Mining Impacts on the Environment

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Overview

• Key Messages on Hardrock Mining
• Problems Caused by Mining Sites
• EPA’s Role at Mining Sites
Key Messages

- Mining is a complex long term activity.
- Modern mining often resembles a complex chemical plant rather than a quarry due to the reliance on acids and cyanides.
- Environmental management of mining requires attention from the very beginning of mine design throughout the life of the mine until closure.
- Environmental compliance requires a robust monitoring program which provides data to the public on a regular basis.
- Reclamation and closure planning begin at the start of mining and are refined throughout the life of the mine.
- Environmental modeling of mine waters is extremely complex. Modeling must be confirmed with life of mine monitoring.
- Environmental impacts may not become apparent until years after closure.
- Mines should be required to obtain financial assurance to cover the costs of remediation by a third party.
Key Messages (cont.)

• The current price of gold has encouraged the expansion of existing mines and the exploration for gold in unconventional locations.

• The price of copper has also increased and the exploration and expansion of copper mines has increased in the US in areas where sulfide mining has not occurred (Michigan, Minnesota)

• The price of uranium has triggered a broad exploration effort throughout the US. Uranium mines and mills may reopen.

• It is likely that there will be broader use of In-Situ uranium mining in the US since it is a low cost method of uranium recovery.

• There is a growing concern that the US does not have direct access to Rare Earths and its mining may increase over the next decade.
Problems Caused by Mine Sites

Environmental Impacts
Hardrock Mining Operations

Surface mining

Underground Mining
Environmental Impacts From Mining

- Contaminated mine water and Acid Mine Drainage (AMD): possible contamination of rivers and streams
- Soil and land-based contamination
- Metal contamination and associated sediments
- Sedimentation and erosion
- Degradation of biological resources: fish
Contaminated Mine Water and Acid Mine Drainage (AMD)

- Generated when metal sulfide minerals are oxidized

- US Bureau of Mines estimated 12,000 miles of western US waterways (about 40 percent) and 180,000 acres of lakes and reservoirs have AMD contamination.

- Tell-tale yellow/orange color of iron deposits
Where do you find AMD at mining sites?
Soil and Land-Based Contamination

This tailings pond will require a low permeability cap to minimize leaching of contaminants into a nearby stream.
Soil and Land-Based Contamination

Blowing tailings at the Holden Mine in Washington
Terrestrial Impacts and Risk

- Air transport of particulate matter and acid emissions
  - Contamination of soils
  - Biological and Vegetation loss and stress

- Massive physical alterations of terrain and erosion
  - Biological /Vegetation loss and degradation
  - Erosion
Uranium Impacts

- Navajo Nation (27,000 square miles stretching over AZ, UT, NM) contains one of the richest uranium deposits in the world
- 140 million tons of uranium mill tailings scattered throughout the western U.S
- Tailings contain radium, decays to produce radon, along with selenium, molybdenum, uranium, and thorium.
- Loss of vegetation cover and erosion
In-situ Uranium Leach Design
new wells primarily inject carbon dioxide, oxygen, and/or sodium bicarbonate along with local aquifer water; but at least one proposal (for South Dakota) would use acid leach
January 24 Letter From EPA to Senator Salazar
Environmental Effects of ISL Facilities

• Possible environmental impacts from ISL facility operation would primarily be to groundwater at the facility, although contamination of soil, surface water and air also may occur.

• Groundwater contamination from ISL generally can occur in three ways:
  – (1) through unavoidable contamination of the exempted portion of the aquifer in which the uranium deposit is localized,
  – (2) through unintentional contamination due to contaminants moving inside of the exempted aquifer area, and
  – (3) as a result of facility structural failure and surface spills.
January 24 letter from EPA to Senator Salazar
Environmental Effects

• Solid waste from ISL consists of soil, bedrock material, the by-product waste from the drilling of injection and production wells, and solids precipitated from fluid holding/evaporation ponds.

• Surface water contaminated by erosion from ISL facilities and wastes may percolate into ground water.

• Both solid and liquid waste from ISL operations have some residual uranium and radium-226 that when improperly disposed or handled may be carried in particulate form by flowing water, potentially leach through soil into ground water, or pollute the air by release of radon.
Under UMTRCA (and RCRA), restoration of groundwater at mills and ISL facilities must be to

- (1) background; or
- (2) Maximum Concentration Limits (equivalent to MCL’s) for particular constituents, whichever is higher (also includes molybdenum, silver, and lead); or
- (3) Alternate Concentration Limits (ACLs), if established

ACLs must be determined on a case-by-case basis by NRC and meet ALARA

Class of use is not an approved provision under UMTRCA/RCRA for meeting ACL’s and ALARA
EPA’s UIC regulations promulgated under the Safe Drinking Water Act (40 CFR 144 and 146) provide standards which must be followed by ISL injection well applicants: UIC Class III injection wells, UIC Class V disposal wells

- Independent of uranium ISL license application to NRC, operator applies to EPA for aquifer exemption and injection well permits
- Typically required:
  - Geologic and hydrologic data and modeling that provides full characterization of the site
  - Define a Project Area for each minable unit, define the Monitoring Well Ring, and propose the boundary of the exempted portion of the injection zone aquifer
- Region will evaluate proposed exemption area relative to the minable portion of the Project Area
Laws & Regulations

What EPA Can and Cannot Do Under its Regulations
Mine Regulation and Life-Cycle

Mineral Development and Mine Rehabilitation Activities through the Mine Life Cycle
General Mining Law of 1872 (30 USC 29)

• Provides a mining claimant the right to patent (i.e., acquire absolute title to minerals) mining claims or sites if they meet the statutory requirements.

• The BLM administers this program through its Washington and 12 State Offices
Federal Land Policy Management Act (FLPMA)

- **Authority:** FLPMA PL 94-79 302b, 314
- **Lead Agency:** DOI
- **Associated Regulations/Policy:** NEPA Process, 40 CFR 1506.11; BLM H-1790-1 Surface Management Regulations, 43 CFR 3809; Mining Claim Occupancy, 43 CFR 3715
- **Land Ownership:** Public
- **Hazard Type:** Environmental/Water Quality; Physical Safety Hazards
National Environmental Policy Act

- **Authority:** 40 CFR 1506.11

- **Lead Agency:** EPA

- **Associated Regulations/Policy:** Exemptions as specified in Section 511(c) of the CWA, Section 7(c) of the Energy Supply and Environmental Coordination Act of 1974 (15 U.S.C. 793(c)(1)), and CERCLA.

- **Land Ownership:** Federal

- **Hazard Type:** Environmental/Water Quality; Physical Safety Hazards
Clean Water Act

• Mines discharging to waters of the US must obtain an NPDES permit
• EPA has established discharge standards for ore mining and dressing category
• Mines can be designed to be zero discharge facilities.
• Mines are subject to the national storm water general permit
The 1980 Bevill Amendment to RCRA excludes extraction and benefication wastes from regulation as RCRA Subtitle C hazardous wastes.

- Mining wastes are RCRA solid wastes.
- Regardless of the Bevill Amendment, mining wastes are fully subject to CERCLA.
CERCLA

- **Authority:** CERCLA 42 U.S.C. Section 9601 et seq, cover mining wastes which release hazardous constituents into the environment which present a threat to human health and the environment.

- **CERCLA 104/106 authorities were delegated to BLM and the FS on federal lands.**

- **Lead Agency:** EPA; Authority provided to other federal agencies under Executive Order 12580/13016

- **Associated Regulations/Policy:** 40 CFR Part 300—National Oil and Hazardous Substance Pollution Contingency Plan

- **Land Ownership:** All

- **Hazard Type:** Environmental and water quality hazards
Further Information

Contact the your Region Mining Team:

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Also contact your Regional Tribal Coordinators