Chapter 9
Site Management Strategies

9.1 Introduction

This chapter presents options that a site manager may consider for managing risk at abandoned mining and mineral processing sites. The site manager may be a State, Federal, or local authority or a private landowner and is most likely managing the site under a number of regulatory and non-regulatory programs. As with any remediation project, strategic planning is critical in abandoned mine characterization initiatives as well as clean-up activities. As part of this strategic planning, the site manager, depending on the specific statutory authority used, the level of resources needed to protect human health and the environment from impacts from an abandoned mine, and the level of resources needed to address those impacts must strike a thoughtful balance in establishing an effective site management strategy.

9.2 Managing for Risk Reduction

Generally, the ultimate goal of all characterization and clean-up activities at abandoned mine or mineral processing sites is the reduction of risk. As discussed in Chapter 6--Scoping Studies, the broad project goals for an abandoned mine-site investigation are to provide the information required to characterize the site and define the risks, and subsequently to develop a program to mitigate risks to human health and the environment.

Risk is comprised of three elements: a source, a receptor, and an exposure pathway by which the receptor is exposed to the hazards from the source. The following describes an example of these elements at mining sites.

> **Source.** At an abandoned mine site, the source may be a waste unit, such as a tailings impoundment, an area of contaminated soil or sediment from which contaminants may be released, or the actual mine pit or underground workings.
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> **Exposure pathways.** The classic pathways for exposure at an abandoned mine site are transport via air (e.g., fugitive dust), ground water (e.g., contaminated plumes), or surface water (e.g., run-off). There are situations at mine sites wherein the pathway is a flow of solid (e.g., waste rock pile slump) or semisolid (e.g., tailings released from an impoundment) waste materials released from a waste unit.
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> In addition to these types of exposure pathways that take the hazard from the source to the receptor, the receptor may actually come to the source for exposure (direct contact). Examples of this include migratory wildfowl landing on contaminated ponds or children playing in contaminated soils; both situations have been observed at abandoned mine sites.
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> **Receptors.** Historically, the primary receptors of concern at abandoned mine sites have been humans. This includes people living or working at the mine site, visitors to the site, and people living downgradient of the site.
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> Additional receptors now also drive the site manager's response, including aquatic species (e.g., fish and invertebrates); terrestrial wildlife (e.g.; invertebrates, birds, and mammals), and floral populations. Often at abandoned mine sites these environmental receptors have been affected in the past and may no longer be present at the time the

actions are taken. Furthermore a whole new ecosystem may have been created by the changes at the mine site. In other cases, for example, where a threat of release is present (e.g., an abandoned tailings dam that about to fail), the floral, terrestrial, and aquatic populations may be in actual and imminent risk of impact.

The importance of using risk-based goals and objectives in developing the risk reduction strategy lies in the ability to reduce risk by addressing all or any one of the risk elements. A hazard from a source that has limited pathways to a distinct receptor population may be controlled simply by eliminating that pathway. For example, an area of metal-contaminated soil may have only fugitive dust or direct exposure as its pathway to any receptor; a covering of clean soil and sod over the soil may virtually eliminate this pathway. While this example does not account for the potential for soil biota to move the contaminants into the food chain, the reduction of major risk pathways (i.e.; fugitive dust and direct exposure) may be considered sufficient for the goal of minimizing risk.

In more complex cases commonly found at abandoned mine sites, the site management strategy must address the source, pathway, and receptors; and most likely multiples of each. For example, both a mine pit and a tailings impoundment may be active hazard sources, while fugitive tailings dust, metal-contaminated groundwater, and acidified surface water may be moving the hazard offsite, thus impacting human and environmental receptors.

To complicate the strategy more, the historic nature of many abandoned mine sites means that exposures have been occurring over time and cumulative effects may need to be taken into account. For example, human populations may have bioaccumulated contaminants. Likewise, ecological resources may have been severely impacted to a point that they are no longer present. An example of this is the effect that dusts laden with zinc, a phytotoxin, have had in eliminating vegetation downwind from certain historically active pyrometalurgical operations. Other examples may be fish populations eliminated from surface waters impacted by acidic or toxic runoff from abandoned mines.

9.3 Categories of Activities that Address Risk Elements

In devising a response strategy to minimize risk, site managers should address the different elements of risk (i.e., source, exposure pathway, and receptor) using one or more of several broad categories of response actions. A variety of actual technological applications, engineering controls, or other activities may be used within each of these response categories. These technologies are discussed in Chapter 10 of this handbook.

Managing the Source. The source of contamination may be addressed by reducing, either in part or entirely, the actual source material through removal (e.g., excavation and removal of chemical-containing drums) or certain types of treatment (e.g., reprocessing of tailings). Because of the large volume of source material (e.g., tailings, waste rock, and smelter slag) that may be of concern at abandoned mine sites, source removal and/or treatment is often infeasible, thus requiring the site manager to strategically focus on collection, diversion, and containment (e.g., capping) activities.

Managing Exposure Pathways. Controlling exposure pathways at abandoned mining and mineral processing sites may be performed by implementing a variety of collection, diversion, or containment activities. These engineering controls often take the form of some sort of capping (e.g., preventing air release or direct contact), damming (e.g., stopping/diverting surface water runoff), or constructing slurry walls (e.g., groundwater management).

An additional management strategy and one of particular importance to managing abandoned mines is control of waste management units (e.g., shoring up tailings impoundment dams or waste rock side dumps that are in danger of failing). This effort prevents the transport of waste materials to new, non-managed locations, as well as preventing the contamination of soil and sediment, wetlands, surface water, and groundwater.

In addition to the control, diversion, and containment responses, exposure pathways may be managed by cleaning up the contaminated media, especially groundwater and surface water which are active transport media (certain contaminated media, such as soil and sediment, are more often considered sources from which air and water may be contaminated and contaminants subsequently transported).

Managing the Receptor Exposure. Controlling the hazard to receptors, whether human or environmental, may include a variety of risk abatement or remediation activities. Individuals may be removed (e.g., evacuated or relocated) if exposure pathways or sources cannot be addressed, this is uncommon. Typically this action is not performed unless extremely high risk is present, a situation not typical of abandoned mine sites. In fact, at many large Superfund mine sites, residents live within the sites and are expected to remain. This presence of human populations, however, may suggest that health intervention and education should be considered to manage exposure until sources and exposure pathways have been controlled.

Similarly, in the case of environmental receptors, population studies may be performed to assess the impacts and risk to the local flora and fauna. In cases where the environmental receptors are significantly reduced or eliminated by historical exposure, the environmental populations may be reintroduced (e.g., restocking, revegetating) or habitat reestablished such that natural repopulation may occur. An example of the latter is stream reconstruction, which is common in parts of the West, during which watersheds are returned to their natural states (e.g., heavy sedimentation removed, riffles and other structure rebuilt, associated wetlands reconstructed). Note that certain stabilization and media cleanup activities may be used to focus on wildlife rather than human health. Examples of this are wildlife fencing to route migratory mammals around mine areas, or draining or netting contaminated ponds to keep waterfowl from the water.

9.4 Time-Based Responses

Armed with the understanding of the categories of responses employed to address specific risk elements, the site manager should further develop the strategic management plan by incorporating the factor of time. In general, site managers should first consider whether any time-critical actions are necessary. If the time critical actions do not completely minimize the risk or are not selected, the site manager should then design a long-term response to remediate the site, and determine whether any expedited response action may be appropriate in the interim (i.e., while long-term response are studies and selected). These three time factors are described as follows:

> **Time-critical actions.** These are immediate actions necessary to address an actual or threatened release. These typically involve removing or stabilizing a threat to human health or the environment.
> **Interim responses.** These are activities that are not time critical but for various reasons (e.g., community needs/desires, because of risk abatement, or to address new findings) need to be performed before a formal study and remediation can be completed. Typical of an interim action are stabilization activities or health-based expedited response actions.

Long-term responses. These responses typically include comprehensive site characterization and evaluation of a variety of long-term clean-up activities. This type of action often requires significant time for the characterization step and to address long-term remediation needs (e.g., permanent reduction of toxicity, mobility and volume of contamination through treatment).

9.4.1 Time-Critical Actions

The first consideration for addressing contamination is the determination of whether or not any immediate threats exist at the mining or mineral processing site. Immediate threats may be an actual, ongoing, or threatened release. Should some immediate threat be identified, the site manager should consider taking action to reduce the immediate risks.

Time-critical actions are characterized by a need for a rapid response to address the immediate threat. Expedited characterization and incremental cleanups are the norm. Under certain regulatory scenarios, these actions are mandated to be short term. Although generally short term, under certain circumstances these actions can be extended. States may use time-critical actions under their own jurisdiction in order to address an immediate threat to its citizens or resources.

Characterization activities, while expedited to address the circumstances, are just as important in planning for time-critical actions as for long-term cleanup actions. The evaluation of threat includes some form of risk analysis, either formal or estimated under the auspices of "best professional judgement." This evaluation should take into account the potential for release (a moot point if the release is on-going), the potential for migration, and the presence and vulnerability of the receptors. Characterization activities potentially include monitoring, assessment, evaluation, and other information gathering activities.

Highlight 9-1
Butte and Walkerville

CERCLA removal actions have been extensively used at the Silver Bow/Butte NPL mine sites. Time-critical removal actions begun at the site in 1988 were based on two facts. First, the cities of Butte and Walkerville are partially located within the site boundaries so exposure potential was high; second, elevated levels of lead and arsenic were detected in the mine waste and in residential yard soils. Based on the potential health effects from the lead and arsenic, EPA believed it was essential that the waste dumps be removed from residential neighborhoods *quickly* rather than waiting for the long term remediation effort to unfold.

Once an immediate threat is identified and/or confirmed, a number of actions may be taken to reduce the risk posed by that threat. Risk reduction activities may include removal or stabilization activities such as removal of sources materials (e.g., excavation and disposal of contaminated materials or waste), removal of contaminated media (e.g., removal of soil contaminated by metals from smelter emissions), reinforcement of containment units (e.g., shoring up tailings dams in danger of failing), or construction of containment structures (e.g, damming ditches or waterways to create reservoirs to contain contaminated runoff). Highlight 9-1 illustrates the use of removal activities in the Butte and Walkerville mining areas in Montana.

With increasing frequency, site managers are likely to be asked to address impacts from abandoned mines sites that pose an immediate risk to the environment. Highlight 9-2 is a brief discussion of how time-critical action in the form of release containment was used at the Talache Mine Site in Idaho.

Highlight 9-2
Talache Mine Site

In May, 1997, a large tailings pile failed at the Talache Mine in Idaho (last operational in the 1960's), releasing tailings containing high concentrations of arsenic and other heavy metals. The tailings washed over and impacted approximately 45 acres of woodlands, 25 acres of wetlands, and 3,000 feet of stream bed. IDEQ, initially took the lead in directing the clean-up of the site, by entering into a "consent decree" with the landowner. Among other stipulations, the landowner was required to immediately implement (during the summer of 1997) a number of "interim corrective actions" to help prevent the migration of additional tailings into the creek the following spring.

It should be noted here that CERCLA also gives EPA the authority to address threats at sites that are not closed or abandoned. This may be of particular importance in the mining sector where mine sites may be inactive rather than abandoned because of the economics of the metals markets. Should a release be justifiably regarded as imminent or substantial threat of release (i.e., a tailings dam failure pending), a Federal or a State agency may step in and take time-critical action to mitigate the risk.

9.4.2 Interim Responses

After considering time-critical activities, site managers should consider whether any opportunities exist for conducting activities that, while not time critical or directed at eliminating the source of contamination, may temporarily decrease exposure from certain pathways. Interim response actions may take any number of forms depending on the needs of the site manager to control or mitigate a situation.

Control, diversion, and containment activities typically focus on controlling exposures or the migration of a release. These activities may be traditional engineering controls (e.g., slurry walls, caps) or may utilize less traditional means (e.g., phytostabilization--see Highlight 9-3). These actions do not necessarily result in a facility being returned to ambient conditions; contamination may still be present and additional investigations or remediation may be required. As long as the containment measures are maintained, however, stabilized facilities commonly do not present unacceptable short-term risks to human health or the environment. This allows site managers the opportunity to shift their resources to health or environmental concerns elsewhere on the site (See Exhibit 9-1 for a review of EPA's RCRA Corrective Action program's Stabilization Initiative).

Highlight 9-3
Phytostabilization

An example of stabilization is phytostabilization, the planting of tolerant grasses on tailings to reduce or eliminate contaminated fugitive dust emissions. This process is considered a stabilization activity because the contaminants are still in the tailings impoundment and the grass does not serve as an isolating cap. The impacts on downwind receptors from the fugitive dust are, however, reduced or eliminated.

Exhibit 9-1. RCRA Perspective

The Program	EPA Office of Solid Waste Corrective Action program
The Problem	Early implementation of the RCRA Corrective Action program focused on comprehensive cleanups at a limited number of facilities. These final cleanups were difficult and time- consuming to achieve. The emphasis on final remedies at a few sites diverted limited resources from addressing releases and environmental threats occurring at many other sites.
The Need	EPA sought to achieve an increased overall level of environmental protection by implementing a greater number of actions across many facilities rather than following the more traditional process of pursuing final, comprehensive remedies at a few facilities.
The Solution	In 1991, the Agency established the Stabilization Initiative as one of the primary implementation objectives for the Corrective Action program.
The Goal	EPA seeks to increase the rate of corrective actions by focusing on near-term activities to control or abate threats to human health and the environment and prevent or minimize the further spread of contamination.

Whereas the goal of control, diversion, and stabilization activities is to control or abate threats to human health and the environment and prevent or minimize the further spread of contamination, Expedited Response Actions (ERAs) may go beyond that goal in that they may include programs to address the actual health or environmental impacts caused by the contamination at issue. A leading example is the lead monitoring and abatement program put in place as part of the Superfund response activities at the Silver Bow/Butte NPL mine site in Montana (See Highlight 9-4). In this particular case one of the potentially responsible parties (PRPs) funded the program. In other cases (e.g., in the absence of any established PRPs), the State or land management agency may need to establish the funding.

Because of the nature of ERAs in addressing health or environmental impacts during an interim period while final action is being formulated and evaluated, they may often run concurrent to risk assessments done as precursors to full-scale remediation. It is important that the ERAs be a component of, or at least consistent with, anticipated final remedies.

Highlight 9-4
Butte/Walkerville ERA Action

In 1994, EPA, in conjunction with the State of Montana and the City of Butte, MT, conducted an Expedited Response Action (ERA) to address elevated levels of lead in residential areas of the City of Butte and the Town of Walkerville. The ERA is a multi-pathway approach which includes: a blood lead surveillance for children less than 72 months old; a lead education/ awareness program for the communities; identification/ monitoring of specific lead sources including lead paint, indoor dust, soil and drinking water; abatement/mitigation of identified sources of lead; establishment of a Lead Advisory Committee; and the cleanup of source area (waste rock dumps and other related mine waste) in residential areas.

This ERA was necessary because a ROD would not be completed until 2001 and there was concern about the elevated blood leads in Butte and the potential for exposure to children from lead sources. This five year project will be evaluated in the Record of Decision (ROD) for the site in 2001 to determine if these actions are addressing the lead sources on this site.

9.4.3 Long-Term Responses

The third strategic consideration for mine-site cleanup is long-term remediation and restoration. These actions are not time-critical and, while linked to or consistent with interim measures, they are not interim in nature. Long-term responses are the final comprehensive cleanup, or if cleanup is deemed unnecessary or uneconomical, the final stabilization and monitoring efforts. Long-term responses also include restoration activities such as revegetation, rebuilding of wildlife habitat, and restocking of fish and wildlife.

The framework of the long-term response varies depending on regulatory and programmatic requirements, the site specific conditions, and the degree of risk posed to human health and the environment. The following activities are generally undertaken to varying degrees.

Scoping. This is the initial planning phase during which available data is collected and reviewed, regulatory requirements evaluated, work teams and community involvement planned and any required health, safety and/or environmental impact plans developed (see Chapter 6 for more on this subject).

Site Characterization. During this phase additional information may be acquired by implementing sampling or analysis programs, or more regular long-term monitoring (see Chapter 7 for additional information regarding sampling and analysis).

- **Risk Assessment.** During this phase the risks to human health and the environment are evaluated (see Chapter 8 for additional information regarding risk analysis). In addition, a risk assessment may be used to evaluate the potential effectiveness of certain response activities.

Response Selection. During this phase the types of appropriate responses, both broadly (see Section 9.3 above), and specifically (See Chapter 10 for additional information regarding Remediation and Cleanup Options) are selected. Typically a range of responses are available and should be evaluated. Highlight 9-5 presents the CERCLA evaluation criteria, some or all of which may be included in non-CERCLA response evaluations, depending on legal requirements or site specific needs.

Response Evaluation. During this phase the responses that were implemented are assessed based on monitoring of the results.

Note that these elements of a long-term remediation effort are typical of the Remedial Investigation and Feasibility Study (RI/FS) and Record of Decision (ROD) development conducted under CERCLA NPL site remediations and the RCRA Facility

Highlight 9-5
CERCLA Evaluation Criteria

CERCLA established specific statutory requirements for remedial actions; remedial actions must; 1) be protective of human health and the environment; 2) attain Applicable or Relevant and Appropriate Standards, Limitations, Criteria, and Requirements (ARARs) or provide grounds for invoking a waiver; 3) be cost-effective; 4) utilize permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable; and 5) satisfy the preference for treatment that reduces toxicity, mobility, or volume as a principal element or provide an explanation in the ROD as to why it does not.

EPA, subsequently developed nine evaluation criteria to address these statutory requirements and the additional technical and policy considerations that have proven important for selecting among remedial alternatives. These criteria are: 1) Overall Protection of Human Health and the Environment, 2) Compliance with ARARs, 3) Long-Term Effectiveness and Permanence, 4) Reduction of Toxicity, Mobility, and Volume, 5) Short-Term Effectiveness (during implementation), 6) Implementability, 7) Cost, 8) State or Support Agency Acceptance, and 9) Community Acceptance.

Assessment (RFA) and Corrective Measures Study (CMS) conducted under the RCRA Corrective Action remediations. As an alternative, a NEPA approach may be considered as presented in Exhibit 9-2 below.

Exhibit 9-2. Insight from a Similar Review Process

The Program	National Environmental Policy Act of 1969 (NEPA) review process
The Comparison	Because of the broad similarities between the remedial investigation/feasibility study (RI/FS) process and the NEPA review process, EPA has determined that CERCLA/SARA is functionally equivalent to NEPA.
Consideration Issues	Specifically, NEPA requires Federal agencies to consider five issues during the planning of major actions: 1) the environmental impact of the proposed action; 2) any adverse impacts which cannot be avoided with the proposed implementation; 3) alternatives to the proposed action; 4) the relationship between short and long-term effects; and 5) any irreversible and irretrievable commitments of resources which would be involved in the proposed action.
The Plan	Generally, the NEPA EIS process produces a document that is similar to a CERCLA RI/FS REPORT or Record of Decision (ROD). Both processes result in a decision document outlining the basis for selection of a preferred alternative

9.5 Strategic Planning Considerations

9.5.1 ARARs

Throughout any remedial action undertaken pursuant to CERCLA at an abandoned mining and mineral processing site, the site manager must consider compliance with CERCLA ARARs. ARARs are Federal, State, and local standards that are directly applicable or may be considered relevant and appropriate to the circumstances on the site. The National Contingency Plan, at 40 CFR 300.5, defines ARARs as:

> Applicable requirements-- Those cleanup standards, standards of control, and other substantive requirements, criteria, or limitations promulgated under federal or state environmental or facility siting laws that specifically address a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance found at a CERCLA site. Only those state standards that are identified by a state in a timely manner and that are more stringent than federal requirements may be applicable.
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> Relevant and appropriate requirements-- Those cleanup standards, standards of control, and other substantive requirements, criteria, or limitations promulgated under federal or state environmental or facility siting laws that while not 'applicable' to a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance found at a CERCLA site address problems or situations sufficiently similar to those encountered at the CERCLA site that their use is well suited to the particular site.

Only those state standards that are identified by a state in a timely manner and that are more stringent than federal requirements may be applicable or relevant and appropriate.

These standards are an inherent part of the scoping process, but also affect the long-term remediation, especially in the setting of cleanup standards as well as in meeting other environmental land use regulations (e.g., regulation pertaining to wetlands and water resources, floodplains, endangered and threatened species/critical habitats, coastal zones, cultural resources, wild and scenic rivers, wilderness areas, and significant agricultural lands).

The consideration of these ARARs should begin in the initial scoping process and be considered throughout design and implementation of the remedial action. Since many abandoned mining and mineral processing sites are located in areas that otherwise may not be considered industrial, some of the ARARs that need to be considered are not common to other sites. For example, a mining site which is located close to a wilderness area with habitat for endangered species and buildings that have been placed on the register of historic places may pose some significantly different management concerns than a site located in a major city. Because of this, the site manager must be aware of all potential ARARs and constantly considering other Federal, State, and local laws, regulations, and policies that will impact the actions at the site. A discussion of Federal ARARs can be found in Appendix D.

9.5.2 State and Other Agencies

The site manager needs to become familiar with the Federal, State, Tribal, and local land management agencies involved with mining and mineral processing site and affected resources. The site manager should identify the appropriate agencies and personnel who should be involved with the remediation process at the mining or mineral processing site as soon as possible. These agencies should be kept involved during planning characterization and clean-up activities that involve the area with which they are concerned.

The NCP in addressing removal actions, states that “EPA shall consult with a state on all removal actions to be conducted in that state.” The NCP clearly delineates state involvement in removal actions on 40 CFR 300.525, where the requirements are described and agreements with EPA discussed. A primary role described for states in 40 CFR 300.525(d) is regarding ARARs, where it states:

> States shall be responsible for identifying potential state ARARs for all Fund-financed removal actions and for providing such ARARs to EPA in a timely manner for all EPA-lead removal actions.

The NCP, in addressing remediation efforts, addresses requirements and agreements regarding state involvement in the RI/FS process, and the selection of remedy, and remediation design and remedial action (40 CFR 300.515(e-g)). State involvement the RI/FS process specific to ARARs are specifically Section 300.515(d), wherein subsections (1) and (2) address identification of ARARs and subsections (3) and (4) address waivers for ARARs.

The NCP, at 40 CFR 300.515(b) stipulate what requirements an Indian tribe must meet in order to be afforded the same treatment as states under section 104 of CERCLA.

9.5.3 Brownfield Initiative

An emerging management tool that may be available to the site manager is the Brownfield Initiative. This program encourages the cleanup and reuse of property that may require environmental cleanup before it can be redeveloped (i.e., brownfields). In the past, redevelopment of these properties often was avoided due to concern about environmental liabilities. Under CERCLA's liability structure present and future owners of contaminated properties can be held liable for cleanup even if they did not cause the contamination. The Brownfield Initiative is an emerging EPA effort to reduce, wherever possible, the barriers to redevelopment of contaminated properties. Where abandoned mine sites are in an area in which the property may have some redevelopment potential (e.g., the city of Butte, Montana has a number of abandoned mine sites within the city's boundaries), site managers should explore opportunities to use the Brownfield Initiative to assist their planning and remediation activities. Additional information can be obtained from the EPA Brownfields website, http://www.epa.gov/swerosps/bf.

9.5.4 Enforcement Considerations

Storm water runoff and discharge of other drainage from inactive and abandoned mines is often subject to State or Federal regulatory program requirements. Historically, these programs have been applied infrequently at inactive or abandoned mines. For example, while adits at inactive and abandoned mines often have discharges that are technically subject to CWA's NPDES requirements, most do not have a permit. Similarly, storm water discharge permits are required at many mines but have never been applied for or issued. In order to develop an effective site management strategy site managers should evaluate the discharges from a mine in the context of applicable State and Federal regulations. In those instances where the mine site has demonstrated contribution to environmental problems, enforcement of existing regulations should be considered an essential element of mitigating risk. Making owners and operators accountable for the discharges from their facilities should always be considered early in the site management strategy development process.

In those instances where current owners or operators are unwilling to comply with provisions of the CWA (or an applicable State statute) addressing mine-site run-off the site manager may want to consider enforcement actions to compel private parties to be responsible for the environmental impacts of their facilities. For those mine sites where the current owner is unable to meet current regulatory requirements the site manager may want to evaluate the feasibility of invoking State or Federal statutes that look to the historic site owner or manager to take responsibility for damaging releases to the environment. CERCLA is the Federal statute that may be applicable in such instances; many states have similar authorities.

Other regulatory programs (discussed in Chapter 11) may also be applicable to environmental concerns at mine sites. Such programs vary considerably among states. The site manager is advised to develop a site specific enforcement strategy in partnership with other Federal and State agencies having jurisdiction over releases from the site. Developing an effective enforcement strategy can be an effective way of meeting the environmental challenges presented by inactive and abandoned mine sites, and is fundamental to meeting public expectations that owners and operators take responsibility for their facilities.

9.6 Additional Sources of Information

Specific procedures and guidance for EPA's removal program are set forth in a ten-volume series of guidance documents collectively titled, *Superfund Removal Procedures* (The chapter on Removals in EPA's *Enforcement Project Management Handbook* summarizes this guidance.) These stand-alone volumes update and replace Official Solid Waste and Emergency Response (OSWER) Directive 360.3B, the single-volume *Superfund Removal Procedures* manual issued in February 1988.

More information on the RCRA Stabilization Initiative is available in the 1991 guidance memorandum, *Managing the Corrective Action Program for Environmental Results: The RCRA Facility Stabilization Effort*.

CERCLA Compliance with Other Laws Manual, Part I, Overview, RCRA, Clean Water Act, and Safe Drinking Water Act. U.S. Environmental Protection Agency (EPA), August, 1988. Washington, D.C. OSWER Directive 9234.1-01.

CERCLA Compliance with Other Laws Manual, Part II, Clean Air Act and Other Environmental Statutes and State Requirements CERCLA Compliance With Other Laws Manual Part II. U.S. Environmental Protection Agency (EPA), August, 1989. *,* Washington, D.C. OSWER Directive 9234.1-02.

Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA. U. S. Environmental Protection Agency (EPA), October, 1988. Washington, D.C. Office of Emergency and Remedial Response.

EIA Guidelines for Mining, U.S. EPA, September 1994. Washington D.C. Office of Federal Activities.

Abandoned Mine Lands Preliminary Assessment Handbook, California Environmental Protection Agency, January 1998, Department of Toxic Substance Control.

Rules of Thumb for Superfund Remedy Selection, U. S. EPA, August 1997, Office of Solid Waste and Emergency Response

A Guide to Preparing Superfund Proposed Plans, Records of Decision and Other Remedy Selection Decision Documents, U. S. EPA, July 1999, Office of Solid Waste and Emergency Response.

Draft EPA and Hard Rock Mining: A Source Book for Industry in the Northwest and Alaska, U. S. EPA, November 1999, Region 10 Office of Water

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