TECHNOLOGY OVERVIEW

ADMINISTRATIVE AND ENGINEERING CONTROLS

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ADMINISTRATIVE AND ENGINEERING CONTROLS

1. INTRODUCTION

Mining sites are often large and complex enough that cleanup is completed either at the point of exposure or to standards that do not allow for the unrestricted use of a property. While unrestricted use is commonly referred to as "residential" use, it is more accurately described as a condition that allows a property to be put to any use without the need for limitations or restrictions to prevent unacceptable human exposure or environmental impacts from occurring as a result of the presence of contamination. Under these circumstances, a system must be put in place to prevent inadvertent exposures to the remaining contaminated environmental media. The system implemented is generally a combination of administrative and engineering controls (AECs) (ITRC 2008).

AECs are used to provide protection from exposure to contaminants that exist or remain on a site. AECs are classified as institutional (administrative and/or legal) controls or engineering (physical) controls. The determination as to the type and duration of a specific AEC depends on regulatory requirements and site-specific conditions, although many controls are put in place for long-term use. State environmental agencies are often charged with the responsibility for managing (which includes tracking and monitoring) the AEC over the long term.

This technology overview is based on ITRC's *An Overview of Land Use Control Management Systems* (ITRC 2008), which contains additional detail and state approaches and use of land use controls. BRNFLDS-3 presents an overview of various systems and state programs that track, monitor, and/or educate people on AECs. Moreover, it describes each of these systems and programs and explains what and how information is provided by each system. Information about the various technologies and their associated costs for development and implementation is provided, advantages and limitations are discussed, potential users are identified, contact information for the user is provided, and case studies offer insight into implementation efforts. It is important to recognize that, due to the ongoing and sometimes contentious debate about the "appropriateness" of AECs in comparison to permanent, active, or "complete" remedies, this document does not evaluate the policy issues related to AECs or their role as part of an appropriate solution to any specific environmental condition.

Administrative controls (ACs) are nonengineered instruments intended to minimize the potential for human exposure to contamination by limiting land or resource use. ACs may be implemented on a community level or on an individual level. These controls may allow access to the site for required monitoring, restrict uses of a property to prevent exposure, or require notification that contamination is present. ACs implemented on an individual basis may include notification, education, and recommendations that individuals may implement to reduce exposure to remaining contamination. ACs may be used alone or as a supplement to engineering controls (ECs).

ECs are physical controls put into place to prevent human and ecological exposure to contamination. ECs generally consist of physical measures designed to minimize the potential for exposure to contamination by limiting direct contact with contaminated areas, reducing contamination levels, or controlling migration of contaminants through environmental media (see

Table 1-1 for examples). As with ACs, ECs may be implemented on a community level or on an individual level. On an individual level, ECs may include installation of water treatment systems in private homes, provision of bottled water, and provision of high-efficiency particulate air (HEPA) vacuums to homeowners. Cleanups with ECs involve ongoing evaluation, site inspections, periodic repairs, and sometimes replacement of remedy components. These requirements are often documented in an AC.

Table 1-1. Examples of administrative and engineered controls

<table>
<tr><th>Administrative controls</th><th>Engineered controls</th></tr>
<tr><td>• Governmental controls
o Easements</td><td rowspan="4">• Signage
• Diversionary structures
• Fencing
• Caps/covers
• Slurry walls
• Extraction wells
• Alternate water sources
• Point-of-exposure water treatment systems</td></tr>
<tr><td>• Proprietary controls
o Covenants</td></tr>
<tr><td>• Enforcement and permit tools with IC components
o Administrative or judicial order0073
o Zoning</td></tr>
<tr><td>• Information and education</td></tr>
</table>

ACs and ECs may be implemented individually or together as a system (see Table 1-2).

Table 1-2. Case studies using administrative or engineering controls

Site name	Primary contaminant	Primary technology/(ies)	Administrative or engineering control
Annapolis Lead Mine Site	Lead	• Capping, covers and grading • Excavation and disposal • Chemical stabilization	• Environmental covenant preventing groundwater use • Environmental covenant preventing residential land use
Copper Basin	Acidity, aluminum, arsenic, copper, cobalt, iron, lead, zinc	• Capping, covers and grading • Excavation and disposal • Backfilling, subaqueous disposal, chemical precipitation • Bioreactor • Constructed wetland	• Deed restrictions limit development in lined and sensitive areas • Five miles of specially constructed fence limits access to mine subsidence areas
Horse Heaven Mine	Mercury	Capping, covers, grading	• Restrictive covenants that govern future redevelopment capacity and requirements to maintain engineering control (fencing; signing) • Prohibitions on removal of calcine and/or other site material containing mercury

The determination as to whether an AC is sufficient or both an AC and an EC are needed depends on federal and/or state requirements and the site-specific conditions.

2. APPLICABILITY

The U.S. Environmental Protection Agency and state cleanup programs may promote the development of contaminated sites by allowing the required level of cleanup to be adjusted to fit the reasonably anticipated, intended, and/or allowable future use of the site. Adjusting cleanup levels to the future use of the site generally makes it possible to redevelop sites that simply cannot be fully remediated to unrestricted use standards due to impracticality, cost, or technology constraints. This approach is known as “risk-based remediation.” When sites are not remediated to unrestricted use standards, AECs are put into place to prevent exposure to contamination remaining on site.

AECs are intended to bridge the gap between a risk-based remediation and unrestricted land use. AECs may be put in place to allow for public notification that contamination is present, allow or restrict access to the site, ensure maintenance and protection of the remedy, and prevent exposure to remaining contamination.

3. ADVANTAGES

AECs can be used in the following circumstances:

- It is impractical to clean up a site to unrestricted use.
- It is too costly to clean up a site to unrestricted use.
- A contaminated site can be cleaned up to safe conditions if land use is limited, controlled, and maintained.

Initially, AECs may be relatively inexpensive to implement.

4. LIMITATIONS

Applying AECs can do the following:

- Incur additional long-term liabilities to the property owner.
- Restrict land value relative to its available use.
- Vary in effectiveness, particularly when implemented at the point of exposure.
- Require some form of persistent management on the part of the landowner; the responsible party; or the federal, state, or local agency.

Over the long term, AECs may prove to be more expensive to implement than a full cleanup to unrestricted use levels.

5. PERFORMANCE

The key to effectively implementing AECs rests with implementing an effective system to track and monitor the AECs. Optimally, the system will be durable, as well as have some ability to enforce adherence to the AECs put in place. States that have very few sites with AECs may use simple AEC management systems, such as a spreadsheet that can be requested by the public in hard-copy format or is available on the state agency’s website. This simple tracking method meets the requirements for Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) 128(a) funding and cost-effectively meets the need to provide information to the public about the sites in the state that rely on AECs as part of the remedy.

States with large numbers of sites with AECs often use management systems with a variety of features that enable the public to easily obtain detailed AEC and site information. These systems also provide information that allows agency staff to manage AEC implementation and compliance efforts.

The effectiveness of any given AEC is dependent to some degree on the willingness of affected individuals to comply with the AEC. For example, individuals may be more or less willing to drink bottled water or use a HEPA vacuum to clean their house on a regular basis. Additionally, some individuals may choose to enter a fenced-off area, although they know that contamination exists.

6. COSTS

Property owners are normally required to maintain and monitor the effectiveness of AECs on their site. Sustainability of these AECs adds long-term costs to the project along with costs associated with insuring the remaining environmental liability. The cost benefit of remediating a site to less than unrestricted use and applying AECs must be projected well into the future.

Many states are struggling with the current funding levels available for the development of systems and/or programs to track and monitor AECs. The costs vary depending on the system's elements and complexity, and various mechanisms may be implemented to fund development. For instance, states that receive funding to develop and enhance response programs under the authorities of CERCLA 128(a) are required to develop AEC registries. A portion of the CERCLA 128(a) funding may be used to support AEC management. The information contained on this list may include but may not be limited to the following: date the response action was completed, site name, the name of the owner at the time of the cleanup, location of the site, whether a AEC is in place, explanation of the type of AEC in place (e.g., deed restriction, zoning, etc.), nature of the contamination at the site (e.g., hazardous substances, contaminants, or pollutants, etc.), and size of the site in acres.

There are also various funding mechanisms to cover the costs incurred with monitoring AECs, including the costs of conducting inspections of the properties with AECs. Property inspections ensure that the current use of the property is in accordance with the provisions of an AEC and are conducted by the party that placed the AEC on the property and/or state regulators. These funding mechanisms include stewardship fees, oversight fees, and trust funds.

7. REGULATORY CONSIDERATIONS

Depending on a state's requirements, AECs may be recorded on the real property deed as either obligations or restrictions imposed on a property. Use restrictions recorded against the real property may be enforceable by the regulatory agency requiring the recordation. Enforcement actions vary from state to state but may include penalties, loss of liability protection, and lawsuits. These recordations have their basis in property law and other regulatory procedures.

In the United States, real property law is governed by state law, which obviously varies from state to state. The basis of real property law in each state depends on local history and conditions.

The basic legal mechanisms are detailed in *Essentials of Practical Real Estate Law* (Hinkel 2004).

8. STAKEHOLDER CONSIDERATIONS

AECs should minimize impact to the community as much as possible; however, in some cases stakeholders may be required make changes due to the remaining contamination. Changes may include requesting permission to sell or change the use of their property, using a special vacuum cleaner to clean the indoor area, or drink water only from a cooler rather than faucet in their kitchen. These are never appealing and are difficult to explain.

9. LESSONS LEARNED

A number of the case studies (Table 10-1) included some form of institutional control following or in conjunction with treatment. The Government Accountability Office (GAO 2005) reports that AECs at Superfund sites and Resource Conservation Recovery Act (RCRA) facilities improve the protection of the public. Ninety-three of 112 Superfund sites and 15 of 23 RCRA sites used AECs (GAO 2005). During 1991–1993 the same report notes that only 10% of the Superfund sites deleted from the National Priorities List used AECs, and 53% of sites deleted in fiscal years 2001–2003 used AECs. While it should be noted that mechanisms for implementation of AECs were not widely in place prior to 1993, these data do demonstrate an increased use of AECs over the past decade.

10. CASE STUDIES

Table 10-1. Examples of administrative and engineering controls

Control	Administrative/ engineered	Description	Case studies
Notification	Administrative or engineered	Provides information to site owners, those considering purchasing the site and/or the general public	• Tar Creek Superfund Site
Allow access to the site	Administrative	Allows the government or responsible party access to the site to conduct required monitoring, maintenance or other necessary activities	• Southeast Ohio Kennecott Copper Mine
Monitor	Engineered	Requires periodic testing of environmental media to ensure that contamination is stable or that contamination has not moved to a point where human or ecological exposure is possible	• Gribbons Basin • Leviathan Mine
Establish, maintain or protect a remedy	Administrative or engineered	Actions required to ensure that a remedy such as a cap, slope or vegetative cover can be implemented and maintained for the appropriate duration	• Copper Basin • Ely Copper • Kerramerican • Black Butte Mercury Mine • Tar Creek Superfund Site
Restrict land use	Administrative	Ensures that property is not used in ways that the remedy is not protective	• Horse Heaven Mine • Black Butte Mercury Mine • Ore Hill • Copper Basin • Annapolis Mine

Control	Administrative/ engineered	Description	Case studies
Restrict/ prevent exposure to waste	Administrative or engineered	Prevents exposure to waste materials	• Horse Heaven Mine • Tar Creek Superfund • Commerce/Mayer Ranch • Copper Basin • TVA Abandoned Coal Mine Site • Orono-Dunweg Mine Site

11. REFERENCES

GAO (Government Accountability Office). 2005. *Hazardous Waste Sites: Improved Effectiveness of Controls at Sites Could Better Protect the Public.* GAO-05-163.

Hinkel, D. F. 2004. *Essentials of Practical Real Estate Law*. New York: Thompson Delmar Learning.

ITRC (Interstate Technology & Regulatory Council). 2008. *An Overview of Land Use Control Management Systems.* BRNFLD-3. Washington, D.C.: Interstate Technology & Regulatory Council, Brownfields Team. www.itrcweb.org.

Missouri's Registry of Abandoned or Uncontrolled Hazardous Waste Sites: dnr.mo.gov/env/hwp/sfund/registry.htm .

Other Missouri resources include the following:

The FY08 registry report.

The Well Drillers Law Summary is at www.dnr.mo.gov/env/wrc/welltypes.htm.

The actual text of the Well Drillers Law is at www.dnr.mo.gov/pubs/pub2175.pdf.