

The Legacy of Hawk Inlet

Scientific Sampling In Hawk Inlet Reveals Serious Toxicity Levels



• A Report and Summary
compiled by the Friends of Admiralty Island
March 31, 2018

Hawk Inlet Marine Field Research
conducted by Oceanus Alaska
at Hawk Inlet, Admiralty Island, 2015-2016



Dedication to Michelle Ridgway


This report is dedicated to the memory of Michelle Ridgway, the meticulous and seemingly tireless marine ecologist who led the Friends of Admiralty Island field research project that is presented in this report. Her professional integrity was beyond question. Michelle died tragically in a motor vehicle accident in early January, 2018. She will be deeply missed by everyone who has valued her quest for truth, learning, and for the protection of the environment upon which we all depend, not merely for short term profit, but for our very survival as a species.

Oceanus Alaska...

...was established in 1992 as an Alaska marine ecological and fisheries consulting firm specializing in research, stewardship and exploration of Alaskan seas. Scientific research focused on seabed and habitat mapping, oceanography and food web processes in Arctic and Subarctic waters. Stewardship services emphasized application of science, policy, law and stakeholder engagement to develop balanced fishery regulatory programs. Clients include academia, private business and public sector organizations..

Friends of Admiralty Island...

...is a non-profit, public interest, volunteer organization formed in 1987 by local Alaskans who wanted the island and its amazing intact salmon watersheds, wildlife and old growth forest diversity to be a living heritage for future generations. We depend on member donations and grants to carry out a program of advocacy for the island's protection through education, promoting scientific research and supporting management that reflects the recognition of the island's values: ecological diversity, wilderness setting, a living Tlingit Indian culture with long history on the island, prehistoric and historic record of paleontology, geology and archaeology. We believe that as people and agencies understand and appreciate these values they will become stronger champions for the island's protection.



Summary

A scientific baseline study in 1981, prior to mine development and operation, determined Hawk Inlet to be a pristine and healthy ecosystem. The scientists concluded, "The quantitative data presented provide an excellent baseline for use in monitoring to ensure the detection of any effects of mine operation."

Final Results of the 1981 Field Program For The Greens Creek Project Part I - Hawk Inlet And Young Bay- Martin Marietta, Environmental Center.

That baseline has never been used. Today, after 36 years of mining, the State of Alaska and the Forest Service (primarily responsible for the mine's permitting and monitoring) conclude that they lack sufficient information to determine the health of Hawk Inlet.

Hawk Inlet can no longer be judged pristine or healthy, based on a scientific sampling study conducted by Friends of Admiralty in 2015-2016. The State is of the opinion that increases in toxic metals in sediment and organisms are primarily related to natural background metals entering the inlet and are not mine related. Sufficient data is lacking to support this opinion. Thousands of years of background metals entering Hawk Inlet did not impair the "pristine" environment, but after only 36 years of mining, the inlet has changed dramatically.

Friends of Admiralty has long advocated that replicating the original 1981 pre-mining baseline will determine the current health of the ecosystem and quantify the mine's effect on Hawk Inlet. Our two-year study proved the feasibility and need to replicate this baseline. We are alarmed at the increase in metal loading in the inlet's



Throughout the year, cargo ships load up with ore at the Greens Creek mine. After a 1989 loading spill dumped lead and other metals into Hawk Inlet, the EPA designated the spill zone an impaired waterbody

sediment and organisms and the apparent decrease in some organism's population numbers.

The original baseline quantified species diversity and population numbers of benthic (bottom dwelling) macroinvertebrates in intertidal and subtidal sites. Scientists, including those from Greens Creek, declare that this type of data represents the best indicator of the health of an ecosystem.

The mine will continue to produce toxic tailings and waste water discharges for the next 30-50 years or longer. The tailings and wastewater discharges will have to be monitored and treated long after the mine closes - scientists say, "forever."

To permit additional tailings expansion and waste water discharges without first adequately determining the Inlet's health and the mine's impact on it is to almost assuredly cause additional irreparable harm to the environment and continue to pose a serious risk to public health.

Admiralty Island: A World Class Ecosystem

Admiralty Island, at over a million acres, is the world's largest remaining expanse of intact, old-growth temperate rainforest. Called Kootznoowoo ("Fortress of the Bear") by the Tlingit people of

Angoon, the only community on the island, this virtually undeveloped treasure supports a wealth of life that is hard to describe. Standing on the bank of one of its hundreds of salmon spawning streams, surrounded by the sound and sight of the feasting eagles, ravens, and gulls, with brown bears plunging to catch a winter's supply of fat, gives but a quick glimpse of the complex interdependence of life that makes Admiralty world famous.

The hundreds of miles of rich marine shoreline blend tidal estuaries with towering old-growth forests. This melding of two

complex ecosystems creates an amazing zone of life as vibrant and productive as can be found on earth. Hawk Inlet, on Admiralty Island's northwestern shore, has exemplified this unparalleled environment.

For over fifty years Admiralty was the center of fierce and often bitter national controversy; log it, road it, eliminate the bears, make it a wilderness, or make it a National Park.

A coalition of environmentalists, sportsmen, commercial seafood interests, scientists and subsistence users urged that the island be protected. Perhaps most important to that plea were the Tlingit elders of Angoon, who were trying to protect their cultural land and their traditional way of life.

President Jimmy Carter recognized the value of Admiralty Island when he proclaimed it a National Monument in 1978, and Congress endorsed that decision in the Alaska National Interest Lands Conservation Act (ANILCA). Both agreed that the Greens Creek mine had a preexisting right to operate within Admiralty Island National Monument, but they set the bar high.

The mine would be able to operate as long as it did not create "irreparable harm" to the Monument's historic, prehistoric, scientific, ecological, and cultural values. The primary cultural values protected under ANILCA are traditional, cultural subsistence activities. Specifically, ANILCA requires mining operations to protect anadromous streams and food fish habitats and to not limit subsistence opportunities. Hawk Inlet is within the traditional subsistence fishing and gathering areas of Angoon, Hoonah and Auk Village (Juneau) Tlingit Indian villages that have depended on the island for thousands of years.



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Pre-Mining Baseline Studies

The Greens Creek mine was in the planning stages in 1975. Studies were conducted in Hawk Inlet from 1978-1982 to document the species diversity and populations of marine life in the intertidal and subtidal area and aquatic life in the freshwater streams. Samples of tissue and sediment were collected to determine heavy metal concentrations. Data from these studies were the foundation for the pre-mining conditions. In the 1981 report, scientists characterized the area as "pristine" and "unpolluted."

Sadly, the pre-mining baseline studies have been ignored. Instead, the Alaska Department of Environmental Conservation (DEC) established a "new baseline" in 1989 after mine development and production had begun, thwarting the scientific usefulness of actual baseline data. This new baseline has been updated periodically, incorporating new monitoring values, resulting in metal values in sediments higher than the pre-mining baseline. There is only one baseline study: that completed before mine development, in 1981. By definition, baselines do not change and they cannot be updated. Therefore, DEC's recent statement that "...current metal values are similar (no data provided) to baseline values..." and then concluded that increases must be a result of natural background and

Sampling locations from the original Hawk Inlet baseline study were identified successfully, thereby demonstrating the feasibility of replicating the baseline to measure ecosystem change over time.

are unrelated to the mine, is both unscientific and misleading. Additionally, the new baseline information does not include the vital data of species diversity and population numbers. In addition to the baseline data collected at Hawk Inlet, a "control area" (an area not affected by the mine) was established in Youngs Bay on the other side of Admiralty Island. If changes observed in Hawk Inlet were not observed in the control area, then factors in Hawk Inlet were likely the cause.

This control area was never used and a new control area was established in Pile Driver Cove, adjacent to Hawk Inlet. Studies demonstrate that water

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from Hawk Inlet flows directly into Pile Driver Cove, compromising it as a control area. Recent data indicate that contaminants in Pile Driver Cove are increasing at the same rate as in Hawk Inlet, and instead of noting this red flag warning, agency regulators dubiously claim that the increases in metals are natural and not mine related.

The State of Alaska and the U.S. Forest Service and other permitting agencies have all stated they do not have substantive information to determine the health of Hawk Inlet.

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The mine is expected to operate for 30 to 50 more years, or longer, and the tailings and wastewater will need to be monitored and treated forever. Permitting and regulatory agencies are underfunded and understaffed, and there are looming policy and climate changes that may create increased environmental stresses. The mine is an important contributor to the regional economy. It requires a reasonable profit and the assurance that it can continue to operate; however, neither the mine, the regulatory agencies, nor the public wants a legacy of a toxic Superfund site.

The State of Alaska and the U.S. Forest Service and other permitting agencies have all stated they do not have substantive information to determine the health of Hawk Inlet. When issuing a permit to expand the mine tailings dump in 2013, the Forest Service



The Friends of Admiralty Island study analyzed tissues of key species of marine animals that typify the food chains in Hawk Inlet

Supervisor substantially reduced the size of the requested expansion because of unknown consequences. He asked that stakeholders work to help fill in the missing data so that a scientific and therefore legal decision can be made regarding the next mine expansion decision, which will need to accommodate the tailings disposal for the next 30 to 50 years. The mine is fast approaching the need for that decision, and a solid scientific understanding of the mine's current impact on the health of Hawk Inlet is critical.

Friends of Admiralty Study

Friends of Admiralty Island raised concerns about apparent errors and omissions in the Greens Creek monitoring program. Agencies would not consider replicating the 1981 baseline -

or even a modified version. This rejection was hard to understand after the Forest Service Supervisor lamented a lack of information and the need for stakeholders to step up to the plate.

Friends of Admiralty felt there was no choice but to prove that the original baseline could be replicated. Replicating the 1981 baseline study uses the years of hard work and good science that was to be the foundation for ongoing studies, so FOA contracted with Oceanus Alaska for a two-year study. Michelle Ridgway, one of the premier marine ecologists in Alaska, was the chief scientist who designed and led the study. Her competency and high scientific standards are reflected in her previous work with the State of Alaska Departments of Environmental Conservation and Natural Resources, the U.S. Environmental Protection Agency, Hecla Greens Creek and other mining companies.

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The study was an exploratory effort to replicate parts of the 1981 study. Sediment samples were collected at 18 intertidal and subtidal sites in Hawk Inlet and Young's Bay between 2015 and 2016. Oceanus Alaska and volunteers collected over 60 tissue and sediment samples that were analyzed in an EPA certified laboratory. The samples were tested for the original 11 metals tested in 1981. Analyses were also done on "opportunity" samples of bear, deer, seal, and a variety of bottom living organisms.



Floyd Jim and Wally Frank, Angoon Tribal leaders, expressing their concerns about toxins in traditional subsistence foods.

Findings

Yes, replicate the baseline.

Friends of Admiralty and Oceanus Alaska demonstrated that the original baseline could and should be replicated.

Increased heavy metals in sediment and invertebrate samples

Seabed sediment habitat supports benthic organisms and nutrient cycling critical to the marine environment. Every station we sampled in Hawk Inlet showed elevated toxic metals compared with the samples in the pre-mining study. The sediment had from 1.2 times the amount of manganese to 646 times for lead. The highest reported mercury concentration in the study's samples was 73 times the highest reported in the original baseline. The average increase for the 11 metals was 73 times original baseline highs and

Bioaccumulation is the process by which the smaller is ingested by the larger and the larger, resulting in the accumulation of larger concentrations of chemical toxicity in the larger and older species.



K.J. Metcalf, President of Friends of Admiralty Island, coordinated the Hawk Inlet study. K.J. is the former Admiralty Island National Monument Ranger for the U.S. Forest Service and has lived in Juneau and Angoon, for over fifty years.

183 times the inlet-wide mean original baseline.

Crabs and bivalves that reside in the sediment were found to have some high levels of heavy metals. Crab, butter clams, cockles, and blue mussels showed elevated concentrations of arsenic, cadmium, copper, lead (except butter clams), nickel (except cockles), and selenium, as compared to the seafood data for the same species elsewhere in Alaska.

There are multiple paths for mine-produced heavy metals to enter the marine and upland environments, including airborne dust, surface and subsurface water runoff, tailings water discharge, ore concentrate loading, and accidental ore spills. Although some pollutants can come from outside sources, the original control area of Young's Bay show relatively little to no change in most of the 11 metals.

Harbor seal tissues

Researchers were also able to analyze the tissues of a harbor seal that was harvested by Angoon subsistence hunters just outside the entrance to Hawk Inlet (but only a half mile away from the mine outfall pipe that carries some 1-2 million gallons a day of mine tailings, waste water and other mine runoff water). The hunters donated the internal organs, stomach, and samples of muscle and blubber for analysis. Lab results showed mercury levels in the seal's liver to be 222 parts per million -- the second highest level of mercury tested in an Alaska seal (with over five thousand seals tested in Alaska). Other metals found in the liver and kidney were concerning. Unfortunately, before lab reports were available, the Angoon hunters had divided the seal meat among family and friends and eaten it.

Dr. Kate Wynne, a marine biologist and professor emeritus from the University of Alaska stated, "The harbor seal harvested and sampled from the Hawk Inlet area tells an eye-opening story that should inspire a broader investigation of contaminant loads in the marine waters in/near Hawk Inlet. The levels of mercury and other metals found in the tissues of this adult male harbor seal were so significantly higher than documented in seals elsewhere, that this alone raises a red flag. But when put into an ecosystem context—where seals are eaten by human and non-human consumers— I totally concur with Michelle Ridgway's summary of the need for further investigation".

When compared to metal concentrations found in 1,228 other phocid seals worldwide, the highly elevated concentrations of mercury and other metals found in the liver and kidney of the Hawk Point seal are noteworthy and provocative. Additional research on metals in the broader food web ... and potential impacts on seal populations and humans who consume seals merit further examination and in-depth analysis.

- Michelle Ridgway



All seawater, sediment and organism tissues were sent to a certified USEPA laboratory. All were tested for organic compounds, hydrocarbons, and eleven trace metals.

Discussion

The evidence is compelling that regulators have substantially underestimated the harm to the marine and upland environments of Hawk Inlet from the Greens Creek mine.

The increase of heavy metals found in sediments and plant and animal tissues suggests that bioconcentration and biomagnification (toxins accumulating in organism tissue over their lifespan and up the food chain) has compromised the water quality of the inlet (especially within the sediment) and likely presents a public health risk.

There is compelling evidence that regulators have substantially underestimated the harm to the marine and upland environments of Hawk Inlet from the Greens Creek mine.

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Hawk Inlet marine life has long been used for subsistence, recreation, and commercial harvest. Boaters from Juneau, Hoonah and other Southeast communities harvest crab, shrimp, salmon and other finfish on a regular basis. Commercial salmon fishing is widespread.

Dozens of commercial

shrimp pots can often be found in the body of water in front of the mine loading dock, near where the lead concentrate spill occurred in 1989.

For thousands of years, Angoon, the sole Tlingit Indian village on the island,



*As Tlingit Elder David Katzeek so aptly put it,
"I hear the creatures of the sea calling.
Who will speak for them?"*

has used Admiralty's western shoreline, including Hawk Inlet, for subsistence and commercial purposes. When the mine was authorized, a condition in federal law provided a clear mandate to protect the natural resources of the island for the benefit of these people. The ancient, historic and contemporary ties Tlingit Natives have to the land are the key to their cultural heritage. These values should never be compromised. As Tlingit Elder David Katzeek so aptly put it, "I hear the creatures of the sea calling. Who will speak for them?"

Action Imperative

1. Replicate the original baseline (testing for the original 11 metals) prior to issuing any new permits. Periodically use the baseline to track changes in the Inlet and to determine if changes are mine related.
2. Determine pathways by which mine toxins enter the marine, aquatic fresh water and upland ecosystems.
3. Use Youngs Bay, or another suitable waterbody, not influenced by the mine, as a control area.
4. Determine the underwater and shore morphology and tidal flow of Hawk Inlet to determine the capacity of the inlet to safely assimilate and flush mine toxins.
5. The 1989 industrial spill of lead ore concentrate in front of the mine dock is a significant source of toxic metals entering the Inlet's food chain. This spill has never been completely cleaned up, mapped or delineated. Determine the spill's present configuration, migration and how it is entering the food chain. Develop mitigation measures for the spill, including removal.
6. Develop a monitoring plan that can determine the rate and pathways of toxins to higher trophic consumers (including humans).
7. Request the State of Alaska declare the entirety of Hawk Inlet an "Impaired Water body."

“ I see an incredible opportunity to work together to discover how Hawk Inlet can become a globally-respected model of 'how to do it right.' With the engagement of both scientists and stakeholders, including the community of Angoon, Greens Creek, and the University of Alaska, we could have a profitable mine while ensuring a healthy and vibrant ecosystem. Can we do this? I think we have to.

– Michelle Ridgeway

We are deeply concerned that our tribal members and others are at a significant health risk by collecting and eating traditional foods from Hawk Inlet.

“ We believe a replication of the 1981 Greens Creek Pre-Mining Base Line Study should be considered as a way to determine mine impacts on the total ecosystem.

– Wally Frank





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Address Service Requested



Juneau

Young's Bay Road

Mill Area

Tailing Piles

Hawk Inlet

Greens Creek Mine

