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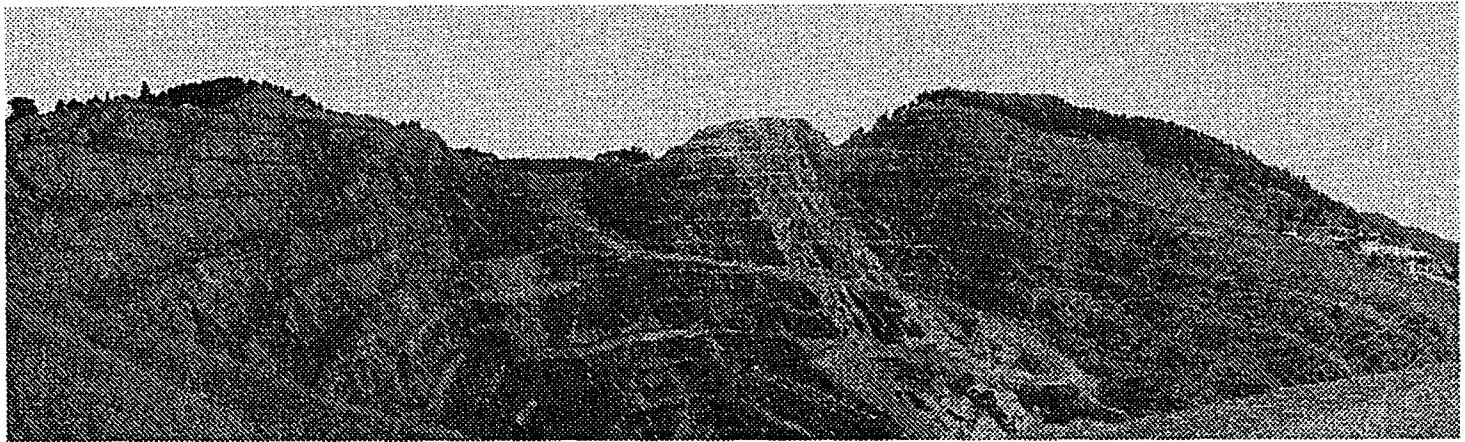
Catalyst for Improving the Environment

Evaluation Report

Nationwide Identification of Hardrock Mining Sites

Report No. 2004-P-00005

March 31, 2004



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Abbreviations

AMD	Acid Mine Drainage
AMLT	Abandoned Mine Lands Team
CERCLIS	Comprehensive Environmental Response, Compensation, and Liability Information System
EE/CA	Engineering Evaluation/Cost Analysis
EPA	Environmental Protection Agency
NMT	National Mining Team
NPL	National Priorities List
OECA	Office of Enforcement and Compliance Assurance
OIG	Office of Inspector General
OSWER	Office of Solid Waste and Emergency Response
PRP	Potentially Responsible Party
ROD	Record of Decision

Cover photo: Homestake Mine, Lead, South Dakota (Tina Lovingood, EPA OIG)



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

OFFICE OF
INSPECTOR GENERAL

March 31, 2004

MEMORANDUM

SUBJECT: Evaluation Report: Nationwide Identification of
Hardrock Mining Sites
Report No. 2004-P-00005

FROM: Carolyn Copper /s/
Director of Program Evaluation: Hazardous Waste Issues
Office of Program Evaluation

TO: Marianne Horinko
Assistant Administrator
Office of Solid Waste and Emergency Response

This is the final report on the subject evaluation conducted by the Office of Inspector General (OIG) of the U.S. Environmental Protection Agency (EPA). This report contains information on EPA's inventory of 156 hardrock mining sites.

This report contains findings and recommendations that describe problems the Office of Inspector General (OIG) has identified and the corrective actions the OIG recommends. This report represents the opinion of the OIG and the findings contained in this report do not necessarily represent the final EPA position, and are not binding upon EPA in any enforcement proceeding brought by EPA or the Department of Justice. Final determinations on matters in this report will be made by EPA managers in accordance with established audit resolution procedures.

On February 5, 2004, the OIG issued a draft report to EPA for review and comment. We received the Agency's response to the draft report on March 8, 2004. The Agency did not identify any factual errors in the report and generally agreed with the report's recommendations.

EPA conveyed their appreciation for the significant effort the OIG staff put into gathering information, developing findings, and providing recommendations. The Agency also believed that the recommendations, if implemented, would enhance the effectiveness of Agency decision-making at hardrock mining sites.

The Agency provided a number of comments on various aspects of our report and on planned actions in response to the report's recommendations. We provide a summary and general evaluation of these comments in the Executive Summary. We include the full text of EPA's comments in Appendix D.

Action Required

In accordance with EPA Manual 2750, you are required to provide this office with a written response within 90 days of the final report date. The response should address all recommendations. For corrective actions planned but not completed by the response date, please describe the actions that are on-going and provide a timetable for completion. Reference to specific milestones for these actions will assist in deciding whether to close this report in our assignment tracking system.

We have no objection to the further release of this report to the public. For your convenience, this report will be available at <http://www.epa.gov/oig>. Should you or your staff have any questions, please contact me at 202-566-0829, or Tina Lovingood, Project Manager, at 202-566-2906.

Attachment

Executive Summary

Purpose

This review, focusing on hardrock mining, is part of an Office of Inspector General (OIG) evaluation of Superfund mega-sites (sites that may cost \$50 million or more to clean up).

Hardrock mining, which is not coal mining, involves the extraction of certain metals and minerals found in hard formations of the earth. They include, among others, copper, gold, iron ore, lead, and silver. Hardrock mining can cause significant impacts on the environment, potentially affecting ground and surface waters, aquatic life, vegetation, soils, air, wildlife, and human health. The Environmental Protection Agency (EPA) has reported that the metal mining industry was the largest toxic polluter in 2000, releasing 3.4 billion pounds of toxics, or 47 percent of the total released by U.S. industry. Although EPA can inherit the responsibility for cleaning up hardrock mining sites, the Agency is just one of several with a role in regulating and cleaning up the environmental impacts of hardrock mining.

Our overall evaluation question was: "Is there a financial impact from hardrock mining sites on the Superfund Trust fund and on States?" This report involved developing an inventory of hardrock mining sites, and providing information on current sites as well as those that may need to be addressed by Superfund in the future. Regional officials provided us with an inventory for all non-coal mines, mills, and primary smelters that had cost or have the potential to cost the Superfund Trust fund \$1 million or more. This report provides information on estimated cleanup costs, human health and environmental risks, cleanup responsibilities, and cleanup time estimates.

Results

We identified 156 hardrock mining sites nationwide that have the potential to cost between \$7 billion and \$24 billion total to clean up (at a maximum total cost to EPA of approximately \$15 billion). These costs are over 12 times EPA's total annual Superfund budget of about \$1.2 billion for the last 5 years. This suggests potential difficulties for the Superfund program, although, based on how EPA may apply listing and/or funding criteria, these costs may not all fall to EPA. Following are some observations:

- There is some uncertainty regarding the current human health and environmental risks associated with sites in the inventory. Over a third (42 percent) of the mining sites that are in EPA's Comprehensive Environmental Response, Compensation, and Liability Information System (CERCLIS), but are not on the National Priorities List (NPL) have unknown human health risks at this time. Ten percent of the mining sites on the NPL have current unknown human health risks. On the other hand, 42 percent

of NPL sites and 30 percent of the CERCLIS/Non-NPL sites have current high or medium human health risks. Similarly, one half (50 percent) of the NPL mining sites have current high or medium environmental risks while nearly two thirds (64 percent) of the CERCLIS/Non-NPL mining sites have current high or medium environmental risks.

- Although at least one potentially responsible party (PRP) has been identified at 83 percent of the hardrock mining sites, uncertainties about the complete nature of these parties' liabilities and their ability to pay for cleanup actions over the extreme long-term counteract this positive news. For example, about 70 percent of current NPL sites have a clearly viable potentially responsible party. However, our data also show that the majority (59 percent) of all the projected sites will need 40 years to "in perpetuity" for cleanup, and we question the ability of businesses to sustain efforts for such lengths of time.
- For long-term response actions that are financed by Superfund, EPA performs these long-term response actions at cleanup facilities for up to 10 years, with the State paying 10 percent of the cost, after which responsibility is turned over to the State. Therefore, potentially responsible party viability and long-term cost issues will have financial impacts on States.
- The management and financial challenges from current and potential future hardrock mining sites are not proportionately distributed throughout the country. More than 70 percent of all sites are located in four EPA Regions – 4, 8, 9, and 10. Also, the western regions (8, 9, 10) and Region 7 have the largest number of sites with high or medium risks to human health, and the western regions contain 75 percent of the sites with acid mine drainage. Region 4's hardrock mining sites account for about half of the nationwide total projected maximum cleanup costs.

Recommendations

Our research indicates some key areas of concern that need to be addressed to enhance the effectiveness of Agency decision-making and planning, concerning the ability of the Superfund program to manage potential challenges from hardrock mining financial concerns. These issues include potentially responsible parties' long-term viability, efficiency and effectiveness of existing remedies and alternative remedies, and location of sites. An appropriate understanding of these issues will raise the Agency's capacity to plan for financial impacts to the Superfund program and develop useful strategies. Therefore, we recommend that EPA's Assistant Administrator for the Office of Solid Waste and Emergency Response take action to have a report produced that looks at the long-term sustainability and liability of businesses involved in hardrock mining operations, the type of remediation technologies currently available, and promising new technologies. We also recommended continuing support for improving EPA's National

Hardrock Mining Framework, and the prioritizing of efforts based on human health and environmental risks and workload per region.

Agency Comments and OIG Evaluation

The Agency agreed with our recommendations and indicated that if they were implemented it would enhance the effectiveness of Agency decision-making at hardrock mining sites. The Agency proposed several actions in response to our recommendations.

Although the Agency accepted our recommendations they had significant concerns regarding the interpretation and analysis of information contained in the report on the risk levels at hardrock mining sites and the cost estimates for cleaning up the sites. The Agency noted that, over the last 20 years, they have placed mine sites on the NPL because they presented significant risks to human health and the environment. Because a variety of remedial and removal actions may have occurred at these sites, the Agency requested that the report explain that many of the sites have low current risk due to Agency or potentially responsible party actions. The Agency also said that our report should reflect the fact that some of the sites have not yet undergone full risk characterization, the risk assessments are subjective judgments made by regional field personnel, and the risk assessments do not consider future risks that may sometimes be greater than current risks based on land use decisions.

Regarding cost estimates, the Agency said that our report should state that many of these sites will never rise to the attention of the Superfund program, but that those that are high risk, where there is no viable potentially responsible party, or States are not willing to address these sites, will. The Agency expressed concern that we report the maximum end of cleanup cost ranges, not the minimum, which could substantially change the cost estimate. In addition, the Agency requested that we report different types of cost estimates based on the reliability of costing data. As an example, the Agency said we should report the cost estimates for those sites where EPA or the State has calculated a site-specific cleanup cost. Finally, the Agency said that our report should note the fact that, until the Agency determines whether a viable potentially responsible party exists or States are willing to take the lead on a site, the extent of Superfund lead expenditures cannot be determined.

The actions the Agency has proposed to address our recommendations are generally acceptable as long as the Agency produces tangible evidence, for OIG review, in lieu of the report we recommended, to substantiate completion of their actions. The Agency needs to provide milestones for the completion of these actions. With regard to the Agency's concerns on the risk assessment and cost estimates that EPA staff provided to us, despite criticisms of the data, the Agency has not provided us with an alternative database, or inventory, with different, or more reliable data. Therefore, within the limitations we state in our report, we believe the data we report is the best available. We worked diligently and transparently with the Agency to obtain their input on the best way

to collect information on the locations, risks, and potential costs associated with hardrock mining activities. We learned early in our work that EPA does not have a consistently used method for calculating cost estimates for hardrock mining sites, nor one that has been demonstrated to be more or less reliable than another. Because of this problem, we report cost estimates in ranges. We present most of our data in terms of maximum projected costs to avoid minimizing the potential liability associated with these hardrock mining sites, as cleanup costs can often be underestimated. Underestimation of cleanup costs can occur when inflation is not considered, when acid mine drainage is inaccurately predicted, or when cleanup is delayed. One study suggests that the discovery of inaccurately predicted acid mine drainage can increase site cleanup estimates by up to 1000 percent or more. Costs to the Federal government may also increase when a PRP defaults. For example, Asarco, which was the potentially responsible party for several sites in the inventory, settled with the Federal government for \$100 million. Based on the cleanup estimate for only one site owned by Asarco in the hardrock mining inventory (\$457.1 million), \$100 million is a considerable underestimate of costs.

We also acknowledge that the Agency may not necessarily inherit all of this liability due to the application of listing criteria, and, where possible, we report costs for those operable units (sites in the hardrock mining inventory generally contained multiple operable units) that have achieved a Record of Decision. Concerning risk information, our draft report clearly stated that our survey asked about current risk and that remedial or removal actions could have occurred in the past, resulting in current risk ratings that are low.

We have made changes to the report as appropriate. The Agency's complete comments are in Appendix D and our responses to specific points are in each Chapter, as appropriate.

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Chapter 1

Introduction

Purpose

This review is part of the Office of Inspector General's (OIG's) evaluation of Superfund mega-sites. The Environmental Protection Agency's (EPA's) Office of Solid Waste and Emergency Response (OSWER) suggested that we examine the issue of mega-sites (sites with actual or expected total removal and remedial action costs of \$50 million or more¹) due to potentially significant cost implications for the Superfund Trust fund. This review focuses on hardrock mining sites because these sites are costly and complex. Resources for the Future recently reported that "the average cost to clean up a non-mega mining site on the National Priorities List (NPL) is about \$22 million, more than double the average for most other non-mega site types, such as chemical manufacturing and recycling sites."

Our overall evaluation question was: "Is there a financial impact from hardrock mining sites on the Trust fund and on States?" To address this question, we needed to obtain a nationwide inventory of hardrock mining sites. This report provides information on the inventory of 156 hardrock mining sites that were identified by EPA officials: a profile of selected site data, human health risk information, ecological/environmental risk information, and cost information. This report provides information on potential financial impact to the Trust fund from hardrock mining sites. Due to the complexity and uncertainties in some of the information provided to us, we were unable to quantify the financial impact on States. However, the report data provides indicators of the potential financial impact on States.

Our report recognizes EPA's current policy is to fund projects based on health risks, contaminant toxicity, contaminant mobility, environmental or ecological risks, or other program considerations, such as the likelihood that a potentially responsible party (PRP) will reimburse EPA, the likelihood that other cleanup programs or States could manage the cleanup, the site specific timing scheme for completing cleanup, and potential land reuse opportunities. It also recognizes that EPA lists sites on the NPL based on human health exposure and then considers other factors, such as: the need for a strong enforcement for uncooperative potentially responsible parties; the level of State, tribal, community, and congressional delegation support; estimated cleanup costs; the timing of the costs and cleanup; environmental justice issues; prospects for commercial redevelopment; and geographic balance. Where the data we collected provide insight on these issues, we present information to assist management in implementing this policy and we make recommendations to strengthen EPA's decision-making ability.

Organization of the Report

Chapter 2 provides a profile of selected inventory data, including information on regional distribution of sites, presence of acid mine drainage, NPL status, and operational status, among others. Chapters 3 and 4, respectively, provide information on human health and environmental/ecological risks. Chapter 5 presents information on projected cleanup costs of hardrock mining sites across the country.

In order to provide proper context, we generally present our information based on whether sites identified in this inventory are currently (1) on the NPL, thus having the ability to have long-term cleanup paid for by the Superfund program (i.e., NPL sites); (2) not yet listed on the NPL for various reasons, but being tracked by the Superfund program in the Comprehensive Environmental Response, Compensation, and Liability Information System (CERCLIS) (i.e., CERCLIS/Non-NPL sites); or (3) not yet included in CERCLIS or on the NPL, but identified by EPA staff as potential sites that may need attention (i.e., Potential sites).

Background

Environmental Consequences of Hardrock Mining

In its 1999 report, "Hardrock Mining on Federal Lands," the National Research Council of the National Academy of Sciences (a non-profit research organization that, under Congressional mandate, advises the Federal government on scientific and technical matters) noted that hardrock mining can cause significant impacts on the environment, potentially affecting ground and surface waters, aquatic life, vegetation, soils, air, and wildlife. Mining sites are typically large, complex, and costly to clean up. At least 19 of the NPL sites in this hardrock mining inventory have estimated cleanup costs \$50 million or more. An example of a mining site is pictured in Figure 1.1.



Figure 1.1

Source: Photo from report: Mineral Policy Center Issue Paper No. 4, *Putting a Price on Pollution - Financial Assurance for Mine Reclamation and Closure*, Jim Kuipers, March 2003.

Hardrock mining is not coal mining. Hardrock mining involves the extraction and beneficiation (separation of minerals/metals from waste) of certain metals and minerals found in hard formations of the earth. These metals and minerals serve as the primary raw materials for most of the industrial, commercial, and consumer equipment and structures produced by the U.S. economy. The removal and beneficiation result in large quantities of waste (e.g., waste rock, tailings, mine water). The total amount of waste produced can range from 10 percent (potash) to 99.99 percent (gold). Open mine pits, tailings ponds, ore stockpiles, and waste rock dumps can all be significant sources of toxic pollutants, primarily heavy metals such as cadmium and lead. EPA's *Toxic Release Inventory 2000* report indicates that the metal mining industry was the largest toxic polluter in 2000, releasing 3.4 billion pounds of toxics, or 47 percent of the total released by U.S. industry. While there is no current consensus, or conventional method for defining or identifying mine sites, EPA estimates there may as many as 200,000 abandoned hardrock mines in this country, although these may not all fall within EPA's responsibility.

The U.S. Forest Service estimates that approximately 10,000 miles of rivers and streams may have been contaminated by acid mine drainage. Acid mine drainage can occur when iron sulfides in rock are exposed to water and oxygen. The process of mining brings sulfide-bearing rock to the earth's surface, fractures it, and exposes substantial amounts to weathering. The minerals gradually oxidize to form dilute sulfuric acid and ferric hydroxide, resulting in acid mine drainage. When acid drainage occurs, it is extremely difficult to control. According to the National Research Council, "improved methods for prediction, prevention, and long-term treatment are needed to minimize the expenses related to acid drainage and to enhance the long-term protection of the environment."² Resources for the Future noted that it would be difficult, if not impossible, to achieve water quality standards at some sites due to acid drainage and leaching of mine wastes.³ An example of acid mine drainage is pictured in Figure 1.2.

² *Hardrock Mining on Federal Lands*, National Research Council, 1999.

³ *Superfund's Future: What Will It Cost?*, Katherine N. Probst and David M. Konisky, Resources for the Future, 2001.

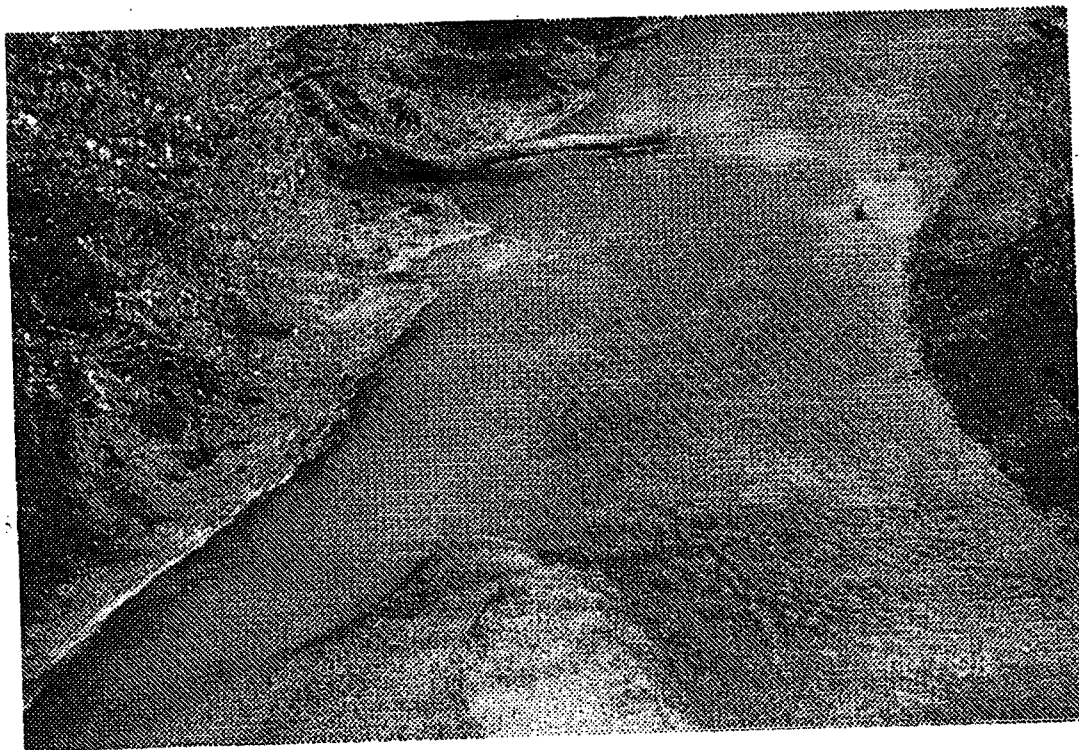


Figure 1.2

Source: National Association of Abandoned Mine Land Programs

According to EPA, in recent years, environmental practices employed by the mining industry have improved considerably and reduced the environmental impacts from mining projects. Bureau of Land Management data indicate the number of plans and notices of operations for new mining activities has fallen approximately 50 percent since 1992. Some improvements made in mining operations include best practices for control of storm water runoff, better treatment of wastewater, better management of tailings and waste rock, and more efficient metal recovery technologies.

Laws and Agencies Involved in Hardrock Mining

A complex set of Federal and State environmental laws and regulations apply to hardrock mining activities. The type and size of mining operations; kinds of land, water, and biological resources affected; organization of State and local permitting agencies; and the manner in which Federal and State agencies implement appropriate laws and regulations determine the degree and effectiveness of regulation. A significant amount of hardrock mining occurs on Federal lands in the Western States.

Cleanup of mine sites located on Federally-owned lands is the responsibility of the Federal agency having jurisdiction over the land, unless those lands become patented and thus private, at which point the States and/or EPA take over cleanup responsibility. The Federal Land Policy and Management Act of 1976 for the Bureau of Land Management and the 1897 Organic Act and 1976 National Forest Management Act for the U.S. Forest Service provide direction for Federal land management. The General Mining Law of 1872 is the primary statute regarding hardrock mining on Federal lands. This 131-year-old law permits "the exclusive right of possession and enjoyment" to any person who finds minerals on public lands, but does not contain any environmental protection provisions or guidance on cleanup programs for abandoned mines. The potential for considerable environmental damage due to the law has led some Federal and State land managers, as well as EPA, to agree that the Mining Law of 1872 is outdated and should be revised. See Appendix A for more details on the General Mining Law.

In September 1997, EPA's Office of Water issued a National Hardrock Mining Framework (the Framework) to provide a multimedia, multi-statute approach for handling environmental issues posed by proposed, active, and abandoned hardrock mining sites. The overall goals of the Framework were to achieve improved environmental protection, use resources more efficiently, and promote fiscal responsibility. The Framework called for regions with mining concerns to develop mining strategies to help them deal with the problems that mining sites pose.

Scope and Methodology

We conducted our evaluation from March 2002 to June 2003, and we formally briefed Agency officials on our preliminary results in September 2003. We defined the sites to be included in the inventory as all non-coal mines, mills, and primary smelters that had cost or have the potential to cost the Superfund Trust fund \$1 million or more.

To collect site-specific information, we developed a survey instrument that we sent to EPA site managers in all 10 EPA regions (see Appendix B). The survey contains questions to collect information on general site characteristics, the Superfund status of the site, cost information for the site, media affected at the site, and information on PRPs' existence and viability (ability to pay for cleanup.)

In developing the survey, we met with EPA headquarters officials from the OSWER and Office of Enforcement and Compliance Assurance (OECA). We also consulted with members of EPA's National Mining Team (NMT) and EPA's Abandoned Mines Land Team (AMLT) asking for input and suggestions. In addition, we field tested the survey instrument with headquarters and regional EPA officials.

To verify the information entered into the survey instrument, we performed several activities. First, we conducted on-site data verification for selected sites in Regions 7 and 8. We focused our data verification on cost data, human health and environmental/ecological risk data, and information on the status of cleanup. Verification for the purposes of this evaluation meant that we asked regional officials to verify their survey information to make sure that it was accurate and complete. It also involved requesting explanations of data entered into source documents.

Specifically, we also asked regional officials:

- ☐ to identify guidance documents used to develop the cost estimates in the survey responses.
- ☐ for the documentation that supported the cost estimates, and where none was available, we asked for regional officials to explain the logic they used to develop the cost estimates.
- ☐ for supporting documentation for the rating decision for current human health and ecological/environmental risks.
- ☐ to answer a series of structured interview questions and checklists relating to their survey responses in order to verify support for the information contained in their survey responses. For our visit to Region 8, we refined this set of supporting interview questions and checklists to again gain additional support for the information in survey responses.
- ☐ to review their submitted survey responses and to verify the accuracy of, or correct, the information they provided for sites in their region.

For the remaining eight regions we requested similar information electronically.

We reviewed prior reports, including the 1997 OIG report on minimizing hardrock mining liabilities; the 2003 report on obstacles impeding the achievement of results from the Agency's hardrock mining Framework; and reports issued by the National Research Council, Resources for the Future, the Center for Science in Public Participation, the Mineral Policy Center, and the Western Governor's Association. We also obtained and reviewed information from the National Mining Association.

We performed our evaluation in accordance with applicable *Government Auditing Standards*, issued by the Comptroller General of the United States. Additional information on scope and methodology is in Appendix C.

Explanatory Notes

Concurrent to our evaluation, EPA formed an AMLT whose goal is to identify abandoned mine lands and find alternatives to their listing on the NPL or find alternative sources of funding. In December 2002, this team identified 88 EPA NPL abandoned hardrock mine sites. EPA has estimated that it will cost a total of about \$2 billion to clean up these 88 sites.⁴ As of September 2003, 70 of the 88 sites are currently listed on the NPL. (The others were deproposed, deleted, or proposed). The number of EPA NPL sites identified in our universe differs from the number of sites the AMLT identified. Specifically, 16 sites in the AMLT universe did not meet the OIG definition and are not included in our data. Reasons for this include the fact that some of these 16 sites were mine waste dumps or secondary smelters, and cleanup costs did not exceed actual or potential costs to EPA totaling \$1 million or more. In addition, our work identified mine sites that were active, inactive, and abandoned.

Limitations

- ☐ ***The inventory may be understated.*** It does not include coal sites by definition, and it does not include all Federal sites, sites that States may not have shared with EPA, sites where it is too early in the process to identify them as meeting our definition, and hardrock landfill or dump sites. It may also be understated based on the regional officials' interpretation of our definition of sites to be included in the database.
- ☐ ***We did not collect or project yearly cost estimates.*** We asked survey respondents to provide cost information including: past costs, total maximum projected cleanup costs, and capital costs, including the portion of projected Federal costs. Since EPA officials indicated it was difficult to pinpoint specific cleanup cost estimates, when we asked for cleanup cost information, we asked for it in ranges, from a "minimum" amount to a "maximum" amount.
- ☐ ***Past costs may or may not be included in total projected cleanup costs.*** We defined "total maximum projected cleanup costs" as those costs *to be paid* by PRPs, EPA, Federal agencies, and other parties. Depending on whether a site manager interpreted costs *to be paid* as those costs *in total* or *in the future*, past costs may or may not be included in total projected cleanup costs. Past costs are costs incurred before a settlement is reached with the potentially responsible parties, or when a settlement is not reached and EPA initiates a cost recovery action associated with cleanup costs paid.
- ☐ ***Risk judgments reflect current conditions.*** We asked respondents to provide information on *current* human health and ecological/environmental risks. At

⁴

This does not include sites on the Bureau of Land Management land. The Bureau estimates it may cost as much as \$35 billion to clean up contaminated hardrock mine sites on Bureau lands.

many of these sites, the States or EPA have not conducted detailed risk assessments. At NPL sites, it is possible that response actions or remediation has occurred thus, lowering the human health and ecological/environmental risk since the listing of the sites on the NPL. Further, current risks do not reflect future risks, which could be substantially higher because portions of these sites may be developed and this development could significantly increase risks posed at these sites.

- ☐ ***PRP viability is the survey respondents' judgment.*** We asked survey respondents to indicate each PRP's viability (ability to pay for cleanup) in one of the following categories: clearly viable, potentially viable, bankrupt or filed for bankruptcy, or PRP viability is suspect or largely unknown. Survey respondents may not be experts in finance or have the knowledge of a PRP's aggregate liability and therefore there may be some uncertainty in their judgments of viability. Site managers may have responded that no PRP existed because no PRP search had been completed.

Chapter 2

Profile of Selected Site Characteristics

In this chapter, we present information regarding the profile of selected site characteristics in the mining sites inventory. The purpose of this chapter is to show site characteristics, such as the regional location of the sites, the operating status of mining sites, the presence of acid mine drainage at mining sites, NPL status, the contaminants of concern, and projections for how long operation and maintenance will take.

What is the Inventory of Mining Sites?

The inventory is comprised of 156 sites: 63 NPL sites, 82 CERCLIS Non-NPL⁵ sites, and 11 Potential (Non-CERCLIS/Non-NPL) sites. Approximately 60 percent of the mining sites in the inventory are Non-NPL sites.

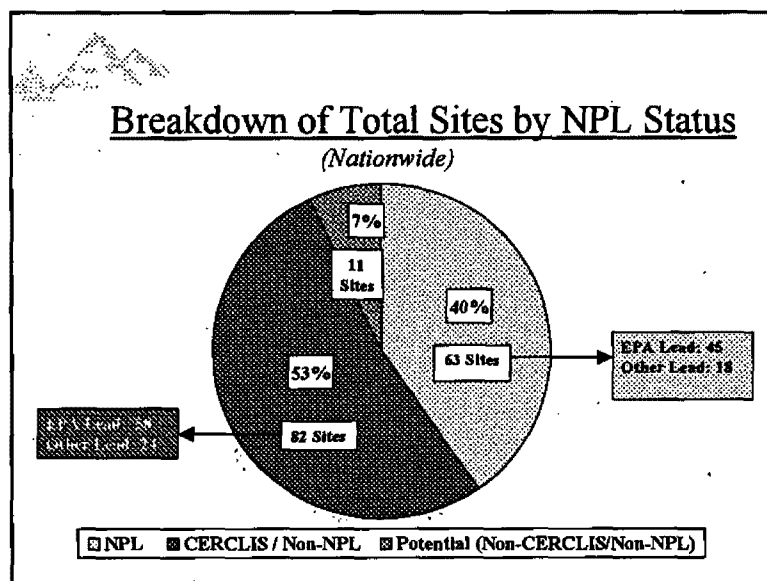


Figure 2.1

Source: *OIG Analysis of Inventory Data*

One-hundred and six (68 percent) of 156 sites in the inventory are, or are projected to be, EPA-lead. However, these may not all become final NPL sites or sites that the Superfund program addresses.

⁵

Inclusion in CERCLIS currently means that the site may be hazardous enough to merit Federal action or be included on the NPL.

There are hardrock mining sites in every EPA region. However, a majority of the sites are concentrated in 5 of EPA's 10 regions. The western regions (Regions 8, 9, and 10) and Regions 4 and 7 have the largest number of sites in the inventory.

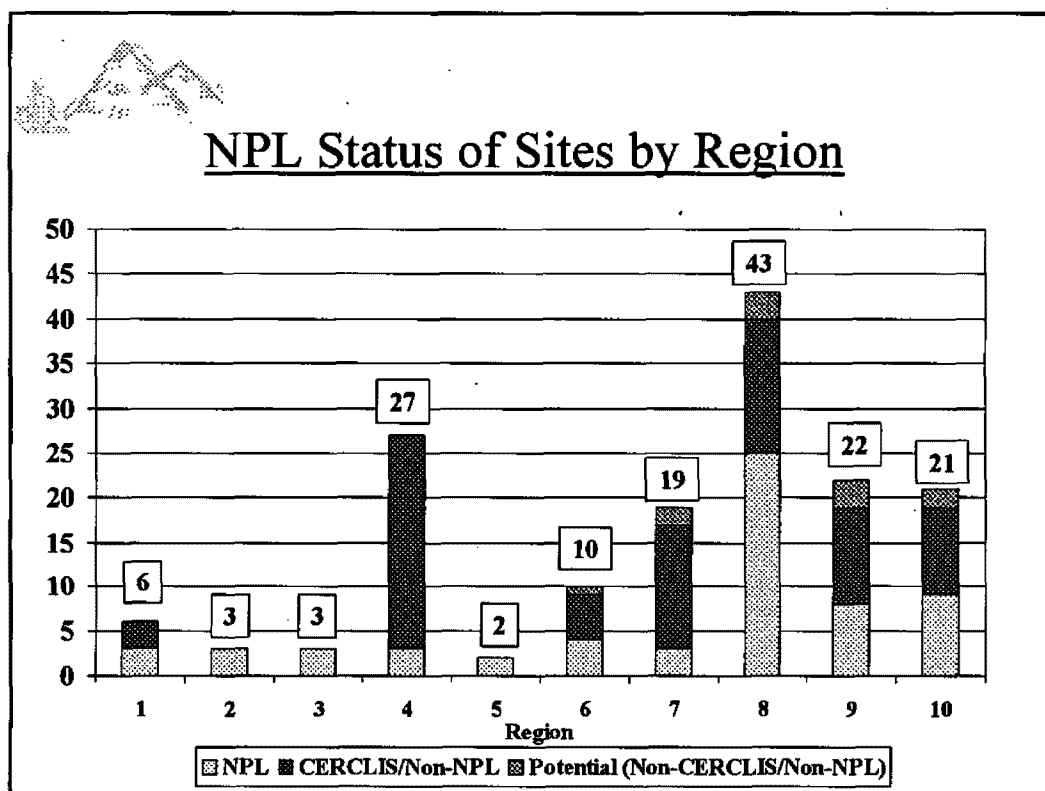


Figure 2.2
Source: OIG Analysis of Inventory Data

Three of the top five regions with the largest number of sites in the inventory (Regions 8, 9, and 10) have developed mining strategies pursuant to the Agency's Hardrock Mining Framework.

What Are Some of the Characteristics of Sites in the Inventory?

Operating status of the sites in the inventory can provide some indication of the ability to locate a PRP - an individual, business, or other organization that is potentially liable for cleaning up a site. Because most of the sites in the inventory are abandoned, this suggests complications locating PRPs and potential increased liability for EPA.

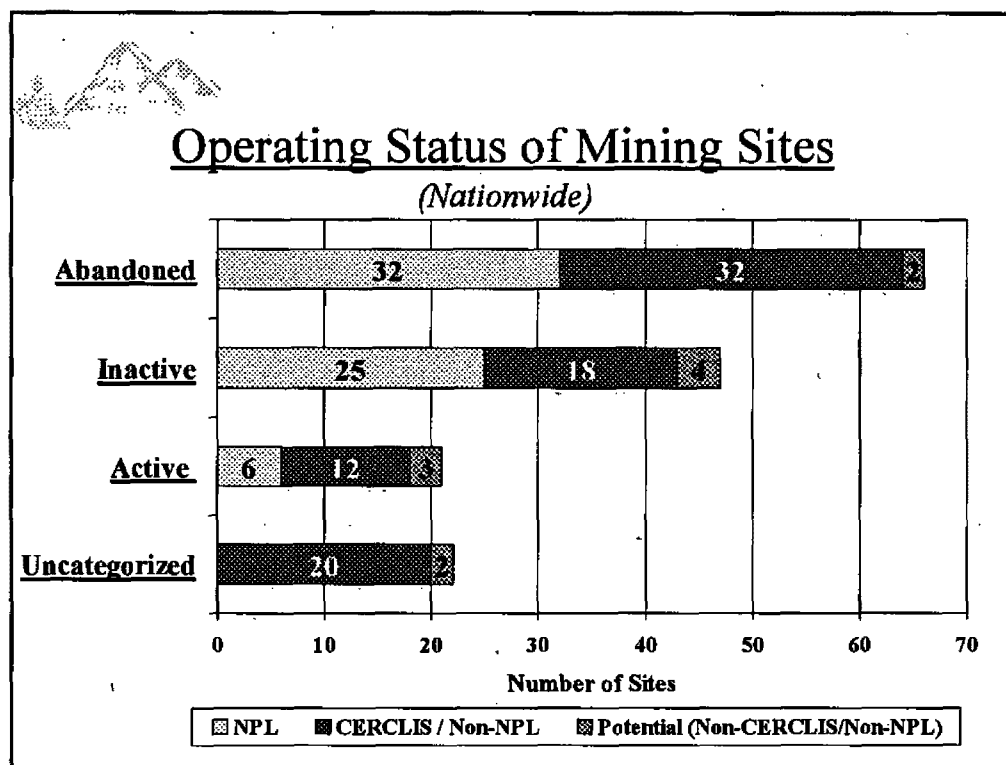


Figure 2.3
Source: OIG Analysis of Inventory Data

Acid mine drainage (AMD) was identified at 45 of the 156 sites in the inventory. The National Wildlife Federation believes that sites where AMD is present should be carefully monitored as "the presence of acid mine drainage is either underestimated or ignored until it becomes evident, at which time the costs often exceed the operator's (sic) financial resources, leading to bankruptcy or abandonment of the site in many cases."

AMD appears to be concentrated in Regions 8, 9, and 10. The following is a list, in descending order, of the total number of sites, by region, with AMD.

Region 8 --- 14 sites	Region 6 --- 4 sites
Region 9 --- 11 sites	Region 4 --- 2 sites
Region 10 --- 9 sites	Region 7 --- 1 sites
Region 1 --- 4 sites	

According to regional officials, the sites in the inventory in Regions 2, 3, and 5, had no AMD.

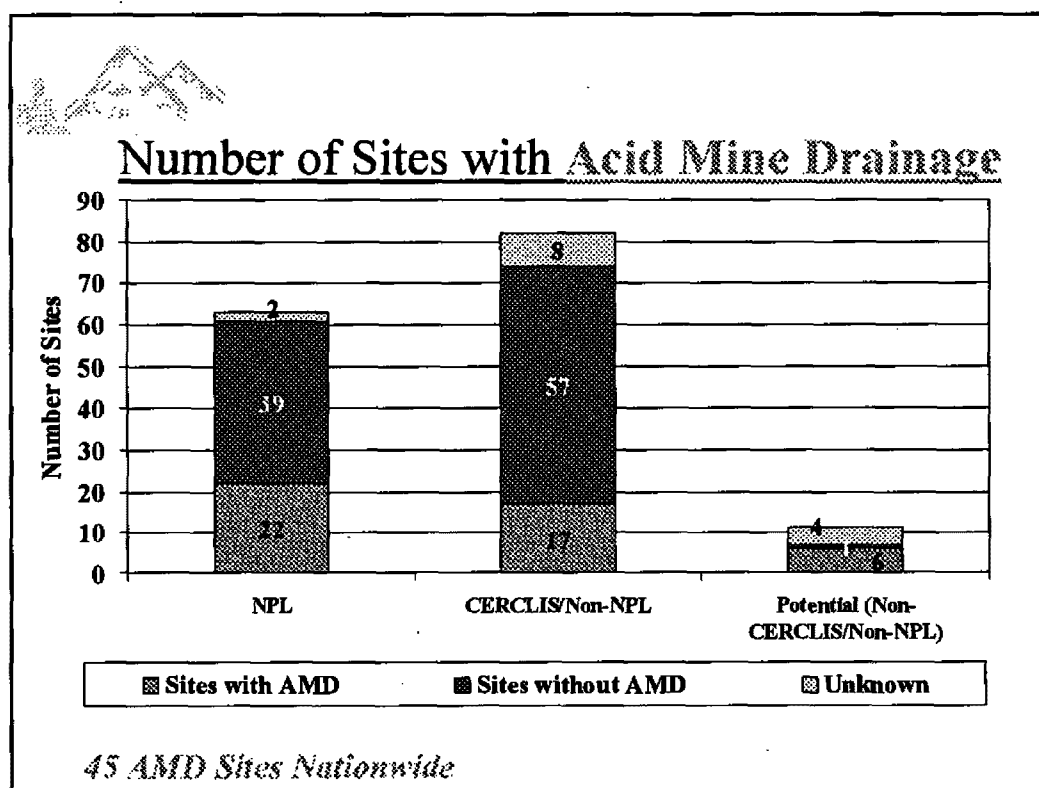


Figure 2.4
Source: *OIG Analysis of Inventory Data*

Lead, arsenic, zinc, and cadmium were the most common contaminants, and were found at between approximately 50 and 80 of the sites in the inventory.

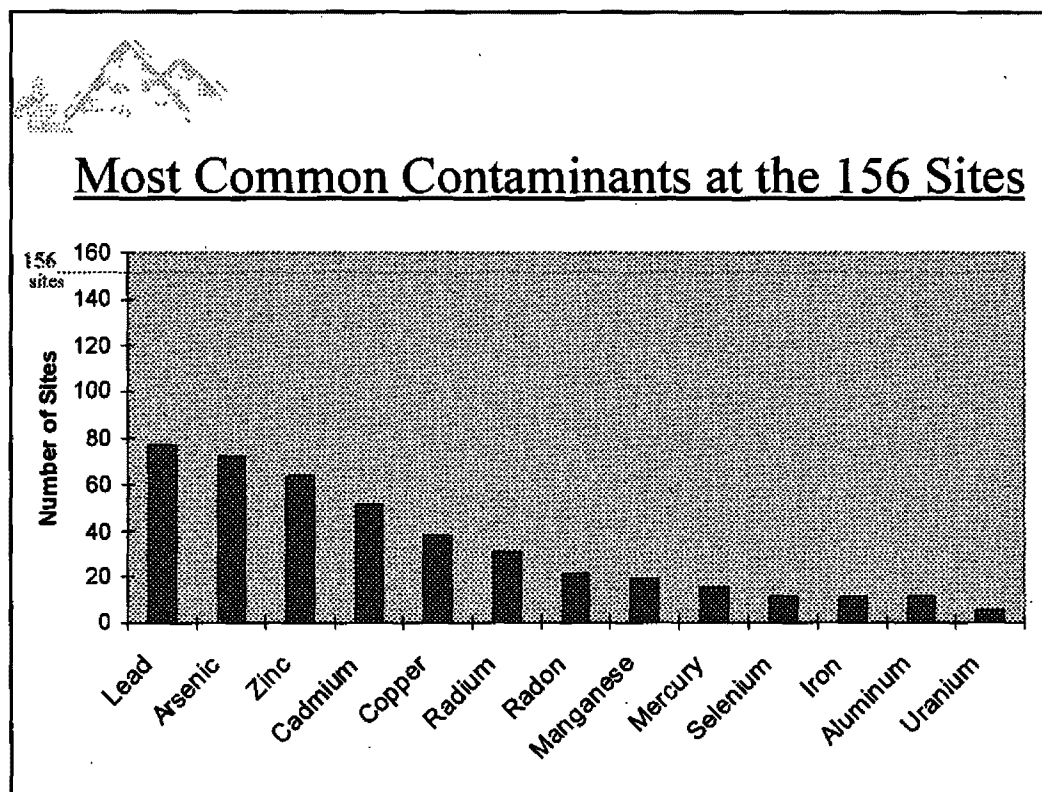


Figure 2.5
Source: OIG Analysis of Inventory Data

Lead, arsenic, zinc, and cadmium cause various health effects. The effects of lead are the same regardless of the exposure pathway. The main target for lead toxicity is the nervous system. Lead exposure may also cause anemia (low numbers of blood cells). At high levels of exposure, lead can severely damage the brain and kidneys in adults or children. Children are at greater risk to lead (than adults), and some of the developmental effects are subtle, yet real (e.g., depressed IQ). In pregnant women, high levels of exposure to lead may cause miscarriage. High-level exposure in men can cause reproductive problems.

Depending on exposure, inorganic arsenic can lead to a sore throat, irritated lungs, and circulatory and peripheral nervous disorders, and can increase the risk of lung cancer.

Inhaling large amounts of zinc (as zinc dust or fumes from smelting or welding) can cause a specific short-term disease called metal fume fever. However, very little is known about the long-term effects of breathing zinc dust or fumes.

The International Agency for Research on Cancer has determined that cadmium is carcinogenic to humans, while EPA has determined that cadmium is a probable human carcinogen by inhalation. For example, breathing air with very high levels of cadmium can severely damage the lungs and may cause death. Breathing air with lower levels of cadmium over long periods of time results in a build-up of cadmium in the kidney and, if sufficiently high, may result in kidney disease.

Agency officials recommended the following websites for information on the toxic effects of these contaminants.

- EPA's Integrated Risk Information
(IRIS, website: <http://www.epa.gov/iriswebp/iris/>)
- Agency for Toxic Substances and Disease Registry Toxicological Profiles
(website: <http://www.atsdr.cdc.gov/toxpro2.html>)

At How Many Sites Have PRPs Been Identified, and What Is Their Viability?

The number and viability (ability to pay) of PRPs at each site provides insight about the parties that may be available to pay for cleanup. As might be expected, the average number of PRPs and their respective viability reduces as the NPL status becomes less certain - from NPL to CERCLIS/Non-NPL to Potential (Non-CERCLIS/Non-NPL).

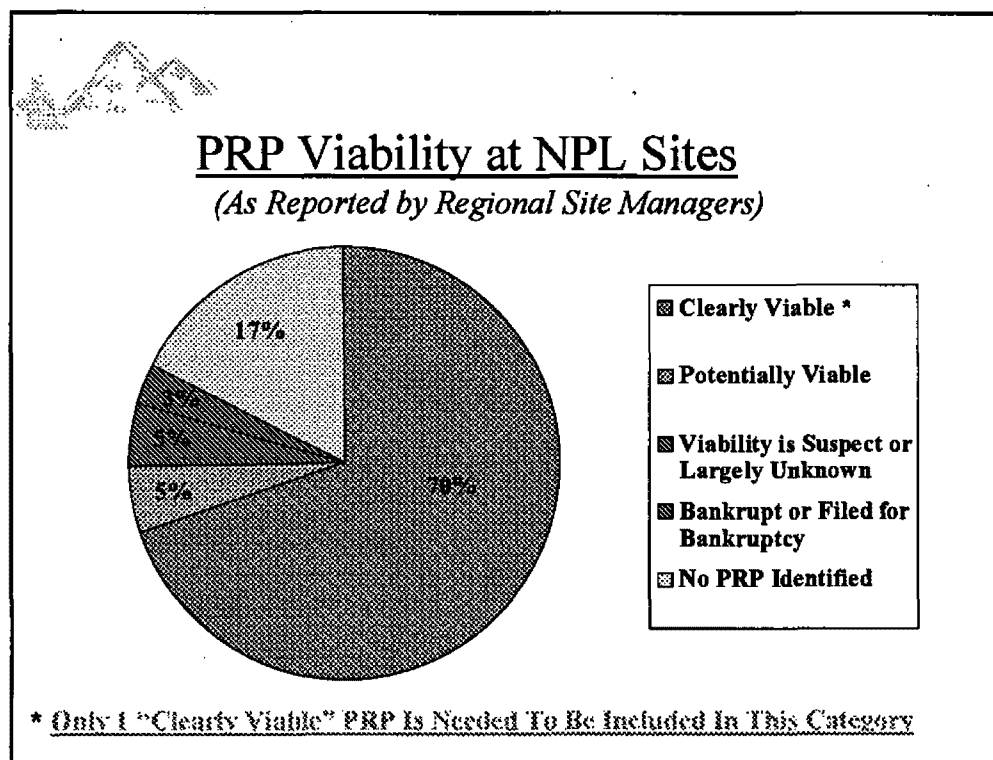


Figure 2.6
Source: OIG Analysis of Inventory Data

At least one PRP was categorized as "clearly viable" at 70 percent of the 63 NPL sites. However, 11 percent of the NPL sites listed a Federal agency, such as the Department of Interior, as the "clearly viable" PRP.

Thirty percent of the NPL sites either lacked an identified PRP, or lacked a clearly viable PRP.

The number of PRPs at each NPL site ranged from zero to a maximum of 10. (Ten was the maximum number the survey questionnaire allowed.) Each NPL site had an average of 2.8 PRPs.

Compared to NPL sites, at CERCLIS/Non-NPL sites, fewer PRPs are identified as being clearly viable. At the majority of sites (67 percent), where a PRP has been identified, the PRP has less than clearly viable status.

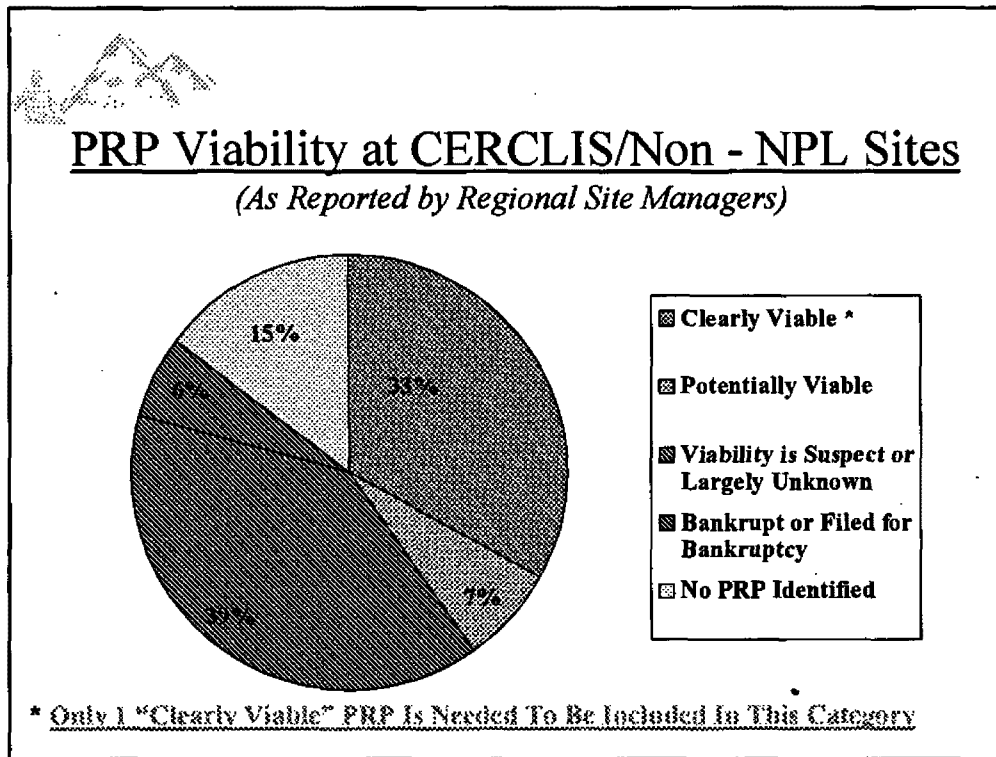


Figure 2.7
Source: OIG Analysis of Inventory Data

As expected, for the 11 Potential (Non-CERCLIS/Non/NPL) sites, overall PRP viability was still less certain, compared to NPL sites and CERCLIS non-NPL sites.

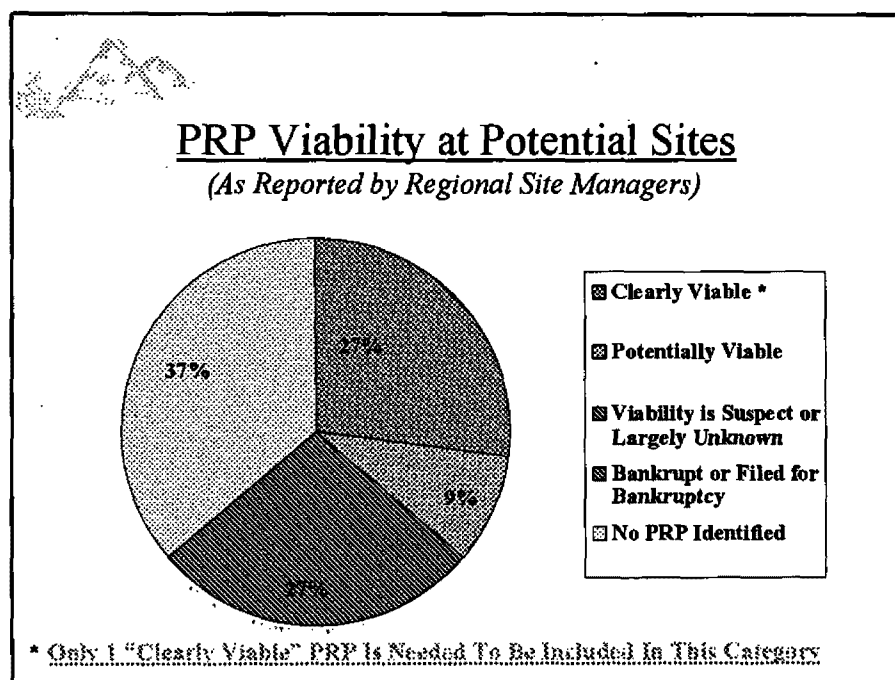


Figure 2.8
Source: OIG Analysis of Inventory Data

How Long Will Operation and Maintenance Be Needed?

Operation and maintenance activities are activities necessary to ensure that the remedy remains protective of human health and the environment. Examples of operation and maintenance activities are operating a treatment plant (when restoring groundwater to a beneficial use), and maintaining fencing, site access, and security measures. For cleanups that are financed by the Superfund program, EPA operates and maintains the cleanup facility for up to 10 years, with the State paying 10 percent of the cost, after which the site is turned over to the State to continue operation and maintenance activities. For funding purposes, the Comprehensive Environmental Response, Compensation, and Liability Act classifies activities during this 10-year period, which EPA calls "long-term response actions," as part of the cleanup, not as operation and maintenance.⁶

The cleanup of mining sites takes generations according to current projections, as more than half (59 percent, or 92 of 156) of the sites will require operation and maintenance (activities necessary to ensure continued effectiveness of a post-construction remedial action) from 40 years to in perpetuity. Forty percent (37 of 92) of these sites are currently on the NPL. Further, operation and maintenance is expected to be needed for 99 of the 156 sites for more than 20 years.

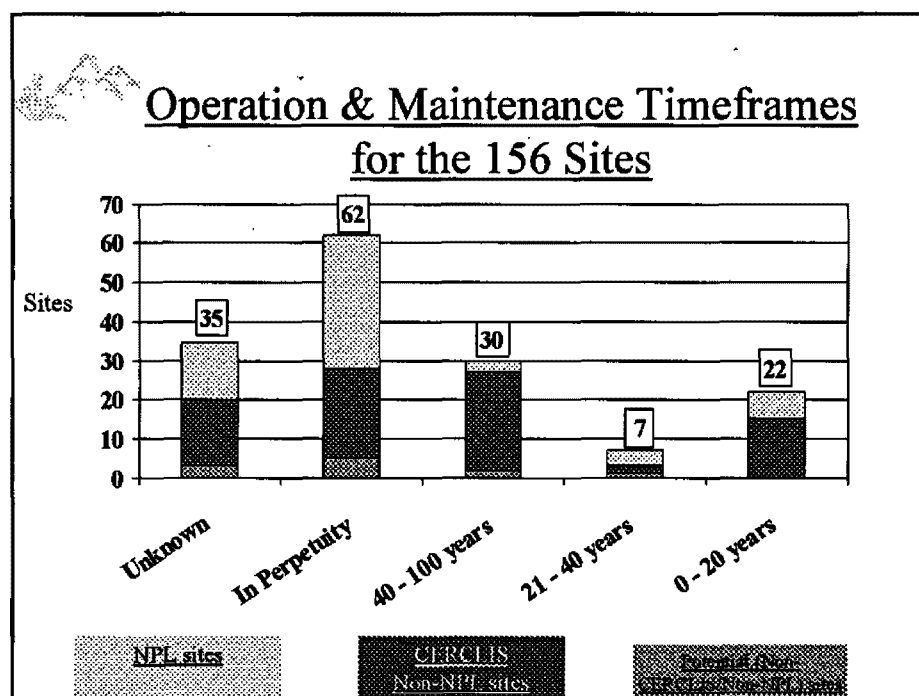


Figure 2.9
Source: OIG Analysis of Inventory Data

Summary and Conclusions

- ☐ The greater number of mining sites in the western Regions (8, 9, and 10) and Regions 4 and 7 show that these regions may have greater needs for resources, guidance, and tools in addressing both the financial and environmental impact of mining sites.
- ☐ There are known human health risks from some of the most common contaminants of concern at hardrock mining sites (lead, arsenic, zinc, and cadmium).
- ☐ Because operation and maintenance activities are projected to go on for decades at the majority of sites, operation and maintenance activities, and the remedies they are associated with, are leading candidates for being site cost-drivers, and therefore, an area that EPA needs to be well informed about. Consolidated information on the efficiency and effectiveness of innovative or promising new cleanup remedies for hardrock mining sites, coupled with consolidated knowledge about the long-term efficiency and effectiveness of traditional or conventional remedies, potentially provide EPA with the foundation for implementing remedies that do not require decades of operation and maintenance investments, conserve Superfund resources, and ensure adequate long-term protection of human health and the environment.
- ☐ The projected length of operation and maintenance periods calls into question the ability of PRPs (or States) to be in a position to assume long-term financial responsibility for one or more sites. Consolidated information on the complete environmental liabilities of businesses engaged in hardrock mining and an evaluation of their ability to pay for liabilities can offer an important basis for fine-tuned EPA projections on sites that may not have a viable PRP.

Chapter 3

Human Health Risk

This chapter reports information on current human health risks at sites in the inventory. Human health risks, according to EPA officials, currently drive the prioritization for funding the cleanup of NPL sites. An example of human health risk from the inventory includes deaths. For example, hundreds have died from exposure to asbestos from a vermiculite mine in Libby, Montana. Several other mine sites in the inventory reported human health risks from exposure to lead; at these sites, a significant percentage of children have blood lead levels above the acceptable limit.

For this survey, human health risk meant that one or more persons were at current risk for exposure or potential exposure to a hazardous condition from a mining site. Current risk does not address future human health risk which could be greater if areas containing mine wastes are developed without site cleanup.

What Are the Current Human Health Risks By NPL Status?

Less than half of the current NPL hardrock mining sites were assessed as having a current high or medium human health risk. However, the largest percentage of NPL sites had current low human health risks. Risk may be low because removal or remedial actions have been completed at NPL sites⁷.

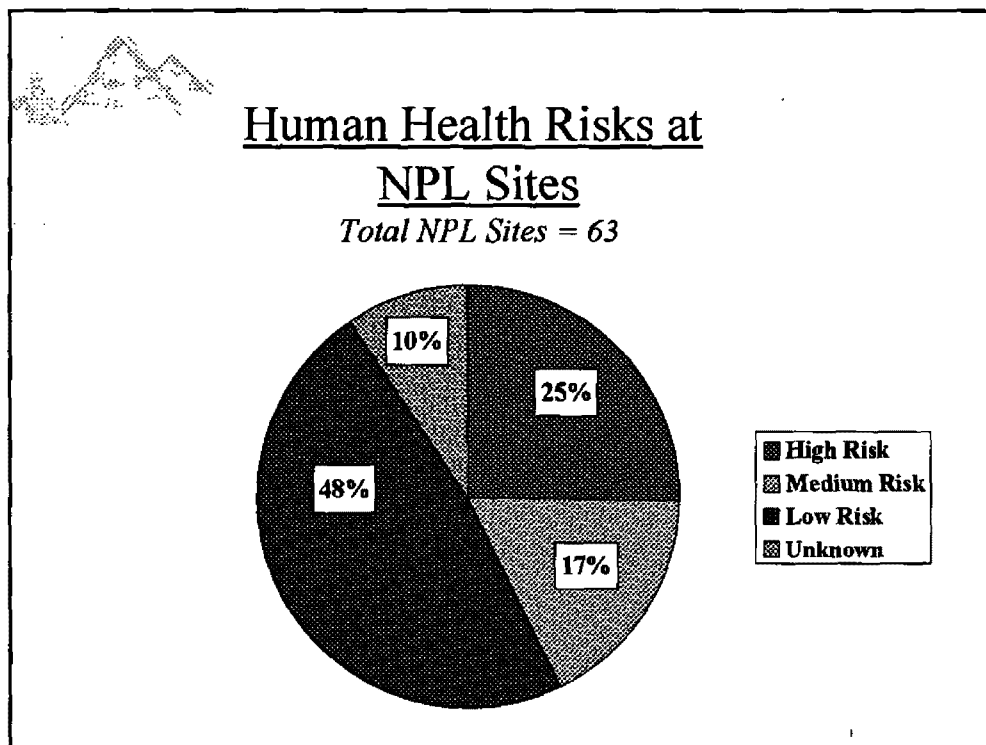


Figure 3.1
Source: OIG Analysis of Inventory Data

⁷

EPA has reported that blood samples collected from children near some mining sites in the inventory before and after cleanups have shown an improvement with a reduction in the average blood lead levels.

Compared to NPL sites, a smaller portion (30 percent) of sites which the Superfund program has in CERCLIS, but which have not yet been listed on the NPL, have a current high or medium human health risk. The largest portion of sites (42 percent) were rated by respondents as having a risk to human health that is currently unknown. Twenty-two (or 27 percent) of these sites are in Florida in Region 4 and are phosphate mining sites.

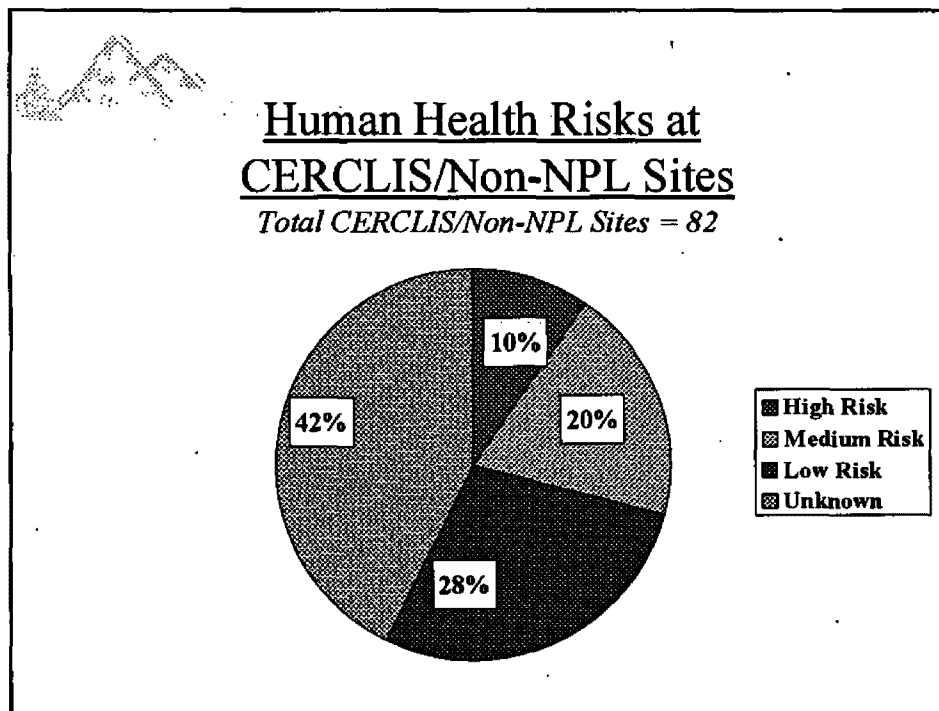


Figure 3.2
Source: OIG Analysis of Inventory Data

Finally, there are 11 Potential (Non-CERCLIS/Non-NPL) sites in our database where current human health risk was assessed. The smallest portion of sites had current high human health risk. The majority of sites were either rated as currently having a low risk to human health (36 percent), or were rated as having a human health risk that is still unknown (55 percent). None of the sites had a medium current human health risk.

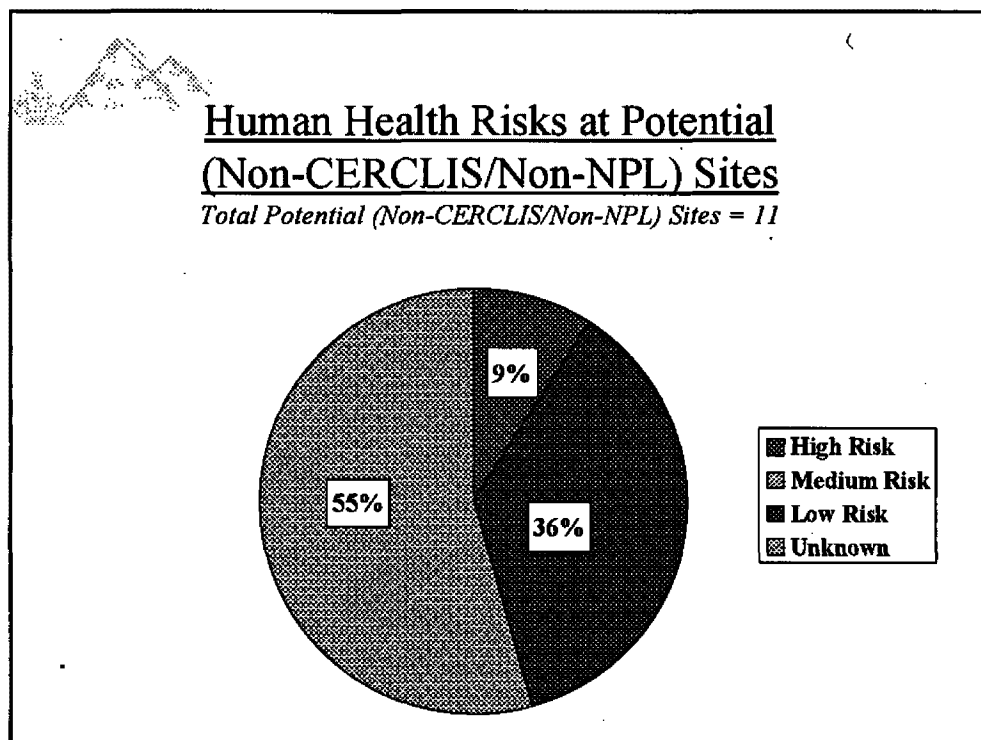


Figure 3.3
Source: OIG Analysis of Inventory Data

What Are the Human Health Risks by Region?

The levels of current human health risks vary by region. Regions 7, 8, 9, and 10 have the most sites (12, 14, 11, and 7, respectively) with high and medium risk to human health. Region 4 has the most sites with unknown risk to human health.

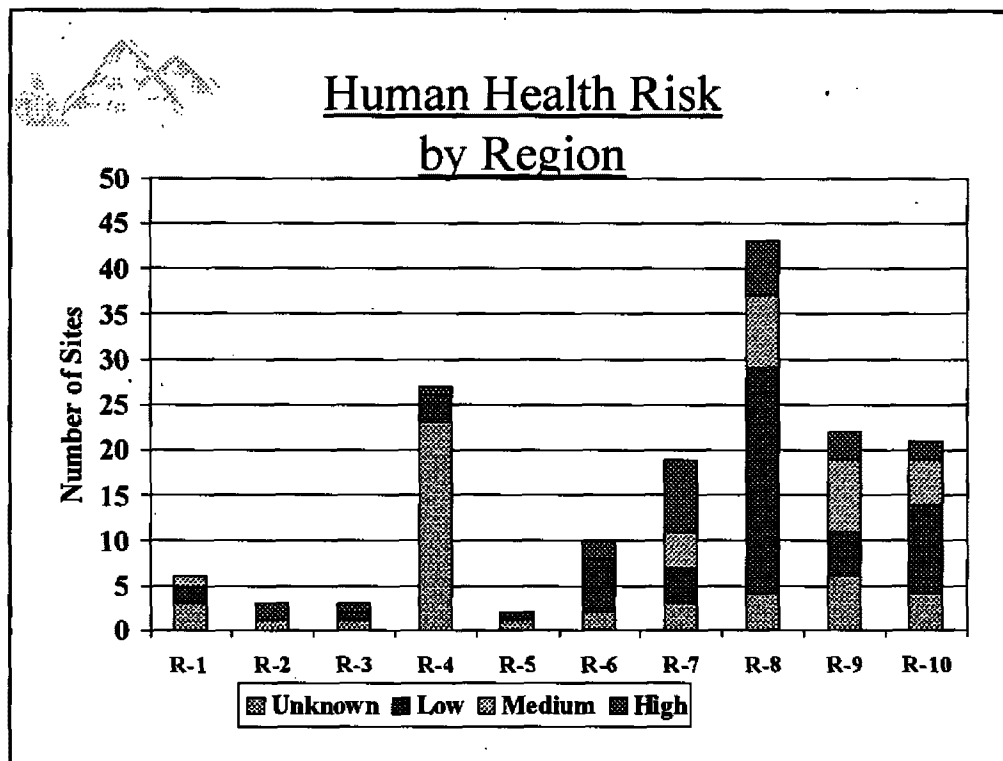


Figure 3.4
Source: OIG Analysis of Inventory Data

Summary and Conclusions

- There is a mix, and some uncertainty, in judgments of the human health risks associated with current and potential future Superfund hardrock mining sites. For example, the majority of current NPL sites, as well as CERCLIS/Non-NPL sites, and the Potential sites, have current low or unknown human health risks. This indicates that to the degree EPA consistently relies on the use of high human health risk criteria to move sites into the Superfund program, our data do not suggest that the Superfund program will absorb all of the CERCLIS/Non-NPL or Potential sites. However, because a large percentage of both CERCLIS/Non-NPL and Potential sites have current human health risks that are unknown, it is not certain what risks these sites may pose and whether they will eventually move into the Superfund program.
- The larger number of high and medium risk sites in the western regions (8, 9, 10) and Region 7 implies that these regions may have greater needs for resources, guidance, and tools in addressing the impacts of hardrock mining sites and may place greater demands on the Superfund program.

Chapter 4

Ecological/Environmental Risk

In this chapter we present information regarding the ecological/environmental risk for the mining sites in the inventory. This chapter shows risk ratings by status of the site and shows the number of sites by ecological/environmental risk in each region. We also report information on the relationship between current human health and ecological/environmental risks.

For this survey, ecological/environmental risk meant that some portion of the ecology/environment was at risk for exposure or potential exposure to a hazardous condition from a mining site.

What Are the Current Ecological/Environmental Risks By NPL Status?

Half of the 63 NPL sites in the inventory are assessed as having a current high or medium ecological/environmental risk. Almost one-quarter of the NPL sites had an unknown current ecological/environmental risk.

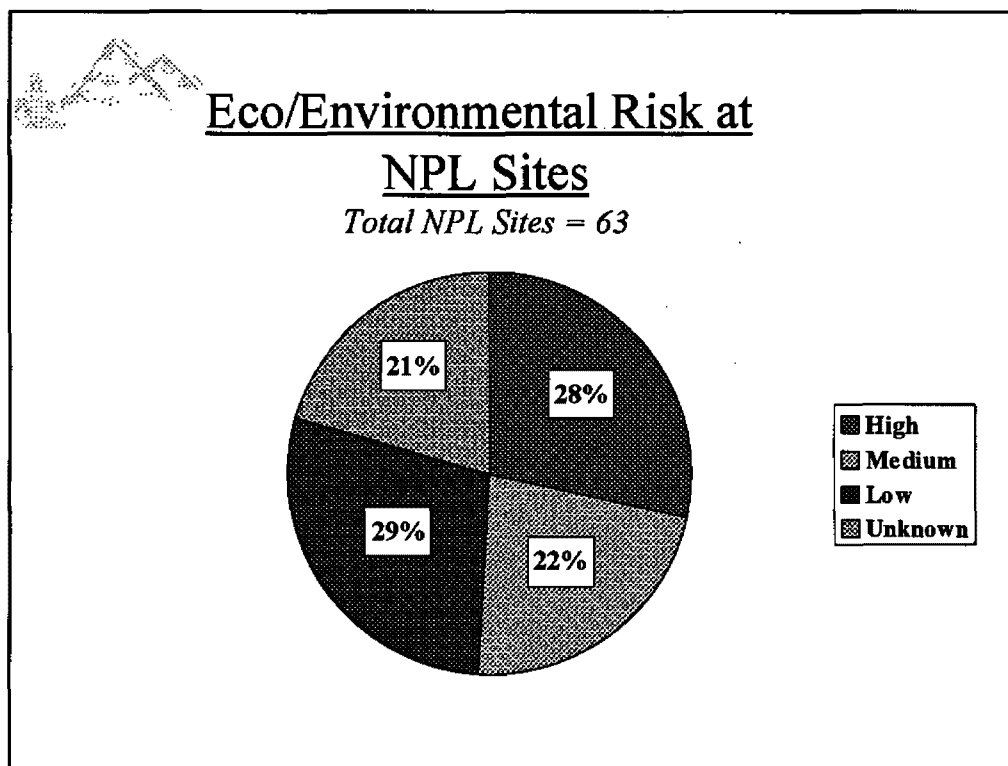


Figure 4.1
Source: OIG Analysis of Inventory Data

For the 82 CERCLIS/Non-NPL sites, ecological/environmental risk appears to be a concern for a greater number of sites than human health is, as a majority (64 percent) of the sites had a current high or medium ecological/environmental risk. For the same sites, human health risk was rated as being currently high or medium at only 30 percent of the sites.

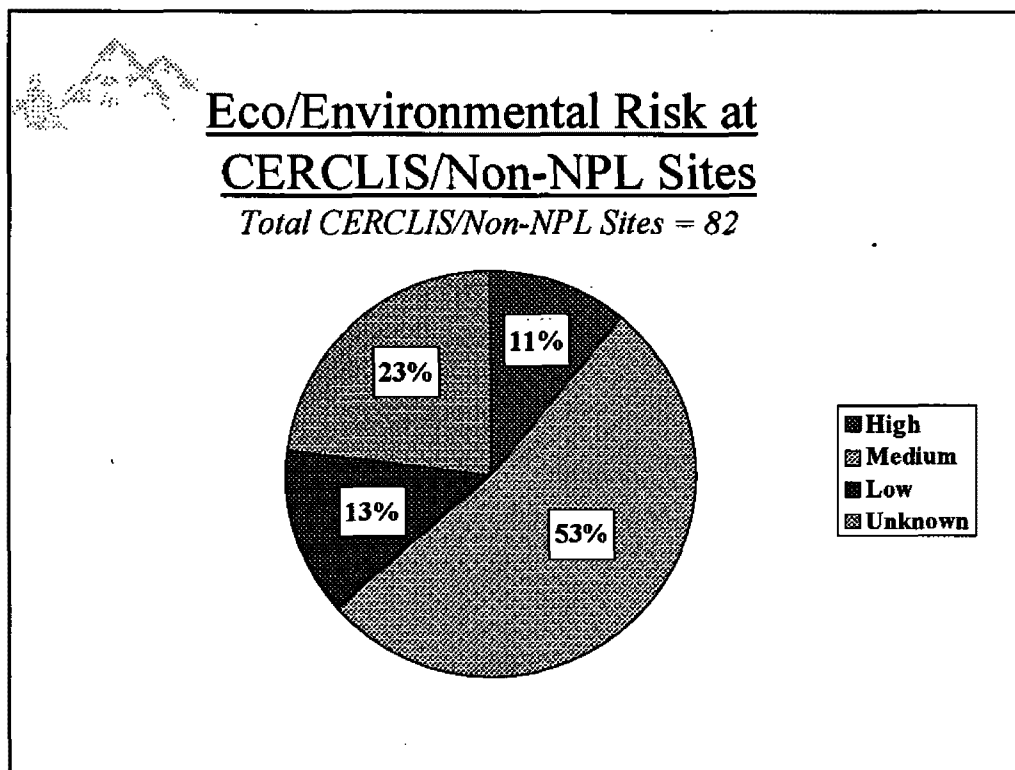


Figure 4.2

Source: OIG Analysis of Inventory Data

There are 11 Potential (Non-CERCLIS/Non-NPL) sites in our database where the judgments for current ecological/environmental risk were provided. Forty-five percent of the sites had either a current high or medium ecological/environmental risk. Together, the majority of sites were either rated as currently having a low current ecological/environmental risk (9 percent), or were rated as having an ecological/environmental risk that is unknown (46 percent).

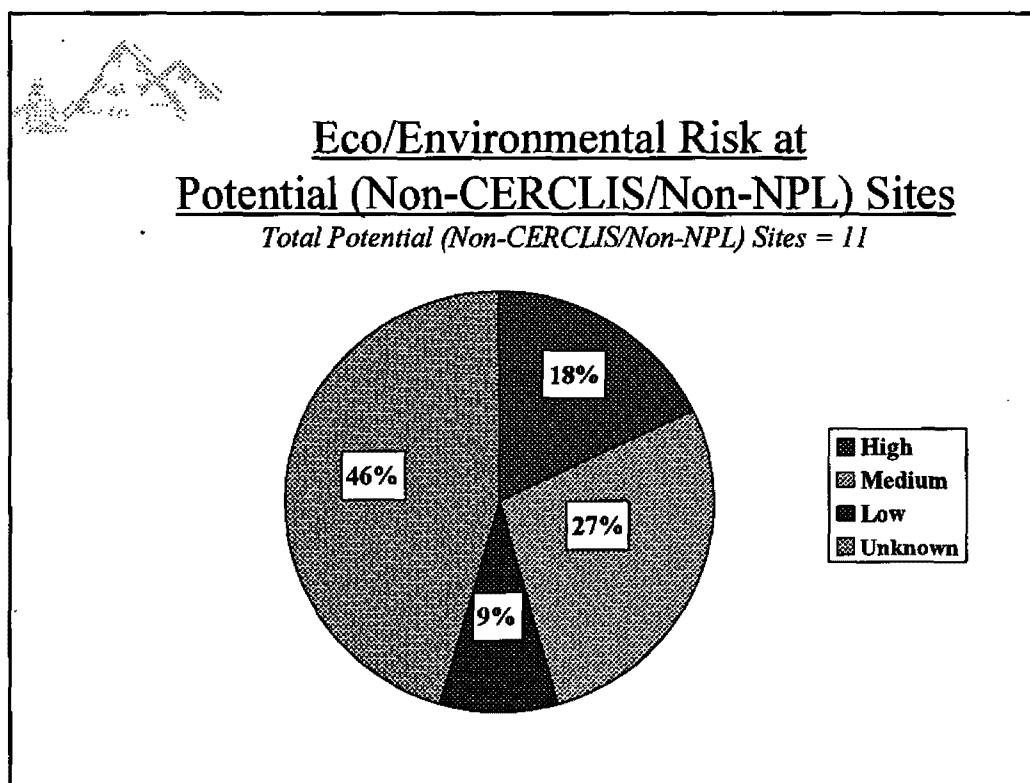


Figure 4.3
Source: OIG Analysis of Inventory Data

What Are the Ecological/Environmental Risks by Region?

Regions 8 and 10 have the most sites (11 and 5, respectively) with high ecological/environmental risk. Regions 4, 9, 8, and 10 have the most sites (25, 17, 17, and 11, respectively) with high and medium ecological/environmental risk. All of the sites in Region 1 had high or medium ecological/environmental risk.

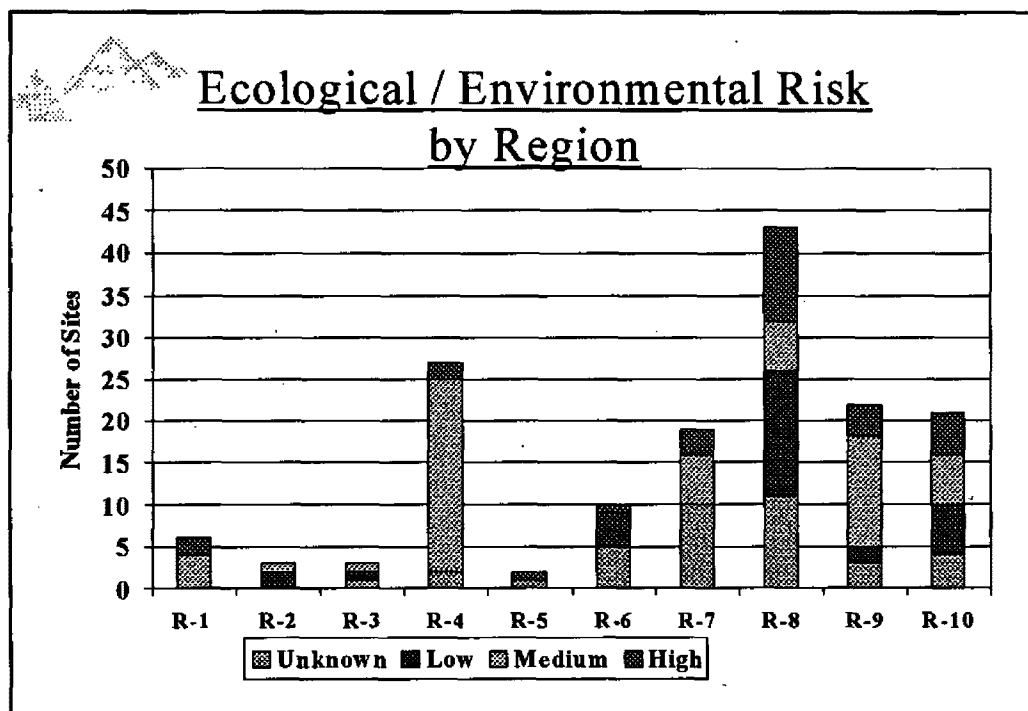


Figure 4.4
Source: OIG Analysis of Inventory Data

What Is the Relationship Between Human Health and Ecological/Environmental Risk?

The following matrix matches up current human health and ecological/environmental risks for sites in the inventory. Twenty-two percent of the sites (35) had a high or medium human health risk and ecological/environmental risk. Fifteen of the 35 sites had acid mine drainage.



Health and Eco/Environmental Risk					
<i>(Nationwide)</i>					
Human Health Risk	Ecological / Environmental Risk				
		High (29)	Medium (60)	Low (30)	Unknown (37)
	High (25)	8	6	2	9
	Medium (27)	6	15	3	3
	Low (57)	13	12	24	8
	Unknown (47)	2	27	1	17

Figure 4.5

Source: OIG Analysis of Inventory Data

Summary and Conclusions

- ☐ NPL sites and CERCLIS/Non-NPL sites were more commonly rated as having high ecological risks than human health risks. For example, while 42 percent and 30 percent of NPL and CERCLIS/Non-NPL sites were rated as having high or medium human health risks respectively, 50 percent of NPL sites and 64 percent of CERCLIS/Non-NPL sites were rated as having high or medium ecological risks.
- ☐ The larger number of high and medium risk sites in the western Regions (8, 9, 10) and Regions 7 and 4 implies that these regions may have greater needs for resources, guidance, and tools in addressing the impacts of hardrock mining sites and may place greater demands on the Superfund program.

Chapter 5

Cleanup Costs

In this chapter, we present information on projected cleanup costs of current Superfund hardrock mining sites and potential future sites. This provides an indication of the financial impact of these sites on the Superfund Trust fund and general revenue which supports the program as well.⁸ This information, combined with data we presented in chapters 2-4, provides context for evaluating the significance and relevance of the impacts.

Given uncertainties in estimating the costs of cleaning up a site that could potentially take years to complete, we present several aspects of cost data. We present most of our data in terms of maximum projected costs to avoid minimizing the potential liability associated with these hardrock mining sites, as cleanup costs can often be underestimated.

Underestimation of cleanup costs can occur when inflation is not considered, when acid mine drainage is inaccurately predicted, or when cleanup is delayed. One study suggests that the discovery of inaccurately predicted acid mine drainage can increase site cleanup estimates by 200 to 1000 percent or more. Costs to the Federal government may also increase when a PRP defaults. For example, Asarco, which was the potentially responsible party for several sites in the inventory, settled with the Federal government for \$100 million. One of the sites in the inventory owned by Asarco is estimated (by a recognized expert in cost estimating cleanup of hardrock mining sites) to cost \$457.1 million to clean up.

As a subset of this cost information, we present information on the maximum Federal capital costs. (Capital costs are expenditures required to construct a remedial action. They are exclusive of costs required for long-term operation and maintenance of the remedial actions.) This amount represents our projection of costs to the Superfund Trust fund. Finally, for context purposes, we present one chart which shows the costs associated with sites that have at least one record of decision (ROD) completed.

We could not identify any uniform, most reliable, cost estimating standards or procedures for hardrock mining sites. EPA did not provide us with evidence regarding the reliability of projected cost estimates for hardrock mining sites or portions of sites, such as operable units. We recognize that as EPA staff learn more about sites as they progress through the Superfund program, the learning process could impact their judgments about costs to clean

⁸

Until 1995, the Trust fund was financed primarily by a tax on crude oil and certain chemicals and an environmental tax on corporations. The authority for these taxes expired in December 1995 and has not been reauthorized; however, the Trust fund continues to receive revenue from interest accrued on the unexpended invested balance, recoveries of cleanup costs from potentially responsible parties, and collections of fines and penalties. The Trust fund has also received revenue from annual general fund appropriations that, along with its other revenues, have been used to fund the Superfund program's operations.

up a site. Cost estimates, like risk estimates, could increase or decrease based on the learning process or stage of a site in the Superfund program.

Trend in Superfund Budgets and Expected Future Demands

In order to provide context for the cost data, we present EPA's Superfund budget for the last 5 years. Figure 5.1 shows that EPA's Superfund budgets have been about \$1.2 billion for the last 5 years.

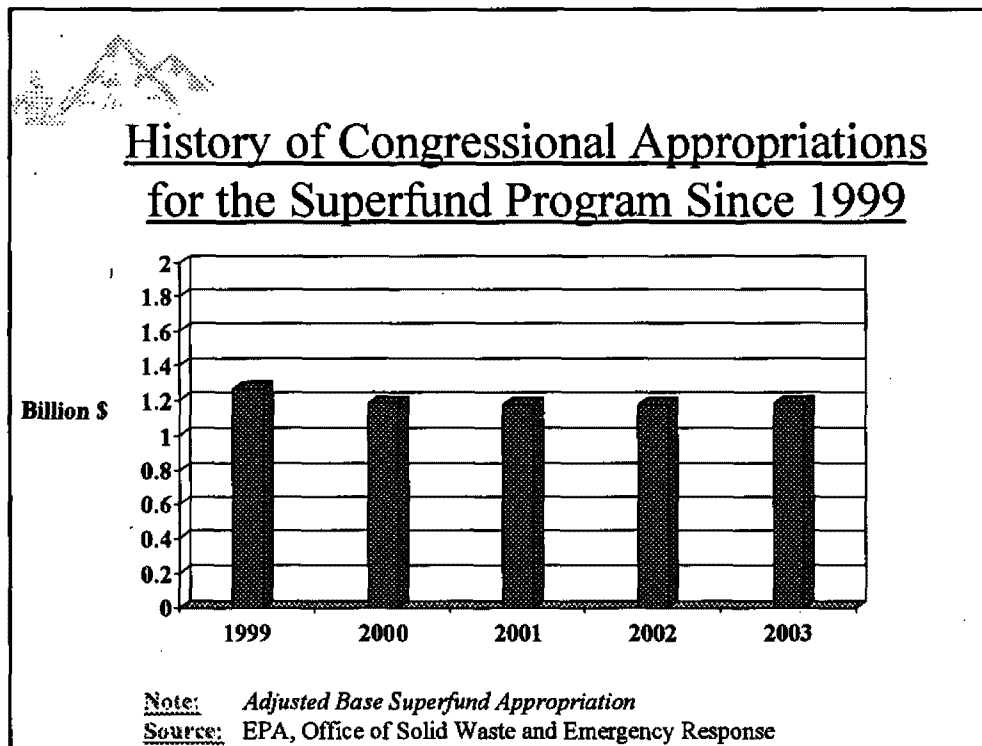


Figure 5.1

In 2001, at the request of Congress, Resources for the Future estimated that EPA's Superfund program needs would be (in inflation-adjusted dollars) about \$1.8 billion in 2003, generally declining to approximately \$1.6 billion in 2009. These estimates exceed historical appropriations and assume that only 2 mega-sites (sites that will cost \$50 million or more to clean up) and 33 non mega-sites will be added to the NPL annually. Resources for the Future concluded that a significant "ramp-down" of the Superfund program was not imminent.

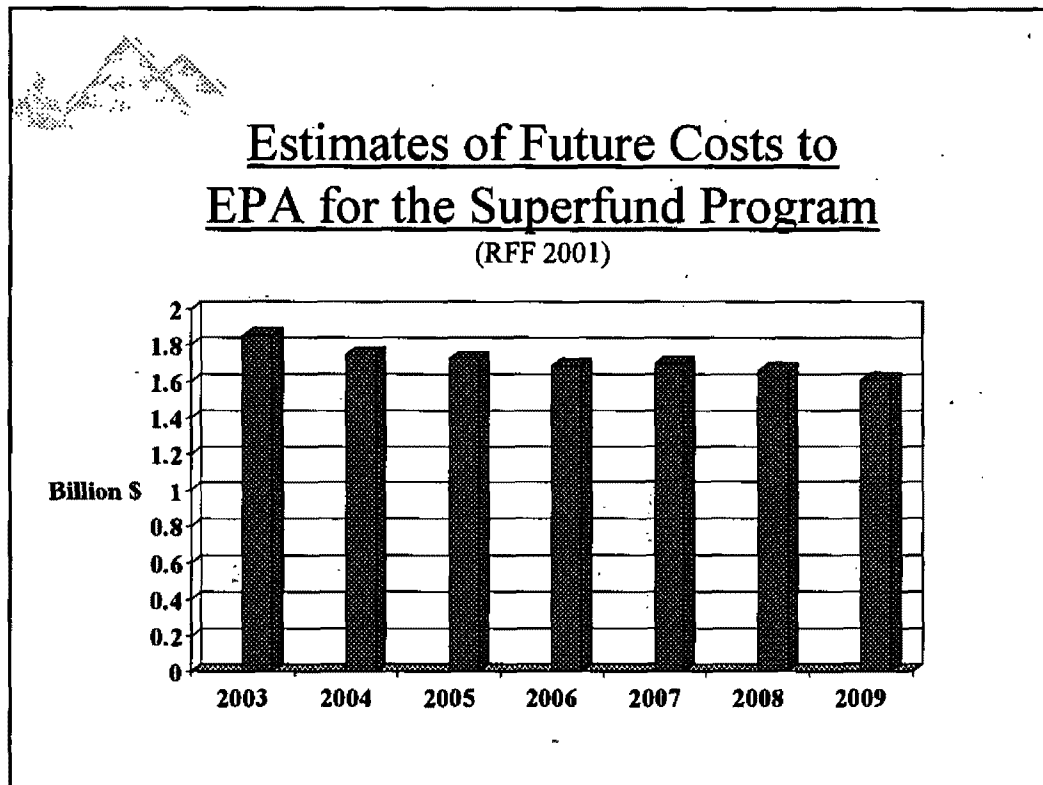


Figure 5.2
Source: Resources for The Future

What Are the Total Maximum Projected Costs As Reported by Regional Site Managers?

Overall potential cleanup costs for mining sites are extremely large relative to EPA's total Superfund budgets. While we did not estimate yearly costs, our data show that maximum cleanup costs will be approximately \$24 billion and, at a minimum, will be about \$7 billion. These maximum projected cleanup costs and the associated cleanup responsibilities will not all be due immediately, and they may not all fall to EPA.

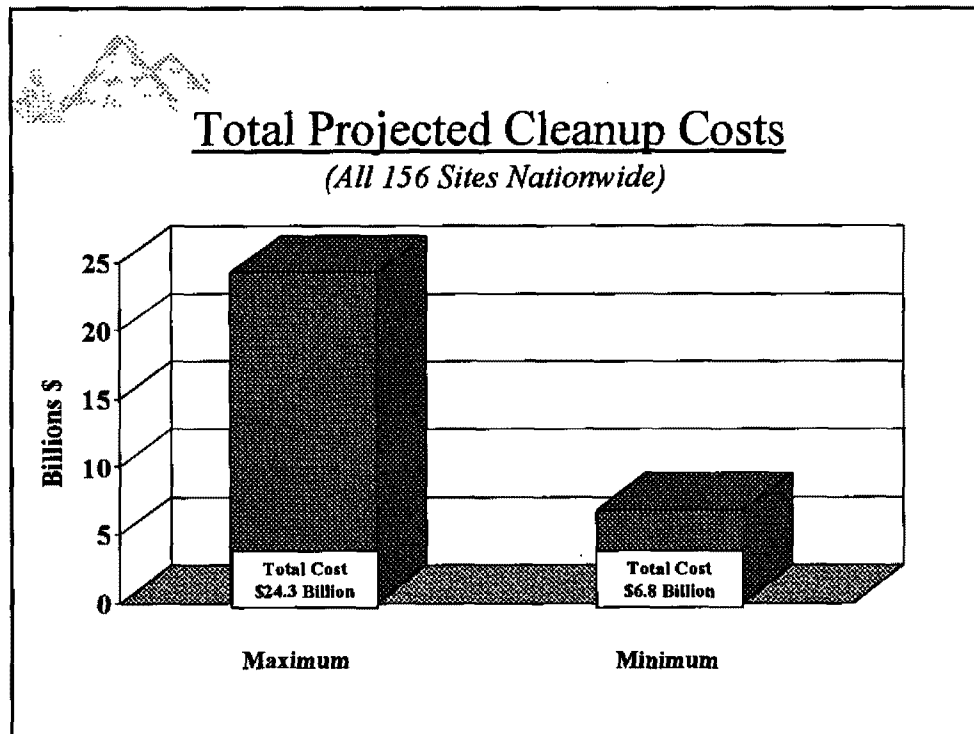


Figure 5.3
Source: OIG Analysis of Inventory Data

For Sites With RODs, What Are The Cost Estimates?

The Agency's Superfund Program Director suggested that cost information for sites with RODs (the public document in which EPA identifies the cleanup alternative to be used at an operable unit of a site) would generally be more accurate.⁹ Because information was reported to us on a site-wide basis in our survey, we did not have individual operable unit¹⁰ information in the database. Subsequently, we asked site managers to provide us with current individual operable unit information. Site managers at 102 of the sites in the database were able to provide cost estimates and current site status for operable units. Some sites had achieved more than one ROD while others had not achieved a ROD.

102 Sites Provided Current Operable Unit Status

	Sites with at Least One ROD or Equivalent ¹¹	Sites without a ROD or Equivalent
NPL	29 (22 are EPA Lead)	13 (10 are EPA Lead)
CERCLIS/ Non-NPL	12 (8 are EPA Lead)	43 (33 are EPA Lead)
Potential (Non- CERCLIS/ Non-NPL)	0	5 (1 is EPA Lead)
TOTALS	41*	61**

Figure 5.4

Source: OIG Analysis of Inventory Data

* The 41 sites with at least one ROD account for \$5.4 billion of the maximum projected cleanup costs, and \$800 million of the maximum Federal capital costs.

** The 61 sites without a ROD account for \$14.1 billion of the maximum projected cleanup costs, and \$11.8 billion of the maximum Federal capital costs.

⁹ We did not test this assumption, although it is consistent with assumptions of Superfund cleanup cost estimating guidance.

¹⁰ A distinct project of the overall site cleanup. Sites can be divided into operable units based on the media to be addressed (such as groundwater or contaminated soil), geographic area, or other measures.

¹¹ A ROD equivalent is an Engineering Evaluation/Cost Analysis, no further action, or a State voluntary cleanup program decision.

What Does Cost Information By NPL Status Tell Us About Impacts to the Superfund Program?

We are presenting the cost information by NPL status because NPL status is an important indication of EPA's current liability. EPA cannot use Superfund resources for long-term cleanup until a site is listed on the NPL. Therefore, total maximum cleanup costs are broken down into each NPL status category.

A majority (61 percent) of the total maximum projected cleanup costs are for sites that are in the inventory and in CERCLIS, but have not been officially added to the program by being listed on the NPL.

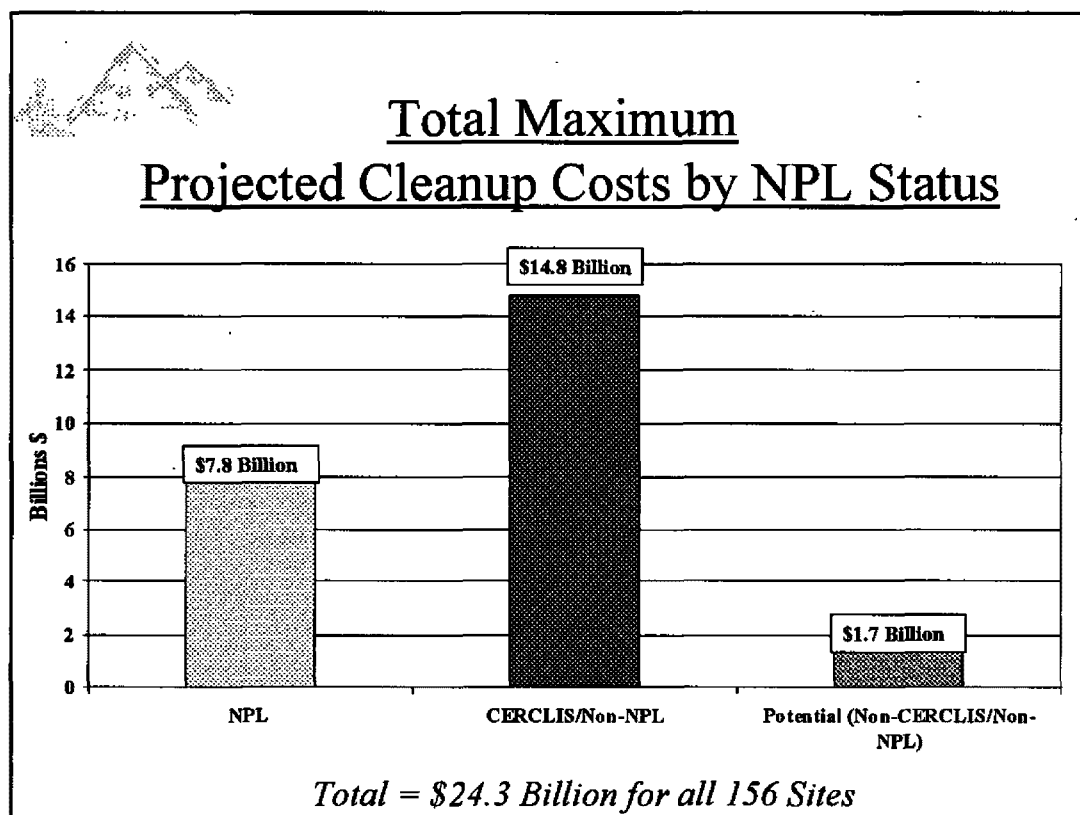


Figure 5.5
Source: OIG Analysis of Inventory Data

At least nineteen of the NPL sites in this hardrock mining inventory have estimated cleanup costs of \$50 million or more.

Federal Capital costs are the costs expected to be paid by the Federal government and represent the real and potential financial impact on the Trust fund. Figure 5.6 shows the amount of the maximum projected cleanup costs that are projected to be Federal Capital costs.

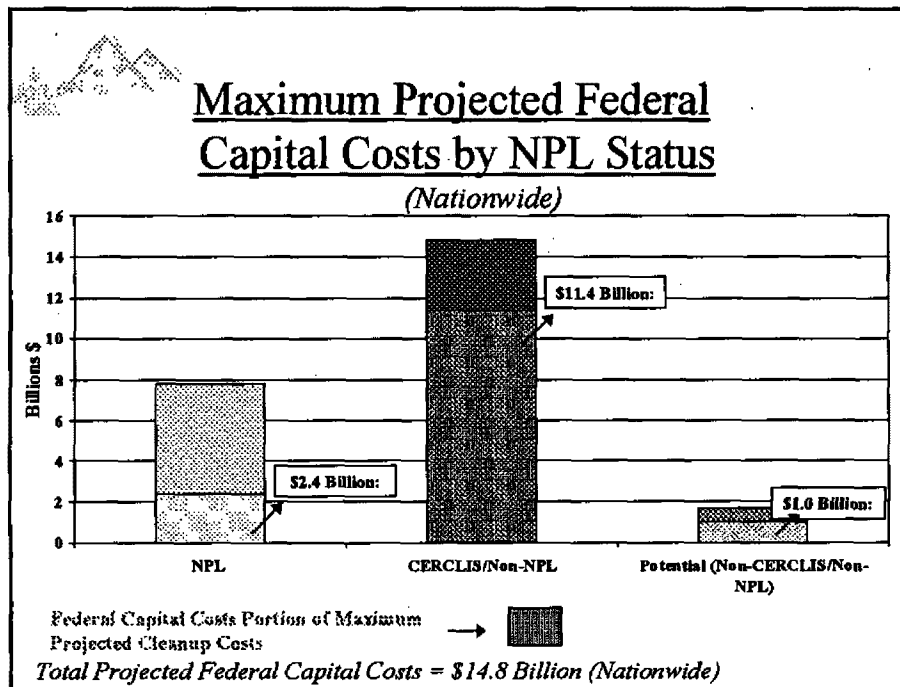


Figure 5.6
Source: OIG Analysis of Inventory Data

For the 63 NPL sites, Federal costs equal approximately \$2.4 (31 percent) of the \$7.8 billion maximum projected cleanup costs.

For the 82 CERCLIS Non-NPL sites, Federal capital costs are expected to comprise approximately \$11.4 billion (77 percent) of the \$14.8 billion maximum projected cleanup costs. Twenty-two of these sites reported Federal capital costs of \$100 to \$500 million each. All of these sites are in Region 4.

For the 11 Potential (Non-CERCLIS/Non-NPL) sites, Federal costs are expected to be approximately \$1.0 billion (59 percent) of the \$1.7 billion projected maximum cleanup cost.

Next are maximum projected cleanup costs by region. Cleanup costs are concentrated in Region 4.

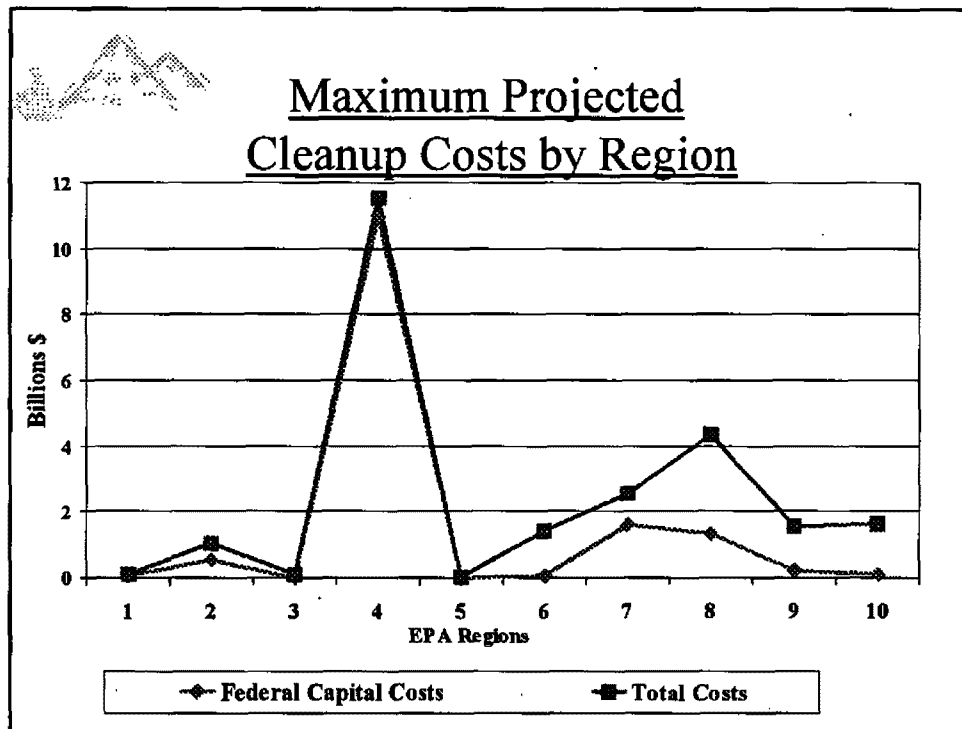


Figure 5.7
Source: OIG Analysis of Inventory Data

As shown earlier, over half (55 percent) of the 156 sites are located in three regions (8, 9, 10). However, Region 4 is accounting for approximately 50 percent, or about \$11 billion, of the total projected maximum cleanup costs. Regions 4, 7, and 8 had the highest amounts, respectively, of projected Federal capital costs.

What Does Projected Cost Compared with Risk Information Tell Us?

Figures 5.8 and 5.9 show the maximum projected Federal capital costs for human health risks for NPL sites and for CERCLIS Non-NPL sites, respectively. The left side of each figure shows the allocation of the maximum Federal capital costs by human health risk, while the right side shows the total number of sites as rated by human health risk category.

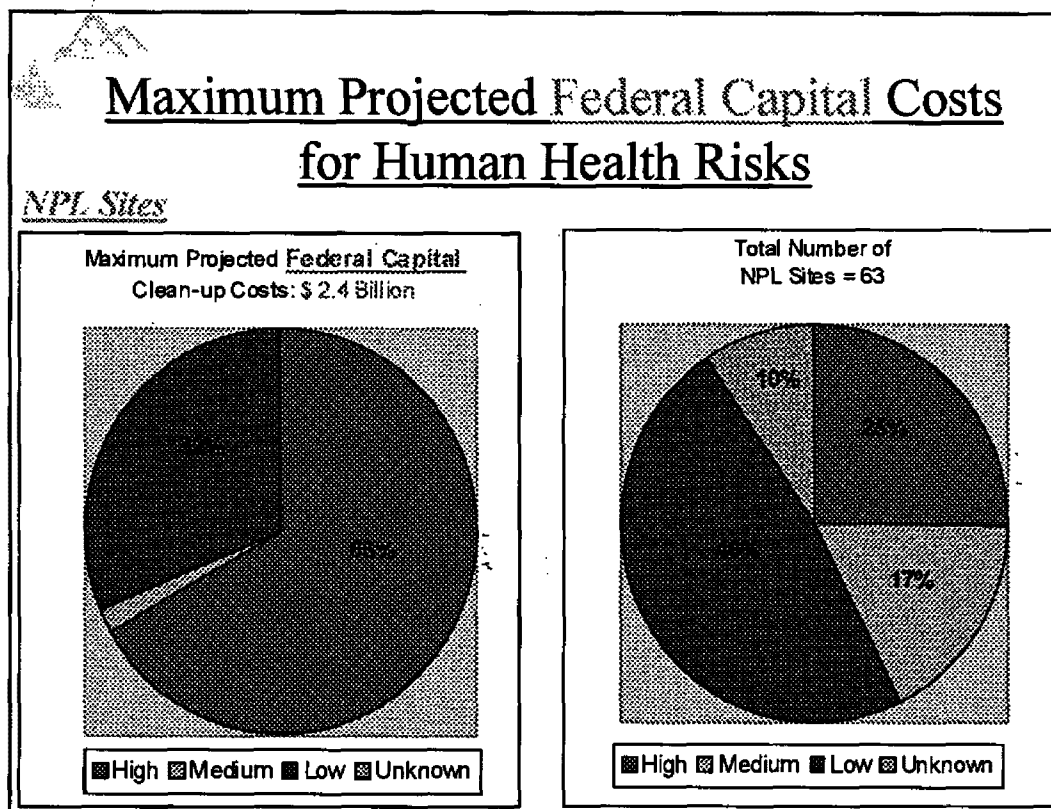


Figure 5.8

Source: OIG Analysis of Inventory Data

For NPL sites, 66 percent of the maximum projected Federal capital costs will be needed for 25 percent of the high risk sites.

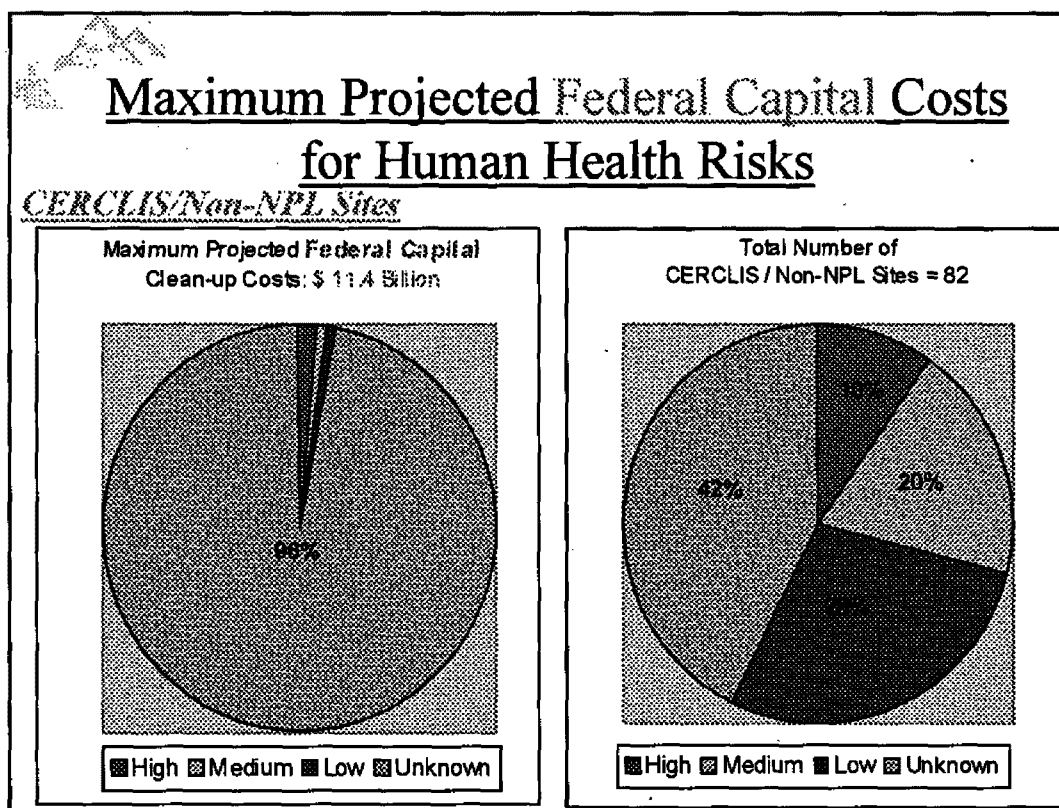


Figure 5.9
Source: OIG Analysis of Inventory Data

For the CERCLIS Non-NPL sites, 96 percent of the \$11.4 billion maximum projected Federal capital costs are projected to be needed for 42 percent of the sites with a current unknown human health risk. Conversely, only 2 percent of the maximum Federal capital costs are projected to be needed for 10 percent of the CERCLIS Non-NPL sites that are assessed as having a current high human health risk. In total, nearly 100 percent of estimated Federal costs to clean up CERCLIS/Non NPL hardrock mining sites in the inventory are projected for sites that predominantly are considered to have current low risk or have a current unknown human health risk. EPA has indicated that almost all of these CERCLIS Non-NPL sites are in regions, including the State of Florida in Region 4, where the availability of water and the quality of the available water are issues of paramount public concern. EPA states that contaminated water impacts the health of living resources and also agriculture, municipal, and industrial water supplies, and commercial recreation. The socioeconomic effects of contaminated water include the increased costs of water treatment where practicable, the costs of developing additional sources of water where contaminated water cannot be rendered useful through treatment, and ancillary effects such

as the inability of urban and rural subsistence fishermen to obtain a safe protein component for their diet.

Figures 5.10 and 5.11 show the maximum projected Federal capital costs for ecological/environmental risks for NPL sites and for CERCLIS Non-NPL sites, respectively. The left side of each figure shows the allocation of the maximum Federal capital costs by ecological/environmental risk, while the right side shows the total number of sites by ecological/environmental risk category.

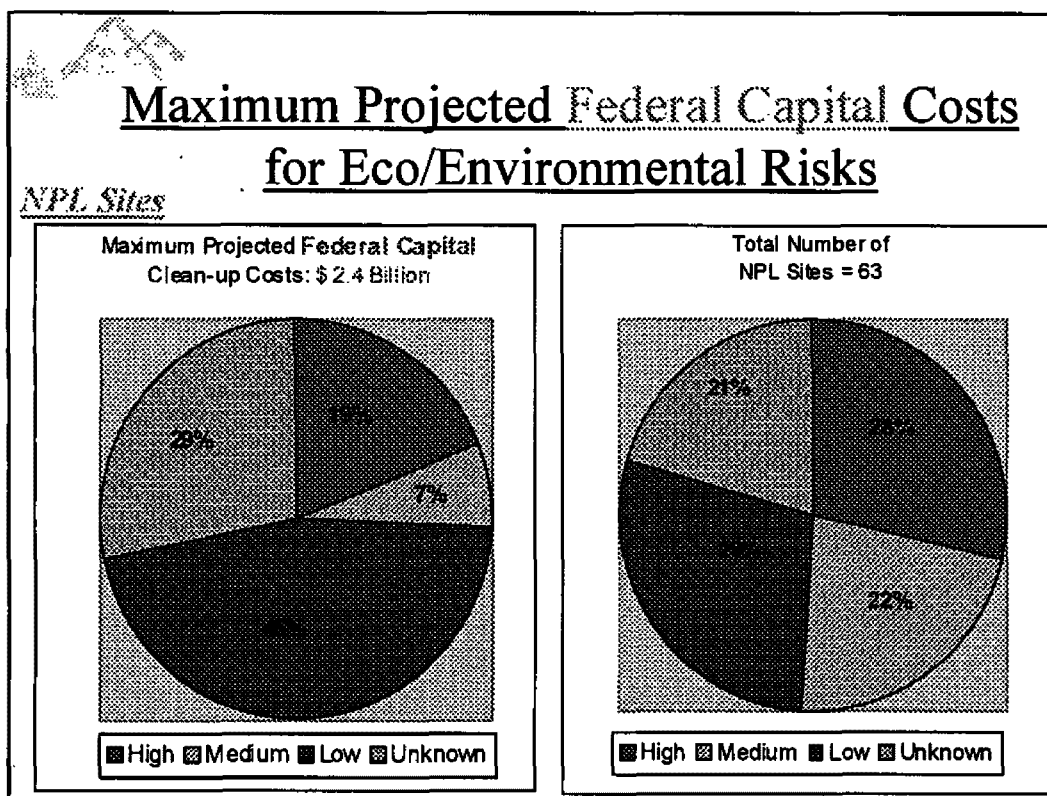


Figure 5.10
Source: OIG Analysis of Inventory Data

Nineteen percent of the \$2.4 billion maximum projected Federal capital costs are expected to be needed for 28 percent of the NPL sites assessed with a current high ecological/environmental risk.

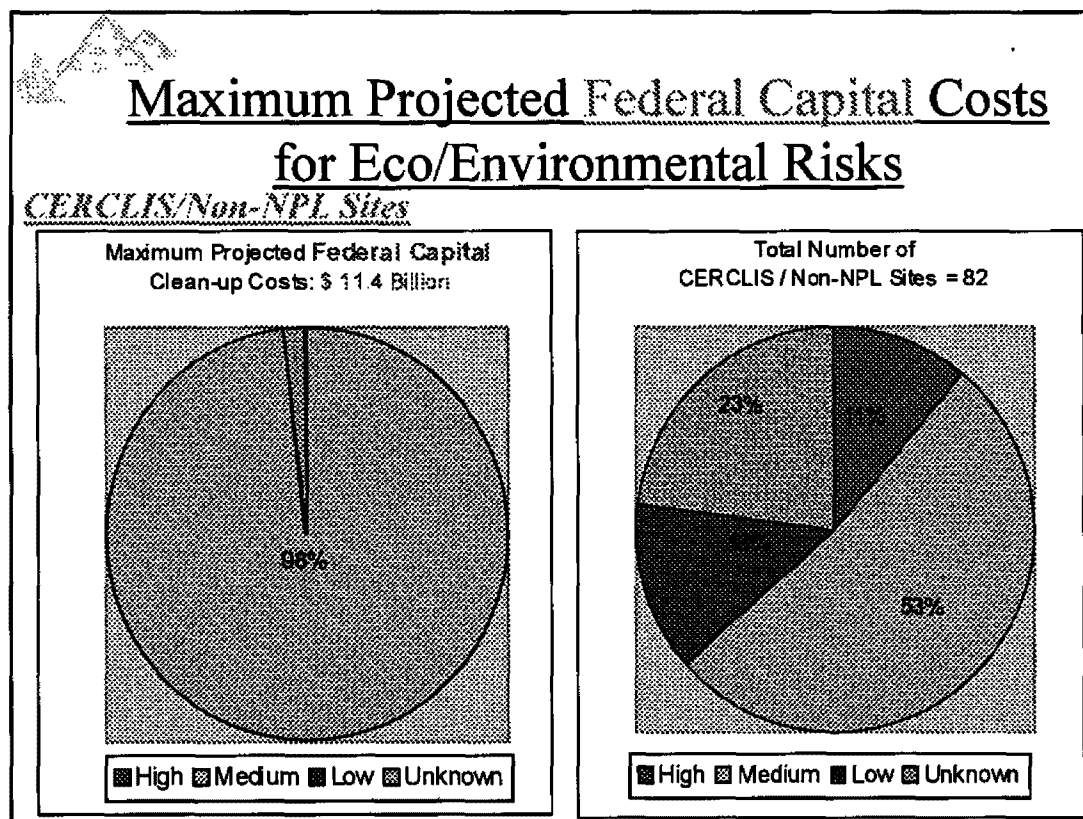


Figure 5.11
Source: OIG Analysis of Inventory Data

Nearly 100 percent of the maximum Federal capital costs are projected to be needed for 53 percent of the sites where a medium risk was assessed. No funds were expected to be needed for the 11 percent of the CERCLIS Non-NPL sites assessed with high risk.

Summary and Conclusions

- ☐ We have identified 156 hardrock mining sites across the country that have the potential to cost between \$7 billion and \$24 billion to clean up. We have not projected the yearly costs to EPA. The total maximum cleanup costs to EPA for the hardrock mining sites we identified are estimated at \$15 billion. Although these costs will not all be due immediately, comparison of these costs to EPA's annual Superfund program budgets for the last 5 years (about \$1.2 billion) suggests these costs, alone, could present a significant management challenge. The challenges that are suggested by the hardrock mining inventory are amplified by the fact that EPA's Superfund program has experienced shortfalls in the last 2 years, resulting in some cleanup activities being stopped, and program increases are not anticipated.
- ☐ Because Region 4 is accounting for almost half of the total projected cleanup costs we report (\$11 billion out of \$24 billion), the region is likely to place extreme demands on the Superfund program and may have a greater need for resources, guidance, and tools in addressing the impacts of hardrock mining sites.

Agency Comments and OIG Evaluation

The Agency commented that the report uses the maximum estimated cleanup costs from the cost range reported by the survey respondents. For example, they believed Region 4 filled out the survey using the \$100 to \$500 million cleanup cost estimate for the 22 phosphate mining sites in Florida. The Region believes that site cleanup costs will most likely fall at the lower end of the \$100 to \$500 million range. The difference between the low and high end of the cost for these 22 sites is about \$8.8 billion. As we've stated elsewhere in our report cost estimates can be inaccurate. The inaccurate prediction of acid mine drainage can increase these costs by up to 1000 percent or more. None of the 22 phosphate mining sites in the inventory in Region 4 have reported the presence of acid mine drainage, and therefore, haven't accounted for the likelihood of acid mine drainage in their cost estimates. This is despite several recent articles that indicate that the highly acidic water in the sites' lagoons have leaked and spilled and contaminated ground and surface water supplies and killed fish and vegetation. Further, as a result of a recent bankruptcy of a company that mined phosphate in Florida, the State of Florida has concluded that State financial assurance requirements (requirements that make sure that funds are available to clean up a facility should the PRP go bankrupt or abandon the site) need to be strengthened so that the taxpayer does not bear the burden of paying for future clean ups. Florida indicated it never considered a phosphate mining company would go bankrupt.

Chapter 6

Conclusions and Recommendations

Summary and Conclusions

We have identified 156 hardrock mining sites across the country that have the potential to cost between \$7 billion and \$24 billion to clean up. The total maximum cleanup costs to EPA for the hardrock mining sites we identified are estimated at \$15 billion. Although these costs will not all be due immediately, comparison of these costs to EPA's annual Superfund program budgets for the last 5 years (about \$1.2 billion) suggests these costs, alone, could present a significant management challenge for the Superfund program. The challenges that are suggested by the hardrock mining inventory are amplified by the fact that EPA's Superfund program has experienced shortfalls in the last 2 years, resulting in some cleanup activities being stopped, and program increases are not anticipated.

The management and financial challenges from current and potential future hardrock mining sites are not proportionately distributed throughout the country. Region 4 is accounting for almost half of the total projected cleanup costs reported (\$11 billion out of \$24 billion). The western regions (8, 9, 10) have more mining sites than other regions, and in addition to Region 7, have more sites that pose high-medium ecological and human health risks.

Although a potentially responsible party has been identified at 83 percent of the hardrock mining sites, uncertainties about the complete nature of these parties' liabilities and their ability to pay for cleanup actions over the extreme long-term counteract the positive news that many have been identified. We found that 70 percent of current Superfund sites have a clearly viable potentially responsible party, and 33 percent of sites in CERCLIS and 27 percent of other potential sites have an identified viable potentially responsible party. However, our data also show that at the majority (59 percent) of sites, the projected operation and maintenance period for the cleanup remedy is 40 years to "in perpetuity".

Overall, our research, considered in context with the financial challenges the Superfund program is currently facing, demonstrate that some key actions need to be taken to enhance the effectiveness of Agency decision-making and planning ability with regard to the substantial impacts that hardrock mining are projected to have. Specifically, factors that can effect how much EPA, or other parties, may pay for cleanup of hardrock mining sites include PRPs' long-term viability, efficiency and effectiveness of existing hardrock mining cleanup remedies, and potential efficiency and effectiveness of innovative or promising hardrock mining cleanup technologies. Factors that can effect how EPA will need to direct its limited resources include which regions have a high concentration of hardrock mining sites, or have sites that pose higher risks than other locations. At a

minimum, an appropriate understanding of these factors will raise the Agency's capacity to plan for financial impacts to the Superfund program from hardrock mining sites and develop reasoned, preventative, strategies and program guidance that could minimize financial and environmental impacts.

Recommendations

In view of our analysis of the information EPA officials have provided to us, we recommend that the Assistant Administrator for the Office of Solid Waste and Emergency Response lead, implement or co-implement as appropriate, and as their jurisdiction and authority permit:

- (1) A review and analysis of:
 - (A) the long-term sustainability, and complete environmental liability of businesses involved in current or inactive hardrock mining operations.
 - (B) the type of remediation technologies (engineered or non-engineered) that are in use at existing Superfund hardrock mining sites, and other hardrock mining sites under EPA's jurisdiction. The review should address the projected long-term costs and period of operation of the remediation technologies, assuming a stated cleanup standard.
 - (C) innovative, alternative, or promising new remediation technologies (engineered or non-engineered) that identify enhanced efficiency and effectiveness in addressing remediation of hardrock mining sites and associated waste. The review should address the projected long-term costs and period of operation of the remediation technologies, assuming a stated cleanup standard.
- (2) Continue to support Agency programs and activities related to developing improvements in the Agency's National Hardrock Mining Framework and developing and sustaining Agency expertise in hardrock mining.
- (3) Prioritize Agency assistance and guidance on hardrock mining site management issues based on the immediate risks and overall potential workload that a region is expected to encounter based on the region's hardrock mining profile.

Agency Comments and OIG Evaluation

The actions the Agency has proposed to address our recommendations are generally acceptable as long as the Agency produces tangible evidence, for OIG review, in lieu of the report we recommended, to substantiate completion of their actions. The Agency needs to provide milestones for the completion of these actions.

Summary of the General Mining Law of 1872

The General Mining Law of 1872 was passed to encourage mineral resource development and the settlement of the Western United States. As amended it offers easy private access to hardrock mineral resources on open public domain lands. The law allows individuals and corporations to: 1) freely prospect for hardrock minerals on Federal lands; 2) mine the land, if an economic deposit is found; 3) sell the extracted minerals without reimbursing the Government; and 4) purchase, or "patent," the land for a nominal sum of \$2.50 or \$5.00 an acre. Once patented, the mining claim becomes a recognized private interest that can be traded or sold. As a consequence, mineral and economic development in the West has been significant. The General Accounting Office estimated in 1992 that "over 3.2 million acres of Federal land had been patented under the 1872 law." Arguments in favor of little or no change to the 1872 Law are made on the grounds that it "embodies principles important to efficient mining: self-initiation of mineral rights, access to prospects, exclusive right to develop a prospect, and security of tenure to 'hold' a discovery."

Critics of the 1872 Law say it is outdated and that the Government (as a steward of the land for its citizens) gets very little return for making the land and mineral resources available. Because the effective price paid by mining companies to use Federal lands and extract the minerals does not equal the economic value of neither such use nor of the minerals, the 1872 Law "effectively transfers wealth from the U.S. public to the hardrock mining industry." Moreover, discrepancies between Federal and State bonding requirements for mined lands have caused concerns that a land patenting provision of the 1872 Law provides mine operators relief from the stricter Federal bonding requirements. The main concern is that some States' regulations have not kept pace with Federal regulations in requiring sufficient financial assurances to restore the land if owners cannot do so. A 1994 Congressional Research Service Report for Congress cites several economic arguments for reform of the law: 1) because the U.S. hardrock mining is a mature industry and the West is now economically developed, the 1872 Law is obsolete; 2) the 1872 Law pays little mind to values embodied in environmental concerns or to alternative uses of the land; 3) as a matter of economic equity, citizens, who as a whole own the land and the minerals, should receive fair value; 4) shortcomings in the law that invite abuse of the claim and patent system diminish the intended economic benefits; 5) treatment of hardrock mining under the 1872 Law is inconsistent with the treatment of extractive industries on other Federal lands.

Survey

**Financial Responsibility
for Superfund Mining Sites**

If you have any questions about the use of this database please contact:
Tina Lovingsood at (202) 556-2504 or Barry Parker at (202) 556-2913.

If specific data is to be Enforcement Confidential check the "Enforcement Confidential" checkbox for the field.

If all of the data in this report is Enforcement Confidential please click here -> [Set All Values Enforcement Confidential](#)

Submitted by: Tina Lovingsood on: 06/11/2003 08:45 AM

☒ Additional Reader:

☒ Additional Editor:

Use of this field gives the selected persons EDIT access to this document. This is helpful when a person is responsible for Updating or Editing a survey form that someone else has created. Please use the drop-down arrow to select the additional editor(s). Thank you.

Use of this field gives the selected persons READ-ONLY access to this document. This is helpful when one person is responsible for Creating and Updating a survey form but would like to allow others to review it. Please use the drop-down arrow to select the additional readers. Thank you.

GENERAL INFORMATION

Region(s)	State(s)	Coordinates Latitude/Longitude	ID Number(s)
1	AL	LAT: 42 LONG: 33	☒ EPA ☒ CERCLA ☒ RCRA ☐ EPA ID ☐ CERCLA ID ☐ RCRA ID ☐ CWA ID ☐ State ID ☐ SPILL ID ☐ Other ID ☐ CWA ☐ Rule ☐ SPC # known ☐ Other
☒ Enforcement Confidential Mine/Mill/Smelter Site Name: (Mine, Mill, and Primary smelters only) Site Name: Junk		Type of mine/mill/smelter: (check all that apply) Gold	
☒ Enforcement Confidential Current or Prospective Site of Concern? ☒ Current ☐ Prospective		☒ Enforcement Confidential Specify Whether Defined Site or Watershed ☒ Defined Site ☐ Watershed	

List all known site IDs and check the boxes for the programs they correspond to. If site ID numbers are not known, but another program is overseeing activity at the site, please check the program box for that site.

CURRENT means the site is being addressed under some Federal or state program. **PROSPECTIVE** means site is of potential concern to EPA because PRP or state may not be able to address problem and EPA may need to fund the cleanup.

SITE OPERATION	
Start Date of Operation (Year is 1990) Year: 1950 Estimate? ☐ Yes ☒ No	End Date of Operation (Year is 1995) Year: 1985 Estimate? ☐ Yes ☒ No
Current Status of Operation ☐ Active ☐ Inactive ☒ Abandoned	
☒ Information Confirmed	
Brief Site Summary purpose, location, address to information put in state NPL site summary Junk	

Specify year of start. If exact year is uncertain then give the best estimate and check the box that indicates best estimate.

Specify year of end. If exact year is uncertain then give the best estimate and check the box that indicates best estimate. If currently operating then check the currently operating box.

Example paragraph: Please limit to 2 paragraphs.

The site is located at and near the location of the former ore processing facilities. These facilities were developed to remove copper from ore mined in from about (year) to (year) when the smelter closed. Milling and smelting produced wastes with high concentrations of (contaminants). These contaminants pose (actual or potential) risks to human health, to life in nearby streams, and to plants and animals in adjacent lands over some (f) square miles. In addition to the (f of cubic yards) of tailings, (f) tons of slag, fine dust and aqueous miles of soil contaminated by airborne wastes, (f) of gallons of ground water have been polluted from wastes and soils. (PRP) purchased the site in (year) and is the PRP of the site.

In (month, year) the EPA placed the area surrounding the smelter on the NPL and EPA, the State, and (the PRP) began investigations into the extent of contamination. Since (year listed) removals and cleanup actions have reduced human health risks at the site. Also, there (are or are not potential) natural resource trustee claims.

OR FOR PARAGRAPH 2:

The site has not been listed on the NPL and/or the site is not listed in CERCLIS, and/or is in the state inventory.

SUPERFUND STATUS	
Indicate National Priorities List (NPL) status ☐ NPL ☐ CERCLIS Non-NPL ☒ Neither	
Please indicate Lead ☐ EPA ☐ State ☒ Other Lead ☐ Other Federal Agency ☐ Tribal	
If other please list: Junk	

CONTACT INFORMATION	
RPM/OSC/EPA Contact (if applicable): Junk Phone: 1	Regional Attorney Junk Phone: 1

PAST COSTS	
☒ Information Confirmed Past Costs for site \$2,000,000	☒ Information Not Available What Activities do the past costs cover? Junk

Example statement of what past costs covered: past costs have been expended to cover the cost of ? removal actions and site assessment activities.

Please include assumptions and what is included in costs estimate (i.e. cleanup, O&M costs, closure, post closure, water treatment, the number of years of maintenance, etc).

The definition of Capital Costs is "Expenditures required to construct a remedial action; They are exclusive of cost required to maintain the action." This definition is detailed in the document entitled "A Guide to Developing and Documenting Cost Estimates During the Feasibility Study" (EPA-540-R-00-002) pages 3-1 and D-1.

MAINTENANCE COSTS			
☐ Information Confirmed			
Sources Providing Maintenance Costs			
☐ Federal (Actual) ☐ Federal (Projected)	☐ State (Actual) ☐ State (Projected)	☐ PRP (Actual) ☐ PRP (Projected)	☐ Other (Actual) ☐ Other (Projected)
Annual Federal Maintenance Costs (Actual) ☐ 0 - No Cost ☐ \$200K to \$500K ☐ \$1 Million ☐ \$1 to \$100K ☐ \$500K to \$1 Million ☐ Unknown			
Annual Federal Maintenance Costs (Projected) ☐ 0 - No Cost ☐ \$200K to \$500K ☐ \$1 Million ☐ \$1 to \$100K ☐ \$500K to \$1 Million ☐ Unknown			
Annual State Maintenance Costs (Actual) ☐ 0 - No Cost ☐ \$200K to \$500K ☐ \$1 Million ☐ \$1 to \$100K ☐ \$500K to \$1 Million ☐ Unknown			
Annual State Maintenance Costs (Projected) ☐ 0 - No Cost ☐ \$200K to \$500K ☐ \$1 Million ☐ \$1 to \$100K ☐ \$500K to \$1 Million ☐ Unknown			
Annual PRP Maintenance Costs (Actual) ☐ 0 - No Cost ☐ \$200K to \$500K ☐ \$1 Million ☐ \$1 to \$100K ☐ \$500K to \$1 Million ☐ Unknown			
Annual PRP Maintenance Costs (Projected) ☐ 0 - No Cost ☐ \$200K to \$500K ☐ \$1 Million ☐ \$1 to \$100K ☐ \$500K to \$1 Million ☐ Unknown			
Annual Other Maintenance Costs (Actual) ☐ 0 - No Cost ☐ \$200K to \$500K ☐ \$1 Million ☐ \$1 to \$100K ☐ \$500K to \$1 Million ☐ Unknown			
Annual Other Maintenance Costs (Projected) ☐ 0 - No Cost ☐ \$200K to \$500K ☐ \$1 Million ☐ \$1 to \$100K ☐ \$500K to \$1 Million ☐ Unknown			
TOTAL Estimated Maintenance Costs - \$8 Million++			
☐ Information Confirmed			
How Long are Maintenance costs expected to be needed?			
☐ 0-2 years ☐ 3-4 years ☐ 40-100 years ☐ In perpetuity ☐ Unknown			

REMOVAL ACTIONS			
☐ Information Confirmed		☐ Information Confirmed	
Number of Removal Actions that have occurred		Are Removal Actions currently ongoing?	
More than two have occurred		☐ Yes ☐ No ☐ Unknown	
Briefly describe Removal Actions			
JUNE			
☐ Information Confirmed			
Removal Actions Costs			
☐ Federal (Actual) ☐ Federal (Projected)	☐ State (Actual) ☐ State (Projected)	☐ PRP (Actual) ☐ PRP (Projected)	☐ Other (Actual) ☐ Other (Projected)
Federal Removal Costs (Actual) ☐ 0 - No Cost ☐ 1 Million or less ☐ 2 to 5 Million ☐ 5 Million or more			
Federal Removal Costs (Projected) ☐ 0 - No Cost ☐ 1 Million or less ☐ 2 to 5 Million ☐ 5 Million or more			
State Removal Costs (Actual) ☐ 0 - No Cost ☐ 1 Million or less ☐ 2 to 5 Million ☐ 5 Million or more			
State Removal Costs (Projected) ☐ 0 - No Cost ☐ 1 Million or less ☐ 2 to 5 Million ☐ 5 Million or more			
PRP Removal Costs (Actual) ☐ 0 - No Cost ☐ 1 Million or less ☐ 2 to 5 Million ☐ 5 Million or more			
PRP Removal Costs (Projected) ☐ 0 - No Cost ☐ 1 Million or less ☐ 2 to 5 Million ☐ 5 Million or more			
Other Removal Costs (Actual) ☐ 0 - No Cost ☐ 1 Million or less ☐ 2 to 5 Million ☐ 5 Million or more			
Other Removal Costs (Projected) ☐ 0 - No Cost ☐ 1 Million or less ☐ 2 to 5 Million ☐ 5 Million or more			
TOTAL Estimated Removal Actions Costs - \$40 Million to \$40 Million++			
Briefly describe in a few words the removal actions (i.e. provide alternative drinking water, repair, impoundment leak, etc.)			

UNRECOVERABLE SUPERFUND TRUSTFUND COSTS

☐ Information Confirmed Amount of Unrecoverable Superfund TrustFund costs ☐ Known ☐ Unknown How much? \$	☐ Information Confirmed Are Unrecoverable Superfund TrustFund costs Actual or Projected? ☐ Actual ☐ Projected
--	--

Unrecoverable means costs are generally believed to be unlikely to be reimbursed from a PRP or other source.

POTENTIALLY RESPONSIBLE PARTY (PRP)

PRPs should be MAJOR PRPs, not dominics or demicromis PRPs. You will be able to list up to 10 separate PRPs.

☐ Information Confirmed									
PRP-01	PRP-02	PRP-03	PRP-04	PRP-05	PRP-06	PRP-07	PRP-08	PRP-09	PRP-10
Potentially Responsible Party #1									
List PRPs (if known) or Federal Facility or other financial contributors									
Junk									
Characterize the PRP's liability									
☐ Clearly liable					☐ Burden is tied to bankruptcy				
☐ Potentially liable					☐ PRP liability is suspect or largely unknown				
Are PRPs or contributors US or Foreign owned? (if known)									
☐ US owned					☐ Foreign Owned		☐ US & Foreign Owned		☐ Unknown
Are PRPs a subsidiary of a larger parent company?									
☐ Subsidiary					☐ Not Subsidiary		☐ Both		☐ Unknown
Indicate approximate cost percentage to be paid by PRP, Federal Facility, or other contributor									
to									
Upon what is this estimate based? Enforcement agreement, order, best guarantee, other									
of									

The approximate cost percentage means the fraction of total cleanup costs to be contributed by the PRP.

FINANCIAL ASSURANCE

☐ Information Confirmed	
To whom has site pledged Financial Assurance (check all that apply)	
☐ State ☐ BLM ☐ EPA ☐ Other	
☐ Information Confirmed	
Amount of Financial Assurance	
☐ Known ☐ Unknown	
List amount: \$	
Specify mechanism used (check all that apply)	
☐ Self Assurance (financial or corporate letter)	☐ Other (trust fund/letter of credit/bonding/other)
☐ Insurance Policy	☐ Unknown
☐ Information Confirmed	
Is it reasonably expected that financial assurance will be adequate to cover closure, post closure, maintenance costs, and any other costs?	
☐ Yes ☐ No ☐ Unknown	
☐ Information Confirmed	
Please provide narrative about the Adequacy of Financial Assurance	
Junk	

Include criteria used to address adequacy. Include types of costs that won't be covered.

RE: Information Confirmed

If EPA drafted financial assurance regulations under EPA's Superfund 108 authority, similar to DOI's 8809 regulations requiring 100% bonding of reclamation costs, and had a fully funded and implemented program, would these regulations apply to this site?

☒ Would Apply ☐ Would Not Apply ☐ Unknown

RE: Information Confirmed

If potential regulation would apply, would the financial assurance be sufficient to cover the Superfund expenditures?

☐ Sufficient ☒ Not Sufficient ☐ Unknown

RE: Information Confirmed

If not sufficient, why not?

Junk

Is This Mine on Public Lands? (BLM or Forest Service Lands)

☒ Yes ☐ No ☐ Unknown

Were Lands Patented?

☒ Yes ☐ No ☐ Unknown

Patented lands are lands secured by a private party pursuant to the 1872 Mining Law

HUMAN POPULATION RISKS	
RE: Information Confirmed Is Human population currently at risk? (One or more persons at risk = Yes) ☒ Yes ☐ No ☐ Unknown	RE: Information Confirmed Provide narrative regarding Human population at risk Junk
RE: Information Confirmed General assessment of site for Human population at risk ☒ High ☐ Low ☐ Medium ☐ Unknown	RE: Information Confirmed Upon what is the assessment for Human population at risk based? (check all that apply) ☒ Risk assessment ☒ Past Experience ☒ Professional Judgment ☒ Other If other please detail: Junk

Provide qualifications on human population at risk. Include, if applicable and notable, the makeup (Environmental justice, tribal, or other sensitive populations) of human population.

MEDIA AFFECTED	
☐ Information Confirmed Media affected at time of action (check all that apply) ☐ Ground water ☐ Soil ☐ Unknown ☐ Surface water ☐ Sediment ☐ Air ☐ Wetlands	☐ Information Confirmed Narrative regarding media affected (optional) Junk

ACID MINE DRAINAGE (AMD)
Is AMD currently occurring at this mine and/or is a remedy in place to address AMD? ☐ Yes ☐ No ☐ Unknown

CONTAMINANTS
☐ Information Confirmed Contaminants of Concern Arsenic, Copper, Cadmium

ECOLOGICAL/ENVIRONMENTAL RISKS	
☐ Information Confirmed Is there current Ecological or Environmental risk? ☐ Yes ☐ No ☐ Unknown	☐ Information Confirmed Narrative of Ecological or Environmental risk Junk
☐ Information Confirmed General Assessment of site for Ecological or Environmental risk ☐ High ☐ Low ☐ Medium ☐ Unknown	☐ Information Confirmed What is the assessment for Ecological or Environmental risk based? (check all that apply) ☐ Risk assessment ☐ Past Experience ☐ Professional judgement ☐ Other If other please detail: Junk

Provide qualifications on ecological/environmental risk. Provide the makeup (endangered species, etc.) of ecology if notable.

CLEANUP STATUS
☐ Information Confirmed Present status of cleanup efforts in RUMS

DATA	
☐ Enforcement Confidential	
Please describe any assumptions made about data provided or not provided.	
Data is junk for display purposes	
Indicate the source(s) for the data you provide	
Junkyard	
Indicate any limitations there are on the data (i.e. reliability of data, etc.)	
Not to be used for other than display purposes	
Please provide any information you have on states' inventories	
None	
Provide qualifications on ecological/environmental risk. Provide the makeup (endangered species, etc.) of ecology, if notable.	
OTHER COMMENTS	
☐ Enforcement Confidential	
Provide any other information about the site that you want us to know	
The information is enforcement confidential	

Details on Scope and Methodology

Our evaluation question was: "Is there a financial impact on the Trust fund and on States from hardrock mining sites?" The report summarizes the first part of the evaluation that will be used to answer the objective. In order to answer the evaluation question, we needed to obtain an inventory of hardrock mining sites. We defined the sites to be included in the inventory as all non-coal mines, mills, and primary smelters that had cost or have the potential to cost the Trust fund \$1 million or more.

To collect site-specific information, we developed a survey instrument that we sent to EPA officials in all 10 EPA regions (see Appendix B). The survey comprised several sections of questions that addressed:

- general information of the site, including its name, location, current cleanup status, type of mine (i.e., gold, silver, phosphate, etc.) and if the site was a current or prospective site of EPA concern;
- the Superfund status of the site (i.e., NPL, CERCLIS Non-NPL, or Potential [Non-CERCLIS/Non-NPL]) and its current lead responsibility;
- cost information for the site in a series of cost ranges, including each site's past costs, total projected cleanup costs, capital costs, maintenance costs, and removal costs;
- the media that had been affected at the site, including the presence of acid mine drainage, and the current human health and ecological/environmental risks (high, medium, low, or unknown) as rated by the survey respondents; and,
- the regional survey respondent's opinion of PRPs' viability.

As mentioned above, we asked regional officials to provide information on human health and ecological risk. Since the Hazard Ranking System is not an effective tool for measuring relative risk¹², we developed a framework for focusing on relative risk. We created the three general risk assessment tiers of high, medium, and low. We also asked regional officials to identify sites where the human health risks were unknown. By using

¹² According to EPA, the Hazard Ranking System is not a risk assessment tool, but rather, a way to screen out sites that are not likely to be of sufficient risk to warrant NPL listing, and at the same time, provide enough information for the purpose of, according to 40 Code of Federal Regulations Part 300, "identifying for the States and the public those facilities and sites which appear to warrant remedial actions." The tool is not effective for measuring relative risk because: (1) site managers do not always score all pathways because once they reach 28.5, they stop scoring, (2) the original Hazard Ranking System versus the revised Hazard Ranking System is not comparable, (3) it is difficult to compare potential risk to actual risk, and (4) the score may not accurately reflect risk.

these assessment tiers, the team planned to gain an understanding of the relative risk for mining sites in the universe. We did not specifically define these assessment tiers; rather, we expected that these assessments would be subjective, and based upon the site manager's experience. However, we did gather information on the factors that contributed to the site managers' assessments.

It is possible that the risk a site posed at NPL listing is different than the current risk which we asked about. For example, when a site was originally listed on the NPL it might have been subjectively rated as a high risk. However, due to remediation efforts or removal actions, the site may now be rated as a low risk. In addition, it is possible that if the remediation for a current low risk site is not maintained, it could become a high risk site. We did not verify the risk ratings assigned by the respondents, and it is possible that the respondents were not risk assessors.

In developing the survey, we met with EPA headquarters officials from OSWER and OECA. We also consulted with members of EPA's NMT and EPA's AMLT asking for input and suggestions. In addition, we field tested the survey instrument with EPA headquarters and regional officials in May 2002. We revised the survey instrument to include appropriate EPA officials suggestions, clarifications, and comments.

In August 2002, we sent the survey instrument along with instructions to mining site managers and management officials in EPA's 10 regional offices and at Headquarters. In December 2002, we asked regional management officials to confirm or correct information for each site specific survey response entered into the OIG survey database.

In February and March 2003, we performed fieldwork in Regions 7 and 8. We conducted data verification for selected sites in these regions. We focused our data verification efforts on cost data, and human health and environmental/ecological risk data, and the status of cleanup. Verification for the purposes of this evaluation meant that we asked regional officials to verify survey information submitted into the database to make sure that it was accurate and complete. It also meant asking for explanations of certain data and obtaining selected documentation where available. We also asked regional officials:

- ☐ to identify guidance documents used to develop the cost estimates in the survey responses.
- ☐ for the documentation that supported the cost estimates, and where none was available, we asked for regional officials to explain the logic they used to develop the cost estimates.
- ☐ for supporting documentation for the ratings decisions for current human health and ecological/environmental risks that were rated as high, medium, low, or unknown.
- ☐ to answer a series of structured interview questions and checklists relating to their survey responses in order to add support for the information contained in their survey responses. For our visit to Region 8, we refined this set of supporting

interview questions and checklists to again gain additional support for the information in survey responses.

- ☐ to review their earlier submitted survey responses and to verify the accuracy of, or correct, the information they provided for these hardrock mining sites.

We also conducted a site visit of the Clear Creek Mine site in Region 8.

In April 2003, we asked officials in the remaining eight Regions to answer the same series of supporting questions and checklists we used for our interviews in Region 8. We made some slight modifications so that we could send these electronically to the other regions. Again, we asked regional site managers and officials to review their earlier submitted survey responses and to verify the accuracy of, or correct, the information they provided for these hardrock mining sites. At the conclusion of our data verification process in June of 2003, we had received an approximate 90 percent response rate for the supporting information for the sites entered into the OIG database.

We reconciled the OIG universe to the universe of sites compiled by the AMLT. We determined that 156 of the site specific survey responses met our definition for hardrock mining sites that had either cost or had the potential to cost the Superfund Trust fund \$1 million or more. While we used this inventory to help answer our evaluation question, we recognize this inventory may be understated. It does not include coal sites by definition and it does not include all Federal sites, sites that States may not have shared with EPA, sites which are too early in the process to identify them as meeting our definition, and hardrock landfill or dump sites. It may also be understated based on the regional officials' interpretation of the OIG definition of sites to be included in the database. Also, we did not presume that sites that were not NPL sites would ever make it to the NPL, though respondents did indicate sites where they believed the Federal government might eventually be needed to fund the cleanups.

Agency Response to Draft Report

March 5, 2004

MEMORANDUM

SUBJECT: OSWER Response to the Office of Inspector General's Evaluation Report entitled "Nationwide Identification of Hardrock Mining Sites"

FROM: Marianne L. Horinko/s/
Assistant Administrator
Office of Solid Waste and Emergency Response

TO: Carolyn Copper
Director of Program Evaluation: Hazardous Waste Issues
Office of Inspector General

This memorandum transmits the consolidated response from the Office of Solid Waste and Emergency Response (OSWER), the Office of Research and Development (ORD), the Office of Radiation and Indoor Air (ORIA), the Office of Federal Activities (OFA), the Office of Water, the EPA National Mining Team (NMT), and the Abandoned Mine Lands Team (AMLT) on the Office of Inspector General's (OIG) Draft Evaluation Report entitled "Nationwide Identification of Hardrock Mining Sites" issued in February 2004. We would like to convey our appreciation for the significant effort the OIG staff put into gathering information, developing findings and providing recommendations.

The Agency has significant concerns regarding the interpretation and analysis of information contained in this draft on the risk levels found at National Priorities List (NPL) and non-NPL hardrock mining sites. We also have concerns with the cleanup cost estimates in the report. Despite these concerns, the Agency agrees with most of the recommendations laid out in the draft report.

This memorandum highlights our concerns. We are also providing specific comments and replacement language in Attachment A. We request that the OIG revise the draft report to incorporate our comments.

Risk Levels at Hardrock Mining Sites:

We are concerned that the report concludes that there are low to unknown human health risks at many of the hardrock mining sites (Executive Summary and Chapters 3 and 6). The Agency has, over the last 20 years, placed mine sites on the NPL because they presented

potentially significant risks to human health and the environment. During that period, a variety of remedial and removal actions have been implemented by the Agency and by Potentially Responsible Parties (PRPs) which have led to significant reduction in risks at these sites. Therefore, the report should explain that many of these sites have low current risk due to early Agency or PRP response actions taken in prior years. The report should also note that Superfund site response is designed to control both current and future exposures, but the survey asked only about current risks.

The Agency recommends that language in the Executive Summary and Chapters 3 and 6 be revised to state the following: "There is some uncertainty regarding the level of human health and environmental risk at the NPL sites and sites included in CERCLIS. The regional field personnel who responded to the questionnaire were asked to broadly characterize "current risk" at the sites as high, medium, low, or unknown. This called for a subjective opinion of current conditions that did not account for the risks that were previously reduced."

The Executive Summary and Chapters 3 and 6 should be further revised to recognize that "Future risks at NPL sites may be substantially higher than current risks because portions of these sites may be developed in the future, and this development could significantly change risks posed at these sites." For example, some sites on the NPL may be currently zoned for commercial or industrial land use. This designation could change in the future to residential land use, thereby increasing the risks posed by the contaminated property.

The Report should also note that many of the non-NPL sites have not undergone a full risk characterization. Since these studies have not been completed, it is highly unlikely that the survey respondents would have enough information to accurately characterize a site as having a high, medium, low or unknown risk. Even though the questionnaire asked for the basis of this broad characterization of risk (e.g., risk assessment, past experience or professional judgment), the report itself does not reflect the bases of the risk characterization. For example, the report does not indicate what portion of the medium risk sites was based on actual risk assessment as opposed to the person's past experience or professional judgment.

Costs to Address Hardrock Mining Sites:

The report gives the overall impression that cleaning up the 156 sites will be very expensive and beyond the capability of the Superfund program. This impression is conveyed by giving equal weight to costs for NPL and non-NPL sites, and doing a good deal of the analysis based only on maximum estimated costs. The report should note that many of these sites may never rise to Superfund attention because the risks do not warrant such actions, or these sites may be addressed by site owners and operators under state or Federal regulatory programs.

Our major concern is that the report uses the maximum estimated cleanup costs from the cost range reported by the survey respondents. For example, Region 4 filled out the survey using the \$100 to \$500 million cleanup cost estimate for the 22 phosphate mining sites in Florida. The Region believes that site cleanup costs will most likely fall at the lower end of the \$100 to \$500 million range. The difference between the low and high end of the cost for these 22 sites is about **\$8.8 billion** (\$2.2 billion versus \$11 billion). **This is a major difference in total costs**, and we request that the report explain that cost estimates represent the upper boundary of a cost range which may be significantly lower.

The Agency also requests that the OIG report use different types of cost estimates based on the reliability of costing data. For example, there are a limited number of sites where EPA or the state has calculated a site specific cleanup cost. The cost estimates for those sites should be identified and separated from the cost estimates for the other sites.

An illustrative example of this is the cost data provided by Region 4. The Region indicated that these data are very speculative because they are based on uncertainties regarding the extent of the problems, contaminant levels, cleanup criteria, and whether the sites will be enforcement vs fund-lead. Region 4 conducted some initial cost calculations for the cleanup of a 500 home subdivision and estimated a cost of \$375,000,000. The Region then extrapolated this data over the 40,000 acres of residential development and the even larger nonresidential mining areas. Using this approach, it is easy to calculate cleanup costs in the billions of dollars.

Another factor that needs to be considered in presenting costs is whether PRPs will pay for these cleanups, or states will take the lead in addressing these hardrock mining sites. The report indicates that \$13.8 billion (maximum estimate in Figure 5.6) will be needed to cleanup sites which pose a risk to human health. The report should note that until the Agency determines if viable PRPs exist or states are willing to take the lead, the extent of EPA Superfund lead expenditures cannot be determined. The IG does address this issue in the survey since they asked respondents to determine if a PRP existed. However, the Agency believes that many respondents noted that there was no PRP because a PRP search had not yet been conducted.

OIG Report Recommendations:

The report provides several good recommendations that, if implemented, would enhance the effectiveness of Agency decision-making at hardrock mining sites. The Agency generally agrees with the recommendations but disagrees that it should prepare a report on all these actions. The Agency proposes to do the following:

- The Office of Solid Waste and Emergency Response, through the AMLT, will work with the Office of Site Remediation Enforcement to conduct an analysis of the environmental liability of businesses involved in current hardrock mining operations.
- The AMLT will work with the Regions to analyze the type of remediation technologies that are in use at Superfund hardrock mining sites to capture the capital and long-term costs and period required to meet cleanup standards. The AMLT will add this data into the upcoming abandoned hardrock mines website.

- The AMLT will work with the Technology Innovation and Field Services Division in the Office of Superfund Remediation and Technology Innovation and the Office of Research and Development and Federal land management agencies to identify innovative or new remediation technologies which may potentially be used to address hardrock mining sites. The AMLT will hold a technical workshop next year with the Regions, ORD and other federal, state and tribal agencies on the applicability of innovative and other new technologies at hardrock mining sites. The AMLT will add new information, as it becomes available, to the upcoming abandoned hardrock mines website.
- The Agency will continue supporting programs and activities related to improving the Agency's Hardrock Mining Framework and developing and sustaining Agency expertise in hardrock mining through activities of the AMLT and NMT.
- The NMT will work with the team representatives from the regions having the greatest level of mining activity (Regions 4,7,8,9,and 10) to assess technical or other guidance needs on hardrock mining management issues. The NMT will update senior Agency management on high priority issues raised by any Region.

We appreciate the opportunity to respond to this draft report. Should you have any questions concerning our comments and action items, you may contact Shahid Mahmud at 703-603-8789 or Johnsie Webster, OSWER Audit Liaison, at 202-566-1912.

Attachment

ATTACHMENT

Specific Comments/Recommended Language

A. Comments related to Risk Levels at Hardrock Mining Sites:

No.	Chapter, page	Comment
1.	Executive Summary, Results	Comment: The characterization of human health risk as low should be qualified to acknowledge that this was based only upon current exposures and risk at the time of the survey, and that neither the survey nor the report addresses exposures and risk which might be expected in the future. It should also be noted that some of the sites addressed may have had removal actions completed before the survey, thereby lowering the risk that existed at the time of the survey. Proposed Alternative Language: The Regional field personnel who responded to the questionnaire in Appendix B were asked to characterize "current risk" at the sites as high, medium, low, or unknown. This called for a subjective opinion that did not account for the risks that would lead to a site being listed on the NPL. Current risks might be low because removal actions or remedial actions had already been completed. Further, risks at NPL sites may be substantially higher because portions of these sites may be developed in the future and this development could significantly increase risks posed at these sites. Superfund site remediation is designed to reduce or control both current and future exposures.
2.	Executive Summary, Recommendations page ii	Comment: While we agree that immediate threats to human health in general warrant a quicker response than less immediate threats, the prioritization discussed in the last sentence on page ii should not be limited to immediate impacts. Prioritization of sites with contaminants like lead, cadmium and arsenic need to recognize that such contaminants are environmentally persistent and tend to bioaccumulate. It can sometimes take years for human health exposures to cause toxic effects. These contaminants pose very real human health threats of a chronic nature, which should be reflected in prioritization and in this discussion.

3.	Chapter 1, page 5	Comment: It is unclear whether current mining practices cause less contamination and environmental damage than practices in the past. Unless a significant number of recently mined sites, with more advanced practices for environmental protection, are being addressed as Superfund sites, we recommend that this text be modified, or at least note its limited relevance to Superfund sites.
4.	Chapter 1, page 7	Comment: The third of the five bullets on page 7, which describe the survey, should be emphasized to reflect that only current risk was characterized. It should be clear that the survey did not address changes in reasonable future land uses. Certain changes (e.g., industrial to residential, or encroachment of human populations in areas which were historically remote) could lead to substantially greater risks which would go unabated unless the sites were cleaned up to protective standards.
5.	Chapter 1, page 8	Comment: The fourth bullet on the Limitations of the Information collected speculates that actual risk today may be even less than at the time of the survey because cleanup may have been provided for some of these sites after the survey. While this may be possible, the report should acknowledge that risks may also be higher. Land development pressures into areas of mine waste contamination may lead to greater human exposures and risk in the future than those which existed at the time of the survey. In support of this position, we note that the National Contingency Plan (40 CFR Part 300, the regulations for Superfund) states that risk assessments, upon which remedy selection is based, are to address reasonable maximum exposures, which go beyond current risk. Proposed language at the end of the 4th bullet: However, it is also likely that human health risk at some of these sites could be greater in the future as development expands into areas of mine waste contamination, unless the site is cleaned up.

6.	Chapter 2, pages 15-16	Comment: The discussion neglects to mention several toxic effects of these contaminants at mining sites. It should be noted that children are at greater risk to lead (than adults), and that some of the developmental effects are subtle, yet real (e.g., depressed IQ). It should also be noted that dermal exposures to arsenic may cause hyperkeratosis and hyperpigmentation and that oral and dermal exposures (to arsenic) may cause skin cancer. Zinc's ability to cause gastrointestinal distress and discomfort should also be noted. It is recommended that EPA's Integrated Risk Information (IRIS, website: http://www.epa.gov/iriswebp/iris/) and the Agency for Toxic Substances and Disease Registry (ATSDR) Toxicological Profiles (website: http://www.atsdr.cdc.gov/toxpro2.html) be consulted and referenced for a more comprehensive discussion of the toxic effects of these contaminants.
7.	Chapter 2, page 20	Comment: The discussion of operation and maintenance costs of pumping and treatment of groundwater remedies is not correct. Pumping groundwater as part of a remedial action (e.g., 90% Federal, 10% State) is funded for 10 years only for remedies restoring groundwater to a beneficial use. If the remedy is pumping groundwater to contain a plume, the pumping is not viewed as an O&M cost.
8.	Chapter 3, page 24	Comment: Note again that the characterization of risk as low is based upon current risk, and does not address future risk, which may be greater unless cleanup is provided. Suggested edit, to be inserted at the second sentence on page 24: Note that future human health risk could be greater if areas containing mine wastes are developed without site cleanup.

9.	Chapter 3, page 28	Comment: Additional text should be added to this discussion to reflect that the low risk at some of the mining sites may be low because removal actions had already been completed (a good thing from the perspective of public health protection). It should also be noted that future risk was not addressed, and that risk in the future may be greater as development leads to human exposures and risk in areas of mining contamination, unless the site is cleaned up. Suggested edit, add as the third sentence on page 28: It should be noted that the survey asked about current health risk. Future health risks at these sites could be greater if development occurs in areas of mine waste contamination without site cleanup.
10	Chapter 3, page 28	Comment: We believe that there is additional relevant information on the human health risk at mining sites which should be reflected as an additional conclusion at the end of Chapter 3. The report should note that ATSDR and EPA have worked together on a number of mining sites where lead was the principal contaminant. On several of these sites, ATSDR collected blood samples from children living near the site. Analyses of these blood samples for lead showed a substantial percentage of the children at these sites had elevated blood lead levels. Following site cleanups, additional blood samples were collected and analyzed for lead showing a measurable drop in the blood lead levels attributable to site cleanup and related activities. Such actions represent quantified improvement in the public health of these communities, which should be reflected in the OIG report. Upon request, OSWER will work with its Regional Offices and ATSDR to provide these reports to OIG. Add as second bullet (of the Summary and Conclusions): "In response to a draft of this report, EPA has reported that blood lead samples collected from children near some mining sites before and after cleanups have shown a dramatic improvement with a reduction in the number of children with elevated levels of lead in the blood."

11.	Chapter 5, page 45	Comment: It should be noted again that the risk being characterized is current risk only. This might best be reflected in this section as a footnote on the figure titled "Maximum Projected Federal Capital Costs for Human Health Risks".
12	Chapter 5, page 46	Comment: The following statement is incorrect "In total nearly 100 percent of estimated federal costs to cleanup hardrock mining sites in CERCLIS, are projected for sites that predominately are considered to be low risk or have unknown human health risk." At many of these sites, the states or EPA have not conducted detailed risk assessments. However, almost all of the sites identified in this study are in regions, including Florida, where the availability of water and the quality of the available water are issues of paramount public concern. Contaminated water impacts the health of living resources and also agriculture, municipal and industrial water supplies, and commercial recreation. The socioeconomic effects of contaminated water include the increased costs of water treatment where practicable, the costs of developing additional sources of water where contaminated water cannot be rendered useful through treatment, and ancillary effects such as the inability of urban and rural subsistence fishermen to obtain a safe protein component for their diet. Direct human health risk is a priority for Superfund, but it is not the only objective of the statute. CERCLA section 104 (a)(1) authorizes the President to act, to "protect the public health, welfare, and the environment."

B. Costs to Address Hardrock Mining Sites:

1	Executive Summary, Results	The Report states ... "We identified 156 hardrock mining sites ... to cost between \$7 billion and \$24 billion total to cleanup.." Comment: The report needs to clarify exactly how the IG came up with a list of 156 potential sites requiring Superfund attention. It is necessary to explain to the reader how reliable this estimate is. <i>The IG should use a range of cost estimates based on reliability of data about a site when calculating costs.</i> For example, there are a limited number of sites where EPA or the state has calculated a cleanup cost. These sites having Engineering Evaluations/Cost Assessments (EE/CAs), RODs or other standard Agency response cost calculations should be identified and separated from other sites.
2	Executive Summary, Results	Comment: The report fails to acknowledge that when a site with significant human health or environmental risks is brought to EPA's attention, the Agency's first task would be to identify if a viable PRP exists. The report should clearly state that the vast majority of mine site cleanups are now being paid for by PRPs. There is an assumption in the report that the billion dollar costs needed to cleanup the 156 sites will be primarily borne by the federal government. That may not be the case. We do, however, acknowledge that some portion of these costs may have to be borne by the federal government at high risk sites where there is no viable PRP or states are not willing to address these sites.

3	Executive Summary, Results	The Executive Summary states that: "For cleanups that are financed by Superfund, EPA operates and maintains the cleanup facility for up to 10 years, with the State paying 10 percent of the cost, after which responsibility is turned over to the State." Comment: The above statement is a source of confusion because it is <u>only</u> true for remedies when the Agency pays for groundwater or surface water restoration. For example, if we cap a site, EPA turns the O&M over to the state once the remedial action is complete, not after 10 years. The Report should use the language provided in the NCP Section 300.435 (f)(3) which states: Recommended Language: "For Fund-financed remedial actions involving treatment or other measures to restore ground- or surface-water quality to a level that assures protection of human health and the environment, the operation of such treatment or other measures for a period of up to 10 years after the remedy becomes operational and functional will be considered to be part of the remedial action." <i>Additionally, if the site is within a tribal reservation, there is no equivalent to the state cost-share and O&M requirements.</i>
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4	Executive Summary, Results	Report states that "Region 4's hardrock mining sites account for about half of thecleanup costs" Comments: The cleanup cost range between \$100 to \$500 million in the OIG survey is very broad and capturing the upper bound costs greatly exaggerates the cleanup costs and provides misleading information. For example, Region 4 filled out the survey using the \$100 to \$500 million cleanup cost estimate for the 22 phosphate mining sites in Florida. The Region believes that site cleanup costs will most likely fall at the lower end of the \$100 to \$500 million range. The difference between the low and high end of the cost for these 22 sites is about \$8.8 billion (\$2.2 billion versus \$11 billion). This is a major difference in total costs and we request that the report explain that cost amounts represent the upper boundary of a cost range which may be significantly lower. Region 4 indicated that these data are very speculative because they are based on uncertainties regarding the extent of the problems, contaminant levels, cleanup criteria, and whether the sites will be enforcement vs fund-lead. Region 4 conducted some initial cost calculations for the cleanup of a 500 home subdivision and estimated a cost of \$375,000,000. The Region then extrapolated this data over the 40,000 acres of residential development and the even larger nonresidential mining areas. Doing this approach, it is easy to calculate a cost of cleanup in the billions of dollars.
5	Chapter 5	Comment: Chapter 5 clean-up costs are noted as maximum and minimum estimates. As noted earlier, the report should separate out costs based on reliability of cost information.
6	Chapter 5 pages 45-46	Comment: The report indicates that \$13.8 billion (maximum estimate in Figure 5.6) will be needed to cleanup human health sites. Until the Agency determines if PRPs are available, it is unclear exactly who will pay. The report questionnaire asked the respondents to identify whether a PRP existed. The Agency believes that many respondents noted that there was no PRP because no PRP search had been conducted at that time. The Agency recommends that the OIG add language that points this out.

C. Comments on HRS:

The discussion related to HRS (including the footnote) as a tool for determining relative risk does not seem relevant for this report and contains inaccurate statements. Even when a site scores way above 28.5, it is not given priority over a site that scores at 28.5, since this score is only a threshold number that indicates the need for further investigation. Further investigation leads to much more accurate evaluation of risk. Also, it is true that some sites might score under the revised HRS that did not score under the old HRS, but the revised HRS has been used to score sites for the past 14 years. Most of the current NPL sites have been scored using the newer HRS.

1. Page 63, last paragraph, second sentence: Change to read "The Hazard Ranking System was not designed as a risk assessment tool, but rather as a screening tool, the purpose of which is to identify sites eligible for response action."¹¹
2. We suggest footnote 11 on page 63 be changed to the following:

The Hazard Ranking System (HRS), as described in 40 CFR Part 300 (12/14/90), Hazard Ranking System, Final Rule, is "the primary way of determining whether a site is eligible to be included on the National Priorities List (NPL), the Agency's list of sites that are priorities for long-term evaluation and remedial response, and is a crucial part of the Agency's program to address the identification of actual and potential releases." Section 105(a)(8)A of CERCLA requires that EPA establish: "Criteria for determining priorities among releases or threatened releases [of hazardous substances] throughout the United States for the purpose of taking remedial action and, to the extent practicable taking into account the potential urgency of such action, for the purpose of taking removal action. Criteria and priorities * * * shall be based upon the relative risk or danger to public health or welfare or the environment * * * taking into account to the extent possible the population at risk, the hazard potential of the hazardous substances at such facilities, the potential for contamination of drinking water supplies, the potential for direct human contact, [and] the potential for destruction of sensitive ecosystems * * *." The HRS was developed to meet the described criteria in a quick and inexpensive way. It is important to recognize that the HRS is not a risk assessment tool, but rather a way to screen out sites that are not likely to be of sufficient risk to warrant NPL listing, and at the same time, provide enough information for the purpose of, according to 40CFR Part 300, "identifying for the States and the public those facilities and sites which appear to warrant remedial actions." * * *" This provision is intended to ensure that the Hazard Ranking System performs with a degree of accuracy appropriate to its role in expeditiously identifying candidates for response actions.

D: Other Comments/Editorial: (Redline/Strikeout on specific language in Report)

Page i, Executive Summary - paragraph 2, 1st sentence

Suggest revising this sentence to read "For the purposes of this report, 'hardrock mining' refers to proposed, active, inactive and abandoned mines, mills and mineral extraction facilities from the

metal, phosphate, uranium and industrial mineral sectors; it does not include coal mining, crushed stone quarrying mining, or aggregate mining."

Page ii, Executive Summary - Recommendations

The first sentence is a bit confusing. Suggest the following revision: ".... to enhance the effectiveness of Agency decision-making and planning, concerning the ability of the Superfund program to manage potential financial burdens in implementing cleanups at hardrock mining sites ~~challenges from hardrock mining financial concerns.~~"

Suggest revising the last sentence to read "....and the prioritizing of resources ~~efforts~~ based on immediate human health and environmental risks"

Page 13

Suggest revising the last sentence to read "Because most of the sites in the inventory are abandoned, the extent of EPA liability stemming from complications of locating PRPs is unknown at this time."

page 25

This paragraph needs to be clarified.

"Compared to NPL sites,(is this all NPL sites or just mining sites?) only 30 percent of sites which the Superfund program has in CERCLIS, (is this 30 percent of identifiable mining sites?) but which haven't been yet listed on the NPL, . . . "

Suggest revising the last sentence as shown below.

Twenty-two (or 27%) of these sites with unknown human health risk are phosphate mining and processing sites in Florida . . . " (See figure 3.4).

page 37

"They are exclusive of costs required for (not to) the long-term operation and maintenance of the remedial action.

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