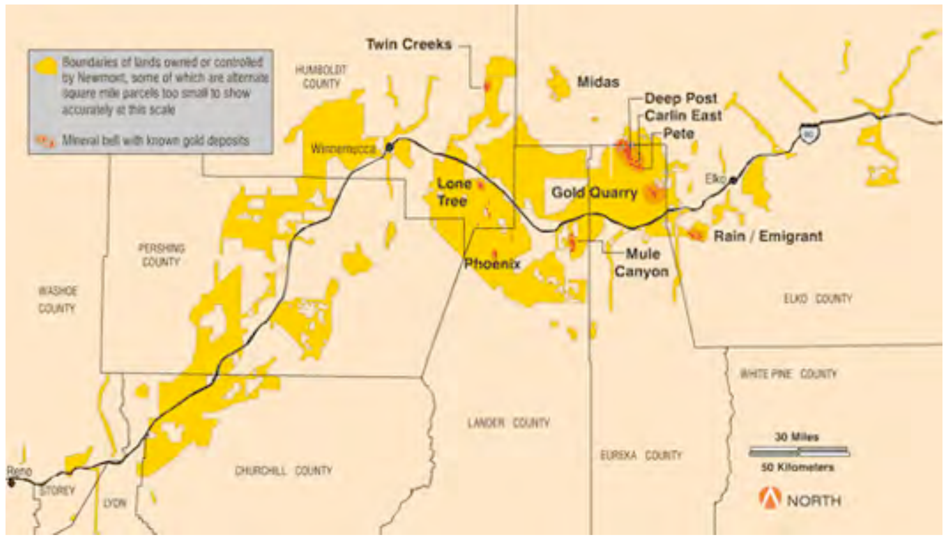
# Environmental Problems at Newmont Mines in Nevada
## January 11 2011




Newmont owns or controls approximately 3,056 square miles of land in Nevada, stretching across the state along the Interstate 80 corridor. The largest gold producer[1] in the United States produced 2.26 million ounces of gold in 2008, and the Nevada operations produced 2.2 million ounces in 2008.[2] Newmont reported $213 million in "Adjusted net income" for the second quarter of 2009.[3] About $74 million of that is from gold sales in Nevada.[4] In 2008 Newmont extracted $907 million in gold sales profits from Nevada's lands.[5]

**Background**

There are numerous environmental problems associated with Newmont's mining operations in Nevada. The most common problems fall into three areas, water usage, water quality, and mercury air pollution. Great Basin Resource Watch (GBRW) has been working with Newmont, as well as state and federal regulators to try and resolve these issues for many years. While Newmont has been willing to discuss these issues, and has allowed GBRW on site to see and discuss the problems, we have seen little substantive work on the ground to rectify the specific problems mentioned in this document. GBRW understands that solutions to these environmental problems are not simple, thus a serious commitment to their resolution is required.

Modern gold extraction is conducted by excavating large quantities of earth to obtain small amounts of gold. The gold exists largely as microscopic particles in the ore, and the average profitable deposits for Newmont gold mines in Nevada are on the order of one ounce of gold for every 14 tons of ore[6] (~0.00023 percent by mass). Roughly, for every ounce of gold refined approximately 100 to 200 tons of earth[7] had to be moved.

*Water Quantity*

Much of the gold ore in Nevada is below the water table. In order to excavate the ore, either by an open pit or underground audit, water must be pumped from the ground surrounding the facility. This process is called dewatering. Dewatering creates what is called a "cone of depression" around the mine, where the water table has been lowered. Some of the ore bodies are so deep that the lowered water table extends a considerable distance from the mine site, resulting in a "drawdown" of water in the entire region.

The valleys between the mountain ranges in the Great Basin are hydrologic basins. These regional groundwater aquifers have an annual flow of water into them from rain and snow melt, which is then available for use. Much of the agricultural, domestic, municipal, and industrial water used is groundwater that pumped from these aquifers. The annual recharge determines what is known as the perennial yield. The perennial yield represents the maximum water available for usage in the valley beyond which the regional aquifer will run a deficit, typically resulting in streams, springs, and seeps going dry. Many mines in Nevada pump groundwater to dewater the mine at levels greatly exceeding the perennial yield of the basins they are in.

After mine dewatering ceases, the water table begins to return to pre-mining levels. It can take hundreds of years to reach a new equilibrium water table, and the new level is likely to be lower than the pre-mining level, due to the existence of a "pit lake." As the water returns it will fill the pit forming a pit lake, a new feature on the landscape. Evaporation of water off of the new pit lake (evaporation rates are very high in Nevada do to high temperatures and low humidity in the summer) is tantamount to pumping water at the same rate from a well. Therefore, the pit lake will act as permanent draw on the groundwater in the region preventing the water table from returning to pre-mining conditions. Water is a critical resource in the arid Great Basin and the large scale dewatering activities at the mines impact regional water resources upon which all life depends.

*Water Quality*

The enormous amount of exposed rock at a mine has the potential, depending upon the chemical makeup and nature of mineralization, to react with the air and water to generate what is called "acid mine drainage." The process is akin to the rock "rusting" due to being exposed to air and water (when it is underground, this exposure is very limited). The acidified water can then further corrode the rock to dissolve out various minerals to an extent that they become a toxic environmental hazard and unhealthy for wildlife and humans. Even in a region as arid as the Great Basin, acid drainage occurs and can run off into surface water or more commonly, infiltrate into the groundwater, polluting the water table.

Pits lakes, as mentioned above, can also become toxic when the walls and bottom react with the air and inflowing groundwater. Besides being a hazard unto themselves, toxic water from the pit lake can infiltrate back into the surrounding groundwater system and pollute it.

Modern gold mines will "mill" higher grade ore, and after gold extraction the waste, called tailings, is discharged into "holding ponds," called tailings impoundments. The tailings during active mining are essentially a slurry that settles over time with the liquid layer typically quite toxic in cyanide and heavy metals. It is therefore very important for tailings impoundments to be well contained. At some mines leakage into the ground below tailings impoundments has occurred, resulting in contamination of the groundwater.

Lower grade ore is subjected to the cyanide heap leach method of gold extraction whereby the coarsely crushed ore is piled in a "heap" and a fairly weak solution of sodium cyanide is sprayed over the top of the heap. As the cyanide solution percolates through the ore it dissolves the microscopic gold particles. The solution is captured at the bottom of the heap pile, and the gold laden, "pregnant", solution is to pumped to processing facilities. Just as with the tailings impoundment the heap leach pile also requires secure containment to avoid contamination of the underlying ground and water table.

With all of the various forms of rock piles, waste rock, heap leach, and tailings piles, there is a long-term danger of drainage from them contaminating the surrounding land and waters for many years after the mine is closed. Depending upon the manner in which this "drainage" is handled, the threat to the landscape can be either severe or minimal.

Overall, there are four significant features common to modern gold mines in Nevada: pit lakes, waste rock piles, tailings impoundments, and heap leach piles. All have the potential to contaminate surface and ground water as outlined above, which constitute the most common water pollution issues in Nevada.

*Mercury Air Pollution*
Gold ores commonly contain other metals, most notoriously, mercury. Pure mercury is a liquid at room temperature, and is gasified easily during mining processes, sometimes reacting with other substances. Mercury is released into the air from gold mines as either mercury vapor, ionic or charged mercury, or bounded to tiny suspended particles (adsorbed mercury). Collectively, Newmont mines in Nevada released 1,386, 1,647, 2,211, and 721 pounds of mercury to the air in 2006, 2007, 2008, and 2009 respectively.[8]

Mercury is widely considered the most dangerous heavy metal because it is toxic to humans and moves freely through the environment. It is connected to various nervous system disorders such as intention tremor, poor mental concentration, and emotional ability. One of the most damaging results of mercury contamination is the impairment of brain development, so mercury is especially threatening to fetuses and young children. Mercury can also target the kidneys and immune system. One of the common end products of mercury in the environment is methyl mercury, an insidious form that concentrates in the food chain. Methyl mercury almost exclusively attacks the nervous system, mainly affecting the central nervous system, and its effects are largely irreversible since they arise from loss of brain neurons.[9]

There are numerous water bodies downwind of the Nevada mines in Nevada, Utah, and Idaho that have elevated levels of mercury. The states have posted fish consumption advisories due to mercury contamination for numerous of these water bodies.

## *Specific Issues at Specific Mines:*
The problems discussed generally above are tagged below for specific Newmont mines. This is by no means a comprehensive list of environmental issues at Newmont's many Nevada operations, but rather highlights some of the larger issues.

### Gold Quarry/Leeville/Carlin operations –northwest of Carlin Nevada
Water usage- dewatering

As of 2007 the Gold Quarry/Leeville/Carlin operations were pumping about 50,000 acre-feet of water per year, which is roughly equivalent to the annual water use of 93,000 people in an urban setting.[10] The Gold Quarry/Leeville/Carlin Operations are all within the Humboldt River system, the largest water system in northeastern/northcentral Nevada.

The drawdown is more than 850 and 800 feet deep at the Gold Quarry and Leeville mines, respectively. The Leeville mine is now affecting the water table about 9 miles northwest of the mine site. Water levels near the Humboldt River have dropped up to ten feet in the carbonate aquifer and a lesser amount in the siltstone aquifer. This is not a huge amount, but this is on the edge of the potentially expanding cone. Springs and seeps have already dried up in this region impacting wildlife and ranching, and the long-term effects have yet to be seen.

Air Emissions - mercury

Gold Quarry released approximately 281 pounds of mercury into the air in 2009 (a typical 500 megawatt coal-fired power plant releases an about 165 pounds of mercury per year).[11]

Hazardous Waste Violations

The Environmental Protection Agency (EPA) filed a Notice of Violation[12] against the Newmont Gold Quarry Mine in May 2008 after investigations found serious problems with the handling and disposal of hazardous waste. According to the EPA's investigation, the mine: 1) failed to identify toxic materials as hazardous waste, particularly mercury-contaminated waste water, 2) failed to meet treatment standards for hazardous waste, including wastes containing mercury and arsenic, 3) generated and stored hazardous waste without a permit, and 4) failed to minimize the release of hazardous waste to the air or water that could threaten human health or the environment. The EPA investigations were initiated under the Resource Conservation and Recovery Act (RCRA), the federal law which regulates the disposal of hazardous waste. Each mine generates more than 1,000 kg (2,204 pounds) of hazardous waste per month. The EPA notified the mines that they must come into compliance, and provide verification to the agency.

**Rain Mine - southeast of Carlin Nevada**

Water Quality - acid mine drainage

This mine is in closure; mining last occurred at the Rain site in the late 1990's. The waste rock dump, just east of the pit, has been reclaimed with up to 5 feet of evaporative cover. However, as of 2007, approximately 40 gallons per minute of highly acidic water (pH 2-3) has been draining from the dump, which is down from the 600 gallons per minute in 2006.[13] This acid drainage must be actively captured and managed; water this acidic from a mine site typically contains high levels of metals and dissolved salts making it toxic to humans and wildlife.

The acid drainage has been occurring for many years, and appears to have reached a steady flow rate implying a consistent source of water. It is possible for acid drainage such as this to continue for hundreds of years or greater. Newmont now believes that the waste rock dump has created pockets for snow to collect thus creating a source for the water,[19] although recently Newmont thought there existed a source (spring) of the water from within the waste rock dump.[14] Newmont's approach now it to improve the "cover" on the dump so that water to prevent deep seepage and acid drainage. Hopefully, there is not a spring as it would need long-term water management, essentially in perpetuity, or some method of water diversion out of the waste rock dump. This problem underscores how important it is to be mindful in developing a mine. Once problems arise it is often not simple to arrest them.

Water Quality - tailings impoundment leakage

The tailings impoundment was first observed to leak in April 1988, when seepage was noted 300 feet below the impoundment. An investigation ensued determining specific leakage points in the tailings dam and identified a contamination plume. A trench drain system was devised to effective catch any contamination, and a series of monitoring wells was put in place to assure that the contamination plume was not advancing. It is unclear at this time whether the trench system is capturing all the contamination from the tailings, and further analysis is most likely needed to assure that springs and groundwater is not being impacted.[15]

Overall, the water quality problems at the Rain Mine site are from various sources and a likely to require multiple levels of investigation and facility modification to assure containment of contaminants, and has the distinct potential to require very long term active management.

**Lone Tree Mine - midway between Winnemucca and Battle Mountain Nevada**

Water quality - pit lake toxicity

*Lone Tree Pit Lake taken April 2009*
*By Travis Rummel, feltsoulmedia.com*

Excavation of the Lone Tree Pit ended in 2006, and it has been filling with water since. At this point Newmont has had to add sodium hydroxide and lime to raise the pH (lower acidity) of the lake to acceptable levels. Even though the acidity has been decreased, artificially, to acceptable levels the water was still high in many metal constituents (arsenic, aluminum, and manganese) as of the first quarter of 2007.[16] Throughout 2008 and 2009 the acidity of the pit lake remained low (pH 3.0 to 3.5)[17]; however, in a recent correspondence with the State of Nevada the pH was reported at 6.5.[18] At this point Newmont believes that a geologic formation called, "Balmy," along the side of the pit lake has been responsible for most of the acid generation,[19] but there will be another 40 years for this pit lake to fill completely. Therefore, the jury is still out as to whether the acid problem at Lone Tree is solved.

Water usage - dewatering

The Lone Tree Mine is also immediately adjacent to the Humboldt River, and through the later 1990's until 2006 was also conducting significant dewatering, adding to impacts to the Humboldt River System. Once the pit lake has filled as much as possible, it will serve as a large source of evaporation, continuing to draw water from the surrounding aquifer.

Air emissions - mercury

Mercury emissions from Lone Tree were also quite high in 2006 totaling about 622 pounds, and decreased to 148 pounds for 2007, and in 2009 further decreased to 7.2 pounds with operations proceeding to closure. The recent decreases are largely due to an end of mining at this site. Lone Tree also had a very odd mercury reporting pattern; in the years from 1998 through 2005 the mine reported (to the Environmental Protection Agency) emissions of 61 or less pounds released, but then in 2006 the number jumped to 622 pounds. The unusual jump in emissions has lead GBRW to wonder whether Newmont was accurately reporting in previous years.

**Mule Canyon Mine - east of Battle Mountain Nevada**

Water quality - acid mine drainage/pit lake problems

Mining operations are generally wrapped up at Mule Canyon. Mining was completed in 1999 at the South Pit. Since then, water has been flowing into the pit to a higher level and of poorer quality than predicted.[20] The level of the South Pit lake rose to the rim in 2005, requiring emergency measures to avoid overflow. This water level is about 350 feet higher than predicted. A monitoring well on the south rim was flooded and is now considered by Newmont to be unreliable. Newmont continues to be resistant to drilling needed monitoring wells directly downgradient of the South Pit to determine whether the substandard pit lake water is infiltrating into the groundwater system.

In late 2006/early 2007 Newmont proposed to manage the overflow from the South Pit by constructing a conduit from the south rim to the shop pond, which would act as an evaporation facility. While this could prevent the contaminated water from entering the existing natural drainage, it is not a long-term solution. As of December 2007 Newmont had been evaporating the water at the pit by misting the water over the pit, and expected to evaporate the pit lake by the end of 2008.[21] However, this will concentrate the salts and toxic metals in the water, which will require a hazardous waste remediation. Newmont needs to determine the source of the water, and see if it can be redirected, otherwise active management will be required, possibly for hundreds of years.

If Newmont had fully characterized the ore from the South Pit as mining proceeded, and had a better understanding of the hydrodynamics, this problem could have been anticipated and avoided. Suspecting that a contaminated pit lake could develop and rise over the lower rim would have allowed for mining at the site in a way to avoid the problem in the first place. One such option would have been to stop mining at the location. To chose this option Newmont would have had to consider environmental protection to be at least as important as the profits from the gold extracted.

Water quality – contamination of groundwater

There is considerable groundwater contamination east of the Pit Dewatering Pond (PDP). According to an analysis by JBR poor water escaped the PDP between March 2004 through December 2004 due to a compromised liner.[22] Contamination is persistent in the wells east of the PDP and well MU-1339A, just west and upgradient of the PDP.[23] The corrective action plan from 2005 recommended pump back measures, but it is not clear that this measure is still active. There is evidence that the contamination plume is expanding, and a complete remediation plan including how to move from active to passive control of the problem appears to have not yet been developed.

**Twin Creeks Mine - northeast of Winnemucca Nevada**

Water quality - tailings facility leakage

Twin Creeks is an active mine with portions that are in closure. The Piñon Tailings facility on the southeast end of the site has had a history of complications starting back in the mid 1990's. Cyanide was discovered in one of the groundwater monitoring wells just south of the tailings facility. Cyanide does not normally occur in the groundwater and must have come from the tailings impoundment, which contained high levels of cyanide when it was in active use. Newmont determined that the monitoring well itself, MW-2, was serving as a conduit for cyanide to reach the groundwater. However, the specific source of the cyanide leak from the tailings pond was not determined. A new monitoring well was drilled, and the original well was sealed off. Newmont also created a number of vadose zone (presumably unsaturated ground, above the water table) monitoring wells. Although many of these wells produce fractious data due to going to dry from time to time, there are a couple that consistently deliver data. These wells have produced substandard water, and in 2007 and 2008 had elevated levels of sulfate, total dissolved solids, chloride, and nitrate, with no indication of decreasing levels.[24] Thus, there is a plume of contamination under and around the Piñon Tailings facility.

Newmont initiated closure operations at the Piñon tailings facility in late 2007, and will continue to monitor the wells around the facility.[25] Newmont seems unconcerned that there exists a contaminant plume, which is roughly 60 to 70 feet below the ground surface, and does not seem interested in discerning the extent of this plume. Good environmental stewardship would mean characterizing the plume including the source, and developing a plan to "manage" it. This could mean pumping back from the wells that show the contamination or otherwise isolating it if possible. Clearly identifying where the leak has occurred would go a long way to finding a solution, but it appears as though Newmont has no intention of analyzing for the source of the leak.

Air emissions - mercury

Twin Creeks mine has shown quite variable mercury emissions from 2006 when state mandated emissions testing began, ranging from 434 pounds per year (lbs/yr) in 2006 to a high of 1679 in 2008 and down to 426 lbs/yr in 2009.[8] The higher emissions from 2008 were due to a system failure at the mine that happened to be caught due to the annual testing regiment. Overall emissions from this mine remain high.

**Phoenix Mine - south of Battle Mountain Nevada**

Water quality - acid mine drainage

Great Basin Resource Watch had grave concerns regarding this mine during its permitting process, due to the highly reactive (likely to producing acid mine drainage) nature of the ore. Newmont is currently managing the Fortitude Pit Lake (which has been filling since 1999), which has required the addition of sodium carbonate to decrease acidity. The Fortitude Pit Lake has the potential to require active management "in perpetuity" – or forever.

*Iron Canyon Waste Rock dump current reclamation - acid drainage occurs well below the lower end of the visible reclaimed hillside*

On the northeastern portion of the site there is acidic drainage from the Iron Canyon Waste Rock dump.[26] Just as with the Rain Mine, the drainage must be captured and treated. Newmont is actively reclaiming the waste rock dump, but is unclear as to the source of the water. Similar to the management at the Rain site, Newmont hopes that development of a robust plant community will prevent water infiltration from rain and snow and that the drainage will then subside.

In general, due to the reactive nature of the rock at the Phoenix site, it is likely to create a number of acid mine drainage management problems. This is a location where a case could be made that the future environmental impacts from this site will be great enough that mining should not have been done.

**For more information: Great Basin Resource Watch - www.gbrw.org - 775-348-1986**
**85 Keystone Avenue, Ste. K, Reno, Nevada 89503**

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[5] Newmont Mining Corporation, "2008 Annual Report, pp. 52-53.
[6] Newmont Mining Corporation, "2008 Annual Report, pg. 28,
[7] Figure based on Newmont's Twin Creeks Mine, *draft Environmental Impact Statement*, July 1996, and Barrick's Cortez Hills Expansion Project, *draft Environmental Impact Statement*, July 2007.
[8] Nevada Bureau of Air Pollution Control, "Calendar Year 2009 Actual Production/Emission Reporting Form Addendum for Mercury Emissions," "Calendar Year 2008 Actual Production/Emission Reporting Form Addendum for Mercury Emissions," "Calendar Year 2007 Actual Production/Emission Reporting Form Addendum for Mercury Emissions," and "Calendar Year 2006 Actual Production/Emission Reporting Form Addendum for Mercury Emissions," http://ndep.nv.gov/bapc/hg/aer.html.
[9] *Heavy Metals in the Environment*, edited by Bibudhendra Sarkar, Marcel Dekker, Inc. 2002.
[10] The 93,000 figure is based on the average water use figure of 175, 000 gallons per person per year in the Reno/sparks area, source: Truckee Meadows Water Authority, http://www.tmh2o.com/
[11] This figure is based on data on coal plants from the Union of Concerned Scientists; "A typical (500 megawatt) coal plant burns 1.4 million tons of coal each year. There are about 600 U.S. coal plants." (http://www.ucsusa.org/clean_energy/coalvswind/c01.html), and the U.S. EPA; "Approximately 75 tons of mercury are found in the coal delivered to power plants each year and about two thirds of this mercury is emitted to the air, resulting in about 50 tons being emitted annually." (http://www.epa.gov/mercury/control_emissions/index.htm).
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