VISUALIZING ZERO

Eliminating Persistent Pollution in Washington State

A Washington Toxics Coalition Report

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Acknowledgments

The authors wish to acknowledge and thank the following people for their input, advice, or assistance:

Ken Steffenson
Philip Dickey
B.J. Cummings
Pam Johnson
Nancy J. Simcox, M.S.
Kelly Moran, Ph.D.
Patty Lovera, M.S.
Jennifer Dold, Esq.
Shirley Leckman, Esq.
Cheryl Holzmeyer
Department of Ecology staff who provided information
We also thank our members, donors and foundation funders including the Dudley, Kongsgaard-Goldman, Bullitt, Public Welfare, Ben & Jerry's, Brainerd, Gordon-Lovejoy, Northwest Fund for the Environment, W. Alton Jones, Beldon, Mitchell Kapor and C.S. Mott foundations.

Illustration on page 2 and 40 by Don Lee.
Photos on front cover and page 14 by Philip Dickey.

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The Washington Toxics Coalition is a non-profit membership-based organization which protects health and the environment by preventing pollution. We accomplish our goals through advocacy, grassroots organizing, alliance building, education, research, and occasional litigation.

Visualizing Zero: Eliminating Persistent Pollution in Washington State,
a Washington Toxics Coalition report.

Printed by EcoGraphics, Woodinville, Washington, on 100 percent recycled paper, 30 percent post-consumer content, not rebleached with chlorine compounds; cover is 100 percent post-consumer recycled paper, not rebleached with chlorine compounds.

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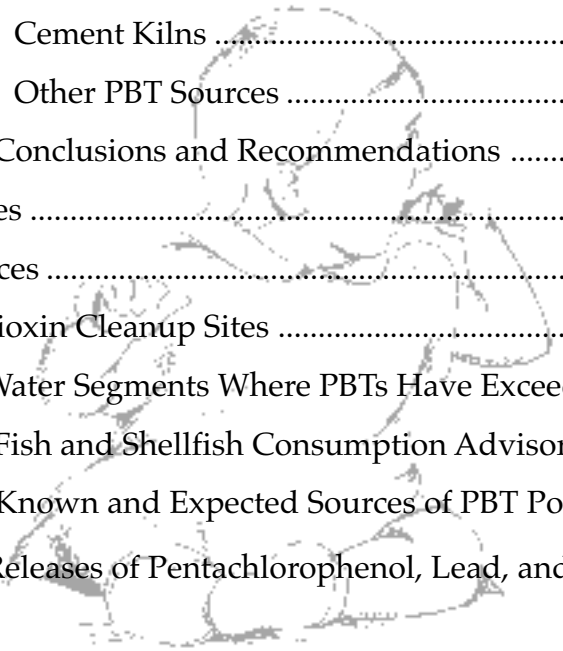


Executive Summary

As we enter the 21st century, every person on Earth is exposed to persistent bioaccumulative toxic chemicals (PBTs) from the moment of conception onward. No creature escapes exposure to these deadly chemicals.

Washington state has a tremendous opportunity to set a globally significant precedent ending PBT pollution. The Washington State Department of Ecology (Ecology) has launched an initiative to eliminate PBT releases and will soon propose a plan for public comment. In the nearly two years since the initiative was announced, however, Ecology and other state agencies have taken almost no action to actually stop PBTs from entering the environment. *Visualizing Zero* examines PBT sources in Washington state and the steps which can and must be taken to stop the contamination of children and other living things with PBTs.

We have a tremendous opportunity in Washington state to set a national precedent in eliminating PBT pollution.

Findings

Continued release of PBTs is unacceptable.

By their very nature, PBTs create unacceptable risks for current and future generations. They are known to cause serious health effects such as cancer, birth defects, and reproductive problems. They last for generations, if not forever. And they build up in people and wildlife, are passed to offspring during the earliest and most vulnerable stages of life, and can increase in concentration up the food chain. A huge body of evidence regarding the impacts of past PBT releases demonstrates that swift action must be taken to prevent further releases of PBTs. *Visualizing Zero* examines part of that evidence for four focus PBTs (dioxin, pentachlorophenol, mercury and lead) to illustrate the urgency of the need for action.

Washington state is extensively contaminated with PBTs.

• Seventy-four waterbodies in Washington have PBT levels which exceed water quality standards.

• Pentachlorophenol was found in 100% of the urban streams in King County that were tested by the U.S. Geological Survey in a recent study.

• Studies have documented PBT contamination in orcas, bald eagles, otters, salmon, rockfish, seals, crabs, seabirds, and other wildlife species in Washington.

• The state has thousands of toxic sites, many of which are contaminated with PBTs. Thirty-nine of these sites are contaminated with dioxin.

• The Washington State Department of Health cautions anglers against the consumption of fish or shellfish from any of the industrialized urban embayments in Puget Sound. Numerous advisories around the state urge people to avoid or limit fish and shellfish consumption because of contamination with dioxins, pentachlorophenol, metals, and other pollutants.

• Other foods are contaminated as well. For example, high levels of lead have been found in carrots grown on a Washington farm due to past lead-based pesticide use. Dioxins are undoubtedly present in meat and dairy products here as they are throughout the nation, as another example.

• House dust is a reservoir for PBTs and a significant toxic-exposure route for small children. Studies of house dust in Seattle have found significant concentrations of lead, pentachlorophenol, and PCBs. Some of these concentrations would trigger cleanups at toxic sites.

More than 190 point sources are known or suspected to release our four focus PBTs to the environment in Washington state.

This number reflects only releases of the four PBT chemicals we focus on in this report: dioxin, pentachlorophenol, mercury and lead. It does not include hundreds of sewage treatment plants in the state that may discharge PBTs, leaking toxic sites where there is no active industrial facility, or nonpoint sources like wood products releasing pentachlorophenol. Nor does it include pollution sources which do not show up in Ecology databases because of major inadequacies in those databases and in reporting requirements.

Toxic chemicals like dioxin and mercury are building up in our children's bodies every day.

❖ **Washington state polluters reported releasing and disposing of more than 330,000 pounds of lead and lead compounds in 1998 alone.** This number is just the tip of the iceberg as most facilities and releases are exempt from reporting requirements. The 1998 reported releases and transfers included:

- More than 3100 pounds emitted to air
- 820 pounds discharged to water
- More than 328,000 pounds released on-site or disposed of off-site

❖ **Pulp mills, incinerators and cement kilns** release dioxins, furans, mercury, and lead.

❖ **Wood treatment companies** release pentachlorophenol directly to the environment and create products which release penta during use and disposal.

- In 1998 alone, four wood treatment companies reported releasing 510 pounds of penta to air and 250 pounds to water, and disposing of 1000 pounds off-site.
- One facility alone, J. H. Baxter & Co. uses approximately 200,000 gallons per year of preservative that is 5% penta.

❖ **More than 2.8 million pounds of lead from industrial polluters were sent to the Washington fertilizer manufacturer Bay Zinc between 1990 and 1997 for inclusion in fertilizers** which end up on farms and grazing land.

❖ **Some of the other sources in the state releasing dioxin, lead and mercury include:**

- Aluminum and steel manufacturers
- Electronics Plants
- Shipyards

- Petroleum Refineries
- Plastic Manufacturers
- Metal Finishers and Fabricators

Governor Locke and his agencies have the power to stop PBT pollution.

Federal and state environmental laws provide ample authority for ending PBT releases. The Department of Ecology is required to establish standards, other rules, and permit conditions which protect people and wildlife from dangerous chemicals. PBTs are clearly dangerous based on their fundamental characteristics and extensive evidence of injuries to wildlife, laboratory animals, and human beings.

Governor Locke's administration not only has the power and the duty to act, it has immediate and ongoing opportunities to do so. Right now, Ecology staff are working on revisions to key state rules such as water quality standards, air standards for pulp mill incinerators, and amendments to dangerous waste rules. They are drafting new wastewater discharge permits for scores of PBT-releasing facilities. If the promise of Ecology's PBT Initiative is to become a reality, provisions ensuring an end to PBT releases must be adopted as part of these rules and permits.

Governor Locke's administration not only has the power and the duty to act, it has immediate and ongoing opportunities to do so.

Alternatives to PBT pollution abound. Pulp mills elsewhere in the world have switched to non-chlorine bleaches, thereby eliminating production of dioxins and furans. Lead-free solders have been developed for electronic products. Alternatives to mercury and PVC hospital products are available and in use. Alternative construction materials are available for piers, utility poles and other structures now made with penta-treated wood. With leadership from Governor Locke, these and other alternatives can put an end to PBT pollution in Washington state.

Recommendations

I) The Department of Ecology should adopt the People's PBT Plan.

A) Immediately prohibit new sources of PBTs.

B) Establish a deadline of 2010 for ending PBT releases from existing sources and toxic sites.

C) Address all PBTs. These include the 27 PBTs Ecology originally listed when it announced its PBT Initiative, as well as lead and other chemicals that meet screening criteria for toxicity and for persistence or bioaccumulation potential.

D) Take immediate action to end PBT releases at key state sources.

1) Pulp Mills. Issue permits for pulp mills based on totally chlorine free (TCF) technologies which prohibit releases of dioxins, furans and other PBTs, immediately at Georgia Pacific and by 2005 at other mills.

2) Incinerators and Boilers. Ban the burning of chlorinated wastes at hog fuel boilers, cement kilns, and medical and solid waste incinerators. Prohibit new incinerators immediately and phase out existing ones by 2003. Regulate incinerator ash as hazardous waste.

3) **Fertilizers.** Prohibit dioxin-laden and other harmful wastes from being made into fertilizer.

4) **Wood Treatment Facilities and Penta-Treated Products.** Ban the use of pentachlorophenol and end all penta discharges by 2003. Regulate penta-treated products as dangerous wastes.

E) Adopt PBT phaseout provisions in state water quality, air, sediment and cleanup standards. For example, upcoming revisions to water quality standards should immediately prohibit mixing zones and establish deadlines for achieving zero discharge for PBTs.

F) Make structural changes at Ecology to ensure successful transition to zero PBT releases. These changes include training regulatory staff on PBTs, linking pollution-prevention staff to regulatory staff, establishing forums that involve labor and community groups in transition planning for key facilities, and improvements in data management and accessibility.

II) The Department of Agriculture should cancel registrations for PBT pesticides on Ecology's list of 27 PBT chemicals, and work with Ecology to identify other PBT pesticides for phaseouts.

III) Regional air authorities should implement the state PBT Initiative through zero discharge provisions in permits and regulations.

IV) The Washington State Legislature should provide adeqate funding for PBT phaseout work at the Department of Ecology and the Department of Agriculture. The legislature should also support tax incentives and other measures to encourage alternatives to PBTs for individuals and others.

V) Governor Locke should make a public statement expressing strong support for phasing out PBTs, direct Ecology and Agriculture to take the steps outlined above, and adopt a purchasing policy for state agencies which gives strong preference to PBT-free products and processes. As the head of the state's executive branch, the governor must show leadership on this issue. He must ensure that Washington's laws to protect children, salmon, orcas and other living things from pollution are faithfully executed. By ending PBT pollution in Washington, the Governor can help our state lead the way for others to follow. A century from now, our descendants will be able to look back at Washington's PBT Initiative as a turning point in the global struggle for policies which respect the rights of people and wildlife, in current and in future generations, to live free of toxic contamination and its consequences.

VISUALIZING ZERO:

Eliminating Persistent Pollution in Washington State

Introduction

As we enter the 21st century, people carry hundreds of toxic contaminants in their bodies. Every child on earth is exposed even before birth to chemicals known to cause cancer and to interfere with development. Every nursing infant takes in dioxins, pesticides and other poisons along with their mother's milk.

A mere century ago, this was not the case. What have we done to our children's world?

For decades, scientists like Rachel Carson and others have sounded the warning bell about toxic chemicals which last for generations and build up in people and wildlife. Nonetheless it remains perfectly legal today to put all but a few of these poisons into the environment. Although these chemicals will plague our children's children, our society has left the spigot open.

It's time to stop the atrocity of contaminating current and future generations with our poisons.

Now, at last in Washington state, we have an extraordinary opportunity to close the spigot. Spurred by a growing public movement for reform, the Washington State Department of Ecology (Ecology) has announced that it will eliminate releases of persistent bioaccumulative toxics (PBTs). In the spring of 2000, it will propose a plan for accomplishing this. Washington is the first state in the nation to take such action. What happens here is incredibly important because it establishes the precedent for other states to follow.

While Ecology launched its PBT Initiative in 1998, it has done little since then to use its ample authorities to stop PBT pollution. Nearly two years after the agency's historic announcement, state pollution rules still do not include provisions for getting to zero PBT releases and polluters continue to pump PBTs into our children's world. Although alternatives abound, the spigot remains wide open.

This report examines PBTs and their sources in Washington state and provides recommendations for how Ecology should proceed with its historic Initiative. Part I discusses what PBTs are and provides background on the state's Initiative. Part II discusses health effects, contamination in the state, and sources for four particularly dangerous PBT chemicals. Part III provides recommendations for action for the Department of Ecology, Governor Locke and other policymakers throughout the state.

It's time to stop the atrocity of contaminating current and future generations with our poisons. We hope this report helps policymakers and activists provide the leadership needed for our childrens' sakes. It's time to visualize and achieve **zero** use, production and releases of PBTs.

PART I

What are PBTs and Why Must They Be Eliminated?

What are Persistent Bioaccumulative Toxics ?

The problems with persistent bioaccumulative toxics are clear from their name. PBTs are ***persistent***: they stay around for decades, or in some cases forever. They are ***bioaccumulative***: they lodge in the fat, bone or other tissue of wildlife and people. Because they are stored in living things, they can increase in concentration at each successive level of the food chain. Concentrations of PBTs in bald eagles can be millions of times higher than levels in the surrounding ecosystem, for example. And PBTs are ***toxic*** even in tiny amounts; regulatory limits for PBTs, where they exist, are frequently measured in "parts per billion" (ppb).

Most people are familiar with some of the more infamous PBTs such as DDT and PCBs that have been largely banned in the United States. But there are many other kinds of PBTs that continue to be released to the environment every day in Washington, the United States and the rest of the world. These include metals like mercury and cadmium, pesticides such as pentachlorophenol and endosulfan, and industrial byproducts such as dioxins and furans.

PBTs are of special concern because they affect more than the wildlife and people with direct exposures to them. They can pass to offspring prior to birth or hatching and through maternal milk. They can travel great distances, affecting people and wildlife far from their point of release to the environment. And once in the environment they don't go away. When we put PBTs into our water and air, or onto the land, we are literally burdening our grandchildren with our pollution and its effects.

Puget Sound orcas are the most contaminated whales in the world. The levels of PBTs in their bodies far exceed those associated with problems in belugas on the St. Lawrence Seaway.

Photo courtesy of Brian Raven, www.ravenscience.org

Some PBTs such as lead and mercury are naturally occurring elements. Use of these elements in industrial processes or products can combine them into more toxic compounds or redistribute them in the environment, increasing exposures for humans or wildlife. While a PBT policy cannot ban the existence of these natural elements, it can prevent their use in products and processes, thus limiting their transformation and discharge into the environment in ways that contaminate food, water, air, homes and workplaces.

The PBT Legacy

The legacy of decades of PBT releases to the environment is all around us. It is in hundreds of toxic

sites that need to be cleaned up at enormous expense, contaminated food and wildlife, and contaminated people.

A huge number of laboratory, human, and wildlife studies provide extensive evidence that PBTs cause cancers, birth defects, immune system suppression, reproductive impairment, neurological damage, and other problems. Based on these studies, there are strong indications that PBTs are contributing to a variety of disturbing human medical trends and statistics. More studies can and should be done, but it is clearly time to adopt a precautionary approach preventing additional contamination. The overwhelming weight of the evidence argues for this approach, particularly in light of what is at stake and the difficulty of removing PBTs from the environment and from our bodies once they are there.

PBTs are an insidious, unseen form of pollution, quietly building up in the food chain and our bodies every day. The effects of PBTs continue to be experienced decades after their release. People and wildlife are paying the price today for PBTs released over the past several decades. Our descendents will pay the price for PBTs we put into the environment today.

The effects of PBTs continue to be experienced decades after their release. Our descendants will pay the price for PBTs we put into the environment today.

Ecology's Initial Proposal — Fall of 1998
List of Persistent Bioaccumulative Toxics to Eliminate

1. aldrin
2. anthracene
3. benzo(a)pyrene
4. benzo(ghi)perylene
5. benz(a)anthracene
6. cadmium and compounds
7. chlordane
8. DDT (DDD, DDE)
9. 1,4-dichlorobenzene
10. 3,3'-dichlorobenzidine
11. dieldrin
12. endosulfan (including isomers and sulphate)
13. endrin
14. heptachlor
15. hexachlorobenzene
16. a-1,2,3,4,5,6-hexachlorocyclohexane
17. g-1,2,3,4,5,6-hexachlorocyclohexane (Lindane)
18. mercury and compounds
19. mirex
20. pentachlorophenol
21. perylene
22. phenanthrene
23. polychlorinated biphenyls
24. polychlorinated dibenzo-p-dioxins and furans
25. toxaphene
26. tributyl tin
27. trifluralin

This list was developed by the province of Ontario using rigorous screening criteria. Citizens groups want Ecology to add other chemicals like lead that are missing from the list. Lead accumulates in bones and was thus overlooked by Ontario which uses bioaccumulation criteria that focus on fat.

Deadlines for Eliminating PBT Releases

New Sources	2005
Existing Sources	2020
Toxic Sites	2025

Citizens groups are calling for an immediate prohibition on any new sources of PBTs and much shorter timelines for existing sources and toxic sites, particularly where alternatives already exist.

The Consequences of Persistent Pollution: What Studies Have Found

- Tumors, skeletal disorders, genital abnormalities and other problems in beluga whales (Colborn 1996).
- Liver tumors in English sole that live near Puget Sound toxic hotspots (PSWQAT 1998).
- Reproductive abnormalities in Columbia River otters (Henny 1994).
- Early or delayed sexual development in Commencement Bay fish (Collier 1997).
- Impaired growth and reduced ability to resist disease in salmon on the Duwamish River (Varanasi 1993, Arkoosh 1991).
- Lower IQs and other neurological effects in human children exposed prenatally to PBTs from fish their mothers ate (e.g. Jacobson 1996).

Medical Trends and Statistics Possibly Linked to Persistent Pollution

- Epidemic rates of cancer in our society (ACS 2000).
- A near doubling between 1970 and 1993 of a male genital birth defect known as hypospadias (Paulozzi 1997).
- Increases in other birth defects such as eye deformities (Edwards 1997).
- Substantially decreased sperm counts globally and in some localities (Swan 1997).
- Epidemic levels of endometriosis, a disease in women that can cause infertility (Holloway 1994).

Only a handful of PBTs such as DDT have been banned in the past. These chemicals were banned one by one at enormous public expense after decades of testing and studies focusing on each specific chemical. By the time action was taken, each chemical had already contaminated the environment, wildlife and people extensively. It had already caused injuries and the seeds were sown for the injuries to continue for generations to come. It is time for a new approach which addresses PBTs as a group and is based on precaution and prevention.

Growing Consensus on the Need for PBT Elimination

Washington state is not alone in acknowledging the dangers of PBTs. For example:

- The International Joint Commission on the Great Lakes and the Puget Sound / Georgia Basin International Task Force have both called for phaseouts.
- The United Nations is negotiating an international protocol to phase out 12 of the most toxic PBTs.
- The U.S. Environmental Protection Agency (EPA) is addressing these same 12 PBTs in its own Initiative.
- The EPA announced in September 1999 that all Great Lakes states would be required to phase out "mixing zones" for PBTs within 10 years (with some exceptions), and called on other states to follow this lead. Mixing zones are areas around discharge pipes where polluters are allowed to exceed water quality standards. These zones are often quite large.
- Following Washington state's lead, Oregon has also launched a PBT Initiative.

The Power and the Duty to Act

The Department of Ecology is both empowered and obligated under a variety of environmental statutes to protect health and the environment. Air, water and waste laws all provide authority and a duty to act against PBTs.

For example, the federal Clean Water Act established a national goal of ending all discharges of all pollutants — not just PBTs — to water by 1985. State clean-water law makes it unlawful to discharge anything into state waters "that shall cause or tend to cause pollution of such waters ..." (RCW.90.48.080). "Pollution" is defined as "such contamination ... as will or is likely to create a nuisance or render such waters harmful, detrimental or injurious to the public health, safety or welfare, or to domestic, commercial, industrial, agricultural, recreational, or other legiti-

mate beneficial uses, or to livestock, wild animals, birds, fish or other aquatic life" (RCW 90.48.020). PBTs clearly fall within this definition.

In addition, the state Hazardous Waste Reduction Act of 1990 established a specific goal of halving hazardous waste generation in the state by 1995 and a general goal of reducing toxic substance use in the state. The law requires certain polluters to prepare pollution prevention plans including goals and strategies for reducing or eliminating hazardous substance use.

Ecology has not used the tools at its disposal to end PBT releases in Washington. Years after the state was to end discharges to water and halve hazardous waste generation, it has not come close to meeting those goals. Ecology does not even track hazardous substance use despite the statutory directive to reduce it. Review of industries' pollution prevention plans is cursory and little is done to ensure that the plans push polluters toward zero PBTs.

Nearly two years have passed since Ecology announced its PBT Initiative. It is time for action. The following chapters outline specific steps Ecology needs to take if its PBT Initiative is to be meaningful and if the agency is to fulfill its statutory mandate to protect health and the environment.

Problems with Current Approach to Chemicals

1) Allows releases until chemicals are proven guilty. Irreversible contamination and harm are done before action is taken.

2) Requires a level of proof that may be impossible to attain. Barriers include:
- the money and time needed to study the full range of effects on various species at various life stages,
- long delays between exposures and effects,
- physical distance between releases and effects given how far PBTs travel,
- exposures to other chemicals that study-subjects experience; there are no longer any "clean" groups to use for comparison,
- political limits on what studies get funded,
- ethical limitations on studying humans.

3) Looks at chemicals one at a time, ignoring new or greater effects from combinations of chemicals.

4) Focuses on end-of-the-pipe controls which move pollutants from one medium to another, rather than on preventing pollution by stopping the creation and use of toxic substances.

A New Approach to Chemicals

1) Adhere to the precautionary principle which requires proof of safety before chemicals are released to the environment. Government should act immediately to stop the production, use, and release of PBTs.

2) Address PBTs as a group, rather than one chemical at a time.

3) Focus on preventing pollution through toxic-substance use reduction and technologies which do not generate PBTs in the first place.

PART II

A Closer Look at Four PBT Chemicals in Washington State

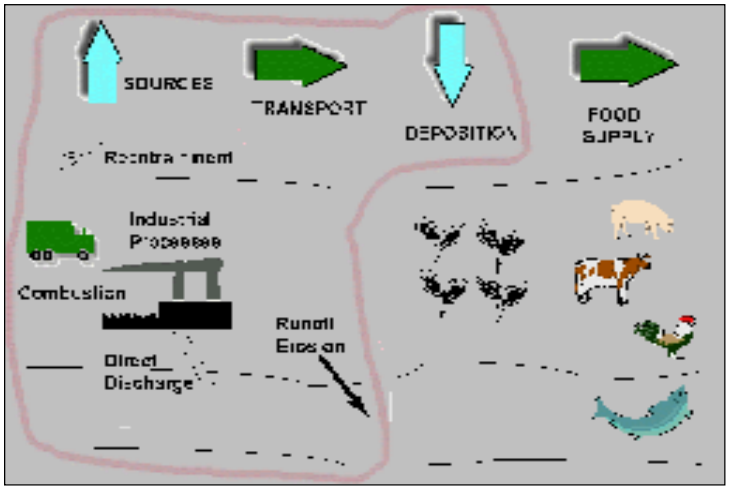
This section reviews four specific PBTs — dioxin, pentachlorophenol, mercury and lead — which all continue to be released into the environment in Washington state. First, we provide an overview of health and environmental effects for each chemical. Second, we discuss where these chemicals are found in the Washington environment. Finally, we discuss several key pollution sources in the state which are releasing one or more of these PBTs, and ways to eliminate those releases.

Health and Environmental Effects

Dioxin

Dioxin has been called "the most toxic substance known to science" because of its wide array of adverse health effects and its ability to cause harm at incredibly low exposure levels.

Dioxin is not deliberately manufactured. Rather, it is the unintended by-product of industrial processes that use or burn chlorine. Dioxin is formed whenever chlorine-containing compounds are exposed to high heat or catalysts in the presence of organic material (Pennise, 1996).



Much of the dioxin and PBTs released by industry make their way into our food supply via airborne deposition on food crops or pollution of aquatic habitats.

Dioxin is actually a family of chemicals with similar properties and toxicity, including dioxins, furans and PCBs. There are 75 different forms of dioxin, 135 different forms of furans and 209 different forms of PCBs. Because not all dioxins, furans and PCBs are equally toxic, the concept of Toxic Equivalency (TEQ) is used to compare the less-toxic forms to the most toxic (known as TCDD). For the purposes of this report, we use the term dioxin to refer to the 7 most-toxic dioxins and the 10 furans with dioxin-like toxicity.

Dioxin in the Environment

Most dioxin escapes into the environment from air emissions (U.S. EPA 1998). Once in the air, dioxin is suspended for a long time and can travel great distances before being deposited on soil or surface water. Dioxin also ends up in water and sediments through direct discharges to water, and run-off carrying contaminated soil into waterbodies.

Dioxin also enters the environment when industrial wastes and municipal sludge contaminated with dioxin are applied to crop and grazing lands as fertilizer. When grazing lands are contaminated, grazing animals take in the contaminated soil as part of their diet.

Exposure to Dioxin

Almost all human exposure to dioxin comes from our food, especially meat, fish and dairy products. Current average daily intake is more than 200 times the amount EPA considers "safe" (Schecter 1999). Nursing infants have significantly higher exposures, and they are receiving them at a very vulnerable time of life.

Dioxin is also in other children's food. Consumers Union tested baby foods and found that a typical jar (2.5 oz) of meat-based baby food exceeds EPA's "acceptable" daily dose by approximately 100 times, for example (Consumer Reports 1998).

The average "background" body burden of dioxin in the U.S. population is at or near levels that have been shown to cause adverse health effects in laboratory animals (DeVito 1995, CHEJ 1999). This means the general population may already be experiencing adverse health impacts from exposure to dioxin.

Infants drink dioxins and other poisons in breast milk.

Wildlife Effects

Extensive evidence shows that dioxin is already harming our wildlife populations. For example, the U.S. Fish and Wildlife Service concluded in a 1994 biological opinion that dioxin releases to the Columbia River would likely result in the "incidental take of bald eagles due to detrimental effects resulting from chronic toxicity such as reduced reproductive success, and other behavioral and physiological impairments that may act to reduce the eagle's ability to survive." The Service urged government agencies to "strive towards elimination of dioxin discharges to the Columbia River …" Reproductive success rates of Columbia River bald eagles are substantially lower than those of eagles from less polluted areas (USFWS 1994).

A study of otters on the Columbia River found a direct association between unusually small genitals, other reproductive abnormalities, and levels of dioxins and other contaminants in young otters' bodies. The researchers also noted that mink had become so rare on the river that they could not be studied as planned. Studies of the mink in the late seventies had found levels of dioxin compounds (PCBs) which were comparable to levels which cause complete reproductive failure in laboratory studies (Henny 1996).

Dioxin is also hurting fish, which are highly sensitive to dioxin. A study of coho survival from 1987 to 1990 found that pollution from pulp mills that operated at Grays Harbor may have made the fish more susceptible to parasites, thus contributing to exceptionally low survival rates (Washington Dept. of Fisheries 1992). The pulp mill effluent contained dioxins and other organochlorines.

Human Health Effects

Dioxin causes cancer, birth defects, immune system suppression, and learning and behavioral problems.

Cancer and Immune System Problems

The International Agency for Research on Cancer has declared the TCDD dioxin a known human carcinogen (McGregor 1998). Though dioxin does not appear to initiate cancer, it is a potent promoter of cancer (Great Boston Physicians for Social Responsibility 1997).

According to the EPA, the average daily intake of dioxin poses a substantial cancer risk to the general population. EPA estimates that the lifetime risk of getting cancer from exposure to dioxin may be as high as one in 10,000 for the general American (CHEJ 1999, U.S. EPA 1994). EPA generally considers cancer risks greater than one in a million as unacceptably high.

Studies of laboratory animals have found alterations to the immune system, such as greater sensitivity to viruses, at levels of dioxin exposure equal to average human body burden levels (DeVito 1995).

Reproductive and Developmental Toxicity

Dioxin has been linked to a number of serious reproductive and developmental effects. For example, evidence links dioxin to endometriosis, an often painful disease in women which can cause infertility. Laboratory studies of rhesus monkeys show a clear correlation between dioxin exposures and endometriosis (Rier 1993).

Children exposed to PBTs before and after birth carry this toxic burden and its effects into adulthood. Milk and many other foods that we drink and eat contain PBTs.

Laboratory studies have also shown that dioxin can reduce testosterone levels, sperm counts and fertility in rats (Kociba, 1976). Dioxin has also been implicated in prenatal deaths (Bowman, 1989).

There is also ample evidence that dioxin causes birth defects. In one rat study, a single low dose of dioxin (.064 micrograms per kilogram) on day 15 of pregnancy led to significantly lower sperm production and decreased size of reproductive organs in male offspring (Mabley, 1992). Other studies have shown dioxin to disrupt the development of the female reproductive system (CHEJ 1999).

Dioxin and Learning Problems

There is increasing concern that dioxin is causing IQ deficits, increased prevalence of withdrawn behavior, hyperactivity and other neurological effects in children. These effects were reported in Dutch studies of children exposed to dioxins and PCBs in the womb. The mothers of these children were exposed to "background" levels in their food (CHEJ 1999).

A group of studies examined the effects of dioxin family organochlorines on children of mothers who ate Lake Michigan fish as compared to those who did not. Children of women who regularly ate fish had higher prenatal exposures to PCBs as measured in umbilical cord samples. These higher prenatal exposures were associated with lower IQs, weaker reflexes, poorer muscle tone, and other cognitive effects (e.g. Jacobson 1996).

Pentachlorophenol

Even though it has been banned in 26 countries, pentachlorophenol (penta) is still widely used in the United States. It is extremely toxic to its intended target as well as non-target species, and has been used to kill everything from weeds to insects before uses were narrowed to its only current use as a wood preservative. Along the way, penta has become very widely distributed in the environment, resulting in numerous toxic sites. Perhaps the most disturbing fact about penta is that it is contaminated with dioxin. Since the volume of penta that is used in the United States every year is so high, the amount of dioxin created through penta production is extremely large, estimated by EPA at 25,000 grams TEQ per year (U.S. EPA 1998).

Pentachlorophenol is so toxic that it has been banned in 26 countries, but is still widely used in the United States to preserve wood utility poles.

Uses

Pentachlorophenol is a restricted-use pesticide currently registered for use in the United States as a wood preservative. Its primary use is for outdoor applications, such as for utility poles, fences, porches, piers, and bridges. It has been used as a wood preservative since 1936. Before 1987 penta was also used an an herbicide, insecticide, moss-killer, and disinfectant. Currently, the primary wood-preservative use of penta is on utility poles.

Pentachlorophenol in the Environment

Penta-treated wood poles and other wood products remain in the environment for years and even decades. Much of the penta eventually leaves the wood either through leaching or volatilization (escape into the air). When it is used to treat utility poles, penta and its contaminants move downward to the bottom of the pole and tend to contaminate nearby soil. The EPA believes, however, that most dioxin escapes from treated wood into the environment through volatilization (U.S. EPA 1999). This is a serious concern because most exposure to dioxin is through food, resulting from airborne deposition on animal forage and food crops.

Pentachlorophenol is moderately persistent in soil and water, with a half-life of about two months. When penta degrades, however, the main degradation products are other chlorinated organic compounds, such as tetra- and trichlorophenols (phenols with fewer chlorine atoms) (U.S. EPA 1999).

Exposure to Pentachlorophenol

Almost all exposure to pentachlorophenol, for those who are not occupationally exposed, is through the food chain (Jorens 1993). Between 1985 and 1991, penta was found in milk, fruit, and meat. Individuals that may have greater exposures include people living in log homes made from penta-treated logs, and occupationally exposed workers. In addition, children and adults can be exposed through ingestion or contact with contaminated soil.

Children generally have greater blood levels of penta than adults do, averaging nearly twice as much, and are widely exposed. Indeed, a 1989 study found penta in the urine of 100% of the 197 children tested (Hill 1989). While levels vary, nearly every person on earth carries penta in his or her body. Penta has been found in breastmilk, seminal fluid, cerebrosprinal fluid, and at high concentrations in testes, kidney, liver, and prostate tissue from individuals not occupationally exposed (Jorens 1993).

Exposures to the highest levels of penta are from occupational exposure. Workers applying penta are exposed at wood treatment plants, joinery mills, and in reapplication of penta to utility poles already in use.

Pentachlorophenol is associated with severe reproductive problems in herons and other wildlife.

Wildlife Effects

Penta is extremely toxic to fish, with concentrations lethal to half the fish (LC50 values) ranging from 66 micrograms per liter in steelhead (Dominguez 1984) to 18 micrograms per liter for rainbow trout fry (Van Leeuwen 1985).

Dramatic demonstrations of the effects of penta on wildlife have occured here in the Northwest. A blue heron colony failed to reproduce when none of its 200 eggs hatched. The dioxins present in the herons' eggs that failed to hatch matched those present in commercially produced penta (Greenpeace 1988). A 1991 spill from the Brooks wood treatment facility in Bellingham traveled to Whatcom Creek, killing 50,000 steelhead salmon at a hatchery (Greenpeace 1988).

Human Health Effects

Pentachlorophenol has high acute toxicity because of its interference with basic metabolic processes. EPA classifies it in its highest acute-toxicity category, so that penta labels of almost all products bear the word DANGER.

Penta poisoning may cause spasms, convulsions, coma, as well as dizziness, headache, personality changes, and anxiety (Jorens 1993). There have been approximately 50 known cases of acute pentachlorophenol poisoning, resulting in 30 deaths (NCAMP 1999).

Penta has been classified as a probable (B2) carcinogen by the EPA, based on a study by the National Toxicology Program that found increased tumor incidence

in mice exposed to penta. People occupationally exposed to penta have been found to have increased incidence of nasal cancer, skin cancer, and leukemia (Jorens 1993).

In the draft science chapter for penta's re-registration EPA included an assessment of cancer risk for various exposures (U.S. EPA 1999). The estimated risks for some workers are truly shocking. For example, EPA estimates that workers applying penta grease to utility poles already in service have a cancer risk of 0.4 per worker, if the workers use all protective equipment, and of 3.4 per worker without protection. This means EPA expects at least 4 in 10 workers with lifetime exposure to get cancer, and if the workers don't use protective equipment, every worker can be expected to get cancer.

Because PBTs accumulate in women's bodies, babies are exposed to them even before birth.

In fact, the EPA's risk assessment finds that cancer risks for nearly all worker exposures are what EPA terms unacceptable, that is greater than 1 in 100,000. The risk assessment also found an unacceptable risk for children exposed to penta-contaminated soil, with a risk of up to 22 per 100,000. The cancer risk for exposure of children to penta-treated wood was also considered unacceptably high.

Non-cancer effects include immune system and developmental effects. Both purified penta and commercial penta have been shown to cause skeletal abnormalities and fetal deaths (Schwetz 1974). Blood levels of penta in humans have been correlated with immune problems including impaired immune response (Daniel 1995). Individuals with chronic penta exposure have been found to have reduced immune responses and a higher incidence of illness (McConnachie 1991). In laboratory tests, rats exposed to purified penta at levels ten times below what EPA considers the "no effect" level had an altered immune response (Blakeley 1998).

EPA expects at least 4 in 10 workers applying penta grease to utility poles already in service to get cancer, ***even if they wear protective equipment****.*

Mercury

Mercury is a naturally occurring metal which exists as elemental mercury, inorganic mercury compounds and organic mercury (primarily methyl mercury). All of these forms are toxic, but organic mercury is considered the most dangerous because of the ease with which it is absorbed orally and because it crosses into the brain and fetus (Schettler 1999). Mercury's toxic effects are believed to be due to its ability to bind to proteins and therefore affect a wide range of biological processes, such as enzyme activity (ATSDR 1997).

Uses

Elemental mercury is used in industrial processes, refining, and in consumer products such as thermometers, barometers, pressure-sensing devices, batteries, lubrication oils and dental amalgams. Inorganic mercury was used in the past primarily in latex paint. However, in 1990 EPA banned mercury in interior paint, and discontinued use of mercury-containing exterior paint in 1991. Methyl mercury, the most common form of organic mercury, is formed when bacteria in soil or water act on mercury in the environment.

Mercury in the Environment

Global atmospheric concentrations of mercury have increased threefold since industrialization. Most of the mercury in the atmosphere is elemental mercury vapor from natural and human sources. Once in the atmosphere, mercury can circulate globally for up to a year. Through precipitation, it finds its way into surface water and land (U.S. EPA 1997).

Exposure to Mercury

Organic mercury in the form of methyl mercury builds up in water, soil, sediments, plants, and animals (U.S. EPA 1997, Mahaffey 1999). Humans are mainly exposed to mercury, however, through consumption of fish contaminated with methyl mercury (Mahaffey 1999, U.S. EPA 1997-2).

Photo courtesy of Brian Raven, www.ravenscience.org

Mercury and other PBTs are associated with reproductive problems including inability to reproduce and developmental and behavioral deficiencies in wildlife and humans.

Mercury contamination of fish is so ubiquitous that fish consumption advisories for mercury are increasing faster than for any other pollutant (U.S. EPA 1997-2). According to EPA data, 1.6 million women and children in the United States are exposed by eating fish to levels of mercury which may harm them or their babies (U.S. EPA 1997-3).

Wildlife Effects

Fish-eating birds and mammals experience the highest exposure to mercury. Adverse effects of mercury on fish and wildlife include reduced ability to reproduce, impaired growth, developmental and behavioral abnormalities, and death (U.S. EPA 1997). Mercury contamination has been documented in the endangered Florida panther and the wood stork, as well as populations of loons, eagles, mink and otter — species that eat fish or fish-eating animals.

Because mercury travels the world via the atmosphere, mercury contaminates the marine environment even in the northeast Atlantic Ocean, far from any human activity. A recent study found that mercury concentrations in seabirds are increasing at a rate of up to 4.8% a year. The authors concluded that "Large increases of mercury pollution ... are of concern because of the current public health problem resulting from widespread incidence of elevated levels of methyl mercury in fish ..." (Coastlines 1998).

Human Health Effects

Mercury is a potent neurotoxin and also harms the kidneys and lungs. The greatest concerns about the effects of mercury relate to exposure of the developing fetus to methyl mercury, which can result in severe mental retardation.

Acute exposure to methyl mercury results in nervous-system harm including blindness, deafness, impaired levels of consciousness, and death (Mahaffey 1999, Gosselin et al, 1984). Chronic exposure to elemental mercury results in behavioral

problems including increased excitability and loss of memory, as well as muscle tremors and gingivitis (Goyer 1991).

For chronic exposures to methyl mercury, EPA currently considers only exposures less than 0.1 micrograms per kilogram body weight per day as having no adverse effects. However, over the past decade this standard has been continually adjusted downward, as scientists find adverse effects at doses previously considered "safe." Today many scientists, including the EPA's Science Advisory Board, believe that the current standard is not protective of the developing fetus against subtle effects of methyl mercury poisoning (Environmental Working Group 1999).

As stated above, methyl mercury crosses the placenta and can have severe effects on the developing fetus. Levels in the blood of the fetus are generally higher than in the mother's blood (Goyer 1991). Infants born to women who ingested high concentrations of methyl mercury had mental retardation, deafness, blindness, seizures, and cerebral palsy (ATSDR 1999).

Methyl mercury is classified by the EPA as a possible human carcinogen. Methyl mercury has been linked to kidney tumors in male mice, and mercuric mercury has been linked to several types of tumors in rats (ATSDR 1999).

Mercury, dioxin and other PBTs have been found in otters. Reproductive problems in young Columbia River otters correspond to PBT levels in their bodies.

Lead

Since lead in gasoline was banned in 1996, the main releases of lead to the environment are from industrial facilities and disturbance of older structures containing lead-based paint.

Lead in the Environment

Once released into the atmosphere, lead usually stays in the atmosphere for five to 15 days. During this time, it may travel thousands of kilometers (ATSDR 1997-2). Lead may also move from the atmosphere into soil or water through wind and rainfall.

Lead persists in soil and tends to remain in the upper few centimeters of soil (U.S. EPA 1997-3, ATSDR 1993). Edible plants may take up lead from the soil through their root systems.

Lead enters water through atmospheric deposition, runoff, wastewater from facilities, and other sources. It migrates to sediments, persists in water, and can be taken up by fish and stored in blood or tissues. Concentrations found in fish — particularly shellfish — can be much higher than levels present in water (NJDOH 1986).

Exposure to Lead

The most significant sources of occupational lead exposure include lead mining and smelting operations, cutting and welding of lead-painted structures, manufacture of lead storage batteries, and production of lead-based paints (ATSDR, 1990).

In the general population, adults are exposed to lead by taking in contaminated food and water. Once ingested, lead is stored primarily in bone. During pregnancy, lead passes virtually unimpeded across the placenta, and may be mobilized from the mother's bone stores and transferred to the fetus (Carrington, 1992).

Young children are exposed to lead through ingestion of lead paint chips (in older buildings) and ingestion of contaminated soil or housedust. Large areas in central and eastern Washington have lead-contaminated soil due to past use of lead arsenate as a pesticide. Lead is tracked in from out of doors and may also come from indoor sources such as paint chips. It has been found in many consumer products such as crayons, mini-blinds, candle wicks and pottery. It is still used in some hair dyes. Recently, lead and other dangerous additives have been found to leach from children's plastic toys (DiGangi 1997).

Wildlife Effects

Lead and its compounds have high chronic toxicity to aquatic life (NJDOH 1986), and lead is well-known to threaten waterfowl populations. A lead mining and smelting complex in northern Idaho has caused die-offs of waterfowl in the Coeur d'Alene River system in northern Idaho since the early 1900s; dozens of tundra swans have died as a result of ingesting lead-contaminated sediment in this river system (Blus et al 1991). Poisoning of migratory birds from lead shot has long been a concern: the deaths of hundreds of geese in Kansas and Massachusetts wildlife refuges were believed due to ingestion of lead shot (Sindingstad 1987, Howard 1979). Recently, dozens of swans in Whatcom County, Washington, died as a result of lead poisoning.

Tundra swans in the Coeur d'Alene River system in northern Idaho have died as a result of ingesting lead-contaminated sediment.

Lead is also associated with behavioral problems and lower survival rates for birds. In a recent study of lead-exposed herring gull chicks, researchers found that the lead-exposed chicks had lower weights and behavioral deficits that reduced their survival rate. Although the parent birds were able to make up for some of the deficits, survival rates were lower (Burger 1997).

Human Health Effects

Because the toxicity of lead has been known for centuries, an extensive body of research has been developed linking lead to adverse health effects. Lead causes a range of health problems including muscle weakness, insomnia, anemia, anorexia, loss of memory, wrist drop, severe cramps, kidney dysfunction, miscarriages, sterility, decreased sperm counts, learning deficits and behavioral problems, high blood pressure, brain damage and cancer (Gosselin et al 1984, ATSDR 1993, Silbergeld et al 1991).

Today, the most concern regarding human exposure to lead revolves around the exposures of young children as well as in-utero exposure of a developing fetus to lead stored in the mother's bones (see below). Recent research shows that extremely low levels of lead can cause irreversible neurological damage to infants and young children, and no threshold has been found below which these effects do not occur.

Learning and behavioral damage are being found at lower and lower levels of lead exposure, including levels previously thought to be "safe" (CPP 1988, Schwartz 1994, Needleman 1990). Consequently, government agencies have continually adjusted downward the limit considered to be the "safe" level of exposure. Currently, the Center for Disease Control considers levels of more than 10 micrograms of lead per deciliter of blood to be "elevated" (ATSDR 1997). However, no threshold level has been found below which adverse effects do not occur.

Although blood lead levels have dropped considerably in the last decade, according to the Center for Disease Control nearly one million children living in the United States have lead levels in their blood that are high enough to cause irreversible damage to their health.

Nearly one million children in the United States have lead levels in their blood that are high enough to cause irreversible neurological damage.

Lead can cause adverse effects on the reproductive system including miscarriages, stillbirths and decreased sperm counts (Silbergeld 1991). Impotence, decreased sex drive and sterility have also been associated with lead exposure (CA Dept. of Health Services 1986). Prenatal exposure at "acceptable" levels has been linked to preterm delivery, congenital abnormalities, low birth weight, and decreases in growth stature (ATSDR 1998).

The EPA has classified lead as a probable human carcinogen. Animal studies have linked lead exposure to kidney cancer. Some epidemiological studies have linked occupational exposure to stomach and lung cancers; however, workers were possibly exposed to other metals besides lead (U.S. EPA 1988).

Contamination in Washington State

Washington state is extensively contaminated with dioxin, mercury, lead and pentachlorophenol, as well as with other PBTs.

The state has thousands of toxic sites, many of which are contaminated with PBTs. Thirty-nine of the sites on Ecology's list are known or suspected to be contaminated with dioxin, for example (See Appendix I).

There are 75 waterbodies on Ecology's list of waterbodies at which water-quality limits for one or more PBTs in sediment, water, or tissue (of organisms in the waterbody) are exceeded. For example, water and sediments in Elliott Bay exceed water-quality limits for mercury, furans, and other PBTs. The Columbia River exceeds water-quality limits in water and tissue for dioxin, mercury, and many pesticides. Commencement Bay water and sediments exceed limits for mercury, dioxin, and furans. Bellingham Bay sediments are highly contaminated with mercury because Georgia Pacific used a mercury-cell process to make chlorine for its pulp mill (See Appendix II).

The state list only includes waterbodies that have been tested and only identifies chemicals checked for in those tests. In addition, Ecology's list does not include "mixing zones," areas beyond discharge pipes in which Ecology allows polluters to exceed water-quality limits so their toxic releases can become diluted.

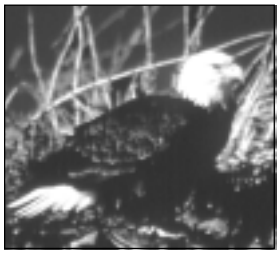
Other waterbodies that are not on the state list are also contaminated with PBTs, even if the state's inadequate water-quality standards are not exceeded. Pentachlorophenol was found in five out of eight waterbodies sampled by Ecology in 1996, for example (WSDOE 1998a). A 1998 U.S. Geological Survey (USGS) study found lead, mercury, and other PBTs to be much higher in sediments and sculpin (a predatory bottom fish) in urban streams than in other streams in western Washington (USGS 1998). A more recent USGS study found pentachlorophenol in 100% of urban streams tested in King County (USGS 1999).

Washington state has at least 75 waterbodies that do not meet state standards for PBTs.

Studies of wildlife around the state have also documented extensive PBT contamination. References have already been made in this report to dioxins and other PBTs in Washington state's otters, bald eagles, and orca whales. Examples of other wildlife found to be contaminated with PBTs include rockfish, seals, crabs, seabirds, and many other species. Virtually no animal in the state is uncontaminated.

The Washington State Department of Health cautions against the consumption of fish or shellfish from any of the industrialized urban embayments in Puget Sound. Numerous advisories around the state urge people to avoid or limit fish and shellfish consumption because of contamination with dioxins, pentachlorophenol, metals, and other pollutants (See Appendix III) (WSDOH 2000).

Other foods are contaminated as well. In 1999, as just one example, the U.S. Food and Drug Administration found high levels of lead in carrots grown on a Washington farm. The high lead level in the carrots was due to past use of a lead-based pesticide, lead arsenate, last used in Washington in the 1960s on apple and other fruit orchards (WSDA 1999-2). Though use of lead arsenate was banned completely on food crops in the late 1980s, its persistence continues to result in harmful exposures today. And as noted below, lead-containing fertilizers derived from industrial waste can today be legally spread on land used to grow food crops.



Levels of PBTs in eagles and other species high on the food chain can be millions of times greater than levels in the surrounding ecosystem.

Dioxins are undoubtedly present in meat and dairy products in Washington state as they are throughout the nation, as another example.

Even house dust is a reservoir for PBTs and a significant toxic exposure route for small children. Studies of house dust in Seattle have found significant concentrations of lead, pentachlorophenol, and PCBs. All Seattle homes tested in one study had PCB concentrations exceeding levels that would trigger cleanups at toxic sites under state law. In another study median lead concentrations in house dust in older Seattle homes exceeded EPA cleanup standards by twofold (Roberts 1995).

In short, past practices have already spread not only the four PBTs focused upon in this report, but also an array of other PBTs throughout the region. Water, land, wildlife, and food have all been contaminated as a result. And yet, we continue to put more PBTs into the environment, as discussed in the following section.

Sources in Washington State

Looking at only our four focus chemicals, we identified more than 190 PBT sources in Washington state. This figure is only the tip of the iceberg even for only these four PBTs. It does not include hundreds of sewage treatment plants, leaking toxic sites where there is no active industrial facility, or nonpoint sources like wood products releasing pentachlorophenol. Nor does it include pollution sources which do not show up in Ecology databases because of major inadequacies in those databases and in reporting requirements.

In this section, we discuss some of the sources of dioxin, pentachlorophenol, mercury, and lead in Washington, with an emphasis on facilities where Ecology has an immediate opportunity to eliminate PBT releases. Recommendations for actions the agency should take are included in Part III below.

PBTs accumulate in soil and food. The Washington State Department of Agriculture recently found high levels of lead in carrots grown on land where lead-based pesticides had not been used since the 1960s.

There are some significant sources of PBTs which we do not address in this section such as cars and lead-based paint on older homes. These sources are important and must be addressed, but are beyond the scope of Ecology databases and files we consulted.

Pulp and Paper Mills

EPA has ranked pulp and paper mills that use chlorine for bleaching as the fourth largest source category of dioxin nationally (WSDOE 1998). The wood used to produce paper contains a dark colored, sticky substance called lignin, which is bleached to make white paper products. Mills using chlorine compounds for bleaching pollute the water, air and land with dioxin, furans and other chlorinated pollutants. Even the resulting paper products are contaminated with dioxin. The pulp and paper industry is most likely a more important dioxin source in Washington than nationally because of the large volume of pulp being bleached with chlorine compounds and the burning of chlorinated wastes at pulp mills (WSDOE 1998).

In Washington, seven pulp and paper mills which use chlorine compounds for bleaching discharge dioxin, furans and other chlorinated pollution into Puget Sound, Bellingham Bay, Commencement Bay, and the Columbia River. As the largest source of dioxin to water (U.S. EPA 1998), pulp mills contaminate fish, other aquatic life, wildlife, and eventually people who eat the fish.

Pulp mills emit dioxin to the air via their hog fuel boilers (incinerators) (WSDOE 1998) and kraft recovery boilers (U.S. EPA 1998). There are 16 incinerators at the seven chlorine-using pulp mills in Washington. Most of them burn chlorinated sludges, a few burn salty wood, and a number of them burn tires, coal, oil, and other chlorinated wastes that could contribute to dioxin emissions. Kraft recovery boilers emit dioxin because they burn spent bleaching chemicals.

Limitations on Finding Out About PBTs in Washington

Several factors make it difficult to fully assess sources and volumes of PBT releases in Washington:

• Only some polluters are required to report. These only provide partial information on certain chemicals.

• There is no centralized database which provides comprehensive data for all state pollution sources on toxic substance use and on PBT releases to all environmental media (air, water, land, waste, products).

• Comprehensive individual databases for air, land, waste and toxic substance use are not available.

• A database for water discharge information does exist at the Department of Ecology but it contains only partial information. The database lacks information on volumes of pollutants discharged, whether mixing zones have been granted, and timelines for permit renewals.

• The Ecology water-quality database is not directly accessible to the public. In order to conduct an assessment, members of the public must ask busy Ecology staffers to query the database. Data generated by agency staff may not accurately reflect what the requestor is seeking to obtain.

• While state law requires certain industries to file pollution prevention plans with Ecology, the agency gives little attention to these plans. As a result, the plans do not provide thorough lists of hazardous substances used, PBTs released, and ways to prevent PBT releases.

• While many individual staff members at Ecology are aware of the PBT Initiative, there is little evidence of the Initiative affecting agency planning and implementation in permitting and rulemaking. Thus, there are no agency planning documents that even begin to comprehensively identify PBT sources and releases.

The wastes from pulp mills, including sludges from wastewater treatment plants and fly ash and bottom ash from incinerators are also contaminated with dioxin. Sludges are landfilled or applied to land as a soil amendment; some mills burn the sludge before landfilling or applying them to land. The Boise Cascade mill in Wallula composts its sludge and then applies it to land. The Fort James Camas mill sells the fly ash resulting from the burning of their sludges to local farmers who apply it to agricultural land. This ash, called "Nutrilime," was tested by Ecology in 1997 and found to have high levels of dioxin (36 ppt TEQ). It also contains lead at 495 ppm, cadmium at 4 ppm and mercury at 2.2. ppm (WSDA 1999).

Even when the waste is put in landfills, dioxin can escape into the surrounding environment. A landfill operated by Rayonier, Inc., located in the middle of a Port Angeles neighborhood contains high levels of dioxin from mill sludges and boiler ash dumped there. Ash at the landfill was tested by EPA as part of a Superfund site investigation (U.S. EPA 1998-2) and found to have extremely high levels of dioxin at 1,793 ppt TEQ, which greatly exceeds the state residential cleanup levels for dioxin of 6.67 ppt (WSDOE 1996). Of particular concern is that EPA found that dioxins and furans are at elevated levels on residential property surrounding the landfill (U.S. EPA 1998-2).

Finally, dioxin that gets into pulp winds up in paper products. When the paper is used for food packaging, dioxin can contaminate food contained in the packaging. Food and Drug Administration studies found that dioxin migrated into food from coffee filters, cream cartons, orange juice cartons, paper cups for hot beverages and soup, paper plates for hot foods and microwave popcorn bags (LaFleur 1990).

Alternatives

Regulatory authorities have acknowledged the need to reduce dioxin releases from pulp mills. New federal regulations, called the "cluster rule," require mills to change their manufacturing processes and be in compliance when the new permits are issued. The cluster rule requires that at a minimum, mills switch from using elemental chlorine to chlorine dioxide. The rule was strongly opposed by national, state and local environmental groups because chlorine dioxide bleaching results in continued releases of dioxins, furans, and other organochlorines. These groups called for new effluent limits to be based on chlorine-free technologies, resulting in zero dioxins and furans.

There are dozens of "chlorine-free" mills worldwide that make cleaner paper products without chlorine. For example, numerous mills in Sweden and Finland are totally chlorine free (Ritchlin 1998.) The Louisiana Pacific mill in Somoa California is also totally chlorine free and other mills in the United States and Canada produce chlorine-free product lines including Georgia Pacific (toilet paper) and Rolland (copy and printing papers).

Chlorine-free mills also use less chemicals, water and energy. For example, an average North American pulp mill using chlorine chemistry uses around 35,000 to 45,000 gallons of water per ton of pulp. A typical chlorine-free pulp mill uses 2,500 to 3,000 gallons of water per ton of pulp — less than one-tenth the amount of water (Chlorine Free Products Association 2000).

Now is a critical time for mills because they are making large capital investments in equipment to comply with the new cluster rule. If mills switch to chlorine dioxide now we could wait for decades before dioxins and furans are eliminated from them. Mills must invest now in clean chlorine-free technology for the 21st century because we cannot afford to wait 20 more years. Ecology must make decisions now to prevent a legacy of pollution and issue new permits that drive the use of chlorine-free technologies.

Health Care Industry

There are 103 hospitals across Washington state. Hospitals are supposed to heal people but they can also be a source of persistent toxic pollutants.

The main PBT source in the health care industry is the incineration of medical waste. While many hospitals, such as the Veteran's Administration and Northwest Hospitals in Seattle have closed their incinerators, others remain open. For example, St. Joseph's hospital in Chewelah currently burns all of its waste. There is also a new incinerator at Washington State University in Pullman that is

The Environmental Injustice of Pulp Mill Pollution

Indigenous and Asian communities and those who rely heavily on fish for food are particularly at risk from dioxin pollution. The Columbia River Intertribal Fish Commission and Northwest Indian Fisheries Commission have documented that Native Americans in the Northwest consume far more fish than the so-called "average" person used to develop dioxin water-quality standards, for example. The Nez Perce Tribe has estimated their tribal fish consumption rates to be closer to 64 grams a day, instead of the 6.5 grams an "average" person might consume. Ecology has conducted a quantitative analysis and is considering a default value of 175 g/day.

Georgia Pacific —The Dirty Secrets of White Toilet Paper

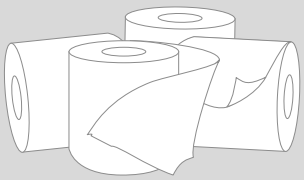
In the heart of downtown Bellingham sits the Georgia Pacific mill. In its more than 65 years of operation, the facility has released massive amounts of extremely toxic pollution to make its bright-white brands of toilet paper and tissue products. TRI data shows that in 1997 alone the company reported releasing more than one million pounds of toxic chemicals into the air, water and land. This amount included more than 15,000 pounds of chlorine and chlorine dioxide.

Georgia Pacific's Bellingham pulp and paper mill has dumped approximately 26,000 pounds of mercury into Bellingham Bay.

In order to make super-white toilet paper and specialty pulps for films, plastic moldings and laminating products, the company used vast quantities of chlorine gas, which they made on site using a mercury-based process. This process resulted in daily discharges of mercury into Bellingham Bay, severely contaminating its water and sediments. Although Georgia Pacific was recently forced to close its chlorine plant, the site is a toxic cleanup site and is now the subject of a major public controversy over adequate cleanup measures.

In 1997, the EPA finalized new regulations to limit releases of dioxin and other pollutants from pulp and paper mills. The rules for calcium sulfite mills such as Georgia Pacific are based on chlorine-free technology and require this type of mill to eliminate all dioxins, furans and other chlorinated pollution. However, during EPA rulemaking, Georgia Pacific claimed they could not use chlorine-free technology to make pulps for plastic products. EPA responded by creating a special category for Georgia Pacific so they could continue using chlorine compounds for bleaching. However, only mills in which 25% of pulp production is for the special plastic products qualify for the special exclusion. But more than 80% of Georgia Pacific's production is pulp for toilet paper. Therefore, the mill cannot legitimately qualify for this category and must be required to use chlorine-free technology, which would eliminate dioxin. Currently the mill is pressuring EPA and Ecology to allow them an exemption.

Georgia Pacific's operating permit will be issued in 2000. This is an excellent example of an opportunity where Ecology should act immediately to prevent PBT releases by requiring Georgia Pacific to move to chlorine-free technology.



The Problem with Chlorine Dioxide Bleaching

• Chlorine dioxide does not eliminate dioxins and furans. While dioxins and furans may be reduced at mills that use chlorine dioxide, they are not eliminated. The pulp and paper industry claims to achieve zero dioxin with chlorine dioxide because it is not detectable in effluent tests. This is deceiving in two ways: 1) the industry has only been required to test for 2,3,7,8 TCDD and TCDF, instead of all 17 highly toxic dioxin/furan congeners, and 2) testing methods are currently unable to detect the lower levels of dioxin that will most likely be present will chlorine dioxide bleaching. In the cluster rules, the EPA states, "Even though dioxins and furans are no longer measurable at end of the pipe at many mills, the potential for formation of these pollutants continue to exist at pulp and paper mills as long as chlorine containing compounds (including chlorine dioxide), are used in the bleaching process" (Federal Register 1998).

• Chlorine dioxide creates large quantities of other chlorinated pollution (Adsorbable Organic Halogens or AOX). While AOX may be reduced when mills switch from chlorine to chlorine dioxide, large volumes of AOX are still discharged to water every day. For example, in September 1999 Georgia Pacific discharged, on average, 5568 pounds of AOX every day — more than two million pounds a year. There are estimates that the mill may reduce the amount of AOX by 75% with chlorine dioxide, however even at this reduction rate, more than 500,000 pounds of AOX will still be discharged into Bellingham Bay each year — compared to close to zero pounds per year if they eliminate all chlorine.

• Chlorine dioxide poses significant health and safety concerns for workers and communities. Chlorine dioxide is a highly unstable and explosive chemical that must be manufactured on site, which means that communities will be trading one accident risk (chlorine) for another (chlorine dioxide) (NJDOH 1988). One of the more dangerous aspects of chlorine dioxide for workers is that they can't smell it until it is near or higher than the level at which it can do harm (Ritchlin 1998).

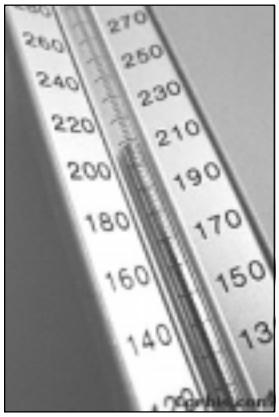
• The use of chlorine dioxide makes it more difficult for mills to eliminate all waste water discharges and go "closed-loop." The highly corrosive nature of chlorine dioxide and the buildup of chlorides make it extremely difficult for mills to recycle their wastewater back into the process. Mills using chlorine dioxide such as the Champion mill in North Carolina that have attempted to close the loop have not been successful.

permitted to burn 200 pounds an hour of medical waste or low level radioactive waste and 800 pounds an hour of pathological waste. Despite opposition by the local community, the Washington Toxics Coalition, and others, Ecology approved the construction of the facility in August 1998 — the same month it announced its intention to eliminate PBTs.

According to the EPA, medical waste incineration is the third leading identified source of dioxin (U.S. EPA 1994) and contributes 10% of the mercury emissions to the environment (U.S. EPA 1997-3). Medical waste incinerators are a significant source of dioxin because there are large amounts of chlorine in medical waste, mostly from polyvinyl chloride plastics (PVC). In fact, 25% of plastic medical products are made of PVC (CHEJ 1999). Incinerators are a source of mercury due to the burning of thermometers and products containing mercury. Until 1997 there were no federal regulations regarding air emissions from medical waste in-

cinerators. As a result, many of these incinerators burned in batches, which led to less complete combustion, and most had few or no pollution control equipment. Now, in the year 2000, hospitals are faced with the decision of bringing their incinerators into compliance with these regulations, having the waste burned off-site, or using a non-incineration treatment technology.

The medical supplies that come into the hospital for use in patient care affect the potential pollutants that will impact the environment when the discarded supplies leave the hospital. Washington hospitals use PVC for IV bags, tubing, oxygen tents, mattress covers, packaging and office supplies. Products they use which contain mercury include thermometers, blood pressure devices, dilation and feeding tubes, batteries, switches, some laboratory chemicals, and fluorescent lamps.



Many hospitals and health care facilities are phasing out mercury-based blood-pressure devices and thermometers in favor of cleaner alternatives.

Alternatives

Many local and state governments are taking action against mercury-containing medical products. Most recently, the city of Duluth in Minnesta banned the sale of mercury thermometers. In 1992, the Minnesota Legislature banned hospitals from distributing or using mercury thermometers on patients. New England states are considering similar legislation banning the sale of mercury thermometers (Skog 2000).

Not only does PVC create dioxin when burned, but the production of PVC is also a large source of dioxin. An analysis at U.S. chemical facilities indicate that the wastes from the PVC production process are among the most dioxin-contaminated wastes known (Greenpeace 1997). Dioxins, furans and polychlorinated biphenyls (PCBs) have been identified in wastes from the Vulcan Chemical Plant in Louisiana at concentrations as high as 6000 parts per billion TEQ (Costner et al 1995). These levels are in the range of the highly dioxin-contaminated Agent Orange, the defoliant used during the Vietnam War. The Department of Ecology should encourage alternatives to PVC not only because of the immediate local consequences of its use and disposal, but also because of the local and global impacts caused by PVC production.

Much of a hospital's waste is non-infectious, solid waste that can be reduced, reused, and recycled. In fact, up to 85% of waste created by hospitals is solid waste, made up of paper, packaging, aluminum, and other materials (Environmental Working Group 1998-2). Only a fraction (6-15%) of the waste generated by hospitals is "infectious waste" that must be treated in order to prevent the

Resources on PBT Alternatives

Pulp and Paper

Web sites that have information about availability of chlorine free paper products include: Reach for Unbleached www.rfu.org; the Chlorine Free Products Association www.chlorinefreeproducts.org; and Seventh Generation www.seventhgen.com/.

Health Care

Extensive information on alternative health care products may be found on the Sustainable Hospitals Project web site at www.uml.edu/centers/LCSP/hospitals/ or on the Health Care Without Harm web site at www.noharm.org.

spread of disease. These special criteria do not specify incineration. However, burning has been a common disposal technique for many hospitals because little was known about the problems of incinerating medical waste, and there was no required testing of ash for pollutants such as mercury and dioxins.

Beth Israel Medical Center, a 950-bed facility in New York City, abandoned plans in the late 1980s to build an incinerator due to community concerns about pollution resulting from medical-waste incineration. Instead, they implemented a waste system that has allowed them to reduce the generation of infectious waste by 1,400,000 pounds and save $600,000 each year in waste-hauling fees.

Alternative Products for Hospitals

Alternatives for PVC and mercury products are widely available and used by many hospitals. For example, hospitals can replace:

This:	*With this:*
mercury thermometers	Digital; gallium-tin or alcohol thermometers
mercury sphygmomanometers (blood pressure monitors)	aneroid/electronic sphygmomanometers
mercury intestinal and esophageal dilators and feeding tubes	alternatives using water, saline or tungsten
mercury-containing batteries	mercury-free alternatives and rechargables.
PVC IV bags	IV bags made with alternative plastics such as rubberized ethylene-propylene.
PVC identification bracelets	polyester bracelets
PVC shower curtains	cloth or nylon shower curtains.

For more extensive information on alternative products, visit the Sustainable Hospitals Project web site at www.uml.edu/centers/LCSP/hospitals/ or the Health Care Without Harm web site at www.noharm.org.

Just as there are alternative products available that do not emit dioxin and mercury, there are viable alternatives to the incineration of infectious hospital waste. For example, autoclaving is a readily available economical alternative to burning infectious waste. Autoclaving is a high-temperature steam disinfection process and hospitals can purchase units to replace incinerators so wastes can be managed on-site. It is unlikely to release dioxins into the environment because autoclaves operate at a much lower temperature than incinerators and they do not combust the waste.

Many hospitals in Washington have abandoned their on-site incinerators and have switched to off-site disposal companies such as Stericycle, Inc., instead of re-

investing in an on-site disinfection system such as autoclaving. There are a number of concerns with hospitals sending their infectious waste off-site to be treated at regional commercial facilities. For example:

- ❖ One or two communities should not have to bear the burden of the region's medical waste problems;
- ❖ Transporting infectious wastes on the road and railways is a hazard;
- ❖ Some commercial facilities will disinfect medical waste using autoclaving or another alternative and then send it to a solid waste incinerator to be burned;
- ❖ Worker safety may be compromised. In 1997, three workers from a Stericycle plant in Morton, Washington, came down with tuberculosis infections in their lungs and 13 of the 30 workers tested positive for exposure to the disease. A number of worker-safety problems at the plant were identified by the Washington Department of Health and other agencies investigating the outbreak.

Northwest Hospital no longer incinerates its medical waste. As a result, this smokestack no longer emits dioxin, mercury and other PBTs into the environment.

In order to be a part of the solution to persistent pollution, hospitals need to re-think their approach to purchasing and waste disposal. Hospitals can do this without compromising the care they provide by:

- ❖ adopting purchasing policies that require the use of PVC-free and mercury-free products and chlorine-free paper products;
- ❖ minimizing solid waste by purchasing reusable items instead of disposables;
- ❖ having better segregation programs for infectious wastes;
- ❖ choosing on-site alternatives to incineration for infectious waste, such as autoclaving.

Hospitals can also join collaborative efforts such as Health Care Without Harm (www.noharm.org), which provides many opportunities for hospitals to do their part. Health Care Without Harm is a broad-based international campaign to reform the environmental practices of the health-care industry. More than 178 organizations in nine countries, including 41 hospitals, are part of the HCWH coalition.

The Department of Ecology must also use the opportunity in developing new air rules for medical waste incinerators (MACT) to prohibit new medical waste incinerators, phase out existing ones and require waste reduction and segregation policies at hospitals.

Solid Waste Incinerators

EPA has identified solid waste incinerators as the number one source of dioxin emissions to air nationally. These incinerators are also a source of lead, cadmium and mercury air emissions. Dioxin, lead, cadmium, and mercury also wind up in the incinerator ash that must be landfilled.

Incinerators are also expensive and need constant "feeding" to generate enough revenue to pay off the debt that communities take on to build them. This leaves little incentive for communities to reduce the waste they generate and recycle.

Washington state has two operating solid waste incinerators, one in Spokane and one in Tacoma. An analysis of hourly projected levels included in the 1995 Title V permit application revealed that approximately 199 pounds of lead, 170 pounds of mercury, 3.4 pounds of cadmium, 2.77 grams of dioxins and furans, and .66 grams of Polychlorinated Biphenyls (PCBs) are emitted to the air from the Spokane incinerator each year (Connor 1998). The exact amounts of these pollutants are not known, because there are no monitors that can check these chemical releases on a continuous basis. The incinerator only performs annual stack tests for these pollutants, covering a mere 12.5 hours out of more than 8,000 hours of annual operation (Connor 1998).

Alternatives exist to solid waste incineration. Many communities in Washington and across the country have rejected incineration and instead pursued intensive waste reduction, recycling and composting programs.

The City of Tacoma also operates an incinerator and is currently seeking permission from the Puget Sound Clean Air Agency (PSCAA) to burn a variety of solid wastes. The incinerator, which was originally permitted to burn coal, wood waste and municipal solid waste, did not operate for a number of years, but in January 1999 received a temporary permit to burn a long list of wastes. The wastes include: wood laminated scrap, roofing asphalt waste, used oil (which can often contain chlorinated contaminants), oil sludge, paper, plastic, textiles, pulp mill clarifier solids, and industrial wastes. Clearly, this incinerator is a recipe for disaster because no permit or monitoring regime could possibly cover the list of hazardous chemicals that might be released from burning such a wide variety of wastes. The temporary permit expires in March 2000 and the facility has applied for a permanent permit to burn these wastes. PSCAA should deny this permit.

According to PSCAA and the Northwest Air Pollution Authority (NWAPA) two solid waste incinerators have closed in the last few years. Both the Olivine incinerator, located in Bellingham, and the Fort Lewis incinerator in Fort Lewis have shut down following a history of failing to meet air pollution requirements. Olivine was fined thousands of dollars for violations and EPA has prohibited the Fort Lewis incinerator from burning solid waste again unless they seek a new permit from PSCAA. These are not unusual cases; many solid waste incinerators that were built across the country could never run as promised by the incinerator company.

Current federal and state incinerator regulations play a toxic shell game with persistent pollution transferring the poisons from air to ash. The standards merely require the addition of more sophisticated pollution control technology to an incinerator. The pollution control devices catch more of the pollution, but then we wind up with more concentrated dioxins and metals in the fly ash which must be disposed of in a landfill.

We must take action now against PBTs to protect our children's health.

Alternatives exist to solid waste incineration. Many communities in Washington and across the country have rejected incineration and instead pursued intensive waste reduction, recycling and composting programs. Seattle, for example, chose not to build incinerators in the late 1980s, but rather determined that an intensive recycling and composting program could prove more cost effective and would reduce environmental impacts. Seattle now has a recycling rate of 42%

(residential and commercial), and with its 1998 Solid Waste Plan decided to expand recycling and waste reduction programs, adopted the principle of zero waste, and made new commitments to sustainable building and product stewardship. Product stewardship looks "upstream" and expects manufacturers and producers to take responsibility for the disposition of a product at the end of its useful life. If manufacturers had to provide waste management services for their products, they would find efficiencies in packaging, reduce toxic materials, and design products for disassembly and recycling. Greater product stewardship would go a long way towards solving some of our solid waste problems.

Ecology should pursue regulations that prohibit new incinerators and phase out existing ones. In addition, cities and counties should require manufactures to take responsibility for the products they make and begin pursuing bans on the sale or disposal of certain types of products such as PVC and mercury-containing or lead-containing products.

Between 1990 and 1997, more than 2.8 million pounds of lead from industrial polluters was manufactured into fertilizer by Moxee City-based Bay Zinc to be spread on farm and grazing land.

Toxic Waste in Fertilizer

Incredibly, toxic industrial wastes from pulp mills, steel mills, tire incinerators and cement kilns are made into fertilizer and legally spread on farms and gardens throughout Washington state. This practice is allowed despite the fact that these wastes contain dangerous levels of lead, mercury, cadmium, dioxin and other poisons. Applying persistent bioaccumulative toxics to farmland is particularly alarming since these substances can build up in the soil and be taken up by crops grown on the soil. Contaminants in fertilizer pose a direct health hazard to farmers, farmworkers, and their children, and can leach into surface and groundwater and harm aquatic life and other wildlife.

Washington state ranked fourth nationally in the amount of toxic waste chemicals that were shipped from steel mills, chemical plants and other industries to fertilizer companies and farms during the 1990-1995 period (EWG 1998).

According to a recent review of Toxics Release Inventory data, more than 2.8 million pounds of lead from industrial polluters was sent to the Washington fertilizer manufacturer Bay Zinc between 1990 and 1997 for inclusion in fertilizers. It can be expected that most of that lead went into fertilizer and ended up on Northwest farms.

In response to widespread public outcry when the practice of making toxic waste into fertilizer became publicly known, Washington state enacted a new fertilizer law in 1998. This new law did not stop the practice of turning toxic waste into fertilizer, but merely set weak standards that allow unacceptable amounts of metals to be added to soil each year. The law did not establish any standards for dioxin.

Department of Ecology testing found dioxin in steel mill, cement kiln and pulp mill wastes. Steel mill wastes had the highest levels. Ecology is currently considering eliminating a loophole that exempts waste from steel mills from hazardous

waste regulations when it is "recycled" into fertilizer. EPA will also be proposing rules to eliminate the exemption nationally. However, eliminating the exemption may not stop steel mill waste from being made into fertilizer.

Ecology should use its rulemaking authority to end the use of steel mill waste, pulp mill waste and other toxic waste laden with persistent pollution in fertilizer.

Wood Treatment Plants and Treated Poles

As noted above, the highly toxic chemical pentachlorophenol (penta) is used as a wood preservative. Although penta is not manufactured in Washington, there are four active wood treatment facilities that use it in their operations. Penta is itself a persistent bioaccumulative toxic chemical, and it is also contaminated with dioxin. Nine wood treatment facilities have operated in Washington and all of them are now federal or state toxic sites, including those facilities currently operating. Dioxin contamination is confirmed at many of the sites, and the source is most likely penta (WSDOE 1998).

From March 1997 to November 1999, Oeser Co. violated its wastewater discharge limit for penta 15 times. In one instance, the permit limit for penta was exceeded by more than a factor of 100.

Two wood treatment facilities — Brooks Manufacturing and Oeser Co., located in Bellingham, discharge penta directly into creeks that empty into Bellingham Bay. From March 1997 to November 1999, Oeser Co. violated its wastewater discharge limit for penta 15 times. In one instance, the permit limit for penta was exceeded by more than a factor of 100. All four active plants have water discharge permits regulating stormwater discharge to surface or groundwater. These permits require dioxin analysis of their stormwater runoff, yet only J.H. Baxter & Company has begun monitoring (WSDOE 1998).

J.H. Baxter & Company treats approximately 40,000 poles using 200,000 gallons per year of a wood preservative that contains 5% penta (WSDOE 1999). The site's groundwater and soil are contaminated and elevated levels of dioxins/furans and penta have been found in the stormwater. Cascade Pole, Co. in Olympia, which has closed down but is a toxic site, has on-going discharges of penta into Budd Inlet.

According to 1998 Toxics Release Inventory data, these four facilities together released 510 pounds of penta to air and 250 pounds to water. They disposed of 1,000 pounds of penta off-site.

Of the approximately 60 million utility poles currently in service in the United States about 36 million have been treated with pentachlorophenol (Malecki, 1992). It has been reported that 10,000 metric tons of pentachlorophenol were used in 1990 (Weinberg Group 1998). Approximately 40 pounds of penta-based product (3.8 pounds active ingredient) are used for each utility pole.

Because penta is applied to wood products that are widely distributed in the environment, it also enters soil, water, and air from dispersed sources. EPA considers penta-treated products to be the largest known source of dioxin creation.

Alternatives to penta for utility poles include non-wood (steel, fiberglass, or concrete) poles, wood treated with copper napthenate, or wrapping with pole

liners. Seattle City Light has had phaseout of penta-treated wood as a goal for some time, but has been unable to find sufficient sources of wood treated with its preferred preservative copper napthenate (Gedlund 2000). The agency is currently beginning to use plastic sleeves to line wood poles. These are designed to prevent microorganisms from attacking the wood, and to keep pesticides from leaching out of the pole. City Light has placed line poles in residential neighborhoods and environmentally sensitive areas, and is designing experiments to test the use of untreated poles with liners. Another Washington state utility, Snohomish County PUD, uses primarily penta-treated poles, but also uses steel, concrete, and fiberglass poles (Enderlein 2000).

Because each alternative to penta has environmental impacts, a full analysis of the impacts of the use and production of each alternative should be conducted.

Cement Kilns

There are two operating cement kilns in Washington state — LaFarge (formerly Holnam) and Ash Grove. Both are located in Seattle. Using high temperatures, cement kilns make Portland cement and other construction materials from mineral sources such as lime, silica, alumina and iron products. These feedstocks are heated to extremely high temperatures in a rotary kiln to create "clinker." The clinker is then ground and mixed with gypsum to make Portland cement, which is the generic term for the type of cement used in virtually all concrete.

More than 190 facilities in Washington release lead, mercury, dioxin and pentachlorophenol into the environment every day.

The primary fuels that are used to run cement plants are coal and petroleum coke. Some facilities burn hazardous waste, waste oil, spent solvents, wood chips, or tires as supplementary fuels. Neither Seattle cement kiln burns "hazardous waste," however, both burn tires and other wastes that could result in persistent pollution. For example, the LaFarge kiln has a permit to burn PCB-contaminated oil, sterilized medical waste (called "Sterifuel") and other wastes.

Dioxin is formed in cement kilns as in solid waste incinerators. Testing of dioxin air emissions at the LaFarge cement kiln showed that when the facility was burning Sterifuel, the dioxin (2,3,7, 8-TCDD and TCDF) levels were about five times higher than when it was burning other fuels (Delta Toxicology 1995).

The cement process also generates a waste called cement kiln dust, fine particles that collect in pollution control devices and can contain dioxin. About 50% of the cement kiln dust generated by the LaFarge cement kiln is sold as an agricultural liming agent. Testing of cement kiln dust revealed that it contained lead at 230 ppm (Bowhay et al 1997) as well as dioxin (WSDOE 1999).

Cement kilns should be prohibited from burning chlorinated and other wastes and cement kiln dust should be prohibited from being "recycled" into agricultural liming agents. Ecology should pursue changes to solid and dangerous-waste laws to accomplish this.

Other PBT Sources

The sources we have highlighted above are just some of the sources of lead, mercury, dioxin and pentachlorophenol in Washington. There are scores of other sources for these PBTs.

A search of Ecology's water pollution database for lead and mercury dischargers produced the list of sources contained in Appendix IV. Sources include aluminum and steel manufacturers, electronics plants, shipyards, coatings companies, sewage treatment plants, petroleum refineries, and others. Unfortunately, the database does not provide information on volume of PBTs released.

The federal Toxics Release Inventory provides a glimpse of PBT release levels. According to TRI data, 3,179 pounds of lead and lead compounds were emitted to air from industrial facilities in Washington in 1998, the latest year for which data has been processed. Eight hundred twenty pounds were discharged to water. And 328,331 pounds of lead and/or lead compounds were released on-site or disposed of off-site. Only some facilities are required to report to the TRI, however, and they need to report only for certain chemicals exceeding large thresholds. Thus, these figures are only the tip of the iceberg.

Despite its limitations, the list of lead and mercury dischargers obtained from Ecology's water database is an important tool for developing and implementing strategies to end PBT pollution in Washington. Even if concentrations and volumes of PBTs released by individual facilities are small, in combination the quantities may be quite significant. More importantly, the presence of lead and mercury in wastewater indicates the use of these materials in the workplace. Lead and mercury are undoubtedly also entering community air, the workplace environment, solid wastes and products, as well as water. Use and disposal of those products lead to additional worker and community exposures and environmental contamination.

Computer production results in lead, mercury and other pollutants to our air and water. Some manufacturers such as Matsushita are phasing out their use of lead in computer products.

Statistics related to lead and mercury in electronics illustrate this point well. Lead and/or mercury are released to water, air, and waste during production of circuit boards, other electronic components and glass panels for computers and other electronic products. A typical desktop computer contains 3.8 pounds of lead. With more than 315 milion computers becoming obsolete in the United States between 1997 and 2004, that adds up to 1.2 billion pounds of lead. More than 400,000 pounds of mercury will be present in those obsolete computers (SVTC 2000).

The computer/electronics example is also a good one to examine because progress has been made toward eliminating the use of lead. Matsushita Electronics Corporation has developed a lead-free solder for flow soldering applications and claims that it can now provide lead-free products to customers, and the Sony Corporation has also developed a lead-free solder alloy. Fujitso has announced that all its products will be lead-free by December 2002. (Matsushita 1999, SVTC 2000, Fujitsu 1999.) The European Union is seriously considering an Initiative which

would require computers and other electronic and electrical devices to be free of lead and mercury by 2004. It behooves our state to promote alternatives to lead in our electronics and electrical manufacturing facilities not only as a matter of protecting health and the environment, but also to help state industries stay ahead of the curve. With strong state PBT-elimination policies in place, state industries will be well positioned as citizens around the world persuade governments to adopt policies increasing demand for PBT-free products and services.

PART III

Conclusions and Policy Recommendations

It is clear that continued production, use and disposal of PBTs will have serious adverse effects on the health of future generations and the environment. As a society, we must change how we deal with our pollution.

In this report, we examined the environmental and health effects as well as sources of only four PBT chemicals. We found myriad effects ranging from subtle reproductive problems to life-threatening disease, in current as well as future generations. We documented hundreds of facilities that release these chemicals daily to our air, water, and land. And we discussed the extensive contamination that has already occurred in Washington state from these PBTs. The situtation is serious. And it will only get worse the longer we delay action.

It is more than time for Ecology to take strong, decisive steps on PBTs, using its ample authority under existing laws to do so.

Alternatives to PBT pollution abound. Pulp mills elsewhere in the world have switched to non-chlorine bleaches, thereby eliminating production of dioxins and furans. Lead-free solders have been developed for electronic products. Alternative construction materials are available for piers, utility poles and other structures now made with penta-treated wood. With leadership from Governor Locke, these and other alternatives can put an end to PBT pollution in Washington state.

We focused on four PBT chemicals. Many, many more PBTs are released to our environment each day. And every day permits continue to be granted for the release of these chemicals — with no end in sight. And those permit limits do not generally take into account the cumulative loading of pollutants — they are calculated as though each facility operates by itself in a vacuum.

In 1998 Ecology announced that it was launching an Initiative to eliminate PBTs, and the public overwhelmingly supported this announcement. The public has been waiting nearly two years for action. It is more than time for Ecology to take strong, decisive steps on PBTs, using its ample authority under existing laws to do so.

We have a historic opportunity in Washington state to lead the country in courageous, innovative pollution prevention policy — to be a national leader in protecting the health of current and future generations and the beautiful and complex ecosystems in which we are graced to live. We recommend that the following actions be taken now to stop the flow of PBTs into the environment.

Recommendations for the Department of Ecology

The Department of Ecology should take the following steps:

1) Adopt the "People's PBT Plan"

By the fall of 2000, Ecology should follow the directive of the state's citizens and adopt a strong plan for eliminating PBT releases in Washington. That plan should do all of the following:

a) Immediately prohibit new sources of PBTs.

b) Establish a deadline of 2010 for ending PBT releases from existing sources and toxic sites.

c) Address all PBTs. These include the 27 chemicals Ecology originally listed when it announced its PBT Initiative, lead and other chemicals that meet screening criteria for toxicity and for persistence or bioaccumulation potential.

d) Identify and commit to immediate actions Ecology will take to address PBTs from key state sources as outlined in Recommendation 2 below.

e) Ensure that comprehensive state policies such as water quality standards include PBT elimination provisions as outlined in Recommendation 3 below.

f) Identify and commit to changes at the Department to ensure successful transition to zero PBT releases, as outlined in Recommendation 4 below.

2) Take immediate strong action addressing specific pollution sources.

Pulp & Paper

❖ Issue a water discharge permit for Georgia Pacific in 2000 which is based on Totally Chlorine Free (TCF) technology and prohibits all discharges of dioxins, furans and other PBTs, in accordance with federal requirements for calcium sulfite mills.

❖ Issue wastewater discharge permits for all other pulp mills in Washington state which:

- Ensure that the mills will achieve zero discharge for dioxins, furans, and all PBTs by 2005 by using TCF technologies. (Zero discharge means zero, not non-detect.)

- Require compliance with water quality standards at the point of discharge as well as beyond. (No mixing zones.)
- Require mills to identify steps they will take to close the loop, ultimately ending discharges of all pollutants, not just PBTs.

❖ As part of the regulation of hog fuel incinerators at pulp and paper mills:
- Immediately prohibit the burning of chlorinated wastes including chlorinated sludges, tires, salt-laden wood, and chlorinated plastics.
- Treat boilers that burn anything other than clean wood as solid waste incinerators regulated by the solid waste incinerator rules.

❖ As part of the regulation of waste-derived fertilizers:
- Immediately prohibit pulp mill sludges and boiler ash from being applied to land as fertilizer or soil amendments.

Medical Waste Incinerators

❖ Adopt a strong Maximum Achievable Control Technology (MACT) air standard in 2000 which includes
- an immediate prohibition on new medical waste incinerators
- phaseouts of existing incinerators by 2003
- an immediate ban on burning mercury items and polyvinyl plastic (PVC) at existing incinerators,
- a requirement that hospitals implement policies and plans that minimize, segregate, and recycle solid wastes in order to minimize volumes that are burned or treated.

❖ Regulate medical waste incinerator ash as dangerous waste.

Solid Waste Incineration

❖ Amend existing solid waste and special ash management standards to include
- a moratorium on new solid waste incinerators
- a phaseout of existing solid waste incinerators by 2003
- an immediate ban on the burning of chlorinated and mercury wastes
- requirements for all incinerator ash to be regulated as hazardous waste, and
- a ban on the utilization of incinerator ash for any purpose (such as in cement or as a landfill cover).

Fertilizers

❖ As part of current and upcoming rulemakings on dangerous-waste regulations, prohibit wastes from dioxin-creating industries such as steel mills, pulp and paper mills, and cement kilns from being made into fertilizer.

❖ Initiate a rulemaking to prohibit other harmful wastes from being made into fertilizers.

❖ Work with the Department of Agriculture to establish standards by 2001 for all fertilizers based on non-degradation of soils and natural background levels of uncontaminated soils.

Wood Treatment

❖ Require that all state wood treatment facilities achieve zero discharge of pentachlorophenol to water by 2003.
❖ Prohibit the use of penta-treated wood in aquatic environments immediately.
❖ Immediately designate used utility poles and other discarded penta-treated wood as dangerous waste under WAC 173-303.
❖ Prohibit the future use of penta-treated poles for any purpose.
❖ Work with the Department of Agriculture to cancel all registrations of pentachlorophenol, with a target of cancellation by 2003. To determine the earliest date possible for cancellation, Agriculture and the Department of Ecology should convene a task force including labor representatives and environmentalists to determine whether regulations can be cancelled at an earlier date.

3. Adopt PBT phaseout provisions in comprehensive state environmental policies.

All state environmental standards and other comprehensive policies affecting multiple pollution sources should implement the zero PBT release deadlines of the state PBT plan. The Department of Ecology should take the following actions, for example:

Our children deserve a PBT-free future!

❖ Adopt new Water Quality Standards during 2000 which:
  • immediately prohibit mixing zones for PBTs,
  • immediately prohibit new sources of PBT discharges, and
  • establish a 2010 deadline for zero PBT discharges from existing sources.
❖ Adopt new Air Standards by 2003 which:
  • immediately prohibit new sources of PBT emissions, and
  • establish a 2010 deadline for zero PBT emissions at existing sources.
❖ Adopt Sediment and Cleanup Policies which:
  • establish protective human health standards in the state sediment management rule,
  • implement pilot projects for sediment treatment technologies which allow more contaminated sediments to be removed from the aquatic environment,
  • establish sediment cleanup levels to protect endangered species and other sensitive populations from not only cancer, but also genetic, reproductive, immune, and neurological hazards.

4. Implement changes at the Department to ensure a successful transition to zero PBT releases.

To accomplish a successful transition to zero PBT releases by 2010, Ecology must give pollution prevention for PBTs phaseouts the priority it deserves. The agency needs to implement structural changes which better integrate phaseouts and pollution prevention into permitting and standard-setting, ensure access to

needed data within the agency and for the public, and facilitate communication with important public groups. Specifically, Ecology should:

a) Elevate the Pollution Prevention Program within Ecology and integrate PBT phaseouts into all agency work.

❖ Provide training for all permit and rulemaking staff regarding the PBT strategy and the need to implement it in all permits, standards, and rules.

❖ Establish structures and procedures within Ecology which link Pollution Prevention staff with all regulatory staff in order to maximize pollution prevention as the basis of permits and rules and to ensure compliance with PBT phaseout deadlines.

❖ Use Pollution Prevention staff to bring together affected workers and other labor representatives, advocates for public health and the environment, experts on alternatives to PBTs, regulated parties, and others to develop transition strategies for key pollution sectors. The agency's single-industry campaigns, workshops, task forces, and other mechanisms should be used for this purpose. The need for an inclusive process to help develop transition plans has been mentioned above with respect to pentachlorophenol-using wood treatment plants. Other sectors Ecology could focus on include the electronics industry, metal platers, steel mills, and others.

❖ Get serious about the statutory goal of reducing hazardous substance use in Washington state, with an emphasis on PBTs. Ecology should adopt changes to the planning requirements for state polluters under the Hazardous Waste Reduction Act of 1990 which will ensure that the plans provide thorough information on hazardous substance use. It should use these and other data to track and regularly report upon progress towards the state hazardous substance reduction goals, including the goal of eliminating use of PBTs.

Ecology Director Tom Fitzsimmons has the statutory authority to stop PBT releases.

b) Establish a publicly accessible database providing full data on toxics releases to all environmental media for state pollution sources, including information on volumes of chemicals released. This database should also include hazardous substance use data gathered under the Hazardous Waste Reduction Act and the federal Emergency Planning and Community Right to Know Law.

5. Call for and support PBT phaseout actions which must be taken by other bodies and individuals.

❖ Call upon the Washington State Department of Agriculture to cancel registrations for PBT pesticides.

❖ Call upon county and local pollution agencies to expand efforts to encourage alternatives to PBTs in household products and from other local sources.

❖ Call upon county and local pollution agencies to implement other programs addressing key PBT sources, such as programs tackling lead-laden paint, particularly in low-income areas.

❖ Call upon regional air authorities to require PBT phaseouts. For example, Ecology should urge the Puget Sound Clean Air Agency to reject the application of the Tacoma solid waste incinerator for a new permit.

❖ Call upon the legislature for tax incentives and other programs to encourage mass transit, bicycles, electric cars, and other alternatives to internal combustion engine vehicles.

Recommendations for the Department of Agriculture

1. Cancel registrations for the PBT pesticides included on Ecology's initial list of 27 PBTs, using realistic yet urgent timelines developed with input from environmental and health organizations, farmworkers and other labor groups, farmers, and others.

2. Identify other PBT pesticides which should be phased out, using criteria consistent with the Department of Ecology's criteria, and working with that agency.

Recommendations for Regional Air Authorities

Implement the goals of the state PBT Initiative through zero-discharge provisions in permits and regulations. For example, the Puget Sound Clean Air Agency should reject the application of the Tacoma solid waste incinerator for a new permit.

We need strong leadership now from Governor Locke to stop the flow of PBT poisons.

Recommendations for the Washington State Legislature

1. Provide adequate funding for PBT phaseout work at the Department of Ecology and the Department of Agriculture.

2. Support tax incentives and other measures encouraging alternatives to PBTs for individuals and others. For example, laws should give tax credits or other rewards to those who choose mass transit, bicycles, electric cars, and other alternatives to internal combustion engine vehicles.

Recommendations for Governor Locke

As the head of the state's Executive Branch and Washington's highest elected official, the Governor must lead the way to zero PBT discharges. He must insist that state pollution laws designed to protect public health and wildlife are fully implemented. He must provide moral leadership against the immoral practice of burdening current and future generations with our poisons. Standing by while PBTs continue to flow into our children's world, their food and their bodies is not an option. The Governor should immediately:

1. Make a public statement expressing strong support for phasing out PBT pollution.

2. Direct the departments of Ecology and Agriculture to carry out the recommendations included above.

3. Adopt a policy requiring state agencies to give strong preference to products that are PBT-free and made in PBT-free processes, such as recycled paper not bleached with chlorine compounds.

By ending PBT pollution, our state can lead the way for others to follow. We can create precedents and momentum for the sorts of actions which must occur around the planet for our children's sakes. A century from now, our descendants will be able to look back at Washington's PBT Initiative as a turning point in the global struggle for policies which respect the rights of people and wildlife, in current and in future generations, to live free of toxic contamination and its consequences.

What Can Members of the Public Do?

Ecology launched its PBT Initiative because of public pressure. It is public pressure from a wide array of groups and individuals that will turn the promise of Ecology's Initiative into a reality for our children. Please, join your voice with those of others from across the state calling for an end to the unethical practice of burdening future generations with our toxic pollution.

❖ Tell Governor Locke that you strongly support phaseouts of PBTs and the recommendations of this report. (Governor Gary Locke, Office of the Governor, PO Box 40002, Olympia, WA 98504-0002; Governor.Locke@governor.wa.gov; phone 360-902-4111, fax 360-753-4110.)

❖ Tell Director Fitzsimmons of the Department of Ecology and Director Jesernig of the Department of Agriculture that you strongly support phaseouts of PBTs and the recommendations of this report. (Director Tom Fitzsimmons, Department of Ecology, PO Box 47600, Olympia, WA 98504-7600; tfit461@ecy.wa.gov; phone 360-407-7001, fax 360-407-6989. Director Jim Jesernig, Department of Agriculture, PO Box 42560; Olympia, WA 98504; jjesernig@agr.wa.gov; phone 360-902-1801, fax 360-902-2092.)

❖ Share this report and other information about PBTs with your friends, neighbors, teachers, co-workers, religious leaders, doctors, elected officials, and others, urging them to become active in the worldwide movement to end PBT pollution.

❖ Choose alternatives to products associated with PBTs and other pollutants and encourage them at local schools, places of worship, your workplace, etc. The Washington Toxics Coalition has extensive information on alternatives. Call our hotline at 1-800-844-SAFE (or from within Seattle dial 632-1545). Visit our web site at www.watoxics.org.

❖ Contact the Washington Toxics Coalition to sign up for updates and to become involved in our PBT Elimination Campaign.

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Appendix I

Dioxin Cleanup Sites

Facility	County
American Crossarm & Conduit	Lewis
Buffalo Don Murphy Rd.	Pierce
Cameron Yakima, Inc.	Yakima
Cascade Pole & Lumber Co. Tacoma	Pierce
Cascade Pole McFarland	Thurston
Eagle Harbor	Kitsap
Eagle Harbor Wyckoff	Kitsap
East Waterway	Snohomish
Frank Brooks Manufacturing	Whatcom
Hanford	Benton
International Paper, Longview	Cowlitz
JH Baxter/Port Quendall	King
Malarkey Asphalt Company	King
Mount Solo Landfill	Cowlitz
Oeser Company	Whatcom
Olympic Wood Products	Mason
Pacific Sound Resources (formerly Wyckoff-West Seattle)	King
Pacific Wood Treating	Clark
Port of Anacortes	Skagit
Port of Seattle Terminal 91 Tank	King
Reichhold Chemical Lone Star	King
Reichhold Chemical Inc.	Pierce
Ross Electric of WA, Coal Creek	Lewis
Simpson	Pierce
Simpson Timber Company	Mason
Strandly Manning	Kitsap/Pierce
Tacoma Redevelopment Property	Pierce
U.S. Army Ft. Lewis, Multisite	Pierce
U.S. BPA Ross OUA	Clark
U.S. Navy Station Everett	Snohomish
U.S. Navy Sub-base	Kitsap
U.S. Navy Sub-base OU3	Kitsap
U.S. Navy Sub-base Whidbey OU2 (Ault Field)	Island
U.S. Navy Whidbey OU3	Island
USACE Manchester Annex	Kitsap
Weyerhaeuser-Everett (bleach plant site)	Snohomish
Weyerhaeuser-Everett (sludge ponds)	Snohomish
Weyerhaeuser-Everett, East (saw mill)	Snohomish
Rayonier, Inc.	Clallam

Source: Washington State Department of Ecology, Washington State Dioxin Source Assessment. July 1998. Publication 98-320.

Appendix II

Water Segments in Washington Where PBTs Have Exceeded Surface Water Quality Limits

Water segments listed under section 303(d) of the Clean Water Act. List only includes waterbodies and chemicals for which testing has been done.
Source: Washington State Department of Ecology

Waterbody Name	Medium	Chemical
Bellingham Bay (Inner) and Whatcom Waterway	Sediment	Mercury, Dibenzofuran, Benzo(a)pyrene
Nooksack River	Water	Mercury
Strait of Georgia	Sediment	Benzo(a)pyrene, Dibenzofuran
Padilla Bay, Fidalgo Bay and Guemes Channel	Tissue	PCBs
Chain Lake	Water	Mercury
Port Gardner and Inner Everett Harbor	Sediment	Mercury, Benzo(a)pyrene
Snohomish River	Tissue	Dioxin
	Sediment	Dibenzofuran
	Water	Mercury
Bear-Evans Creeks	Water	Mercury
Kelsey Creek	Water	Aldrin, Dieldren, Chlordane, DDT
Mercer Slough	Water	4,4'-DDD, DDT, Dieldren, 4,4—DDE
Lake Union/Lake Washington Ship Canal	Tissue	Dieldrin
Duwamish Waterway and River	Sediment	Dibenzofuran, Benzo(a)pyrene, Mercury, Hexachlorobenzene
	Tissue	PCBs
Elliott Bay	Sediment	Dibenzofuran, Mercury, Benzo(a)pyrene, Hexachlorobenzene
	Water	Benzo(a)pyrene
Green River	Water	Mercury, PCBs, Endrin, Mercury, Toxaphene
Smay Creek	Water	Dieldrin
Soos Creek System	Water	Mercury
Springbrook (Mill) Creek	Water	Mercury
Commencement Bay (Inner)	Sediment	Mercury, Benzo(a)pyrene, Hexachlorobenzene, Dibenzofuran
	Water	Dioxin
	Tissue	Dieldrin
Commencement Bay (Outer)	Sediment	Mercury, Dibenzofuran
	Water	Dioxin
Thea Foss (City) Waterway	Sediment	Benzo(a)pyrene, Mercury
	Tissue	PCBs
White (Stuck) River	Water	Mercury
Chambers Creek	Tissue	PCBs
Budd Inlet (Inner)	Sediment	Benzo(a)pyrene, Mercury, Dibenzofuran
	Tissue	PCBs

Appendix II

Water Segments in Washington Where PBTs Have Exceeded Surface Water Quality Limits

Waterbody Name	Medium	Chemical
Deschutes River	Water	Mercury
Ward Lake	Tissue	PCBs
Dyes Inlet and Port Washington Narrows	Sediment	Mercury
	Tissue	Mercury
Eagle Harbor	Tissue	PCBs
	Sediment	Mercury, Benzo(a)pyrene
Port Gamble Bay	Tissue	Dieldrin
Quartermaster Harbor	Tissue	Dieldrin
Sinclair Inlet	Tissue	PCBs, Dieldrin, Aldrin
	Sediment	Mercury
Elwha River	Water	PCBs
Grays Harbor (Inner)	Tissue	Dioxin
Black River	Water	Mercury
Chehalis River	Tissue	PCBs
Sacajawea Lake	Tissue	Dieldrin, Chlordane, PCBs, DDE
Walla Walla River	Tissue	Dieldrin, PCBs, Hexachlorobenzene, Chlordane, Heptachlor, DDE, DDT
Snake River	Tissue	Dioxin
	Water	Endrin, Aldrin, Heptachlor, Dieldrin, Toxaphene, DDD, DDE, DDT, PCBs
Palouse River	Tissue	PCBs, DDE, Dieldrin
Esquatzel Coulee	Water	Dieldrin
Granger Drain	Water	Dieldrin, DDT, DDE
Marion Drain	Water	DDE, Dieldrin
Moxee (Birchfield) Drain	Water	DDT, DDD, DDE, Dieldrin
Snipes Creek	Water	DDT, Dieldrin, DDE, DDD
Spring Creek	Water	DDT, DDD, DDE, Dieldrin
Status Creek	Water	DDE, Dieldrin
Sulphur Creek Wasteway	Water	DDT, DDE, Dieldrin
Toppenish Creek	Water	DDE, DDD, Dieldrin
Wide Hollow Creek	Water	Dieldrin, DDT, DDD, DDE
Yakima River	Tissue	Dieldrin, DDE, PCBs, Mercury, DDT
	Water	DDT, Dieldrin, DDD, DDE, Endrin, Heptachlor, Mercury, Aldrin
Cherry Creek	Water	Dieldrin, DDT, DDE
Wilson Creek	Water	Dieldrin
Crab Creek	Water	Chlordane, DDE, Dieldrin, DDT
	Tissue	PCBs

Appendix II

Water Segments in Washington Where PBTs Have Exceeded Surface Water Quality Limits

Waterbody Name	Medium	Chemical
Goose, Lower Lake	Water	Dieldrin
Potholes Lake	Tissue	Dieldrin
	Water	Dieldrin
Mission Creek	Tissue	DDE, DDT
	Water	DDT
Chelan Lake	Tissue	PCBs, DDE
Roses (Alkali) Lake	Tissue	DDE
Andrews Creek	Water	DDE
Ninemile Creek	Water	DDT
Okanogan River	Water	Dieldrin, Aldrin, DDT, Heptachlor, DDE, DDD
	Tissue	PCBs, DDD, DDE
Osoyoos Lake	Water	DDD, DDE, Heptachlor, Dieldrin, Aldrin, DDT
Similkameen River	Water	Aldrin, Dieldrin, DDE, Heptachlor, DDT, DDD
Tallant Creek	Water	DDT
Unnamed Creek	Water	DDT
Long Lake (Reservoir)	Water	DDT, PCBs, Dieldrin, Endrin, Heptachlor, Aldrin, DDD, DDE, Chlordane
	Tissue	PCBs
Spokane River	Water	Dieldrin, Mercury, DDT, DDE
	Tissue	PCBs
Little Spokane River	Tissue	PCBs
Hangman Creek	Water	DDE, Dieldrin
Pend Oreille River	Water	Heptachlor, Aldrin, DDE, DDD, Endrin, DDT
	Tissue	Aldrin
Columbia River	Water	Benzo(a)pyrene, Dioxin, Mercury, Aldrin, Heptachlor, Dieldrin, Chlordane, Hexachlorobenzene, Toxaphene, DDE, Endrin
	Tissue	DDE, Dieldrin, Dioxin, PCBs
Franklin D. Roosevelt Lake	Tissue	Mercury, Dioxin
	Water	Mercury, Dioxin
Hood Canal (North)	Sediment	Dibenzofuran, Benzo(a)pyrene, Mercury
Possession Sound (North)	Water	DDE, Dieldrin
	Sediment	Dibenzofuran, Mercury
Puget Sound (Central)	Sediment	Mercury, Dibenzofuran, Benzo(a)pyrene
Tacoma Narrows	Tissue	Dieldrin

Appendix III

Fish and Shellfish Consumption Advisories Due to Chemical Contamination

Source: Washington State Department of Health web site, 3/20/00, www.doh.wa.gov:80/ehp/oehas/EHA_fish_adv.htm

Location (Advisory may apply to only part.)	Issued By	Chemicals	Species Affected	Recommendations
Budd Inlet	Thurston County Health Dept.	creosote, VOCs, pentachlorophenol dioxins	all shellfish	No consumption
Commencement Bay	Tacoma-Pierce County Health Dept.	PCBs, metals, TCE diethylphthalates	all bottom fish and all shellfish, inc. crab	No consumption
Dogfish Bay	Bremerton-Kitsap County Health District	metals, vinylchloride	all shellfish, all bottom fish	Unknown
Dyes Inlet	Bremerton-Kitsap County Health District	unknown	all shellfish, all bottom fish, inc. crab	No consumption
Eagle Harbor	Bremerton-Kitsap County Health District	PAHs, mercury	all shellfish, all bottom fish,, inc. crab	No consumption
Indian Island	US Navy	pesticides, metals	shellfish	No consumption
King County	Seattle-King County Dept. of Public Health	general-historical industrial discharges	all bottom fish, all shell-fish, inc crab, seaweed	No collection/consumption from Puget Sound waters in King County, esp where signs posted
Lake Roosevelt	WA State Dept. of Health	dioxins, mercury	walleye, whitefish, sturgeon	No more than 20 fish meals per month of sport fish

Appendix III

Fish and Shellfish Consumption Advisories Due to Chemical Contamination

Location	Issued By	Chemicals	Species Affected	Recommendations
Manchester State Park	Bremerton-Kitsap County Health Dept.	PCBs, dioxins	all shellfish	No consumption
Sinclair Inlet	Bremerton-Kitsap County Health Dept.	mercury, PAHs	all shellfish, inc crab all bottomfish, inc rockfish	No consumption
Yakima River	WA State Dept. of Health	DDT, DDE	mountain whitefish, common carp, and all bottomfish including bridgelip sucker	No more than 1 meal per week; eat fish such as trout instead of bottom fish

Apendix IV: Known and Expected Sources of Persistent, Bioaccumulative and Toxic Pollutants in Washington State

This list has been compiled with the best available information from state and federal agency databases and files. There may be errors or omissions in those databases and files, and thus in this list. The public's right to know about PBT releases and sources in Washington is stymied by inadequate reporting requirements, deficiencies in databases and the lack of a comprehensive database which contains full information on PBT use and releases.

Key for Reason for Listing:

TRI – Toxics Release Inventory data obtained from Ecology 3/15/00, covers 1998 (Limited self-reporting under federal right-to-know law.)

Ecology – Listed on Discharge Monitoring Report permit and/or on water permit discharge printout from Ecology water pollution database. Permits obtained from Ecology in the summer and fall of 1999. Facility is identified as "suspected" where numerical limits for pollutants are not included in the printouts.

Puget Sound Clean Air Agency – Custom report on lead and mercury reporting sources prepared for the Washington Toxic Coalition, February 2000.

EPA PCS – United States Environmental Protection Agency Envirofacts Database, Water Discharge Permits, accessed 1/27/2000 www.epa.gov/enviro/index_java.html

Southwest Air Pollution Control Authority – 1998 Emission Inventory, Annual Toxic and Hazardous Air Emissions.

EPA Dioxin Reassessment – data and reassessment issued in 1994.

Ecol Diox Asst – Washington State Dioxin Source Assessment, Ecology 1998.

Key to Media Notes.

POTW = discharges to publicly owned treatment works.

Chemical	Source Category and Facility Name	Location	Known or Suspected	Reason for Listing	Media	Other Notes
LEAD AND LEAD COMPOUNDS						
	PESTICIDES/AG CHEMICALS					
	Bay Zinc Co. Inc.	*Moxee City*	*Known*	*TRI*	*air, offsite transfer*	
	STEEL PRODUCTION/PRODUCTS					
	Alaska Steel Products, Inc	*Colville*	*Known*	*TRI*	*air offsite transfer*	
	Atlas Foundry & Machine Co	*Tacoma*	*Known*	*Ecology*	*water*	
	Birmingham Steel Corp	*Seattle*	*Known*	*TRI*	*air offsite transfer*	
	BHP Coated Steel	*Kalama*	*Known*	*Ecology*	*water*	
	Davis Wire Corp.	*Kent*	*Known*	*TRI*	*POTW*	
	Jorgensen Forge Corp.	*Tukwila*	*Known*	*TRI*	*offsite transfer*	
	Schnitzer Steel Industries	*Tacoma*	*Known*	*Ecology*	*water*	
	BATTERIES					
	Dynn Battery Inc.	*Seattle*	*Known*	*TRI*	*air*	
	Exide Corporation	*Sumner*	*Known*	*Ecology*	*water*	
	SMELTING/REFINING					
	Non-Ferrous Metals, Inc	*Seattle*	*Known*	*TRI*	*air*	
	METAL FINISHING/FABRICATING					
	Metal Finishing Inc.	*Marysville*	*Known*	*Ecology*	*water*	
	Sandvik Special Metals	*Kennewick*	*Known*	*Ecology*	*water*	
	Capital Industries Inc.	*Seattle*	*Known*	*Puget Sound Clean Air Agency*	*air*	
	Farwest Fabricators	*Moxee City*	*Known*	*Ecology*	*water*	

Apendix IV: Known and Expected Sources of Persistent, Bioaccumulative and Toxic Pollutants in Washington State

Chemical	Source Category and Facility Name	Location	Known or Suspected	Reason for Listing	Media	Other Notes
LEAD AND LEAD COMPOUNDS (cont.)						
	INCINERATORS					
	Olympic, no longer operating	Ferndale	Suspected	Ecology	water	
	Spokane	Spokane	Suspected	Ecology	air, ash	
	MINING/MINING SERVICES					
	Pacific Coast Coal Co.	Black Diamond	Known	Ecology	water	
	Cominco American	Metaline Falls	Known	Ecology	water	
	Echo Bay Minerals Co. Kettle River Joint Venture	Republic	Known	TRI	air, land	
	Echo Bay Exploration	Republic	Suspected	Ecology	water	
	Delano Mine/ River Mine	Carson	Known	Ecology	water	
	PETROLEUM REFINING/PROCESSING					
	Lybbert Petroleum	Tacoma	Known	Ecology	water	
	Time Oil	Vancouver	Known	Ecology	water	
	Unocal	Edmonds	Known	Ecology	water	
	Tosco NW Co.	Renton	Suspected	Ecology	water	
	PULP MILLS					
	Weyerhaeuser Longview	Longview	Known	Ecology	water	
	Weyerhaeuser Snoqualmie	Snoqualmie	Suspected	Ecology	water	
	UTILITIES					
	Pacificorp Centralia Thermal Plant, Centralia	Lewis	Known	TRI, Southwest Air Pollution Control Authority	air, water, land offsite disposal	
	Tacoma DPU Steam Plant 2	Tacoma	Known	TRI	air, land	
	ELECTROPLATING					
	Production Plating	Mukilteo	Known	Ecology	water	
	Smith Chrome Plating	Walla Walla	Known	Ecology	water	
	INDUSTRIAL CHEMICALS					
	Reichhold Chemicals Inc. (toxic site)	Tacoma	Known	Ecology	water	Toxic Site
	Seafab Metals Co	Seattle	Known	TRI	POTW, air	
	Seafab Metals Corp.	Clark County	Known	TRI	air	
	Cytec Industries	Longview	Suspected	Ecology	water	
	ELECTRONICS					
	Pacific Circuits Inc.	Burlington	Known	Ecology	water	
	Advanced Silicon Materials Inc.	Moses Lake	Known	Ecology	water	
	Johnson Matthey Electronics	Spokane	Known	TRI, Ecology	air, POTW, water	
	Electronic Specialty	Vancouver	Known	Ecology	water	

Apendix IV: Known and Expected Sources of Persistent, Bioaccumulative and Toxic Pollutants in Washington State

Chemical	Source Category and Facility Name	Location	Known or Suspected	Reason for Listing	Media	Other Notes
LEAD AND LEAD COMPOUNDS (cont.)						
	SHIPYARDS/BOAT MFG					
	Duwamish	Seattle	Known	Ecology	water	
	Northlake	Seattle	Known	Ecology	water	
	Todd Pacific	Seattle	Known	Ecology	water	
	Lake Union Drydock	Seattle	Known	Ecology	water	
	U.S. Navy Puget Sound Naval Shipyard	Bremerton	Known	TRI, Ecology	air, water, POTW offsite transfer	
	Fishermens Boat Shop	Seattle	Known	Ecology	water	
	Foss Maritime	Seattle	Known	Ecology	water	
	Marco	Seattle	Known	Ecology	water	
	Pacific Fisherman	Seattle	Known	Ecology	water	
	Nichols Bros	Freeland	Known	Ecology	water	
	COATINGS					
	Marysville Powder Coatings	Arlington	Known	Ecology	water	
	Super Surface Techs	Lynnwood	Known	Ecology	water	
	Artisan Finishing System	Marysville	Known	Ecology	water	
	Coastal Manufacturing	Everett	Known	Ecology	water	
	Novatech Inc.	Spokane	Known	Ecology	water	
	AIRCRAFT					
	B.F. Goodrich	Everett	Known	Ecology	water	
	Boeing Commercial Airplane	Auburn, Puyallup	Known	Puget Sound Clean Air Agency	air	
	MILITARY					
	U.S. Navy Submarine Base Bangor	Silverdale	Known	Ecology	water	
	U.S. Naval Air Station	Oak Harbor	Known	Ecology	water	
	U.S. Navy Undersea Warfare Center	Keyport	Known	Ecology	water	
	U.S. Army Fort Lewis DA, Public Works	Fort Lewis	Known	Puget Sound Clean Air Agency	air	
	Fleet Industrial Supply	Kitsap County	Known	EPA PCS	water	
	CHLOR-ALKALI					
	Pioneer Chlor Alkali Company	Tacoma	Known	Ecology	water	
	Elf Atochem	Tacoma	Known	EPA PCS	water	
	ALUMINUM					
	Reynolds Metals	Longview	Known	EPA PCS	water	
	Aeronal America	Enlet	Suspected	Ecology	water	
	CEMENT					
	Tilbury Cement	Bellingham	Known	Ecology	water	
	CEMENT KILNS					
	LaFarge	Seattle	Suspected	Ecology	water	

Apendix IV: Known and Expected Sources of Persistent, Bioaccumulative and Toxic Pollutants in Washington State

Chemical	Source Category and Facility Name	Location	Known or Suspected	Reason for Listing	Media	Other Notes
LEAD AND LEAD COMPOUNDS (cont.)						
	LANDFILLS					
	Aberdeen	Aberdeen	Suspected	Ecology	water	
	Inman Landfill	Bow	Known	Ecology	water	
	Cowlitz County	Longview	Known	Ecology	water	
	VALVES AND PIPES					
	Nelson Irrigation Corp.	Walla Walla	Known	TRI	offsite transfer, air	
	SEWAGE TREATMENT PLANTS					
	250 Across the State		Known/Suspected	Ecology	water	Ferndale plant has repeated permit violations for metals
	OTHER					
	Burlington Environmental Georgetown	Kelp	Known	TRI	offsite transfer	
	AAA Monroe Rock Corp.	Snohomish	Suspected	Ecology	water	
	Titanium Sports Technologies	Kennewick	Suspected	Ecology	water	
	Vlox Corp (Nuclear Pacific)	Seattle	Known	TRI	air, POTW, offsite transfer	
	Gulf Industries	Hoquiam	Known	Ecology	water	Fuel
	Pendleton Woolen Mills	Washougal	Known	Ecology	water	
	Cornec Industries	Colville	Known	Ecology	water	Commercial laundry
	Justesen Industries	Blaine	Known	Ecology	water	Fabricated wire products
	Gamma Metals	Arlington	Known	Ecology	water	
	Powder Fab Inc.	Arlington	Known	Ecology	water	Transportation equipment/supplies
	Columbia Lighting Inc	Spokane	Known	Ecology	water	Commercial lighting
	Seatac Airport	Seattle	Known	Ecology	water	
	Sunquest Air Specialties	Everett	Known	Ecology	water	
	Sorrento Laclalis Inc.	Olympia	Known	Ecology	water	
	Ravnar Veneer Inc	Sparaway	Known	Puget Sound Clean Air Agency	air	Softwood veneer and plywood
MERCURY						
	ELECTRONICS					
	Johnson MattheyElectronic	Spokane	Known	Ecology	water	
	Pacific Circuits	Silverdale	Known	Ecology	water	
	LANDFILLS					
	Aberdeen Landfill	Aberdeen	Suspected	Ecology	water	
	Cowlitz County Landfill	Longview	Known	Ecology	water	
	Inman Landfill	Bow	Known	Ecology	water	
	MILITARY					
	U.S. Navy Undersea Warfare Center	Keyport	Known	Ecology	water	
	U.S. Navy Submarine Base	Silverdale	Known	Ecology	water	

Apendix IV: Known and Expected Sources of Persistent, Bioaccumulative and Toxic Pollutants in Washington State

Chemical	Source Category and Facility Name	Location	Known or Suspected	Reason for Listing	Media	Other Notes
MERCURY (cont.)						
	PULP AND PAPER MILLS					
	Georgia Pacific	Bellingham	Known	Ecology, TRI	water, air	
	Weyerhaeuser	Longview	Known	EPA PCS	water	
	Weyerhaeuser Technology Center	Federal Way	Known	Ecology	water	
	ORES/MINING					
	Resource Finance Inc	Metaline Falls	Known	EPA PCS	water	
	Delamar Wind River Mine	Carson	Known	Ecology	water	
	Pacific Coast Coal Co	Black Diamond	Known	Ecology	water	
	Echo Bay Exploration	Republic	Suspected	Ecology	water	
	SHIPYARDS					
	U.S. Navy Puget Sound Shipyard	Bremerton	Known	EPA PCS	water	
	Northlake Shipyard	Seattle	Suspected	EPA PCS, Ecology	water	
	STEEL					
	Atlas Foundry & Machine Co	Tacoma	Known	Ecology	water	
	BHP Coated Steel Corp.	Kalama	Known	EPA PCS	water	
	TEXTILES					
	Pendleton Woolen Mills	Washougal	Known	Ecology	water	
	OTHER					
	Fabrex Corp	Burlington	Suspected	Ecology	water	
	Hoar Diamond Hanford Inc	Benton	Known	EPA PCS	water	
	Recomp	Ferndale	Suspected	Ecology	water	
	Vikings Industries	Washougal	Known	Ecology	water	
DIOXINS/FURANS						
	BLEACHED PULP AND PAPER PLANTS					
	Boise Cascade	Wallula	known	Ecology	air, water, ash	operates a hogged fuel boiler that burns wood
	Georgia Pacific	Bellingham	known	Ecology	air, water, ash	operates 4 hogged fuel boilers that burn wood and chlorinated sludges
	Fort James Paper	Camas	known	Ecology	air, water, ash	operates a hogged fuel boiler that burns wood and sludges
	Kimberly-Clark	Everett	known	Ecology	air, water, ash	operates a hogged fuel boiler than burns oil, gas and chlorinated sludges
	Simpson-Tacoma Kraft	Tacoma	known	Ecology	air, water, ash	operates a hogged fuel boiler that burns oil, gas bio-solids wood fiber and old corrugated cardboard recycling rejects
	Weyerhaeuser	Longview	known	Ecology	air water ash	operates 7 hogged fuel boilers that burn solid waste, paper, coal, drinked fiber, oil and chlorinated sludges
	Weyerhaeuser	Cosmopolis	known	Ecology	air, water, ash	operates 1 hogged fuel boiler that burns oil, distillate, on-spec propane

Apendix IV: Known and Expected Sources of Persistent, Bioaccumulative and Toxic Pollutants in Washington State

Chemical	Source Category and Facility Name	Location	Known or Suspected	Reason for Listing	Media	Other Notes
DIOXINS/FURANS (cont.)						
	CEMENT KILNS					
	LaFarge (Holnam) Cement Kiln	Seattle	known	Ecology	air, ash	has permit to burn PCB-contaminated oil, sterilized medical waste (Sterifuel)
	Ashgrove	Seattle	known	Ecology	air, ash	
	MAGNESIUM PRODUCTION					
	North West Alloys	Addy	suspected	Danish EPA	air	
	STEEL MILLS					
	Birmingham Steel	Seattle	suspected	EPA, Ecol Dioxin Assit	air, ash	
	Jorgensen Forge Corp	Seattle	suspected	EPA, Ecol Dioxin Assit	air, ash	
	MUNICIPLE WASTE INCINERATORS					
	Tacoma Steam Plant	Tacoma	known	EPA, Ecology	air, ash	currently applying for a permit to burn many different kinds of waste
	Olympia	Fontaine	known	EPA, Ecology	air, ash	currently closed
	Fort Lewis	Tacoma	known	EPA, Ecology	air ash	currently closed
	Spokane	Spokane	known	EPA, Ecology	mr,ash	ash is sent to Regional Ash landfill in Roosevelt
	MUNICIPLE WASTE INCINERATORS					
	Battelle Marine Science Lab		known	EPA, Ecology	air, ash	
	St Joseph's	Chewelah			air, ash	operating
	Washington State University	Pullman	known	EPA	air, ash	new
	WOOD PRESERVING					
	Cascade Pole Co	Tacoma	known	Ecology	MTCA & site operating	Discharge to Blair waterway
	Frank Brooks Manufacturing	Bellingham	known	Ecology	MTCA site & operating facility	Discharge to Whatcom Creek
	JH Baxter	Arlington	known	Ecology	MTCA site & operating facility	Discharge to groundwater
	Oeser Company	Bellingham	known	Ecology	EPA Superfund site & active facility	Discharge to Little Squalicum Creek
	American Crossarm & Conduit	Chehalis	known	Ecology	EPA Superfund site, closed	Discharge to Dillenbaugh Creek
	Eagle Harbor-Wyckoff	Bainbridge Island	known	Ecology	MTCA site, closed	Discharge to Eagle Harbor
	International Paper		known	Ecology	MTCA site, closed	Discharge to area ditches, groundwater & Columbia River
	Pacific Wood Treating		known	Ecology	MTCA site, closed	Discharge to Lake River
	Cascade Pole Co.	Olympia	known	Ecology	MTCA site, closed	Discharge to Budd Inlet

Apendix IV: Known and Expected Sources of Persistent, Bioaccumulative and Toxic Pollutants in Washington State

Chemical	Source Category and Facility Name	Location	Known or Suspected	Reason for Listing	Media	Other Notes
DIOXINS/FURANS (cont.)						
	WOOD WASTE (HOG FUEL) BOILERS					
	84	across the state	expected	Ecology	air, ash	16 of the boilers are located at bleached pulp and paper mills. The boilers are incinerators that burn a variety of wastes, including wood, tires, chlorinated sludges, oil, coal, and other wastes.
	MUNICIPALITIES					
	250 Sewage Treatment Plants	across the state	expected	Ecology	air, sludge	
	OIL REFINERIES					
	Texaco	Anacortes	known	Ecol Diox Asst	water	
	ARCO	Bellingham	suspected	Ecol Diox Asst	water	
	U.S. Oil and Refining	Tacoma	suspected	Ecol Diox Asst	water	not tested
	Tesoro	Anacortes	suspected	Ecol Diox Asst	water	not tested
	TOSCO Refining	Bellingham	suspected	Ecol Diox Asst	water	
	NON-POINT SOURCES					
	Forest fires	state-wide	suspected	EPA	air	
	Residential wood and oil burning	state-wide	suspected	EPA	air	
	Diesel fuel combustion	state-wide	suspected	EPA	air	
	Coal combustion	state-wide	suspected	EPA	air	
	Charcoal briquette combustion	state-wide	suspected	EPA	air	
	Fertilizers made from dioxin-laden industrial wastes	state-wide	known	Ecol Dioxin Asst	land	
	Household trash burn barrels	state-wide	known	Test results, EPA Research Triangle Park		
PENTACHLOROPHENOL						
	PORT OF OLYMPIA	Olympia	Known	Ecology	water	
	Cascade Pole	Tacoma	Known	Ecology	water	
	Reichhold Chemicals Inc	Tacoma	Known	Ecology	water	
	Lilyblad Petroleum	Tacoma	Known	Ecology	water	
	Brooks Manufacturing	Bellingham	Known	Ecology	water	
	J H Baxter & Co.	Arlington	Known	TRI	air, offsite transfer	
	Hampton Lumber Mills/Peckwood Inc.	Peckwood	Suspected	Ecology	water	
	Oeser	Bellingham	Known	Ecology, TRI	water, air, offsite transfer	

Appendix V: Releases of Pentachlorophenol, Lead, and Mercury Reported to the Federal Toxics Release Inventory

Source: Toxics Release Inventory data obtained from the Department of Ecology 3/15/00. TRI covers only some polluters for only some releases. These releases occurred in 1998, the latest year for which information has been processed. Dioxin releases were not covered by TRI in 1998. Release volumes are given in pounds. "POTW" means "publicly owned treatment works."

Facility	City	County	Chemical	Air	Water	Land	POTW	Offsite
Nonferrous Metals Inc.	Seattle	King	lead	255	0	0	0	
US Navy Puget Sd Naval Shipyard	Bremerton	Kitsap	lead	150	812	0	8	24,151
Johnson Mathey Electronics-Spok	Spokane	Spokane	lead	5	0	0	5	
Jorgensen Forge Corp	Seattle	King	lead	0	0	0	0	1000
Yakima Bait Co First St.	Granger	Yakima	lead	0	0	0	0	
Davis Wire Corp	Kent	King	lead	0	0	0	250	
Nelson Irrigation Corp	Walla Walla	Walla Walla	lead	250	0	0	0	50
Aladdin Steel Products	Colville	Stevens	lead	5	0	0	0	
Canam Steel Corp	Sunnyside	Yakima	lead	0	0	0	0	
Dyno Battery Co	Seattle	King	lead	27	0	0	0	
LEAD TOTAL				**692**	**812**	**0**	**263**	**25,201**
Pacificorp Centralia Thermal Plt	Centralia	Lewis	lead cpds	106	8	78,330	0	1581
Bardahl Manufacturing Corp	Seattle	King	lead cpds	0	0	0	0	
Bay Zinc Co. Inc.	Moxee	Yakima	lead cpds	29	0	0	0	16,124
Seafab Metals Corp	Seattle	King	lead cpds	756	0	0	6	
Viox Corp (Nuclear Pacific)	Seattle	King	lead cpds	134	0	0	1	405
Burlington Envtl-Georgetown	Seattle	King	lead cpds	0	0	0	0	887
Tacoma DPU Steam Plant 2	Tacoma	Pierce	lead cpds	20	0	1	0	
Echo Bay Minerals Co. Kettle R..	Republic	Ferry	lead cpds	5	0	250,000	0	
Birmingham Steel Corp	Seattle	King	lead cpds	1436	0	0	0	235,198
Burlington Environmental - Kent	Kent	King	lead cpds	0	0	0	0	
Seafab Metals Corp	Vancouver	Clark	lead cpds	1	0	0	0	
LEAD COMPOUND TOTAL				**2487**	**8**	**328,331**	**7**	**254,195**
LEAD & LEAD COMPOUND TOTAL				**3179**	**820**	**328,331**	**270**	**279,396**
Georgia Pacific West Inc.	Bellingham	Whatcom	merc cpds	1160	23	0	0	1289
MERCURY TOTAL				**1160**	**23**	**0**	**0**	**1289**

Appendix V: Releases of Pentachlorophenol, Lead, and Mercury Reported to the Federal Toxics Release Inventory

Facility	City	County	Chemical	Air	Water	Land	POTW	Offsite
Brooks Manufacturing Co	Bellingham	Whatcom	penta	0	0	0	0	
JH Baxter & Co.	Arlington	Snohomish	penta	500	0	0	0	250
The Oeser Co	Bellingham	Whatcom	penta	10	250	0	0	750
Cascade Pole Co.	Tacoma	Pierce	penta	0	0	0	0	
PENTACHLOROPHENOL TOTAL				**510**	**250**	**0**	**0**	**1,000**
CHEMICALS TOTAL				**4849**	**1093**	**328,331**	**270**	**281,685**

We do not inherit the earth from our ancestors,
we borrow it from our children.

—Native American Proverb

WASHINGTON TOXICS COALITION

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