

ALASKA STATE LEGISLATURE
SENATE RESOURCES STANDING COMMITTEE

February 27, 2009

3:37 p.m.

MEMBERS PRESENT

Senator Lesil McGuire, Co-Chair
Senator Bill Wielechowski, Co-Chair
Senator Hollis French
Senator Gary Stevens
Senator Thomas Wagoner - via teleconference

MEMBERS ABSENT

Senator Charlie Huggins, Vice Chair
Senator Bert Stedman

OTHER LEGISLATORS PRESENT

Representative Bryce Edgmon

COMMITTEE CALENDAR

Overview of Pebble Mine Permitting and Associated Issues

The Pebble Partnership: John Shively, CEO, and Ken Taylor, Vice President, Environment

Department of Natural Resources: Ed Fogels, Director, Office of Project Management and Permitting & Dick Mylius, Director, Division of Mining, Land and Water

Bristol Bay Native Corporation: Mel Brown, Director

Birch Horton, Bittner & Cherot: Bill Horn, Esq., representing Trout Unlimited

University of Washington Fisheries Research Institute: Dr. Daniel Schindler

Center for Science in Public Participation: Dr. Kendra Zamzow, Environmental Geochemist

Lodge Owner: Brian Kraft

PREVIOUS COMMITTEE ACTION

No previous action to consider

WITNESS REGISTER

JOHN SHIVELY, CEO
Pebble Partnership

POSITION STATEMENT: Commented on Pebble Mine permitting issues.

KEN TAYLOR, Vice President
Environment
Pebble Partnership

POSITION STATEMENT: Commented on Pebble Mine permitting issues.

ED FOGELS, Director
Office of Project Management and Permitting
Department of Natural Resources (DNR)

POSITION STATEMENT: Reviewed the state's mine permitting policies.

BILL HORN, ESQ.
Birch Horton, Bittner & Cherot
Trout Unlimited

POSITION STATEMENT: Commented on destructive consequences of mining in the Bristol Bay area.

MEL BROWN
Bristol Bay commercial fisherman

POSITION STATEMENT: Related the serious concerns of Bristol Bay's commercial fishermen on advancing the Pebble Mine project in that area.

BRIAN KRAFT
Fishing lodge owner in Bristol Bay

POSITION STATEMENT: Raised serious water quality issues related to allowing a mine in the Bristol Bay area.

DR. DANIEL SCHINDLER, Professor of Aquatic Sciences
Fisheries Research Institute
University of Washington

POSITION STATEMENT: Commented on what makes Bristol Bay fisheries sustainable and how mining isn't compatible.

DR. KENDRA ZAMZOW, Environmental Geochemist
Center for Science in Public Participation

POSITION STATEMENT: Elaborated on serious technical risks associated with a Pebble Mine project in the Bristol Bay area.

RICK HALFORD

Representing himself

POSITION STATEMENT: Related some history and perspective on why he opposed the Pebble Mine project in Bristol Bay.

ACTION NARRATIVE

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CO-CHAIR BILL WIELECHOWSKI called the Senate Resources Standing Committee meeting to order at 3:37 p.m. Present at the call to order Senators McGuire, French, and Wielechowski. Senator Wagoner was present via teleconference.

Pebble Mine Overview

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JOHN SHIVELY, CEO, Pebble Partnership, and Ken Taylor, Vice President, Environment, Pebble Partnership, introduced themselves.

Mr. Shively said this project holds certain opportunities for the state even though it is very controversial. He said the Pebble Partnership is made up of two companies - Northern Dynasty, a Canadian junior mining company that actually did most of the exploration on the Pebble project, and Anglo American, which is a major international mining firm that joined the partnership in the middle of 2007 in a 50/50 partnership. The board of directors is made up of six people, three from each company.

He showed maps of the Pebble location north of Iliamna and Newhalen and a little west of Nondalton in an area that feeds into two of the major rivers in the Bristol Bay watershed. The prospect is made up of two pieces of land; Pebble West (towards the surface) originally found by Cominco in the early 80s and Pebble East. At Pebble West Cominco did some prospecting for a while and decided they weren't really interested. Northern Dynasty took over the prospect, although Cominco retained an interest. Northern Dynasty did further exploration and increased the reserves at Pebble West and found a deeper and richer prospect called Pebble East. It is estimated to have about 72 million pounds of copper, 94 million ounces of gold, and 4.8 billion pounds of molybdenum. It is not likely they would try to permit the whole prospect at one time, and general that's not how these kinds of prospects are developed. But the Pebble Partnership doesn't have a defined project at this time; they

have a defined prospect. Getting there presents certain challenges.

MR. SHIVELY said he is particularly proud of the low impact footprint for the exploration. They have one small camp, not to keep people, but to store pipe and things like that. Over 800 holes have been drilled in this prospect; the drill rigs are set on pallets to keep them off the tundra. When they are through drilling the hole, they pick everything and reclaim the area within weeks. By the next season you can't see where the holes were drilled.

MR. SHIVELY then turned the presentation over to Mr. Taylor, who he said has had a number of positions in state government. He was head of the Division of Habitat when he was commissioner of the Department of Natural Resources (DNR). When he looked for someone who would give him an honest answer about environmental issues for this project, Mr. Taylor was at the top of his list.

KEN TAYLOR, Vice President, Environment, Pebble Partnership, said the Pebble Project is in the process of finishing the most intense environmental studies ever conducted in the state. He highlighted a few of the disciplines used. Since 2004, hydrology studies have been ongoing in all three of the tributaries, which include the Upper Talarik Creek, and the North and South Forks of the Koktuli River. They have monitored 29 continuously gaged stations, three of them operated by the U.S. Geological Survey (USGS). The USGS has less than 50 stations in Alaska, so this is a huge number of stations for this small geographic area.

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In addition to that, 125 instantaneous measurement sites take hydrological records while consultants are out in the field. In addition to surface water monitoring, they have an extensive ground water monitoring program. It has expanded over the last five years as new deposits were found. As of 2008, there were almost 5,000 monitors for ground water.

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Fisheries studies have been intensive. They look at everything from the spawning activity of salmon to flying replicate surveys up all of the tributaries to determine where they are spawning the extent of spawning distribution. They are also doing a lot of work on radio telemetry with rainbow trout having had experience in conducting a grayling radio telemetry study a couple of years ago.

SENATOR MCGUIRE asked him to expand on that.

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MR. TAYLOR explained that radio telemetry is a tool biologists use to track individual animals or fish. Once they even used it to track rocks to see what the channel forming flows of the various streams were. These kinds of studies allow biologists to get a better idea of whether or not more than one species is spawning in the same area year after year. For instance, rainbow trout have a fidelity to the Upper Talarik. In addition, they have a very extensive fish habitat mapping project that involves transits cross the streams looking at off-channel habitats, which are the little ponds and slews connected to the streams. These are important overwintering habitats primarily for Coho and Chinook. Understanding that habitat in extent at different flow rates is going to be very important if a project ever gets developed in this area.

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The department has had a lot of requests for the fisheries data their independent environmental consultants are collecting and a data release schedule indicated when it would be available. These consultants are very good and go through all of their data sets and quality assurance/quality control procedures before those data are released to the public. Information on the extent of the anadromous water bodies was wanted, so Pebble worked with the agencies to go through their data sets to pull out the upper most observations of all anadromous fish to include them in the anadromous waters catalogue. This is important from a permitting standpoint, because it gives them more authority.

The department has released a number of data sets so far and yesterday they released data on tissue sampling of vegetation, fish and mammals. A number of other releases are scheduled for 2009; the fisheries dataset should be released early in 2010.

MR. TAYLOR said once they complete all of the environmental baseline characterization work, they put together an environmental baseline document. There will be about 52 chapters to this document and it will be done probably some time in 2010.

Receiving a viable project design from the engineering team would trigger the permitting process that would go to the lead federal agency. Then they would begin the EIS process.

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Typically, a third-party contractor is hired to weigh the alternatives and to put a project together. The permitting challenge is large, and they are working with several state and federal agencies concurrently to get the 67 different types of permits that would be involved.

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SENATOR STEVENS joined the committee.

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MR. SHIVELY said the project needs to develop an existing 82-mile road that is now used largely by fishermen for transferring boats between Iliamna Lake and Cook Inlet. The port would probably be in Inishkin Bay, but there is also talk about using Williamsport. It would be a substantial port because a lot of supplies would have to be imported and the concentrate would have to be exported on ore ships. In addition, the land up towards the mine is primarily state land until you get to Iliamna where large chunks are owned by the Iliamna Native Corporation and Pedro Bay Native Corporation on the Bristol Bay side. On the Cook Inlet side six village corporations own part of the land. In addition to the road, they intend to transport the concentrate in a slurry by pipeline. The slurry would be dewatered at the port and the water would be piped back up to the mine for reuse. So they would likely have two pipelines; one a diesel and, depending on how they do power, they might have a gas pipeline.

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The project needs 300-600 MW of power and none is readily available. Their base case will probably be importing LNG into Nikiski and producing the power there as part of what would be the Railbelt grid. Because Pebble would be a large industrial user, it may have impacts on other developing projects such as the bullet line and both hydro projects. In addition, wind is being tested at the sight.

If inexpensive power is brought into the mine, Mr. Shively said, they really have a responsibility to get it to the rest of the region. They would probably look to the state to help with the transmission of that power, and given the fact that it would positively impact the PCE program for the region, it is something the state might look seriously at.

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MR. SHIVELY said they had done some social economic studies. The two boroughs closest to this project both have had significant

decreases in student population for the years between 2000-2007 where it has dropped faster than the drop in population as a whole. This is not a good sign, and that probably doesn't take into account the fact that generally in rural Alaska you find higher birth rates. One of their employees was a Bristol Bay High School graduate, and when he graduated there were 28 students in his graduating class and now there are 37 students in the whole high school. This is just one of the signs of economic problems in the region despite the fact that it has a very healthy and vibrant fishing industry, which is important to local people for a whole variety of reasons.

In closing, he said, they have an ore body, an intensive environmental studies program, and the potential for a lot of economic opportunity. It could provide as many as 1,000 permanent jobs, it could provide energy, and it is a state-owned resource; it would provide a fiscal base for the local government, some fiscal support for the state government and support Alaska businesses. They don't have a mine plan, because they have not come to the conclusion that they can have a plan that would be economic and meet the high standards that it will have to meet. He said:

We've never gone out and asked people to support the Pebble Mine, because we don't have a Pebble Mine. All we've ever asked for is that people wait and see if we can have a plan and then test that plan against what we know will be extremely high standards, probably the highest standards any mine in the world has been tested against.

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SENATOR STEVENS asked if they expect much traffic on the road if they have a slurry line.

MR. SHIVELY replied that having the slurry pipeline would substantially cut down traffic on the road that would only be used for bringing supplies to the mine. It is a potentially difficult drive in the winter time. Pipelines have less operator error, and the road is hazardous in the winter time.

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SENATOR STEVENS asked if he looked at the mine's possible impact on subsistence hunting and caribou herds there.

MR. SHIVELY replied they would shut the road down during migrations, the same as they do at the Red Dog.

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ED FOGELS, Director, Office of Project Management and Permitting, Department of Natural Resources (DNR), briefed the committee on how large mines are permitted in Alaska.

MR. FOGELS showed a map of mines in Alaska from the perspective of being the permitter; it showed Greens Creek, Pogo, Fort Knox, Usibelli and Red Dog as currently operating. Rock Creek Mine was operating, but is in temporary closure. The only mine the state is currently permitting is the Chuitna Coal Project near Anchorage. The Kensington Mine is awaiting the resolution of a Supreme Court decision as to whether it can proceed or not. The two big mines in Alaska that are on the horizon are the Pebble Project and Donlin Creek. Southeast has a company exploring the Niblack prospect and it is in permitting. Tulsequah Chief and the Galore Creek Mines are Canadian. Their trans-boundary watersheds drain into Alaskan waters and could potential affect our fish; so, the department is watching those projects also.

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He said one of his main messages is that many permits are required to mine. The Department of Natural Resources (DNR) is at the top of the list of state agencies that issue permits and that is primarily because of its coordination role that is laid out in statute. Because of that, the department formed the "Large Mine Permitting Team" that involves a lot of agencies. A tremendous body of experienced people work in these agencies, he said; they have worked on large mine projects and have advanced degrees in hydrology, biology, mine engineering and they also now have public health officials.

The U.S. Environmental Protection Agency (EPA) and the Army Corps of Engineers are at the top of the federal agencies list. The last three agencies, the Bureau of Land Management, The Forest Service and the National Park Service are typically involved when a mine is on their property or close to it.

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MR. FOGELS said because of federal agency involvement, almost all mines will trigger the National Environmental Policy Act (NEPA) and for large projects this will almost always require the development of an Environmental Impact Statement (EIS). The EIS process is the driver of the large mine permitting process. The state does not require one, but it helps them make their decisions. Permitting has a tremendous amount of public involvement.

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MR. FOGELS said he would give them "an incredibly brief Mining 101 overview," because it is really important to understand what is going on from an environmental perspective. He showed them a photograph of a Fort Knox pit near Fairbanks showing ore and waste. He explained that ore is the rock that the miners are after because it has economic concentrations of metals in it. To get to that ore they have to remove waste that does not have that economic concentration in it and that waste has to be put somewhere. It is first removed and placed in rock dumps that are all subject to permitting requirements. That reveals the ore that is taken to the mill, which is a facility that through a process of grinding, crushing, and chemical extraction removes whatever the miners are after.

He said that all agencies are concerned mostly with the waste from the mill called "tailings" and these can be pretty significant in volume. They can be disposed of in a number of different ways; the two most common methods in Alaska are dry stack tailings and wet tailings impoundments. In dry stack tailings the tailings are compressed and the water is squeezed out. The tailings can then be built up into some kind of engineered structure that is designed to be stable. In a wet tailings scenario, the tailings are slurried in a wet slurry form behind some kind of dam and stored in an impoundment. There they settle out and typically a water cap is maintained on top that will keep those tailings from contacting oxygen.

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He said some mines have very benign waste materials. At Fort Knox, for example, the waste rock is essentially clean granite chips that a person could landscape with, and you don't have to worry about those. At other mines, such as Red Dog, the waste rock and tailings are very reactive; they still have a lot of mineralization in them. As rain water percolates through these tailings facilities, it can pick up metals and turn acidic. This is what concerns them. So all that water has to be captured, treated and handled appropriately before it can be released to the environment. No two mines are alike and there is a very wide spectrum. So, a lot of time is spent looking at the geochemical analysis of all the rock types in a mine.

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The main state permit that addresses the waste materials at a mine is the Department of Environmental Conservation (DEC) Integrated Waste Management Permit. That essentially allows a

company to store this waste in an approved manner after thorough engineering and chemical analyses. This authorization also requires financial assurance, a financial mechanism that allows the department to take care of the property should the mining company not be able to do so.

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Another very important state authorization is the Reclamation Plan Approval. All mines in Alaska must be reclaimed by state law; the mine site must be returned to a stable condition and this permit also requires financial assurance should the mining company not be able to reclaim the site.

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The Dam Safety Certification is issued by the DNR; all large dams in the state need it. Dams have to be designed to strict state standards which include seismic standards appropriate to the seismic risk in the area. The dams also need financial assurance "so there is some financial mechanism to take care of those dams as long as they exist."

MR. FOGELS said financial assurance is essentially a very detailed engineering analysis of what it would cost the state to take care of and maintain the various components of a mining site. It's based on a thorough engineering analysis; the department gets spread sheets that may be hundreds of pages long that are very detailed. The cost for pounds of grass seed required for revegetation, for instance, is calculated and reviewed by agency experts. If the state doesn't have the expertise somewhere, they will contract out to other experts to cross check or supplement their work. Costs are way lower if all you have to do is revegetate, but as soon as you get into long-term monitoring or water treatment, they really escalate. He said the Red Dog will need monitoring and water treatment for a very long time. He explained that the Division of Habitat in the Department of Fish and Game has to approve any work in any fish bearing waters.

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There are two Title 16 permits. All mines must have a monitoring plan, which explains how they are going to monitor the environment - air quality, surface and ground water quality - and fish and wildlife populations. They have to do this not only before they mine, but during mining and post closure. Agencies have to approve this monitoring plan. This is vital, because this allows people to catch problems early if something isn't working as planned.

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Environmental audits of all environmental systems at each mine are required every five years. How well the agencies do their jobs is also audited. They are done by third-party experts who also reevaluate the financial assurances to make sure the amounts are current.

MR. FOGELS wrapped up that many permits are required and many agencies are involved, not just DNR. They have really good experts who have been doing mine permitting for years and they have financial assurance requirements to protect the state's interests should something go wrong. Contamination is an issue at all sites and there are ways to prevent it from occurring and to control it if something should happen that was unforeseen. He explained:

The key is to understand the waste characteristics...if you understand that, then you really know what the long-term risks are going to be. You need to know the water balance, how the water travels through the mine site. Every drop of water in that mine site has to be accounted for and where it's going to go eventually. You minimize the footprint; minimize that contact with water. We make the companies design for closure. Now-a-days we want to know how they are going to close the mine before they even start it. That's so critical. Monitoring - we've got to have good monitoring, and we back it all up with our five-year health check up, the environmental audit.

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SENATOR WAGONER wanted more explanation of the financial assurances. For instance, how is the bond amount determined if the Red Dog decides to expand? What type of monitoring will the Red Dog get after it closes and for how long?

MR. FOGELS answered that the amount of the bond by law has to be adequate to cover the liabilities of a project at all times. If the mine should expand, the financial assurances need to be reevaluated. This is essentially what the five-year audit does. The Red Dog Extension Project is currently in the permitting process. The extension would allow them to mine an additional pit that would extend its life for another 30 years. The bond will go up considerably.

He explained that monitoring typically scales back a little bit after closure, but they determine what the environmental risks are and make sure the appropriate monitoring stations are there. For Red Dog, water quality is the biggest concern; so, all the ground and surface monitoring stations will be active well past closure and monitoring will essentially go on forever. The bond will have to reflect that.

SENATOR WAGONER said the only fear he has with the bonding is what if the corporation that was responsible for the Red Dog Mine, through a reorganizational plan, declares bankruptcy. What would that do to the bond and the state's ability to collect the money to do the reclamation the company escaped from doing by declaring bankruptcy?

MR. FOGELS replied the state's financial assurances are designed to deal with that type of situation. The Red Dog Mine's bond amount is in the form of a letter of credit through a third-party major banking institution. So if at any time the company goes bankrupt or even if it reorganizes they still have the letter of credit. It is designed so that the state would get a check for whatever the current amount is - now it's \$154.9 million. A piece of that would go into a trust fund that's designed to generate the income necessary for that perpetual care and maintenance. "It's not really a bond as such. It's designed to eventually be a trust fund controlled by the State of Alaska."

SENATOR WAGONER commented that he has heard that scenario played out by several people as a way for companies to get away from liability.

SENATOR STEVENS said his biggest concern is seismic risks. "What if there is a breach of that dam? What would escape from behind that dam and what effect could it have on the river system and Bristol Bay?"

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MR. FOGELS replied that the state's dam safety regulations require that any dam be designed appropriately for the area's seismic risk. It's an engineering exercise, essentially, and it would just cost more to beef up that dam to be strong enough to withstand "the maximum credible earthquake that you can foreseeably expect to find in that area." The first step would be to design it so it's really strong.

A tailings facility consists mostly of solids with a thin water cap on top. So if the dam fails, it's not that the dam is holding back nothing but water. The water may be a couple hundred feet behind the face of the dam. The Red Dog dam has a 300-400 foot beach from the crest back toward the water. If that dam broke in half, very little water would come gushing through, however it would be a major issue for the mining company and the state.

MR. FOGELS said he couldn't speak about the impacts of a catastrophic failure without seeing specific facility designs. For instance, it's possible to "fraction out your waste products" into clean tailings and dirty tailings. You might mitigate some risk by putting the dirty tailings way back from the face of the dam and have the clean tailings up against the face of it.

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SENATOR STEVENS asked if they had studied the record of various companies' successes or failures with reclamation.

MR. FOGELS answered that the department has a lot of reclamation experience in Alaska, but it hasn't spent a lot of time looking at the records of specific companies. A lot of mines are still operating here; some are temporarily shut down because they are waiting for metals prices to go back up.

SENATOR FRENCH said the public believes the failure of the project rests in the legislature's hands. How much fate rests in the hands of the DNR commissioner and the governor or would this truly be a discretionary decision made by professionals in the DNR?

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MR. FOGELS answered that was a tough question. The company has purchased claims and has mineral rights to the area. The department is bound to evaluate their proposal and give them a reasonable opportunity to demonstrate they can make the project go while still protecting the state's other resources. If they can demonstrate they can build the mine and protect the fish to the state's satisfaction, the state agencies may have no choice but to issue their permits to proceed. The state could change its set of standards by changing the law one way or the other.

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SENATOR MCGUIRE said this mine is an unprecedented size for Alaska. Has he looked at how regulations in other states or other countries with mines of this size compare to Alaska's?

MR. FOGELS answered they had looked at other mine projects in other areas; some in more detail than others. Some of the biggest mines in the world are international. The department works very closely with Canadian government officials on their projects. The state's process is strong. It really comes down to some very basic things. You have to demonstrate an engineering design that keeps the dirty water inside the mine, and won't let it leave the mine without being treated in some fashion. It's a matter of technical expertise to cross-check the designs and make sure the risks are understood. State water quality standards are high.

SENATOR MCGUIRE asked what some of the cutting edge technologies are in tailings disposal.

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MR. FOGELS answered one of the issues with tailings is their sheer volume, and you can't do anything about that. About half the tailings of an underground mine can be mixed with cement and be pumped back down into the mine. This is a good way for dealing with that volume. For above-ground disposal, you can dry out the tailings and make them into a dry stack, which could be sculpted to blend into the environment better. A wet tailings impoundment is always going to have a dam and a flatter area. The real technology comes in when addressing the geochemistry issues with the rock. The very reactive tailings at Red Dog, for instance, need to have the acid neutralized so oxygen is kept from the tailings. So, a tremendous amount of research is being done on that right now.

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BILL HORN, ESQ., Birch Horton, Bittner & Cherot, representing Trout Unlimited, said Bristol Bay, its river systems and its salmon runs are an extraordinary resource that merit an extraordinary review process before major activity is allowed to put those resources at risk. The incomparable fisheries in this region have long been recognized in the state by many historic designations and protections (listed in his briefing). The fisheries, especially the sockeye salmon fishery, constitute a sustainable renewable resource that supports millions of dollars of economic activity in presently well-established commercial and sport fish sectors. In addition, that same resource has

sustained the subsistence economies in dozens of villages for centuries.

Into this established sustainable economy now come proposals for an enormous sulfide mine project. Unfortunately, the historic record of such operations provides a lot of evidence that such activity can pose substantial risks to fishery resources. Because of that risk, special care must be taken and an informed decision has to be made before any determination is made to allow a major sulfide mining project to precede inside the Bristol Bay drainages. This is especially critical, because the effects of the mine would be far-reaching. He pointed out that Mr. Shively made it clear that the mine, itself, is only a small part of the equation. If permitted, ultimately all of the infrastructure he outlines in addition to massive dams, tailing disposal reservoirs and a new town will be part and parcel of the project. Once of full complement of infrastructure is built, it is completely foreseeable that other nearby mineral sites will become economically viable and put on the path to development. He concluded that, "Just as at Prudhoe Bay, the development of the oil field and its related infrastructure prompted the development of all the satellite oil fields on the North Slope, the development of Pebble and its infrastructure will likely to the same in the Bristol Bay drainage."

MR. HORN stated that the decision to permit the Pebble Mine to proceed is in reality a decision to let a full-scale sulfide mining district take root in the head waters from the Kvichak and Nushigak River systems. A decision of that magnitude goes well beyond specific concerns about water quality, tailing dam specifications or the size of the mining pit, and the permit review process needs to be scaled accordingly to the consequences associated with the mine.

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As a legal matter, Mr. Horn said, every time someone suggests an additional review process or elevated substantive review standards, someone raises the specter of takings claims, but in this situation, takings is a red herring. The Alaska Supreme Court has made it very clear in cases like Beluga that a state mining claim carries with it no right to mine and any rights or privileges associated with a claim are only prospective and contingent; the state is fully within its rights to deny permission to mine without any liability to compensate the claimant. The bottom line, he emphasized, is that permit review procedures, as well as standards, may be altered and may be made

tougher without triggering any takings under state or federal law.

Accordingly, he recommended that because of the enormous long-term consequences to the region of allowing Pebble and its infrastructure to proceed, to ensure that whatever decision is made is based on complete information and a comprehensive appreciation of its aggregate impacts and consequences. "We just think that Bristol Bay's extraordinary resources demand no less."

MEL BROWN, representing Bristol Bay area commercial fisherman, said, "We have huge concerns." He noted that he is not representing Bristol Bay Native Corporation. The Pebble Project is the most high profile event that has happened to Bristol Bay in the last few years, he said. They are learning and beginning to realize if it ever happens, it's going to be one of the largest mines in the world. However, the ore is not that high of a grade and it will need to be crushed into a dust to get the copper and gold out.

He said they are also seriously concerned that the Pebble Project is located in a saddle where the flow of the water goes in all directions and tailings containment will supposedly have to hold toxins forever. The media has recently reminded them about a number of earthen dams that have released toxins into river systems in Tennessee and Kentucky with huge impacts.

The first Exxon Valdez oil spill distribution went to 3,600 fishermen. That figure gives them an idea of how many people are involved in the Bristol Bay red salmon fishery. "It's the largest in the world...and there isn't any other class that produces that much red salmon. And we want to be sure that we're thinking of this on a long-term basis - that this will continue to sustain the commercial fishermen and also the subsistence people."

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MR. BROWN said 80 percent of the people in the area want Bristol Bay absolutely protected. The next competing river for fish used to be the Frazier River, but now you can hardly catch a fish there.

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BRIAN KRAFT, said he owns two fishing lodges in the Bristol Bay area, one in the Naknek and one on the Kvichak by Lake Iliamna; he said he understands the situation - they need jobs and they

have to be self-sustaining. He said it's the ultimate irony that they have the world's most prolific salmon runs and their head waters are in an area that also has a massive mineral deposit. "The concern is the immediate massive consumption of water."

Mr. Fogels said the department is doing its job, but he also hears Commissioner Irwin say it is 140 people short and even the State of Montana has a stricter permitting process.

Bristol Bay is special, he said, and deserves some special protection. In 1972 this body recognized that and passed the Bristol Bay Fisheries Reserve.

He repeated that he was not against mining, but it's unfortunate that Pebble is located where it is. Seventy-five percent of the large mines that have been permitted since NEPA have had ground water problems, and just one mistake would critically adversely affect other industries in the area.

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SENATOR STEVENS asked what he is thinking of for developing the economy out there short of mining.

MR. KRAFT replied besides the seasonal fishery jobs that are already there, every village corporation could get involved in tourism and vertically integrate within the fishing and tourism industries. Had Pebble not come along, he had hoped that Iliamna would have found something to sustain its economy, but when it comes to water and mining at that location, he urged them to err on the side of caution.

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DR. DANIEL SCHINDLER, Professor of Aquatic Sciences at the University of Washington Fisheries Research Institute, said he is one of its principle investigators and has worked on sockeye salmon in this part of the world since 1946. He said he would relate to them what makes the Bristol Bay fisheries so sustainable and give them a long-term perspective of where his research is headed.

What he has learned about the salmon in Bristol Bay challenges a lot of conventional wisdom about fisheries sciences. This can be appreciated by looking at this type of landscape that the salmon have so successfully colonized. It's a geologically diverse landscape that includes glaciers, coastal planes, rivers, streams, and lakes. The overriding characteristic is a highly permeable geology with a lot of water. That water moves freely

through the geological structures and that water movement is needed for successful incubation of the embryonic salmon, which is why the salmon have been so successful there.

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The issue they have learned by studying salmon for 60-plus years in this part of Alaska is they need to ask carefully about what constitutes salmon habitat. They have learned in the last decade that streams are not necessarily interchangeable; and again he said you need to think about the network of habitat that supports fisheries. Disturbed salmon that can't reach their spawning ground happens simultaneously with very high production in adjacent streams.

Basically, he explained, because this landscape is so permeable and easily disturbed by hydrologic and climate processes, he developed a "portfolio effect" with the idea that every component of the stock isn't necessarily operating synchronously with each other. As some parts of the population increase in abundance, others may decline and these different dynamics balance themselves out over the long term. For instance, if you think about your retirement investments, one of the smart things you are going to do is diversify your portfolio, which stabilizes it and actually produces higher long-term gains than if you have a very simplified portfolio. He explained:

The reason this analogy is important is that Bristol Bay sockeye are supported by a very diverse habitat portfolio that involves populations that are specifically adapted to each of those streams, rivers, and lakes that they spawn in. The fishery integrates across all this diversity and as a result the fishery is much more stable and much more productive - because we have this vast and diverse network of habitat.

Evidence is quite striking in looking at Bristol Bay catch statistics, he said, illustrating with a graph. Production has been variable, but sustained for over 100 years, and in fact it has increased in the last 20 years. Certain districts dominate the catch for a while and then other districts overtake them. This shows how the diversity of watershed types and the populations associated with them have stabilized catch in the system. This is called the "portfolio effect."

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They see the same thing at smaller scales, like the Wood River system where many of its streams can be stepped across with four

steps and hip waders, but they produce from a couple thousand fish per year up to 60,000 per year. The dynamics are not synchronous; different populations are doing different things in different years.

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DR. SCHINDLER said it's important to realize that natural populations and natural landscapes have incredible capacity to for renewal. Salmon are very highly adapted to living and flourishing on disturbed landscapes and they can be rejuvenated from flooding and droughts. As an example of this, he said the Kvichak River system in the early 90s was barely replacing itself and went into a massive decline. In the last four years, however, the system bounced back without any help from hatcheries or habitat restoration. It was simply the reflection of the natural capacity of a system with its intact portfolio of habitat to bounce back from natural disturbances.

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DR. SCHINDLER finished with a short movie about assessing what toxins do to fish in the water environment. Salmon have a good sense of smell, he said; they smell their way to their home stream. But, it turns out that copper interferes with the ability of salmon to smell things.

He explained that in addition to being able to smell their way home, juvenile salmon are able to smell danger in the water, and one of the major sources of mortality for them is being eaten by a large predator. When the predator abrades the skin of a Coho salmon, the skin releases a "smell" to the environment that changes the behaviors of its surviving brothers and sisters.

He presented a short movie that showed how juvenile Cohos hide in the gravel when a tiny piece of baby coho skin is dropped in the water; however, when they are exposed to a very low dose of copper, they become oblivious to the piece of skin. So they don't go for cover. These levels of copper are not toxic to salmon, but it drastically changes their behavior abilities to respond to the presence of predators. These are the types of ecological responses that are going to be very hard to assess with standard toxicological techniques, which is illustrative of the types of things they need to think about in doing a true impact assessment of mining's potential impacts on fresh water resources, especially salmon.

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SENATOR WIELECHOWSKI asked if copper is the only substance that can drastically change salmon behavior.

DR. SCHINDLER replied that other substances can imperil olfaction; copper is the one that has been studied the most.

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SENATOR WAGONER asked how many parts per million can copper get to before it starts to affect the ability of the salmon to smell.

DR. SCHINDLER replied that the movie they just saw about olfactory impairment used 10parts/billion, a relatively low concentration. This research group based with NOAA has started working with how low concentrations have to be before it no longer impairs salmons' ability to smell things. The point is that they are lower concentrations than would cause direct toxicity to the salmon itself.

SENATOR WAGONER asked how familiar he is with the Bristol Bay salmon fishery.

DR. SCHINDLER replied that he has a pretty fair assessment of the salmon production across Bristol Bay; he has been there since 1993.

SENATOR WAGONER asked what percentage of the Bristol Bay watershed the mine might affect.

DR. SCHINDLER replied the mine site is quite small, but if you start asking how far contaminants would go if a catastrophic dam failure happened, it would go through a large chunk of the watershed area. The area's contaminants are very soluble in water and the geology is extremely permeable. That is why the salmon are there in such high densities, and also why they are so vulnerable.

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SENATOR WAGONER asked how one corrects 10 parts/billion of copper.

DR. SCHINDLER replied the most common way is through dilution.

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SENATOR STEVENS said he grew up in Oregon and during that time the salmon fishery was lost, and asked if he had any examples of a lost fishery being revived in an area like this.

DR. SCHINDLER replied the reality is that diverse habitat portfolios just don't exist anymore in the Lower 48. Most of Oregon's surviving fisheries are propped up through hatchery production and very intensive restoration programs, not natural salmon runs. Last year, the Sacramento River's King fishery was closed down because of poor ocean conditions, a prime example of when a "portfolio" is reduced to a single strategy. When that population goes down, there is no alternative. Alaska still has all the options. The best place to look for ideas about opportunity and capacity for renewal are in our own backyard.

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DR. KENDRA ZAMZOW, (power point not in folder) Environmental Geochemist at the Center for Science in Public Participation, said she would address some of the technical risks associated with the Pebble Mine project. She has been a resident of Alaska since 1985, and prior to the work she does now she was a set netter and owned and operated a drift net boat in the Copper River.

She went to Senator Wagner's question about copper and said she found it's not so much the amount of copper in the water as the suddenness of increasing it. Fish can take a certain amount of copper if they are used to it over time, but sudden increases of even 2-5 parts/billion can have some disruptions.

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She said this is sort of continuing to Mining 102 where you start with some tunnels, you have economic ore that comes out and then you have waste rock. Some waste rock is fairly benign and other is reactive and the difference is usually attributable to the amount of sulphide in it. When sulphide contacts oxygen and water, it becomes sulphuric acid, which is battery acid. Sometimes it happens naturally if you have outcroppings of this material or if you are putting in a highway. It becomes a big problem with larger volumes.

DR. ZAMZOW explained that the ore goes into the mill and when it comes out, you have you send the economic metals to market in a finely ground version and the processed chemicals is put in a slurry that goes to the tailings dam. The ore and the waste are very close to each other and a geologist is on-site during the blasting separating the two. They do the best they can as the process is ongoing.

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DR. ZAMZOW said the proposed Pebble project will dwarf the size of the state's other mines. They are worried about the geochemistry. Northern Dynasty had 400 drill-hole samples from Pebble West and a lot of the material is known to be acid-generating. Given that acid could form, they would have to figure out where it would travel. She remarked that other developments could eventually happen once Pebble was operating.

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The Pebble East deposit has better grade of ore, but it's much deeper at 500-1,000 ft. Underground methods have been proposed for getting it out. Block caving is one method and that would require going down below the ore and shooting explosives up and allowing it to "rubblize." Then it gets hauled out. This method not only rubblizes the ore, but it fractures the rock above it and eventually the ground surface subsides. So, there is a conduit to the surface with a lot of fractures and the ground water has the potential to contact air and water in a lot of ways it didn't have previously - creating the potential for the creation of sulphuric acid that can mix with the groundwater and go anywhere.

Another concern, Dr. Zamzow said, is that the dams, which would have to be very large, would have material move through the soils under them. Whether that becomes an issue or not has to do with how quickly it moves through the soils. If it moves slowly it could be diluted in the groundwater, but if it moves quickly it could be more of an issue. She has heard that about 9 billion tons of material would have to be handled. Dams can hold 2.5 billion tons of material; she would hope that the remaining material would be nonreactive, which could be used for roads, but she didn't know that for sure.

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The Pebble Partnership has shown a connection between the South Fork Koktuli and the Upper Talarik River underneath the ridge. So the groundwater, itself, is connected, she warned. This could potentially happen in other areas, but they don't know that for sure, either.

Some drilling muds have the potential for toxicity, she explained, and the DEC is looking into that. Some spills have happened in other projects and there is concern that some of the kettle lakes might be upwelling areas affecting salmon spawning areas. There are also concerns with seismic risks.

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She said Pebble proposed at least two dams that are fairly large, one is approximately 740 ft. and another about 710 ft. Those numbers could change as the mine plan is developed. But, there are known faults in the area - one is only 18-20 miles away and they expect the dam to be built for that. They don't know if there are any faults that could potentially be closer. A 2007 earthquake was relatively close and that needs some on-the-ground work with trenches and aerial imagery to really define the seismic risk.

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She also showed a picture of a 90 ft.-high dam that was once actually one of the best built tailings dams. It was basically a lot like the Red Dog mine, a lead/zinc mine with some acid in it. A portion of the tailings area was built on a limestone layer that had clay underneath it. The acid dissolved the calcium carbonate. Water on clay is very slick, and a 50 ft. section slipped and the dam collapsed. "It's just an illustration that we can do things with as best we know how and things we can't predict may happen."

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She said as part of the EIS, 180 mines' water quality were looked at and about 25 were looked at in great detail. They found that about 93 percent of the mines that had the potential to contaminate ground water actually did. This is a small study, but the USGS out of Reston, VA, is doing a much larger study with more recent mines.

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RICK HALFORD, Trout Unlimited, said he spent his life being supportive of the mining industry, "but this one is different." It is overwhelmingly large, and it is a special type which is dangerous. Because of its infrastructure cost, it's more of an all-or-nothing question than anything else the state has ever looked at - and - it's in a very difficult location.

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He stated, "There is a reason that a company as experienced as Cominco sold these claims for substantially less than they had invested. There's a reason that the claims didn't go forward, and that reason is a cloud on all the rest of the industry in the state today." He said the Pebble Mine dispute and everything about it makes it very hard for lots of other legitimate prospects to get money. So, it's important for the legislature to look at it as much as it can and for them to all help each other get to a decision as soon as possible.

MR. HALFORD explained that the legislative branch has the right, the opportunity and the obligation to gather as much information as it can. The legislature is an ideal place to go to the National Academy of Sciences with a program receipt appropriation that the applicant has to pay for - and it's certainly legitimate to say they have to pay for it - to get a truly objective view of a cost benefit analysis of this project. Actually waiting until there is an application everything shortens the timeline for everything, and Pebble will have spent a lot more money and the rest of the industry has stayed under that cloud a lot longer. Again he encouraged them to go to the Academy of Science for a truly objective view; it could be run through either the legislature or the DNR. If the Pebble Project is found to be impossible then the Pebble Partnership will have spent less money to find that out.

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SENATOR STEVENS asked if he thought science could find the answer - yes or no - at the end of the day.

MR. HALFORD answered he has always felt that they could do more with resources in conflict with better continuous active management. It has to be objective and based on complete information.

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SENATOR MCGUIRE asked if asking the mining industry to pay for those kinds of studies has any precedence.

MR. HALFORD replied that generally program receipts are what pay for most of the regulation of applicants in these kind of cases.

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MR. SHIVELY admitted that all the concerns they have heard are legitimate; fishermen should be concerned. His job is to mitigate the risks. However, he corrected that Pebble won't build a new town, but it'll be a camp situation. Right now they have a rule that if you come out to work for them you can't hunt or fish.

MR. TAYLOR added that this is a complicated project, particularly when you get into water chemistry. They are doing the very best job they can through their consultants to collect good water chemistry information.

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SENATOR FRENCH drew from a June 2008 Alaska Law Review article that said the state's regulatory scheme allows too much discretion; it doesn't fully articulate the sorts of things the state should be thinking about in awarding the many permits. He asked Mr. Fogels his view of the article and the strength or weakness of the state's current regulatory scheme.

MR. FOGELS answered that he read the article and so have most of the agency people on the team. "To put it bluntly, we respectfully disagree with that article." The writer seemed to forget that other agencies are involved in mine permitting, and it faulted DNR for not having the authority to regulate water quality, but that's DEC's role. A lot of agencies are involved.

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SENATOR STEVENS asked his opinion about going to the National Academy of Sciences for a cost benefit analysis and to comment on how it would be funded.

MR. FOGELS answered they had actually met with Academy staff to discuss this very issue and they said a half million bucks would get the legislature and the state an answer. Right now, he wasn't sure they actually had a question. He needs a project proposal and engineering diagrams in hand. The department has already asked third-party experts to help them, and it has no experience with the Academy. He didn't know how long it would take them to come up with they analysis. The department already bills back all the state services to the project applicant for probably 15 other projects throughout the state; so that wouldn't be a problem.

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CO-CHAIR WIELECHOWSKI thanked everyone would who testified and adjourned the meeting at 5:32 p.m.