Ecology/Health Responses to Public Comments Received on the *Draft Mercury Chemical Action Plan*

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Ecology/Health Responses to Public Comments Received on the *Draft Mercury Chemical Action Plan*

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Purpose of this Document

The purpose of this document is to report on and respond to comments received by the Washington State Department of Ecology (Ecology) on the *Draft Mercury Chemical Action Plan.* Comments were received by letter, fax, and e-mail during a 60-day comment period, September 4 through November 8, 2002. Also, written and oral comments were received during two public forums, in Tacoma on September 26, 2002 and in Moses Lake on October 3, 2002.

In this document, Ecology has matched substantive comments with pertinent sections of the *Draft Mercury Chemical Action Plan*, using the following format:

1. Restatement of a section of the *Draft Mercury Chemical Action Plan*
2. Comments received on that section
3. Ecology or, in some cases, Washington State Department of Health (Health) review and analysis of comments
4. Ecology or Health conclusions

Comments on grammar or minor text changes are not addressed here. Written comments are reported as received, with no changes in grammar, spelling, or capitalization. Oral comments are summarized from notes taken by Ecology staff during the two public forums.

Abbreviations and Acronyms

BMP	best management practice
CESQG	conditionally exempt small quantity generator
CPG	Coordinated Prevention Grant
DOE	Washington State Department of Ecology (also "Ecology")
DOH	Washington State Department of Health (also "Health")
EPA	United States Environmental Protection Agency (also "USEPA)
Hg	mercury
HVAC	heating, ventilation and cooling systems
MACT	maximum achievable control technology
MCAP	Mercury Chemical Action Plan (also "Mercury CAP")
MRW	moderate risk waste
MSW	municipal solid waste
PBT	persistent, bioaccumulative toxin
POTW	publicly owned treatment works (sewage treatment facility)
SQG	small quantity generator
TCLP	toxicity characteristic leaching procedure
TRC	Thermostat Recycling Corporation
TRI	Toxics Release Inventory
UWR	Universal Waste Rule

Who Commented

Ecology received comments from representatives of the following groups and from several thousand individuals. These groups and individuals offered diverse opinions on PBT-related issues. We appreciate the time and effort each took to review the draft *Mercury Chemical Action Plan*, develop comments, and submit them.

Organizations ("Org-")

1. Aequus Corporation
2. Alliance of Automobile Manufacturers
3. American Chemistry Council, Chlorine Chemistry Council
4. Association of Washington Business
5. Automotive Recyclers of Washington
6. Boeing Company
7. Green River Community College Biology 110- Northwest Ecology
8. Local Hazardous Waste Management Program in King County
9. Kettle Range Conservation Group
10. King County Water and Land Resources Division, Hazardous Waste Management Program
11. King County Solid Waste Division
12. King County Industrial Waste Program
13. Kitsap County Board of Commissioners
14. Kitsap County Health District
15. Mercury Awareness Team
16. Mayor, City of Mt. Vernon
17. Mayor, City of Olympia
18. Newell-Hoerling's Mortuary, Inc.
19. Northwest Pulp and Paper Association
20. People for Puget Sound
21. Resources Coalition, Fat Chance Mining
22. Seattle Public Utilities
23. City of Spokane Solid Waste Management
24. Thurston County Environmental Health
25. Total Reclaim, Inc.
26. TransAlta Centralia Generation LLC
27. City of Vancouver
28. Washington State Dental Association
29. Washington State Funeral Directors Association
30. Washington State Hospital Association
31. Washington Physicians for Social Responsibility
32. Washington Refuse and Recycling Association
33. Washington Toxics Coalition
34. WashPIRG

Individuals ("Ind-")

1. Youram Bauman, Ph.D.
2. Susan Cook, Ph.D.
3. Kinley Deller
4. Daniel Hart, Professor, American Indian Studies
5. Irene Haynie
6. Elsie Higgins
7. Georgia Huffman-Rux
8. Loretta Jancoski
9. Jan McCoy
10. John Miles
11. Mary Ann Newell
12. Olemara Peters
13. Ron Riggins, Professor, Western Washington University
14. Stanley Stahl
15. David Stitzhal
16. Adrian Troutman
17. Betty Wade
18. Shawn Waliser

Public Meetings ("PubMtg")

September 26, 2002 - Public Forum at Henry Foss High School in Tacoma on the *Draft Mercury Chemical Action Plan*

October 3, 2002 - Public Forum at Big Bend Community College in Moses Lake on the *Draft Mercury Chemical Action Plan*

Plus

Individual e-mails (1,160)

Working Assets citizen letters (927)

WashPIRG postcards (over 2,000)

Phone calls urging a strong action plan (53)

E-Mail Example

Dear Ecology,

I am writing you and my legislators to urge you to protect the health of Washington's citizens and wildlife from the dangers of mercury by developing a strong mercury chemical action plan as part of the strategy to eliminate PBTs from the environment.

Mercury is a highly toxic substance that does not break down in the environment. I strongly support eliminating mercury from the environment. Your department's chemical action plan should:

- Close loopholes in current regulations and permits that allow industries to discharge mercury into our water and air.
- Prohibit the disposal of products containing mercury in landfills and incinerators; ban the sale of certain mercury-added products, like thermostats and fever thermometers and require labeling for all other products that contain mercury.
- Clean up abandoned mines that are leaching mercury into the environment.
- Require health care facilities to reduce or, where possible, eliminate their use of products containing mercury.

Please help Washington move toward a toxic-free future. I look forward to hearing from you on this issue.

Sincerely,

Working Assets Letter Example

(see next page)

[redacted]

CitizenLetter®

An urgent message from a concerned citizen

October 31, 2002

Tom Fitzsimmons, Director
Department of Ecology
P.O. Box 47600
Olympia, WA 98504-7600

Dear Mr. Fitzsimmons,

I am writing to urge you to quickly phase out mercury products and strengthen mercury emissions standards.

Washington residents are seriously threatened by mercury pollution. Last spring, the contamination was so high that the Health Department was forced to issue warnings about eating local fish. Even a small amount of mercury can cause blindness, deafness and learning disabilities, especially in young children.

The Department of Ecology (DOE) will be adopting a plan to address mercury pollution. The DOE should meet its commitment to protect the public from mercury.

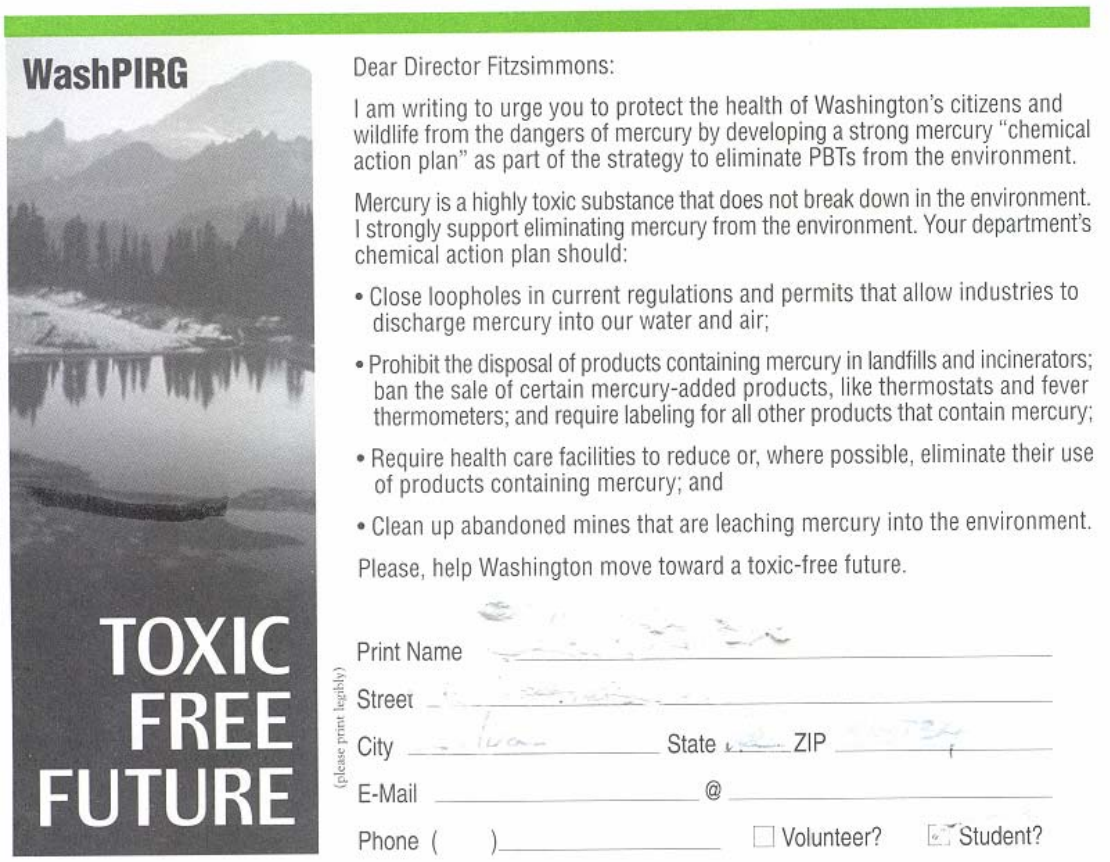
The plan should include recommendations for legislation to ban the sale of mercury products when there are viable alternatives, like like thermometers and thermostats, and requiring manufacturers to label mercury-containing products. It should also take the necessary steps to strengthen air and water emissions standards.

Please tell me how you intend to address this important issue.

Sincerely,

[redacted]

WashPIRG Postcard Example



Summary Total of Comment-related Documents

34.....Organizations

18.....Individual letters

33.....Comments from public forums in Tacoma and Moses Lake

1160.....Individual e-mails

927.....Working Assets citizen letters

>2000.....WashPIRG postcards

53…..Phone calls urging a strong action plan

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Introduction and Background to the Mercury Chemical Action Plan

Comments Related to the Goals of the Mercury Chemical Action Plan

The Draft Mercury Chemical Action Plan stated

The *Mercury Chemical Action Plan* is designed to meet two, co-equal goals:

1. Virtual elimination of the use and release of anthropogenic mercury in Washington State.
2. Minimize human exposure to anthropogenic mercury.

"Virtual elimination" is defined for this document as a reduction of mercury releases to the air, water and land from anthropogenic, or man-made, sources using life-cycle management practices (e.g., pollution prevention and release controls) so as to approach the levels and fluxes of mercury that would be expected from naturally-occurring processes. This virtual elimination goal is identical to that expressed in the U.S. Environmental Protection agency (EPA) Working Draft: PBT National Action Plan for Mercury, the Canada-US Binational Toxics Strategy for the Great Lakes and in the tri-lateral North American Regional Action Plan developed by Canada, the US and Mexico.

The purpose of the *Mercury Chemical Action Plan* his to prevent new mercury from entering the environment and reduce the contribution of existing sources. Since eating fish is the greatest source of mercury exposure for most people (as opposed to breathing mercury or absorbing it though the skin), preventing the entry of mercury into the environment is the best way to reduce mercury exposure that causes health effects.

The long-term strategy for reducing exposure to mercury is to lower concentrations of methylmercury in fish by limiting mercury releases into the atmosphere from burning mercury-containing fuel and waste and from other industrial processes. Reducing the use of consumer products that use mercury, trading in mercury-using products for those that don't, also helps to prevent spills that contribute to environmental mercury contamination. Mercury that is released into the atmosphere today may end up on our dinner table tomorrow. Children are especially sensitive to the damaging effect of mercury on the development of their nervous and circulatory systems. Damage to children's ability to learn and control their behavior has great social and economic cost. Heart disease is a major killer of adults. There is evidence that early exposure to mercury damages blood vessels in the heart and those leading to the brain. Prevention of mercury exposure has great public benefit in health and well-being. Damage to wildlife that is similar in nature to damage in humans has also been reported. Reducing mercury benefits our ecosystems as well.

Public Comments

Org-1: When developing a Chemical Action Plan on a Persistent Bioaccumulative Toxins, one would assume that all sources of contamination would be considered in creating the CAP. Although, we have found that is not the case. According to Ecology staffer, Cheri Peele, Ecology is limiting its scope for the Mercury Chemical Action Plan only to products that use Mercury in WA. By such a limitation, Ecology is looking at pounds of pollution and ignoring tons of mercury deposited in WA.

Org-3: The Councils agree that mercury may pose a risk to human health in certain circumstances and commends DOE for addressing concerns raised by mercury exposure. However, DOE's first goal, the "virtual elimination of the use and release of anthropogenic mercury in Washington State," fails to consider whether, or to what extent, the virtual elimination of the use and release of anthropogenic mercury in Washington will reduce exposures and risks to Washington residents. That goal fails to recognize that significant sources of mercury originate well outside the State (likely in other counties) and that significant sources of mercury released in the state may be non-anthropogenic. Therefore, it is unclear whether any actions proposed in the Mercury CAP will significantly reduce actual exposures and risks to State residents.

Org-3: DOE's second goal of the Mercury CAP, to "minimize human exposure to anthropogenic mercury," again fails to recognize the potential significance of non-anthropogenic sources of mercury. Further, although the second goal comes closer to considering potential risks, the Mercury CAP fails to assess and specifically manage human exposures to mercury. Rather, DOE appears to assume that human exposures will be minimized when anthropogenic mercury uses and releases in the State are eliminated. DOE does not attempt to demonstrate in the draft Mercury CAP a link between the elimination of the use and release of anthropogenic mercury in the State, and decreased human mercury risks. In any event, it is unlikely that there is such a direct link. This is an issue that DOE must address when it attempts to manage mercury and other PBTs. We urge DOE to develop a process *now* to scientifically assess human risks, and to determine effective means to control those risks.

Org-7: I think it would be extremely hard to virtually eliminate the use and release of anthropogenic mercury in Washington…Minimize human exposure is a little bit easier because you could tell people and aware them of mercury but I don't think many people will take response to it. (Lindsey de Haan)

Org-9: Develop a framework that will eventually eliminate new mercury pollution.

Org-9: Develop a framework that will reduce mercury pollution over time.

Org-15: Page 1, paragraph 4: Addition: "The Mercury Chemical Action Plan …..The number one source of mercury for most people is from their mercury amalgam dental fillings. The World Health Organization (WHO), Document 118, 1991, p. 36. shows that the average daily exposure to mercury in fish is 3 ug, while the average daily exposure to mercury in dental amalgams is between 3.8-21 ug. A National Institute of Dental (NIDR) study of 1147 military

men conducted in 1998 revealed that men with amalgams had almost 4 times as much mercury in their urine. It also showed that 90% of the mercury was from mercury amalgams. Thus, the NIDR study confirmed the WHO report conclusion that amalgams are the main source of mercury in the human body. Kingman A et al., NIDR Research, "Mercury concentrations in urine and blood associated with amalgam exposure in the US military population", Journal of Dental Research, 1998, 77(3):461-71.

Terminating the placement of mercury amalgam dental fillings is the best way to reduce mercury exposure that causes health effects.

Org-19: NWPPA compliments the Department on their thoughtful, step-by-step approach to addressing Persistent Bioaccumulative Toxins (PBT) in Washington. The Mercury Chemical Action Plan (MCAP) is the first targeted effort and we encourage the Department to maintain their commitment to an inclusive PBT strategy (characterized by staff at the Sept. 26th Forum) as:

- Pollution prevention
- Public education on the "societal problem"
- Promote alternatives where available, and
- Effectively manage past releases where management is economically feasible and cost-effective.

NWPPA believes Ecology's tenets of education, pollution prevention advocacy and voluntary cooperation are vital to a successful Strategy where all citizens have a role to play in PBT reduction.

Org-19: NWPPA supports the MCAP goals on targeting anthropogenic sources of mercury for reduction and on minimizing exposure to anthropogenic mercury.

Ind-15: There are two ways to be a leader. One is to have a vision and get everyone to line up behind you. The other is to see line of visionaries and to stand in front of them.

This latter opportunity is open to ecology today. Much heavy lifting on mercury has been done already. If even the most far-reaching version of the chemical action plan were passed, Washington will simply be joining others around the nation and globe that are addressing the mercury issue.

PubMtg: Dave Stitzhal, Environmental Consultant. Comment made at the September 26, 2002 *Draft Mercury Chemical Action Plan* Public Forum – Tacoma:

Plan needs to have a vision. A lot of "heavy lifting" has been done today, and here is a low risk opportunity for Ecology to be a leader. Manufacturers should pay for the life-cycle responsibility of Hg in their products. The solutions proposed in the draft plan are funded by the taxpayers. Ecology needs to shrug off those motivated by money. For Ecology to be a real leader, it should take steps to:

- Place the cost on industry/manufacturer
- Phase-out mercury products
- Set up mercury disposal options

- Require clear labeling of products
- Prevent the use of dental amalgam

Industry is not being held responsible. Ecology and Health needs to be motivated by health.

Ecology's Review and Analysis of Public Comments

Review of the comments above indicates a variety of viewpoints and perspectives about the need to further reduce anthropogenic mercury sources in Washington. The comments assert that:

- Naturally occurring mercury sources may also provide a route of human health exposure.
- Anthropogenic sources of mercury from outside Washington need to be considered.
- Mercury amalgam fillings are the number one exposure source of mercury for many people.

Ecology was directed by the Washington State Legislature to: "Develop a mercury chemical action plan that includes, but is not limited to:

1. Identifying current mercury uses in Washington;
2. Analyzing current state and federal laws, regulations, rules, and (1) voluntary measures that can be used to reduce or (2) eliminate mercury;
3. Identifying mercury reduction and elimination options; and
4. Implementing actions to reduce or eliminate mercury uses, and (1) releases…"

Ecology has developed the MCAP with this directive in mind. In the final MCAP, Ecology added text addressing naturally occurring mercury in Washington and what is known about sources of mercury migrating from outside of Washington's borders. Ecology defers to the Washington State Department of Health (DOH) regarding the issues associated with human exposure to mercury from mercury amalgam fillings.

Ecology's Conclusions

Ecology recognizes there are a variety of views about the need to further reduce anthropogenic mercury releases in Washington State. Ecology agrees that the overall mercury problem in our environment and in certain parts of the food chain is part of a larger global problem. Ecology believes everyone needs to do their part in working towards the goals of "virtual elimination" and minimizing human exposures to mercury. Ecology believes that a significant reduction in the annual load of mercury released to Washington's environment can be achieved by:

- Reducing the number of fluorescent lamps, thermostats, thermometers, and other products routinely disposed of to Washington's landfills and incinerators.
- Redirecting mercury-laden medical waste away from autoclaves.
- Collecting amalgam waste prior to down-the-drain disposal.

Ecology has little authority to direct out-of-state sources of mercury. Simply waiting for "someone else to solve the problem" is not acceptable when easily achievable common-sense solutions are available.

Comments Related to Exposure to Mercury

The Draft Mercury Chemical Action Plan stated

Human beings can be exposed through three routes of exposure:

1. Eating certain fish that are long-lived or are predators that have accumulated mercury in their tissues through the food web.
2. Inhaling mercury vapor from liquid mercury spills (a problem in enclosed spaces only) and to a limited amount from amalgams
3. Skin absorption through contact with liquid mercury or creams and unguents containing mercury in any form

Public Comments

Org-3: To the extent DOE chooses not to undertake further analyses and develop a scientific risk-based approach for managing mercury exposures, however, we believe that DOE should clearly explain in the Mercury CAP that its recommended actions may not lead to significant decreases in mercury exposure or risks to Washington residents. For example, Washington residents should not be misled to believe that the additional controls on mercury uses and disposal recommended in the Mercury CAP will necessarily decrease mercury levels in fish. Further, DOE should attempt to quantify and present the financial and societal costs associated with the proposed actions – most of which will be borne in a variety of manners by State residents. Costs to Washington residents could mount as DOE develops CAPs and takes action for other PBTs. State residents should understand that significant state spending and additional burdens placed on residents may not result in significant mercury reductions.

Org-15: 80% of Americans have mercury amalgam dental fillings. They are the number one source of mercury vapor exposure. Spills of elemental mercury are a much rarer source of exposure for most Americans, but one that can cause a risk of a temporary high exposure that can cause serious harm.

Org-31: The gravity of the toxicity posed by mercury – a potent neurotoxin -- is of significant consequence. The necessity to phase out mercury in consumer and health care products, and from environmental releases, has been recognized by the state's major medical associations. The Washington Academy of Family Physicians, Washington State Medical Association, and Washington State Public Health Association have each endorsed resolutions encouraging the phaseout of mercury from products and practices. In doing so, these associations recognized that permanent harm can be caused – particularly to children and developing fetuses –by mercury exposure. These effects include learning and behavioral disabilities, birth defects, and serious impacts to the kidneys and lungs.

DOH's Review and Analysis of Public Comments

Comments provided reiterate the consequences of mercury toxicity and note that silver-mercury amalgam dental restorations are the primary source of exposure to elemental mercury vapor.

DOH's Conclusions

The Washington State Department of Health concurs with the public comments presented.

Comments Related to Exposure to Mercury Vapor

The Draft Mercury Chemical Action Plan stated

Elemental (liquid) mercury can evaporate and cause exposure if the mercury is in an enclosed space. For instance, mercury spilled in a room can evaporate and reach exposure levels high enough to cause health effects even from short-term exposure.

Spills of mercury from broken thermometers, blood-pressure cuff monitors, jewelry, thermostats, and switches containing mercury are among the things that can result in air exposures to mercury vapor large enough to cause symptoms. Mercury in outdoor air is generally not at concentrations that cause health effects. Mercury travel worldwide in the high atmosphere is not available for people to breathe. Its importance to exposure occurs when it returns to earth in the form of a mercury compound dissolved in rain or snow, since it can then enter the food web.

Public Comments

No comments were received for this category.

DOH's Review and Analysis of Public Comments

No comments.

DOH's Conclusions

The Washington State Department of Health concurs that adverse health effects can occur from inhalation of elemental mercury indoors. Occupational studies support this conclusion. While mercury-containing devices could, when releasing mercury due to breakage, increase body burden levels and add to an individual's daily elemental mercury vapor exposure, there is insufficient data to suggest that this type of exposure alone results in adverse health effects to non-occupationally exposed individuals.

Comments Related to How Mercury Enters the Environment

The Draft Mercury Chemical Action Plan stated

The most common source of exposure to mercury for most people is eating of fish that contain methyl mercury, a carbon-containing (organic) compound of mercury. While other foods are known to contain trace amounts of mercury, consumption of fish with high mercury levels is by far the largest exposure source from mercury for most fish eating people. Fish is generally very good food. In order to understand why eating some fish may be a health concern, the question of how mercury gets into fish needs to be answered. Understanding how mercury gets into the environment is essential to understanding how mercury gets into fish.

Elemental mercury can evaporate and enter the air even at ambient temperatures, but especially when heated. Compounds of mercury (that are found in coal, for instance) can undergo chemical reaction during combustion and release elemental mercury to the air. Elemental mercury can also be released slowly from ores, and from the amalgams it forms with other metals. Most elemental mercury released into the air is circulated worldwide at high atmospheric levels. It may react with other chemicals, especially chlorine compounds, in the atmosphere, and be deposited through rain or snow precipitation anywhere worldwide. The mercury circulating like this cannot be breathed, and does not present a route of exposure to humans or other living things while it is in the atmosphere. Once it reacts and precipitates, its compounds can enter other routes of exposure, especially the food web.

Inorganic mercury compounds (i.e., mercurous or mercuric chloride) result form chemical reactions between mercury and other elements or compounds. Exposure to such compounds is rare for people who do not work in laboratories or industries where such compounds are used. Mercury compounds are very caustic and present a health problem mostly from the ingestion route, in which people swallow mercury compounds accidentally or deliberately. The corrosive nature of the mercury compounds can damage the stomach and digestive tract. Inorganic mercury compounds can also be converted to organic mercury compounds in the digestive tract, which can then be absorbed into the general circulation and be transported by blood and other body fluids to the brain and kidney where they cause damage.

Mercury gets into fish through a complex process that involves many steps. First, mercury in the form of mercuric chloride from combustion of mercury-containing materials enters bodies of water by being deposited directly on water, or the land that makes up a watershed. The combustion process causes chemical reactions between other substances and mercury, forming fine particles in air that can be caught up in water droplets that later fall to earth as rain or snow. Run-off from land puts the inorganic mercury into streams and lakes throughout their watershed. Once in sediments of streams and lakes, bacteria can take up the deposited mercury, change it chemically to the organic form (methyl mercury), which does not readily leave the bacteria.

Animals that eat the bacteria accumulate the mercury compounds within the bacteria. Because most living things are not very efficient at extracting energy from food, they must eat many times their own weight to sustain their life. Mercury in food is excreted very slowly and is left largely bound up in cells. Because of these qualities, it increases in amount over time within

individual living things, if they are continually exposed to mercury. Invertebrate organisms eat bacteria and other mercury-containing microorganisms in large amounts. Large fish eat many times their weight in small fish and invertebrates. At each step of this food chain, the amount of mercury left behind in tissues increases in amount. Predatory fish that are long-lived can accumulate hundreds of thousands to millions of times the concentration of mercury that entered the water as precipitation or run-off. Human beings can be exposed to mercury when they eat fish that have high mercury concentrations. The amount of mercury that human beings get depends on the amount of fish they eat, and the concentration in those fish species they choose to eat.

Limiting mercury releases into the atmosphere from burning coal and waste and from other industrial processes will reduce fall-out of mercury to waterbodies and watersheds, and ultimately reduce mercury concentrations in fish. Likewise, reducing the use of mercury-containing consumer, and trading in mercury-using products for those that don't, also helps to prevent spills that contribute to environmental mercury contamination. Eating fish, for most people, is the greatest source of mercury exposure. Reducing mercury in fish will reduce most people's exposure

The *Mercury Chemical Action Plan* is designed to ultimately reduce the effects of mercury on the health of people and wildlife. Since eating fish is the greatest source of mercury exposure for most people (as opposed to breathing mercury or absorbing it though the skin), preventing the entry of mercury into the environment is the best way to reduce mercury exposure.

Public Comments

Org-1: EPA has been conducting studies of air deposition of mercury through out the United States. One of the areas of monitoring is WA. From the data developed, EPA estimates that 85% of Mercury contamination to WA is from air deposition from Asia. In urban areas, much of this air deposition is finally deposited to local waterbodies via scouring from stormwater runoff. The MCAP developed by Ecology makes no mention of the 85% of Mercury pollution deposited in WA state via Asian pollution cited by EPA and the United Nations. And, the MCAP makes no mention of urban stormwater as a carriers of such pollution.

Org-19: The stated goals of the MCAP focus on anthropogenic mercury in Washington State – this first-step is appropriate. Since mercury is a naturally occurring element in the earth's crust, mercury is contained in organic matter. Mercury's unique chemical properties have promoted its use in scientific measuring devices, lighting devices, batteries, switches and health applications to name several man-made uses of mercury. Working to ensure these known quantities are appropriately handled and then disposed of/recycled, in accordance with all federal and state regulations, is the appropriate role for Ecology and the Department of Health.

Ecology's Review and Analysis of Public Comments

Review of the comments above suggests one view that "85% of mercury releases come directly from Asian sources". Ecology has reviewed available literature and has not found any documented evidence that this is the case. While Ecology agrees that anthropogenic release of mercury occurs everywhere and that these releases contribute to an environmental problem that

is global in nature, Ecology does not agree with the statement that "…85% of mercury contamination to Washington is from air deposition from Asia."

Ecology was provided a copy of the report that the commenter used to arrive at his "85% from Asia" conclusion. Ecology's review of this report, referred to as *the Application of the REMSAD Modeling System to the Midwest* (S. Douglas, T. Myers, R. Beizaie, and G. Glass, SAI), resulted in the following conclusions:

- A review of the memorandum and a subsequent conversation with the lead author (S. Douglas) refutes this assertion.
- A figure in the above-referenced report may have been misunderstood or misinterpreted to yield the claim. Figure 7 shows model output for "tagged results" for a number of Mercury Deposition Network (MDN) sites. The bar graph for station WA18 (the Seattle, Sandpoint site) shows the model simulating roughly 85% of (wet deposition) mercury at that station coming from "boundary conditions" and "discrepancies."
- Ecology discussed the report with Dr. Sharon Douglas, the report's lead author. When informed that some were saying that the memo showed 85% of Washington's mercury coming from China, Dr. Douglas responded, "I don't remember saying that." She went on to explain that the model doesn't differentiate between sources from various geographical areas. The "boundary conditions" referred to in Figure 7 were set by entering a value for global atmospheric background. For this run of the model, this "background" value was attributed to "personal communication" from three people. Dr. Douglas indicated that input values for this variable have since been improved.

Dr. Douglas raised a number of caveats that must be considered when using the results reported in this memo.

- "Boundary conditions" and "discrepancies" are not equivalent to sources from China, Asia, or any other geographical area. Additionally, estimates of atmospheric global background mercury (on which "boundary conditions" were set) include US sources that have contributed to global background mercury loads.
- This was a "demonstration effort" and the results were preliminary.
- The model did not do a good job of predicting mercury wet deposition at MDN sites. It did a particularly poor job of predicting wet deposition at WA18 where the actual value was more than 20x higher than the simulated value.
- The modeling effort focused on Wisconsin.
- The model predicts that most of the mercury deposition is dry rather than wet, yet Figure 7 represents conditions for wet deposition only.

Ecology interprets the overall point of this first public comment above as essentially:

"What is released in Washington is insignificant compared to the rest of the world – so why bother?"

Ecology does not agree with this view. Ecology's mission is to protect human health and the environment. We believe mercury is a serious environmental problem globally and a significant problem locally. The sooner we can reduce releases and emissions, the better quality of life and environment for everyone. Ecology expects other states and nations to do the same. Many states are taking steps already. Ecology believes it is important for Washington State to do the same – especially in those areas where non-mercury alternatives are readily available.

Ecology concurs with the second comment above, especially the point: "Working to ensure these known quantities are appropriately handled and then disposed of/recycled, in accordance with all federal and state regulations, is the appropriate role for Ecology and the Department of Health."

Ecology's Conclusions

Ecology agrees that anthropogenic releases of mercury into the environment is a worldwide problem. Once mobilized in the environment, mercury can cycle through land, air, and water, undergoing a number of complex chemical and physical transformations. An understanding of the global mercury cycle is necessary to understand the causes of mercury accumulation and to evaluate the role played by human activities and by different sources of mercury emissions.

Ecology supports efforts by the United Nations Environment Programme (UNEP), U.S. Environmental Protection Agency (EPA), Environment Canada (EC), Northeast Waste Management Officials' Association (NEWMOA), and other national, state, and local governmental efforts to identify the need to further reduce releases of anthropogenic mercury, to identify actions that can be taken to further reduces mercury releases, and to take actions to reduce mercury releases.

Comments Related to How Mercury Affects Health

The Draft Mercury Chemical Action Plan stated

Whether or not mercury will affect a person's health depends on the route and amount of exposure, and who the person is. Health problems caused by mercury are most severe for the developing fetus and for young children. Pregnant women who eat fish contaminated with large amounts of methylmercury run the risk that their babies will have unhealthful changes in their central nervous system and possibly in their heart or blood vessels. Nervous system changes can affect their baby's ability to learn. In adults, methylmercury can lead to problems of the central nervous system and possible adverse effects on the cardiovascular system. Such problems typically take weeks or months before effects are detectable after the adult person has been exposed.

Based on human and animal data, the International Agency for Research on Cancer (IARC) and the Environmental Protection Agency (EPA) have classified methylmercury as a "possible" human carcinogen. This means that mercury has been found to produce cancer in two animal species, but that evidence is not adequate to say that it causes cancer in humans.

Public Comments

Org-15: The following peer-reviewed and non peer-reviewed scientific publications are all human studies linking mercury and cancers.

1. There is an increased risk of malignant brain cancer (gliomas) in men with occupational exposure to mercury. Navas-Acien A, et al, Occupation, exposure to chemicals and risk of gliomas and meningiomas in Sweden, Sweden, Am J Ind Med 2002 Sep; 42(3):214-27.
2. Male mercury miners were found to have an increase in lung cancer and liver cancer; researchers found an excess of ovarian cancer in female workers. Bofetta P, et al, Cancer occurrence among European mercury miners, Cancer Causes Control, 1998 Dec; 9(6):591-9.
3. The results of this study suggest that exposures of low levels of mercury can interfere with lymphocyte signal transduction and offers an explanation as to how mercury exposure can lead to immune cellular dysfunction. Rosenspire AJ, et al, Low levels of ionic mercury modulate protein tyrosine phosphorlyation in lymphocytes, Int J Immunopharmacol 1998 Dec; 20(12):697-707.
4. This review article indicates that cancer and heart disease display spatial patterns that show that calcium and selenium deficiencies and mercury excess in their etiologies (root causes). It concludes that longevity is most common where there are sufficient levels of calcium and selenium and low levels of mercury. Foster HD, Landscapes of longevity: the calcium-selenium-mercury connection in cancer and heart disease, Med Hypotheses 1997 Apr; 48(4):355-60.
5. The EPA mercury assessments reveal that genetic toxicity data is key; that inorganic mercury can act as a human germ cell mutagen; that for methylmercury the degree of concern for germ cell mutagenicity is high; and that mercury deposits in body organs may contribute to intractable infections or precancer. Schoeny R, Use of genetic toxicology data in US EPA

risk assessment: the mercury study report as an example, Environ Health Perspect 1996 May; 104 Suppl 3:663-73.

6. This study evaluated the importance of trace amounts of elements [including mercury] in thryroid cancer and concluded that the results of the study support the hypothesis that the direct toxic heavy metal influence on thyrocytes plays a major role in thyroid cancer etiology. Zaichick V Ye, et al, Trace elements and thyroid cancer, Analyst 1995 Mar; 120(3):817-21.
7. This article performs a risk analysis review of prior studies and concludes that, among other things, mercury amalgam is an occupational hazard for glioblastoma (malignant brain cancer) and immunotoxicological effects. Bjorklund G, Mercury in the dental office. Risk evaluation of the occupational environment in dental care, Tidsskr Nor Laegeforen 1991 Mar 20; 111(8):948-51.
8. Fur hat workers occupationally exposed to mercury had significantly higher mortality from stomach cancer for both men and women; there was a significant excess of lung cancer in women. Merler, E, A cohort study of workers compensated for mercury intoxication following employment in the fur hat industry, J Occup Med 1994 Nov; 36(11):1260-4.
9. Kadykow M, Mercury-induced granuloma [a group of inflammatory cells forming a skin lump] stimulating malignant melanoma [skin cancer],Przegl Dermatol 1986 Mar-Apr; 73(2):147-51. [Polish language.]
10. This article publishes the experience of a 75 year old man who was implanted with a mercury zinc pulsator under his right breast which developed male breast cancer; the mercury was considered causative. Rasmussen K, Male breast cancer from pacemaker pocket, Clin Electrophysiol 1985 Sep; 8(5):761-3.
11. This review article concluded that divalent ions of mercury may complex small molecules, enzymes, and nucleic acids in such a way that the normal activity of these species is altered. Free radicals may be produced in the presence of these metal ions which damage critical cellular molecules. Jennette KW, The role of metals in carcinogenesis: biochemistry and metabolism, Environ Health Perspect 1981 Aug; 40:233-52.

DOH's Review and Analysis of Public Comments

The comment provided 11 articles, several from peer-reviewed journals, with the suggestion being made that these articles "link" mercury and cancer. It is unclear if the comment is meant to suggest that the "link" describes associations or correlations.

DOH's Conclusions

Presently, the population of greatest concern for health effects from mercury exposure consists of women of child bearing age, as they can pass mercury to the developing fetus during pregnancy. There is general consensus that the critical organ for toxicity is the brain since the developing nervous system is very sensitive. Effects of mercury on the developing fetus are well documented, with observed effects including brain damage, mental retardation, blindness, seizures, and inability to speak. Further, children poisoned by mercury may develop nervous and digestive system problems and have kidney damage. Although the commenter provides articles addressing cancer and mercury exposure in occupational settings, a citation on amalgams and mercury effects, and a case study involving a cancer endpoint, effects from low-level exposure to

mercury have indicated that outcomes in the developing fetus are of most concern. When the literature is considered in its entirety, available data indicate that there are inadequate human cancer data available for all forms of mercury. Associations between mercury exposures and overall cancer rates have not been established through epidemiological studies. Two studies have associated mercury exposure with acute leukemia; however, interpretation of the results was difficult due to a lack of control for various risk factors, the small sample sizes of the populations studied, and difficulties in determining historical exposures to mercury within the populations. These types of data have resulted in the International Agency for Research on Cancer and the U.S. Environmental Protection Agency classifying methylmercury as a "possible" human carcinogen.

Comments Related to Preliminary Inventory of Anthropogenic Sources of Mercury in Washington State

The Draft Mercury Chemical Action Plan stated

Mercury releases and potential releases were calculated in two ways. First, releases from point sources were estimated in Table 1. Second, mercury in products disposed with solid waste or sewage was estimated in Table 2. The fate of mercury in disposed products is unknown. Ninety-one percent of municipal solid waste in Washington is landfilled. Presumably, many of the products listed in Table 2 are landfilled. The mercury contained, particularly in products that break easily, such as fluorescent lamps and thermometers, may be released prior to or during the waste collection process or on the face of the landfill before a daily cover layer is applied.

Table 1. Estimated Annual Releases from Point and Area Sources

Sources	Estimated annual mercury releases or potential releases (pounds)	Receiving Medium	Data Source	Confidence Level
Combustion of Distillate Fuel #2	733	Air	See Table x for estimate.	Low
Coal-fired power plants	436	Air	Toxics Release Inventory, 2000	High
POTWs	298	Land	Estimate of mercury in biosolids.	High
Manufacturing	296	Air, Land, Water	Toxics Release Inventory, 2000	Low
Municipal Waste Combustors	146	Air	TRI, Spokane Solid Waste	High
Medical Waste Autoclaves, Retorts	106	Air, Land	Derived from estimate of dental amalgam in red bag waste.	Low
Sewage Sludge Incinerators	79	Air	Estimate of mercury in biosolids.	High
Crematoria	57	Air	See Table 14 for estimate	Low
Combustion of Residual Fuel	29	Air	See Table x for estimate.	Medium
Medical Waste Incinerators	0.3	Air	WA Dept. of Ecology Eastern Regional Office	High
Gold Mining	0 - 777	Air, Land, Water	Toxics Release Inventory, 2000	Low
TOTAL	2,180 – 2,957			

Table 2. Estimated Mercury in Products Disposed of in Washington State Annually

Mercury Products	Estimated pounds of mercury disposed with solid or medical waste or sewage annually
Fluorescent lamps	505 – 1,839
Thermostats	444
Dental Amalgam from Dental Facilities	404
Auto Convenience Light Switches	219
Button Cell Batteries	88
Dental Amalgam in Feces and Urine	62
Household fever thermometers	11 - 300
TOTAL	1,733 – 3,356

Public Comments

Org-6: The estimated amounts of mercury in products in Washington State should include a quantitative analysis of how much mercury these sources contribute to the environment through air emissions or ground water seepage exposure pathways. This information should to be used in ranking control of these sources among the other recommended actions.

Org-19: NWPPA believes Ecology's initial focus on anthropogenic mercury issues, with additional research on fate and transport, and reducing possible exposure routes to the environment and humans as methylmercury (CH_3Hg), makes logical sense.

PubMtg: Randy Ray, Pacific Seafood Processors Association. Comment made at the September 26, 2002 *Draft Mercury Chemical Action Plan* Public Forum – Tacoma:

The inventory is flawed. Ecology is not looking at mobile emissions from cars and trucks, and also wood stoves. Recyclers are some of the biggest sources – they sell it to China – where 85% of the problem comes from. We need to look at cemeteries and urban storm water runoff also, as well as natural sources. There are three "mercury belts" in the US – 30-50% evaporates from the land. Ecology is looking at "pounds" and turning a blind eye to "tons". The biggest polluters are Seattle, King County, Tacoma, and Pierce County.

Ecology's Review and Analysis of Public Comments

Ecology refers to Tables 1 and 2, found on page 6 of the draft MCAP as a "preliminary inventory" of estimated annual releases of anthropogenic mercury from Point and Area Sources (Table 1) and Mercury in Products Disposed of in Washington State Annually (Table 2). This information is preliminary and is subject to change as more information is collected and compared with similar information gathered elsewhere.

One of the commenters stated that 85% of the mercury problem in Washington comes from China. Ecology's review with the author of the report that led this commenter to this conclusion proved that such a conclusion was incorrect. Similarly, Ecology believes that it is not appropriate to do a statistical analysis of estimates that are preliminary in nature and scope.

Ecology plans to collect additional information about the mercury load from mobile sources such as cars and truck and from storm water.

Ecology's Conclusions

All annual source information on mercury summarized in the MCAP is estimated. Ecology believes this information indicates that significant amounts of mercury are released annually in Washington's environment. Many of the releases result from the disposal of various mercury-containing consumer products. Ecology believes that improving the management and control of the disposal (including proper recycling) of these products can significantly reduce the amount of mercury annually released into Washington's environment.

Ecology also concurs that certain sources of mercury (i.e., coal-powered utility plants, diesel combustion, gold mining/refining) await pollution-control technology improvements that will significantly reduce their mercury releases. These improvements are several years away. Ecology expects to continue to work with those affected stakeholders over these several years to achieve further reductions.

Comments Related to Natural Sources of Mercury in Washington State

The Draft Mercury Chemical Action Plan stated

Currently, no summary exists describing natural sources of mercury in Washington State and sources of mercury deposited in Washington originating outside the state. As part of ongoing research efforts, the Department of Ecology is in the process of reviewing existing studies to develop such a summary. This is expected to be included as part of the background information for the final version of the *Mercury Chemical Action Plan*. Citations for known studies and ongoing research efforts are included in the Research and Monitoring section of this document. Occurrences of cinnabar, the ore from which mercury is mined, are listed in Appendix E.

Public Comments

Org-3: Natural sources of mercury. DOE should also consider the extent to which natural sources of mercury contribute to mercury exposures and risks within the State. For example, DOE might find that significant amounts of mercury were released from the eruption of Mt. St. Helens and now significantly contribute to mercury contamination of fish. It will be critical to know to what extent mercury from natural sources are primary contributors to exposure and risk.

Org-6: A full inventory of all potential sources of mercury into the Washington State environment and a more accurate estimation of the amounts released by each source is needed to support an evaluation of the recommended mercury control options.

Ecology has done a better job in the draft plan than in the preliminary draft plan in identifying potential sources of mercury in Washington State. However, it fails to include sources of mercury from out-of-state sources. Studies indicate global sources may represent 70-80 percent of the mercury reaching Washington State through air deposition. The inclusion of all potential sources is needed to develop even a rudimentary mercury budget for the state. Natural background levels from mercury deposits in un-mined ore are also not considered.

Similarly the amounts of mercury "released" to the environment from many of the identified sources are not well known. This is reflected in the report by assigning a high, medium or low confidence level to each source. A more accurate method for determining quantities of mercury released from these sources is needed. This improved information will allow ranking the recommended actions based on level of environmental mercury reduction achieved if those sources were further controlled.

Ecology's Review and Analysis of Public Comments

Since the completion of the draft MCAP, Ecology has conducted a literature search about natural sources of mercury in Washington State. The following summary is drawn from a new chapter in the MCAP that addresses these issues:

Natural sources of mercury include volcanoes, geothermal systems, as well as degassing and erosion from mineral deposits and mercury-enriched soils. Some authors and researchers include oceans, forests, and forest fires as natural sources, and while they do emit mercury, much of this mercury is probably recycled from other sources. The same may be true for emissions from anthropogenically enriched soils.

Volcanoes: Apparently the only direct measurements of mercury emissions from a Washington State volcano were made at Mount St. Helens in September 1980, by Varekamp and Buseck (1981). Measurements of the mountain's "gas plume" were made on five days during an active, but non-eruptive, phase and yielded mercury emission estimates of 200 to 1700 kg/day.

Few measurements of mercury in Mt. St. Helens ash have been reported. In the only data located, Sarna-Wojcicki et al. (1981) did not detect mercury in 11 analyses with detection limits of 1 and 5 ppm.

As noted by Varekamp and Buseck (1981), "Most of the mercury initially present in the magma seems to be released into the atmosphere before solidification of the magma." It is possible that the solid material, including ash, may actually be depleted in mercury.

Goff (2002) used SO_2 emission rates from Mt. St. Helens (Pettit et al., 2000) and Hg:SO_2 ratios from other volcanoes (Goff et al., 1998) to estimate mercury emissions from Mt. St. Helens. His estimate of emissions in 1994 is equivalent to $\leq$ 25 kg/yr ($\leq$ 60 lbs/yr). Goff further states, "I'm sure that values are much less now" (Goff, 2002).

Recent work by Schuster *et al*. (2002) reports mercury concentrations in an ice core from the upper Fremont Glacier in Wyoming. This 270-year record includes a substantial mercury peak that the authors believe is associated with Mt. St. Helens activity in the early 1980s. This appears to be the first report of volcano-related mercury peaks in ice cores. Similar peaks have not been reported in sediment cores. Interpretation of these results is still somewhat controversial (Engstrom, 2002; Swain, 2002)

Geothermal Systems: Both atmospheric emissions of mercury and deposits of mercury-bearing ores are associated with hot springs and geothermal areas (Varekamp and Buseck, 1983; 1984). Varekamp and Buseck (1986) estimate global emissions from geothermal systems at less than 10% of those from active and passive volcanoes.

No information on mercury emissions to air or water from geothermal areas in Washington State was located for this summary.

Degassing and Erosion from Mineral Deposits and Mercury-enriched Soils: Although emission of mercury to the atmosphere from mercury-enriched soils and minerals is a recognized phenomena, the magnitude of these emissions is disputed and uncertain (Zehner and Gustin, 2002; Engle et al., 2001). Mercury flux from soil is strongly influenced by incident radiation (sunlight), mercury speciation and concentration, temperature, and other variables (Gustin et al., 2000; Zehner and Gustin, 2002; Engle et al., 2001). To date, most measurements of mercury flux from mercury-enriched soils have been conducted in arid areas with little vegetative cover

(e.g. parts of Nevada and California.) Vegetation and shade - like that present in western Washington - is likely to reduce emission rates, perhaps by as much as 90% (Zehner, 2002).

All else being equal, emissions from land surfaces increase with increasing mercury concentrations in soil and rock (Gustin *et al*., 2000; Zehner and Gustin, 2002). Gustin *et al*., (2000) consider land surfaces to be enriched when their mercury concentrations exceed 0.1 mg/Kg, noting that the average upper crustal abundance of mercury is ~0.06 mg/Kg. Ecology (San Juan, 1994) measured background concentrations of mercury in 166 statewide soil samples. *Natural background concentrations* in these soils (located 1.5' – 2' below the surface) had a median concentration of 0.024 mg/Kg. Only four of 166 soil samples exceeded 0.1 mg/Kg. The highest was 0.186 mg/Kg.

Areas enriched in mercury are concentrated near active plate tectonic boundaries and are associated with high crustal heat flow, volcanism, hydrothermal systems, and subsequent mineral deposits (Zehner and Gustin, 2002). Huntting (1956) summarizes information on 85 "occurrences" of mineral mercury in Washington State. Of the 53 of these "occurrences" mapped by Huntting (1956), 45 (80%) are located in the Cascades. Another 8 (14%) are located in the northwest corner of the Olympic Peninsula. Thus the distribution of mercury-enriched sites in Washington is spatially quite limited.

The U.S. Bureau of Mines (1965) states "only two quicksilver [mercury] mining districts have produced commercially in Washington – the Morton District in Lewis County and the Green River District in King County." This source also reports little mercury production in Washington after 1943, and none after 1958.

One area of potential mercury enrichment is the upper Nooksack River Basin. Babcock and Kolby (1973) measured mercury in stream sediments and reported elevated concentrations (up to 0.84 mg/Kg) from Boulder Creek in the North Fork drainage. Falley (1974) found mercury-enriched sediments of several tributaries of the North and Middle Forks; the highest – 8 mg/Kg - in Clearcut Creek on the Middle Fork.

In summary, there appear to be only restricted areas of mercury-enrichment in Washington State and no major deposits. Degassing of soils and rocks is probably a minor source of mercury in the state, although erosion from isolated deposits may contribute to elevated mercury concentrations in selected drainages.

Oceans: Although some authors refer to the oceans as a natural source of mercury, oceans appear to serve instead as a pool of mercury fed by both natural and anthropogenic sources. Most of this mercury is subsequently recycled back to the atmosphere. A small portion (estimated at < 2% annually in Figure 2) is incorporated into sediments and removed from the cycle. In a recent evaluation, Mason and Shue (2001) suggest "that there is a net transfer of mercury from the terrestrial environment to the ocean, and that the concentration of Hg in the deep ocean is increasing at a few percent per year." The ocean is probably a net sink, rather than a net source, of mercury.

Forests and Forest Fires: Although forest fires have been reported as a source of mercury (Frieli et al., 2001), the mercury released, like that released by the oceans, appears to be largely

recycled mercury absorbed by plants from the atmosphere. Mercury is exchanged between atmosphere and vegetation with the main direction being from air to plants (Grayton *et al*., 2001; Lodenius *et al*., 2001, and Benesch *et al*., 2001). Plant uptake appears to take place by way of deposition and uptake through leaf stomata.

Ecology's Conclusions

While there are naturally occurring sources of mercury in Washington, Ecology believes that the environmental impact from these sources is relatively minor compared to the anthropogenic releases in Washington and outside of Washington. The goal of the *Mercury Chemical Action Plan* is to focus on anthropogenic sources and find ways to reduce human-caused releases of mercury into Washington's environment.

Comments Related to the International, National, and Local Context

The Draft Mercury Chemical Action Plan stated

Because mercury is a global pollutant that travels long distances, efforts to reduce mercury in the environment must take place at all levels of government. Many efforts are underway; a few are summarized below.

The United Nations Environment Program is in the process of developing a Global Mercury Assessment, including an outline of options for addressing any significant global adverse impacts of mercury, to be presented to the UNEP Governing Council at its twenty-second session in 2003. More information is available at http://www.chem.unep.ch/mercury/default.htm.

In 2000, the Phase II Report of the North American Regional Action Plan (NARAP) on Mercury was completed. NARAP was developed as a result of the North American Agreement on Environmental Cooperation (NAAEC) by the Commission on Environmental Cooperation. The NAAEC was signed as a parallel side agreement to the North American Free Trade Agreement in 1994. NARAP establishes a number of cooperative initiatives among Mexico, Canada, and the United States to improve the scientific understanding of the mass balance of mercury in North America, to promote pollution-prevention actions across the continent, and to assist Mexico in capacity building. The plan is available at http://www.cec.org/programs_projects/pollutants_health/smoc/pdfs/Hgnarap.pdf.

As part of EPA's, Persistent, Bioaccumulative and Toxic Chemicals Program, the agency is in the process of developing a PBT National Action Plan for Mercury. The working draft for this report is available at http://www.epa.gov/pbt/hgaction.htm. The goal for the Washington *Mercury Chemical Action Plan* is identical to that expressed in the EPA draft.

The Great Lakes Binational Toxics Strategy, a Canada-US strategy for the virtual elimination of persistent toxic substances in the Great Lakes signed in 1997, has set the goal of a 50 percent reduction nationally in the deliberate use of mercury and a 50 percent reduction in the release of mercury from sources resulting from human activity in the US by 2006. Additional information is available at http://www.epa.gov/glnpo/p2/bnsintro.html.

In 1998, New England Governors and the Eastern Canadian Premiers adopted a Regional Mercury Chemical Action Plan. The Plan's goal is the virtual elimination of anthropogenic mercury releases, with an interim goal of a 50 percent reduction in mercury emissions by 2003.

In developing its Draft Mercury Report, California identified 33 states with mercury-reduction efforts. These are summarized in Appendix A on page 105 of the California report, available at http://www.dtsc.ca.gov/HazardousWaste/HWMP_REP_DraftMercury2.pdf.

Nineteen states, including Washington, have introduced legislation to control the use of mercury in products. Eleven states have passed such legislation, including California and Oregon. A summary is contained in Appendix G of this report.

Many of the mercury-reduction efforts in Washington to date have taken place at the local level. Clark, King, Kitsap, Kittitas, Snohomish, and Thurston Counties, as well as the Cities of Seattle, Spokane, Tacoma and Vancouver have all conducted mercury reduction programs, detailed in the body of this report.

Public Comments

Org-6: The effect of EPA and other national programs for mercury reduction on mercury sources in Washington State should be fully considered in assessing the need for state-based actions.

National programs can provide more equal treatment of sources to ensure that industries and manufacturers are not at a competitive disadvantage. Although the CAP addresses some national programs for some sources it should do a better job of assessing the need for state-based actions in light of pending federal requirements or programs. It should also acknowledge that federal regulations such as those under the Clean Air Act, the Clean Water Act and federal hazardous waste management and remediation programs are developed using technical information, including complex models that are not available to Ecology.

Ecology's Review and Analysis of Public Comments

Ecology supports efforts by US Environmental Protection Agency (EPA), the United Nations Environment Programme (UNEP), Environment Canada (EC), the Northeast Waste Management Officials' Association (NEWMOA), and other national, state, and local governmental efforts to identify the need to further reduce releases of anthropogenic mercury, identify actions that can be taken to further reduces mercury releases, and take action to reduce mercury releases.

Several states, including Washington, have introduced various forms of legislation to control the use of mercury in products. Eleven states have passed legislation (in varying degrees of control and management of mercury-containing products and sources), including California and Oregon. Many of the mercury-reduction efforts in Washington are taking place at the local level. Clark, King, Kitsap, Kittitas, Snohomish, and Thurston counties, as well as the cities of Seattle, Spokane, Tacoma, and Vancouver have all conducted or are currently conducting mercury reduction programs.

Ecology's Conclusions

Ecology believes that national, state, and local efforts are needed to successfully reduce anthropogenic releases of mercury into the environment. National efforts are necessary to ensure equal treatment and level playing fields. State and local efforts are necessary since the sources of mercury vary from state to state and across regions. What may work well in Connecticut to achieve local mercury reductions may not be effective or necessary in Washington. What may be needed in King County may not be needed in Kittitas County.

Comments Related to the Mercury Chemical Action Plan: Development Process to Date

The Draft Mercury Chemical Action Plan stated

The *Mercury Chemical Action Plan* (MCAP) is the first Chemical Action Plan to be developed as part of the Department of Ecology's Persistent Bioaccumulative Toxin (PBT) Strategy. The PBT Strategy Implementation Plan was completed in December 2001 and is available at http://www.ecy.wa.gov/programs/eap/pbt/pbtfaq.html. The Washington State Legislature Provided funding to Ecology to implement the PBT Strategy during the 2001-2003 Biennium. Ecology selected mercury as the first PBT to be addressed.

In January 2002, due to the importance of health effects of mercury, a core group of staff from the Departments of Ecology and Health was formed to coordinate the *Mercury Chemical Action Plan* development process, and has met bi-weekly throughout the year. As a result of this close collaboration, the *Mercury Chemical Action Plan* has become a joint document of both the Department of Ecology and the Department of Health.

From January to March, 2002, individual and small group interviews were held with Ecology staff to identify potential sources of mercury in Washington State, ongoing and planned efforts to reduce those sources, and potential strategies for additional reductions. Information was also gathered from sources in other states and EPA regarding mercury reduction activities. This information was compiled into the Draft Background Document, an initial working draft intended for review purposes.

In March 2002, at the direction of the Washington State Legislature, Ecology formed an External "Mercury Advisory Committee", initially composed of 12 members representing agriculture, business, environmental, local government, and public health sectors. Ecology also contracted with Ross and Associates to facilitate both the advisory committee meetings and public forums scheduled for the fall of 2002. The Advisory Committee met to review the Draft Background Document in April, followed by a written comment period.

During April and May, 2002, an internal Gap Analysis Committee, composed of Department of Ecology and Department of Health staff, reviewed the Draft Background Document, identified gaps in knowledge regarding the use of mercury in Washington, and identified potential strategies for mercury reduction. The comments of the Advisory Committee and the work of the Gap Analysis Committee were applied to the Draft Background Document to develop the Preliminary Draft Action Plan. Twelve potential areas for short-term action were identified.

In June, a second Advisory Committee meeting was held. The Advisory Committee was expanded at this point to 22 members at the request of Advisory Committee members, other stakeholders, and Legislative members. In adding members, Ecology made efforts to maintain balance among the sectors represented. At the June meeting, the Advisory Committee reviewed initial estimates of mercury releases from various sources, the twelve sources proposed for short-term action and possible mercury reduction strategies. This meeting was followed by a three

week comment period for the Advisory Committee on the Preliminary Draft Action Plan. Comments from parties not on the Advisory Committee were also accepted and considered.

In July and August, external comments were incorporated. The Preliminary Draft Action Plan was reviewed by Department of Ecology and Department of Health staff, and recommendations for action developed.

Recommendations for short-term action were developed for relatively large mercury sources where known, cost-effective solutions exist. Consistent with the Department of Ecology's agency goals and the goals of this action plan, pollution-prevention strategies, or avoiding the use of mercury, were preferred over pollution-control strategies, or minimizing the release of mercury to the environment following use. More detailed plans for implementing short-term action will be developed in consultation with stakeholders. In some cases, such as the removal and recycling of convenience light switches in vehicles, a key component of the more detailed plans will be allocating responsibility for costs involved among affected parties.

Because of the attention focused on mercury reduction around the United States and other countries, cost estimates for specific mercury reduction strategies are changing rapidly. The development of new technology, such as in-office dental amalgam separators, and research, such as the identification of accurate, cost-comparable non-mercury medical equipment, have reduced mercury reduction costs by providing impacted sectors with lower-cost options and greater certainty regarding their effectiveness. As additional mercury-reduction efforts continue to be implemented in locations around the country, it is anticipated that further cost reductions will be achieved by learning from the experience of others, new technology, and, in some cases, economies of scale. As the Department of Ecology proceeds with implementation of mercury reduction activities, it will continue to identify and, in cooperation with stakeholders, the EPA, other states, local governments, and research institutions, to help create cost-effective solutions to address the needs in Washington State.

The current draft, the *Draft Mercury Chemical Action Plan*, will be released for public comment on September 4, 2002. Ecology and Health will hold a 60 day public comment period, during which two public forums will take place. The first will be held in Tacoma at Henry Foss High School on September 26, 2002; the second will be held in Moses Lake at Big Bend Community College on October 3, 2002. Both public forums will be facilitated by Ross and Associates.

The final meeting of the Advisory Committee will take place in late October. In November and December, public comments will be considered and incorporated, and the Action Plan will be finalized for release at the end of 2002.

The Draft Background Document, the Preliminary Draft Action Plan, the Draft Action Plan, and all External Advisory Committee meeting handouts and notes have been posted on Ecology's web site at http://www.ecy.wa.gov/programs/eap/pbt/mercuryplan.html. Throughout the Action Plan development process, individual meetings have been held with stakeholders upon request. Through list serves, e-mail, and phone calls, Ecology and Health staff have maintained close contact with staff from local governments, other states, and federal agencies working on mercury policy, working to ensure that the information and recommendations in Washington's *Mercury Chemical Action Plan* reflect the best and most updated thinking available.

Org-3: The Councils commend DOE for addressing concerns raised by mercury and for its extensive efforts in developing the draft Mercury CAP. DOE has succeeded in collecting and examining important information that will form the basis of a scientific and useful strategy to efficiently and cost-effectively manage mercury risks. DOE has identified an important route of possible human exposure to mercury (the water-to-fish-to-human pathway) and has done a good job of developing an inventory of a number of possible anthropogenic sources of mercury. DOE has also collected and compiled state and federal laws applicable to mercury, listed regulatory and non-regulatory methods to limit the releases and uses of mercury, and has identified important sources of information that can be examined further to assist in preparation of a plan to manage mercury. All of DOE's efforts are important to the development of a useful, cost-effective plan to manage mercury risks. However, we believe that more work must be done before DOE can recommend actions for the management of mercury.

Org-6: The Mercury Chemical Action Plan (MCAP) reviewed here is an example of how WDOE's initiatives to protect the environment may have contributed to the challenge that the company faces to be competitive in an international market. The MCAP development process, mandated by the legislature, has been inflexible, hesitant and arbitrary in its execution. WDOE continues to try to generate a plan that in effect duplicates the Federal effort on the same subject, wasting valuable resources of both WDOE and business that could be better used to address real problems within WDOE and the economy. The fact that Ecology's management considers this effort to be a template for additional chemical action plans addressing an ever-changing persistent bioaccumulative and toxic (PBT) chemicals "Working List" further alarms the regulated community. We strongly encourage WDOE to discontinue the entire PBT program and reassign the resources to other more productive tasks where real progress is needed in protecting the competitive and natural environment.

Org-6: The process Ecology followed to develop the CAP should not be used as a model for future CAPs because:

- The necessary level of information is missing for these recommendations.
- No adequate risk analysis framework is described to assess potential effectiveness of the recommended actions.
- Essential, verifiable cost impact information is unavailable / unreliable on which to base public policy or business decisions as to priority actions.

To ensure that a PBT CAP (mercury in this case) provides a workable model for future CAPs requires that WDOE consistently applies the following principles:

- All sources of the PBT under review (mercury in this case) should be assessed including state, regional, national and global inputs to the mass balance, including air deposition. These must be included in a clearly defined set of exposure pathways on which all analysis of PBT impact can be based.
- Where the material is a naturally occurring substance, a background level should be identified for affected areas. Where important information is lacking, the CAP should assess the need for obtaining that information to ensure that recommended control measures will actually address the problems.

- CAP recommended actions should be developed and ranked using risk management principles. The draft CAP does not have any ranking methodology or other process to assess the costs and effectiveness of the recommended actions and alternative actions. The risk analysis should compare several models to determine if results are comparable. Assumptions put into the model should be clearly identified and the factual basis for them described. Most models fail on the assumptions used, not the algorithm logic in the model.
- The CAP should explain where and how it's recommended actions relate to and go beyond those actions proposed by EPA in its draft CAP. The CAP should use the best available information to quantify loads of PBT from sources and to assess the effectiveness of instate source controls to reduce PBT exposure to humans and sensitive species. Any assumptions made should undergo impact significance analysis to determine if they are skewing the results from risk modeling.

The CAP should specifically assess the impact of recommended Federal and State actions on the state's economy including:

- Loss of existing manufacturing / service business or jobs
- Loss of potential manufacturing / service business or jobs
- Adverse impact on regional, national and international trade through ports
- Best use of resources allocated to PBT programs in developing State's economy when compared to other activities such as transportation, education, waste water treatment / storm water treatment et al.
- Costs to identify products that contain or produce PBTs from the global marketplace.

Org-19: The Northwest Pulp and Paper Association (NWPPA) believes Ecology's step-by-step approach to mercury correctly aligns itself with Ecology education, pollution prevention and regulatory role, which is defined in the Department's multi-year PBT Strategy.

Org-19: NWPPA supports the MCAP issue prioritization scheme, but believes the schedule could be overly ambitious. NWPPA believes that it is fiscally responsible in these lean economic times to concentrate the Department of Ecology and Health's limited funding resources on reducing exposure pathways of man-made mercury through education, pollution prevention and *voluntary* reduction strategies.

Focusing Ecology's efforts in a thoughtful prioritized plan, which builds on voluntary measures and consumer and small business education, is a judicious use of limited state funding resources.

Org-19: NWPPA generally opposes legislation to ban certain products without first understanding the commercial, economic, environmental and human health implications. Product bans result in unfair competitive advantages to specific manufacturers and retails based on geographical location. Any such proposals should be scientifically defensible and justifiable.

PubMtg: Rachel Scott – citizen. Comment made at the September 26, 2002 *Draft Mercury Chemical Action Plan* Public Forum – Tacoma:

Weak plan. It is distressing to me that Ecology is not more proactive. Please revise the plan to be more aggressive.

PubMtg: Ivy Sager-Rosenthal, WashPIRG. Comment made at the September 26, 2002 *Draft Mercury Chemical Action Plan* Public Forum in Tacoma:

Thank you to Ecology/Health for addressing this issue and thank you for taking a hard look at all reduction options. WashPIRG will submit written comments later. WashPIRG is disappointed that strong options that were in the "June 26" draft of the plan were "taken off the table" in the September 10 draft of the plan. In these times of tight budgets, Ecology should concentrate on effective programs. The King County dental voluntary compliance example should demonstrate that voluntary compliance won't work. Ecology should take a more active role in mandating Hg reductions.

Ecology's Review and Analysis of Public Comments

Review of the comments above indicates a variety of viewpoints and perspectives:

- Ecology's step-by-step approach to mercury correctly aligns itself with Ecology education, pollution prevention, and regulatory role, which is defined in the Department's multi-year PBT Strategy.
- The MCAP development process, mandated by the legislature, has been inflexible, hesitant, and arbitrary in its execution.
- All of Ecology's efforts are important to the development of a useful, cost-effective plan to manage mercury risks. However, we believe that more work must be done before Ecology can recommend actions for the management of mercury.
- It is distressing to me that Ecology is not more proactive. Please revise the plan to be more aggressive.

Ecology has developed the MCAP based on the specific directive from the Washington State legislature. As such, the MCAP is considered to be a work in progress. Ecology's goal is to achieve those mercury reductions that can be obtained through a variety of voluntary efforts in the short term and work with affected stakeholders to achieve those mercury reductions that will take additional time and technology improvements to achieve.

Recommendations for short-term action were developed for relatively large mercury sources where known, cost-effective solutions exist. Consistent with Ecology's agency goals and the goals of this action plan, pollution-prevention strategies, or avoiding the use of mercury, were preferred over pollution-control strategies, or minimizing the release of mercury to the environment following use. More detailed plans for implementing short-term action will be developed in consultation with stakeholders. In some cases, such as the removal and recycling of convenience light switches in vehicles, a key component of the more detailed plans will be allocating responsibility for costs among affected parties.

Ecology's Conclusions

Ecology believes the process followed to develop the MCAP is a fair and open process. In January 2002, due to the importance of health effects of mercury, a core group of staff from the Departments of Ecology and Health was formed to coordinate the MCAP development process.

This group has met bi-weekly throughout the year. As a result of this close collaboration, the MCAP has become a joint document of both the Department of Ecology and the Department of Health.

At the direction of the Washington State Legislature, Ecology formed an external Mercury Advisory Committee, composed of 22 members representing agriculture, business, environmental, local government, and public health sectors. Ecology also contracted with Ross and Associates to facilitate both the Mercury Advisory Committee meetings and public forums scheduled during the public comment period on the draft MCAP.

The Draft Background Document, the *Preliminary Draft Mercury Chemical Action Plan*, the *Draft Mercury Chemical Action Plan*, and all external Advisory Committee meeting handouts and notes were posted on Ecology's web site at http://www.ecy.wa.gov/programs/eap/pbt/mercuryplan.html throughout the MCAP development process. Additionally, individual meetings were held with stakeholders upon request. Through list serves, e-mail, and phone calls, Ecology and Health staff have maintained close contact with staff from local governments, other states, and federal agencies working on mercury policy. This coordination works to ensure that the information and recommendations in Washington's MCAP reflect the best and most updated thinking available.

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Human Use and Release of Mercury

1. Mercury Release from Fossil Fuel Combustion

Comments Related to Mercury Release from Coal-Fired Power Plants

The Draft Mercury Chemical Action Plan stated

Nationally, coal-fired power plants are the largest known source of anthropogenic mercury emissions. Washington has fewer coal-fired power plants than the Midwest and the Eastern regions of the country, although the state has other sources that burn coal.

Ecology regulates two active facilities classifiable as coal-fired steam generators. One is the TransAlta Centralia Steam Plant, and the other is the City of Tacoma Steam Plant #2. A third coal-fired power plant in Shuffleton is listed on the EPA Acid Rain program listing of facilities.

According to the Toxics Release Inventory, the TransAlta Centralia steam plant released 436 pounds of mercury in 2000. Of the mercury released, 374 pounds was reported emitted to air, 0.29 pounds to water, and 62 pounds to land. The air emissions were based on a combination of stack tests and sampling of the coal.

Based on stack testing done this year and the maximum utilization (capacity factor) of the facility, the Centralia Power Plant would emit 350 – 360 pounds per year of mercury and mercury compounds.

Centralia Power Plant has reported mercury emissions for 10 years to Southwest Clean Air Agency. Emissions have been estimated from a stack test in 1992 and from coal mercury testing. In 1999, the EPA required extensive coal mercury testing for coal-fired power plants. The coal burned by the Centralia Power Plant has a mercury content of about 60 parts per billion; primarily elemental mercury which is not collected well by control equipment for other emissions. The coal mined at Centralia is washed before combustion, which will remove some mercury. The power plant has two electrostatic precipitators to remove coal ash particulate; some mercury is also removed with the ash in the precipitators.

Mercury emissions from coal-fired power plants are not currently limited by law or regulation. The US Department of Energy has set goals to reduce mercury emissions from coal plants by 50 to 70 percent by 2005 and 90 percent by 2010.

In 1997, the Southwest Clean Air Agency (SWCAA) completed a Reasonably Available Control Technology (RACT) review of the Centralia Power Plant. Although the focus of the RACT review was on sulfur dioxide and nitrogen oxides, the evaluation included mercury and other hazardous air pollutants. The 1996 emissions of 390 pounds/year were modeled and the

resulting ambient air impact was 0.3% of the Acceptable Source Impact Level (ASIL). The RACT Review acknowledged that the proposed emissions controls should also remove some mercury, however, mercury was not identified as a pollutant of concern for RACT review.

As a result of the review, SWCAA ordered new emission controls installed under authority of RCW 70.94.154. The first of two scrubbers, or Flue Gas De-Sulfurization Units, started up in October 2001; the $200 million project will be complete in July 2002. Although they are designed primarily to remove sulfur dioxide from the flue gas, they will also remove mercury due to cooling of the exiting gas temperature. The removed mercury will end up in wall board that will be manufactured from the waste products of this process.

In March 2002, TransAlta tested the mercury emissions of the scrubbed unit. Initial results show the mercury removal is about one-third.

The Bush Administration, Senator Jeffords of Vermont, and others have proposals to reduce mercury pollution from coal-fired power plants. It remains to be seen what will emerge from Congress. The final law will probably not be passed until sometime in 2003.

In December 2000, under the Clinton Administration, EPA announced it had affirmatively decided that mercury air emissions from power plants should be regulated under the Clean Air Act, because mercury poses great hazards to public health. Under this decision, EPA is to propose regulations by 2003 and issue final rules by 2004.[1]

The Draft MCAP Recommended the Following Actions

Proposed, Short-term
Wait for federal regulations requiring mercury reduction at coal-fired utility boilers, then evaluate the need for more stringent requirements in Washington State.

Ongoing
Review Pollution Prevention Plans or new facilities reporting under lowered TRI thresholds for mercury.

Public Comments

Org-23: Since the Federal government has set goals, this should prove adequate for the state as well.

Org-34: We do not support the recommendation to wait for federal regulations requiring mercury reduction. We urge Ecology to adopt stringent requirements for mercury emissions from power plants that will require all plants to reduce mercury emissions by 90 percent by 2007 and 100 percent by 2010.

Org-33, Org-34: The Centralia coal-fired Power Plant is the state's largest industrial source of air-borne mercury emissions. Waiting for federal regulations will only delay the reduction of

[1] http://yosemite.epa.gov/opa/admpress.nsf/, 3/4/02.

mercury pollution. In fact, as of right now, the effectiveness of any proposed federal regulations to reduce mercury emissions from power plants is seriously in doubt. The Bush Administration's most recent proposal, the "Clear Skies Initiative," would allow power plants to emit more mercury and other pollutants than currently permitted under the Clean Air Act.

Org-33: Finally, the Centralia coal plant reported to the Toxics Release Inventory sending one pound of mercury to a Washington dairy farm. Coal fly ash is used as soil amendment on farms. Ecology should prohibit the use of wastes containing high levels of mercury and other persistent toxic chemicals on farmlands.

It is counterproductive to wait for these so-called reforms. Ecology should take the initiative and adopt more stringent regulations immediately. The technology is available for plants like the Centralia Power plant to meet a 90% reduction goal by 2007 and a 100 percent reduction by 2010 and we urge Ecology to include this recommendation in the plan.

Org-26: We support Ecology's recommendation that the state follow the federal programs and delay any state requirements for mercury from power plants until EPA regulations are implemented.

Org-31: Reducing mercury emissions from industrial sources is a major and necessary step for reducing mercury releases into our environment. It is crucial that the final CAP include measures to reduce emissions. Phasing out mixing zones would comprise a good starting point for reducing emissions and releases of mercury into the environment. In addition, Washington's coal power plant is a considerable source of mercury emissions – it is vital that these emissions be curtailed, and that future energy sources in the state move towards alternative, clean energy and conservation.

PubMtg: Jeremy Green, citizen. Comment made at the September 26, 2002 *Draft Mercury Chemical Action Plan* Public Forum – Tacoma:

There are 19 coal plants on the east coast that have not installed updated technologies to further reduce Hg emissions and there are no consequences for this. Voluntary efforts do not work. The original draft (June 26) was a lot stronger. The September draft is more "George Junioresque"

Ecology's Review and Analysis of Public Comments

Review of the comments above suggests that some commenters would like Ecology to draft state-specific regulations for mercury emissions from coal-fired utility plants. Such an effort would take several years, involve several stakeholders and at least two authorities (Ecology and the Southwest Washington Clean Air Agency), and would likely be delayed until national rules are developed. Therefore, Ecology has concluded that MCAP implementation efforts specific to coal-fired power plants should wait for federal regulations requiring mercury reduction at coal-fired utility boilers.

Currently the primary source of mercury from the combustion of coal is the TransAlta Centralia Steam Plant. According to the Toxics Release Inventory, the TransAlta Centralia Steam Plant released 436 pounds of mercury in 2000. Of the mercury released, 374 pounds was reported emitted to air, 0.29 pounds to water, and 62 pounds to land. The air emissions were based on a

combination of stack tests and sampling of the coal. Earlier in 2002, the Centralia Steam Plant installed two scrubbers, or Flue Gas De-Sulfurization Units. This $200 million project was completed in July 2002. Although these units are designed primarily to remove sulfur dioxide from the flue gas, they will also remove mercury due to cooling of the exiting gases. The annual release of mercury from the Centralia Steam Plant is expected to be reduced by one-third.

Ecology's Conclusions

Mercury emissions from coal-fired power plants are not currently limited by law or regulation. The US Department of Energy has set goals to reduce mercury emissions from coal plants by 50 to 70 percent by 2005, and 90 percent by 2010.

The Bush Administration, Senator Jeffords of Vermont, and others have proposals to reduce mercury pollution from coal-fired power plants. It remains to be seen what will emerge from Congress. The final law will probably not be passed until sometime in 2003.

Ecology evaluated the following reduction options:

- Develop state regulations requiring reduced emissions.
- Wait for federal regulations requiring mercury reduction at coal-fired utility boilers, then evaluate the need for more stringent requirements in Washington State.

Ecology determined the following recommended actions

- *Proposed, Short-term*
  Wait for federal regulations requiring mercury reduction at coal-fired utility boilers, then evaluate the need for more stringent requirements in Washington State.
- *Ongoing*
  Review Pollution Prevention Plans or new facilities reporting under lowered TRI thresholds for mercury.

Comments Related to Fuel Oil: Distillate, Residual, and Crude

The Draft Mercury Chemical Action Plan stated

Distillate fuels include jet fuels, diesel fuels, heating oil, and kerosene. Residual oil is composed of the heaviest components of crude oil. It can be thought of as that portion of the crude oil that is left over when all other products are removed, hence the name "residual." Most residual oil is burned to generate electricity or to provide power to relatively large industrial processes. It is also the prime fuel source for ocean-going ships.[2]

Mercury is thought to exist as a contaminant in all fuel oils. It is assumed that all mercury present in fuel oils will be released into the atmosphere during the combustion process.

Quantity and Estimated Uncertainty

Concentrations of mercury in fuel oil depend upon the type of oil used. No comprehensive oil characterization studies have been done, but data in the literature report mercury concentrations in crude oil ranging from 0.023 to 30 parts per million by weight, while the range of concentrations in residual oil is 0.007 to 0.17 parts per million by weight. Because EPA found only a single mean value in the literature for mercury concentration in distillate oil, no conclusions can be drawn about the range of mercury in distillate oil.

Based on a review of available literature, three mercury emission factors are presented for residual oil combustion: the 0.73 lb/10 Btu factor from AP-42, 0.46 lb/10 Btu from the Electric Power Research Institute (EPRI), and 0.21 lb/10 Btu from the EPRI residual oil analyses. On balance, these data provide little information for emission factor development.

The available information on uncontrolled mercury emissions from crude oil combustion is ambiguous. Because the data are quite sparse and the relative quality of the data is uncertain, the midpoint of the range was selected as the best "typical" emission factor.

The uncontrolled emission factors for distillate, residual, and crude oil are presented in the table below. Data are insufficient to develop controlled emission factors for fuel oil combustion. There is considerable uncertainty in these emission factor estimates due to the variability of mercury concentrations in fuel oil, the incomplete database on distillate oil, and the uncertainty in sampling and analysis for detecting mercury. Therefore, these estimates should not be used to determine emissions from specific oil-fired units.

[2] New Jersey Task Force, New Jersey Mercury Task Force Report: Volume III, New Jersey Department of Environmental Protection, December 2001, pp. 60, 63.

Table 3: Typical Mercury Emission Factors

Fuel Oil Type	Typical mercury emission factors					
	$Kg/10^{15}$ J	$Lb/10^{12}$ Btu	g/Mg fuel oil	10^{-3} lb/ton fuel oil	$g/10^{3}$ L fuel oil	$Lb/10^{6}$ gal fuel oil
Residual # 6	0.02	0.46	0.009	0.017	0.0085	0.071
Distillate #2	2.7	6.2	0.12	0.24	0.10	0.86
Crude	41	95	1.7	3.5	1.7	14

According to the Energy Information Administration of the U.S. Department of Energy, in 1999, Washington consumed 20,305 thousand barrels of distillate fuel and 9,592 thousand barrels of residual fuel.[3] Applying the emission factors above, 733 pounds of mercury were released from the combustion of distillate fuel and 29 pounds for residual. No information was found on the volume of crude oil consumed in Washington.

The Draft MCAP Recommended the Following Action

Ongoing
Promote efforts to reduce energy usage.

Public Comments

Ecology received no comments in this category.

Ecology's Conclusions

Fuel oil is not currently regulated for mercury content, either in Washington State or nationally. More research and monitoring are needed to evaluate and obtain a better understanding about quantities of mercury released from this source in Washington. Further testing of mercury content in fuel oil would provide better information about quantities of mercury released from this source in Washington.

Currently the best reduction option to reduce the amount of mercury released from fuel oil combustion would be to reduce energy use from these sources.

[3] http://www.eia.doe.gov/pub/state.data/pdf/wa.pdf, September 1, 2002.

Comments Related to Oil Refineries

The Draft Mercury Chemical Action Plan stated

The mercury present in petroleum crude is distributed to the petroleum products and waste materials produced in the refining process. The actual distribution is dependent on the chemical form of mercury present and the specific type of refining process. Some mercury will be present in the air and water emissions and in the solid and dangerous waste materials disposed of and treated off-site.

The quantity of mercury in crude oil is very dependent on source. The overall range in petroleum process in the United States is from 0.1 to 29,700 ppb, while the majority of reported values are less than 20 ppb.[4]

A recent draft report prepared for Ecology's Industrial Section regarding pollution prevention opportunities for refineries in Washington State included some data collected by the Washington refineries. Washington refineries primarily have been processing Alaska North Slope crude. The refineries have indicated a mean mercury content of 1.98 ng/g. The number of samples analyzed by Washington State refineries was not provided in the draft report.

In the 2000 Toxics Release Inventory, four refineries reported releasing a total of 8.2 pounds of mercury compounds to air, 11.9 pounds to water, and 104.6 pounds to land.

As part of a grant from EPA, Ecology has hired a contractor to prepare a report identifying pollution prevention opportunities that might be applicable to Washington refineries. One of the pollutants to be discussed in the report is mercury. The report will be final in the fall of 2002.

Washington refineries have all been required to prepare Pollution Prevention Plans for their facilities as part of their most recent NPDES permit renewal. This plan focuses on the wastewater discharges. At the next NPDES permit renewal cycle Ecology will ask the refineries to review the Ecology report described above and identify pollution prevention opportunities that might be applied at their facilities.

The Draft MCAP Recommended the Following Actions

Planned, next NPDES permit renewal cycle
Refineries will be asked to review the Pollution Prevention report prepared for Ecology and identify and implement pollution prevention opportunities applicable to their facilities.

Public Comments

Ecology received no comments in this category.

[4] U.S. Environmental Protection Agency; "Mercury in Petroleum and Natural Gas: Estimation of Emissions from Production, Processing and Combustion" September 2001 (EPA 600/R-01-066)

Ecology's Conclusions

Fuel oil is not currently regulated for mercury content, either in Washington State or nationally. More research and monitoring are needed to better understand mercury releases from this source in Washington. Currently, the best option to reduce the amount of mercury released from fuel oil combustion would be to reduce energy use from sources that use fuel oil.

Comments Related to Wood Fired Boilers and Stoves

The Draft Mercury Chemical Action Plan stated

Wood and wood wastes are used as fuel in both the industrial and residential sectors. In the industrial sector, wood waste is fired in industrial boilers to provide process heat, while wood is burned in fireplaces and wood stoves in the residential sector. Studies have shown that wood and wood wastes may contain mercury; however, insufficient data are available to estimate the typical mercury content in wood and wood wastes.

The primary source of mercury emissions from wood combustion processes is the combustion gas exhaust stack. Very small quantities of mercury also may be emitted with the fugitive PM emissions from bottom and fly ash handling operations. The data on mercury emissions from wood combustion are limited. A National Council of the Paper Industry for Air and Stream Improvement (NCASI) report provided a range and average emission factor for boilers without electrostatic precipitators (ESP's) and for boilers with ESP's. The boilers without ESP's included a variety of control devices including cyclones, multiclones, and various wet scrubbers. The average emission factor reported for boilers without ESP's was 3.5 x 10^{-6} kg/Mg (6.9 x 10 lb/ton) of dry wood burned. The average emission factor reported for boilers with ESP's was 1.3 x 10^{-6} kg/Mg (2.6 x 10 lb/ton) of dry wood burned.

The most recent AP-42 section on wood waste combustion in boilers provided an average uncontrolled emission factor for mercury emissions based on four emission test reports. The AP-42 uncontrolled emission factor for mercury emissions from wood waste combustion is 2.6 x 10^{-6} kg/Mg (5.2 x 10 lb/ton) of wet, as-fired wood burned.

The NCASI average emission factor reported for wood-fired boilers with ESP's of 1.3 x 10^{-6} kg/Mg (2.6 x 10 lb/ton) of dry wood burned is recommended for estimating mercury emissions from wood waste combustion in boilers.

For residential wood combustion, only one emission factor was found in the literature. This emission factor is based on one test burning one type of wood (pine) at a single location. In 1987, the Department of Energy estimated that 22.5 million households, nationwide, burned approximately 42.6 million cords of wood. Given that the density of wood varies greatly by wood species and moisture content, and that the above emission factor is from a single test, nationwide emissions of mercury from residential wood combustion were not estimated.

Total 1994 mercury emissions from wood combustion are estimated to be 0.1 Mg (0.1 tons), nationwide. In 1995, the Department of Ecology estimated that nearly half of Washington's households had wood burning devices. Given available data, however, estimated mercury emissions from wood combustion for Washington State cannot be calculated at this time.

The Draft MCAP Recommended the Following Actions

Proposed, Mid-term
Evaluate cleaner fuel sources.

Public Comments

Org-33: In April 1997, Ecology did a survey of hog fuel (wood waste) boilers in the state (Publication No. 97-204, April 1997) and found 85 boilers, 11 of which were located at pulp mills. In addition to wood wastes, Ecology found a variety of wastes and fuels being burned in these facilities, including coal, turpentine, primary and secondary pulp sludge, corrugated cardboard, refuse derived fuel, tires, and de-inked fiber. As part of a Reasonable Available Control Technology (RACT) process in 1998/99, Ecology's Air Division identified mercury as one of the hazardous air pollutants from hog fuel boilers. These industrial boilers are most likely a larger source of mercury pollution than has been identified in the CAP. We would like a more thorough assessment of their contribution to mercury pollution as well as a more comprehensive solution to the problem. Ecology should finish the RACT process that was started for these boilers and prohibit the burning of fuels and wastes that will result in mercury, dioxin, and other persistent toxic pollution.

Ecology's Review and Analysis of Public Comments

Mercury emissions from wood combustion are not specifically regulated. Total 1994 mercury emissions from wood combustion are estimated to be 0.1 Mg (0.1 tons), nationwide. In 1995, the Department of Ecology estimated that nearly half of Washington's households had wood burning devices. Given available data, however, estimated mercury emissions from wood combustion for Washington State cannot be calculated at this time.

Ecology's Conclusions

Wood combustion is not regulated for mercury content in Washington State or nationally. More research and monitoring are needed to better understand mercury releases from combustion sources in Washington. Currently, the best long-term reduction option is to evaluate and consider using cleaner fuel sources.

2. Mining and Manufacturing

Comments Related to Mercury Mining

The Draft Mercury Chemical Action Plan stated

Nationally, in the past, mercury mining has been a source of mercury releases to the environment. While there is no current mercury mining in Washington State, it is possible that contamination from past activities still exists.

Cinnabar, the ore of mercury, is known to occur in 13 of Washington's 39 counties (see Appendix E), but the only production of any consequence has come from the Morton district of Lewis County. The first recorded production there was 75 flasks in 1916. The district later produced 6,438 flasks (76 pounds per flask) during the period 1926 through 1942, with production each year except 1939.[5]

In 1970, Ecology sampled water from the Tilton River, which receives drainage from the mining area. Concentrations were less than 0.5 ppb, at the time, considered a background level. Fish tissue samples collected upstream and downstream of the mining area contained approximately 0.1 mg/l of mercury.[6] The mine is not listed as a state cleanup site in Ecology's database.

It is unknown whether mercury released as a result of mining still exists at the mine site or downstream. The mine does not appear in Ecology's database of hazardous waste sites.

The Department of Ecology Central Regional Office is in the process of prioritizing abandoned mines throughout Washington as potential toxic waste cleanup sites. Information on the abandoned mercury mine will be considered in this evaluation.

The Draft MCAP Recommended the Following Actions

Ongoing
Prioritize abandoned mines as potential toxic waste cleanup sites.

Public Comments

Org-21: The DNR, Division of Geology and Earth Resources, has a vast quantity of information on mining and cinnabar. http://www.wa.gov/dnr/htdocs/ger/pubs_ol.htm *Inactive and Abandoned Mines Lands Inventory -- Roy and Barnum -- McDonnell Mines, Morton Cinnabar Mining district, Lewis County, Washington.* I have visited with one of the geologists, Mac McKay about his mining inventory. His e-mail is McKay, Donald Mac
E-mail Address(es): mac.mckay@wadnr.gov

[5] Marshall T. Hunting, "Inventory of Washington Minerals, Part II, Volume 1"; State of Washington Department of Conservation and Development, Division of Mines and Geology; Olympia, Washington; 1956; p.263.
[6] Ronald A. Lee, "Investigations: Mercury in Washington State;" Office of Technical Services, Department of Ecology; Olympia, Washington; July, 1971; p. 12.

Org-33: According to the CAP, there was a mercury mine in the Morton district of Lewis County that produced nearly one-half million pounds of mercury from 1926-1942. This mine is not currently on the state's database of hazardous waste sites. It is likely, particularly because there were no environmental regulations in place in the early 1900s, that significant contamination exists or is migrating off site. Ecology's recommendation to prioritize abandoned mercury mines as potential toxic waste cleanup sites is a good one.

Abandoned gold operations, which used mercury for gold processing, are probably a more significant source of mercury to the environment than identified in the CAP. The tailings or slurry were often discharged directly into the streams or onto the stream banks. Thus, the mercury is generally dispersed downstream within stream sediments. It is extremely important for Ecology to complete the abandoned-mines inventory and identify the quantity of extent of mercury released to the environment and the amount available for release.

Org-34: We support the plan's recommendation to prioritize abandoned mines as potential toxic waste cleanup sites. We urge Ecology to recommend that the ongoing assessment of abandoned mines be completed quickly.

The plan states that the quantity of mercury released from abandoned mines, including an abandoned mercury mine in Lewis County, is unknown. This is due in part to the fact that Washington has yet to complete an assessment of abandoned mines. This assessment would identify mercury-polluting mines and help the state prioritize cleanup activities. In addition, the completion of the assessment may help Washington secure federal money for mine cleanups. Several current proposals in Congress would provide states with federal money for mine cleanup provided that an abandoned mine assessment has been completed in the state.

PubMtg: Greg Christensen, Recreational Prospector. Comment made at the October 3, 2002 *Draft Mercury Chemical Action Plan* Public Forum in Moses Lake:

Those of us that are weekend recreational prospectors on occasion find elemental mercury in the various streams we prospect in. But we have no place to take or dispose of the mercury. Suggests setting up collection points, like EPA Region 9 to drop off Hg waste/materials. Recreational prospectors would love to work with Ecology on this.

Ecology's Review and Analysis of Public Comments

Currently, there are no operating mercury mines in Washington. Review of historical records on mercury mining in the state indicates that the extent of mining for mercury in Washington has been limited and never was economically feasible. The only production of any consequence has come from the Morton District of Lewis County.

Historically, Washington has seen extensive hard rock mining through out the state. The state consists of 68 mining districts. Major metals that have been mined in Washington include gold, silver, copper, and lead.

Currently, there are only four operating mines recovering metals in Washington.

A vast majority of metals mines have been long-closed, and in most cases, abandoned. At this point there is no way to identify the exact universe of abandoned mine sites in Washington. One estimate indicates there may be as many as 3500 abandoned metals mines in Washington. Of these, it is estimated that approximately 500-600 are considered significant (greater than 200 pounds of product produced during the life of the mine).

Ecology's Conclusions

Ecology's Toxics Cleanup Program is currently developing a protocol for identifying abandoned mine lands. Once an abandoned mine site has been identified, the following information is collected:

- Identify potential contaminants of concern;
- Conduct an initial determination of the extent and kind of releases(s) or potential release(s) and determine the migration route;
- Collect general site information and site characteristics such a waste type/quantity, ownership status; and
- Identify physical hazards at mines.

Once this information is gathered, a determination can be made of the potential risks to human health or the environment. Future activities will focus on identification and prioritization of abandoned mine lands and the short- and long-term actions needed, including cleanup. This effort is expected to take several years and will be done in conjunction with other state and federal land management agencies.

Additionally, Ecology is open to further evaluating the offer from recreational weekend prospecting groups regarding the recovery of elemental mercury from river bottoms. Discussions will need to be held with the state departments of Fish & Wildlife and Natural Resources regarding any concerns these agencies may have with metals-recovery activities from river beds in the state.

Comments Related to Gold Mining – Placer Gold Mining

The Draft Mercury Chemical Action Plan stated

Mercury has a chemical affinity for gold. When mercury is added to gold-bearing material, the two metals form an amalgam. Mercury is later separated from amalgam by retorting. Extraction of gold and other precious metals from their ores by treatment with mercury is called amalgamation.[7]

According to the United States Geological Survey (USGS), miners used mercury to recover gold throughout the western United States at both placer (alluvial) and hardrock (lode) mines. In a California study, USGS found that the vast majority of mercury lost to the environment was from placer-gold mines, which use hydraulic, drift, and dredging methods.

Placer gold was discovered in Blewett Pass and the northern and central sections of Washington State from 1858 to 1860. Placer gold occurs in the counties of Chelan, Clallam, Ferry, Kittitas, Lincoln, Okanogan, and Whatcom.[8] Through 1969, 275 thousand troy ounces of placer gold was mined in Washington, only 0.2 percent of total placer gold mined in the United States from 1792 to 1969.[9]

According to the USGS, at hydraulic mines, placer ores were broken down with monitors or water cannons and the resulting slurry was directed through sluices and drainage tunnels, where gold particles combined with liquid mercury to form gold-mercury amalgam. Loss of mercury in this process was 10 to 30 percent per season, resulting in highly contaminated sediments at mine sites. In California, where 60 percent of the nation's placer gold was mined through 1969,[10] elevated mercury concentrations in present-day mine waters and sediments indicate that hundreds to thousands of pounds of mercury remain at each of the many sites affected by hydraulic mining.[11] Contamination issues are likely considerably less serious in Washington State; however, historic gold mining has been identified as a source of mercury to Lake Roosevelt.

The Draft MCAP Recommended the Following Actions

Ongoing
Prioritize abandoned mines as potential toxic waste cleanup sites.

Proposed, Mid-term
Investigate whether existing gold mine heap leach or other extractions, surface impoundments, and/or tailings disposal facilities meet Dangerous Waste regulations.

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[7] http://pubs.usgs.gov/gip/prospect1/goldgip.html, 4/1/02.
[8] J. M. West, "How to Mine and Prospect for Placer Gold," http://imcg.wr.usgs.gov/usbmak/ic8517.html, 3/29/02.
[9] J. M. West, "How to Mine and Prospect for Placer Gold," Table 1: Placer gold production, by States, 1792 – 1969," http://imcg.wr.usgs.gov/usbmak/8517t1.html, 3/29/02.
[10] J. M. West, "How to Mine and Prospect for Placer Gold," Table 1: Placer gold production, by States, 1792 – 1969," http://imcg.wr.usgs.gov/usbmak/8517t1.html, 3/29/02.
[11] http://water.wr.usgs.gov/mercury/fs06100.html, 4/1/02.

Public Comments

Org-21:

Page 23 'Groups Affected'
I would like to add 'Small-scale (recreational) mineral prospectors'

Page 24 'Recommended Actions'
Add another paragraph: 'Work with small-scale mining interests (recreational prospectors) in the collection of elemental mercury'. Provide 'drop-off' collection points at rallies and other events.

Page 24 'Identification and Description of Source'
Refer to the information given above for page 7.
My main concern is the education of my miner friends. Underwater elemental mercury poses little risk to us, however it will change to a gas during low water conditions and becomes extremely hazardous. We have a large knowledge base of where mercury has been deposited [and found] in watercourses, from our gold recovery work. Many of us have vials of mercury in our garages with no place to dispose of them. Suction dredging [for gold recovery] is the only 'practical' method to remove mercury from streams and rivers. The small-scale mining community would like to work with you in this effort.

Ecology's Review and Analysis of Public Comments

Ecology will incorporate the changes into the final *Mercury Chemical Action Plan* (MCAP).

Ecology's Conclusions

Ecology is open to further evaluating the offer from recreational weekend prospecting groups regarding the recovery of elemental mercury from river bottoms. Additional discussions will need to be held with the state departments of Fish & Wildlife and Natural Resources regarding concerns these agencies may have with these metals-recovery activities.

Also, in the near-term and as resources allow, Ecology plans to investigate whether existing gold mine heap leach piles, surface impoundments, and other tailing/disposal facilities meet Dangerous Waste regulations.

Comments Related to Gold Mining – Lode Gold Mining

The Draft Mercury Chemical Action Plan stated

Lode, or hard rock, gold mines process ore to remove gold. A search of Ecology's database of permitted sites and facilities resulted in several gold mines, most of which are not in operation.

Table 4. Gold Mines Permitted by the Washington State Department of Ecology

Facility Name	City	County	Reason for Interaction with Dept. of Ecology
Alder Mill	Twisp	Okanogan	State Cleanup Site
Asamera Minerals Cannon Mine	Wenatchee	Chelan	WDP Discharge to Groundwater
Delano Wind River Mine	Carson	Skamania	WDP Discharge to Groundwater
Azurite Mine Tailing Pile	Winthrop	Whatcom	State Cleanup Site
Echo Bay Minerals Co.	Republic	Ferry	Emergency/Haz Chem Rpt TIER2; Hazardous Waste Generator; WDP Discharge to Groundwater; WDP General Permit; Toxics Release Inventory
Gold Mountain Mine	Curlew	Ferry	Hazardous Waste Generator (Inactive)
Hecla Knob Hill Mine	Republic	Ferry	WDP Discharge to Groundwater; State Cleanup Site
Lamefoot Mine Echo Bay Minerals Co.	Republic	Ferry	Hazardous Waste Generator; Toxics Release Inventory
Madre Mine		Stevens	Dam Sites for Tailings
Okanogan Minnie Mine Millsite	Carlton	Okanogan	Hazardous Waste Generator

The metal mining industry first had to report to TRI for activities taking place in 1998. Two gold mines in Washington State reported releasing a combined 1,432 pounds of mercury to land. One of these, the Lamefoot Mine, has since ceased operation. According to the mines, this estimate was based on a back calculation of mercury in the mine's ore and the quantity of ore removed. The "land release" reported consists of the mercury contained in the scrap rock, put back into the mine, and the tailings, which are contained in tailing piles. The actual release of mercury to the environment from these sources through air or water is unknown.

The presence of mercury in the ore raises an interesting question, however. While no Washington State gold mine reported air emissions of mercury, four Nevada gold heap leach mines reported air emissions totaling 13,560 pounds. According to EPA, the mercury that is emitted originates in the ore. Ore roasters and autoclaves can be point sources of air mercury emissions. The cyanide leach heap solution that extracts gold from ore also extracts mercury. Processing of the pregnant heap leach solution can involve stripping units, electrowinning units, retorts, refining furnaces, and carbon regeneration kilns. All of these unit processes are potential sources of air emissions of mercury.[12]

[12] US EPA Mercury Task Force PBT Mercury Work Group, Working Draft: PBT National Action Plan for Mercury, US EPA, March 15, 2002, pp. 39-40.

Hecla Mining Company, which owns the one active gold mine identified, Knob Hill Mine in Republic, reported that precipitates and sludges, both containing precious metals, could potentially be a feedstock to a refinery furnace. Hecla calculated the annual mercury content of sludges and precipitates to be 1.02 pounds. The refinery furnace is permitted by the Department of Ecology for air emissions, but the permit does not contain a mercury emission limit. The furnace does have pollution-control equipment in place, which may capture some of the mercury released.[13]

The Draft MCAP Recommended the Following Actions

Proposed, Mid-term
Investigate whether existing/future gold mine heap leach or other extraction operations, surface impoundments, and/or other tailings disposal facilities meet Dangerous Waste regulations.

Proposed, Long-term
Evaluate mercury emissions from gold mines.

Public Comments

Org-33: Ecology should immediately require that Washington gold mines measure and report mercury air emissions or prove that there are none. In addition, we support Ecology investigating whether mine-tailings disposal facilities are in compliance with dangerous-waste regulations and enforcing the rules if they are not. As part of the investigation, Ecology should ensure that there is no cross-media shift of mercury pollution from the mining waste to the air in order to comply with the dangerous waste rules.

If mercury air emissions are confirmed at active lode mines, Ecology should require improvements in internal mercury controls. Many of the major gold producers have reduced mercury emissions from the operations by 30-40% with new control mechanisms. Ecology should require the most advanced technology at Washington gold mines.

Org-34: We support the plan's recommendation to investigate whether existing or future mining operations meet Dangerous Waste regulations. We also support the recommendation to evaluate mercury emissions from gold mines. We urge Ecology to include in the plan a requirement that the investigation of sources of mercury released include studies on the releases of mercury from all mining activities, including through volatization from tailings piles, waste rock piles, and other sources. We also urge Ecology to require active mines to install stringent control technology to eliminate any mercury emissions identified.

Org-34: The lack of data available regarding mercury emissions at active mines is troubling. Ecology must identify and quantify the sources of mercury at gold mines. Although the plan identifies gold mining as a major source of mercury discharges to land, it is possible these mines are releasing mercury to the air through other means, including volatization. Volatization of mercury is increasingly becoming an issue at active gold mines. Even though many mine tailings or waste rock piles may be lined, depending upon the geochemistry of the rock and other

[13] Pers. comm., Dave Holland, Senior Environmental Analyst, Hecla Mining Company, June 5, 2002.

factors, the mercury in the rock may be released to the environment through the air. Thus, it is important that the plan include a recommendation that the investigation of the sources of mercury at mines include all sources of mercury released at mines, including through volatization.

Org-34: If mercury emissions are confirmed at active lode mines, Ecology should require the most advanced technology at gold mines to reduce mercury emissions. Many of the major gold producers have reduced mercury emissions from the operations by 30-40% with new control mechanisms.

Ecology's Review and Analysis of Public Comments

The 2000 Toxic Release Inventory (TRI) reporting requirements for mercury and other PBTs resulted in the first time reporting of mercury releases from lode gold mines in Washington. The previous TRI threshold was 10,000 lbs. per year. Now that Ecology and EPA (nationally) are aware that lode gold mining may be a significant source of mercury releases, additional investigation regarding the actual sources of these releases is needed.

Ecology's Conclusions

More research and monitoring are needed to better understand mercury releases from lode gold mining and other metals mining operations in Washington State. As resources allow, Ecology will work with the mining industry to further investigate the releases of mercury from all mining activities, including volatilization from tailings piles, waste rock piles, and other sources.

Comments Related to Manufacturing of Mercury-Containing Products

The Draft Mercury Chemical Action Plan stated

A "mercury-containing product" is defined for this plan as a product, commodity, chemical, or a product with a component that contains mercury or a mercury compound intentionally added to the product, commodity, chemical, or component in order to provide a specific characteristic, appearance, or quality or to perform a specific function or for any other reason. This definition is used to be consistent with definitions in use by other states addressing the issue of mercury in products.[17] Only one manufacturer of mercury-containing products was identified in Washington from sources available.

Instrument Manufacturers

Identification and Description of Source
Mercury is used in many medical and industrial instruments for measurement and control functions. These instruments include thermometers, pressure-sensing devices, and navigational devices. Mercury may be used as a component in a final product or as part of a manufacturing process.
One facility with a related SIC code (3812), Honeywell in Redmond, reported off-site mercury transfers to the 2000 Toxics Release Inventory. SIC code 3812 includes search, detection, navigation, guidance, aeronautical, and nautical systems and instruments.[18]

Quantity and Estimated Uncertainty
Honeywell reported off-site transfers of 84 pounds of mercury to the 2000 Toxics Release Inventory.

Public Comments

Org-6: Ecology should acknowledge that although other "specialty" products used by the aerospace industry and others, may contain small amounts of mercury, few viable alternative products exist. There are national programs such as FAA flight safety requirements and OSHA worker safety requirements that set acceptable performance standards for some products and their use. The CAP should acknowledge that these national programs are the appropriate means for addressing the limited potential for exposure to mercury from these products. The recommended action to "draft legislation" to address products as sources in Washington State should recognize that many products which contain mercury have no reasonable substitutes and should not be further regulated by the state. The risk of exposure to mercury from these products is extremely small and can be addressed by current Federal programs. Limits on the availability of these products to manufacturers would place Washington in an economic disadvantage in comparison to states with no state-based restrictions.

Org-6: Identification of mercury containing products is nearly impossible without an international program of labeling.

Manufacturers, service businesses, and even government does not have the ability to determine if a product contains mercury at the extremely low levels under discussion (parts per billion). The Seattle City Council's recent resolution "to consider the presence of PBTs and the potential for their release in making purchasing decisions" is a excellent example of how the global scope of trade will defeat a local / State effort to control use of these products. It also illustrates how the misleading statement contained in the draft Mercury CAP that products containing mercury are the largest source of "release" of mercury to the environment can be applied by local governments and others to develop and fund projects that will have little or no impact on improving human health or the environment but will result in further restrictions on business and free trade.

Org-23: Are you intending to supersede the current dangerous waste regulations? That is are you going to regulate all products that contain "added" mercury. There has to be far greater than one manufacturer of products that contain "added mercury" i.e. fluorescent light manufactures, Thermostat manufacturers, etc. What are you attempting to define?

Org-33: Honeywell manufactures mercury-added instruments at its facility in Redmond. The facility reported sending 84 pounds of mercury to a reuse/recovery facility. The long-term solution is for companies like Honeywell to find alternatives to using mercury in these products. Ecology should recommend supporting legislation to phase out mercury-added products.

Org-33: Ecology used Toxic Release Inventory (TRI) to quantify releases of mercury to air, water, and land by certain industries that report to TRI. We suggest that Ecology also include the total waste numbers since it is important to know the total amount of mercury wastes and pollution (releases) that industries are responsible for generating. The total mercury waste managed by TRI industries in Washington for the year 2000 is 156,954 pounds. This number should be included in the CAP because even though some of the mercury might wind up being recycled or landfilled it doesn't mean it won't eventually be released to the environment. We are concerned with the total amount of mercury waste each facility is responsible for creating so the total waste numbers from TRI should be included.

Ind-15: for this action plan to help with the heavy lifting, to raise the bar just a little, we should ask the manufacturers of mercury products -- and the people and companies that use those products -- to pay for the life-cycle environmental costs of mercury,

Impacts from mining
To the spill on the hospital floor
To the health impacts from the mercury in the contact lens solution many of you in this room have in your eyes.

That's manufacturer responsibility, and this plan falls short of putting the burden of a solution on those who generate and make money from mercury.

Notice that all of the proposed solutions in the current draft plan are funded by we taxpayers, not mercury users.

For our state, and the department of ecology, to get in front of the line that's already forming, this plan needs to:

- Legislate a phase out of mercury containing products,
- The plan should improve the safety of mercury disposal at the expense of the manufacturer,
- The plan should provide the public with right-to-know information through clear consumer labelling
- The plan should phase out mercury emissions from industrial sources
- The plan should prevent mercury releases through dental amalgam use and require dental offices to install *Filtration Units*

Ind-31: With a strong directive for mercury phaseout from a broad-based medical community throughout the state, it is vital that the Department of Ecology take this opportunity to bolster the framework of its mercury CAP and require industry to take appropriate measures to keep this toxic chemical out of our environment, and to keep our children out of harm's way. In particular, we ask Ecology to ensure that the final mercury CAP require industry to move towards safe, available and cost-effective alternative products and practices. Ecology recommends legislation to phase out mercury in products in favor of safe, effective, and available alternatives. We want to emphasize that this is a vital step in eliminating mercury from our state's environment.

Ecology's Review and Analysis of Public Comments

Ecology received a wide range of comments and views on the issue of the manufacturing of mercury-containing products. These comments included:

- Manufacturers of mercury products, and the people and companies that use those products, should pay for the life-cycle environmental costs of mercury.
- Are you intending to supersede the current Dangerous Waste Regulations?
- The final *Mercury Chemical Action Plan* (mercury CAP or MCAP) should require industry to move towards safe, available, and cost-effective alternative products and practices.
- Honeywell manufactures mercury-added instruments at its facility in Redmond. The facility reported sending 84 pounds of mercury to a reuse/recovery facility. The long-term solution is for companies like Honeywell to find alternatives to using mercury in these products.
- Include the total waste numbers since it is important to know the total amount of mercury wastes and pollution (releases) that industries are responsible for generating.
- Ecology should acknowledge that although other "specialty" products used by the aerospace industry and others may contain small amounts of mercury, few viable alternative products exist. There are national programs such as FAA flight safety requirements and OSHA worker safety requirements that set acceptable performance standards for some products and their use.
- Identification of mercury-containing products is nearly impossible without an international program of labeling.

While Ecology would prefer manufacturer responsibility for the lifecycle cost of mercury-containing products, this issue will need to be addressed legislatively. As public awareness increases about the range of mercury-containing products in use, we expect they will expect that society address the issue of how we choose to pay for the recycling, disposal, and long-term management of mercury-containing products. Whichever option (manufacturer pays or government pays) is chosen, there will be costs.

The MCAP is not intended to supercede existing regulations and statues. The Ecology/Health MCAP is a guidance document designed to:

- Identify sources of human-caused mercury in our state,
- Outline the existing regulatory structure around mercury, describe existing mercury-reduction efforts, and identify additional strategies, and
- Recommend actions that Ecology could take to make further progress.

Ecology understands that Honeywell has already moved away from using mercury in its products and now uses a non-mercury alternative.

Ecology chose to focus on determining what amounts of mercury are currently released into our state's air, land, and water, rather than determining the overall mercury usage. Much mercury is recycled or retorted under existing authorities. Our interest is in minimizing the release of mercury through increased recycling and phasing out of production.

Ecology was not able to collect the necessary information in time to identify those "specialty" products used by the aerospace industry and others which may contain small amounts of mercury. Ecology recognizes that for these products especially, few viable alternative products exist. As such, Ecology is focusing mercury-reduction efforts on those products or practices which release large amounts of mercury into the environment and for which there are readily available alternatives.

Ecology agrees that labeling of mercury-containing products would be a useful tool to help consumers know which products contain mercury. A recent decision by the National Electrical Manufacturing Association (NEMA) requiring fluorescent lamps to be labeled later in 2003 is an encouraging step.

Ecology's Conclusions

Ecology has identified several mercury-containing products and commodities in the MCAP that are known to release mercury into our environment upon disposal or use. The goal of the MCAP is to achieve further reductions in mercury releases over the next several years.

Comments Related to Manufacturing of Products where Mercury is a Contaminant

The Draft Mercury Chemical Action Plan stated

Pulp and Paper

According to the *1997 EPA Mercury Study Report to Congress,* mercury can be introduced to the pulping process through wood that is being pulped, in the process water used in the pulping process, and as a contaminant in makeup chemicals added to the process. If the mercury is not purged from the process in wastewater or as dregs, it can accumulate in the chemical recovery area and subsequently be emitted from chemical recovery combustion sources. The amount of mercury emitted may depend on the degree to which the pulping process is closed (i.e., the degree to which process waters are recycled and reused).[14]

In Washington, three facilities reported releasing a total of 89.6 pounds of mercury in 2000 to the Toxics Release Inventory.

The current NPDES Permit requires mercury monitoring of the final effluent from the Georgia Pacific tissue mill at a detection limit of 0.2 ug/L.

Industrial Organic Chemicals

Establishments primarily engaged in manufacturing industrial inorganic chemicals. Mercury may be a contaminant in feedstock.

Two facilities, reported releasing a total of 58 pounds of mercury in 2000 to the Toxics Release Inventory.

Cement Manufacturing

According to the *1997 EPA Mercury Study Report to Congress*, the primary sources of mercury emissions from Portland cement manufacturing are expected to be from the kiln and the preheating/precalcining steps.[15]

One facility, Ash Grove Cement in Seattle, reported a release of 62 pounds of mercury in air emissions in the 2000 Toxics Release Inventory.

[14] U.S. Environmental Protection Agency Office of Air Quality Planning and Standards and Office of Research and Development; "EPA Mercury Study Report to Congress, Volume II: An Inventory of Anthropogenic Mercury Emissions in the United States"; Washington, DC; December 1997; p. 4-45.
[15] U.S. Environmental Protection Agency Office of Air Quality Planning and Standards and Office of Research and Development; "EPA Mercury Study Report to Congress, Volume II: An Inventory of Anthropogenic Mercury Emissions in the United States"; Washington, DC; December 1997; p. 4-42.

Lime Manufacturing

According to the 1997 EPA Mercury Study Report to Congress, fuels, including primarily coal, oil, petroleum coke, or natural gas, are used to provide the energy for calcination. Petroleum coke is usually used in combination with coal. Auxiliary fuels may include shredded municipal garbage, chipped rubber, or waste solvent. Mercury is expected to be present in the coal, oil, and possibly in appreciable quantities in any waste-derived fuels. Any mercury emitted from fuel combustion will occur during the calcination step and will be discharged as vapor kiln exhausts.[16]

One lime manufacturer, Graymont Western U.S. in Tacoma, reported releasing 1.4 pounds of mercury in air emissions in the 2000 Toxics Release Inventory.

Primary Production of Aluminum

Identification and Description of Source
Sodium hydroxide is apparently used in purifying bauxite, the ore of aluminum. Sodium hydroxide may be contaminated with mercury. Trace mercury may be present in alumina, petroleum coke, and pitch. Petroleum byproducts of coke and pitch are used to make anodes for production of aluminum.

Quantity and Estimated Uncertainty
One facility, Reynolds Metals in Longview, reported 0.6 pounds of mercury released to air in the 2000 Toxics Release Inventory. Reynolds and Kaiser Aluminum and Chemical of Mead together reported off-site transfers of 41.82 pounds of mercury.

Public Comments

Org-19: NWPPA asserts that the pulp and paper manufacturing description condensed from the 1997 EPA Mercury Study Report to Congress contains inadvertent generalizations and does not recognize the process differences between paper and pulp mills.

According to the 1997 EPA Mercury Study Report to Congress, mercury can be introduced to the pulping process through wood that is being pulped, in the process water used in the pulping process, and as a contaminant in makeup chemicals added to the process. If the mercury is not purged from the process in wastewater or as dregs, it can accumulate in the chemical recovery area and subsequently be emitted from chemical recovery combustion sources. The amount of mercury emitted may depend on the degree to which the pulping process is closed (i.e., the degree to which process waters are recycled and reused). [18]

Org-33: Mercury is a contaminant in chlorine, which has been used by the pulp and paper industry for bleaching pulp. Most mills are switching to chlorine dioxide for bleaching. However, mercury may still be a problem because some companies make chlorine dioxide from

[16] U.S. Environmental Protection Agency Office of Air Quality Planning and Standards and Office of Research and Development; "EPA Mercury Study Report to Congress, Volume II: An Inventory of Anthropogenic Mercury Emissions in the United States"; Washington, DC; December 1997; p. 4-56.

elemental chlorine (e.g. Weyerhaeuser, Longview). The use of chlorine chemicals in the pulp and paper industry is more than a mercury problem. It results in dioxin pollution and other organochlorine pollution, which will leave a toxic legacy for our children. Ecology can solve a much larger PBT problem by requiring mills, in the next round of NPDES permitting, to meet effluent limits based on chlorine-free bleaching technologies.

With respect to Georgia Pacific in Bellingham, Ecology should do a much more comprehensive investigation into the potential mercury pollution caused by the facility. From 1987-2000, the facility reported releasing more than 16,000 pounds of mercury into the air. In addition, mercury most likely ended up in the wastes generated by the facility. These wastes were reportedly disposed of in many places in Whatcom County. Georgia Pacific should be required to identify and clean up all the locations contaminated by their processes or practices, not only Bellingham Bay.

Org-33: The one cement facility in downtown Seattle, AshGrove, reported releasing 62 pounds of mercury into the air. Depending on wind direction, this mercury can wind up in Puget Sound, contaminating the fish many people eat. It is likely that the fuel this facility burns contributes to the mercury emissions. For example, the facility burns coal and tires. Regulations should be adopted that prohibit the burning of fuels in industrial boilers that contribute to mercury pollution. In addition, state air-emissions requirements should be amended to include a deadline of 2010 for achieving a zero-discharge limit for mercury.

Org-33: The Birmingham steel mill in downtown Seattle reported sending more than 50 pounds of mercury waste to a facility in Mexico that makes zinc fertilizer. We would like Ecology to investigate the mercury air emissions for this facility since it is likely that they are a source of mercury air pollution despite the fact that they did not report air emissions to the Toxics Release Inventory. The mercury pollution from secondary steel mills most likely comes from car components, since they recycle cars and other metals. This is why it is so important to remove mercury in cars before the end of life and to require mercury-free cars in the future. Ecology should set a 2010 deadline for having mercury-free cars sold in Washington. Ecology should support legislation that accomplishes this as well as the removal of mercury components for proper disposal (see Vehicle switches section below for more details).

Org-34: We support requiring pulp and paper mills to meet NPDES permits limits based on chlorine-free bleaching technologies.

Pulp and paper mills that have refused to adopt chlorine-free bleaching technologies emit mercury because chlorine used by the mills is contaminated with mercury. Chlorine-free bleaching technologies would help to eliminate this source of mercury and Ecology should base limits in the next round of NPDES permits for these mills on such technologies.

Ind-5, Ind-6, Ind-14, Ind-17: That mercury emissions from industrial sources be phased out.

Ecology's Review and Analysis of Public Comments

Ecology received a wide range of comments and views on the issue of the manufacturing of mercury-containing products. These comments included:

- Pulp and paper mills that have refused to adopt chlorine-free bleaching technologies emit mercury because chlorine used by the mills is contaminated with mercury.
- Mercury may still be a problem because some companies make chlorine dioxide from elemental chlorine.
- Regulations should be adopted that prohibit the burning of fuels in industrial boilers that contribute to mercury pollution.
- Mercury pollution from secondary steel mills most likely comes from car components, since they recycle cars and other metals. This is why it is so important to remove mercury in cars before the end of life and to require mercury-free cars in the future.
- Mercury can be introduced to the pulping process through wood that is being pulped, in the process water used in the pulping process, and as a contaminant in makeup chemicals added to the process.
- Mercury emissions from industrial sources should be phased out.

Pulp mills use different processes to produce pulp and bleach. Pulp mills in Washington have converted to elemental chlorine bleaching, and the last remaining chlor-alkali facility in Washington has closed. Agency regulatory staff will continue to take enforcement actions when appropriate. Ecology anticipates continued decreases in dioxin discharges from pulp mills as a result of changes made to comply with new EPA rules. Ecology is drafting permits, enforceable by agency regulatory staff, to address pulp mill dioxin discharge.

One commenter recommended that regulations be adopted to prohibit the burning of fuels in industrial boilers because this contributes to mercury pollution. This is unlikely given that one of the larger sources of mercury in Washington (and globally) is the everyday combustion of petroleum products in our cars, trucks, and buses also releases mercury into the environment.

Ecology agrees that mercury pollution from secondary steel mills most likely comes from car components (e.g. convenience light switches), since they recycle cars and other metals. Additional discussion is provided in the section, *Comments Related to Vehicle Switches.*

Ecology acknowledges that mercury can be introduced to the pulping process through wood that is being pulped, in the process water used in the pulping process, and as a contaminant in makeup chemicals added to the process. Mercury is a naturally occurring element that is also present in many of our natural resources such as coal and crude oil that is used in everyday energy generation and transportation processes.

Ecology agrees in principle that mercury emissions from industrial sources should be continually reduced and, where possible, phased out. We recognize that this will be a long-term effort given that mercury is a naturally occurring element already present in rocks, soils, coal, oil, wood, and other sources.

Ecology's Conclusions

In the MCAP, Ecology has identified several manufactured products and commodities where mercury is a contaminant. The goal of the MCAP is to achieve further reductions in mercury releases from these types of facilities over the next several years.

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3. Use of Products Containing Mercury

Comments Related to Mercury-Containing Products - General

The Draft Mercury Chemical Action Plan stated

Due to its unique properties, mercury has been and is found in a wide variety of products. Some products in common use include: thermometers, thermostats, other measuring devices, some button cell batteries, mercuric oxide batteries, dental amalgam, fluorescent lighting, and some switches and relays. Pesticides, paint, and alkaline batteries manufactured before the early 1990's may also contain mercury. Mercury is found as a contaminant in some products, including those derived from caustic soda or chlorine manufactured using a mercury cell process. Examples of such products include soaps and detergents. If products containing mercury are broken or disposed of with solid waste, medical waste, or sewage, the mercury can be released to the surrounding environment.

The total amount of mercury released from products is unknown, because no complete inventory of mercury in use in products exists to date. In 2001, New Hampshire and Rhode Island passed legislation that requires manufacturers selling products that intentionally contain mercury to notify the state of the product and the amount of mercury used. This information is being compiled through the Interstate Mercury Reduction and Education Clearinghouse (IMERC). It is expected that IMERC will provide the best estimate to date of mercury in use in products and potentially released to the environment.

In the meantime, estimates of releases from the most common mercury-added products exceed 1,600 pounds annually in Washington State. For calculations and assumptions, see the Mercury Release Inventory section of this report. Based on these calculations, the general category of "mercury products" is by far the largest source of mercury releases in the state.

Support mercury product legislation including labeling provisions, manufacturer-funded collection systems, phase-out of mercury use in products, and selected bans on the sale of certain products, including mercury thermometers and novelties.

Investigate whether the HWTR Program's "Education Fee" excludes dental offices or other small generators. Determine if known generators/sources of mercury-bearing dangerous wastes are getting a fee exclusion (disincentive). Conversely, Ecology could explore a fee break (incentive) if the generator were mercury/PBT free.

Chapter 173-303 WAC includes Standards for Universal Waste Management (WAC 173-303-573). The current rules allow batteries, thermostats, and fluorescent lamps containing mercury to be managed as Universal Wastes. Ecology could investigate whether adding additional mercury bearing waste streams, including switches, as Universal Wastes would encourage better management and/or prevent more mercury wastes from being mismanaged.

The Draft MCAP Recommended the Following Actions

Proposed, Short-term

Draft legislation that will seek to reduce the use and release of mercury in products in Washington State.

Public Comments

Org-8, Org-11: We recommend that Ecology introduce legislation that will:

- Require manufacturers of mercury-containing products to provide collection, recycling and disposal systems or use existing systems at their expense;
- Require manufacturers to label mercury-containing products about mercury content and disposal;
- Prohibit the disposal of mercury-containing products other than as hazardous waste or by disposing in a collection, recycling or disposal system for such products;
- Prohibit the sale of the following mercury-containing products after a specified date: thermometers (with some exceptions); motor vehicles manufactured after January 1, 2003 that contain a mercury light switch; novelty items; thermostats; and unlabeled mercury-added products.
- Prohibit schools from buying bulk elemental or chemical mercury for classroom use;
- Require state procurement offices to give priority to non-mercury-containing products when purchasing equipment, supplies and other products.

Model legislation has been developed by a consortium of New England states, and product stewardship legislation that specifically addresses sources of mercury has been adopted in many New England states, Minnesota and Oregon. This kind of legislation is no longer considered "pioneering." Washington State should adopt laws at least as progressive as these other states and go beyond, where appropriate, to move us toward the ambitious goals of the Action Plan.

Org-20: Finally, the biggest source of mercury releases in the state falls under the general category of products. These products can enter waste streams that then enter Puget Sound. Ecology must recommend to the legislature that it pass a bill that addresses the mercury products problem, including the following key provisions:

- Quickly phase out the use of mercury in products with readily available alternatives, including novelties, thermometers, auto switches, thermostats, and manometers by January 1, 2004.
- Require the manufacturers of thermostats, automobiles, and lamps to fully fund a collection system to capture targeted numbers of their products that contain mercury before they reach landfills or incinerators. Manufacturers should be required to pay for systems that will effectively collect their mercury products and prevent them from polluting our air and water.

Org-22: We are encouraged that Ecology has included some discussion of product stewardship principles in the reduction options in the plan. However, we would like to see product stewardship tactics carried through into the "recommended action" strategies. Toxic wastes from all sources are prohibited in Seattle's garbage. Items such as mercury thermometers are

collected at our household hazardous-waste sheds at high cost to ratepayers. As awareness about the health and environmental hazards of mercury increase, this cost burden on local governments is going to increase at a time when we are more and more financially constrained. A product stewardship approach would shift the cost burden of end-of-life management of mercury-containing products from governments to manufacturers. This is likely to be the most efficient way of reducing the mercury stream entering Washington's environment, as manufacturers pursue product redesign in order to reduce costs.

Org-22: SPU would like to see manufacturer-funded take-back programs as "recommended actions," specifically under the "Use of Products Containing Mercury" section (p. 35-63). For example, as opposed to advocating that local governments fund the collection programs/product exchanges for both fever thermometers and lamps, the recommended actions for these products should instead promote the establishment of manufacturer- funded take-back programs (p.39, 45 respectively). These manufacturer-funded programs should cover set up, implementation, and collection costs. We support product stewardship strategies as recommended actions for all mercury added products covered in this section.

Org-22: The recommend action listed under "Mercury Added Products—General" (p.37) is to draft legislation that seeks to reduce the use and release of mercury. We would like the recommended action be the more specific option listed in this section – "Support mercury product legislation including labeling provisions, manufacturer-funded collection systems, phase-out of mercury use in products, and selected bans on the sale of certain products, including mercury thermometers and novelties (p.37)." Selected bans on mercury-added products will quickly eliminate unnecessary use of mercury, reduce the costs of end-of-life management, and reduce a source of mercury into the environment.

Org-27: Much of the anthropogenic mercury releases that we might be able to easily affect in the near term appear to be from mercury-added products that are disposed (see MCAP - Tables 1 and 2). For these sources, pollution prevention strategies offer the best opportunities. Solid waste collection operations and wastewater treatment facilities have little opportunity to screen for or limit the volumes of mercury-added products and related by-products once they enter the waste stream. A key is to limit the volume of mercury-added products that are produced and available to residential and commercial consumers or prevent them from entering the waste stream.

Org-31: Finally, in cases where the public is purchasing a product that contains mercury, it is a fundamental responsibility for manufacturers to clearly label any mercury content in its product, as a basic public right-to-know policy.

Org-33, Org-34: Mercury-added products are the single largest source of mercury to the solid waste stream identified in the plan. Despite the fact that the plan recommends drafting legislation that will seek to reduce the use and release of mercury in products, we understand that Ecology no longer intends to take that course of action. If Ecology does not plan to draft legislation, *we urge Ecology to include in the plan a recommendation to support legislative efforts to reduce the use and release of mercury in products.*

Org-33, Org-34: Mercury product reduction legislation was introduced in the 2002 Legislative Session. House Bill 2686 and Senate Bill 6553 included several common sense provisions relating to the reduction of mercury pollution. These provisions included banning the sale of automobiles with mercury switches and mercury-containing thermometers, thermostats, blood pressure devices, and novelty items; requiring manufacturers of certain products to finance product collection and disposal systems; and labeling of certain products as containing mercury. All of these provisions provide the most effective and efficient way to eliminate mercury pollution from mercury-added products.

Org-34: Similar legislation may be introduced in the Legislature in the upcoming session and we urge Ecology to include a recommendation in the plan to support legislation that includes the provisions outlined above.

Ecology's Review and Analysis of Public Comments

Review of the comments above suggests general support for legislation that targets current use and disposal practices surrounding products that contain mercury. Additionally, these comments suggest general agreement that the disposal of mercury-containing consumer products (e.g., thermometers, thermostats, fluorescent light tubes, etc.) results in the largest source of mercury release in Washington State. Additional comments request that Ecology recommend in the MCAP support for legislation that requires labeling of mercury-containing products, bans on the future sales of certain mercury-containing products, and requirements that product manufacturers pay for the recycling or disposal costs of mercury-containing products. Some commenters also suggest that Ecology introduce such legislation.

Ecology's Conclusions

Ecology reviewed and considered the comments submitted regarding the need for legislation or other measures that restrict or better manage the use and disposal of mercury-containing-products. Chapter 3, *Use of Products Containing Mercury,* of the final MCAP contains the following recommended actions:

Support legislation to meet the following objectives:

1. Eliminate or reduce non-essential uses of mercury in household, institutional, and industrial products and processes. Segregate and recycle mercury attributable to the remaining uses and/or products to the maximum degree possible.

2. Reduce the overall amount of mercury-containing waste from household, commercial, and industrial sources through source reduction, segregation, and safe waste management, including recycling.

In order to meet these objectives, legislation may include the following principles:

- Requires manufacturers to notify the Department of Ecology of mercury-containing products sold in Washington.

- Requires the Department of Ecology to become a member of the Interstate Mercury Education and Reduction Clearinghouse.
- Requires the Department of Ecology to adopt Universal Waste Rules for largest feasible number of mercury-containing products and elemental mercury that is not contained in a product.
- Bans the sale of mercury-containing products that are clearly and immediately unnecessary.
- Gradually phases out mercury-containing products, starting with products that contain more than one gram of mercury down to those that contain 10 milligrams over a period of time. Exemptions would be allowed for products that meet one or more of the following criteria:
  - The product was manufactured prior to the effective date of the program.
  - Mercury is required to meet federal or state health and safety rules.
  - The product is beneficial to the environment or protects public health and safety.
  - There are no feasible alternatives to using mercury in the product.
  - There is no comparable non-mercury-added product available at a reasonable cost.
- Requires mercury-containing products, components, and packaging to have a label.
- Bans the disposal of mercury or mercury-containing products at a solid waste or wastewater treatment facility, unless allowed under a permit or license.
- Requires manufacturers of mercury-containing products to develop plans for and ensure the success of collection systems through whatever mechanisms they choose.
- Establishes disclosure requirements for certain products that are used by health care facilities and contain incidental mercury.
- Establishes controls on the sale of elemental mercury.
- Requires and provides funds for the Department of Ecology and the Department of Health to conduct public education and outreach on mercury fish advisories and programs developed around principles outlined above.
- Requires state agencies in Washington to include a preference for non-mercury or low-mercury products that have comparable performance to mercury-containing products.

Although Ecology is not sponsoring legislation during the 2003 Legislative Session regarding the uses and disposal of mercury-containing products, Ecology goes on record in the MCAP that we will support legislation that addresses all or some of the legislative principles identified above.

Comments Related to Mercury Fever Thermometers

The Draft Mercury Chemical Action Plan stated

Consumer mercury fever thermometers contain 0.5 to 1.5 grams of mercury[17] and are used to measure body temperature in health care facilities, private homes, and schools.

The estimated amount of mercury in thermometers broken per year in private homes ranges from 11 to 300 pounds, depending on assumptions used. Based on surveys from Thurston County and King County, it is assumed that this mercury is disposed by pouring it down the drain or throwing it away with household trash.

No estimate is available for mercury thermometers broken in health care facilities or schools.

Non-mercury alternatives are readily available. These include digital thermometers, which alcohol thermometers, card thermometers, and gallium-indium-tin thermometers. Digital thermometers may be powered by a button cell battery containing up to 25 mg of mercury or be solar powered.

In the spring of 2002, Ecology awarded grants to four local governments; the City of Tacoma, Kitsap County, Kittitas County, and Thurston County; to conduct mercury thermometer exchanges. These projects are ongoing.

Hi-School Pharmacy, the Oregon Center for Environmental Health, Clark County Environmental Services, the Southwest Washington Health District, and the City of Vancouver Solid Waste Services collaborated to conduct a mercury thermometer exchange in the spring of 2001, with Hi-School Pharmacy locations as collection points.

King County conducted a pilot mercury thermometer exchange in an office building during the summer of 2002. The county is planning a larger exchange for the fall of 2002.

Snohomish County has been exchanging mercury fever thermometers for two years at its fixed Household Hazardous Waste Collection site.

Major pharmacy chains, including CVS, Rite Aid, Walgreen, Wal-Mart, Eckerd, Albertson's, Kroger, K-Mart, Safeway, Winn Dixie, Ahold USA, Target, Longs, Costco, Brooks, Shopko, Duane Read, and Meijer, have all voluntarily agreed to stop selling mercury fever thermometers.[18]

Bans prohibiting the sale of mercury fever thermometers except by prescription have been passed in the states of California, Oregon, Indiana, Maine, Maryland, Massachusetts, Minnesota, New Hampshire and Rhode Island. Numerous similar local ordinances have been passed cities and counties across the country, in many cases preceding state legislation.

[17] Bill Ravanesi, Health Care Without Harm, "Mercury in Medical Devices," Sustainable Hospitals website, http://www.sustainablehospitals.org/HTMLSrc/IP_mercury_amounts.html.
[18] Health Care Without Harm, http://www.noharm.org/index.cfm?page_ID=26.

King County is working to ban the sale of mercury fever thermometers.

Many local and state governments, medical facilities, non-profit groups, and others have conducted mercury thermometer exchanges over the past few years.

The Draft MCAP Recommended the Following Actions

Ongoing
Support mercury thermometer exchanges.

Planned, Short-term
Investigate the feasibility of a statewide mercury thermometer exchange in collaboration with pharmacy chains and other interested parties.

Public Comments

Org-13, Org-14, Org-16, Org-17: Ban the sale of mercury products where viable alternatives exist, such as fever thermometers.

Org-30: On page 38, the statement is made that there is no estimate of the number of mercury thermometers broken in Washington's hospitals. I suggest addition of the following thought, "A recent Washington State Hospital Association survey indicates that about half the state's 97 general, acute hospitals are now using mercury-free thermometers for patient care."

Org-30: On page 39, under the headline of Reduction Options, I suggest the sentence read as follows, "Ban the sale of mercury thermometers, except by prescription or for use in special circumstances for manufacturing and calibration."

Org-33: We support mercury-thermometer exchanges, particularly in conjunction with pharmacies and other interested parties. We support Ecology's recommendation on this subject.

Org-34: We urge Ecology to recommend legislation to phase out mercury products, like thermometers. Phasing out mercury-added products will eliminate this source of mercury.

Org-34: While we support the recommendation to support mercury thermometer exchanges, we do not believe this recommendation goes far enough. We urge Ecology to include as a recommendation in the plan the reduction option to ban the sale of mercury thermometers, except by prescription.

Banning the sale of mercury-containing thermometers will move us towards a permanent solution for eliminating this source of mercury pollution. The availability of non-mercury alternatives has already prompted many pharmacies nationally to refuse to sell these mercury thermometers and many state and local governments have adopted mercury thermometer bans.

Ecology's Review and Analysis of Public Comments

Review of the comments above suggests strong support for specific legislation that would ban the sale and distribution of household mercury fever thermometers, in addition to Ecology's recommendation to support mercury thermometer exchange programs. Additional comments recommend that Ecology be open to any legislation that allows for the continued use of mercury thermometers, if required by prescription or for use in special circumstances for manufacturing and calibration. One comment pointed out that mercury fever thermometers are no longer used in about half of the state's hospitals, based on a recent survey.

Ecology's Conclusions

Ecology mentions in the final MCAP that the agency is supportive of legislation that would do the following:

1. *Eliminate or reduce non-essential uses of mercury in household, institutional, and industrial products and processes. Segregate and recycle mercury attributable to the remaining uses and/or products to the maximum degree possible.*

The following legislative principles must be included to meet the above-mentioned objective:

- Ban the sale of mercury-containing products that are clearly and immediately unnecessary.
- Gradually phase out mercury-containing products, starting with products that contain more than one gram of mercury down to those that contain 10 milligrams over a period of time.

In conclusion, Ecology recommends the following in the final MCAP:

Ongoing
Support mercury thermometer exchanges.

Planned, Short-term
Investigate the feasibility of a statewide mercury-thermometer exchange in collaboration with pharmacy chains and other interested parties.

These are the same recommendations that were in the draft MCAP.

Comments Related to Batteries

The Draft Mercury Chemical Action Plan stated

Mercury is used to prevent gas formation in batteries. It is currently used in mercuric oxide batteries, also known as mercury-zinc batteries, which can be button- shaped or larger. The larger mercuric oxide batteries are used by the military and hospitals. Other button shaped batteries are zinc air batteries and silver oxide batteries.

It is estimated that 88 pounds of mercury annually are disposed with button cell batteries in solid waste.

Non-mercury alternatives are not currently available for button cell-batteries.

The Draft MCAP Recommended the Following Actions

Ongoing
Support the collection of button-cell batteries at household hazardous waste collection facilities through CPG grants.

Public Comments

Org-23: Current Universal Waste Regulations apply to batteries that designate per WAC 173-303 as hazardous. They do not have to apply to batteries that are not hazardous in nature. (i.e., alkaline batteries). The law is intended to apply to lead acid, mercury and nickel-cadmium batteries which designate as hazardous waste.

Ecology's Review and Analysis of Public Comments

Given that non-mercury alternatives are currently not available to replace mercury-containing button-cell batteries, and that it is unlikely that the Universal Waste Rule will apply to the disposal of button-cell batteries, Ecology will focus on button-cell battery recycling efforts where feasible.

Ecology's Conclusions

Ecology will, where possible and feasible, continue to support the collection of button-cell batteries at household hazardous waste collection facilities through CPG grants.

Comments Related to Wall Thermostats

The Draft Mercury Chemical Action Plan stated

Many heating, ventilation, and air conditioning systems contain mercury switches. These switches may be disposed of improperly when the system is changed, or they may be disposed with construction and demolition debris if the building is demolished.

Wall thermostats contain three grams of mercury per switch, and units may contain up to six switches. An estimated 431 pounds of mercury from thermostats is disposed of with solid waste in Washington each year.

Mercury-free thermostats are readily available at comparable cost. Digital thermostats, operated properly, provide the added benefit of energy savings from improved performance. Honeywell plans to phase out mercury in its popular T87 residential model by 2006.[19]

The Thermostat Recycling Corporation (TRC) is owned by three thermostat manufacturing companies facilitates the collection by HVAC wholesalers from contractors of all brands of used, wall-mounted mercury-switch thermostats so that the mercury can be purified for re-use. TRC provides containers for a minimal fee to wholesalers for the collection of thermostats. When the container is full, TRC pays for shipping and provides a replacement container. TRC depends upon local and state governments to promote its services. As of January 2002, TRC listed only two locations in Washington State, Johnstone Supply in Spokane and Trane Parts Center of the Northwest in Bellevue.[20]

The Draft MCAP Recommended the Following Actions

Proposed, Short-term
Include HVAC switches and gauges, beyond thermostats, as waste streams covered by the Universal Waste Rule.

Proposed, Short-term
Provide outreach and education to building inspectors on removing mercury equipment prior to demolition of buildings.

Proposed, would require additional funding
Support expansion of the Thermostat Recycling Corporation.

Public Comments

Org-27: Product stewardship principles could enhance these product regulation/ban strategies by involving manufacturers in recovering existing products before they are disposed and/or in helping to educate and inform the public and businesses about appropriate methods and

[19] http://twincities.bizjournals.com
[20] http://www.nema.org/index_nema.cfm/664/, accessed 6/25/02.

opportunities for properly handling these items when their useful life is past. It sounds as though the Thermostat Recycling Corporation would be willing to work cooperatively with the state to expand regional opportunities and outreach to improve the collection of these items from HVAC contractors; this sounds like a strategy to be pursued immediately. The MCAP should bolster recommendations to address these sorts of approaches.

Org-33: Although we generally support the expansion of the Thermostat Recycling Corporation, we do not support Ecology spending its scarce resources on doing it. We believe that the manufacturers of thermostats, which created the pollution problem in the first place, should bear the financial responsibility for making their program work. This is their job, not Ecology's. As mentioned previously, we support the rapid phaseout of mercury thermostats by January 1, 2004.

Org-34: While the proposed recommendation to provide outreach and education to building inspectors on removing mercury equipment prior to the demolition of buildings is certainly a necessary strategy to eliminating mercury pollution, it only addresses a small part of the problem. We urge Ecology to support legislation to phase out mercury thermostats and require thermostat manufacturers to finance the expansion of collection systems. We also support requiring manufacturers to meet collection target rates for collection systems.

Org-34: Many economical non-mercury alternatives for thermostats exist. Thus, there is no need for manufacturers to continue selling mercury thermostats. The Thermostat Recycling Corporation is a start in the right direction but should not be funded using taxpayer dollars. Thermostat manufactures are responsible for putting these dangerous products into the stream of commerce and should be responsible for ensuring that these products are disposed of safely.

PubMtg: Steve Cofchin, Air Systems. Comment made at the September 26, 2002 *Draft Mercury Chemical Action Plan* Public Forum in Tacoma:

I represent the HVAC industry – both residential and industrial. HVAC industry has become very progressive in dealing with mercury. Can't buy mercury thermostats – a thing of the past. Mercury thermostats are still used in boilers. Demolition of HVAC outfits is primarily done by "mom and pop" operations. Also, landfills don't handle mercury yet. I took some fluorescent lights to the LF and they said to just put in with the rest of the waste. The best way to handle mercury is the hazardous waste collection at the landfill. Thermostat Recycling Corp (TRC) has two facilities in WA – in Fife and in Spokane. This is convenient for those who live near these facilities, but not convenient for those who don't . We need the proper infrastructure to do this.

Ecology's Review and Analysis of Public Comments

Review of the comments above suggests support for specific legislation that would phase out mercury thermostats and require thermostat manufacturers to finance the expansion of collection systems. Additional comments recommend that the Thermostat Recycling Corporation would be willing to work cooperatively with the state to expand regional opportunities and outreach to improve the collection of these items from HVAC contractors. One comment pointed out that one can no longer purchase commercial mercury thermostats – a thing of the past – although mercury thermostats are still used in boilers.

Ecology's Conclusions

Ecology mentions in the final MCAP that the agency is supportive of legislation that would do the following:

1. *Eliminate or reduce non-essential uses of mercury in household, institutional, and industrial products and processes. Segregate and recycle mercury attributable to the remaining uses and/or products to the maximum degree possible.*

The following legislative principles must be included to meet the above-mentioned objective:

- Ban the sale of mercury-containing products that are clearly and immediately unnecessary.
- Gradually phase out mercury-containing products, starting with products that contain more than one gram of mercury down to those that contain 10 milligrams over a period of time.

In conclusion, Ecology recommends the following in the final MCAP:

Proposed, Short-term
Include HVAC switches and gauges, beyond thermostats, as waste streams covered by the Universal Waste Rule.

Proposed, Short-term
Provide outreach and education to building inspectors on removing mercury equipment prior to demolishing buildings.

Proposed, would require additional funding
Support expansion of the Thermostat Recycling Corporation.

Comments Related to Lamps

The Draft Mercury Chemical Action Plan stated

Mercury-containing lamps include fluorescent tubes, compact fluorescent lamps, high-intensity discharge lamps, and neon lamps.

While mercury in fluorescent lamps has decreased steadily over the last twenty years, a certain amount of mercury is still required to ensure that the lamp operates properly. A typical fluorescent lamp has a phospor-coated glass tube with electrodes at either end. The tube contains mercury, a small amount of it in vapor form. When voltage is applied, the electrodes energize the mercury vapor, causing it to emit ultraviolet (UV) energy. The phosphor coating absorbs the UV energy, causing the phosphor to fluoresce and emit visible light.[21]

According to a recent study by the New Jersey Department of Environmental Protection, a typical discarded fluorescent tube releases between 3 and 8 mg of elemental mercury vapor over two weeks. Approximately 620 million fluorescent bulbs are discarded annually in the U.S., and many are broken during disposal.[22] Scaling for population and assuming a 20 percent recycling rate, discarded bulbs release approximately 690 to 1,839 pounds of mercury in Washington annually.

Low-mercury fluorescent lamps are available. Whether a switch to low-mercury lamps will lead to a decrease in the total amount of mercury used in fluorescent lamps will depend on the lifespan of the newer lamps as compared to the old.

Household use of compact fluorescent lamps (CFL's) is increasing. For example, King County utilities distributed more than 300,000 CFL's in 2001 to promote energy conservation. Many retail stores stock large selections of energy-efficient, mercury bearing CFL's. CFL's contain 5 to 10 mg of mercury, and have a lifespan of about 10,000 hours. [23]

Estimates are not available for mercury entering the waste stream from CFL's, high-intensity discharge lamps and neon lamps.

Lamps will be continuously generated now and in the foreseeable future because no alternatives currently exist.

Snohomish County collects fluorescent lamps at all of its transfer stations.

King County is conducting outreach to businesses about using and recycling fluorescent lamps.

Thurston County collects fluorescent lamps at its household hazardous waste facility.

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[21] National Electrical Manufacturer's Association (NEMA), Fluorescent Lamps and the Environment," 2001, www.nema.org/lamprecycle/nemafluorfinal.pdf.
[22] Aucott, Michael, Michael McLinden, and Michael Winka, "Release of Mercury from Broken Fluorescent Bulbs," Journal of Air Waste Management Association, in press.
[23] Local Hazardous Waste Management Program in King County, "Mercury in King County," August 2002.

The Association of Lamp Recyclers, the National Electrical Manufacturers Association, and the Solid Waste Association of North America recently received a $750,000 to undertake a nationwide lamp recycling promotion effort.

The Draft MCAP Recommended the Following Actions

Ongoing
Make funding available for local governments to increase fluorescent collection capacity through CPG grants.

Planned, Short-term
Work with King County to conduct outreach and education to large quantity generators on the requirements of the Universal Waste Rule.

Proposed, Short-term
Conduct outreach and education statewide for large quantity generators on the requirements of the Universal Waste Rule.

Public Comments

Org-8: *Current Regulations and Policy*

[Para. 2]
The Universal Waste Rule (UWR) for Dangerous Waste lamps provides a streamlined regulatory avenue for regulated generators to dispose of their mercury added lamps through recycling.

We should state that recycling (rather than hazardous waste disposal) is the recommended best management practice in Washington State and the majority of lamp recyclers are equipped to handle tubes of all shapes and sizes, HID, neon, CFLs and other mercury lamps.

Regarding generator status, small quantity generators (SQGs) are still liable for the proper disposal of their hazardous waste and should not be considered exempt from the provisions of the rule. This is particularly important given the large quantity of lamps (4000 four-foot tubes) that an SQG can dispose without technically exceeded the limits. Although landfilling of lamps occurs in many areas, it should be considered a failure of the Universal Waste rule. It's not useful to describe landfilling as a common, acceptable practice for any audience. Instead, we should emphasize the need for making recycling facilities available to more remote areas of the state for all commercial generators to use.

While EcoLights Northwest is the only recycler physically located in Washington State, dozens of lamp recycling firms and brokers recycle lamps from generators located in Washington State. Lamp recycling services doing business in Washington include Earth Protection Services, Inc. (EPSI), Onyx Environmental Services/Superior Special Services, Safety Kleen, Nu-Life Industries, and many more. Mail-in services are available in addition to pick-up and drop-off recycling. (It should also be noted that EcoLights is not currently operating at full capacity and thus could handle more lamps at its existing facility.) For a full list of lamp recyclers doing business in Washington State, see www.metrokc.gov/hazwaste/fluor/.

[Para. 3]
Presently all the major lamp makers have a line of low mercury products that are not designated dangerous waste. It should be noted that these products, with the exception of Philips lamps, cannot accurately be called "low mercury." Rather, they are lamps designed to pass TCLP through the use of an additive and, in the case of GE and Osram Sylvania lamps, they do not actually contain lower levels of mercury than the standard product. We should note that these "green" lamps can be recycled and recycling is still the best management practice for this waste stream.

Activities of Other Groups
Since 1999, King County has conducted outreach to businesses about recycling of fluorescent lamps. Efforts include technical assistance visits to businesses, a financial incentive, a website and print materials, workshops and targeted education for key audiences, including property managers, lighting contractors and electric utilities. As of July 2000, King County discontinued acceptance of all commercial lamps from transfer stations and landfills (King County Solid Waste Division, Solid Waste Acceptance Policy, 2000). The City of Seattle Municipal Code bans solid waste disposal of mercury lamps from any source, including households. Household lamps are accepted at household hazardous waste collection facilities.

Recommended Actions
The following are activities for the Department of Ecology to undertake with the collaboration of local governments, nongovernmental organizations and the private sector on behalf of Washington State:

- Engage lamp manufacturers and distributors in state-level discussions on producer responsibility to support lamp takeback efforts by the private sector.
- Spearhead effort to require labeling of mercury-containing lamps sold in Washington State.
- Support stronger statewide and local enforcement of existing Universal Waste rule for lamp recycling, including fines when appropriate.
- Work with waste haulers on state and local level on education and enforcement efforts to eliminate fluorescent lamps from the solid waste stream at the point of pickup from the generator.
- Work with lamp manufacturers, distributors and recyclers to overcome barriers to increased recycling of commercial lamps: lack of knowledge, lack of convenient access to recycling facilities in remote areas, lack of storage space at businesses, and cost of recycling.
- Work with retailers and local governments to overcome barriers to increased recycling of household lamps -- lack of knowledge and lack of convenient access to recycling facilities -- for instance, through retail take back programs for consumers.

[According to Sustainable Conservation, 2000, the biggest barrier to lamp recycling is that "many consumers (this includes individuals and businesses) don't know that fluorescent lamps contain mercury and that mercury is an environmental problem."]

- Establish a tangible goal of increasing the lamp recycling rate in Washington State to 40 percent by the end of 2004 and to 70 percent by the end of 2006. Monitor lamp recycling rates statewide to gauge progress toward goals.

Org-23: State-wide ban for disposal of household generated fluorescent lighting unenforceable. Attempts to supersede current federal and state exemptions. Makes no allowance for consumer use and purchase of reduced mercury content lighting. State should be encouraging the use of reduced mercury lighting.

Org-24: The burden of collection should not be placed on local government. Manufacturer take-back should be required. Local government's role should be in education and enforcement, not providing the collection service. Incineration should be prohibited. Landfilling should be prohibited and enforced.

Org-25: Regarding the generation of compact fluorescent lamps and the resulting mercury released from their disposal, there is currently work being conducted by the Zero Waste Alliance on behalf of Northwest Power Utilities into this issue. While there is some disagreement on the accuracy of the work and the sited figures, it represents a very good starting point for dealing with this issue. Attached is a copy of the September 10, 2002 Draft Report on the issue. A meeting of stakeholders was conducted October 29, 2002 in Portland. A revised report and further meetings are expected in the coming weeks.

Org-25: Alternatives - I suggest reworking the paragraph for clarity and accuracy, perhaps as follows: "Waste lamps that contain mercury will be continuously generated now and in the forseeable future because no non-mercury containing alternatives currently exist for fluorescent lamps."

Org-25: Page 43 - Last line on page - EcoLights Northwest (Seattle) was incorrectly named in the reverse.

Org-25: I suggest the following language. "Presently, several lamp manufactures sell lines of low mercury products that may not designate as dangerous waste.....In a landfill situation, most lamps will be broken as they are thrown in, and a portion of the mercury can escape as mercury vapor as an air emission, not to the ground. Another problem with the test is that some lamp manufacturers use additives, thus allowing the tube to pass the TCLP test with higher levels of total mercury...."

Org-25: Finally, in my reading of the document I could find no discussion in either the Alternatives or Recommended Actions of the issue of Product Stewardship, or perhaps more appropriately, Producer Responsibility. Manufacturer's produce these materials, make the profits from the sale of the items, but do not share in the cost of proper management of materials when they are disposed of. While there are some good examples of voluntary programs to address the issue such as the Thermostat Recycling Corporation, in reality these voluntary programs are largely ineffective. I believe that the final document should identify possible legislative or agency options to require companies to take responsibility for the proper management of materials they manufacture or sell in Washington State.

Org-27: Within Clark County, our household hazardous waste facilities already accept fluorescent lamps from the public for mercury recovery/disposal. We use some Ecology CPG funding to support this program. MCAP recommendations might provide similar support for CESQG generators with lamps or support and fund coordination with local utilities, perhaps

through pilot programs, to encourage the recovery of compact fluorescent lamps (CFLs) from the public through these or other facilities (potentially including retailers with which utilities have existing programs to encourage the utilization of energy conserving CFLs). With increasing volumes of CFLs being generated and with a high percentage of traditional commercial fluorescents still not being collected for recycling, this is an important area on which to focus education and technical assistance strategies. Information could also be provided on the benefits and availability of low-mercury varieties of fluorescents.

Org-33: While we generally support the use of energy efficient CFLs and do encourage businesses and consumers to use them, we believe that the manufacturers of CFLs should be required to label their products so that consumers are aware of the mercury in them. We also support research into alternatives to CFLs that do not contain mercury.

Org-34: Because compact fluorescent light bulbs (CFLs) are the best choice for improving energy efficiency, the use of CFLs should be encouraged. However, we urge Ecology to support legislation to label CFLs as containing mercury so that consumers know how to properly dispose of them.

Ecology's Review and Analysis of Public Comments

Public comments summarized above suggest that Ecology collaborate with local governments, nongovernmental organizations, and the private sector to engage lamp manufacturers and distributors in state-level discussions on the following issues:

- Producer responsibility to support lamp takeback efforts by the private sector.
- Spearheading efforts to require labeling of mercury-containing lamps sold in Washington.
- Supporting stronger statewide and local enforcement of the existing Universal Waste rule for lamp recycling.
- Working with waste haulers on the state and local level on education and enforcement efforts to eliminate fluorescent lamps from the solid waste stream.
- Working with lamp manufacturers, distributors and recyclers, retailers, and local governments to overcome barriers to increased recycling of commercial lamps including lack of knowledge, lack of convenient access to recycling facilities in remote areas, lack of storage space at businesses, and cost of recycling.

Additional comments:

- Support legislation to require manufacturer take-back or collection of burned-out fluorescent lights.
- Note that the local government role should be in education and enforcement, not providing the collection service.
- Suggest enforcing prohibitions on the incineration and landfilling of fluorescent lamps.

One comment pointed out that all major lamp makers have a line of low mercury products that are not designated as dangerous waste. The commenter suggested that these products, with the exception of Philips lamps, cannot accurately be called "low mercury." Rather, they are lamps designed to pass TCLP through the use of an additive and, in the cases of GE and Osram Sylvania lamps, they do not actually contain lower levels of mercury than the standard product.

The commenter notes that these "green" lamps can be recycled, and that recycling is still the best management practice for this waste stream.

Ecology's Conclusions

In the final MCAP, Ecology made the following recommendations:

Ongoing
Make funding available for local governments to increase fluorescent lamp collection capacity through Coordinated Prevention Grants.

Planned, Short-term
Work with King County to conduct outreach and education for affected generators on the requirements of the Universal Waste Rule.

Proposed, Short-term
Conduct outreach and education statewide for affected generators on the requirements of the Universal Waste Rule.

In January 2003, the National Association of Electrical Manufacturers announced that its members will begin labeling fluorescent lamps in the fall of 2003 to state that the lamp contains mercury. Labeling is expected to increase public awareness of mercury in fluorescent lamps and will begin to raise issues around the proper disposal of these lamps. In response, Ecology is planning to encourage other state government agencies, businesses, and school districts to voluntarily recycle their fluorescent lamps.

Comments Related to Vehicle Switches

The Draft Mercury Chemical Action Plan stated

Historically, mercury has been used most in convenience lighting applications (e.g., the light that turns on when you open the trunk or hood) and anti-lock brake applications. According to the Alliance for Automobile Manufacturers, convenience light switches will be phased out by the end of 2002.

Vehicle manufacturers continue to employ new applications of mercury, primarily in HID headlamps and electronic equipment, including flat screen panels and navigational systems. While these uses contain far less mercury than convenience light switches, they remain a concern.

A safe and effective program to collect mercury switches and other mercury-added automotive parts does not currently exist in the state of Washington. When vehicles are removed from service and recycled, the mercury in switches and other mercury-added components are most likely released into the environment. Mercury enters the environment during the crushing and shredding of automobiles and subsequently, when scrap steel is recycled in electric arc furnaces.

Ecology estimates that approximately 263 pounds of mercury are disposed and potentially released from convenience light switches in vehicles each year. Ecology does not currently have an estimate for mercury released from other sources in vehicles. When melted in electric arc furnaces, 6-10 tons of mercury emitted nationally each year, primarily as a result of mercury from switches in scrap steel from vehicles and, to a lesser degree, appliances.

The Columbia Ridge Landfill at Arlington, Oregon received 41,550 tons of auto fluff was received from Washington State in 2001. None of that fluff came from Schnitzer Steel in Tacoma, however.

Between Schnitzer Steel, Pacific Coast Shredding and Seattle Iron & Metals the approximate amount of auto fluff generated and disposed of each year in Washington State is between 127,000 – 150,000 tons.

There are approximately 340 licensed auto recyclers in the state.

Ball bearing switches are available to replace mercury tilt switches in convenience lighting at comparable cost.

The Hazardous Waste and Toxics Reduction Program has begun talking to auto recyclers about the existence of mercury switches and the necessity of removing them before crushing. Information concerning the proper collection and disposal of mercury switches was first printed in the, “You Auto Recycle” Manual, a Guide for Managing Solid and Hazardous Wastes for Vehicle Recyclers – 1997. (The manual is in English and Spanish). The issue of mercury switches has been pointed out during on-site technical assistance visits at auto recyclers and during past workshops given for the industry.

Information concerning mercury switches was given out during the mercury switch replacement project conducted recently for the City of Vancouver for their government fleet of vehicles.

The Departments of Ecology and Health are currently in discussion with General Administration on replacing mercury switches in Ecology and Health fleets and potentially extending to the entire Washington State fleet. General Administration has agreed to include language in future vehicle contract bids to avoid the purchase of mercury components.

In 2002, the Automotive Recyclers of Washington Association (AROW) will inform their membership at six workshops throughout the state concerning many issues affecting auto recyclers. The issue of mercury switches will be briefly discussed. A handout will be provided listing the cars where mercury switches are most likely to be found.

The Draft MCAP Recommended the Following Actions

Proposed, Short-term
Evaluate regulatory and voluntary programs for removing convenience switches from vehicles.

Proposed, Mid-term
Consider adding auto switches to the Universal Waste Rule.

Public Comments

Org-2: In the second paragraph (p. 45), where other uses of mercury are discussed, it is important to note that industry is aggressively working to find a replacement for the trace amounts of mercury in these sources.

Org-2: In this section, DOE states that approximately 263 pounds of mercury are disposed of each year. There should be a statement somewhere in this discussion that this estimate is suspect and based on limited data. This is the method the U.S. EPA uses in identifying similar data.

Later in the same paragraph, the report states that nationwide 6-10 tons of mercury is emitted each year from switches melted in electric arc furnaces. It then states that these emissions come from automotive switches and "to a lesser extent" appliances. In a presentation by the Institute of Scrap Recyclers in November of 2001, they stated that 8-10 million cars and 40 million appliances are scrapped each year. If a sufficient number of these appliances are older, they likely contain mercury switches. If conclusive data on either cars or appliances is not available, then they should be treated equally as potential sources of mercury emissions from arc furnaces. Automobiles should not be singled out as the primary or major source of mercury emissions unless there is substantial, verifiable data to support this point.

Org-2: It is noted that ball bearing type switches are available as replacements to mercury switches. In fact, automakers have already replaced all convenience light switches with ball bearing type (non-mercury) switches in their new models. No cars today are being produced with mercury convenience light switches.

Org-2: The report states that the General Administration has agreed to include language in future vehicle contract bids to avoid the purchase of mercury components. The Alliance recommends that components which contain trace amounts of mercury (such as flat screens displays and HID lights) be exempt from this requirement as no known substitute for mercury exists for these components and they contain less mercury than typical laptop computers or fluorescent lights used in buildings.

Org-2: In our earlier comments it was noted that the discussion of Oregon and Rhode Island should be amended. The Rhode Island law does not require auto manufacturers to fund a collection system. The collection provision applies to all other manufacturers, but not auto manufacturers. The inclusion of the statement by the National Auto Recycling Association is inappropriate. It is neither an update of state activity on mercury, nor in keeping with the general nature of the discussion in this section.

Org-2: In this list of options, the report should also include:

- Enforcement of existing Water Pollution and Waste laws that are currently in place.

Org-2: This report states that the amount of mercury emissions in Washington State from Electric Arc Furnaces (the primary source of automotive switch emissions) is quite small (0.6 kg per year). This suggests that there are far larger sources of mercury emissions in the state beyond autos or that the problem is originating from outside of the state. A more in-depth inventory of emissions is necessary before any legislative action.

- Considering auto switches as Universal Waste should be given priority since it reduces many of the burdens related to collecting switches today. This change would make it easier for dismantlers to comply with existing regulations.

Org-5: We agree with your recommendation to add - "auto switches to the Universal Waste Rule" to make them easier to store and transport. This is an important first step in getting these switches out of vehicles.

Org-5: We see your recommendation to - "Evaluate regulatory and voluntary programs for removing convenience switches from vehicles", as being very unclear as to what the results are likely to be. When you couple that with some of the other options listed in the report, the results of that evaluation could be very beneficial for the environment or of little value with a high price tag. Let us further explain in our next point.

If mercury is truly a concern to the Department and others, the focus must be on removing the mercury switches before the vehicle is wrecked. Most vehicles are retired due to a collision. In some collisions involving vehicles with mercury switches, the switches get broken and the mercury is released at the site of the collision. We have been told that the mercury in just one convenience light switch is enough to contaminate a 20-acre lake.

It is also far less expensive to remove the switches from a vehicle BEFORE it is wrecked rather than after. After it is wrecked, it takes far more time and expense to "unfold" the vehicle parts to access the switch that may already be broken.

Therefore, we recommend that you revise your draft to state this as the priority - to remove the mercury switches while the vehicles are still operating to minimize the risk to the environment and to minimize the costs of removing these switches.

Org-5: We are very concerned about some of the items on your list of options. Specifically - "Require auto dismantlers to make reasonable effort to remove switches." Based on our previous comments, this is far less protective of the environment and greatly increases costs.

Org-5: The entire cost of this automotive convenience light mercury removal effort must be borne by those who chose to use the mercury switches instead of another technology. It is not new news that mercury is toxic. People made decision to use the mercury switches regardless. Remember, this was not for safety purposes; these are "convenience lights" for convenience purposes.

We recommend this also be added to your draft report - that the manufacturers be responsible for the entire cost of removing these switches and not shift the costs to other parties who did not profit from the decision to use mercury instead of another technology.

Org-5: Certain programs in other states and some proposed in this state put this burden on auto recyclers. Let us explain why this is a very bad idea.

- Our industry is under enormous pressure right not to continue to exist. The costs to operate a vehicle recycling facility are escalating rapidly. As our costs are forced up by new stormwater regulations, new regulations dealing with fluids, collecting refrigerant gases, additional recordkeeping, etc., the price we must charge for used parts is going up. The difference between purchasing used parts and new parts is now getting much closer. As these costs move closer together, those who purchase our used parts can purchase new parts for almost the same cost and not have the considerations that go with used parts. Bottom line, higher costs from all of these new requirements including removing, storing and disposing of mercury switches could put our industry out of business
- The auto recycling industry is one of the best examples of outstanding handling of waste. We focus on re-use before we recycle. Re-use is the highest form of waste management. As we just explained, if our costs continue to rise due to government regulations, our businesses will no longer be viable, and the state's environment will lose the huge amount of vehicle re-use from which it now benefits.
- Finally, if there are fewer auto recyclers in business, where will the over 400,000 discarded vehicles per year go? Who will remove the fluids, batteries, greenhouse refrigerant gasses, etc. and where will they go. The risks to the environment are huge if new regulations and added costs put our industry out of business.

If you are not aware, over the past 10 years, our industry's capacity has been reduced by about 30% simply because vehicle recycling facilities have closed. It is nearly impossible with today's environmental regulations to open a new recycling facility.

Org-22: In your discussion of the sources of mercury found in vehicles (p. 45), you describe a variety of vehicle parts and lighting systems that contain mercury. In the "recommended actions" section for these products, however, the plan only prescribes action to deal with convenience switches, and does not discuss the other sources of vehicular mercury (49). The plan should include recommended action strategies to deal with all sources of mercury found in vehicles. Again, SPU is in support of a product stewardship approach to dealing with these sources of mercury.

Org-23: Require manufacturers to pay for recycling in advance.

Org-23: Require automotive recyclers to handle switches as Universal wastes.

Org-27: Similarly, mercury convenience switches in in-service or scrapped automobiles are a concern, and a significant source that will not be addressed by planned design changes from manufacturers. We support the development of a pilot or on-going program that works cooperatively with auto-wreckers and auto-shredders to recover these switches prior to crushing or shredding. While it would be better for manufacturers to directly participate in this financially, however, lacking that, we believe it would still be a good investment of public resources, and possibly at reasonable cost in proportion to the benefits received, to fund a removal and disposal/recycling program that recovers these switches (accounting for as much as 1,000 pounds of mercury over the next 5 years across the state if the estimates of Table 2 are correct). Oregon's model of working with shredders/mills and their auto bulk suppliers to remove and collect mercury switches seems like a good start that would work well for Washington State with appropriate funding and/or regulations.

Org-33: As mentioned previously, we support the phaseout of mercury switches in automobiles and requirements that the manufacturers of automobiles pay for effective systems with targeted capture rates for preventing mercury switches from reaching landfills or incinerators.

Org-34: We support the phase-out of mercury switches in automobiles and requirements that automobile manufacturers fund disposal systems.

PubMtg: Ed Levesque, Lakeview Auto Wrecking. Comment made at the September 26, 2002 *Draft Mercury Chemical Action Plan* Public Forum in Tacoma:

Need to add the mercury auto switch to the Universal Waste Rule. These switches need to be removed before the vehicle is scrapped. Mercury is often released at the sire of an auto accident if the convenience switch is broken. Do it while the vehicle is still operating. This cost should be borne by the manufacturer.

Ecology's Review and Analysis of Public Comments

Public comments suggest that Ecology support both the phase-out of mercury switches in automobiles, as well as requirements that automobile manufacturers pay for effective systems with targeted capture rates for preventing mercury switches from reaching landfills or incinerators.

Additional comments suggest there is a need to add mercury auto switches to the Universal Waste Rule, and that mercury-containing automobile switches need to be removed before the vehicle is scrapped. One comment noted that mercury can be released at the site of an auto accident if the convenience switch is broken. Another noted that the auto industry is aggressively working to find a replacement for the trace amounts of mercury in these sources.

Additional comments noted that while Ecology states that approximately 263 pounds of mercury are disposed of each year, there should be a statement that this estimate is suspect and based on limited data.

Ecology's Conclusions

In the final MCAP, Ecology made the following recommendations:

Proposed, Short-term
Evaluate regulatory and voluntary programs for removing convenience switches from vehicles.

Proposed, Mid-term
Consider adding auto switches to the Universal Waste Rule either before or as EPA adopts the federal rules.

Ecology's understanding is that, according to the Alliance for Automobile Manufacturers, convenience light switches will be phased out by the end of 2002 in all American and foreign made automobiles.

Comments Related to Medical Facilities

The Draft Mercury Chemical Action Plan stated

Medical facilities have traditionally used a number of devices, including thermometers and sphygmomanometers (blood pressure measuring devices), which contain mercury. If these devices are broken, they may pose a hazard to staff and patients and a financial liability for the facility. If they are disposed of with solid waste, red bag waste, or sewage, mercury may be released to the environment.

A more complete list of products containing mercury found in hospitals is available at http://www.noharm.org/library/docs/Going_Green_List_of_Mercury-Containing_Items_i.pdf.

There is likely a mercury release involved, though data is lacking for Washington State. A number of hospitals and medical facilities have reported as generators of dangerous waste since 1997.

In Boston, Massachusetts, medical facilities averaged mercury discharges of 22 ppb in their regulated effluent prior to concerted mercury-reduction efforts. Following reduction efforts, mercury levels were reduced to an average of 2 ppb.

In 1998, the American Hospital Association and the EPA signed a memorandum of understanding to virtually eliminate mercury from hospitals' waste streams by 2005; to reduce overall volume of hospital waste by 33 percent by 2005 and 50 percent by 2010, and to identify hazardous substances for pollution prevention and waste reduction opportunities. The memorandum of understanding led to the creation of Hospitals for a Healthy Environment, a partnership between the American Hospital Association, EPA, Health Care Without Harm, and the American Nurses Association, to help hospitals meet these goals. Tools, resources, and other information is available at www.h2e-online.org.

Hospitals for a Healthy Environment has developed a pledge program whereby participating hospitals commit to work toward achieving the goals set forth in the memorandum of understanding between the American Hospitals Association and the Environmental Protection Agency. While over 335 hospitals have made the commitment, only one hospital in Washington Sate, Mark Reed Hospital in McCleary, has signed the pledge.

The Draft MCAP Recommended the Following Actions

(1) Develop a voluntary, collaborative program in cooperation with the Washington State Hospital Association to encourage the adoption of mercury reduction policies by the Association and the installation and following of best management practices (BMPs). Include outreach and education, targeted technical assistance visits, "sweeps", etc. Include a recognition program. Consider developing a memorandum of understanding with the Hospital Association to reduce the use of mercury in hospitals. Time frame: at least two years.

(2) If voluntary program not successful at significantly reducing mercury discharges from these facilities, amend RCW 173-216, the state waste discharge permit program, to include a default state local limit for mercury. The limit would reflect a reasonable level of pre-treatment by a facility and would apply to all facilities, not just hospitals. Time frame: longer than two years.

Other recommendations:

Outreach and education to POTWs.

Add mercury equipment such as thermometers and sphygmomanometers (though not lab products or mercury-containing drugs) as waste stream covered by the Universal Waste Rule as part of the Dangerous Waste Regulations.

As part of regular inspections, compliance inspectors can look for improper disposal of mercury equipment. Aside from looking for improper disposal of mercury products, the current inspection program would not otherwise be expanded.

Draft boilerplate language for use by local health departments in waste facility permits, requiring that medical waste facilities do not accept waste containing mercury. Have affirmative contact with local environmental health directors, presenting boilerplate language.

Consider special section in general biosolids permit on mercury- could be advisory. Consider requiring more frequent analyses for mercury as permit condition, either for the general permit, or on an as needed basis with final approval of coverage.

Outreach and education to NW Biosolids Management Association and appropriate chapters/ committees of the Pacific NW Clean Water Agency to emphasize the importance of hospitals' reducing their use of mercury products.

Public Comments

Org-12: We recognize the tremendous amount of work that the MCAP Advisory Committee and the State put into developing the draft MCAP, and are taking this opportunity to comment on recommendations concerning Medical Facilities, Dental Facilities, and Publicly Owned Treatment Works (POTWs). King County Industrial Waste has worked with both medical and dental facilities in the past several years. In the case of hospitals, we developed and issued a General Permit to 14 hospitals in our service area, requiring that they practice BMPs in order to reduce their mercury discharges.

Org-20: Another identified source of mercury into wastewater treatment plants is hospitals. In its recommendation, Ecology should support legislation to phase out the sale of mercury thermometers and blood pressure devices in Washington State. This would address two large sources of mercury in health care facilities. Ecology should also limit the voluntary program to eliminate mercury in health care facilities to a one year timeline. If significant progress towards is not made, Ecology should pursue mandatory programs for mercury elimination in health care facilities.

Org-30: The Washington State Hospital Association enthusiastically accepts the DOE report's recommendation that the state and hospitals work together to develop a voluntary, collaborative program to encourage adoption of mercury reduction policies. In fact, the association, DOE, and others will conduct three training sessions for hospitals in October and November of 2002.

Org-30: The report suggests that medical facilities in our state contribute a significant amount of mercury to the Washington waste stream. We think that assertion lacks scientific support. With no baseline data, there can be no recognition of the reductions already achieved by Washington hospitals and no way to measure future reductions.

Org-30: There is no recognition that about half the hospitals in the state, as measured by the WSHA survey conducted this summer, are already working to reduce mercury use and properly dispose of mercury. Several hospitals estimate that, outside of fluorescent lights and lamps, the mercury content in their waste stream approaches zero.

Org-30: The report would be more balanced and useful if it explicitly recognized that for some applications in hospitals there are no reasonable mercury-free substitutes. Bilirubin lamps are in this category. There are also mercury-using products for which there are mercury-free substitutes, but about which there is disagreement between reasonable, trained individuals on the adequacy of mercury-free substitutes. An example of this is esophageal tubes with mercury weights. There are substitutes that use tungsten, but many physicians think the mercury weights are notably superior. Therefore, we suggest that the report be more flexible to allow for differences of judgement among medical professionals.

Org-30: Aside from the aspects above which are unique to medical facilities, hospitals share the concern other businesses have about fluorescent lights and HVAC switches that use mercury. Hospitals are possibly more intense users of these than some other sectors of the economy because hospitals are open 24 hours a day, seven days a week. But, the fluorescent lights and switches also last a very long time and have small amounts of mercury. They need only to be disposed of in a careful manner.

Org-30: On page 49, under the headline of Quantity and Estimated Uncertainty, I think it would be more factual and balanced to write, "At present we cannot estimate the amount of mercury released by health facilities because of a lack of data. About 20 larger hospitals have reported as generators of dangerous waste since However, a recent Washington State Hospital Association survey indicates some hospitals with reduction programs estimate that, aside from mercury from fluorescent lights, the amount of residual mercury in their waste stream approaches zero."

Org-30: On page 51, under the headline of Activities of Other Groups, please insert the following language, **"**Washington State Hospital Association conducted a members' survey this spring to stimulate more effort on mercury reduction and assess what was in progress already. The survey showed that:

- about half the hospitals in the state have a mercury reduction plan in place – some for five years or more,
- about 40 percent have estimated the residual mercury in their waste streams, and
- about half contract out the routine collection of mercury.

Org-30: Additionally, WSHA co-hosted three workshops for hospitals around the state on reducing mercury use and its disposal. The association established regular communications to members and a mercury use webpage to stimulate its members, provided them more tools to work with, and given them more confidence to move ahead."

Org-30: On page 51, the hospital association urges the following language be added to paragraph (1) under Recommended Action, "The outreach and education will present mercury-free alternatives to mercury-containing products, recognizing that some clinicians may disagree on the efficacy or quality of some alternatives."

Org-30: On page 52, the hospital association strongly urges the elimination of the first line under paragraph (2). There is no known measurement of how much mercury waste Washington State hospitals discharge, so there is no way to measure if the amount were significantly reduced at some time in the future. After deleting that line, I suggest the notion expressed of creating a default state-set local limit be simply listed as one of the Reduction Options on page 51.

Org-33: Ecology should pursue a two-pronged approach to health-care mercury problems. First, as mentioned previously, Ecology should support legislation to phase out the sale of mercury thermometers and blood pressure devices in Washington State. This would address two large sources of mercury in health-care facilities. Ecology should also pursue a Memorandum of Understanding (MOU) with the Washington State Hospital Association and environmental health groups that commits hospitals to:

- the virtual elimination of mercury from the hospital waste stream by 2005 and conducting mercury thermometer exchange programs;
- continuously reducing the use of plastics containing polyvinyl chloride (PVC), which forms highly toxic dioxin when manufactured and burned as waste, as well as reducing the use of hazardous materials such as solvents and other toxic materials used in laboratories and building maintenance;
- increasing hospital purchase of more environmentally preferable products; and,
- reducing the overall volume of hospital waste by 50 percent by 2010.

The state of Maine already has an MOU like this in place. It makes sense for Washington to pursue a similar effort and address more than just mercury since hospitals are a source of additional persistent toxic chemicals. We do not think that it is sufficient for Ecology to rely solely on the Hospitals for Healthy Environment program to accomplish these goals. We are very concerned that only one hospital in Washington has signed up for the program. Additional accountability and resources must be provided at the state level for hospitals to reduce persistent toxics. If sufficient progress cannot be made with this approach in one year, Ecology should pursue a new regulation that achieves the goals outlined above.

Org-34: As mentioned previously, we urge Ecology to support legislation to phase out the sale of mercury thermometers and blood pressure devices. We also support Ecology developing a Memorandum of Understanding (MOU) with the Washington State Hospital Association and environmental health groups that would require the virtual elimination of mercury from the hospital waste stream by 2005.

WashPIRG, Org-13, Org-14, Org-16, Org-17, Ind-1, Ind-4: Require health care facilities and schools to substitute mercury products with non-mercury alternatives where possible.

PubMtg: Robb Menual, Washington State Hospital Association. Comment made at the September 26, 2002 *Draft Mercury Chemical Action Plan* Public Forum in Tacoma:

The WSHA will submit detailed comments later. A WSHA survey of WA hospitals shows that 50% of the WA hospitals are working on Hg reduction efforts. WSHA sees a need to "excite" the other 50% to do the same. WSHA supports the educational and voluntary measures in the draft plan. Negatives I see in the draft plan –

- The medical waste section is weak in science. Several points so not have decent documentation.
- There are 3 kinds of Hg "categories"
  - Products where there are available and comparatively priced alternatives
  - Products where the utility and use of an alternative is "debatable"
  - Products where there are no alternatives (e.g. – jaundice lamps for newborns)
- Suggest the Ecology ask the legislature for another year to complete the plan.
- WSHA would like Ecology and Health to continue to work with us. We'll go to bat for you.

Ecology's Review and Analysis of Public Comments

Several commenters recommended that Ecology should pursue a two-pronged approach to health-care mercury problems:

1. Ecology should support legislation to phase out the sale of mercury thermometers and blood pressure devices in Washington State.
2. Ecology should pursue a memorandum of understanding (MOU) with the Washington State Hospital Association and environmental health groups to commit hospitals to mercury thermometer exchange programs and the virtual elimination of mercury from the hospital waste stream by 2005.

Another commenter stated that the Washington State Hospital Association enthusiastically accepts the Ecology report's recommendation that the state and hospitals work together to develop a voluntary, collaborative program to encourage adoption of mercury reduction policies, and pointed out that there is no recognition that about half the hospitals in the state are already working to reduce mercury use and to properly dispose of mercury. Several hospitals estimate that, outside of fluorescent lights and lamps, the mercury content in their waste stream approaches zero.

Ecology's Conclusions

In the final MCAP, Ecology made the following recommendations:

1. Develop a voluntary, collaborative program with the Washington State Hospital Association encouraging the association to adopt mercury-reduction policies for its members that establish and follow best management practices. Include outreach and education, targeted

technical assistance visits ("sweeps"), etc. Incorporate H2E membership as part of a recognition program. Consider developing a MOU with the Hospital Association to reduce the use of mercury in hospitals. Time frame: approximately two years.

2. If a voluntary program is not successful at significantly reducing mercury discharges from these facilities, amend Chapter 173-216 RCW, the State Waste Discharge Permit Program, to include a default state local limit for mercury. The limit would reflect a reasonable level of pre-treatment by a facility and would apply to all facilities, not just hospitals. Time frame: longer than two years.

Comments Related to Dental Facilities

The Draft Mercury Chemical Action Plan stated

Silver-colored amalgam fillings used by dentists contain about 50 percent mercury by weight. Mercury from dental use can be released to the environment from amalgam fillings wearing, when old fillings are drilled out or when new fillings are placed.

The Association of Metropolitan Sewerage Agencies (AMSA) estimates that mercury levels in dental wastewater are approximately 56 mg/dentist/day, based on a review of several studies examining wastewater concentrations, water flow and consumption rates.[24] AMSA concluded that dental discharges account for the largest portion of POTW influent loadings and, therefore, represent the source for which pollution prevention and source control efforts would be expected to be most effective with respect to measurable results.[25]

King County conducted a survey of dentists' waste disposal practices with regard to amalgam. Results are summarized in Table 6. Roughly 50 percent of the dentists in Washington State practice in King County.

Table 6. Estimated Mercury Discharged from Dental Offices in King County, Washington Total Pounds per Year[26]

Disposal Pathway	Sewer	Red Bag	Garbage	Unknown	Total
Amalgam scrap	0	53	58	40	151
Trap amalgam	Unknown	Unknown	Unknown	Unknown	Unknown
Pump filter	Unknown	Unknown	Unknown	Unknown	Unknown
Wastewater particles	51	0	0	0	51
TOTAL	51	53	58	40	202

Beyond waste from dental offices, AMSA further estimated that 17.2 µg/day/person of mercury is released through feces and urine as amalgam fillings wear. "Person" in this estimate is defined as an adult over 20 years of age.[27]

In 1995, the Washington Dental Service Foundation published and distributed a 60 page booklet called "Going Green," in part using grant funds from Ecology. The booklet includes a chapter on amalgam.

[24] Larry Walker Associates, "Mercury Source Control and Pollution Prevention Program Evaluation: Final Report," prepared for the Association of Metropolitan Sewerage Agencies under grant from U.S. Environmental Protection Agency, March 2002, p. 7.
[25] Walker, p. 51.
[26] Hazardous Waste Management Program, Water and Land Resources Division, Dept. of Natural Resources, King County, "Management of hazardous dental wastes in King County, 1991 - 2000," October 5, 2000.
[27] Walker, pp. 9 – 10.

Information on best management practices is being provided to dentists through Ecology's regional offices, especially the Southwest Regional Office through increased Generator Contact (IGC) visits and other technical assistance visits.

From 1995 to 2000, King County worked with dentists to achieve voluntary, proper disposal of wastes. In 2000, King County published a report, which concluded that the voluntary program had not worked. A significant number of dental offices were still discharging wastewater that did not comply with King County discharge limits for mercury and silver. In September 2001, King County required dentists to follow best management practices for amalgam wastes and to install a King County-approved amalgam separator at each chair or in a central location where amalgam is removed or placed. Existing offices are required to install separators by July 1, 2003.[28]

The Solid Waste and Envirostars programs in Kitsap and Snohomish Counties have been involved in public education programs discouraging improper disposal of mercury from dental offices.

Many MRW facilities offer mercury collection or diversion programs.

The Draft MCAP Recommended the Following Actions

1) Develop a voluntary, collaborative program in combination with the Washington State Dental Association (WSDA) to encourage the adoption of mercury policies by the Association and the installation of amalgam separators and follow best management practices.

- Work with the WSDA on outreach and education to dentists. This includes targeted tech assistance visits, state-wide or regional "sweeps," and normal compliance inspection visits. Include recognition program and possibly help with funding.
- Work with Stericycle or other waste collection companies to set up one-time collection of leftover elemental mercury.
- Clarify handling practices for amalgam cartridges and other dental waste.
- Time frame: at least two years.

2) If the voluntary program above is not successful at significantly reducing mercury discharges to POTWs, Ecology will consider additional action including:

- Develop a monitoring program for public sewage treatment plants to determine if mercury limits in the effluent or biosolids are appropriate.
- Develop a general permit for dentists, requiring them to install amalgam separators and follow best management practices. This would not apply to dentists in the nine areas that have delegated authority for pretreatment programs. Time frame: longer than two years.

[28] Industrial Waste Program, Water and Land Resources Division, Department of Natural Resources, King County, Washington, "Industrial Pretreatment Quarterly," September 2001.

Other recommendations:

Conduct outreach and education to POTWs.

Consider special section in general biosolids permit on mercury, which could be advisory.

Consider requiring more frequent analyses for mercury as permit condition, either for the general permit, or on an as needed basis with final approval of coverage.

Outreach and education to NW Biosolids Management Association and appropriate chapters/ committees of the Pacific NW Clean Water Agency to emphasize the importance of amalgam separators.

Draft boilerplate language for use by local health departments in waste facility permits, requiring that medical waste facilities do not accept waste containing mercury. Have affirmative contact with local environmental health directors, presenting boilerplate language.

Public Comments

Org-8, Org-11: King County now requires dental offices that place or remove amalgam fillings to meet local wastewater discharge limits for mercury. For most dental offices, this will require implementing best management practices and installing amalgam separation equipment.

In the "Recommended Action" section, Ecology should simply state that it will enforce existing regulations and require dental offices to comply with the provisions of the Dangerous Waste Regulations regarding the discharge of their wastewater. By doing this, Ecology could accomplish its objective of reducing mercury discharges with no new laws, permits, programs or significant resources. Management of mercury waste would be the responsibility of those who use the mercury and would be relatively simple: on-site treatment units are cost effective and effective. Enforcing this regulation would reduce mercury entering local wastewater treatment facilities and septic systems an estimated 40 – 60 percent.

Org-9: Require dental offices to filter mercury out of wastewater.

Org-10: In July 2001, the King County Industrial Waste Program and Public Health-Seattle & King County advised dental offices discharging wastewater to the King County wastewater treatment facilities that they must meet local discharge limits for mercury. (King County has a delegated publicly owned treatment works. Our local limit for mercury, 0.2 parts per million, is the same as the discharge limitation under the State Dangerous Waste Regulations.) For most dental offices, this means installing amalgam separators to treat wastewater on-site. The deadline for King County's requirement is July 1, 2003.

Org-10: During the period July 1, 2001 to present, more than 200 King County dental offices have installed amalgam separators. Ten manufacturers of separation equipment market their products to King County dentists, and the major dental supply houses now carry amalgam separators. The Seattle-King County Dental Society serves as a conduit of information about manufacturers–this November, for example, the Society will host a Technology Fair to introduce

dentists to available equipment. In our experience, once separation equipment is mandated, dental offices are quick to comply. During 1994 - 2000, we ran a voluntary program that encouraged amalgam separators. Only 25 out of the estimated 1000 King County dental offices installed equipment–not a good rate of return for our county program, which spent six years and an estimated $100,000 on the voluntary program. Since the July 2001 mandate, more than 200 offices are in compliance. We expect this to increase substantially by July 2003, resulting in significant decreases in mercury discharged to our wastewater treatment facilities. Separators are now readily available. They are effective, and cost effective. Dentists prefer a clear directive about what is required of them: they repeatedly ask for a level playing field and a clear statement of legal requirements. The King County situation clearly shows that dentists will purchase and install separators when clearly directed to do so.

Org-10: In our opinion, Ecology must require that dental offices comply with the provisions of the Dangerous Waste Regulations regarding the discharge of their wastewater–e.g., that no wastewater with concentrations of mercury > 0.2 ppm may go to non-delegated POTWS. Rather than setting up new permitting systems, relying on voluntary efforts that have been proven to be ineffective, and/or shifting responsibility to local POTWS, we recommend that Ecology simply enforce the regulations currently on the books.

Org-12: With dental offices, we recently made the transition from a voluntary program to one that requires dentists be in compliance with our local limits for mercury (0.2 mg/L) by July of next year. This decision was taken after a six-year voluntary program failed to achieve compliance. We recommend that if you implement a voluntary program for dental facilities, it should include periodic benchmarks for a specified percentage of dental offices to have installed amalgam separator units each year, working towards 100% compliance.

Org-12: We have also reviewed Washington State Dental Associations August 1, 2002, comments including the ENVIRON Analysis and Modeling of King County Dental Office Wastewater Mercury Regulation. I would like to comment on their conclusion that the cost per pound of mercury removed by the use of pretreatment units at the dental office is excessively high. This conclusion is based, in part, on their assumption that it is appropriate to use POTWs to treat toxic pollutants. Thus they only consider the pounds of mercury that, according to their calculations, is released via our effluent to receiving waters; they do not consider the amount released via grit and biosolids. POTWs are not designed to remove toxic pollutants from wastewater. Any such removal is incidental and toxic pollutants that are not released in the effluent end up in either the grit or the biosolids. They do not go away.

Currently, King County recycles 100% of our biosolids and is investigating the possibility of recycling our grit. Any mercury that enters our system will eventually end up in the environment. We agree with ENVIRON that our biosolids have extremely low levels of mercury, but do not agree that this is an acceptable reason to allow dental facilities to release mercury into the environment.

Org-15: Dental offices are the primary source of mercury in the environment, contributing 70% of emissions into the environment. The dental industry used 44 metric tons of mercury in 2001. Approximately 100 million mercury amalgam dental fillings are placed annually by 175,000 dentists. Mercury Policy Project Report, June 14, 2002 (www.mercurypolicy.org)

Comment: This section doesn't even mention mercury amalgam dental fillings as a source of environmental contamination even though a growing number of cities are recognizing amalgams as the PRIMARY source of mercury in the environment. Palo Alto, CA - 83%; Seattle, WA - 40-60%; Boston, MA - 13-76% (Mercury Policy Project Report, June 4, 2002, www.mercurypolicy.org) Mercury is found in human feces from swallowing mercury which erodes from amalgams. The mercury is not extracted in the wastewater treatment plant. Some is methylated and is discharged in the water effluent and the rest is found in the biosolids "sludge" which is frequently spread on cropland as fertilizer.

Org-20: Fortunately, by far the largest source of mercury input to POTWs has already been identified. A known and feasible reduction opportunity exists for dental offices, and a track record of failure through voluntary measures exists. King County spent five years and significant resources on a voluntary, cooperative effort to educate dentists about the problem and convince dentists to install amalgam separators that capture approximately 95% of mercury before it is released into wastewater. Despite extensive outreach, few dentists installed the new technology, and the county eventually made this a requirement in order to achieve their goal. It would be an unwise use of resources for Ecology to repeat this failure statewide. *Ecology must require that dentists install amalgam separators to reduce this input.*

Org-23: Agree with strategy. Dentists seem to be the least aware of environmental regulations and responsibilities of any professional group. Need educational efforts with strategy.

Org-24: Dentists should be required by state law to install amalgam separators. A statewide authority is called for here!

Org-28: The Washington State Dental Association is in agreement with the proposed Recommended Action in the August, 2002 draft Mercury Chemical Action Plan to develop a "voluntary, collaborative program" between the Department of Ecology and WSDA to reduce the discharge of mercury via dental amalgam from dental offices. The WSDA believes that a cooperative program will encourage dental offices to adopt these practices without the need for expensive, cumbersome regulatory measures. The WSDA represents more than 3,000 practicing dentists in the state as their primary professional association and has the ability to conduct long-term information programs for the dentists of Washington State on dental waste management.

The Association's approved Policy on Dental Amalgam and Other Metal Waste recommends, in part:

- The installation and use of amalgam separators meeting ISO standards in dental offices that place or remove amalgam fillings, and
- Implementation of Best Management Practices to prevent the release of amalgam and other sources of metal pollution into wastewater or solid waste, including:
  a. Regular cleaning and replacing, as needed, of all wastewater filters and traps.
  b. Proper disposal of all scrap amalgam and amalgam waste from traps, filters and separators and collection by a licensed treatment, storage, disposal or recycling facility.
  c. Proper disposal of spent processing fixer.
  d. Preventing disposal of amalgam waste directly into office drains or with medical waste which will be heat-treated.
  e. Proper disposal of lead foils and aprons.

Org-28: WSDA must point out that dental office discharges account for only a tiny fraction of mercury released in the environment. A 1997 U.S. EPA Mercury Report to Congress estimated that only 0.4% of the national mercury emission is from dentistry. The EPA estimates that 72 percent of mercury released into the environment is from air emissions, primarily from burning coal, medical waste and sewage sludge. The largest sources of mercury pollution in Washington are airborne emissions from Asian power plants (more than 80 percent by some estimates).

Org-28: WSDA does not agree that this conclusion cited in the draft plan (MCAP draft, page 53) in regards to dental office discharges are "the largest portion" of treatment plant influent loadings in Washington. Dental office discharges have been estimated to account for about 14 percent of the mercury load on King County's sewer treatment plants. The AMSA report contains an average national estimate that is three times this level. WSDA believes that the King County studies are more accurate and, therefore, more reflective of conditions in this state.

Org-28: The use of amalgam as a dental material continues to decline as a result of better oral health primarily due to community water fluoridation and to the development of other restorative materials. Nationally, dentists report a 30 percent reduction in the use of amalgam over the past ten years. In time, as research continues, it is possible even less amalgam will be used in dental practices. Even at that future point, dental offices will likely continue to discharge amalgam, since removal of existing amalgam fillings is the source of 90 percent of the amalgam discharged. This all must be kept in perspective, however, as amalgam accounts now for less than one percent of mercury discharges. This amount is only going to diminish further.

Org-28: Finally, and as importantly as these deliberations on the environment, the WSDA concurs with federal, national and world health agencies and professional associations that have concluded that there is no harm to patients from the use of amalgam as a restorative material. Until such time as adverse health effects are reported from scientific evidence, there is no justification for any prohibition on the use of dental amalgam.

Org-28: WSDA representatives met with DOE staff on September 19 to begin development of a cooperative reduction program. WSDA is committed to this approach and will proceed ahead, even while the MCAP remains in a draft state.
Examples of activities that could be undertaken include:

- Continuing Education programs for dental offices delivered online, through self-study materials, and through presentations at dental society meetings.
- Distribution of office posters and other printed reminders of BMP.
- Collection and recycling of bulk (elemental) dental mercury. WSDA and the ADA recommend that dental offices use only precapsulated amalgam and discontinue use of elemental mercury. Existing stores of elemental mercury should be identified and removed through local collection and recycling programs.
- Presentations and one to one contact with dentists and office staff during the annual Pacific Northwest Dental Conference.
- Distribution of materials to newly-licensed dentists.
- Ongoing publicity through WSDA's newsletter and web site.

This is a continuation of ongoing WSDA, ADA and local component efforts to educate dentists on reducing and controlling amalgam discharges. All three levels of organized dentistry have provided information and training on Best Management Practices and the use of amalgam separators. A cooperative statewide program will be an effective expansion of these efforts. ADA is launching a comprehensive mercury reduction education and training program that WSDA will support for at the state-level. ADA is also in discussion with EPA on joint national training and information activities.

Org-28: A reasonable time frame and goal for voluntary compliance should be developed. Consideration must be given to addressing current factors that will encourage or inhibit compliance. For example, WSDA agrees that DOE should prepare recommendations to coordinate and clarify conflicting waste disposal regulations that create barriers to disposal of contact amalgam. Financial incentives for installation of separators (such as King County's reimbursement program) should be identified at local, state and federal levels to expedite compliance. The time frame must recognize that separators are an emerging technology with only a recent marketplace identity. Studies indicate that peer-to-peer reports (word of mouth) are the primary factor in technology transfer among dentists. Dentists will want to learn the experience their colleagues have with separator effectiveness and impact on the dental office.

Org-28: While WSDA agrees with the voluntary compliance approach DOE is recommending for control of dental amalgam discharges, some statements included in the MCAP concerning dental amalgam require clarification to achieve a balanced understanding of the science regarding effects of amalgam and efforts to control its discharge. Dental office discharges potentially account for only a tiny fraction of mercury released in the environment. A 1997 U.S. EPA Mercury Report to Congress estimated that only 0.4% of the national mercury emission is from dentistry. The EPA estimates that 72 percent of mercury released into the environment is from air emissions, primarily from burning coal, medical waste and sewage sludge. WSDA opposes burning waste which contains mercury from any source.

Org-28: The effectiveness of regulatory measures (mandatory installation of separators) is of questionable value. ENVIRON International Corporation has completed both a national and King County study of mercury discharged in dental amalgam from dental offices. (Copies are attached) ENVIRON utilized a mass balance analysis for dental office discharges into King County's POTWs and on an aggregate national level. Both studies conclude that discharges of dental amalgam from dental offices which employ Best Management Practices (chairside traps, vacuum filters, landfill or recycling of amalgam waste) do not cause significant impact on the methylmercury levels in the environment. Further, ENVIRON concludes that reduction in mercury discharges from the use of amalgam separators does not result in meaningful reduction in the concentration of methylmercury in the environment, but the cost of mandating separators is excessive in comparison to other regulated industries.

Org-31: It is also important that the CAP require the dental profession statewide to install mercury filtration devices to stem the flow of mercury into the wastewater. King County currently requires dentists to install filters by 2003; similar requirements are reasonable expectations for dentists throughout the state.

Org-33: Ecology's proposal will not result in the mercury reductions necessary to meet the elimination goals of the CAP. Here is a primary reason why: King County spent seven years and between $140,000-$350,000 on a voluntary program, coercing, cajoling, and begging dentists to stop putting their mercury down the drain. From 1995-2001, the county could only get 32 out of 1500 dental offices to participate. In 2001, the county decided to require that dentists have amalgam separators in place by July 2003. In the 6-month period following the announcement of the new requirements, 47 dentists installed amalgam separators. This shows that dentists are much more likely to do the right thing when a clear deadline for compliance is in place.

Ecology's failure to take King County's past experience into account is surprising. Further, it only costs a few hundred dollars per year for each dentist to properly manage amalgam waste. Ecology should abandon ideas for voluntary compliance for dentists and give dentists until the end of 2003 to comply with a requirement for the capture and proper disposal of mercury amalgam. This should be done by amending the state waste-discharge permit to include a mercury pre-treatment limit and by pursuing a general permit for dentists that requires amalgam separators and best management practices.

Finally, Ecology should take immediate action at dental facilities and enforce existing dangerous-waste regulations. The dangerous-waste regulations do not allow for mercury amalgam that designates as dangerous waste to be disposed of down the drain even if the generators are "small quantity generators."

According to WAC 173-303-070:

"(b) Small quantity generators will not be subject to the requirements of this chapter if they:

(i) Designate their waste in accordance with WAC 173-303-070; and

(ii) Manage their waste in a way that does not pose a potential threat to human health or the environment; and

(iii) Either treat or dispose of their dangerous waste in an on-site facility, or ensure delivery to an off-site facility, either of which, if located in the United States, is…"

If dentists are placing amalgam waste that would be designated as dangerous waste down the drain or if they are sending it to an autoclave, this is a violation of the above dangerous-waste requirements. The dental facility must have a specific permit or be included in a statewide permit for a mercury discharge to a treatment plant. In addition, autoclaves are not permitted to accept dangerous waste, nor are they appropriate since mercury can volatize in these systems, posing health risks and environmental risks. *Ecology should take immediate, aggressive enforcement actions to prevent amalgam from winding up in these systems.*

Org-34: We cannot support Ecology's recommendation to develop a 2-year voluntary program that encourages the adoption of mercury policies and the installation of mercury amalgam separators. We do support requiring dentists to install mercury amalgam separators by January 1, 2004.

Org-34: According to the plan, dental amalgam is the third largest source of mercury disposed of to solid waste, medical waste, or sewage annually. "Dentists the Menace," a national report released this year, found that dentists are the largest dischargers of mercury to wastewater

treatment plants. The mercury discharged ends up in waterways or is applied to farmland as sludge because these plants cannot effectively treat mercury-contaminated wastewater.

Org-34: King County's voluntary effort, which was mentioned previously, is a perfect example of why such a two-year voluntary program is both expensive and ineffective. The few hundred dollars it will cost dentists annually to install these separators is reasonable when compared to the costs of cleaning up mercury that has contaminated our waterways and farmland.

Org-13, Org-14, Org-16, Org-17, Ind-5, Ind-14: Require dentists to install waste separators that will eliminate scrap amalgam from entering waste water.

PubMtg: Retired Dentist. Comment made at the September 26, 2002 *Draft Mercury Chemical Action Plan* Public Forum in Tacoma:

Applaud effort, but placement of Hg fillings in mouth is not addressed. Ecology and Health need to attack the real Hg issue. Children's exposure is most critical. Put out some kind of profile as Health did with Hg in fish.

PubMtg: David Hemion, Washington State Dental Association. Comment made at the September 26, 2002 *Draft Mercury Chemical Action Plan* Public Forum in Tacoma:

TNT article stating the 500 lbs of Hg goes into the sewer is inaccurate. If it takes longer to develop a MCAP based on scientific basis then we should do it. The facts need to be stated. We agree with the voluntary approach. WSDA has a policy that recommends "best management practices" and amalgam separators. We recognize we need to address the issue of medical waste. EPA estimates the < ½ of 1% Hg is from amalgam waste. Much of our problem is outside of WA. We need to be honest with WA's population about the problem. FDA also says the Hg amalgam is safe – there is a lot of just plain quackery out there. We need to get past the quackery and scare tactics regarding the use of dental amalgam.

PubMtg: Larry Lawton, Washington State Dental Association. Comment made at the October 3, 2002 *Draft Mercury Chemical Action Plan* Public Forum in Moses Lake:

Commends Ecology on the effort to date. WSDA has adopted a plan and fully supports installation of amalgam separators. But one issue is what do we do with the amalgam collected in the separators? We need to work on that. I agree we should have a repository. I am uncertain about the POTW studies. They are trying to relate presence of mercury in wastewater/biosolids to amalgam and better science/data needed. These studies should be redone.

(The above is a summary of Mr. Lawton's oral comments. He also provided written comments.)

Ecology's Review and Analysis of Public Comments

Review of the comments above indicates a variety of viewpoints and perspectives:

- The Washington State Dental Association (WSDA) is interested in working with Ecology on developing a voluntary collaborative program.

- Other commenters, including the King County Local Hazardous Waste Management Program, the Washington Toxics Coalition, and others, stated that they did not believe a voluntary approach was effective, citing previous efforts by King County. Many of these commenters also stated that Ecology has existing regulatory authority to require the installation of amalgam separators, which the agency should exercise.

In regards to the comments about the ENVIRON Analysis and Modeling of King County Dental Office Wastewater Mercury Regulation, Ecology agrees with the conclusion provided by King County that the cost per pound of mercury removed by the use of pretreatment units at the dental office is excessively high. This conclusion is based, in part, on ENVIRON's assumption that it is appropriate to use POTWs to treat toxic pollutants. Thus the ENVIRON study only considers the pounds of mercury that, according to their calculations, is released via King County's effluent to receiving waters; they do not consider the amount released via grit and biosolids. POTWs are not designed to remove toxic pollutants from wastewater. Any such removal is incidental and toxic pollutants that are not released in the effluent end up in either the grit or the biosolids. They do not go away.

Additional views were expressed about the safety of mercury amalgam use in the human population in the first place. Ecology and Health responses to this issue can be found in the section, *Comments Related to Mercury Dental Amalgams in General,* near the end of this document.

Ecology's Conclusions

Following a review of pertinent regulations, Ecology made the following recommendations in the final MCAP:

1. Develop a program with the Washington State Dental Association (WSDA) to implement best management practices that comply with regulations within two years statewide. In most cases, these practices will include the installation and proper maintenance of amalgam separators certified under International Standards Organization (ISO) 14001.

2. Work with the WSDA on outreach and education to dentists. This includes targeted technical-assistance visits, statewide or regional "sweeps," and normal compliance inspection visits. Include recognition program and possibly help with funding.

3. Work with waste collection companies to set up a one-time collection of leftover elemental mercury.

4. Clarify handling practices for amalgam cartridges and other dental waste.

Ecology believes that this approach is both feasible and proactive, and that it will significantly reduce the amount of amalgam waste currently being disposed of in Washington. Ecology believes King County is establishing a good model that can be followed as we develop and implement a memorandum of understanding with the WSDA**.**

Comments Related to Veterinarians

The Draft Mercury Chemical Action Plan stated

Like the medical sector, veterinarians use equipment that contains mercury.

The quantity of mercury contained in equipment used by veterinary practices in Washington State is unknown. It is expected that mercury from equipment is released when equipment is broken and the mercury spilled.

The Draft MCAP Recommended the Following Actions

Proposed, Long-term
Conduct outreach and education to encourage the replacement of mercury products with non-mercury products and to improve spill response.

Public Comments

No comments were received for this category.

Ecology's Review and Analysis of Public Comments

No comments.

Ecology's Conclusions

In the final MCAP, Ecology made the following recommendations:

Proposed, Long-term
Conduct outreach and education to encourage the replacement of mercury products with non-mercury products and to improve spill response at veterinary facilities.

Comments Related to K – 12 Schools/Universities

The Draft Mercury Chemical Action Plan stated

In K-12 schools, mercury and mercury products are commonly found in medical offices; chemistry, physics, and biology laboratories and classrooms; school buildings and maintenance areas; and heating, ventilation and air conditioning shops and laboratories in vocational-technical schools. Items containing mercury commonly found in schools include: fever, laboratory, candy, or oven thermometers; thermostats; blood pressure devices; mercury switches; relays; barometers; vacuum gauges; laboratory chemicals; thermostat probes; fluorescent lamps; mercury vapor lamps; metal halide lamps; and high pressure sodium lamps.

Items that contain mercury and jars of elemental mercury can be a liability for schools. At a school in Connecticut, the act of cleaning out a supply closet resulted in 12 broken mercury laboratory thermometers. The school was evacuated and paid clean up costs of $6,000. At another school, a broken mercury barometer resulted in clean-up costs totaling $200,000.[29]

The statewide Rehab the Lab Project conducted approximately 350 visits (note: some of these visits were follow up visits to the same school) to schools throughout the state. The visits mainly focused on the identifying and removing toxic old chemicals from schools; and reorganizing shelves into a compatible chemical storage system. Mercury, mercury salts and oxides were some of the chemicals recommended for disposal by Ecology and King County staff. Approximately 100-200 lbs. of mercury and mercury compounds have been removed from schools statewide, and likely another 100-200 lbs. still needing removal. Rehab the Lab staff have visited over half the middle and high schools throughout the state. There are still schools needing assistance but this project is not funded presently.

The public schools in Washington have not been surveyed. Other states have had surveys and chemical assessments done. Example surveys and assessment will be attached to mailed collected information.

Through its Rehab the Lab program, the King County Local Hazardous Waste Management Program removes old, unneeded chemicals from science labs and provides technical assistance to help schools manage their hazardous chemicals.

Through the School Science Lab Chemical and Mercury Clean-out Project, the Vermont Agency of Natural Resources offered a one-time clean-out for middle and secondary school in cooperation with Vermont Solid Waste Districts, Alliances and the Association of Vermont Recyclers.

The Massachusetts Department of Environmental Protection contracted with the Northeast Waste Management Officials Association (NEWMOA) to conduct a pilot project in Massachusetts

[29] Northeast Waste Management Officials' Association, "Getting Mercury Out of Schools," developed on contract with the Massachusetts Department of Environmental Protection and the Massachusetts Executive Office of Environmental Affairs, 2002.

public schools. Mercury devices were removed and replaced with non-mercury devices, and education for students on mercury was provided.

The Draft MCAP Recommended the Following Actions

Proposed, Short-term
Work with EPA and King County to remove mercury from schools as part of a more comprehensive clean-out program.

Proposed, Long-term
Work with universities to reduce the use of mercury products.

Public Comments

Org-23: Agree with assessment. Recommend a mercury round-up for schools ad Universities to eliminate as much as possible quickly. Pattern after Department of Agriculture's pesticide round-ups.

Ecology's Review and Analysis of Public Comments

Ecology concurs with this comment.

Ecology's Conclusions

In the final MCAP, Ecology made the following recommendations for K-12 education:

Proposed, Short-term
Work with EPA and King County to remove mercury from schools as part of a more comprehensive clean-out program. Through its Rehab the Lab Program, the King County Local Hazardous Waste Management Program removes old, unneeded chemicals from science labs and provides technical assistance to help schools manage their hazardous chemicals.

In the final MCAP, Ecology made the following recommendations for universities:

Proposed, Long-term
Work with universities to reduce the use of mercury products. Ecology recognizes that colleges and universities must retain some mercury compounds for the purposes of student chemistry, biology, and related laboratory programs and for necessary accepted analytical practices for research projects. Universities are encouraged to replace any unnecessary mercury-containing products or procedures as alternatives are developed.

Comments Related to Laboratories

The Draft Mercury Chemical Action Plan stated

Laboratories use both equipment containing mercury and mercury compounds. It is unknown how much mercury is used or released by laboratories in Washington.

The City of Spokane prepared a booklet called "Best Management Practices for Laboratories" in 1995, which was mailed to the better known laboratories in Spokane. The Eastern Regional Office conducted site visits to a more complete list of laboratories in Spokane County in 1997 to distribute the booklet.

In Seattle in 1996, Ecology conducted the first workshop for community college, four-year college, and some high school laboratories to discuss waste reduction, waste disposal, and housekeeping issues. The workshop covered the issues of dumping chemicals and metals, including mercury, down the drain. The workshop was repeated in Leavenworth in 1997.

The Medical Industry Waste Pollution Prevention Round Table (MIRT) was established in 1999 to provide a forum for medical industry professionals, including those from laboratories, interested in exchanging ideas on and working to develop new ways of preventing and reducing waste. This group draws participants from hospitals and other medical industry support professions in the greater Puget Sound area. MIRT is led by a steering committee made up of representatives from the King County Local Hazardous Waste Management Program, King County Department of Natural Resources, the Business and Industry Resource Venture, the Washington State Department of Ecology, Environmental Protection Agency Region 10, the Washington Society for Healthcare Environmental Services, and the Northwest Pollution Prevention Resource Center. MIRT organizes and presents numerous seminars of interest to the medical industry and organizes campaigns within the medical industry to address waste issues.

The Draft MCAP Recommended the Following Actions

Proposed, Long-term
Work with labs to reduce the use of mercury products.

Public Comments

PubMtg: Larry Henderson, Washington State Independent Laboratory Assn. Comment made at the September 26, 2002 *Draft Mercury Chemical Action Plan* Public Forum in Tacoma:

We try to reduce toxic chemical usage in the lab. There are specific Clean Water Act monitoring and analytical protocols that require the use of Hg. For example – PCB testing – there is no alternative available. We need to realize that some things are out of our control.

Ecology's Review and Analysis of Public Comments

Ecology concurs with this comment.

Ecology's Conclusions

In the final MCAP, Ecology made the following recommendations for laboratories:

Proposed, Long-term
Work with laboratories to reduce the use of mercury products and compounds and to promote best management practices with regard to laboratory waste. Ecology recognizes that laboratories must retain some mercury compounds for the purposes of necessary accepted analytical procedures. Laboratories are encouraged to replace any unnecessary mercury-containing products or procedures as alternatives are developed.

Comments Related to State Purchasing

The Draft Mercury Chemical Action Plan stated

State agencies purchase many products that may contain mercury. By choosing non-mercury products when possible, state agencies can create a greater market demand for these products and reduce the use of mercury. State agencies also contract with mercury recyclers and hazardous waste haulers for the disposal or recycling of mercury products. Most state contracts can also be used by local governments and other jurisdictions, often providing local governments a discount on goods and services due to the dynamics of bulk purchasing. This combined purchasing power can also be leverage to get more environmentally preferable products on state contracts.

Products that may contain mercury purchased by state agencies include fluorescent lamps, button cell batteries, medical equipment, dental supplies, vehicles, appliances, bilge pumps, thermostats, and HVAC equipment.

Releases may occur when products are broken or improperly disposed.

Agencies generally do not use the state contract to dispose of lamps. They go to a non-contract supplier for this service at a lower cost than is specified in the contract. No centralized records have been kept on this disposal activity. Ecology hopes to collect such data once the State's new contract 12201 for disposal of spent lighting is awarded

Typically, the vendors are asked to submit quarterly reports to GA, but they do not offer do it. If they do, information is not broken down by purchasing entity.

Governor Locke has called for an Executive Order on Sustainable Government. Ecology will participate in the multi-agency group to draft the executive order. The intent is that the executive order would require state agencies to purchase environmentally preferable products when they meet price and performance needs. Additionally, it will ask for life cycle considerations to be made for some product purchases, which includes potential impacts from product manufacture through ultimate disposition.

Ecology will research state contracts to determine which products the state purchases contain PBTs (broadly defined), and identify non-PBT products that should be purchased instead.

Ecology has contacted General Administration regarding its current Invitation for Bid for Lamps and Ballasts. The contract requires that the vendor employ a "Lamp Specialist" to be the customers' primary and single point of contact for product use issues. Ecology has requested that information on fluorescent lamp recycling be provided as part of the Lamp Specialist's technical assistance. Vendors are also required to provide training for customers; Ecology has requested that information on fluorescent lamp recycling be included as part of the training.

Ecology and Health plan to approach General Administration about including specifications in the next invitation for bid for vehicles, requiring that vehicles not have mercury switches and requiring vendors to disclose all mercury devices in vehicles on the contract.

The Draft MCAP Recommended the Following Actions

Ongoing
Work with General Administration to review contracts as they come up for renewal to include a preference or requirement for non-mercury products.

Public Comments

Org-22: SPU also thinks the plan should support stronger recommendations for state purchasing contracts to select for mercury-free or lowest mercury content products. This would be more consistent with the Executive Order on Sustainability than the current recommendation. In general, stronger purchasing specifications will help enhance markets for alternative products and will be a model for local governments to follow.

Org-33: Washington State should lead by example and make a commitment to purchasing mercury-free products when alternatives are available. The CAP should include a recommendation to support legislation or Executive Orders to accomplish this.

Because chlorine use in pulp and papermaking can be a source of mercury pollution, the state should also commit to purchasing chlorine-free recycled paper. Because many cities and universities purchase off the state contract this would have a significant impact on reducing persistent toxic pollution.

Org-34: We urge Ecology to support legislation or an Executive Order that will require state agencies to give preference when purchasing to mercury-free and low-mercury products.

Ecology's Review and Analysis of Public Comments

In September 2002, Governor Locke signed an executive order directing state agencies to establish sustainability objectives and prepare biennial sustainability plans to modify their practices. The executive order also established a council to advise state agencies on how to apply sustainability measures to government operations. The Governor's Sustainable Washington Advisory Panel is comprised of 25 representatives from the public and private sector. Their goal is to find ways of using human, environmental, and economic resources more wisely, including the use of energy-efficient products, recycled materials, and conservation programs.

The advisory panel has spent the last year developing a roadmap for the state. They have agreed on a vision of achieving a fully sustainable state within one generation, by 2030.

In a report titled "A New Path Forward: Action Plan for a Sustainable Washington," the panel highlighted 11 priority recommendations to Washington State. The recommendations targeted economic vitality, tax policy, natural resource protection, and state government performance.

The recommendations include:
- Investing in clean energy and establishing clean energy standards;
- Committing to greenhouse gas reduction targets and mitigation strategies;

- Adopting industry-sponsored "green building" standards for all new state government construction projects;
- Engaging and informing citizens on sustainability; and
- Defining, documenting, and communicating the vision and progress of sustainability efforts.

Panel members explained that a successful sustainability strategy will entail participation by the executive branch of state government, the Legislature, the private sector and the public. The panel anticipates broad distribution of its report to draw attention to its concerns and proposals.

Ecology agrees that Washington State should lead by example and make a commitment to purchasing mercury-free products when alternatives are available.

Ecology's Conclusions

In the final MCAP, Ecology made the following recommendations regarding state purchasing practices:

Proposed, Short-term
Continue to work with the state Department of General Administration to include a preference or requirement for non-mercury products in future contracts.

Take the necessary steps to ensure that Ecology is following the Governor's Executive Order on Sustainability to the fullest extent possible.

Comments Related to Dairies

The Draft Mercury Chemical Action Plan stated

Milk-producing dairies use mercury manometers to monitor pressure changes in automatic-milking systems. The two most common manometers, often referred to as J-shape and U-shape, contain one-pound (approximately two tablespoons) of elemental mercury when installed. A third type, that is less common, contains four to five ounces of elemental mercury when installed. The manometers are potential sources of mercury spills if broken or of mercury vapor released to the atmosphere if milking systems are malfunctioning.

The interagency team working on this issue roughly estimated that up to 20% (approximately 150) of the 730 milk-producing dairies that were operating in 2000 were using mercury manometers. Using a grant from EPA to fund a rebate/replacement project, at least 110 farms will have had mercury manometers removed by June 2002.

Between October 2000 and December 2001, 90 manometers were removed from dairies. Of those 90 manometers, 40 were J-shaped, 35 were U-shaped, and 15 were the smaller size. On an average, the J-shaped contained approximately 12 oz. of elemental mercury instead of the expected one pound. The average amount collected from the U-shape was 10 oz instead of the expected one pound. The third type average was at 3 oz. instead of the expected 5 oz. Therefore, instead of removing 80 pounds of elemental mercury, only 56 pounds was removed. Based on this information, approximately 24 pounds of elemental mercury cannot be accounted for.

The Draft MCAP Recommended the Following Actions

Non-mercury dairy manometers have been successfully collected in Washington.

Public Comments

No comments were received for this category.

Ecology's Review and Analysis of Public Comments

No comments.

Ecology's Conclusions

Non-mercury dairy manometers have been successfully collected in Washington. Between October 2000 and December 2001, 90 manometers were removed from dairies.

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4. Products Containing Mercury as End-of-Life

Comments Related to Solid Waste Combustion

The Draft Mercury Chemical Action Plan stated

The largest municipal waste combustor currently in operation in Washington State is the Spokane Waste to Energy facility, owned by the City of Spokane and operated by Wheelabrator.

The Tacoma Steam Plant is classified as municipal waste combustor by the Department of Ecology. The City is contesting this classification, arguing that the facility should be considered a coal-fired power plant. The steam plant is currently not in operation. It burns a combination of construction and demolition debris and coal.

The Spokane facility estimates recent emissions at 18.45 pounds per year. This is a considerable reduction from previous years; based on an eight year average of mercury emissions, the facility releases approximately 97 pounds of mercury annually. New pollution-control devices are likely responsible for the decrease. The facility accepts fluorescent lamps from residences and small businesses for incineration.

For 2000, the Tacoma Steam Plant reported mercury emissions to the Toxics Release Inventory of 49 pounds.

The Draft MCAP Recommended the Following Actions

Proposed, next permit renewal
Consider prohibiting the incineration of fluorescent lamps.

Public Comments

Org-23: The City of Spokane Waste-to-Energy Plant *does not* accept fluorescent lighting from small businesses. CESQG's are required to handle their mercury containing lighting, that designates as a hazardous waste, as Universal wastes or hazardous waste. Household lighting is accepted as exempt waste per WAC's. Recent estimates need to be used for future forecasts in terms of future emissions.

Org-23: In addition to the acceptance of household batteries and thermometers, the Household Hazardous Waste program has always accepted elementary mercury, dental amalgam, mercury bases pesticides, thermostats, manometers, and other mercury containing devices for recycling. The only household mercury containing items we do not accept are fluorescent bulbs from households.

Org-23: No. Continue to follow state and federal laws concerning household waste. Attempt to divert as much mercury as possible by Household Hazardous Waste collections. Continue to handle mercury-containing materials under the Universal Waste Regs. Yearly emission numbers do not rationalize such a ban in comparison to other sources.

Org-32: First, with respect to the pick-up and transportation of solid waste, WRRA is concerned that DOE does not place the haulers in the role as the mercury police, sorting through disposed garbage looking for mercury. We support efforts that will keep hazardous materials from entering the waste stream, and additional efforts that put the burden and costs of disposal on the manufacturers and consumers of these goods.

Org-32: WRRA's comments are more extensive and focused on the Draft MCAP's suggestions or inferences that landfill emissions are a significant source of mercury emissions to the atmosphere. We believe that the Draft MCAP suggests that a majority of mercury that is placed in landfills will escape into the atmosphere or a "Garbage in, Garbage out" scenario, which the scientific literature indicates, is not correct.

It appears that Ecology, as a consequence of these suggestions, is undertaking investigations of mercury emissions from landfills. MCAP at 71. WRRA is extremely concerned that the Draft Report suggests that landfills and solid waste management practices may be a significant source of Mercury in the environment. Throughout the Draft Report, unsupported inferences, contrary to existing technical literature, are made implying that landfills contribute to significant releases of Mercury to the environment, and that the amount of mercury disposed may be equated to the amount of mercury emissions from landfills to the environment.

WRRA disagrees. The evidence presented in the MCAP and available in existing literature does not support such a conclusion. The MCAP, which contains only very few citations, and numerous un-cited statements throughout appears to have overlooked the significant body of available research on the topic. We are therefore including a literature survey titled *"A Perspective on Hg in Laiidfill Gas in the Context of the Global Mercury Cycle",* November 27, 2001, by Dr. Jean Bogner, PhD, University of Illinois, for The Department's consideration in developing the MCAP. The review analyzes data from both natural and man- made sources of mercury, and provides a contextual analysis of known information about the fate of mercury in landfills, as well as numerous sources of available literature and recommendations for further study to aid in the understanding of mercury fate and transport.

Org-32: WRRA submits that instead of studying mercury emissions at landfills in Washington, Ecology can better use its technical and financial resources to reduce the amount of mercury entering the solid waste stream, before it could ever reach a landfill. Should the study proceed as recommended, WRRA believes that the draft proposal in circulation should be re-drafted to identify what hypothesis is being tested and how results will be interpreted. It is not clear, for instance, whether the study proposes to test any particular hypothesis about the different types of landfills targeted for sampling, about the methylation of mercury, or about the amount of organic mercury destroyed by combustion. Without such clarity and focus, we fear that the results could be subject to misinterpretation and misuse. And, in any case, a technically sound study that has been subjected to outside review can only serve the interests of the MCAP program.

Org-32: The MCAP suggests that landfills may be a significant source of mercury emissions to the atmosphere, without considering existing technical literature on the topic which again and again finds otherwise. In its 1997 *Mercury Study. Report to Congress* (Dec. 1997)[30] (*"EPA Mercury Study"),* EPA reported to Congress that the total mercury emissions from municipal solid waste landfills were only *0.05 percent* of the total mercury emissions from all man-made sources. EPA estimated that landfills emitted approximately *162 pounds* of mercury per year - nationwide - as compared to *154 tons* from all other anthropogenic sources. Mercury emissions from other mercury emitters, both large and small are from one to several *orders of magnitude higher* than from landfills. Clearly mercury emissions from municipal waste landfills are extremely small as compared to these other sources.

Though a number of landfill studies are available, Ecology's MCAP apparently relies on a single study[31] from a Florida landfill to support its recommendation to study landfill emissions further. While some of the Florida study's conclusions have been questioned,[32] the study confirms EPA's conclusion in 1997 that landfills do not constitute a significant source of total mercury emissions to the environment. The mean concentration of total gaseous mercury emissions measured in the Florida study was 7.2 $\mu g/m^3$, which is well within the range used by EPA in its 1997 Mercury Study (5.8 ng/m3 to 20.8 $\mu g/m^3$)[33].

Other studies have reached similar results. Thus, existing studies confirm that landfills are a *de minimis* source of mercury emissions to the environment.

Org-32: The MCAP suggests that the quantity of mercury disposed of in solid waste landfills is a bigger problem than Ecology's own data would support. Throughout the document, the MCAP makes statements to suggest the amount of mercury-containing products discarded in Washington State trash represents the amount of mercury actually disposed of in Washington's solid waste landfills. For example, the MCAP states, "Ninety-one percent of municipal solid waste in Washington is landfilled. Presumably many of the products listed in Table 2 [fluorescent lamps, thermostats, dental amalgam, auto convenience light switches, button cell batteries, thermometers] are landfilled." MCAP at 5. This quote strongly implies that most of Ecology's estimated 1,733 to 3,356 pounds of mercury disposed of annually ends up in landfills and may thereafter be released to the environment. Elsewhere in the Mercury Study, Ecology "conservatively estimates" that 1,076-2,553 pounds of mercury are disposed of in solid waste landfills. MCAP, Table 7 at 70.

Yet even after reaching this "conservative" conclusion, Ecology concedes the mercury in many of these products never reaches a landfill. *Id.* at 70. For example, Ecology estimates that 44%-76% of landfill mercury products are fluorescent lamps and thermometers; however, Ecology admits that "mercury in products that break easily, such fluorescent lamps and thermometers, may be released before or during the waste collection process." *Id.* Indeed, in its 1997 *Mercury*

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[30] Mercury Study Report to Congress, EPA-452/R-97-003. December 1997.

[31] Lindberg et al., "Methylated mercury species in municipal waste landfill gas sampled in Florida, USA," *35 Atmospheric Environment* 4011 (August 2001).

[32] For example, the Florida study did not address mercury emissions to the air. Rather, it measured small amounts dimethyl mercury in the landfill gas before it reached the landfill flare.

[33] Legend: µg/m3 = micrograms per cubic meter or one millionth of a gram of mercury per cubic meter of gas. ng/m3 = nanograms per cubic meter or one billionth of a gram of mercury per cubic meter.

Study, EPA assumed that all discarded lamps transported in a garbage truck would be broken and all mercury emitted to the air before reaching a landfill. *EPA Mercury Study*, Vol. II at 3-6. Elsewhere, the MCAP acknowledges that many fluorescent lamps are accepted at moderate risk waste facilities or recyclers. MCAP at 43-44. Likewise, the same table includes "dental amalgam from dental facilities" as a source of 8%-19% of mercury disposed of in landfills; however, the text then states that this waste stream is treated as biomedical waste and/or dangerous waste, managed out-of-state, and would be volatilized before reaching a landfill.

Based on the evidence presented, Ecology's MCAP does not support the conclusion that landfills receive the volumes of mercury waste that the MCAP estimates. This is not to say that mercury in the solid waste stream an insignificant problem; however, there are significant practical problems to addressing this problem once mercury-containing devices have entered the waste stream. Once co-mingled with municipal solid waste, it is virtually impossible to screen and remove mercury-containing devices. Mercury-containing devices represent a miniscule portion of the solid waste stream and are extremely difficult to identify and safely extract. Many devices - particularly fluorescent lamps - are broken before they ever reach a disposal site. We believe that the most productive and cost-effective strategies for controlling mercury in the waste stream are source reduction, product stewardship, diversion and recovery of specific mercury-containing products, enforcement of existing dangerous waste regulations, and public education. Accordingly, WRRA supports Ecology's efforts to reduce the amount of mercury that actually enters the solid waste stream upstream of solid waste landfills, and suggests that it would be appropriate to include enhanced efforts to enforce existing Universal Waste and Dangerous Waste regulations as a study recommendation.

Org-32: While municipal solid waste landfills are small source of mercury emissions to the environment, given the persistence and toxicity of mercury, it is important to reduce mercury emissions from all sources. EPA has announced that it intends to regulate emissions of mercury from coal and oil-fired electric utility units by December 2004, which will begin to deal with the single largest source of mercury emissions. With respect to landfills, whatever mercury emissions exist are caused by disposal of a wide range of mercury-bearing materials including fluorescent lights, thermometers, switches and batteries. While we wish to reinforce the point that we believe that incidental mercury disposed in landfills is safely managed, clearly eliminating the use of mercury in these products by producers, and diverting mercury-containing devices away from disposal would eliminate the risk of releasing mercury during disposal.

Org-33: Washington State is home to two solid waste incinerators, one in Spokane and one in Tacoma, releasing over 50 pounds of mercury to the air each year combined. The Tacoma incinerator is currently closed, but the city wants to re-open it. Incinerators are more than just a mercury problem. We have serious concerns about the incineration of waste for several reasons.

- EPA has identified solid-waste incinerators as the number-one source of dioxin emissions to air nationally. Incinerators are also a source of lead and cadmium. Dioxin, lead, cadmium, and mercury also wind up in the incinerator ash that must be landfilled.
- Current federal and state incinerator regulations play a toxic shell game with persistent pollution, transferring these poisons from air to ash. The standards merely require the addition of more sophisticated pollution-control technology. The pollution-control devices catch more of the pollution, but result in more-concentrated dioxins and metals in the fly ash,

which must be disposed of in a landfill. This back-end approach of pollution control has been proven over and over again to fail in regard to persistent toxic pollution. We need to prevent mercury and other persistent toxics from being created and this is clearly one place where we can do that.

- There are environmentally preferable alternatives to burning waste and every effort should be made to use these alternatives rather than incinerate.

Ecology's recommendation in the mercury CAP should be to amend current regulations to prevent the siting of new incinerators and to prohibit the incineration of solid waste after 2010.

Ecology's Review and Analysis of Public Comments

Everyone recognizes the importance of minimizing the incineration of mercury-containing wastes. Comments suggest a variety of ways to achieve this goal. Efforts to reduce the mercury content of the waste stream have begun with Household Hazardous Waste programs and related efforts. Questions remain about the most efficient and equitable ways to achieve this reduction. Enactment of legislation, such as the recently signed Mercury Reduction Act of 2003 (signed by Governor Locke in May 2003), that eliminate or reduce non-essential uses of mercury in household, institutional, and industrial sources through source reduction, segregation, recycling, and sales bans is a good first step.

Ecology's Conclusions

There are a number of ways that the mercury content of the waste stream can be reduced. Among the most effective are reductions in the mercury content of consumer goods, education efforts aimed at alerting citizens to items such as thermometers, fluorescent light bulbs, batteries, etc., that may contain mercury, and supporting programs that provide citizens with opportunities to recycle or sequester mercury-containing products rather than disposing of them. To this end, Ecology has included wording in the final MCAP describing some of the efforts to reduce the disposal of mercury-containing products, supporting the collection and recycling of fluorescent lights, and recommending outreach and education to local communities on mercury-containing products, proper disposal methods, and non-mercury alternatives.

Comments Related to Medical Waste Incinerators

The Draft Mercury Chemical Action Plan stated

Washington State has one medical waste incinerator, at Washington State University (WSU) in Pullman. The WSU Medical Waste, Low-level Radioactive Waste and Pathological Waste separates waste by type, because of different burning characteristics.

Medical waste (paper, plastic, bedding, glass, etc. which have come into contact with infected animals) and low-level radioactive waste (the same as medical, plus a few small animal carcasses) can sustain combustion, and are burned under one set of conditions. Pathological waste (animal carcasses) cannot sustain combustion by itself, and is burned under different conditions.

The facility does do sorting in terms of what actually goes to the incinerator, but actual burning is based on the type of material.

Seven Toxic Air Pollutants are addressed in the permit: Hydrogen Chloride, Dioxins, Lead, Cadmium, Mercury, Chromium, and Nickel. Distribution of each Toxic Air Pollutant has to be modeled to demonstrate that the Acceptable Source Impact Level (ASIL) will not be exceeded.

The lowest ASIL for mercury or mercury compounds is 0.17 micrograms per cubic meter, averaged over 24 hours. In addition, the permit limits mercury concentration at the stack to 0.24 grains per thousand dry standard cubic feet @7% oxygen.

The permit requires that the incinerator be tested for each of the Toxic Air Pollutants at startup and every 36 months thereafter.

The permit limits pathological waste throughput to 180,855 pounds per year, and medical waste to 977,168 pounds per year. Based on results of the initial source test, that would result in mercury emissions of 2.8 and 0.03 pounds per year, respectively. Actual air mercury emissions for 2001 were calculated at 0.30 pounds, total.

They are required to transfer ash from the incinerator to sealable, non-melting, non-combustible container. The containers must go to an approved site for disposal. That would probably reduce mercury release by a certain amount.

The facility has a waste management plan as addressed in the Environmental Impact Statement. It is unknown at present whether the plan includes a section that addresses mercury.

The Draft MCAP Recommended the Following Actions

Given the very low levels of emissions, no recommendations for further reduction have been made at this time.

Public Comments

Org-33: The Pullman incinerator is the last medical-waste incinerator in Washington, but that does not mean medical waste from Washington health-care facilities is not burned. Commercial medical-waste haulers in Washington, including Stericycle, own incinerators or have contracts to haul to incinerators in other states. Alternatives to incineration for all types of medical waste are feasible and available. In order to cease incineration of medical waste in the state, Ecology should amend existing regulations to prevent the siting of new medical-waste incinerators and prohibit the incineration of medical waste in the state after 2005. As part of the program to eliminate mercury in healthcare, Ecology should also get firm commitments from hospitals to end the incineration of their medical waste (in state and out of state) as a way to reduce mercury, dioxin, and other persistent toxic pollution. For example, hospitals can specify in their contracts with waste companies that they do not want their waste incinerated.

Ecology's Review and Analysis of Public Comments

A single set of comments was received on medical waste incinerators. The suggestions in these comments were focused on discouraging incineration of medical wastes both inside and outside of Washington.

Ecology's Conclusions

The MCAP focuses on minimizing mercury sources. There are a number of ways that the mercury content of the medical waste stream going to incinerators can be reduced. To this end, Ecology has included wording in the final MCAP recommending that facilities establish a source-separation program, recommending outreach and education to WSU and the local community on mercury in products, proper disposal methods, and non-mercury alternatives.

Comments Related to Landfills

The Draft Mercury Chemical Action Plan stated

When products containing mercury are disposed of in landfills, mercury may be released through air emissions or possibly in leachate. Air emissions may occur when mercury products are dumped on the open face of the landfill and broken, prior to the application of a cover layer, or, later, with methane gas emissions. Ninety-one percent of municipal solid waste in Washington is landfilled. It is anticipated that most products containing mercury that are not recycled are landfilled.

The amount of mercury in discarded products sent to landfills is conservatively estimated at 1,076 to 2,553 pounds annually. This estimate includes thermometers used in private homes, fluorescent lamps, wall thermostats, and scrap dental amalgam. It does not include products other than thermostats with mercury switches, including appliances, other HVAC equipment, bilge pumps, or others. In all likelihood, not all of the mercury originally in the discarded products actually reaches the landfills. In particular, mercury in products that break easily, such as fluorescent lamps and thermometers, may be released before or during the waste collection process. Mercury in scrap dental amalgam that is disposed of as biomedical waste and treated at a medical waste autoclave or retort may volatilize before ultimate disposal at a landfill. Sterilized biomedical waste from dental offices is currently disposed of at the landfill in Coffin Butte, Oregon. Additional mercury from broken products may volatilize on the face of the landfill, before the daily cover layer is applied.

Table 7. Estimated Mercury in Products Landfilled Annually in Washington State

Mercury Products Assumed Landfilled	low estimate (lbs)	high estimate (lbs)
Fluorescent lamps	505	1,839
Thermostats	444	444
Dental Amalgam from Dental Facilities (solid waste)	116	116
Dental Amalgam from Dental Facilities (biomedical waste)	106	106
Household fever thermometers	11	300
Total pounds of mercury in discarded products in Washington	1,182	2,805
Percent of municipal solid waste landfilled	91%	91%
Total pounds of mercury in discarded products landfilled	1,076	2,553

The fate of mercury in landfills is not well understood. A recent study conducted in Florida showed that methylmercury was emitted with landfill gas.[34] Statistics are currently unavailable on the total volume, bioavailability, or the toxicity of the reduced mercury versus the oxidized mercury compounds from landfills in Washington.

The Draft MCAP Recommended the Following Actions

Ongoing
Investigate mercury emissions in landfill gas and on the open face of active landfills.

Public Comments

Org-1: The MCAP only focuses on pounds commercial uses of products containing mercury. Plus, no relation to a thermometer going to a landfill in Yakima and contaminating a fish in the San Juans or the Columbia is ever shown.

Org-6: The CAP concludes that the amount of mercury contributed by product sources is equal to the amount of mercury estimated to be sent to landfills and other disposal sites from each of the mercury-containing products. The amounts of mercury estimated as released from products through disposal in landfills ignores the results of studies of the amount of mercury estimated to be actually released from these landfills compared to the amounts in the products disposed at the sites. It also ignores the reductions achieved from existing recycling programs at the landfills and other disposal sites.

Since these conclusions are used to support the recommended action to impose controls on products entering Washington State, the data to support such a conclusion must be accurate. If a quantitative analysis demonstrates that the amounts contributed to the environment through releases from products disposed at landfills are low compared to other sources, this information should be used to rank source control actions in relationship to other control options that could result in larger reductions at a lower cost.

Org-11: Please revise the name of table 7 to read: Estimated Mercury in Products Disposed of in Washington State Annually.

Org-13, Org-14, Org-16, Org-17: Prohibit the disposal of mercury-containing products in the solid waste stream throughout Washington State.

Org-23: …(T)he only other comment that I have is noting the discrepancy in the action plan regarding fluorescent lighting being disposed of at a Waste-To-Energy plant as opposed to landfills. Certainly both sources release mercury to the environment yet to regulate the disposal of lighting in one instance, while ignoring the other, does not make a lot of sense. Granted, in both instances the breakage of the bulbs, either on-site or in transit to the disposal site, certainly impacts your values as well.

[34] Lindberg, S.E., D. Wallschläger, E.M. Prestbo, N.S. Bloom, J. Price, D. Reinhart, "Methylated mercury species in municipal waste landfill gas sampled in Florida, USA." Atmospheric Environment 35 (2001) 4011 – 4015, 24 February 2001.

Org-33: Mercury wastes that wind up in landfills can leach into groundwater, volatize into the air, or wind up in landfill gas emissions. Ecology should amend current regulations to prohibit the disposal of all mercury-containing products in landfills.

Ecology's Review and Analysis of Public Comments

Several sets of comments raise questions about the fate of mercury in landfills (and in its transport to landfills). The draft's estimates of the amount of mercury associated with landfills are also called into question. Some comments point out the difficulty of quantifying the release of mercury from landfill-associated activities. There seems to be a general consensus as to the value of keeping mercury out of solid waste streams and of the difficulty of predicting the exact fate of mercury once it has entered waste streams.

Ecology's Conclusions

Based on information and comments received since the publication of the draft MCAP, estimates of mercury in discarded products in the solid waste stream have been modified. Table 7 was eliminated and not included in the final MCAP.

Given its volatility and potential for methylation and migration, the security of mercury in landfills cannot be assumed. The MCAP recommends investigating mercury emissions in landfill gas and on the open face of active landfills. There seems to be a general consensus that mercury in solid waste streams should be minimized.

There are a number of ways that the mercury content of waste streams can be reduced. Among the most effective are reductions in the mercury content of consumer goods, education efforts aimed at alerting citizens to items like thermometers, fluorescent light bulbs, batteries, etc. that may contain mercury, and supporting programs that provide citizens with opportunities to recycle or sequester mercury-containing products rather than disposing of them. To this end Ecology has included wording in the final MCAP describing some of the efforts to reduce the disposal of mercury-containing products, supporting the collection and recycling of fluorescent lights, and recommending outreach and education to local communities on mercury-containing products, proper disposal methods, and non-mercury alternatives. (See comments on Mercury Retirement.)

Ecology agrees, as stated in the draft MCAP, that not all of the mercury originally discarded with mercury-containing products actually reaches the landfill. Estimates of mercury in products disposed of at landfills do take into account current recycling rates. In an effort to obtain the most current information regarding mercury levels in landfills in Washington, Ecology is funding a study to collect samples of landfill gas and analyze the gas samples for mercury at several open and closed landfills around the state.

Comments Related to Medical Waste Autoclaves and Retorts

The Draft Mercury Chemical Action Plan stated

There are two freestanding medical waste facilities in Washington. One is an autoclave in Ferndale; the other is an Electro-Thermal Deactivation Plant in Morton. The autoclave is leased by Stericycle from Recomp.

An autoclave sterilizes medical waste through high pressure and high temperature steam. Once the medical waste has been sterilized, it is transported to the Roosevelt Landfill. There is no shredding or grinding of the medical waste.

The plant in Morton first grinds the medical waste, making it unrecognizable and reducing the volume. Next, through a patented process called Electro-Thermal Deactivation, the waste is rendered non-infectious with low-frequency with low-frequency radio waves. The non-infectious medical waste is hauled to Coffin Butte, Oregon, for disposal.

Some hospitals and perhaps biotech laboratories in Washington have their own autoclaves on-site, which they use to sterilize regulated medical waste.

Information from dental office visits and other medical waste sources points to a potential problem at facilities involved in microwave/autoclave sterilization of medical and infectious wastes, with subsequent landfill. Mercury amalgam is often placed in "red bag" as infectious/ medical waste by dentists.

The Draft MCAP Recommended the Following Actions

Proposed, Short-term
Work with medical waste facilities and the Washington State Hospital Association to educate the medical community about disposing of mercury as hazardous waste.

Proposed, Short-term
Work with the Department of Labor and Industry to clarify the interpretation of infectious waste and hazardous waste regulations for the dental community, providing direction for the handling of mixed waste.

Proposed, Mid-term
Include requirement that medical waste facilities not accept mercury as part of a medical waste facility permit template for local health departments,

Public Comments

Org-33: Washington has one regional autoclave in Ferndale, numerous autoclaves at hospitals, and one regional Electro-thermal Deactivation (ETD) facility in Morton. Mercury wastes should not be disposed of in these facilities since they are not designed to deal with mercury wastes and are not legally permitted to accept hazardous waste. As mentioned earlier, King County

estimates that more than 50 pounds per year of mercury is sent to the Stericycle facility in Morton. Ecology should take a two-pronged approach to this problem. First, as discussed previously, Ecology should take enforcement actions to prevent the disposal of mercury amalgam at these facilities. Second, Ecology should pursue monitoring and regulation of air and water emissions at autoclaves and ETDs. Regulations should prohibit these facilities from accepting mercury and other toxic wastes that can result in harmful persistent toxic emissions and require on-going monitoring to ensure mercury wastes are not entering the facility.

PubMtg: Stephanie Marvin, Dentist. Comment made at the September 26, 2002 *Draft Mercury Chemical Action Plan* Public Forum in Tacoma:

The Assn. of Metropolitan Sewerage report – WSDA does not agree with this report. WSDA believes the King County studies are more accurate. Two additional weaknesses I see with the draft plan:

- There needs to be a mandate that the incineration of biosolids be eliminated
- Mandate that dentists refrain from disposing amalgam in red bag medical waste.

Ecology's Review and Analysis of Public Comments

There is a consensus that mercury should not be included in wastes that are sent to autoclaves as infectious waste. One of the main areas of concern in this regard is the "red bag" wastes that come from dental offices. There is disagreement as to the relative responsibility of various parties for keeping mercury out of the infectious waste stream.

Ecology's Conclusions

The MCAP focuses on keeping mercury out of (infectious) medical and dental wastes that go to autoclaves and retorts and on making sure that mixed (dangerous and infectious) wastes are treated as dangerous wastes – meaning that they are not to be sent to autoclaves and retorts. To this end, Ecology has included wording in the final MCAP recommending extensive education and outreach to the medical and dental communities. Monitoring air and water around permitted facilities and hospitals with autoclaves, and monitoring medical and hazardous waste generators to ensure that they are complying with existing disposal regulations, are also recommended.

Comments Related to Publicly Operated Treatment Works (POTWs)

The Draft Mercury Chemical Action Plan stated

Mercury is present in wastewater treated by POTWs. Following treatment, mercury is present in POTWs' effluent, biosolids, and air emissions. The preferred method of biosolids management in Washington is beneficial use, which means that mercury in the biosolids is eventually recycled back to the environment. Loading and concentrations of mercury in effluent are regulated by NPDES permits.

According to the Association of Metropolitan Sewerage Authorities (AMSA), the largest source of mercury in wastewater influent is discharges from dental offices. The next largest source is domestic, of which 83 percent is attributed to dental amalgam. Other domestic sources include laundry graywater and household products. The third largest source is hospitals.

The sources with the greatest potential for achieving measurable reductions in wastewater influent are dental offices and hospitals. Of the domestic sources, human waste is considered uncontrollable and laundry graywater is considered very difficult to effectively control. Household products are controllable to the extent that residents can be persuaded to stop using them or to the extent that their availability can be restricted through product bans. According to AMSA, legislative efforts to restrict the availability of certain mercury containing products may prove effective in reducing discharges from household products.[35]

There are about 350 treatment works treating domestic sewage in Washington, most of which discharge 100 percent of their effluent to waters of the state and produce about 100,000 dry tons of biosolids per year. Most of these are publicly owned treatment works. About 80% of that material is applied to the land in some manner.

Based on data contained in Ecology's Biosolids Data Management System (BDMS), the median value for mercury in biosolids in Washington is about 2 ppm. A report published by Ecology in 2001 (WDOE 01-07-007) estimated the median value for septage to be slightly higher, around 3.1 ppm, also based on information contained in BDMS. Studies from the City of Tacoma in the early 1990's showed a mercury range of 1 ppm to 1430 ppm in septage. Biosolids which are applied to the land must be analyzed for mercury and other pollutants. Measured values are well below Ecology's regulatory limit of 57 ppm for mercury in biosolids, which is risk-based.

Twenty sewage treatment plants that discharge to surface waters have effluent limits for mercury that regulate the amount of mercury in the discharge (Table 8). These discharges are regulated through the NPDES program. Discharges to ground can be regulated using State Waste Discharge permits.

[35] "Mercury Source Control and Pollution Prevention Program Evaluation;" Association of Metropolitan Sewerage Authorities; p. ES-4.

Effluent limits for mercury are included in NPDES permits if monitoring data indicate that there is a reasonable potential for the mercury criteria to be violated at the edge of the allowed mixing zone. The 20 plants with extant mercury limits fit this scenario. However, discharges that receive enough dilution in the receiving water to ensure compliance with numeric criteria during critical condition at the boundary of the mixing zone are not given water quality-based effluent limits. In this case, mercury could be present in the discharge and is allowed by the NPDES permit.

Table 8. Sewage Treatment Plants with Mercury Limits in NPDES Permits

Sewage Treatment Plant	Reporting Frequency	Number of Mercury Violations, 4/1/01 – 1/1/02
Northwest Region		
Duvall	monthly	2
Everett	monthly	0
Ferndale	monthly	0
Granite Falls	monthly	1
Monroe	monthly	0
North Bend	monthly	2
Southwest Region		
Cowlitz	monthly	0
Enumclaw	monthly	0
Puyallup	monthly	0
Sumner	monthly	3
Yelm	monthly	0
Central Region		
Entiat	monthly	1 (failure to report)
Eastern Region		
Diamond Lake	?	0
Moses Lake Larson	bi-annually	0
Othello	? annually	0
Quincy	?	0
Royal City	?	0
Spokane	monthly	0
Walla Walla	monthly	1

The City of Tacoma is developing a mercury reduction plan for both sewage and solid waste.

King County has required all dentists to install amalgam separators by June 2003.

The Association of Metropolitan Sewerage Agencies conducted a study to determine the extent to which pollution prevention and source control programs could achieve measurable reductions in POTW influent and if these reductions would enable POTWs to comply with proposed new, lower effluent limits. Influent load reductions for mercury achievable through pollution prevention activities for POTW case studies on average ranged from 12% to 90% depending on

the agency's existing pollution prevention efforts and the extent of additional pollution prevention conducted.[36]

To further reduce the mercury in biosolids, one effective approach may be to establish a voluntary pollution prevention program for POTWs. Ecology could survey the treatment works, look for those with mercury levels that are approximately two or more standard deviations above the mean, and focus on them. Ecology would work with the facilities to determine why the values are high, how to reduce them.

The Ecology Pre-Treatment Workgroup, which is composed of the four Ecology regional pre-treatment coordinators, could coordinate with the Northwest Biosolids Management Association Pretreatment Committee members to develop pollution-prevention and mercury-reduction strategies.

Ecology could set a lower regulatory threshold for mercury in biosolids. In order to do this, Ecology would need to show that the risk posed by mercury in biosolids is greater than EPA calculated to set the current limit.

The Draft MCAP Recommended the Following Actions

Proposed, Mid-term
Consider eliminating mixing zones in the next round of regulatory review.

Public Comments

Org-12: We strongly disagree with the recommended actions in the Medical and Dental Facilities sections that would require increased POTW monitoring of mercury levels in the biosolids and effluent. These recommendations essentially shift the burden of mercury reduction to Publicly Owned Treatment Works (POTWs) in the event that voluntary programs are not successful. This shifts the cost of mercury reduction from the generator of the waste to the ratepayers. The recommended action to eliminate mixing zones for POTW effluent limits for mercury, under the section concerning POTWs, also shifts the responsibility of removing mercury from the generator to the public. Treating for mercury at the treatment plant is prohibitive. POTWs can only effectively control pollutant loading by doing source control. This recommended action could have the undesired consequence of increasing the numbers of POTWs that are in violation of their NPDES permits, in spite of any efforts at source control. Rather than shifting the burden of source control and compliance to individual POTWs, statewide mandatory controls should be implemented first. This will reduce discharges of mercury to the environment at the source, the appropriate level of control.

Org-15: It is not possible to achieve mercury influent load reductions up to 90% without addressing the dental mercury contribution. This document admits that dental mercury is the primary source of mercury in POTWs, but relies on voluntary efforts by the dental industry which have invariably proven a dismal failure. You need look no further than King County for

[36] "Mercury Source Control and Pollution Prevention Program Evaluation;" Association of Metropolitan Sewerage Authorities; pp. ES-2,3.

proof. This document also accepts as a given that mercury in human waste is uncontrollable. The clearly needed strategy is legislation to ban any further use of mercury amalgam dental fillings.

Org-15: Again the focus on the downstream recipients of mercury (POTWs) is misplaced. The focus needs to be on point sources that contribute to POTW mercury levels. Since dental facilities are the known primary source of POTW mercury, they should be the focus of Ecology's efforts. Only mandatory amalgam separators, monitored solid waste practices and a legislative ban of mercury amalgams will work to reduce mercury in POTWs.

Org-20: People for Puget Sound encourages Ecology to phase out the discharge of mercury through point sources into Puget Sound. The main sources to water identified in this document include oil refineries, pulp and paper mills, and Publicly Owned Treatment Works. For all dischargers, *Ecology must start by eliminating mixing zones for mercury.* Mixing zones have absolutely no capacity to mitigate the impact of mercury in the environment, and therefore must not be used as a credible tool under the National Pollution Discharge Elimination System.
In 1998 Ecology removed from the triennial review of water quality standards, a draft policy phasing out PBT mixing zones. The reason given then, and as recently as September 27, 2002, in a letter from Megan White, states "A decision was made not to move forward with revisions to the mixing zone regulations for PBTs in light of this much broader forum (the PBT strategy) If you are interested in the status of the PBT strategy, please visit our website for more information". The draft mercury plan now flip flops, and recommends *considering* phase out of mercury mixing zones for POTWs in the next round of triennial review.

Because the current triennial review has no guaranteed end date, because there is not a commitment from Ecology to doing a "next" trienniel review, and finally because of the quoted directions above, we do not have great confidence that this issue can move forward as recommended in the CAP. Clearly the agency has moved forward on water quality protections outside of the triennial review process, and we urge you to do so now for all discharges, not just POTWs.

Org-20: POTWs face an additional challenge of meeting water quality standards end-of-pipe as they do not have total control over the discharges into their system. As a first step, pretreatment permits must be reviewed, renewed, and enforced. Mercury reduction opportunities in those permits must be identified and implemented.

Org-20: Meeting water quality standards at the end of pipe will require additional pollution prevention measures. Where these measures are identified in the chemical action plan, they should be required, not left up to voluntary actions. We believe voluntary measures are preferable when they result in achieving the goal of a policy. However, in the case of wastewater discharges, Ecology understands the role enforcement plays, along with voluntary compliance, in reducing pollution.. All dischargers have the opportunity to voluntarily reduce their pollution, but few go beyond what is legally required.

Org-27: Page 77 of the MCAP has a Recommended Action for POTWs: "Consider eliminating the mixing zones in the next round of regulatory review". The City requests that the MCAP not carry forward this recommendation. Rather the focus should be on implementation of the types

of options discussed on Page 76 of the MCAP. These options focus on identifying and implementing means to reduce mercury in the influent to POTWs, and as such are more viable and cost effective means for removing mercury from the environment. Focusing on pollution prevention will result in less mercury entering the environment in an uncontrolled manner.

Org-31: Reducing mercury emissions from industrial sources is a major and necessary step for reducing mercury releases into our environment. It is crucial that the final CAP include measures to reduce emissions**.** *Phasing out mixing zones would comprise a good starting point for reducing emissions and releases of mercury into the environment.* In addition, Washington's coal power plant is a considerable source of mercury emissions – it is vital that these emissions be curtailed, and that future energy sources in the state move towards alternative, clean energy and conservation.

Org-33: One of the most immediate steps Ecology can take to reduce mercury pollution to waterways is to eliminate mixing zones for mercury by amending water-quality permits. In addition, Ecology should amend the water-quality standards to eliminate mixing zones for mercury and all persistent toxic chemicals since they do not dilute.

Org-33: The mercury problems at dental, medical, and other facilities eventually wind up at sewage treatment plants. This is especially disturbing since a lot of the sludge from treatment plants is used as fertilizer on farms and in forests. Ecology must take strong measures to prevent the releases from the source. Ecology should eliminate mixing zones in sewage treatment plant NPDES permits; establish a much more stringent limit for sludges used for fertilizer that is not greater than background mercury levels in soil (.07 ppm); and, review, renew, and enforce pretreatment permits.

Org-34: With respect to POTWs, we urge Ecology to eliminate mixing zones for mercury for POTWs and all other discharges. Mixing zones have absolutely no capacity to mitigate the impact of mercury in the environment. Permittees should not be allowed to discharge mercury at levels that exceed water quality standards.

Org-34: The recommendation to wait until the next review of water quality standards is inadequate. It was our understanding that when Ecology abandoned a draft policy phasing out PBT mixing as part of its triennial review of water quality standards, a phase out of mixing zones for PBT chemicals like mercury would be addressed by the PBT strategy. In fact, in a letter dated September 27, 2002, Ecology's Water Quality Program Manager, Megan White, informed WashPIRG that mixing zones would not be part of the triennial review because "A decision was made not to move forward with revisions to the mixing zone regulations for PBTs in light of this much broader forum [the PBT strategy]."

Org-34: The plan's assertion that mixing zones will not be considered as part of the PBT strategy but instead as part of the triennial review then leaves us wondering whether the agency has any plans to address this significant and completely unnecessary pollution source at all. It has been 10 years since the agency has completed a triennial review. We cannot afford to wait another 10 years to phase out mixing zones. Thus, we urge Ecology to include a recommendation in the plan to phase out mixing zones for mercury for all dischargers, not just POTWs.

Ecology's Review and Analysis of Public Comments

Some commenters urge swift elimination of mixing zones; others urge dropping references to the potential elimination of these mixing zones. While there seems to be a general consensus on the advisability of reducing or eliminating mercury discharges to POTWs, there is little consensus on the preferred approach. Some commenters resist increased testing of effluents and biosolids. Others recommend banning dental amalgam; requiring amalgam separators; establishing more stringent limits for sludge used for fertilizer; and reviewing, renewing, and enforcing pretreatment permits.

Ecology's Conclusions

With regard to mixing zones, the wording found in Ecology's Proposed PBT Strategy still holds:

"During the next triennial review of the water quality standards, Ecology will evaluate and prioritize policy and technical updates to the standards. If funding becomes available, the use of 'mixing zones' will be reviewed in light of current state and federal regulations to determine whether stricter controls are needed on the use of dilution areas of PBTs."

To reduce or eliminate mercury discharges to POTWs, the MCAP suggests several options:

- Identification of high-mercury facilities followed by collaboration between the facility and Ecology to reduce mercury levels through prevention.
- Look at options to reduce the mercury threshold in biosolids.

and recommends two:

- Coordinate with the Northwest Biosolids Management Association Pre-Treatment Committee to develop pollution-prevention and mercury-reduction strategies.
- Consider the feasibility of eliminating mixing zones in the next round of regulatory review.

Comments Related to Septic Systems

The Draft Mercury Chemical Action Plan stated

Mercury is known to be present in septage, probably from a number of sources, including human waste as a result of the deterioration of mercury-amalgam fillings, disposal of broken mercury thermometers, mercury fungicides in paint products, and others sources. When septage is ultimately disposed, whether by land application, incineration, or land filling, mercury may be reintroduced to the environment. If septage is not pumped and removed from an onsite system in a timely manner the system may deteriorate, and pollutants may then enter the environment around the septic system. It is unknown whether mercury would remain with solids in the tank or leach to the surrounding environment

Approximately one-third of the households in Washington are served by on-site systems. The total amount of septage generated, and the portions disposed through wastewater treatment plants or recycled by direct application to the land are not known. About 300 – 350 pumpers service onsite systems in Washington.

Sampling and analysis of septage for mercury and most other pollutants is not typically required under federal or state laws. Studies from the City of Tacoma in the early 1990's showed a mercury range of 1 ppm to 1430 ppm in septage**.** AMSA data from Ohio in "Mercury in Household Products" showed a median concentration of 6.95 ppm.

To implement a successful pollution-prevention strategy for mercury in septage, Ecology would need to identify which products contain mercury, and conduct outreach and education on safer alternatives or proper disposal where possible.

Ecology uses its Biosolids Management Guidelines to make decisions on permit conditions.

The Draft MCAP Recommended the Following Actions

Proposed, Mid-term
Provide outreach material to septic pumping firms for distribution to customers.

Public Comments

Org-15: Human waste containing mercury is obviously the primary consistent source of mercury in septic systems. The other sources would generally be intermittent. Again, the only effective strategy to reduce this mercury source is through a legislative ban of the use of mercury amalgams as a dental restorative material.

Ecology's Review and Analysis of Public Comments

The one public comment proposed a ban on mercury amalgams.

Ecology's Conclusions

Because septage is wastewater and is ultimately discharged to POTWs, the comments provided for the previous discussion are relevant here.

Comments Related to Sewage Sludge Incinerators

The Draft Mercury Chemical Action Plan stated

In sewage, mercury tends to combine with sludge, rather than remain ambient in water. When the sludge is incinerated, mercury may be released with stack emissions. Mercury not released may remain in ash. In the past at least one facility has give it away as free fill, but the ash should be going to a municipal solid waste landfill. It may be stored on site temporarily. Anacortes, Bellingham, Edmonds, Lynwood, and Vancouver have sludge incinerators

U.S. Filter in Vancouver reports mercury emissions dated 96/05/29-30 as 25.9 g/day from their incineration of sewage sludge.

Table 9. Sewage Sludge Incinerated in 2000

Facility	Dry Tons Incinerated		
Anacortes WWTP	604		604
Edmonds WWTP	2,674		2,674
LaConner WWTP, Skagit Co SD #1	8	at Bellingham	
Longview Fibre Company	125		125
Lynnwood WWTF	1,843		1,843
North Bend WWTP	95	at Edmonds	
Post Point WWTP- Bellingham	3,806		3,806
Skagit Cnty Sewer Dist #2 WWTP	7	at Bellingham	
Sumner WWTP	57	at Edmonds	
Vancouver Westside TP	6,827		6,827
Whatcom Cnty Water Dist #13 TP	13	at Bellingham	
		TOTAL	15,879

The Draft MCAP Recommended the Following Actions

Any pollution prevention programs designed to keep mercury out of sewage will result in lower emissions from sewage sludge incinerators.

Public Comments

Org-27: It is appears that the total mercury emitted from sludge incineration is markedly over-estimated (see Table 15 - page 117). It is recommended that mercury from incineration be based upon stack testing data and ash analysis. Table 15 indicates that 34.39 pounds of mercury were emitted in stack and ash from Vancouver's POTW incinerator. We believe that the number is closer to 15 to 20 pounds.

a. Emissions from incinerators can easily be calculated using stack testing data and number of hours an incinerator operated in one year. for instance, in 2000, the City of Vancouver's

certified stack emission for the Fluidized Bed Furnace (FBF) was 0.005 lb/hr [2.27 gram/hr] and stack emissions from the Multiple Hearth Furnace (MHF) were 18 mg/minute [0.432 gram/hr]. Using burn times reported under the Air Discharge Authorizations, [FBF = 1,235.8 hr; MHF = 3,824.4 hr) a total of 15.3 lb/yr were emitted from incineration of the sludge. Less than 0.4 lb/yr of mercury was contained in the ash from the incinerators. Thus a total emission from incineration was approximately 15.7 lb/yr. This actual number is less than half of the Table 15 value for mercury "emitted" by Vancouver's POTW incinerator.

b. The MCAP methodology appears to calculate mercury emitted via incineration using 2.24 ppm mercury in sewage sludge fed to the incinerators for each city, regardless of whether they provided actual data. For example, the City of Lynnwood, provided mercury data for their sludge indicating an average concentration of 1.02 ppm. The City of Vancouver's average concentration of mercury was 1.72 ppm. Yet a mercury concentration of 2.24 ppm was uniformly applied to all incineration operations.

   The MCAP also appears to use a long ton instead of standard ton or metric ton when calculating mercury emitted (2,240 lb/ton conversion was used in calculations). We are not aware of any Cities that use a "long ton" when reporting the amount of sludge processed. Metric tons are used in reporting under 40CFR 503, but Table 12 for biosolids uses 2,000 lb/ton when calculating the mercury emitted to the environment from applied biosolids.

   For Vancouver's POTW incinerator, these two assumptions result in an estimated mercury "emissions" of 34.39 lb/yr. Using actual City data and correct (or consistent) conversion for pounds/ton, the City calculated mercury "emissions" of 21.45 pounds/year using the MCAP methodology or approximately 62% of the figure reported in Table 15.

PubMtg: Stephanie Marvin, Dentist. Comment made at the September 26, 2002 *Draft Mercury Chemical Action Plan* Public Forum in Tacoma:

The Assn. of Metropolitan Sewerage report – WSDA does not agree with this report. WSDA believes the King County studies are more accurate. Two additional weaknesses I see with the draft plan

- There needs to be a mandate that the incineration of biosolids be eliminated.
- Mandate that dentists refrain from disposing amalgam in red bag medical waste.

Ecology's Review and Analysis of Public Comments

The key suggestions were to eliminate sludge incineration (no reasoning provided) and to alter the way the draft calculates mercury loads for sludge incineration. These suggested changes include using stack tests to estimate the mercury loads associated with sludge digestion, and using alternative values for the concentration of mercury in incinerated sludge.

Ecology's Conclusions

The use of stack test results to estimate mercury loads from sludge incineration is inadequate as it would not account for the mercury retained in fly ash and bottom ash. Because mercury is neither created nor destroyed when sludge is incinerated, using the mercury concentrations

associated with sludge fed to incinerators to estimate the mercury associated with incinerating sludge accounts for the mercury in ash as well as air emissions.

The second set of suggestions for improving the loading calculations are well-taken and have been incorporated into calculations used in the final MCAP. These calculations, which are summarized in Table 19, estimate an annual load of 32.5 lbs Hg/yr.

Comments Related to Steel Recyclers

The Draft Mercury Chemical Action Plan stated

Scrap metal is often contaminated with mercury, as mercury is used in auto switches and other equipment recycled in electric arc furnaces in steel mills.

Birmingham Steel reported a release of 0.7 pounds of mercury through air emissions in the 2000 Toxic Release Inventory.

The Draft MCAP Recommended the Following Actions

Proposed, Short-term
Evaluate regulatory and voluntary programs for removing convenience mercury switches from vehicles.
Work with steel recyclers and other stakeholders to develop comprehensive auto and appliance switch removal program.

Public Comments

No comments were received for this category.

Ecology's Review and Analysis of Public Comment

No comments.

Ecology's Conclusions

In the final MCAP, Ecology made the following recommendation:

Proposed, Short-term
Evaluate regulatory and voluntary programs for removing convenience mercury switches from motor vehicles prior to recycling/re-melting of scrap steel.

Comments Related to Crematoria

The Draft Mercury Chemical Action Plan stated

There are 66 crematories in Washington;[37] none of them are currently permitted by the Department of Ecology.

The United Kingdom estimates that the average body contains 4.9 grams of mercury; Sweden estimates the amount at 4.4 grams. Mercury in human bodies is contained primarily in dental fillings (SOURCE?). Cremations account for approximately 11% of all mercury emissions in the UK and 32% of mercury emissions in Sweden. Fifty-nine percent of deaths are cremated in Washington State, compared to 26% nationally. Using the British estimate for average mercury in human bodies, approximately 57 pounds of mercury are released in Washington annually through crematory stack emissions. Crematories are not regulated for mercury.

The Draft MCAP Recommended the Following Actions

Proposed, Mid-term
Work with the crematory industry in a collaborative approach to identify the most productive way to reduce mercury emissions from crematoria.
Test stack emissions from crematoria to develop better data on mercury releases.

Public Comments

Org-15: Research European methods of reducing mercury vapor emissions, from crematoria. Switzerland mandates selenium filters which reduce mercury vapor emissions by 85%. *Comment:* Crematoria, like POTWs, should be concerned that they are faced with the shifting of cost responsibilities for mercury toxic waste from dentists to them.

Org-15: Page 116: Table 14. *Comment:* Why does this table use 1 gram of mercury as the amount released per cremation? On page 80 the Plan quotes studies from the United Kingdom and Sweden which estimates, respectively, 4.9 grams and 4.4 grams, as the average amount of mercury in a human body at the time of cremation. This comports with statistics which show the average dental filling contains .5 grams of mercury (Directions For Use, Caulk Dentsply) and the average American adult has 8-10 amalgam dental fillings (i.e. 4-5 grams).

The Plan's use of the erroneous 1 gram figure underestimates the amount of mercury from crematoria fivefold, i.e. rather than 57 pounds per year, it is closer to 250 pounds per year, a tremendous amount of toxic mercury.

Org-18: We are appalled and outraged at the possibility that The Department of Ecology may cause us to participate in the mutilation of deceased individuals if the removal of amalgam fillings becomes a reality! Make no mistake, we do consider the removal of fillings to be an act of mutilation, as would any person of integrity! Our deceased are not garbage to be so ruthlessly

[37] http://www.cremationassociation.org/docs/00data-projtest-new.pdf, 3/28/02.

pillaged! They are individuals and families love them! We can't believe any dentist with integrity would willingly pursue the job (which leaves the field wide open for those dentists of doubtful integrity!) And where is the funeral home to deposit these potentially hazardous nuggets? And you expect the families of the deceased to pay someone to mutilate their loved ones? Any what of the hundred thousand burials out there whose decomposed fillings re leaching into the ground? Are we eventually going to have a state imposed gang of grave robbers, employed to dig up an take the fillings? The whole proposal is disgusting and yet, we are ecology minded. Surely, Department of Ecology can put their thinking caps on and come up with a less repulsive idea! We urge you to consider carefully the impact on our society, our industry and the individuals you say you are trying to "protect" with your proposals, rules and regulations. This one is outrageous!

Org-29: As I testified at the Forum held in Tacoma, we believe the amount of Mercury released into the atmosphere from cremation has been overstated in your estimates. We, also, feel that elimination of cremation as a method of disposition within our state is not an alternative, since nearly 60 % of our population is now choosing that as a disposition of choice.

Org-29: There is no "practical" way to remove dental fillings from the teeth of deceased individuals after death:

- It is a violation of funeral director and embalmer standards to mutilate a deceased human body after death; therefore the funeral director/embalmer cannot remove dental fillings.
- Because most bodies that are cremated are not embalmed, the Department of Health regulations requiring a body to be refrigerated within 24 hours after death and remain refrigerated until disposition would require a dentist to remove the dental fillings while the body remains in the refrigeration unit.
- Refrigeration Units are not designed to allow a dentist to work within them.
- It is cost prohibitive for families to pay a dentist to come to a funeral home and remove dental fillings prior to cremation (if not impossible to find one willing to do it).
- Who knows which deceased persons have dental fillings containing Mercury? The funeral director doesn't know. They do not look inside the deceased person's mouth prior to refrigeration. The mouth is usually closed at the time of death and is very difficult to open, especially if there is "no embalming". The family may not know the type of dental work that has been done on their relatives. Dental records are not available to the funeral director.

Org-29: In the information provided to you with my testimony in the Tacoma Forum, there was a 1999 study that took place in Bronx, NY that was jointly funded by the Cremation Association of North America (CANA) and the Environmental Protection Agency (EPA). In this study the EPA determined the acceptable level of Mercury release would be .5 grams per hour. In the study the crematory was able to maintain approximately ½ the acceptable level. In a recent Washington State Department of Ecology Cremation permit application from White Salmon, WA, the DOE attempted to set the level of acceptable emissions at .05 milligrams per hour – a level that is unattainable under any conditions and with any current equipment available.

Org-29: We would ask the committee to remove crematories from any proposed legislation.

Org-33: Because crematoria are likely to be significant sources of mercury air emissions, Ecology should quantify the emissions and adopt regulations that reduce and prevent mercury air emissions from crematoria.

PubMtg: James Noel, Washington State Funeral Directors Assn. Comment made at the September 26, 2002 *Draft Mercury Chemical Action Plan* Public Forum in Tacoma:

The calculations used to determine the Hg load from cremations is based on flawed statistics. Also, I am most upset about Ecology going ahead and applying emission controls of 0.05mg/hour in a new crematory air discharge permit. These standards are not technically attainable.

PubMtg: Jeff Wilson, Funeral Director (Tefford's Chapel of the Valley/Crematory). Comment made at the October 3, 2002 *Draft Mercury Chemical Action Plan* Public Forum in Moses Lake:

I represent the crematoria. No one more shocked than me. Just heard about this issue one week ago. In our industry, we always thought of cremation as "clean decomposition". I don't see any answer. Consider the grieving family being asked to remove fillings.

There used to be a place to send pacemakers. Now there is nowhere. We have a huge problem in landfills – All those throw away batteries; what are we doing with those? Medical waste is huge problem as well. There is less amalgam used now. In future we won't have as many.

Our industry (funeral directors) don't have a clue. There's an upcoming district meeting and this will be discussed.

What are the barriers to removing amalgam fillings and using other substitutes? There is less amalgam used now. In the future we won't have as many.

Ecology's Review and Analysis of Public Comments

Some comments assert that the draft MCAP overestimated mercury loads from cremations; other comments assert underestimation. Representatives of crematoria expressed a high level of concern over any effort to remove mercury fillings prior to cremation. Differing opinions were offered on the feasibility of treating crematory emissions to decrease mercury emissions.

Ecology's Conclusions

Ecology has determined that the calculation of *Estimated Annual Mercury Releases from Dental Amalgam at Crematoria in Washington State* (page 125, Table 18 of the final MCAP) is based on a 1 gram estimate that was compiled by EPA in a review of German, Swiss, and British data, not solely British data as indicated on page 92 of the final MCAP.

The MCAP raises the option of testing stack emissions from crematoria to develop better data on mercury releases. It further recommends working with the crematory industry in a collaborative approach to identify the most productive way to reduce mercury emissions from crematoria.

Comments Related to Recycling and Disposal of Products Containing Mercury as Hazardous Waste at Household Hazardous Products Facilities

The Draft Mercury Chemical Action Plan stated

The following household hazardous waste facilities are listed in the recycling database as accepting mercury products. This does not necessarily include fluorescent lamps.

County	City	Name and Location of HHW Site	Address and Phone
Adams	Othello	Bruce Transfer Station	Lucy Rd 509-488-6171
Adams	Ritzville	Ritzville Transfer Station	Danekas Rd 509-659-1540
Asotin	Clarkston	Asotin County Landfill	2901 6th Ave 509-758-9230
Benton	Richland	Richland Landfill	Hwy 240, 3 miles NW of Richland 509-942-7498
Clark	Vancouver	Central Transfer and Recycling Center	11034 NE 117th Ave 360-256-8482
Clark	Vancouver	West Van Materials Recovery	6307 Lower River Rd 360-737-1727
Franklin	Pasco	Household Hazardous Waste Facility	Basin Transfer Station, 1721 Dietrich Rd 509-547-2088
Grays Harbor	Aberdeen	Central Transfer Station	4201 Olympic Hwy East at Transfer Station 360-533-1251
Island	*Camano Island*	*Camano Island Transfer Station/Recycle Park 75 E. Camano Hill Road*	*360-387-9696*
Island	Coupeville	Coupeville Landfill/Recycle Park	630 West State Hwy 20 360-678-0504
Island	Langley	Bayview Transfer Station	5790 S Kramer Rd 360-321-4505
Island	Oak Harbor	Oak Harbor Transfer Station	3155 N. Oak Harbor Rd 360-675-6161
Jefferson	Port Townsend	Jefferson County Moderate Risk Waste Facility	360-379-6911
King	Seattle	South Transfer Station	8100 Second Ave South 206-386-9790
Kitsap	Port Orchard	Kitsap County MRW Facility	Olympic View Ind. Park: 5551 SW Imperial Way 360-337-5777
Kittitas	Ellensburg	Kittitas County Moderate Risk Waste Facility 925 Industrial Way	509-962-7542
Klickitat	*Dallesport*	*Dallesport Transfer Station*	*136 Tidyman Rd* *509-773-4448*
Klickitat	Goldendale	Goldendale Transfer Station	Highway 142, west of town 509-773-4448
Klickitat	Roosevelt	Roosevelt Regional Landfill	Roosevelt Landfill 509-773-4448
Klickitat	White Salmon	BZ Corners Transfer Station	5 Fir Tree Rd 509-773-4448
Lewis	Centralia	Hazo Hut	Across St. from 1411 S. Tower Ave 360-740-1221
Okanogan	Okanogan	Okanogan Cty Central Landfill Recycling	240 B&O Rd North 509-422-4530
Pend Oreille	Ione	North County Transfer Station	1712 Sullivan Lake Rd 509-442-3051

The Solid Waste Program encouraged local governments to submit proposals for mercury reduction projects as part of the CPG grant program in 2002. Five proposals for mercury reduction projects were funded.

The Draft MCAP Recommended the Following Actions

Ongoing
Make funding available for local governments to increase collection of mercury products through CESQG grants.

Public Comments

Org-9: Develop a safe method for improving the safety of mercury disposal and require manufacturers of mercury products to help pay for safe mercury-disposal systems.

Ecology's Review and Analysis of Public Comments

Ecology generally concurs with this comment. The legislative principles outlined in the final MCAP (Chapter 3, pages 49-50) also endorse the concept that manufacturers of mercury-containing products develop plans for and ensure the success of collection systems through whatever mechanisms they choose. Some manufacturers, such as thermostat manufacturers, for example, have created the Thermostat Recycling Corporation – which creates a mechanism where mercury-containing thermostats can be collected and the mercury recycled or retired.

Ecology's Conclusions

In the final MCAP, Ecology made the following recommendation:

Ongoing
Make funding available for local governments to increase collection of mercury products through Coordinated Prevention Grants.

Comments Related to Mercury Retirement

The Draft Mercury Chemical Action Plan stated

A considerable amount of effort is being spent to prevent mercury's release to the environment by collecting it from products for recycling. Large stocks of elemental mercury currently owned by the private sector, including recycling facilities, and the federal government and do not have, or soon will not have, a market in this country. There are questions about whether exporting large quantities of mercury to other countries is environmentally responsible. There is a need to develop a solution for the long term storage of elemental mercury.

Mercury collection programs are based on the need to prevent mercury's release to the environment. EPA considers elemental mercury to be a product. The price of elemental mercury has fallen considerably on the world market since the 1960's, making it more accessible to more groups of people. Anecdotal evidence points to widespread contamination of the Amazon River as a result of mercury used by gold miners.

As chlor-alkali plants close, large volumes of elemental mercury will come on the market.

The Department of Defense maintains the country's largest stocks of elemental mercury, 11 million pounds, in four facilities. DOD's current policy is to refuse accepting additional stocks of elemental mercury from the public for storage.

In February 2001, the Environmental Council of States (ECOS) passed a resolution calling on the Federal government to recommend a "long term storage plan" for mercury stocks.

On November 2, 2001, a joint letter was sent from the Association of State and Interstate Water Pollution Control Administrators, ECOS, the Association of State and Territorial Solid Waste Managers, the State and Territorial Air Pollution Program Administrators, and the Association of Local Air Pollution Control Officials to EPA Administrator Christine Todd Whitman, calling on EPA to work with state officials to develop an integrated approach to reducing mercury contamination. Such a strategy would include creating a stewardship approach for the safe, long term storage of elemental mercury.

On November 14, 2001, EPA Assistant Administrator G. Tracy Mehan, III, sent a memo to EPA Administrator Christine Todd Whitman, proposing that EPA senior managers develop policy recommendations on management of surplus mercury for her consideration.

Ecology staff will be participating in multi-state discussions on the creation of a national mercury repository.

The Draft MCAP Recommended the Following Actions

Ongoing
Work with the Quicksilver Caucus to develop proposals for long-term mercury management infrastructure.

Public Comments

Org-2: In this section, the report mentions the need for long-term storage of mercury. The Alliance supports this position as it makes little sense to gather mercury from products only to risk its release by putting it back into commerce. The U.S. House of Representatives is considering legislation to ban the use of thermometers containing liquid mercury and require a national plan for mercury stockpiling and disposal. This would be companion legislation to Senate bill S. 351. The Alliance encourages this effort and asks state regulators to urge the House to pass this type of legislation.

Org-2: The need for long-term storage of mercury should be addressed by state regulators urging the U.S. House of Representatives to pass companion legislation to Senate bill S. 351.

Org-33: Ecology should support the long-term storage and containment of government and industry stockpiles of elemental mercury and urge federal acceptance of surplus mercury from the chlor-alkali industry pending a permanent retirement solution, and related proposed federal legislation.

PubMtg: Judy Johanason, Pacific Northwest National Laboratory. Comment made at the October 3, 2002 *Draft Mercury Chemical Action Plan* Public Forum in Moses Lake:

Particularly interested in idea in removing Hg from product use

- Good idea to have a repository
- Excited about suggestion to include mercury in Universal Waste Rules – including labs
- *Cost:* Mercury is expensive to deal with. Minimum bill is $400/drum to get rid of it.

Hope that the "quicksilver" group will bring full weight to bear on this

Ecology's Review and Analysis of Public Comments

There seems to be a consensus on the need to establish a national mercury repository to provide for the long-term storage of mercury.

Ecology's Conclusions

In the final MCAP, Ecology made the following recommendation:

Ongoing
Work with the Quicksilver Caucus to develop proposals for long-term mercury management infrastructure.

Mercury in the Environment

Comments Related to Mercury in the Air

The Draft Mercury Chemical Action Plan stated

Washington State has two monitoring stations as part of the National Atmospheric Deposition Program Mercury Deposition Network. One station is located at the Hoh Ranger Station in Olympic National Park and the other is located in Seattle. Both are operated by Frontier Geosciences, Inc.

Public Comments

Org-3: Air deposition. Focusing on the fish-to-human route of exposures, if DOE finds that air deposition is important for fish mercury contamination, it should look for sources of mercury air emissions within the State and determine to what extent those emissions contribute to depositions within the State. If DOE determines that releases from landfills are important sources of mercury it should estimate the amount of mercury that will volatize from landfills and that might leach from landfills.[38] Importantly, DOE should also try to estimate the extent to which emissions originating outside the State contribute to mercury depositions to relevant aqueous environments within the State. Those emissions could be substantial, yet there may be little the State can do on its own to manage those emissions. In the latter situation, Washington State's only recourse may be to encourage federal, regional and international control measures and/or to manage risks through fish advisories.

Org-23: Need monitoring station on Washington-Idaho border. Current locations fine for monitoring Asian emissions but reflect nothing of the State of Washington.

Ind-6: It does not surprise me that recycled mercury is being sold to China. How ironic. We are directly in line to receive it back via clouds and rain.

[38] In the draft Mercury CAP, DOE suggests that mercury disposed in the landfills might volatize and be released with methane. It might be important to know, for example, the rate of release of mercury from different products such as amalgam fillings that are placed in landfills (DOE identifies amalgam sent to landfills from dentist offices as a source of mercury that may need to be controlled) or whether elemental mercury binds to other metals in a landfill, thereby preventing their release. DOE should make an attempt to estimate what percentage is actually released through volatization or seepage to the ground water. EPA's Mercury Report to Congress concluded that total emissions from municipal solid waste landfills was only .05 % of the total manmade sources of mercury emissions or 162 pounds annually. This is a *national estimate*. Similarly the 2002 New Jersey Mercury Task Force Final Report concluded that low concentrations of mercury in landfill gas argues that no efforts to control this source are necessary at this time. DOE makes no attempt to correlate its estimated 1733-3356 pounds from a variety of products disposed of in landfills with the EPA emissions estimate. Instead the report states "the fate of mercury in disposed products is unknown" and the recommended action for products containing mercury is to "draft legislation that will seek to reduce the use and release of mercury in products in Washington state".

PubMtg: Nancy Witte, Safe Food Fertilizer (SFF). Comment made at the October 3, 2002 *Draft Mercury Chemical Action Plan* Public Forum in Moses Lake:

Why go after solids instead of the air - air pollution of mercury is worse
The Japanese deal with mercury and arsenic all the time – have you done similar studies?
The controls Ecology is proposing are on solids – why not use same approach as Japanese?

Ecology's Review and Analysis of Public Comments

Ecology generally concurs with the comments about mercury in the air.

Ecology's Conclusions

Air-monitoring stations and air-monitoring projects require available funding mechanisms. Although funding is not available at the present time, Ecology will continue to pursue opportunities when applicable and available.

Comments Related to Mercury in the Water

The Draft Mercury Chemical Action Plan stated

Thirty sections of a total of ten waterbodies in Washington State exceed water quality standard for mercury. These have been placed on the 303(d) list, the list of waterbodies failing to meet the state's water quality criteria.

Inner Bellingham Bay and Whatcom Waterway
Port Gardner and Inner Everett Harbor
Bear-Evans Creeks
Inner Budd Inlet
Inner Commencement Bay
Outer Commencement Bay
Duwamish Waterway and River (5 sections)
Dyes Harbor and Port Washington Narrows
Eagle Harbor
Elliot Bay
Franklin D. Roosevelt Lake
Green River (3 sections)
North Hood Canal
Central Puget Sound
Sinclair Inlet
Springbrook (Mill) Creek
Snohomish River
White (Stuck) River
Yakima River (5 sections)

Public Comments

Org-3: *Direct releases to water.* For the fish-to-human route of exposure DOE might find that direct releases to surface water significantly contribute to mercury in aqueous environments. Important sources of those direct releases could be old mining operations within the State or in neighboring states. It is possible that old mining operations could contribute more mercury to relevant aqueous environments than do atmospheric deposition. Therefore, DOE should investigate the direct release of mercury to waterways from old mining operations as well as from other potential sources (such as solid waste landfills or land application of sewage sludge) and determine the level of risk posed by those sources of mercury. It is likely that much of that information has been collected and is available to DOE. If it finds important direct releases of mercury to relevant aqueous environments, DOE might take directed action to limit those specific releases.

Org-6: One example is the failure to include information collected and analyzed in the June 2002 draft report prepared by the Puget Sound Water Quality Action Team on Status Trends and Effects of Toxics Contaminants in the Puget Sound Environment. The report states that water column samples measured for mercury collected in King County and in three major Puget Sound

regions (Cherry Point, March Point and Commencement Bay) were well below the state water quality criteria for mercury despite effluent data from wastewater treatments showing that effluent limits for mercury are occasionally exceeded. Similarly samples taken for selected marine mammals show levels consistent with levels found in mammals from other remote marine waters that might indicate that national and global sources are having the greater impact on marine mammals than local sources.

Ecology's Review and Analysis of Public Comments

Ecology is currently evaluating abandoned mining operations as funding is available to investigate these sites. Difficulties associated with investigating abandoned mines for water quality and other environmental impacts include the remoteness of these sites, unknown and unquantified physical dangers associated with abandoned mining operations, and determining who owned, operated, or managed abandoned mining facilities several years ago.

The draft report prepared by the Puget Sound Water Quality Action Team, entitled *Status Trends and Effects of Toxics Contaminants in the Puget Sound Environment,* has been significantly revised since the June 2002 draft. Among other things, the report currently makes the following recommendations regarding water quality in Puget Sound:

1. Conduct marine water monitoring programs for metals and organic contaminants to track changes in environmental health and success of source control programs.
2. Reassess the chemistry and toxicity of the sea-surface microlayer.
3. Investigate the bioavailability of sea-surface microlayer metals and develop sea-surface microlayer screening benchmarks specific to Puget Sound.
4. Investigate the potential for sea-surface microlayer contaminants to affect intertidal organisms.

Ecology's Conclusions

Over the long-term, Ecology plans to work with federal government agencies and the Washington State Department of Natural Resources to focus specifically on potential mercury releases in their assessments of abandoned mines for clean up. One ongoing action by Ecology is prioritizing abandoned mines as potential toxic waste cleanup sites.

In addition, over the long-term Ecology plans to incorporate many the recommendations made in the report, *Status Trends and Effects of Toxics Contaminants in the Puget Sound Environment,* into future monitoring plans and programmatic implementation plans.

Comments Related to Mercury in Sediment

The Draft Mercury Chemical Action Plan stated

In 1991, Ecology adopted the Sediment Management Standards (Chapter 173-204 WAC). To date, Washington remains the only state with adopted standards for sediment quality. The Sediment Management Standards address three major points:

1. Procedures for cleanup of historic sediment contamination
2. Procedures for preventing future sediment contamination from discharges
3. Standards for defining sediment contamination

Public Comments

Org-20: The CAP states that "reducing mercury in fish will reduce most people's exposure." It is interesting then that one of the most direct routes of mercury exposure for fish, that from historically contaminated sediments, is not addressed as a source of mercury, and no recommendations are given for how to decrease this exposure from contaminated sediments. The issue is recognized in the overview of laws and regulations regarding mercury, and on pg. 89, the CAP states *" The Toxics Cleanup Program has identified the cleanup of PBTs and abandoned mine cleanup as two of six major challenges the program will continue to face in coming years"* But nowhere in the plan are those challenges identified or solutions offered. It assumes that the current system will meet the goal of reducing the contribution of existing sources of mercury.

Ecology's Review and Analysis of Public Comments

Contaminated sediments are known to cause adverse effects to fish and shellfish, humans, and the environment. Cleaning up sediment sites is often more costly and complex than cleaning up land sites. To compound the problem, pollution discharges continue to impact and/or recontaminate sites.

There are approximately 134 sites with sediment contamination in Washington. Investigations and cleanup activities are completed or in process at over 120 of these sites, which average approximately 27 acres each. The predominant source of contamination comes from industrial activities (52%), followed by Navy and shipyard operations (20%), followed, in turn, by combined sewer overflows (13%), stormwater (10%), and spills (5%). Sediment sites contaminated with mercury include portions of Bellingham Bay (including Whatcom Waterway), Eagle Harbor, portions of Lake Union, the Lower Duwamish Waterway, and the Puget Sound Naval Shipyard.

Several years ago, Ecology's Toxics Cleanup Program added technical staff to focus on sediment contamination and cleanup, which increased the program's capacity to clean up contaminated sediment sites. Bolstered technical support included updating sediment management standards based on current scientific information, maintaining the sediment information database, participating in a multi-agency effort to select and construct a disposal facility for contaminated sediments, and implementing guidelines for disposing of relatively clean sediments.

Contaminated sediment sites can be a major source of PBTs. Contamination at these sites is often old, and finding the source and owner/operator is often difficult.

Ecology's Conclusions

Ecology will continue to pursue sediment cleanup as part of the ongoing activities of the Toxics Cleanup Program.

Comments Related to Mercury at Toxic Waste Cleanup Sites

The Draft Mercury Chemical Action Plan stated

Until very recently, Ecology's Toxics Cleanup Program has not consistently tracked mercury as an individual contaminant at cleanup sites. As a result, Ecology does not have comprehensive records on which toxic waste cleanup sites have or have had mercury contamination. The Toxics Cleanup Program is moving to a system that will require reporting to a level of detail such that mercury can be tracked (PRO 840 Handling Environmental Data Submittals). Special efforts would be required to identify the sites statewide where mercury has been a contaminant and to populate the new data fields.

Based on an informal survey of project coordinators in August 2000, the Toxics Cleanup Program identified a partial list of the sites in Table 10 as having mercury or multiple PBTs.

Table 10. Partial List of Specific Sites that Have or Had Mercury as of August 2000:

Site name	City	Contaminants	Status
Cameron	Yakima	Multiple PBTs	Cleaned up
Eagle Harbor	Bainbridge	Benzo(a)pyrene, mercury	Cleaned up or in process of clean up
Former Lake Hills Sewage Treatment Plant	Redmond	Mercury, PCBs	Cleanup complete. Excavation and off-site disposal.
Georgia Pacific	Bellingham	Mercury	Remedial Investigation, some cleanups completed, some in process
King County Metro Lake Union site	Seattle	Benzo(a)pyrene, mercury	Cleanup in progress. Excavation and off-site disposal at a subclass C landfill.
Lake Union	Seattle	Dieldrin, benzo(a)pyrene mercury, PCBs	Pre-Remedial Investigation stage, waiting to be cleaned up
Lower Duwamish Waterway	Seattle/ Tukwila	PCBs, Benzo(a)pyrene, furans, mercury, hexachlorobenzene	Remedial Investigation/Final Studies planned
Martin Airfield	Walla Walla	Agricultural chemicals	Cleaned up
Noble Metals'		Mercury	Remediation complete
Puget Sound Naval Shipyard OUB	Bremerton	PCBs, mercury	Process of clean up
Wenatchee Tree Fruit Research Station	Wenatchee	Multiple PBTs	Cleaned up
Western Farm Services	Pasco	Agricultural chemicals with PBTs	Remedial Investigation
Weyerhaeuser	Longview	Mercury	Majority of mercury on site removed, final studies under review
Whatcom Waterway site	Bellingham	mercury in sediments	draft cleanup action plan in development, proposes containment/possible treatment
Wood Industries		Multiple PBTs	Cleaned up

Public Comments

Org-9: Identify hazardous sites and begin a clean-up program.

Org-20: It is also important to recognize the challenges to cleaning up mercury-contaminated sites to inform the legislature. In order to help understand the impacts of their decisions to programs that contribute directly to the success of this phase-out strategy, it is critical that they understand the full extent of the mercury problem.

Org-20: The biggest challenge we've identified is the ability for Ecology to oversee progress and assure adequate cleanup plans when limited by shrinking state and federal funding, and growing demands on the state's dedicated account for toxic control.

Org-20: When this account was created under the Model Toxic Control Act, it is unlikely that revenue calculations predicted the current needs of Ecology's Toxic Cleanup Program. For example, it could not have foreseen the dramatic rise of drug lab cleanups, or the need to address area-wide arsenic contamination. It was also created when the federal Superfund was a healthier funding source. Because of these growing challenges to state resources, the amount available to actually clean up sites contaminated with mercury and other PBTs is in jeopardy. Ecology must aggressively pursue other revenue sources and maximize cost recovery at current sites to ensure cleanups happen on an urgent timeline

Org-20: In order to track the progress and better understand the challenges of individual sites, as part of this action plan Ecology should also track the estimated amount of mercury at each site, and report yearly the status of the cleanup, and the amount of mercury that has been removed or isolated at each site.

Org-33: Mercury-contaminated sediments and toxic sites around the state are the best example we have that show how the current approach to regulation has failed the environment and public health. The CAP does not adequately characterize the extent of the mercury clean-up problem we have and provides no plan of action. Ecology should provide details on mercury contaminated sites including but not limited to the Duamish, Commencement Bay, and Bellingham Bay. Ecology should also track the estimated amount of mercury at each site, and report yearly the status of the cleanup, and the amount of mercury that has been removed or isolated at each site. Finally, because of a reduction in Model Toxics Control Act clean-up funds projected in the upcoming years, Ecology should aggressively pursue additional source of revenue or increases in existing hazardous-substance taxes to ensure cleanups happen on an urgent timeline.

Wash-PIRG, Ind-1, Ind-4: Clean up abandoned mines that are leaching mercury into the environment.

PubMtg: Robin Solash, The Evergreen State College (TESC) Student. Comment made at the September 26, 2002 *Draft Mercury Chemical Action Plan* Public Forum in Tacoma:

What is the plan to address Hg at Superfund sites? The President has cut Superfund dollars.

PubMtg: Jim Dawson, People for Puget Sound. Comment made at the September 26, 2002 *Draft Mercury Chemical Action Plan* Public Forum in Tacoma:

Thanks for work done thus far on MCAP. People for Puget Sound will submit written comments later. I question why so much is voluntary. This shows a lack of commitment. Mixing zones is a tool that does not work for PBTs. We need stricter "end-of-pipe" treatment. One source that needs more detail is historical sources – there are no recommendations for cleanup efforts. This is critical to include against the backdrop of federal Superfund dollars going dry.

Ecology's Review and Analysis of Public Comments

Ecology recognizes that there are many concerns about past historical releases of mercury into Washington's environment from abandoned mining activity, past industrial releases, and historical releases from a variety of non-point sources. The MCAP is designed primarily to focus on "pollution prevention" rather than emphasize historical sediment, soil, and groundwater pollution problems.

Washington's Model Toxics Control Act became law in 1989 with passage of Initiative 97. The purpose of the act was to establish a cleanup law and provide funding to clean up contaminated sites, improve management of hazardous wastes, and prevent future contamination through pollution prevention. From this law, Ecology's Toxics Cleanup Program (TCP) was founded. The main purpose of the TCP is to get and keep contaminants out of the environment. Using money from the fund established by the act, TCP has identified more than 9,000 contaminated sites in Washington. Of those, nearly 5,000 sites require no further action as of 2003.

Sites documented as contaminated with mercury are being addressed by TCP using the authority of the Model Toxics Control Act. Many cleanups of mercury-contaminated sites are already under way or completed, as pointed out in Table 10 above. Many of the remaining mercury-contaminated sites will require long-term, costly cleanups before they can be completed.

Ecology's Conclusions

Ecology's Toxic Cleanup Program (TCP) has identified the cleanup of persistent, bioaccumulative toxins (PBTs) and abandoned mines as two of six major challenges TCP will continue to face in future years.

Until very recently, TCP has not consistently tracked mercury as an individual contaminant at cleanup sites. As a result, Ecology does not have comprehensive records on which toxic cleanup sites have or have had mercury contamination. TCP is moving to a system that will require reporting to a level of detail such that mercury can be tracked.

Ecology's existing contaminated-sites database (the Integrated Site Information System) has identified 36 counties with multiple sites contaminated with metals and priority pollutants affecting all environmental media (air, land, water). Mercury may be one of these metals and/or priority pollutants. Snohomish and Pierce counties have more than 100 sites potentially contaminated with mercury, while King County has 475.

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Mercury in the Food Chain

Comments Related to Mercury in Fish

The Draft Mercury Chemical Action Plan stated

Research and monitoring

1. "Public Health Assessment: Lower Duwamish Waterway;" Seattle, King County, Washington; Washington State Department of Health under a cooperative agreement with the Agency for Toxic Substances and Disease Registry

   Average and high dose exposures associated with fish consumption from the Lower Duwamish River were calculated for methylmercury and three other contaminants of concern for anadromous species (Chinook and Coho Salmon), bottomfish (English Sole), other finfish (Quillback Rockfish and Shiner Perch), and crab. Fish consumption rates were taken from a survey of the Suquamish Tribe and used to calculate the high-end dose estimate. The high-end consumption dose calculated for all salmon types was found to be 1.9 times higher than the oral reference dose for methylmercury. Because salmon are migratory fish, chemical concentrations are not thought to be site-related. The report also found relatively high levels of mercury in quillback rockfish in non-urban areas of Puget Sound compared to other species. Limited sampling indicated that both red rock and Dungeness crab contain elevated levels of mercury.

2. "Exposure Analysis of Five Fish Consuming Populations for Overexposure to Methylmercury" Washington State Department of Health, Environmental Health Programs; Olympia, Washington; January 2001.

   Report concluded that some Native American fish consumers are likely to exceed DOH's tolerable daily intake (TDI) for methylmercury based on a detailed analysis of fish consumption rates. The report also states that such overexposure to methylmercury needs to be reduced below the TDI by consuming a variety of salmon species in order to limit the amount of chinook salmon consumed. Chinook contain the highest levels of methylmercury of all the salmon species analyzed.

Public Comments

Org-1: The Pacific Seafood Processors Association represents commercial fish processing companies with facilities in Washington and Alaska. The reason for our keen interest is because in your draft Ecology states that the fish we market is contaminating women and children. We take exception to those comments and believe Ecology is acting in a way that is irresponsible to the State, consumers, and to the fishing industry. A few select fish can pose harm and EPA has done a responsible job of creating a balanced story to the public.

Org-1: The Ecology Mercury Chemical Action Plan cites the need to eliminate mercury from commercial purposes to stop contamination of fish, and therefore people. One must then ask the question how the MCAP will assist in this goal? The "fish" cited as essential to avoid for children and women of childbearing age by EPA, FDA and the WA Dpt. Of Health are shark, swordfish, tilefish, king mackerel, and tuna steak. WDOH cautions women of childbearing age and children should only eat limited amounts of canned tuna. But consumption of canned tuna is ok.

Org-1: Some local hot spots cause fish contamination related to historic industrial Mercury pollution. Ecology has a complete listing and analysis of these sites on record. Fish localized to these sites can show mercury contamination. The WDOH has identified these fish and provides warnings to recreational fishers. These sites are never used for commercial fishing. Surprisingly, the MCAP does not contain any action to address these local spots industrial spots nor the fish associated with these spots.

Org-7: I also think that the fish consumption advisories need to be more widespread. Most people are not aware that they need they need to limit their fish intake in order to reduce their mercury intake. There should be advisories on TV. There should also be advisories posted in grocery stores next to products that may contain mercury. There doesn't seem to be a big emphasis on community awareness and there should be. (*Emily Shultis)*

Org-33 and Org-34: The plan correctly states that one of the most common ways people are exposed to mercury is by eating mercury-contaminated fish. This exposure is of special concern for sensitive populations like pregnant women, young children, and populations who consume large amounts of fish, like Native Americans and Asians. EPA estimates that up to 1.16 million women of childbearing age eat enough mercury-contaminated fish to pose a risk of harm to their future children. Given the harm that eating mercury-contaminated fish poses, it is critical that Washington have a program to effectively monitor levels of mercury in fish, issue fish advisories in a timely manner, and communicate the risks to the public.

Unfortunately, the plan does not call for an evaluation of the effectiveness of Washington's current program. A thorough examination of this program is critical to ensuring that the health of consumers, especially the health of members of sensitive populations like pregnant women and young children, is protected. We urge Ecology to include a recommendation in the plan for Ecology and the Department of Health to conduct a review of the state's fish-advisory program to ensure that it effectively protects the public's health.

Org-34: Unfortunately, no where in the plan does it call for an evaluation of the effectiveness of Washington's current program. A thorough examination of this program is critical to ensuring that the health of consumers, especially the health of members of sensitive populations like pregnant women and children, is protected. We urge Ecology to include a recommendation in the plan for Ecology and the Department of Health to conduct a review of the state's fish advisory program to ensure that it effectively protects the public's health.

DOH's Review and Analysis of Public Comments

The comments provide widespread viewpoints on the issue of mercury in fish. The comments do not address the sub-section entitled *Fish* in the section "Mercury in the Food Chain" specifically but provide general input, such as the need to have an effective monitoring program in this state. Others suggest that the monitoring program requires evaluation, that hot spots of contamination need to be addressed, that advisories should be made more available (television broadcasts), that only a few fish are overly contaminated, and that the state policy on tuna is unclear.

DOH's Conclusions

Presently, the state Department of Health (DOH) does not have an advisory program for fish consumption, does not have a mandate to monitor fisheries, and does not have the money for either monitoring or developing fish consumption advisories. Current efforts are underway to obtain funding to create a comprehensive program for state fish concerns.

Many different steps have been taken to inform the public, industry, and the health care community in Washington State about the issue of mercury in fish. DOH has issued news releases with an accompanying question and answer fact sheet to all major news outlets in the state. Informational pamphlets on this issue have been developed and distributed. Furthermore, DOH has developed the "fish facts" website to help present a balanced message along with many resources and references (see www.doh.wa.gov/fish).

Additional steps include direct contact with medical, nursing, and other health professionals, and well as communication with these individuals through their organizations, schools and through the State Public Health Association. DOH has also communicated this information to both the public and the medical and nursing community through our system of Community Health Departments and Community and Migrant Health Centers.

The comment on tuna (canned versus steak) can be best clarified by understanding that deep ocean running tuna, such as blue fin from which we get steaks, are a different species from, for example, albacore, which is one type of canned tuna. Mercury concentrations in these two species from the family Scomberidae can differ as their diets, as well as their size, differ. The average albacore is 15 – 20 lbs, while Pacific and Atlantic blue fins can reach weights of 1000 and 2000 lbs, respectively. As a result, it is suggested that steaks be avoided, while canned tuna is recommended for consumption in limited amounts.

Ecology recently completed a study that evaluated level of mercury in fish tissue collected from 18 lakes and two rivers throughout Washington State: *Mercury in Edible Fish Tissue and Sediments from Selected Lakes and Rivers of Washington State* (Publication No. 03-03-026). This report is online at http://www.ecy.wa.gov/biblio/0303026.html.

Comments Related to Mercury in Fish-Eating Birds

The Draft Mercury Chemical Action Plan stated

No information has been identified regarding the effect of mercury on fish-eating birds in Washington State.

Public Comments

No comments were received for this category.

Ecology's Review and Analysis of Public Comments

No comments.

Ecology's Conclusions

More studies and research are needed regarding the concentrations of mercury in, and effects of mercury on, fish-eating birds in Washington State. Ecology is not aware of studies or data that evaluate the concentrations and impacts of mercury in birds. If future resources and funding become available, Ecology may have the opportunity to explore this issue with further study, but at the present time such resources are not anticipated.

Comments Related to Mercury in Fish-Eating Mammals/ Other Mammals

The Draft Mercury Chemical Action Plan stated

No information has been identified regarding the effect of mercury on fish-eating mammals in Washington State.

Public Comments

Org-7: I have noticed that the action plan seems to be mainly concerned with human consumption of fish because of the mercury content in these marine animals. I am concerned with the lack of information on other animals that may contain mercury and that will be consumed by humans. As a class we have searched for information on mercury contamination in plants, both marine and terrestrial, and animals, again both marine and terrestrial. We have found that not much research has been done on other organisms, with the exception of fish, as it pertains to mercury contamination. I am concerned with how your department is going to address these gaps of information and how you are going to attempt to get information on organisms other than fish and how these organisms can affect human health. (*Sheena Nash)*

PubMtg: Nancy Witte, SFF. Comment made at the October 3, 2002 *Draft Mercury Chemical Action Plan* Public Forum in Moses Lake:

We are dumping mercury on the soil, along with arsenic, cadmium, and at the same time our soil is lacking in selenium. It is difficult to find mineral sources for cows that are not mineral laden with mercury. You don't know what's in that grain. A veterinarian at the University of Kentucky has documented that animals are dying of cadmium poisoning from the feed. The whole supplementation issue with cattle is a disaster. Average dairy cow only lives 3-4 years instead of 7-8 years. This is an animal rights issue.

Ecology's Review and Analysis of Public Comments

Ecology agrees with the comment that the MCAP is mainly concerned with human consumption of fish. Few data are available regarding mercury contamination in other marine animals, although this could be an important issue for species like seals and orcas that consume large quantities of fish. If future resources and funding become available, Ecology may have the opportunity to explore this issue with further study, but at the present time such resources are not anticipated.

Ecology's Conclusions

More research is needed regarding the levels of mercury in, and effects of mercury on, fish-eating mammals in Washington. Ecology is not aware of any studies or data to evaluate mercury levels and mercury exposure impacts to mammals.

Comments Related to Mercury in Humans

The Draft Mercury Chemical Action Plan stated

With enough exposure, mercury as an element, or as any of its compounds, can affect health of humans and other animals. Mercury contamination is a worldwide problem. It can come from many sources. It occurs naturally in the environment in rocks, soils, water, and air. It may be released into the environment as a result of volcanic activity. Mercury also comes from industrial pollution, especially the burning of coal and other fossil fuels and from burning household or industrial wastes. Mercury compounds settle into sediments of lakes, rivers, and oceans, where bacteria convert the inorganic mercury compound to methyl mercury. Fish absorb methyl mercury from water as it passes over their gills. However, fish accumulate most of the methyl mercury that gets into their tissue from the prey they eat.

The most common way that people are exposed to enough mercury to cause them harm is through eating certain predatory, long-lived fish that have accumulated methyl mercury (an organic compound of mercury) into their tissues at levels above what the human body can handle. Mercury does not easily leave the body again either through the urine or feces, but tends to accumulate over time with continued exposure. Methyl mercury is slowly changed to inorganic mercury that stays for a long period of time in the central nervous system (primarily the brain).

Methyl mercury enters the brain readily, passing through the "blood-brain barrier" attached to an amino acid. It can also be carried to other tissues and is recirculated between the liver and intestine attached to a sulfur-containing compound (glutathione). It stays for a long-time.

Methyl mercury's primary toxic effect is on the brain. The developing brain is more sensitive to the harmful effects of methyl mercury, and the compound behaves differently in the adult brain. Other organ systems, especially the heart and blood vessels, are also affected by methyl mercury.

In the developing brain (of fetuses and infants) mercury affects all different cells within the brain and causes a general disturbance in both normal development and growth of the brain by interfering with cell division of neurons and the migration of neurons to various functional parts of the brain during development. In studies that looked at damage to young children in Minamata, Japan and in Iraq, this damage was manifested in delayed developmental milestones and changes in anatomy. In studies of fish-eating populations, effects were seen at even lower levels and were detected as functional damage, that is, in neuropsychological change that can be detected through tests of reasoning, reflexes, and behavior.

In the adult brain, there is a time period between exposure and the onset of symptoms, which can be weeks or months in length. Strange sensations ("pins and needles," numbness) are the first symptoms that appear at the lowest exposure dose. With continuing exposure and accumulation of mercury, changes in sensation that are processed through the cerebellum (which maintains balance and smooth functioning of muscles), difficulty in co-ordination of the muscles used in speaking, constriction of visual fields, and loss of hearing may follow. Some of these symptoms may result from the inability of some neural cells to repair initial damage because new proteins

cannot be made. Whether or not adults suffer damage depends greatly on whether individuals have inherent protective mechanisms such as whether or not they can make enough of certain molecules (glutathione) that can bind mercury and prevent it from interacting with neural cells.

Once in the brain, methyl mercury is changed to the inorganic mercury form, which seems to be the form that does the damage to the brain.

Studies of fish consuming populations in Finland have also shown statistically significant associations with risk of cardiovascular disease, especially increased progression of carotid atherosclerosis. In a study of 7-year-old children, elevation in both systolic and diastolic blood pressure was associated with increased exposure from mercury from their mothers consuming certain fish tissues and meats during pregnancy.

Of the concern that eating large amounts of certain fish that have accumulated methyl mercury either because they live a long time or have preyed on and eaten many smaller fish that have taken up mercury from smaller organisms, Washington Department of Health has issued a consumption advisory for women of child-bearing age. The Department of Health recognizes that fish is good food, that is low in fat, is a good source of proteins and certain fish oils that are good for the heart and cardiovascular system. Catching, cooking, and eating fish are important cultural and family practices. The Department of Health recommends that people eat a variety of fish and shellfish as part of a balanced, healthy diet.

Because of health concerns due to mercury in fish, women of childbearing age and children under six are advised:

- Do not eat any shark, swordfish, tilefish, king mackerel, or either fresh caught or frozen tuna steaks.
- Limit the amount of canned tuna you eat, based upon your bodyweight. Guidelines are:
    - Women of childbearing age should limit the amount of canned tuna they eat to about one can per week (six ounces). A woman who weighs less than 135 pounds should eat less than one can of tuna per week.
    - Children under six should eat less than one half a can of tuna (three ounces) per week. Specific weekly limits for children under six range from one ounce for a child who weighs about 20 pounds, to three ounces for a child who weighs about 60 pounds.

Public Comments

Org-3: DOE should characterize potential sources of mercury that may significantly contribute to significant routes of human exposures and identify control measures to decrease those sources.

Once DOE determines significant routes of human exposures it should determine what sources of mercury significantly contribute to those exposures and quantify those sources. For example, for the fish-to-human route of exposure, DOE should determine how mercury enters relevant aqueous environments, and determine and quantify potential sources of that mercury. That analysis should examine the potential for air deposition, direct releases to water and contributions by natural sources of mercury.

Org-15: Another serious health hazard to humans has been the use of mercury packaged with aluminum in vaccines. The mercury is used as a preservative (thimerosal) and needs to be removed from all vaccines. Parents of children with late onset autism are fighting for the removal of mercury from vaccines which they believe is responsible for autism. Because children under 6 months of age do not produce bile which helps remove toxins, their bodies retains mercury and it accumulates with each successive vaccine. The number of mandatory vaccines has increased, particularly over the past decade. No consideration is given for age, body weight or genetic predisposition to mercury poisoning. Gulf War soldiers were given 13 to 16 vaccines at once and have a long list of health problems labeled "Gulf War Syndrome." French soldiers did not get Gulf War Syndrome because they were not given vaccines with mercury as a preservative.

Org-15: There is no safe level of mercury in the human body. The most common way that people are exposed to enough mercury to cause them harm is from mercury amalgam dental fillings. (World Health Organization, Document 118, 1991, page 36).

PubMtg: Danielle Esposito, citizen. Comment made at the September 26, 2002 *Draft Mercury Chemical Action Plan* Public Forum in Tacoma:

Consider this a human rights issue. There is too much sympathy for industry. Ecology is always soft on industry.

DOH's Review and Analysis of Public Comments

Comments provided pertain to mercury in vaccines, a quote from the World Health Organization (WHO) on mercury toxicity from 1991, and the need for DOE to determine what sources of mercury are most responsible for contamination that lead to human exposures.

DOH's Conclusions

Thimerosal has been one of the most widely used preservatives in vaccines. It is approximately 50% mercury by weight and is metabolized or degraded to ethylmercury and thiosalicylate. Under the U.S. Food and Drug Administration Modernization Act of 1997, the FDA has compiled a list of products that contain mercury. This list is frequently updated as products listed are removed from production or are formulated without mercury.

Presently, all of the routine pediatric vaccines can be obtained without thimerosal [DTaP, Pneumococcal conjugate, Inactivated Poliovirus, Varicella (chicken pox), MMR (mumps, measles, and rubella), Hepatitis B, Hib (Haemophilus influenza type b conjugate) and Hib/Hepatitis B combination]. One of three DTaP vaccines being produced contains a trace amount [less than 1 microgram thimerosal per 0.5 ml dose (equivalent to less than 0.5 microgram of mercury per 0.5 ml dose)]. The same is true for Hepatitis B vaccines: one is free of thimerosal and one contains a trace amount.

The comment that references the WHO document quote is correct. There is no known benefit to the ingestion of (or exposure to) mercury in any of its forms. When WHO, as well as Washington State, derives Tolerable Daily Intake values, it is done with the understanding that

these intake values are tolerable but that steps should be taken to further reduce exposure. As a result, DOH is working with DOE and is in full support of the endeavors being put forth by DOE in their mercury-reduction efforts. Mercury-reduction efforts proposed in the MCAP address many mercury sources that have pathways leading to possible human exposure.

The federal Clean Water Act requires Ecology to identify waterbodies that fail to meet water quality standards and to prepare cleanup plans (Total Maximum Daily Loads or TMDLs), to improve a waterbody's health. Through a public process, DOE's Water Quality and Environmental Assessment programs work with local interests to reduce water pollution in waterbodies that are on the 303(d) list of polluted waters. Currently there are 30 waterbodies in Washington that do not meet water quality standards for mercury Ecology is responsible for (1) proposing and establishing conditions for specific discharge permits and nonpoint pollution management plans to reduce mercury (and other) pollution, and (2) developing a monitoring plan to evaluate the effectiveness of long-term cleanup of the impacted waterbody.

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Other Sources of Mercury Exposure

Comments Related to Other Sources of Mercury Exposure

The Draft Mercury Chemical Action Plan stated

Other sources of mercury exposure that could possibly occur include:

- Breathing vapors in air from spills.
- Breathing contaminated workplace air or skin contact during use in the workplace (dental, health services, chemical, and other industries that use mercury).
- Practicing rituals that include the use of mercury.
- Release of mercury from dental work and medical treatments.

During the spring of 2001, the state Department of Health (DOH) issued a fish-consumption advisory for women of childbearing age and children under age six due to high levels of mercury. The advisory states that these groups should avoid eating shark, swordfish, tilefish, king mackerel, or tuna steak. It also recommends limiting the amount of canned tuna consumed, depending on a person's weight. For example, a 135-pound woman should eat no more than a can (6 ounces) of tuna per week. Specific weekly limits of canned tuna for children range from one ounce for a child who weighs about 20 pounds to three ounces for a child who weighs about 60 pounds.

Too much mercury is not healthy for anyone, but children are particularly impacted. If exposed during fetal development or early childhood, mercury can cause central nervous system changes that affect a child's ability to learn. Since issuing the advisory, DOH staff has worked with representatives from populations of special concern to develop health messages and activities within their communities. DOH issued a news release and developed a question-and-answer fact sheet and a "fish facts" web site (www.doh.wa.gov/fish). In addition, DOH worked with the Washington State Public Health Association, local health departments, community and migrant health centers, and nutritionists from the Women, Infants and Children (WIC) Program.

Native Americans and Asian and Pacific Islanders in Washington may be at increased risk for mercury exposure, because they rely on fish as a key source of dietary protein. To address the potential for increased mercury exposure among these populations, DOH has focused action to communicate the advisory within these communities. These actions include presentations before the American Indian Health Commission, consultation with the Governor's Councils on Native American and Asian Pacific American Affairs, and discussion with several other key organizations and individuals from these communities.

From these discussions DOH has learned that, while communicating fish advisories is important, efforts to reduce mercury in fish are crucial for effective public-health protection.

It is important that messages reinforce the tremendous health benefits of eating fish while balancing those messages with specific warnings about mercury in certain fish. Fish is a healthy food, and the Department of Health recommends that people eat a variety of fish as part of a balanced diet. Health benefits of eating fish are:

- Fish is an excellent low-fat food, a great source of protein, vitamins, and minerals.
- The oils in fish are important for unborn and breastfed babies.
- Eating a variety of fish helps to reduce your chances of stroke or heart attack.

Shellfish: While the major source of methylmercury exposure in humans is consumption of fish, consumption of shellfish tends to contain much lower amounts than most predatory fish species. As stated by the EPA (EPA 1996), out of the top 10 most commonly consumed types of fish by the U.S. population, clams ranked as having the lowest mercury concentration. Regional data from Puget Sound Ambient Monitoring Program (PSAMP) and NOAA supports this notion. Methylmercury accumulates up the food chain, so that fish at the top of the food chain will have the most mercury in their flesh. Of these fish, the largest (i.e., oldest) fish will have the highest levels. Shellfish, which are generally filter feeders and low on the food chain, tend to have much lower levels of mercury compared with predatory fish and therefore their consumption is thought not to be of concern. Despite their relatively low levels, certain populations such as recreational and subsistence fishers who routinely consume shellfish may be at increased risk due to their high consumption rates.

EPA 1996. Mercury study report to Congress Volume VI: Characterization of human health and wildlife risks from anthropogenic mercury emissions in the United States. U.S. Environmental Protection Agency. EPA452/R-96-001f.

Public Comments

Org-1: The Pacific Seafood Processors Association represents commercial fish processing companies with facilities in Washington and Alaska. The reason for our keen interest is because in your draft Ecology states that the fish we market is contaminating women and children. We take exception to those comments and believe Ecology is acting in a way that is irresponsible to the State, consumers, and to the fishing industry. A few select fish can pose harm and EPA has done a responsible job of creating a balanced story to the public.

DOH's Review and Analysis of Public Comments

The comment provided (Org-1) also was provided in the section *Comments Related to Mercury in Fish.*

DOH's Conclusions

In the conclusions of that section (*Comments Related to Mercury in Fish*), we indicate that DOH has taken various steps to inform the public, industry, and health care community in Washington State about the issue of mercury in fish. This information deals with the dangers of mercury exposure as well as the benefits of fish consumption.

Education and Outreach

Comments Related to Education and Outreach

The Draft Mercury Chemical Action Plan stated

Focused education and outreach efforts are called for under many separate sections of this plan. The general public, the dental and health care communities, schools and certain industries, as well as state and local government agencies all have been identified as being important groups where education and outreach activities must be directed.

Principles of effective and equitable community education include the early involvement of representative members or key leaders and organizations that represent the particular group, in the development of educational goals, strategies and in setting criteria for success. Education and outreach activities proposed under this plan, shall be defined and where feasible, implemented and evaluated in conjunction with existing leadership and other stakeholders from within the particular community group, professional group, industry or agency to which it pertains.

For each targeted group, a brief plan that defines the goals, objectives of specified activities, and that contains criteria and plan for evaluation will be written. Costs and staff time associated for developing and carrying out these plans will be specified and funding secured (wherever possible.)

A key strategy for fomenting education at the community level is the CPG grant opportunities made available by Department of Ecology for mercury reduction work at the community level. Currently five counties are developing programs appropriate for their residents. These are:

Kittitas County – Mercury thermometer exchange project.
Yakima County – Purchase of a crusher for fluorescent tubes.
Kitsap County – Mercury fever thermometer exchange
City of Tacoma – Mercury fever thermometer exchange
Thurston County –Mercury phone survey and thermometer exchange

Additionally, the Department of Health will continue to expand their education and outreach efforts with health care providers and the public, regarding the statewide advisory for mercury in fish, and other fish advisories that exist or may occur. (See plan attached.) Nutrition consultants with the DOH Women, Infant and Child health program will continue to be instrumental to reaching young women and small children in the state, with this information.

Public Comments

Org-9: Provide the public with information about mercury contamination by providing product labeling and by publicizing the results of food testing, including that of both wild and hatchery fish.

Org-23: Yakima County's funding and purchase of bulb crusher is an extremely poor decision. According to the EPA, the act of crushing make one a TSD facility, and requires the appropriate paperwork to be in order to be such, and they risk potentially running into conflicts with WISHA employee exposure issues as all of the available bulb crushers are only rated to be safe for the handling of the reduced mercury containing bulbs.

Org-27: Given the role that pollution prevention approaches will need to play in getting mercury-added products out of the waste stream and wastewater system, outreach and education need to play key strategies among the MCAP recommendations. An overall outreach program focused on mercury, as well as other PBTs, should be a priority for the Department and the MCAP. The Summary of Recommendations chart (pages ix and x of the MCAP) does contain some education strategies that are linked to major and minor "sources" and there is a brief discussion of Education and Outreach on page 97, however, there is not a clear proposal for an integrated education and outreach effort program that covers strategies or encourages citizen or business actions that could make a difference.

Org-27: In Vancouver and Clark County we have already undertaken some activities, including a mercury thermometer exchange program in the spring of 2001 through a local retailer (Hi-School Pharmacy) along with the designation of our local "mercury awareness month" (see http://www.ci.vancouver.wa.us/ solidwaste/Mercury,%20Gazette.pdf). We are also currently completing a new interactive exhibit for our Water Resources Education Center that focuses on the topic of PBTs and mercury (we anticipate that this exhibit which is being developed with the support of Clark County and coordinated prevention grant (CPG) funding from Ecology will be ready in early 2003). Clark County worked with our transfer station facility operator in 2001 to obtain a fluorescent bulb crusher, and other mercury-related education efforts are being contemplated at the regional city-county level. In November 2001, the City worked with the Washington State Recycling Association and other local governments, including Ecology to offer a workshop in Olympia. A coalition of groups is providing special workshops around the state for the medical industry this fall and locally the Pacific NW Pollution Prevention Resource Center will be working with other partners (including Clark Public Utilities) to offer a local mercury reduction roundtable next week. There is a clear need to support as part of the MCAP regional and statewide outreach programs to support these efforts. Ecology and Department of Health's *Quicksilver Review* and other recent mercury-related publications are a good start in this direction. A key focus of outreach efforts should be on what individuals and businesses can do to reduce mercury releases and on creating broader awareness about how to reduce mercury exposure.

PubMtg: Linda Dennis, Smedes & Associates. Comment made at the October 3, 2002 *Draft Mercury Chemical Action Plan* Public Forum in Moses Lake.

Suggest DOH/DOE work with the media office to target Eastside. The west side of Washington is getting lots of attention and coverage, while the east side is not getting as much attention. Ecology and Health PIOs should target eastern Washington media sources to get the word out over here. The plan should be consumer friendly. Ecology/Health needs to explain why things are going to happen because people won't understand it. Also will funds be available to offset costs of changes?

Ecology and DOH Review and Analysis of Public Comments

Comments provided address ongoing outreach efforts by various groups, the need for further outreach, as well as the need for directed outreach towards eastern Washington. Other comments pertained to bulb crushers and the suggestion that product labeling should be provided along with publicized food test results.

Ecology and DOH Conclusions

As stated previously, many outreach efforts have been initiated and will continue into the future. To date, some of the steps taken have been to inform the public, industry, and health care community in Washington about the issue of mercury in fish. DOH has issued news releases with an accompanying question-and-answer fact sheet to all major news outlets in the state. In conjunction with the Women, Infant and Child Health Programs, informational pamphlets on this issue have been developed and distributed. DOH has developed the "fish facts" website along with many resources and references to help present a balanced message.

Additional steps include direct contact with medical, nursing, and other health professionals, communication with them through their organizations, schools, and the State Public Health Association. DOH has also communicated this information to both the public and the medical and nursing community through our system of Community Health Departments and Community and Migrant Health Centers. In providing these outreach efforts, DOH has been working with groups and individuals from both the east and west sides of the state.

Jurisdiction for food product labeling resides with agencies such as the United States Department of Agriculture and the United States Food and Drug Administration. Presently, Washington State is not involved with efforts to change existing requirements of labeling food items as they pertain to mercury.

Thermometer collection efforts conducted during February 2003 in King, Kitsap, and Thurston counties, and by the city of Tacoma, resulted in the collection of over 50,000 household mercury fever thermometers.

Ecology will review future grant applications that propose the use of bulb crushers by local governments to crush fluorescent lamp bulbs to ensure that the applicant is aware of, and will be able to comply with, appropriate regulations.

Comments Related to Research and Monitoring

The Draft Mercury Chemical Action Plan stated

The draft MCAP identified the following areas of ongoing research and monitoring that are either under the lead on Ecology or another agency:

Washington State Toxics Monitoring Program
Department of Ecology

The goal of the Toxics Monitoring Program is to investigate the occurrence and concentrations of toxic contaminants in edible fish tissue and surface waters from freshwater environments in Washington where contamination is suspected. The objectives of the program are to provide information about the level of toxic contamination in the surface water and edible fish tissue from freshwater lakes, rivers and streams that have not yet been monitored or where relevant data are greater than ten years old; to provide a screening level assessment of the potential for adverse effects of toxic chemicals on aquatic biota and other wildlife; to provide screening level information to the Washington State Department of Health that could be used to trigger additional studies for evaluating health risks associated with the consumption of fish; and to provide information for resource managers and the public about the status of toxics contamination in water and edible fish from freshwater environments in Washington.

Monitoring Program to Verify 303(d) Metals Listings for Selected Rivers and Creeks
Department of Ecology

In January 1998, Ecology, EPA, Northwest Environmental Advocates, and the Northwest Environmental Defense Center agreed to a cleanup schedule directing how Washington will improve the health of nearly 700 water segments on the 303(d) list. In light of this agreement, Ecology's Environmental Assessment Program has been reviewing the 1998 303(d) list to determine how to best address the various listings. During the course of this review, 13 metals listings for five rivers and one creek were identified as needing verification sampling before resources were committed to TMDLs. The listings are based on old or questionable data.

The goal of the monitoring program is to verify the validity of the metals listings. Following Ecology (2001) guidance, the decision to recommend retaining a waterbody or waterbody parameter on the 303(d) list will be based on finding at least one exceedance of state standards.

Puget Sound Ambient Monitoring Program
Puget Sound Water Quality Action Team, Department of Ecology, Department of Fish and Wildlife, Department of Health, Department of Natural Resources, King County Department of Natural Resources, National Marine Fisheries Service, EPA, US Fish and Wildlife

The Puget Sound Ambient Monitoring Program (PSAMP) brings together local, state, and federal agencies, coordinated by the Action Team, to assess trends in environmental quality in Puget Sound. As a member of PSAMP, the Department of Fish and Wildlife monitors the levels of mercury in the edible muscle tissue, liver, or whole bodies of fish and crabs.

Statewide Mercury in Fish Tissue Project
Department of Ecology

Several studies in recent years have found problem levels of mercury in freshwater fish from Washington State. These studies were limited to specific waterbodies (Lake Whatcom and Lake Roosevelt); consequently limited information is available on the distribution and magnitude of mercury in edible fish tissue statewide. In addition, regional information is lacking on other factors that might influence the uptake of mercury into freshwater fish.

To address the lack of information on fish tissue concentrations Ecology's Environmental Assessment Program will collect and analyze game fish from approximately 20 waterbodies, mainly lakes, distributed statewide. The target species for this work will be bass due to their wide distribution and capacity to bioaccumulate mercury. The target is 10 bass to from each waterbody. Muscle fillet from each bass will be analyzed separately. To evaluate other factors effecting mercury uptake, surface sediments from three locations in each lake will also be analyzed for total mercury. A single depth integrated water column sample for pH, dissolved oxygen, and hardness, along with a vertical profile of temperature and secchi depth will also be collected from each lake. A final project report will be prepared that discusses the study findings. In addition, the data generated will be entered into Ecology' Environmental Information Management system.

Lake Whatcom Mercury in Sediment Project
Department of Ecology

Fish tissue sampling conducted by Ecology's Environmental Assessment Program (EAP) in previous studies has found mercury levels of potential concern in game fish (primarily bass) from the lake. Mercury concentrations are high enough that the lake will probably be listed on the next version of the clean water act section 303(d) list of impaired waterbodies. To address the issue of whether ongoing sources of mercury are present or if natural conditions are promoting the uptake of mercury EAP will conduct a joint study with USGS in FY03. EAP will collect approximately 30 surface sediments and 3 cores from the lake to evaluate current and historic mercury concentrations. Analysis will include total mercury in all samples. Methyl-mercury levels will also be determined in approximately 15 of the surface sediment samples. In addition, as part of the Lake Whatcom dissolved oxygen TMDL water samples will be collected quarterly from 10 tributaries to the lake and analyzed for total mercury. The USGS will review existing information on the watershed and supplement funding (via Whatcom County Health Department) to collect an additional 5 cores from surrounding lakes. Together these efforts will provide information to hopefully determine the current status of sources of mercury to the Lake Whatcom watershed. The need for a more formal TMDL to address mercury will also be evaluated.

Transport of Mercury and Other Metals to the West Coast of the U.S.
University of Washington and Frontier Geosciences, Inc., funded by US EPA

The researchers' previous work has shown that combustion derived air pollutants from Asia can be transported to the US in 6-8 days. This discovery was made based on observations of a number of gaseous and aerosol species at the Cheeka Peak Observatory (CPO) on the

northwestern tip of Washington state. Recently the project has shown that the largest flux of these pollutants often occurs in the free troposphere, above the marine boundary layer. Since Asia is also a region of high mercury emissions, the US EPA-NERL and Office of International Activities have sponsored a project to measure Hg^0 and coarse and fine aerosol chemistry at CPO. Measurements began in the spring of 2001 and are planned to continue until 2002. Preliminary "near-real time" data from Cheeka Peak can be viewed at http://faculty.washington.edu/djaffe/data.htm.

Quicksilver Caucus – EPA Mercury Stewardship Initiative
Department of Ecology, Environmental Council of States, US EPA

Ecology is participating as part of the Quicksilver Caucus, a coalition of state government organizations formed to highlight their concerns about mercury pollution. The group includes state air, water, and waste associations, the Environmental Council of States (ECOS), the National Governors Association, and other state organizations. ECOS is providing logistical support to the Quicksilver Caucus. EPA is working with states, through the Quicksilver Caucus, to resolve two difficult mercury issues: (1) How to meet mercury reduction goals for specific waterbodies where mercury water pollution is caused primarily by air deposition; and (2) How to ensure safe stewardship of mercury supplies and wastes.

EPA Region 10 Mining Workgroup
US EPA, Department of Ecology, Department of Natural Resources, U S Department of Agriculture Forest Service, US Department of Interior Bureau of Land Management,

The EPA Region X mining coordinator has brought these agencies together as part of an effort to begin coordinating abandoned mine issues. To date this activity has focused on identifying what information is presently available regarding mine locations, existing problems, and the identification of each agency's authorities and capabilities for dealing with mine issues. The present outcome of this work is an effort being coordinated by WDNR to gather all agency data into a single multi-agency database/GIS system. Other agencies including the USFS and BLM have recently received EPA delegated authority for the use of CERCLA to manage sites on lands under their authority.

Mercury Deposition Network
National Atmospheric Deposition Program, Frontier Geosciences, Inc.

The objective of the Mercury Deposition Network is to develop a national database of weekly concentrations of total mercury in precipitation and the seasonal and annual flux of total mercury in wet deposition. The data will be used to develop information on spatial and seasonal trends in mercury deposited to surface waters, forested watersheds, and other sensitive receptors. There are two monitoring sites in Washington. One is at the Hoh Ranger Station in Olympic National Park and has been inactive since 1995. The second is at the National Oceanographic and Atmospheric Administration's facility in Seattle and is operated by Frontier Geosciences, Inc.

Org-9: Develop a system for monitoring the presence of mercury at key points (such as in food) where it can have impacts. Establish benchmarks for eventual reduction of mercury at these entry points.

Org-15: The lack of research on the amounts of mercury being discharged from dental offices is appalling. This report admits that 90% of the mercury in POTWs is from mercury amalgam yet no efforts are being expended to mandate amalgam separators or monitor actual mercury levels being discharged. Additionally, crematoria have been identified as a major source of mercury in the air of Washington state (59% of bodies are cremated in WA).

Potential research questions:
What is the amount of mercury vapor being discharged from crematoria?
What is the amount of mercury being discharged in wastewater from dental facilities?
What is the amount of mercury being disposed in biohazard bags from dental facilities?
What is the impact of mercury on humans in WA?
What are the health impact on WA citizens who have had their mercury amalgams removed?

Org-19: NWPPA suggests the MCAP analyze the synergistic effect of regulatory programs for manufacturing industries for future environmental benefit before adding duplicative new regulations.

There are many state and federal regulatory programs designed to assess, monitor, control and clean up hazards to the environment and humans. The MCAP characterizes some programs and ongoing research, but fails to synthesize the potential effect of all of the programs to for future environmental improvement for manufacturing industries. Specifically for pulp and paper, environmental regulatory initiatives include MACT I pulping and bleaching processes, MACT II on combustion units, forthcoming MACT for boilers, as well as recent effluent guideline development for bleached production categories. In each of these efforts EPA accomplished extensive data collection efforts to understand the presence of toxic pollutants (including mercury) from this industry, and established discharge or emission limits when needed to protect human health or the environment.

PubMtg: *Jon Mundall, MD.* Comment made at the October 3, 2002 *Draft Mercury Chemical Action Plan* Public Forum in Moses Lake:

With the shortfall in the budget coming up, how much can be implemented? What can you actually do?

I have 4 comment areas:
- Re: Crematoria – any research done to determine technical fix such as distilling or sulfur?
- Re: fish – to my knowledge no good current system to measure levels. If there is, how soon until all fish be labeled toxic?
- Re: fish – a lot of fish becomes chicken feed, dog food and cat food. A lot is also used as fertilizer.

- Re: Hg fungicide - How much taken up by plant? Is this a reason why wheat is now such a common allergen to humans? More research is needed.

Ecology and DOH Review and Analysis of Public Comments

Multiple points relating to monitoring and possibilities for research in the future were given by stakeholders. Multiple comments were provided on dental amalgams and crematories.

Ecology and DOH Conclusions

Many of the comments regarding dental amalgams are addressed in the section, *Comments Related to Mercury Dental Amalgams in General*.

Although DOH is allowed by law to do research, it is not the primary emphasis of the department. In fact, research endeavors are usually initiated in collaboration with other agencies or universities, as the resources of DOH are rather limited.

Of the point-source combustion sources that release mercury into the environment, crematories are considered to be responsible for a fraction of one percent of total emissions.

Ecology continues to conduct or be a key part of several monitoring activities related to mercury. These include the Washington State Toxics Monitoring Program, monitoring selected rivers and creeks for metals as part of the 303(d) program, and the statewide mercury in fish tissue project.

Ecology recently completed a study that evaluated level of mercury in fish tissue collected from 18 lakes and two rivers throughout Washington State: *Mercury in Edible Fish Tissue and Sediments from Selected Lakes and Rivers of Washington State* (Publication No. 03-03-026). This report is online at http://www.ecy.wa.gov/biblio/0303026.html.

Additional Comment Categories not included in the Draft MCAP

Comments Related to the Need for Cost-Benefit Analyses

The Draft Mercury Chemical Action Plan stated

Because of the attention focused on mercury reduction around the United States and other countries, cost estimates for specific mercury reduction strategies are changing rapidly. The development of new technology, such as in-office dental amalgam separators, and research, such as the identification of accurate, cost-comparable non-mercury medical equipment, have reduced mercury reduction costs by providing impacted sectors with lower-cost options and greater certainty regarding their effectiveness. As additional mercury-reduction efforts continue to be implemented in locations around the country, it is anticipated that further cost reductions will be achieved by learning from the experience of others, new technology, and, in some cases, economies of scale. As the Department of Ecology proceeds with implementation of mercury reduction activities, it will continue to identify and, in cooperation with stakeholders, the EPA, other states, local governments, and research institutions, to help create cost-effective solutions to address the needs in Washington State.

Public Comments

O-3: In sum, potential adverse costs should be considered and quantified along with potential positive socio-economic and health benefits. Those assessments should be clearly presented in the Mercury CAP. DOE should select risk management options in light of anticipated benefits and costs associated with those options. In some cases political input may be necessary. Further, DOE should consider ways to minimize costs by using current federal and state regulatory requirements to manage mercury releases. The use of existing statutory authority may minimize disruption and, in the case of reliance on federal requirements, help ensure that Washington State is not placed at a competitive disadvantage.

O-6: CAP recommended actions should detail how costs to business and the consumer were used in ranking recommend actions. The impact on Washington businesses ability to compete in the national and global market place should be included in this assessment. The CAP acknowledges that costs to businesses and actual costs of the recommended actions were a consideration in selecting the recommended actions, however this does not include any assessment of costs or explain how costs were considered in the selection of recommended actions.

O-6: A life cycle analysis, which includes the environmental and economic impact of alternative products, should be considered in developing recommended actions for replacement of these products with alternatives.

Without such an analysis the benefits and costs of further controlling or removing these products from commerce and replacing them with alternative products cannot be fully assessed. This level of information is vital to assist decision makers in implementation of recommended actions. The life cycle analysis would also provide additional valuable analysis of the overall environmental impact of product substitution. In life cycle analysis, all the contributing factors such as energy, water use / pollution, greenhouse gases and the like can be compared to the harm done in manufacture / use of the PBT containing product. This is a much more effective way to determine the value of a proposed substitution.

Ecology's Review and Analysis of Public Comments

Ecology did not do a formal cost-benefit analysis for the following reasons:

- Lack of resources and time available to do a comprehensive analysis.
- Limited usefulness due to changing market conditions and an increasing availability of alternatives.

The recommendations in the draft MCAP were not ranked, but rather the selection of recommended actions are based on what can be accomplished in the "near term" – where readily available alternatives can serve as a cost-effective replacement for the mercury-containing product. Ecology agrees that several of the long-term recommendations (i.e., national emissions requirements for coal-burning plants) may require more detailed economic analyses.

Ecology's Conclusions

Due to a lack of resources and time available, and due to changing market conditions, Ecology elected not to do a detailed cost-benefit analysis. Instead, the recommendations in the final MCAP are identified as "short-term" (next 2 years), "medium-term" (next 3-5 years), and "long-term" (beyond 5 years) recommendations. Additional recommendations are made about current activities that are "ongoing". If regulations are required as a result of statutory changes in the future, cost-benefit analyses will be conducted in order to comply with the appropriate requirements involving rule development.

Comments Related to Recommendations to Extend the Time to Develop the MCAP

The Draft Mercury Chemical Action Plan stated

In March 2002, at the direction of the Washington State Legislature, Ecology formed an External "Mercury Advisory Committee", initially composed of 12 members representing agriculture, business, environmental, local government, and public health sectors. Ecology also contracted with Ross and Associates to facilitate both the advisory committee meetings and public forums scheduled for the fall of 2002. The Advisory Committee met to review the Draft Background Document in April, followed by a written comment period.

During April and May, 2002, an internal Gap Analysis Committee, composed of Department of Ecology and Department of Health staff, reviewed the Draft Background Document, identified gaps in knowledge regarding the use of mercury in Washington, and identified potential strategies for mercury reduction. The comments of the Advisory Committee and the work of the Gap Analysis Committee were applied to the Draft Background Document to develop the Preliminary Draft Action Plan. Twelve potential areas for short-term action were identified.

In June, a second Advisory Committee meeting was held. The Advisory Committee was expanded at this point to 22 members at the request of Advisory Committee members, other stakeholders, and Legislative members. In adding members, Ecology made efforts to maintain balance among the sectors represented. At the June meeting, the Advisory Committee reviewed initial estimates of mercury releases from various sources, the twelve sources proposed for short-term action and possible mercury reduction strategies. This meeting was followed by a three week comment period for the Advisory Committee on the Preliminary Draft Action Plan. Comments from parties not on the Advisory Committee were also accepted and considered.

In July and August, external comments were incorporated. The Preliminary Draft Action Plan was reviewed by Department of Ecology and Department of Health staff, and recommendations for action developed.

Recommendations for short-term action were developed for relatively large mercury sources where known, cost-effective solutions exist. Consistent with the Department of Ecology's agency goals and the goals of this action plan, pollution-prevention strategies, or avoiding the use of mercury, were preferred over pollution-control strategies, or minimizing the release of mercury to the environment following use. More detailed plans for implementing short-term action will be developed in consultation with stakeholders. In some cases, such as the removal and recycling of convenience light switches in vehicles, a key component of the more detailed plans will be allocating responsibility for costs involved among affected parties.

Because of the attention focused on mercury reduction around the United States and other countries, cost estimates for specific mercury reduction strategies are changing rapidly. The development of new technology, such as in-office dental amalgam separators, and research, such as the identification of accurate, cost-comparable non-mercury medical equipment, have reduced mercury reduction costs by providing impacted sectors with lower-cost options and greater

certainty regarding their effectiveness. As additional mercury-reduction efforts continue to be implemented in locations around the country, it is anticipated that further cost reductions will be achieved by learning from the experience of others, new technology, and, in some cases, economies of scale. As the Department of Ecology proceeds with implementation of mercury reduction activities, it will continue to identify and, in cooperation with stakeholders, the EPA, other states, local governments, and research institutions, to help create cost-effective solutions to address the needs in Washington State.

The current draft, the *Draft Mercury Chemical Action Plan*, will be released for public comment on September 4. Ecology and Health will hold a 60-day public comment period, during which two public forums will take place. The first will be held in Tacoma at Henry Foss High School on September 26; the second will be held in Moses Lake at Big Bend Community College on October 3. Both public forums will be facilitated by Ross and Associates.

The final meeting of the Advisory Committee will take place in late October. In November and December, public comments will be considered and incorporated, and the Action Plan will be finalized for release at the end of 2002.

The Draft Background Document, the Preliminary Draft Action Plan, the Draft Action Plan, and all External Advisory Committee meeting handouts and notes have been posted on Ecology's web site at http://www.ecy.wa.gov/programs/eap/pbt/mercuryplan.html. Throughout the Action Plan development process, individual meetings have been held with stakeholders upon request. Through list serves, e-mail, and phone calls, Ecology and Health staff have maintained close contact with staff from local governments, other states, and federal agencies working on mercury policy, working to ensure that the information and recommendations in Washington's *Mercury Chemical Action Plan* reflect the best and most updated thinking available.

Public Comments

Org-4: *Extend the Time to Develop the Mercury Chemical Action Plan*. The Legislature has directed Ecology to complete the action plan by December 15, 2002. Because the intent of the Legislature is to use the mercury chemical action plan as a model for future chemical action plans and the current draft is in desperate need of significant changes, AWB members believe that more time is needed to develop the action plan. AWB requests that the department ask the legislature for additional time to develop the mercury chemical action plan.

PubMtg: Robb Menual – Washington State Hospital Association. Comment made at the September 26, 2002 *Draft Mercury Chemical Action Plan* Public Forum in Tacoma:

Suggest the Ecology ask the legislature for another year to complete the plan.

Ecology's Review and Analysis of Public Comments

Two comments recommend that Ecology specifically ask the Legislature for more time to complete the *Mercury Chemical Action Plan* (MCAP). Ecology and Health determined that we were on schedule to complete the MCAP as directed by the Legislature, and on track with the schedule laid out in the 2002 legislation. Throughout the Action Plan development process,

individual meetings have been held with stakeholders upon request. Through list serves, e-mail, and phone calls, Ecology and Health staff have maintained close contact with staff from local governments, other states, and federal agencies working on mercury policy, working to ensure that the information and recommendations in Washington's *Mercury Chemical Action Plan* reflected the best and most updated thinking available.

Ecology's Conclusions

Ecology determined that ample time was provided in the schedule provided by the Legislature. This schedule directed Ecology to complete the MCAP and "finalize the plan by December 31, 2002" with implementation to begin no later than February 1, 2003. Ecology has stayed on that schedule and met that commitment. Due to formatting and editing of the final MCAP document, it was not available for distribution and web site listing until mid-February 2003. However, Ecology and Health began informing stakeholders and the public of MCAP recommendations and implementation actions in late December 2002.

Comments Related to Definitions of "Sources" and "Releases"

The Draft Mercury Chemical Action Plan stated

Limiting mercury releases into the atmosphere from burning coal and waste and from other industrial processes will reduce fall-out of mercury to waterbodies and watersheds, and ultimately reduce mercury concentrations in fish. Likewise, reducing the use of mercury-containing consumer, and trading in mercury-using products for those that don't, also helps to prevent spills that contribute to environmental mercury contamination. Eating fish, for most people, is the greatest source of mercury exposure. Reducing mercury in fish will reduce most people's exposure

The *Mercury Chemical Action Plan* is designed to ultimately reduce the effects of mercury on the health of people and wildlife. Since eating fish is the greatest source of mercury exposure for most people (as opposed to breathing mercury or absorbing it though the skin), preventing the entry of mercury into the environment is the best way to reduce mercury exposure.

Mercury releases and potential releases were calculated in two ways. First, releases from point sources were estimated in Table 1. Second, mercury in products disposed with solid waste or sewage was estimated in Table 2. The fate of mercury in disposed products is unknown. Ninety-one percent of municipal solid waste in Washington is landfilled. Presumably, many of the products listed in Table 2 are landfilled. The mercury contained, particularly in products that break easily, such as fluorescent lamps and thermometers, may be released prior to or during the waste collection process or on the face of the landfill before a daily cover layer is applied.

Public Comments

O-3: Further, DOE should be careful not to mislead the public when assessing the quantity of mercury "released" by various mercury sources. DOE does not estimate actual releases of mercury to the environment (i.e., mercury that will lead to human exposures) in the draft Mercury CAP. DOE implies, however, when discussing the amount of mercury "released" from various anthropogenic sources that "released" mercury results in human exposures. In many instances the "releases" of mercury referred to by DOE includes mercury that is captured in pollution control devices and properly managed, mercury that is properly managed in licensed landfills, and mercury that is managed in other appropriate ways (in many cases pursuant to health-based regulation). That is also true when DOE cites TRI data, which includes as "releases" mercury that is properly managed in licensed landfills. If DOE believes that properly managed mercury poses a threat of human exposure it should describe how those exposures occur and quantify those exposures.

Ecology's Review and Analysis of Public Comments

One commenter felt that Ecology's use of the term mercury "release" was potentially misleading, suggesting that all releases of mercury results in human exposure.

Ecology's Conclusions

Ecology disagrees with this comment. Mercury is an element, does not break down, and can readily move between air, land, and water, and travel great distances. The release of mercury has the potential to enter the food chain and result in exposure to fish, wildlife, and humans.

As explained in the section on how mercury enters the environment, mercury released to the environment from human activities may enter the food chain and become concentrated in fish. The consumption of fish containing high levels of mercury is the greatest route of exposure for most people. Reducing mercury in fish by reducing human releases of mercury will therefore reduce most people's exposure. Because of the complexity of the mercury cycle, the ability of mercury to travel long distances, and the persistence of mercury in the environment, achieving reductions of mercury in fish will require coordinated efforts among governments to reduce mercury releases, as well as, in all likelihood, some period of time.

Where information on proper management of mercury was available, estimates of mercury releases do not include mercury that is recycled or otherwise captured through pollution control equipment. Release estimates do include products disposed of as solid waste. Many of these products may be broken at some point during the disposal process, releasing the mercury contained within. Little is known about the long-term fate of mercury in landfills; this is currently a focus of Ecology research.

Comments Related to the Need for Risk Assessments

The Draft Mercury Chemical Action Plan stated

The draft MCAP did not contain any specific language regarding risk assessments. The main purpose of the Ecology/Health *Mercury Chemical Action Plan* was to identify sources of human-caused (anthropogenic) mercury in Washington State, outline the existing regulatory structure around mercury, describe existing mercury-reduction efforts, identify possible strategies for further mercury reduction, and make recommendations for action to be taken by the state departments of Ecology and Health.

Public Comments

Org-3: DOE should more completely identify and analyze potential routes of human exposures to mercury.

The first steps in managing exposures to mercury are determining how people are exposed, quantifying risks resulting from those exposures, and ranking the relative importance of those exposures. Once routes of exposure are characterized, efforts should be made to determine sources of mercury that contribute to those exposures.

The draft Mercury CAP identifies one important route of human exposure to mercury – human exposure through consumption of mercury-contaminated fish. We agree that exposure through the food chain (and particularly fish) is an important route of human exposure to mercury and other PBT. Additional work must be done, however, to characterize the fish-to-human exposure route. For example, because fish take up mercury from their environment, it will be important to know to what extent current air depositions contribute to mercury in relevant aqueous environments. It will also be important to know to what extent discharges to surface or ground water (point and non-point discharges) contribute to mercury in aqueous environments. In addition, it will be important to know to what extent fish take up mercury that re-circulates in the aqueous environment and whether that mercury is the result of historic activities. Without examining those issues, it will be difficult to know whether it will more effective to manage, for example, mercury volatilization and air deposition, surface water runoff, or sediments.

DOE mentions other potential routes of human exposure, such as direct exposure to mercury vapors, but fails to assess the significance of those exposures to human health risk. For example, it may be important to assess and quantify the risks to human health posed by amalgam fillings or mercury volatizing from mercury lamps that are in use. It is necessary for DOE to assess the relative contributions to risk posed by various routes of exposure, otherwise it is possible that DOE will manage insignificant contributors to risk while ignoring important contributors to risk.

Org-6: The CAP should include an evaluation and ranking of recommended actions based on risk management principles, including cost considerations.

The process used to develop the recommended actions does not explain how Ecology developed the recommended actions for each source or selected them from other options. If a ranking process was used, it should be included to describe how Ecology selected the recommended

actions for each source from other options that are available. For example, the recommended action for the wood stove source is to "evaluate cleaner fuel sources". Other actions which might have been considered range from no action to a ban on wood stoves in areas where they are a local source of air deposition to waterbodies with high mercury levels in fish tissue. Ecology should show how and why it selected the recommended action from the list of possible actions.

Ecology should develop and prioritize among the recommended actions based on risk management principles. Ecology should describe how implementation of each recommended action would actually reduce the level of methyl mercury exposure to Washington state residents and species at risk from mercury exposure relative to the reductions expected from other recommended actions.

DOH's Review and Analysis of Public Comments

The two public comments provided on this topic suggest that prioritization of human exposure from sources be based on quantifiable risk assessment calculations. Further, the actions taken by DOE should not only be risk-based but should also reflect cost in establishing priority for recommended actions; that is, DOE actions should include risk management tools in prioritization.

DOH's Conclusions

Risk assessment techniques can be valuable tools in determining how resources can be best used to address environmental health issues. They can be used as an option for the identification and prioritization of strategies for reducing mercury emissions into the environment. DOH in its efforts to protect public health conducts health assessments in which substantial attempts are made to identify the population that is most sensitive or most exposed to the toxicant being investigated. This population then is defined as the population of greatest concern. By protecting this population, all other less exposed and/or less sensitive populations or individuals are protected. Through its protection efforts, DOH is most concerned with direct exposures to humans, such as through direct skin contact, inhalation, or ingestion. As a result, the concern to DOH is the direct pathway to human exposure, such as with consumption of fish contaminated with mercury.

The purpose of the Ecology/Health *Mercury Chemical Action Plan* was to identify sources of human-caused (anthropogenic) mercury in Washington State, outline the existing regulatory structure around mercury, describe existing mercury-reduction efforts, identify possible strategies for further mercury reduction, and make recommendations for action to be taken by the Departments of Ecology and Health. With this purpose in mind, both Ecology and Health have relied on generally accepted principles and practices of risk assessment and risk management to help determine which mercury reduction actions are feasible and make the most sense to accomplish in the short term, and to identify those mercury reduction actions that will need to be addressed in the long term. In developing the MCAP, Ecology and Health did not have the financial resources to, for example, determine to what extent current air depositions contribute to mercury in relevant aqueous environments or know to what extent discharges to surface or ground water (point and non-point discharges) contribute to mercury in aqueous environments.

Comments Related to Mercury Dental Amalgams in General

The Draft Mercury Chemical Action Plan stated

1) Develop a voluntary, collaborative program in combination with the Washington Dental Association to encourage the adoption of mercury policies by the Association and the installation of amalgam separators and follow best management practices.

- Work with Dental Association on outreach and education to dentists. This includes targeted tech assistance visits, state-wide or regional "sweeps," and normal compliance inspection visits. Include recognition program and possibly help with funding.
- Work with Stericycle or other waste collection companies to set up one-time collection of leftover elemental mercury.
- Clarify handling practices for amalgam cartridges and other dental waste.
- Time frame: at least two years.

2) If voluntary program above is not successful at significantly reducing mercury discharges to POTWs, Ecology will consider additional action including:

- Develop a monitoring program for public sewage treatment plants to determine if mercury limits in the effluent or biosolids are appropriate.
- Develop a general permit for dentists, requiring them to install amalgam separators and follow best management practices. This would not apply to dentists in the nine areas that have delegated authority for pretreatment programs. Time frame: longer than two years.

Other recommendations:

Conduct outreach and education to POTWs.

Consider special section in general biosolids permit on mercury, which could be advisory.

Consider requiring more frequent analyses for mercury as permit condition, either for the general permit, or on an as needed basis with final approval of coverage..

Outreach and education to NW Biosolids Management Association and appropriate chapters/ committees of the Pacific NW Clean Water Agency to emphasize the importance of amalgam separators.

Draft boilerplate language for use by local health departments in waste facility permits, requiring that medical waste facilities do not accept waste containing mercury. Have affirmative contact with local environmental health directors, presenting boilerplate language.

Public Comments

Org-9: Reduce and eventually eliminate the use of mercury from dental amalgam. Require dental offices to filter mercury out of wastewater.

Org-15: I have thoroughly reviewed the Draft Washington State Mercury Chemical Action Plan and am very concerned at the cursory treatment that has been given to dental amalgam as a major source of mercury in the environment and as a source of health harm. No serious attempt to quantify mercury exposure can be accomplished without a comprehensive analysis of the multiple exposures which begin with the placement of mercury amalgam dental fillings into the teeth of Washington citizens. And no serious strategies can be postulated which do not begin with a prospective proposed ban of the use of mercury amalgam dental fillings as a dental restorative material.

Org-15: While the amount of mercury used in almost every other category other than the dental industry has dropped significantly, or ceased, only dental mercury continues to be used as if mercury in dental fillings were somehow different and not a health concern. These events have propelled dental amalgam to near the top of the charts of volume of industry usage. The failure of government agencies to address mercury amalgam as a matter of serious concern has forced concerned citizens to mobilize for the passage of federal and state legislation, and for citizens who have been harmed by the mercury in amalgams to file lawsuits seeking court determinations on the hazards of mercury amalgams. We see this draft Plan as a continuing effort to minimize the health hazards associated with mercury amalgams, giving cover to the dental industry which will never voluntarily cease the use of a product that is known to be toxic to all forms of life.

Org-15: The average mercury amalgam dental fillings weighs one gram. 50% of the filling is mercury; i.e. .5 grams or 500,000 ug. As much as 50% of the mercury in mercury amalgam dental fillings has been found to have vaporized after 5 years, and 80% by 20 years.

Mercury vapor from amalgam is the single largest source of systemic mercury intake for persons with mercury amalgam fillings ranging from 50-90% of the total exposure.

Mercury vapor crosses the blood-brain barrier, passes into the brain cells and forms inorganic mercury which cannot readily pass back out of the brain cells. Mercury in the brain has a half life of more than 20 years. Thus, daily exposure from mercury amalgams results in ever-increasing levels of mercury in the body tissues.

Org-15: The single most important action which can be taken to limit releases of mercury into the environment is to cease using mercury amalgams. This will stop dental offices from being the primary source of mercury into the environment. It will also, eventually, mean that crematoriums will not cremate bodies with mercury amalgams sending mercury vapor into the air.

If mercury dental fillings are banned, mercury in biosolids from waste treatment plants will no longer be spread on cropland. This is another source of mercury into the rivers from erosion and rainwater.

Org-15: There is an immense body of scientific studies linking mercury amalgam fillings to diseases. There are studies which show that dental personnel are occupationally exposed to higher levels of mercury vapor than the general public; that they have higher levels of mercury accumulation in their bodies; and, the mercury causes measurable adverse health effects in dental personnel including significantly lower scores than controls on neurobehavioral tests of motor speed, visual scanning, visuomotor coordination, concentration, verbal memory, visual memory and emotional/mood tests. Dentists are commonly found to have chronic fatigue due to immune system overload and positive autoimmune titers. (See www.home.earthlink.net/~bernie1/amalg6.html www.altcorp.com, and www.amalgam.org)

Ind-11: The city of Vancouver's Fire Department produced a 20 minute video tape on the dangers of fighting a fire at a dental office on August 20, 2002. Thanks to Chief Don Bivins and Captain Dan Monaghan, the members of the Vancouver Fire Department will learn the true risks of fighting a fire at dental offices that have mercury amalgam material and/or mercury amalgam scrap in the dental office building. When I saw a copy of an e-mail titled "Hazards to Firefighters in Med/Dental Facilities" dated July 8, 2002, it said the video tape was ready for viewing for training. I was very pleased and proud of my city of Vancouver. I applaud Chief Bivins for his leadership in providing vital facts about the dangers of mercury and fire to his firefighters. DOE knows that mercury and fire are not a good combination and a fact that all firefighters need to know. I hope that the Department of Ecology will consider requesting and reviewing this training tape from the Vancouver's Fire Department.

Ind-11: The Food and Drug Administration took public comments on a proposed FDA rule to declare mercury fillings safe from February 28, 2002 to May 21, 2002 and again July 16, 2002 to September 16, 2002. The docket number is No. 01N-0067. I am the file manager for Consumers for Dental Choice and I received copies of people's e-mails and letters that they sent to the FDA regarding the dangers of mercury dental fillings. All of the e-mails and letters that I received told how mercury from dental fillings affected people's health and their lives. Many people did not know that their fillings were 50% mercury and this is another excellent example of people being part of the mercury pollution problem. Only when a government agency informs dental consumers that a silver/amalgam dental filling is 50% will dental consumers be part of the mercury pollution solution.

PubMtg: Ann Clifton, MAT/DAMS. Comment made at the September 26, 2002 *Draft Mercury Chemical Action Plan* Public Forum in Tacoma:

I am the co-chair the Mercury Awareness Team (MAT) of WA. I have several handouts which I will leave with you – including “Dentist the Menace” report, the U. of Calgary School of Medicine sheep study. 1 shot in a 6 month old = enough Hg as 40 shots in an adult. Our group is anxious to eliminate Hg use in dental fillings. Sweden has banned amalgam fillings.

PubMtg: Elsie Higgins, multiple chemical sensitivity survivor. Comment made at the September 26, 2002 *Draft Mercury Chemical Action Plan* Public Forum in Tacoma:

I had multiple health problems and when they removed my last filling, I no longer had any health effects. ADA is wrong to say that amalgam is okay. They continue to use amalgam because it is cheaper. The interaction between Hg and gold releases Hg into the body. 1/200 people are not

able to deal with this – not able to excrete mercury from their bodies. Also, diesel continuing Hg is an emission concern.

PubMtg: David Hemion, Washington State Dental Association. Comment made at the September 26, 2002 *Draft Mercury Chemical Action* Plan Public Forum – Tacoma:

TNT article stating the 500 lbs of Hg goes into the sewer is inaccurate. If it takes longer to develop a MCAP based on scientific basis then we should do it. The facts need to be stated. We agree with the voluntary approach. WSDA has a policy that recommends "best management practices" and amalgam separators. We recognize we need to address the issue of medical waste. EPA estimates the < ½ of 1% Hg is from amalgam waste. Much of our problem is outside of WA. We need to be honest with WA's population about the problem. FDA also says the Hg amalgam is safe – there is a lot of just plain quackery out there. We need to get past the quackery and scare tactics regarding the use of dental amalgam.

DOH's Review and Analysis of Public Comments

Multiple comments were provided on numerous topics asserting:

- the need for mercury amalgams to be banned,
- mercury amalgams represent a significant source for mercury exposure into our environment,
- amalgam separators in dental offices need to be required,
- dental patients need to be informed of mercury content in amalgam fillings,
- crematoriums are a source of mercury into the environment (due to mercury in amalgams),
- mercury amalgams are safe, and
- Ecology should request and review a training tape developed by Vancouver's Fire Department entitled "Hazards to Firefighters in Med/Dental Facilities."

DOH's Conclusions

Summaries of body burden sources in humans from various mercury sources are well documented. On an individual basis, however, it is difficult to determine exposure because of:

- the variability in fish consumption by individuals, the variability in amount of contamination in finfish and shellfish consumed by individuals,
- the variability in the number of amalgam fillings in individuals, and
- the retention rate of elemental mercury.

As stated previously by DOH, women of childbearing age who are considering becoming pregnant or who are pregnant represent the population of concern. When this population consumes contaminated fish in quantity, as would be the case with subsistence fish-consuming populations or with populations consuming fish as a primary source of protein, DOH has the greatest concern since these women can pass mercury to the developing fetus during pregnancy. In many individuals who are not occupationally exposed, but who have large numbers of amalgam fillings, dental amalgams can represent the largest single source to total body burden.

To investigate possible effects on individuals with amalgam fillings, two large-scale clinical trials are presently underway. One study, involving children aged 8 to 10 years of age, is investigated endpoints including:

- three neurobehavioral indices including combined assessments of attention, memory, and motor domains;
- one neurological assessment involving nerve conduction velocity; and
- an endpoint aimed at assessing renal function.

The second study follows children 6 to 8 years of age with at least two fillings, measuring IQ and testing neuropsychological, cognitive, and behavioral function. Although these trials are still ongoing, information to date indicates any harmful effects being investigated can not be attributed to amalgam fillings**.** A recently completed study of 500 adults, 30 to 49 years of age with an average of more than 10 amalgam fillings, found no association between exposure to mercury from dental amalgams and deficits in cognitive or fine motor function.

Ecology will contact the Vancouver Fire Department and request a copy of their video, *Hazards to Firefighters in Medical/Dental Facilities,* to provide to Ecology's Spill Response Program for future training needs.

Comments Related to Mercury Reduction Success Measures

The Draft Mercury Chemical Action Plan stated

Recommendations for short-term action were developed for relatively large mercury sources where known, cost-effective solutions exist. Consistent with the Department of Ecology's agency goals and the goals of this action plan, pollution-prevention strategies, or avoiding the use of mercury, were preferred over pollution-control strategies, or minimizing the release of mercury to the environment following use. More detailed plans for implementing short-term action will be developed in consultation with stakeholders. In some cases, such as the removal and recycling of convenience light switches in vehicles, a key component of the more detailed plans will be allocating responsibility for costs involved among affected parties.

Public Comments

Org-3: DOE should provide transparent, scientifically-based reasoning when recommending actions in the Mercury CAP and it should provide a mechanism to measure the effectiveness of implemented actions.

In the draft Mercury CAP, DOE makes a number of recommendations for managing the "human use and release of mercury." DOE fails to explain why its recommendations are necessary, whether or how they will reduce mercury exposures or risks in the State, and whether they are feasible or cost-effective. It is not clear from the discussion in the draft Mercury CAP whether any of the recommended actions are necessary or will actually be beneficial. Again, DOE simply assumes that any action to limit the use and release of mercury will decrease human exposures.[39] DOE should clearly present various mercury risk management options, explain how each option would reduce mercury exposures and risks, and provide some estimate of the costs associated with each option.

Further, DOE should be careful not to mislead the public when assessing the quantity of mercury "released" by various mercury sources. DOE does not estimate actual releases of mercury to the environment (i.e., mercury that will lead to human exposures) in the draft Mercury CAP. DOE implies, however, when discussing the amount of mercury "released" from various anthropogenic sources that "released" mercury results in human exposures. In many instances the "releases" of mercury referred to by DOE includes mercury that is captured in pollution-control devices and properly managed, mercury that is properly managed in licensed landfills, and mercury that is managed in other appropriate ways (in many cases pursuant to health-based regulation). That is also true when DOE cites TRI data, which includes as "releases" mercury

[39] For example, DOE recommends the elimination of mixing zones to manage point source discharges from POTWs (draft Mercury CAP at 77). DOE does not quantify the amount of mercury currently released in POTW water discharges or attempt to determine whether those discharges pose a significant source of mercury in State waterways. DOE does not even attempt to estimate the effect, if any, the elimination of mixing zones might have on human mercury exposures. DOE also does not explain how the elimination of mixing zones will reduce risks or whether POTW will be able to comply with more stringent NPDES permit limits. To the extent current NPDES permit limits are health-based water quality standards, changes in permit limits (such as the elimination of mixing zones) should not be necessary. Finally, DOE should consider the costs to the State and to ratepayers if POTWs are required to undertake costly process changes or to make costly facility changes to meet new discharge limits.

that is properly managed in licensed landfills. If DOE believes that properly managed mercury poses a threat of human exposure it should describe how those exposures occur and quantify those exposures.

Org-3: Finally, to ensure progress towards reducing risks posed by mercury it is necessary to regularly measure the results of risk management actions. DOE should outline a method in the Mercury CAP to periodically assess and measure the effectiveness of implemented risk management actions for mercury. Ineffective risk management actions will not be cost-effective and will insufficiently address potential risks. Periodic review of risk management efforts can identify those actions that ineffectively or inefficiently reduce risks. DOE should provide for a mechanism to replace ineffective or inefficient risk management actions with more useful, cost-effective risk management actions.

Ecology's Review and Analysis of Public Comments

Comments received suggest that Ecology:

- Provide transparent, scientifically-based reasoning when recommending actions in the Mercury CAP (MCAP).
- Assumes that any action to limit the use and release of mercury (such as the elimination of mixing zones) will decrease human exposures.
- Should clearly present various mercury risk management options, explain how each option would reduce mercury exposures and risks, and provide some estimate of the costs associated with each option.
- Should be careful not to mislead the public when assessing the quantity of mercury "released" by various mercury sources.
- Outline a method in the MCAP to periodically assess and measure the effectiveness of implemented risk management actions for mercury.
- Provide for a mechanism to replace ineffective or inefficient risk management actions with more useful, cost-effective risk management actions.

Ecology's Conclusions

Ecology was directed by the Legislature to "develop a planned strategy for the reduction of mercury from the environment". This included developing a MCAP that includes, but is not limited to:

1. Identifying current mercury uses in Washington.
2. Analyzing current state and federal laws, regulations, rules, and voluntary measures that can be used to reduce or eliminate mercury.
3. Identifying mercury reduction and elimination options.
4. Implementing actions to reduce or eliminate mercury uses and releases.

In meeting these legislative objectives, Ecology believes it has also provided scientifically-based reasoning in its recommendations and conclusions, and identified and listed several mercury reduction and management options. In the final MCAP, Ecology identified short-tern, medium term, and long-term priorities and committed to encouraging stakeholder involvement as future reduction actions are addressed.

Comments Related to Legislation

The Draft Mercury Chemical Action Plan stated

The draft MCAP provided a summary of existing state and federal laws in Appendix F (pages 149-160) entitled: *Status of Local, State and Federal Mercury Product Legislation and Laws, 2001-2002 Legislative Sessions, July 29, 2002.*

Public Comments

Org-9: Recommend legislation to phase out commercial mercury-containing products such as thermometers, thermostats, automobile switches, and novelties such as toys and clothing.

Org-9: Recommend legislation to phase out the use of mercury in schools, health care facilities, and other institutions.

Org-13, Org-14, Org-16, Org-17, Ind-5, Ind-14, Ind-17: Support legislation that requires manufacturer-funded collection systems to reduce the financial burden on local governments.

Org-13, Org-14, Org-16, Org-17, Ind-5, Ind-6, Ind-14: Support legislation that requires labeling of mercury products to advise consumers of proper disposal.

Org-27: Where there are existing and effective alternatives (such as for mercury fever thermometers and thermostats and mercury activated automotive convenience switches), it makes sense to enact state level product bans on the sale of these items, unless these are able to first be implemented on a reasonable timeframe at the national level. Some on our City Council bad expressed interest two years ago in considering a thermometer ban, however, we concluded that such an approach would be more effective if done at the state level. Oregon has adopted a product ban.

WashPIRG, Ind-1, Ind-4, Ind-10, Ind-13: Close loopholes in current regulations and permits that allow industries to discharge mercury into our water and air.

PubMtg: Megan Roberts, Seattle Public Utilities. Comment made at the September 26, 2002 *Draft Mercury Chemical Action Plan* Public Forum in Tacoma:

Need to strengthen the product stewardship – this option needs to pass the burden on to manufacturers. We need to shift the cost from the government to industry. For example – fluorescent lamps – the disposal/recycling responsibility should shift from solid waste facilities to manufacturers and retailers. There needs to be legislation and labeling provisions. Additionally, the state should develop purchasing restriction for products with mercury.

PubMtg: Gregg Small, Washington Toxics Coalition. Comment made at the September 26, 2002 *Draft Mercury Chemical Action Plan* Public Forum in Tacoma:

Echo Ivy comments – applaud what Ecology and the legislature has done. Also there is a lot of activity being done elsewhere. However, there are missed opportunities – there is too much voluntary and education and not enough mandates. Plan should:

- Support legislation on products
- Mandate amalgam separators for dental offices
- And the manufacturer should play a growing role on the long-term disposal of Hg containing products

PubMtg: Jim Gurber, DAMS Inc. Comment made at the October 3, 2002 *Draft Mercury Chemical Action Plan* Public Forum in Moses Lake:

Support the Diane Watson/Dan Burton Bill in Congress. Best way to address this is to ban Hg amalgam filling, esp. pregnant women, and children in the next 5 years. I think this bill is a good way to address this problem. Why isn't amalgam toxic to the teeth when it is regulated as a hazardous substance before being put in the mouth and after it is removed from the mouth?

Ecology's Review and Analysis of Public Comments

Review of the comments made in this category indicates that many commenters would have preferred that Ecology introduce legislation that is designed to reduce or eliminate the uses of products that contain mercury or may release mercury upon disposal. Ecology has determined that drafting and introducing such legislation was not possible this year due to other agency priorities for legislation. Additionally, Ecology is aware that other stakeholder groups will likely introduce mercury-reduction and mercury-elimination legislation during the 2003 Legislative Session. Ecology will be required to do a bill analysis on any mercury-reduction related legislation.

Ecology has decided to include a number of "legislative principles" in the final MCAP. These principles include the following:

Key Principles of Mercury Reduction and Education Model Legislation:

Background

Objective 1: To eliminate or reduce non-essential uses of mercury in household, institutional, and industrial products and processes and segregate and recycle mercury attributable to the remaining uses and/or products to the maximum degree possible

Objective 2: By 2003 reduce the overall amount of mercury-containing waste from household, commercial, and industrial sources, through source reduction, segregation, and safe waste management, including recycling

Recommendations

- Reduce/eliminate the use of mercury in medical and consumer products to the extent feasible.
- Identify and implement source reduction programs and develop model legislation.

- Draft model legislation implementing coordinated labeling and manufacturer take-back programs to help consumers identify products containing mercury and how to properly dispose of them.
- Eliminate the use of mercury in school science programs through initiation of programs and/or legislation.
- Adopt measures to curtail the sale of elemental mercury.
- Ban uses of non-essential or frivolous uses/applications of mercury.

Model Legislation Principles for Mercury Reduction and Education

The following are proposed elements of the Mercury Reduction and Education Model Legislation. Each of the program elements described below includes a brief description of the program function and a rationale for the approach.

Notification

Program: Require manufacturers and wholesalers to inform the state of the mercury-added products they sell and specify the type of product, name, and address of manufacturer, amount of mercury in each unit, and total amount of mercury in all of the mercury-added products produced by the manufacturer.

Interstate Clearinghouse

Program: Establish a Clearinghouse to coordinate key elements of the model legislation, including manufacturers' product notifications, applications for phase-out exemptions, collection plan reviews, applications for alternative labeling, mercury content disclosures, and public education and outreach.

Bans on Certain Mercury-Added Products

Program: Ban the sale of mercury-added toys, games, cards, ornaments, apparel, and novelties in the state. Restrict the sale of mercury fever thermometers allowing consumers to purchase them with a prescription. Ban the sale of dairy manometers in the state and authorize the state to establish collection and exchange programs for these products. Prohibit primary or secondary schools from using or purchasing elemental chemical mercury or mercury compounds in the classroom.

Phase-out and Exemptions

Program: Gradually phase-out mercury-added products starting with those products that contain more than one gram of mercury down to those that contain 10 milligrams over a period of time. Manufacturers of fluorescent lamps with greater than 10 milligrams of mercury would have a longer period of time to apply for an exemption.

Labeling

Program: Require mercury-added products, components, and packaging to have a label.

Disposal Ban

Program: Prohibit mercury-added products from disposal in a solid waste management or wastewater treatment facilities, unless allowed under a permit or license.

Collection

Program: Require that manufacturers develop a plan and ensure the implementation of a system for the collection of mercury-added products through whatever mechanisms they choose.

Disclosure Requirements for Certain Products That Are Used by Health Care Facilities and Contain Incidental Mercury

Program: Require manufacturers of specified formulated product categories that are used in health care facilities to disclose the mercury content of tested batches of their formulated product.

Control on the Sale of Elemental Mercury

Program: Limit the sale of elemental mercury except for medical, dental amalgam, research, or manufacturing purposes and require provision of safety information, including a Material Safety Data Sheet.

Public Education and Outreach

Program: Implement educational and outreach programs to support the implementation of the program elements outlined above.

Universal Waste Rule

Program: Require state to adopt Universal Waste Rules for largest feasible number of mercury-added products and elemental mercury that is not contained in a product.

State Procurement

Program: Implement a state procurement initiative that would allow for state contracts for goods and services to explicitly include a preference for low or non-mercury-added products that have comparable performance to mercury-added products.

Ecology's Conclusions

Ecology has included the above listed principles for mercury-reduction and education-model legislation in the MCAP. Ecology will review all proposed mercury legislation against these principles and determine whether or not any proposed legislation can be supported by the department.

During the 2003 legislative session, the Washington State Legislature passed "The Mercury Reduction and Education Act" (Engrossed Substitute House Bill 1002). This bill was signed into law by Governor Locke on May 14, 2003. Highlights of this law include the following:

- Effective January 1, 2004, a manufacturer, wholesaler, or retailer may not knowingly sell at retail a fluorescent lamp if the fluorescent lamp contains mercury and was manufactured after November 30, 2003, unless the fluorescent lamp is labeled in accordance with the guidelines listed under this act.
- Directs the state Department of Health to develop an educational plan for schools, local governments, businesses, and the public on the proper disposal methods for mercury and mercury-added products.
- Provides that a school may not purchase for use in a primary or secondary classroom bulk elemental mercury or chemical mercury compounds, and by January 1, 2006, all primary and secondary schools in the state must remove and properly dispose of all bulk elemental mercury, chemical mercury, and bulk mercury compounds used as teaching aids in science classrooms, not including barometers.
- Effective January 1, 2006, no person may sell, offer for sale, or distribute for sale or use in this state a mercury-added novelty. A manufacturer of mercury-added novelties must notify all retailers that sell the product about the provisions of this section and how to properly dispose of any remaining mercury-added novelty inventory.
- Effective January 1, 2006, no person may sell, offer for sale, or distribute for sale or use in this state a manometer (to measure blood pressure) that contains mercury or a thermometer that contains mercury to any health care facility in this state. Designates some exemptions to this prohibition.
- Effective January 1, 2006, no person may sell, install, or reinstall a commercial or residential thermostat that contains mercury unless the manufacturer of the thermostat conducts or participates in a thermostat recovery or recycling program designed to assist contractors in the proper disposal of thermostats that contain mercury in accordance with 42 U.S.C. Sec. 6901, et seq., the federal resource conservation and recovery act.
- Declares that no person may sell, offer for sale, or distribute for sale or use in this state a motor vehicle manufactured after January 1, 2006, if the motor vehicle contains an automotive mercury switch.
- Directs the state Department of General Administration to, by January 1, 2005, revise its rules, policies, and guidelines to implement the purpose of this act.
- Authorizes the state Department of Ecology to participate in a regional or multi-state clearinghouse to assist in carrying out any of the requirements of this act.
- Declares that a violation of this act is punishable by a civil penalty not to exceed one thousand dollars for each violation in the case of a first violation. Repeat violators are liable for a civil penalty not to exceed five thousand dollars for each repeat violation. Penalties collected under this section must be deposited in the state toxics control account created in RCW 70.105D.070.
- Exempts crematories (as that term is defined in RCW 68.04.070).
- Exempts prescription drugs regulated by FDA under the federal Food, Drug and Cosmetic Act, biological products regulated by FDA under the public health service act, and

substances lawfully sold as over-the-counter without a prescription and regulated by the federal food, drug and cosmetic act.

- Directs the state Department of Ecology to petition the U.S. Environmental Protection Agency requesting development of a national mercury repository site.

The Mercury Reduction and Education Act becomes effective on July 27, 2003.