ENVIRONMENTAL LAW & POLICY CENTER

June 16, 2023

Bryan Karchut
Black Hills National Forest
1019 N. 5th Street
Custer, SD 57730

RE: Pactola Reservoir – Rapid Creek Watershed Withdrawal, #NP-3479

Dear Mr. Karchut:

Thank you for the opportunity to comment on the proposed Pactola Reservoir—Upper Rapid Creek mineral withdrawal. The Environmental Law & Policy Center (ELPC) supports the withdrawal, but ELPC recommends and requests that the agencies consider expanding the withdrawal from the specific HUC-12 subwatershed in the proposal to the entire Rapid Creek HUC-8 (#10120110) watershed, or to more of the other eleven HUC-12 subwatersheds that drain into the Reservoir. In particular, we recommend inclusion of the North Fork Rapid Creek, South Fork Rapid Creek, Castle Creek, and State Creek subwatersheds further upstream. Because of the nature of the geology of the central Black Hills, gold mining in those additional areas could pose a significant threat to the water quality of the Reservoir, which is the primary drinking water source for Rapid City and Ellsworth Air Force Base, and to area groundwater as well.

ELPC is an environmental public interest law organization headquartered in Chicago, with offices throughout the Midwest. ELPC has a long 30-year record of advocating for the environment throughout the region, and has previously been involved in other controversies involving sulfide mining and the threat it poses to water quality.

ELPC is of course quite aware of the unfortunate history of the U.S. unilaterally breaching its obligations under the 1868 Fort Laramie treaty when gold appeared in the Black Hills, and ELPC fully supports the claims of the Lakota bands in the region to be able to decide for themselves how land and water on the Great Sioux Reservation should be managed. ELPC also acknowledges that the area around Pactola Reservoir and the Upper Rapid Creek watershed contains numerous historic and cultural resources of particular value to the tribes that must be protected. And, of course, any mining in this region could result in disparately adverse impacts on recognized environmental justice communities.

ELPC's focus in this comment, however, is on the specific environmental issues posed by possible gold mining operations in the Pactola/Upper Rapid Creek area, with a particular concentration on water impacts. ELPC also addresses arguments opponents of the proposed mineral withdrawal might offer.

The Upper Rapid Creek/Pactola Reservoir Area

The Pactola Reservoir, Upper Rapid Creek, and its tributaries are the primary source of drinking water for Rapid City, South Dakota and for Ellsworth Air Force Base (AFB). Surface or groundwater contamination in the Rapid Creek watershed can also negatively affect the Madison Aquifer, which provides drinking water to most of western South Dakota.

The Pactola Reservoir has 15 miles of lakeshore and 800 acres of open water. Since its construction in 1952, the Reservoir Complex has become a significant recreational resource, with high-quality trout fishing, boating, camping, picnicking, hiking, and swimming. Upper Rapid Creek feeds into the Reservoir, with the North Fork of Rapid Creek and Castle Creek its principal tributaries. Then, below the dam on U.S. 385, Rapid Creek flows down to Rapid City and then the AFB.

The geology in the area consists largely of very old Precambrian metamorphic rocks overlain by younger Paleozoic sedimentary rocks. The younger rock, often limestone or sandstone, has substantial fracture and permeability; even the older rocks are permeable due to fracturing and weathering. Acid rock drainage, either from natural sources or from sulfide mining, has been an issue for decades, as has iron bog leaching. Very low pH groundwater escapes to the surface from seeps and springs, and there have been stream reaches with enough contamination to have significant adverse effects on plants and wildlife. Much of the acidic drainage comes from abandoned mines in the area.[1]

The interaction of surface water and groundwater in the central Black Hills is complex. In some cases, streams are recharge sources for groundwater, other times groundwater is what is supplying the streams. Because the rock is typically fractured, the subsurface conductivity for water in the area can be quite rapid, and cannot be assumed to follow surface watershed lines.

Despite these chronic problems, Rapid City and Ellsworth AFB have been able to deliver high-quality drinking water as the contaminants are diluted and eventually subjected to active treatment. Additional contamination could very well make that considerably more difficult or expensive to accomplish. And additional contamination, and its impact on fish, plants, and wildlife, could significantly reduce the area's recreational value.

Potential Water Impacts

Gold mining poses a significant risk to water quality.[2] ELPC should not need to remind the agencies involved here that gold mining's environmental record is disturbing, both globally

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[1] *See generally* Kenner et al., *Upper Rapid Creek Watershed Assessment* (2004), https://danr.sd.gov/Conservation/WatershedProtection/ReportsPublications/upperrapidcreek_assess_final.pdf; *see also* Redden et al., *Maps Showing Geology, Structure, and Geophysics of the Central Black Hills, South Dakota* (USGS 2008),https://pubs.usgs.gov/sim/2777/.

[2] ELPC of course recognizes the difference between mineral exploration and actual mining. *See generally* USFS, *Federal Hardrock Minerals Prospecting Permits Project* (Superior National Forest May 2012),

and nationally. Gold mine disasters such as the Zortman-Landusky mine in Montana, the Summitville mine, and the Gold King spill in Colorado illustrate just how devastating the consequences can be.

The only large active gold and silver mine in the Black Hills—the Coeur Wharf Resources mine north of Terry Peak and west of Lead—itself has a checkered history, with an admitted "accidental, low-level cyanide and ammonia release" into Annie Creek in the 90's and early 2000's. The Couer Wharf Resources mine reported 181surface spills since 1983, and the surrounding surface and groundwater suffers from elevated nitrate, uranium, and arsenic levels.[3] The mine was forced to discharge polluted water on an emergency basis in 2014,[4] and is currently in violation of the surface water quality standards for selenium.[5]

The threats to water quality are many, but there are four of particular concern:

(1) *Acid mine drainage:* As the agencies well know, when sulfide ores are exposed to air and water, the chemical reaction results in sulfuric acid, which lowers the pH of any water it may reach. Acid mine drainage can come from exposed rock at the mine site, exposed heap leach piles where gold or other metals are extracted from the ore, and waste piles that remain when extraction is completed. The acid can not only directly affect fish, plants, and wildlife, but it can leach out heavy minerals which can pose a significant risk to human health. Acid mine drainage does not go away, and can require perpetual water treatment following a mine closure.[6]

(2) *Sulfates:* Another byproduct of exposing sulfide ore to air and water is sulfate. Once thought to be a minor drinking water irritant, sulfates are now associated (along with sulfate-reducing bacteria) with the methylation of always-present mercury. Methylmercury is the chemical form that bioaccumulates in fish, and can be a significant neurotoxin.[7] Just this past month, the U.S. Army Corps of Engineers revoked permits for the proposed NewRange copper-nickel sulfide mine in northeastern Minnesota, in large part because there were no permit conditions that could reasonably assure that methylmercury contamination associated with sulfates

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https://www.lrl.mn.gov/docs/2015/other/150681/PFEISref_2/USFS%202012b.pdf. While exploration itself can have significant adverse environmental impacts, ELPC's focus is on effects of full-blown mining projects.

[3] Darsha Dodge, *DANR to hold hearing on future of Wharf Mine Boston Expansion*, Rapid City Journal (May 16, 2023), https://rapidcityjournal.com/danr-to-hold-hearing-on-future-of-wharf-mine-boston-expansion/article_b72d2994-f294-11ed-bfb2-c38c86bb8cc0.html. Exhibit 1.

[4] Charles Michael Ray, *Heavy Runoff Overwhelms WHARF Pollution Control*, South Dakota Public Broadcasting (May 21, 2014), https://listen.sdpb.org/environment/2014-05-21/heavy-runoff-overwhelms-wharf-pollution-control

[5] Makenzie Huber, *State board considering expansion of Black Hills gold mine*, South Dakota Searchlight (May 19, 2023), https://southdakotasearchlight.com/2023/05/19/state-board-considering-expansion-of-black-hills-gold-mine/ Exhibit 2.

[6] The acid mine drainage literature is substantial. Earthworks has a useful short fact sheet. https://www.sosbluewaters.org/FS_AMD.pdf, Exhibit 3. *See also* U.S. Forest Service, *Acid Mine Drainage from Impact of Hardrock Mining on the National Forests: A Management Challenge* (1993).

[7] *E.g.* Jeremiason et al., *Sulfate Addition Increases Methylmercury Production in an Experimental Wetland*, 40 Envt. Sci. Tech. 3800 (2006), https://www.fs.usda.gov/nrs/pubs/jrnl/2006/nc_2006_jeremiason_001.pdf, Exhibit 4.

would not exceed the water quality standards of the downstream Fond du Lac Band of Lake Superior Chippewa Indians.[8]

(3) *Cyanide:* The advent of the cyanide heap leaching process is the only reason mining of low-grade gold ores has been economical. Mine operations crush the ore, pile it up, and then add cyanide to the pile to leach the gold out of the ore. In gold mines around the world, cyanide solutions have leaked into surrounding surface and groundwater, sometimes at highly toxic levels.[9]

(4) *Tailings dam failure:* Gold mining operations, like most major industrial mining processes, dispose of the contaminated waste from metal extraction typically by turning it into a slurry and then depositing it into large basins built with earthen dams and filled with water. Unfortunately, all tailings basins leak, and some of them collapse.[10] In 2014, for example, the tailings basin for the Mt. Polley copper-nickel mine in British Columbia collapsed due to foundation failure, sending 7.3 million metric tons of tailings downstream with catastrophic consequences.

Of course, all mines today attempt to avoid those problems. But, as USFS recognized in the context of the fairly recent Rainy River Mineral Withdrawal in northeastern Minnesota, dam failures still occur even on modern mining projects with engineered design. Water collection, treatment, and discharge systems also fail, leading to discharges of toxic metals, or chemical constituents like sulfates that can increase the availability of toxic metals, which can bioaccumulate in fish and other aquatic organisms and pose a genuine risk to public health.[11]

The Upper Rapid Creek watershed already suffers from acid mine drainage problems traceable to older mining operations. Adding to that problem with more low pH water, with sulfates, with cyanide, and with the risk of tailings basin leaking or even collapse is ample justification for a mineral withdrawal for the next 20 years.

These problems are difficult, expensive, and often impossible to remediate after-the-fact. There are 1,300 abandoned mines in the Black Hills alone, and an estimated 22,500 abandoned mine features in the American West. EPA has estimated that abandoned hardrock mines have

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[8] Decision Memo, New Range Copper Nickel LLC—Status of 404 Permit (June 6, 2023), https://www.mvp.usace.army.mil/Missions/Regulatory/PolyMet/, Exhibit 5.

[9] *See e.g.* Peer Ledger, *The Dangers of Cyanide in Gold Miningj* https://www.peerledger.com/blogs/the-dangers-of-cyanide-in-gold-mining Because of the dangers, cyanide heap leach mining has been banned in Montana and several other places around the world. The industry is seeking alternatives, but with very limited success. Exhibit 6.

[10] *See Chronology of major tailings dam failures* (last updated 4/18/23), http://www.wise-uranium.org/mdaf.html. ELPC is aware that some mines have been experimenting with "dry stack" tailings as a substitute, where the tailings are dewatered and stored, rather than spigoted into a conventional tailings basin. Whether that would be feasible with a Black Hills gold mine is unknown.

[11] USFS/BLM, *Rainy River Withdrawal: Environmental Assessment* 45 (Dec. 2022), https://eplanning.blm.gov/public_projects/2022642/200540165/20071350/250077532/20221120_RevisedEA_FinalRevision-508.pdf

contributed to the contamination of 40% of the nation's rivers and 50% of all lakes.[12] The Mineral Policy Center estimated 30 years ago that there really are over 500,000 abandoned hardrock mines, with total reclamation costs between $32.7 and 71.5 billion.[13] It is no longer unusual for single site reclamation costs to exceed $1 billion.[14]

The rules require, not only that mining companies on federal lands bear those costs, but that they provide a financial guarantee to assure that money will be available for reclamation, including perpetual water treatment, as a condition for receiving a permit.[15] Unfortunately, the record shows that mining companies have typically been able to use strategic asset transfers and bankruptcy to avoid those obligations.[16] These enormous costs generally fall on taxpayers or on the environment, if reclamation and cleanup does not ultimately occur.

Responses to Potential Objections

ELPC anticipates that objections to the proposed mineral withdrawal will fall into three categories: (1) gold is, or should be, treated as a "critical mineral"; (2) environmental review can and should wait until an actual mining plan is proposed; and (3) modern gold mining has successfully addressed all potential environmental problems. None of those arguments has any merit.

1. Gold is not a "critical mineral."

The hardrock mining industry has attempted to hitch its star to the effort to shift to renewable energy, that we need domestic sources of "critical minerals" now to build wind turbines, solar panels, and electric vehicles, and peripheral environmental concerns simply have to give way to the exigencies of the climate emergency.

Whatever the merits of that argument might be for minerals like lithium for lithium-ion batteries, or certain rare earth metals, they have no merit at all for gold. Gold has none of the characteristics necessary for designation as a "critical mineral entitled to special consideration."

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[12] Government Accountability Office (GAO), *From Gold Rush to Rot—The Lasting Environmental Costs and Financial Liabilities of Hardrock Mining* (Feb. 22, 2023), https://www.gao.gov/assets/gao-23-105408.pdf, Exhibit 7.

[13] Earthworks, *Burden of Gilt* (1993), https://earthworks.org/resources/burden_of_gilt/

[14] E.g. Chevron Molybdenum Mine, Questa, NM, https://www.taosnews.com/news/environment/federal-government-to-share-cost-of-questa-mine-cleanup/article_04ae6f8f-8280-532c-85f5-07cc82c4ed06.html, Exhibit 8.

[15] *See generally* 43 C.F.R. pt. 3809. Unfortunately, EPA has not adopted rules requiring financial assurance for hardrock mining generally under CERCLA. *Idaho Conservation League v. Wheeler*, 930 F.3d 494 (D.C. Cir. 2019).

[16] The wave of coal mining company bankruptcies lay out the playbook. Separate productive assets from liability assets, put environmental liabilities into the compromised entity, file bankruptcy, and discharge the obligation. Macey et al., *Bankruptcy as Bailout: Coal Company Insolvency and the Erosion of Federal Law*, 71 Stan. L. Rev. 879 (2019). The ASARCO bankruptcy in the 2000s was a prominent illustration of this pattern in the hardrock mining industry, where the government eventually secured considerable fraudulent conveyance recoveries, but nowhere near the total costs.

Section 7002(a)(2) of the Energy Act of 2020 defines a "critical material" as a "non-fuel mineral, element, substance or material that the Secretary of Energy determines: (i) has a high risk of supply disruption; and (ii) serves an essential function in one or more energy technologies, including technologies that produce, transmit, store, and conserve energy. 30 U.S.C. § 1606(a)(2). The definition also includes "critical minerals," which are designated by the U.S. Geological Survey (USGS). "Critical minerals" are "minerals, elements, substances and materials" that USGS determines "(i) are essential to the economic or national security of the United States; (ii) the supply chain of which is vulnerable to disruption (including restrictions associated with foreign political risk, abrupt demand growth, military conflict, violent unrest, anti-competitive or protectionist behaviors, and other risks through the supply chain); and (iii) serve an essential function in the manufacturing of a produce (including energy technology-, defense-, currency-, agriculture-, consumer electronics-, and health care-related applications), the absence of which would have significant consequences for the economic or national security of the United States. essential to the economic or national security of the U.S." 30 U.S.C. § 1606(c)(4)(A).

USGS's methodology includes three evaluations: (1) a quantitative evaluation of supply risk wherever sufficient data were available; (2) a semi-quantitative evaluation of whether the supply chain had a single point of failure, and (3) a qualitative evaluation when other evaluations were not possible. The quantitative evaluation uses (A) a net import reliance indicator of the dependence of the U.S. manufacturing sector on foreign supplies, (B) an enhanced production concentration indicator which focuses on production concentration outside of the United States, and (C) weights for each producing country's production concentration by its willingness to continue to supply to the United States.[17]

Gold is not on either list.[18] The reasons are clear.

First, very little gold is used in electronics or any other technology, energy or otherwise. Globally, about 47% of the gold is used for jewelry, and 46% for physical bars, central banks, and coins. Fashion and financial speculation should not drive federal lands policy. Only 6% is used for electronics, and that portion declined from 2021 to 2022.[19] Gold does not show up as a key material for transmission lines, for nuclear, solar, or wind energy generation, for fuel cells

[17] USGS Open-File Report 2021-1045, https://doi.org/10.3133/ofr20211045; Nassar et al., *Evaluating the mineral commodity supply risk of the U.S. manufacturing sector*, Sci. Adv. 6(8)(2020), https://doi.org/10.1126/sciadv.aay8647; Nassar et al., *Methodology and technical input for the 2021 review and revision of the U.S. Critical Minerals List, U.S. Geological Survey Open-File Report 2021-1045*, https://doi.org/10.3133/ofr20211045. *See generally* Executive Order 13817—*A Federal Strategy to Ensure Secure and Reliable Supplies of Critical Minerals*, 82 Fed. Reg. 60835 (Dec. 20, 2017).

[18] USGS, *2022 Final List of Critical Minerals*, https://d9-wret.s3.us-west-2.amazonaws.com/assets/palladium/production/s3fs-public/media/files/2022%20Final%20List%20of%20Critical%20Minerals%20Federal%20Register%20Notice_2222022-F.pdf, Exhibit 9. U.S. Department of Energy, *Critical Materials Assessment* (May 2023), https://www.energy.gov/sites/default/files/2023-05/2023-critical-materials-assessment.pdf. (DOE 2023 Critical Materials Assessment).

[19] US Geological Survey, *Mineral Commodity Summaries* (Jan. 2023), https://pubs.usgs.gov/periodicals/mcs2023/mcs2023.pdf (USGS 2023 Mineral Commodity Summaries), at 80-81.

and batteries, in LED lighting, consumer electronics, electric vehicles, in optoelectronics, or in hydrogen electrolyzers.[20]

Second, there are no supply chain problems for gold. The U.S., Canada, and Australia all have large gold reserves. Dozens of countries have substantial gold reserves. There is no production concentration either.[21]

There are substitutes. Base metals clad with gold alloys are widely used to economize on gold in electrical and electronic products and in jewelry; many of these products are continually redesigned to maintain high-utility standards with lower gold content. Generally, palladium, platinum, and silver may substitute for gold. Recycling is another alternative. About 36% of reported gold consumption comes from recycled materials today.[22]

Gold meets no official definition of critical mineral. It is not critical to energy, to manufacturing, or to technology. Its primary use is for jewelry, and recycled gold is available to meet much of that demand. There are, of course, critical minerals needed to complete the transition to renewable, zero-carbon-emission energy.[23] But gold is not one of them.

2. There is no need to wait for a full mine operation plan.

ELPC acknowledges that, approximately a year ago, the U.S. Forest Service noticed a draft Decision Notice, with a final Environmental Assessment/Finding of No Significant Impact for F3 Gold's proposed Jenny Gulch Gold Exploration Drilling Project, which is near the area presently under review. ELPC further acknowledges that it is not uncommon for USFS to approve mining exploration plans of operation (POs) with only limited environmental review, particularly in areas with active claims under the General Mining Law of 1872.[24] Fuller environmental review, typically full environmental impact statements, often waits until a company submits a full operation plan for actual mining activities.

Companies like F3 Gold or Mineral Mountain, who appear to have 1872 law claims in the relevant geographic area, may urge the agencies to follow that process. They will request the agencies give them fairly free rein to explore, and then hold off on full environmental scrutiny unless and until they discover enough gold out there and propose a plan of operation for an actual mine. After all, the 1997 Land and Resource Plan for the Black Hills National Forest expressly contemplates mining activities may occur on Forest lands.

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[20] DOE 2023 Critical Materials Assessment, at 3.
[21] USGS 2023 Mineral Commodity Summaries, at 80-81.
[22] *Id.; see also* Gold.info, *Gold Recycling—the Environmentally Friendly Alternative*, https://www.gold.info/en/gold-recycling/, Exhibit 10.
[23] *E.g.* Melissa Barbaneli, World Resources Institute, *Overcoming Critical Minerals Shortages is Key to Achieving U.S. Climate Goals* (May 3, 2023), https://www.wri.org/insights/critical-minerals-us-climate-goals
[24] U.S. Forest Service (USFS) regulations under the National Environmental Policy Act (NEPA) exempt many mineral investigation activities on USFS land from environmental review altogether. "Categorical Exclusion 8" or "CE-8" exempts mineral investigations "and their incidental support activities" if they will take less than one year to complete and if they will require the construction of less than one mile of "low standard road" or will rely on existing roads.

Of course, that argument is available to oppose *any* mineral withdrawal under section 204 of FLPMA, as well as any programmatic landscape-level environmental review by land management agencies. FLPMA reflected the change in federal land policy from disposal to retention and management, following the 1960's-era Public Land Law Review Commission's recommendation that:

> The policy of large scale disposal of public lands reflected by the majority of statutes in force today should be revised and that future disposal should be only of those lands that will achieve maximum benefit for the general public in non-Federal ownership, while retaining in federal ownership those whose values must be preserved so that they may be used and enjoyed by all Americans.[25]

FLPMA recognizes the mineral withdrawals were part of the larger planning framework and were necessary to manage use of federal lands and natural resources for the public's benefit.[26] Withdrawals must be consistent with FLPMA's requirement that:

> [T]he public lands [must] be managed in a manner that will protect the quality of scientific, scenic, historical, ecological, environmental, air and atmospheric, water resource, and archaeological values, that, where appropriate, will preserve and protect certain public lands in their natural condition, that will provide food and habitat for fish and wildlife and domestic animals, and that will provide for outdoor recreation and human occupancy and use.

43 U.S.C. § 1701(a)(8); *see generally National Mining Ass'n v. Zinke,* 877 F.3d 845 (9th Cir. 2017)(upholding withdrawal of one million acres of public lands surrounding Grand Canyon National Park to forestall uranium mining).

Both the executive and legislative branches of the federal government have likewise encouraged federal agencies to do more programmatic or landscape-level environmental review.[27] The Council on Environmental Quality's (CEQ) Guidance on Effective Use of Programmatic NEPA Reviews (Dec. 18, 2014) explains that these kinds of broader reviews are especially appropriate "in geographic settings where several Federal actions are likely to have effects on the same environmental resources."[28] That, of course, is precisely what the current

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[25] Public Land Law Review Commission, *One-Third of the Nation's Land: A Report to the President and to the Congress* (1970), *quoted in* Glicksman et al., *The Rocky Road to Energy Dominance: The Executive Branch's Limited Authority to Modify and Revoke Withdrawals of Federal Lands from Mineral Production*, 33 Geo. J. Envtl L. Rev. 173, 206 (2021).

[26] *Compare* General Mining Law of 1872, 17 Stat. 91, which does not reflect modern public lands policy at all, and needs to be repealed.

[27] *See* Fiscal Responsibility Act of 2023, Pub. L. 118-5, § 321 (adding new § 108 to NEPA); Biden-Harris Permitting Action Plan 4 (May 2022), https://www.whitehouse.gov/wp-content/uploads/2022/05/Biden-Harris-Permitting-Action-Plan.pdf, Exhibit 11.

[28] Guidance at 9, https://ceq.doe.gov/docs/ceq-regulations-and-guidance/Effective_Use_of_Programmatic_NEPA_Reviews_Final_Dec2014_searchable.pdf

segregation, and the ultimate mineral withdrawal will allow the agencies to do. Delaying that consideration until one or potentially several site-specific mining operation plans have been submitted does not allow for that kind of consideration.

3. Technology and modern mining methods have not eliminated the risks inherent in gold mining.

The mining industry's answer, when confronted with the history of mining environmental disasters, is always the same. That was then, this is now, and modern mining methods have solved all of the serious environmental problems of the past.

That is just not true. The hardrock mining industry has been challenged to "prove it first," i.e. before any permits issue, prove that a sulfide mine has operated for ten years and closed for ten years without causing pollution, and has never met that challenge. There are still tailings basin collapses every year. There are acid mine drainage problems from old and new mines alike. No one has come up with an economical and safe substitute for using cyanide to leach gold out of sulfide ore.

It is of course the agencies' responsibility to consider potential mitigation of possible adverse environmental effects when determining whether to finalize a mineral withdrawal. But the argument that mitigation and management or new technology will reduce the risks to near-zero simply has no credibility.

Expansion of the Withdrawal Area

ELPC supports the proposed mineral withdrawal, but requests that USFS and BLM consider whether a larger-scale withdrawal might better preserve the environmental and cultural/historic resources at stake. Contaminants from the subwatersheds upstream can and will reach Upper Rapid Creek and the Pactola Reservoir, whether by surface flow or by conduction through moving groundwater. Water flows in Karst and other fractured topography is difficult to predict and it does not respect watershed boundaries. To create an adequate margin of safety in this unique geology, ELPC recommends that a much larger portion of the Rapid Creek HUC-8 watershed be included in the withdrawal.

The recent Rainy River mineral withdrawal in the Superior National Forest in Minnesota was for 225,504 acres, covering essentially an entire HUC-8 watershed. In that case, the agencies understood the complex interactions of surface and groundwater in that entire area, and therefore did not limit the withdrawal just to those particular locations where there were active exploration or mining plans that had been proposed or even underway. And mining on federal lands in Minnesota is governed by a leasing system, giving agencies more knowledge and control over what kinds of mining activities are being proposed. Mining on federal lands is, on the other hand, governed by the General Mining Law of 1872, where claims and discovery of minerals can, by themselves, create legal rights that can effectively constrain the agencies' ability to manage and control what activities place on the lands over which they have responsibility.

ELPC anticipates that the agencies will complete an analysis to project likely mining interest in this area. That will depend on geology and economics, of course, but with live gold prices near $2,000 an ounce and the long history of interest in Black Hills gold and other minerals, the agencies should not discount the possibility of several entities attempting to perfect mining claims throughout the Rapid Creek watershed. There is no reason to conclude that this activity will be limited to the one or two entities who have sought permission for mining-related activities in the past couple of years in distinct areas. The mineral withdrawal should be extensive enough to assure that the agencies and the public can stay ahead of the situation.

Thank you again for the opportunity to comment.

Respectfully submitted,

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https://rapidcityjournal.com/community/danr-to-hold-hearing-on-future-of-wharf-mine-boston-expansion/article_b72d2994-f294-11ed-bfb2-c38c86bb8cc0.html

ALERT TOP STORY EDITOR'S PICK

DANR to hold hearing on future of Wharf Mine Boston Expansion

Darsha Dodge
May 16, 2023

Leaching piles are shown at the actively mined portion of the Wharf Mine in 2019 near Lead. The company plans to expand its mining operation by 47 acres on the southern edge of its property.
Journal file photo

Darsha Dodge

A proposed expansion that would add nearly 50 acres of land and seven years of mining activity to the Coeur Wharf gold mine in Lead will face its final hurdle before the South Dakota Department of Agriculture and Natural Resources this week.

South Dakota's Board of Minerals and Environment will hold two days of contested case hearings in Pierre to determine whether Wharf Resources is qualified to receive an expansion permit. Wharf has been in operation since December 1982 and has been granted four additional mining permits to expand its operation: two in 1986, one in 1998 and another in 2011.

The Boston Expansion would add 48.2 acres of land to the existing Wharf Mine, an open pit, heap-leach gold operation that's the last of its kind in South Dakota. Lawrence County Commissioners approved a conditional use permit for the Boston Expansion in January 2022. The expansion would render 6.7 million tons of ore, according to Wharf's large-scale permit application from June 2022, to be processed in Wharf's existing heap-leaching facility.

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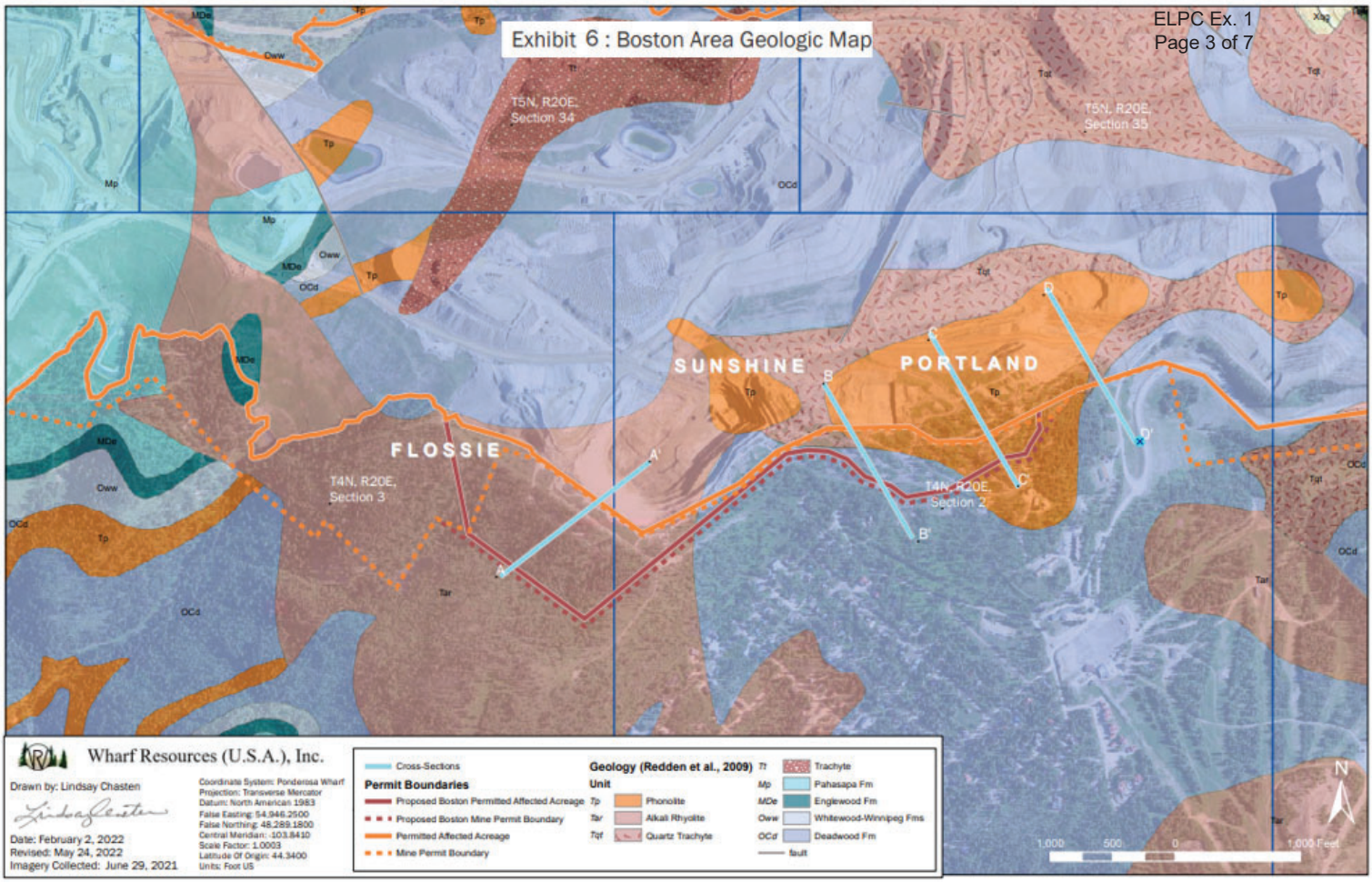
Their initial plans indicate the first phase of expansion will occur in the Flossie Pit in 2023 should the permit be granted. They'll move onto the Portland Pit after mining in Flossie, planning to backfill the mined areas with waste rock as they go. Wharf has been doing concurrent reclamation and plans to continue salvaging topsoil with the goal of returning the area to rangeland.



Coeur Wharf

Four isolated areas with the potential for acid rock drainage were identified as part of the permit application; Wharf plans to buffer those areas to neutralize potential acid-generating material.

"Wharf has operated for nearly 40 years without encountering significant acid producing conditions. Also, historic mines in the current mine area, which date back to the late 1800s, have not been a source of significant acid rock drainage," Wharf said in its application.

The report identifies two different sources of nitrate at the Wharf Mine which occur in groundwater in the area. The first is a natural breakdown of residual cyanide; the other is blasting residue from ammonium nitrate fuel-oil explosives. Wharf said several "accidental, low-level cyanide and ammonia release" impacted Annie Creek in the '90s and early 2000s. They use denitrifying bacteria to spray leach pads and spent ore, inject them into areas where nitrate in groundwater may be elevated, and treat ponds with water from sumps, spent ore repositories, process water and water treatment plants, the application stated.

Wharf is currently in violation of the surface water standard for selenium at False Bottom Springs and DANR issued a warning letter in 2021. The mitigation project, which included sonic drilling to analyze the source of the selenium, is ongoing.

Data from wildlife and vegetation surveys from 2020 and 2021 were used as part of the Boston Expansion permitting; Wharf conducted separate surveys for bat habitat and nesting raptors as required by South Dakota Game, Fish & Parks. The Northern Long-Eared Bat is listed as an endangered species, while four other species — Townsend's Big-Eared Bat, Silver-Haired Bat, Long-Eared Myotis and Fringe-Tailed Myotis — are listed as sensitive. Wharf's report states no bats were located in old mine works or cliffs along the proposed expansion areas. Three mine shafts in the area were closed as well.

The Broad-Winged Hawk, listed as rare under South Dakota's Natural Heritage Program, has been sporadically sighted in the western portion of the proposed Boston Expansion area, according to Wharf's permit application. They say no active nests have been observed in the area since 2003. Wharf will attempt to transplant a small patch of 10 thinleaf huckleberry plants — a sensitive species — should the area be disturbed during mining.

Opposition letters sent into DANR ask the permit not be issued due to the potential environmental impact from spills. The Prairie Hills Audubon Society requested the permit be denied until South Dakota's regulations on cyanide are improved and the bonds required by mining companies are increased. A Lead resident asked that "some portion of the northwestern Black Hills" be left alone, while another expressed concern about the potential contamination of aquifers. Others still cited the destruction of the Black Hills' unique landscape.

This Journal file photo shows a truck containing 150 tons of rock coming up from the bottom of the Wharf Mine in Lead.
Journal file

Black Hills Clean Water Alliance Executive Director Dr. Lilias Jarding wrote a letter opposing the expansion and claimed 181 reported surface spills since 1983. BHCWA worked with a geochemist from Columbia University to measure samples from Fantail, Whitewood and Annie Creeks; they say results appear to show multiple elevated samples of uranium and arsenic.

Carla Marshall of Rapid City petitioned to intervene in the permit process in late April, saying the process shows a lack of government-to-tribal communications, a violation of the 1868 Fort Laramie Treaty and incomplete reporting data on the state website.

"From what I have gathered, from 1983 to 2023 Wharf/Coeur Mining, including the Golden Reward Mine, filed 216 'accident' reports," Marshall wrote. "The total amount of these reports comes out to be 125,232, but that is not an accurate amount as nine or more of these reports filed with the State are void of amount and unit."

In contrast, multiple organizations in the Northern Hills wrote to support the expansion at Wharf Mine, including the Lawrence County Commissioners, who cited Wharf as a "vital, reliable and consistent employer." Coeur Wharf's website shows they employ 260 mining professionals, 98% of whom live in the Black Hills.

Organizations like Wellfully and the United Way of the Black Hills wrote to support the expansion and highlighted Coeur Wharf's contributions to the local community since their inception.

"Employees of Coeur Wharf sit on our Northern Hills Community Cabinet as well as our Board of Directors. Employees and the company contribute to our fundraising campaign, which funds the grants to nonprofits. They have also been a partner in our education efforts in the Northern Hills," wrote Jamie Toennies, then-executive director of UWBH in Jan. 2022.

Director of SD CEO West Women's Business Center Michelle Kane said Wharf has been a key sponsor of their Women in Leadership Program for seven years, and that "it's really an example of a successful business and community nonprofit partnership where we are more efficient working together."

DANR issued a recommendation of conditional approval to Wharf for the Boston Expansion, stating it addresses all legal requirements. Their formal recommendation includes stipulations requiring Wharf to submit an annual surface and groundwater characterization report on or before March 1 each year; notify DANR within five working days of receiving any written complaints from landowners about dust, noise and blasting; and do tree-clearing operations outside of migratory bird nesting season.

The South Dakota Board of Minerals and Environment will hold a contested case hearing on the Boston Expansion permit application beginning at 9 a.m. Mountain Time May 18 and 19 in Pierre. The board will either approve, conditionally approve or disapprove the application. Any decision may be appealed to the circuit court and the State Supreme Court.

Contact Darsha at **ddodge@rapidcityjournal.com**

By Darsha Dodge

City Editor

ECONOMY ENVIRONMENT GOVERNMENT

State board considering expansion of Black Hills gold mine

BY: **MAKENZIE HUBER** - MAY 19, 2023 2:40 PM

A portion of the Wharf Mine near Lead in 2019. (Seth Tupper/South Dakota Searchlight)

A state board won't make a final decision on the proposed expansion of South Dakota's lone large-scale gold mine for another two months, after the board listened to two days of testimony during a hearing this week in Pierre.

The expansion of the Coeur Wharf Resources mine, just north of Terry Peak and west of Lead, would cover 48 acres to the south of its operation on land already owned by the company. The expansion is expected to extend the mine's life by one to three years, or until 2028 or 2030. The mine was granted four other expansion permits in its 40-year history, the latest in 2011.

Department of Agriculture and Natural Resources Secretary Hunter Roberts recommended conditional approval of the permit on April 17. Steven Blair, assistant attorney general, said "no grounds exist for denial of the permit" based on the DANR permitting process.

But after the Board of Minerals and Environment heard testimony Thursday and Friday, the board chairman instructed attorneys for Wharf and the DANR to amend conditions in the recommended permit to assure the public that a water quality violation at the mine is being addressed in a timely manner.

Wharf in violation of surface water standards

Several Black Hills residents, Wharf employees and business partners attended the meeting in support of the mine, citing the company's contributions to local communities and organizations, and the economic impact on the region. Wharf employs over 250 people and accounts for nearly a quarter of Chicago-based Coeur Mining's gold production.

"They're here to stay," said Bob Ewing, chairman of the Lawrence County Commission.

But concerns from Rapid City-based activist Carla Marshall prompted a hearing after she filed as a formal intervenor in the case. A couple of other concerned citizens and organizations, including the Prairie Hills Audubon Society, sent opposition letters to the DANR. Marshall's concerns focused on the environmental, aesthetic and cultural impact the mine has in the Black Hills.

Marshall, a member of the Cheyenne River Sioux Tribe, said the mine is illegal because it's in unceded territory under the 1868 Fort Laramie Treaty. That agreement promised the Black Hills to Native American tribes but was later broken by the U.S. government. She wants government-to-government consultation and cultural surveys to be completed.

The mine uses the heap-leach extraction method. Mined ore is crushed, piled on giant pads and treated with a cyanide solution to leach out the precious metals. The pads are double lined with alarms to catch any leaks or spills in the material, Wharf officials testified.

Wharf is currently in violation of surface water quality standards for selenium, a naturally occurring mineral in soil that can be harmful to people and fish in great amounts. DANR issued a warning letter in 2021 about selenium in water near the mine.

The southern border of Wharf Resources is visible (left) along Nevada Gulch Road up to Terry Peak near Lead. (Makenzie Huber, South Dakota Searchlight)

Roberta Hudson from the state Minerals, Mining and Superfund Program testified that selenium had built up in fish tissue at False Bottom Creek. The department first noticed increases in 2014, Hudson said. Wharf had begun depositing rock at the site in an effort to reclaim an area no longer used for the mine, though Wharf Environmental Manager Matt Zietlow said it was "unknown" if Wharf caused the problem.

Higher amounts of selenium over time can cause reproductive impairments and disfiguration in fish, and eventually threatens aquatic life. In 2020, the accumulated amount rose above the acute limit and has remained "pretty consistently above" since then, Hudson said.

DANR directed Wharf in late 2021 to report monthly progress toward a solution and called for Wharf to establish a treatment plan by October 2024 and to have it operating by 2025. The mitigation project, which included sonic drilling to analyze the source of the selenium, is ongoing.

The board does have grounds to deny the permit because of the violation, board member Bob Morris said during the hearing, although it is technically a separate activity to the proposed expansion.

"Everything else Wharf submitted is fully in compliance with the law," Morris stated during Hudson's testimony. "This is one issue of concern but it's not a deal-breaker."

Board Chairman Rex Hagg told South Dakota Searchlight the board prefers to see a mitigation timeline added in the expansion permit conditions to provide accountability and assurance to the public.

"Our job as the board is to be the last point of oversight on these types of deals," Hagg said, "so we're there to protect the public and state's interest to make sure this is taken care of."

Wharf reclaims former mining lands

During the permit application process, the company conducted environmental surveys and tests, with subcontractors and guidance from the state. The company also surveyed for affected and endangered wildlife and vegetation in the area. Although an endangered bat species, the northern long-eared bat, was noted in the area at one point, a later survey did not find the bats again. A small patch of mountain huckleberry, identified by DANR as a sensitive species, was also observed on the far western edge of the expansion border, which Wharf officials said would be transplanted elsewhere if the operation disturbs the plants.

Representatives from Wharf, including Zietlow, the environmental manager, explained how the company reclaims areas as it completes mining. Topsoil is stripped and stockpiled during the operation and used later for reclamation. Mine reclamation includes the

placement of topsoil over the area, reseeding with native vegetation and trees, and continued monitoring by the company.

“Mining is a short-term disturbance,” Zietlow said.

Ewing said he’s visited the reclaimed sites in his role as a county commissioner.

“It’s just like nothing happened,” he said. “They’ve done a good job.”

The expansion will disturb an estimated 31.9 million tons of material, including 6.7 million tons of ore and 25.2 million tons of overburden and non-mineralized rock.

Wharf produced nearly 80,000 ounces of gold in 2022, over 91,000 ounces in 2021 and over 93,000 in 2020, according to the 2022 Coeur annual report. There was no silver produced at the mine during those years, though it did produce roughly 63,000 ounces of silver in 2019. Wharf’s 2022 sales totaled over $150 million, and its net income was over $34 million.

Zietlow told board members Wharf paid about $6 million in severance taxes to the state over the last five years.

MAKENZIE HUBER

Makenzie Huber is a lifelong South Dakotan whose work has won national and regional awards. She's spent five years as a journalist with experience reporting on workforce, development and business issues within the state.

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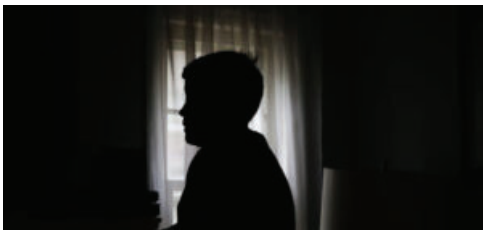

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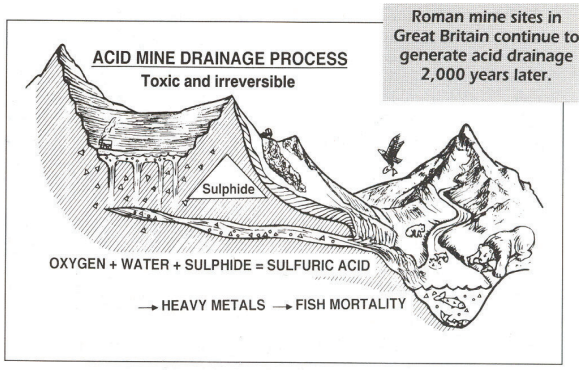
EARTHWORKS

HARDROCK MINING: ACID MINE DRAINAGE

Acid mine drainage is considered one of mining's most serious threats to water resources.[1] A mine with acid mine drainage has the potential for long-term devastating impacts on rivers, streams and aquatic life.



HOW DOES IT FORM?

Acid mine drainage is a concern at many metal mines, because metals such as gold, copper, silver and molybdenum, are often found in rock with sulfide minerals. When the sulfides in the rock are excavated and exposed to water and air during mining, they form sulfuric acid. This acidic water can dissolve other harmful metals in the surrounding rock. If uncontrolled, the acid mine drainage may runoff into streams or rivers or leach into groundwater. Acid mine drainage may be released from any part of the mine where sulfides are exposed to air and water, including waste rock piles, tailings, open pits, underground tunnels, and leach pads.

HARM TO FISH & OTHER AQUATIC LIFE

If mine waste is acid-generating, the impacts to fish, animals and plants can be severe. Many streams impacted by acid mine drainage have a pH value of 4 or lower – similar to battery acid.[2] Plants, animals, and fish are unlikely to survive in streams such as this. For example, acid and metals runoff from the Questa molybdenum mine in New Mexico has harmed biological life in eight miles of the Red River.[3]

TOXIC METALS

Acid mine drainage also dissolves toxic metals, such as copper, aluminum, cadmium, arsenic, lead and mercury, from the surrounding rock. These metals, particularly the iron, may coat the stream bottom with an orange-red colored slime called *yellowboy*. Even in very small amounts, metals can be toxic to humans and wildlife. Carried in water, the metals can travel far, contaminating streams and groundwater for great distances. The impacts to aquatic life may range from immediate fish kills to sub-lethal, impacts affecting growth, behavior or the ability to reproduce.

Metals are particularly problematic because they do not break down in the environment. They settle to the bottom and persist in the stream for long periods of time, providing a long-term source of contamination to the aquatic insects that live there, and the fish that feed on them. Over 100 miles of the Clark Fork River in Montana, the Coeur d'Alene River in Idaho, and the Columbia River in Washington are contaminated by metals pollution from historic mining activities upstream.

PERPETUAL POLLUTION

Acid mine drainage is particularly harmful because it can continue indefinitely --

causing damage long after mining has ended.[4] Due to the severity of water quality impacts from acid mine drainage, many hardrock mines across the west require water treatment in perpetuity. For example, government officials have determined that acid drainage at the Golden Sunlight mine will continue for thousands of years.[5] Water treatment can be a significant economic burden if the company files for bankruptcy or refuses to cover water treatment costs. For example, acid runoff from the Summitville Mine in Colorado killed all biological life in a 17-mile stretch of the Alamosa River. The site was designated a federal Superfund site, and the EPA is spending $30,000 a day to capture and treat acid runoff.[6] In South Dakota, Dakota Mining Co. abandoned the Brohm mine in 1998, leaving South Dakota with $40 million in reclamation costs – largely due to acid mine drainage.[7] And, at the Zortman Landusky Mine in Montana, the State of Montana was left with millions in water treatment costs when Pegasus Gold Corp. filed for bankruptcy in 1998.[8]

Even with existing technology, acid mine drainage is virtually impossible to stop once the reactions begin. To permit an acid generating mine, means that future generations will take responsibility for a mine that must be managed for possibly hundreds of years. Predictions about the success of managing this waste in the long term are, at best, speculative.[9]

SOURCES:

[1]USDA Forest Service 1993, Acid Mine Drainage from Impact of Hardrock Mining on the National Forests: A Management Challenge. Program Aid 1505. p. 12.

[2]Mineral Policy Center, Golden Dreams, Poisoned Streams, 1995.

[3]Atencio, Earnest, High Country News, "The mine that turned the Red River Blue," August 2000.

[4]Placer Dome 2002, Available: http://www.placerdome.com/sustainability/environment/reports/ard.html

[5]Montana Department of Environmental Quality, Draft Environmental Impact Statement, Golden Sunlight Mine, November 1997.

[6]U.S. Environmental Protection Agency, Liquid Assets, 2000.

[7]McClure, Robert. "The Mining of the West: Profit and Pollution on Public Lands". Seattle Post-Intelligencer, June 13, 2001.

[8]Ibid.

[9]Environmental Mining Council of B.C., Acid Mine Drainage: Mining and Water Pollution Issues in B.C., Brochure.

CASE STUDY: ZORTMAN LANDUSKY

- Zortman Landusky is a large open pit gold mine located in Montana adjacent to the Fort Belknap Reservation.
- In 1993, the Fort Belknap Council, State of Montana and the EPA filed suit against the company charging that the mine's discharges "present human health risks" and that "the acidity of the discharges would kill fish and aquatic life."
- In 1998, the company abandoned the site and filed for bankruptcy, leaving significant reclamation and water treatment costs from acid mine drainage and metals pollution.
- State and federal authorities have determined that acid runoff from the mine will have to be collected and treated in perpetuity.

"Water treatment will have to go on for hundreds of years, possibly forever."

Wayne Jepson, Montana State Regulator, Helena Independent Record, 2002.

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Sulfate Addition Increases Methylmercury Production in an Experimental Wetland

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Atmospheric mercury is the dominant Hg source to fish in northern Minnesota and elsewhere. However, atmospherically derived Hg must be methylated prior to accumulating in fish. Sulfate-reducing bacteria are thought to be the primary methylators of Hg in the environment. Previous laboratory and field mesocosm studies have demonstrated an increase in methylmercury (MeHg) levels in sediment and peatland porewaters following additions of sulfate. In the current ecosystem-scale study, sulfate was added to half of an experimental wetland at the Marcell Experimental Forest located in northeastern Minnesota, increasing annual sulfate load by approximately four times relative to the control half of the wetland. Sulfate was added on four separate occasions during 2002 and delivered via a sprinkler system constructed on the southeast half (1.0 ha) of the S6 experimental wetland. MeHg levels were monitored in porewater and in outflow from the wetland. Prior to the first sulfate addition, MeHg concentrations (filtered, 0.7 μm) were not statistically different between the control (0.47 $\pm$ 0.10 ng L^{-1}, $n = 12$; mean $\pm$ one standard error) and experimental 0.52 $\pm$ 0.05 ng L^{-1}, $n = 18$) halves. Following the first addition in May 2002, MeHg porewater concentrations increased to 1.63 $\pm$ 0.27 ng L^{-1} two weeks after the addition, a 3-fold increase. Subsequent additions in July and September 2002 did not raise porewater MeHg, but the applied sulfate was not observed in porewaters 24 h after addition. MeHg concentrations in outflow from the wetland also increased leading to an estimated 2.4× increase of MeHg flux from the wetland. Our results demonstrate enhanced methylation and increased MeHg concentrations within the wetland and in outflow from the wetland suggesting that decreasing sulfate deposition rates would lower MeHg export from wetlands.

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Introduction

Efforts to reduce mercury (Hg) emissions in Minnesota and throughout the rest of the world assume change in atmospheric deposition of Hg will ultimately result in a proportional change of methylmercury (MeHg) concentrations in fish, all other things being constant. Accordingly, it is thought that fish now have mercury concentrations that are 3−4 times greater than natural (preindustrial) levels, because there is strong evidence that atmospheric Hg deposition is currently 3−4 times greater than natural rates (*1*−*6*). However, the proportion of Hg that is methylated and bioaccumulated in fish may not have been constant in some aquatic systems over that time period. Higher than expected Hg concentrations in fish may be the result of increased sulfate deposition to sulfate-poor ecosystems, where sulfate availability controls the activity of the bacteria that methylate Hg. A comparison of museum fish from the 1930s collected from low alkalinity lakes in northern Minnesota and fish collected from the same lakes in the 1980s indicated a 10-fold increase in Hg concentrations (*7*), consistent with the sulfate-enhancement hypothesis.

Hg methylation in natural systems is primarily by sulfate-reducing bacteria in sediments (*8*−*11*) and in wetlands (*12*−*16*), but has also been observed in floating macrophytes and periphyton (*17*). Wetlands, being a major source of MeHg to waters where fish exist (*18*−*21*), represent a critical link between atmospheric Hg deposition and accumulation of MeHg in aquatic food chains. The objective of this study is to determine if enhanced sulfate loads elevate MeHg levels in a sub-boreal *Sphagnum*/conifer wetland. Previous studies conducted in the laboratory and in field microcosms demonstrate a link between increased sulfate reduction rates and enhanced Hg methylation (*8, 12*). In this study, we artificially increased sulfate loads to an experimental wetland to examine the impact of increased sulfate deposition on Hg methylation at the watershed scale.

Material and Methods

Site Description. The United States Department of Agriculture Forest Service Marcell Experimental Forest (MEF; Figure 1) is an 890 ha tract of land located 40 km north of Grand Rapids, Minnesota (47°32′N, 93°28′W). The experimental site, wetland S6, is one of seven small watersheds that have been used for long-term study of forest hydrology and Hg cycling at the MEF (*22*−*26*). Climatic and hydrologic data have been collected continuously at monitoring stations since 1959. Two peatland/upland forest watersheds have been instrumented and studied in detail, including hydrology (*27, 28*), nutrient cycling and behavior (*29, 30*), and release of organic carbon and acidity (*31*). A National Atmospheric Deposition Program (NADP) site has been operating at Marcell since 1978 and the first Mercury Deposition Network (MDN) station began operation at the MEF in 1992 (*32, 33*). Hydrologic monitoring and other related research continues at the MEF.

The landscape of the MEF is typical of morainic landscapes in the western Great Lakes region. The S6 watershed contains an elongate 2.0 ha mature black spruce (*Picea mariana*) and

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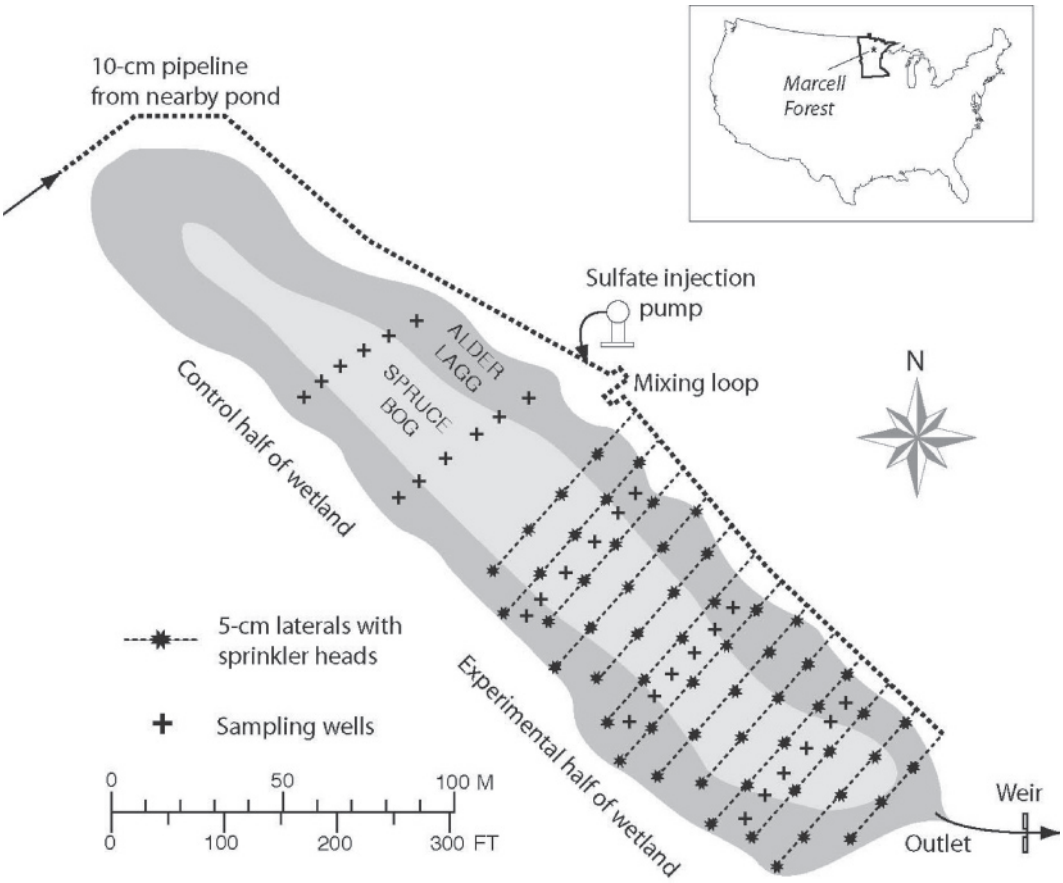

FIGURE 1. The S6 wetland in the Marcell Experimental Forest, northern Minnesota. The irrigation system consists of ~360 m of 10-cm diameter PVC pipe running adjacent to the north side of the S6 wetland. From this main line, thirteen 5-cm diameter laterals, spaced 14 m apart, extend across the experimental half of the wetland. Adjustable sprinkler heads spaced at 16-m intervals along each lateral operate with a spray radius of approximately 8−9 m and rotate on 0.6-m vertical risers. Wells for sampling peat pore waters are arrayed along five transects, each consisting of two lagg wells, two bog wells, and two "transition" wells between the bog and the lagg.

tamarack (*Larix laricina*) wetland. The S6 wetland (Figure 1) is characterized by an alder (*Alnus rugosa*) lagg (a zone of higher pH at the contact with mineral-soil uplands) encircling the slightly raised spruce/*Sphagnum* bog. Outflow from the S6 watershed (pH = 4.9 ± 0.7) has been monitored with a 120° V-notch weir since 1964 (*34*). The 6.9 ha upland was clear-cut in 1980 to convert the upland from predominantly aspen (*Populus tremula*) to white spruce (*Picea glauca*) and red pine (*Pinus resinosa*).

Sulfate Additions. Sulfate was added to the experimental half of the S6 wetland in five simulated rainfall events (6−10 mm) from November 2001 through October 2002 by means of a PVC irrigation system (*35*) constructed in 2001 (Figure 1). The system consists of ~360 m of 10-cm diameter PVC pipe running adjacent to the north side of the wetland. From this main line, thirteen 5-cm diameter laterals, spaced 14 m apart, extend across the experimental half of the wetland. Adjustable sprinkler heads spaced at 16 m intervals along each lateral operate with a spray radius of approximately 8−9 m and rotate on 0.6 m risers. Valves installed on each lateral allowed flow rates to be maintained to operate sprinkler heads at the desired radius. The PVC pipes were glued together at most joints, but flexible hosing at several joints allows for temperature contraction and expansion. Source water for the system was drawn from a dilute (conductivity ~10 μS cm^{-1}), low mercury (<1 ng L^{-1}), rain-fed pond, and a concentrated sodium sulfate solution was injected into the main line resulting in sulfate concentrations in the irrigation water of ~200 mg L^{-1}. A mixing loop after the injection point ensured a homogeneous sulfate solution. When the desired amount of sulfate had been added, a 1-mm rainfall equivalent cleared the lines and "washed" the sulfate off plant surfaces and into the peat porewaters. The 2002 sulfate load delivered by the irrigation system was 32 kg ha^{-1}, equivalent to approximately four times current annual atmospheric deposition and similar to atmospheric sulfate deposition in the northeastern United States (*32, 33*). The sulfate load was seasonally distributed based on historical sulfate deposition rates. Lithium bromide was used as a hydrologic tracer, but it appears to be nonconservative, and was not as useful as hoped.

Field Sampling. Filtered water samples were collected from 30 peat wells 1 day prior to, and 1, 3, 5, 7, 14, 28, and 56 days following, each sulfate addition. The wells were situated along 5 transects designated as experimental (ET1, ET2, and ET3) or control (CT2 and CT3). Each transect consisted of 6 wells: 2 lagg wells (one each in the N and S laggs), 2 bog wells, and 2 transition wells. The bog wells were located in the raised black spruce area of the wetland, the lagg wells were in the alder lagg, and the transition wells were located between the lagg and raised bog portions of the wetland. Unfiltered samples were collected at the S6 and nearby S7a outlet weirs every two weeks and whenever peat well sampling occurred. All mercury samples were collected in acid-cleaned 125 mL Teflon bottles using established protocols (*24*). Peat wells were designed to integrate peat porewater from the surface of the water table down to about 25 cm and by design collected porewater from depths corresponding to greatest hydraulic conductivity. Peat wells consisted of acid-cleaned 5-cm diameter PVC pipes cut to a length of 45 cm and driven approximately 35 cm into the peat. Approximately 40 holes (0.65-cm diameter) were drilled

into the wells to allow porewater to flow freely. A 2.5-cm diameter, finely slotted, acid-cleaned PVC Geoprobe screen, capped on the bottom, was inserted into each well and wells were capped between samplings. Samples were drawn from inside the Geoprobe screen with a hand pump and filtered through 0.7 μm ashed glass fiber filters. Field duplicates and blanks constituted approximately 20% of all samples collected. Experimental results from the November 2001 and October 2002 additions are not presented in this paper because many of the sample wells froze shortly after sulfate additions. Outflows from sampled watersheds were measured at 120° V-notch weirs with individually calibrated stage−discharge relations and hourly stage readings (S7a) or a continuous strip-chart recorder (S6).

Laboratory Methods. Accepted clean methods were utilized throughout the collection and analysis of mercury and methylmercury samples. Samples analyzed for total mercury were first oxidized with 0.2 N bromine monochloride, neutralized with hydroxylamine, and then analyzed using the stannous chloride/cold vapor atomic fluorescence spectroscopic (CVAFS) method (*24, 36*). Analysis of MeHg was performed using the aqueous distillation/CVAFS method (*37, 38*). Briefly, following distillation, water samples were ethylated with sodium tetraethylborate, purged with nitrogen and collected on Tenax TA (Alltech 60−80 mesh) traps. Hg species were thermally desorbed from the Tenax in an argon stream and separated on an OV-1 chromatographic column, converted to elemental mercury in a pyrolytic column, and analyzed on a Tekran 2400 CVAFS. Lab duplicates and performance standards were routinely analyzed as part of the quality assurance plan. Sulfate and other anions were measured by ion chromatography (Dionex ICS 2000), while cations were measured with ICP-MS (Thermalelectric PQ ExCell).

Results and Discussion

Porewater MeHg Concentrations. Dramatic increases in porewater MeHg concentrations were observed following the May 22, 2002 sulfate addition (Figure 2a). One day prior to the addition (Day −1), MeHg levels in the peat porewaters were not significantly different ($p = 0.62$) in the control (0.47 ± 0.10 ng L^{-1}, $n = 12$; mean ± one standard error) versus the experimental (0.52 ± 0.05 ng L^{-1}, $n = 18$) half of the wetland (Figure 2a). In the period between the May and July additions, MeHg porewater levels in the experimental half increased and remained elevated, while the control half exhibited no statistically significant change relative to Day −1. All MeHg concentrations in the experimental half were statistically higher than those of Day −1 at $p < 0.05$ except for Day 56 ($p = 0.13$). Porewater MeHg levels in the experimental half were also higher than the control half at $p < 0.05$ except for Day 1 ($p = 0.06$), demonstrating that the sulfate addition elevated MeHg levels after the May addition and, relative to the control half, maintained them for an extended period of time. Total Hg levels were similar between the experimental and control halves at this time; however, the fraction of total Hg occurring as MeHg increased after the May sulfate addition and remained elevated (Figure 2b). In addition, other water chemistry parameters (cations, anions, pH, and DOC) unimpacted by the sulfate addition behaved similarly between the experimental and control halves.

Changes in MeHg levels in the experimental half were inversely related to sulfate concentration in the peat porewaters in the first four sampling dates following the May addition (Figure 2a). Sulfate levels were undetectable at Day −1 in both the control and experimental halves. Following the May addition the average sulfate concentration increased to 1.09 ± 0.33 mg L^{-1} ($n = 18$) at Day 1 in the experimental half of the wetland and remained undetectable in the control half. As the sulfate reducing bacteria utilized the added sulfate, levels began to drop gradually, until sulfate was undetectable again on June 5 (Day 14) and porewater MeHg concentrations were at a local maximum, 1.63 ± 0.27 ng L^{-1} ($n = 18$). Following June 5 and prior to the July addition, sulfate levels across the wetland were detectable, but lower in the control half, although not statistically ($p > 0.05$). The average sulfate concentration in the control during 2002 was 0.02 ± 0.01 mg L^{-1}.

MeHg levels decreased after the June 5 maximum, but not back to the pre-addition levels. Net methylation (methylation − demethylation) was apparently enhanced in the experimental half of the wetland by the addition of sulfate. Two possible mechanisms for sustaining the elevated MeHg concentrations include the creation of a larger biologically available sulfur pool (*14, 39, 40*) or an increase in sulfate-reducing bacteria that methylate mercury.

The current study employed a large number of sampling wells collecting depth-integrated porewaters dispersed over a large area (2.0 ha). The large scale and experimental design makes it difficult to compare to other studies. However, similar studies done at smaller scales and at specific depth intervals were conducted in the Experimental Lakes Area (ELA), Canada (*12*) and in Degero Stomyr in northern Sweden (*14*). In the current study, MeHg porewater concentrations increased by a factor of 3 (from 0.52 ± 0.05 ng L^{-1} to 1.63 ± 0.27 ng L^{-1}) two weeks after a 4× increase in sulfate load (Figure 2a). Branfireun et al. (*12*) reported MeHg increases of up to 10× following a 20× increase in sulfate load to an experimental mesocosm (0.16 m^2) in a poor fen peatland at ELA. A 2× increase in sulfate load at the ELA study site resulted in a 3−4-fold increase in MeHg levels (*12*). The ELA study was conducted over 5 days and in most cases MeHg in the porewaters returned to pre-addition levels. The study in Sweden (*14*) examined MeHg in porewaters from sedge peatland microcosms (4 m^2) dosed with sulfate for three years. A MeHg increase of approximately 5× was reported in the mesocosm receiving an ∼7× increase in sulfate load.

Rain events influence MeHg levels in S6 not only by supplying sulfate, nutrients, and mercury, but also by transporting added sulfate within the wetland or flushing it from the wetland. The first rainfall after the spring addition—12 mm on May 28 and 17 mm on May 29—was not substantial enough to flush the added sulfate from the wetland. Indeed, the estimated sulfate load transported from the wetland was only 0.36 kg from May 21−June 5 compared to the added sulfate of 14.3 kg. An extremely large rain event (208 mm) occurred on June 22−24, preceded by a smaller event (36 mm) on June 18−19, resulting in record flows from S6 (Figure 3b). The amount of sulfate transported from the wetland at this time was 4.3 kg, still a relatively small amount compared to what was added. Despite this extreme hydrologic event, MeHg in the porewaters of the experimental half of the wetland exceeded those in the controls.

Contrary to expectations from the May sulfate application, MeHg concentrations did not increase in peat porewaters following the July and initially after the September sulfate additions (Figure 2). Moreover, there was no observed increase in porewater sulfate in the experimental peat wells, even 1 day after the applications. However, MeHg concentrations remained elevated in the experimental half relative to the control until late September. The most likely explanation for this seasonal contrast is temperature, which plays a key role in controlling sulfate reduction and methylation/demethylation rates. At the time of the May addition peat temperatures (as measured at the nearby S2 wetland, 0.4 km away), were still quite cool (4.5 °C at 5 cm), the bog having thawed only weeks before, and the added sulfate persisted for two weeks and changes in MeHg were observed. Peat temperatures increased slowly to above 16 °C by the time of the July addition and were still at 15 °C for the third addition

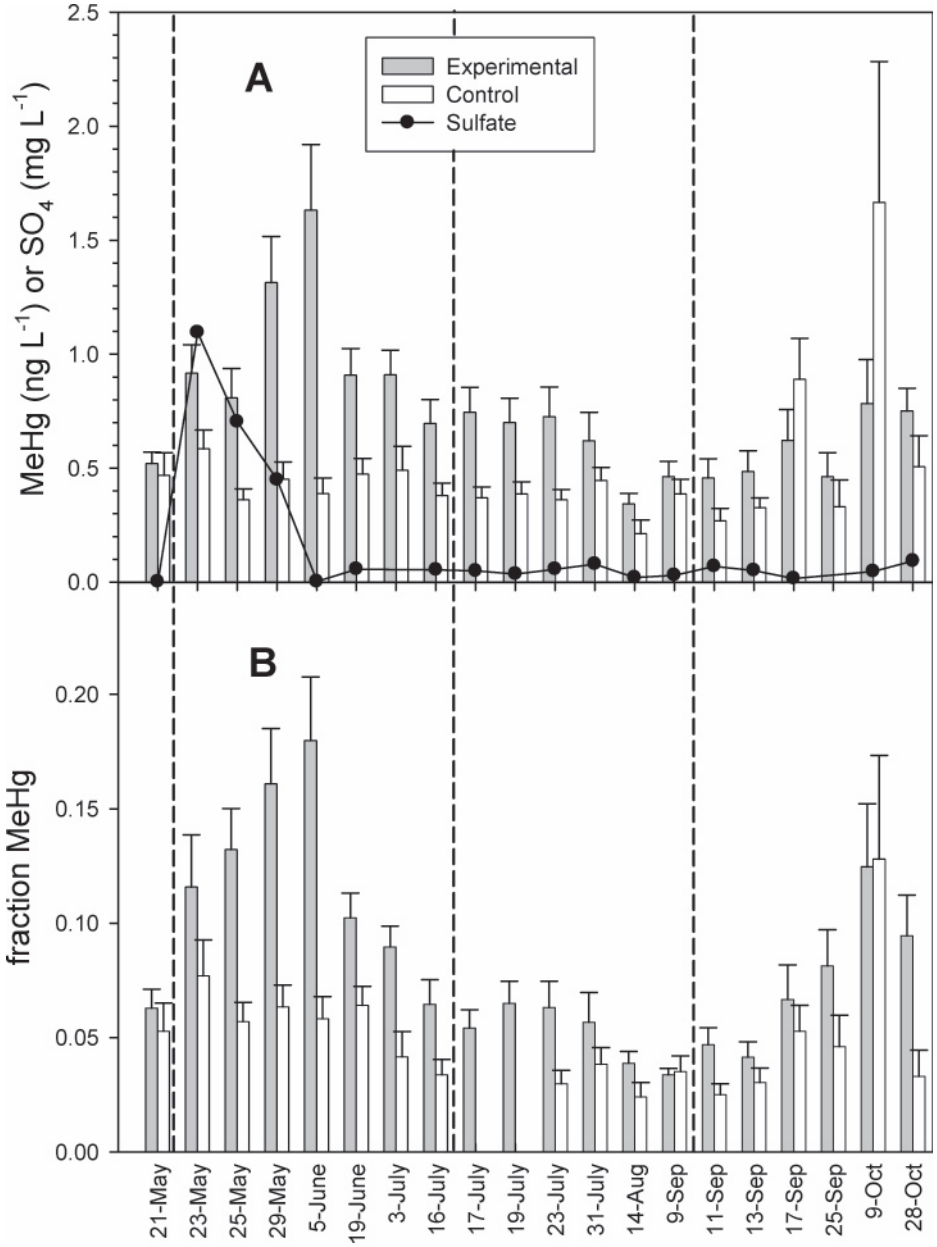

FIGURE 2. (A) MeHg concentrations (±1 standard error) in pore waters from control and experimental peat wells and sulfate concentrations in experimental peat wells only; sulfate was generally below detection (<0.01 mg L^{-1}) in the control wells. Each dotted line represents a sulfate application. (B) The fraction of total Hg existing as MeHg in control and experimental peat wells.

in early September. The warm late-summer peat temperatures likely led to very high sulfate reduction rates such that much of the added sulfate may have been consumed within 24 h (the first sampling day) following the July and September applications. Some of the sulfate may have also been entrained in the more abundant vegetation during the summer additions.

A subsequent decrease in peat temperature and outflow in late September/early October coincided with more variable MeHg concentrations and the control half actually exceeding MeHg levels in the experimental half on a few days, but these differences are not statistically significant (Figure 2). Currently, we cannot explain these observations, but they appear independent of the sulfate addition. The limited MeHg results from after the October 2002 addition (not presented because of extensive well freeze-up) were also highly variable and may be related to decreases in temperature. A few of these samples had MeHg concentrations exceeding 10 ng L^{-1}, however they could not be independently verified by additional late season field collections. Decreased temperatures might have contributed to the increase in MeHg concentrations, but other factors including Hg deposition through litterfall or possibly organic matter oxidation owing to late-season water-level fluctuations could have played a role. Litterfall, which begins in mid-September, is an important component of the total Hg flux to the Marcell wetlands, contributing nearly twice the Hg delivered by wet deposition alone (*41*, *42*). Water level in the wetland was decreasing at this time creating relatively stagnant conditions. Flow from S6 decreased substantially in September 2002 with only a few small rain events (Figure 3b). With the decline in water level, labile organic matter in the surface peat may have been oxidized releasing bound mercury as well as sulfate to the dissolved phase.

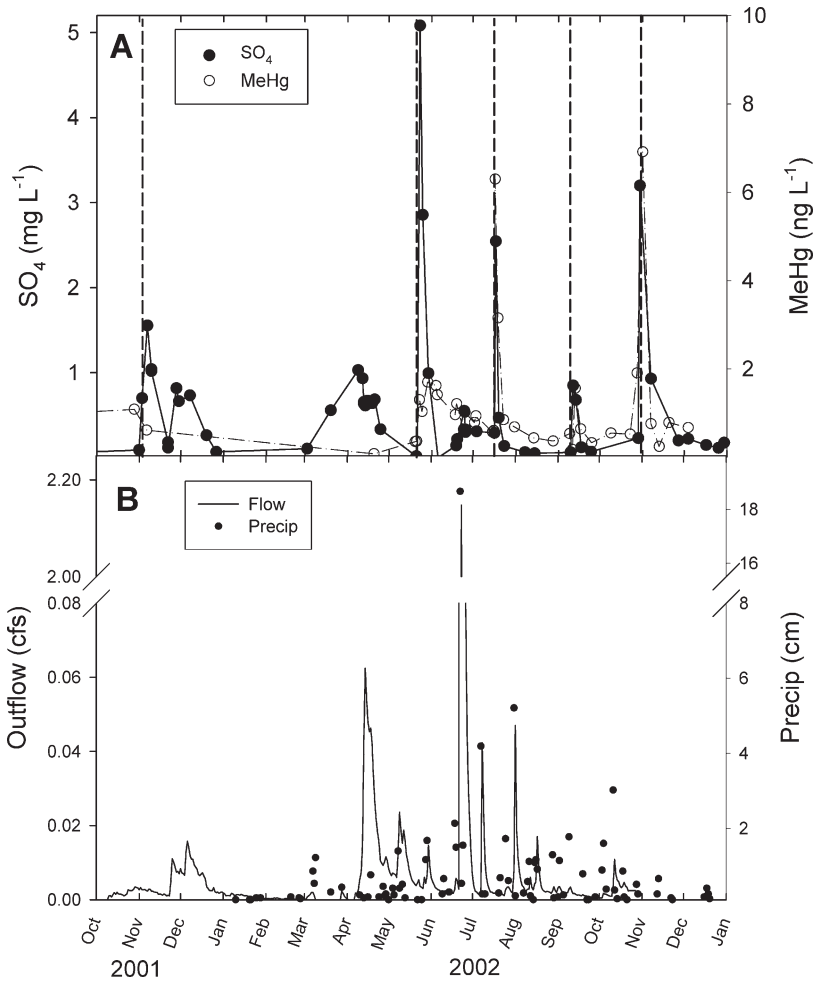

FIGURE 3. (A) MeHg and sulfate concentrations in the outflow from the S6 wetland. (B) Hydrologic outflow and precipitation events at S6. Flows were measured by chart recorder at the S6 weir (in operation since 1964), and precipitation was measured with a rain gauge located near the west end of the S6 wetland.

MeHg Export from S6. MeHg and sulfate concentrations increased at the S6 weir following each sulfate addition (Figure 3a), although the timing of the increases varied over the course of the experiment. Elevated concentrations observed at the weir after the July and September additions are in contrast to the peat wells where increases in sulfate or MeHg were not observed (but MeHg remained elevated relative to the control). Higher sulfate concentrations persisted at the weir following the May and late October additions, consistent with the peat well trends. A small pool impounded behind the weir likely contributed to these trends. Although sulfate was not added directly to the pool, some sulfate flowed into it within hours of each addition, increasing sulfate concentrations. Sulfate levels at the weir then declined over time as the pool was flushed by additional sulfate-depleted water from the wetland. For example, in May the flushing rate, k_f, of the weir pool was 1.37 d^{-1}, (k_f = flow/volume). The observed first-order loss of sulfate from the pool, k_{obs} (0.27 d^{-1}), from Day 1 to Day 7 was significantly less than k_f indicating a substantial flow of sulfate from the wetland to the weir pool. Sulfate levels in the peat porewaters were elevated at this time (Figure 3). In contrast, pool flushing rates following the July (0.48 d^{-1}) and September (0.33 d^{-1}) additions, were similar to k_{obs} for July (0.59 d^{-1}) and September (0.37 d^{-1}) suggesting that a pulse of sulfate was introduced to the weir pool within hours after these additions and then simply flushed out. Presumably due to high sulfate reduction rates or the sulfate never reaching the water table, sulfate in peat porewaters was insignificant during July and September and thus outflow of sulfate from the wetland to the pool was insignificant at this time. Water chemistry samples were not taken frequently enough following the October 2002 addition to calculate k_{obs} accurately.

MeHg trends at the weir closely track those for sulfate (Figure 3a). Following the May addition, MeHg concentration gradually increased at the weir, similar to the peat porewaters (Figure 2). The concentrations at the weir and in the peat porewaters were also similar at this time indicating that the peat porewaters were supplying the MeHg flowing over the weir. However, following the July and September additions, MeHg concentrations at the weir spiked immediately after each addition and the weir concentrations exceeded peat porewater concentrations. It is not clear if these spikes were due to high levels of MeHg flowing from the wetland or MeHg formation in the weir pool itself. However, based on the flushing rate of the pool, it appears that the dominant loss process for sulfate was flushing and that sulfate reduction in the weir pool was negligible.

Empirically modeled MeHg export from S6 without sulfate addition was compared to measured MeHg export in 2002. The observed daily MeHg export exceeded the predicted MeHg export during periods immediately following sulfate additions. To model MeHg export from S6 in the absence of sulfate additions, data from 2001 (prior to the 2002 sulfate additions to S6) showed a strong correlation between flows at the S6 weir and a nearby wetland weir, S7a ($r^2 = 0.71$).

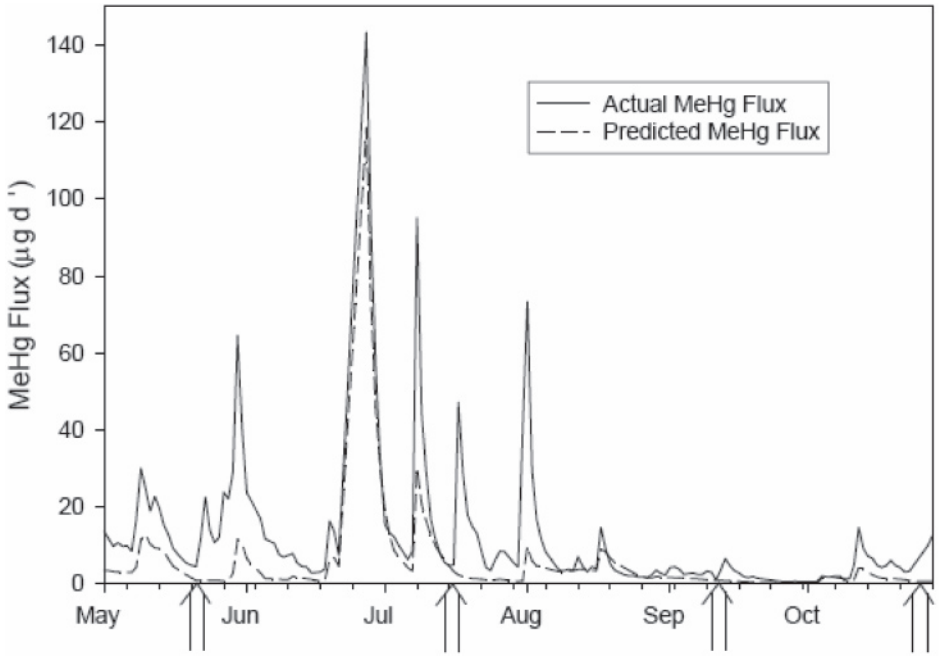

FIGURE 4. Actual and predicted fluxes of MeHg from the S6 wetland for 2002. The predicted flux is that which would have occurred in the absence of sulfate addition and is based on a correlation of 2001 (pretreatment) MeHg fluxes from S6 with those from a nearby reference wetland, S7a (see text). Arrows indicate experimental sulfate applications.

Furthermore, MeHg export from S7a was correlated to MeHg export from S6 in 2001

$$\log \text{Flux}_{S6} = 1.23 \times \log \text{Flux}_{S7a} - 1.62 \ (r^2 = 0.77 \text{ in } 2001) \quad (1)$$

where Flux_{S6} (μg d^{-1}) is the measured MeHg flux out of wetland S6 and Flux_{S7a} (μg d^{-1}) is the measured flux out of wetland S7a. Flux_{S6} and Flux_{S7a} are daily fluxes determined from average daily flows measured at the weirs and MeHg concentrations interpolated between sampling dates (see Supporting Information). In 2001, the weirs were sampled biweekly and in 2002 additional samples were collected from the weir at S6 corresponding to each porewater sampling date. Using eq 1, the MeHg flux for May though October 2002 that would have come from S6 in the absence of sulfate addition was estimated and compared to the actual flux (Figure 4). Excluding the high flow values from the June 22−24 storm event and the unusually high MeHg concentration observed the day after the October 2002 addition (including these values yields an even greater enhancement), the MeHg flux observed in 2002 (1780 μg MeHg) was more than two times greater (144%) than would have occurred without sulfate addition (730 μg MeHg).

In this study, enhanced MeHg concentrations were observed in the experimental peat porewaters and in the flow from the S6 wetland following sulfate addition. Enhanced MeHg concentrations were not observed in peat porewaters following the July and September additions, but the added sulfate did not increase porewater sulfate concentrations due to either rapid sulfate utilization or entrainment in overlying vegetation. Not all MeHg and sulfate trends observed can be readily explained in this initial year of sulfate addition, but sulfate addition enhanced MeHg concentrations in most cases, despite the fact that our addition of sulfur was negligible relative to the sulfur pool in the upper 30 cm of peat. At no point in the study were there any indications that the sulfate load decreased methylation as has been observed in the past in lake enclosures (*43*). The most likely explanation for these observations is that biologically available sulfur is a limiting factor in this system for the methylating bacteria. The addition of the limiting factor, sulfate, increased MeHg levels and may have increased the biologically active sulfur pool in S6. One possible implication of this study is that historic increases in atmospheric sulfate deposition (now on the decline) may have enhanced contemporary MeHg production and export from wetlands, contributing to widespread mercury contamination of aquatic food chains. It follows that decreases in sulfate deposition could result in less export of MeHg from wetlands and possibly result in lower MeHg levels in fish.

Acknowledgments

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Supporting Information Available

Additional plots and further information on methods related to eq 1 and Figure 4 used to estimate enhanced export of MeHg from the S6 wetland. This material is available free of charge via the Internet at http://pubs.acs.org.

Literature Cited

(1) Engstrom, D. R.; Swain, E. B. Recent declines in atmospheric mercury deposition in the Upper Midwest. *Environ. Sci. Technol.* **1997**, *31*, 960−967.
(2) Swain, E. B.; Engstrom, D. R.; Brigham, M. E.; Henning, T. A.; Brezonik, P. L. Increasing rates of atmospheric mercury deposition in midcontinental North America. *Science* **1992**, *257*, 784−787.
(3) Benoit, J. M.; Fitzgerald, W. F.; Damman, A. W. H. The biogeochemistry of an ombrotrophic bog: Evaluation of use as an archive of atmospheric mercury deposition. *Environ. Res.* **1998**, *78*, 118−133.
(4) Schuster, P. F.; Krabbenhoft, D. P.; Naftz, D. L.; Cecil, L. D.; Olson, M. L.; Dewild, J. F.; Susong, D. D.; Green, J. R.; Abbott,

M. L. Atmospheric mercury deposition during the last 270 years: A glacial ice core record of natural and anthropogenic sources. *Environ. Sci. Technol.* **2002**, *36*, 2303−2310.
(5) Lamborg, C. H.; Fitzgerald, W. F.; O'Donnell, J.; Torgersen, T. A non-steady-state compartmental model of global-scale mercury biogeochemistry with interhemispheric atmospheric gradients. *Geochim. Cosmochim. Acta* **2002**, *66*, 1105−1118.
(6) Lamborg, C. H.; Fitzgerald, W. F.; Damman, A. W. H.; Benoit, J. M.; Balcom, P. H.; Engstrom, D. R. Modern and historic atmospheric mercury fluxes in both hemispheres: global and regional mercury cycling implications. *Global Biogeochem. Cycles* **2002**, *16*, 1104.
(7) Swain, E. B.; Helwig, D. D. Mercury in fish from northeastern Minnesota lakes: historical trends, environmental correlates, and potential sources. *J. Minn. Acad. Sci.* **1989**, *55*, 103−109.
(8) Gilmour, C.; Henry, E.; Mitchell, R. Sulfate stimulation of mercury methylation in freshwater sediments. *Environ. Sci. Technol.* **1992**, *26*, 2281−2287.
(9) King, J. K.; Saunders, F. M.; Lee, R. F.; Jahnke, R. A. Coupling mercury methylation rates to sulfate reduction rates in marine sediments. *Environ. Toxicol. Chem.* **1999**, *18*, 1362−1369.
(10) Warner, K. A.; Roden, E. E.; Bonzongo, J. C. Microbial mercury transformation in anoxic freshwater sediments under iron-reducing and other electron-accepting conditions. *Environ. Sci. Technol.* **2003**, *37*, 2159−2165.
(11) Hammerschmidt, C. R.; Fitzgerald, W. F. Geochemical controls on the production and distribution of methylmercury in near-shore marine sediments. *Environ. Sci. Technol.* **2004**, *38*, 1487−1495.
(12) Branfireun, B. A.; Roulet, N. T.; Kelly, C. A.; Rudd, J. W. M. In situ sulphate stimulation of mercury methylation in a boreal peatland: toward a link between acid rain and methylmercury contamination in remote environments. *Global Biogeochem. Cycles* **1999**, *13*, 743−750.
(13) Heyes, A.; Moore, T. R.; Rudd, J. W. M.; Dugoua, J. J. Methyl mercury in pristine and impounded boreal peatlands, experimental Lakes Area, Ontario. *Can. J. Fish. Aquat. Sci.* **2000**, *57*, 2211−2222.
(14) Branfireun, B. A.; Bishop, K.; Roulet, N. T.; Granberg, G.; Nilsson, M. Mercury cycling in boreal ecosystems: The long-term effect of acid rain constituents on peatland pore water methylmercury concentrations. *Geophys. Res. Lett.* **2001**, *28*, 1227−1230.
(15) King, J. K.; Harmon, S. M.; Fu, T. T.; Gladden, J. B. Mercury removal, methylmercury formation, and sulfate-reducing bacteria profiles in wetland mesocosms. *Chemosphere* **2002**, *46*, 859−870.
(16) Harmon, S. M.; King, J. K.; Gladden, J. B.; Chandler, G. T.; Newman, L. A. Methylmercury formation in a wetland mesocosm amended with sulfate. *Environ. Sci. Technol.* **2004**, *38*, 650−656.
(17) Mauro, J. B. N.; Guimaraes, J. R. D.; Hintelmann, H.; Watras, C. J.; Haack, E. A.; Coelho-Souza, S. A. Mercury methylation in macrophytes, periphyton, and water − comparative studies with stable and radio-mercury additions. *Anal. Bioanal. Chem.* **2002**, *374*, 983−989.
(18) St. Louis, V.; Rudd, J.; Kelly, C.; Beaty, K.; Bloom, N.; Flett, R. Importance of wetlands as sources of methylmercury to boreal forest ecosystems. *Can. J. Fish. Aquat. Sci.* **1994**, *51*, 1065−1076.
(19) St. Louis, V.; Rudd, J.; Kelly, C.; Beaty, K.; Flett, R.; Roulet, N. T. Production and loss of methylmercury and loss of total mercury from boreal forest catchments containing different types of wetlands. *Environ. Sci. Technol.* **1996**, *30*, 2719−2729.
(20) Krabbenhoft, D.; Benoit, J.; Babiarz, C.; Hurley, J.; Andren, A. Mercury Cycling in the Allequash Creek Watershed, Northern Wisconsin. *Water Air Soil Pollut.* **1995**, *80*, 425−433.
(21) Hurley, J. P.; Benoit, J. M.; Babiarz, C. L.; Shafer, M. M.; Andren, A. W.; Sullivan, J. R.; Hammond, R.; Webb, D. A. Influences of watershed characteristics on mercury levels in Wisconsin rivers. *Environ. Sci. Technol.* **1995**, *29*, 1867−1875.
(22) Kolka, R. K.; Grigal, D. F.; Nater, E. A.; Verry, E. S. Hydrologic cycling of mercury and organic carbon in a forested upland-bog watershed. *Soil Sci. Soc. Am. J.* **2001**, *65*, 897−905.
(23) Grigal, D. F.; Kolka, R. K.; Fleck, J. A.; Nater, E. A. Mercury budget of an upland-peatland watershed. *Biogeochemistry* **2000**, *50*, 95−109.
(24) Kolka, R. K.; Nater, E. A.; Grigal, D. F.; Verry, E. S. Atmospheric inputs of mercury and organic carbon into a forested upland bog watershed. *Water Air Soil Pollut.* **1999**, *113*, 273−294.
(25) Kolka, R. K.; Grigal, D. F.; Verry, E. S.; Nater, E. A. Mercury and organic carbon relationships in streams draining forested upland peatland watersheds. *J. Environ. Qual.* **1999**, *28*, 766−775.
(26) Fleck, J. A.; Grigal, D. F.; Nater, E. A. Mercury uptake by trees: An observational experiment. *Water Air Soil Pollut.* **1999**, *115*, 513−523.
(27) Boelter, D. H.; Verry, E. S. *Peatland and Water in the Northern Lake States*; U.S. Department of Agriculture: St. Paul, MN, 1977.
(28) Nichols, D. S.; Brown, J. M. Evaporation from a sphagnum moss surface. *J. Hydrol.* **1980**, *48*, 289−302.
(29) Verry, E. S.; Timmons, D. R. Waterborne nutrient flow through an upland-peatland watershed in Minnesota. *Ecology* **1982**, *63*, 1456−1467.
(30) Grigal, D. F. Elemental dynamics in forested bogs in northern Minnesota. *Can. J. Bot.* **1991**, *69*, 539−546.
(31) Urban, N. R.; Bayley, S. E.; Eisenreich, S. J. Export of dissolved organic carbon and acidity from peatlands. *Water Resour. Res.* **1989**, *25*, 1619−1628.
(32) Mercury Deposition Network. http://nadp.sws.uiuc.edu/mdn/.
(33) National Atmospheric Deposition Network. http://nadp.sws.uiuc.edu.
(34) Nichols, D. S.; Verry, E. S. Stream flow and ground water recharge from small forested watersheds in north central Minnesota. *J. Hydrol.* **1991**, *245*, 89−103.
(35) Beaty, K. G. *An Irrigation System and Hydrological Network for a Wetland Acidification Project*; Canada Department of Fisheries and Oceans: Ottawa, ON, 1987.
(36) Bloom, N.; Fitzgerald, W. Determination of volatile mercury species at the picogram level by low-temperature gas chromatography with cold-vapour atomic fluorescence detection. *Anal. Chim. Acta* **1988**, *208*, 151−161.
(37) Bloom, N. Determination of picogram levels of methylmercury by aqueous phase ethylation, followed by cryogenic gas chromatography with cold vapour atomic fluorescence detection. *Can. J. Fish. Aquat. Sci.* **1989**, *46*, 1131−1140.
(38) Horvat, M.; Bloom, N.; Liang, L. Comparison of distillation with other current isolation methods for the determination of methyl mercury compounds in low level environmental samples. 1. Sediments. *Anal. Chim. Acta* **1993**, *281*, 135−152.
(39) Gilmour, C.; Riedel, G.; Ederington, M.; Bell, J.; Benoit, J.; Gill, G.; Stordal, M. Methylmercury concentrations and production rates across a trophic gradient in the northern Everglades. *Biogeochemistry* **1998**, *40*, 327−345.
(40) Benoit, J. M.; Gilmour, C. C.; Mason, R. P.; Heyes, A. Sulfide controls on mercury speciation and bioavailability in sediment pore waters. *Environ. Sci. Technol.* **1999**, *33*, 951−957.
(41) St. Louis, V. L.; Rudd, J. W. M.; Kelly, C. A.; Hall, B. D.; Rolfhus, K. R.; Scott, K. J.; Lindberg, S. E.; Dong, W. Importance of the forest canopy to fluxes of methyl mercury and total mercury to boreal ecosystems. *Environ. Sci. Technol.* **2001**, *35*, 3089−3098.
(42) Balogh, S. J.; Huang, Y. B.; Offerman, H. J.; Meyer, M. L.; Johnson, D. K. Episodes of elevated methylmercury concentrations in prairie streams. *Environ. Sci. Technol.* **2002**, *36*, 1665−1670.
(43) Winfrey, M. R.; Rudd, J. W. M. Environmental factors affecting the formation of methylmercury in low pH lakes. *Environ. Toxicol. Chem.* **1990**, *9*, 853−869.

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ES0524144

HOT Info

****PolyMet is now known as NewRange Copper Nickel, LLC****

NewRange Copper Nickel, LLC – Section 404 permit status

The U.S. Army Corps of Engineers, St. Paul District, announced June 6, that it revoked the previously suspended NewRange Copper Nickel Company's permit for the NorthMet mine.

Corps officials revoked the Clean Water Act Section 404 permit because the permit does not ensure compliance with water quality requirements of the Fond du Lac Band of Lake Superior Chippewa. The Corps made this decision after thoroughly considering all information provided to the district at a public hearing hosted in May of 2022 to include the evaluation and recommendations provided by the U.S. Environmental Protection Agency and information provided by the Fond du Lac Band (Band) under their respective water quality authorities granted by the Clean Water Act, as well as information provided by NewRange Copper Nickel Company and the public.

The Corps initially completed its Record of Decision and issued a Section 404 Clean Water Act individual permit for regulated activities at the NorthMet project March 21, 2019. At that time, Corps officials determined the project was compliant with all applicable federal laws and regulations. The Corps subsequently suspended the permit March 17, 2021, at the request of the EPA, while the EPA considered effects from the project under Section 401(a)(2) of the Clean Water Act to water quality downstream in the state of Wisconsin and within the Band's Reservation. The EPA issued a "may affect" determination to the Band and the state of Wisconsin on June 4, 2021. The Band submitted an objection to the permit and its "will affect" determination on Aug. 3, 2021, and requested the Corps hold a public hearing.

The Corps held a public hearing in May 2022, to seek information on whether the permit should be re-issued, revoked, or modified with new conditions to ensure compliance with the Band's applicable water quality requirements. During the hearing, the Band provided information on its determination that the NorthMet project will violate its water quality requirements. The EPA agreed with the Band and recommended the Corps not reinstate the suspended permit. The permittee provided information to support their view that the project would not violate the Band's water quality and requested the Corps reinstate the suspended permit. The Corps also received verbal and written comments from the public.

Given the Corps' jurisdiction under Section 404 of the Clean Water Act, the Band and EPA's water quality authority provided in the Clean Water Act, and the absence of sufficient permit conditions to ensure compliance with the applicable downstream water quality requirements of the Band as required by Section 401(a)(2) of the Clean Water Act, the Corps must revoke the suspended permit. The decision does not preclude NewRange Copper Nickel LLC from submitting a new permit application that will meet all applicable water quality requirements for its project.

The Corps' decision memo on this action may be found here.

Related documents and past decisions

Notice of public comment period extension on Clean Water Act Section 401(a)(2) action

Notice of NorthMet Clean Water Act Section 401(a)(2) public hearing

Corps' Letter of Suspension for NorthMet Clean Water Act Section 404 permit

Corps' Record of Decision on Clean Water Section 404 permit - NorthMet Mine

- Decision summary
- (1) Appendix A - Figures
- (2) Appendix B - FEIS comments
- (3) Appendix C - Bio opinion
- (4) Appendix D - NHPA MoA
- (5) Appendix E - 401 water quality cert.
- (6) Appendix F - Impacts
- (7) Appendix G - Mitigation

Corps' Clean Water Act Section 404 permit NorthMet Mine

- Section 404 Clean Water Act Permit
- Appendix A - Permit figures
- Appendix B - Impacts
- Appendix C - 401 water quality cert.
- Appendix D - Bio opinion
- Appendix E - NHPA MoA

Contact information

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St. Paul District, Regulatory Division
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Suite E1500
Saint Paul, MN 55101

Phone: (800) 290-5847
Email: mvp-reg-inquiry@usace.army.mil

Resources/References

Final Environmental Impact Statement (PDF) (Minnesota Department of Natural Resources)

Partners:

U.S. Environmental Protection Agency

To access a playlist containing all the recorded sessions from the PolyMet public hearing please click **here** (external YouTube link).

Public hearing presentations and information

Collapse All Expand All

- Environmental Protection Agency
- Fond du Lac Band of Lake Superior Chippewa
- NewRange Copper Nickel, LLC (formerly PolyMet)
- U.S. Army Corps of Engineers

The Dangers of Cyanide in Gold Mining

Gold mining can be extremely dangerous and one of the most harmful practices is the use of cyanide to extract the precious metal from the rock. Fortunately, there are a range of innovators trying to eliminate this notorious poison from the mining process.

Since the mid-1800s, cyanide has been considered a cheap and effective way to separate gold from rocks and the techniques have remained largely unchanged over the years. When the ore is brought out of the ground, it is mixed with a cyanide solution in large vats. Over a period of about 24 hours, the solution

Over the past five years, there have been three cyanide spills at Barrick Gold's Veladero mine in Argentina, with one leak polluting five different rivers. This prompted sanctions from the San Juan government, after Barrick failed to complete improvements that would have prevented the third spill from happening in March 2017.

In 2014, some 500,000 gallons of cyanide solution spilled from a retaining pond at the Proyecto Magistral mine in Mexico. The worst cyanide spill ever was probably the 2000 disaster at the Aural Gold mine in Romania, in which a tailings dam ruptured, spilling 3.5 million cubic feet of cyanide-contaminated waste into the Tisza and Danube Rivers. Not only did this spill have terrible environmental impacts, it also caused a significant threat to human health.

Here are three examples:

Kasis Environmental

A startup from New Brunswick, Canada, called Kasis Environmental says that it has devised a safe, environmentally friendly means of separating gold. The product is called KCell, and it is a biofiber that gold clings to. CEO Travis Osmond won't discuss the composition, other than to say it's made of organic material. He believes it could address a market that's worth about $4 billion worldwide. Osmond said miners can lower KCell into the slurry like a teabag. A day later, they remove the KCell from the solution and bits of gold are clinging to it. Osmond said a kilogram of KCell can extract 25 grams of gold. The company has been improving the material for years, and says that it picks up gold better and faster than anything else on the market.

Zhichang Liu

Chemistry postgraduate student Zhichang Liu has discovered a means of swapping cyanide with corn starch to separate gold from other minerals. According to Wired magazine, Liu was part of a team at Northwestern University in suburban Chicago that was experimenting on ways to make three-dimensional cubes from gold and starch. But one solution produced not cubes but tiny needles of gold. Further tests produced more needles, each 1.3 nanometres wide, that could easily be harvested from the solution. The residue of Liu's method is a mildly alkali metal salt that is easily disposed of, said Wired. Liu has published his findings in the journal Nature Communications.

CSIRO's Thiosulphate Process

The Australian research organization CSIRO has developed a patented cyanide-free thiosulphate process, which it has been working on for more than 20 years - they call the process "Going for Gold." Thiosulphate is non-toxic so the process reduces environmental risks in gold extraction. To bring the product into production, CSIRO partnered with a small gold producer, Eco Minerals Research, to build a demonstration plant to trial the process. They received support from the Science and Industry Endowment Fund, as well as the Australian Government, and in 2019 they transferred the technology to the Australian company Clean Mining Limited. The company now offers consumers greener gold thanks to this technology.

platform provides end-to-end traceability from the mine all the way to the consumer to support responsible sourcing and due diligence. To learn more about our work in gold, click here.

References

1. Juliana Castilla (May, 2017), Exclusive: Barrick faces sanctions for Argentina cyanide spills, judge says, *Reuters.* Retrieved from https://www.reuters.com/article/us-barrick-gold-mine-argentina-exclusive-idUSKBN1841BK
2. AP News (August, 2014), Mexico mine spills 500,000 gallons of cyanide. Retrieved from https://apnews.com/article/2c74912a5ea84d12aed6e6bad271276a
3. Judit Kanthak (April, 2000), The Baia Mare Gold Mine Cyanide Spill: Causes, Impacts and Liability, *Reliefweb.* Retrieved from https://reliefweb.int/report/hungary/baia-mare-gold-mine-cyanide-spill-causes-impacts-and-liability
4. Wired Magazine (May, 2013), 'Green' gold extraction method replaces cyanide with starch. Retrieved from https://www.wired.co.uk/article/cornstarch-cyanide-gold
5. CSIRO, Cyanide-free gold recovery. Retrieved from https://www.csiro.au/en/work-with-us/industries/mining-resources/Processing/Going-for-gold

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United States Government Accountability Office

Report to the Ranking Member, Committee on Natural Resources, House of Representatives

January 2023

ABANDONED HARDROCK MINES

Land Management Agencies Should Improve Reporting of Total Cleanup Costs

GAO-23-105408

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Land Management Agencies Should Improve Reporting of Total Cleanup Costs

GAO Highlights

Highlights of GAO-23-105408, a report to the Ranking Member, Committee on Natural Resources, House of Representatives

Why GAO Did This Study

There are at least 22,500 known abandoned hardrock mine features—e.g., pits or tunnels—on federal lands. They pose risks to human health and the environment because they can leak toxic chemicals, such as arsenic, into nearby waterways.

Interior and USDA may pay for the cleanup of abandoned mine contamination on federal lands if no viable potentially responsible party is identified. Federal accounting standards direct agencies to estimate and report certain future cleanup costs in their financial statements.

GAO was asked to provide information about agency cleanup of abandoned hardrock mines. This report describes (1) what Interior and USDA have spent to clean up environmental contamination at abandoned hardrock mines from fiscal years 2017 through 2021; (2) the extent to which agencies communicated estimated cleanup costs; and (3) Interior's steps to implement the abandoned hardrock mine land program, and the extent to which Interior followed leading practices for program management.

GAO reviewed federal accounting standards, laws, regulations, and agency documents; analyzed mine cleanup expenditure and cost estimation data; and interviewed agency officials.

What GAO Recommends

GAO is making four recommendations, including for Interior and USDA to improve reporting of total cleanup costs and for Interior to develop performance measures. Interior and USDA agreed with GAO's recommendations.

View GAO-23-105408. For more information, contact Nathan Anderson or Cardell Johnson at (202) 512-3841, AndersonN@gao.gov, or JohnsonCD1@gao.gov.

What GAO Found

The U.S. Departments of the Interior (Interior) and Agriculture (USDA) spent approximately $109 million and $10 million, respectively, from fiscal years 2017 through 2021, to clean up contamination at abandoned hardrock mines on the lands they manage. Both agencies said they have more abandoned hardrock mines than funds to clean them up.

Molybdenum Mine Cleanup on Federal and Private Lands in New Mexico

Source: GAO. | GAO-23-105408

Note: Molybdenum is a hardrock mineral used in the production of steel and other materials.

Interior and USDA included certain estimated costs for cleaning up abandoned hardrock mines in their financial statements, consistent with federal accounting standards. However, while not required to do so by the accounting standards, the agencies did not clearly identify which costs were specific to abandoned hardrock mines. Further, Interior and USDA budget materials did not communicate known information about implicit exposures related to abandoned hardrock mines—cleanup costs where there is an expectation that the government will provide assistance beyond the legally required amount. GAO's work on fiscal exposures demonstrates the importance of agencies providing decision makers with a comprehensive picture of the federal government's future financial obligations. Without Interior and USDA clearly communicating specific information on known potential future cleanup costs for abandoned hardrock mines, decision makers may not be able to make fully informed cleanup decisions.

Interior has taken some steps to implement the abandoned hardrock mine land program established under the Infrastructure and Investment Jobs Act to conduct certain activities, including inventory and cleanup, on mines on federal land, and provide grants for those activities to states and tribes with jurisdiction over abandoned hardrock mine land. For example, in collaboration with federal and nonfederal partners, Interior has begun developing a national inventory of mines and has drafted high-level goals and objectives for the program. As Interior continues building the program, it could benefit from developing performance measures—as described in leading practices for program management—to help officials fully assess progress toward achieving its goals and objectives.

Contents

Figures

Abbreviations

BIA	Bureau of Indian Affairs
BLM	Bureau of Land Management
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act of 1980, as amended
FWS	Fish and Wildlife Service
IIJA	Infrastructure Investment and Jobs Act
Interior	U.S. Department of the Interior
NEAT	National Environmental Accomplishment Tracking
NPS	National Park Service
USDA	U.S. Department of Agriculture

U.S. GOVERNMENT ACCOUNTABILITY OFFICE
441 G St. N.W.
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January 13, 2023

The Honorable Raúl M. Grijalva
Ranking Member
Committee on Natural Resources
House of Representatives

Dear Mr. Grijalva:

Releases of hazardous substances from abandoned hardrock mines have contributed to the contamination of 40 percent of the country's rivers and 50 percent of all lakes, according to the Environmental Protection Agency.[1] The contamination can pose risks to human health and the environment, and cleanup can be expensive and complicated.[2] For example, releases of hazardous substances from the Questa mine, a molybdenum mine located in northern New Mexico, contaminated the local groundwater with lead and arsenic, among other substances. This contamination threatened the village of Questa, which is 9 miles away, as well as the ecology in the area.[3] Cleanup of the Questa mine site was underway as of October 2022, and the total project is expected to cost approximately $1 billion, according to mine site documentation (see fig. 1).

[1]Environmental Protection Agency, "Fact Sheet: Water Quality Credits a Former Mine lands: Improving America's Water Resources, Reclaiming Lost Landscapes" (Washington, D.C.), accessed August 2022, https://semspub.epa.gov/work/11/176035.pdf. Federal minerals are commonly classified as locatable, leasable, or saleable. For the purposes of this report, unless indicated otherwise, we use the term "hardrock mining" to refer to the mining of locatable minerals. Locatable minerals include, for example, copper, lead, zinc, magnesium, gold, silver, and uranium—those minerals that are not leasable or saleable. Leasable minerals include oil, gas, coal, phosphate, and potash. Saleable minerals include common varieties of sand, stone, and gravel, typically used to construct roads, bridges, dams, and buildings. This report focuses on abandoned hardrock mines. Abandoned leasable and saleable mineral mines, such as abandoned coal mines and stone quarries, are out of the scope of this report. Furthermore, defense-related uranium is outside the scope of this report.

[2]For the purposes of this report, the term "cleanup" refers to responding to releases of hazardous substances from abandoned hardrock mines.

[3]For example, it was reported in 2000 that the contamination had eliminated the trout population in the Red River. *High Country News* and Ernest Atencio, "The Mine that Turned the Red River Blue" (Paonia, CO: 2000), accessed August 2022, https://www.hcn.org/issues/184/5962.

Figure 1: Molybdenum Mine Cleanup Site Located Near Questa, New Mexico

Source: GAO. | GAO-23-105408

Thousands of abandoned hardrock mines are located on federal lands managed by the U.S. Department of the Interior (Interior) and the U.S. Department of Agriculture (USDA). The USDA's Forest Service and Interior's Bureau of Land Management (BLM) and National Park Service (NPS) operate programs to address the environmental hazards found at abandoned hardrock mines on the federal lands they manage.[4] In addition, Interior's Bureau of Indian Affairs (BIA) has a role related to

[4]For purposes of this report, we refer to the Forest Service, Bureau of Indian Affairs (BIA), BLM, Fish and Wildlife Service (FWS), and NPS as "bureaus" and the Interior and USDA as "agencies." When we use the term "federal land management agencies," we are referring to BLM, FWS, NPS, and Forest Service. FWS has taken steps to address the few mines located on the lands it manages but does not have a centralized, bureau-wide abandoned hardrock mine program. The Environmental Protection Agency also has a role related to cleaning up abandoned hardrock mine contamination, but it is not a federal land management agency and, thus, is not included in our scope.

addressing the hazards at abandoned hardrock mines located on tribal lands, specifically trust and restricted fee lands.[5]

Until the federal government established requirements in the 1970s under which hardrock mine operators must reclaim the land after their operations cease, an operator could extract hardrock minerals and abandon the mine without reclaiming it.[6] This has led to the abandonment of mines with at least 140,000 known pits, tunnels, and other mine features on federal lands, as of 2019, according to a previous GAO report.[7] Of these, about 22,500 pose or may pose environmental hazards—risks to human health or wildlife from long-term exposure to harmful substances. However, we reported in 2020 that agencies estimated that there could be more than 390,000 abandoned mine features not captured in federal databases.[8] If no viable responsible party exists to pay for the cleanup of an abandoned hardrock mine's contamination, the federal government may pay for the cleanup.

Federal accounting standards require federal agencies to estimate and report certain future cleanup costs as environmental liabilities in their

[5]The federal government holds legal title to lands held in trust for tribes (tribal trust lands), but the Indian tribes retain the benefits of land ownership. Indian tribes hold title to tribal restricted fee lands, but there are legal restrictions against alienation or encumbrance of the land (the land cannot be sold, leased, or conveyed without the approval of the Secretary of the Interior). For the purposes of this report, we use the term "tribal lands" to refer to tribal trust and restricted fee lands. While mining on tribal lands is generally not subject to the General Mining Act of 1872, we include mining on tribal lands in the scope of our report. For more information about mining on tribal lands, see GAO, *Hardrock Mining Management: Selected Countries, U.S. States and Tribes Have Different Governance Structures but Primarily Use Leasing*, GAO-21-298 (Washington, D.C.: June 30, 2021).

[6]Reclamation is a process that includes activities such as environmental restoration and the mitigation of safety hazards. Under the Federal Land Policy and Management Act of 1976, the Bureau of Land Management issued regulations, effective in 1981, that required mining operators to reclaim the bureau's land disturbed by hardrock mining. See 45 Fed. Reg. 78,902 (Nov. 26, 1980) (codified as amended at 43 C.F.R. pt. 3800, subpt. 3809). The Forest Service began requiring reclamation and financial assurances in 1974. See 39 Fed. Reg. 31,317 (Aug. 28, 1974) (codified as amended at 36 C.F.R. pt. 228).

[7]See GAO, *Abandoned Hardrock Mines: Information on Number of Mines, Expenditures, and Factors That Limit Efforts to Address Hazards*, GAO-20-238 (Washington, D.C.: Mar. 5, 2020).

[8]This amount includes mine features that may pose environmental and physical safety hazards. See GAO-20-238. In this report, we focused on environmental contamination from abandoned hardrock mines and not physical safety hazards.

annual financial statements.[9] Reported environmental liabilities have been growing for the past 20 years. The federal government's total reported environmental liabilities increased about 32 percent, from $465 billion to $613 billion, from fiscal years 2017 through 2021.[10] In 2017, we identified the federal government's environmental liabilities as a high-risk issue, in part because environmental liabilities represent the fourth-largest liability on the federal government's financial statements and because of their continued growth.[11]

The Infrastructure Investment and Jobs Act (IIJA), enacted in November 2021, required, among other things, Interior to establish a program to conduct certain eligible activities, including inventorying and reclaiming, on abandoned hardrock mine land, as well as to provide grants to states and tribes to conduct eligible activities on abandoned hardrock mine land under their jurisdiction—a first-of-its-kind, nationwide program.[12] In addition to authorizing Interior to conduct these activities, the IIJA also authorizes Interior to transfer funding to USDA for eligible activities on National Forest System lands.

You asked us to provide information about agency cleanup of abandoned hardrock mines. This report (1) describes what Interior and USDA spent to clean up environmental contamination at abandoned hardrock mines from fiscal years 2017 through 2021; (2) assesses the extent to which the agencies communicated estimated cleanup costs for, and federal fiscal

[9]Federal Accounting Standards Advisory Board, *FASAB Handbook of Federal Accounting Standards and Other Pronouncements, as Amended* (Washington, D.C.: June 30, 2022).

[10]The federal government's environmental liabilities also include estimated costs for disposal of hazardous waste associated with federal property, plant, and equipment.

[11]GAO, *High-Risk Series: Progress on Many High-Risk Areas, While Substantial Efforts Needed on Others*, GAO-17-317 (Washington, D.C.: Feb. 15, 2017). GAO's High-Risk Series identifies federal programs and operations that are high - risk due to their vulnerabilities to fraud, waste, abuse, and mismanagement or that need transformation.

[12]Pub. L. No. 117-58, § 40704, 135 Stat. 429, 1093 (2021) (codified at 30 U.S.C. § 1245). Specifically, the IIJA calls for Interior to establish a program to inventory, assess, decommission, reclaim, respond to hazardous substance releases on, and remediate abandoned hardrock mine land based on conditions including need, public health and safety, potential environmental harm, and other land use priorities. The IIJA further provides that funding made available for this program may only be used for federal, state, tribal, local, and private land that has been affected by past hardrock mining activities, and for water resources that traverse, or are contiguous to, such land. The IIJA authorized $3 billion for this program, 50 percent of which is for grants to states and tribes that have jurisdiction over abandoned hardrock mine land for eligible activities to reclaim that land, and 50 percent is for Interior for eligible activities on federal land.

exposure from, abandoned hardrock mines in their financial statements and budget materials; and (3) describes the steps Interior has taken to implement the IIJA's abandoned hardrock mine land program, and assesses the extent that it has followed leading practices for program management.

To describe what Interior and USDA spent to clean up abandoned hardrock mines from fiscal years 2017 through 2021, we summarized expenditure data from relevant departmental offices and bureaus within Interior and USDA for the most recent 5 fiscal years prior to the start of our review—fiscal years 2017 through 2021. To assess the reliability of the data obtained from these federal agencies, we tested the data for accuracy by checking for missing data and errors and requested information about the data systems used and any limitations from the agencies. We determined that the data were sufficiently reliable for describing agencies' expenditures to clean up abandoned hardrock mines. We also analyzed agency documentation on prioritizing cleanup projects and tools that contain criteria used in decision-making.

To assess the extent to which the agencies communicated estimated cleanup costs for, and federal fiscal exposure from, abandoned hardrock mines in their financial statements and budget materials, we analyzed Interior and USDA documents for fiscal years 2017 through 2021. These documents included agency financial statements and budget materials, which included Interior's budget in briefs as well as USDA's budget justifications and explanatory notes.[13] In addition, we reviewed our previous work on reporting federal fiscal exposures and the 2017 High-Risk Series related to the U.S. government's environmental liabilities.[14]

Furthermore, we analyzed data sources that the agencies used to track mine site information, such as Interior's Environmental and Disposal Liability database, as well as USDA's Management Schedule Legal Letters and National Environmental Accomplishment Tracking (NEAT) database, to identify any cost estimates that officials said they either

[13]We also reviewed Interior's and USDA's budget materials for fiscal year 2022 to see if the amount of funding that the agencies requested changed because of the enactment of the IIJA in November 2021.

[14]GAO, *Fiscal Exposures: Improving Cost Recognition in the Federal Budget,* GAO-14-28 (Washington, D.C.: Oct. 29, 2014); *Fiscal Exposures: Improving the Budgetary Focus on Long-Term Costs and Uncertainties,* GAO-03-213 (Washington, D.C.: Jan. 24, 2003); *Long-Term Commitments: Improving the Budgetary Focus on Environmental Liabilities,* GAO-03-219 (Washington, D.C.: Jan. 24, 2003); and GAO-17-317.

included or did not include in their financial statements. To assess the reliability of the data, we checked for missing data and errors, reviewed documents about the data systems, asked agency officials about the data and any limitations, and reviewed their written responses. We determined that the data were sufficiently reliable for the purposes of describing estimated cleanup costs included in financial statements and budget materials. However, we also found that not all data fields in NEAT are required to be populated, and we discuss these findings in the report.

To describe the steps Interior has taken to implement the IIJA's abandoned hardrock mine land program, we reviewed the IIJA and Interior's fiscal year 2022 appropriations. To help us identify any goals, objectives, and performance measures for Interior's new abandoned hardrock mine land program, we analyzed its strategic plan for fiscal years 2022 through 2026, draft abandoned hardrock mine land program documentation and guidance, and interagency working group meeting documentation.[15] To assess the extent that Interior followed leading practices for program management, we analyzed Interior's development of goals, objectives, and performance measures and compared them with leading practices for program planning and development from the Project Management Institute's *The Standard for Program Management*.[16]

To obtain information for this report, we interviewed officials from Interior's Office of Environmental Policy and Compliance, BLM, BIA, FWS, and NPS, as well as officials from USDA's Environmental Management Division and the Forest Service. We also selected a sample of eight mine sites to use as illustrative examples throughout the report.[17] To select these sites, we used a list of factors that may affect agencies' estimates of potential cleanup costs for abandoned hardrock mine sites and then the following criteria to identify the sites: (a) mines that exemplified multiple factors; (b) at least one mine that was reported as an environmental liability in agencies' fiscal years 2017 through 2021

[15]This new Abandoned Mine Land Technical working group is supporting the development of the abandoned hardrock mine land program, according to Interior officials, and comprises federal partners, including the Forest Service and the Environmental Protection Agency.

[16]Project Management Institute, Inc., *The Standard for Program Management*, Fourth Edition (2017). The Project Management Institute is a not-for-profit association that, among other things, provides standards for managing various aspects of projects, programs, and portfolios.

[17]These sites included the Questa, Josephine, Red Devil, Gold King/Brooklyn, Holden, Blue Ledge, Grant-Kohrs Ranch/Clark Fork River, and Nacimiento mines.

financial statements and one that was not; (c) no mines that were from the same geographic location; and (d) mines that had high estimated costs reported in fiscal year 2021 financial statements.

For each of the eight sites, we reviewed documents that described the site's history and that agencies used to assess the mine and any associated contamination. From the list of eight sites, we chose to visit two—the Nacimiento and Questa mines in northern New Mexico—in June 2022, based on geographic location and agency availability to facilitate site visits. Findings from our review of the mine sample cannot be generalized to all mines. For further details on our objectives, scope, and methodology, see appendix I.

We conducted this performance audit from September 2021 to January 2023 in accordance with generally accepted government auditing standards. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objectives. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objectives.

Background

General Mining Act of 1872 and Liability for Funding Mine Cleanup

The General Mining Act of 1872 grants individuals and operators the statutory right to explore, develop, and mine valuable mineral deposits—such as copper, gold, silver, and uranium—on lands managed by USDA and Interior that are open to mineral entry. However, until the 1970s, when the Federal Land Policy and Management Act of 1976 was enacted and the Forest Service began requiring reclamation and financial assurances, mining operators could disturb land while mining without reclaiming the land.[18] Thus, for mining that occurred prior to the legal and regulatory changes in the 1970s, the federal government (and, thus, taxpayers) may clean up those mines if the original operator of the abandoned mines is deceased, or the mining company has dissolved. Mines that ceased operating prior to promulgation of the federal land managing agencies' regulations did not have to provide any bonding or

[18]As noted previously, BLM issued regulations, which became effective in 1981, that required mining operators to reclaim land.

financial assurances, such as cash or certificates of deposit, to cover the costs of reclamation.[19]

Impacts of Mining

Abandoned Mines Can Significantly Impact Communities and the Environment

The Gold King mine is in the Bonita Peak Mining District in southwestern Colorado. This gold and silver mine produced about 700,000 tons of ore while in operation between 1887 and 1922, but the mine has since been abandoned. The metal-laden water and sediments from the abandoned mine were being released into nearby creeks and streams. A 2015 mine investigation led by the Environmental Protection Agency triggered a rapid release of about 3 million gallons of contaminated water into the Cement Creek. This leak affected rivers in three states and the Navajo Nation in various ways, such as contaminating farm irrigation water.

The federal government, along with some mining operators, has already contributed millions of dollars to clean up the Gold King mine. In addition, New Mexico and the Navajo Nation have settlement agreements in place and will receive $32 million and $31 million in compensation, respectively, from the federal government to address harms to their communities.

Settling Ponds Near the Gold King Mine

Source: Environmental Protection Agency. | GAO-23-105408

Since the advent of relatively widespread mining on federal lands in the mid-1800s, mining has had the potential to create significant impacts to human health, safety, and the environment. For example, some “legacy” hardrock mines—that is, areas mined before the advent of modern environmental laws and regulations—have generated large quantities of hazardous substances, often over hundreds of square miles. This occurred when, for example, operators dug into the earth’s crust to reach and extract mineral deposits that are found deep in the ground or used toxic chemicals, such as a sodium cyanide solution, to leach gold from ore by spraying it over large piles of crushed ore. In some instances, legacy areas have released acidic water carrying heavy metals and pollutants such as arsenic, mercury, and lead. Such releases have contaminated groundwater and surface water, exposing people and wildlife to harmful substances, as we previously reported.[20]

The extent and type of work required to clean up abandoned hardrock mines can vary widely, depending on the extent, type, and concentration of contaminants. This cleanup could include treating contaminated water on a short- or long-term basis, covering disturbed areas with soil and vegetation, removing hazardous substances, or other response actions, with the goal of cleaning up the mine site for alternative land uses that are consistent with federal requirements, such as recreation or conservation.

[19]Under current requirements, mine operators must obtain approval of a plan of operations from federal land managers for operations over a certain level of activity. Such plans must include, among other things, a plan for reclaiming the site and financial assurances to cover the estimated reclamation costs to the federal government should the operator fail to do so, thus potentially reducing the risk that the federal government will need to pay for cleanup.

[20]GAO, *Federal Land Management: Key Differences and Stakeholder Views of the Federal Systems Used to Manage Hardrock Mining,* GAO-21-299 (Washington, D.C.: July 21, 2021).

Department and Bureau Responsibilities Related to Hardrock Mine Cleanup

The U.S. Departments of the Interior and Agriculture, as well as some bureaus within them, collect information about abandoned hardrock mine sites, features, and the associated hazards on lands under their jurisdiction.[21]

- At Interior's department level, the Office of Environmental Policy and Compliance manages the Central Hazardous Materials Fund, as well as the environmental and disposal liabilities program.[22] Within Interior, BLM and NPS have programs that aim to address environmental hazards posed by abandoned mines, among other objectives.[23] In addition, BIA may assist tribes affected by hazardous substance releases or other environmental contamination, such as from abandoned hardrock mines, on tribal lands, among other activities.[24]
- At USDA's department level, the Hazardous Materials Management Program provides leadership and policy in various areas, such as establishing annual funding priorities, funding hazardous material cleanups on USDA-managed lands, and tracking cost recovery from polluters. Within USDA, the Forest Service has the Safety and Environmental Restoration program that oversees the agency's work to address environmental hazards caused by abandoned hardrock mines, among other activities.

When executing abandoned mine cleanup projects, Interior and USDA may use their authority under the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), as

Costly Water Treatment Systems at Some Mine Sites Are Necessary in Perpetuity

Molybdenum mining began at the Questa mine on 3,622 acres of public and private lands in northern New Mexico in 1920 and occurred intermittently until 2014. Both underground and open pit mining occurred at the site. Mining operations contaminated soil, sediment, surface water, and groundwater. While the mine was operating, about 328 million tons of acid-generating waste rock were excavated and deposited in nine large waste rock piles.

To treat the water emanating from these piles, a complicated system was constructed at the mine site and is expected to run in perpetuity because of the level of contamination. The estimated cost for 30 years of water treatment is about $156 million, according to mine site documentation.

Questa Mine's Water Treatment System

Source: GAO. | GAO-23-105408

[21]Federal land management agencies typically began developing their inventories of abandoned hardrock mines in the 1980s and 1990s, basing them on historic maps, mine records, and surveys.

[22]The Central Hazardous Materials Fund is Interior's principal source of funds for the cleanup of highly contaminated sites located within national parks, national wildlife refuges, and other department-managed lands. The environmental disposal liabilities program is designed to assist bureaus in establishing the completeness, accuracy, and validity of their accounts.

[23]FWS officials told us that there are a limited number of abandoned hardrock mines on the lands they manage. In addition, Interior officials said that most National Wildlife Refuges and other lands managed by FWS are not currently subject to the General Mining Act of 1872. *See* 50 C.F.R. § 27.64 (stating that prospecting, locating, or filing mining claims on national wildlife refuges is prohibited unless otherwise provided by law).

[24]In comparison to federal land management agencies for the lands they manage, BIA does not maintain an inventory of abandoned hardrock mines on tribal lands. Other agencies, such as the Environmental Protection Agency, may also assist tribes in addressing contamination from mines.

amended, to respond to releases or threatened releases of hazardous substances, pollutants, or contaminants on the lands they manage.[25] CERCLA authorized two kinds of response actions to clean up contaminated sites: (1) removal and (2) remedial actions. Removal actions tend to be shorter-term actions that address more immediate risks, whereas remedial actions tend to be longer-term actions that offer a more permanent solution, according to a Congressional Research Service report.[26] This report also states that because of the typically greater extent and cost of remedial actions, they are subject to more in-depth review in the form of remedial investigations and feasibility studies. After these are completed, agencies are to produce a record of decision, which describes how the releases will be addressed and the estimated costs, among other things.[27]

Environmental Liabilities and Federal Accounting Standards

Federal agencies are required to report certain cost estimates for addressing contamination at various sites, called environmental liabilities, on their annual financial statements, according to the federal accounting standards.[28] These standards say that costs for cleanup work should be reported as environmental liabilities when they are both probable and reasonably estimable.[29] In addition, agencies may need to include an estimate of contingent liabilities.

[25]Pub. L. No. 96-510, 94 Stat. 2767 (1980) (codified as amended at 42 U.S.C. §§ 9601-9675). Specifically, Executive Order 12580, as amended, delegates the authority of the President under CERCLA section 104 to federal agencies to, among other things, take remedial actions for releases or threatened releases of hazardous substances, pollutants, or contaminants from any facility or vessel under the federal agency's jurisdiction, custody, or control. Exec. Order No. 12580, § 2(e)(1), 52 Fed. Reg. 2923, 2924 (Jan. 29, 1987).

[26]Congressional Research Service, *Comprehensive Environmental Response, Compensation, and Liability Act: A Summary of Superfund Cleanup Authorities and Related Provisions of the Act*, 7-5700, R41039 (Washington, D.C.: June 14, 2012), 8.

[27]Officials from USDA stated that most of the abandoned mine cleanups on the lands they manage are completed using removal actions and that they use CERCLA's remedial action process for complex mine cleanup projects.

[28]Federal Accounting Standards Advisory Board, *FASAB Handbook of Federal Accounting Standards and Other Pronouncements, as Amended*. For the purposes of this report, we refer to environmental and disposal liabilities as "environmental liabilities."

[29]The standards also say that an agency is required to recognize a liability for environmental cleanup costs as a result of past transactions or events (e.g., environmental contamination) when a future outflow or other sacrifice of resources is probable and reasonably estimable. "Reasonably estimable" relates to the ability to reliably quantify in monetary terms the outflow of resources that will be required.

- In determining whether an agency's environmental cleanup responsibilities meet the probable criterion, the agency must first establish its legal liability or acceptance of financial responsibility for a project, such as cleaning up abandoned hardrock mine sites. The determination of whether it is probable depends on whether the cleanup is government related (i.e., the federal government is responsible or legally liable for the cleanup) or government acknowledged (i.e., the federal agency is not legally liable, but chooses to perform the cleanup).[30] For projects that do not meet the level of probable, the federal accounting standards do not require an environmental liability and associated costs to be reported in the agency's financial statements. However, agencies have the discretion to disclose these costs in the notes to its financial statements.
- Once the federal accounting standards' probable criterion is met, agencies are to determine whether cleanup costs are reasonably estimable. In determining whether costs are reasonably estimable for government-related cleanup, agencies are to consider a completed study—such as a remedial investigation and feasibility study—or prior experience with a similar site or similar site conditions. If a study has been completed, or the agency has experience with a similar site or similar site conditions, then the agency is to record its best estimate of the cleanup liability for financial statement purposes, provided that technology exists to clean up the site.[31] If the estimate is a range, the agency records a liability for the low end of the estimated range and

[30]Government-related cleanup, as it relates to environmental damage or contamination, means that a governmental entity either caused contamination (i.e., contribution of waste) or is otherwise related to it in such a way that it is legally liable to clean up the contamination. If the agency believes that it is more likely than not that it will be legally liable, then the probability criterion is met. For government-acknowledged cleanup, costs are probable only to the extent that the agency is authorized to formally accept financial responsibility for cleanup; has appropriations; and either actual cleanup activities have been performed but not yet paid for, or there are amounts that are otherwise due and payable (e.g., grants).

[31]If there is no completed study or comparable site or condition, remediation costs for a site would not be considered reasonably estimable at that time, but the agency would recognize the anticipated cost of conducting a future study, if required, plus any other identifiable costs. If no remediation technology exists, then remediation costs would not be reasonably estimable, but the agency would be required to recognize the costs to contain the contamination and any other relevant costs, such as costs of future studies.

discloses the range in a note to the financial statements.[32] When reasonable estimates cannot be generated, such as cleanup costs at sites where no feasible remedy exists, then an explanation is to be disclosed in the notes to the financial statements. Information in the notes needs to include the nature of the environmental damage and an estimate of the possible liability, an estimate of the range of the possible liability, or a statement that such an estimate cannot be made. For government-acknowledged cleanup, the liability is the estimated cost of (1) actual cleanup activities that have been performed but not yet paid for and (2) any amounts that are otherwise due and payable (e.g., grants).

- Agencies may need to include contingent liabilities related to pending or threatened litigation or possible claims or assessments in their financial statements. Contingencies include potential liabilities resulting from litigation, where it is uncertain whether the agency is legally liable for the cleanup of the contamination.[33] Contingencies may be recognized as liabilities in the financial statements; disclosed in the notes; or not be reported at all, depending on the circumstances.[34]

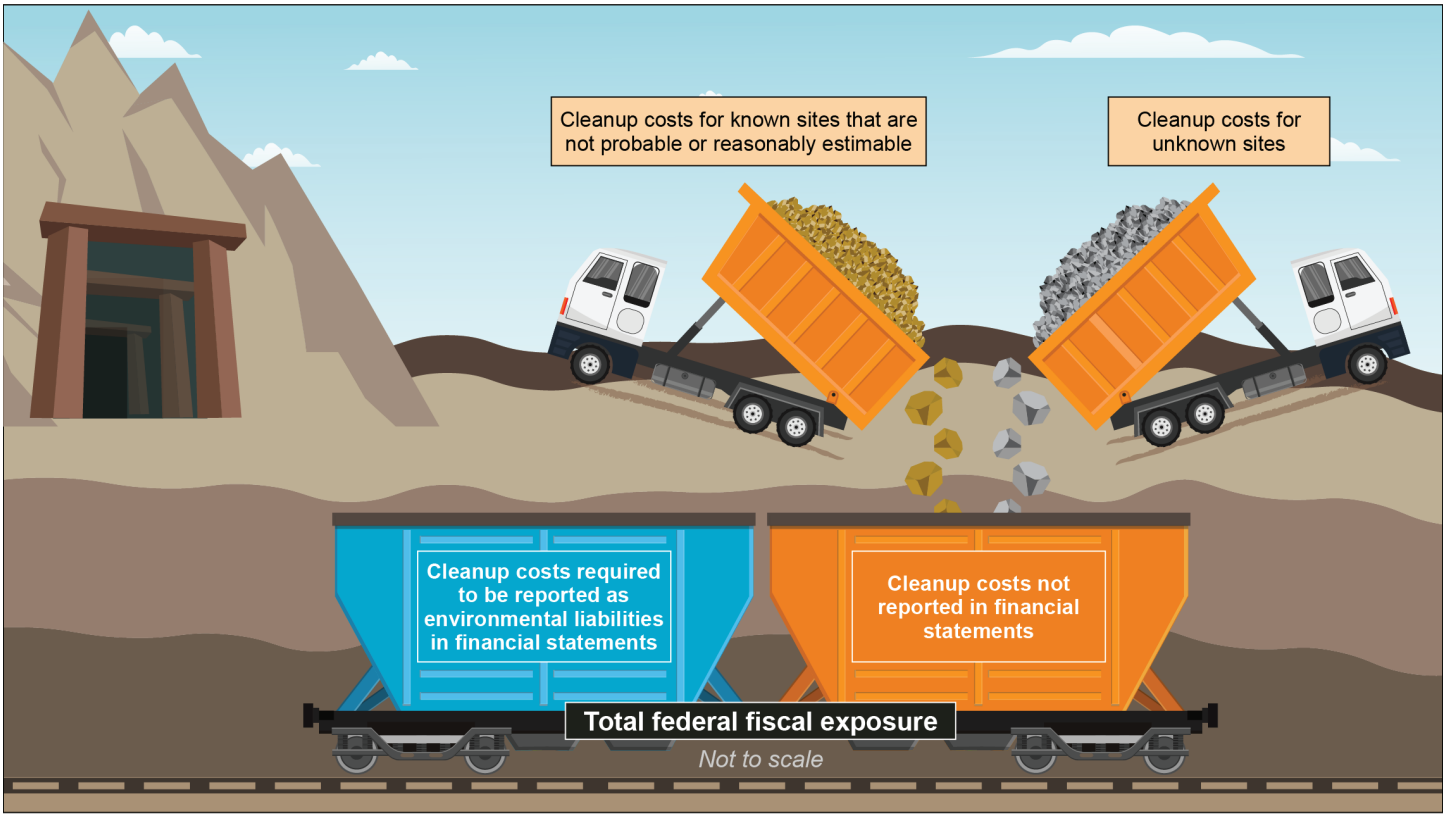
[32]When faced with uncertainty about cleanup costs, agencies said that they develop a range of costs representing the high and low cost estimates and disclose the range in the notes to their financial statements. This may occur when agencies do not have specific cost estimates for all sites. Federal accounting standards direct agencies to report the lower limit of all ranges for probable liabilities, which can be $0, when no amount within the range is a better estimate than any other amount, and to disclose the range in the notes to the financial statements.

[33]Federal Accounting Standards Advisory Board, *FASAB Handbook of Federal Accounting Standards and Other Pronouncements, as Amended*, Statement of Federal Financial Accounting Standards 5: Accounting for Liabilities of The Federal Government (Washington, D.C.: June 30, 2022). “Contingencies” are existing conditions, situations, or sets of circumstances involving uncertainty as to the possible gain or loss to an entity that will ultimately be resolved when one or more future events occur or fail to occur.

[34]The accounting standards say that contingencies should be recognized as a liability when a past transaction or event has occurred (e.g., environmental contamination) and future expending of resources is probable and measurable. For contingencies pertaining to pending or threatened litigation and unasserted claims, “probable” means that a future outflow or other sacrifice of resources is “likely to occur.” A contingency should be disclosed in the notes if any of the conditions for liability recognition are not met and there is a reasonable possibility that a loss or an additional loss may have been incurred. The estimated liability may be a specific amount or a range of amounts. If some amount within the range is a better estimate than any other amount within the range, that amount is recognized. If no amount within the range is a better estimate than any other amount, the minimum amount in the range is recognized, and the range and a description of the nature of the contingency is disclosed.

While the federal accounting standards require certain environmental liabilities and contingencies to be reported or disclosed in federal agencies' financial statements, these do not comprise the total federal fiscal exposure, or the total amount that the federal government may have to pay. In addition to the liabilities and contingencies in financial statements, there are other components that, when combined, account for total federal fiscal exposure (see fig. 2). These include costs to clean up known sites that are not currently probable or not reasonably estimable and costs to clean up unknown sites.

Figure 2: Components of Total Federal Fiscal Exposure



Sources: GAO; borodatch/stock.adobe.com. | GAO-23-105408

Notes: Federal agencies are required to report certain cost estimates for addressing contamination at various sites, called "environmental liabilities," on their annual financial statements, according to the federal accounting standards. Fiscal exposure includes amounts in financial statements or accompanying notes, as well as responsibilities and expectations for government spending that are not included in financial statements. Environmental liabilities may also include contingent liabilities, which are potential liabilities in litigation, where it is uncertain whether the agency is legally liable for the cleanup of the contamination.

Fiscal exposures vary widely as to source; likelihood of occurrence; magnitude; and strength of the government's legal obligation, as we have previously reported.[35] Given this breadth, it is useful to think of fiscal exposures as lying on a spectrum extending from explicit to implicit exposures. Fiscal exposures may be explicit, in that the federal government is legally required to pay for the cleanup. Alternatively, they may be implicit, in that the exposures arise from expectations based on current policy or past practices, and there may be an expectation that the government will provide assistance beyond the amount legally required. For the purposes of this report, abandoned hardrock mine site liabilities, contingencies, and reasonably possible cleanup costs included in agency financial statements—either in the financial statements or in the notes—are described as explicit exposures.[36] The known mine sites where agencies consider the cleanup remedies to not be probable or to not be reasonably estimable, as well as unknown mine sites that are not included in agency financial statements, are described in this report collectively as "implicit exposures" because they may encumber future budgets or reduce fiscal flexibility.[37]

[35]We use the term "fiscal exposure" to provide a conceptual framework for considering the wide range of responsibilities, programs, and activities that may explicitly or implicitly expose the federal government to future spending. Fiscal exposures include not only liabilities, contingencies, and financial commitments that are identified on the financial statements or accompanying notes but also responsibilities and expectations for government spending that do not meet the reporting or disclosure requirements for the financial statements. See GAO-03-213.

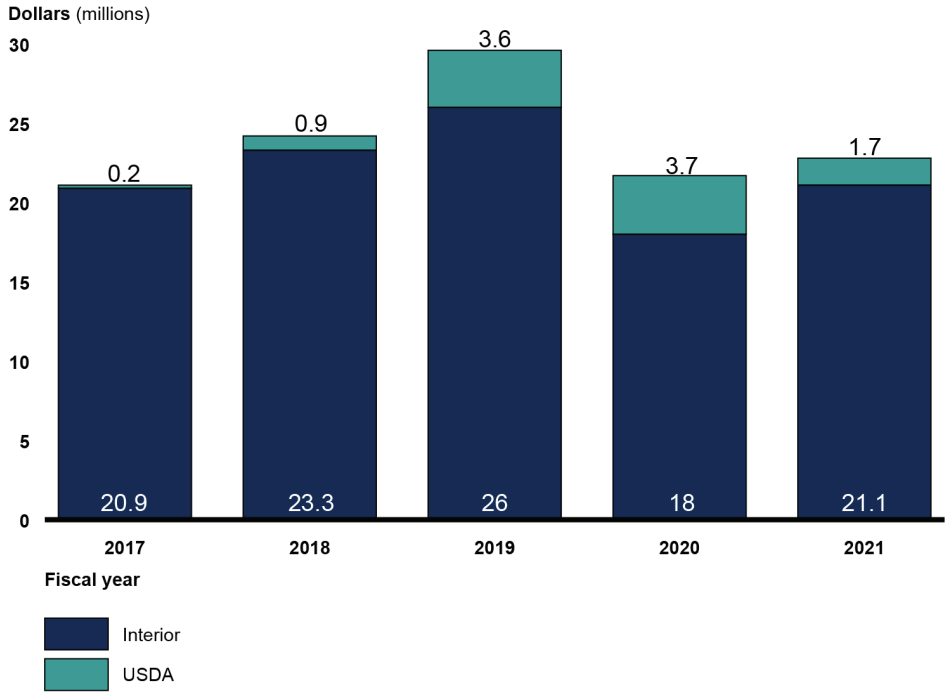
[36]The accounting standards state that "reasonably possible" means the chance of the future confirming event or event occurring is more than remote but less than probable.

[37]GAO-03-213.

Interior and USDA Spent an Average of about $22 Million and $2 Million per Year from Fiscal Years 2017 through 2021, Respectively, to Clean up Contamination at Abandoned Hardrock Mines

To clean up contamination at abandoned hardrock mines from fiscal years 2017 through 2021, Interior's and USDA's documents indicate that together they spent an average of approximately $24 million per year and used information such as the mine's risk to human health and the environment to prioritize cleanup funding. Specifically, Interior's documents show that the agency and bureaus spent about $109 million, and USDA's documents show that the agency and the Forest Service spent about $10 million (see fig. 3).[38]

Figure 3: U.S. Departments of the Interior (Interior) and Agriculture (USDA) Expenditures to Clean up Abandoned Hardrock Mines, Fiscal Years 2017 through 2021



Source: GAO analysis of Interior and USDA documents. | GAO-23-105408

[38]These amounts include expenditures to clean up environmental contamination from abandoned hardrock mines. They also include expenditures at both the department and bureau levels within each agency. About $38 million of Interior's expenditures could not be separated from other expenditures, so this amount includes BLM's labor for cleaning up abandoned hardrock mines, as well as other labor categories, such as safety assessments. Since the agency does not separate some expenditures, BLM used budgeted amounts for some of the data provided to GAO. Because of varying definitions of hardrock mining, agency expenditures may not include those amounts that are not associated with mining claims under the General Mining Act of 1872.

Illustrative Example of Forest Service Expenditures on a Cleanup Project in New Mexico

The Forest Service spent about $870,000 from fiscal years 2017 through 2021 to clean up the Nacimiento copper mine in northern New Mexico. The mine cleanup has involved pumping and treating groundwater contaminated from toxic chemicals, such as sulfuric and ferric acid, that mine operators injected into the ground to extract copper. The acid caused the metals to dissolve into the groundwater, so over the course of the project, the Forest Service installed a bioreactor and settling ponds to remove the contamination. In a bioreactor, liquids are added to solid waste to help bacteria break down the waste and stimulate biodegrading.

Nacimiento Mine's Bioreactor and Settling Pond

Source: GAO. | GAO-23-105408

Note: These amounts include expenditures, at both the department and bureau levels within each agency, to clean up environmental contamination from abandoned hardrock mines. About $38 million of Interior's expenditures could not be separated from other expenditures, so this amount includes Bureau of Land Management (BLM) labor for cleaning up abandoned hardrock mines, as well as other labor categories, such as safety assessments. Since the agency does not separate some expenditures, BLM used budgeted amounts for some of the data provided to GAO. Because of varying definitions of hardrock mining, agency expenditures may not include those amounts that are not associated with mining claims under the General Mining Act of 1872. Amounts have been rounded to the nearest thousand.

In addition to expenditures for cleaning up certain mines, both Interior and USDA work to identify potentially responsible parties (e.g., mine operators) and recover cleanup costs. Interior and USDA officials said that potentially responsible parties reimbursed their agencies $881,000 and $3.2 million, respectively, from fiscal years 2017 through 2021.[39]

Furthermore, Interior and USDA officials said that they have more abandoned hardrock mines on the lands they manage than funds to clean them up and that they used similar information to determine on which mines to spend their annual appropriations. Specifically, Interior and USDA considered funding mine cleanup projects based on information

[39]Interior documentation showed that this amount was reimbursed to the agency's Central Hazardous Materials fund. USDA officials said that this amount was reimbursed to the agency's Hazardous Materials Management Program fund, as well as to the Forest Service's Safety and Environmental Restoration program.

such as the mine's risk to human health and the environment.[40] While the USDA and the Forest Service used this information to prioritize abandoned mine cleanup projects, USDA department officials said that they had ceased using this information in 2022 because the agency's budget office said that funding would no longer be provided from the Hazardous Materials Management Program for any Forest Service cleanup projects, including for mine cleanups.[41]

See appendix II for a comparison of the information that Interior and USDA used when prioritizing funding for mine cleanup.

[40]Interior's guidance says that its core priorities for its funding prioritization process are to consider risks to human health and the environment, legal obligations, and secretarial and mission priorities. Interior assesses projects using 11 criteria, such as the mine's proximity to population and threat to water bodies and whether there is a known toxic substance and the possibility that it could migrate off Interior-managed lands. Interior has a departmental-level process to prioritize funds to clean up contaminated sites, which may include abandoned hardrock mine sites, and BIA, BLM, FWS, and NPS can use this process if they choose to do so. BIA and FWS have chosen to do so, while BLM and NPS have developed their own frameworks. However, these frameworks are largely based on the departmental-level prioritization process, according to officials.

[41]USDA officials said that they funded abandoned mine cleanup projects through their Hazardous Materials Management Program and Forest Service-funded mine cleanup projects through their Safety and Environmental Restoration program. USDA assesses projects using five criteria, such as the presence of legal risks and the proximity to watersheds. Agency officials said that any money received from potentially responsible parties (e.g., mine operators) under the Hazardous Materials Management Program to clean up specific mines would be spent as agreed upon in any associated legal settlements. However, if there are any funds remaining after that site has been cleaned up, and all ongoing obligations—such as for maintenance and monitoring—have been met, these funds can be used to address other mine sites, according to officials.

Agencies' Financial Statements Included Certain Cleanup Costs, but Financial Statements and Supplemental Reports Did Not Communicate Implicit Exposures

Interior and USDA included certain estimated cleanup costs, or explicit exposures, for abandoned hardrock mines in the aggregated total environmental liabilities reported in their financial statements, consistent with federal accounting standards. However, Interior and USDA budget materials did not communicate known information about implicit exposures specifically for abandoned hardrock mines.[42] USDA does not consistently track potential cleanup costs for abandoned hardrock mines in a manner that allows the agency to generate a more precise estimate for communicating its fiscal exposure to Congress and the public.

Agencies Included Certain Explicit Exposures in Their Financial Statements but Did Not Specify Which of These Pertain to Abandoned Hardrock Mines

Interior and USDA reported or disclosed the explicit exposures posed by certain abandoned hardrock mines in their financial statements, consistent with federal accounting standards. For the purposes of this report, explicit exposures are liabilities, contingencies, and reasonably possible cleanup costs in agency financial statements or in the notes. However, these explicit exposures were aggregated together with other liabilities and contingencies, and the financial statements did not specify the amount that pertains to abandoned hardrock mines or some other types of sites. For example, Interior and USDA reported and disclosed about $1.2 billion and $0.8 billion in explicit exposures, respectively, in their agency financial statements in 2020.[43] These costs included abandoned hardrock mine cleanup costs, combined with other types of

[42]Budget materials included Interior's budget in briefs, as well as USDA's budget justifications and explanatory notes. Known mine sites where agencies consider the cleanup remedies to not be probable or to not be reasonably estimable, as well as unknown sites that are not included in agency financial statements, are described in this report as implicit exposures because they may encumber future budgets or reduce fiscal flexibility.

[43]In fiscal year 2020, Interior reported about (a) $988 million for probable environmental and disposal liabilities, (b) $177 million for the lower end of the range of reasonably possible environmental and disposal costs, (c) $2 million for probable environmental contingent liabilities, and (d) $10 million for reasonably possible environmental contingent costs. USDA reported about (a) $239 million for probable environmental and disposal liabilities, (b) $47 million for the lower end of the range of reasonably possible environmental and disposal costs; and Forest Service reported (c) $451 million for probable environmental contingent liabilities, and (d) $0 for reasonably possible environmental contingent costs. However, USDA does not track the amount specifically related to probable and reasonably possible environmental contingent liabilities.

hazardous substances cleanup costs, a practice that is consistent with federal accounting standards.

Because agency financial statements did not specify which estimated costs were for abandoned hardrock mine cleanup, we analyzed Interior and USDA documents, reviewed databases, and interviewed officials to understand which reported explicit exposures were for abandoned hardrock mines. For example, abandoned hardrock mines accounted for $221 million—or about 19 percent—of Interior's explicit exposures in fiscal year 2020.[44] For USDA, abandoned hardrock mines accounted for about $441 million—or 60 percent—of USDA's explicit exposures in fiscal year 2020.[45]

Interior's total explicit exposures for abandoned hardrock mines increased from $83 million in fiscal year 2017 to $301 million in fiscal year 2021, according to our analysis of Interior's data.[46] In addition, the number of abandoned hardrock mine sites included in Interior's explicit exposures increased from 158 sites in fiscal year 2017 to 203 sites in fiscal year 2021, which is an increase of 28.5 percent.[47] Figure 4 illustrates what BLM, NPS, and BIA reported as their explicit exposures for abandoned hardrock mines on lands they manage, or on tribal lands.[48]

[44]Of the $221 million, Interior's environmental liabilities database showed that the agency considered about $67 million to be probable costs and about $154 million to be reasonably possible costs.

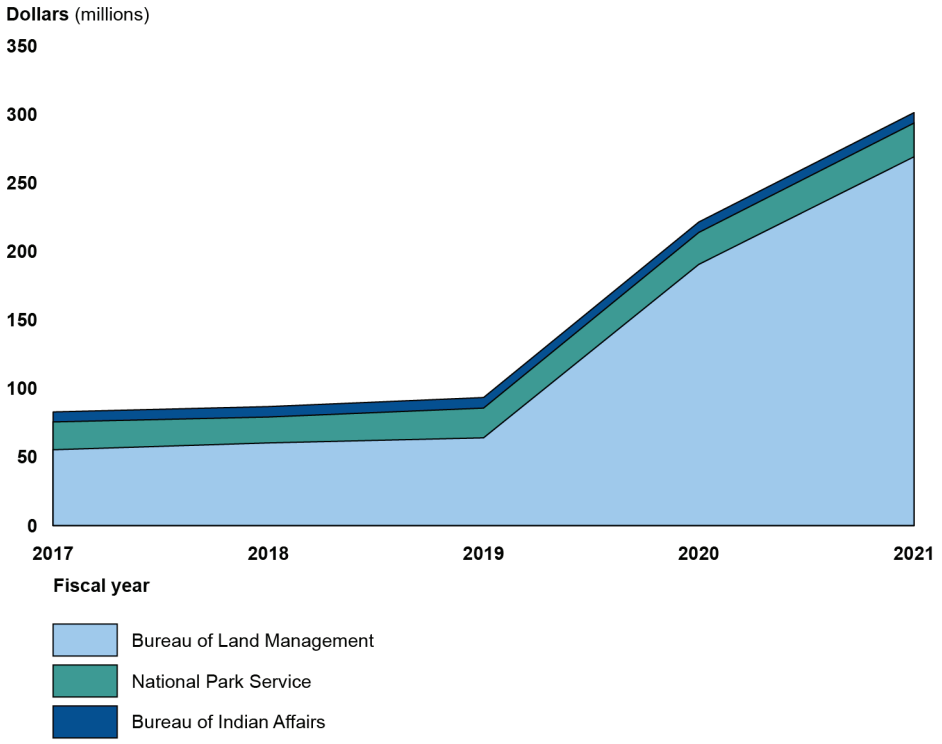
[45]USDA data showed that the agency considered the $441 million to be probable costs.

[46]Interior officials said that they reported the agency's costs, for the mines that Interior is cleaning up, in Interior's financial statements, as well as any potential future cleanup costs for mines where cleanup is already underway but will take multiple years to complete. This amount includes both probable and reasonably possible costs.

[47]These sites were included in Interior's abandoned hardrock mine cleanup cost estimates reported in the main body of its financial statements and disclosed in the notes. As we previously reported, BLM and NPS said that there are 6,446 mine sites or features with either confirmed or unconfirmed environmental hazards on the lands they manage, which is likely an underestimate. See GAO-20-238.

[48]FWS did not have any explicit exposures for hardrock mines for fiscal years 2017 through 2021, according to Interior data, because of the limited number of mines on the lands it manages.

Figure 4: U.S. Department of the Interior's (Interior) Estimated Cleanup Costs for Abandoned Hardrock Mines Included in Its Financial Statements, Fiscal Years 2017 through 2021



Source: GAO analysis of Interior information. | GAO-23-105408

Note: These amounts included Interior's abandoned hardrock mine cleanup cost estimates reported as probable liabilities in the main body of its financial statements and disclosed as reasonably possible in the notes.

According to agency officials, the increase in environmental liabilities for abandoned hardrock mines was largely driven by BLM and NPS adding new sites and updating mine site assessments to develop a more accurate picture of future costs. We have previously reported that uncertainty about cost estimates is higher in the initial stages of developing an estimate when there is less information available about resource needs and requirements.[49] As Interior officials further assess

[49]Further, we reported that cost estimates tend to increase over time as more knowledge is gained about resource needs and requirements. GAO, *Cost Estimating and Assessment Guide: Best Practices for Developing and Managing Program Costs,* GAO-20-195G (Washington, D.C.: Mar. 12, 2020).

Limited Accessibility of Mine Sites Can Affect Agencies' Development of Cost Estimates

Officials from the U.S. Department of the Interior and the U.S. Department of Agriculture said that limited accessibility of sites in remote locations can affect cost estimates because it can be difficult to perform site inspections to determine the extent of contamination. Inaccessibility can stem from remoteness, weather conditions, road conditions, or safety concerns. For example, the Red Devil mine, which is located in a remote area of Alaska, has no road or rail connection to the mine site, so it is only accessible by boat, plane, or all-terrain vehicle, and only during summer. This limited accessibility has made cost estimating challenging, according to Bureau of Land Management officials.

Red Devil Mine

Source: U.S. Geological Survey. | GAO-23-105408

abandoned hardrock mine sites, they said that some factors affect the development of cost estimates, such as the type and extent of contamination present at a site, the limited accessibility of sites in remote locations, the availability of funding to conduct site cleanups, and the availability of subject matter experts to manage cleanups at mine sites.[50]

According to our analysis and USDA officials, the agency's contingent liabilities included abandoned hardrock mine cleanup costs of $441 million annually for fiscal years 2017 through 2020 and $0 as the minimum amount of a range in fiscal year 2021—reflecting a change in USDA's determination of its liability for the costs.[51] The contingent liabilities of $441 million per year for fiscal years 2017 through 2020 reflected estimated cleanup costs for one mine site—the Questa mine in New Mexico.[52] In USDA's fiscal year 2021 financial statements, the range of cleanup costs of $0 to about $715 million for this mine site, as well as

[50]USDA officials also told us that some of these factors affect their ability to develop cleanup cost estimates of abandoned hardrock mines.

[51]Contingencies are reported for potential liabilities related to pending or threatened litigation, where it is uncertain whether the agency is legally liable for the cleanup of the contamination. As a result, contingencies may be recognized, disclosed, or not be reported at all, depending on the circumstances, according to federal accounting standards.

[52]The Questa mine site has been the subject of extensive litigation. In 2017, the Tenth Circuit found that under the facts in that case, the federal government was liable as an owner under CERCLA for its equitable portion of the costs necessary to remediate the contamination arising from mining activity on federal lands. Chevron Mining, Inc. v. U.S., 863 F.3d 1261 (10th Cir. 2017). On remand to the district court to address equitable allocation, the U.S. District Court for the District of New Mexico held in June 2022 that the U.S. government is liable for 30 percent of all past and future eligible response costs at the Questa mine site. The U.S. Departments of the Interior and Agriculture appealed the judgment and, in November 2022, the Tenth Circuit dismissed the appeal.

two other sites, was included as probable contingencies in its notes, consistent with federal accounting standards.[53]

According to a USDA official and agency data, USDA has not included in the agency's financial statements the estimated costs for the roughly 5,300 mines they anticipate needing cleanup, some of which they have already started cleaning up.[54] USDA officials said that their determinations regarding which mine cleanup projects' costs to include in the agency's financial statements are based on a 2002 memorandum, which cited federal case law at the time, establishing the Forest Service's position that abandoned hardrock mines should not be considered CERCLA liabilities.[55] The memorandum further stated that unless there is no existing viable responsible party, the Forest Service will have no cleanup costs at such mine sites. While there have been developments in federal case law since the 2002 memorandum, including a case involving the Questa mine site, as mentioned above, USDA officials stated that the agency has not updated the memorandum or developed additional guidance regarding reporting abandoned hardrock mine cleanup costs.[56] However, agency officials said that following these developments, the

[53]As noted previously, agencies may track a range of costs representing the high and low cost estimates and disclose the range in the notes to their financial statements.

[54]This amount is out of about 16,000 mine sites with either confirmed or unconfirmed environmental hazards on the lands that the Forest Service manages, as we previously reported. GAO-20-238. For government-acknowledged cleanup (i.e., the federal agency is not legally liable, but chooses to perform the cleanup), cleanup costs are reported as liabilities only to the extent that the agency is authorized to formally accept financial responsibility for cleanup; has appropriations; and either actual cleanup activities have been performed but not yet paid for, or there are amounts that are otherwise due and payable (e.g., grants). According to USDA officials, because USDA does not report government-acknowledged liabilities, USDA environmental liabilities do not include the estimated long-term cleanup costs related to government-acknowledged site cleanup.

[55]The memorandum relied upon a series of federal district court decisions from 1994 to 2001 that each found that the government could not be held liable as an owner under CERCLA. See U.S. v. Friedland, 152 F. Supp. 2d 1234 (D. Colo. 2001); U.S. v. Iron Mountain Mines, 987 F. Supp. 1263 (E.D. Cal. 1997); Idaho v. Hanna Mining (D. Idaho 1994) (slip op.). USDA considers such mine sites to be government acknowledged for the purposes of whether to include them in its financial statements, according to USDA officials.

[56]As noted previously, in 2017, the Tenth Circuit found that under the facts in that case, the federal government was liable as an owner under CERCLA for its equitable portion of the costs necessary to remediate the contamination arising from mining activity on federal lands. *Chevron Mining*, 863 F.3d at 1266. *See also* El Paso v. U.S., No. CV-14-08165, 2017 WL 3492993, at *7 (D. Ariz. Aug. 17, 2017) (finding the federal government to be an owner for the purposes of CERCLA).

Forest Service began to report the estimated cleanup costs for certain similar sites as probable contingencies.[57]

Agencies Did Not Communicate Known Implicit Exposures for Abandoned Hardrock Mines to Congress in Budget Materials

Interior and USDA budget materials did not communicate known cost information about implicit exposures—cleanup costs where there is an expectation that the government will provide assistance beyond the amount legally required—specifically for abandoned hardrock mines. Agencies may communicate information on total estimated cleanup costs in budget materials that discuss information about the financial state of programs. In addition, USDA does not consistently track potential cleanup costs for abandoned hardrock mines, which impedes its ability to communicate precise estimates to Congress and the public.

Agencies Did Not Communicate Known Implicit Exposures for Abandoned Hardrock Mines

Interior did not communicate information about implicit exposures specifically for abandoned hardrock mines in its department-wide or bureau-level budget materials that would help inform Congress and the public about its potential future cleanup responsibilities. Interior's budget requests for activities that include the cleanup of abandoned hardrock mines have been relatively small when compared with its explicit exposures. As previously noted, Interior's explicit exposures for abandoned hardrock mines increased from $83 million in fiscal year 2017 to $301 million in fiscal year 2021. For fiscal years 2017 through 2021, Interior requested an average of $29.8 million per year for appropriations that could be used to clean up abandoned hardrock mines, as well as other activities, such as the cleanup of abandoned coal mines or orphaned oil and gas wells.[58] Interior's documents do not specify what portion of these requested amounts would be used specifically to clean up abandoned hardrock mines.

[57]USDA officials stated that following the *Chevron Mining* decision, the Forest Service began to report other similar sites as probable contingencies when the agency is in active enforcement or cost recovery against a responsible party and where that party has asserted counterclaims against the Forest Service. According to our review of USDA documentation, in fiscal year 2021 this resulted in USDA reporting two other mines as probable contingencies. In December 2022, USDA officials said that their determinations regarding which mine cleanup project costs to include in the agency's financial statements depend on several key mine site-specific factors, including USDA's potential liability at a particular site, total estimated known cleanup costs, and USDA's potential share of such costs.

[58]For fiscal years 2022 and 2023, Interior requested $254.6 million and $137.2 million, respectively, for activities that include, among other things, the cleanup of abandoned hardrock mines under Interior's IIJA abandoned hardrock mine land program.

USDA's budget materials from fiscal years 2018 through 2021 contained a rough estimate of $4 billion to $6 billion needed for abandoned hardrock mine cleanup.[59] However, this estimate was not based on known cleanup costs from mine site investigations, documents, or studies. Rather, as we previously reported, this 2014 estimate is based on a series of assumptions and has not been updated in the past 8 years.[60] This estimate has not been updated since 2014 because the amount of funding that the Forest Service is appropriated annually—approximately $5 million—will not address the estimated $4 billion to $6 billion needed for cleanup, according to Forest Service officials. Therefore, the officials said that they do not think it is worth expending the resources to update the total cost estimate. For fiscal years 2017 through 2021, USDA requested an average of $3.5 million per year for activities that may include efforts to clean up abandoned hardrock mines.[61] USDA and Forest Service documents do not specify what portion of this requested amount would be used specifically to clean up abandoned hardrock mines.

In 2013, we found that budget reporting does not always fully capture or require consideration of federal fiscal exposures.[62] In such cases, we have recommended the use of supplemental reporting—that is, communicating information about fiscal exposures in budget materials—to provide policymakers with a more complete understanding of explicit exposures and implicit fiscal exposures.[63] We also found that expanding the availability and use of supplemental reports, including information on measures that can signal significant changes in the magnitude of fiscal exposures, can be important to enhancing transparency and oversight

[59]USDA's budget materials for fiscal year 2017 did not include an estimate for abandoned hardrock mine cleanup.

[60]GAO-20-238.

[61]For fiscal years 2022 and 2023, USDA requested about $6.5 million in appropriated hazardous material management account funds for USDA cleanup projects. However, as previously noted, the agency's budget office said that as of fiscal year 2022 funds can no longer be used from the Hazardous Materials Management Program for any Forest Service cleanup projects, including for abandoned hardrock mine cleanup projects. For fiscal year 2022, the Forest Service requested $100 million under the IIJA.

[62]GAO-14-28.

[63]GAO-03-219 and GAO-14-28.

over federal resources, as well as aid in monitoring the financial condition of programs over the longer term.[64]

Since 2003, we have reported on the importance of agencies improving recognition of implicit exposures and providing Congress and the public with a more comprehensive picture of the federal government's future financial obligations.[65] For example, in October 2013, we found that for some fiscal exposures, agency budget submissions might communicate incomplete information or potentially misleading signals about the government's future financial obligations.[66] In our 2017 High-Risk Series report, we stated that some departments and agencies may need to improve the completeness of information about long-term cleanup responsibilities and their associated costs so that decision makers, including Congress, can consider the full scope of the federal government's cleanup obligations.[67]

Transparency through reporting in budget materials is an essential element for providing Congress with a more comprehensive picture of fiscal exposures for abandoned hardrock mines. Without additional information about both agencies' known fiscal exposures specifically for abandoned hardrock mines, policy makers may not be able to make fully informed decisions that could, for example, help Interior implement the new abandoned hardrock mine land program called for by the IIJA. Expanding the availability of information on agencies' estimated cleanup costs specifically for abandoned hardrock mines in supplemental reports, that is not available elsewhere, could also help decision makers to monitor and have a clearer picture of the federal government's fiscal exposure. This information could include any potential future cleanup costs for mines where cleanup is already underway, as well as those estimates available in mine site investigations, documents, or studies. By more fully reporting on their fiscal exposure, Interior and USDA could help ensure that decision makers—including Congress, Interior, and USDA—are better equipped to make important mine cleanup funding decisions.

[64]GAO-14-28.

[65]GAO-14-28, GAO-03-213; and GAO-03-219.

[66]GAO-14-28.

[67]GAO-17-317.

USDA's Estimated Cleanup Costs Are Not Tracked Consistently

USDA does not consistently track potential cleanup costs for abandoned hardrock mines in a manner that allows the agency to generate a more precise estimate than the $4 billion to $6 billion estimate previously discussed for communicating its fiscal exposure to Congress and the public. USDA's Office of the General Counsel currently tracks contingencies where there is a probable and reasonably possible chance that a court will determine that the federal government is liable for cleanup, according to USDA officials. As a result, in fiscal year 2021, USDA included three mines in its contingency-tracking document, out of the approximately 16,000 abandoned hardrock mines on lands managed by the Forest Service with either known or suspected contamination.[68] In addition, Forest Service officials told us that the documentation they use to comply with CERCLA, such as remedial investigations and feasibility studies, as well as records of decision, contain mine site cleanup estimates, but estimates from these documents are not regularly included in NEAT—the department-level database for managing USDA's site cleanup program.[69]

While USDA maintains NEAT, the database is not being used as a tool for tracking estimated cleanup costs.[70] NEAT includes data fields, such as site description, whether the site has mixed ownership, whether the site is reported as an environmental liability in USDA's financial statements, fiscal year funded, funding amount, activity phase, and estimated cost of activity. However, USDA officials told us that these fields are optional for entry by staff, so when data on estimated cleanup costs are available—for example in site assessment studies or records of decision—they are

[68]In comparison, Interior tracks abandoned mine cleanup costs by site in a department-wide database and then reports known amounts in its financial statements, according to agency documents.

[69]Under the CERCLA process, site investigation studies include remedial investigation and feasibility studies, which seek to determine the nature and extent of contamination at a site, test whether certain technologies are capable of treating the contamination, and evaluate the cost and performance of technologies that could be used to clean up the site. A record of decision identifies the selected remedy for addressing the site's contamination and a cost estimate for implementing the remedy, among other things.

[70]USDA began using NEAT in 2018 in response to a GAO recommendation to ensure that USDA has information needed to better identify potentially contaminated sites, including abandoned hardrock mines. USDA officials said that NEAT's primary purpose is to track agency progress and accomplishments in evaluating and cleaning up hardrock mine sites. See GAO, *Hazardous Waste: Agencies Should Take Steps to Improve Information on USDA's and Interior's Potentially Contaminated Sites*, GAO-15-35 (Washington, D.C.: Jan. 16, 2015).

not regularly entered into NEAT or used for tracking estimated cleanup costs.[71] USDA officials further stated that these fields are optional to ensure that a small number of priority data fields, such as the site's status, are entered into NEAT. However, the optional nature of certain fields, such as the estimated cost of activities, results in inconsistent data collection and affects USDA's ability to access readily available information.

USDA has information quality guidelines that apply to all types of information disseminated by USDA agencies and offices.[72] According to these guidelines, USDA is to ensure the quality, objectivity, utility, and integrity of the information that USDA's agencies and offices disseminate to the public. By not having more precise and readily available information on estimated cleanup costs in the NEAT database, USDA officials may not be able to consistently track agency progress in achieving its abandoned hardrock mine program's objectives and make informed decisions. Officials said that tracking potential cost estimates in NEAT is possible for a subset of their roughly 16,000 mines with either known or suspected contamination, where assessments have been completed, and that it could be a helpful tool that would allow them to capture this information more systematically.

[71]According to USDA officials, staff entering information into NEAT include officials from USDA headquarters, USDA agencies, and the nine Forest Service regional offices.

[72]U.S. Department of Agriculture, "Information Quality Activities," accessed April 29, 2022, https://www.usda.gov/ocio/guidelines-and-compliance-resources/information-quality-activities.

Interior Has Taken Some Steps to Implement the New Abandoned Hardrock Mine Program but Has Not Yet Developed Performance Measures to Help It Evaluate Program Results

Interior has taken some steps to implement the abandoned hardrock mine land program called for under the IIJA, and it has not yet developed performance measures to allow it to assess the results of the program's efforts and achieve its goals.[73] According to Interior officials and draft program documentation, as of October 2022, the department was in the early stages of defining and planning this program. The program will include a component to address abandoned hardrock mines on federal lands, as well as a grant component to address mines on state, tribal, local, or private lands, according to draft program documentation.[74]

Interior received $5 million in fiscal year 2022 appropriations,[75] which officials stated enabled it to take the following steps:

- **Developing an inventory of abandoned hardrock mines.** As directed by the IIJA, Interior has taken some steps to inventory abandoned hardrock mines by starting development of a national abandoned mine inventory database, in coordination with other federal agencies, states, and tribes. Interior is using an existing geospatial platform developed by the U.S. Geological Survey as the foundation for the database, according to Interior officials and draft

[73]Specifically, the IIJA directs the Secretary of the Interior to establish a program to inventory, assess, decommission, reclaim, respond to hazardous substance releases on, and remediate abandoned hardrock mine land based on conditions including need, public health and safety, potential environmental harm, and other land use priorities. Pub. L. No. 117-58, § 40704(a), 135 Stat. 429, 1093 (2021).

[74]The IIJA calls for the Secretary of the Interior, subject to the availability of funds, to provide grants on a competitive or formula basis to states and tribes that have jurisdiction over abandoned hardrock mine land to reclaim that land. § 40704(b), 135 Stat. at 1093. Amounts made available for this program may only be used for federal, state, tribal, local, and private land that has been affected by past hardrock mining activities and water resources that traverse or are contiguous to such land. § 40704(c), 135 Stat. at 1093. According to Interior officials, for purposes of the IIJA program, "abandoned hardrock mine land" encompasses lands that contain features resulting from the past exploration, development, mining, or processing of noncoal solid minerals, and associated facilities. This includes sand and gravel pits and abandoned uranium mines on federal, state, tribal, and other nonfederal lands, according to officials.

[75]Specifically, the $5 million appropriated by the Consolidated Appropriations Act, 2022 could be used for this program or another Interior program established under the IIJA—the orphaned oil and gas well program. Pub. L. No. 117-103, 136 Stat. 49, 370. According to Interior officials, Interior used all $5 million for the abandoned hardrock mine land program. Interior officials also noted that the $5 million was in addition to other funds the Department received to use for the abandoned hardrock mine land program.

documentation.[76] In spring 2022, federal and state stakeholders proposed lists of fields for inclusion in the database, which were provided to the involved parties for feedback.[77] Interior officials told us in July 2022 that continued development of the database is constrained by funding and staff limitations.

- **Establishing an interagency working group.** Interior officials told us that they established an interagency working group for the program to obtain input on program implementation from partners.[78] According to Interior officials and meeting documentation, initial meetings of the abandoned hardrock mine interagency working group have focused on determining program goals.
- **Establishing programmatic goals and objectives.** Interior has developed draft goals and objectives for the abandoned hardrock mine land program, according to draft documentation on program implementation. The program's goals include providing funds to support federal, state, and tribal abandoned mine land programs and establishing an interagency technical work group to assist with policy development and funding decisions. While the draft program documentation does not include goals or objectives related to reducing Interior's fiscal exposure from abandoned hardrock mines, Interior officials said that their efforts to clean up abandoned hardrock mines under the program may help reduce the agency's environmental liabilities.[79]
- **Developing plans to award grant funding.** Interior officials told us that they started preliminary discussions on how to prioritize funding for the federal land component of the abandoned hardrock mine land

[76]U.S. Geological Survey's USMIN Mineral Deposit Database is a national-scale geospatial database that provides information on mines, mineral deposits, and mineral districts of the United States. U.S. Geological Survey, "USMIN Mineral Deposit Database," accessed Sept. 9, 2022, https://www.usgs.gov/centers/gggsc/science/usmin-mineral-deposit-database#overview.

[77]These stakeholders included officials from the U.S. Geological Survey, BIA, NPS, the Interstate Mining Compact Commission, the Nevada Division of Minerals, BLM, the Forest Service, and Interior.

[78]These partners included federal agencies, such as the Forest Service and the Environmental Protection Agency.

[79]Reducing the environmental liabilities from abandoned hardrock mine sites is not a specific requirement of the abandoned hardrock mine land program authorized under the IIJA. Interior officials stated that the program's ability to reduce environmental liabilities is dependent on receiving sufficient funding and the precedence in addressing sites with environmental contamination.

program, including drafting a matrix for prioritizing funds and developing implementation guidance. Draft program implementation documents also include a framework for establishing the state and tribal grant-funding component of the program. In addition, Interior officials stated that they plan to develop an implementation plan for the federal component in fiscal year 2023.

While Interior has taken some steps to implement the new program, Interior's draft documentation did not include performance measures for the new abandoned hardrock mine land program, among other program outcomes and benefits that can be used for measuring the program's progress in meeting its goals.[80] Interior officials told us that the agency plans to develop and model the financial and program management documentation for the federal abandoned hardrock mine land program after similar documentation developed for Interior's orphaned oil and gas well program, also established under the IIJA.[81] However, Interior did not have performance measures for the orphaned oil and gas well program in its documentation, as of November 2022. Interior officials told us that the agency's ability to further develop and implement the abandoned hardrock mine land program is dependent on the availability of additional program funding and staff resources. Officials stated that because the orphaned oil and gas well program received the full $4.7 billion in appropriations that was authorized in the IIJA in fiscal year 2022, they have prioritized the development of that program, while doing some planning for the abandoned hardrock mine land program.

As Interior continues developing and implementing its abandoned hardrock mine land program, it could benefit from developing quantitative performance measures based on leading practices for program management. In 2011 and 2019, we reported that performance measures are important for tracking progress in achieving goals and are a key

[80]The documentation we reviewed included financial and program management guidance for the orphaned oil and gas well program, program budget documents, and the agency's strategic plan for fiscal years 2022 through 2026.

[81]Specifically, the IIJA called for Interior to establish a program to plug, remediate, and reclaim orphaned wells located on federal land, as well as to provide grants to states and tribes. Pub. L. No. 117-58, § 40601, 135 Stat. 429, 1080 (2021). In addition to authorizing funding for the program, the IIJA appropriated nearly $4.7 billion for the orphaned oil and gas well program.

element of effective strategic planning.[82] Likewise, we have previously reported that the Project Management Institute's *The Standard for Program Management* provides generally recognized leading practices for program management.[83] *The Standard for Program Management* provides an overview of a program's three life cycle phases and associated actions with each phase. Interior is currently in the first phase—program definition—as it undertakes activities to formulate and plan program activities. This phase includes authorizing the program, developing its roadmap required to achieve the expected results, as well as defining the key performance indicators and associated quantitative measures required to effectively monitor the delivery of program benefits.[84] This phase's purposes are to progressively elaborate the goals and objectives to be addressed by the program and define the expected program outcomes and benefits, among other things.

Consistent with the practices established in *The Standard for Program Management,* an important next step to move forward with implementing the abandoned hardrock mine land program will be to define quantitative performance measures that help program officials fully and accurately assess their progress toward achieving their goals. Doing so could help Interior create a foundation for assessing the new program's performance as the agency progresses in (1) cleaning up abandoned hardrock mines on federal lands, which may reduce its fiscal exposure; and (2) awarding grants to states and tribes to clean up abandoned hardrock mines on lands subject to their jurisdiction.

[82]GAO, *Environmental Justice: EPA Needs to Take Additional Actions to Help Ensure Effective Implementation*, GAO-12-77 (Washington, D.C.: Oct. 6, 2011); and *Environmental Justice: Federal Efforts Need Better Planning, Coordination, and Methods to Assess Progress*, GAO-19-543 (Washington, D.C.: Sept. 16, 2019).

[83]GAO, *Columbia River Basin: Additional Federal Actions Would Benefit Restoration Efforts*, GAO-18-561 (Washington, D.C.: Aug. 24, 2018). Program management planning ensures that a program is continually aligned with an organization's strategic priorities to deliver the expected benefits, according to *The Standard for Program Management*. Aspects of program management include developing plans to engage stakeholders, communicating internally and externally, managing resources, and managing risks. See Project Management Institute, Inc., *The Standard for Program Management,* Fourth Edition (2017). The Project Management Institute is a not-for-profit association that, among other things, provides standards for managing various aspects of projects, programs, and portfolios.

[84]According to *The Standard for Program Management*, the second phase of the life cycle is program delivery, and the third phase is program closure.

Conclusions

Certain abandoned hardrock mines on lands managed by Interior and USDA contribute to the federal government's fiscal exposure. These mines can cause environmental degradation and hazardous conditions that pose risks to human health and the environment. The federal government may pay for their cleanup, which could run into the billions of dollars per mine site, if no other viable potentially responsible parties are identified.

Interior and USDA did not clearly identify which explicit exposures are specifically for abandoned hardrock mines when they included them in their financial statements. In addition, neither agency communicated known information about implicit exposures in their budget materials. If the agencies communicated more specific and precise information in their budget materials, Congress and the public could have a more complete picture of Interior's and USDA's long-term cleanup responsibilities and their anticipated costs from abandoned hardrock mines.

USDA does not consistently populate certain information, such as cleanup cost estimates, from its mine site documentation into its NEAT database. If the agency required available mine cleanup cost estimation data to be regularly entered into NEAT, this information would be available for decision-making and informing Congress and the public of USDA's fiscal exposure from abandoned hardrock mines.

Interior has taken steps to implement a first-of-its-kind abandoned hardrock mine land program called for by the IIJA, but it has not yet established performance measures to achieve its cleanup goals. By doing so, Interior could monitor whether it is achieving its goals to clean up mines.

Recommendations for Executive Action

We are making a total of four recommendations, two to Interior and two to USDA:

The Secretary of the Interior should expand the information available to Congress regarding the agency's fiscal exposure from abandoned hardrock mines by clearly identifying the amount of known cleanup cost estimates specifically for such mines in supplemental reports or other budget materials. (Recommendation 1)

The Secretary of Agriculture should expand the information available to Congress regarding the agency's fiscal exposure from abandoned hardrock mines by clearly identifying the amount of known cleanup cost

estimates specifically for such mines in supplemental reports or other budget materials. (Recommendation 2)

The Secretary of Agriculture should require the inclusion of available cleanup cost estimates from documents, such as records of decision and site investigation studies, in NEAT, so that more precise information can be considered for program management and decision-making. (Recommendation 3)

The Secretary of the Interior should develop quantitative performance measures for the IIJA abandoned hardrock mine land program, as the agency continues to design and implement the program, to enable the agency to assess its progress toward meeting its program goals. (Recommendation 4)

Agency Comments

We provided a copy of this report to the U.S. Departments of Agriculture and the Interior for review and comment. In their comments, reproduced in appendixes III and IV, both agencies stated that they concurred with our recommendations. Both agencies also provided technical comments, which we incorporated as appropriate.

As agreed with your office, unless you publicly announce the contents of this report earlier, we plan no further distribution until 30 days from the report date. At that time, we will send copies of this report to the appropriate congressional committees, the Secretary of the Interior, Secretary of Agriculture, and other interested parties. In addition, the report is available at no charge on the GAO website at https://www.gao.gov.

If you or your staff have any questions about this report, please contact us at (202) 512-3841 or AndersonN@gao.gov or JohnsonCD1@gao.gov. Contact points for our Offices of Congressional Relations and Public Affairs may be found on the last page of this report. GAO staff who made contributions to this report are listed in appendix V.

Sincerely yours,

Nathan Anderson
Director, Natural Resources and Environment

Cardell Johnson
Acting Director, Natural Resources and Environment

Appendix I: Objectives, Scope, and Methodology

This report (1) describes what the U.S. Departments of the Interior (Interior) and Agriculture (USDA) spent to clean up environmental contamination at abandoned hardrock mines from fiscal years 2017 through 2021; (2) assesses the extent to which the agencies communicated estimated cleanup costs for and federal fiscal exposure from abandoned hardrock mines in their financial statements and budget materials; and (3) describes the steps Interior has taken to implement the Infrastructure Investment and Jobs Act's (IIJA) abandoned hardrock mine land program, and assesses the extent that it has followed leading practices for program management.

To describe what Interior and USDA spent to clean up abandoned hardrock mines from fiscal years 2017 through 2021, we analyzed expenditure information from Interior's Bureau of Indian Affairs (BIA), Bureau of Land Management (BLM), Fish and Wildlife Service (FWS), National Park Service (NPS), and Office of Environmental Policy and Compliance, and USDA's Environmental Management Division and the Forest Service for the most recent 5 fiscal years prior to the start of our review—fiscal years 2017 through 2021. For examples of ways that agencies expended funds to clean up hardrock mines, we reviewed agency documentation, such as historical reports and documentation issued to comply with the Comprehensive Environmental Response, Compensation, and Liability Act of 1980, as amended. To assess the reliability of the data obtained from these federal agencies, we tested the data for accuracy by checking for missing data and errors and requested information about the data systems used and any limitations from the agencies. We determined that the data were sufficiently reliable for describing agencies' expenditures to clean up abandoned hardrock mines. In addition, we reviewed and summarized federal agency guidance containing the processes that each use when determining which abandoned hardrock mine cleanup projects to fund. We also reviewed scoring tools, such as matrixes, which contain criteria that are used to rank and select mines to fund for cleanup.

To assess the extent to which the agencies communicated estimated cleanup costs for, and federal fiscal exposure from, abandoned hardrock mines in their financial statements and budget materials, we reviewed and summarized relevant sections of the federal accounting standards. We analyzed government documents for fiscal years 2017 through 2021. These documents included agency financial statements and budget materials, which included Interior's budget in briefs as well as USDA's

budget justifications and explanatory notes.[1] We also reviewed the body of work where GAO has discussed the importance of agencies improving recognition of fiscal exposures and providing a comprehensive picture of the federal government's future financial obligations.[2] These reports discussed a conceptual framework for fiscal exposures that was developed from information found in sources such as the federal accounting standards, literature reviews, discussions with budget experts and federal agencies, and experiences of other nations. We also reviewed our 2017 High-Risk Series report, which discussed the federal government's environmental liabilities and the need for some agencies to improve the completeness of information about long-term cleanup responsibilities and their associated costs so that decision makers, including Congress, can consider the full scope of the federal government's cleanup obligations.[3]

We also analyzed data sources that the agencies used to track mine site information, such as Interior's Environmental and Disposal Liability database, as well as USDA's Management Schedule Legal Letters and National Environmental Accomplishment Tracking (NEAT) database, to identify any cost estimates that officials said they either included or did not include in their financial statements. We also reviewed USDA's information quality guidelines to determine whether the agency followed them when entering cost estimate data for abandoned hardrock mines into the NEAT database. We assessed the data fields in USDA's NEAT database to determine the extent to which the data provide quality information on potential cleanup cost estimates.

To assess the reliability of the data used to report estimated cleanup costs for abandoned hardrock mines in the agencies' financial

[1]Explanatory notes include budget information. We also reviewed Interior's and USDA's budget materials for fiscal year 2022, although fiscal year 2022 was not in the scope of this report, to see if the amount of funding that the agencies requested changed because of the enactment of the IIJA in November 2021. We describe this information in our findings.

[2]GAO, *Fiscal Exposures: Improving Cost Recognition in the Federal Budget,* GAO-14-28 (Washington, D.C.: Oct. 29, 2014); *Fiscal Exposures: Improving the Budgetary Focus on Long-Term Costs and Uncertainties,* GAO-03-213 (Washington, D.C.: Jan. 24, 2003); and *Long-Term Commitments: Improving the Budgetary Focus on Environmental Liabilities,* GAO-03-219 (Washington, D.C.: Jan. 24, 2003).

[3]GAO, *High-Risk Series: Progress on Many High-Risk Areas, While Substantial Efforts Needed on Others*, GAO-17-317 (Washington, D.C.: Feb. 15, 2017).

statements, we checked for missing data and errors, reviewed documents about the data systems, asked agency officials about the data and any limitations, and reviewed their written responses. We also interviewed Interior and USDA Offices of Inspector General to determine whether their audit findings for fiscal years 2017 through 2021 cast doubt on the reliability of the data. While we determined that the data were sufficiently reliable for the purposes of this report, not all data fields in NEAT are required to be populated. We describe these findings in the report.

To provide further context to the cost estimates reported, we reviewed a previous GAO report that identified in 2020 the estimated number of mine features with known or unknown environmental contamination on Interior- and USDA-managed lands.[4]

To describe the steps Interior has taken to implement the IIJA's abandoned hardrock mine land program, we reviewed the IIJA and Interior's fiscal year 2022 appropriations. To help us identify any goals, objectives, and performance measures for Interior's new abandoned hardrock mine land program, we analyzed its strategic plan for fiscal years 2022 through 2026, draft abandoned hardrock mine land program documentation and guidance, and interagency working group meeting documentation.[5] To assess the extent that Interior has followed leading practices for program management, we analyzed Interior's development of goals, objectives, and performance measures and compared them with leading practices for program planning and development from the Project Management Institute's *The Standard for Program Management*.[6]

To select mines to visit and use as illustrative examples throughout the report, we

1. developed a preliminary list of factors that may affect agencies' estimates of potential cleanup costs for abandoned hardrock mine

[4]GAO, *Abandoned Hardrock Mines: Information on Number of Mines, Expenditures, and Factors That Limit Efforts to Address Hazards*, GAO-20-238 (Washington, D.C.: Mar. 5, 2020).

[5]This working group is described in our findings.

[6]Project Management Institute, Inc., *The Standard for Program Management*, Fourth Edition (2017). The Project Management Institute is a not-for-profit association that, among other things, provides standards for managing various aspects of projects, programs, and portfolios.

sites by reviewing previous GAO reports and conducting interviews with Interior and USDA officials;

2. confirmed these factors with the agencies through another round of interviews where officials also provided mine site examples of these factors, where applicable;
3. summarized and analyzed the list of 13 factors and associated mine site examples;[7] and
4. used the following criteria to select a nongeneralizable list of eight abandoned hardrock mine sites: (a) mines that exemplified multiple factors; (b) at least one mine that was reported as an environmental liability in agencies' fiscal years 2017 through 2021 financial statements and one that was not; (c) no mines that were from the same geographic location; and (d) mines that had high estimated costs reported in fiscal year 2021 financial statements.

We selected eight mine sites, which included the Questa, Josephine, Red Devil, Gold King/Brooklyn, Holden, Blue Ledge, Grant-Kohrs Ranch/Clark Fork River, and Nacimiento mines. For each of the eight sites, we reviewed documents that described the site's history and agencies used to assess the mine and any associated contamination. From these eight, we chose to visit two mine sites, the Nacimiento and Questa mines in northern New Mexico, in June 2022, based on geographic location and agency availability to facilitate site visits. Findings from our review of the mine sample cannot be generalized to those we did not select or include in our review.

To obtain information for this report, we interviewed officials from Interior's Office of Environmental Policy and Compliance, BLM, BIA, FWS, and NPS, as well as officials from USDA's Environmental Management Division and the Forest Service.

We conducted this performance audit from September 2021 to January 2023 in accordance with generally accepted government auditing

[7]These 13 factors included (1) the type and extent of contamination; (2) limited staff and subject matter expertise available to manage cleanup; (3) limited funding available for cleanup; (4) accessibility of sites in remote locations; (5) unsure of cleanup costs at a particular cleanup phase; (6) readily available technology to remediate a site; (7) management may not prioritize estimating costs; (8) standards, responsibilities, laws, and regulations for cleanup may not yet exist, change as the environment changes, or change cleanup standards; (9) officials may not always schedule cleanup activities in a timely manner; (10) land ownership complications; (11) some officials managing mine site cleanup may choose remedies that are more extensive and costly than required or are not consistent between sites; (12) incomplete data; and (13) legal liability concerns over sites.

standards. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objectives. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objectives.

Appendix II: Information That Interior and USDA Used to Make Funding Decisions for Cleanup of Abandoned Hardrock Mines

The U.S. Department of the Interior (Interior) and the U.S. Department of Agriculture (USDA) used similar information to make funding decisions for abandoned hardrock mine cleanup projects. For example, they both prioritized funds based on the mine's risk to human health and the environment. See table 1 for a comparison of the information that Interior and USDA used to fund mine cleanup projects.

Table 1: Examples of Information That the U.S. Department of the Interior (Interior) and the U.S. Department of Agriculture (USDA) Used to Make Funding Decisions for Abandoned Hardrock Mine Cleanup Projects, as of November 2022

Information	Interior	USDA
Environmental justice	✓	✓
Human health threat or risk	✓	✓
Ecological threat or risk	✓	✓
Near watershed	✓	✓
Enforcement or legal risk	✓	✓
National Priorities List site[a]	✓	✓
Soil or air release pathway	✓	✓
Cost recovery or partnership potential	✓	✓
Regulatory factors driving need for site funding	✓	✓
Secretarial or mission priorities	✓	✓
Whether the Comprehensive Environmental Response, Compensation, and Liability Act of 1980, as amended, has a role	✓	✓
Toxicity of contaminants	✓	✓
Level of urgency to address	✓	✓

Legend:
✓ = yes
✗ = no

Source: GAO analysis of Interior and USDA documents. | GAO-23-105408

[a]The National Priorities List includes sites of national priority among the known releases or threatened releases of hazardous substances, pollutants, or contaminants throughout the U.S. and its territories, according to the Environmental Protection Agency.

Appendix III: Comments from the U.S. Department of Agriculture

USDA United States Department of Agriculture | Forest Service | Washington Office | 1400 Independence Avenue, SW Washington, D.C. 20250

File Code: 2160
Date: January 5, 2023

Mr. Cardell Johnson
Director, Federal Lands and Water
Natural Resources and Environment
U.S. Government Accountability Office
441 G Street, NW
Washington, DC 20548

Dear Mr. Johnson:

The U.S. Department of Agriculture (USDA) appreciates the opportunity to respond to the U.S. Government Accountability Office (GAO) draft report, "Abandoned Hardrock Mines: Land Management Agencies Should Improve Reporting of Total Cleanup Costs (GAO-23-105408)." USDA generally agrees with the GAO draft report and recommendations.

As noted by GAO on page 18 of the draft report, "USDA included certain estimated cleanup costs, or explicit exposures, for abandoned hardrock mines in the aggregated total environmental liabilities reported in their financial statements, consistent with federal accounting standards."

Thank you again for the opportunity to review the draft report. If you have any questions, please contact Robert Velasco, Chief Financial Officer, at robert.velasco@usda.gov.

Sincerely,

RANDY MOORE
Chief

Caring for the Land and Serving People

Printed on Recycled Paper

Appendix IV: Comments from the U.S. Department of the Interior

United States Department of the Interior

OFFICE OF THE SECRETARY
Washington, DC 20240

Cardell Johnson
Director, Natural Resources and Environment
U.S. Government Accountability Office
441 G Street, NW
Washington, DC 20548

Dear Mr. Johnson:

Thank you for providing the Department of the Interior (Department) an opportunity to review and comment on the draft Government Accountability Office (GAO) draft report titled, *Abandoned Hardrock Mines: Land Management Agencies Should Improve Reporting of Total Cleanup Costs* (GAO-23-105408). We appreciate GAO's review of the Department's management of hardrock liabilities and accounting procedures.

The Department concurs with the following recommendation(s) issued by GAO.

Recommendation 1: The Secretary of the Interior should expand the information available to Congress regarding the agency's fiscal exposure from abandoned hardrock mines by clearly identifying the amount of known cleanup cost estimates specifically for such mines in supplemental reports or other budget materials.

Response: Concur. The Department reports environmental liabilities as required by Federal Accounting Standards Advisory Board (FASAB), requirements and the June 30, 2022, FASAB Handbook of Federal Accounting Standards and Other Pronouncements, as amended (or current version) and OMB Circular A-136, Financial Reporting Requirements. In addition to this reporting, the Department will include the value of known environmental liabilities associated with abandoned hardrock mine land in reports related to Section 40704 the Infrastructure Investment and Jobs Act (IIJA), supplemental reports or other budget materials.

Responsible Official: Director, Office of Environmental Policy and Compliance

Target Date: June 30, 2023

Recommendation 4: As the agency continues to design and implement the IIJA abandoned hardrock mine land program, the Secretary of the Interior should develop quantitative performance measures for the program to enable the agency to assess its progress toward meeting its program goals.

Response: Concur. The Department drafted Agency Priority Goals (APGs) as quantitative and qualitative performance measures for fiscal year 2023. The APGs include mitigating high priority abandoned hardrock mine land to eliminate dangerous environmental conditions and

pollution caused by past mining. Reclamation and remediation of abandoned hardrock mine lands will address the health and safety hazards and environmental degradation of abandoned mines.

Responsible Official: Director, Office of Environmental Policy and Compliance

Target Dates: June 30, 2023

The attached enclosure contains technical comments and proposed corrections to incomplete information for your consideration while finalizing the report.

If you should have any questions or need additional information, please contact the PFM AM team at DOI_PFM_AM@ios.doi.gov.

Sincerely,

JOAN MOONEY

Digitally signed by JOAN MOONEY
Date: 2023.01.06 12:12:45 -05'00'

Joan M. Mooney
Principal Deputy Assistant Secretary
Exercising the Delegated Authority of the
Assistant Secretary for Policy, Management and Budget

Enclosure

Appendix V: GAO Contacts and Staff Acknowledgments

GAO Contacts

Nathan Anderson at (202) 512-3841 or AndersonN@gao.gov,
or Cardell D. Johnson at (202) 512-3841 or JohnsonCD1@gao.gov

Staff Acknowledgments

In addition to the contacts named above, Casey L. Brown (Assistant Director), Janice Poling (Assistant Director), Keesha Luebke (Analyst in Charge), Adrian Apodaca, Tammy Beltran, Robert Dacey, Cindy Gilbert, Susan Irving, Jason Scott Kirwan, Kristen Kociolek, Jordan Kudrna, Barbara Lancaster, Jessica Lemke, Benjamin Licht, Joseph Maher, Phillip McIntyre, Jordan Miller, Patricia Moye, Katrina Pekar-Carpenter, Leslie Pollock, Emily Ryan, Caitlin Scoville, Jeanette Soares, and Christopher Spain made contributions to this report.

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Washington, DC 20548

https://www.taosnews.com/news/environment/federal-government-to-share-cost-of-questa-mine-cleanup/article_04ae6f8f-8280-532c-85f5-07cc82c4ed06.html

Federal government to share cost of Questa Mine cleanup

Judge orders 70-30 split for $1 billion Superfund project

By Geoffrey Plant
Jul 13, 2022

1 of 4

NATHAN BURTON/Taos News

Mine officials stand on one of the many access roads within the now-closed Chevron molybdenum mine near Questa.

Nathan Burton

In a binding decision issued last week, a U.S. District Court judge in Albuquerque found that the federal government bears some financial responsibility for the cleanup of the Chevron Molybdenum Mine in Questa, leaving taxpayers on the hook for upward of $300 million.

Chevron Mining, Inc. filed its lawsuit against the federal government in 2013, seeking financial compensation under the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), better known as the Superfund Act. The mine was placed on the National Priorities List for cleanup in 2011.

Senior Judge Paul Kelly wrote in the June 28 declaratory judgment that the U.S. government is responsible for 30 percent of past and future costs associated with the remediation of the Questa mine, the cleanup costs for which the U.S. Environmental Protection Agency estimates will top $1 billion. Chevron is responsible for the 70-percent majority cost of remediating the Questa site.

The basis for the judgment was the judge's finding that the U.S. Government had encouraged expansive mining at the site at various times in the mine's history to bolster the nation's strategic molybdenum reserves and encourage economic development. The judgment found that the U.S. government encouraged mine development — which resulted in the need for the remediation work taking place now — by transferring federal land to Molycorp, the mine's previous owner, and providing financial assistance for mineral exploration.

The Questa mine was operated on-and-off for nearly 100 years, beginning as an underground mine in 1919. It became an open pit mine in the mid-sixties, and returned to underground workings in the early 1980s. Towering and steep, low-pH (acidic) waste piles will take years to make safe from the forces of erosion and for plant life, while a complex underground water impoundment system and the largest wastewater treatment plant in Taos County theoretically will operate in perpetuity to treat polluted water and prevent it from leaving the now-closed mine site. A tailings pipeline corridor, Eagle Rock Lake and the site of the mine's former tailings ponds southwest of Questa, has also been a focus of reclamation activities.

"Without the encouragement and involvement of the United States, Molycorp's open pit mine and second underground mine likely would not have been developed," Judge Kelly wrote in the opinion, adding that Molycorp "was not coerced by the United States into this mining activity" and therefore bears the bulk of the financial liability for the cleanup.

"Molycorp was the operator of the Questa Site and performed all waste rock and tailings disposal activities, making it the primary party responsible for the generation and disposal of waste at the Questa site," Kelly said.

Chevron Mining, Inc. celebrated the ruling, without which it would have been responsible for 100 percent of cleanup costs.

"We are pleased that Judge Kelly agreed with Chevron that the U.S. Government should bear a significant amount of the past and future costs associated with the remediation of the Questa Mine based on the U.S. Government's ownership of relevant land in and around the mine, as well as its active participation in the development of the open pit mine and the placement of the resulting waste rock piles," Chevron Mining, Inc. said in a statement. "Chevron remains committed to implementing the ongoing remediation and reclamation projects and will continue to work with the EPA to ensure the remedial work meets all applicable regulatory standards."

Questa Mayor John Anthony Ortega said his community, which was heavily impacted both by mine pollution and the economic downturn when the mine closed, expects the federal government to strictly adhere to its new obligations.

"I would expect that the EPA and Federal Government be held to the same standards that they are holding Chevron Mining to," he said, adding that "the record of decree" — the document that guides the Superfund project — "must be followed no matter who is responsible for the clean-up costs. I, along with the citizens of the Village of Questa, expect that the record of decree will be followed."

Rachel Conn, deputy director of Amigos Bravos, a Taos-based, state-wide water conservation organization, called the judge's ruling "yet another case of the public subsidizing extractive industry on public lands," and said the 150-year-old federal 1872 General Mining Act is the common denominator to the public's liability for pollution created by the Questa Mine and other hard rock mines in New Mexico, Arizona and elsewhere in the West.

"Here, a private company used public lands for mining and created a legacy of polluted ground and surface water that has harmed communities in Northern New Mexico," Conn said. "It doesn't sit well that they are now demanding that the public help pay their cleanup bill.

"Much of the problem is rooted in the outdated federal 1872 Mining Act, which allows mining interests to exploit public minerals and hamstrings the ability of federal agencies to prevent ill-advised mining operations on public lands," Conn added. "Ultimately, this case demonstrates that Congress urgently needs to update 19th-century mining laws to safeguard the public interest. If the public is going to be on the hook for cleanup costs, we need stronger tools to deny harmful activities from occurring on our public lands."

An effort is underway to change the 19th-century law.

On May 10, the 150th anniversary of President Ulysses S. Grant signing the Mining Act into law, U.S. Sen. Martin Heinrich and U.S. Rep. Raúl Grijalva held a press conference to promote the Clean Energy Minerals Reform Act, newly-introduced congressional legislation that would reform the old mining law.

House and Senate versions of the bill are currently sitting in congressional committees. The Senate version has been referred to the Senate Committee on Energy and Natural Resources, while the House version was referred to the House Committee on Natural Resources, the House Subcommittee on Energy and Mineral Resources and the House Subcommittee for Indigenous Peoples of the United States.

“It’s time that we had a 21st-century approach to mining in this country," Heinrich said at the May press conference. "Especially at a moment when we’re seeing increased efforts to create more domestic supply for many of these minerals, now is the right time to reform the oversight and statutory process under which we mine on our public lands."

According to a fact sheet from Grijalva's office, the reform bill seeks to hold the mining industry to full financial account when it comes to remediation and post-mine reclamation, set clear environmental protection and reclamation standards, require consultations with tribes affected by proposed mining operations and establish a 12.5 percent royalty on new mines and an 8 percent royalty on existing mines.

“The transition to a clean energy future will inevitably involve mining, there’s no question, but that doesn’t mean we should risk permanent damage to our sacred places, our wilderness and our health," Grijalva said. "I don’t believe we can build a 21st-century clean energy economy using a 19th-century law."

According to a General Mining Act fact sheet from Heinrich's office, the "antiquated system" still in place under the 1872 hard rock mining law "has allowed mining companies to extract more than $300 billion worth of gold, silver, copper, and other valuable minerals from U.S. public lands without paying a cent in federal royalties to the American people. These same companies have left the public with billions of dollars in cleanup costs for abandoned hard rock mines, which have polluted 40 percent of the headwaters of western watersheds. Many Indigenous communities' sacred sites and lands are continuously at-risk of being permanently destroyed by mining."

DEPARTMENT OF THE INTERIOR

Geological Survey

2022 Final List of Critical Minerals

AGENCY: U.S. Geological Survey, Department of the Interior.

ACTION: Notice.

SUMMARY: By this notice, the Secretary of the Interior, acting through the Director of the U.S. Geological Survey (USGS), presents the 2022 final list of critical minerals and the methodology used to develop the list. The 2022 final list of critical minerals, which revises the final list published by the Secretary in 2018, includes the following 50 minerals: Aluminum, antimony, arsenic, barite, beryllium, bismuth, cerium, cesium, chromium, cobalt, dysprosium, erbium, europium, fluorspar, gadolinium, gallium, germanium, graphite, hafnium, holmium, indium, iridium, lanthanum, lithium, lutetium, magnesium, manganese, neodymium, nickel, niobium, palladium, platinum, praseodymium, rhodium, rubidium, ruthenium, samarium, scandium, tantalum, tellurium, terbium, thulium, tin, titanium, tungsten, vanadium, ytterbium, yttrium, zinc, and zirconium.

ADDRESSES:

Public comments received on the draft list of critical minerals are available at www.regulations.gov under docket number DOI-2021-0013.

FOR FURTHER INFORMATION CONTACT:

James Mosley, (703) 648-6312, jmosely@usgs.gov. Persons who use a telecommunications device for the deaf (TDD) may call the Federal Relay Service (FRS) at 1-800-877-8339 or dial 711 to contact Mr. Mosley during normal business hours. The FRS is available 24 hours a day, 7 days a week, to leave a message or question with this individual. You will receive a reply during normal business hours. Normal business hours are 9:00 a.m. to 5:30 p.m., Monday through Friday, except for Federal holidays.

SUPPLEMENTARY INFORMATION:

Pursuant to Section 7002 of the Energy Act of 2020 (the Energy Act) (Pub. L. No. 116-260), on November 9, 2021, the Secretary of the Interior, acting through the Director of the U.S. Geological Survey (USGS), published in the *Federal Register* a draft list of 50 mineral commodities proposed for inclusion on the Interior Department's list of critical minerals and the methodology USGS used to create the list. 86 FR 62199. The *Federal Register* notice provided for a 30-day public comment period, which closed on December 9, 2021. On December 14, 2021, the USGS published a notice in the *Federal Register* extending the comment period by 32 days. 86 FR 71083. The public comment period closed on January 10, 2022. The comments are available for public viewing at www.regulations.gov under docket DOI-2021-0013. Consistent with the methodology described in the November 2021 *Federal Register* notice, the 2022 final list of critical minerals revises the Interior Department's final list of critical minerals, which it published in 2018 pursuant to Executive Order 13817—A Federal Strategy to Ensure Secure and Reliable Supplies of Critical Minerals. 83 FR 23295.

USGS received 1,073 comments during the extended comment period and received 4 letters after the comment period. Two comments were made anonymously, 996 were from individuals, and 77 were submitted on behalf of organizations. The comments included 91 requests to include specific minerals, including copper, phosphate, silver, and lead, which also were not on the 2018 final list, and helium, potash, and uranium, which were on the 2018 final list, but not on the draft list. Many of the comments requesting to include these specific minerals noted their importance or provided other qualitative rationale for their inclusion. However, the comments did not identify any inaccuracies in the data used to conduct the quantitative evaluation in accordance with the published USGS methodology, nor did they identify any single points of failure. USGS applied the quantitative methodology to each of the minerals requested for inclusion that were not on the draft list, and per the criteria articulated in the *Federal Register* Notice publishing the draft list at 86 FR 62199, a qualitative evaluation was conducted only when other evaluations were not possible. After applying the methodology, USGS determined that the minerals requested for inclusion did not meet the criteria for inclusion on the final list.

There were 991 requests, the vast majority of which were form comments, supporting the removal of uranium (included on the 2018 final list) from the 2022 final list. The comments also included 5 requests supporting the exclusion of other specific minerals, including copper, helium, potash, rhenium, and strontium, none of which the USGS had proposed for inclusion on the list. As noted above, USGS received requests to include four minerals that other commenters also requested to exclude: copper, helium, potash, and uranium.

Some commenters took issue with USGS's reliance on the Mineral Policy Act of 1970 to characterize uranium as a fuel mineral. Even assuming the Mineral Policy Act of 1970 does not inform the meaning of "fuel mineral" in the Energy Act, uranium nevertheless qualifies as a "fuel mineral" under the latter statute. The Energy Act excludes "fuel minerals" from the definition of critical minerals, and uranium is used as a fuel: while uranium has important non-fuel uses, it is a major fuel commodity in the United States.

Many public comments addressed issues not directly associated with the development of the 2022 final list of critical minerals. Instead, they addressed regulatory and policy issues. These comments will be passed on to other agencies for appropriate consideration.

A small number of comments requested the addition of processed mineral products that were not evaluated for inclusion on the list in this cycle. These included high purity silicon metal and boron carbide, for example, materials for which USGS does not have sufficient data to evaluate at this stage. The USGS appreciates the input from stakeholders and is identifying opportunities to include evaluation of these and other minerals or mineral products in the next update of the methodology.

The Department's list of critical minerals is not static and will be reviewed at least every three years and revised as necessary to reflect current data on supply, demand, and concentration of production, as well as current policy priorities, as required under the Energy Act. The 2022 final list of critical minerals was created using the most recent available data for non-fuel minerals and the current state of the methodology for evaluation of criticality.

The methodology used to develop the 2022 final list of critical minerals is based on the definition of "critical mineral" and the criteria specified in The Energy Act. The methodology was published by the USGS in 2020[1] and 2021[2] and includes three evaluations: (1) A quantitative evaluation of supply risk wherever sufficient data were available, (2) a semi-quantitative evaluation of whether the supply chain had a single point of failure, and (3) a qualitative evaluation when other evaluations were not possible. The quantitative evaluation uses (A) a net import reliance indicator of the dependence of the U.S. manufacturing sector on foreign supplies, (B) an enhanced production concentration indicator which focuses on production concentration outside of the United States, and (C) weights for each producing country's production contribution by its ability or willingness to continue to supply the United States. Further details on the underlying rationale and the specific approach, data sources, and assumptions used to calculate each component of the supply risk metrics are described in the references cited in this notice.

Several comments addressed the overall methodology that USGS used to develop the list, including assertions that the USGS should include additional quantitative or qualitative factors. USGS appreciates these suggestions and will consider them in future updates to the methodology. However, the USGS did not find that any of the comments identified technical flaws in the factors considered or data used in the quantitative methodology that would warrant any changes in the methodology.

After considering all comments received, the USGS believes that the methodology described in USGS Open-File Report 2021-1045 (https://doi.org/10.3133/ofr20211045) remains a valid basis for the review and revision of the list of critical minerals. Therefore, the USGS is hereby finalizing the draft list of 50 critical minerals as the final list. A listing of which critical minerals are predominantly recovered as byproducts and further rationale for excluding copper, helium, lead, phosphate, potash, rhenium, silver, strontium, and uranium from the 2022 final list of critical minerals are outlined in the draft list of critical minerals published in the *Federal Register* at 86 FR 62199. Host minerals for critical minerals that are predominantly recovered as byproducts are identified in USGS Open-File Report 2021-1045, p. 11.

The U.S. Government and other organizations may also use other definitions and rely on other criteria to identify a mineral as critical. In addition, there are many minerals not on the 2022 final list of critical minerals that are nevertheless important to the economic and national security of the United States. This 2022 final list of critical minerals is not intended to replace related terms and definitions of minerals that are deemed strategic, critical or otherwise important.

Authority: E.O. 13817, 82 FR 60835 (December 26, 2017) and The Energy Act of 2020, Section 7002 of Title VII (December 27, 2020).

James D. Applegate,

Associate Director for Natural Hazards, Exercising the Delegated Authority of the Director, U.S. Geological Survey.

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[1] Nassar, N.T., Brainard, J., Gulley, A., Manley, R., Matos, G., Lederer, G., Bird, L.R., Pineault, D., Alonso, E., Gambogi, J., Fortier, S.M., 2020, Evaluating the mineral commodity supply risk of the U.S. manufacturing sector Sci. Adv., 6 (8) (2020), p. eaay8647, https://doi.org/10.1126/sciadv.aay8647

[2] Nassar, N.T., and Fortier, S.M., 2021, Methodology and technical input for the 2021 review and revision of the U.S. Critical Minerals List: U.S. Geological Survey Open-File Report 2021-1045, 31 p., https://doi.org/10.3133/ofr20211045.

Gold Recycling – the Environmentally-Friendly Alternative

Gold Recovery Instead of Overexploitation

Recycling of Gold Jewellery

To extract only 10 grams of gold, huge conveyor systems must move up to 5 tonnes of ore. With the extravagant use of heavy machinery, diesel exhaust fumes are emitted into the atmosphere. Also the use of chemicals such as mercury and cyanide make gold prospecting a burden on the environment. Furthermore, where gold deposits are being exploited, the rivers are dammed up, forests felled, mountains removed. These are all good arguments for the recovery of old gold, re-melting it in refineries and an intensive recycling. In this way new gold is recovered, with far less damage to the environment.

Recoverable Gold in Numerous Products

It is incredible where recoverable gold or at least usable traces of it are to be found: in dental gold, in old, faded and no longer worn jewellery, but above all in defective technical equipment, industrial fittings as well as electrical scrap. Due to its excellent material properties, gold has a multitude of uses in modern technological products.

READ MORE ABOUT:

- Chemical Characteristics
- Application of Gold
- Gold Deposits
- Gold Extraction / Mining
- Gold Prospecting
- Gold Recycling
- Investment Gold
- Gold Jewellery
- Gold Trade
- Gold Alloys

Gold Recovery by Melting Old Dental Gold

The melting down of unused dental gold, crowns, inlays and dental alloys is routine for specialised laboratories. There is a differentiation between yellow and white gold and more importantly gold-bearing dentures. Apart from gold, the alloys also contain silver, platinum and palladium.- the gold content can be up to 90%. Many owners of unused dental gold are unaware of its value and at today's market price how lucrative the proceeds could be. An evaluation by an expert ascertains the exact gold proportion. That this is financially worthwhile, lies also on the high price of gold. Because of the very high melting point of dental gold, often alloyed with platinum, just the separation of the gold and platinum from a kilogram of dental gold has associated costs of 200 Euros.

Recycling of Gold in a Precious Metals Foundry

In a precious metals foundry mainly pieces of gold jewellery, gold bars and gold appliqués are processed. Also here a laboratory initially analyses the fine gold content, which can be very different. Where necessary, decorative stones or glass pearls must be removed from jewellery and the components separately melted down to ultimately recover the pure gold contained in the jewellery.

Gold Bearing Electrical Scrap in Mobile Telephones, Computers and Co.

The most exciting recycling source is undoubtedly our electrical scrap. The electrical contacts in mobile telephones, computers or cars sometimes include a small amount of gold, which improve the electrical conductivity. Also factories, workshops and residential homes count as gold bearing, which is why experts talk of "urban mining" and initially claim these "suburban deposits" before destroying the natural environment. Additionally, undertaking well-published technological gold recycling, especially in countries such as Germany which are poor in resources, frees them from expensive imports and makes them somewhat more independent.

Giving Old Gold from Electrical Scrap a New Value

Naturally, the gold content of electrical scrap belongs to the smallest category. However: from 40 scrap mobile phones for example, nearly as much gold can be recovered as can be mined from a tonne of gold bearing ore. A tonne of old computer circuit boards produces more than 200 grams of the precious metal. Whereas gold from jewellery brings a 90 percent recovery, gold from electrical scrap has up to now only about 15 percent. The majority of European scrap equipment is shipped to Asia or Africa to be salvaged, where it mostly remains hidden. Recycling experts refer to a value of 3.7 billion Euros, which this lost precious metal could achieve. In the coming years it will be seen how sustainable our economy really is. Everybody can make his contribution. A mobile phone, an old laptop are important raw material sources, that should not be simply thrown in the rubbish unused.

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THE BIDEN-HARRIS PERMITTING ACTION PLAN TO REBUILD AMERICA'S INFRASTRUCTURE, ACCELERATE THE CLEAN ENERGY TRANSITION, REVITALIZE COMMUNITIES, AND CREATE JOBS

With the passage of President Biden's Bipartisan Infrastructure Law (BIL), the United States is making generational investments in our infrastructure and competitiveness that will create well-paying union jobs, grow our economy, invest in communities, combat climate change, and conserve and restore the natural places we value.

To ensure the timely and sound delivery of much-needed upgrades to America's infrastructure, the Biden-Harris Administration is today releasing an Action Plan to strengthen and accelerate Federal permitting and environmental reviews, fully leveraging the permitting provisions in the BIL.[1]

The Biden-Harris Permitting Action Plan establishes that Federal environmental review and permitting processes will be:

- **Effective, efficient, and transparent** to accelerate delivery of well-designed infrastructure projects, to ensure predictability and timeliness for project sponsors and stakeholders;
- **Guided by the best science**, information, and complete environmental effects analysis to promote the best outcomes; and
- **Shaped by early and meaningful public input** – particularly from disadvantaged communities – and through **partnership with State, territorial, and local governments** and in consultation with **Tribal Nations**[2] to deliver results for all Americans.

To deliver on these expectations, the Action Plan contains five key elements that build on strengthened Federal approaches to environmental reviews and permitting: (1) accelerating permitting through early cross-agency coordination to appropriately scope reviews, reduce bottlenecks, and use the expertise of sector-specific teams; (2) establishing clear timeline goals and tracking key project information to improve transparency and accountability, providing increased certainty for project sponsors and the public; (3) engaging in early and meaningful outreach and communication with Tribal Nations, States, territories, and local communities; (4) improving agency responsiveness, technical assistance, and support to navigate the environmental review and permitting process effectively and efficiently; and (5) adequately resourcing agencies and using the environmental review process to improve environmental and community outcomes.

The Action Plan fully leverages existing permitting authorities and new provisions included in the BIL, such as new coordination and timeline requirements[3] that apply to major transportation projects, and new FAST-41 requirements and authorities, including those for covered projects in the renewable or conventional energy production, electricity transmission, water resources, broadband, pipelines, carbon capture, and other infrastructure sectors. The permitting provisions of BIL enhance efficiency,

[1] The Action Plan covers the Administration's executive agencies and departments, as well as independent agencies that agree to take these steps or are directed to do so by statute.

[2] "Tribal Nation" means an American Indian or Alaska Native tribe, band, nation, pueblo, village, or community that the Secretary of the Interior acknowledges as a Federally recognized tribe pursuant to the Federally Recognized Indian Tribe List Act of 1994, 25 U.S.C. 5130, 5131.

[3] These provisions appear in Section 11301 ("One Federal Decision") of the Infrastructure Investment and Jobs Act of 2021, and refer to requirements applicable to FHWA, FTA, and FRA, and not the provisions of Executive Order 13807, which the Biden Administration revoked on January 20, 2021.

accountability, and predictability and provide the tools needed to ensure timely and sound delivery of these historic infrastructure investments. Within 90 days of the issuance of this Action Plan, the Office of Management and Budget (OMB), in consultation with the Council on Environmental Quality (CEQ), will provide guidance to agencies on carrying out the initiatives in this Action Plan.

This Action Plan is another example of the Administration acting decisively to deliver the benefits of infrastructure investment to the American people by moving swiftly to advance and help build well-designed projects that promote, rather than compromise, our environmental goals. Long overdue improvements to our nation's ports, airports, rail, and roads will help ease inflationary pressures, create conditions for businesses to thrive, and strengthen supply chains. Building new clean energy generation and transmission projects will power homes, automobiles, and businesses and help avoid the worst impacts of climate change. Responsible and sustainable domestic sourcing of critical minerals and materials will power our clean energy economy and reduce reliance on unreliable foreign supply chains. And delivering clean residential water supplies, high-speed internet, and open space to all Americans, especially those historically underserved, is imperative.

Critically, the modernization of America's infrastructure must deliver benefits to all communities and avoid the mistakes of the past. Too often, infrastructure investments have resulted in highways being built through vulnerable communities, climate change and other pollution risks being ignored, irreparable damage to natural resources discounted, and disproportionate and negative impacts on low-income neighborhoods, rural places, communities of color, and Tribal land.

As part of the Permitting Action Plan, Federal agencies are pursuing a coordinated set of actions to enable efficient and effective permitting and environmental review all in service of our ultimate goal – to enable infrastructure projects infused and informed by the Biden-Harris Administration's values to be delivered on-time to the American people, including by:

Accelerating Smart Permitting through Early Cross-Agency Coordination. The Biden-Harris Administration will improve coordination and focused information exchange among responsible Federal agencies to increase productive communication that moves projects forward. The Administration will leverage the interagency Federal Permitting Improvement Steering Council (Permitting Council) to improve coordination among agencies and resolve issues consistent with climate, economic, and equity goals. Established in 2015, the Permitting Council includes the deputy secretaries or equivalent of 13 Federal permitting agencies, the CEQ Chair, the OMB Director, and an Executive Director, who serves as the Permitting Council Chair. While the Permitting Council provides a governance structure and set of procedures for FAST-41 covered projects, the Permitting Council's membership will be deployed more broadly in this Action Plan as a governing body to help address pressing issues, provide guidance, and take other necessary actions to facilitate sound and efficient permitting. The Permitting Council Executive Director, CEQ Chair, and OMB Director, in cooperation with the National Economic Council (NEC), the White House Climate Policy Office (CPO), and the White House Infrastructure Implementation Team, will work closely with the Permitting Council agency members, other senior agency officials, and Permitting Council member agency Chief Environmental Review and Permitting Officers (CERPOs), to help ensure that appropriate resources, coordination mechanisms, and attention are being devoted to environmental reviews and permitting, and that environmental review and permitting decisions are being conducted in an efficient and effective manner. The Permitting Council also will fully leverage its role as a Federal center for permitting excellence to help avoid and resolve potential conflicts and

bottlenecks before they emerge, and identify and share best practices, drawing upon the expertise of agency CERPOs, who will provide day-to-day technical support for permitting processes, facilitate timely reviews, and resolve permitting issues in a timely fashion.

In addition, the Administration has convened sector-specific teams of experts, including teams marshaled by the CPO and NEC, that are advancing the responsible build-out and modernization of U.S. infrastructure by facilitating interagency coordination on siting, permitting, supply chain, and related issues for:

- Offshore wind energy and transmission;
- Onshore renewable energy and transmission;
- Broadband;
- Production and processing of critical minerals;
- Transportation; and
- Climate-smart infrastructure.

Within 60 days of the issuance of this Action Plan, these teams will provide to the Permitting Council a charter that describes their organizational structure, mission and objectives, and strategies for promoting the effectiveness and timeliness of permitting. In addition, these teams will provide updates to the Permitting Council at least quarterly on the status of large, complex, or significant projects in meeting permitting milestones and schedules, strategies to address disputes or complicated issues, whether additional resources are necessary to reduce bottlenecks, and any other pertinent issues as determined by the teams. The Biden-Harris Administration will continue to evaluate whether to convene other-sector-specific teams to improve permitting processes and advance infrastructure investments.

In addition, the Biden-Harris Administration is taking several other steps to improve cross-agency coordination, including:

- **Leveraging the Permitting Council's FAST-41 process, coordination functions, and expanded authorities.** The BIL modified key functions of the Permitting Council to facilitate environmental review and permitting for FAST-41 "covered" projects, which tend to be complex, capital intensive, and involve multiple Federal agencies. The Biden-Harris Administration will make expanded use of the Permitting Council's new authorities, including the ability to help facilitate infrastructure projects proposed by Tribes on Tribal lands, accelerate information sharing and troubleshooting, and help agencies remedy near-term resource shortages for permitting. Agencies will, as relevant and appropriate for certain projects, encourage project sponsors to use the FAST-41 process, which is designed to promote coordination, transparency, efficiency, and good outcomes consistent with environmental, climate change, and climate resilience goals. Consistent with new provisions in BIL, the Permitting Council Executive Director will provide quarterly reports to Congress assessing agency compliance with FAST-41 requirements. The Permitting Council will work with the Department of Transportation to make upgrades to the Federal Permitting Dashboard to better track and monitor agency progress in the environmental review and permitting process.
- **Leveraging the Department of Transportation's Interagency Infrastructure Permitting Improvement Center.** The Interagency Infrastructure Permitting Improvement Center (IPIC) plays a critical coordination and troubleshooting role for transportation projects, which are not

part of the FAST-41 process. IPIC will help facilitate environmental review and permitting for BIL-funded transportation projects by developing program-specific guidance, sharing best practices, coordinating priority projects, tracking metrics for timeliness and project outcomes, and continuing to explore innovative approaches to environmental review and permitting to help improve community and environmental outcomes. Agencies participating in transportation project reviews should closely coordinate with the Department of Transportation to identify and resolve issues at the earliest possible time, conduct concurrent reviews and work on joint documents, and aim to meet permitting timetable milestones.

- **Developing programmatic approaches to permitting and environmental review**. Within 90 days of the issuance of this Action Plan, agencies and cross-agency teams will identify and report to the Permitting Council opportunities to prepare new programmatic analysis and approaches or special area management plans within priority sectors or regions in order to address common issues, eliminate duplication, and site and design projects in a manner that is smart from the start by reducing resource conflicts and incorporating climate-smart approaches to siting or design.
- **Working to reform outdated permitting laws and regulations**. The Mining Law of 1872 still governs mining of most critical minerals on Federal public lands. The Department of Interior has established an interagency working group (IWG) to advance legislative and regulatory reform of mine permitting and oversight. The IWG released a list of Biden-Harris Administration fundamental principles for mining reform to promote responsible, timely mining under strong community engagement, environmental, and labor standards that avoids the historic injustice that too many mining operations have left behind. Per Section 40206 of the BIL, the working group will deliver recommendations to Congress by November. It will also host public input and comment sessions and work with relevant agencies to initiate updates to mining regulations by the end of the year.

Establishing Clear Timeline Goals and Tracking Key Project Information. Communities and project proponents all benefit from having clear information about the schedules, key milestones and deadlines, and public comment opportunities for the environmental review and permitting of a project, regardless of whether it is covered by FAST-41. Clear timeline goals and up-to-date information increase accountability, encourages efficiency, enables greater public participation in project decisions, and builds trust in government. The Biden-Harris Administration will therefore:

- **Create permitting schedules with clear timeline goals.** Federal law requires certain agencies to establish and post on the publicly-accessible Federal Permitting Dashboard or another public webpage project permitting schedules and other information for certain large-scale projects. Consistent with these statutes, lead agencies, in coordination with cooperating agencies, are directed to establish and post schedules that are both ambitious and realistic, contain relevant milestones, and meet all requirements in applicable law to complete environmental review and permitting in a sound and timely manner. Permitting Council members and their CERPOs will regularly review applicable permitting timetable data and key action milestones for projects to provide accountability.
- **Track key information on the Federal Permitting Dashboard**. The Federal Permitting Dashboard has proven to be an effective mechanism to enhance transparent interagency coordination and efficient decision-making. The Permitting Council will continue to provide guidance to assist

member agencies in posting and maintaining information that must be posted to the Dashboard for FAST-41 covered projects, including timetables, milestones, and new information required by the BIL on public engagement opportunities and the status of mitigation measures agreed to as part of the environmental review and permitting process. The BIL also gives the Permitting Council Executive Director new authority to direct an agency to add projects not covered by FAST-41 to the Dashboard in the interest of transparency. Within 90 days of the issuance of this Action Plan and on a regular basis thereafter, the Permitting Council Executive Director, CEQ, and OMB will provide guidance to Permitting Council agencies on which non-FAST-41 projects should be added to the Dashboard. In addition, the Permitting Council will work with DOT, which manages the Dashboard, to explore using the Dashboard or another platform to provide access to information on net greenhouse gas (GHG) emissions or emissions reductions associated with projects, consistent with the Administration's commitment to addressing climate change.

- **Identify the lead and cooperating roles for Federal agencies in permitting processes**. To enhance coordination among Federal agencies and avoid permitting delays, the lead Federal agency with responsibility for a project should identify—as early as possible—all other agencies that have relevant authority or expertise in a funding or permitting decision. The lead Federal agency will develop and implement coordination plans, interagency agreements, or other mechanisms designed to ensure sustained and effective coordination and accountability. Where applicable, these workplans will be reflected on the Federal Permitting Dashboard or similar platform.

Engaging in Early and Meaningful Outreach and Communication with States, Tribal Nations, Territories, and Local Communities. Proactive, early, and ongoing engagement with the public and State, local, Tribal, and territorial partners is a core value of the Biden-Harris Administration's Permitting Action Plan and is fundamental to delivering timely projects that serve the needs and priorities of communities. Under the Permitting Action Plan, agencies are therefore engaging in:

- **Early and sustained Tribal consultation**. Agencies will consult with affected Tribal Nations as early as possible, in a sustained manner, and in a fashion that respects the Nation-to-Nation relationship. Where appropriate, agencies should invite Tribal Nations to serve as cooperating agencies in environmental review processes. As part of their annual progress reports to OMB on implementing agency Tribal consultation plans, as required by President Biden's Memorandum on Tribal Consultation and Strengthening Nation-to-Nation Relationships, agencies shall report on cooperation and consultation with Tribal Nations in the environmental review process. The Permitting Council, CEQ, and OMB will provide additional guidance and training to Federal agencies on Tribal consultation.
- **Proactive State, territorial and local government partnership.** Agencies will identify and coordinate with relevant State, territorial, and local governments as early as possible and in a sustained manner. Where applicable, environmental issues should be studied during the planning stage of project development and incorporated into the environmental review process. To the maximum extent feasible, and specifically for FAST-41 covered projects, agencies should develop coordinated project plans that take into account all Federal, State, territorial, and local environmental and permitting actions, and incorporate such plans in memoranda of understanding for State, territorial, and local government agency participation in the Federal

environmental review and permitting process. When relevant, agencies should also seek to include non-Federal environmental reviews and permitting activities on the Permitting Dashboard. Consultation and coordination with Tribal, local, territorial and State governments should, among other things, inform development of efficient timetables for decision-making that are appropriate given the complexities of the proposed projects. Additionally, lead and cooperating agencies should share with State, Tribal, territorial, and local authorities best practices involved in review of covered projects and invite input from State, Tribal, territorial, and local authorities regarding best practices.

- **Public participation**. Consistent with the National Environmental Policy Act (NEPA), National Historic Preservation Act, and other applicable requirements including Title VI of the Civil Rights Act and Executive Orders on Environmental Justice and Limited-English Proficiency, agencies will review policies, procedures, and staffing to ensure that the public has a meaningful opportunity to participate in decision-making. Doing so will require agencies to account for the languages spoken within affected communities and any technological or other obstacles to participation. Agencies will consider identifying a chief public engagement officer, or otherwise dedicate specific staffing, and partnering with trusted local messengers to enhance the effectiveness and efficiency of public participation and conduct proactive outreach to diverse community members. Where possible, agencies should post information about project-related public meetings, public hearings, and public comment periods on the Permitting Dashboard or another public webpage and on other media platforms used by the affected community.

Improving Responsiveness, Technical Assistance, and Support. Agencies will identify, share, or develop resources, trainings, and tools to assist project sponsors, permit applicants, affected communities, Tribal communities, and other stakeholders to navigate the environmental review and permitting process effectively and efficiently and improve the Federal government's overall responsiveness, technical assistance, and support. Agencies will do so by engaging directly with State, Tribal, territorial, and local governments, and through national stakeholder entities (e.g., National Governors' Association, Council of Mayors, etc.). Key actions include:

- The Permitting Council will host sector-specific and regional meetings with Tribal Nations and non-Federal permitting stakeholders, including State, Tribal, territorial, and local governments to obtain their input on ways to improve coordination among all parties involved in permitting.
- The Permitting Council Executive Director and CERPOs will provide informational sessions with project sponsors and other interested stakeholders to provide an overview of and facilitate understanding of the Federal permitting processes.
- Agencies will review environmental review and permitting information collection requirements and make changes where reporting requirements can be consolidated, clarified, or simplified, and identify ways that information can be collected more efficiently.

Adequately Resourcing Agencies and Using the Environmental Review Process to Improve Environmental and Community Outcomes. Sufficient levels of skilled agency staff and effective use of budgetary resources are essential to completing timely, informative environmental reviews that are guided by the best available science and help deliver improved environmental and community outcomes. Consistent with these goals, agencies should prioritize available resources to address workforce needs and implementation of the initiatives in this Action Plan. This includes using existing

resources as efficiently as possible to achieve permitting objectives through strategies such as using programmatic approaches, working on single environmental documents, conducting collaborative field studies with other Federal agencies or partners, and coordinating with the expert teams on ways to efficiently and effectively address complex issues. This also includes assessing human capital needs and, as appropriate, utilizing best practices for accelerated hiring, such as using standardized job postings. Agencies with existing authority to fund liaison positions and other needs within other agencies should coordinate with agencies that need additional capacity given current resources.

Agencies should also make full use of available technology, data, and tools to efficiently and holistically assess environmental and community effects, including information on climate change effects and identify ways to make enhanced use of new technology to collect, analyze, share, and publicly communicate relevant information.

In addition, to help Federal agencies conduct and complete environmental reviews that are consistent across government and predictable to project proponents and stakeholders, CEQ will provide guidance on key elements of sound and effective environmental reviews. In addition, CEQ is taking the following actions:

- **Establishing clear and consistent standards for assessing climate change impacts of projects.** CEQ will update its guidance on consideration of GHG emissions and climate change under NEPA to ensure that agencies fully consider the climate effects of their decisions. Where consistent with applicable law, agencies will make investments and permitting decisions that will reduce GHG emissions and align with relevant climate change goals. Agencies should develop consistent agency specific guidance and identify tools and other assistance that they can provide to help project sponsors and stakeholders assess the climate change effects of projects.
- **Modernizing NEPA regulations.** The previous Administration weakened the regulations implementing NEPA, creating uncertainty and legal vulnerability for infrastructure projects. Consistent with the Biden-Harris Administration's priorities, including on science-based decision-making, climate, and environmental justice, CEQ has embarked on a two-phase rulemaking to ensure that this bedrock environmental statute supports complete environmental analysis and broad public participation and provides predictability for stakeholders.

Demonstrating Agency Accountability. Agencies with environmental review and permitting responsibilities should, within 90 days of the issuance of this Action Plan, complete initial plans for their key strategies for implementing this Action Plan, processes to ensure project timetables and schedules are developed and that environmental review and permitting is completed in a sound and timely manner consistent with this Action Plan and the law, processes to ensure effective community engagement and sound and effective permitting consistent with this Administration's environmental values, the key performance measures and data they will be tracking to monitor performance, and processes for addressing and elevating issues as appropriate. OMB, CEQ, CPO, the Permitting Council Executive Director, NEC and WHIIT will engage with each agency's CERPO and key officials on each agency's draft plans for these strategies, processes, and measures to ensure alignment and key gaps that need to be addressed. Within 30 days upon the issuance of OMB and CEQ's guidance, agencies will finalize their implementation plans.