

Focus Puget Sound

Port Gardner and the Snohomish Estuary

A PUGET SOUND INITIATIVE site - Reaching the goal of a healthy, sustainable Puget Sound now and forever



WASHINGTON STATE
Department of Ecology

Department of Ecology Investigates Sediment Quality in Port Gardner and the Snohomish Estuary

Background

Puget Sound, a regional and national treasure, is in trouble – threatened by stormwater runoff, toxics, development, industrial pollution, and many other factors, and struggling under the impact of increasing human population. Recognizing its unique role as an ecosystem and its contribution to our state's economic and human well being, the state established the Puget Sound Initiative – a historic effort under way to restore and recover the Sound by the year 2020. In response to this directive and armed with state funding, the Department of Ecology's Toxics Cleanup Program is focusing cleanup and restoration efforts on priority in-water and upland sites within one-half mile of Puget Sound. Seven bays have been identified as priority areas for Puget Sound waterfront site cleanup.

Ecology has launched sediment investigations at all of the priority bays. The City of Everett, overlooking Port Gardner/Snohomish Estuary in northern Puget Sound, has historically supported waterfront industries, recreation, fishing and remarkably productive estuary habitat supporting fish and wildlife. As part of the Puget Sound Initiative, Ecology is focusing on Port Gardner and the Snohomish Estuary for priority cleanup. Several waterfront cleanup sites have been identified and some cleanup and restoration efforts in these areas have begun (see map). Additional cleanup sites or baywide cleanup needs may be identified as Ecology learns more about overall sediment quality and the extent of baywide contamination.



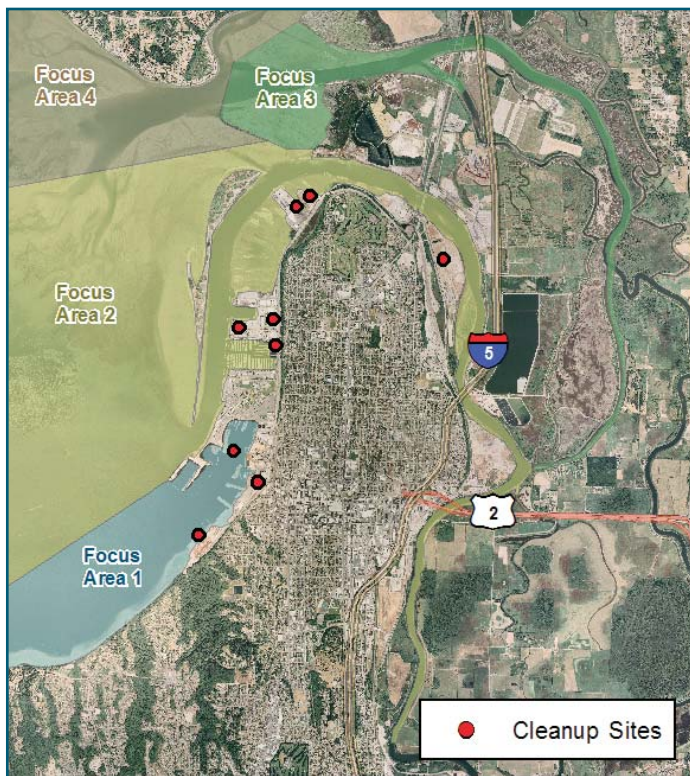
Port Gardner and the Snohomish Estuary, current cleanup sites.

Look at the Ecology Web site for more information on cleanups being conducted in Port Gardner/Snohomish River Estuary or the sediment study; link to www.ecy.wa.gov/programs/tcp/cleanup.html.

Scope of Baywide Sediment Study

The baywide study included areas of Port Gardner Bay that had not been sampled recently or previously, and part of the Lower Snohomish River and the Estuary.

The Bay was divided for study into four focus areas: East Waterway, including the southern shore of Port Gardner; the mainstem of the Lower Snohomish River, including the estuary and Maulsby Mudflats; Steamboat Slough; and the Northern Snohomish Delta, including Ebey Slough (see map below).



The four focus areas of the sediment investigation. The dots represent areas where cleanup sites have been identified or have begun.

What We Did to Sample Port Gardner and the Snohomish River Estuary

On the floor of the Bay, we sampled sediment down to 10 centimeters, which is the most biologically active layer and analyzed for the presence of common sediment contaminants and biological toxicity. We also sampled much deeper, to about 12 feet, for sediment



Field team collects surface sediment samples.

contaminants. We took tissue samples from bottom fish, shellfish and crab throughout the area and analyzed for contaminants of human health concern. We also took plant tissue samples that were of interest to the Tulalip Tribe and analyzed for contaminants of human health concern (see photo above).

In addition, we were able to look broadly at the sediments by using a type of underwater camera to determine what types of plant and animal species are present and provide more information on the health of the sediment (see photo on next page).

What Did We Learn?

The analyses focused on finding chemicals that exceeded the state's Sediment Management Standards, as well as areas of toxicity that may be impacting the biological community. These standards identify chemical contaminants that commonly occur at contaminated sites, and are typically screened for the evaluation of sediment health. What we found included chemicals exceeding those standards for mercury, zinc, and 4-methyl phenol. These chemical exceedances were confined to the East Waterway. Dioxins/furans were detected throughout the area at relatively low concentrations but were elevated in the East Waterway.

Numerous locations throughout the area failed the biological toxicity tests, which were exceedances of the state's Sediment Management Standards. The majority



Sediment images with the underwater camera. The left image is healthy sediment with eelgrass, tubes and feeding voids that indicate an active community of animals. The right image is a stressed environment impacted by the presence of wood waste. The sediment is very black due to lack of oxygen where a healthy community of animals cannot survive.

of toxicity tended to be in the Maulsby Mudflats of the main stem of the Lower Snohomish River and the East Waterway. Biological toxicity tests determine if sediment-dwelling organisms are impacted. Some of these locations also have elevated chemical contaminants while others do not. Areas without obvious chemical contaminants, but with biological toxicity, appear to be affected in part by the presence of decaying wood waste. This wood waste tends to increase overall biological toxicity to the sediment-dwelling organisms and degrade habitat quality for eel grass beds and natural resources. This, in turn, can impact fish and shellfish that use these resources for habitat and food.

The East Waterway and the Lower Snohomish River area have supported a Navy Homeport, industrial and other uses including pulp/paper mills, lumber mills, marinas and extensive in-water log storage. So it is no surprise that these are areas where Ecology is already overseeing nine cleanups in response to previous sampling (see cleanup sites on map). The new baywide information confirms the importance of working hard to clean up those areas of the waterfront that are impacting the environment.

The extent of contaminants and biological toxicity in the East Waterway and the Maulsby Mudflats off the mainstem of the Lower Snohomish River will take some more work to understand. It is possible that additional cleanup sites could be identified, but more analysis is needed to be sure.

What Are the Next Steps?

These results point to the need for the Washington Department of Health (DOH) to complete a Health Consult using the fish, shellfish, crab and plant tissue data we collected. The DOH is currently working on this Health Consult and should have it complete in October 2009. The results also confirm the importance of moving forward aggressively on the cleanup sites that are under way. For example, some of the highest dioxin concentrations were located in areas already designated for future cleanup in the East Waterway. Those cleanups are already moving ahead, and should reduce the risk from dioxin. Ecology may also need to designate some new cleanup sites, especially in the East Waterway, Maulsby Mudflats, and the sloughs where toxicity was found.



Frequently Asked Questions

Q *What kinds of contaminants were found and at what levels?*

A There was some mercury, zinc and 4-methyl phenol contamination found but it was limited to the East Waterway. Dioxins were present in all four areas of the Bay with the highest concentrations in the East Waterway, lower concentrations in the Maulsby Mudflats, and lowest concentrations in Ebey and Steamboat Sloughs.

Q *What is the risk of mercury and zinc to Port Gardner/Snohomish River Estuary?*

A Both mercury and zinc were found at levels exceeding state standards. At high enough concentrations, both can impact animals that live in the sediments. Mercury can impact human health if it is widespread as a contaminant. It appears that neither mercury nor zinc is widespread, and both are confined to the East Waterway.

Q *Where does 4-methyl phenol come from and what is the risk to the environment?*

A This chemical was found at the sediment surface and up to 5 feet in depth at levels exceeding state standards. At the concentrations found, the animals that live in the sediments are likely impacted. This chemical is commonly found at sites that have decaying wood waste. It is produced when the wood waste decays into smaller and smaller pieces.

Q *Where does dioxin come from?*

A Dioxins and dioxin-like compounds represent a family of chemical compounds. They are byproducts of human and natural activities, such as combustion and incineration, forest fires, chlorine bleaching of pulp and paper, automobile operation (from leaded fuels), certain types of chemical manufacturing and processing, and other industrial processes. Typically released in very small amounts, dioxins tend to build up in the environment because they break down very slowly. They are found everywhere in the environment – in air, soil and water. Sometimes they are broadly scattered over an area; sometimes a “hot spot” exists where a particular operation took place. Wherever they are, dioxins strongly bind to soil and sediments.

For this Port Gardner study, we collected and analyzed tissue for dioxin. The Washington Department of Health is currently working on a Health Consult to determine if any new fish consumption advisories are necessary. When this work is complete, we will provide this information to the community.

Q *Do dioxins pose a risk to human health?*

A Most of what is known about the health effects of dioxins comes from studies of workers exposed to relatively high dioxin levels. These studies and research with animals indicate that dioxins at high levels are likely to cause cancer in humans and can cause developmental and reproductive effects. However, the background levels that people are normally exposed to are generally much lower. The



possibility of adverse effects from low levels of exposure to dioxins in the general public remains debatable and controversial. This is because we are exposed to different mixtures of dioxins over time and it is difficult to know how toxic the various mixtures are. It is also a challenge to measure or observe the effects, if any, from exposures to the general public at these low background levels.

Scientists and health experts are concerned about dioxins because studies have shown that exposure to them may cause a number of adverse health effects. Because dioxins exist throughout the environment, almost every living creature, including humans, has been exposed to dioxins. The health effects associated with dioxins depend on a variety of factors including the level of exposure, when someone was exposed, and how long and how often. Because dioxins are so widespread, we all have some level of dioxins in our bodies.

Q *How can we learn more about dioxin risk?*

A More data is needed to better understand the risks to our health from low levels of exposure to dioxins. Most of our exposure comes from the foods we eat. In the case of Port Gardner/Snohomish River Estuary, it is unlikely that exposure would increase significantly from visiting and recreation activities. We are currently consulting with state and county health officials to determine whether any fish and shellfish consumption limits should be established.

Q *What are the sources of the contaminants and toxicity in Port Gardner/Snohomish River Estuary?*

A Ecology does not yet know all of the sources of the contaminants found in the recent sediment study. Historic industrial use of the waterfront is a likely source. Dioxins come from activities including combustion and incineration, forest fires, chlorine bleaching of pulp and paper, certain types of chemical manufacturing and processing, and other industrial processes.

Q *How might I be exposed to the contaminants?*

A Exposure takes place, basically, through three routes: eating, breathing, and skin contact. For example, eating bottom fish and shellfish can result in dioxin and mercury exposure. Skin contact with highly contaminated sediments can result in exposure to contaminants as well. For dioxin particularly, the primary pathway for exposure is diet, especially meat and dairy products.

Q *When will we know more? When will the study be completed?*

A Ecology is working with the Department of Health to conduct a Health Consult using the bottom fish, shellfish, crab and plant tissue samples to provide better information about the health of the Bay and potential human health risk. We plan to have the Health Consult complete by October 2009. We are also working with local and state health agencies to evaluate the results of sampling analysis and communicate potential health risks to Port Gardner and Everett communities.



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Toxics Cleanup Program Web Site

www.ecy.wa.gov/programs/tcp/sites/psi/overview/

[psi_baywide.html](http://www.ecy.wa.gov/programs/tcp/sites/psi/overview/psi_baywide.html)

Reference for more detailed information on contaminants:

- Washington State Sediment Management Standards: www.ecy.wa.gov/programs/tcp/smu/sed_chem.htm
- Puget Sound Initiative priority bays link: www.ecy.wa.gov/programs/tcp/sites/psi/overview/psi_baywide.html
- MTCA Cleanup link: www.ecy.wa.gov/programs/tcp/cleanup.html
- Dioxin link: www.ecy.wa.gov/pubs/0104010.pdf

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