# Chlorine Adds to Quilcene Bay Woes – by JD Gallant

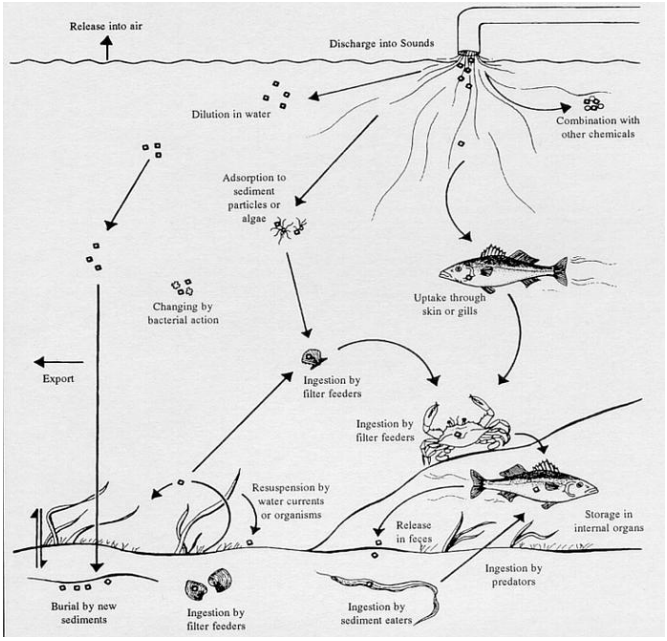
**During testing of wastewater coming from the Coast Seafoods' oyster hatchery on the Quilcene Bay estuary, the Greenfleet team of citizen scientists discovered the toxin chlorine. Although some of the toxin was also discovered in surrounding waters, there appears to be no question but that the hatchery is a point source of the problem. This is a report on that finding and possible ramifications for the bay.**

**Background:**

The Greenfleet Team began its indicator monitoring on Quilcene Bay in 2010. During the first 3 years we monitored dissolved oxygen, turbidity, and to a lesser degree, nitrates. Our reports have indicated that Quilcene Bay has very serious problems with high dissolved oxygen which indicates high levels of nitrates in the water. In late 2011, Pacific Seafood—a large international corporation—purchased Coast Seafoods with plans for a major expansion.

My concerns about Coast's expansion were detailed to the Department of Ecology in September of 2011. In response, Ecology ordered Coast to perform its own wastewater tests in order to ascertain that they were not putting pollutants into the estuary. (Subsequent investigation showed that Pacific / Coast had already prepared for the expansion to begin immediately after the study was concluded.) As

expected, the report claimed that "Coast Seafoods Company's hatchery is fully compliant with applicable regulatory requirements and is not negatively impacting the waters of Quilcene Bay."




This drawing shows how toxins, pollutants, and other hazardous substances can penetrate into the environment in a way that will affect plants and wildlife in the ecosystem.

Since spring of 2013 the whole picture has changed. According to their website the Pacific / Coast Hatchery has increased five-fold its oyster spat (baby oysters) production up to 40 billion annually. As a result, wildlife above and below the water surface has been greatly impacted. For the most part, the birds and mammals are gone—following the fish to somewhere.

At the end of 2012 and throughout 2013, we blamed this phenomenon on very high levels of suspended solids, most of which come from Coast hatchery's wastewater. But in May of 2014 we found another serious contributor when Connie and I got a good sniff of the air at the Herb Beck marina: Chlorine.

The photo below shows tanks hatcheries use to grow algae they feed to larval and juvenile shellfish.

Realizing that chlorine could be a reason for the loss of birds and fish, we ordered supplies and equipment to determine if the toxin exceeded Washington State's legal limit. What we are finding is that chlorine in the bay is far exceeding the State's maximum as allowed in WAC 173-201A-240 of 13 micrograms per liter. The results of these

findings are now being prepared for Jefferson County's Department of Environmental Health and Washington's Department of Ecology.

In BC, Canada, chlorine killed these full-grown salmon.

**Chlorine: A Dangerous Toxin**

Our research into chlorine showed that whether used in a backyard pool or a shellfish hatchery, chlorine is very poisonous at very low levels to most living organisms—including fish and shellfish. The US Fish and Wildlife Service says that if 1 pint of chlorine is added to 20,000 gallons of water, that water will be poisonous to fish. Because chlorine is so deadly to fish and other aquatic animals, it is essential that this form of hazardous waste be removed from effluent before it is poured into our streams and estuaries. Most developed and developing nations of the world have very strict controls on chlorine in wastewater.

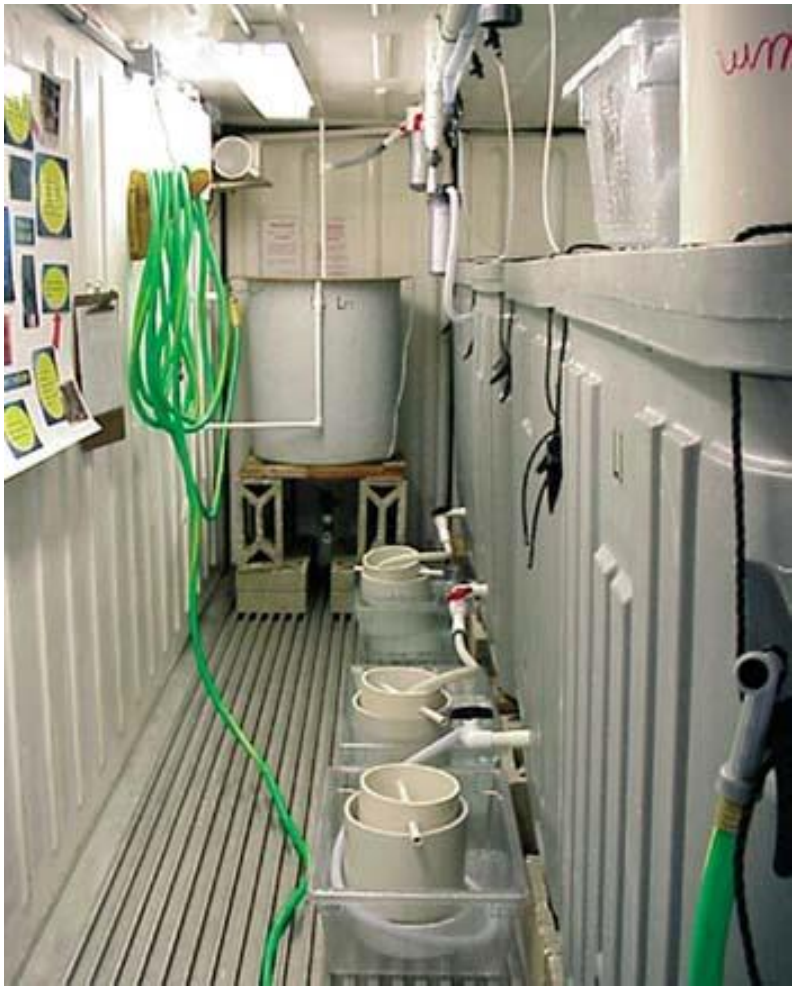
A swimming pool spill killed these fish.

Chlorine easily combines with other chemicals. For example, chlorine exposed to ammonia (which is found in oyster feces) forms chloramine, a more persistent form of chlorine. Ingested by many marine animals, it can kill or weaken them. And while some chlorine can simply evaporate, it can also be spread by currents until it eventually reaches harmless levels—causing much harm in the meantime.

**Chlorine as a disinfectant in shellfish hatcheries:**

Because shellfish hatcheries want only "clean" water for maximum production, they filter and disinfect incoming water – often using chlorine. The water is then typically dechlorinated with sodium thiosulfate after which it is inoculated with special strains of algae that they have purchased or grown in-house. Again using chlorine, the tanks and equipment for growing shellfish and their algal food are disinfected between each use. The chlorine-laden water and other waste

such as feces are drained—and hopefully treated—then the marine water, plus fresh water used for rinsing et cetera, is returned to its source (in our case to Quilcene Bay) and the process begins again.



We know they use chlorine, but where does it go?

Most shellfish hatcheries are "mom-and-pop" operations that do little damage to the environment even though they do produce some toxins, nitrates, and other pollutants. That is probably why the EPA and state environmental agencies have so far deemed them "inconsequential" to the water bodies on which they are located (usually larger than Quilcene Bay). However, when the world's largest shellfish hatchery—as claimed on Coast's website—is located in a poorly-flushed 3-square-mile bay (per WA Dept. of Ecology) that connects to the famously poorly-flushed Hood Canal, we have a situation well worth investigating. The fact that the vast majority of the oysters hatched in their hatchery are shipped far away and don't mitigate the local damage just adds to the problem.

**How we test for chlorine:**

Because of limited budget and expertise, we opted to use standard methodology for determining concentrations of free and total chlorine as outlined in the instruction manuals for our LaMotte and Hach test instruments. We collect samples in sealed glass jars protected from direct sunlight and agitation. They are delivered within 15 minutes to our portable facilities inside a 40-foot sailboat to be analyzed by our colorimeters using the DPD method—which is commonly used by citizen scientists and for some commercial applications.

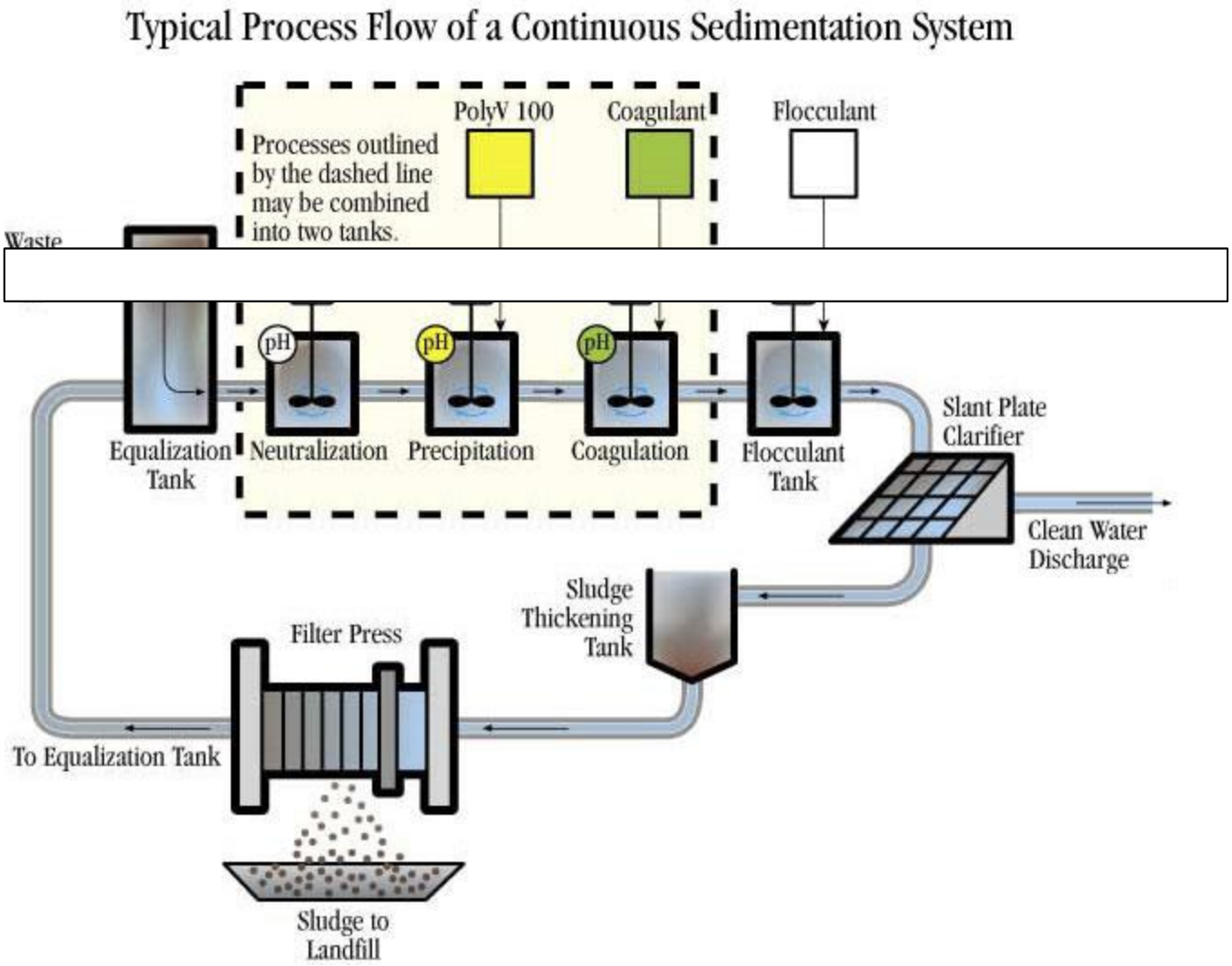
**Legal limits on chlorine use:** Washington State (WAC 173-201A-240) in agreement with the U.S. Environmental Protection Agency tells us that it is illegal to discharge waste water with levels of chlorine higher than 13 parts per billion (13 micrograms per liter). Our testing of the Coast / Pacific hatchery's output indicates that the concentration of chlorine near the discharge point and in the surrounding waters are well above that amount.

Curt testing for chlorine in Quilcene Bay on the Sea Turtle.

There seems to be no question that the law is being violated when total chlorine levels in Quilcene Bay are consistently exceeding the legal limit for brief exposure—which is what is happening according to our analysis. The only question that remains is what Jefferson County's Department of Environmental Health, Washington's Department of Ecology, and the people of Jefferson County will do to stop the pollution.

**Damage by chlorine to fish and shellfish:**
According to the EPA and Washington's and the U.S.'s departments of fish and wildlife, chlorine is one of the pollutants that fish and shellfish try to avoid and, unfortunately, if they cannot, they will not prosper and may die. For example, fish and shrimp can move away to avoid pollutants, but crabs and oysters will just have to suffer the consequences.

**How chlorine could be removed from the hatchery's effluent:**
The most popular way for the chlorine to be rendered (more or less) harmless is by channeling the contaminated water to a holding pond where it is aerated and exposed to sunlight until most of the chlorine evaporates or forms less harmful compounds. However, to get chlorine below EPA limits, chemicals such as thiosulfate are usually used. For such a large operation as Coast / Pacific




**A typical system that might be used for filtering and settling of wastewater at the Coast hatchery.**

hatchery in Quilcene, the treatment system would probably need a rather large settling pond and some sophisticated equipment. I'm sure a good engineer would have fun with the project.

To remove the chlorine only—which to me would not be acceptable—they could inject thiosulfate into the wastewater. (We experimented with the chemical in our miniature lab and it proved to be quite effective.) However, using only thiosulfate at the Pacific / Coast hatchery would not do what needs to be done for our estuary. Simply, just sprinkling a few crystals of thiosulfate won't do the job!

**Must Coast Seafoods leave Quilcene Bay?**
We don't know! However, we do know that getting rid of the chlorine won't remove the other pollutants from the hatchery's waste water. The baby oysters still poop their nutrients—and billions of baby oysters generate a lot of poop, some algae are dumped before they're eaten by the spat, and there's bound to be other material and chemicals finding their way into the hatchery's drains and subsequently into the estuary. Simply, the only way to stop all pollutants will be to build a comprehensive treatment system.

One idea passed to the Port Commissioners at a public meeting was to replace the hatchery with a commercial marine center for encouraging tourism and local use of Quilcene Bay and Herb Beck Marina. Such an idea would, of course, entail much public discussion since the economic issues involving the use of this area are complex.

However, if Coast/Pacific continues to operate the hatchery in a manner similar to the past 2 years, what will happen to Quilcene Bay and Dabob Bay – and Northern Hood Canal? Will the fabulous Hood Canal waterways become another Chesapeake Bay or Love Canal? Right now we have a choice, but that choice may not be here tomorrow.

## SUPPORTING DOCUMENTS