A Review

of

Industrial

Hard Rock Mining in Alaska

By

Ann Rothe
Halcyon Research

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RESEARCH

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ARM's participating organizations include:

Alaska Wilderness, Recreation and Tourism Association
Indigenous Environmental Network
Kachemak Bay Conservation Society
Cook Inlet Alliance
Copper Country Alliance
Transboundary Watershed Alliance
Bristol Bay Alliance
Southeast Alaska Conservation Council
Northern Alaska Environmental Center
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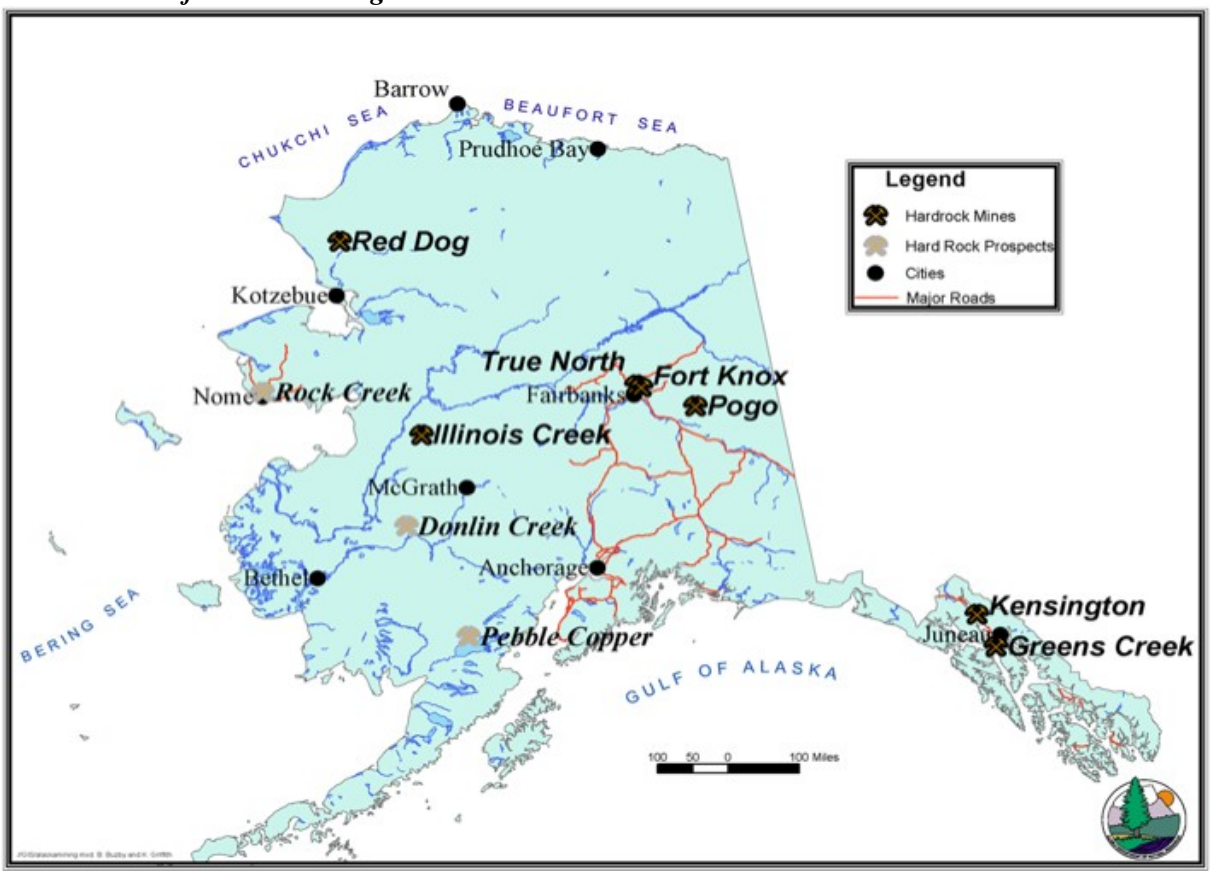

EXECUTIVE SUMMARY

The purpose of this report is to inform public debate about current and proposed hard rock lode mines in Alaska. Its intent is to help answer the question of what benefits—and liabilities--Alaskans will realize in considering these developments.

In recent years, Alaska has seen a significant growth in proposals for development of large lode mines. The scale of mining activities that occur at these mines dwarfs any mining activity which took place earlier in Alaska's history, including mining that occurred during the Klondike and Nome gold rushes of the late 1800s, as well as mining at the Kennicott copper mines that operated near McCarthy from 1906 to 1938. Modern mining and ore-processing techniques achieve such economies of scale, allowing thousands of tons to rock to be mined each day, that vast acreages can be mined profitably. Three industrial-scale hard rock mines in Alaska are now producing zinc, lead, gold, silver and other minerals under the management of multi-national corporations. Nearly a dozen more large mines have been proposed for state and federal lands. Each of these projects spans thousands of acres and has the potential to transform entire landscapes.

These mines hold the promise of jobs for Alaskans and revenue for the state, but they also hold the potential for significant long-term economic and environmental liabilities for all Alaskans. A number of prominent Alaskans, including former Governor Jay Hammond, have begun to question whether current and proposed industrial-scale mines in Alaska can meet the mandate specified in Alaska's constitution to provide maximum benefit to all Alaskans:

> *"The Legislature shall provide for the utilization, development and conservation of all natural resources belonging to the State for the maximum benefit of its people."*
> *Alaska Constitution, Article 8, Section 2*

Currently, Alaska's mining industry employs approximately 3,000 people and generates nearly $11 million in tax revenue to local governments. The State of Alaska requires payment of annual claim rentals or mineral lease rentals on claims or leases on state lands. It also requires a royalty payment of 3% of the net income the company earns from the sale of minerals taken from state lands. This is the lowest royalty rate applied to mining operations in Alaska on mineral lands where royalty payments are required. Rates on private lands and leased claims range from 1.5 to 5% of gross revenues the mine owner receives from the sale of minerals produced from mining operations. In addition, the state requires payment of a mining license tax for mining operations on all lands in Alaska, whether private, state or federal. Like state royalty payments, the mining license tax is also based on net income from mining activities. As well, the state requires payment of corporate income tax.

A general estimate of the state's direct income revenue from the mining industry is outlined below in Table 1, as is direct income revenue to local governments and data regarding the number of people employed by the mining industry in the state. The figures do not include indirect public revenues that may be realized from economic activity that mining activities stimulate. The numbers simply provide a snapshot of the direct revenue the state receives from the mining industry. The figures show that in 2004, the state received direct income revenue from mining equivalent to 1.3% of the market value of the minerals extracted. If municipal/borough taxes are included, the direct income revenue to local and state

governments combined for 2004 was equivalent to 2.1% of the market value of the minerals extracted.

Table 1 State Revenue from Mining

State Revenue from Mining (current dollars)	**2001**	**2002**	**2003**	**2004**
Corporate Income Taxes	285,825	18,665	32,704	323,706
Mineral Rents and Royalties	1,841,729	2,056,416	2,624,693	3,046,767
Mining License Taxes	2,068,232	469,270	1,030,845	10,317,238
TOTAL	**4.2 million**	**2.5 million**	**3.7 million**	**13.7 million**
Municipal/Borough taxes	9,763,220	9,703,208	10,510,048	10,999,663
Estimated market value of metals produced	**788 million**	**823 million**	**888 million**	**1.06 billion**
Employment	2,835	2,824	1,906	3,048

Because of the varying ways in which pertinent data have been gathered and evaluated, it is difficult at best to compare the state's mining industry revenue to revenue from other industries in Alaska. However, looking at what data are available for other industries for comparable years, some figures emerge that may prove generally useful in evaluating the level of direct income revenue the state receives from mining activities in Alaska. For the state's dominant industry, oil and gas extraction, the relevant figures are outlined below in Table 2.

Table 2 State Revenue from Oil and Gas Extraction

State Revenue from Oil and Gas Extraction (current dollars)	**2001**	**2002**	**2003**	**2004**
Taxes, fees, rents and royalties	**2.3 billion**	**1.7 billion**	**2.1 billion**	**2.4 billion**
Municipal/borough taxes	214,758,700	220,236,400	220,865,400	220,515,500
Estimated market value of oil and gas extracted	**12.6 billion**	**9.6 billion**	**12.3 billion**	----------
Employment	9,500	8,900	8,100	8,200

For 2003, the last year for which production figures are available, the state received direct income revenue from oil and gas production equivalent to 17% of the market value of the oil and gas extracted.

Pursuant to Article IX, Section 15 of Alaska's constitution, which established the Alaska Permanent Fund, a portion of state revenues from mineral resources extracted from state lands (including hard rock minerals, coal, oil and gas) are to be deposited to the fund each year. Mining revenue distributions to the fund since the fund was established total approximately $8.8 million. This compares to a total of $5.3 billion in distributions to the fund from energy resource revenues (coal, oil and gas). The average annual distribution to the permanent fund from oil and gas revenues in the years 2001-2004 amounted to 2.8% of the estimated value of these resources. The average annual distribution to the fund from mining revenues for this same time period was equivalent to 0.09% of the value of the mineral resources extracted from state lands.

Data regarding state revenues from commercial and sport fisheries are not directly comparable to mining industry revenue in terms of examining the state's income as a percentage of the value of the resources harvested, but they offer a snapshot of the general economic impact of commercial and sport fishing activities.

Table 3 State Revenue from Commercial Fisheries

State Revenue from Commercial Fisheries	**2001**	**2002**	**2003**
License Fees, Taxes/Assessments	**54.6 million**	**49 million**	**50.4 million**
Municipal/borough taxes	9,192,300	7,610,400	8,351,700
Market value of fish sold by fishers to processors ("ex-vessel" value)	1.1 billion	997 million	1.09 billion
First wholesale value (market value of fish sold by processors)	**2.3 billion**	**----------**	**----------**
Employment	15,130	14,110	----------

The economic data for sport fisheries are based on results of a national survey of fishing, hunting and wildlife-associated recreation that is conducted every five years by the U.S. Census Bureau for the U.S. Fish and wildlife Service. The survey asks households that participated in hunting, fishing or wildlife viewing how much money they spent to conduct these activities. Survey data from 2001 were updated for 2003 by the American Sportfishing Association. Survey results for Alaska are outlined below in Table 4.

Table 4 State Revenue from Sport Fisheries

State Revenue from Sport Fisheries	**2001**	**2003**
License and Stamp Fees	13,926,600	14,589,800
Sales/Fuel Taxes	2,785,000	3,037,100
TOTAL	**16.7 million**	**17.6 million**
Total expenditures made within Alaska by sportfishers	**587 million**	**640 million**
Employment	11,064	12,065

State revenues and relative economic impacts for commercial and sport fisheries are particularly pertinent to discussions regarding proposed large mine developments as these are industries dependent on maintenance of clean water and productive fisheries habitat, two resources that are most often adversely impacted by mining activities. In considering the value of mine developments, it is important to weigh the potential risks to other economic activities.

Large mine developments can pose significant risks to the public in terms of environmental, social and health impacts. Mining operations frequently involve a great degree of environmental disturbance that can extend far beyond the mining area and continue long after mining activities have ended, impacting natural resources (water, fish and wildlife) that are held in trust by state and federal governments for the public.

In regions of the world where mining has occurred, the magnitude of impacts from mining activities has, in many cases, been profound. The impacts have included altered landscapes, extremely low soil and water pH, changes in slope of land and rates of erosion, abandoned tailings piles, alterations in groundwater regimes, contaminated soils and water, and significant changes in plant communities. These, in turn, have led to impacts to fish and wildlife populations, changes in river regimes, land no longer useable due to contamination or loss of soil, high levels of contaminants in milk of domestic animals that graze in areas where mining activities occurred, air pollution from dust or toxic gases, surface subsidence and landslides.

Since 1997, mine operators have been required to submit annual reports regarding the toxic substances released to the environment by their mining activities pursuant to the provisions of the federal Emergency Planning and Community Right-To-Know Act. Mine operators are required to report to the U.S. Environmental Protection Agency (EPA) each year the locations and quantities of toxic substances released during their operations. Alaska holds fourth place in the national rankings for highest total toxic releases within its borders. According to the state's 2003 Toxics Release Inventory, the three highest levels of total toxic chemicals released onsite in the state were reported by: 1) Red Dog Mine; 2) Greens Creek Mine; and 3) Ft. Knox/ True North Mine. The three mines were also the largest sources of Persistent Bioaccumulative Toxics (PBTs) releases, and Red Dog ranked first in the state for release of dioxin and dioxin-like compounds. In 2004, Alaska's Red Dog Mine topped EPA's TRI list with the greatest level of toxic releases of any single source in the nation.

Compounding concerns regarding public liability for environmental impacts from mine operations in Alaska is the fact that the industrial-scale mines currently operating in the state are all owned by foreign corporations. Nearly all of the proposed large mines will be owned by foreign-based multi-national corporations. It is not clear whether Alaska will be able to secure adequate redress in U.S. courts for damages from mining activities in the event that any of these corporations default on their pollution control and mine reclamation responsibilities.

The state's reclamation regulations and reclamation bonding requirements are designed to mitigate environment impacts from mining activities. Alaska's standard for reclamation requires that, "a mining operation shall be conducted in a manner that prevents unnecessary and undue degradation of land and water resources" and that a mine site must be reclaimed "to leave the site in a stable condition." To ensure that mine operators have adequate funds available to complete full reclamation, state law gives the Alaska Department of Natural Resources (ADNR) the authority to set bond requirements for large lode mines that reflect the reasonable and probable costs of reclamation for these mines.

A recent independent review was conducted of state bond requirements for the three large lode mines currently operating in Alaska as well as for two mines that have been permitted and are under development. The review concluded that the state's reclamation bonds were significantly lower than the amounts actually needed to fully reclaim mined areas. The difference between the reclamation bonds held by the state and the amounts required for reclamation of the mines reviewed ranged from 80% to as little as just 25% of the amount actually needed for full reclamation. To date, the state has had to declare one reclamation bond forfeit for a large lode mine operation in Alaska. This occurred when, in 1998, the mining company that owned and operated Illinois Creek Mine declared bankruptcy. The

state had set a reclamation bond for the mine of $1.2 million. The actual amount needed to fully reclaim the mine is now estimated at $3.8 million.

The late Governor Hammond suggested a simple list of criteria by which Alaskans—citizens and policy makers—should evaluate proposed resource development efforts in our state to ensure healthy and sustainable economic growth:

1. Is it environmentally sound?
2. Do most Alaskans want it?
3. Can it pay its own way?
4. Does it meet our constitution's mandate to manage resources for the maximum benefit of all Alaskans?

Only if it meets the above four criteria, the Governor asserted, should a resource development project be encouraged.

The damages to natural resources from mining activities are potentially enormous costs that the public may be asked to bear, but they are difficult to predict. There is no easy answer for how Alaskans should weigh these costs against the potential benefits of jobs and revenue when evaluating proposed industrial mine developments in Alaska.

Alaskans will benefit if each of the industrial-scale hard rock mine developments currently under consideration in the state receives the kind of careful scrutiny Governor Hammond called for, with particular attention given to the state’s tax and royalty structures for the mining industry as well as how reclamation bonding requirements are calculated.

INTRODUCTION

A Set of Criteria

'The Legislature shall provide for the utilization, development and conservation of all natural resources belonging to the State for the maximum benefit of its people."
Alaska Constitution, Article 8, Section 2

When recently asked what Alaska's greatest future challenge was, one of Alaska's most influential governors, the late Jay Hammond replied, "Assuring development of Alaska's resources provides maximum benefits for all Alaskans, not simply a favored few at a cost to the many."[1]

Governor Hammond asserted that since our state's constitution mandates resource development projects benefit all Alaskans, one could assume that all such projects have met this standard. Yet, Hammond pointed out, the history of exploitation of Alaska's oil, timber, fishery and mineral wealth is filled with examples of benefits flowing to corporate owners, those obtaining jobs or holding limited entry fishing permits, or municipalities garnering property taxes, with very little return to all Alaskans. All Alaskans, however, share costs of managing, enhancing, providing state services, maintaining required infrastructure, mitigating environmental problems and enforcing regulations pertaining to resource development efforts. In every case, except oil development, these costs appear to far exceed what the state receives from the development.

Governor Hammond suggested a simple list of criteria by which Alaskans—citizens and policy makers—should evaluate proposed resource development efforts in our state to ensure healthy and sustainable economic growth:

1. Is it environmentally sound?
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The tug-and-pull between resource protection and resource exploitation has presented a constant challenge for Alaskans. How do we balance the economic benefits of allowing our resources to be developed with the need to protect Alaska's wild country that sustains us and our quality of life? Governor Hammond has raised an important point: that Alaskans have often borne a significant portion of the cost of support and management for major development projects in the state. To ensure this cost is not unnecessary and overwhelming, we must ensure that any resource development initiative where private companies are proposing to exploit public resources for private gain receives close scrutiny to determine whether it's in Alaskans' best interest. Governor Hammond has come up with effective criteria to guide such scrutiny. This report is intended to help Alaskans apply to industrial

[1] "Resource Use Must Benefit Everyone." Guest editorial by Jay Hammond, *Anchorage Daily News*, December 19, 2004.

hard rock mining the kind of close examination he has called for, and to inform public debate about current and proposed hard rock mines in the state. We are trying to help answer the question of what we're going to get for what we're giving up in considering these developments.

Scope of Report

In recent years, Alaska has seen a significant growth in industrial-scale mining and now faces a series of proposals for more of these massive mines, the size of which would have been boggling to early Alaska sourdoughs. Even the Kennecott Mine, in operation from 1906 to 1938 and, at the time, the largest copper mine in the world, is small by comparison. The total amount of ore milled over three decades at Kennecott—nearly a million tons—is equal to a third of the tonnage of ore milled annually at Red Dog Mine, and the total acreage encompassed by all four mines at Kennecott—about five square miles—is a third the acreage of the proposed Pebble Gold and Copper Mine Complex near Lake Iliamna in the Bristol Bay drainage. Three industrial-scale hard rock mines in Alaska, including Red Dog, are now producing zinc, lead, gold, silver and other minerals under the management of multi-national corporations. Nearly a dozen more large mines have been proposed for state and federal lands. Each of these projects spans thousands of acres and has the potential to transform entire landscapes. This report will focus on ten of these mines, the three where operations are ongoing, two where operations ceased, and five that are in various stages of permitting and review. The report includes information about the nature and design of each mine, the companies that are developing the mines, the contribution each project is making or will make to Alaska's economy, and the public costs of each.

CHAPTER I. A BRIEF PRIMER ON MINING IN ALASKA

Alaska's Mining History

In the minds of many Americans, the image of the sourdough miner is nearly synonymous with the image of Alaska. The discovery of gold at Crow Creek in Southcentral Alaska in 1888 prompted more than 60,000 Americans to make their way north to seek their fortune. This was the first of Alaska's "gold rushes." It was followed by gold discoveries in the late 1800's in Southeast Alaska, including the Klondike Gold Rush of 1897-1900, as well as turn-of-the century gold discoveries in Interior Alaska, and the Nome gold rush of 1898 on Alaska's Seward Peninsula.

The techniques used in these initial gold mining activities varied, depending on the nature of the gold deposits and the resources of the miners[2]. Many of the early prospectors used a gold pan for washing and separating the heavy minerals in deposits found in sediments in stream and river drainages—called placer deposits. Miners also mined placer deposits using a sluice box where the placer gravel was shoveled into an elongated box through which flowed a stream of water. Larger placer mining operations used a variety of dredges—floating processing plants that dredged gravel from river or lake bottoms, processed the gravel to remove the gold, and then discharged the gravel after removing the precious metal. For gold ore deposits in hard rock, early miners dug shafts to reach the richest ore, or stripped off top soils and overlying rock (overburden) to access the ore.

Many of these techniques continue to be used today in small gold mining operations. But within the last two decades, Alaska has seen a surge in mining projects the size and scope of which dwarf even the most extensive of early mining efforts and are focused not just on gold, but on a variety of metals, including zinc, lead, copper, silver and molybdenum. Modern ore-processing techniques have made mining vast acreages of land economically feasible, and changing whole landscapes the inevitable result.

Industrial Mining in Alaska

The ten hard rock mines examined in this report all use similar techniques for extracting minerals from mineral ores. The term "ore" is an economic one. **Ore** is the earthen material that contains enough of the target minerals to be extracted profitably.[3] Because the market value of a mineral can change substantially, the distinction between ore and other mined materials also changes depending on the mineral content of the ore to be mined, the mineral price at the time mining activities are occurring, and the extraction technology used. Likewise, **ore deposit**, or **orebody**, is an economic term for the mass of rock from which a mineral can be profitably extracted, and **waste rock** is the rock that doesn't contain an adequate percentage of the target mineral to be economically valuable. Modern mining techniques achieve such economies of scale, allowing thousands of tons of rock to be mined per day at a low enough cost that an ore deposit can contain as little as .015 ounces of gold

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[2] Lacy, Willard D.. PhD. "An Introduction to Geology and Hard Rock Mining." Rocky Mountain Mineral Law Foundation. <http://www.rmmlf.org>

[3] U.S. Environmental Protection Agency, Regions 8, 9 and 10. The Abandoned Mine Site Characterization and CleanUp Handbook. August 2000.

per ton and still be mined profitably.[4] That translates to excavating 50 tons of rock from an ore deposit to produce enough gold for a pair of wedding rings.

Industrial Mining Technologies

Of the ten mines examined in this report, three are underground mines and the remaining seven are open pit mines. Open pit mining is the most cost-effective way of mining low-grade ores that are located close to the surface over a wide area. After the overburden is removed, the pits are excavated in ever-expanding terraces to increasing depths. Once all the ore is mined, the resulting pits can range in size up to two miles across and 1,200 feet deep.

Underground mining is used to target ore deposits at greater depths. Modern underground mining methods differ substantially from the early mining days of hand-dug mine shafts and ore carts. While shafts and caverns of varying sizes are still dug using a variety of techniques to access high-grade ore deposits, the extent of the tunneling is substantially greater. These "supported methods" of underground mining can be expensive depending on the technique used and the amount of structure needed to support the surrounding rock.

The method routinely used underground to mine for lower grade ores is termed "block caving." It involves drilling and setting off explosives in the orebody to fragment the rock and cause it to collapse as ore and waste rock are removed. The areas of fragmented rock that are mined can range in size of up to 1,000 feet or more in diameter. Caving techniques vary depending on the orebody, but all allow for a high degree of mechanization and removal of large quantities of ore at low cost.[5]

Milling Ore

Once the ore is mined, it is crushed and ground to fine particles, and then processed to remove the minerals. This is termed **beneficiation**[6] or, more commonly, **milling**, the procedure by which the ore with the highest concentration of minerals is separated from the less valuable material, usually deposited as **tailings** in a tailings impoundment.

The processes used to concentrate the ore, that is, to separate the economically valuable minerals from the ore vary depending on the specific gravity of the mineral, its conductivity, magnetic permeability, affinity for certain chemicals, and solubility.[7]

- **Gravity separation** is generally used for ore minerals with high densities (like gold and platinum) that are coarse enough to allow for physical separation of the minerals. The principle behind the process is the same as that for gold pans and sluice boxes, but the process is more sophisticated, using finely ground magnetite or silicon in a

[4] "Gold Mining: Old and New Methods". Mine Engineer. June 5, 2005. <http://mine-engineer.com>

[5] Lacy, Willard, PhD. "An Introduction to Geology and Hard Rock Mining", Rocky Mountain Mineral Law Foundation. <http://www.rmmlf.org>

[6] 40 CFR 372.3. Definitions. "Beneficiation means the preparation of ores to regulate the size (including crushing and grinding) of the product, to remove unwanted constituents, or to improve the quality, purity or grade of a desired product."

[7] U.S. Environmental Protection Agency, Regions 8, 9 and 10. The Abandoned Mine Site Characterization and CleanUp Handbook. August 2000.

water suspension and shaking tables, or complex modifications of the simple sluice, to separate heavier minerals from lighter materials.

- **Flotation** is commonly used to process metals like copper, zinc, lead and silver. It is a processing technique that involves adding chemicals to an ore-water slurry, and then forcing air through the slurry. The rising bubbles carry with them metallic sulfide particles, and a layer of mineral-laden foam accumulates on the surface of the flotation cell. This is skimmed off and the minerals recovered. The process involves multiple steps with different chemical reagents used for different minerals. The materials left after the minerals have been floated, along with any wastewater not recycled in the system, are discharged to a tailings impoundment.[8]

- **Leaching** is the process of extracting minerals from ore by adding a solvent that dissolves the mineral. In preparation for the leaching process, the ore may be heated using roasting furnaces or autoclaves, or it may be chlorinated. For gold processing, sodium cyanide is used as a leachate. For copper, sulfuric acid is often used. Two methods of leaching are commonly used: vat leaching and heap leaching.

- In **vat leaching**, the ore is placed in a vat or tank, the solvent is added, and then the solution is agitated, heated, aerated or pressurized to facilitate the leaching. After the processing, the solution in which the mineral is now suspended, called a "pregnant" solution, is drawn off the tanks, and the waste is deposited to the tailings impoundment after being treated to remove as much of the leachate as possible.[9]

- In **heap leaching**, the ore is placed on sloping, impermeable pads, and repeatedly sprayed with a leachate solution. The solution percolates through the pile and flows into a drainage system from which the pregnant solution is collected for further processing. After leaching, the spent ore is either left in place or moved to a dedicated waste site. These spent ore piles can range in size up to several hundred feet high, cover hundreds of acres and contain millions of tons of leached ore. Often they are sources of environmental contamination. In addition to residual cyanide solution, they may contain arsenic, mercury, selenium and other heavy metals, as well as oxidized sulfide ores that may generate acid drainage. If not properly contained, these contaminants can spread to surrounding drainages or into groundwater.[10]

- The **recovery processes** used for extracting minerals from the pregnant solutions collected in vat or heap leach circuits vary with the properties of the minerals. The pregnant solution may be chemically treated, evaporated or exposed to changes in temperature, causing the metal to precipitate out of the solution. Metals can be also be precipitated out by placing the solution in an electrolytic cell and applying an electric charge. For recovering copper, scrap metal plates may be inserted into the solution. The copper adheres to the metal plates, and is then removed by washing the plates. For recovering gold, the solution may be passed through activated carbon

[8] U.S. Environmental Protection Agency, Regions 8, 9 and 10. The Abandoned Mine Site Characterization and CleanUp Handbook. August 2000.

[9] Ibid.

[10] Ibid.

filters where the gold is absorbed onto the carbon. The carbon is then removed and washed with a cyanide solution and caustic soda to remove the gold. Then the wash solution is processed through electrolytic cells, where the gold is recovered, melted and poured into a mold. The gold removed from the mold is called a **dore bar**[11] or ingot. The solutions used in these recovery processes are recycled, or treated to remove as much of the leachate as possible and discharged to the tailings impoundment.[12]

"Zero Discharge"

Facilities designed for industrial mining operations in Alaska are often permitted as "zero discharge" facilities, which is understood to mean that all chemical solutions and process water used in the facility are contained within the facility's operating systems. But the term "zero discharge" is somewhat misleading. Off-site discharges are allowed, often to authorized “mixing zones”, if there is a buildup of water on the mine site. Zero discharge facilities frequently cause contamination due to design and mitigation failures such as leaks and unintentional discharges of contaminants. This needs to be kept in mind when reviewing proposed mine developments where operators are promising to operate zero discharge facilities. Current technologies for excavating and processing ore, and managing waste streams from processing activities, will often result in environmental contamination, either in the form of substances that were locked in the earth's crust prior to excavation, many of which form toxic substances when exposed to air and water, or in the form of chemicals that are added to aid in processing the ore from which the precious metals are extracted (e.g., sodium cyanide).

These contaminants are mobilized by normal environmental processes (wind action, rain and snow accumulation, melting and runoff) for which containment is difficult, or they enter the environment through leaks in leach pad or tailings impoundment liners, leaks in leach pad well seals, slurry pipelines and other ore processing systems, or from ore loading and unloading operations. Underscoring the fact that zero discharge mining operations are not usually possible is Alaska's authorization of mixing zones in waters near zero discharge mine facilities. Within these authorized mixing zones, mine operators are allowed to exceed state water quality standards.

[11] Dore usually contains both gold and silver.

[12] “Gold Mining: Old and New Methods”. Mine Engineer. June 5, 2005. <http://mine-engineer.com>

CHAPTER II. STATE AND FEDERAL MINING LAWS

Mining On Federal Lands: The 1872 Mining Law

A 133 year-old federal law, the 1872 Mining Law,[13] governs prospecting and mining for hardrock minerals on federal lands. The law was passed when the nation was expanding its boundaries in the wake of the Civil War. The intent of the law was to encourage settlement and development of the American West. Under the law, individuals or corporations can access federal lands to explore for mineral resources, and upon making a discovery, stake a claim on a mineral deposit. A claim gives the claim holder exclusive right to develop and keep the mineral resources within claim boundaries.

Once a claim is deemed to be productive and the claim holder has spent at least $500 developing it, the holder may apply for a mineral patent. A $250 fee is required with a patent application plus $50 for each claim included in the application. If the patent is approved, the claim holder can purchase the mineral rights and the surface property for $2.50-5.00 an acre, depending on the nature of the mineral deposit. There is no requirement for federal royalty payments for minerals extracted from federal mining claims, as there is for oil and gas extracted from federal lands.[14]

There is no limit on the number of claims a person can locate. There is no requirement that mineral production ever commence. Claims can be held indefinitely with or without mineral production, subject to challenge if not developed. Mineral production can take place without a patent. In fact, a great deal of mineral production on federal lands is occurring on unpatented claims.[15] (Since 1995, Congress has enacted a series of one-year moratoria on issuing federal mineral patents.) The Mining Law contains no provisions for environmental protection, but mining activities on federal mining claims are subject to all general environmental laws, including the Clean Water and Clean Air Acts, the National Environmental Policy Act, federal and state reclamation requirements, and federal and state statutes regarding the handling and disposal of certain toxic wastes.

There are over 8,000 federal mining claims in Alaska that encompass nearly 185,000 acres of land.[16] Of the ten mines examined in this report, three are located, in part or in whole, on federal mining claims.

Mining On State Lands: Mineral Claims and Leases

Prior to statehood, mining in Alaska was carried out under the claim-patent system of the 1872 Mining Law. When the Alaska Statehood Act was signed into law in 1959,[17] Section 6(i)

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[13] 30 U.S.C. §§ 22-24, 26-28, 29-30, 33-35, 37, 39-42 and 47, May 10, 1872, as amended 1875, 1880, 1921, 1925, 1958, 1960 and 1993.

[14] The Mineral Leasing Act of 1920 removed oil, gas, and coal from management under the claim-patent system of the 1872 Mining Law, and set up a system where the federal government retains ownership of the leased lands.

[15] Humphries, Marc. CRS Issue Brief for Congress: Mining on Federal Lands. October 3, 2003. Congressional Research Service, Resources, Science and Industry Division.

[16] Bureau of Land Management. 2004. Active Federal Mining Claims in Alaska: BLM, Anchorage, Alaska. <http://sdms.ak.blm.gov/sdms/download.jsp>

of the Act specified that all grants of federal land to the new state include mineral rights. Further, the Act mandated that "grants of mineral lands to the State of Alaska" be made on the condition that if the state decides to sell, grant, deed or patent any of these lands, it must retain the mineral rights, and, further, that mineral deposits on these lands "shall be subject to lease by the State" under terms set by the Legislature.

Alaska now has a bifurcated system governing the granting of mineral rights on state lands. It utilizes a claim system for most state lands, and claims are acquired by discovery, location, and recording.[18] The state has no patent system by which claim owners can purchase the lands on which their claims are located. The state also issues mineral leases on state lands that were known to contain mineral deposits at the time the state selected them pursuant to the Statehood Act and where it has determined that there are potential use conflicts with surface owners.[19] State law grants the Commissioner of Natural Resources the authority to determine which state lands are open for filing mineral claims and which lands are subject to mineral leasing.[20] Both state mining claims and state mineral leases give to the claim holder or lessee exclusive right to locatable minerals, which the state defines as precious minerals such as gold, silver and platinum; base metals such as copper, lead and zinc; precious stones such as sapphires, rubies and diamonds; industrial stones such as garnet, diamond and quartz sand; and building stones such as marble, dolomite or granite.[21]

For state lands that are open only to mineral leasing, the land can be staked and recorded in much the same manner as a mining claim.[22] Once a lease area is located, a lease application is then filed, and while the application is being processed, the applicant is granted a "leasehold location" which confers exclusive right of possession of minerals in the identified lease area. Except for preliminary sampling and testing, mining of the leasehold location is not permitted. Mining cannot begin until a lease has been issued. A state mineral lease is valid for up to 55 years and is renewable as long as the leaseholder satisfies the terms of the lease agreement.[23] Appendix 1 contains a copy of a state mineral lease agreement. Holders of mining claims can apply to the state to convert claims to a mineral lease, which has the effect of extinguishing all existing mining claims within the lease area and defining specific rights of control and tenure that might otherwise be disputed by other mining claimants in the area.

State law also allows the granting of an exclusive right to prospect for minerals on state lands.[24] The prospector is given a certificate of location and the exclusive right to stake mining claims or leasehold locations within the boundaries of the prospecting site. Prospecting site certificates are valid for two years. The Commissioner of Natural Resources

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[17] Public Law 85-508. 72 USC § 339.

[18] AS 38.05.195

[19] AS 38.05.185

[20] Ibid.

[21] Alaska Department of Natural Resources Division of Mining, Land and Water. "Fact Sheet: Mineral Locations (Claims) and the Rights Acquired." March 2004.

[22] AS 38.05.205

[23] Ibid.

[24] AS 38.05.245.

sets standards for the minimum amount of work that must be done each year in order to maintain possession of a prospecting site.

The state requires holders of mining claims to pay annual rent of $25 per claim ($0.63/acre if the claim is a full forty acres) for the first five years after the claim is filed; $55 per claim in years 6-10 ($1.38/acre for a full forty-acre claim); and $130 per claim after the 10th year ($3.25/acre for full forty-acre claim). Rent for mineral leases is $25/quarter quarter section (40 acres) for the first five years after the lease is issued; $55/quarter quarter section for the second five years; and $130/quarter quarter section for every year thereafter. The rental for prospecting sites is $200 for the two-year term of the prospecting site certificate.

In addition, state law requires that a minimum amount of labor must be performed or improvements made to mining claims or mineral leases on state lands.[25] A minimum of $100 in labor or improvements must be spent annually for each 40-acre claim or 40-acre parcel of a lease. For a block of claims or a lease, these funds can be spent on any one claim or section of a lease. Work can be performed in excess of a year's requirement in any one year and applied to future years for up to four years. The claim or leaseholder can also make cash payments to the state in an amount equivalent to this annual labor requirement.

Once production begins, a mineral royalty of 3% of the net income the claim or lease holder earns from the sale of minerals taken from state lands per year is required, (unlike state oil and gas leases, where the royalty is based on the gross market value of the oil or gas taken from state lands.[26])

State and Federal Environmental Requirements for Mining Activities

For large mines in Alaska, including the ten reviewed in this report, there are a series of state and federal permits required before mining activities can begin that are intended to limit the impacts of mining activities on the environment.[27] Under state law, a mine operator must:

- Develop a **Plan of Operations** for mine development and have it reviewed and approved by the Alaska Department of Natural Resources (ADNR);

- Prepare a **Reclamation Plan** for rehabilitating or "reclaiming" the mine site when mining operations end. The plan must include an accounting of all costs associated with reclamation. This then forms the basis for negotiations with ADNR for determining a bond requirement that will ensure sufficient funds are available to close the mine when operations end, and reclaim the mine area to standards set in state law.[28] State bond requirements include not only a reclamation bond, but any bond that may be required as part of a solid waste permit for the mine;

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[25] AS 38.05.210.

[26] State of Alaska Department of Natural Resources Competitive Oil and Gas Lease Form #DOG 9208.

[27] Fogels, Edward. 2004. "Large Mine Permitting—How It Works". Large Mine Project Unit, Alaska Department of Natural Resources Office of Project Management and Permitting.

[28] AS 27.19.020. Reclamation Standard; 11 AAC 97.200-250. Reclamation Performance Standards.

- Prepare a **Monitoring Plan for Surface Waters, Groundwater, Fisheries and Wildlife** and have it reviewed and approved by ADNR and the Alaska Department of Environmental Conservation (ADEC);

- Obtain a **Solid Waste Disposal Permit** (if required) from ADEC;

- Obtain **Sewage Treatment System Approval** from ADEC for any sewage treatment system designed for mine operations and housing facilities;

- Obtain any **Air Quality Permits** from ADEC that may be required for mining operations, including permits for milling, ore transfer and power generation facilities;

- Secure out-of-stream and instream **Water Rights** for any streams or rivers in the vicinity of the mine site. (Reservation of an instream water right is not required, but ADNR advises mine operators to do so in order to establish a priority use of the water over others who might file later for water rights);[29]

- Obtain **Transportation Rights-of-Way** from ADNR and the Alaska Department of Transportation (ADOT) for construction of roads, pipelines, transmission lines and other needed means of access to the mine site;

- Obtain **permits** from ADNR for mitigation measures for any construction and/or mine development that may constitute a **barrier** to anadromous **fish**;

- Obtain approval from ADNR that adequate measures are incorporated into mine development and operations plans to ensure **Cultural Resources Protection**;

- Obtain a **Dam Safety Certification** from ADNR that asserts the design of any proposed tailings impoundment dam is sound and functional; and

- Obtain confirmation from ADNR that any proposed mine development within Alaska's coastal areas has been subjected to a **Coastal Zone Consistency Determination** and has been deemed to be consistent with the Alaska Coastal Management Program (ACMP).

Proposed mine developments in Alaska must also obtain the following from federal regulatory agencies:[30]

- A Clean Water Act Section 401 **National Pollution Discharge and Elimination System (NPDES) Permit** from the U.S. Environmental Protection Agency (EPA) for mine discharges to drainages within the mine area;

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[29] Alaska Department of Natural Resources Division of Mining, Land and Water. 2003. "Fact Sheet: Reserving Water for Instream Use."

[30] Fogels, Edward. 2004. "Large Mine Permitting—How It Works". Large Mine Project Unit, Alaska Department of Natural Resources Office of Project Management and Permitting.

- A **Clean Water Act Section 404 Wetlands Dredge and Fill Permit from the U.S. Army Corps of Engineers (the Corps)** for any mining activities that may occur in or near designated wetlands;

- Certification from the Corps that adequate measures have been taken in the mine development and operations plans to meet the requirements of **Section 106 of the Historical and Cultural Resources Protection Act**;

- Assurances from the U.S. Fish and Wildlife Service (USFWS) or National Marine Fisheries Service (NMFS) that review has been completed pursuant to **Section 8 of the Endangered Species Act,** and it has been determined that mine development and operations will not impact any threatened or endangered species;

- Assurance from USFWS that mine development and operations meet the requirements of the **Bald Eagle Protection Act** and will not impact bald eagles;

- Assurance from the USFWS that any impacts mine development may have to **Migratory Birds** have been or will be adequately mitigated; and

- Assurances from NMFS that adequate measures have been taken to ensure that mine development and operations will not impact **Essential Fish Habitat**.

In addition, mine operators must ensure that mine development and operations comply with zoning laws and conditional use permits that may be required by local governments.

While there is no opportunity for public review when mining claims or leases are established, for nearly all of these regulatory actions and permits, an opportunity for review by the public is normally required, including the opportunity for public comments to be submitted to permitting agencies and given consideration in the permitting process.

A mining company proposing to develop a large mine in Alaska can request the services of ADNR's Large Mine Project Unit to facilitate the permitting process for the proposed mine. ADNR will then request the company enter into a Memorandum of Understanding (MOU) with Department in which the company agrees to reimburse the state for all costs incurred by ADNR, ADEC, the Alaska Department of Fish and Game and the Alaska Department of Law for the agencies' review and processing of state permits required for mine development, as well as the agencies' participation in federal permitting processes for the mine. A copy of the MOU between ADNR and Northern Dynasty Mines for permitting of the Pebble Mine is included in Appendix 2.

Mine Reclamation and Reclamation Bonding

Reclamation of mined land does not mean restoration. Alaska's standard for reclamation requires that, "a mining operation shall be conducted in a manner that prevents unnecessary and undue degradation of land and water resources" and that a mine site must be reclaimed "to leave the site in a stable condition."[31] "Stable condition" is defined as "a condition that

[31] AS 27.19.020.

allows for the reestablishment of renewable resources on the site within a reasonable period of time."[32] The state's regulations for mine reclamation further define this standard to require that the mine site be stabilized so that within one year after reclamation, soil erosion is controlled to a level that existed prior to mining activities, and within five years, the area has re-vegetated without the need for fertilization. If the area does not re-vegetate naturally, fertilizing and replanting is required, although reseeding or replanting does not have to be done with native plants. Depending on the post-mining use approved by the state, the land may not have to be re-vegetated at all.[33]

In Alaska, requirements for reclaiming a mine site once mining operations have ceased are dictated by state law, regardless of whether the mine is on private, state or federal lands.[34] For most private land in Alaska—with the exception of Native corporation lands, tribal lands and lands homesteaded prior to statehood—the state has ownership of mineral rights, that is, the "subsurface estate." The state can sell mineral resources beneath private lands without prior approval of the surface landowner and the landowner cannot prohibit mineral development even when it results in disturbance to the surface, but the landowner has the right to set more stringent reclamation requirements than the state. For mines located on federal lands, ADNR can enter into cooperative agreements with federal agencies to implement the state's reclamation requirements.[35]

As noted earlier, mining operations can't proceed on state, federal or private lands without mining operators first developing a reclamation plan that is reviewed and approved by ADNR.[36] Mine operators bear full liability for the cost of reclamation, and for any pollution that may result from mining activities. Reclamation plans normally contain an environmental monitoring regime that mine operators must implement during and upon completion of mine reclamation. Monitoring requirements may extend up to 30 years after reclamation has been completed.

To ensure that mine operators have adequate funds available to complete full reclamation, state law gives ADNR the authority to require that the mine operator post bonds in sufficient amounts. For placer mining operations, bonds cannot exceed $750/acre, and ADNR's commissioner is required to establish a bonding pool for mining operations as an alternative to individual performance bonds, allowing placer miners to pay into the pool which in turn is used to post bonds covering the operations of all members. For lode mines, such as the large mines reviewed in this report, the $750/acre limit doesn't apply, and ADNR can set a bond requirement that "reflects the reasonable and probable costs" of reclamation for these mines.[37] Bond negotiations undertaken by ADNR for lode mines have included not only bond

[32] AS 27.19.100.

[33] 11 AAC 97.200.

[34] AS 27.19.010.

[35] AS 27.19.060.

[36] AS 27.19.030.

[37] bid.

requirements for reclamation but also bonds for solid waste permits issued to the mines by ADEC.[38]

A recent independent review[39] was conducted of state bond requirements for six mines in Alaska. (See Appendix 3.) The review concluded that the state's reclamation bonds were significant lower than the amounts actually needed to fully reclaim mined areas. The difference between the reclamation bonds held by the state and the actual amounts required for reclamation of the mines reviewed ranged from a 20% shortfall in the state's bond for Kensington Mine to a nearly 74% shortfall for Ft. Knox Mine. To date, the state has had to declare one reclamation bond forfeit for a large lode mine operation in Alaska. This occurred when, in 1998, the mining company that owned and operated Illinois Creek Mine declared bankruptcy. The state had set a reclamation bond for the mine of $1.2 million. The current estimate for the actual amount needed to fully reclaim the mine is approximately $3.8 million.[40]

[38] Pers. comm. w/ Bob Loefler, Director, Alaska Division of Mining, Land and Water. June 10, 2005. ADEC is authorized to require bonds for solid waste permits pursuant to AS 46.03.100.

[39] Chambers, David M., PhD. 2005. "Alaska Large Mine Reclamation Bonding." A report of the Center for Science in Public Participation. Bozeman, MT.

[40] Alaska Reclamation Group (ARG). 2000. Illinois Creek Mine Final Reclamation Plan, June 2000, p. 13. Estimated reclamation cost = $3,759,764.

CHAPTER III. ALASKANS AND MINING DOLLARS

Rentals, Royalties, Mining License Taxes and Exploration Credits

As noted in chapter II, Alaska requires payment of annual claim rentals or mineral lease rentals on claims or leases on state lands. It also requires a royalty payment of 3% of the net income the company earns from the sale of minerals taken from state lands. In addition, the state requires payment of a mining license tax for mining operations on all lands in Alaska, whether private, state or federal. As well, the state requires payment of corporate income tax. Alaska's corporate income tax rates are graduated in $10,000 increments of Alaska taxable income from 1% for income under $10,000 to 9.4% for income over $90,000.[41]

Mining Licenses and License Taxes[42]

Alaska requires all who are engaged in mining activities on state, federal or private lands in Alaska to acquire a mining license and to pay a mining license tax. The tax is payable on all production from state, private or federal lands within the state. It is based on net income (as defined by state law[43]) and is not charged on the first 3 ½ years of production (unlike state oil and gas royalties, which are assessed as soon as production begins.) After 3 ½ years, if the net income from a mining operation is less than $40,000, there is no mining license tax charged. If annual net income is between $40,000-100,000, the mining license tax rate is 5%. Annual net income above $100,000 is assessed a mining license tax of 7%.

Exploration Incentive Credits[44]

The state grants "exploration incentive credits" for mining exploration work done in Alaska on private, state or federal lands. These incentives are granted for the cost of work leading up to development of a mine, including surveying, aerial photography, collecting ore samples, and samples analyses up until all permits are issued for mine construction to begin. A mine operator can claim credit for expenses of at least $250,000 for work done over a period of at least one year, with at least $40,000 in costs accumulating per year. Exploration credit can be applied against state taxes up to 50% of the mining company's corporate or mining license tax burden or against mineral royalties for up to 50% of royalty payments for the mine at which exploration activities occurred. This credit can be carried forward to a subsequent tax year as long as it is applied within fifteen years after taking the credit, and it doesn't need to be used over consecutive tax years. It can also be passed to subsequent mine owners as long as they qualify. The total credit claimed cannot exceed $20 million.

The state also pays a discovery bonus of $10,000 to those who discover a new mineral deposit.[45] (The bonus is paid not for the discovery alone, but only after the first shipment of ore with a value of over $100,000 has been made from a single lode or placer deposit that's been discovered.)

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[41] Alaska Department of Revenue Tax Division. 2005. Revenue Sources Book: Forecast and Historical Data.

[42] AS 43.65.010.

[43] AS 43.20. Alaska Net Income Tax Act.

[44] AS 27.30.010-090.

[45] AS 27.22.010.

Alaska's Mineral Royalties: How They Compare

Mineral production royalties usually fall into one of four categories:

Flat rate unit of production royalty requires the mine owner to pay a fixed amount of money for each ton, pound or ounce of mineral product that is produced or sold from mining claims or leases. This type of royalty is usually used for sand and gravel. It doesn't take into account the selling price or any costs of production, and usually isn't adjusted for inflation.

Gross or Net Smelter Return (NSR) Royalty is based on a fixed or variable percentage of the sales price, or gross revenue, the mine owner receives from the sale of minerals produced on mining claims or leases (similar to Alaska's oil and gas royalties.) Gross revenue for metals mines is often termed the "Net Smelter Return" because the mine owner usually sells the mineral product in a form that requires further processing at a smelter or refinery. The Net Smelter Return is normally based on the price paid by the smelter or refinery, and may be calculated using the spot, or current price, of the mineral with deductions allowed for the costs of further processing. Royalty payment stipulations normally specify the selling price that is to be used because of the differences in spot and contract market prices for different metals.

Net Revenue or Net Proceeds Royalty is based on a percentage of gross revenue received from mineral sales from mining claims or leases with deductions for some operating costs associated with mining and onsite processing. These allowable production costs, which are deducted before the royalty is calculated, include direct cash costs at the mine site and don't allow for deductions for indirect expenses such as exploration, corporate overhead or other indirect costs. Royalty payment stipulations normally specify the allowable deductions and how they will be determined.

Net Profits or Net Income Royalty is similar to a net revenue royalty in that it allows for specific production costs to be deducted prior to calculating royalty payments, but it also allows deductions for all the costs associated with a mine's operations, including exploration costs, corporate overhead, depreciation, depletion allowances, amortization, and usually all taxes paid. (The definition of net income that is used to calculate mining license taxes in Alaska is also used to calculate mineral royalties for state mining claims and leases.[46]) Payments made under net profits royalties will vary depending on the definitions used and the actual calculations applied. They will very often be zero because the deductible expenses yield a "net income" of less than zero.

Table5 shows how the three percentage-based royalty concepts would apply to a mine producing 100 tons of ore with a final market value (after smelting) of $50 per ton of ore mined. In each case, a royalty rate of 5% is used. The table illustrates how the total amount

[46] AS 43,65.060.

of royalties received can change substantially due to changes in the "base amount" to which the royalty rate is applied. In this example, "net profits" are negative due to the deduction of indirect costs, and hence the net profits royalty is zero.

Table 5. Examples of percentage-based royalty concepts.

Gross or Net Smelter Return (NSR) Royalty	
Current market price of mineral after smelting	$50.00/ton
Cost of processing	(20.00)/ton
"Net Smelter Return" price	30.00/ton
Royalty rate	5%
Total royalty amount for 100 tons of ore	**$150.00**
Net Revenue or Net Proceeds Royalty	
Smelter price	$30.00/ton
Allowable direct costs of mining and onsite processing	(15.00)/ton
Net revenue/net proceeds	15.00/ton
Royalty rate	5%
Total royalty amount for 100 tons of ore	**$75.00**
Net Profits or Net Income Royalty	
Smelter price	$30.00/ton
Allowable direct costs of mining and onsite processing	(15.00)/ton
Net revenue/net proceeds	15.00/ton
Allowable indirect costs	(18.00)/ton
Net profits/net income	(3.00)/ton
Royalty rate	5%
Total royalty amount for 100 tons of ore	**$0**

As noted earlier, Alaska's mineral royalty requirement is a 3% net profits royalty. Other royalty requirements within the state include:

> The NSR royalties ranging from 3.5 to 5% that Kinross pays for production on the claims it leases from private individuals at Ft. Knox Mine and True North Mine;
>
> The modified flat rate unit of production royalty[47] the U.S. Forest Service negotiated in its 1996 land exchange agreement with Greens Creek Mining Co. for mineral production from the exchanged lands at Greens Creek;
>
> The 1.5-4.5% NSR royalty[48] Placer Dome and NovaGold will pay Calista Corporation for gold production at Donlin Creek; and
>
> The sliding scale NSR royalty St. Andrews Goldfields will pay for gold production on the claims it leases from private owners at Nixon Fork, which is based on the final

[47] The royalty rate is linked to the price of ore concentrate produced from the exchanged lands: 0.75% when the price is below $150/ton and 3% when the price rises above $150/ton.

[48] Calista will receive an NSR royalty of 1.5% until the Placer Dome partnership recovers its capital investment, after which Calista's NSR royalty increases to 4.5%.

market price of gold: less than $300/oz—2%; $300-350—3%; $350-450—4%; over $450—5%.

Land or claim owners with whom mine owners have leases may also require an **advance minimum royalty**, which is paid by the mine owner in advance of commercial production. Unlike claim or lease rental payments, mine owners are usually allowed to recover advance minimum royalty payments by applying them to future actual production royalty payments. St. Andrews Goldfields is required to pay an advance minimum royalty of $36,000/year to the owners of the claims at Nixon Fork.

State Revenue From Mining

A general estimate of the state's direct income revenue from the mining industry is outlined in Table 6. The figures do not include indirect public revenues that may be realized from economic activity that mining activities stimulate, such as business taxes paid by local merchants who supply goods to mining companies or taxes paid on fuel. They also do not include mining payroll dollars spent in local communities or the secondary effects of that spending. The numbers simply provide a snapshot of the direct revenue the state receives from the mining industry. The table below also includes direct income revenue for local governments. The figures show that in 2004, the state received direct income revenue from mining equivalent to 1.3% of the market value of the minerals extracted. If municipal/borough taxes are included, the direct income revenue to local and state governments combined for 2004 was equivalent to 2.3% of the market value of the minerals extracted.

Table 6. Revenue from mining

State Revenue from Mining (current dollars)	**2001**	**2002**	**2003**	**2004**
Corporate Income Taxes[49]	285,825	18,665	32,704	323,706
Mineral Rents and Royalties[50]	1,841,729	2,056,416	2,624,693	3,046,767
Mining License Taxes[51]	2,068,232	469,270	1,030,845	10,317,238
TOTAL	**4.2 million**	**2.5 million**	**3.7 million**	**13.7 million**
Municipal/Borough taxes	9,763,220	9,703,208	10,510,048	10,999,663
Estimated market value of metals produced[52]	**788 million**	**823 million**	**888 million**	**1.08 billion**
Employment[53]	2,835	2,824	1,906	3,048

[49] Alaska Department of Revenue Tax Division. 2004. Non-Petroleum Corporation Income Liabilities by Sector.

[50] Revenue figures for all but corporate income tax and estimated minerals values taken from Szumigala, D.J. and R.A. Hughes. 2005. Alaska Mineral Industry 2004: Alaska Division of Geological & Geophysical Survey Special Report 59.

[51] Includes metals, coal and material.

[52] Gold, silver, copper, lead, zinc.

[53] Szumigala, D.J. and R.A. Hughes. 2005. Alaska Mineral Industry 2004 : Alaska Division of Geological & Geophysical Survey Special Report 59. Includes coal mining, mineral exploration and mineral development employment.

Mining Industry Dollars vs. Other Industries

Because of the varying ways in which pertinent data have been gathered and evaluated, it is difficult at best to compare the state's mining industry revenue to revenue from other industries in Alaska. However, looking at what data are available for other industries for comparable years, some figures emerge that may prove generally useful in evaluating the level of direct income revenue the state receives from mining activities in Alaska. For the state's dominant industry, oil and gas extraction, the relevant figures are outlined in Table 7.

Table 7. Revenue from oil and gas extraction

State Revenue from Oil and Gas Extraction (current dollars)	**2001**	**2002**	**2003**	**2004**
Taxes, fees, rents and royalties[54]	**2.3 billion**	**1.7 billion**	**2.1 billion**	**2.4 billion**
Municipal/borough taxes[55]	214,758,700	220,236,400	220,865,400	220,515,500
Estimated market value of oil and gas extracted[56]	**12.6 billion**	**9.6 billion**	**12.3 billion**	----------
Employment[57]	9,500	8,900	8,100	8,200

For 2003, the last year for which production figures are available, the state received direct income revenue from oil and gas production equivalent to 17% of the market value of the oil and gas extracted.

Data regarding state revenues from commercial and sport fisheries are not directly comparable to mining industry revenue in terms of examining the state's income as a percentage of the value of the resources harvested, but they offer a snapshot of the general economic impact of commercial and sport fishing activities.

[54] Alaska Department of Revenue Tax Division Revenue Source Books, Spring 2002-2005. Figures include payments to the Alaska Permanent Fund and other restricted revenue payments.

[55] Alaska Department of Commerce, Community and Economic Development Office of the State Assessor. Alaska Taxable: Detailed Municipal Taxation Data.

[56] Estimates based on annual production data from the Alaska Oil and Gas Conservation Commission and average annual prices for crude oil and natural gas from the Alaska Department of Revenue and the U.S. Energy Information Administration. Total annual production data for 2004 is not yet available from either agency.

[57] Alaska Department of Labor Current Employment Statistics. July 2005.

Table 8. Revenue from commercial fisheries

State Revenue from Commercial Fisheries[58]	**2001**	**2002**	**2003**
License Fees, Taxes/Assessments	**54.6 million**	**49 million**	**50.4 million**
Municipal/borough taxes	9,192,300	7,610,400	8,351,700
Market value of fish sold by fishers to processors ("ex-vessel" value)	1.1 billion	997 million	1.09 billion
First wholesale value (market value of fish sold by processors)[59]	**2.3 billion**	----------	----------
Employment[60]	15,130	14,110	----------

The data for sport fisheries (Table 9) are based on results of a national survey of fishing, hunting and wildlife-associated recreation[61] that is conducted every five years. The survey asks households that participated in hunting, fishing or wildlife viewing how much money they spent to conduct these activities. Survey data from 2001 were updated for 2003 by the American Sportfishing Association.[62]

Table 9. Revenue from sport fisheries

State Revenue from Sport Fisheries	**2001**	**2003**
License and Stamp Fees[63]	13,926,600	14,589,800
Sales/Fuel Taxes	2,785,000	3,037,100
TOTAL	**16.7 million**	**17.6 million**
Total expenditures made within Alaska by sportfishers[64]	**587 million**	**640 million**
Employment	11,064	12,065

State revenues and relative economic impacts for commercial and sport fisheries are particularly pertinent to discussions regarding proposed large mine developments as these are industries dependent on maintenance of clean water and productive fisheries habitat, two resources that are most often adversely impacted by mining activities. In considering the

[58] Revenue and ex-vessel value data from the Alaska Department of Fish and Game Division of Commercial Fisheries. Ex-vessel value data from 2003 is preliminary. Data from 2004 is not yet available.

[59] Data provided by Peter Larsen, Institute for Social and Economic Research, University of Alaska Anchorage. See Appendix 6.

[60] Olson, Paul and Dan Robinson. 2004. "Employment in the Alaska Fisheries." *Alaska Economic Trends,* December 2004. Alaska Department of Labor and Workforce Development.

[61] 2001 National Survey of Fishing, Hunting, and Wildlife-Associated Recreation. U.S. Census Bureau. <http://www.census.gov/prod/www/abs/fishing.html>

[62] American Sportfishing Association. Fishing Statistics: Economic Impact of Sport Fishing. <http://www.asafishing.org/asa/statistics/economic_impact/ecoimp_state_report>

[63] Alaska Department of Fish and Game Division of Administration.

[64] Based on a survey of individuals who engaged in sportfishing in Alaska during the two survey years.

value of mine developments, it is important to weigh the potential risks to other economic activities.

Permanent Fund Contributions

In 1977, Alaska's constitution was amended to establish a permanent investment fund into which "at least twenty-five percent of all mineral lease rentals, royalties, royalty sale proceeds, federal mineral revenue sharing payments and bonuses received by the state" are to be deposited annually.[65] State statutes spell out how these funds are to be deposited, including a portion of state revenues from mining on state lands.[66] Mining revenue distributions to the fund since the fund was established total approximately $8.8 million. This compares to a total of $5.3 billion in distributions to the fund from energy resource revenues (coal, oil and gas). The following table shows these distributions for the last four years.

Table 10. Permanent Fund Distributions from Mining and Energy Resource Revenues[67]

	2001	2002	2003	2004
Mining Revenues Distributed to Fund	$924,053	$897,124	$882,947	$560,141
Estimated Market Value of Minerals Produced	$788 million	$823 million	$888 million	$1.08 billion
Coal Revenues Distributed to Fund	$931,220	$516,437	$546,368	$421,325
Estimated Market Value of Coal Produced	$48 million	$37 million	$38 million	$51 million
Oil / Gas Revenues Distributed to Fund	$331,406,504	$260,159,472	$392,626,268	$354,660,492
Estimated Market Value of Oil and Gas Produced	12.6 billion	9.6 billion	12.3 billion	----------

Over these four years, the average distribution to the permanent fund from oil and gas revenues amounted to 2.8% of the estimated value of these resources. The average distribution to the fund from mining revenues was equivalent to .09% of the value of the mineral resources extracted from state lands.

Public Costs Of Mining And Mine Impacts In Alaska

Mining Impacts

Large mine developments can pose significant risks to the public in terms of environmental, social and health impacts.[68] Mining operations frequently involve a great degree of environmental disturbance that can extend far beyond the mining area and continue long after mining activities have ended, impacting natural resources (water, fish and wildlife) that are held in trust by state and federal governments for the public. The location and nature of

[65] Alaska Constitution, Article IX. Section 15.

[66] AS 37.13.010.

[67] Data provided by Peter Larsen, Institute for Social and Economic Research, University of Alaska Anchorage. See Appendix 7.

[68] The World Bank Environment Department. 2005. Environmental Assessment of Mining Projects, Environmental Assessment Sourcebook.

the ore deposit, as well as metals prices, set constraints on all aspects of development, including the method of mining, location of mine facilities, requirements for support infrastructure and the suitability of waste management and disposal methods. This in turn profoundly affects the environmental, social and health impacts of mine developments, and can create a significant liability that is often borne by government entities and the citizens they serve.[69]

Acid mine drainage is perhaps the most significant source of mine pollution. Water from precipitation or surface flow becomes contaminated when it comes in contact with mining wastes, including waste rock and tailings. As water filters through the wastes, metallic sulfides in the ore oxidize, dissolve and release heavy metals, forming a highly acidic effluent. Effluent that contains mineral processing chemicals such as cyanide may also leak from leach pads, well seals and pipes. And leaks from tailings impoundments represent another source of contamination.

In regions of the world where mining has occurred, the magnitude of impacts from mining activities has, in many cases, been profound. The impacts have included altered landscapes, extremely low soil and water pH, changes in slope of land and rates of erosion, abandoned tailings piles, alterations in groundwater regimes, contaminated soils and water, and significant changes in plant communities.[70] These, in turn, have led to impacts to fish and wildlife populations, changes in river regimes, land no longer useable due to contamination or loss of soil, high levels of contaminants in milk of domestic animals that graze in areas where mining activities occurred, air pollution from dust or toxic gases, surface subsidence and landslides.[71]

Environmental contamination that results from hard rock mining can continue for thousands of years after mining operations have ended. For example, in Europe, acid drainage is still occurring from hard rock mines operated by the Romans prior to 476 A.D.[72] In the western United States, mine pollution and its impacts on the environment and human health present serious and ongoing problems for government entities and the public.[73] In Alaska, there are over 400 abandoned mines[74] and an estimated 72 miners or mines reported to be producing metals.[75] All but four of these producing mines are placer mines. The four non-placer mines currently producing metals in Alaska are Red Dog, Ft. Knox/ True North, Greens Creek and Illinois Creek.

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[69] Ibid.

[70] Summary Report, Pan-American Workshop on Abandoned Mines, Santiago, Chile, June 1, 2001. Sponsored by the United Nations Environment Programme and the Chilean Copper Commission.

[71] "Environmental impacts of mining in eastern Washington." University of Washington Center for Water and Watershed Studies. January 1999.

[72] Ibid.

[73] Durkin, Thomas V. and Jonathan G. Herrmann. 1994. "Focusing on the Problem of Mining Wastes: An Introduction to Acid Mine Drainage." EPA Seminar Publication No. EPA/625/R-95/007 "Managing Environmental Problems at Active and Abandoned Metals Mine Sites."

[74] Western Governors Association. 1998. "Abandoned Hardrock and Noncoal Mines in the West: A Partnership Report."

[75] Szumigala, D.J. and R.A. Hughes. 2005. Alaska Mineral Industry 2004 : Alaska Division of Geological & Geophysical Survey Special Report 59.

Mine Wastes and the Toxics Release Inventory

Since 1997, mine operators have been required to submit annual reports regarding the toxic substances released to the environment by their mining activities pursuant to the federal Emergency Planning and Community Right-To-Know Act. Under the provisions of the Act, industries that manufacture, process or otherwise use toxic substances are required to report to the U.S. Environmental Protection Agency (EPA) each year the locations and quantities of toxic substances released during their operations.[76] The Act requires the agency to maintain and annually update a database of the release reports it receives.[77] EPA's Toxics Release Inventory (TRI) is the annual compilation of nearly 650 chemicals and chemical categories released by various industries in the United States. In 1997, EPA expanded the list of industries that must report releases of toxic substances to include the coal and metal mining industries.[78]

EPA's decision to require reports of mining industry releases for inclusion in the TRI prompted the National Mining Association (NMA) to file a lawsuit in 1998 challenging not only EPA's authority to extend TRI reporting requirements to the mining industry, but EPA's interpretation that the industry's TRI reports must include toxic chemicals placed in containment units at mines, as well as the agency's decision that mining companies were required to report toxics produced from the extraction and milling of metal ores. With regard to milling ore, the mining industry lawsuit claimed that the toxics contained in the ores were naturally occurring and had not been "manufactured" as defined in the Act.[79]

In 2001, the federal District Court presiding over the case issued a decision that upheld EPA's authority to extend TRI reporting requirements to the mining industry and upheld EPA's determination that mining facilities must report their releases to land, including into landfills and onsite containment areas. The Court determined that extraction and milling of undisturbed ores does not fit the Right-to-Know Act's definition of "manufacturing," but it made clear its decision did not set aside EPA's determination that mining facilities must report any toxic chemicals generated during extraction and milling which are not present in naturally occurring undisturbed ores (e.g., the creation of sulfates from sulfides as a result of the unearthing and processing of metal ores).[80]

Since the mining industry has been included in EPA's annual Toxic Release Inventory, Alaska has moved from forty-seventh to fourth place in the state rankings for highest total toxic releases within its borders.[81] In 2004, Alaska's Red Dog Mine topped EPA's TRI list with the greatest level of toxic releases of any single source in the nation.

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[76] 42 USC § 11023

[77] 42 USC § 11023.

[78] 62 FR 23834 May 1, 1997. 40 CFR Part 372. Addition of Facilities in Certain Industry Sectors; Revised Interpretation of Otherwise Use; Toxic Release Inventory Reporting; Community Right-to-Know; Final Rule.

[79] U.S. Environmental Protection Agency. 2002. Summary of EPCRA Section 313 Reporting Requirements and The National Mining Association (NMA) Lawsuit. Washington, DC.

[80] U.S. Environmental Protection Agency. 2001. June 14, 2001 letter to J. Daniel Berry, Esq. from Elaine G. Stanley, Director, Office of Information Analysis and Access, U.S. Environmental Protection Agency. Washington, DC.

[81] U.S. Environmental Protection Agency. 2002. 2000 Toxics Release Inventory ALASKA <http://www.epa.gov/tri>

According to the state's 2003 Toxics Release Inventory,[82] the three highest levels of total toxic chemicals released onsite in the state were reported by: 1) Red Dog Mine; 2) Greens Creek Mine; and 3) Ft. Knox/True North Mine. The three mines were also the largest sources of Persistent Bioaccumulative Toxics (PBTs) releases, and Red Dog ranked first in the state for release of dioxin and dioxin-like compounds.

Public Costs of Clean-Up

A majority of the pollution problems from mining activities in Alaska and throughout the West stem from inactive and abandoned mines for which the owners and operators are not known or no longer exist as the result of bankruptcies and dissolution of companies. This leaves the public bearing the cost of clean-up and pollution abatement for these mines. There are a range of pollution problems reported from the abandoned mines listed in Alaska's index of contaminated sites.[83] They include low pH in soils and water in and around mined areas; high levels of cadmium, lead, arsenic and zinc in soils and water near the mine sites; mercury contamination; cyanide and other processing chemicals present in soil and water near mill sites; contamination of groundwater from heavy metals and processing chemicals; release of contaminated water from impoundment dam failures; fuel spills; PCBs contamination; and acid mine drainage.

Most of these mines were developed prior to the existence of many of the pollution control and reclamation requirements that are currently in place in Alaska and other states, as well as before the development of new technologies to prevent and control pollution from mining activities. For example, significant advances have been made in techniques for predicting the level and degree of acid mine drainage that may be generated by waste rock from different ore bodies, and these testing techniques have informed the selection of mitigation measures.[84] Measures employed to prevent and control acid mine drainage include blending acid-generating rock with rock of a neutralizing potential, adding alkaline materials such as lime or soda ash to waste rock, covering acid-generating rock with soil or clay to minimize contact with air and water, and installing drainage systems to collect and treat run-off from waste rock piles. But there is no treatment system or series of prevention measures that can eliminate pollution problems associated with mining activities, and no technology currently exists for accurately predicting the severity of those problems.[85]

Current state law holds mine operators fully liable for environmental damages resulting from mining activities, and ADNR has the authority to set bonding requirements to ensure that funding is available to complete mine reclamation and mitigate environmental damage. But ensuring that adequate bonds are in place for reclamation costs does not necessarily address

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[82] Alaska Department of Environmental Conservation Prevention and Emergency Response Program Alaska Toxics Release Inventory, 2003 Summary. <http://www.dec.state.ak.us/spar/perp/tri>

[83] Alaska Department of Environmental Conservation Contaminated Sites Program CS Database. <http://www.dec.state.ak.us/spar/csp/db_search.htm>

[84] Durkin, Thomas V. and Jonathan G. Herrmann. 1994. "Focusing on the Problem of Mining Wastes: An Introduction to Acid Mine Drainage." EPA Seminar Publication No. EPA/625/R-95/007 "Managing Environmental Problems at Active and Abandoned Metals Mine Sites."

[85] Ibid.

liability for pollution problems that may emerge long after reclamation is completed. In Alaska, efforts to ensure this burden of liability doesn't pass to the public are complicated by the fact that the majority of the state's large mine owners are foreign corporations, which may make it difficult, if not impossible, to secure adequate redress for environmental damages caused by mining operations. The following statement from Kinross Gold Corporation, owners of Ft. Knox/ True North illustrates this difficulty:

> "Substantially all of the executive officers and directors of Kinross and its independent accountants are nonresidents of the United States, and a substantial portion of Kinross' assets are located outside the United States. These executives and accountants reside in Canada, making it difficult or impossible to effect service upon them in the United States. As a result, it may be difficult for U.S. residents to effect service in the United States or enforce a judgment obtained in the United States against Kinross or any such persons. Execution by United States courts of any judgment obtained against Kinross or its officers or directors in United States courts would be limited to the assets of Kinross or such persons, as the case may be, located in the United States." [86]

Public Liability for Mining Operations: Some Case Studies

The following case studies from other areas of the country illustrate the difficulty in adequately predicting the full and long-term impacts of mine developments, and may offer some cautionary tales for large-scale mine operations in Alaska.

SUMMITVILLE GOLD MINE, Colorado[87]

Located in southcentral Colorado, the Summitville Gold Mine was an open pit heap leach gold mine that used cyanide to extract gold from the ore. The mine operated from July 1986 through October 1991, at which time it was abandoned, and its operator, Summitville Consolidated Mining Corp. Inc., declared bankruptcy. Since then, the U.S. Environmental Protection Agency (EPA) and the State of Colorado have spent over $200 million cleaning up and stabilizing the mine site. EPA's portion of the costs have been paid by the Superfund program. The agency took legal action against mine operators to recover the funds, but only a small percentage of the costs were recovered from settlements with responsible parties.[88]

The Alamosa River downstream of the Summitville Mine is used extensively for livestock watering and agricultural irrigation. Principal crops include wheat, barley, alfalfa and potatoes. Wetlands associated with the Alamosa are important habitat for migratory waterfowl and the endangered whooping crane. As of 2001, 10 years after mine operations ended, 17 miles of the river downstream of the mine still don't support any aquatic life. Contamination of ground and surface waters down-gradient of the mine began shortly after open pit mining started. Cyanide-laden solution leaked into groundwater below the heap leach pad, and on several occasions leaked from transfer pipes directly into Wightman Fork,

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[86] Kinross Gold Corporation. 2004. United States Securities and Exchange Commission Form 10-K, Annual Report for the year ending December 31, 2003.

[87] United States Geological Survey. 2001. *Newsletter, Vol. 5. No. 4,* 2001; and the Colorado Department of Public Health and Environment. <http://www.cdphe.state.co.us/hm/summitville.asp>

[88] < http://www.epa.gov/region8/superfund/co/summitville/#status>

a tributary of the Alamosa. Additionally, acidic metal-bearing drainage seeped from numerous sources around the mine site, including a mine waste dump. The metals that contaminated the Alamosa include copper, cadmium, zinc, lead and aluminum. The mine acid discharge has a pH of approximately 3. (The river normally has a pH of about 7.) The source of the acid and metals contamination was determined to be decomposition of sulfide-bearing minerals in the mine's ore and waste rock piles.

In 1990, all stocked fish in the Terrance Reservoir downstream of the mine site and in farm holding ponds along the Alamosa River disappeared. Acid and metal contamination from the mine site is assumed to have been the cause.

GILT EDGE MINE, South Dakota

An open pit cyanide heap leach gold mine, the Gilt Edge was abandoned by Dakota Mining in 1999, when the company declared bankruptcy. (After declaring bankruptcy, Dakota Mining also abandoned Illinois Creek Mine in Alaska, another cyanide heap leach gold mine.) Production began at Gilt Edge in 1988. By 1992, acid mine drainage had developed, and over the remaining years of operation, Dakota was cited numerous times for environmental violations and lack of compliance with pollution limits. Numerous cyanide spills occurred, and cyanide was detected in groundwater and in nearby creeks.

As a result of the mine's acid drainage, local streams no longer support viable fish populations. The pH level in Ruby Gulch Creek, within the mine's watershed, dropped to 2.1. Current estimates for clean-up and reclamation of the mine are about $15 million. The company had posted a reclamation bond of $6 million.

GROUSE CREEK MINE, Idaho

A cyanide vat leach operation, the Grouse Creek gold mine began operation in 1994, and shut down operations three years later. The mine was operated by Hecla Mining (which owns a 29.7% interest in Greens Creek Mine in Alaska.) The mine did not produce the predicted amount of gold and caused a series of significant pollution problems. In 1994, a major landslide at the mine buried nearby Jordan Creek, and numerous cyanide spills and leaks also occurred. In 1996, Hecla was fined $85,000 by EPA for violating its pollution discharge permits. Cyanide and mercury exceeded allowable discharge levels by more than 500% over a period of 13 months.

Two years after mining operations ended, cyanide was still leaking into nearby Jordan Creek at over 12 times the levels at which chronic exposure to the chemical adversely affects fish and other aquatic organisms. Jordan Creek is important habitat for endangered Chinook salmon, steelhead and bull trout.

MOLYCORP MOLYBDENUM MINE, New Mexico

Mine operations began in 1964 in an open pit. Molycorp, the mine operator, is now mining underground. Over 100 tailings slurry spills into the Red River have been documented in a five-year period. As a result of acid mine drainage and heavy metal contamination leaching from the mine, at least eight miles of the Red River downstream of the mine are biologically dead. This portion of the Red River once was habitat to a renowned trout fishery. Residents

of Questa, a small town near the mine site, have reported the Red River just below the mine has turned milky blue from the aluminum that has coated the riverbed. Other heavy metals such as copper, lead, zinc and cadmium have been detected at both acute and chronic levels in a 20-mile stretch of the Red River. Toxic dust containing lead was often detected blowing into Questa from the mine's tailings storage ponds. The local high school had to be relocated, at the mine owner's expense, as a result of ongoing dust problems.

CHAPTER IV. A LOOK AT 10 MINES

Overview of Mine Development

In its most recent report on Alaska's Mineral Industry, Alaska's Division of Geological and Geophysical Survey identified over 140 significant mineral lode deposits in Alaska.[89] Of these, more than a dozen are being explored and a handful are being developed or are in production. This report looks at ten of these: three lode mines that are currently in production; two where production ceased due to bankruptcies of mine operators; and five that are in advanced stages of exploration, permitting or development.

While the public has access to information regarding direct income revenue to the state from corporate income taxes, royalties and mining license taxes paid by the mining industry as a whole (see Table 6), information regarding corporate income taxes paid by individual mine operators is confidential as is information regarding mining license taxes and royalties paid for each mine because these payments are based on net income mine owners realize from each mine's operations.

Eight of the ten mines reviewed are owned by foreign-based multi-national corporations that operate through subsidiaries whose sole assets appear to be the mines they operate. (Of the remaining two, one is owned by the State of Alaska, which acquired the mine when the mine operator declared bankruptcy.) Appendix 4 contains an organizational chart for Kinross Gold Corporation of Toronto, Ontario, owner of Ft. Knox/ True North Mine (through its subsidiary, Fairbanks Goldmining, Inc., a U.S. corporation registered in Delaware.) The chart illustrates a fairly typical pattern of ownership for Alaska's large lode mines. This ownership pattern may serve the function of limiting a corporation's tax liabilities while at the same time providing a source of the investment capital needed to develop a large mine. Industrial-scale mining operations involve significant risk in that they take a huge investment of capital in exploration and initial development, and a long period of time after production commences to recover capital investments and achieve profitability.[90] This statement from Northern Dynasty Minerals Ltd., a smaller company proposing to develop the Pebble Gold-Copper prospect in southwestern Alaska, illustrates this risk:

> "Exploration for minerals is a speculative venture necessarily involving substantial risk…Northern Dynasty has a history of 20 years of losses. Northern Dynasty may never be profitable. Northern Dynasty has paid no dividends on its shares since incorporation and does not anticipate paying dividends in the foreseeable future."[91]

This is not an unexpected financial picture for a small mining company. Normally these companies are able to raise funds for initial exploration work, and when a significant deposit is located and market conditions are right, they seek to establish a joint venture with a large

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[89] Szumigala, D.J. and R.A. Hughes. 2005. Alaska Mineral Industry 2004 : Alaska Division of Geological & Geophysical Survey Special Report 59.

[90] Lacy, Willard, PhD. "An Introduction to Geology and Hard Rock Mining", Rocky Mountain Mineral Law Foundation. <http://www.rmmlf.org>

[91] Northern Dynasty Minerals Ltd. 2005. United States Securities and Exchange Commission Form 10-K, Annual Report for the year ending December 31, 2004.

multi-national corporation to secure funds needed for mine development and operations (with the expectation they will earn enough money to recover their initial exploration costs once the mine goes into production.)[92] One of the proposed mines reviewed in this report, Donlin Creek, is a joint venture between a small partner and a large corporation.

Factors Affecting Mine Development

A number of factors affect large mine development in Alaska, including continuity of orebodies, smelter operations and costs, rates of inflation, interest rates, the strength of the U.S. dollar and other currencies, global and regional political or economic policies, political upheaval in countries with significant mineral production, and speculation and sales by central banks and other holders and producers of metals in response to these factors, which in turn affect metals prices on the world's commodity markets.[93] Appendix 5 includes a table and figures that show annual price estimates for precious and industrial metals over the last decade. While there has been a trend of price increases over the last two years, there are no assurances prices will continue to remain at current levels or increase at current rates.[94] And increasing prices don't necessarily translate to increasing net profits for mining companies as higher production costs—particularly energy costs—may offset price gains.[95]

In 2003, Alaska established an Industrial Roads Program within the Alaska Department of Transportation and Public Facilities (ADOT) to implement Governor Frank Murkowski's "Roads to Resources" initiative.[96] The fundamental premise behind the Governor's initiative is that building roads in remote areas of Alaska will encourage development of resources in these areas. ADOT's Industrial Roads Program has analyzed a number of options for roads to proposed large mines. But in nearly all cases, mine operators have chosen to explore other alternatives to address transportation issues, including taking responsibility for designing and constructing access roads in order to avoid public access requirements that would apply to state-constructed roads or roads financed with construction bonds secured through the Alaska Industrial Development and Export Authority (AIDEA).[97] This appears to have had the effect of reducing ADOT's role to providing design services, and tends to indicate that factors other than public funding of roads appear to drive mine development in Alaska. This conclusion is consistent with other studies that have examined the role of public road construction in stimulating resource development.[98]

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[92] Pers. comm. w/ Bob Loefler, Director, Alaska Division of Mining, Land and Water. June 10, 2005.

[93] Hecla Mining Company. 2005. United States Securities and Exchange Commission Form 10-K, Annual Report for the year ending December 31, 2004.

[94] Ibid.

[95] "Mining profits squeezed as rising costs outweigh strong prices: Merrill Lynch." *The Canadian Press*, July 7, 2005.

[96] Alaska Minerals Commission 2004 Report to the Alaska Legislature.

[97] McKinnon, Mike. 2005. Alaska Department of Transportation and Public Facilities Industrial Ports and Roads Program Status Report, May 2005.

[98] University of Alaska Anchorage Institute for Social and Economic Research Summary N. 57. March 1995. "How Would A Road Affect Cordova?"

Mines currently in operation: Ft. Knox/True North

Ownership

The Ft. Knox/True North mine complex is owned and operated by Kinross Gold of Toronto, Ontario through Fairbanks Gold Corporation, a wholly owned subsidiary. (See Appendix 4.)

Location and Description[99]

The mine complex is located 25 miles northeast of Fairbanks in the Cleary Creek drainage, and is accessible from the Steese Highway. It's a gold mine that consists of a series of open pits, rock dumps, an ore stockpile, growth medium stockpiles, a milling facility, an ore haulage system, mine operations buildings, power and water supplies, and mine operations and exploration roads. It's comprised of four properties situated on state and Alaska Mental Health Trust lands:

> Fort Knox is an open pit mine currently in production. It encompasses an open pit, a mill and mining claims that cover approximately 50,560 acres. This includes 1,168 state mining claims that cover approximately 49,330 acres, a state Mineral Lease covering 1,240 acres and one unpatented federal lode mining claim. Production began at the mine in 1997.
>
> True North is an open pit mine that began production in 2001. It encompasses an open pit and state mineral claims that cover approximately 9,400 acres. Kinross owns 104 of these claims. The remaining claims are divided into two groups the company has leased from private individuals. These are subject to Net Smelter Royalty (NSR) rates ranging from 3.5% to 5%. Mineral production to date has been from one of these leased blocks. Kinross just completed negotiations with private individuals on a lease for a third block of 138 state claims. No ore processing takes place at True North. Ore is hauled to the Ft. Knox mill for processing. Operations at True North were expanded in 2002. Three new pits were created, allowing for the mining of an additional 7.4 million tons of ore. Proposed expansion will lengthen the mine's life by up to two years.
>
> Ryan Lode covers approximately 1,235 acres that includes 30 state mining claims, ten patented federal mining claims and five unpatented federal mining claims, which are either leased from private parties or owned by Kinross. The leased claims are subject to a 5% NSR royalty.
>
> Gil Property is adjacent to the Ft. Knox block of mining claims and includes 167 state mining claims covering approximately 6,670 acres. Kinross is developing the property under a joint venture agreement with Teryl Resources Corporation, and Kinross holds an 80% ownership interest.

The Ft. Knox mill processes ore by first separating the higher grade ore using a gravity separation circuit. Then the ore is further processed in a vat leaching system that uses

[99] Kinross Gold Corporation. 2004. United States Securities and Exchange Commission Form 10-K, Annual Report for the year ending December 31, 2003.

cyanide. Carbon is added to the pregnant solution to absorb the gold. The carbon particles are transferred to a recovery circuit where the gold is stripped from the carbon by a solution, plated on a cathode and melted into dore bars that are then shipped out to smelters.

Production/Income/Taxes[100]

Over the last four years, the amount of ore mined annually at Ft. Knox/True North increased from 34.4 million tons in 2001 to 45. 4 million tons in 2004. [101] The tonnage of ore processed at the mine's milling facility decreased slightly during the same time period, from 15.6 million tons in 2001 to 14.6 million tons in 2004. Annual gold production also decreased during this time period, from approximately 411,000 ounces in 2001 to 338,000 ounces in 2004. Annual revenues ranged $109 million in 2001 to approximately $139 million in 2004. However, Kinross reported a net loss of $20 million in 2001 and a net loss of $25 million in 2003, a year when mine revenues were $131.6 million. Net income for 2003, a year when mine revenue was $136 million, Kinross reported net earnings of $3.9 million.

Ft. Knox/True North employs an average of 427 people and pays borough property taxes in the amount of approximately $3.6 million annually. [102]

State Investment

Kinross secured $25 million in bonds from AIDEA for mine development and expansion. These were paid of in full in the first half of 2004.[103]

Environmental Concerns

When the Fort Knox mine was permitted, the long-term contamination risks associated with the mine tailings impoundment were determined to be low since the Fort Knox ore contains relatively low levels of sulfide minerals.[104] However, the ore from the True North satellite mine, which is being processed at the Fort Knox mill, does contain significant levels of sulfides. Since True North ore processing began in 2001, the levels of arsenic, antimony and selenium in the tailings decant have risen significantly, and the levels of copper have been elevated since Fort Knox ore processing began.[105]

There is a problem with seepage from the Ft. Knox tailings impoundment dam. Permitted as a "zero discharge" facility, zero discharge from the tailings impoundment is now maintained by pumping a series of collection wells located down-gradient of the dam. At the present

[100] Does not include state corporate income taxes. Mine owners' corporate income taxes are considered confidential.

[101] Production estimates, revenue and net earnings reported for 2001-2003 were taken from Kinross Gold Corporation. 2004. United States Securities and Exchange Commission Form 10-K, Annual Report for the year ending December 31, 2003. Figures are for Ft. Knox and True North combined. Production and revenue data for 2004 were taken from Kinross Gold Company. 2005. True North Ft. Knox 2004 Annual Activity Report..

[102] Szumigala, D.J. and R.A. Hughes. 2005. Alaska Mineral Industry 2004 : Alaska Division of Geological & Geophysical Survey Special Report 59.

[103] Kinross Gold Corporation. 2004. Third Quarter Report 2004. For 9 months ending September 30, 2004.

[104] Fairbanks Gold Mining, Inc., Project Description for the Fort Knox Mine, July 1997, Section 1.4.2.

[105] Kinross Gold Corporation, Fort Knox Mine Solid Waste Permit Quarterly Report, Third Quarter 2003.

time, it is assumed that the quality of the tailings dam seepage will improve after mine closure to the point that pumping will no longer be required. Long-term pumping is not included in the costs used to determine the Fort Knox reclamation bond. However, the long term impacts from the True North ore are not clearly understood, and the company is now planning to process ore from at least one more satellite deposit (the Gill Project), which could also affect the acidity and level of contaminants in the tailings dam seepage water.

In addition to concerns about long-term seepage from the Fort Knox tailings impoundment dam and it impacts to water quality in the watershed, surface and groundwater could potentially be impacted in the area because of the generation of acid mine drainage from waste rock and mine-wall rock leaching, but it is too early in the life of the mine to know whether this will be a long-term concern.

State Reclamation Bond

The state's reclamation bond for Ft. Knox was set at approximately $12.2 million.[106] The True North satellite mine bond totaled $1.4 million, which brought the total bond posted for the mining complex to $13.6 million. In its review of the state's bond requirements (Appendix 3), the Center for Science in Public Participation estimated the amount needed for reclamation of Ft. Knox is approximately $47.4 million and for True North $4.8 million, for a total of $52.2 million.

[106] Figure provided by Ed Fogels, Large Mine Project Team Leader, Alaska Department of Natural Resources Office of Project Management and Permitting.

Greens Creek

Ownership

Greens Creek Mine is a joint venture between Hecla Mining Company of Coeur d'Alene, Idaho and Kennecott Greens Creek Mining Company, the manager of the mine, and Kennecott Juneau Mining Company, both wholly owned subsidiaries of Kennecott Minerals, which in turn is a wholly owned subsidiary of Rio Tinto of London, England. Hecla owns a 29.7% interest in the mine and Rio Tinto owns 70.3%.

Location and Description

The mine is an underground mine located on the northern end of Admiralty Island, within the boundaries of Admiralty Island National Monument. The ore body is being mined primarily for silver, but lead, zinc and gold are also extracted. The mine property includes 17 patented federal mining claims and one patented mill site, in addition to 300 acres leased from the U.S. Forest Service. Mine owners also hold title to mineral rights on 7,500 acres of land adjacent to the mine site. Ore concentrate from the mine's mill is hauled by truck to a marine terminal located about 9 miles from the mine, where it is shipped to smelters worldwide.

Production/Income/ Taxes

The amount of ore milled annually at Greens Creek over the last four years increased from 658,000 tons in 2001 to 805,000 tons in 2004. Average annual silver production at the mine during this time period was 10.8 million ounces and average gold production was 94,000 ounces.

The mine produced an average of 67,000 tons of zinc and 22,000 tons of lead per year from 2001-2004. [107]

The value of the minerals produced at Greens Creek ranged from $150 million in 2001 to $181 million in 2004. [108] The mine employs an average of 270 people, [109] and pays approximately $680,000 in annual property taxes to the Juneau Borough. Because the mine is located on federal mining claims, mine owners pay no royalties for mine production to either the state or federal governments (pursuant to the 1872 Mining Law.) As noted earlier, information about payments the mine makes to the state in mining license taxes and corporate income taxes is considered confidential and not available to the public.

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[107] Production information from Hecla Mining Company. 2005. United States Securities and Exchange Commission Form 10-K, Annual Report for the year ending December 31, 2004, and Rio Tinto 2005 Annual Report and Financial Statements.

[108] Estimated. Estimates based on average annual market prices from the U.S. Geological Survey (USGS) Minerals Commodities Summaries, February 2000 and January 2005.

[109] Szumigala, D.J. and R.A. Hughes, R.A. 2005. Alaska Mineral Industry 2004 : Alaska Division of Geological & Geophysical Survey Special Report 59.

Environmental Concerns

The Forest Service and the company stated in the 1980's that there would be no impact from metals leaching or acid mine drainage at the Greens Creek Mine.[110] Yet, lab and field tests at the mine in 2000 showed that the tailings and waste rock have "significant potential" to generate acid and are currently leaching heavy metals.[111] In February of 2003, the Alaska Department of Environmental Conservation clearly documented acid mine drainage at Greens Creek for the first time. Monitoring conducted by Greens Creek in 2001 and 2002 showed that sulfate and heavy metals leaching from waste rock piles into ground and surface waters was increasing.[112] Greens Creek has violated the Clean Water Act 391 times by releasing levels of copper, zinc, cyanide and acids in excess of those allowed in its state and federal pollution permits. Acid mine drainage is a long-term concern. It is possible that water at the mine site will need to be intercepted and treated for decades after mine production ends to remove acid and metals.

State Reclamation Bond

The state's reclamation bond for Greens Creek was set at $26.2 million.[113] In its review of the state's bond requirements (Appendix 3), the Center for Science in Public Participation estimated the amount needed for reclamation of Greens Creek is approximately $35.4 million.

[110] Greens Creek Final Environmental Impact Statement, USDA/USFS, Jan 1983, p. 4-23. ("Because of the stable chemical nature of the tailings, it was estimated that no significant increase in levels of metal ions would occur.")

[111] Shepherd Miller, Inc. 2000. Technical Review ARD/Metals Leaching and Freshwater Monitoring Plan Greens Creek Mine.

[112] Alaska Department of Environmental Conservation. 2002. Greens Creek Solid Waste Permit Annual Report.

[113] Figure provided by Ed Fogels, Large Mine Project Team Leader, Alaska Department of Natural Resources Office of Project Management and Permitting.

Red Dog

Ownership

Teck Cominco Ltd., a Canadian mining company based in Vancouver, British Columbia, owns and operates the mine. The mine was owned by Cominco through its subsidiary Cominco Alaska Incorporated prior to Cominco's merger with Teck.

Location and Description

Red Dog Mine, the world's largest producer of zinc, is located in northwestern Alaska on the western edge of the Brooks Range between Noatak National Preserve to the east and Cape Krusenstern National Monument to the west. The mine is approximately 55 miles inland from Chukchi Sea. Red Dog ore deposits are situated on a 120 square-mile block of land that belongs to Northwest Alaska Native Association (NANA), a Native for-profit corporation created pursuant to the 1973 Alaska Native Claims Settlement Act.

In 1982, Cominco entered into an agreement with NANA to develop the ore deposit at Red Dog.[114] Mine development began in 1986 and construction was completed in 1989, the same year that operations and production began.[115]

The mine encompasses a number of ore bodies that total more than 160 million tons of reserves and resources. The deposit is 15.9 percent zinc and 4.4 percent lead and contains nearly 2.9 ounces of silver per ton.[116] The ore lies close to the surface in a relatively flat area, making open pit mining the method of choice for extraction.[117] After ore is removed from the pit, the rock is crushed. Zinc and lead concentrates, the mine's primary products, are separated in a milling process that utilizes vat leach circuit and a range of chemicals, including 60-70 grams of cyanide per ton of ore. Red Dog produces nearly 20,000 tons of ore concentrates and waste each day.[118]

The ore is hauled to a shipping port along a road built within a right-of-way through Cape Krusenstern National Monument that is held by NANA. In 1985, Congress granted NANA a 100-year easement for a transportation corridor that bisects the northern portion of the national monument and includes land for a port site inside monument boundaries. The grant exempted the corridor from review under provisions of Title XI of the Alaska National Interest Lands Conservation Act, which require an environmental impact assessment and full public review of proposed transportation and utility corridors across federal lands protected under the Act.[119]

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[114] Teck Cominco Limited. 2003. Red Dog Mine, Alaska, USA. <http://www.teckcominco.com/operations/reddog>.

[115] Ibid.

[116] Northwest Alaska Native Association, Cominco. 1998. Shared Values, Common Goals, Exceptional Results: The Red Dog Mine Story. Kotzebue, AK.

[117] Ibid.

[118] Werniuk, J. 2001. Red Dog Mine: Cominco's Alaska triumph. *Canadian Mining Journal* April. [Hereinafter, Werniuk 2001]

[119] 43 USC Section 1629.

Within the transportation corridor, the State of Alaska financed the construction of a 30-foot wide, 52-mile long all-weather haul road extending from the mine west to the Chukchi Sea, where a shallow-water dock, offshore ore loading facility, fuel distribution and storage systems and other port facilities were built.

Collectively, the corridor and port are known as the DeLong Mountain Transportation System (DMTS), which is managed by the Alaska Industrial Development and Export Authority (AIDEA).[120] Cominco entered into a contract with AIDEA for a priority, non-exclusive right for use of the system until 2040 to transport ore concentrates over the haul road, store ore concentrates in buildings at the port and load concentrates onto ore ships.[121]

Trucks weighing 100 tons each when loaded leave the mine site every 15 minutes around the clock, taking ore along the 52-mile haul road to DeLong Mountain port, where the ore is stored in two quarter-mile-long buildings that can hold 1.1 million tons of ore concentrates until the product can be shipped.[122] (The port is accessible to ore ships for only about 100 ice-free days per year.[123]) The water at the port is so shallow that the concentrates must be loaded onto small barges for transport to large ore ships anchored approximately three miles offshore.[124]

Production/Income/ Taxes

From 2001 through 2004, the amount of ore mined annually at Red Dog Mine ranged from 8 million tons in 2001 to 6.3 million tons in 2004. The tonnage of ore processed annually at the mine's milling facility also decreased during this time period, from 3.5 million tons in 2001 to 2.9 million tons in 2004. The tonnage of zinc produced ranged from 570,000 tons in 2001 to 554,000 in 2004 and annual lead production increased from 105,000 tons to 117,ooo tons during the same period. During this period, the mine also produced an average of 6.9 million ounces of silver per year.[125]

The value of the minerals produced at Red Dog Mine from 2001 to 2004 ranged from $550 million in 2001 to $625 million in 2004.[126] In 2001, Teck Cominco reported net annual earnings of $4 million for its operations at Red Dog. In 2002, the company reported a net

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[120] Alaska Industrial Development and Export Authority. 2005. Project Fact Sheet: DeLong Mountain Regional Transportation System (DMTS) Road and Port serving mining district that includes the Red Dog Mine.

[121] Ibid.

[122] Ford, J., and L. Hasslebach. 2001. Heavy Metals in Mosses and Soils on Six Transects along the Red Dog Mine Haul Road, Alaska. Western Arctic National Parklands, National Park Service, Alaska Region. [Hereinafter Ford and Hasslebach 2001]

[123] Werniuk 2001.

[124] Ibid.

[125] Production information for lead and zinc from Teck Cominco 2002 and 2004 Annual Reports. Silver production estimates from Szumigala, D.J. and R.A. Hughes. 2005. Alaska Mineral Industry 2004 : Alaska Division of Geological & Geophysical Survey Special Report 59.

[126] Estimated. 2001 revenue estimated based on average annual prices from the U.S. Geological Survey (USGS) Minerals Commodities Summaries, February 2000 and January 2005. Revenue for 2002 -2004 includes total sales for lead and zinc reported in Teck Cominco 2004 Annual Report and estimates for market value of silver produced in those years.

loss of $36 million at Red Dog Mine. In 2003, the company's net annual income for Red Dog was $42 million and in 2004, it was $207 million.[127]

Approximately 500 full-time and contract employees work at Red Dog Mine. Red Dog employment represents 30% of non-government jobs in the NANA region, with 290 of 510 jobs reported in 2004 held by NANA shareholders. The mine is the only property taxpayer in the Northwest Arctic Borough, paying an average of $6 million in property taxes annually. Because the mine is located on lands for which the surface estate and subsurface estate are owned by NANA regional corporation, Teck Cominco pays no mineral royalties to the state. As noted earlier, information about payments the mine makes to the state in mining license taxes and corporate income taxes is considered confidential by the state and not available to the public.

State Investments

In 1987, AIDEA sold $103 million in tax-exempt bonds to fund a portion of the $180 million it cost to construct the DMTS. The $77 million balance was provided by a state appropriation. In 1997, AIDEA sold $150 million in bonds to fund expansion of the DMTS port to accommodate increased production from Red Dog. The bonds are being repaid with annual usage fees assessed to Teck Cominco for use of the system. The usage fees included a base fee of $12 million plus a supplemental payment of $6 million, for a total of $18 million annually. Payments are made to AIDEA quarterly.

The Alaska Department of Transportation and Public Facilities (ADOT) undertook feasibility studies for construction of a road linking the DTMS road to the village of Noatak and construction of a new 5,000-ft. airport runway at Noatak that could accommodate jet aircraft[128]. This was in response to frequent flight restrictions at the Red Dog Mine airport due to area weather conditions. Subsequent to the completion of ADOT's design and feasibility studies, Teck Cominco determined it could manage the problems at the Red Dog airport. Nonetheless, ADOT decided to relocate and reconstruct the Noatak airstrip as the existing strip had been damaged by erosion. Federal funds were used for the reconstruction. The new airstrip location will allow for a runway expansion to 5,000 feet. The road from Noatak to the DMTS road is still under consideration as it will provide a means of getting fuel to the village from the DTMS port, thereby reducing the village's energy costs. One of the routes under consideration would require securing a new transportation corridor in Cape Krusenstern National Monument.

Environmental Concerns

As noted earlier, Teck Cominco is now required to file annual reports with EPA describing releases of toxic substances to the environment caused by mining activities at Red Dog Mine. These reports are included in EPA's Toxics Release Inventory (TRI). TRI reports for Red Dog Mine detail toxic releases to land, water and air from waste rock and tailings solids, metal loads from water sources in tailings impoundments, emissions from power generators and

[127] Teck Cominco 2004 Annual Report.

[128] McKinnon, Mike. 2005. Alaska Department of Transportation and Public Facilities Industrial Ports and Roads Program Status Report, May 2005.

incinerators, fugitive dust emissions, and discharges from sewage treatment facilities. By far, most releases are from waste rock and tailings solids.[129]

In 1998, its first year of reporting, Red Dog Mine's releases totaled nearly 250 million pounds of toxics, the fifth highest total for all metal mines in the nation.[130] The inclusion of the mining industry in the TRI for 2000 pushed Alaska from forty-seventh to fourth place in state rankings for highest total toxic releases. Red Dog Mine's releases accounted for 83 percent of the total releases of toxic substances within Alaska's boundaries.[131] The 2000 TRI shows Red Dog Mine released nearly 445 million pounds of toxics, including 308 million pounds of zinc compounds, 123 million pounds of lead compounds and 2 million pounds of cadmium compounds.

In 2001, Alaska again ranked fourth in the nation for the amount of toxic substance releases that occurred within its borders. More than 522 million pounds of toxic chemicals were released as a result of industrial operations in the state.[132] Of that total, Red Dog Mine was responsible for 432 million pounds, or approximately 83 percent. In addition, Red Dog surpassed all other Alaskan mining operations and industries in the total of persistent bio-accumulative toxins reported,[133] releasing more than 128 million pounds of lead compounds and 2.2 million pounds of cadmium compounds. As noted earlier, in 2004, Red Dog topped the TRI list for all pollution sources in the nation.

Although the metals in the waste rock that constitutes a "release" for TRI reporting purposes are naturally occurring minerals, mining and placement of waste rock in dumps makes these metals much more easily available to water from precipitation or surface flow than they were before they were excavated from the orebody in which they were locked. As water filters through the waste rock, metallic sulfides in the ore oxidize, dissolve and release heavy metals, forming a highly acidic effluent. This is evidenced at Red Dog by the acid mine drainage coming from the waste rock piles. This drainage contains dissolved lead, zinc, cadmium and other metals.

Teck Cominco contends that inclusion of these "naturally occurring substances" in the required TRI reports creates a "distorted picture of the actual potential for human health or environmental risks" from the mine.[134] However, the fact that significant pollution now exists at Red Dog that would not have been present if this material had not been mined cannot be dismissed. Acid mine drainage from the waste rock piles at Red Dog constitutes the primary reason that water treatment is required at the mine. The discharge water from the mine's

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[129] Cominco. 1999. Nature's Gift to the People: Land, Air, Water. Cominco's Promise to the People: To Protect Those Gifts. Kotzebue, AK.

[130] U.S. Environmental Protection Agency. 2002. TRI Releases in 1998 for Top 25 Metal Mining Facilities. <http://www.epa.gov/tri/tri98/press/metal_table_fac.pdf>

[131] U.S. Environmental Protection Agency. 2002. 2000 Toxics Release Inventory ALASKA <http://www.epa.gov/tri>

[132] U.S. Environmental Protection Agency. 2003. 2001 Toxics Release Inventory ALASKA <http://www.epa.gov/tri>

[133] Ibid.

[134] Teck Cominco. 2004. Red Dog Operations: TRI Release Numbers Misleading Without Context. <www.teckcominco.com/operations/reddog/tri/tri-release.htm>

tailings impoundment, which includes drainage from the waste rock piles and mine pit as well as tailings from the mill, will require treatment in perpetuity.

The nearly continuous heavy traffic along the DTMS constitutes another source of pollution that is causing concern. Road traffic generates a significant amount of dust from the roadbed and from loss of ore concentrates from the ore trucks.[135] To minimize the loss of concentrate and reduce dust emissions, Teck Cominco replaced its older trucks that had open-top containers on tandem tractor-trailers with new trucks that have hydraulically sealed cargo covers and a side-dumping feature.[136] Teck Cominco also installed washing stations for the trucks at both the mine and the port, but freezing weather conditions soon proved them useless.

The potential environmental and human health impacts of the release of heavy metals, specifically lead and cadmium, from industrial activities at the mine and from ore truck traffic dust along the haul road and at the port have generated concern among residents in the region, as well as among federal land managers and state resource agency personnel. Potential impacts on village drinking water supplies and regional air quality are prominent issues, as are impacts to fish, wildlife and plants on which residents depend for subsistence.

In March 2004, residents of the village of Kivalina (located northwest of Red Dog Mine and north of the DMTS port) filed a lawsuit[137] against Teck Cominco under the citizen suit provisions of the federal Clean Water Act asserting the company committed nearly 4,000 violations of pollution discharge permits issued for the mine and port sites. The alleged violations were committed in spite of the generous provisions of the permits and subsequent court-issued compliance orders which allow the company to discharge approximately 2.4 billion gallons of mine effluent each year into the middle fork of Red Dog Creek. Red Dog Creek is a tributary of the Wulik River, the source of the village's water supply. The lawsuit is currently pending in federal district court in Anchorage.

State Reclamation Bond

The state's reclamation bond for Red Dog Mine was set at approximately $21.9 million.[138] It is recognized by Teck Cominco and the state agencies that this amount would not be sufficient for mine closure and water treatment in perpetuity, which will be required. Teck Cominco and regulatory agency staff are presently involved in a review process that will result in a new reclamation plan, with commensurate bonding. A rough estimate for the new reclamation bond is approximately $100 million.[139]

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[135] Ford and Hasslebach 2001.

[136] Ecology & Environment, Inc. 2002. Wild Foods Investigation Public Review Draft Report Northwest Alaska. Prepared for Alaska Department of Environmental Conservation.

[137] Complaint for Injunctive and Declaratory Relief and Civil Penalties, Kivalina Relocation Planning Committee v. Teck Cominco Alaska Inc., No. A)2-231 CV (D-Alaska filed March 8, 2004.)

[138] Figure provided by Ed Fogels, Large Mine Project Team Leader, Alaska Department of Natural Resources Office of Project Management and Permitting.

[139] Pers. com. between David Chambers, Center for Science in Public Participation, Ed Fogels, ADNR, and Jim Kulas, Teck Cominco, during Red Dog planning meetings April 28- 29, 2005.

Mines Where Operations Ceased: Illinois Creek

Ownership

The State of Alaska owns Illinois Creek Mine and has since Dakota Mining Corp., the mine's original owner and developer, declared bankruptcy in 1998. After it took ownership of the mine, the state realized the bond it had required of Dakota Mining to complete mine reclamation was inadequate. It entered into a lease agreement with Viceroy-Alaska LLC, a wholly owned subsidiary of Canadian-based Viceroy Resource Corporation, to keep the mine operating in order to generate enough revenue to pay the balance of the cost of reclamation. The terms of the agreement called for Viceroy to develop a management plan for the mine site, confirm mineral resources, develop a reclamation plan, and, at the option of the state and Viceroy-Alaska, complete reclamation of the mine site.[140] Viceroy-Alaska subsequently sold its interest in the lease to American Reclamation Group, an Anchorage-based company headed by former Alaska Commissioner of Natural Resources Harry Noah and Ken Poley, formerly with Placer Dome Inc.[141]

Location and Description

Illinois Creek Mine is an open-pit, heap-leach gold mine located in interior Alaska, 60 miles southwest of Galena and 30 miles east of the Yukon River. It is located on state lands selected pursuant to the Alaska Statehood Act and subject to the mineral leasing requirements of Section 6(i) of the Act. The property consists of two state mining leases totaling 62,480 acres.

The mine was originally leased by USMX, a wholly owned subsidiary of Dakota Mining, in 1995. It had a predicted life of six years, with a projected yield of 340,000 ounces of gold (at a gold equivalent grade of o.o74 ounces per ton.) Dakota Mining estimated it would process 778,000 tons of ore a year, and excavate 3 ½ million tons of waste rock annually, which the company planned to place in dumps along the perimeter of the active mining area. The total area to be disturbed by mining activities was approximately 400 acres.

Mine operations at Illinois Creek began in 1997, but ceased three months later when Dakota Mining could not pay its equipment contractors. Operations resumed in late 1997, but ceased again in May 1998, when Dakota Mining declared bankruptcy. In 1999, the state declared Dakota Mining's reclamation bond forfeit and seized control of the mining leases. The reclamation bond forfeited by the company was insufficient to reclaim the mine, so the state entered into its lease agreement with Viceroy Resources Corporation, who later sold its interest in the lease to the American Reclamation Group (ARG). ARG has continued mining operations in order to raise sufficient funds to complete full reclamation of mine site.

The state predicts that rinsing and reclamation of the leach pad will be completed by the end of 2005. The state has offered up all equipment and other assets at the mine site for sale to be available as the reclamation process progresses to completion.

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[140] Viceroy Resources Corporation. 1999. "Viceroy Engaged to Manage Illinois Creek Mine, Alaska." Press release issued September 23, 1999.

[141] Pers. comm. w/ Bob Loefler, Director, Alaska Division of Mining, Land and Water. June 10, 2005.

Environmental concerns

In the course of undertaking the reclamation process for Illinois Creek, ARG discovered that excess solution had accumulated in the mine's heap leach system for a number of reasons, including incorrect water balance modeling, mechanical failures in the solution processing system and an interruption of ore processing activities during the course of Dakota Mining 's bankruptcy proceedings. To deal with the problem of over-saturation of the leach heap, ARG received authorization from the state to draw down the leach pond (into which the leach solution drains), treat the drawn-off solution to remove the cyanide and then spray it on an area near the active mine site. Although testing of the solution before spraying revealed that 98% of the cyanide had been removed, it still contained contaminants such as arsenic, copper and ammonia. To date, no adverse effects from the spraying have been observed.[142]

State Reclamation Bond

The total amount of the bond posted by Dakota Mining, which the state eventually obtained, was $1.6 million. Actual mine reclamation costs have been estimated at $3.8 million.[143]

[142] Ibid.

[143] Alaska Reclamation Group (ARG). 2000. Illinois Creek Mine Final Reclamation Plan, June 2000, p. 13. Estimated reclamation cost = $3,759,764.

Nixon Fork

Ownership

The Nixon Fork Mine was developed in 1994 by Nevada Goldfields, Inc., a wholly owned subsidiary of Consolidated Nevada Goldfields Corporation. Nevada Goldfields sold its interest in the mine to Real Del Monte Mining Corporation. Mining operations ceased at Nixon Fork when Real Del Monte filed for bankruptcy in 1999. The claims and all of the surface facilities and equipment returned to the original claim owners, Ted Almasy and Margaret Mespelt. In 2003, Mystery Creek Resources, a wholly owned subsidiary of Canadian-based St. Andrews Goldfields, Inc., entered into a lease agreement with Almasy and Mespelt to resume mining at Nixon Fork.

Location and Description

The Nixon Fork Mine is an underground gold mine located approximately 35 miles east of McGrath. The mine property consists of 95 unpatented federal lode claims, 15 federal placer claims and 106 state mining claims. Thirty-three of the federal claims are located on lands obtained by Doyon Corporation pursuant to provisions of the 1971 Alaska Native Claims Settlement Act (ANSCA). All but four of the state claims overlap federal claims on lands managed by the U.S. Bureau of Land Management (BLM). The mine consists of the underground mine, a mill site, a waste rock dump and a tailings impoundment. The mill used conventional gravity separation and flotation circuits to process the gold.

The gold mined at the Nixon Fork Mine from 1994 through 1999 was found in a deposit that contained copper-iron sulfide, iron sulfide, iron-arsenic sulfide, zinc-iron sulfide and molybdenum sulfide. Nearly 135,000 tons of waste rock was produced as a result of mining activities. About 35% of this was backfilled underground. The balance was left at the surface.

In resuming operations at the mine, St. Andrews Goldfields' mine development plan would nearly double the acreage subject to mining activities, and add a new waste rock dump that would cover 6.7 acres. The tailings impoundment would be expanded from 9.7 acres to 16.9 acres, with an additional 10.7 acres devoted to a filtered tailings site. The company also plans to expand the mine's airstrip.

Production/Income

When it originally developed the mine, Nevada Goldfields estimated the gold reserves at nearly 72,000 ounces of gold, averaging 0.94 ounces of gold per ton of ore. Total gold production for the mine from 1994-1999 was 165,150 ounces, yielding a total estimated value (based on the average price of gold for this time span) of $57,000,000.

St. Andrews estimates that once operations resume, the mine will produce approximately 50,000 ounces of gold annually and 500,000 pounds of copper.

Environmental Concerns

The high sulfide content of the waste rock at Nixon Fork translates to a high potential for generating acid mine drainage. Tailings from previous mining operations are believed to be

causing copper contamination of Ruby Creek,[144] and the levels of copper in Ruby Creek are high enough to cause impacts to aquatic organisms. Site cleanup and reclamation plans do not currently address this issue. The expansion of the mine to add a second waste rock dump will increase this potential for acid mine drainage.

When the mill facility was originally designed for Nixon Fork Mine, gravity flotation circuit technology was selected for ore processing over cyanide treatment because of the extreme risk a cyanide operation posed to the area in terms of transportation of leachate and risk of spills and leaks. The original designers also determined the tailings impoundment could not operate at zero discharge.[145] St. Andrews has proposed the use of a cyanide vat leach circuit for gold recovery when it resumes operations at the mine. St. Andrews has stated that adding cyanide leach circuit to ore processing operations will not impact the environment because the mill facility will be a zero discharge facility. BLM, the manager of the federal claims, has initiated a NEPA review of St. Andrews' proposal.

[144] Nixon Fork Mine Draft Plan of Operations, December 2004, (Section 5.1.4, p. 49)Section 5.1.4, p. 49.

[145] Kuiper and Associates, LLC. 2005. April 19, 2005 letter to Jeff Denton, U.S. Bureau of Land Management Anchorage Field Office from James E. Kuiper, PE, Principal/ Consulting Engineer, Kuiper and Associates, LLC. Butte, MT.

Proposed Mining Projects: Kensington

Ownership

The mine is owned by Coeur d'Alene Mines Corporation of Coeur d'Alene, Idaho.

Location and Description

The proposed Kensington Mine will be an underground, hard rock gold mine located approximately 45 miles north of Juneau and just east of the Lynn Canal within the boundaries of the Tongass National Forest. The mine area is located on National Forest lands, state tidelands and privately owned federal patented mining claims which encompass two historic mines: the old Kensington Mine, which operated from 1897 to 1938, and the Julian Mine, which operated from 1896 to 1928. Together during the course of their operations, the two mines produced 40,500 ounces of gold from approximately 75,000 tons of ore.

The new Kensington Mine will include a mill site where ore will be processed using a froth floatation method, a tailings impoundment (up to 40% of the tailings will be backfilled into the underground mined area), a tailings slurry pipeline leading to a subaqueous disposal site in Lower Slate Lake, a dewatering plant for removing and recycling water from the tailings slurry, and a power plant that will burn propane (LPG). Mine developers have proposed building a dock at Slate Creek Cove in Berners Bay and a dock at Cascade Point for a ferry system to transport workers daily from Juneau across Berners Bay to the mine.

The State has issued 12 permits, authorizations and certifications for the mine, including leases for the ferry docks, a permit for road construction and management, water rights for work in anadromous fish streams, and state certifications for U.S. Army Corps of Engineers (Corps) Clean Water Act Section 404 permits on state tidelands. Approximately $91.5 million will be spent in initial construction costs. Construction will include the two dock facilities, approximately five miles of roads, the mill facility, the first phase of a tailings dam, and administrative and laboratory facilities.

Projected Production

Coeur estimates the proposed mine area contains 1.9 million ounces of gold[146]. Annual gold production is expected to be 100,000 ounces a year with operating costs of $220/ounce.[147] The mine is predicted to process 2,000 tons of ore per day, produce 400 tons per day of waste rock, and produce 1,900 tons of mine tailings per day over a 10-year period. The project will employ 300-400 people during the 22 months of construction, and 225 people to operate the mine and processing facilities once construction is complete. Coeur has set a goal of 95% local hire, and predicted mine operations would generate $9 million in annual tax revenues and $21 million in purchases from both Haines and Juneau.[148]

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[146] "Kensington mine receives permits." *Anchorage Daily News*, May 10, 2005.

[147] Coeur d'Alene Mines, "Properties: Kensington—Leading Coeur's Growth in Gold. March 2005. <http: www.coer.com/property_kensington.html>

[148] Bigsby, Kristin. "Mine firm share optimistic plans." *Chilkat Valley News.* Volume XXXIII, Number 28.

State Investment

The state Legislature approved the issuance of $20 million in bonds through the Alaska Industrial Development and Export Authority (AIDEA) for construction of port and tailings facilities. (This is twice as much bonding as AIDEA is normally permitted to award, thereby requiring special legislative approval.) Because of use of AIDEA money, the ports must be available for use by the public. AIDEA has committed to spending $150,000 to conduct an independent review of Coeur's financial and engineering plans for the mine.[149]

Environmental Concerns

The primary concern regarding the potential environmental impacts of the Kensington Mine centers on Coeur's proposal for disposing of mine tailings. In 1998, when Coeur completed its initial plan to develop the mine, the plan included construction of a dry tailings stack near Lynn Canal for disposal of mine tailings. The initial mine development plan was approved and permitted by state and federal regulatory agencies. Then the price of gold dropped, making the development of Kensington less profitable. In November 2001, Coeur submitted a revised development plan for the mine to regulatory agencies that proposed building a 500 foot-long by 90 foot-high dam across the outlet of Lower Slate Lake, an existing 20-acre lake from which Slate Creek, an anadromous fish stream, flows to Berners Bay, and depositing mine tailings in the lake via a slurry pipeline from the mill site. Coeur estimated that the cost of using Lower Slate Lake as a tailings impoundment is approximately 1% of the cost of constructing the dry tailings stack the company proposed in its initial mine development plan.[150]

According to EPA, permitting the disposal of tailings into Lower Slate Lake would set a national precedent. No such disposal plan has been permitted before.[151] Dumping of mine tailings into the lake will destroy the lake's population of Dolly Varden. Nonetheless, the Corps issued a Clean Water Act Section 404 permit to Coeur allowing the company to use the lake as a tailings impoundment. The Corps determined such use was permissible as a result of changes in Section 404 implementing regulations instituted by the Bush Administration concerning the definition of "fill material."

On September 12, 2005, a lawsuit was filed in federal court by three citizens' groups, the Southeast Alaska Conservation Council, Sierra Club, and Lynn Canal Conservation Society, challenging the Corps decision to permit tailings disposal to Lower Slate Lake.[152] The groups assert the permit constitutes a clear violation of the Clean Water Act and sets a dangerous precedent for the permitting and regulation of mine operations in other areas of Alaska and throughout the country. The groups also named the U.S. Forest Service in the suit, challenging its decision to approve the revised mine development plan that includes the Lower Slate Lake tailings proposal. The case is currently pending in federal court.

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[149] "Kensington mine gets state backing." *Chilkat Valley News*. Volume XXXXIV, Number 21.

[150] Bluemink, Elizabeth. "SEACC sues to block Kensington." *Juneau Empire*, September 13, 2005.

[151] "Kensington mine gets state backing." *Chilkat Valley News*. Volume XXXXIV, Number 21.

[152] Bluemink, Elizabeth. "SEACC sues to block Kensington." *Juneau Empire*, September 13, 2005.

Local residents and commercial fishermen have also raised concerns regarding the potential impacts of Kensington Mine to marine fish and wildlife in Berners Bay, which supports productive commercial fisheries and is a popular recreation area. The National Marine Fisheries Service (NMFS) prepared a biological opinion pursuant to Section 7 of the Endangered Species Act examining the impacts of mine activities and mine-related vessel traffic on Steller sea lions and humpback whales in Berners Bay. NMFS concluded that the project would not jeopardize the continued existence of those species but provided some non-binding conservation recommendations for the Forest Service and Corps to institute. One of these recommendations was to re-locate the proposed Cascade Point dock to a different location because of important spawning habitat at Cascade Point for the Lynn Canal stock of Pacific herring, a keystone species that is an important nutritional resource for several marine mammal and salmon species.

State Reclamation Bond

The state's reclamation bond for Kensington was set at $7.4 million.[153] In its review of the state's bond requirements (Appendix 3), the Center for Science in Public Participation estimated the amount needed for reclamation of Kensington is approximately $9.2 million.

[153] Figure provided by Ed Fogels, Large Mine Project Team Leader, Alaska Department of Natural Resources Office of Project Management and Permitting.

Pogo Mine

Ownership

Teck Pogo, a wholly owned subsidiary of Teck Cominco Ltd., holds a 40% share of the Pogo Mine. Sumitomo Metals Mining Ltd., a wholly owned subsidiary of Tokyo-based Sumitomo Corporation, owns a 51% share, and the remaining 9% is held directly by Sumitomo Corp.

Location and Description

Pogo Mine is an underground gold mine located 38 miles northeast of Delta Junction. The mine property encompasses approximately 40,000 acres of state lands in the upper Goodpaster River valley and is comprised of 1,281 state mining claims. The reserve is estimated at 7 million tons with a gold content of 0.47 ounces/ton or 2.6 million ounces of gold. The minerals formation is a gold sulfide ore body in a large quartz vein system.

The mine will include a mill site, a tailings impoundment and waste rock storage facilities. The ore will be processed using gravity separation and flotation circuits, and then further processed in a cyanide vat leach circuit. About 10% of the tailings produced as a result of the flotation and tank leaching process will contain cyanide. These will be treated to remove as much of the cyanide as possible, combined with other tailings and cement, and then deposited underground in the mined formation. The balance of the mine tailings produced will be deposited in piles above ground. A surface water catchment system and impoundment will be constructed to collect onsite precipitation and run-off from the dry stack tailings, and the water collected will be recycled to the ore processing mill.[154] Access to the project will be via a 49-mile all season road from the Richardson Highway.[155] The state has granted a right-of way for construction of the road as well as a power line that will connect the mine to the existing Interior Alaska power grid.

The mine is permitted and construction has begun. Gold production is scheduled to begin in 2006.

Projected Production

The mine is expected to process 2,500 tons of ore a day, producing approximately 400,000 ounces of gold per year over the anticipated 10-year life of the mine.[156] It will employ up to 700 people during construction and 360 people during operations for a predicted 10-year mine life.

Environmental Concerns

During the permitting process, concerns were raised about the location of the surface water catchment system for the mine and its proximity to the Goodpaster River. In public hearings

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[154] U.S. Environmental Protection Agency. "Pogo Mine Project: An Introduction." <http://yosemite.epa.gov/R10/WATER.NSF>

[155] Alaska Department of Natural Resources Division of Mining, Land and Water. Pogo Gold Project: Public Notice of Final Decision. December 18,2003.

[156] Allan, Michael. Teck Cominco Ltd. Vice President of Engineering. "Pogo Project Update." Presentation to the Canadian Institute of Mining, Vancouver Branch. September 30, 2004.

and public comments submitted to regulatory agencies, fears were expressed about the possibility that contaminants from the mine would enter the river. The concerns regarding the location of the catchment system were not addressed, and the system was permitted as designed. The Northern Alaska Environmental Center filed an administrative challenge to the federal Clean Water Act Section 401 permit issued for the catchment system, and as a result, Teck Cominco added two more test wells to the three the company had planned to drill to monitor water quality in the vicinity of the tailings impoundment. The company also agreed to enhance their water quality monitoring program and to undertake fisheries studies in the Goodpaster River. In addition, the company agreed to establish a citizens' oversight group to review the results of the fisheries and water quality monitoring studies. The Alaska Department of Environmental Conservation has issued the mine a state Waste Management Permit for the disposal of tailings and other solid wastes both above and below ground.

State Reclamation Bond

The reclamation bond for Pogo was set at $26.6 million, which must be submitted to ADNR within the first year of operation.[157] In its review of the state's bond requirements (Appendix 3), the Center for Science in Public Participation estimated the amount needed for reclamation of Pogo is approximately $34.5 million.

[157] Alaska Department of Natural Resources, Division of Mining, Land and Water. Pogo Gold Mine Project Plan of Operations Approval. December 18, 2003.

Donlin Creek

Ownership

The Donlin Creek Mine project is a partnership between Placer Dome, Inc., a Canadian mining company based in Vancouver, BC, and NovaGold Resources, Inc., also based in Vancouver. Junior partner NovaGold owns a 70% interest in Donlin Creek. Placer Dome must provide $30 million in investment capital to earn back a 70% share of the project[158]. The subsurface estate encompassed by the proposed mine belongs to Calista Corporation, a Native regional corporation established pursuant to the 1971 Alaska Native Claims Settlement Act. The project partners entered into a 20-year lease agreement with Calista for the Donlin Creek property. Under the terms of the agreement, Calista will receive a Net Smelter Return royalty ranging from 1.5 to 4.5% and an annual property lease payment of $1 million.

Location and Description

The proposed Donlin Creek Mine will be an open pit gold mine located in the Kuskokwim Mountains of western Alaska, 150 miles northeast of Bethel and 12 miles north of the Kuskokwim River village of Crooked Creek.

The mine area encompasses nearly 27,000 acres[159]. The mine, if developed, will consist of a series of open pits from which the ore will be mined, an ore processing mill where the ore will be crushed and ground. Gold will be extracted from the crushed ore using froth flotation, pressure oxidation and carbon-cyanide circuit leaching systems. Mine operations will also include a large tailings impoundment and waste rock dumps. In addition, Placer Dome has constructed a 5,000 foot-long airstrip and housing facilities for up to 75 people. The company has completed an extensive exploration program, as well as four years of environmental baseline studies. Capital costs for the mine are estimated at $602 million. Annual operating costs are estimated at $17.44/ton of ore milled.

The mine, once constructed, would require a 70-megawatt power supply. Three options are being considered to supply this power: 1) Calista Corporation has proposed construction of a coal-fired power plant at Bethel and a 150-mile long transmission line from Bethel to the mine. Coal would be shipped to Bethel from British Columbia; 2) a 400-mile long transmission line from the mine to the existing Railbelt energy grid, connecting probably at Nenana; and 3) onsite diesel or LPG-powered generators. [160]

Projected Production

As a result of its exploration program, NovaGold has estimated gold reserves 11.1 million ounces with a cut-off grade of 0.04 ounces/ton, and the company has indicated there is a potential for discovery of an additional 17 million ounces[161].

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[158] Liles, Patricia. "Ambler JV agreement announced: NovaGold to capture Spectrum shares", *Petroleum News*, Mining News Section, April 18, 2004.

[159] NovaGold Resources website.

[160] Liles, Patricia. "Donlin Creek narrows power options", *Alaska Journal of Commerce,* June 21, 2004.

[161] Alaska Exploration and Mining News, <http://www.alaska-freegold.com>

State Investment

The state approved $10 million to upgrade the existing 15-mile winter road from the mine site to the village of Crooked Creek on the Kuskokwim River for mine access. The Alaska Department of Transportation and Public Facilities was prepared to undertake a design and engineering study for the road, but NovaGold took over design and construction planning because of the problems associated with allowing public use of the road as would be required if it were state-funded.

Environmental Concerns

The ore deposit at Donlin Creek is a high sulfide deposit, which means the potential for generation of acid mine drainage may also be high. The mine is located in the watershed of the Kuskokwim River, a critically important river for sustaining regional commercial and subsistence salmon fisheries. Downriver of the mine, the delta region of the Kuskokwim merges with the delta region of the Yukon River, forming one of the richest wetland habitats in the world. Over fifty Alaska Native villages are located in the Yukon-Kuskokwim Delta whose residents depend on the harvest of fish and wildlife for subsistence. Concerns are just now beginning to be expressed about the potential impacts of mine contaminants to subsistence resources as mine development plans are becoming more widely known in the region.[162]

State Reclamation Bond

Mine development is too preliminary for bond negotiations.

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[162] Nick, Robert. "More about mining and learning Placer Dome", <http://www.deltadiscovery.com/Nick/robertnick.html>

Pebble

Ownership

The state mining claims on which the Pebble prospect is located were originally held by Teck Cominco. Northern Dynasty Minerals Ltd., a Vancouver-based company, purchased a 100% option to develop the leases. Northern Dynasty Minerals then established a wholly owned subsidiary called Northern Dynasty Mines, Inc., whose sole asset appears to be the option to develop Pebble. Northern Dynasty Minerals contracted the management of the mine's exploration and development program, as well as its ongoing operation, to a Canadian company called Hunter Dickinson, Inc. Specifically, Hunter Dickinson, Inc. will manage Northern Dynasty Mines, Inc. (NDM). It is likely that NDM will look for a partner in developing Pebble at some point in the future.[163]

Location and Description

The proposed Pebble Mine will be a large open pit mine and milling operation in southwest Alaska, approximately 17 miles northwest of Iliamna in the Bristol Bay watershed. It is located on state lands and encompasses 1,158 state mining claims that cover approximately 74,000 acres. Gold, copper, molybdenum and silver will be extracted at Pebble. The mine will be developed in three stages, with the Phase 1 open pit covering nearly a square mile expanding to a Phase 3 pit covering nearly 2 square miles.[164] Construction of the mine will require re-channeling of the north fork of the Koktuli River. Phase 1 of mine development will involve mining about 450 million tons of ore, Phase 2 about 1.5 billion and Phase 3 an estimated 2.2 billion tons. The company revised its initial development plans to include a larger mill, one that can process 200,000 tons of ore a day, twice the 100,000 tons of the original mill design considered. A cyanide vat leach system is currently under consideration for extracting gold from the ore. The series of tailings impoundments designed to hold several billions tons of mining wastes will cover nearly 12,800 acres.[165]

NDM announced in March 2005 that planned operations at Pebble may be further expanded as a result of the exploratory data gathered during the 2004 field season, which show a potentially larger mineral deposit than first determined.[166] Estimates for recoverable gold are now set at 41 million ounces.[167] The current mine proposal includes plans for a 56-mile road from the mine site to a port to be constructed on the west side of Cook Inlet, passing along the southern boundary of Lake Clark National Park. Processed ore would be delivered to the port by truck or via a slurry pipeline built in the road corridor.

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[163] Pers. comm. w/ Bob Loeffler, Director, Alaska Division of Mining, Land and Water. June 10, 2005.

[164] Northern Dynasty Minerals Ltd. "Developing a Copper-Gold-Molybdenum Giant: Pebble Project, Alaska, USA", November 2004. <www.northerndynasty.com>

[165] Northern Dynasty Minerals Ltd. "Developing a Copper-Gold-Molybdenum Giant: Pebble Project, Alaska, USA", November 2004. <www.northerndynasty.com>

[166] Bradner, Tim. "Pebble growth could double original projection", *Alaska Journal of Commerce,* November 8, 2004.

[167] Angasun, Trefon Jr., Community Relations consultant, Northern Dynasty Mines, Inc. Testimony before the Lake and Peninsula Borough Assembly May 2, 2005.

Power needed for mine operations is now estimated at about 200 megawatts (more than the Kenai Peninsula currently uses).[168] Two options for delivering power are being considered: a transmission line and subsea cable connecting the mine to Homer Electric Association's power grid; or a transmission line through Lake Clark National Park connecting the mine to the Beluga gas fields.[169]

NDM has entered into a Memorandum of Understanding with the Alaska Department of Natural Resources to facilitate permitting of the mine, but no permit applications have been filed. The company has drafted a baseline environmental studies plan and is currently in the process of collecting baseline environmental date for the project area. Currently, 100 employees are engaged in pre-development activities at the mine site, operating out of a remote camp and an operations base in Iliamna. Northern Dynasty plans to complete preliminary studies and submit applications for project approval in 2006. Eighty percent of the current workforce is Alaskan.[170]

Project feasibility studies will be completed by December 2005 or January 2006. Northern Dynasty is spending $35 million for environmental and engineering studies in 2005, about $13 million of which has been budgeted for environmental studies.[171]

In addition to Pebble, NDM has identified four other major deposits in the region: Highland Valley (24,000 acres) to the west of the Pebble deposit, Grasberg (6,400 acres) to the southwest, Escondida (14,000 acres) to the east and Callahuasi (32,000 acres) to the southeast.

NDM is currently looking for letters of support since the company has had difficulty in recent months raising investment capital.[172]

Projected Production

Estimated mineral reserves indicate 27 million ounces of gold and 16.5 billion pounds of copper[173], (0.27% copper per ton; 0.05% molybdenum and 0.009 ounces gold/ton). It is estimated to be the largest gold deposit in North America and the fifth largest copper deposit in the world.[174] It is predicted the deposit is of sufficient size to support mining operations

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[168] Liles, Patricia. "Mining News: Area near Alaska's Pebble deposit booming." *Petroleum News*, Vol. 9, No. 28, Week of July 11, 2004.

[169] Northern Dynasty Minerals Ltd. "Developing a Copper-Gold-Molybdenum Giant: Pebble Project, Alaska, USA", November 2004. <www.northerndynasty.com>

[170] Dickinson, Robert A., Chairman, Northern Dynasty Minerals Ltd. Letter to shareholders, September 16, 2004.

[171] Bradner, Tim. "Pebble studies up for mine permitting process." *Alaska Journal of Commerce*, Sunday, April 3, 2005.

[172] Angasun, Trefon Jr., Community Relations consultant, Northern Dynasty Mines, Inc. Testimony before the Lake and Peninsula Borough Assembly May 2, 2005.

[173] Dickinson, Robert A., Chairman, Northern Dynasty Minerals Ltd. Letter to shareholders, September 16, 2004.

[174] Northern Dynasty Minerals Ltd. "Developing a Copper-Gold-Molybdenum Giant: Pebble Project, Alaska, USA", November 2004. <www.northerndynasty.com>

for 30-50 years.[175] Once in production, 600 to 1,000 people will be employed full-time to operate the mine.[176]

State Investment

The Alaska Department of Transportation and Public Facilities (ADOT) is currently conducting a study of potential mine port sites at Iniskin Bay and Iliamna Bay in Cook Inlet. ADOT is also evaluating potential corridors for a 65-mile road from the mine to the port.[177] After the road corridor and port site have been selected, the State will undertake detailed studies to facilitate design, engineering and construction.

NDM is looking at seeking funding from the Alaska Industrial Development and Export Authority (AIDEA) for construction of the road and port, citing the road and port for Red Dog Mine as a model to follow for Pebble.[178]

Environmental Concerns

The potential for generation of acid mine drainage is a major concern as the ore deposit at Pebble is a high sulfide deposit. This concern is exacerbated by the sheer size of the mine and the volume of wastes that will be generated during the course of the mine's operations, as well as the possibility that cyanide will be used for ore processing.

The mine is located in the watershed of Alaska's Bristol Bay near the headwaters of rivers that sustain the largest runs of red and king salmon in the world.[179] The Bristol Bay watershed supports significant commercial and subsistence fisheries, as well as sport fisheries that in turn sustain a substantial and growing ecotourism industry. A number of Alaska Native villages in the region have passed resolutions opposing the mine's development.[180] The villagers' main concern is the impact the mine's operations may have on water quality and on fish and wildlife species on which they depend for subsistence. Likewise, wilderness lodge owners in the region are concerned about the mine's impacts on what are considered world-class sport fisheries and the wilderness character of the region.[181]

State Reclamation Bond

Mine development is too preliminary for bond negotiations.

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[175] Dickenson, Robert A., Chairman, Northern Dynasty Minerals Ltd. Letter to shareholders, September 16, 2004.

[176] Bradner, Tim. "Pebble growth could double original projection", *Alaska Journal of Commerce,* November 8, 2004.

[177] Ibid.

[178] Ibid.

[179] Dobyn, Paula. "Pebble Prospect doesn't pan out for local villages", *Anchorage Daily News*, March 22, 2005.

[180] Ibid.

[181] Bristol Bay Alliance. "Pure water is more precious than gold." <www.bristolbayalliance.com/about_us.htm>

Rock Creek

Ownership

Rock Creek is owned by NovaGold Resources, Inc. of Vancouver, BC. NovaGold acquired the patented federal mining claims on which the mine is located when it purchased Alaska Gold Company (AGC) in 1999. AGC dominated gold mining on the Seward Peninsula during the Nome gold rush, and continued its dominance for most of the last eighty years. The company was owned by the New York banking families of Morgan and Guggenheim. They bought up as many small mining claims as they could in Alaska during the early 1900s, ultimately gaining ownership of over 15,000 acres of land around Nome as well as land around Fairbanks and at Dawson Creek in the Yukon. But after the families sold the company after World War II, it eventually went bankrupt in the 1980's and mining activity on the company's Nome properties was abandoned.

Interest in AGC's holdings was revived in the late 1990s when three former employees of Placer Dome Corp. bought a defunct mining company called NovaGold. They entered into joint ventures with major mining companies to leverage capital for investment in mining projects, and in 1999 they bought AGC and acquired the Nome properties. They were able to raise the money to pay off cost of buying AGC by immediately selling the company's properties near Fairbanks. In examining the Nome properties, they realized the tailings left over from Nome gold fields were all sand and gravel. One pile, totaling 26 million cubic yards, was worth $52 million. NovaGold began selling gravel tailings from the Nome gold fields, and has raised enough money to finance exploration work on a number of mine prospects, including Rock Creek.

Location and Description

Rock Creek Mine is located on 14,000 acres of federal patented mining claims seven miles north of Nome. The mine is accessible from Nome's existing road system. NovaGold holds an exploration and mining lease on an additional 20,000 acres of subsurface in the area belonging to Bering Straits Native Corporation, an ANCSA regional corporation, and has entered into a as a surface use agreement with Sitnasuak Native Corporation, the local village corporation and owner of the surface lands. The company has completed a project feasibility study for the mine and has submitted federal and state permit applications for mine development.[182]

The mine will be an open pit mine, with the initial pit more than a half mile long by a quarter mile wide and 500 feet deep. The mine will include a mill site, waste rock dumps and a tailing impoundment that will be created by damming Rock Creek, which runs through mine site. Tailings will be deposited subaqueously.[183] Freeze-back of the tailings impoundment is being considered for closure. Gold production is predicted to begin in 2006. The expected life of the mine is six to nine years.

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[182] NovaGold Resources, Inc. "Rock Creek Project and Nome Gold Project. 2005. <www.novagold.net>

[183] Krzewinski, Thomas G., P.E., Travis E. Ross, P.E. and Doug Nicholson. Rock Cree Mine Near Nome, Alaska. Geotechnical Investigation/ Studies for Open Pit, tailings Impoundment, Waste Dumps and Plant Facilities. Golder Associates, Inc. and NovaGold Resources, Inc. 2004.

NovaGold has plans to expand Rock Creek to incorporate the Big Hurrah gold deposit as a satellite field. The mines will be operated with the same workers on a split schedule, with crews working half time at Rock Creek and half time at Big Hurrah.

NovaGold is looking at developing other deposits in the area, including deposits on patented and private lands the company acquired when it purchased AGC. These deposits, which the company refers to collectively as the Nome Gold Project, encompass the historic deposits of the famous Nome goldfields. The area has produced nearly 5 million ounces of gold over the last eighty years. It currently contains an estimated 1.2 million ounces of measured gold and probably an additional 1.1 million ounces of recoverable gold found in shallow sand and gravel deposits, which also include about 295 million tons of recoverable sand and gravel resources. Outside this defined gold area, NovaGold owns lands that contain an additional 847 million tones of sand and gravel, the largest deposit in the Pacific Rim with immediate access to a port.[184]

Projected Production

Rock Creek is expected to produce an average of 100,000 ounces of gold per year, for a total production cost of $200-250 per ounce. (Until 1998, the gold deposits were mined solely as placer mining operations producing about 25,000 ounces of gold annually. Then the price of gold dropped and these placer operations were abandoned.)

As noted earlier, NovaGold is generating operating capital for the development of Rock Creek by selling sand and gravel taken from tailings piles left over from historic mining activities. The company has examined markets for sand and gravel in the Pacific Rim, and has discovered that a significant market demand exists on the West Coast and in Asia. It is now exploring expansion of its sand and gravel operations.

State Investment

The state has initiated construction of the Glacier Creek by-pass road to improve access to the Rock Creek area at a projected cost of $6 million. Impetus for construction the by-pass came from Nome residents who were concerned about the impacts of ore truck traffic to the watershed within which is located the existing road leading to the mine.[185]

Environmental Concerns

The mineral deposits encompassed by the Rock Creek Mine are high sulfide deposits that include arsenic and lead sulfosalts. The potential for production of acid mine drainage from the mine's waste rock piles could be high.

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[184] Ibid.

[185] McKinnon, Mike. 2005. Alaska Department of Transportation and Public Facilities Industrial Ports and Roads Program Status Report, May 2005.

Reclamation Bond

Mine development is too preliminary for bond negotiations.

V. CONCLUSIONS

It bears repeating that the late Governor Hammond suggested a simple list of criteria by which Alaskans should evaluate proposed resource development efforts in our state to ensure healthy and sustainable economic growth:

> Is it environmentally sound?;
> Do most Alaskans want it?;
> Can it pay its own way?; and
> Does it meet our constitution's mandate to manage resources for the maximum benefit of all Alaskans?

The Governor strongly recommended that a resource development project be encouraged only if it meets these criteria.

All of the individual mine summaries in this report, as well the review of mining impacts statewide, have provided evidence which indicates that the damages to Alaska's natural resources from mining activities are potentially enormous costs the public may be asked to bear. However, these costs are difficult to predict. There is no easy answer for how Alaskans should weigh them against the potential benefits of jobs and revenue when evaluating proposed industrial mine developments in Alaska. Alaskans--and Alaska policy-makers--would benefit if each of the industrial-scale hard rock mine developments currently under consideration within the state received the kind of careful scrutiny Governor Hammond called for, with particular attention given to the state's tax and royalty structures for the mining industry as well as how reclamation bonding requirements are calculated.

As owners of the public resources that mining companies want to exploit, we have the authority and responsibility to determine whether large lode mine developments in Alaska provide the "maximum benefit to all Alaskans" as called for in Alaska's constitution. In exercising this authority, we need to consider not just short-term benefits for our generation of Alaskans, but the long-term liabilities we may be asking our children to bear.

Appendix 1. State upland mining lease agreement

(Revised April, 2005)
DNR 10 4024

STATE OF ALASKA
DEPARTMENT OF NATURAL RESOURCES
DIVISION OF MINING, LAND AND WATER

Upland Mining Lease

Lease ADL #:

This lease is entered into between the State of Alaska (referred to in this lease as "the state") and _____ (referred to in this lease as "the lessee", whether one or more), whose address is

The state and the lessee agree as follows:

1. GRANT. (a) Subject to the provisions of this lease, including stipulation(s) ____ attached to this lease, the state grants to the lessee

(1) the exclusive right to mine, extract, remove and dispose of all minerals subject to AS 38.05.185 AS 38.05.275 (referred to in this lease as "locatable minerals"), in or upon the following described tract of land: (See list of converted mining claims and ADL numbers)

containing approximately _____ acres, more or less (referred to in this lease as the "leased area");

(2) the exclusive right to explore for locatable minerals within the leased area; and

(3) subject to the lessee obtaining all required and necessary permits and approvals and subject to all other terms of this lease, the right to mine and produce locatable minerals from the leased ground and where necessary to place, construct, erect, install, maintain, repair, use, replace, and remove excavations, openings, shafts, ditches, drains, settling ponds, dams, impoundments, reservoirs, pits, wells, tailings ponds, stockpiles, waste dumps, mine roads, utility lines, pipelines, haulageways, mine buildings, mining machinery, mining equipment, and other improvements as may be reasonably necessary for the prospecting for, extraction of, or basic processing of locatable minerals on the leased area, provided that the lessee shall acquire timber it uses or clears from the leased area in accordance with AS 38.05.

(b) Subject to the lessee's compliance with the requirements set out in paragraphs 10 and 11 (GENERAL PERMITTING REQUIREMENTS and PLAN-OF-OPERATIONS) the

lessee may mine and remove locatable minerals by any method consistent with good mining practice, including underground and surface mining. However, the rights granted by this lease are subject to prior vested mineral rights if any, such as federal mining claims. In addition, the rights granted by this lease are to be exercised in a manner that will not unreasonably interfere with other rights of the state or any of its other permit holders, lessees, or grantees, consistent with the principle of reasonable concurrent uses as set out in article VIII, section 8 of the Alaska Constitution.

(c) The surface rights granted by this lease may, in the lessee's discretion, be exercised in support of mining on other land when it is reasonably necessary to do so and is in conjunction with mining locatable minerals on the leased area. If other adjoining surface land is needed, the lessee of this lease must first request and receive authorization through another land lease or mill site permit to use the needed land.

(d) For the purposes of this lease, the leased area contains one or more converted mining claims shown on the attached lease map. The Director of the Division of Mining, Land and Water may require that the lessee survey the leased area's exterior boundary under 11 AAC 86.311 (unless the state waives that survey requirement). If the Director requires a survey, after the survey is completed the legal description shown in (a)(1) of this paragraph and the lease map referred to in this subparagraph will be corrected as necessary to conform to the surveyed location of that boundary.

(e) If this lease is issued without a prior determination that each location included within the leased area has a discovery, the state reserves the right to require the lessee to show a discovery on each location and to remove from the leased area any location that lacks a discovery.

(f) If the state's ownership of the locatable minerals within the leased area is less than the entire and undivided interest, the grant under this lease is effective only as to the state's interest in the locatable minerals. The rentals provided for in this lease must be paid to the state in the proportion that the state's interest bears to the entire undivided interest. In addition, royalties shall only be due on net income from the sale of locatable minerals to the extent the state has an interest in those minerals.

2. RESERVED RIGHTS. (a) The state, for itself and others, reserves all other rights not expressly granted to the lessee by this lease. These reserved rights include:

(1) the right to explore for, develop, lease, and remove from the leased area all minerals other than locatable minerals,

(2) the right to establish or grant easements and rights of way upon, through, or in the leased area for any lawful purpose, including roads, railroads, well sites, pipelines, utility lines, drill holes, shafts, and tunnels necessary or convenient for the working of the leased area for natural resources other than locatable minerals or necessary or convenient for access to or the working of other land for any purpose;

(3) the right to manage and to convey to third parties by grant, lease, permit, or otherwise, any and all interests in the leased area other than those granted by this lease, provided that any conveyance to a third party is made subject to the concurrent use provisions of article VIII, section 8 of the Alaska Constitution as well as the provisions of this lease.

(b) The rights reserved pursuant to paragraph 2 (a) shall not be exercised in any manner that unreasonably interferes with lessee's operations under the lease. The state shall

provide lessee with prior notice of the state's intent to exercise any rights reserved under paragraph 2 (a) and the opportunity to comment on the proposed exercise of these rights. The parties shall work cooperatively to identify potential conflicts and the state shall require as a condition to the state or any other party's exercise of any reserved rights, such stipulations as appear necessary to avoid unreasonable interference with lessee's operations under this lease or endangerment of those operations.

3. TERM. This lease is issued for a term of ___ years from its effective date, and is subject to renewal as provided in 11 AAC 86.312 and AS 38.05.205.

4. ANNUAL LABOR. (a) Labor shall be performed or improvements made annually on or for the benefit or development of each mining lease on state land. Where adjacent mining leases are held in common, the expenditure may be made on any one mining lease and credited to all leases held in common which are subject to a common plan of development.

(b) Labor shall be performed at the annual rate of $100 for each partial or whole 40 acres of each mining lease. If more work is performed than is required by this section to be performed in any one year, the excess value may be applied against labor required to be done during the subsequent year or years, for as many as four consecutive years. Instead of performing annual labor, the lessee may make a cash payment to the state equal to the value of the labor required by this subsection.

(c) During the year in which annual labor is required or within 90 days after the close of that year, the lessee or some other person having knowledge of the facts shall record with the recorder of the district in which the mining lease is located a signed statement setting out the information, as required by the commissioner, concerning the annual labor of the preceding year, any labor in excess of that required for the preceding year, and any payment of cash instead of annual labor.

5. RENTAL. The annual rent due under the lease shall be determined according to AS 38.05.211 and 11 AAC 86.313. The rental shall be paid each year in advance and is subject to adjustment under AS 38.05.211(d).

6. MINING LICENSE TAX AND PRODUCTION ROYALTY AND OTHER TAXES. In exchange for and to preserve the right to extract and possess minerals produced, the lessee shall file a Mining License Tax return under AS 43.65 and 15 AAC 65 and a Production Royalty return under AS 38.05.212 and 11 AAC 86.760-796; and pay any tax and royalty on minerals produced from the lease during each year. In addition, if a lease is located within a borough that levies a property tax, the lessee may be subject to this taxation by the borough under Article IX, Section 5 of the Constitution of the State of Alaska and AS 29.45.030(a)(1)(A).

7. ABANDONMENT. Failure to timely submit an affidavit of annual labor, rental payment or production royalty payment constitutes a default of this lease under AS 38.05.265 and paragraph 18 of this lease, Default and Termination. If any statement of annual labor, annual rental payment or production royalty payment is less than the amount due, the lessee will be granted 30 days after receipt of a notice from the state to submit the additional amount due. If the lessee does not correct the default within the time allowed in the notice, the lease automatically terminates without further notice, except that disputes regarding the amount of production royalty due the state will be resolved under 11 AAC 86.760 - 796.

8. RECORDS. (a) The lessee shall keep all records necessary to establish discovery, support statements of annual labor, and for a period of six years, accounting data and information for production royalty payments. Upon request, copies of those records must be submitted to the Division of Mining, Land and Water at the address shown in paragraph 23 of this lease.

(b) Upon the lessee's request, the state will keep information submitted to the state under this paragraph confidential in accordance with AS 38.05.035(a)(9).

9. PAYMENTS. All payments to the state under this lease must be made payable to the Alaska Department of Revenue in the manner directed by the state, and, unless otherwise specified upon 60 days' notice to the lessee, must be mailed to the address specified below.

DEPARTMENT OF NATURAL RESOURCES
Support Services Division
550 West 7th, Suite 1410
ANCHORAGE, ALASKA 99501
ATTENTION: FINANCIAL SERVICES

10. GENERAL PERMITTING REQUIREMENTS. Before any activities occur on this lease, all required state, federal and municipal agency permits and other authorizations must be issued. Activities requiring and not requiring a permit are specified under 11 AAC 96.010-11 AAC 96.110.

11. PLAN-OF-OPERATIONS. (a) A plan-of-operations, as provided under regulations 11 AAC 86.800 - 815, must be submitted to and approved by the state before activities requiring a permit or plan of operations approval may occur under this lease.

(b) As part of the plan-of-operations, an approved reclamation plan as required under AS 27.19.010 - 100 and its implementing regulations, 11 AAC 97, must also be submitted to and approved by the state before activities may occur under this lease.

(c) All of the lessee's activities on the leased area must be in conformance with the approved plan-of-operations insofar as a plan of operations is required.

12. TITLE OF THE STATE; ACCESS. The state makes no representations or warranties, express or implied, as to title to, access to, or quiet enjoyment of the leased area. The state is not liable to the lessee for any deficiency in title to or difficulty in securing access to the leased area. The lessee or any successor in interest to the lessee is not entitled to any refund of prior rentals paid under this lease due to deficiency in title and is not entitled to a refund of rentals paid under this lease due to difficulty in securing access. However, the Department of Natural Resources will attempt to prohibit the location of subsequent mineral rights in the form of mining claims under AS 38.05.195 or prospecting sites under AS 38.05.245. If subsequent claims or prospecting sites are located in conflict with this lease, the department will close these locations upon verification that a conflict exists. In addition, the department will attempt to provide legal access across land it manages for purposes reasonably related to the activities of the lessee under this lease and along previously used routes and routes to be approved by the state, to be granted in accordance with state statutes and regulations.

13. CONDUCT OF OPERATIONS. The lessee shall perform all activities under this lease in a lawful, prudent, and skillful manner under the plan of operations and other required permits. The lessee shall carry out at the lessee's expense all lawful orders and requirements relative to

the lessee's occupation and use of the leased area. If the lessee fails to carry out these orders and requirements, the state has, together with any other available legal recourse, the right to enter the leased area to repair damage or prevent waste at the lessee's expense.

14. BINDING EFFECT. This lease and all of its provisions and any attached stipulations extend to and are binding on the heirs, executors, administrators, successors, or assigns of the state and the lessee.

15. INSPECTION. The lessee shall keep available at all reasonable times and with prior reasonable notice for inspection by any authorized representative of the state, the leased area, all improvements, machinery, and fixtures on the leased area, and all reports and records required by law and by paragraph 8 of this lease, except for such documents which are protected under any law, regulation or rule of court. The lessee shall permit the state to copy and make extracts from any such reports and records. All documents entitled to confidentiality pursuant to paragraph 8 (b) above shall be kept confidential by the state in accordance with state law.

16. ASSIGNMENT. The lessee may assign, sublease, or transfer this lease, or any interest in or rights under this lease, only upon approval of the state as provided by 11 AAC 82.605.

17. SURRENDER. The lessee may at any time surrender all or part of the leased area under 11 AAC 82.635.

18. DEFAULT AND TERMINATION. (a) The failure of the lessee to timely perform its obligations under this lease, or the failure of the lessee otherwise to abide by all express or implied provisions of this lease, is a default in the lessee's obligations under this lease. Whenever the lessee fails to comply with any of the provisions of this lease (other than a provision that, by its terms, provides for automatic termination), and fails to cure the default or to begin and diligently continue to remedy the default within 30 days after receipt written notice of the default and an opportunity to be heard, the state may order suspension of activity on the leased area until compliance is achieved, and may terminate this lease after additional written notice and an opportunity to be heard.

(b) After termination of this lease for any reason, the state may, if not adequately covered by a bond issued pursuant to paragraph 21 below, take possession of the property, improvements, and equipment of the lessee on the leased area as security for the payment of rent due, or to indemnify against any loss or damage sustained by reason of the default of the lessee.

19. RIGHTS AND OBLIGATIONS UPON TERMINATION. (a) Unless the state has invoked its rights under paragraph 18(b) of this lease or has otherwise directed, under the terms of this lease, within one year after the termination of this lease or the completion of reclamation, whichever is later, as to all or any portion of the leased area, the lessee shall remove from the leased area or portion of the leased area all machinery, equipment, structures, tools, and materials owned or placed on the leased area by the lessee. Upon the expiration of that period and at the option of the state, any machinery, equipment, structures, tools, or materials that the lessee has not removed from the leased area or portion of the leased area become the property of the state and may be removed by the state at the lessee's expense.

(b) Subject to the conditions set out in this paragraph, the lessee shall deliver up the leased area or portion of the leased area in accordance with the approved plan of operations and reclamation plan.

20. DAMAGES AND INDEMNIFICATION. (a) The lessee agrees to comply with AS 38.05.130 before exercising rights if any, reserved by the state pursuant to AS 38.05.125 prior to the date(s) of location of the mining locations subject to this lease and which are granted by this lease. The lessee agrees to pay for any damages that may become payable under AS 38.05.130 by reason of lessee's exercise of these rights or by reason of the lessee's failure to comply with the reasonable concurrent use requirements of paragraph 1(b) of this lease and article VIII, section 8 of the Alaska Constitution and to indemnify the state and hold it harmless from and against any claims, demands, liabilities, and expenses arising from or in connection with such damages.

(b) The lessee shall indemnify the state for, and hold it harmless from, any claim, demand, liability, or expense, including claims for loss or damage to property or injury to any person, caused by or resulting from any act or omission committed under this lease by or on behalf of the lessee, including acts of omissions of independent contractors. The lessee is not responsible to the state under this subparagraph for any loss, damage, or injury caused by or resulting from the sole negligence of the state or anyone acting on the state's behalf.

(c) The lessee expressly waives any defense to an action for breach of a provision of this lease, or to an action for damages, where such defense is based on the fact that the act or omission complained of was committed by an independent contractor.

21. BOND. Before any activities can occur on this lease, the bonding requirements of AS 38.05.130 and AS 27.19.040 and its implementing regulations, 11 AAC 97.400-450, must be met.

22. AUTHORIZED REPRESENTATIVES. The director or mineral property manger of the Division of Mining, Land and Water, Department of Natural Resources, State of Alaska, and the person executing this lease on behalf of the lessee will be the authorized representatives of their respective principals for the purposes of administering this lease. The state or the lessee may change the authorized representative or the address to which notices to that representative are to be sent by a notice given in accordance with paragraph 23. When activities under a plan of operations are underway, the lessee shall also designate, in a notice under paragraph 22, by name, job title, and address, an agent who will be present in the state during all lease activities.

23. NOTICE. (a) Any notice required or permitted under this lease must be in writing or by an electronic medium producing a permanent record and must be given personally or by registered or certified mail, return receipt requested, addressed as follows:

TO THE STATE **TO THE LESSEE:**

State of Alaska
Department of Natural Resources
Division of Mining, Land and Water
Mineral Property Management
550 W 7th Ave, Ste 900 B
Anchorage, Alaska 99501-3577

(b) Any notice given under (a) of this paragraph will be effective when received by the representative specified in (a).

24. STATUTES AND REGULATIONS. This lease is subject to all applicable state and federal law, including statutes and regulations in effect on the effective date of this lease; and new statutes and regulations or changes to existing statutes and regulations placed in effect after the effective date of this lease, to the extent constitutionally permissible. In case of conflicting provisions, statutes and regulations take precedence over this lease.

25. INTERPRETATION. This lease is to be interpreted in accordance with the rules applicable to the interpretation of contracts made in the state. The paragraph headings are not part of this lease and are inserted only for convenience. The state and the lessee expressly agree that the laws of the State of Alaska will apply in any judicial proceeding affecting this lease.

26. INTEREST IN REAL PROPERTY. It is the intention of the parties that the rights granted to the lessee by this lease constitute an interest in real property in the leased area.

27. WAIVER OF CONDITIONS. The state reserves the right to waive any breach of a provision of this lease, but any such waiver extends only to the particular breach so waived and does not limit the rights of the state with respect to any future breach; nor will the waiver of a particular breach prevent termination of this lease for any other cause or for the same cause occurring at another time. Any amendment or modification to this lease to be effective must be in writing signed by the state and lessee. The state or lessee shall not be deemed to have waived any right to notice under paragraph 23 above unless such waiver is in writing and specifically waives such notice.

28. SEVERABILITY. If it is finally determined in any judicial proceeding that any provision of this lease is invalid, the invalid portion will be treated as severed from this lease and the remainder of this lease will remain in effect.

29. DEFINITIONS. All words and phrases used in this lease are to be interpreted consistently with AS 01.10.040.

30. EFFECTIVE DATE. This lease takes effect _____, 20____.

BY SIGNING THIS LEASE, the state as lessor and the lessee agree to be bound by its provisions.

STATE OF ALASKA LESSEE

By:_____ By:_____

Title:_____ Title:_____

STATE OF ALASKA
Third Judicial District

This is to certify that on _____, 20___, before me appeared _____, who executed this lease as lessee and acknowledged voluntarily signing it.

_____
Notary public in and for Alaska
My commission expires:_____

STATE OF ALASKA
Third Judicial District

This is to certify that on _____, 20___, before me appeared _____, of the Division of Mining, Land and Water of the State of Alaska, Department of Natural Resources, who executed this lease and acknowledged voluntarily signing it on behalf of the State of Alaska as lessor.

_____
Notary public in and for Alaska
My commission expires:_____

ADDENDUM AND STIPULATIONS TO UPLAND LEASE ADL

1. Plan of Operation and Permits. A Plan of Operations and Reclamation Plan must be submitted to the Division of Mining, Land and Water under the Annual Placer Mining Application or Hardrock Application process, and mining may not begin until the division approves the Plan of Operations and Reclamation Plan and other required agency permits have been issued.

2. Historical, Prehistoric, and Archeological Resources. If any known or discovered site, structure older than 50 years, or object of historical or archeological significance is discovered during operations on leased areas, the lessee shall report the discovery immediately to the State Historic Preservation Officer, Division of Parks and Outdoor Recreation, and shall make every reasonable effort to protect the site, structure, or object against damage until the State Historic Preservation Officer (telephone 1-907-269-8720) has given directions to its preservation.

3. Bond. As authorized under Paragraph 21 of this lease, 11 AAC 86.805 or AS 38.05.130, a lease bond in the amount of $3/acre or more may be required.

Appendix 2. MOU between the state and Northern Dynasty for permitting Pebble Mine

MEMORANDUM OF UNDERSTANDING

BETWEEN THE ALASKA DEPARTMENT OF NATURAL RESOURCES AND NORTHERN DYNASTY MINES, INC. FOR SERVICES ASSOCIATED WITH THE REVIEW AND AUTHORIZATION PROCESS FOR THE PEBBLE GOLD-COPPER PROJECT

This Memorandum of Understanding (Agreement) is dated, for reference purposes only, the _____ day of _____ 2004, and is between the Alaska Department of Natural Resources (DNR) under AS 27.05.010, AS 38.05 and 11 AAC, and Northern Dynasty Mines, Inc., (NDM).

The purpose of this agreement is for NDM to agree to reimbursement to DNR for costs incurred by DNR, Department of Law (DOL), the Department of Fish and Game (ADF&G) and the Department of Environmental Conservation (DEC) in review of specific tasks related to the Pebble Gold-Copper Project and the processing of State permits and approvals necessary for the permitting, operation and reclamation of the Pebble Gold-Copper Project as described below. DNR has entered into separate agreements with DOL, ADF&G, and DEC which provide for reimbursement by DNR of costs incurred by the agencies for services which are within the scope of this agreement. The terms of these agreements between DNR and the other agencies are consistent with the terms of this Agreement.

DNR and NDM agree as follows:

1. *Term of Agreement* - Notwithstanding the date DNR and NDM sign this Agreement, the term of this Agreement is from March 12, 2004 to June 30, 2004, unless further extended by mutual agreement between DNR and NDM.

2. *DNR Responsibility and Authority* - The DNR under its authority will serve as lead state agency and coordinate the review and adjudication of state applications for the Pebble Gold-Copper Project. DNR also will serve as lead State agency in the review of and comment on federal permits or authorizations for the Pebble Gold-Copper Project when State agencies are to provide such review. DNR will have a team leader assigned to each project or application which is covered by this Agreement with the responsibility for seeing that DNR's duties as lead agency under this Agreement are accomplished. The

same person may serve as the team leader for DNR on all projects covered by this Agreement. The team leader shall have substantial experience in co-coordinating agency and public involvement in the consideration and issuance of permits and other State authorizations for large mining projects in Alaska. As lead State agency, DNR will facilitate participation by the DNR, DEC, ADF&G, DOL and others in the review and consideration of requests and authorizations, and related public processes, with the goal of timely and efficient completion of all tasks. Attachment 1 provides the list of primary state personnel involved with the Pebble Gold-Copper Project.

3. *Reimbursement by NDM* - NDM agrees to reimburse the DNR for the costs associated with DNR, ADF&G, DEC and DOL's consideration of requests for permits and other authorizations or approvals covered by this Agreement, including the adjudication of permits or authorizations before a state agency under state administrative procedures. Reimbursement for the time of personnel working on matters covered under this Agreement is estimated to be at the rates stated in Attachment 1. This Agreement applies to requests for permits and other authorizations or approvals relating to those projects or activities listed in Attachment 2. Reimbursement costs include prorated rental costs for DNR office space, telecommunications, office supplies, and administrative indirect costs that will not exceed 15.1% of budgeted personal services. These cost estimates will be revised as necessary to include the need for consultants for which the State will seek reimbursement under this agreement, and any additional activities or agreements will be reviewed with NDM and agreement reached before any additional costs are incurred or assessed by the State.

4. *Billings by the State* - DNR will bill NDM for the costs incurred by the DNR, ADF&G, DEC and DOL in a format agreed to between DNR and NDM. DNR will bill NDM every six months during the life of this agreement, and NDM will submit payment to DNR within 45 days of receipt of the billing, unless disputed in accordance with Section 5 of this Agreement.

5. *Dispute Resolution* - If NDM disputes the accuracy of any billing, payment for that item(s) will be made if billing does not exceed total Agreement amount. Then NDM gives DNR written notice of the disputed amount and request for review within 45 days of NDM's receipt of the billing. The Commissioner of the DNR shall review the billing and NDM's objections to it, and provide NDM with a written decision on what charges the Commissioner finds are due under this Agreement. If NDM disagrees with the Commissioner's decision, NDM shall notify the Commissioner of this within 30 days of NDM's receipt of the Commissioner's decision. NDM and DNR shall confer and agree upon a single person to review the circumstances surrounding the disputed billing and, after notice and hearing, the person shall deliver a written decision resolving the dispute. The person's decision is final and the person may award fees and costs as he or she deems appropriate. The cost of the person's services in resolving the dispute shall be shared equally by NDM and DNR.

6. *NDM Audit of State Records* - In addition to its rights under paragraph 5 of this Agreement, and without limiting those rights, DNR agrees that NDM shall have the right to conduct an audit of the Department's expenditures.

7. *Payment of Fees* - Unless otherwise specified herein, or in an amendment to or modification of this Agreement, this Agreement does not affect NDM's responsibility for paying all fees and other costs normally required or legally authorized to be paid to DNR, ADF&G, DEC, or DOL by NDM or the amount of these fees and costs, including but not limited to, application fees, annual payment(s), or other compensation required by any authorization(s) if issued to NDM during or as a result of the project review and adjudication process by DNR, ADF&G, DEC or DOL. Reimbursements on this Agreement are billed quarterly and are due 45 days after receipt of billing from DNR.

8. *Special Services* - The cost of special services adjunct to the state agencies' processing of the project applications or evaluating project alternatives, including by way of example a risk assessment, survey, or engineering review/analysis needed to assist the state in evaluating the project, or consulting services necessary to review or provide technical expertise not available in DNR, ADF&G, DEC, and DOL and not otherwise specifically provided or identified in this Agreement shall be agreed to separately between DNR and NDM as provided in Section 9. The cost of such special services, if agreed to by DNR and NDM, shall be paid by NDM under this Agreement and the estimated costs in Attachment 2 adjusted accordingly, or paid by NDM directly to the contractor if the contract for special services is between NDM and the contractor.

9. *Extension/Amendment* - NDM and DNR may by mutual written agreement, extend/amend this Agreement including by way of example, to provide for additional time, to cover additional reimbursable cists, or to change the scope of work.

10. *Notice/DNR Contact Person* - For purposes of this Agreement, Ed Fogels shall be the DNR contact person. Any notice to DNR from NDM under this Agreement, except as provided in Sections 5 and 6 shall be deemed to have been made by NDM when mailed first class or hand delivered to:

    Ed Fogels, Large Mine Permitting Manager
    Office of Project Management and Permitting
    Department of Natural Resources
    550 W 7th Avenue, Suite 900D
    Anchorage, AK 99501-3577

Note: Fax may be used to receive copies for information purposes only. The fax number is 269-8930. Ed Fogels's work phone number is 269-8629. E-mail address: **edf@dnr.state.ak.us**

Billings will be mailed for payment to:
    Northern Dynasty Mines, Inc., Pebble Gold-Copper Project

Attn: Bruce W. Jenkins, Director of Corporate Affairs
1020-800 W Pender Street
Vancouver, BC
Canada, V6C 2V6

Any notice to NDM under this Agreement shall be mailed to:
Bruce W. Jenkins, Director of Corporate Affairs
Northern Dynasty Mines, Inc., Pebble Gold-Copper Project
1020-800 W Pender Street
Vancouver, BC
Canada, V6C 2V6

Note: Fax may be used to receive copies for information purposes only. The fax number is (604) 662-8956. Bruce Jenkins may be reached at work phone number (604) 684-6365. E-mail address: **brucej@hdgold.com**

11. *Laws* - The Laws of the State of Alaska shall govern the construction, validity, and performance of this Agreement.

****

This Agreement is entered into voluntarily by NDM and approved with the full understanding and acknowledgement that nothing in t his agreement guarantees NDM will receive any permit, or other authorization(s), or a favorable review under any particular conditions, nor does this Agreement relieve NDM of the responsibility for determining and securing all local, state, and federal approvals or authorizations which may be necessary for design, construction, operation, maintenance, reclamation or termination of the proposed project. Nothing in this Agreement prohibits the DNR, ADF&G, DEC, DOL, or another state agency and NDM from entering into separate agreement for review, studies, or other activities associated with the Pebble Gold-Copper Project.

Dated this _____ day of _____, 200___.

_____
Project Manager, OPMP
Department of Natural Resources

UNITED STATES OF AMERICA)
State of Alaska)
_____ Judicial District)

THIS IS TO CERTIFY that on this _____ day of _____, 200___, before me personally appeared Edmund Fogels, Project Manager, of the Department of Natural Resources, Office of Project Management and Permitting, of the State of Alaska, who executed the foregoing Memorandum of Understanding and acknowledged voluntarily signed the same.

IN TESTIMONY WHEREOF, I have hereunto set my hand and affixed my official seal on the day and year shown above.

_____
Notary Public in and for the State of Alaska
My commission expires:_____

Dated this _____ day of _____, 200___.

_____
Northern Dynasty Mines, Inc.

UNITED STATES OF AMERICA)
State of Alaska)
_____Judicial District)

THIS IS TO CERTIFY that on this _____ day of _____, 200___, before me personally appeared _____ of Northern Dynasty Mines, Inc. who executed the foregoing Memorandum of Understanding and acknowledged voluntarily signed the same.

IN TESTIMONY WHEREOF, I have hereunto set my hand and affixed my official seal on the day and year shown above.

Notary Public in and for the State of Alaska
My commission expires:_____

ATTACHMENT 1

Billing Rate Estimates for State Personnel

(DNR may authorize use of staff not included on this list depending on Staff availability. Hourly rates are approximate, and may vary depending on individual personnel status, such as annual merit increases, benefit changes, etc.)

NAME	AGENCY	DISCIPLINE	HOURLY BILLING RATE
Stan Foo	DNR	Mining	57.30
Ed Fogels	DNR	Project Coordination	61.55
Bill Jeffress	DNR	Project Coordination	75.31
Justin Ireys	DNR	Mining	28.82
Brent Martellaro	DNR	Mining	35.00
Charles Cobb	DNR	Dam Safety & Engineering	61.55
Steve McGroarty	DNR	Mining	49.79
Mary Maurer	DNR	Hydrology	49.04
Jim Vohden	DNR	Hydrology	49.04
Mac MacLean	DNR	Habitat Biology	63.00
Pete McGee	DEC	Water Quality	46.22
Luke Boles	DEC	Water Quality	22.23
Cam Leonard	DOL	Legal Counsel	97.57

ATTACHMENT 2

TASKS TO BE ADDRESSED BY INTERAGENCY REVIEW TEAM

The most important need is for adequate agency resources to work on activities and authorizations associated with Northern Dynasty's permitting activities associated with the Pebble Gold-Copper Project.

Specific tasks to be addressed are:

1. Provide review of a baseline data collection program, including ongoing guidance and review of data as the program progresses.
2. Provide a coordinated effort on the State's part in the NEPA Process.
3. Provide guidance in developing ad submitting various state agency permit applications.
4. Provide coordinated and timely review of all permit applications.
3. Dam permitting efforts for any tailings impoundments, water supply reservoirs, etc.
4. Coastal Zone Review Process on all matters related to Pebble Gold-Copper
5. Land use permitting for activities on State lands
9. State agency activities required for Federal authorizations such as the NPDES (402) Permit, and the Wetlands Fill (404) Permit.
10. Work done by ADNR, OHMP for the NPDES required biomonitoring

Estimate of reimbursable costs for the activities of the state agencies covered by this agreement during the period March 12, 2004 through June 30, 2004. Please note that this is only an estimate and as tasks become more clearly defined cost adjustments may be made as described in Section 3 of this Agreement.

DNR/OPMP		$3,000.00
RSAs to DNR:		
	Office of Habitat Management & Permitting	$5,500.00
	Division of Mining, Land & Water	$2,000.00
	DNR Estimated Indirect/Overhead not to exceed 15.1% on personal services charges	$1,586.00
RSA to DEC	Indirect included in estimated cost	$2,000.00
RSA to DOL	Indirect included in estimated cost	
RSA to ADF&G	Indirect included in estimated cost	$5,500.00
	TOTAL	**$19,586.00**

When making payment, please make check payable to: State of Alaska, Department of Natural Resources.

Send payment to:

Division of Mining, Land and Water
550 W 7th Avenue, Suite 1070
Anchorage, AK 99501-3579
Attn: Karlyn Herrera

Appendix 3. Review of State Reclamation Bonds for Six Large Mines

ALASKA LARGE MINE RECLAMATION BONDING – 2005

David M Chambers, Ph.D.
Center for Science in Public Participation
August, 2005

Reclamation bonds, or by their more formal name financial sureties, are the financial instruments that guarantee that mines will be closed according to their state and federal permit requirements even if the operating company goes bankrupt and is financially unable to meet these obligations.

The Center for Science in Public Participation, a non-profit public interest organization that provides technical services to public interest groups and tribal governments, has conducted a series of detailed analyses of the reclamation bonds required of Alaska's large mines by state and federal regulators. These 'bonds' represent monies to cover liabilities that the state/federal government would likely incur if a company operating a mine could no longer meet its obligation under issued permits to safely close a mine. Bonds for mines are required under Alaska statutes that require reclamation planning, administered by the Alaska Department of Natural Resources,[186] and by solid waste regulations administered by the Alaska Department of Environmental Conservation[187] when the mine waste meets criteria for solid waste designation.[188]

We analyzed six large mines in Alaska – Fort Knox, True North, Greens Creek, Red Dog, Pogo and Kensington. Fort Knox, True North, Greens Creek and Red Dog are operating mines. However, at Red Dog the state holds only a minimum bond because the reclamation plan is undergoing major revision, and the Solid Waste Permit is just being put into place. The Pogo mine is under construction, and is expected to go into operation in 2006. Kensington mine construction is proposed to begin in mid-2005.

Alaska has had one major mine bankruptcy, the Illinois Creek Mine operated by USMX/Dakota Mining (1999), and the $1.6 million bond held by the State was not adequate to close the mine. However, the state was able to contract with a company to continue operating the mine while using mining revenues to pay for closure.

In its calculation for the mine bond, CSP² produced at least 3 closure scenarios for each mine.[189] The first scenario replaced the assumptions made by the company or agency in its bond calculations. A second CSP² bond scenario assumed 'worst case' conditions, which were generally associated with the need for water treatment in perpetuity at mines with acid-producing mine waste (e.g. Red Dog and Greens Creek). A third scenario was CSP²'s

[186] See Alaska Statutes Title 27, Chapter 19, Section 40
[187] See Alaska Administrative Code, Title 18, Chapter 60, Section 455
[188] In essence ADEC has determined that tailings and waste rock with the potential to produce acid mine drainage will need to be permitted and bonded under Alaska solid waste regulations.
[189] Calculations include spreadsheets for each detail of the calculation, including labor and equipment rates, amounts of material moved, and all assumptions made in the calculations.

most-probable case assumption, i.e. a case that generally follows the predictions for closure conditions adopted by the agencies in their mine analyses. This scenario incorporates all of the costs CSP² has identified in its research as critical to fiscally sound mine closure, but which are often underestimated or ignored during bond calculation by companies and/or agencies.

These costs include:

- *Contingency*: Contingency costs reflect the level of detail and completeness of the cost estimate, as well as the degree of uncertainty of factors and assumptions used in the cost estimate.
- *Mobilization / Demobilization*: Mobilization/demobilization costs account for the transport of equipment and materials to and from the mine site, as well as infrastructure needs.
- *Engineering Redesign*: Engineering redesign costs stem from a lack of detailed information and plan development in a financial assurance estimate, as well as the need to account and design for actual conditions at the time of reclamation and closure.
- *Engineering, Procurement, Construction Management*: This indirect cost accounts for the requirement of construction engineering, procurement, and construction management on behalf of the agencies in the event they become responsible for reclamation.
- *Contractor Overhead*: Contractor overhead accounts for administrating, management, public relations, safety, environmental, legal, performance bonding and other costs associated with doing business.
- *Contractor Profit*: This indirect cost accounts for contractor profit.
- *Agency Administration*: Agency administration includes costs incurred by state and federal agencies in situations where reclamation and closure are performed by regulatory agencies.
- *Inflation*: Inflation indirect costs account for the difference in the dollar value between the time the estimate was generated and reclamation and closure are performed.

The table shows the bond amounts currently held by both state and federal regulatory agencies in Alaska, and the CSP² calculation that was interpreted to be the most probable, i.e. mid-range calculation of the bond amount. This took into account the factors outlined above, which in all cases increased the reclamation calculation over the actual amount held by the agencies.

MINE	CSP² BOND ESTIMATE	ACTUAL BOND
Fort Knox	$47,362,335	$12,150,415
Red Dog	$100,000,000	$11,010,250
True North	$4,825,061	$2,536,874
Greens Creek	$35,409,797	$26,238,518
Kensington	$9,216,416	$3,154,305
Pogo	$34,560,335	$26,654,432
	==========	==========
TOTAL	$231,373,944	$81,744,794

Reclamation Surety Analysis

As can be seen from the table results, the total amount CSP² has estimated Alaska regulatory agencies should be holding to fully protect the public against is significantly larger than the actual amounts held.

The difference between the CSP² estimates and actual amount held varies between approximately 25% at the Greens Creek and Pogo mines, to almost 75% at Fort Knox.

There is a significant difference (89%) at Red Dog, but it is acknowledged by all parties that the bond amount currently being held for this mine does not approach a realistic reclamation cost estimate, and that the reclamation planning and permit evaluation currently underway for Red Dog will provide the information necessary to calculate an appropriate bond estimate.

Structural Changes to Alaska Reclamation Bonding

In 2004 the Alaska Legislature passed a bill authorizing the Department of Natural Resources to accept corporate guarantees as one form of financial surety for mine reclamation. A corporate guarantee is a pledge from a company to perform reclamation at a minesite, as opposed to requiring a financial surety in a readily available form like cash, bonds, letters of credit, etc. Several states presently allow corporate guarantees (Arizona, Colorado, Nevada, Utah and Wyoming).[190] Michigan also passed a law authorizing corporate guarantees in 2004, but Michigan limits the corporate guarantee to 25% of the reclamation amount.

Regulations implementing Alaska's new statutory authority for corporate guarantees have yet to be implemented. In implementing a viable corporate guarantee strategy under the Alaska statute, it will be important to incorporate a rigorous means-test to insure that corporations which are allowed to use the corporate guarantee instead of traditional financial assurance

[190] Hardrock Reclamation Bonding Practices in the Western United States, James R Kuipers, Center for Science in Public Participation, February 2000, p. I-14

vehicles, and to perform periodic checks to assure there is no danger of companies financial status changing enough to place the corporate guarantee at risk.

A second consideration of the corporate guarantee is that the State should no longer be reluctant to calculate to full cost of reclamation for a minesite. Corporate guarantees allow a company much more flexibility in meeting the demands of a financial surety for its reclamation obligation. Corporate guarantees are also the least expensive way for a company to provide these guarantees. In exchange for this financial flexibility and cost efficiency, the State needs to implement more rigorous reclamation cost calculation procedures which reflect the actual costs that are likely to be incurred by the public sector in the event a mining company goes bankrupt and a regulator is forced to close the minesite.

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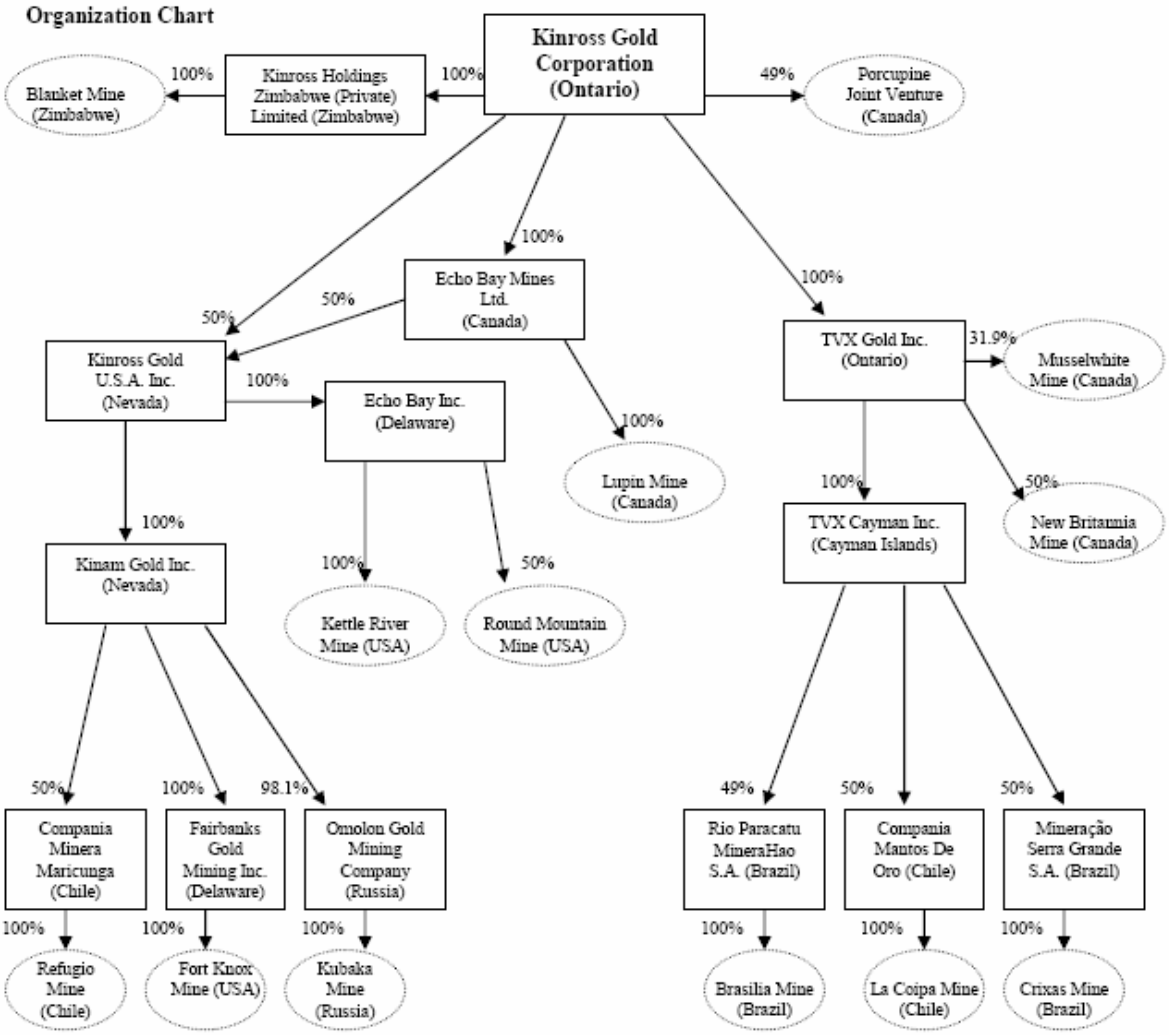
Appendix 4. Organization Chart for Kinross Gold Corporation



Appendix 5. Average Annual Prices for Precious and Industrial Metals 2001-2004

	I. Gold (Dollars/Oz.)	II. Silver (Dollars/Troy Oz.)	Zinc (Cents/Lb.)	Lead (Cents/Lb.)	III. Copper (Cents/Lb.)	Molybdenum (Dollars/Kilo)
1995	386	5.15	46.8	42.3	133.1	17.50
1996	389	5.19	46.5	48.8	104.0	8.30
1997	332	4.89	59.7	46.5	103.2	9.46
1998	295	5.54	46.5	45.3	75.0	5.90
1999	285	5.20	45.0	44.0	71.2	5.80
2000	280	5.00	51.2	43.6	82.2	5.64
2001	272	4.39	40.2	43.6	71.6	5.20
2002	311	4.62	35.3	43.6	70.7	8.27
2003	365	4.91	37.5	43.8	80.7	11.65
2004	410	6.46	50.0	53.0	128.0	29.67

Table 1. Average annual precious and industrial metals prices for the period 1995-2004. [191]

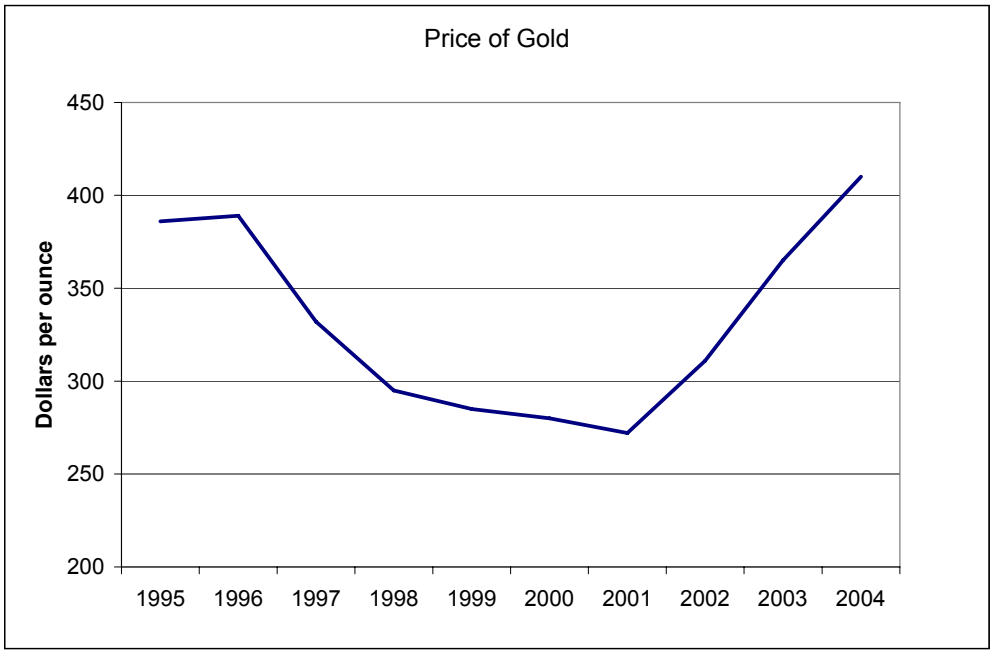


Figure 1. Average annual gold prices 1995-2004. Engelhard Corporation's average gold price quotation for the year.

[191] U.S. Geological Survey (USGS) Minerals Commodities Summaries, February 2000 and January 2005.

Figure 2. Average annual silver prices 1995-2004. Handy & Hartman quotations.

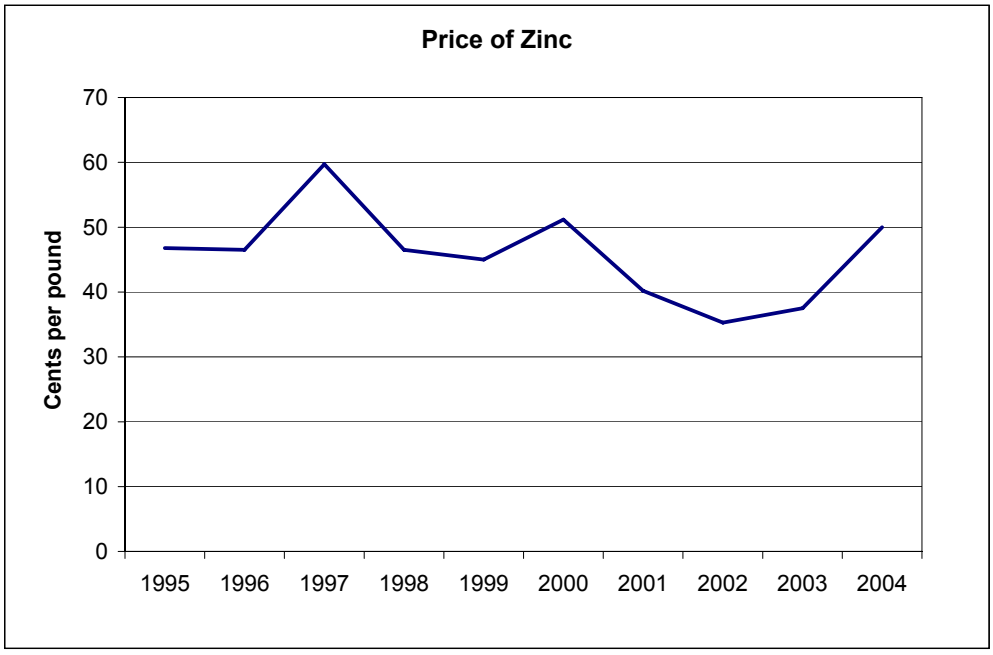


Figure 3. Average annual zinc prices 1995-2004. London Metal Exchange quotations.

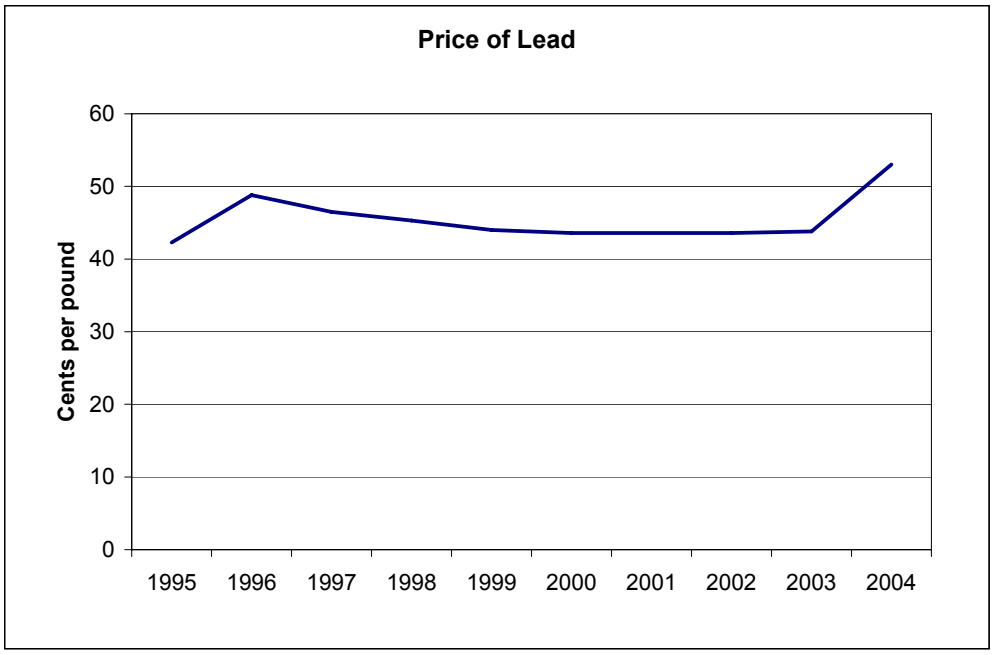


Figure 4. Average annual lead prices 1995-2004. North American Producer prices. (London Metal Exchange quotations average 36% higher for the same 10-year period.)

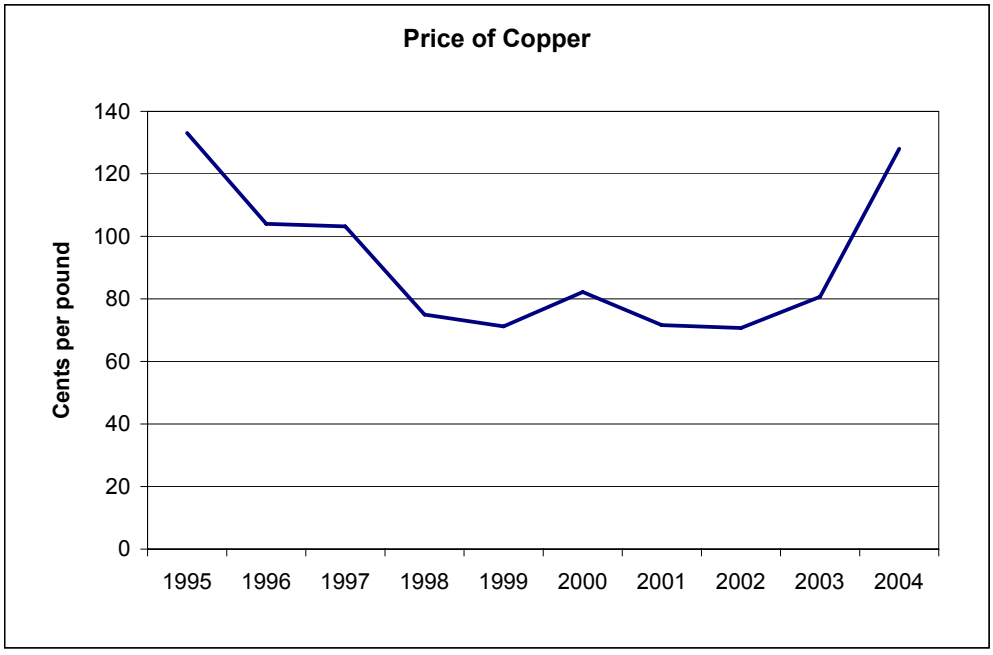


Figure 5. Average annual copper prices 1995-2004. London Metal Exchange quotations for high-grade copper.

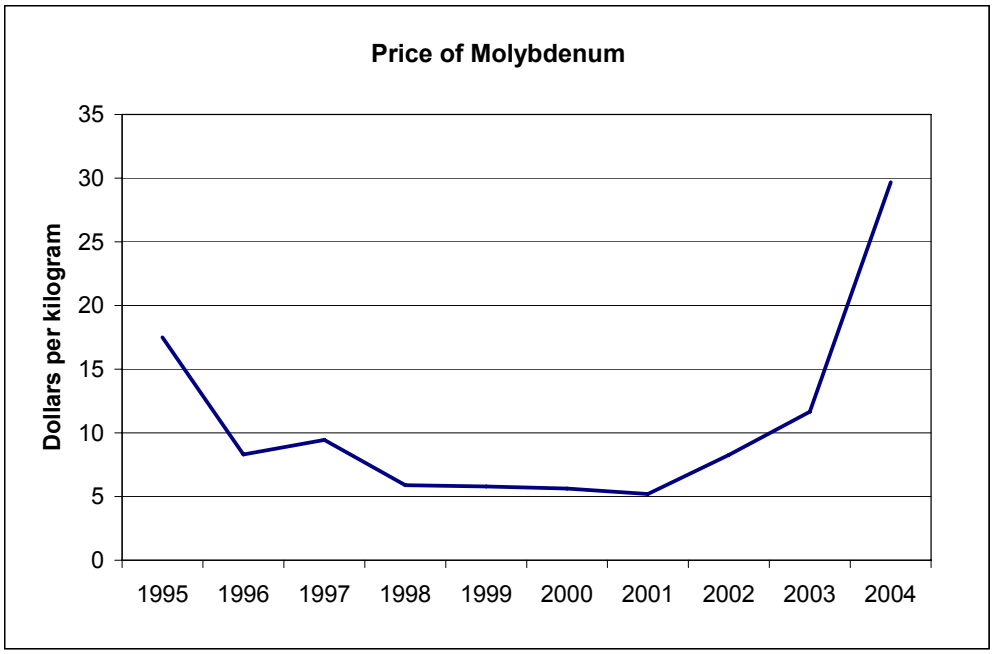


Figure 6. Average annual prices of molybdenum contained in technical grade molybdic oxide 1995-2004. Prices for 1995-1999 are time-average price per kilogram of molybdenum as reported in Platts Metals Week. Prices for 2000-2004 are major producer prices per kilogram of molybdenum.