# Mercury in Schools

# Pilot Project

# Final Report to Oregon DEQ

DEQ Agreement 030-03

DEQ Agreement 048-05

CFDA #66.640

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Oregon Association of Clean Water Agencies

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# Mercury in Schools Pilot Project

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## Executive Summary

Removing mercury-containing equipment from schools is an effective mercury reduction technique. Focusing mercury reduction efforts in schools has a benefit in addition to solving water quality problems - - it reduces mercury exposure for children and teachers.

The project tested mercury reduction programs in two Oregon school districts - Eugene's 4J District and the Corvallis 509J School District.

An estimated 17 pounds of mercury was removed through this program. To put that number in perspective, based on current estimates, DEQ indicates that wastewater treatment plants in the Willamette Basin will be required to remove 7.0 pounds of mercury in the Willamette Basin to meet the mercury Total Maximum Daily Load (TMDL) plan for meeting water quality standards.

While there is not a direct relationship between mercury-containing equipment and mercury-containing laboratory chemicals removed from these schools, certainly some of the mercury-containing products would have spilled, been broken, or poured down the drain in the future.

Estimated costs to remove the mercury per pound are:

- For Eugene, $498 per pound, and
- For Corvallis, $258 per pound.

These removal costs do not include staff time to coordinate the surveys, equipment replacement and proper disposal, and the time commitment for this type of project is large. The Eugene cost estimate does not include the cost of disposal – the project was able to coordinate disposal with a DEQ-sponsored hazardous waste cleanup event.

## 319 Mercury in Schools Grant Requests

Oregon Association of Clean Water Agencies received a 319 Non-Point Source Grant from Oregon DEQ to pilot test school partnerships as a mercury reduction strategy.

The initial Non-Point Grant Agreement was DEQ agreement 030-03, Project Number W02549, PCA#64543 and was signed in September of 2002. That grant was for $14,878 in expenses, and $9,919 in match. That agreement extended until 10/31/03.

Due to difficulties scheduling work with Oregon school districts, the project was delayed. Due to the delay, the work could not be accomplished by the 319 project deadline, but the expenditure of ACWA funds to replace equipment and pay for proper disposal continued.

DEQ issued a second *Mercury in the Schools 319 Grant* to ACWA in December of 2004 (DEQ Agreement #048-05, Project #W02549, PCA#64543) for $9,500 to print educational materials associated with the project. This portion of the grant had no local match requirement since DEQ was providing the required match.

This report covers the activities of both grants.

## Project Statement of Work

The School Pilot Mercury Reduction Program was intended to conduct school mercury reduction and replacement pilot projects in three Oregon communities. Mercury is a Persistent Bioaccumulative Toxin (PBT) and a toxic of concern in Oregon. The pilot project goals were to:

- Remove sources of mercury within the Willamette River watershed in order to start planning to meet the expected mercury TMDL.
- Remove the risk of children being exposed to elemental mercury in schools.
- Provide a non-toxic replacement for mercury, where feasible.
- Educate school districts, teachers and students on mercury and other PBT issues in the Willamette Watershed.
- Develop mercury teaching tools.
- Provide guidance to pollution prevention coordinators and educators on the quantity and pervasiveness of mercury in middle and high schools.
- Provide a "how-to" guidance for local municipalities to remove mercury sources from schools before mercury reaches public waters through improper disposal or accidents.

The grant funding assisted in the development and implementation of a pilot project to determine just how much mercury is in public schools. The project report serves as a guide for local wastewater treatment plant operators, municipalities, and others to follow when working with schools to remove that source of mercury before it enters the environment. This information will also help Oregon schools comply with a recent state law requirement restricting the use and purchase of mercury containing compounds in schools.

## Results from participating communities

Although three communities anticipated participating in the program, the project team was unable to convince Washington County-area schools to participate. The schools in the Eugene and Corvallis school districts participated in the project.

### Eugene

#### Anticipated scope of work

The initial scope of this project included funds for the removal, proper disposal, and replacement of mercury-containing equipment and chemicals from initially one school in the 4J School District. However, staff from 4J had already started their own inventory of mercury in all the 4J schools and therefore, the City decided to include four high schools in the pilot program. The ACWA grant coordinator authorized removal activities at all four schools. The schools discharge to the Eugene/Springfield Water Pollution Control Facility in Eugene, Oregon.

#### Project Accomplishments

In conducting the program, Eugene developed a survey form for staff to use to conduct the inventory at each school. At one of the schools, the city had the benefit of utilizing student assistance in performing the inventory. In addition to the students, Eugene District 4J Staff, which included their Safety Specialist and a science teacher from the Rachel Carson Center for Natural Resources, surveyed four Eugene High Schools. The items surveyed included all mercury-containing items as the 4J District wanted to obtain a comprehensive assessment of what mercury-containing items were on site.

After the removal and replacement of products, the City requested additional funds from the ACWA grant coordinator to include Bethel School District. Although the Bethel District initially appeared interested, the district later declined the grant assistance.

### Amount of Mercury Identified and Replaced in Schools

The pilot project removed 136 thermometers and 5 freestanding and wall-mounted barometers from the four schools. Each thermometer contains almost a gram of mercury. Each barometer contains approximately 1 pound of mercury. In addition, mercury-containing lab chemicals were also inventoried and removed. The chemicals included Mercury Chloride, Mercury Nitrate, and Mercury Oxide. One mercury spill kit was also removed.

The school district also collected and disposed of 3,014 (12,000 linear feet) of fluorescent tubes that were not covered by the scope of this project but were included in the inventory. Each 4-foot tube typically contains between 20-60 milligrams of mercury, some have as high as 80 milligrams of mercury in them.

We estimate that Eugene removed and properly disposed of 5.3 pounds of mercury through this program. This does not count the fluorescent tubes the District disposed of properly.

## Corvallis

### Anticipated Scope of Work

Corvallis planned to survey one high school and one middle school within the Corvallis water and wastewater service area. The City would offer to pay for removal and replacement of elemental mercury, mercury salts, and mercury-containing compounds. The City would develop a survey form, and use it to visit each school's science rooms, health clinics, and other areas where mercury compounds might be found. Excluded from this survey were durable items such as climate control thermostats and fluorescent light tubes. The survey included durable items such as spectral tubes and laboratory and fever thermometers.

### Project accomplishments

In carrying out the project, Corvallis Public Works staff developed survey forms and surveyed two schools. Copies of the survey forms are included as Appendix A. The school district requested a survey of one additional school. The initial high school identified for this program (Corvallis High School) previously experienced an expensive mercury spill and cleanup, so little mercury was expected. Corvallis Public Works staff obtained authorization to include a third school in the grant.

After completion of the grant-funded portion of this project, Corvallis Public Works offered the school district the opportunity to have a similar mercury removal take place at all the other schools in the district. The City of Corvallis provided survey forms to the school district's risk management director, and she arranged for each science teacher and/or principal to perform a survey of their school.

### Amount of mercury identified and replaced in schools

The initial pilot project removed 91 mercury thermometers from three schools. Each thermometer has up to about a gram of mercury, or enough to pollute a 20-acre lake. The survey also found and removed mercury-containing gauges and equipment containing almost 3200 grams of mercury, and almost 500 grams of various mercury-containing chemicals (e.g., mercury oxide, mercury sulfate, mercuric thiocyanate) from the three schools.

The second round of surveys identified and replaced and additional 17 thermometers, 13 thermoregulators, and five spectral tubes totaling about 30 grams of mercury. This second round also identified and removed almost 1700 grams of mercury-containing compounds such as mercury oxide, mercury sulfate, mercury chloride and mercury nitrate. There was also one contaminated spill kit from a broken thermometer that added almost one additional gram of elemental mercury. This project also disposed of five pints of sulfuric acid.

We estimate that the City of Corvallis removed and properly disposed of 12 pounds of mercury that could have found its way into the wastewater collection system and eventually to the Willamette River.

## Development of education and outreach materials

The project team hired an experienced educational curriculum writer and design team to produce educational materials for use in middle schools. The educational materials were written with a middle-school audience in mind.

The curriculum writer was Susan Blackaby (5327 SW Dover Court, Portland, OR, 97225, e-mail at sblackaby@attbi.com). The final designer was Julie Hill (The Design Ranch, 1654 NW Albany Avenue, Bend, OR 97701, e-mail at jhcowgirl@bendcable.com).

Materials produced under the project include:

1. Student Pocket Folder
2. Teacher's Guide
3. Mercury audit checklists for a) health care providers, b) physical plant staff, c) janitorial staff and d) a home audit for students.

Additional copies of these educational materials were printed with the second grant. This will allow municipalities to use these educational materials as part of mercury reduction programs required under plans developed to meet water quality standards, Total Maximum Daily Load (TMDL) Implementation Plans.

Eugene and Corvallis used copies of the educational materials as part of their pilot project.

### Eugene Educational Outreach Distribution

In Eugene, the distribution of the outreach materials is continuing. The City of Eugene believes that it is important to provide an overview of the materials during the distribution process rather than providing them to the school to distribute.

### Corvallis Educational Outreach Distribution

The City of Corvallis used the educational materials developed for the schools that participated in the program. Corvallis Public Works staff distributed these materials to the risk management division of the 509J Corvallis School District for dissemination to students.

In addition, during the years that this project was underway, Corvallis Public Works developed several additional outreach tools and strategies. A nine-foot long window display was erected in a downtown storefront that dedicates space to community education. This display aimed to educate citizens about the hazards of mercury, where mercury is found in the home, and provided information about hazardous waste disposal events. The window display also served as an advertisement for a booth that Public Works staff developed for the annual Da Vinci Days festival. Da Vinci Days is a three-day festival celebrating art, science, and

technology. The booth featured posters similar to those displayed in the storefront, but also contained hand-on games and activities to educate children and adults about mercury. The booth was very popular. Staff encouraged visitors to exchange their mercury-containing fever thermometers for mercury-free alternatives and provided coupons good for free exchange at the next DEQ-sponsored event at Corvallis Disposal. A final local effort included mercury hazard information at the annual Earth Faire, an environmental education and entertainment festival sponsored by the Corvallis Environmental Center.

## Budget

The spread sheet below summarizes the budget expenditures related to the project.

| Date | Name | Memo | Amount |
|---|---|---|---|
| 09/23/2003 | NWFF Environmental | NWFF Environmental - Mercury Disposal | 990.00 |
| 09/23/2003 | VWR International | VWR International - 319 Mercury Grant | 1,099.51 |
| 10/29/2003 | VWR International | VWR International - 319 Mercury Grant | 114.08 |
| 11/25/2003 | Susan Blackaby | Research & Writing for Mercury Project | 1,680.00 |
| 11/25/2003 | Toni Lee Curry | Mercury Education packet design services | 750.00 |
| 05/03/2004 | VWR International | VWR International - 319 Mercury Grant | 209.96 |
| 05/03/2004 | VWR International | VWR International - 319 Mercury Grant | 14.43 |
| 05/03/2004 | VWR International | VWR International - 319 Mercury Grant | 1,178.89 |
| 05/05/2004 | VWR International | VWR International - 319 Mercury Grant | 42.22 |
| 05/13/2004 | Allivan Marketing, LLC | Barometers for mercury project | 1,237.67 |
| 05/17/2004 | VWR International | VWR International - 319 Mercury Grant | 201.26 |
| 06/14/2004 | VWR International | VWR International - 319 Mercury Grant | 127.91 |
| 06/15/2004 | VWR International | VWR International - 319 Mercury Grant | 46.74 |
| 06/15/2004 | VWR International | VWR International - 319 Mercury Grant | 100.36 |
| 06/29/2004 | The Design Ranch | Design Services of Mercury project | 4,284.00 |
| 07/06/2004 | Bartelson Environmental | Bartleson - 319 Mercury Grant | 365.00 |
| 04/26/2005 | DocuMart-Macadam | Mercury 319 printing costs | 8,511.94 |
| 04/27/2005 | The Design Ranch | Design Services of Mercury project | 255.00 |
| | | | **21,208.97** |

## Eugene Cost Description

### Replaced equipment costs

The project purchased a total of $2,641 of mercury-free equipment. for the four Eugene 4J District high schools. The school district did not request funding to replace any chemicals.

### Mercury pickup and disposal costs

The City of Eugene and 4J School District were able to benefit from Oregon DEQ's Solid Waste program that paid all the disposal costs for the items collected and disposed of through Lane County's Hazardous Waste program. This allowed the City to be able to spend more money for the replacement of materials than what was originally projected.

### Staff time contributed to project

An estimate of 50 hours of City of Eugene staff time was spent on this project as we had assistance from the schools in conducting the inventories. Part of this time was also spent researching non mercury product alternatives. In addition, since the distribution of the educational materials is still in process, there will be additional hours for this part of the project that will more than double the initial 50 hours already spent on this project.

## Corvallis Cost Description

### Replaced equipment costs

The initial pilot of three schools purchased $1,240 of mercury-free substitute equipment. While some mercury-containing chemicals were identified and removed, the teachers did not always request any replacements with mercury-free substitutes.

During the additional surveys for the entire school district, city staff identified, removed, and replaced $222 of equipment and $275 of chemicals.

### Mercury pickup and disposal costs

Pickup, transportation and disposal costs from the initial pilot survey totaled $990. Note that the costs would have been significantly higher due to one very large item (a manometer) containing about 3.2 kilograms of mercury. A department from Oregon State University donated this equipment to the school many years ago. It has been in storage for a long time. The Oregon State University agreed to take the equipment back as a museum piece. Disposal estimates for this one item were about $1,200. If this amount is considered an in-kind contribution from Oregon State University, disposal costs would total $2,190.

Pickup, transportation and disposal costs from the additional surveys for the entire school district totaled $365.

### Staff time contributed to project

While Corvallis did not track all hours contributed to this project, a conservative guess would be about 200 hours. This estimate includes time spent on related activities that promoted or brought attention to the project. Actual time spent may be as much as 50% more than reported here.

## Summary of In-Kind Expenses

The chart below summarizes the in-kind expenses to the project.

| *Agency* | *Staff person* | *Hours contributed* | *Contribution @$65/hour* |
|---|---|---|---|
| **Clean Water Services** | | | |
| | Mark Jockers | 23 | $2024 |
| | Marney Jett | 64 | $5632 |
| **City of Corvallis** | | | |
| | Mark Taratoot | 200 | $13,000 |
| **City of Eugene** | | | |

| | | | |
|---|---|---|---|
| | Sharon Olson | 50 | $ 3,250 |
| **ACWA** | | | |
| | Janet Gillaspie | 60 | $3,900 |
| | | **Total In-kind Contributed** | $27,806 |

The total in-kind contribution required for the first grant[1] was $9,919 in match. That was more than exceeded in by the contributing agencies.

## Recommendations and suggestions

Projects involving schools take a lot of coordination and lead time. The project team underestimated the coordination and response time lag from the participating school districts. Improved coordination between these types of projects and pollution prevention teams, such as those that operate in the Portland and Eugene areas would be best.

Overall,

- Projects involving school districts, especially multiple school districts, probably require a long planning horizon. This project took about three times as long as anticipated. Involving districts at the highest level may be the best initial strategy.
- Because disposal costs are based on the volume of the container needed to transport the items, it is a good idea to coordinate multiple projects to maximize the space within the container that is utilized. Getting the initial inventory completed can be difficult.
- Finding the proper vehicle for distributing the educational materials can be difficult. Distributing the materials one-on-one with the teachers involved seems best, but is very time intensive. Improved coordination with the teachers involved in the schools targeted is needed.
- As the mercury Total Maximum Daily Load plans for the Willamette are finalized, it would be ideal for DEQ to recognize the efforts that many communities are making to minimize mercury entering the environment. It may be that proactive communities have minimal additional opportunities to reduce mercury from wastewater systems because of previous successes.
- As compact fluorescent light "bulbs" gain more and more market share and become more common, their disposal risk will grow. It would be ideal if DEQ or some other agency or association worked towards making it more convenient for individuals and businesses to dispose of burned-out tubes and bulbs. Corvallis Disposal, for example, holds four hazardous waste disposal events each year in their community. While many people do participate, it is not a convenient way for residents to dispose of one or two bulbs they may need to get rid of. Further, if kept in storage longer while waiting for an event, breakage may occur. Ideally, drop sites would be established in convenient locations for residents to bring compact fluorescent bulbs, and ideally the temporary storage of these items for residents would not contribute towards an entity being designated a significant generator.

It would be ideal for DEQ to recognize the efforts that communities are taking to minimize mercury entering the environment such as this pilot project as well as efforts by Lane County's Pollution Prevention Committee, a multi-agency group that has sponsored mercury thermometer collection events for the general public and a collection event for dentists hosted by Lane County and the cities of Eugene and Springfield.

[1] DEQ Agreement 030-03, project #W02549, PCA#64543

## Anticipated water quality impact

### Eugene

Any programs the City of Eugene can implement or participate in to reduce mercury in our community are a step toward reducing the amount of mercury in the wastewater collection system, in the Willamette River Watershed and in the environment. Although we may not be able to detect any measurable differences in mercury in the wastewater collection system with each individual program or policy that is implemented, collectively, we may be able to detect measurable differences over time. In addition, with projects like this, we can also measure the amount of mercury that is removed from the environment. In addition, the risk of exposure to school staff and students is also reduced by removing mercury-containing items. Finally, the overall benefit of this program and other related programs is the educational benefit of providing information and guidance to the community concerning the potential impacts and hazards of mercury. The information and guidance the students and staff receive at school could also reduce the amount of mercury products they are purchasing and using in their homes, and also help prevent releases to the environment.

### Corvallis

The risk of elemental mercury or mercury salts entering the wastewater collection system is reduced. All of the chemicals and equipment was disposed of properly and will not contaminate the Willamette River or tributaries. The educational effort focused on high-school and middle-school students is likely to reduce risks of mercury contamination from residences entering soil or water in our area. Because of the scale involved, because it is unlikely that all these items would enter the environment at the same time, and because of sampling limitations, it is unlikely that Corvallis Public Works will identify any measurable improvement in water quality from this one project.

One thing to keep in mind, however, is that while schools may not constitute the largest sources of mercury to the environment, they are places where mercury and children may come together, leading to dangerous and often expensive situations.

## Project Team

The project team included:

- Mark Jockers, Clean Water Services, project manager
- Sharon Olson, City of Eugene
- Mark Taratoot, City of Corvallis
- Marney Jett, Clean Water Services
- Janet Gillaspie, ACWA, project assistant

## Appendix A – Survey Form

## Appendix B – Non-Point Source Grant Agreement Expenditures/Match Report