

**Abandoned Uranium Mines Working Group**  
**Addressing Health and Safety Risks of Abandoned Uranium Mines**  
**Multiagency Strategic Plan**

December 3, 2020

*The abandoned uranium mines working group (AUMWG) is a consortium of federal agencies working together to address the human health, safety, and environmental challenges posed by the nation's approximate 4,225 abandoned mines resulting from legacy defense-related uranium mining. By marshalling and leveraging the resources of multiple federal agencies, the group works with states and Tribes to identify and address high-priority mines in an effective and coordinated manner.*

**Purpose**

This document is a collaborative effort between the U.S. Department of Energy (DOE), U.S. Department of Interior (DOI), Bureau of Land Management (BLM), Bureau of Indian Affairs (BIA), National Park Service (NPS), U.S. Department of Agriculture (USDA), U.S. Forest Service (FS), and the U.S. Environmental Protection Agency (EPA) to develop a comprehensive multiagency strategy to address the human health, safety, and environmental risks posed by defense-related abandoned uranium mines (AUMs).

This plan summarizes the scope of the problem, provides existing information on the costs for cleanup, describes the authorities and roles in addressing the human health, environmental and physical hazards associated with these mines, and presents a coordinated federal agency strategy to work together and along with state and Tribal partners to address AUMs. This document does not address other types of hard-rock mining sites.

**Problem Statement**

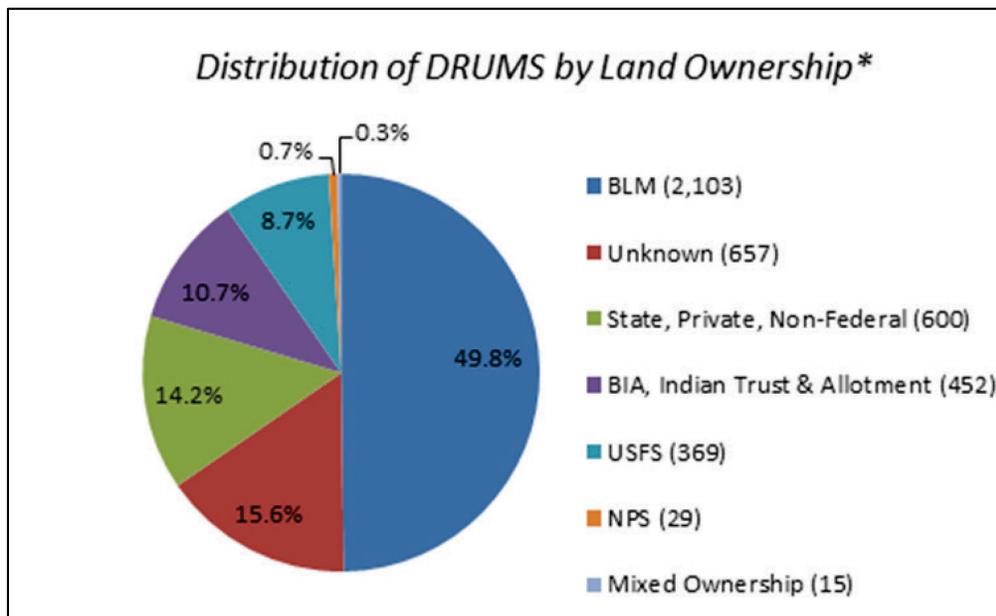
The August 2014 Defense-Related Uranium Mines (DRUM) Report to Congress prepared by DOE identified 4,225 mines from which the U.S. Atomic Energy Commission (AEC) purchased ore. Most of these mines are abandoned<sup>1</sup>. The DRUM report concluded there are numerous data gaps associated with abandoned uranium mines. Most importantly, the extent of human health, environmental and physical safety risks, knowledge of other public health and safety threats, and environmental degradation caused, or may have been caused, by the mines should be accurately answered.

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<sup>1</sup> An abandoned mine is one where development, mining, and other operations ceased with no evidence to demonstrate that the operator intended to resume mining. Some abandoned mines may have viable responsible parties; other abandoned mines are without viable responsible parties. For purposes of this effort, this latter group is referred to as "orphan sites."

The DRUM report cites that over 90% of these mines are in the five states of Arizona, Colorado, New Mexico, Utah, and Wyoming. Most of the sites (over 65%) are small and small/medium mines, each having produced 1,000 tons or less of ore. Nearly 60% of all the mines are on federal public land managed by BLM and FS. The BLM estimates that 50% of mines on public land will likely require site inspections to identify and evaluate threats to human health, safety, and the environment as well as to determine if response actions are warranted.

The DRUM report also concluded that 11% of DRUM are on Tribal land, the majority of these on the Navajo Reservation. The radiological risks are not evident at many AUMs. As a result, mine waste material had been used in construction of some homes, and in other cases, homes have been built directly on top of mine waste. To date, over 50 homes on the Navajo Reservation have been remediated or replaced due to radiologic contamination.



\*Data from DOE's *Defense-Related Uranium Mines Prioritization Topic Report* (June 2014); does not include mines that began operating after 1970.

The DRUM report also found that the majority of uranium mine production was from very large mines (those that produced over 500,000 tons of ore) in New Mexico, including mines on the Navajo Nation as well as Laguna Pueblo land. Of the 75.9 million tons of uranium ore produced for defense-related purposes, New Mexico mines led in production with over 52 million tons, exceeding the combined ore produced in Colorado, Utah, and Wyoming.

While many abandoned mines can pose physical hazards such as open shafts and pits, mines on private and Tribal land can pose a higher radiological exposure threat, since residents can build homes on or near abandoned mines without being aware of the risk. In these cases, the incremental lifetime cancer risk, as estimated by DOE and EPA, can be 1,000 times higher than

the maximum level of risk considered acceptable by EPA for site cleanups under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). In contrast, according to the DRUM report, chemical and radiological risks are typically lower where recreational risk scenarios are more typical, with estimated risks of 1 in 10,000. In some cases, mines on Tribal, private, and public land can also impact important ecological resources such as wetlands.

Some of the highest-risk mines occur on Tribal lands and other areas where poverty, linguistic isolation, limited educational attainment, and other factors contribute to increased vulnerability to pollution. Many of these areas can be easily identified using EPA's Environmental Justice screening tool, EJSCREEN, at <http://www2.epa.gov/ejscreen>. The government's response to the AUM problem within the Navajo Nation has received attention from several members of Congress, the Government Accountability Office (GAO), and national press outlets such as the *New York Times* and *Los Angeles Times*.

The EPA, DOE, DOI, and the USDA have used existing authorities and funding to address some of the worst problems. Although there is no comprehensive federal program, these agencies are using their authority to inventory, assess, cleanup and conduct long-term monitoring and maintenance of abandoned uranium mine sites.

### **Cleanup Costs**

The costs for mine assessment, reclamation, and remediation vary significantly. Although costs for individual mines cannot be estimated without site-specific data, the DRUM report estimated reclamation and remediation costs by production-size category of the mines. Reclamation typically involves mitigating the physical safety hazards by closing vertical shafts and horizontal adits and stabilizing as well as covering waste rock piles. Remediation often involves removing or stabilizing and covering waste rock piles and addressing surrounding soils that exceed cleanup levels. If the waste rock and soil material is removed, it is placed in an onsite or offsite repository. In the DRUM report, it was concluded that an unknown, but likely limited number of mines have impacted surface water or groundwater. Where this has occurred, it significantly increases cleanup costs. Remediation cost estimates generally include many activities that would be in reclamation actions; therefore, the costs for these two actions should not be added together.

The EPA estimates that it may cost approximately \$2 billion to \$5 billion for the reclamation and remediation of abandoned uranium mines based on the DRUM report cost estimates shown below. The costs for 37 "Very Large" mines in the U.S. were not addressed in the DRUM report, because costs vary widely. Several of these mines have begun some level of reclamation or remediation. Other costs associated with mine reclamation and remediation can be from long-term monitoring and maintenance costs, if needed. However, the large cost range for reclamation and remediation of all mines reflects the fact that preliminary inventory and assessment data (e.g., number of waste piles, levels of gamma and radon radiation) have not been collected for many sites.

## Reclamation and Remediation Costs for Defense-Related Mines<sup>2</sup>

Tons of Ore Produced	Mine Production Size Category	Range of Reclamation Costs	Range of Remediation Costs <sup>3</sup>
0–100	Small	\$10,000–\$70,000	\$10,000–\$80,000
100–1,000	Small/Medium	\$10,000–\$80,000	\$20,000–\$100,000
1,000–10,000	Medium	\$50,000–\$250,000	\$110,000–\$840,000
10,000–100,000	Medium/Large	\$270,000–\$730,000	\$2,500,000–\$6,500,000
100,000–500,000	Large	\$560,000–\$1,400,000	\$4,900,000–\$15,400,000
>500,000	Very Large	Not estimated	Not estimated

The GAO estimates that it would take EPA about 105 years to fund removal actions at 21 of the highest priority Navajo mines without Potentially Responsible Parties (PRPs) under CERCLA, if current funding levels continued (*Uranium Contamination Overall Scope, Time Frame and Cost Information is Needed for Contamination Cleanup on the Navajo Reservation*, GAO-14-323, May 2014).

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<sup>2</sup> Data from DOE’s *Defense-Related Uranium Mines Report to Congress* (August 2014).

<sup>3</sup> The “Range of Remediation Costs” does not include long-term water treatment costs and may be understated.

## **Federal Agency Authorities, Funding, and Roles**

Responsibility for inventory, assessment, investigation, and cleanup of mines varies depending on location, legal authority, funding source, implementing agency, and regulatory approach. Some potential approaches are outlined in the table below.

<b>Mine Location</b>	<b>Authority to Conduct Work</b>	<b>Funding Source</b>	<b>Lead Agency</b>	<b>Support Agency<sup>a,b</sup></b>
Federal land	CERCLA Federal Land Policy and Management Act National Forest Management Act Surface Resources Act	Appropriations to federal agency; PRPs and settlements	Land management agencies (BLM, FS, and NPS)	States DOE
Tribal land	CERCLA	Appropriation to EPA; PRPs and settlements	EPA	Tribes BIA, DOE
State and Private land	CERCLA	Appropriation to EPA; PRPs and settlements	EPA	States DOE

<sup>a</sup> “Support Agency” refers to agencies that, in addition to the Lead Agency, provide or receive resources.

<sup>b</sup> DOI, through the Surface Mining Control and Reclamation Act (SMCRA) of 1977, funds the states for their AML program, which is a source of funding to address physical safety hazards on Federal, state, and private land.

## **Strategy**

In FY 2015, following their collaboration with DOE to prepare the DRUM report, representatives from EPA, DOE, BLM, and FS formed this working group to develop a coordinated approach to the assessment and cleanup of abandoned uranium mines. The approach would use existing authorities and agreements to implement a multiyear program to inventory, assess, investigate, prioritize, and cleanup AUMs that pose a high risk to human health, safety, or the environment. It builds upon successful interagency models in the Grants Mining District of New Mexico and the Navajo Nation. Each agency will engage in Tribal consultation as appropriate. And, each agency may choose to seek an appropriation based upon its share of the AUMs.

The following is a brief description of agency roles in addressing mines within their jurisdiction. This one-government approach optimizes the benefit to the government by leveraging resources to expedite the reduction of risk to human health, safety, and the environment. In all instances, where a PRP can be found, agencies would follow the CERCLA process to require response actions by that party.

The EPA will continue efforts to execute enforceable agreements with PRPs for mine cleanup, implement the Tronox settlement, oversee trust settlements, and conduct fund-lead response actions such as replacement of contaminated homes, as well as assessments of high-priority mines located near homes. A major focus of EPA's efforts will continue to be on investigations and response actions in the San Mateo Basin of the Grants Mining District mines on or near the Navajo Nation, and collaboration with the DRUM program.

The DOE will continue to maintain the existing DRUM database and add information collected by all federal agencies so that the database continues to become complete and more accurate. This data will ultimately be transferred to the agencies. It will also assist BLM and FS, through existing agreements, in doing AUM site inventory and assessment on public land, as well as establishing agreements with EPA for state, Tribal and private land. This work will help to validate and add more information to the DRUM database, better determine the location of some mines (including ones whose land ownership was uncertain when the DRUM report was published) and provide information that BLM and FS will use to determine if a mine requires reclamation or remediation and what priority it should be given.

The DOE will substantially complete Campaign #1, inventorying mines on public land, in FY2022. With interagency collaboration, DOE will initiate Campaign #2, inventorying and assessing mines on Tribal land in FY2023. Within the following year, DOE will initiate Campaign #3, inventorying and assessing mines on private property. In FY2021, DOE will work with partner land management agencies on reclamation of physical safety hazards which represent an immediate threat to human health and safety.

The BLM will continue assessment and cleanup of DRUM sites. The rate of progress at those sites is constrained by available funding. The BLM currently leverages program funding, existing agreements, and available federal funding with states to continue its response actions on the mine sites it has already identified. Additional funding would specifically allow BLM to complete preliminary assessments and site inspections of AUM on public land. The BLM will continue to partner with DOE so that the resources of both agencies can be leveraged to collectively do DRUM inventory work on BLM-managed land.

The FS will continue assessment and cleanup of AUM sites commensurate with annual funding and other priority projects. Additional funding would permit the FS to conduct a complete AUM inventory and evaluate these sites for potential releases to the environment. The FS is partnering with EPA Regions, as well as states and DOE to leverage agency resources and collectively address AUMs located on FS-managed land.

As a trustee for Tribal mine sites, BIA will participate in community outreach efforts, ensuring that Tribes are informed and consulted both formally and informally. The BIA may monitor the ongoing work at Tribal sites and provide long-term monitoring of institutional controls and completed remedies applied to Tribal lands.

The National Park Service is investigating the nature and extent of contamination at the Orphan Mine Site, located on and below the South Rim in the Grand Canyon National Park, using its CERCLA authority. The NPS intends to identify a recommended cleanup action for the upper mine area in the near term and address the lower mine area in the future as they are generally inaccessible to park visitors.

Ultimately, the agencies propose taking a coordinated multiyear program to inventory, prioritize, assess, and clean up AUMs that pose a high risk to human health, safety, or the environment. The Strategic Plan will be reviewed by the participating agencies annually and revised as appropriate.

Nothing in this strategy is intended to supersede existing authorities or agency guidance or policies or impact the current process of identifying PRPs and initiating CERCLA removal actions.

## **Communication and Coordination**

### ***Internal***

The working group recognizes the need for general communication and coordination guidelines to maintain open and transparent lines of communication and ensure that the team functions and performs as effectively as possible. Outlined below are general guidelines that the group will follow:

- The AUMWG will serve as the umbrella organization for the communication of general AUM and DRUM issues.
- Positions of the AUMWG shall be the result of discussion and agreement among the AUMWG members and approval by appropriate management of the agencies involved.
- The AUMWG will uphold an environment of open and transparent dialogue.
  - ❖ Follow general meeting practices.
  - ❖ Bring any issues or opportunities early to the group for discussion.
- The AUMWG will, in general, be staffed by agency/department headquarters, regional, and field representatives who will be responsible for communicating and coordinating with their respective senior-level managers and regional or state-level counterparts.
- The AUMWG will hold quarterly conference calls to provide and discuss updates and course corrections, lessons learned, and best practices. Calls may be rescheduled or canceled as needed by the group.

- The AUMWG will convene annually (face-to-face or video teleconference) for purposes of planning, general coordination, and issue identification.
  - ❖ One goal of the annual meeting is for the agencies to share their respective priorities with each other and, to the extent possible, find opportunities to leverage interagency effort.
  - ❖ A second goal of the annual meeting is to identify joint priority projects and develop milestones, identify agency responsibilities, and seek management commitment for each joint project.
- The AUMWG will work electronically in a shared workspace (e.g., DOI's SharePoint).
- The AUMWG will invite industry, states and Tribes as appropriate.

### ***External***

Important to the success of the AUMWG is effective communication and coordination with external partners and stakeholders. These include states, Tribes, industry, Congress, OMB, and others. The AUMWG will prepare a communications strategy that will center on sharing the AUM approach to build awareness of the effort and its progress, collect additional input and ideas, and generate interest in participating in and advancing the AUM effort. The strategy will be reviewed and updated, as appropriate.