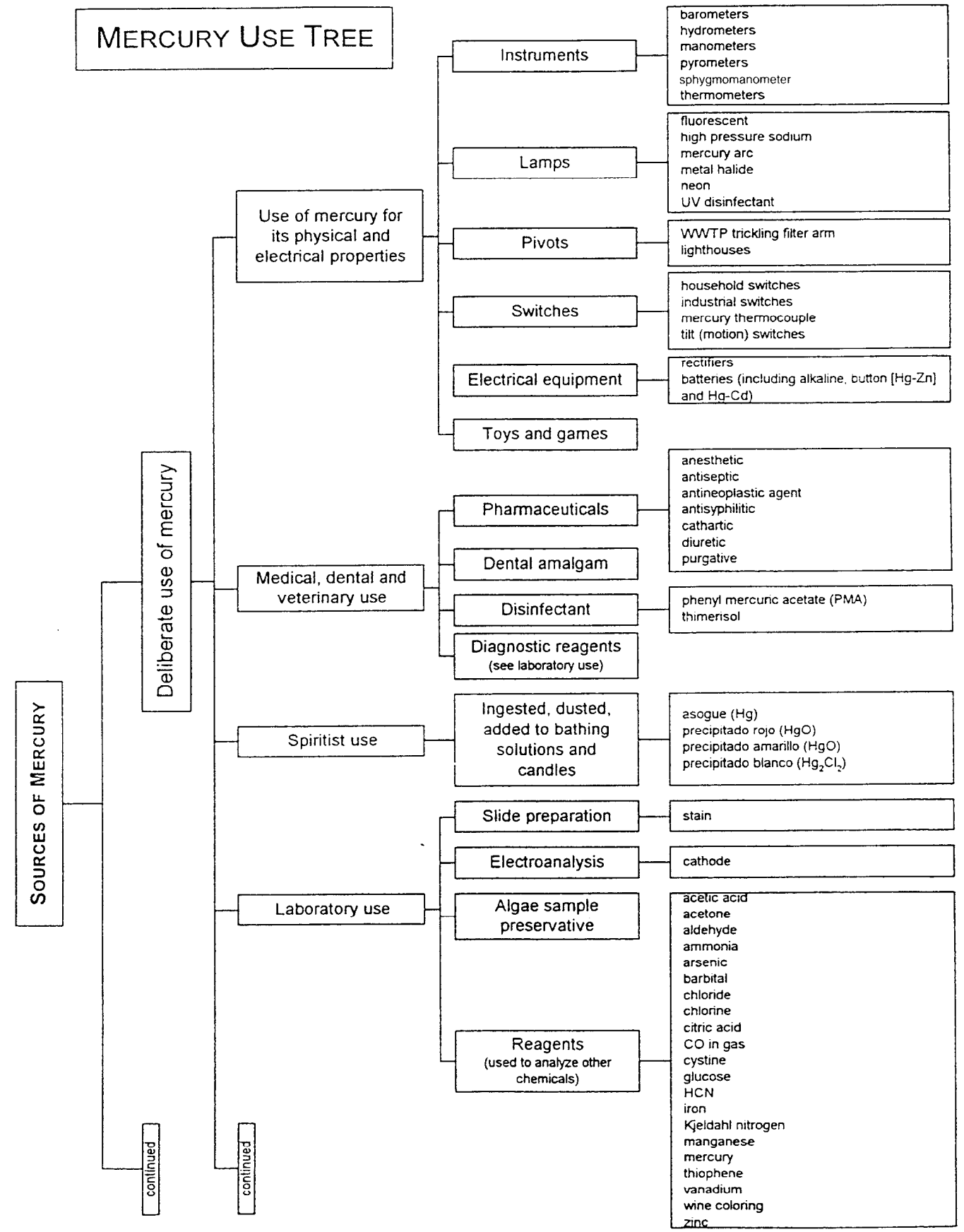
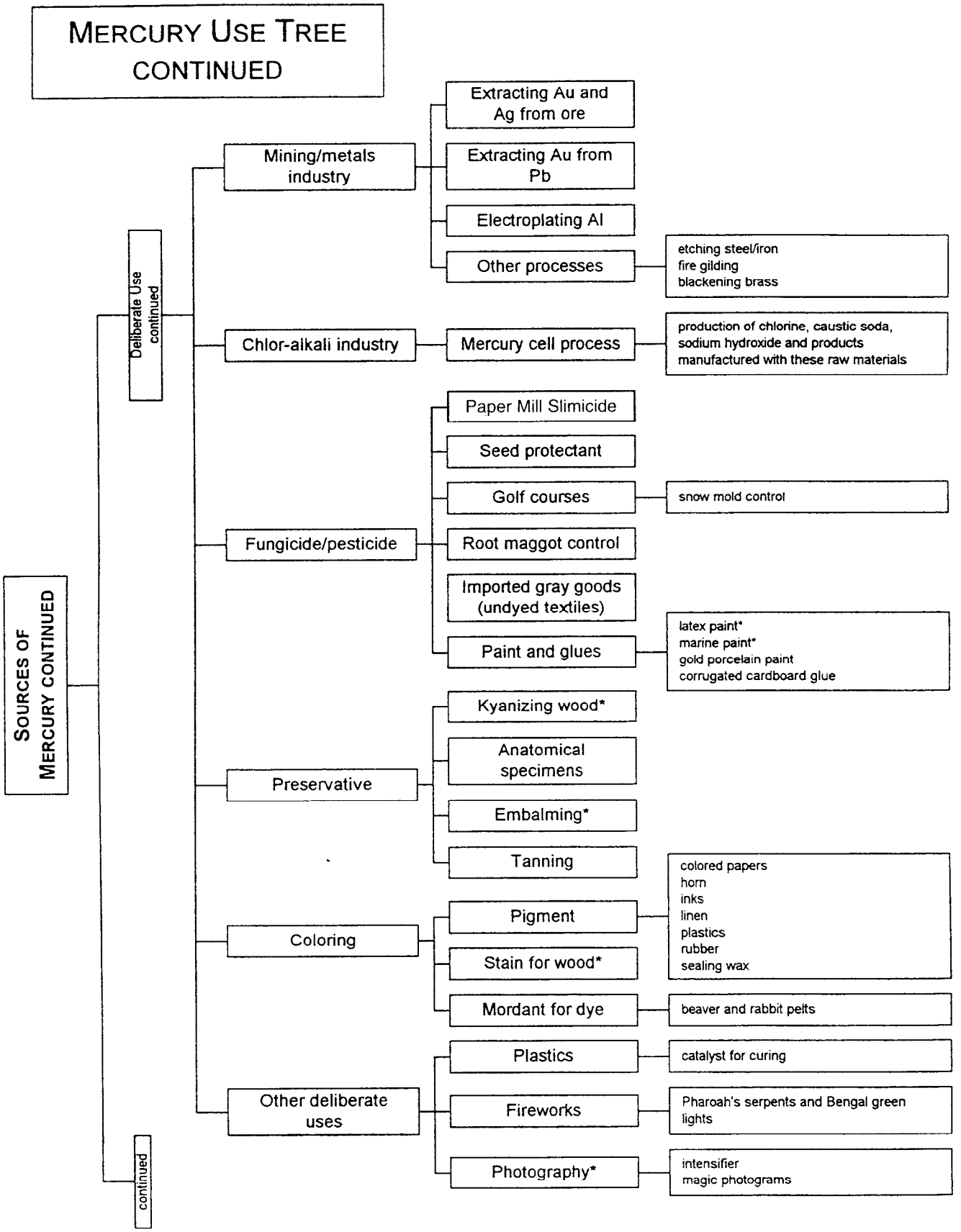
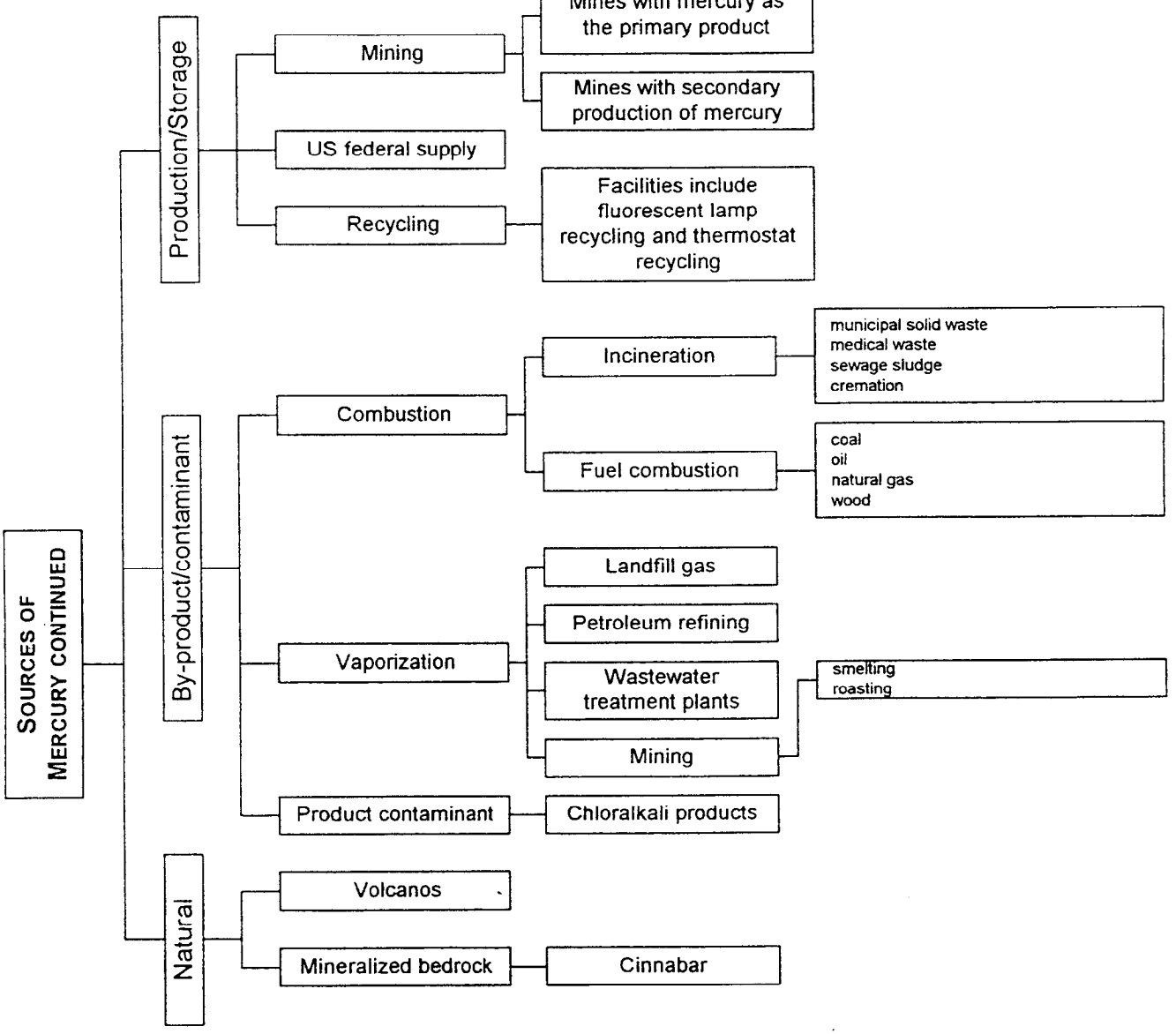
Appendices



Superior Work Group
5/29/96


MERCURY USE TREE CONTINUED
SOURCES OF MERCURY CONTINUED
Deliberate Use continued
continued
Mining/metals industry
Extracting Au and Ag from ore
Extracting Au from Pb
Electroplating Al
Other processes
etching steel/iron
fire gilding
blackening brass
Chlor-alkali industry
Mercury cell process
production of chlorine, caustic soda, sodium hydroxide and products manufactured with these raw materials
Fungicide/pesticide
Paper Mill Slimicide
Seed protectant
Golf courses
snow mold control
Root maggot control
Imported gray goods (undyed textiles)
Paint and glues
latex paint*
marine paint*
gold porcelain paint
corrugated cardboard glue
Preservative
Kyanizing wood*
Anatomical specimens
Embalming*
Tanning
Coloring
Pigment
colored papers
horn
inks
linen
plastics
rubber
sealing wax
Stain for wood*
Mordant for dye
beaver and rabbit pelts
Other deliberate uses
Plastics
catalyst for curing
Fireworks
Pharoah's serpents and Bengal green lights
Photography*
intensifier
magic photograms

MERCURY USE TREE CONTINUED



* discontinued

Western Lake Superior Sanitary District
2626 Courtland Street
Duluth. Mmnesota 55806
218-722-3366

FOR IMMEDIATE RELEASE

DATE:
Contact:
Phone Number:

WLSSD Launches Mercury Reduction Project

Duluth, Minn.-The Western Lake Superior Sanitarv District (WLSSD) kicks off a Mercury Reduction Project Today. Taking a community approach to mercury reduction, the WLSSD will be working with wastewater customers to find alternatives to products and processes that use mercury.

Mercury reaches a wastewater treatment plant from many users of the system. Industries manufacturing products from raw materials along with labs, hospitals, dental practices, schools and homes have all been found to discharge mercury to the wastewater. Although it is rarely disposed of in large quantities, mercury builds up rather than breaks down in the environment.

"We have a limited ability to apply science, technology and your money to the treatment process to clean up the mercury waste that the community sends to us," said WLSSD Executive Director Kurt Soderberg. "Pollution prevention is the most efficient approach to removing this persistent toxic substance from the wastewater."

As mercury persists in the environment it converts to methylmercury, a toxic compound that builds up in the tissues of animals and humans. Exposure to methylmercury can have long-lasting health effects, especially on fetal development during pregnancy.

WLSSD is establishing partnerships with local industries, dentists and hospitals to identify sources of mercury and reduce or eliminate these sources. "We invite all interested partners to work with us on this innovative project and protect Lake Superior," said Soderberg.

For more information about this community Mercury Reduction Project, call the WLSSD at 218-722-3336.

# # #

This news release can be modified to fit your program.
Replace the underlined sections with your local information.

U n i v e r s i t y M e m o r i a l M e d i c a l C e n t e r

January 2. 1997

Mary Smith
Director of Sales
Mercury Laboratory Products
40 Third Street
Duluth, MN 55805

Subject: Certificate of Analysis

Dear Ms. Smith:

As you are aware, mercury is ever increasingly becominga concern as an environmental pollutant. Mercury released from air and water sources is transformed into methylmercury in lakes or rivers. The methylmercury bioaccumulates in the aquatic food chain making consumption of fish hazardous to those organisms high on the food chain. As a result, regulations on the discharge of mercury to the solid and wastewater stream are becoming increasingly stringent.

Because of this knowledge, and our concern for the environment, our institution has instituted a mercury reduction policy. This policy requires the elimination or minimization of mercury in all our purchases. Low level concentrations of mercury in products (less than 10,000 ppm) are not required to be listed on Material Data Safety Sheets. The contribution from the sum of these low concentration sources account for a large fraction of the mercury in the wastewater stream. In order for our purchasing department to be able to make an informed choice on mercury concentration within the products that it buys, we are requesting that all vendors supply us with a certificate of analysis and/or a notarized affidavit which describes product mercury concentration and the detection method used in the analysis. This information will be used along with other criteria in the selection process of our vendors.

Please submit the aforementioned information on all products that you intend to supply our institution. Thank you for your understanding and assistance in this matter.

Sincerely

Jane Doe
Purchasing

Anderson's Acids
98 Molarity Drive
Marathon, Ontario
H2S 04 CANADA

Customer : Acme Manufacturing, Inc.

Att: John Jefferson
Fax : l-800-555-5555

Product Grade : SULFURIC ACID 93%
Shipment Date : 09/03/96

B/L Number : 00008650
Quantity (as is) : 100.400 T

Customer P/O No.: Cl25062

Routing : ONR-HEARST-AC-SSTMA-WC-SUPER-BN-CLOQ-DNE

Tank Car/Tank Truck No. :
UTLX125021

The analysis below is representative of the quality of product loaded into the above shipment

Parameter	Analysis	Specification
Strength (% H2SO4)	93.67	93.19 Min
Color (HU)	11	40 MAX
Iron (ppm Fe)	9	50 MAX
Sulfur Dioxide (ppm SO2)	10	50 MAX
Appearance (%T)	100	
Oxides of Nitrogen (ppm N03)	1	10 MAX
POM (ml 0.02N KMn04)	1.00	5.00 MAX
Mercury (ppm Hg)	0.060	

ANALYST : C. MORIN

MERCURY BACKGROUND SEARCH TELEPHONE SURVEY TEMPLATE

1. Hello my name is _____ and I am conducting a raw materials analysis for _____

2. Because we are concerned with protecting the environment from mercury pollution, we are conducting a raw materials analysis with a special focus on mercury that may incidentally be in the (product name) you supply to us.

3. Is there a technical representative who could answer a few questions about (product name) for me?

4. If transferred, repeat questions 1 and 2. If not transferred, would you please answer a few questions about (product name) for me?

5. If the company is only a distributor, ask for manufacturer's name and a contact person.

6. Do you know if _____ contains any mercury?
   6a. What are the technical and sales specifications?
   6b. What method was used to measure the mercury content and what were the detection limits?
   6c. Do you have any mercury-free products or substitutes for (product name)?

7. Is elemental mercury used in your production process for (product name)?
   7a. If yes, how does this impact the mercury content in (product name)?

8. Have you changed your production process recently?
   8a. If yes, what did you do before the process change and what do you do now?
   8b. Have you investigated whether or not this process change could have increased the mercury content of._____?
   8bl. If yes, would you share the results of your investigation with us?

9. Have you checked for mercury in your raw materials?
   9a. If yes, what raw materials contain mercury?
   9b. What are the technical and sales specifications?
   9c. What method was used to measure the-mercury content and what were the detection limits?
   9d. Have you investigated finding a mercury-free supplier?

10. Have you changed raw material suppliers recently?
    10a. Have you investigated whether or not this change could have increased the mercury content of (product name)?
    l0b. If yes, would you share the results of your investigation with us?

11. Could we get a schematic or flow chart of your production process and a list of the raw materials you use?

12. Would you like to be informed of any significant findings we may discover?

13. Could I please get an address and telephone number at which to contact you'?

14. This has been very helpful and is sincerely appreciated. Thank you for your time and cooperation!

WLSSD MEDICAL FACILITY MERCURY SURVEY

This checklist is provided as a sample. A checklist can be a useful tool to help medical facility stqff identify sources of mercury in their workplace.

Type of Facility (hospital, clinic) _____

Size of Facility (number of beds, number of patient visits) _____

Contact Name _____

Title _____ Phone _____

Mercury Sources

Please indicate the following mercury sources located or used in your facility.

- Fever thermometers (including home-care visits and those sent home with newborns)
- Sphygmomanometers
- Commercial manometer
- Gastrointestinal diagnostic equipment
- Feeding tubes

Chemicals
- Zenker's solution • Histological fixatives

Staining solution and preservatives
- Mercury chloride • Mercury (II) oxide • Mercury (II) chloride • Mercury (II) sulfate
- Mercury nitrate • Mercury iodide • Other

Lamps
- Fluorescent • Metal halide • High pressure sodium • Ultraviolet

Batteries
- Mercuric oxide • Button batteries

- Thermostats
- Barometers
- Switches (relay, tilt, silent)
- Other possible mercury sources - please list here any other materials that should be a concern for mercury pollution.

_____

_____

Have you considered mercury-free alternatives for any of the products listed above? - Yes - No

Facility Practices

Complete the following section on facility practices. Additional pages may be attached if needed.

Safety Practices

Is staff training provided on the health and environmental concerns of mercury? - Yes - No

Is staff training provided on mercury spill prevention or management? - Yes - No

If yes, indicate the departments that have this training and the frequency

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Is there a mercury spill clean-up kit on site? - Yes - No

Have there been any mercury spills within the last ten years? - Yes - No

If yes, indicate the source of the spill(s) and the clean-up method

---

Purchasing Practices

Does your facility have a policy on purchasing mercury-containing products? - Yes - No
If yes, please attach policy.

Does your purchasing department currently require a disclosure by your vendors of mercury concentrations in chemicals/reagents? - Yes - No

Disposal Practices

What is the current procedure for disposal of medical waste?

- autoclave • incineration • other

Have your sewer drain traps or catch basins been cleaned to remove mercury? - Yes - No

If yes, list the area of the facility and dates

Was mercury discovered? - Yes - No

Are any mercury products in your facility currently recycled? - Yes - No

Are there other facility practices that you think should be a concern for mercury pollution? List here:

WLSSD OPERATIONS AND MAINTENANCE HAZARDOUS WASTE CHECKLIST

Work Area *(please include building numbers)* _____

Supervisor _____ Date _____

Mercury Sources

Please indicate the following mercury sources located or used in your department. Place a check in the boxes provided. Circle specific sources listed. If you have identified a source of mercury that is not listed here please add it to the list.

- Barometers
- Batteries - List the types

_____

- DC Watt hour meters, Flow meters, Vibration meters
- Displacement/Plunger relay
  power supply switching, 1 to 4 poles, NO, NC, many voltage and current ratings, generally for high-current, high-voltage applications such as lighting, resistance heating, commercial welders
- Flame sensors/Safety valves
  - some infrared heaters (Robert Shaw and Harper Wyman) • some furnaces (White Rodgers)
  - stainless steel bulb, capillary tube, bellows /control device. Used for unsupervised burners in certain gas-fired devices with standing pilot or electronic ignition pilot
- Lamps
  - fluorescent • high-pressure sodium • metal halide • ultraviolet
- Switches
  - relay switches • pressure control (mounted on bourdon tube or diaphragm) • tilt switches
  - silent light switches (single pole and three way) • temperature control (mounted on bimetal coil or attached to bulb device) • fire alarm box switch • sump pump floats
- Reed relays
  - used for low-voltage, high-precision analytical equipment
- Thermometers
- Thermostats
  - ovens, room temperature control, refrigerators
- Vacuum gauges
  - needle or bourdon gauges, manometers
- Other possible mercury sources - please list here any other materials that you think should be a concern for mercury pollution.

_____ _____

_____

Other Hazardous Products or Hazardous Wastes

Please indicate the following hazardous products or waste used or created in your department. Place a check in the boxes provided. Circle specific sources listed. If you have identified a hazardous product or waste that is not listed here, please add it to the list.

- Asbestos (brake shoes, siding insulation, etc.)
- Lead (paint, pipes, sandblasting sand, etc.)
- Lead-acid batteries
- Electrical component wastes - Please list _____ _____
- Chemical pesticides, fungicides or herbicides
- Chemical cleaners - caustics, corrosives, toxic
- Laboratory waste (chemicals)
- Industrial chemical wastes from your work process - Please list

_____

- PCB-contaminated ballast (ballast, transformers, etc.)
- Paint
- Aerosol products - Please list

_____

- Paint residue (fillers, dust, paint containers)
- Ink sludge
- Solvents (paint thinner, acetone, etc.)
- Antifreeze
- Waste motor oil
- Other waste automotive fluids - Please list

_____

- Combustible waste (fuel oil, kerosene, gasoline, etc.)
- Rags saturated with hazardous fluids (solvents, motor oil)
- Filters saturated with hazardous fluids
- Other possible materials - Please list here any other materials that you think should be a concern for hazardous product/waste management.

_____ _____

_____

WLSSD DENTAL OFFICE WASTE MANAGEMENT SURVEY

This survey is provided as a sample. A survey can be a useful tool for wastewater treatment plant staff to initiate discussions with dental office staff.

Dental office _____

Contact name _____

Title _____ Phone _____

Please indicate the number for each subject listed below:

patients are seen in the office each week. (average)

_____ old amalgams are removed each week. (average)

_____ new amalgams are placed each week. (average)

Check the equipment or materials used in your dental office.

- Raw mercury
- Pre-capsulated amalgam capsules
- Water-injected vacuum pump
- Dry turbine vacuum pump
- Recycler on vacuum pump
- External exhaust on vacuum pump
- Silver recovery unit for X-ray fixer waste

Check the disposal method used for the material collected on cuspidor, evacuation unit, vacuum pump and saliva ejector filters.

- Washed down the sink
- Thrown in the garbage
- Recovered for recycling
- Other _____

What materials does your office recycle?

- Silver/mercury amalgam
- Gold
- Photo processing developer Amount per year: _____
- Lead foil packets from X-ray film
- Office paper
- Other _____

Of the amount of new amalgam placed, estimate the following percentages based on the amount of amalgam mixed. Please include amalgam recovered from traps and filters.

-% of amalgam mix that is actually placed in teeth

-% of amalgam mix that is recycled

-% of amalgam mix that is lost to sewer

-% of amalgam mix that is disposed of in the garbage

-% of amalgam mix that is disposed of as infectious waste

-% of amalgam mix that is swallowed

Of the total old amalgams removed, estimate the following percentages based on total amount of amalgam removed. Please include the amalgam recovered from traps and filters.

-% of amalgam removed that is recycled

-% of amalgam removed that is lost to the sewer

-% of amalgam removed that is disposed of in the garbage

-% of amalgam removed that is disposed of as infectious wastes

-% of amalgam lost before the patient gets to the office

What is your preferred method for learning about waste management? (Check three)

- Printed information (brochures, pamphlets, manuals, professional newsletter)
- Seminars (• day • evening • weekend)
- On-site consultation with a waste specialist
- Informational hotline
- Speakers at dental society meetings
- Trade fairs
- Other- _____

What factors would help you to change the way you presently dispose of waste? (Check five)

- Consistency of information
- Concern about governmental enforcement
- Concern about liability
- Concern about public image
- Concern for the environment
- Concise disposal guidelines
- Professional association endorsement
- No cost increase
- Concern for public health and safety
- Concern for employee health and safety
- Pickup services available for waste
- Drop-off services for waste

Cl Ease of disposal

Resource List

"A Guide for Dentists: How to Manage Waste from your Dental Practice," 1993, 5 pp. WLSSD, 2626 Courtland Street, Duluth, MN 55806. 218-722-3336. Or send in attached reply card.

"Conducting an Internal Mercury Audit for Manufacturing Facilities," 1994, 6 pp. Contact: Solid and Hazardous Waste Education Center, 610 Langdon Street, Rm. 529, Madison, WI 53703, 608-262-0385.

"Get Mad Now, Not Later" mercury brochure, 1994, 6 pp. Contact: WLSSD, 2626 Courtland Street, Duluth, MN 55806. 218-722-3336. Or send in attached reply card.

"Mercury in the Environment" brochure, undated. Describes items that contain mercury. Call MPCA at I-800-657-3864 or MDNR at I-800-662-9278 or WDNR at I-608-266-2111.

"The Case Against Mercury: RX for Pollution Prevention," 1995, 10 pp. Targeted to health-care providers. Contact: Terrene Institute, 1717 K Street NW, Suite 801, Washington, DC 20006, 202-833-8317.

Great Lakes Pollution Prevention Information Resources Catalog, Illinois Hazardous Waste Research and Information Center, One East Hazelwood Drive, Champaign, IL 61820, 217-333-8940.

MercAlert video. 1993. 15 minutes. Contact: WLSSD, 2626 Courtland Street, Duluth, MN 55806, 218-722-3336. Or send in attached reply card.

"Mercury Pollution Prevention at a Bleached Kraft Pulp and Paper Mill," 1996 TAPPI International Environmental Conference Proceedings. Book I, Session #16-3, TAPPI Technology Park/Atlanta, PO Box 105113, Atlanta, GA 30348-5113, 800-332-8686.

Mercury Pollution Prevention in Michigan, a report by the Michigan Mercury Pollution Prevention Task Force, April 1996, PO Box 30028, Lansing, MI 48909-7528.

Minnesota Fish Consumption Advisory, Minnesota Department of Health, 121 East Seventh Place-PO Box 64975, St. Paul, MN 55164-0975. 800-657-3908.

Strategies for Reducing Mercury in Minnesota, Minnesota Pollution Control Agency, 1994, 520 Lafayette Road, St. Paul, MN 55155. 612-296-6300.

"A Review of Fish Consumption Advisories," Robert Reinert, as published in National Forum on Mercury in Fish: Proceedings, USEPA office of Water, June 1995. EPA 823-R-95-002.

"Medical Waste Pollution Prevention: Keep Mercury out of the Wastewater Stream," USEPA Region 5, September 1995.

"Mercury in Medical Waste," fact sheets 1-3, USEPA Region 5, September 1995.

"Collection Program for Raw Mercury Supplies from Michigan Dentists," Final report 1996, Detroit Water and Sewerage Department, 800-552-9278.

Lake Superior Pollution Prevention Strategy Implementation Plan: Recommendations for Achieving Zero Discharge in Wisconsin, Minnesota and Michigan. Lake Superior Pollution Prevention Team, September 1995.

"Wisconsin Mercury Sourcebook," Wisconsin DNR, PO Box 7921. Madison WI 53707-7921, 608-266-2621.

Mercury Contamination of Aquatic Ecosystems, U.S. Geological Survey, web site address: http://h2o.usgs.gov/public/wid/FS_216-95/FS_216-95.html, December 1995.

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