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Proposed Priority: Mineral Processing

Universe and Types of Facilities

Evidence gathered in recent inspections indicates that mineral processing facilities are failing to obtain the necessary permits and adequately manage their wastes. EPA has found that the mishandling of mineral processing wastes has caused significant environmental damages and resulted in costly cleanups. These highly acidic wastes have caused fish kills and the arsenic and cadmium that these wastes often contain have been found in elevated levels in residential wells. Mining is defined simply as the taking of minerals, either fuel minerals or non-fuel minerals, from the earth. Non-fuel minerals are further divided into metallic and nonmetallic minerals. **SIC code 14** includes establishments that conduct mining and quarrying of nonmetallic minerals, except fuels; and those engaged primarily in mining or quarrying, developing mines, or exploring for non-fuel, nonmetallic minerals. The metal mining industry (**SIC code 10**) includes facilities engaged primarily in exploring for metallic minerals, developing mines, and ore mining. Hardrock mining involves uncovering and extracting non-fuel metal and mineral deposits of solid ores or eroded deposits in streambeds.

Large companies tend to dominate mining of such metals as copper, silver, and gold, while more diverse mine operators may be involved in mining lead, zinc, and iron metals. According to USDA, **abandoned mine sites**, which are on private, state, and public lands, pose significant physical and/or environmental hazards. Of the approximately 65,000 abandoned sites under BLM's jurisdiction, the agency estimates that 5% may have CERCLA or water quality problems and about 25% have physical safety hazards.

Geographic Range

Most mining for base and precious metals occurs in the western US while mining for industrial rocks and minerals is more common in the eastern US.

Key Pollutants and Risk Factors

Mining produces significant amounts of **waste and byproducts**, ranging from 10% to over 99.99% of the total material mined. Wastes include overburden and waste rock, which are primarily disposed of in piles near the mine site. Waste rock dumps are generally constructed on unlined terrain, with underlying soils stripped, graded, or compacted depending on engineering considerations. Tailings, also a common mining waste, contain a mixture of impurities, trace metals, and residue of chemicals used in the beneficiation process. Tailings usually leave the mill as a slurry consisting of 40-70% liquid mill effluent and 30-60% solids; liquids are commonly re-used in milling processes. While most mine tailings are disposed in on-site impoundments, some tailings are dewatered and disposed of in piles; thus minimizing seepage volumes and the amount

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of land required for an impoundment. Specific types of environmental impacts include:

- **Acid mine drainage (AMD)**, resulting from sulfide oxidation in rocks exposed to air and water, can pose significant threats to surface and groundwater quality and resources not only during active mining, but also for decades after operations cease. Abandoned mines and refuse piles can produce AMD for over 50 years. AMD lowers water pH making it unable to support many forms of aquatic life; carries toxic, metal-bearing sediment into streams, killing waterborne plant and animal species; and increases disease risks for humans consuming drinking water and fish tissue with a heavy metal content.
- **Acid leaching operations** use high concentrations of acids to extract metals from ore, producing large volumes of metal-bearing acid solutions. Contamination of soil, groundwater, and surface water is caused by leakage, spillage, or seepage of the leaching solution at various stages of the process. Significant risks are posed to human health due to **metal contamination**. Specifically, children living near abandoned lead and zinc mines are especially at risk due to high level of lead found in their blood.
- **Fugitive Dust Emissions:** Many mining operations (ore crushing, conveyance of crushed ore, loading bins, blasting, mine and motor vehicle traffic, waste rock piles, windblown tailings) emit particles as fugitive dust. This dust can contain arsenic, lead, and other toxic heavy metals, and can be deposited in surface water, causing sedimentation and turbidity.
- **Erosion and Sedimentation:** Erosion and sedimentation affect surface water and wetlands more than any other media. Erosion can also adversely affect soil organisms, vegetation, and revegetation efforts because it results in the movement of soil, including topsoil and nutrients, from one location to another.
- **Cyanide and Other Chemical Releases:** Cyanide, which is used during the mining of gold and silver, can adversely impact water, soil, aquatic organisms, wildlife, waterfowl, and humans. Other chemicals (oil, petroleum products, solvents, acids, and reagents) used during the beneficiation process or in vehicles and equipment can impact human health and the environment if released.
- **Habitat Modification:** Mining, which can cause large disturbances to the land, affect the withdrawal and discharge of water, manipulate the topography, and release particulates and chemicals, can have indirect impacts on various habitats.

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- **Disruption of Surface Water and Groundwater:** The massive quantities of water necessary for mining can disrupt surface water and groundwater flows, and result in drawdown. Drawdown reduces the water available for recharging wetlands and surface waters, thereby affecting any organisms that depend on those waters. Water that percolates through waste piles and tailings can become contaminated with heavy metals, thus contaminating both groundwater and surface water.
- **Subsidence:** Mining subsidence is the surface impact of collapsing overlying strata into mined-out voids, creating sinkholes or troughs. Sinkholes interrupt surface water drainage patterns, affecting ponds, streams, and wetlands.
- **Aesthetics:** Most mining operations cause aesthetic impacts, including large land disturbances such as unnatural anomalies and holes; lack of vegetation; and impacted wildlife habitats.