



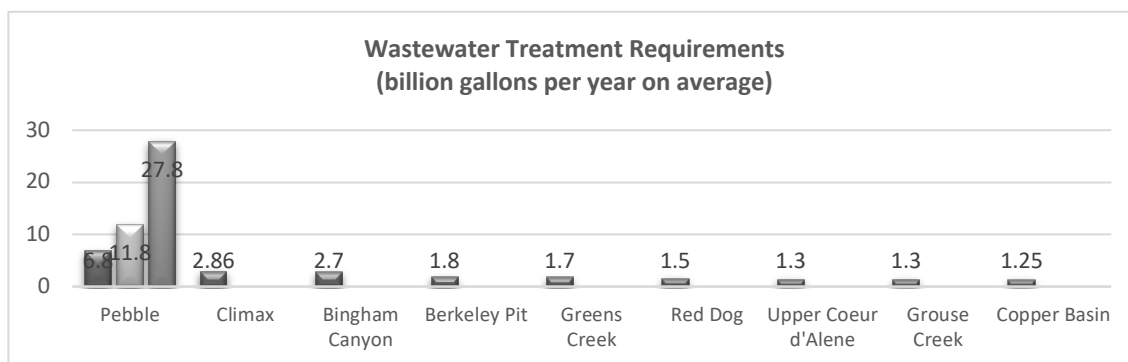
## PEBBLE MINE: UNPRECEDENTED WASTE WATER CAPTURE & TREATMENT REQUIREMENTS

BY BONNIE GESTRING, MAY 2019

The Draft Environmental Impact Statement (DEIS) for the proposed Pebble Mine estimates that the 20-year mine plan will generate an average of 6.8 billion gallons per year of wastewater during operations and 11.8 billion gallons per year after the mine closes (phase 1).<sup>1</sup> The 78-year mine plan would generate an estimated 27.8 billion gallons of wastewater per year after the mine closes.<sup>2</sup> The wastewater will contain metals and other pollution harmful to fish and public health. Capture and treatment of this wastewater will be required in perpetuity,<sup>3</sup> and it must be treated to standards that protect fish and other aquatic life because it will be discharged to surface water (the North Fork Kaktuli River, South Fork Kaktuli River, and Upper Talarik Creek watersheds).<sup>4</sup>

**This is unprecedented. We can find no other U.S. hardrock mining operations that capture and treat such a large volume of contaminated mine water for discharge to surface water (see chart and table below).**<sup>5</sup> This volume is more than three to six times the amount of contaminated mine water treated at the nation's largest Superfund sites (e.g., the Berkeley Pit and Upper Coeur d'Alene Basin) and two to four times the volume treated at the largest operating open pit copper mine in the U.S. (Bingham Canyon).

The proposed water treatment system for the 20-year Pebble mine plan is highly complex and untested.<sup>6</sup> Furthermore, the failure rate for collecting and treating wastewater at operating U.S. mines is significant. Our review of 15 operating open pit copper mines, accounting for 99% of U.S. copper production in 2015, found that 93% failed to capture and treat wastewater, resulting in significant impacts to water quality.<sup>7</sup> This presents an unacceptable risk to the pristine and economically vital waters of the Bristol Bay watershed.



*Graph: Comparison of average annual wastewater treatment requirements for Pebble (20-year mine operations, 20-year mine phase 1 closure, and 78-year mine operations, respectively) with other major mines with large wastewater treatment requirements.*

**Table 1. Comparison of annual average wastewater treatment volumes at the proposed Pebble Mine with other U.S. hardrock mines that treat large wastewater volumes and discharge to surface water, and the impacts of failing to capture and treat wastewater.**

<b>Mining Operation</b>	<b>Estimated Waste Water Treatment (Gallons/Year)</b>	<b>Mine Status</b>	<b>Impacts</b>
Pebble (copper/ gold/ molybdenum)	6.8 billion during operations for 20-year mine plan <sup>8</sup> 11.8 billion after mine closes (years 0-20) for 20-year mine plan <sup>9</sup> 27.8 billion gallons at post closure for 78-year mine plan <sup>10</sup>	Proposed	At risk is the nation's largest and most productive wild sockeye salmon fishery.
Climax (molybdenum)	2.86 billion <sup>11</sup>	Operating	Discharges of zinc, copper, cadmium and lead into Tenmile Creek have exceeded aquatic life standards, and cadmium and lead have exceeded water quality standards. <sup>12</sup> The mine has also been a significant uncontrolled source of phosphorus to Dillon Reservoir, which supplies water to the city of Denver. The mine re-opened in 2012. It has been discharging molybdenum at levels up to 14 times higher than state limits. <sup>13</sup> The mine has requested more time to meet standards and a weakening of the standard. <sup>14</sup> Colorado Health Scientists oppose weakening the standard, saying it would be acutely lethal to aquatic life. <sup>15</sup> Water treatment will be required in perpetuity. <sup>16</sup>
Bingham Canyon (copper/gold/ molybdenum)	2.7 billion <sup>17</sup>	Operating	Acid waters from the leaching of wastes have caused extensive contamination of the groundwater. The impacted aquifer represents approximately ¼ of the potential drinking water for the Salt Lake City Valley. <sup>18</sup> In 2008, the Fish and Wildlife Service took legal action against Kennecott for the release of hazardous substances from the mine's facilities, including selenium, copper, arsenic, lead, zinc and cadmium. <sup>19</sup> Bingham Canyon is currently the largest operating open pit copper mine in the U.S. A portion of the Bingham Canyon is a proposed Superfund site. <sup>20</sup>
Berkeley Pit/Continental Mine complex (copper/gold/ molybdenum)	1.8 billion <sup>21</sup>	Berkeley Pit (Superfund)  Continental Pit (Operating)	Acid mine drainage has contaminated groundwater, surface water and soils with arsenic and other mine contaminants. <sup>22</sup> It is one of the largest Superfund sites in the U.S. The pit lake contains roughly 50 billion gallons of highly acidic water that must be pumped and treated in perpetuity. <sup>23</sup>
Greens Creek (silver)	1.7 billion <sup>24</sup>	Operating	Water quality violations for zinc and lead have occurred as a result of discharges into Greens Creek, and discharges of diesel oil and drilling mud to Zinc Creek. <sup>25</sup> Surface water in Further Creek, Further Seep and Duck Blind Drain has been degraded with sulfates, lower pH and zinc. <sup>26</sup>
Red Dog (lead and zinc)	1.5 billion <sup>27</sup>	Operating	In 1989, zinc contamination from the mine lead to fish kills in the Wulik River, approximately 25 miles downstream from the mine. <sup>28</sup> The EPA issued an Administrative Complaint and penalty. <sup>29</sup> Water

			treatment in perpetuity will be required at the mine to treat acid mine drainage. <sup>30</sup>
Upper Coeur d'Alene and Bunker Hill Mine Complex (lead and silver)	0.8 - 1.3 billion <sup>31</sup>	Closed (Superfund Complex)	The site is considered one of the largest and most complex Superfund sites in the nation, spanning 1,500 square miles and 166 river miles. <sup>32</sup> Both surface water and groundwater in the Upper Basin are severely contaminated. Lead and other metals pose serious risks to people and the environment. <sup>33</sup> Despite decades of clean-up, regular fatalities of tundra swans continue to occur every year from exposure to heavy metals at the site. <sup>34</sup>
Grouse Creek (Gold)	1.3 billion <sup>35</sup>	Closed	There have been multiple exceedances of water quality standards for cyanide and mercury due to leaks from the tailings impoundment. <sup>36</sup> In 2003, the Forest Service and EPA determined the leaking tailings pond an "Imminent and substantial endangerment to human health and the environment," and used CERCLA authority to pull the mine into a time critical removal action. <sup>37</sup>
Copper Basin Mining District (copper)	1.25 billion <sup>38</sup>	Closed (Superfund Complex)	Acid mine drainage has polluted streams in the North Potato Creek and Davis Mill Creek watersheds and parts of the Ocoee River with high concentrations of iron, copper, manganese, aluminum, and zinc. <sup>39</sup> Contaminated sediments impact the Ocoee River adjacent to the mining operations and continue approximately 25 miles downstream of the site. <sup>40</sup>
Summitville (gold)	1.1 billion <sup>41</sup>	Closed (Superfund)	A major spill at the mine resulted in the release of acid mine drainage into the Wightman Fork and the Alamosa River. <sup>42</sup> The Alamosa River system below the site does not fully support aquatic life. There has been some uptake of metals in livestock, and some agricultural soil degradation from irrigation. <sup>43</sup>
Chino & Cobre (copper)	0.77 billion <sup>44</sup>	Operating	In 2011, the U.S. Department of Justice and State of New Mexico issued a consent decree for damages to natural resources from the Chino Mine. The investigation of natural resource injuries was related to the release of hazardous substances into the environment from acid mine drainage and process solution, among other sources. <sup>45</sup> The groundwater pollution plume extends over 13,935 acres from Chino and 528 acres from Cobre. <sup>46</sup> The 2003 ecological risk assessment reported elevated concentrations of copper and zinc in surface water from five different drainages at Chino.
Central City/Clear Creek (gold/silver)	0.45 billion <sup>47</sup>	Superfund	Mining and milling activities resulted in the watershed becoming contaminated with heavy metals, significantly impacting aquatic life and potentially threatening human health. <sup>48</sup>
Questa (molybdenum)	0.4 billion <sup>49</sup>	Closed (Superfund)	Groundwater, surface water, sediments, soils and biological resources on and around the Questa site and Red River Corridor have been contaminated with heavy metals. <sup>50</sup> According to the U.S. EPA, over 230 tailings spills occurred from 1966-1991 along the Red River floodplain. <sup>51</sup> Unauthorized releases continued to be a problem after mine closure in 2014, due to the company's difficulty in constructing and operating a water treatment plant. <sup>52</sup>

<sup>1</sup> Average annual water treatment during operations, based on 50<sup>th</sup> percentile (29 cfs converted to billions of gallons per year). Source: Knight Piesold Ltd., Pebble Project: Pebble Mine Site Operations Water Management Plan July 6, 2018. Table 4.2, p. 47. Average annual water treatment during closure phase I (50 cfs converted to billions of gallons per year), based on 50<sup>th</sup> percentile Source: Knight Piesold, Pebble Mine Site – Closure Water Management Plan, September 21, 2018. Table 5.1, p. 23. The average annual water treatment plant discharge drops to 30 cfs in Phase 3 of closure and to 13 cfs at Phase 4 (Table 4.16-3) DEIS.

<sup>2</sup> An annual average discharge of 118 cfs (converted to 27.8 billion gallons per year) from pit lake required to maintain pit lake level. Source: Prucha, Robert H., “Review of Groundwater Impacts of the Proposed Pebble Mine in the February 2019 Draft EIS and Evaluation of Potential Impacts to the Coupled Hydrologic System,” May 14, 2019 (DRAFT)

<sup>3</sup> U.S. Army Corps of Engineers, Pebble Project Draft Environmental Impact Statement, February 2019, p. 4.18-17 and p. 4.18-18.

<sup>4</sup> U.S. Army Corps of Engineers, Pebble Project Draft Environmental Impact Statement, February 2019, p. 4.18-17 and p. K4.18-2.

<sup>5</sup> There are mines in Nevada that capture and discharge large volumes of mine water into groundwater via infiltration trenches. However, there are no large mines in Nevada that capture, treat and discharge an annual average of 29-50 cfs into surface water. Source: e-mail response from Rob Kuczynski, P.E., Supervisor, Regulation Branch, Bureau of Mining Regulation and Reclamation, Nevada Division of Environmental Protection, May 13, 2019.

<sup>6</sup> Andre Sobolewski, Clear Coast Consulting, Technical Memorandum re: Review of water treatment plants proposed for Pebble Project (DRAFT), April 22, 2019.

<sup>7</sup> Earthworks, U.S. Operating Copper Mines: Failure to Capture and Treat Wastewater, May 2019.

<sup>8</sup> Average annual water treatment during operations, based on 50<sup>th</sup> percentile (29 cfs converted to billions of gallons per year). Source: Knight Piesold Ltd., Pebble Project: Pebble Mine Site Operations Water Management Plan July 6, 2018. Table 4.2, p. 47.

<sup>9</sup> Average annual water treatment during closure phase I (50 cfs converted to billions of gallons per year), based on 50<sup>th</sup> percentile Source: Knight Piesold, Pebble Mine Site – Closure Water Management Plan, September 21, 2018. Table 5.1, p. 23. The average annual water treatment plant discharge drops to 30 cfs in Phase 3 of closure and to 13 cfs at Phase 4 (Table 4.16-3) DEIS.

<sup>10</sup> An annual average discharge of 118 cfs (converted to 27.8 billion gallons per year) from pit lake required to maintain pit lake level. Source: Prucha, Robert H., “Review of Groundwater Impacts of the Proposed Pebble Mine in the February 2019 Draft EIS and Evaluation of Potential Impacts to the Coupled Hydrologic System,” May 14, 2019 (DRAFT).

<sup>11</sup> Average flow of new WTP is expected to be 5,433 gpm (or 2.856 billion gallons per year). Source: Climax Molybdenum Co. “Reclamation Permit Number 1977-493. Technical Revision TR-19.” Property discharge water treatment plant (PDWTP). p. 7. <http://drmsweblink.state.co.us/drmsweblink/0/doc/952054/Electronic.aspx?ssearchid=40649396-d8b8-4135-9d17-0b9514614b46>

<sup>12</sup> Northwest Colorado Council of Governments. 2012. *Blue River Water Quality Management Plan*. pp. B-5, B-14, B-15, B-19, B-20, B-30. <http://nwccog.org/wp-content/uploads/2015/04/Blue-River-Watershed-2012-208-Plan.pdf>

<sup>13</sup> Denver Post, “Climax Mine asks for third extension of molybdenum water pollution limits and no one is objecting.” January 3, 2018. <https://www.denverpost.com/2018/01/03/climax-mine-molybdenum-water-pollution-extension/>

<sup>14</sup> Id.

<sup>15</sup> Denver Post, CDPHE scientists warn Climax Mine Molybdenum may pose health risk, oppose companies push to raise statewide pollution limit. January 11, 2018. <https://www.denverpost.com/2017/11/01/climax-mine-molybdenum-pollution-poses-risk-colorado-public-health/>

<sup>16</sup> <https://www.watereducationcolorado.org/publications-and-radio/headwaters-magazine/fall-2012-rooted-in-colorado/climax-comes-back/>

<sup>17</sup> Average of 2,600 gpm at water treatment plant for Zone A and Zone B. Source: E-mail from Douglas Bacon, Project manager-Kennecott, Utah Department of Environmental Quality, January 29, 2019.

<sup>18</sup> [https://deq.utah.gov/legacy/great-salt-lake-advisory-council/docs/2011/Mar/031611\\_southwest.pdf](https://deq.utah.gov/legacy/great-salt-lake-advisory-council/docs/2011/Mar/031611_southwest.pdf)

<sup>19</sup> United States v. Kennecott Utah Copper Corporation. Complaint Case: 2:08cv00122. February 14, 2008. [https://www.fws.gov/mountain-prairie/nrda/lakepointwetlands/r\\_Kennecott\\_Utah\\_Copper\\_CDFinal.pdf](https://www.fws.gov/mountain-prairie/nrda/lakepointwetlands/r_Kennecott_Utah_Copper_CDFinal.pdf)

<sup>20</sup> EPA website, Superfund Site: Kennecott (South Zone), Available at: <https://cumulis.epa.gov/supercpad/SiteProfiles/index.cfm?fuseaction=second.cleanup&id=0800601>

<sup>21</sup> Currently treating 5 million gallons per day. Source: E-mail from Garrett Smith, Hardrock Mining Bureau Permit Section, Montana DEQ, January 23, 2019. Missoulain, “Treating toxics countdown begins on Berkeley Pit water,” June 20, 2016. Available at: [https://missoulain.com/news/state-and-regional/treating-toxics-countdown-begins-on-berkeley-pit-water/article\\_29d53a79-1dad-5b57-8fc5-b113a955afb9.html](https://missoulain.com/news/state-and-regional/treating-toxics-countdown-begins-on-berkeley-pit-water/article_29d53a79-1dad-5b57-8fc5-b113a955afb9.html)

<sup>22</sup> U.S. EPA, Superfund Site: Silver Bow Creek/Butte Area, Butte, Montana, <https://cumulis.epa.gov/supercpad/SiteProfiles/index.cfm?fuseaction=second.ous&id=0800416>

<sup>23</sup> Montana Standard, Getting the Berkeley Pit Under Control: Pumping Treated Water Could Start as Soon as March,” December 10, 2018. Available at: [https://mtstandard.com/news/local/getting-the-berkeley-pit-under-control-pumping-treated-water-could/article\\_404e9d28-8931-5e34-b0d9-521b75aca267.html](https://mtstandard.com/news/local/getting-the-berkeley-pit-under-control-pumping-treated-water-could/article_404e9d28-8931-5e34-b0d9-521b75aca267.html)

<sup>24</sup> Greens Creek APDES Fact Sheet 4.2 at 12.

Available at; [http://dnr.alaska.gov/mlw/mining/largemine/greencreek/pdf/gc-apdesfactsheet\\_ak0043206.pdf](http://dnr.alaska.gov/mlw/mining/largemine/greencreek/pdf/gc-apdesfactsheet_ak0043206.pdf).

<sup>25</sup> Juneau Empire, “Two firms in Southeast Alaska pay sizeable environmental fines,” June 13, 2006; Juneau Empire; Alaska Department of Environmental Conservation, Alaska Pollution Discharge Elimination System Permit Fact Sheet, Permit Number AK0043206, Permit Issuance Date September 30, 2011.

<sup>26</sup> U.S. Department of Agriculture, Greens Creek Mine Tailings Disposal Facility Expansion, Draft Environmental Impact Statement, April 2012.

<sup>27</sup> Alternative B predicted that an average of 1,527 million gallons would need to be discharged annually until the year 2026 to maintain the water balance in the tailings impoundment. After that period, an average of 1,350 million gallons would need to be discharged annually. Alternative B was selected by EPA as the preferred alternative. Source: Tetrattech, Oct. 2009. Red Dog Mine Extension - Aqqaluk Project. Final Supplemental Environmental Impact Statement. Available at:

<http://dnr.alaska.gov/mlw/mining/largemine/reddog/pdf/rdseis2009vol1.pdf>

<sup>28</sup> Zinc levels in creek concern state officials,” Anchorage Daily News, October 7, 1989. Anchorage Daily News, “Toxic metals foul stream near mine,” August 16, 1990; United States Environmental Protection Agency Region 10, Administrative Complaint, Docket No. 1091-02-16-309(g), February 28, 1991.

<sup>29</sup> United States Environmental Protection Agency Region 10, Administrative Complaint, Docket No. 1091-02-16-309(g), February 28, 1991

<sup>30</sup> Tetrattech, Oct. 2009. *Red Dog Mine Extension - Aqqaluk Project. Final Supplemental Environmental Impact Statement*. Available at [http://northern.org/media-library/document-archive/clean-water-mining/red-dog-mine/aqqaluk-final-seis/Red\\_Dog\\_Final%20SEIS.pdf](http://northern.org/media-library/document-archive/clean-water-mining/red-dog-mine/aqqaluk-final-seis/Red_Dog_Final%20SEIS.pdf)

<sup>31</sup> Current flows are between 1,500 – 2,499 gpm. Source: E-mail from Dan McCracken, P.E. Kellogg Remediation Program Manager, Department of Environmental Quality, January, 24, 2019.

<sup>32</sup> U.S. EPA website: Bunker Hill Mining & Metallurgical Complex Smelterville, ID. Available at: <https://cumulis.epa.gov/supercpad/SiteProfiles/index.cfm?fuseaction=second.cleanup&id=1000195>

<sup>33</sup> Id.





<sup>34</sup> Coeur d'Alene Press, "A particularly Deadly Season for Swans in the CDA River Basin, April 9, 2019. Available at: [https://www.cdapress.com/local\\_news/20190409/a\\_particularly\\_deadly\\_season\\_for\\_swans\\_in\\_the\\_cda\\_river\\_basin](https://www.cdapress.com/local_news/20190409/a_particularly_deadly_season_for_swans_in_the_cda_river_basin). Idaho Fish and Game, Press Release: Tundra swans are dying from historic mine waste in the Coeur d'Alene River Basin. <https://idfg.idaho.gov/press/tundra-swans-are-dying-historic-mine-waste-coeur-dalene-river-basin>

<sup>35</sup> <https://www.deq.idaho.gov/media/60181001/yankee-fork-salmon-river-jordan-creek-hecla-mining-company-grouse-creek-unit-npdes-401-certification-1217.pdf>

<sup>36</sup> U.S. EPA Fact Sheet, NPDES permit Number: ID 002646-8, November 24, 1999.

<sup>37</sup> U.S. Forest Service and U.S. EPA, Removal Action Memorandum, Grouse Creek Tailings Impoundment Dewatering, May 21, 2003.

<sup>38</sup> E-mail of annual treatment volume at the Copper Basin Mining Superfund Site for 2018 from Ashley Pulley, P.E., Environmental Consultant, Division of Remediation, Tennessee Department of Environment and Conservation, January 23, 2019.

<sup>39</sup> Faulkner, B., Wyatt, E.G., Chermak, J.A. and Miller, F.K. 2005. "The largest acid mine drainage treatment plant in the world." Paper presented at the 26th West Virginia Surface Mine Drainage Task Force, April 19-20, 2005. p. 2. <http://wvmdtaskforce.com/proceedings/05/fulkner.pdf>; ATSDR. 2001.

"Sulfide in well water." *Health Consultation, Copper Basin Mining District*. <http://www.atsdr.cdc.gov/hac/pha/pha.asp?docid=1357&pg=1>

<sup>40</sup> U.S. EPA, Copper Mining District Case Study, July 2005.

<https://semspub.epa.gov/work/04/11121241.pdf>

<sup>41</sup> Up to 2,100 gpm. Source: Denver Post, "One of Colorado's worst superfund sites has been fixed, but the State's on the hook for \$2M a year to keep it clean," July 10, 2018. Available at: <https://www.denverpost.com/2018/07/10/colorado-summitville-mine-cleanup/>.

<sup>42</sup> EPA Superfund website:

<https://cumulis.epa.gov/supercpad/cursites/csinfo.cfm?id=0801194>

<sup>43</sup> Id.

<sup>44</sup> Current = 171 million gallons from Cobre Mine to Chino Water Treatment Plant + 600 million gallons per year from Chino Mine = 771 million gallons. Source: Golder Associates. Aug. 2007. Chino Closure/Closeout Plan - 2007 Update. Basis Of Cost Estimate For Water Treatment With Comingling. [http://www.emnrd.state.nm.us/mmd/marp/permits/documents/GR009RE\\_20081121\\_Chino-ClosureCloseoutPlan-AppendixD-08282007.pdf](http://www.emnrd.state.nm.us/mmd/marp/permits/documents/GR009RE_20081121_Chino-ClosureCloseoutPlan-AppendixD-08282007.pdf); Telesto Solutions Inc. Aug. 2009. 2009 Cobre Closure/Closeout Plan. Prepared for Freeport-McMoran, Inc. Table C.5. [http://www.emnrd.state.nm.us/mmd/marp/permits/documents/GR002RE\\_20090810\\_Cobre\\_2009\\_Closure\\_Closeout\\_Plan.pdf](http://www.emnrd.state.nm.us/mmd/marp/permits/documents/GR002RE_20090810_Cobre_2009_Closure_Closeout_Plan.pdf)

<sup>45</sup> United States and State of New Mexico v. Freeport McMoran Corporations, et. al, Consent Decree, Case 1:11-cv-01140. December 2011.

<sup>46</sup> New Mexico Office of Natural Resources Trustee. Jan. 2012. Final Groundwater Restoration Plan for the Chino, Cobre, and Tyrone Mine Facilities. Available at:

[http://www.gilaresources.info/pdfs/Final.Groundwater.Restoration.Plan.Chino.Cobre.Tyrone\\_1.4.2012.pdf](http://www.gilaresources.info/pdfs/Final.Groundwater.Restoration.Plan.Chino.Cobre.Tyrone_1.4.2012.pdf)

<sup>47</sup> 250 gpm at ATWTP and 600 gpm at NCCWTP. Source: EPA, Fifth Five-Year Review Report for Central City/Clear Creek, November 2017.

<sup>48</sup> EPA Superfund website:

<https://cumulis.epa.gov/supercpad/SiteProfiles/index.cfm?fuseaction=second.cleanup&id=0800257>

<sup>49</sup> Approximately 1 million gallons per day. Source: Taos News, "Success Story: Golder Associates and the former Chevron Questa Mine," January 23, 2019. Available at: <https://www.taosnews.com/stories/success-story-golder-associates-and-the-former-chevron-questa-mine,48517>

<sup>50</sup> EPA Superfund website:

<https://cumulis.epa.gov/supercpad/SiteProfiles/index.cfm?fuseaction=second.Cleanup&id=0600806#bkgground>

<sup>51</sup> U.S. EPA, Record of Decision, Molycorp Inc., Questa, New Mexico, Cerclis ID No. NMD002899094, December 20, 2010.

<sup>52</sup> <https://apnews.com/577b1901523244cdbcfd27f5440d2cfb6>



EARTHWORKS • 1612 K St., NW, Suite 808 Washington, D.C., USA 20006  
www.earthworksaction.org • bgestring@earthworksaction.org • 406-549-7361