

BATES COLLEGE

MERCURY USE AND MANAGEMENT PLAN

**Campus Avenue
Lewiston, Maine 04240**

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1.0 OBJECTIVE AND POLICY

1.1 Regulatory Overview

This Mercury Use and Management Plan (MUMP) has been prepared by Bates College (Bates) to satisfy the requirements specified in Part 3B of the College's Industrial User Permit. The Industrial User Permit (see Appendix A) is a wastewater discharge license that has been issued to Bates by the Lewiston-Auburn Water Pollution Control Authority (LAWPCA). This permit grants permission to Bates to discharge wastewater to the Lewiston sewer system providing the discharged effluent meets the limitations and conditions specified in the permit.

LAWPCA has determined that the average daily discharge of mercury from non-industrial sources in Lewiston-Auburn is 33 ng/L (parts per trillion). This level is based upon analytical testing conducted during the years 2000 and 2001 throughout the Lewiston-Auburn area. LAWPCA is using 33 ng/L as Lewiston-Auburn's "background level" to determine which permitted facilities will be required to provide additional monitoring for mercury. Facilities with discharges above this background level must develop and implement a MUMP in an effort to reduce mercury in their wastewater discharges to the sewer system. Since March 1, 2002, Bates has implemented quarterly monitoring and analysis at the ng/L level for mercury. The results of the quarterly monitoring are summarized in Section 8.1.

1.2 Objective of the Mercury Use and Management Plan

The primary objective of the MUMP is to maintain effluent concentrations of mercury at or below the background level of 33 ng/L. The MUMP is also being developed to identify pollution prevention and wastewater reduction opportunities and to implement those opportunities that are technically and economically feasible.

1.3 Policy of Bates College

Bates is committed toward becoming a "green campus," one that educates its community about the environment and reflects environmental responsibility in its policies and actions. An attribute of this commitment is to transfer its intellectual understanding of environmental issues to practical action in its daily operations. It is the policy of Bates College to comply with all of its environmental permits and regulations. This includes full compliance with the effluent limitations and conditions specified in the Industrial User Permit. This commitment is supported in Bates' Green Action Plan (GAP), which was developed during the 1990's and represents a resource

base and definitive guide for environmental stewardship at the College. The GAP also promotes source reduction of toxic chemicals and wastes, including the reduction of products containing mercury.

2.0 HAZARDS OF MERCURY EXPOSURE

Mercury exists in nature in its elemental form and also in inorganic and organic compounds. It can be found in the air, water and soil. Elemental mercury is a silver-colored liquid that evaporates slowly at room temperature. Elemental mercury can be inhaled as a vapor into the lungs where it is absorbed into the bloodstream. It can also be absorbed through the skin and into the blood stream, or ingested, although elemental mercury usually passes through the stomach and out the body without any harm. Elemental mercury makes up over 90% of all the mercury in the atmosphere. Elemental mercury is not water-soluble and does not absorb onto particulates, therefore it is removed from the atmosphere very slowly and has a one-year half-life in the atmosphere.

Inorganic mercury compounds are produced from the reaction of elemental mercury with other inorganic elements. Inorganic mercury compounds are generally water-soluble and associate with particulates in the atmosphere. Elemental and inorganic mercury are emitted into the atmosphere by combustion sources such as coal-fired boilers and incinerators that burn municipal solid wastes. Inorganic mercury can also be produced in the atmosphere by the oxidation of elemental mercury with ozone or other oxidants. Inorganic mercury compounds in the atmosphere are removed relatively quickly, either in precipitation or by deposition of dry particles.

Organic mercury compounds are produced in nature and industry and vary greatly in toxicity. Some forms of mercury degrade in the environment into methylmercury. Methylmercury is a highly toxic form of mercury that can enter the body through inhalation, skin absorption, and ingestion. Once in the body, methylmercury acts as a neurotoxin, damaging the tissues of the nervous system. Methylmercury also bioaccumulates in organisms up the food chain and is commonly found in fish tissue.

The primary route of mercury exposure to humans is through the ingestion of fish containing methylmercury. Inhalation of mercury vapors can occur in industries that process or use mercury and during mercury spills that occur in enclosed areas. Elemental and organic mercury can enter the body through skin contact, which may also result in mercury exposure.

2.1 Exposure Limits

The Occupational Safety and Health Administration (OSHA) has established an airborne permissible exposure limit of 0.1 milligrams per cubic meter (mg/m³) of elemental mercury vapor. The National Institute for Occupational Safety and Health (NIOSH) recommends over an 8-hour work shift an airborne exposure limit of 0.05 mg/cubic meter. When skin contact also occurs, an employee may be overexposed, even though air levels are less than the limits listed above. The Environmental Protection Agency (EPA) estimates that mercury exposure of 0.021 mg of inorganic or organic mercury per day in food or water for an adult of average weight will probably not result in any harm to one's health.

The policy to remove mercury from as many sources as possible within the College was not developed because these working areas pose a danger to employees and students, but to remove it from the environment since mercury is so pervasive in air, water and land.

3.0 POLLUTION PREVENTION TEAM

As an integral part of the MUMP, Bates has formulated a Pollution Prevention Team (PPT) at the campus. The purpose of the PPT is to oversee the development of the MUMP and the implementation and maintenance of Best Management Practices (BMPs). BMPs can be structural and non-structural controls or policies that are implemented into a college's operational procedures in order to achieve a desired affect. The PPT is also required to monitor the progress of the campus in achieving the reduction goals established in the MUMP. It is the responsibility of the PPT to ensure the report described in Section 9.0 is completed and submitted to LAWPCA on an annual basis. The PPT will also review and update the MUMP annually.

Members of the PPT include:

PPT Leader: Manager of Environmental, Health and Safety (EH&S)

PPT Members: Environmental/Safety Specialist and Director of Facilities

4.0 MERCURY INVENTORY ON CAMPUS

4.1 Inventory Criteria

The LAWPCA requires selected facilities to conduct and maintain an inventory of mercury-containing items on site. Bates conducts yearly inventories of mercury items in selected departments throughout the campus in order to implement appropriate BMPs and to minimize the risk of mercury releases. The Mercury Log Sheet (see Appendix B) is sent to departments that are most likely to use or store mercury-containing items or generate mercury-containing waste. For the purposes of this document, the terms “most likely” refers to all mercury-containing items with the exception of fluorescent lamps. Fluorescent lamps contain mercury, but due to their widespread presence in all college buildings, they are not included in the inventory. (Procedures for cleaning up broken lamps are included within this document). The log sheet identifies the type, quantity, weight, and source of each mercury-containing item. The log sheet is completed by each department and returned to the PPT for compilation into a facility-wide inventory. This inventory is updated on an annual basis and submitted to the PPT, who maintains the campus-wide Mercury Log inventory for the MUMP (see Appendix C).

Inventory information is used in monitoring the implementation and maintenance of BMPs and the reduction goal established in this plan. These inventories are conducted in order to:

- determine the locations, types and quantities of mercury-containing products and wastes;

- ensure all mercury-containing products are properly labeled, packaged and stored;

- use this information to develop a procurement system to control the purchase and use of these products;

- identify areas requiring mercury spill kits;

- identify the type of BMPs required and the location of their implementation;

- measure the progress in reducing the quantity of mercury-containing products and wastes on campus.

4.2 Locations of Inventories

The departments listed below participate in the Mercury Log inventory. These locations were selected due to the presence of mercury and likelihood of any spillage or leakage flowing into the sewer system. The other locations not selected include dormitories, administration offices, academic rooms, etc. where the presence of mercury (besides being present in fluorescent lamps) is unlikely. The following departments and buildings were selected for inventory:

Environmental, Health & Safety

Facilities Plant

Carnegie Hall

Dana Chemistry

Lane Hall

Theater

Olin Arts Center

Chase Hall

Pettingill Hall

Village I, II & III

Alumni Gym

Medical

Merrill Gym

Underhill Ice Arena

If other mercury sources are found outside of the inventory (other than fluorescent lamps), they will be added to the inventory list.

5.0 PROCUREMENT OF MERCURY-CONTAINING PRODUCTS

Controlling the procurement of mercury-containing products is essential for proper mercury management and minimization. Before waste generation or process emissions of mercury-containing items can be reduced, the quantity brought into the campus must be monitored and controlled.

5.1 Bates College Policy on Procurement of Mercury-Containing Products

It is the policy of Bates College to pre-approve all purchases of mercury-containing products by every department throughout the campus. This is necessary in order to meet the mercury reduction goal specified in the College's Industrial User Permit and to implement BMP No. 13, which is identified in Section 10 of this plan. For products containing or suspected of containing mercury that could enter the sewer system, each department shall request from the vendor a certification of mercury content. A sample vendor certification request form is included in Appendix D and can be used to obtain this information.

Each department must acquire prior approval from the Office of Environmental, Health and Safety (OEHS) to purchase any product or instrument containing mercury. The OEHS will review the purchase request and request the department to determine whether any alternative is available. If an alternative does exist, the OEHS will encourage the purchasing department to obtain the alternative. If an alternative cannot be found, the OEHS will allow the purchase of the item but will work with the department to limit the quantity purchased and to continue seeking non mercury-containing alternatives. Whenever mercury-containing equipment is broken and must be replaced, every practical attempt shall be made to replace these broken items with non mercury-containing products.

5.2 Equipment and Products Containing Mercury

Equipment Containing Mercury

Mercury is found in many forms of equipment used in teaching laboratories, boiler rooms, vehicle maintenance shops and others. The Bates College Mercury Log Sheet (see Appendix B) contains a list of equipment and instruments that are known to contain mercury. This list should not be viewed as a comprehensive list of all equipment or instruments containing mercury. All equipment and instruments identified in a department shall be labeled as containing mercury.

Mercury-Containing Products

Listed below are mercury-containing products and the typical concentrations with each product. These products have also been added to the List of Mercury-Containing Products in the “Bates College Mercury Log Sheet”

Product	Mercury Content (ng/l)
Ajax Powder ¹	170.
Comet Cleaner ¹	150.
Kodak Fixer ¹	6,900., 3,700.
Kodak Developer ¹	2,650.; 6,000.
Alconox Soap ¹	4., 5.
Dove Soap ¹	2.7
Ivory Dishwashing Liquid ¹	61.
Soft Cide Soap ¹ (Baxter)	8,100.
Sparkleen Detergent ¹	8.6
Bathmate ²	U 25.
Blue Skies ²	74.2
Holt Springs Cleaner ²	56.6
Raindance ²	36.
LL Break ²	3,050.
Iron Clad Sour ²	133.
Refresh ²	83.
LL Sudsy ²	U 27.
Soft Brite ²	30.
Trust ²	283.
Flo-Det ²	32.
Super-Flo Kon ²	121.

Prior to purchasing substitutes for any of these products, one shall contact the manufacturer to determine if their product has been tested for low levels of mercury. Analytical testing of the product may be necessary to determine if low level concentrations of mercury exists in the product. Departments may contact the OEHS for assistance.

¹ – Mercury content was obtained from the “Wisconsin Mercury Source Book”, a document that is available from the Environmental Protection Agency.
² – Mercury content was determined by product samples taken by Bates College and analyzed by Katahdin Laboratory.
 U – Indicates the compound was analyzed but was not detected above the laboratory Practical Quantitation Limit.

5.3 Sources of Available Alternatives

Listed below are some alternatives for mercury-containing items and equipment. Department heads shall notify the OEHS whenever substitutes cannot be located.

Fluorescent Lamps

There are no practical substitutes for fluorescent lamps. Fluorescent lamps use considerably less energy than incandescent lamps and last much longer. Since less energy is utilized and much of our electricity comes from coal-fired facilities, which are the largest sources of mercury emissions to the air, fluorescent lamps are a good alternative to incandescent lamps. Spent fluorescent lamps are classified as Universal Waste in the State of Maine if they are sent to a licensed recycling company. Mercury-containing lamps are prohibited from being disposed of in any landfill located in Maine. An effective alternative would be to purchase low mercury-containing lamps. Typical fluorescent lamps (four feet long) contain about 22.8 mg of mercury. Low mercury-containing lamps contain less than 10 mg of mercury¹.

Manometers, Barometers, and Vacuum Gauges

Mercury in manometers, barometers, and vacuum gauges respond to air pressure that can be calibrated on a scale. Alternatives to these operate on the same principle but use mercury-free liquids in the tube. Alternatives such as needle or bourdon gauges operate under a vacuum with a needle indicator. Electronic gauges, used to measure pressure, must be calibrated using a mercury thermometer. Electronic gauges can be purchased and when necessary, calibrated by an off-site contractor.

Switches and Relays

Switches can be found in laboratories in the form of airflow/fan limit controls, fluid level controls, pressure and temperature controls, etc. Mercury is found in temperature-sensitive and mechanical switches. Small electrical switches may contain 3,500 mg of mercury and industrial switches may contain up to eight pounds of mercury¹. Alternatives to mercury thermostats are electronic thermostats and snap switches. Mechanical light switches can replace “silent” light switches.

¹ – Mercury content was obtained from the “Wisconsin Mercury Source Book”, a document that is available from the Environmental Protection Agency.

Mercury Thermometers

Alternatives most comparable in cost and use to the mercury thermometer include digital thermometers, glass gallium-tin or glass alcohol thermometers.

Mercury-Containing Chemicals

There are many mercury-containing chemicals used in laboratories that are not readily apparent. Although concentrations of chemicals are generally listed on material safety data sheets (MSDS), manufacturers are only required to list chemicals in concentrations of 1% (0.1% for carcinogens) or more, so chemical products containing mercury in concentrations less than 10,000 parts per million (ppm) will not be listed. Whenever the presence of mercury in a laboratory chemical is suspected, the manufacturer shall be contacted to provide a certificate of analysis to confirm or deny its presence. Listed below are alternatives to some laboratory chemicals:

<u>Chemical</u>	<u>Alternative</u>
mercury (II) oxide	copper catalyst
mercury (II) chloride	magnesium chloride or zinc formalin
mercury (II) sulfate	silver nitrate/potassium/ chromium (III) sulfate
mercury nitrate	ammonia/copper sulfate
mercury iodide	phenate method
sulfuric acid (commercial grade) source	sulfuric acid from a cleaner
Zenker's Solution	zinc formulation

6.0 MERCURY USE AND STORAGE GUIDELINES

6.1 Guidelines for Safe Usage of Mercury-Containing Items

Guidelines for the safe usage and management of mercury-containing items is essential in order to minimize personal exposure and releases to the environment. The following usage guidelines shall be followed whenever handling mercury-containing items and wastes:

- All mercury-containing instruments, products, chemicals and waste shall be clearly labeled as containing mercury;
- Smoking, eating and drinking shall be prohibited in areas where mercury is being used;
- In order to facilitate cleanup, use mercury in areas with uncarpeted and untiled floors and when used in laboratories, use mercury-containing chemicals on smooth-surfaced tables and benches with secondary containment. Mercury should never be handled over sinks or drains;
- Persons working with mercury shall wear disposable gloves and aprons. Vapor respirators should also be worn when mercury is used in a confined area without adequate ventilation. All watches and jewelry should be removed to avoid plating of the mercury on metal surfaces;
- Every laboratory shall have a fully-stocked mercury spill kit;
- Train all employees and students who use mercury-containing items on the properties and hazards of mercury as well as the proper disposal procedures;
- All mercury-containing equipment shall be cleaned and calibrated in accordance with the manufacturer's guidelines.

6.2 Guidelines for Safe Storage of Mercury-Containing Items

In locations where mercury-containing items cannot be replaced or discarded, it becomes essential that these items are stored in a safe manner that minimizes the risk of breakage or spills. Departments should consult the OEHS when in need of assistance of providing proper storage for mercury-containing items. The general storage guidelines for mercury-containing items are:

- Mercury-containing products should be stored in labeled, tight, closed containers located in a cool, well ventilated area away from acetylene, ammonia, and nickel;

- Mercury should not be stored near incompatibles such as chlorine dioxide, nitric acid, nitrates, ethylene oxide, chlorine, and methylazide;
- Waste mercury-containing materials should not be placed in waste containers used to collect biomedical waste or solid wastes (rubbish) that is eventually incinerated. The incineration of municipal solid waste is one of the largest contributors of airborne mercury. This would cause mercury to be discharged into the air and eventually into the water;
- Mercury thermometers shall be stored in padded cases, shelves and drawers that protect thermometers from accidental breakage;
- Barometers and manometers containing mercury shall be encapsulated with Teflon to minimize breakage;

7.0 MERCURY SPILL POLICY

Spills of mercury can be harmful to humans and the environment if not recovered, managed and disposed in a safe and effective manner. The EPA and the Maine Department of Environmental Protection (Maine DEP) require immediate notification of releases of specific quantities of mercury to the environment. This section discusses the College's spill clean up policy and the procedure for reporting releases of mercury to the environment.

7.1 Spill Clean Up Procedures

Whenever elemental mercury is spilled into a room, mercury vapor is emitted into the air and cannot be detected by nearby personnel. The concentration levels of the vapor will be dependent upon a number of variables including the quantity spilled, room size, room temperature and available ventilation. Breathing mercury vapors can be very dangerous depending on the concentration of the vapor and the quantity inhaled. The following is a list of typical quantities of elemental mercury that are found in mercury-containing items:

fluorescent light bulb	10 to 40 milligrams
fever thermometer	500 to 700 milligrams
thermostat	3000 milligrams

According to the EPA, the amount of mercury in a fluorescent light bulb or thermometer (less than one ounce) is not likely to cause serious health problems if it is not heated, does not spread to a wide area and is immediately cleaned up.

Broken Fluorescent Light Bulb

When a fluorescent lamp breaks, the mercury released is not visible but shall be cleaned up immediately. During any spill, no one should ever place himself or herself in harm's way. Whenever one is unsure of the correct response, back away from the incident and notify the Safety Office immediately. Respond to the breakage of fluorescent light bulbs using the following procedures:

1. If more than 10 bulbs break at one time:
 - a) Secure the area and post signs that indicate a spill has occurred and unauthorized personnel should keep out;
 - b) Immediately provide as much ventilation as possible, avoid skin contact and breathing of dust and call the Safety Office (ext. 6413 or 8226). This is a spill that must be reported by the Safety Office to the MEDEP and all spill clean up material must be managed as a Hazardous Waste.
 - c) Remain out of the contaminated area. The Safety Office will arrange for the waste to be picked up by a trained outside cleanup contractor.

2. For breakage of 10 bulbs or less:

Secure the area and post signs that indicate a spill has occurred and unauthorized personnel should keep out.

Provide as much ventilation as possible. If possible try to exhaust the contaminated vapor to the outside;

Avoid skin contact and breathing of dust and call the Safety Office (ext. 6413 or 8226) immediately.

Call the Physical Plant and request the appropriate bulb storage box that will be necessary to hold the broken bulb(s) and clean-up material

Once the waste container has arrived, the cleanup operation can begin using caution to avoid skin contact and breathing of dust.

Using gloves, safety glasses, dustpan and brush, and a wet sponge, clean up the glass and dust and place it into the waste container that is labeled "Waste Mercury-Containing Lamps." Wipe the area with a wet sponge to pick up any remaining residue from the spill. Do not use a vacuum to clean up the broken bulb(s).

Brush and wipe off any remaining dust off the dustpan and discard the contaminated brush, sponge and gloves into the same container.

Call Physical Plant to remove the waste container and replace it with an empty container. Thoroughly wash your hands and face after cleaning up any mercury waste spill. If clothing is contaminated it should be laundered separately.

Mercury Thermometers

The individual(s) responsible for the breakage of a mercury thermometer can clean up the spilled material if conditions are conducive for a safe cleanup (i.e. mercury is not spilled onto hot surface that can increase the volatilization rate and vapor concentration). The following clean-up procedure can be followed:

1. Immediately evacuate the area to prevent the spread of further contamination. If time permits, prior to evacuation, check the clothing and shoes of individuals who were near the area when the spill occurred. All contaminated clothing or shoes should be removed and disposed as hazardous waste;
2. If possible, cool the room to 70 degrees F in order to reduce evaporation;
3. Close all inside doors to the room and open all exterior doors and windows. If available, utilize a fan to ventilate the contaminated vapors to the outside. All attempts should be made to keep the air flowing in the room;
4. Use a flashlight if necessary to locate the spilled mercury. The spilled mercury beads should be easy to identify using a flashlight and turning off the lights in the room.
5. If the spilled mercury cannot be located, ventilate the room for 24 hours exhausting the mercury vapors from the room to the outside;
6. Use the items in the mercury spill kit to contain and pick up the mercury. Ensure the mercury does not flow into drains and cracks or crevices in the floor;
7. If the mercury was spilled on a hard surface, using a card, stiff paper or squeegee, work the spill mercury to the center of the spill area to form larger droplets. Push the mercury beads into a plastic dustpan or use an eyedropper to pick up the beads. The small sized beads can be picked up using an adhesive tape. Deposit the mercury into a vapor-tight plastic container labeled with the words: "hazardous waste mercury liquid";
8. Once all the visible mercury has been cleaned up, if available, sprinkle sulfur powder (usually found in mercury spill kits) on the spill area and let sit overnight. A color

change of the powder from yellow to brown indicates that mercury is still present and additional clean up is necessary. If the powder remains yellow, clean up can be terminated.

9. If the spilled occurred on a porous surface (i.e. hardwood floor), the mercury may seep into the cracks and crevices of the floor. If this occurs, isolate the area and contact the OEHS immediately.
10. If the mercury was spilled onto a carpet or other cloth material, isolate the area and contact the OEHS immediately;
11. Inspect your shoes and clothing for any mercury contamination prior to leaving the area. If the mercury cannot be removed from these materials, they should be disposed of along with the recovered mercury.
12. If weather permits, continue to ventilate the room with outside air for another 24 to 48 hours.
13. Once the clean up is completed, wash your hands and other parts of your body that have come in contact with mercury or mercury contaminated materials.

Other Mercury-Containing Items

Other items such as mercury-containing thermostats, manometers, barometers, etc. contain significant amounts of liquid mercury that could present a hazard to anyone remaining in the immediate area of the spill. Whenever mercury is released from these items, the following procedures should be followed:

1. Evacuate and isolate the area. Remove all contaminated clothing and shoes and leave in the contaminated room appropriately labeled;
2. Notify the OEHS immediately;
3. Close all interior doors and open all exterior doors and windows in the room;
4. If possible, ventilate the room with outside air and exhaust any contaminated air to the outside. Restrict access to the room until the arrival of the emergency spill contractor.
5. The OEHS will notify the emergency spill contractor and notify the appropriate agencies.

7.2 Spill Reporting Procedures

Mercury is a hazardous substance as defined in Title 40, Part 302.3 of the Code of Federal Regulations and must be reported whenever specific quantities are spilled into the environment.

Depending upon the quantity released and associated damage to the environment, releases of mercury could result in monetary penalties issued by the Maine DEP and EPA. Any amount of mercury spilled into a sink or floor drain should be reported to the OEHS immediately, who will proceed to notify the LAWPCA if the drain empties into the sewer system. Any amount of liquid mercury spilled to the outside should also be reported to the OEHS. The OEHS representative will notify the Maine Department of Public Safety and the National Response Center immediately (within one hour) if more than one pound of mercury is released to the outside.

The telephone numbers for the agencies that may need notifications are listed below:

<u>Agency</u>	<u>Telephone Number</u>
National Response Center	800-424-8802
Maine Department. of Public Safety	800-452-4664
Lewiston-Auburn Water Pollution Control Authority	782-0917

The National Response Center will notify the Marine Safety Office in Portland (if necessary) and the Maine Department of Public Safety Office will notify the Maine Department of Environmental Protection and the Unified Emergency Management Agency (if necessary).

8.0 WASTEWATER DISCHARGE PERMIT LIMITATIONS AND REQUIREMENTS

As part of the effort to detect the presence of mercury in its wastewater, Bates samples and analyzes its wastewater discharges to the sanitary sewer. When necessary, Bates will also analyze cleaning products used at the facility that have been known to possibly contain trace levels of mercury. For the purposes of this document, trace levels are defined as mercury concentrations in the range of parts per trillion.

8.1 Sampling and Analysis of Wastewater Discharges

In accordance with its Industrial User Permit, Bates is required to sample and analyze the wastewater discharged from the campus for trace levels of mercury on a quarterly basis. The two sampling locations specified in the Industrial User Permit are Site 001 – Bardwell/Chase Halls and Site 002 – Carnegie Science Building. Each sampling location is located outside and adjacent to each of these buildings in the designated manholes. Quarterly sampling is required to be performed at these two locations in accordance with EPA Method 1669 (see Appendix E). The analyses of these samples are conducted in accordance with EPA Method 1631 (see Appendix F). Bates hires a State of Maine Certified Laboratory to perform the sampling and analysis of the quarterly samples. In some situations, the sampling manhole may be steam-

cleaned prior to the sampling event in order to remove or minimize any outside contamination of the samples. Copies of the analytical results reported by the laboratory will be maintained in Appendix G of this MUMP. Semiannual monitoring results are listed in the following table:

Clean Mercury Monitoring Analytical Results

Sampling Date	Analytical Results (ng/l)	
	Bardwell/Chase Hall	Carnegie Science
04/26/2002	66.3	119.
07/09/2002	139.	<0.50
11/15/2002	520	24.
12/02/2003	66.	46.5
03/14/2003	46.2	7.98
05/13/2003	53.6	111.
09/15/2003 ¹	311.	649.
11/21/2003 ¹	908.	84.5
02/25/2004	167.	13.2
05/26/2004	101.	57.7
07/29/2004	113.	119.
11/18/2004	281.	63.
3/21/2005	104.	64.2
5/12/2005	51.3	147.
7/28/2005	90.9	259.
11/18/2005	68.5	1,330.0

¹ – The sampling manholes were not steam cleaned prior to the sampling event.

8.2 Sampling and Analysis of Products Suspected of Containing Mercury

Some products used at the College have been known or suspected of containing trace levels of mercury. Manufacturers using mercury-contaminated (at trace levels) water in the manufacturing process of their products are typically the cause of this contamination. When the quarterly monitoring results indicate mercury concentrations in excess of 33 ng/l, Bates will attempt to determine the cause of the contamination. The storage, use, and waste-generation locations of mercury in the campus will be inspected for any sign of spillage or leakage into the sanitary sewer system. If no evidence of spillage or leakage into the sanitary sewer system is discovered, Bates will examine the cleaning products that are used at the campus in large quantities. If necessary, Bates will have some of these products analyzed for mercury at trace-level concentrations. The sampling and analytical protocols used on these samples will be similar to the ones specified in EPA Method 1669 and 1663. Copies of the analytical results reported by the laboratory will be maintained in Appendix G of this MUMP.

9.0 REDUCTION GOAL

The goal of Bates is to continuously improve the discharge quality by lowering mercury levels which can be attributed to sources within Bates College's control. Bates will attempt to reach this goal by implementing the current and past BMPs.

10.0 BEST MANAGEMENT PRACTICES

BMPs for mercury consist of procedures and policies that are designed into the day-to-day operations of a college for the reduction and possible elimination of mercury-contaminated items. In order for the BMPs to be manageable, only those that are technically and economically feasible are considered for implementation. The following is a list of BMPs and their implementation status:

- BMP No. 1: Manage and collect universal waste, which include mercury-containing waste, in accordance with the Maine DEP Regulations. This BMP continues to be implemented on a daily basis.
- BMP No. 2: Clean out chemical stock rooms throughout the campus. The majority of chemical stock rooms have been cleaned out of mercury-containing chemicals that are either expired or are no longer being used.
- BMP No. 3: Designate a position to control the purchasing and issuance of chemicals in chemical stock rooms. The Chemistry Department continues to restrict the purchasing and issuing of chemicals from its stockrooms to only a few college employees, who have been trained to minimize overbuying and stocking of chemicals.
- BMP No. 4: Purchase mercury spill kits for every chemical laboratory on campus. These spill kits have been purchased for every chemical laboratory that uses and stores mercury-containing chemicals or equipment. These spill kits are maintained and replenished whenever necessary (i.e., after being used for spill cleanup).
- BMP No. 5: Periodically sample and analyze for mercury wastewater effluent discharged into the sewer system. In accordance with their Industrial Discharge Permit, Bates continues to sample and analyze for mercury in the two designated sampling points on a semiannually basis.
- BMP No. 6: Contact manufacturers of cleaning products suspected of containing mercury. Bates has contacted several manufacturers of cleaning

supplies that are used on campus inquiring about the amount of mercury contained in their cleaning products. Several manufacturers reported that some of their cleaning products contained low levels of mercury concentration (in ppm). For some of these products, Bates was successful in finding alternative suppliers of mercury-free cleaning products. In these instances, Bates changed suppliers and began purchasing mercury-free cleaning products. For other cleaning products, Bates was unsuccessful in finding alternative cleaning products containing no mercury.

- BMP No. 7: Label all containers and equipment containing mercury. Containers and equipment containing mercury in the chemical stockrooms and classrooms have been labeled.
- BMP No. 8: Establish an inventory control system to track the location, use and purchase of mercury-containing items and storage of mercury wastes. An inventory was developed during early 2003 for Carnegie Science & Dana Chemistry buildings.
- BMP No. 9: Implement a campus-wide policy to replace broken mercury-containing equipment (thermometers, manometers, barometers, etc.) with mercury-free equipment (e.g. replace mercury thermometers with alcohol or digital thermometers) whenever possible. This is an ongoing program that encourages the replacement of mercury thermostats and switches with solid-state devices whenever breakage occurs or during remodeling of classrooms. Due to their accuracy and the traditional scientific approaches being taught in classrooms, some faculty members continue to use mercury thermometers. For these reasons, this substitution program has been encouraged but is not being mandated in the classrooms.
- BMP No. 10: Provide improved storage containers and storage locations for mercury-containing equipment and products. Storage containers for mercury-containing equipment and products continues to be inspected for potential breakage and leakage and is replaced whenever necessary.
- BMP No. 11: Develop a written mercury spill protocol for departments having mercury-containing products and wastes on site. This spill protocol

has been completed for science laboratories and the Physical Plant. As part of this protocol, the OEHS has purchased an approved vacuum cleaner that is designated and is only used to pickup mercury spills.

BMP No. 12: Provide universal waste training for all janitors who manage universal waste on site. This training was provided by the OEHS during 2003. Training is scheduled for 2006.

BMP No. 13: Develop and implement a standard operating procedure (included in Section 5.0 of this plan) for the purchase of mercury-containing products and equipment in order to identify, minimize, and track all purchases of these items. Still an informal procedure, but all departments have been instructed to contact OHES for information prior to purchasing mercury-containing products.

11.0 MEASURING REDUCTION PROGRESS

All areas subject to potential mercury spills continue to be monitored. No mercury or mercury compounds (other than those contained in cleaning products of which no alternatives have been found) have been allowed to enter the municipal sewer system. The PPT continues to monitor the progress of the BMPs and its overall effectiveness in reducing and maintaining the wastewater effluent concentration of mercury to below 33 ng/L. Each quarter, the PPT will review the analytical results of the quarterly sampling event and determine if any of the BMPs need to be modified to achieve the reduction goal.

As illustrated in Section 8.2 above, mercury contamination in cleaning products is suspected to be the major contributor of mercury concentrations detected in the quarterly wastewater samples taken at the college. However, based on the study titled: "Deposition of Air Pollutants to Casco Bay", prepared by Sonoma Technology, Inc. for Beverly Bayley-Smith, Casco Bay Estuary Project and the University of Southern Maine (see Appendix H), total atmospheric deposition (wet and dry) of mercury loading to Casco Bay may be 84 to 92% of the overall mercury loading to the Bay. This translates into a small percentage of mercury being discharged into Casco Bay from wastewater treatment plants. Bates College believes that further reduction in mercury contamination in its wastewater discharge is not likely until all of its suppliers of cleaning products can find a water source for its manufacturing operations that is free of mercury contamination. It also believes that more regulatory emphasis should be

focused on atmospheric deposition of mercury in order to obtain significant reductions of mercury contamination in Maine's lakes and rivers.

12.0 UPDATING THE MUMP

The PPT updates the MUMP and the progress of the implementation of each BMP (Section 10) at the beginning of each year and provides all revisions to the recipients of the MUMP.

REFERENCES

Some of the information in this document came from the sources listed below:

“Draft Wisconsin Mercury Sourcebook: Laboratories,” World Wide Web address: <http://www.epa.gov/glnpo/bnsdocs/hgsbook/>, 2002

“Maine DEP’s ‘Mercury in Products’,” World Wide Web address: <http://www.state.me.us/dep/mercury/products.htm> , 2002

“EPA’s ‘Alternatives to Mercury Thermometers’,” World Wide Web address: <http://www.epa.gov/glnpo/bnsdocs/hg/thermfaq.html>, 2002