

Pebble Mine (Copper/Gold Prospect)

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Ground Truth Trekking

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Summary

The proposed Pebble Mine is located in Southwest Alaska, on state land near Lake Iliamna and Lake Clark, and is situated atop the largest known gold deposit in the world (http://www.visualcapitalist.com/portfolio/global-gold-mines-and-deposits-ranking-2012). If built, the mine would be North America's largest gold and copper mine, potentially producing hundreds of billions of dollars worth of metals. The proposed mine is also located at the headwaters of some of the world's most productive salmon rivers, which ultimately feed into fisheries-rich Bristol Bay. The potential environmental and economic impact on the salmon fishery prompted significant opposition to the Pebble Mine proposal before the permitting process had begun.

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Permitting of the proposed mine began in late 2017, with a general plan (http://www.northerndynastyminerals.com/i/pdf/ndm/Pebble_Project_Preliminary%20Assessment%20Technical%20Report_Februa calling for a large open pit mine during the initial decades of operation, a similarly large underground mine late in the mine's life, and the impoundment of billions of tons of mining waste behind several earthen dams. As of late 2017, more than$750 million (http://www.businessweek.com/articles/2013-09-27/why-anglo-american-walked-away-from-the-pebble-mine-gold-deposit#p2) had been spent on exploration, but a new funding partner (https://www.northerndynastyminerals.com/pebble-project/project-status/) might mean more exploration spending in 2018

The proposed mine has been very controversial in Alaska and has garnered attention around the world, largely due to the scale of the project and the potential environmental and economic impact on the salmon fishery. The developer is Pebble Limited Partnership (http://www.pebblepartnership.com/), which is owned by Northern Dynasty Minerals, a junior mining company. Northern Dynasty began exploration at the Pebble site in 2002. Pebble Limited Partnership was until recently half-owned by Anglo American (http://www.angloamerican.com/), one of the largest mining companies in the world, had which financed most of the exploration. Anglo American pulled out in 2013, abandoning its $541-plus million investment.

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Mine proponents have argued that the mine will create jobs in the region and tax revenue for the state of Alaska, that the mine can be built without risk of harming the watershed, and that it is impossible to reasonably oppose a project before final mine plans are drawn up. Opponents have argued that the mine would negatively impact the entire Bristol Bay watershed regardless of design details, that it would create an unacceptable risk to fisheries downstream (/Issues/Fisheries/BristolBay.html) permanently (/Issues/OtherIssues/InPerpetuity.html), and that the mine must be opposed before formal plans are released to the public, because there are large inherent risks and because opposition becomes difficult or impossible once a state permit is issued.

Mine Outlook

Northern Dynasty recently acquired a new funding partner (https://www.adn.com/business-economy/2017/12/18/pebble-project-gets-a-new-funding-partner/), the Canadian mining company, First Quantum Minerals. By paying $150 million over four years, First Quantum Minerals reserves the option of purchasing a 50% stake in the Pebble Prospect. The agreement between First Quantum Minerals and Northern Dynasty also prompted a drop (https://www.fool.com/investing/2017/12/18/why-northern-dynasty-minerals-stock-dropped-nearly.aspx) in Northern Dynasty's stock prices. Northern Dynasty used the first year's installment ($37.5 million) to move forward with the permitting process, applying for federal permits (https://www.adn.com/business-economy/2017/12/24/pebble-partnership-to-finally-file-permit-application/)with the Army

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Corp of Engineers. Permits are for a new, smaller proposed mine (https://www.adn.com/alaska-news/environment/2017/10/04/pebble-unveils-long-awaited-smaller-mine-plan/) at the Pebble Prospect, modified to address criticisms (https://www.alaskapublic.org/2017/10/06/pebble-shows-first-glance-at-its-new-mine-plans/) from mine opposition. (/Issues/MetalsMining/opposition-to-pebble-mine-prospect.html)

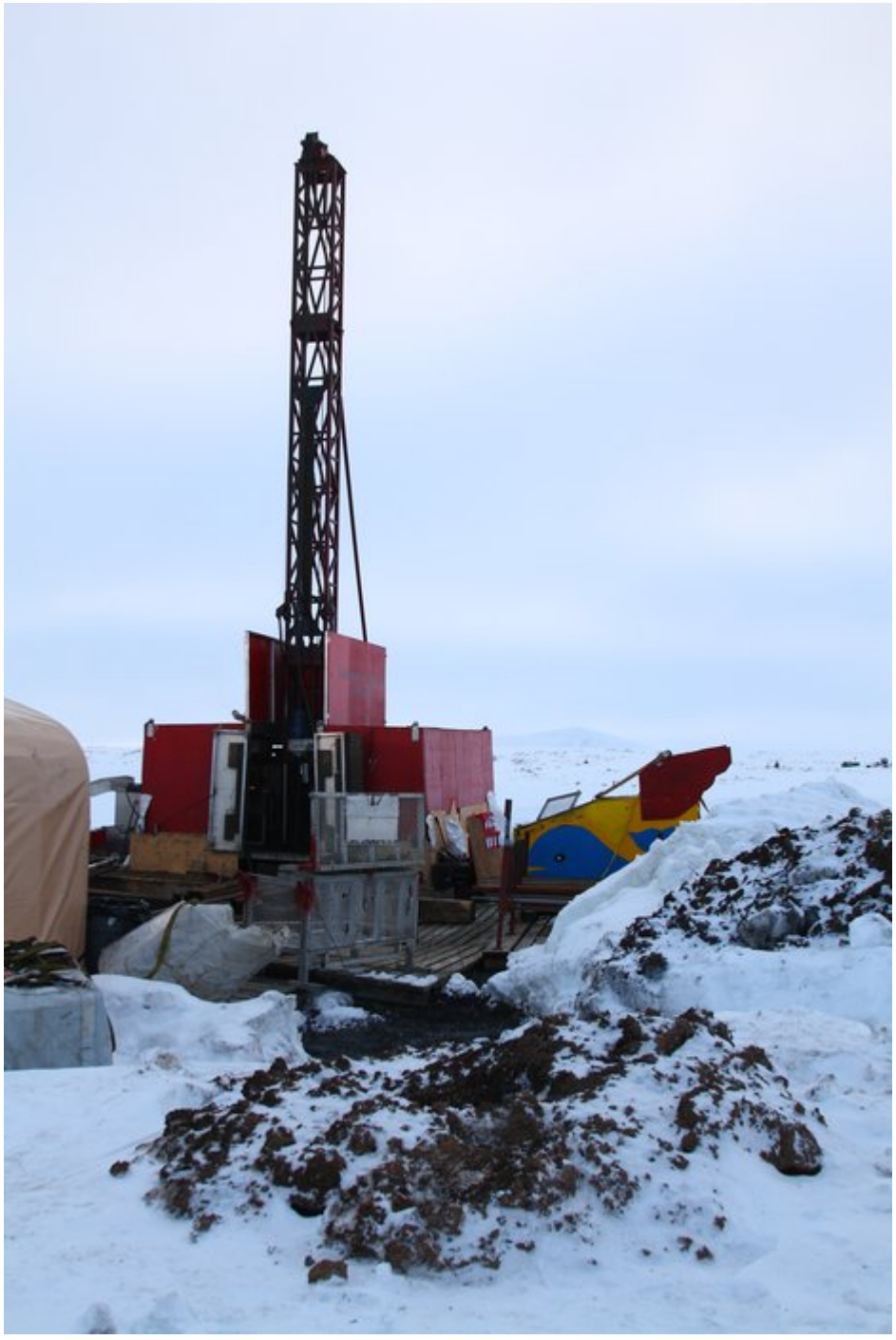
This flurry of activity follows shortly after the Pebble Limited Partnership and EPA settled their legal disputes pertaining to the restrictions imposed by the EPA under the Clean Water Act prior to Pebble Limited Partnership having submitted their mine proposal (see the Opposition to Pebble (/Issues/MetalsMining/opposition-to-pebble-mine-prospect.html) article or EPA Involvement section below for more detail).

Though the value of the metals at Pebble is clearly high, the potential for a profitable mine is contentious even in the mining industry. The optimism indicated by Northern Dynasty's recent activity and the acquisition of a new funding partner are tempered by a recent report (https://seekingalpha.com/article/4045672-northern-dynasty-minerals-ltd-pebble-deposit-commercially-viable) indicating the prospect was uneconomical from mine investing analyst Kerrisdale Investment Firm. Even as Northern Dynasty escaped EPA restrictions and acquired new investment, their share price has languished at around 1/10th their peak value from 2011.

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The large multinational mining company Anglo-American pulled out (http://www.businessweek.com/articles/2013-09-27/why-anglo-american-walked-away-from-the-pebble-mine-gold-deposit) of the project in September 2013, abandoning $541+ million in cash investment and relinquishing its 50% stake in Pebble Limited Partnership, leaving Northern Dynasty as the sole owner of the prospect. Anglo-American described (http://www.angloamerican.com/media/releases/2013pr/2013-09-16) the move as a business decision, prioritizing projects with lower risk, greater benefits, and lower capital costs. Although Northern Dynasty vowed to bring the mine through permitting and into operation, it is questionable if Northern Dynasty has the financial resources to do so alone.

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PEBBLE PROSPECT — Photos from around the Pebble Prospect taken in March 2008. — Get Photo (/photos/pebble-prospect_6/)

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Subsequently, in April 2014, the global mining giant Rio Tinto (presently one of the largest mining companies in the world) gifted (http://www.riotinto.com/media/media-releases-237_10183.aspx) its 19.1% stake in Northern Dynasty to two Alaskan charities. Rio Tinto stated that the project did not fit its strategy. Rio Tinto's gifting its shares, as opposed to selling them, is an extraordinary action. Both charities subsequently sold the shares (http://www.adn.com/node/1593876?sp=/99/188/). Both Rio Tinto and Anglo-American have now forfeited their stakes in the potential mine, which might be worth $300 billion or more over its lifetime if built.

Although both Anglo American and Rio Tinto have stated that their severing of Pebble connections is part of their larger business strategies, there is reasonable speculation that EPA action and the intense negative publicity around Pebble Mine have at least partly driven these decisions. However, recent declines in metal prices and the remoteness of the project, which calls for huge initial investments in basic infrastructure like roads, a powerplant, and a harbor, should not be discounted as factors.

In May 2014, Pebble Limited Partnership - now wholly owned by Northern Dynasty - filed a lawsuit (http://thehill.com/policy/energy-environment/206917-pebble-mine-sues-epa) against the EPA, for its invocation of CWA section 404(c). In early June 2014, the State of Alaska joined the lawsuit (http://www.adn.com/article/20140608/state-asks-join-pebble-lawsuit-against-epa) on the side of Pebble. One month later, the United Tribes of Bristol Bay joined the EPA's position, now placing

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Governor Sean Parnell's administration and the local tribes in direct opposition. In September 2014, a federal judge dismissed (http://thehill.com/policy/energy-environment/219197-judge-throws-out-lawsuit-against-epa-on-alaska-mine) the lawsuit, on the grounds that it cannot be filed until the EPA makes a decision on the mine. The EPA has announced it will not rule until January 2015, at the earliest. In late November, 2014, Pebble achieved a limited victory when a federal judge temporarily halted (http://www.adn.com/article/20141124/federal-judge-sides-pebble-halt-epa-mine-action-now) the EPA from pre-emptively invoking 404(c). In January 2016, both a watchdog
group and the EPA inspector general found there was no evidence (http://www.adn.com/article/20160113/watchdog-finds-no-evidence-bias-epa-bristol-bay-mining-study) the EPA had improperly collaborated with mine opponents. This created a setback for Pebble's lawsuit, but did not resolve it.

In another matter, September 2014, Pebble admitted guilt and settled out-of-court for illegally purchasing confidential information (http://www.adn.com/article/20140914/pebbles-apology-court-settlement-rings-hollow) about the Renewable Resources Coalition, and using the information against the conservation organization in a publicity campaign. The same month, Pebble sued the EPA (http://washingtonexaminer.com/epa-accused-of-collaboration-with-anti-mining-activists-violating-advisory-committees-law/article/feed/2172810), claiming it had illegally collaborated with environmental groups in its invocation of CWA section 404(c). By the start of 2015, Pebble's activities had largely contracted to legal action, and

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it's CEO was a Washington D.C. attorney. The 2014 legal saga is simply and effectively summarized in an anti-Pebble Huffington post column. (http://www.huffingtonpost.com/joel-reynolds/pebble-mine-2014-year-in_b_6397558.html)

Without the funding of major backers, the Pebble project severely contracted (http://www.adn.com/article/20140727/year-after-pebble-iliamna-lake-communities-adjust-new-normal) in 2014-2015. In 2014, exploration largely ceased. Pebble reports the number of regional jobs it creates (including support work, contractors, and short-term employment) has been cut from 1,403 in 2013, to 184 in 2014. The Pebble prospect is Northernn Dynasty's primary asset, and between mid-July 2011 and the end of 2014, Northern Dynasty's stock has lost roughly 90% of its value.

In 2015 and 2016, Pebble Limited Partnership had failed to successfully advance the project further or find new investors for the project, while opposition remained strong (see these journalistic articles summarizing 2015 (http://www.huffingtonpost.com/joel-reynolds/pebble-mine-2015-in-revie_b_8913358.html) and 2016 (http://www.huffingtonpost.com/joel-reynolds/pebble-mine-2015-in-revie_b_8913358.html) developments).

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Geography of the Pebble Prospect

Location

The Pebble prospect is located in an area of wet tundra surrounded by low mountains approximately 16 miles west of the village of Nondalton. The communities of Nondalton, New Stuyahok, Ekwok, Dillingham, Naknek, South Naknek, King Salmon, Levelock, Igiugig, Newhalen, Iliamna, Pedro Bay, and Kokhonak lie in the region of the proposed mine, and many are downstream of the Pebble site.

The prospect sits on a drainage divide between Upper Talarik Creek and the Koktuli River, which form the headwaters of two separate rivers draining into Bristol Bay. Frying Pan Lake, located in a proposed tailings (/Issues/MetalsMining/MineTailings.html) storage area at the Pebble site, drains into the Koktuli River, which then joins the Mulchatna and finally the Nushagak River. The Nushagak empties into Bristol Bay near the town of Dillingham. Upper Talarik Creek drains into Lake Iliamna, which empties into Bristol Bay through the Kvichak River.

This site is also surrounded by other mining claims (/Issues/MetalsMining/MiningClaimsNearPebble.html) such as the Groundhog Prospect (/Issues/MetalsMining/MiningClaimsNearPebble.html). These are unlikely to be

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developed on their own, but may piggyback on infrastructure built for Pebble. In this sense, development of Pebble may trigger widespread mine development in the area.

How much metal?

In May 2013, Pebble Limited Partnership released an economic impact study with estimates (http://corporate.pebblepartnership.com/files/documents/IHS-Pebble_Economic_Employment_Study.pdf) of the amount of recoverable metals in the deposit. This includes 55 billion pounds of copper, 3.3 billion pounds of molybdenum, and 67 million ounces of gold. The deposit contains smaller amounts of silver, rhenium, and palladium.

Both the quantity of metal and the quality of the ore will figure into how much could be eventually mined. Therefore Northern Dynasty has published estimates of the copper resource ranging from
382 million pounds to 56,766 million pounds depending on the geologic and economic criteria (https://www.northerndynastyminerals.com/pebble-project/reserves-resources/) used. If prices are higher, mining lower grade ore becomes economically feasible. Since metal prices and extraction costs are dynamic, an exact “quantity of recoverable metal in the ground” can’t be accurately defined. The potential recovery rates (https://www.northerndynastyminerals.com/pebble-project/reserves-resources/) at Pebble West have been estimated at 85% for copper, 70% for gold, and 78% for molybdenum.

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TAILINGS AREA — The most recent plans from Pebble would put tailings many hundreds of feet deep here. — Get Photo (/photos/tailings-area/)

Layout

The mineral prospect includes two distinct areas, Pebble West and Pebble East. Pebble West is relatively shallow, and would be a massive open-pit mine (/Issues/MetalsMining/GoldMiningMethods.html), almost two miles wide and a few thousand feet deep. The ore in Pebble East is much deeper beneath the surface and would be mined using block caving (/Issues/MetalsMining/block-caving-underground-mining-method.html#axzz2GE6HBONO). This process involves mining the deposit from the bottom upwards, collapsing the ground

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into the cavity left behind. These mines would use all of the water (/Issues/MetalsMining/PebbleHydrology.html) from the upper reaches of Talarik Creek and the Koktuli River.

Employment and Economics

The current market value of the Pebble deposit is greater than $300 billion, using 2013 estimates of recoverable metals and July 14, 2014 metal spot prices (http://www.infomine.com/investment/metal-prices/). This breaks down to roughly $179 billion in copper, $43 billion in molybdenum, and $87 billion in gold. This is down from $500 billion several years ago, due to downward revisions of the Northern Dynasty's 2010 estimated recoverable metal, and a drop in gold prices. Northern Dynasty has removed the 2010 metal estimates from its website.

If the mine were constructed, its metal would be exported to smelters as ore concentrate. Revenues from this activity would go into mine operation (wages, services, equipment, power, environmental remediation), taxes, and paying off the large initial development & construction liabilities. The remaining balance would be profit for the mine owners. Offsetting this would be the cost-to-society of any "external" costs not captured within the mine operation. For instance, if water contamination damaged the downsteam salmon fisheries, then this would become an potential economic loss to the state, regardless of whether the mine operator is liable. (i.e., if the fishery was reduced in value by $10 million, this would be a "real" cost, regardless of whether it was concretely linked to the mine).

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Destinations of Money: In-State, Out-of-State

Depending on the workforce, its origin (state residents vs. out-of-staters) and its spending habits (purchasing locally vs. purchasing out-of-state goods), wage income could either help fuel the Alaska state economy, or quicky leave it. Historically, skilled workers have migrated to Alaska to work in its resource extractive industries, and it is unclear how many of Pebble's jobs would be filled by residents.

Most payments to vendors for equipment (ex: heavy mining machinery, natural gas powerplant) and major industrial operations (ex: operation of ocean-going ships) would be expected to leave the state immediately, since such vendors are not located in Alaska. Fuel supplies (diesel, natural gas) could concievably be supplied from in-state or out-of-state.

Due to the ownership structure of the current developing firm, most of the profits of the mine would likely flow out of state, to the owners and managers of Northern Dynasty Minerals.

Value of Taxes

Metal mining generates state revenues directly via excise taxes, but at a much lower rate (/Issues/MetalsMining/Mining-Taxes-Revenue-Alaska.html) than oil & gas extraction. For example in 2004, one tax assessment (http://northern.org/media-library/document-archive/clean-water-mining/mining/a-review-of-industrial-hard-rock-mining-in-alaska/download)showed oil and

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gas extraction in the state paid about 19% of the oil and gas's market value in combined state, borough, and municipality resource taxes. On the other hand, metal mines paid about 2.3% of the market value of their metal in combined taxes. Another assessment (http://www.akrepublicans.org/seaton/24/pdfs/seat_hb418_08.pdf)for 2004 calculates these rates at 22.3% and 1.5% respectively. Using rates of 1.5%-2.3% and the market value of metal above we can estimate that the Pebble mine could pay up to $7.5-11.5 billion in combined natural resource taxes over the lifetime of the mine.

Value of Affected Industries

To estimate the net economic impact of the mine, impacts to fisheries, tourism, and other industries must be compared to these direct economic benefits of the mine. The annual economic value (http://www.bber.umt.edu/pubs/survey/Economics%20of%20Wild%20Salmon%20Ecosystems%20in%20Bristol%20B of the fisheries, hunting, and tourism industries in Bristol Bay exceeds what would be generated by the mine. Around 75% of local jobs are related to the fishing industry, with a total payroll of around $175 million. Bristol Bay alone is responsible for around 40% of the nation's salmon catch each year. Potential impacts range from clearly expected environmental disruptions, such as that produced by building and operating a road through the region, to less predictable accidents, such as diesel pipeline ruptures and the entry of fugitive dust into salmon streams. The chance of accidental failure of the waste storage facilities must also be considered - either minor failures, such as seepage of

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contaminated water through the groundwater regime (a relativley likely failure), or catastrophic rupture of a tailings dam (a very unlikely but very high consequence failure).

Widespread impacts are uncertain, therefore subject to the bias of the estimator. The relative costs and likelihood of these impacts has therefore been a subject of hot debate. The EPA, in the moderate position (gtt's opinion), concluded its Watershed Assessment (http://cfpub.epa.gov/ncea/bristolbay/recordisplay.cfm?deid=253500) that an adverse impact on the downstream waters is likely. Pebble Limited Partnership has asserted it can follow a "no net loss" policy, in which there will be no adverse impacts on other environmentally dependent industries, and that any damages could be fully rehabilitated. Whether this can be technically accompished is questionable.

Economic Role of Pebble's Metals

While gold has very little utility (/Essays/ValueofGold.html), both copper and molybdenum are critical metals in modern civilization, as are the lesser metals (silver, rhenium, and palladium) in the deposit. Copper in particular is one of the most important metals of the modern age, used heavily in electronics, electric motors, plumbing, and roofing. In May 2013, Northern Dynasty Minerals released an economic impact study (http://www.northerndynastyminerals.com/i/pdf/ndm/NDM_PebbleProject_NEIS_May2013.pdf) indicating the Pebble could increase the U.S. copper production by 20%. This study further estimates that, over a 29 year period, the mine would

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support 15,000-16,000 nationwide jobs and generate roughly $1 billion in government revenues. The majority of the jobs and revenues would be realized in lower 48 states.

Copper is central to many “green” technologies such as windmills and electric cars. However, mining more metal has the net effect of reducing price and therefore reducing the rate of recycling (/Essays/MetalsRecycling.html) and the incentive to conserve existing stocks. Recycled copper has a much smaller environmental footprint than virgin copper produced from a mine. This comes at a higher price, but that price may be closer to the actual “true cost” (/Issues/OtherIssues/TrueCost.html) to society.

Environmental Concerns

Discussion of the impacts of the project is dominated by three related topics:

- Perpetual storage of mining waste
- Physical footprint of the mine
- Potential impact on regional fisheries

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GROUNDHOG MOUNTAIN THUNDERSTORM — Thunderstrom approaching from Groundhog Mtn, within the Groundhog mining claims — Get Photo (/photos/groundhog-mountain-thunderstorm/)

Mining waste storage

The perpetual storage (/Issues/OtherIssues/perpetual-waste-storage-perpetuity.html) of acid generating (/Issues/MetalsMining/AcidMineDrainage.html) tailings (/Issues/MetalsMining/MineTailings.html) behind earthen dams is probably the single greatest hazard posed by this project. The most official proposal available (http://dnr.alaska.gov/mlw/mining/largemine/pebble/water-right-apps/) calls for at least four large earthen dams, effectively replacing two valleys with large lakes. Depending on how the waste is processed and

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stored, these may or may not require water treatment in perpetuity. Concerns include the worldwide history of failures at containing mine tailings, the inadequate consideration of seismic hazards (/static/uploads/files/120907%20Pebble%20Seismic%20Critique.pdfg37ZL3/120907%20Pebble%2 in the area, complex local hydrology (/Issues/MetalsMining/pebble-mine-water-impacts-hydrology.html), and the long-term risk to Bristol Bay fisheries (/Issues/Fisheries/BristolBay.html). See our articles "Pebble and Perpetuity" (/Issues/MetalsMining/pebble-mine-perpetual-waste-storage-forever.html), "Tailings Storage at Pebble" (/Issues/MetalsMining/pebble-mine-tailings-storage-management.html), and "Alternative Tailings Storage at Pebble" (/Issues/MetalsMining/pebble-mine-alternative-tailings-storage-management-options.html) for more details.

The Mount Polley mine tailings breach (http://en.wikipedia.org/wiki/Mount_Polley_mine_disaster) in August, 2014 has provoked additional criticism (http://www.adn.com/article/20140818/carey-restino-after-mt-polley-mine-disaster-making-molehill-out-mountain) of Pebble's plans, but also at least one argument that Mount Polley demonstrates a Pebble breach would cause limited damage (http://www.petroleumnews.com/pntruncate/10334086.shtml). The full damages caused by the Mount Polley breach are not well-established, and the parallel between the two mines is limited: Pebble's sulphide ore has strong acid-generating potential, which is associated high levels of dissolved heavy metals in impoundment water. In contrast, the Mount Polley tailings are not acidic, although the tailings do contain substantial quantities of available heavy metals, including arsentic. It may be found that Mount Polley's water is

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largely non-toxic and the only significant water quality impacts are caused by the sediment released. Most of these particles may be settle to the bottom of Polley and Quesnel lakes, immediately downstream of the mine. The future effects of Mount Polley are unknown (http://www.theglobeandmail.com/news/british-columbia/mount-polley-tailings-spill-effects-could-last-for-decades/article20596892/). Knight-Piesold, which has been a major geotechnical engineer for Pebble (including doing its seismic risk assessment and preliminary tailings facility designs) also designed Mount Polley's tailings facility, but was not the engineer-of-record for the facilities at the time of breach.

An official report (https://www.mountpolleyreviewpanel.ca/) recently identified the cause of failure (http://www.ctvnews.ca/canada/inadequate-design-behind-b-c-tailings-dam-failure-report-1.2213685) at Mount Polley as being due to the dam's foundation overlying a glacial lake deposit, making it a serious engineering failure. Although Pebble has not released official mine plans, the 2012 preliminary assessment (https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=2&cad=rja&uact=8&ved=0CCc showed Pebble's tailings dams being built atop concrete foundations on bedrock, which situates the dams on stronger foundations than Mount Polley.

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Footprint of the mine

In addition to the issues surrounding the tailings facility, the mine itself would turn many square miles of valleys and river into an open pit, waste piles, and mineworks. Pebble Mine would be a massive industrial project employing 1000 workers and using more power than the entire Kenai Peninsula. Development of the mine would bring many miles of roads and bridges, transmission lines, and pipelines into an undeveloped area. Transport of the ore would most likely be along a private 100-mile road to a new port in Cook Inlet. All of this infrastructure would impact the surrounding ecology and the subsistence lifestyle (/Issues/OtherIssues/Subsistence.html) of the majority of communities in the area. Additionally, this infrastructure could be used to support other mining projects on nearby mineral claims (/Issues/MetalsMining/MiningClaimsNearPebble.html) that could amplify the footprint of the mine. Lastly the mine would produce pollutant emissions from burning millions of gallons of diesel fuel, natural gas, and ship fuel in the course of normal operations. The emissions would include heavy metals, particulate matter, and between 47 and 150 millions tons of CO2 (/Issues/MetalsMining/powering-pebble-prospect-electricity-fuel.html) (over a 25 year or 75 year mine life). At 1.9 million tons per year, this is an annual CO2 emission level comparable to the yearly greenhouse gas emissions of a small African country (e.g.Liberia: 2.1 million tons/yr (https://en.wikipedia.org/wiki/List_of_countries_by_greenhouse_gas_emissions)). Over the lifetime of the mine, this could add up to more the annual

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emissions of a small European country (e.g.Belguim: 113 million tons/yr (https://en.wikipedia.org/wiki/List_of_countries_by_greenhouse_gas_emissions)).

Impact on fisheries

Any large tailings dam that needs to be maintained in perpetuity (/Issues/OtherIssues/perpetual-waste-storage-perpetuity.html) presents a risk to downstream ecosystems. The Pebble site is at the headwaters of the productive Bristol Bay watershed (/Issues/Fisheries/BristolBay.html). The waters downstream of Pebble contain all five species of Pacific salmon, pike, several types of trout, char, and whitefish. Sport, commercial, and subsistence (/Issues/OtherIssues/Subsistence.html) fishing are critical components of the economy and livelihoods of Bristol Bay and most of the debate about Pebble Mine centers around the potential impact on these fisheries (/Issues/Fisheries/BristolBay.html). Bristol Bay is the largest commercial sockeye salmon fishery in the world, with an estimated run size of 32 million fish (http://www.adfg.alaska.gov/static/fishing/PDFs/commercial/2012_bristolbay_sockeye_forecast.pdf) in 2012.

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FRYING PAN LAKE — North end of Frying Pan Lake. — Get Photo (/photos/frying-pan-lake_3/)

Northern Dynasty maintains that it has a “no net loss” policy (http://www.minesandcommunities.org/article.php?a=2953) for fisheries in the area which would mean than any loss of productivity would be theoretically compensated for in some other way. These direct effects that Pebble would seek to mitigate include destruction of salmon spawning habitat near the mine, an increase in “total dissolved solids” (http://en.wikipedia.org/wiki/Total_dissolved_solids) downstream of the mine, and the release of metal compounds that can interfere with the homing mechanism (http://pebblescience.org/pdfs/Pebble_copper_salmon.pdf) of salmon. A similar policy is in effect in Canada, where it includes actions such as attempting to create new habitat near the habitat that was destroyed, or simply paying a lump sum to the government to compensate for

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the fish and habitat loss. No studies have determined whether the no net loss policy has been effective in Canada. Even if such a policy could possibly mitigate some of these direct negative effects of mining on the local salmon populations, it could never begin to address a large scale tailing dam failure.

EPA Involvement

In 2012 the Environmental Protection Agency (EPA) agreed to conduct a "Watershed Assessment" of the Bristol Bay region (http://yosemite.epa.gov/R10/ECOCOMM.NSF/bristol+bay/bristolbay). This request was brought by a number of tribal groups, conservation organizations, and concerned individuals. Involvement of the EPA was opposed by PLP, and some tribal groups in the region. The draft report by the EPA was issued in May 2012 and concluded that mining development posed a significant threat to salmon fisheries in the region. The report was peer-reviewed by an independent panel of experts in August 2012. This panel gave numerous suggestions for improvement to the report, and generally agreed with the overall findings. In April 2013 the EPA released a revised Watershed Assessment (http://cfpub.epa.gov/ncea/bristolbay/recordisplay.cfm?deid=242810), taking into account scientific peer review of the initial report as well as over 200,000 comments.In response to the EPA's proposed determination, the Pebble Partnership sued the EPA and an injunction was granted by the state supreme court.

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In July 2014, the EPA had officially proposed to block development of the Pebble deposit on the basis that the mine would cause irreversible and unacceptable damage to the Bristol Bay salmon ecosystem (executive summary (http://www2.epa.gov/sites/production/files/2014-07/documents/pebble_es_pd_071714_final.pdf) and full proposal (http://www2.epa.gov/sites/production/files/2014-07/documents/pebble_pd_071714_final.pdf) **Big**), invoking its Clean Water Act Section 404(c) (http://water.epa.gov/lawsregs/guidance/cwa/dredgdis/404c_index.cfm) powers. Alaska Governor Sean Parnell criticized (http://www.adn.com/node/1526571) the EPA action. Earlier, in Feburary 2014, the Environmental Protection Agency hadinvoked (http://yosemite.epa.gov/opa/admpress.nsf/names/r10_2014-2-28_bristol_bay) its power under the Clean Water Act's Section 404(c) to review and possibly prevent the project from moving forward, based on environmental risks. The oil & gas industry (/Issues/AlaskaOilandGas.html) is keenly watching the fight (http://blogs.platts.com/2014/10/27/alaska-mining-oil/), as this may be precedent-setting case on the EPA's power to invoked 404(c) pre-emptively.

The EPA, under new administration, settled with Pebble Limited Partnership](https://www.epa.gov/newsreleases/epa-and-pebble-limited-partnership-reach-settlement-agreement) in 2017, agreeing to reverse restrictions imposed under the Clean Water Act in exchange for Northern Dynasty Minerals dropping legal charges (https://www.adn.com/alaska-news/environment/2017/07/11/epa-moves-to-cancel-proposed-restrictions-at-pebble-prospect/) against the EPA.

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Opposition

Opposition to the Pebble project has been intense and widespread. Most communities and tribal organizations in the area are officially opposed to the project including the two regional level native organizations. Other pressure has come from numerous local residents, conservation organizations, and fishing groups (both recreational and commercial). In addition opposition has come from consumers of jewelery and seafood, as well as from a large number of outdoor-related groups and outfitters. See our article “Opposition to Pebble” (/Issues/MetalsMining/opposition-to-pebble-mine-prospect.html) for more detail.

Stakeholder Engagement

In October 2012, Pebble Limited Partnership sponsored a series panel discussions in Anchorage. These were hosted by the Keystone Center and have been the subject of much controversy in the state. See our article (/Issues/MetalsMining/KeystonePebble.html)on the Keystone Dialogue for more information.

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