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# *Protecting Public Health at Superfund Sites: Can Institutional Controls Meet the Challenge?*

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***Cover Photographs:***

*All photographs are  
of the Sharon Steel  
Superfund Site in  
Midvale, Colorado.*

*Photographs by  
John Pendergrass.*

**PROTECTING PUBLIC HEALTH  
AT SUPERFUND SITES:  
CAN INSTITUTIONAL CONTROLS MEET THE CHALLENGE?**

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## LIST OF ACRONYMS AND ABBREVIATIONS

G/dL	Micrograms per Deciliter
AG	Attorney General
ARARs	Applicable or Relevant and Appropriate Requirements
ARC	Assistant Regional Counsel
As	Arsenic
ATSDR	United States Department of Health and Human Services' Agency for Toxic Substances and Disease Registry
BOR	United States Department of Interior's Bureau of Reclamation
CAG	Community Advisory Group
CEC	Cannons Engineering Corporation
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act of 1980
CCHD	Cherokee County Health Department
CRP	Community Relations Plan
CSRRs	Contaminated Soils Remediation Regulations
CTF	Citizens' Task Force
DEQE	Massachusetts Department of Environmental Quality Engineering
DOE	United States Department of Energy
EE/CA	Engineering Evaluation/Cost Analysis
ELI	Environmental Law Institute
EMP	Environmental Master Plan
EPA	United States Environmental Protection Agency
ESD	Explanation of Significant Differences
FY	Fiscal Year
GIS	Geographic Information System
HEPA	High-Efficiency Particulate Air
HUD	United States Department of Housing and Urban Development
IEUBK	Integrated Exposure Uptake Biokinetic Model
MBTA	Massachusetts Bay Transit Authority
MCL	Maximum Contaminant Level
MDEP	Massachusetts Department of Environmental Protection
MoDOT	Missouri Department of Transportation
MRRC	Mining Remedial Recovery Company
NCP	National Contingency Plan
NPL	National Priorities List
O&M	Operations and Maintenance
ORC	Office of Regional Counsel
OSHA	United States Occupational Safety and Health Administration
OU	Operable Unit
Pb	Lead
PCBs	Polychlorinated Biphenyls
PPA	Prospective Purchaser Agreement
ppb	Parts per Billion

ppm	Parts per Million
PRP	Potentially Responsible Party
RCRA	Resource Conservation and Recovery Act
RD/RA	Remedial Design/Remedial Action
RI/FS	Remedial Investigation/Feasibility Study
ROD	Record of Decision
RP	Responsible Party
RPM	Regional Project Manager
SARA	Superfund Amendments and Reauthorization Act of 1986
TAC	Technical Advisory Committee
TAG	Technical Assistance Grant
UDEQ	Utah Department of Environmental Quality
UDOH	Utah Department of Health
UDOT	Utah Department of Transportation
UOSH	Utah Occupational Safety and Health
USDA	United States Department of Agriculture
VOC	Volatile Organic Compound
WIC	Woman-Infant-Child
XRF	X-Ray Fluorescence

## EXECUTIVE SUMMARY

The U.S. Environmental Protection Agency (EPA) has prescribed the use of institutional controls at a significant number of sites that are being cleaned up under the federal Superfund program. Institutional controls include both legal and administrative mechanisms designed to limit exposure of humans and the environment to residual hazardous substances. They are intended to ensure that the actual use to which a site is put after remediation is compatible with the level of cleanup at the site and to limit exposure pathways to toxins of concern. Despite the increasing use of institutional controls at Superfund sites, there has been little analysis to date of the effectiveness of these controls in practice.

This report investigates the effectiveness of institutional controls at four NPL sites. The Environmental Law Institute researched and analyzed the administrative, legal, economic, public health, and policy implications of using institutional controls to prevent exposure to residual hazardous substances.

The study consists of four in-depth case studies of NPL sites where there has been experience selecting and implementing various types of institutional controls. Specifically, each case study examines: the intended purpose of the selected controls and their time frame for operation, the process used in selecting the controls, the costs and efforts associated with their implementation, public acceptability of the controls, their effectiveness and reliability to date, their predicted long-term effectiveness, and potential barriers to their successful implementation and operation. Based on insights gained through the individual case studies, this report also addresses more generally key issues surrounding the selection and use of institutional controls at NPL sites.

Case studies of the Cannons Engineering Corporation site in Bridgewater, Massachusetts, the Sharon Steel site in Midvale, Utah, the Cherokee County site in Kansas, and the Oronogo-Duenweg Mining Belt site in Jasper County, Missouri, revealed that some institutional controls have not been implemented as required by the Records of Decision for the sites, while others have so far been effective in preventing human exposure to residual hazardous substances at the sites. At the Bridgewater site, deed and land restrictions were implemented through a Declaration of Restrictions that was recorded with the deeds to the affected properties. Though specified in the Record of Decision (ROD), public education programs were not carried out at Bridgewater. Institutional controls at the Sharon Steel site in Midvale included regulations governing excavations on private property within a residential area where some, but not all, contaminated soils were removed. The remedies for the Cherokee County and Jasper County sites are similar, including the institutional controls that have been and will be implemented. Health education programs have been implemented at both sites. The RODs for both sites also specify that zoning and deed restrictions will be used as institutional controls, but these controls have not yet been implemented at either site. Whether they have been effective to date, or not, or are still being implemented, the institutional controls at each site, and the methods used to implement them, suggest important lessons that can be learned from the experiences at these sites.

Institutional controls often depend on local government resources, authorities and

agencies. Yet, despite the essential role of local governments in assuring the effectiveness of institutional controls, they are not necessarily consulted by EPA before it selects institutional controls that may rely on local governments to be effective. Because there is no requirement to consult local governments before selection of the remedy or to examine their authority and resources, a remedy may be selected, including a specific institutional control, without determining whether the local government is able to implement the particular institutional control.

Cooperation among federal, state, and local governments in the implementation and operation of institutional controls is critical to their long-term efficacy. The importance of such cooperation is illustrated by the success of health education programs at the Cherokee County, Kansas, and Jasper County Missouri, sites, where state, city and county health departments, ATSDR, USDA Extension Service, and EPA coordinated their efforts. In contrast, health education was not successful at the Sharon Steel site in Midvale, Utah, where the City, State and EPA had difficulty cooperating on several aspects of the remedy. The City never fulfilled its informal commitment to educate its citizens about the institutional controls that the City was required to implement. In part, its failure to do so may have been due to the lack of cooperation among the three levels of government.

Records of Decision typically include only vague or general descriptions of institutional controls, although some RODs may be quite specific. General language that does not describe specific institutional controls can undermine the effectiveness of those controls by providing little guidance to state and local governments, by precluding public input in the development of specific controls, and by limiting the ability of EPA and the public to ensure that appropriate controls are implemented and maintained. In contrast, detailed and specific language on institutional controls may limit flexibility, mandate controls that may not be feasible or practical, and deter creative implementation and operation of institutional controls by local governments, or other implementers, unless EPA coordinates extensively with state and local governments regarding the controls prior to issuing the ROD.

Institutional controls rely heavily on humans to implement, oversee, and administer them. It is human nature to ignore tasks that no one else seems to care about or where the purpose is not readily apparent. Residual hazardous substances are a classic example of a problem that is not readily apparent. Thus, in many cases, the tasks associated with implementing institutional controls are unlikely to be the focus of widespread public attention. People who oppose something or who do not believe a task is necessary are also less likely to carry out that task than those who support it or agree that it is needed. The case studies revealed instances where institutional controls were not implemented as intended due to human errors that may be attributable to these problems.

One method of reducing the risk of human error is to build redundancy into the institutional controls. Rather than using a single institutional control, a system of institutional controls can be created that provides a fail-safe function. The level of redundancy should depend on the risks at the site, accounting for the expected duration of the risks, the potential consequences of exposure, the population that may be exposed, the capabilities of the

implementing entities and individuals, and the potential exposure pathways.

Institutional controls need to be monitored to assure that they are serving their intended purpose. Although EPA is required to review the remedy at least once every five years if contamination is left on-site, the frequency of review may not be sufficient to avoid failures. Similarly, although the state must take responsibility for operation and maintenance of the remedy, including assuring that institutional controls are in place and reliable, at a fund-financed cleanup, the states vary in their ability to carry out this responsibility. At a minimum, the remedial project manager and the assistant regional counsel, or the corresponding state officials, should initially verify that every chosen institutional control is established as required. Depending on the nature of the controls and the risks at the site, EPA or state staff, as appropriate, may need to monitor the operation of the controls during the period before the first five-year review, as part of the five-year review, and in the interim between five-year reviews. Such monitoring and oversight should include verifying that the control is in place and operating as intended, and that nothing is limiting its effectiveness. Another element of the oversight system could be to increase the amount of information available to the public about controls that are in place, and to rely, in part, on public oversight of the controls. To facilitate such public monitoring, EPA might consider establishing regional and national databases of the controls in place and making them publicly available.

At some sites specific institutional controls are selected after the ROD is signed. This takes these decisions out of the normal Superfund decision making process and, in particular, out of the normal process for public participation. The practice thus reduces public involvement in decisions about institutional controls, which raises concerns at several levels. Public participation in the selection of controls is not only essential to the fairness of the process, but it often also leads to better decisions, including improvements in the controls selected. At the level of implementation of controls, reduced public involvement in their selection may reduce community awareness and acceptance of the controls, which could impair their efficacy and longevity.

A fundamental element of the success of institutional controls is that community members to whom the controls apply understand their terms and the importance of compliance. Public education is often prescribed as a method of accomplishing this purpose, but research indicated that, in practice, education may be overlooked. But without adequate education efforts, residents are less likely to know about or understand the residual risks at a site and are not empowered to protect themselves or their community. The use of sound science to communicate public health threats was a useful part of public education programs in the Tri-State Mining District and contributed to high public awareness and acceptance of the remedies at the Cherokee County and Jasper County sites. Community members may be more receptive to messages that are delivered by local agencies and organizations. The report recommends that EPA consider working with local governments, including health departments, to provide educational programs and materials.

Records of Decision rarely include detailed information about how institutional controls

will be implemented. In particular, few RODs provide budgets for paying for the activities that will be necessary if controls are to operate and be effective over the long periods typically required to protect human health and the environment from residual hazardous substances. The report recommends that EPA consider in RODs the costs of implementing, monitoring and operating institutional controls for their expected lifetime. The first task in budgeting for the costs of institutional controls is to determine what institutions or individuals will implement the controls chosen for a site, what activities will be involved in implementing each institutional control, and what the frequency of those activities will be. Then the costs of performing each activity can be estimated. Analyses of the activities and tasks necessary to implement institutional controls and estimates of the costs of carrying out those activities and tasks would put implementation of selected controls on a substantially better foundation.

In addition to the direct costs of implementing institutional controls, their use can impose substantial indirect costs on communities, property owners, prospective purchasers and developers by limiting the way a site may be used. The burden of the restrictions on use of the site falls on the property owner and the community, with the owner reaping potentially lower profits from use of the property and the community receiving lower social benefits from the allowed uses than would have been possible if no restrictions existed. In order to better account for the indirect costs of restricted site use, the report recommends that EPA and Congress consider including the relative social benefits of the different alternatives as a criterion for choosing the appropriate remedial action.

## **I. INTRODUCTION**

### **A. Purpose of Study**

Pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA or Superfund), remedies selected for National Priorities List (NPL) sites are, whenever possible, supposed to permanently reduce risks of residual contamination to a level that is fully protective of human health and the environment. However, due to the technical and financial impracticability of achieving this result at some sites, in recent years the U.S. Environmental Protection Agency has prescribed the use of institutional controls at a significant number of sites.

In the Superfund context, institutional controls include both legal and administrative mechanisms designed to ensure that the actual use to which a site is put after remediation is compatible with the level of cleanup completed. Where residual contamination remains in potentially hazardous concentrations, institutional controls may be implemented to limit exposure pathways to toxins of concern.

Many of the bills currently before Congress to reauthorize the Superfund program would further increase reliance on institutional controls at NPL sites. Some of the legislative proposals to reauthorize CERCLA include specific provisions for institutional controls, and many call for EPA to consider future land use when determining cleanup standards for a particular site. Participants in the reauthorization process agree that land use-based cleanup standards will necessitate the implementation of institutional mechanisms to ensure that land use remains consistent with cleanup levels selected.

Despite mounting support for such changes to the Superfund program, there has been little analysis to date of the efficacy of institutional controls in practice. In part, that is because many controls are intended to function perpetually, yet few have been in place long enough to be evaluated over a significant period of time. A number of sites that rely on institutional controls for a significant component of their remedies are, however, due for five-year review. In light of the opportunity presented by those sites, the Environmental Law Institute, in cooperation with the U.S. Environmental Protection Agency, undertook a study to research and analyze the administrative, legal, economic, public health, and policy implications of using institutional controls to prevent exposure to residual hazardous substances.

The study consists of four in-depth case studies of NPL sites where there has been considerable experience selecting and implementing various types of institutional controls. Specifically, each case study examines: the intended purpose of the selected controls and their time frame for operation, the process used in selecting the controls, the costs and efforts associated with their implementation, public acceptability of the controls, their effectiveness and reliability to date, their predicted long-term effectiveness, and potential barriers to their successful implementation and operation. Based on insights gained through the individual case studies, this report also addresses more generally key issues surrounding the prescription and use of institutional controls at NPL sites. A principal goal of the study is to identify ways that

the process of selecting and implementing institutional controls could be strengthened to better ensure their efficacy over time. The study concludes by offering recommendations for achieving this purpose.

## **B. Methodology**

The first stage of this study was to identify sites where institutional controls constituted a significant portion of the remedy and had been in place long enough to provide sufficient research material. Initially, this was done by reviewing EPA's list of sites where the technical remedy had been complete for at least five years.<sup>1</sup> This was done on the premise that, of all sites where institutional controls had been prescribed, those on the five year review list were most likely to have had them in place for a considerable period of time. To determine which sites on the list actually relied on institutional controls, the list was cross-referenced with EPA's Envirofacts database,<sup>2</sup> a public information tool that makes available Record of Decision (ROD) summaries and fact sheets for most NPL sites. At the time of ELI's research, some RODs and fact sheets were temporarily unavailable through the database due to reorganization of EPA's electronic filing system. In the absence of another efficient mechanism for reviewing these sites, they were eliminated without evaluating the institutional controls in place.

In addition to considering the time frame for implementation of institutional controls, the initial identification of sites was further guided by criteria developed in cooperation with EPA. Some of these criteria were later eliminated because they could not be satisfied or turned out not to be as relevant as expected. The criteria that remained of interest included diversity in institutional controls, the nature and proximity of surrounding communities, the level of public involvement in site activities, and variety in agencies responsible for implementing institutional controls.

For sites that appeared to be of interest, ELI reviewed the complete RODs to obtain a greater level of detail about site conditions and the types of institutional controls prescribed. In a few cases, the RODs did not mention institutional controls as the Envirofacts information had. Those sites were eliminated at this stage. For sites still of interest, telephone interviews were conducted with the site's Regional Project Manager (RPM) and/or the Assistant Regional Counsel (ARC) to obtain the most current information about the history and status of institutional control selection and implementation. This process revealed that most sites under consideration had little to no experience with institutional controls in practice. Many were not far enough along in the process of implementing the controls to provide adequate study material, and others had controls in place, but those institutional controls were relatively insignificant to the remedy as a whole and therefore would be of little real value to the study.

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<sup>1</sup> Pursuant to CERCLA, a review of the remedy is to be conducted after construction has been complete for five years. EPA, therefore, maintains a five year review list of sites ready for this process.

<sup>2</sup> See U.S. EPA, Envirofacts Data Warehouse and Applications (last modified April 1999) <[http://www.epa.gov/enviro/index\\_java.html](http://www.epa.gov/enviro/index_java.html)>.



In order to identify additional sites where institutional controls of interest had actually been implemented, ELI initiated two new research efforts. The first mirrored the initial five year review list approach, but instead used an EPA list of sites where construction had been completed by FY 97 and where institutional controls had been prescribed in the ROD. Some of the sites on this list overlapped with those on the five year review list, and therefore needed no further review. Information about the remaining sites was gathered using Envirofacts. Sites that appeared to be of interest were further investigated using complete RODs and, where appropriate, follow-up phone calls with the site RPM and/or the ARC.

The second new approach to identifying potential case studies relied upon the experience and institutional knowledge of RPMs and ARCs already contacted in the course of the research, other Superfund officials in EPA regional offices, and colleagues in non-governmental organizations working on institutional control issues. Sites suggested by these contacts were investigated through Envirofacts, complete RODs, and phone interviews with site officials.

The site selection process ultimately yielded four sites for case studies.<sup>3</sup> The process of in-depth research at these sites began with a more extensive literature review, which included media articles, texts of institutional control provisions adopted, documents pertaining to settlement agreements with responsible parties, and community relations materials. ELI then visited each of the sites chosen to interview those involved with the selection, implementation, and operation of institutional controls at the sites. Individuals interviewed varied among the sites but typically included officials from EPA and the Agency for Toxic Substances and Disease Registry (ATSDR), officials from relevant state, county and municipal agencies, representatives of community groups, and current site owners. Additional site documents were collected during the course of site visits and reviewed for their relevance to institutional controls. As necessary, follow-up phone calls were also conducted after the site visits, where analysis of information gathered mandated further research.

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<sup>3</sup> Since two of the sites studied are very similar in terms of geographical location, contamination, technical remedies, and institutional controls, they are presented jointly in this report. Those sites are the Cherokee County Superfund Site and the Oronogo-Duenweg Mining Belt Site.

## II. BACKGROUND ON THE SUPERFUND PROGRAM

In the late 1970s, the public in the U.S. became aware of the risks inherent in the uncontrolled and undocumented methods that had for decades been used to dispose of hazardous substances.<sup>4</sup> In response to the public uproar, Congress, immediately after the 1980 election, enacted the Superfund statute (CERCLA).<sup>5</sup> The statute addresses the cleanup of sites where hazardous substances were released into the environment or where there is a substantial threat that hazardous substances will be released into the environment.

The law authorizes the federal government, through EPA, to clean up releases of hazardous substances and to take action to prevent the release of hazardous substances.<sup>6</sup> The federal government also may require the parties responsible for the release or threat of release to take the necessary action.<sup>7</sup> More importantly, the parties responsible for the release or threat of a release of the hazardous substances may be required to pay all the government's costs of responding to the problem.<sup>8</sup> This provision also applies to costs incurred by state or tribal governments.<sup>9</sup>

The federal Superfund law may be used to deal with almost any site that is contaminated with hazardous substances. But it has some important limitations that result in its being used at far fewer sites than it might potentially reach. The most important limitation is on the expenditure of federal funds. Funds may be used to respond to emergencies, where there is imminent and substantial danger to human health or the environment, and to pay for cleanups of sites listed on the NPL.<sup>10</sup> In practice the federal government puts most of its time, effort and money into cleaning up sites listed on the NPL.

Superfund takes its name from the revolving fund set up to finance cleanups of sites where hazardous substances have been released or where there is a risk of such a release. The Superfund is a revolving fund because Congress envisioned that money from the fund would be used to clean up some sites, but that the government would recover most of those funds from the parties responsible for the hazardous substances at the sites. This was accomplished by virtually copying a strict liability provision from the Clean Water Act that required parties responsible for spilling oil or hazardous substances to pay for the cleanup. Thus, except for limited defenses, those responsible for hazardous substances at a site cleaned up with Superfund money were made strictly liable for the cost of the cleanup.

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<sup>4</sup> Portions of this background section have been updated from John Pendergrass, *Environmental Law in the United States, A Revista Direito Ambiental*" (São Paulo, Brazil, 1996) (in Portuguese).

<sup>5</sup> 42 U.S.C.'9601 *et seq.*

<sup>6</sup> 42 U.S.C.'9604.

<sup>7</sup> 42 U.S.C.'9606(a).

<sup>8</sup> 42 U.S.C.'9607(a).

<sup>9</sup> 42 U.S.C.'9607(a)(4)(A).

<sup>10</sup> 42 U.S.C.'"9604 and 9611.

## A. Cleanup Standards and Procedures

CERCLA authorizes EPA to remove contaminants or take other remedial action whenever there is a release, or a substantial threat of a release, into the environment of any hazardous substance or of any pollutant or contaminant that may present an imminent and substantial danger to the public health and welfare.<sup>11</sup> Removal is a temporary response to immediate emergencies, whereas remedial actions are intended to be permanent remedies, including treatment that renders the hazardous substances benign or less dangerous.<sup>12</sup>

Congress established cleanup criteria in the Superfund Amendments and Reauthorization Act of 1986 (SARA).<sup>13</sup> SARA states that there should be a presumption in favor of permanent cleanup remedies, including permanent treatment.<sup>14</sup> The statute does not define a permanent remedy, but it states that land disposal is not a permanent remedy and is therefore a disfavored technique. Congress intended this provision to eliminate the problem that wastes from Superfund sites were simply being transported around the country for disposal at new sites where they were contributing to new releases of hazardous substances.

SARA also requires a cleanup to meet any standards from other federal or state statutes that are "legally applicable" or "relevant and appropriate," often referred to as ARARs.<sup>15</sup> Thus, if a standard under another federal or state statute would by its terms be legally applicable to a site, then the cleanup must meet that standard. Similarly, if a standard from another federal or state statute, though not legally applicable, would be relevant and appropriate to be applied to the site, then the cleanup must meet that standard as well. This standard avoided dealing directly with the different positions of the environmentalists and responsible parties because the level of allowable residual contamination depends on other environmental laws.

The statute also provides additional criteria to guide the selection of a remedy, but these allow the Agency considerable discretion. In deciding what action to take to remedy a site the Agency must consider: the long-term uncertainties of land disposal; the goals and requirements of the federal solid and hazardous waste laws; the persistence, toxicity, mobility, and propensity of hazardous substances to bioaccumulate; the short- and long-term potential to cause human health problems; long-term maintenance costs; the potential for failure of the remedial action and the resulting costs for future remedial action; and the potential threat to human health and the environment due to excavation, transportation, and redisposal or containment.<sup>16</sup> After considering these factors, the Agency must choose a remedy that protects human health and the environment, that is cost effective and that uses permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent

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<sup>11</sup> 42 U.S.C.'9604(a)(1).

<sup>12</sup> 42 U.S.C.'9601(23) and (24).

<sup>13</sup> Pub. L.99-499 (1986).

<sup>14</sup> 42 U.S.C.'9621(b)(1).

<sup>15</sup> 42 U.S.C.'9621(d).

<sup>16</sup> 42 U.S.C.'9621(b)(1)(A)-(G).

practicable.<sup>17</sup>

If the remedy will leave hazardous substances, pollutants or contaminants at the site, EPA must review the remedial action every five years to assure that it continues to protect human health and the environment.<sup>18</sup> In such cases EPA normally will use barriers or containment systems and institutional controls to control exposure to the residual contamination.<sup>19</sup>

EPA has issued regulations, part of the National Contingency Plan (NCP), that further explain how it will consider the statutory criteria in deciding what action to take at a specific site. In the NCP, EPA refined the statutory criteria and defined a process for considering them as part of a Feasibility Study for the site.<sup>20</sup> In deciding what type of remedial action to take at a site, EPA develops and considers alternative actions that balance the statutory criteria. In deciding among the various alternatives, EPA first considers two threshold criteria: overall protection of human health and the environment and compliance with ARARs. A remedy must meet threshold criteria before it will be considered further as a potential remedy for a site. Remedies that meet threshold criteria are evaluated on a second set of criteria called primary balancing criteria: long-term effectiveness and permanence; reduction of toxicity, mobility, or volume through treatment; short-term effectiveness; implementability; and cost. Finally, two modifying criteria, state and community acceptance, are reviewed.<sup>21</sup>

The NCP also provides that EPA expects to use institutional controls, such as water use and deed restrictions, to supplement engineering controls, as appropriate, to prevent or limit exposure to hazardous substances. Institutional controls may be used during the Remedial Investigation/Feasibility Study (RI/FS) process, implementation of the remedial action and, where necessary, as part of the completed remedy. The NCP notes that institutional controls will not be used as a substitute for active response measures as the sole remedy unless active measures are not practicable, based on the balancing of trade-offs among alternatives during the remedy selection process.<sup>22</sup>

The first major step in the cleanup process is the performance of RI/FS. The RI/FS determines the scope of the remedial action required, assesses the site and evaluates alternative approaches to remediating the site. After completion of the RI/FS, EPA issues the Record of Decision (ROD) that sets forth the selected remedy and explains the factors that led to the selection. After the issuance of the ROD, the remedial design (RD) is developed to provide a

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<sup>17</sup> 42 U.S.C.'9621(b)(1).

<sup>18</sup> 42 U.S.C.'9621(c). *See also* 40 C.F.R. '300.430(f)(4)(ii)(1998)(five year review required if residual hazardous substances, pollutants or contaminants will exceed levels that would allow for unlimited use and unrestricted exposure).

<sup>19</sup> For a discussion of institutional controls generally see Section C., *infra*.

<sup>20</sup> *See* 40 C.F.R.'300.430(e)(9)(1998).

<sup>21</sup> 40 C.F.R.'300.430(f)(1)(i)(1998).

<sup>22</sup> 40 C.F.R.'300.430(a)(iii)(C)&(D)(1998).

detailed plan for construction of the remedy. The remedial action (RA), or the actual construction and operation of the remedy, is then performed. Following completion of the RD/RA, the site moves into the operation and maintenance (O&M) phase. O&M can include, for example, ensuring the proper functioning of engineering controls, such as the pumping and treating of contaminated groundwater or ensuring that a clay soil cap remains intact.<sup>23</sup> In addition, CERCLA Section 121 (c) provides that with respect to a remedial action that results in contamination remaining on site, EPA must review the action "no less often than each 5 years after the initiation of such remedial action to assure that human health and the environment are being protected" and may take actions as required.<sup>24</sup>

## **B. State Role**

The role of the states in the Superfund cleanup process can vary from site to site but typically EPA leads the enforcement, investigation, and remediation efforts. For federal sites at which private parties are not paying for the cleanup, the cleanup is conducted primarily using federal funds. The role of the states ranges from required cost-sharing at federally funded cleanups to active site management. The Superfund statute provides that EPA must consult with affected States before determining the appropriate remedial action to be taken. Remedial actions may not be performed unless the state in which the release occurs first enters into a contract or cooperative agreement with EPA that provides assurances that, among other obligations, the state will assure all future maintenance of the removal and remedial actions and pay for ten percent of the costs of the remedial action including all future maintenance.<sup>25</sup>

The state role with respect to institutional controls is addressed in the NCP. The NCP provides that when appropriate as part of operation and maintenance assurance, the state must assure that any institutional controls implemented as part of the remedial action at a site are in place, reliable, and will remain in place after the initiation of operation and maintenance.<sup>26</sup>

## **C. Public Participation**

The statute includes several public participation requirements. Section 117 encourages community involvement in the Superfund process by providing the public with the opportunity to comment on the remedies selected to clean up facilities and by requiring consideration of public comments in the remedy selection process. Before EPA may adopt a plan for remedial action it must publish a notice and brief analysis of the proposed plan and make the plan available to the public. The analysis must include sufficient information to provide a reasonable explanation of the proposed plan and alternative proposals. In addition, the Agency must provide reasonable opportunity for a public meeting at, or near, the facility regarding the

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<sup>23</sup> 40 C.F.R."300.430, 300.435 (1998).

<sup>24</sup> 42 U.S.C.'9621(c).

<sup>25</sup> 42 U.S.C.'9604(c) and (d); 40 C.F.R. Subpart F (1998).

<sup>26</sup> 40 C.F.R."300.435(f), 510(c)(1998).

proposed plan and proposed findings on cleanup standards.<sup>27</sup>

The statute further requires that notice of the final remedial action plan must be made available to the public before commencement of any remedial action. The final plan must be accompanied by a discussion and explanation of any significant changes made to the proposed plan, and must include a response to each of the significant comments, criticisms and new data submitted. If the Agency takes a remedial or enforcement action, or enters into a settlement or consent decree, that differs in any significant respects from the final plan, it must provide an explanation of the significant differences and the reasons that the changes were made.<sup>28</sup>

In implementing the public participation requirements of the statute, EPA differentiates between removal and remedial actions. The requirements for both removal and remedial actions are aimed at keeping the public informed and providing an opportunity for the public to comment on proposed cleanup actions. The requirements are set out in detail in the NCP.<sup>29</sup>

### 1. Removal Actions

For all removal actions, an Agency spokesperson must be designated to inform the public about the actions taken and to respond to inquiries. In addition, the Agency must establish an administrative record and make the record available to the public at a central location at or near the site, as required by Section 113(k) of the statute.<sup>30</sup>

Additional community relations requirements vary according to the duration of the removal action and the length of time that will elapse prior to the beginning of on-site removal actions. For example, if the Agency determines that less than six months will elapse prior to the beginning of on-site removal actions, the NCP requires that the Agency issue a notice of availability of the public record in a major newspaper within 60 days of the start of on-site removal activity, provide an opportunity for comment, and prepare written responses to significant comments.<sup>31</sup>

Additional requirements apply when a removal action is expected to extend beyond 120 days. The Agency must take the additional step of conducting community interviews with local officials, public interest groups, or other interested parties. In addition, the Agency must prepare a formal Community Relations Plan (CRP) that specifies the communications activities that the Agency will undertake. The Agency also must establish and publicize at least one information repository at or near the location of the removal action that contains items

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<sup>27</sup> 42 U.S.C.'9617.

<sup>28</sup> 42 U.S.C.'9617(b) and (c).

<sup>29</sup> 40 C.F.R.'300.415(n) and '300.430(c) (1998).

<sup>30</sup> 40 C.F.R.'300.415(n)(1), (2)(i), and (3)(iii) (1998).

<sup>31</sup> 40 C.F.R.'300.415(n)(2) (1998).

available for public inspection and copying.<sup>32</sup>

Similar community relations requirements apply to removal actions where at least six months will elapse before on-site removal actions begin. For example, the Agency must conduct community interviews and prepare the CRP prior to completion of the engineering evaluation/ cost analysis (EE/CA), and must publish a notice of availability and brief description of the EE/CA. The Agency is also required to provide a public comment period upon completion of the EE/CA and make available to the public written responses to significant comments.<sup>33</sup>

## 2. Remedial Actions

The public participation requirements for remedial actions are more stringent than for removal actions. The requirements under the NCP vary according to the stage of the cleanup activities. For example, prior to the remedial investigation, the community relations requirements are similar to those for certain removal actions. The Agency must conduct community interviews, prepare a community relations plan, and meet the statutory requirement of establishing an information repository and administrative record. In addition, EPA must inform the public of the availability of technical assistance grants (TAGs) and include in the information repository material that describes the TAG application process.<sup>34</sup>

Upon completion of the Feasibility Study and Proposed Plan, the statute and NCP require the Agency to publish a notice of the availability of the RI/FS and proposed plan. The notice also must include a summary of the plan and an announcement of a comment period. The Agency also must provide an opportunity for a public meeting at or near the site during the comment period and must prepare a publically available transcript of the meeting.<sup>35</sup>

The Agency is required to follow special procedures if it determines that significant changes are necessary prior to the issuance of the ROD. These requirements vary according to whether the changes could or could not be reasonably anticipated by the public. For example, if the changes could be reasonably anticipated by the public, the Agency must include in the ROD a discussion and explanation of the changes. If significant changes prior to the issuance of the ROD could not be reasonably anticipated by the public, the Agency must issue a revised proposed plan that includes a discussion and explanation of the significant changes. The Agency also must seek additional public comment on the revised proposed plan.<sup>36</sup>

After the ROD has been signed, the Agency must publish a notice announcing the

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<sup>32</sup> 40 C.F.R.'300.415(n)(3) (1998).

<sup>33</sup> 40 C.F.R.'300.415(n)(4) (1998).

<sup>34</sup> 40 C.F.R.'300.430(c)(2) (1998).

<sup>35</sup> 40 C.F.R.'300.430(f)(3)(i) (1998).

<sup>36</sup> 40 C.F.R.'300.430(f)(3)(ii) (1998).

availability of the ROD for public inspection and copying.<sup>37</sup> At this time, the Agency is also required to revise the CRP, if necessary, to reflect community concerns that pertain to the remedial design and construction phases. Finally, prior to the initiation of the remedial action, the Agency must issue a fact sheet and provide a public briefing that includes information about construction schedules and other relevant information such as any traffic pattern changes that may occur.<sup>38</sup>

### 3. Post-ROD Significant Differences

In addition to the requirements for community relations and public involvement during the remedial action phase, if the actual remedial or enforcement action differs significantly from the remedy selected in the ROD with respect to scope, performance, or cost, the statute requires additional community involvement. These requirements also apply to settlements and consent decrees in which the remedy selected differs significantly from the one selected in the ROD. The additional procedures that must be followed under the NCP vary depending on whether the settlement, consent decree, enforcement action or remedial action significantly changes as opposed to fundamentally alters the original remedy.<sup>39</sup>

If the consent decree, settlement, remedial or enforcement action includes significant changes, the Agency must publish a notice that briefly summarizes the explanation of significant differences and make the explanation and supporting information available to the public. The changes must be included in the administrative record and information repository and published in a major local newspaper.<sup>40</sup>

If the remedial or enforcement action, settlement, or consent decree fundamentally alters the basic features of the selected remedy with respect to scope, performance or cost, the Agency must propose an amendment to the ROD and issue a notice of availability along with a brief description of the proposed amendment. The Agency also must provide an opportunity for public comment and a public meeting during the comment period. After the ROD is amended, the Agency must publish a notice of availability of the amended ROD and make the amended ROD and supporting information available for public inspection and copying in the administrative record and information repository, prior to commencement of the affected remedial action.<sup>41</sup>

Section 122 of the statute and the NCP require that any consent decree for a removal action, RI/FS or remedial RD/RA work must be published in the Federal Register at least 30 days before the agreement becomes final. Opportunity to file written comments also must be

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<sup>37</sup> 40 C.F.R.'300.430(f)(6) (1998).

<sup>38</sup> 40 C.F.R.'300.435(c)(1) and (3) (1998).

<sup>39</sup> 40 C.F.R.'300.435(c)(2) (1998).

<sup>40</sup> 40 C.F.R.'300.435(c)(2)(i) (1998).

<sup>41</sup> 40 C.F.R.'300.435(c)(2)(ii) (1998).



provided. The Agency is required to prepare a response to significant comments, criticism, and new data submitted on the proposed plan and RI/FS, and to ensure that the response document accompanies the ROD. The statute also requires the public to be provided with an opportunity to comment on certain types of administrative orders.<sup>42</sup>

#### **D. Institutional Controls**

Protecting human health and the environment at sites where some contamination is left in place requires varying combinations of mechanisms designed to block the potential exposure pathways.<sup>43</sup> These mechanisms or tools include physical barriers, such as pavement, other impermeable caps, and covers made of clean soil that physically separate humans and environmental receptors from the contaminants. Some physical barriers, such as pavement and impermeable caps, are intended to prevent water from reaching the contamination and leaching it into groundwater, while others, including covers of clean soil and structures located above contaminated soils, are intended to prevent direct human contact with contamination. Different types of barriers are needed depending on which exposure pathway they are intended to block. Although barriers may prevent direct contact and reduce the likelihood of exposure due to drinking contaminated groundwater, other tools may also be needed.

##### 1. Definitions

Another set of mechanisms for blocking pathways of exposure is intended to assure that the site is used in ways that will prevent exposing people to the residual contaminants or that will limit the time that people might be exposed to periods considered safe. Restricting land use is particularly important for protecting children, who can be more sensitive to some contaminants and who have a full lifetime of potential exposure ahead of them. Another category of tools for blocking pathways of exposure are actions by governments of all levels, and by other institutions, to assure that the physical barriers remain in place and remain effective, that the population that might be exposed is warned or notified of where the contaminants are and how to avoid them,<sup>44</sup> and that the land continues to be used in ways that serve the function of limiting exposure as originally intended. With the exception of physical barriers, all these tools are for purposes of this study referred to generically as institutional controls.<sup>45</sup>

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<sup>42</sup> 42 U.S.C.'9617 and 40 C.F.R.'300.430(c)(5)(I) (1998).

<sup>43</sup> This section is adapted from John Pendergrass, *ASustainable Redevelopment of Brownfields: Using Institutional Controls to Protect Public Health*, @ 29 Environmental Law Reporter 10243-10258 (1999).

<sup>44</sup> Providing notice of the location of residual hazardous substances is important because they typically will not be obvious, but will instead be covered and hidden by barriers such as clean soil, pavement, or structures.

<sup>45</sup> A barrier or other physical control is not an institutional control, but an institutional control may make a barrier more effective. Also, in most cases, institutional controls will be needed to assure that barriers remain effective over time by assuring that it is properly maintained for the full time it is needed to perform its function. *But see* John S. Applegate and Stephen Dycus, *Institutional Controls or Emperor's Clothes?*

Institutional controls are legal, administrative, or institutional mechanisms for managing risks to human health or the environment.<sup>46</sup> In the broadest sense, they are methods or tools for modifying human behavior to reduce risks from external sources. Institutional controls are used in a variety of contexts to limit exposure to, rather than to eliminate, contaminants at contaminated sites. They include measures such as zoning, notices and warnings, easements, restrictive covenants, reversionary interests, restrictions on the use of specific resources such as soils or groundwater, and withholding insurance for certain uses of land. Governments in the United States have long used institutional controls to manage risks from sources as varied as floods, earthquakes, buried gas pipelines, buried electrical lines, hazardous enterprises, and contaminated rivers and lakes. Thus, institutional controls have a long history, which includes both successes and failures.<sup>47</sup>

## 2. Overview of Issues Pertaining to the Use of Institutional Controls

Institutional controls, like most legal tools, operate by inducing humans to modify their behavior. Managing human behavior is an extraordinarily difficult task. None of the institutional controls currently in use, or under consideration for future use, is foolproof. None can reduce to zero the risk of human or environmental exposure to hazardous substances left in place at a site. Nor is there a universal, all-purpose institutional control appropriate for all sites. As a preliminary matter, it is also important to recognize that institutional controls have the potential to be either over- or under-protective, depending on the level of contamination, the type of control used, the population affected, and the length of time the control is needed. Institutional controls can reduce, but not eliminate, the risks of future exposure to hazardous substances left in place at contaminated sites, particularly when several controls are used at a site.

For example, some people ignore notices and warnings to limit consumption of, or to

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*Long-term Stewardship of the Nuclear Weapons Complex*, 28 ELR 10631, 10640 (1998) (defining institutional controls to include physical barriers). The difference in terminology is unimportant as it is generally agreed that barriers and institutional controls often must be integrated components of a system for reducing risk at sites where hazardous substances are left in place in amounts that might present a risk to human health if exposure were not reduced.

<sup>46</sup> See Ariz. Admin. Code '18-7-201(24) (1998) (Stating that A>[i]nstitutional control= means a legal or administrative tool or action taken to reduce the potential for exposure.@) Some definitions of institutional controls include only legal tools, as in the following example: AInstitutional controls are legally binding provisions (such as local ordinances and state and federal laws) designed to control future uses of land or resources by limiting development and/or restricting public access to a site with residual contamination.@ The Oak Ridge Reservation, Stakeholder Report on Stewardship, p. 11 (The Oak Ridge Reservation End Use Working Group, 1998). But the same paragraph admits that A[a]dvisories and warnings, although not legally enforceable, are considered institutional controls.@ *Id.*

<sup>47</sup> For an analysis of past experience with institutional controls in these and other situations, see John Pendergrass, *Use of Institutional Controls as Part of a Superfund Remedy: Lessons From Other Programs*, 26 ELR 10109 (1996).

avoid completely, specific types of fish caught in contaminated water bodies.<sup>48</sup> They may consume more than advised out of economic necessity or out of doubt about the warning. Providing notice of risks, even when combined with instructions on how to avoid the risk, cannot guarantee that no one will engage in the behavior that puts them at risk.

Among the issues relevant to the effectiveness of institutional controls are how long the risk is expected to remain, how many people may be exposed, what potential exposure pathways exist, whether children may be exposed, how the population may change during the life of the risk, the cost of implementing the control, and the health and safety consequences of exposure. The duration of the risk is an important variable in choosing appropriate institutional controls. Some hazardous substances will degrade over time or become less of a risk by becoming less bioavailable, while the risk from other substances may never change absent treatment or removal. Radioactive materials remaining at some Department of Energy (DOE) sites have received substantial attention because they have half-lives of tens of thousands of years and will remain hazardous for hundreds of thousands of years.<sup>49</sup> But less exotic substances such as lead, mercury, arsenic, and cadmium will not degrade at all and will remain potentially hazardous unless removed or treated. In order to effectively protect against exposure to such long-lived risks, institutional controls would need to last essentially for as long as humans are expected to live on the planet. Some risks will, however, have much shorter lives. For example, a contaminated water body may flush remaining contaminants from its waters within decades or even within years after a source of contamination is removed.

The consequence of the failure of institutional controls could be that humans are unknowingly exposed to the hazardous substances left in place at a contaminated site.<sup>50</sup> This means that regulators, developers, neighbors, and land owners need to better understand the risks remaining at a site and the way those risks can be managed to avoid human exposure. It also means that the types of institutional controls used should vary depending on the type and expected longevity of the hazardous substances at a site, as well as on the expected and potential uses of the site. Thus, the types of controls appropriate for a former gasoline service

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<sup>48</sup> See, e.g., *CBS to Pay \$9.5 Million to Settle Liability in Montrose DDT-PCB Litigation*, 29 *Env't Rep. (BNA)* No. 30, 1467-68 (Nov. 27, 1998) (stating that "The contaminants pose . . . a serious health threat to local fishermen, who continue to fish in the area despite posted warnings not to consume fish caught in the waters. @).

<sup>49</sup> See Katherine N. Probst & Michael H. McGovern, *Long-Term Stewardship and the Nuclear Weapons Complex: The Challenge Ahead* 13 (1998) (explaining that "[r]adioactive contaminants have the potential to present some hazard for about ten times the half-life of a given isotope @ and providing a table of half-lives ranging from tritium, with a half-life of 12 years and a hazardous period of about 120 years, to plutonium 239, with a half-life of 24,100 years and a hazardous period of almost 250 thousand years). Uranium 238 with a half-life of more than 4 billion years will remain hazardous for the expected lifetime of the planet.

<sup>50</sup> The risk of unknowing exposure to hazardous substances is likely to be substantially higher, however, if the site remains contaminated. Leaving contaminated sites to lie fallow without any risk assessment, cleanup, or redevelopment is clearly the worst alternative in terms of public health and welfare.

station will differ from those appropriate for a site that has been used for a variety of industrial purposes for more than a century. Similarly, the uses for which a site is suitable should be considered, but using a substantially longer and broader frame of reference than many regulators and developers currently use.

### 3. Zoning

Governmental controls on the use of land will, in many cases, be the institutional controls of first resort. They are among the most common institutional controls and can be among the most effective. Governmental control of the use of private property is, however, a controversial and complex issue in itself. It therefore has a long history in law and government that has established limits on the ways land use may be controlled and on the extent of control that may be exercised.

Government-imposed land use controls typically are of two types. The first limits the activities that a landowner may undertake. It groups compatible uses within a demarcated area and separates incompatible uses by requiring them to be in separate areas or zones. The second limits structure size, location and other characteristics within a property's boundaries. The first type of control is typical of urban and suburban areas and is embodied in land use zoning. The second type of control is common in rural as well as more developed areas. It includes rules, known as setback rules, requiring certain structures or uses to be a certain distance away from the property boundary. The second type may also include rules designed to protect public health and safety and be embodied in building permits.

Controlling land use has been one of the governmental functions that has largely been left to the states. States have broad authority, called the police power, to regulate private activities to protect the public health, safety, and welfare. As a form of police power regulation, zoning legislation must be authorized at the state level. Typically, municipalities or counties are then authorized to pass local zoning rules and to implement those rules. Thus, zoning is governed by state law but generally is implemented by municipalities and counties.

The essence of zoning, and the source of the term, is the division of the municipality (or county) into geographical areas or zones and the designation of each zone for a category of uses. The municipal government adopts regulations governing the use of land within each zone. These regulations apply uniformly to all land within a zone, but differ between zones. The differences in regulations between zones are the heart of the system. They implement the core concept of zoning, which is to separate types of land uses that are incompatible with each other. There are three basic categories of uses: residential, commercial, and industrial. The different types of uses are separated by prohibiting a category of uses in a zone designated for other uses. Thus, industrial uses typically are prohibited in residential zones.<sup>51</sup>

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<sup>51</sup> Ironically, the impetus for the first zoning ordinance, adopted by New York City in 1916, was commercial interests seeking to stop the encroachment of garment factories (an industrial use) and offices (a use typically allowed and even encouraged in commercial zones now). Platt, *supra* note 8, at 233.

#### 4. Property Law-Based Institutional Controls

Property law-based restrictions on the use of land are commonly selected as institutional controls at contaminated sites because, like zoning, they are existing tools that appear, at least on the surface, well suited to the task. Regulators frequently refer to “deed restrictions” as the method to be used to assure that land with residual contamination is not used inappropriately.<sup>52</sup> This term does not, however, have a specific meaning in property law. It is instead a general description of a variety of different property law tools for controlling the use of land. These include restrictive covenants, reversionary interests, easements, servitudes, and requirements of notices in deeds and other conveyance documents.

#### 5. Notifying the Public

Public health departments have a long history of using institutional controls as a method of managing risks to public health from contaminated water sources. Notice can be provided to the public through a variety of methods. Some of the more common forms of disseminating notices include the following: inclusion in official publications such as the Federal Register or state counterparts; publication in the official notice sections of newspapers of general circulation in the affected area; mailings to residents of the affected area; signs in the affected area; public service announcements on radio and television; groundwater use advisories; and site registries. More specific information may be provided to prospective purchasers of property by notices appended to property records.

#### 6. Regulatory Institutional Controls

Direct regulation is another way to limit activities that are inconsistent with residual contamination. Under direct regulation, governments issue regulations prohibiting or conditioning certain activities on contaminated land, or they prohibit or restrict uses of specific resources. These prohibitions or restrictions are enforced by the level of government that issues the regulations. In some cases, citizens also are allowed to enforce the restrictions through citizen suits. In any case, citizens are important to successful implementation of regulatory controls as they can be the most effective monitors of compliance if they know what the restrictions are and how to determine if they are being followed.

Many states regulate groundwater quality as part of their water quality regulatory program, typically by defining “waters of the state” to include groundwater.<sup>53</sup> Along with prohibiting or regulating discharges to groundwater, such states may regulate the uses of groundwater. The Safe Drinking Water Act also provides authority for the states and EPA to

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<sup>52</sup> See 40 C.F.R. '300.430(a)(1)(iii)(D) (the NCP refers to deed restrictions as one of two types of institutional controls, along with restrictions on water use). Many states also require A deed restrictions@ for sites cleaned up to land use-based standards, *see* Environmental Law Institute, *An Analysis of State Superfund Programs: 50-State Study: 1998 Update*, Chap. VI (1998).

<sup>53</sup> *See, e.g.,* Ariz. Rev. Stat. '49-201.37 (1997).

regulate which groundwater sources may be used for drinking water.

In addition, states have general authority to protect the public health and welfare, which may be used to control the use of specific contaminated water sources. A state or local health department may issue an order or directive prohibiting the use of a specific water source for drinking due to contamination. Local governments may also be authorized to regulate certain activities in order to protect water quality.

Much is already known about the efficacy of many types of institutional controls. Experience with mechanisms such as zoning, restrictive covenants, reversionary interests, easements, warnings, notices, and regulations, demonstrates that these institutional controls cannot prevent exposure to risk. Further study of these and other types of institutional controls is needed to identify the types of controls that are most effective in specific situations, ways of improving the effectiveness of institutional controls, and how the implementation of institutional controls can be improved. The following case studies examine these issues, along with issues of how institutional controls are selected, at four Superfund sites.

### **III. CASE STUDIES**

#### **A. Cannons Engineering Corporation, Bridgewater, Massachusetts Site**

##### **1. Background and Site Description**

###### **a. Type of Site, Location, Contamination**

The Cannons Engineering Corporation (CEC) site consists of two parcels totaling about six acres located in a small industrial park on the outskirts of Bridgewater, Massachusetts. The site is one of four CEC sites on the Superfund program's NPL. Two CEC sites are located in Massachusetts and two in New Hampshire. The Bridgewater site is bordered by industrial developments to the north and east and a wooded lowland to the south and west. A wetland area lies south and west of the site. From 1974 until 1980, CEC used the site to store, transport and incinerate hazardous wastes including oils, emulsions, solvents, pesticides, lacquers, plating wastes, and other organic and inorganic chemicals. Some of the wastes received at the Bridgewater site were sent to three other CEC sites in Massachusetts and New Hampshire. The Massachusetts Department of Environmental Protection (MDEP), then the Department of Environmental Quality Engineering (DEQE), revoked Cannons' license in 1980 for allegedly mishandling hazardous substances, falsifying records and reporting violations. The CEC facility was then closed. Approximately 700 drums and 155,000 gallons of liquid waste and sludge were left on the site. The soil, sediment, buildings, and ground and surface waters were contaminated with polychlorinated biphenyls (PCBs), polycyclic aromatic hydrocarbons, volatile organic compounds (VOCs), pesticides, and metals such as iron, selenium, manganese, lead and silver.

###### **b. Background and Status of Cleanup**

Between 1980 and 1982, MDEP and EPA inspected the site and sampled and analyzed the on-site soil, surface water, and groundwater. As a result of the investigations, in October 1982, the State of Massachusetts contracted for the removal of 700 drums and 155,000 gallons of sludge and liquid waste. The site was subsequently placed on the NPL in September 1983.

In May 1987, EPA released a site Remedial Investigation (RI) and Endangerment Assessment (EA) that identified and assessed the contaminants present in the air, soils, sediments, and surface and groundwater. Also in May 1987, EPA issued a Superfund Program Information Sheet that summarized the RI and EA. The RI indicated that the soils were contaminated with VOCs and PCBs. Organic contaminants were confined primarily to surface soils, with low concentrations detected in subsurface samples. Low levels of PCBs were detected in surface soils but were absent from subsurface samples. Groundwater sampling indicated low levels of contamination. Total VOC concentrations were less than 50 parts per billion (ppb) in all but three of the monitoring wells, which had slightly higher levels of

contamination.<sup>54</sup>

The Feasibility Study for the site was completed in February 1988.<sup>55</sup> EPA held a public meeting on February 11, 1988 and a public hearing on February 25, 1988. The purpose of the hearing was to solicit public comment on the preferred remedial alternative, as well as other alternatives evaluated in the FS and the Proposed Plan for cleaning up the site. Several hundred people attended the initial information meeting. Also in February of 1988, EPA issued a Superfund Program Information Sheet on the Proposed Cleanup Plan. The FS mentioned institutional controls in the discussion of groundwater remediation considerations<sup>56</sup> as well as in several of the no-action alternatives for the site, most notably in the no-action alternative for groundwater.<sup>57</sup> The February 1988 Information Sheet, however, did not mention institutional controls as part of the potential cleanup remedies. In addition, the Proposed Plan issued on January 29, 1988 did not propose institutional controls specifically, although it noted that "groundwater use would be restricted under the no action with monitoring" alternative for groundwater cleanup.

EPA issued the ROD for the Bridgewater site in March of 1988. Several remedial alternatives were outlined – none of which actually included institutional controls – although institutional controls are discussed in the ROD.<sup>58</sup> The alternatives fit in two categories: source control and management of migration. In the source control category the following options

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<sup>54</sup> ROD at 6-7.

<sup>55</sup> Draft Final Feasibility Study, Cannons Engineering Corporation Site, Bridgewater, Massachusetts, January 1988, Volume I.

<sup>56</sup> In outlining the factors that may be evaluated when considering an appropriate remediation rate, the FS addresses the effectiveness and reliability of institutional controls as follows:

Institutional controls restricting groundwater use should be implemented at sites where exposure poses potential threats to human health. Institutional controls would be adopted to restrict groundwater use at the CEC site. These controls are expected to be effective in the near term; long-term effectiveness, however, is uncertain.

FS at 7-108, 7-111. In addition, the FS notes that the cleanup of groundwater contamination will be based on the factors set out in EPA's Groundwater Protection Strategy (August 1984). The factors include, among other factors, the reliability of institutional controls. FS at 3-22.

<sup>57</sup> FS at 6-11 (notes in initial screening of no action alternative for groundwater that "protection of public health and the environment could not be ensured because groundwater use restrictions could be violated"); 4-5 (discussing no action alternatives in general); 4-18 (section on identification and screening of technologies notes "deed restrictions could be implemented to prohibit the use of groundwater at the site; however, conformance with the restrictions cannot be effectively monitored and enforced"); 5-4, 6-2, 6-3, 7-10, 7-12, 7-14 (no action alternative for source control); 5-11, 5-12, 7-140, 7-143 (no action alternative for management of migration); 1-146 (notes in technical feasibility section that "implementation of institutional controls regarding use of the groundwater at the site would not be under the direct control of EPA – deed and land restrictions would be pursued through legal channels; the time to implement these restrictions would depend on the cooperation of the property owner, as well as state and local authorities.").

<sup>58</sup> See section IV.A.1.c, Types of Institutional Controls, below.



were outlined: a minimal no action alternative; two containment alternatives based on landfilling; and three treatment alternatives based on a thermal aeration treatment process or a thermal incineration process. In the management of source migration category several options were also considered: minimal no action with monitoring and four variations on active pumping and treating of the groundwater. None of the source water control or management of migration options included institutional controls.

The remedy selected was developed by combining components of the different source control and management of migration alternatives including: fencing the area to restrict access to soils, treating certain contaminated soils on site by thermal aeration and PCB contaminated soil with off site incineration, and installing a groundwater monitoring system. The ROD selected natural attenuation with monitoring for addressing groundwater for several reasons:

groundwater contamination at the site does not pose a significant risk to human health and the environment because the analysis of the groundwater conditions indicates that no contaminants migrate past the site boundaries at levels above drinking water standards or any other criteria which are protective of human health or the environment. Additionally there is no current use of the groundwater within a one mile radius of the site. Residences and commercial facilities in the vicinity of the site are served by a municipal water supply system.<sup>59</sup>

As discussed in more detail below, the ROD required institutional controls such as deed and land use restrictions to prevent the use of on-site groundwater for all water use purposes until maximum contaminant levels (MCLs) are achieved. The institutional controls selected for the site were also intended to notify future property owners of the site's history and any related risks. In addition, an education program that included public meetings and presentations was selected in the ROD to help protect public health.<sup>60</sup>

Thus, despite the assessment in the FS that it would be difficult to assure compliance with institutional controls<sup>61</sup> and that implementation would be dependent on the cooperation of the property owner and state and local authorities,<sup>62</sup> natural attenuation combined with institutional controls was selected for addressing groundwater contamination. This approach may have been selected in part because the groundwater did not have high enough levels of contamination.

EPA issued a press release announcing the cleanup plan and mailed a notice entitled "Superfund Cleanup Plan" in March of 1988. Neither document mentioned institutional

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<sup>59</sup> ROD at 33-34.

<sup>60</sup> ROD at 36-37.

<sup>61</sup> FS at 4-18, 6-11.

<sup>62</sup> FS at 7-146.

controls as part of the cleanup remedy for the site, even though institutional controls were selected in the ROD.

The remedial action prescribed in the ROD began in 1988, when a group of parties that had been identified as potentially responsible for contaminating the site removed and disposed of a large amount of the hazardous substances, pursuant to an administrative consent order with EPA. Subsequently, the responsible parties (RPs) agreed to perform the remedial work at the site in a consent decree entered in August of 1989, and resumed cleanup efforts in 1990. EPA issued another Superfund Program Fact Sheet in November of 1989 to announce the beginning of soil cleanup and building demolition at the site. A public meeting was held on November 8, 1989 to explain and discuss the site cleanup. Approximately 14 people attended the meeting.

The soil remediation stage of the cleanup was completed and quarterly groundwater monitoring commenced in 1991. As a result of the remedial work, approximately 1,200 tons of steel and 1,300 tons of concrete were recycled and 480 cubic yards of other non-hazardous materials were disposed of in a landfill. Hazardous soils and materials were disposed of using three different approaches. Approximately four hundred tons of PCB-contaminated soils were incinerated off site; 11,330 tons of VOC-contaminated soils were treated in an on-site thermal aeration facility; and a demolished incinerator and an additional 360 cubic yards of hazardous debris were disposed of at an EPA-regulated facility. The quarterly groundwater monitoring continued until 1993, when the wells were evaluated. The evaluation showed that the groundwater flow and contaminant levels conformed to projected estimates, and the monitoring schedule was reduced to a single yearly test.

A five year review of the remedy was completed in September 1995. Results of the review indicated that the selected remedy was adequately protective of human health and the environment. The review concluded that long term monitoring of the groundwater should continue until cleanup goals were met in an estimated 15-20 years.

#### c. Types of Institutional Controls

Institutional controls were outlined but not discussed in detail in the Bridgewater ROD. They were not mentioned in the summary of the remedy selected. Rather, it is only toward the end of the ROD in the section on documentation of the selected remedy that they are discussed.

The ROD states:

Institutional controls (*e.g.*, deed and land restrictions) will be required legal instruments as part of the remedial action to prevent the use of on-site groundwater for all water use purposes and to protect human health. Institutional controls will also alert future property owners to potential site-related risks. Education programs including public meetings and presentations will be undertaken to increase public awareness.

Most of the institutional controls discussed in the ROD were implemented at the site. Deed and land restrictions were implemented through a Declaration of Restrictions that was recorded with the deeds to the properties. The restrictions limit the use of groundwater and, although not mentioned in the ROD, also limit soil use through soil excavation restrictions aimed at preventing ground water exposure. In contrast, the education programs mentioned in the ROD were not implemented.

The specific institutional controls for the site were developed after the ROD was issued by EPA with assistance from the RPs and the Massachusetts Attorney General's Office (AG). The process for selecting the specific institutional controls is discussed in more detail below. The Declaration of Restrictions, the document developed that describes the institutional controls in detail, included restrictions on land use, groundwater use and excavation. The restrictions were identical for the most part for the property owned by the Town and the privately owned piece of property that is part of the site. The Declaration provides that site use be restricted to the private uses listed in part of the current Town of Bridgewater Protective Zoning By-Laws, including office and laboratory uses, retail business and consumer service establishments, automotive service and open air drive-in retail service and industrial, wholesale and transportation uses. A list of these permissible uses was included as an attachment to the Declaration.

In addition, for the site property owned by the Town, at the Town's request, the Declaration expressly addressed municipal uses of the property. Specifically, the Declaration provides that municipal uses be restricted to municipal office buildings, municipal storage facilities, and municipal fire stations unless EPA and MDEP provide certification, recorded in the Registry of Deeds, that additional municipal and Town uses are permissible. These provisions were intended to ensure that the Town would not be limited to the private uses permitted under the zoning restrictions.

Second, the Declaration restricts groundwater use as follows: "groundwater shall not be drawn from any point on the Premises, nor shall it serve as drinking water supply or be used for any other purpose, nor shall groundwater wells be installed at the Premises, until the USEPA and MADEP provide certification to be recorded at the Registry of Deeds, which certificate describes what uses of the groundwater are permissible."

Third, the Declaration restricts soil use. Specifically, the Declaration states: "no excavation below the level of the groundwater may be undertaken on the Premises without advance written approval from the USEPA or the MADEP." Accordingly, soil may be excavated without permission only if the excavation is limited to soil that is above the level of groundwater.

The Declaration specifically provides that the restrictions run with the land and are imposed in gross. It also states that the restrictions are for the benefit of and enforceable by EPA and MDEP. The Declaration requires:

A notice of restrictions, in compliance with law, shall be recorded before the expiration of thirty (30) years from the date of this deed and shall name the person or persons appearing of record who own the Premises at the time of recording; and in the case of any such recording, a subsequent notice of restriction shall be recorded within twenty (20) years after the recording of any prior notice of restriction until the period of these restrictions has elapsed.<sup>63</sup>

In all likelihood, these provisions are intended to ensure the continuation of the restrictions for the necessary period of time (*e.g.* the approximately 30 year duration of the natural attenuation of the contamination in the groundwater) by avoiding any state property law rules that may have made it difficult to do so. The Declaration notes that failure to record the notice of restrictions does not affect the enforceability of the restrictions.

The Declaration also purports to bind subsequent owners or grantees of the property by providing that "any grantee hereby covenants for itself, its successors and assigns to timely execute, and record such documents and take such action . . . as shall be necessary to cause such notice of restriction to be effective and enforceable. . . ." The Declaration further provides: "Any grantee further covenants for itself, its successors and assigns, to include the restrictions and protective covenants . . . in each lease and sublease of the premises. . . ."

Thus, the Declaration develops the institutional controls that were outlined in the ROD with the exception of education institutional controls. As discussed below, the education institutional controls were determined by EPA to be unnecessary, given the lack of community interest in the site.

#### d. Background and Status of Enforcement Efforts

After MDEP (then DEQE) revoked Cannons' license for allegedly mishandling hazardous substances, falsifying records and reporting violations, CEC continued to own the property until 1983, when the Town of Bridgewater, Massachusetts, a municipal corporation, acquired title pursuant to tax delinquency proceedings brought against CEC. A privately owned parcel adjacent to the CEC property was included as part of the Superfund site because of the presence of PCB and VOC contaminated sediments, and because contaminated ground water from the CEC property migrated beneath it.

As noted above, EPA entered into agreements with some of the RPs for performance of the removal work and the remedial work. EPA enforcement measures for the Bridgewater site were part of a broader, overall enforcement strategy for the four CEC sites. In 1987 and 1988, EPA mailed over 600 notice letters to potentially responsible parties (PRPs) at the four sites. Settlements were reached with approximately 300 small volume waste contributors or *de minimis* parties. The United States and the States of Massachusetts and New Hampshire then entered into a settlement with 48 of the larger volume RPs worth \$33 million for the four CEC

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<sup>63</sup> Declaration of Restrictions at 5.

sites, including the Bridgewater site. The larger volume RPs agreed to pay approximately \$18 million in cash and complete approximately \$16 million worth of remedial work at three of the sites, including Bridgewater. An additional settlement was reached with 13 *de minimis* parties, bringing the total number of *de minimis* settlers to 313 and the total past and future response costs reimbursed through *de minimis* settlements to \$13.5 million. In 1988, EPA lodged in court the consent decrees reached with the 48 larger volume RPs and the 13 *de minimis* parties, and in the same action brought suit against CEC and 24 other nonsettling PRPs who were ineligible for, or had rejected, *de minimis* settlement offers. The two consent decrees were entered by the court following challenges to entry brought by the nonsettling defendants.<sup>64</sup> By 1991, EPA resolved the litigation with nonsettlers and collected an additional \$7,668,500 in settlements.

e. Background and Status of Reuse

In November of 1996, Osterman Propane Company, a small propane distribution operation, relocated to the portion of the site owned by the Town of Bridgewater. Relocation from the company's previous site in downtown Bridgewater became necessary when development of the Old Colony Railroad, a commuter railroad system connecting the City of Boston with the Town of Bridgewater and other Massachusetts cities and towns, was projected to occur along a corridor that included Osterman's property. To facilitate a portion of the construction plans, the Massachusetts Bay Transit Authority (MBTA) used its eminent domain authority to take title to the parcel of land and buildings that Osterman owned in the Town of Bridgewater.

The redevelopment of the site was atypical in that Osterman did not select the site itself and, in its view, had little option but to relocate to the site, given that its current property was going to be condemned and the Town, which had the authority to issue permits for propane operations<sup>65</sup> as well as approval for new businesses, had selected the site for Osterman's relocation.

The details of the transaction between Osterman, the Town, and the MBTA are complicated at best and, for the most part, not relevant for purposes of studying the institutional controls at the site. Several agreements were entered into by MBTA, Osterman, and the Town in order to facilitate the relocation of Osterman to the site. Representatives for the Town of Bridgewater declined numerous requests for interviews, but other sources reported that the Town transferred ownership of the site to MBTA in exchange for approximately \$110,000 in cash, as well as additional property. The transfer of title from the Town to MBTA was conducted almost simultaneously with the transfer of the property from MBTA to Osterman.

MBTA, Osterman and the Town agreed that MBTA would relocate Osterman to the site prior to the transfer of title to the property. This facilitated MBTA's construction schedule and

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<sup>64</sup> See United States v. Cannons Engineering Corp., 720 F. Supp. 1027, 1033-34 (D. Mass. 1989).

<sup>65</sup> The Town Fire Department issues permits to facilities that intend to store propane.

allowed Osterman to negotiate a prospective purchaser agreement (PPA) with EPA, in order to ensure that it would be protected from liability for existing contamination at the site.<sup>66</sup> Both MBTA and Osterman are signatories to the PPA, and receive liability protection under the covenant not to sue granted by the federal government. The Town contributed to the \$30,000 consideration paid by Osterman to EPA for the liability protection in the PPA, according to one interviewee.

Prior to taking title to the site and pursuant to an agreement with the Town, Osterman began to prepare the site for the relocation of its business in October of 1996. Osterman rough graded for the installation of a gravel driveway, installed a 30,000-gallon propane storage tank and associated equipment, and installed electrical and water lines. Osterman also installed a temporary office trailer with a self-contained septic system.

The PPA imposes several standard obligations on Osterman and MBTA. For example, Osterman must provide access to the site for EPA, the State, and the RPs performing cleanup activities. MBTA and Osterman are also required to record a certified copy of the PPA with the Registry of Deeds to provide notice of the PPA to all successors-in-title.<sup>67</sup> In addition, the PPA requires any successors (*e.g.*, successors in title, lessees, and sublessees) to agree in writing to provide access and cooperate with EPA, the State, and the RPs.<sup>68</sup> Among the other requirements are for Osterman to repair or replace any equipment or wells involved in any response action that are damaged as a result of its operations.<sup>69</sup>

Institutional controls are specifically referenced several times in the PPA. Specifically, it provides:

EPA retains all of its authorities and rights with respect to institutional controls, including enforcement authorities under the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), the Resource Conservation and Recovery Act (RCRA), and any other applicable statutes or regulations.<sup>70</sup>

Osterman and MBTA "acknowledge the existence of institutional controls on the site" and "shall comply with and maintain the institutional controls."<sup>71</sup>

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<sup>66</sup> It took considerable time to negotiate the PPA in part because Osterman opted to negotiate the terms of the covenant not to sue in order to broaden its coverage to include protection from liability for natural resource damages. Osterman was not able to negotiate a covenant not to sue from the State, because state law requires that the only consideration the State can accept in exchange for a covenant not to sue is cleanup activities. Because Osterman was not performing cleanup activities, a covenant not to sue from the State was not available. *See* General Laws of Massachusetts, Chapter 21E, Section 3A(j).

<sup>67</sup> Paragraph 14.

<sup>68</sup> Paragraph 15.

<sup>69</sup> Paragraph 18.

<sup>70</sup> Paragraph 13.

<sup>71</sup> Paragraph 16.

Modification of the Declaration of the Restrictions requires approval of EPA and the State.<sup>72</sup>

Osterman and MBTA recognize that the implementation of response actions, including, but not limited to, institutional controls at the site may interfere with the use of the property and may require closure of their operations.<sup>73</sup>

Osterman is required to submit documentation to EPA detailing all revisions to the development plan for the site and all future plans for its development that require excavation of soils, within at least 45 days of any planned excavation of soils. Soil may be removed from the site only with prior written approval of EPA.<sup>74</sup>

The covenant not to sue provided to the MBTA and Osterman does not apply to claims regarding the securing, implementation or costs of supplemental institutional controls.<sup>75</sup>

The rights and benefits conferred on Osterman and MBTA may be assigned or transferred only if the assignee or transferee provides a description of its activities on the site, the new use of the site complies with the terms and requirements of the PPA, and the use is consistent with all applicable institutional controls. The PPA notes that because a significant part of the ROD has been performed and the recorded institutional controls on the property should ensure the effectiveness and integrity of the remedial action implemented, the government agrees not to require from Osterman or its successors or assigns any additional monetary payment as consideration for the transfer of rights, benefits and obligations to successors.<sup>76</sup>

The PPA was published in conjunction with the designation of a 30-day comment period, but no public comments were received. In part, the lack of comments may simply reflect the minimal community interest in the site in general. One interviewee noted, however, that the relocation transaction was kept "hush, hush" in the interest of moving the transaction along quickly and, therefore, the local community may not have known about the relocation and the PPA.

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<sup>72</sup> Paragraph 16.

<sup>73</sup> Paragraph 17.

<sup>74</sup> Paragraph 19.

<sup>75</sup> Paragraph 22(g). According to one interviewee, the supplemental institutional controls were referenced in the PPA in order to ensure that new institutional controls could be imposed if a new use of the property indicated the need for additional institutional controls.

<sup>76</sup> Paragraph 30.

The second parcel that is part of the site also was put into use in recent years. In 1998, a communications tower was installed on the property. The site owner did not seek approval from EPA to install the tower and EPA is now examining whether the institutional controls were violated as a result. As discussed below, if the installation of the tower required excavation below groundwater and/or is an impermissible use under the declaration, then the institutional controls failed to restrict the use of the site, but this has yet to be determined.

f. History and Status of Community Involvement

Public interest and participation has been minimal with the exception of the first public meeting. Public meetings were held about the site cleanup in November 1987 and February 1988. The first meeting was an informational meeting to discuss the RI and answer questions from the public. The second meeting was an informational meeting to describe the cleanup alternatives that EPA examined, discuss EPA's Proposed Plan, and answer questions from the public. According to EPA records, an earlier meeting was also held in the fall of 1983 to explain plans for the RI and to define the extent of contamination and remedial action alternatives. In addition, a public hearing was held during February 1988 to accept oral comments on the Proposed Plan and Feasibility Study reports. The last public meeting was held in November 1989 to discuss the cleanup. Approximately 14 people attended the meeting. Four fact sheets were produced for the site at different points in the cleanup process and one news bulletin.

As discussed, the February 1988 meeting drew several hundred people but attendance at the subsequent meetings was low. Public comments on the remedy were also limited. No comments on institutional controls were received and no comments were received on the PPA. Interviewees suggested that community interest was low because of the non-residential location and the lack of serious residual contamination at the site. Furthermore, the institutional controls do not have wide applicability and govern only the two properties that are on the site. With respect to public involvement in selection of the institutional controls for the site, however, it is important to note that several key documents used to notify the community about the site cleanup, particularly the Fact Sheet and the Proposed Plan, did not mention institutional controls and, therefore, provided no notice to the public. According to EPA, the failure to discuss institutional controls in these documents was due to the fact that they considered natural attenuation the remedy for the site, not institutional controls, and that institutional controls were only intended to supplement the remedy by assuring protectiveness until drinking water standards are achieved. However, as noted above, the ROD states that institutional controls "will be required legal instruments as part of the remedial action. . . ."<sup>77</sup>

2. Selection and Administration of Institutional Controls

a. Process for Identifying Institutional Controls

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<sup>77</sup> ROD at 37.



The institutional controls selected by EPA in the ROD were very general and essentially served as place holders. The EPA and state staff assigned to the site explained that they used this general language in order to allow for the flexibility necessary to work out the details later with the state and local government and to alter the institutional controls at a later date if necessary. While the Town of Bridgewater was on notice that institutional controls were likely to be included in the ROD, the Town was not consulted and did not work with EPA in the institutional controls selection process. The specific, detailed institutional controls were the product of a collaborative, noncontentious effort among the RPs, EPA, and the State. For a variety of reasons, including lack of interest on the part of the RPs and a good working relationship between EPA and the State, the institutional controls selection process was productive and non-adversarial.

The RPs did not focus on the institutional controls when providing comments to EPA on the Proposed Plan. With respect to the groundwater, their primary concern was that even the plan to install monitoring wells and perform sampling, as opposed to pumping and treating the groundwater, was unwarranted in light of the low levels of organic contamination and the hydrologic conditions.<sup>78</sup> The lack of interest in the institutional controls on the part of the RPs may have been due in part to the fact that the RPs did not own the properties on the site and, therefore, would not be required to implement the institutional controls.

Overall, the selection of general institutional controls for the site does not appear to have been an important aspect of the remedy selection process or an important part of the remedy. The ROD indicates that the institutional controls were given almost no attention or analysis.

Given that the institutional controls outlined in the ROD were vague, the selection of specific controls occurred primarily after the ROD was issued. The RPs initially drafted the institutional controls for EPA's review. EPA then took the proposed institutional controls and worked with the State AG to ensure that the institutional controls were acceptable under state law. At the time the institutional controls were selected, Massachusetts did not have a statute or regulations on institutional controls, and EPA Region I had only limited experience with developing institutional controls for Superfund sites. Accordingly, EPA and state staff did not have guidance or models to rely upon in selecting the institutional controls, except for the institutional controls used for the Industriplex site in Massachusetts. A state law had recently been enacted that allowed the State Office of Environmental Affairs to hold conservation trusts. Initially, the State planned to use the conservation trust authority as a mechanism for restricting the use of the site; however, the Office of Environmental Affairs ultimately decided that the conservation trust provisions should be used in a more traditional conservation context. The institutional controls developed by EPA with the assistance of the AG and RPs were set out in a Declaration of Restrictions, as described above.

#### b. Implementation of Institutional Controls

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<sup>78</sup> ROD at 47.

Implementation of the institutional controls required two major steps. The first step was for the Town to enact a special ordinance that authorized it to restrict its own use of the site. On September 16, 1991, at a special Town meeting the following article was adopted:

That the Town authorize the Board of Selectmen to enter into a Declaration of Restrictions with the United States Environmental Protection Agency and the Massachusetts Department of Environmental Protection limiting the use of land and to run with the land on a certain parcel of land owned by the Town of Bridgewater ... said Declaration of Restrictions to be recorded in the Plymouth County registry of Deeds.<sup>79</sup>

Thus, the article authorized the Town to agree to the Declaration of Restrictions that was developed by the RPs, EPA and the AG.

The second major step in the institutional control implementation process was the recordation of the Declaration of Restrictions. Both the Town and the private land owner recorded the restrictions on their properties. Since the Registry of Deeds in Plymouth, Massachusetts uses the name of the property owner as the key to searching deed restrictions,<sup>80</sup> as opposed to the property name and location,<sup>81</sup> the restrictions were listed under the Town name and last name of the private property owner. Interviews with personnel in the Registry of Deeds Office indicated that the first time they were asked to record use restrictions on contaminated property, it took some thought as to how to handle the request because such untraditional use restrictions had not been recorded before and the Office was not familiar with them. The Office has subsequently recorded similar deed restrictions on contaminated properties and now considers it routine.

Aside from the public meetings and hearings specifically required under CERCLA, education programs prescribed in the ROD were not implemented. According to EPA, the community was not interested in the site after the early public meetings so the Agency did not follow up on the education efforts referenced in the ROD. Given the location of the site in an industrial park, the lack of interest or need for education efforts is understandable. However, because the Proposed Plan and Fact Sheets for the site did not reference institutional controls, it is possible, although unlikely, that the community may have been more interested in the institutional controls if they had been better informed.

#### c. Operation of Institutional Controls to Date

Both the Town and privately owned properties remained vacant for several years, during

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<sup>79</sup> Letter from Town Clerk to Town Counsel, dated September 17, 1991.

<sup>80</sup> The Registry of Deeds maintains both hard copy and computerized records that can be searched by the public.

<sup>81</sup> Ch. 36, Section 14 of the Massachusetts General Laws (1830).

which time the effectiveness of the institutional controls was not tested.<sup>82</sup> Development of both properties within the last three years, however, has provided an opportunity to assess the effectiveness of the controls.

The first test of the institutional controls came when the Town tried to relocate Osterman to the site, as discussed above. Osterman was reluctant to rely on the references to zoning in the Declaration for establishing permissible uses of the property, because zoning could be subject to change. Osterman wanted to ensure that use of the site for a propane gas business would remain a permissible use of the property. In addition, Osterman was concerned about ensuring that it would not be held liable for contamination that was currently on the site and requested that it be permitted to install its own monitoring wells to collect independent data about site contamination.

As a result of Osterman's concerns, the Declaration was amended to clarify that propane distribution was a permissible use of the site and to provide that Osterman could install its own groundwater monitoring wells. Specifically, a Certification of Additional Uses Under Declaration of Restrictions was added to the Declaration approximately six years after the original Declaration was signed. The Certification provided that Osterman had purchased the property and that EPA and MDEP had determined that use of the property for the propane gas business and the installation of groundwater wells and drawing of groundwater for the purpose of conducting groundwater monitoring was permissible, provided a plan for excavation, installation of wells, and monitoring was first submitted to and approved in writing by EPA and MDEP.

These revisions were not substantive changes given that a propane gas business was probably acceptable under the zoning restrictions referenced in the Declaration and that Osterman could have sought advance written approval under the Declaration to install the monitoring wells. Nevertheless, it is interesting, as discussed below, that the new property owner was not comfortable with the long term effectiveness of the institutional controls in place that were tied to zoning restrictions. In addition, as discussed above, before it acquired the property, Osterman entered into a PPA that specifically references the institutional controls and attaches the Declaration as an exhibit.

The operation of the institutional controls was triggered several times both prior to and after Osterman moved onto the site:

Initial Site Preparation Work: In order to operate its business on the property, Osterman needed to construct a driveway, install a pier for a propane tank, and install a trailer with a self-contained septic system. Interviewees offered

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<sup>82</sup> ELI was unable to confirm reports from interviewees that a neighboring land owner sought to acquire or lease the property owned by the Town prior to Osterman's acquisition of the property. It is possible, according to interviewees, that the neighboring property owner did not move onto the site because he was told by the Town that he could not install a septic system due to the institutional controls.

varying recollections of whether and how the work was formally approved by EPA. According to one interviewee, the ground was pierced for the installation of the pier without prior approval by EPA but EPA subsequently approved the installation. According to another interviewee, approval of all the site preparation activities was provided during the course of the property transfer and PPA negotiations, but the approval may have been provided by the government lawyers and not the technical staff. In any event, it is clear that EPA was well aware of Osterman's activities, because they are outlined in the PPA.

Installation of Septic System: At the time this study was conducted, a small office building was under construction on the Osterman property. Due in part to the excavation restrictions in the Declaration and PPA, Osterman was constructing the office with minimal excavation for the foundation, although the high water table was also part of the reason for the construction plan. The excavation restrictions were therefore triggered primarily because of the excavation required for the building's septic system. The building and septic system have been approved by EPA but interviewees varied in their perceptions of how long the approval process took and the reasons for delay in construction of the system. According to EPA, Osterman obtained initial approval from the Town for a building permit and septic system. When EPA reviewed the plans, however, it found the plans included some excavation below the ground water table. As a result of EPA's review, Osterman was required to change its original plan and seek further approval from the Town. Osterman later sought and received approval from EPA to construct two buildings instead of one on the property.

Due to the residual contamination in the groundwater, Osterman intends to install three monitoring wells with the septic system in order to be able to establish what contaminants, if any, have entered the soil from the septic system. The data is intended to serve as a safeguard against liability for contamination that was in the groundwater prior to the installation of the septic system.

Although not directly related to the operation of the institutional controls, it is worth noting that the controls and, more specifically, the potential liability arising from the residual contamination at the site have caused some tensions between the RPs and the new site owner. When Osterman took ownership of the property, the RPs reportedly took the position that they should be released from all further obligations with respect to engineering and institutional controls. Specifically, the RPs maintained that if the site was acceptable for sale and reuse, additional remedial work and institutional controls were not necessary for protection of human health and the environment. EPA rejected this position.

The residual contamination has also caused Osterman to take precautions by documenting that its operations are not contributing hazardous substances to the site. For example, Osterman hired an engineer to assess the site. In addition, as noted above, the

company plans to install its own monitoring wells independent of the RP-installed wells. Despite these concerns, however, Osterman decided that the property was a minimal risk because substantial information had been gathered about the residual contamination. The Superfund site was viewed as less of a liability risk than a non-Superfund site that had been used for industrial purposes, because less would be known about the latter site.

In addition to the development of the Osterman property, the institutional control land use restrictions may have been triggered by the communications tower constructed on the property adjacent to Osterman's property. ELI did not interview the property owner and, therefore, has no independent verification of the facts. However, according to interviewees, the tower was constructed within 90 days and some type of approval was obtained from the local government because of the wetlands on the property but no EPA approval was sought or provided.

#### d. Outlook for Operation of Institutional Controls

The site is subject to five year reviews under CERCLA. In addition, the RPs are still required to submit annual reports on the status of the site, although EPA has indicated that the reporting period may be reduced to once every two years. Each of these processes may help ensure proper operation of the institutional controls.

Town well drilling restrictions may also serve as a potential check against institutional control violations.<sup>83</sup> Specifically, Town regulations provide that a well permit must be obtained from the Board of Health for each new well. The Board of Health reviews applications to ensure that they meet the guidelines set out in the regulations. The regulations provide, *inter alia*, that chemical and bacteriological analysis must be made of the water from each well. If well water exceeds maximum contaminant levels set by EPA, the Board of Health may order a suitable water conditioner to be installed. Before a building permit can be issued, a well must be installed, its water analyzed and the laboratory report and well log submitted to the Board of Health. Accordingly, the regulations, may help ensure that contaminated water is not inappropriately used at the site, assuming that applications are submitted to the Board as required.

At least in the short term, the outlook is good for maintaining the integrity of the institutional controls. Osterman is cooperative and appears willing to maintain the institutional controls, the RPs are continuing to monitor the site, and EPA is fairly active in its oversight. Regardless of whether the institutional controls were violated by the owner of property adjacent to Osterman's property, it is likely that the current investigation by EPA will increase the owner's awareness and EPA's monitoring of the institutional controls.

As one interviewee pointed out, it is always possible for a person to simply disregard an

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<sup>83</sup>The regulations were effective June 25, 1993, and issued under the authority of the Massachusetts General Laws, Chapter III, Section 3.1 and Articles 1 and 2 of the State Sanitary Code.

institutional control, particularly when a regulator is not on site. On the other hand, as another interviewee noted, institutional controls are just like other laws that people are expected to adhere to without a policeman on every corner.

The long term outlook is less clear for maintaining the institutional controls. The controls are intended to stay in place at least until the remedy has met the remediation goals for groundwater outlined in the ROD. Given the possibility of a change in ownership and/or use of the properties, and the likelihood of reduced EPA oversight and reduced RP monitoring activities, lack of compliance with the institutional controls is possible. Although the PPA and Declaration purport to bind successors, it is possible that a new owner or lessee may not adhere to the institutional controls and may, for example, excavate below groundwater without approval, or use the property for an impermissible use. In light of EPA's standard five year review period and the RPs likely shift to bi-annual monitoring, without active EPA oversight or RP monitoring such violations could go undetected for considerable periods of time.

Both the representatives for the RPs and the current owner volunteered that even if the institutional controls were to fail it would not cause a threat to health or the environment because of the minimal residual contamination remaining on the site. In other words, in their view, the controls are not crucial to limiting exposure to hazardous substances. In addition, given the location of the site in an industrial park that is unlikely to become a residential area and the fact that the groundwater is not used for drinking water, failure of the institutional controls may not be a serious concern from an environmental or health perspective at the Bridgewater site. It is interesting to note, however, that while the groundwater is not currently used for drinking water, it is classified as a potential source of drinking water.

The probability of the long term effectiveness of the deed restrictions providing notice to prospective purchasers is fairly good. Although a computerized search for the restrictions on the Osterman property using computers provided in the public information room at the Registry of Deeds produced a copy of the PPA with the Declaration and Certification attached, it was initially difficult to find the records because the owner's name must be entered exactly as it appears in the records. For example, the search produced different results when the owner's first and middle initial were used in addition to his last name. However, since the institutional controls apply to owners of the properties, a prospective purchaser or developer would in all likelihood persevere to find some property records prior to purchase. Once the records are found, the restrictions would probably be attached to the deed, based on the sample searches run for this study.

Interestingly, the Declaration and Certification were not included as separate documents but were only found as attachments to the PPA. It is possible that the Declaration was not included as a stand alone document for efficiency purposes, but it also is possible that the Declaration was not included separately under Osterman's name because the previous owner, the Town, had imposed the restrictions in the Declaration. Given that the standard practice is to "run down schedules" in the grantor's name going back 50 years, however, it is likely that the Declaration would show up in a search for the duration of the period the groundwater controls

are in place (*i.e.*, 15-20 years), particularly because all successors are supposed to sign the PPA and record it.

### 3. Analyses

#### a. Analysis of Successful Institutional Controls

The land and deed restrictions have been successful for the most part. As discussed above, the institutional controls were developed in a collaborative manner by EPA, the State, and the RPs, and the property owners cooperated in recording the Declaration of Restrictions on their properties. The Town's cooperation was essential because it had to take the additional step of securing an ordinance to allow the imposition of the restrictions. The recordation process was also a success, even though the Recorder of Deeds was not familiar with such types of property restrictions.

The operation of the institutional controls also has been effective. The Town adhered to the institutional controls and did not use the property in a manner inconsistent with the institutional controls during the time it owned the property. The Declaration of Restrictions clearly put Osterman, the new site owner, on notice that institutional controls applied to the property, and Osterman has adhered to the controls. The owner of the other property complied with the institutional controls for many years. Although it is possible that the owner may recently have violated the institutional controls with the installation of a communications tower on the property, this has not been confirmed. The controls have also been successful in that a search of property records produced the restrictions on the property, indicating that property records will provide notice to the prospective purchasers.

The institutional controls have worked because all of the relevant parties cooperated with one another and made an effort to effectuate the institutional controls. Instead, the parties could have argued and disputed the selection of controls, the Town could have failed to take the necessary measures to adopt the institutional controls, both property owners could have neglected to record the restrictions, and the Recorder of Deeds Office could have declined to record unusual property restrictions. Because these problems did not arise and the parties worked together in selecting and complying with the controls, they have been successful to date.

#### b. Analysis of Problems to Date

No serious problems have emerged thus far. Some concerns are raised, however, by the process used to select the controls. Although institutional controls were mentioned in the ROD, the level of detail was minimal. As a result, the specific institutional controls actually had to be selected post-ROD. This effectively precluded public participation in the selection process. Even if the public chose not to comment, it is arguable that the public should at least have been provided the opportunity to participate. Furthermore, the EPA Fact Sheets, press release, and Proposed Plan did not mention institutional controls as a component of the remedy, making it

even more difficult for the community to participate in the selection process.

The lack of early coordination between EPA, the Town and the AG's office also raises some general concerns. The coordinated effort to implement the institutional controls did not begin until after the institutional controls had been selected in the ROD. Although this did not produce any serious problems in the Bridgewater case, because all of the parties were cooperative, when the institutional controls are selected post-ROD no process is in place to resolve controversial issues. Furthermore, local constraints may not be obvious until it is too late. For example, in the Bridgewater case it could have been problematic if the Town was not able to pass an ordinance to impose the restrictions or if the Recorder of Deeds was not willing to take some initiative in recording the restrictions.

The most obvious concern with respect to implementation of the institutional controls was the failure to implement the education program at all because it was determined to be unnecessary given the lack of community interest in the site. Arguably, more thorough consideration of the institutional controls in the ROD development process may have avoided the inclusion of a seemingly unnecessary control. While failure to implement the control did not prove to be a problem at the Bridgewater site, primarily because the community is not directly affected by the institutional controls, in principle it is troubling that EPA was essentially able to ignore a part of the remedy that was selected through a regulatory process with little or no accountability or explanation to the public.

#### c. Analysis of Potential Future Problems

EPA has limited resources and is not able to monitor the site constantly. The construction of the communications tower shows that even a diligent EPA staff cannot keep apprised of all site developments. Although the tower may not have triggered the land use restrictions, the fact that EPA did not know that the tower was under construction and is investigating it after the fact shows that the regulators charged with enforcing the institutional controls do not have the resources to monitor each site on a regular basis or follow through immediately. Furthermore, monitoring of the site by RPs is likely to decrease over time, as evidenced by the steady reduction in monitoring and reporting by the Bridgewater RPs. Thus, as the personnel familiar with the site retire, move to new jobs, or simply become focused on new sites and put the Bridgewater site low on their work priority list, it is possible that the institutional controls could be violated and that the violation would not be detected for quite some time, particularly if a five year review is not required for several years.

In addition, oversight and enforcement of institutional controls selected for the site is necessarily subject to individual judgements, unlike engineering controls that arguably can be evaluated more objectively. EPA has already made several decisions at Bridgewater regarding whether to approve proposed construction on the site. Based on statements by interviewees, a perception that oversight was not uniformly administered could develop. For example, some



interviewees expressed concern that the communications tower was approved very quickly<sup>84</sup> when other proposed excavation was not. Others reported rumors that proposed uses of the Town's property had been rejected by the Town on the grounds that a septic system could not be installed, but the Town and EPA subsequently approved a septic system for Osterman's use. Finally, other interviewees expressed concern that the proper approval procedures were not followed for Osterman's preliminary site work.

Based on the facts, some of these perceptions are seemingly incorrect. Regardless of whether the perceptions are accurate, they highlight the fact that at any site there are likely to be perceived inequities in the way institutional controls are implemented and enforced. Over a long period of time, perceptions of inequities at any site could undermine confidence in the institutional controls and could lead to reduced compliance. Both regulators and property owners could become frustrated and thwart the effective implementation of the controls.

In addition, a problem could arise due to the site's reliance on controls such as zoning, that can be easily modified by political bodies. Osterman's decision to insist on an amendment to the Declaration of Restrictions, rather than rely on zoning, to ensure that it could use the property for its business highlights from a business' perspective the uncertainty of some institutional controls. Furthermore, while flexibility is desirable in some cases, the fact that the Declaration of Restrictions was amended to ensure a use of the property that was beneficial to the Town and MBTA raises questions about whether such flexibility could be used in another situation in a way that could undermine protection of human health and the environment.

Although unlikely, it is also possible that the deed restrictions may not provide effective notice to parties that are interested in the site. For example, although available in computer-based system and in hard copy from the public information room of the Registry of Deeds, it took some effort to find the correct formulation of the owner's name in order to find the property records. It was also difficult to identify the name of the other property owner and, therefore, difficult to confirm whether the restrictions were recorded. As discussed, a prospective purchaser would in all likelihood persevere until the records were found. The deed restrictions are less effective, however, in terms of providing notice to members of the community or interested parties that want to learn about the site or may have concerns about the way it is used by an owner or lessee.

Finally, several parties interviewed did not believe that institutional controls were necessary at the site because of the minimal level of contamination in the groundwater. If institutional controls are perceived as unnecessary, as they are by some parties at the Bridgewater site, then respect for the controls may be undermined. Thus, over the long term it may become more and more difficult to achieve compliance with those controls. Combined with limited monitoring and enforcement resources this could be problematic.

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<sup>84</sup> As noted earlier, EPA did not approve the tower and is now investigating whether approval should have been obtained by the land owner.

In sum, the potential problems that may arise at the Bridgewater site stem primarily from problems inherent in institutional controls, regardless of the particular site. At this point, it is unlikely that these problems will actually occur at the Bridgewater site, given the site characteristics and the regulators and stakeholders involved. However, because the institutional controls may be in place for another 15 years or more while the groundwater contamination is naturally attenuating, such problems cannot be ruled out entirely, as the stakeholders, land development patterns, groundwater use and other factors could change over the next decade or longer.

## **B. Sharon Steel Superfund Site, Midvale, Utah**

### **1. Background and Description of Site**

#### **a. Type of site, Location, Contamination**

The Sharon Steel (Midvale Tailings) Superfund site is a former ore milling and smelting facility located in Midvale, Utah, a small metropolitan municipality approximately 12 miles south of Salt Lake City. The facility, originally owned and operated by the U.S. Smelting, Refining and Mining Company, later known as UV Industries, Inc., operated from 1906 to 1971, extracting sulfide concentrates of lead, copper, and zinc from ore by froth flotation. Smelting operations ceased in 1958, while milling activity continued until 1971. Sharon Steel purchased the site in 1971, but never used the facility for any sort of mining activity.

Tailings left on-site after milling activity ceased are estimated to occupy a volume of nine million cubic yards.<sup>85</sup> Prior to the Superfund remedy the tailings were left in uncovered piles over 50 feet deep, and because of their fine sand-like grain they were often used as a recreational resource by area residents. An environmental health problem was first suspected in 1982, when the Utah Department of Health (DOH) learned that local citizens were gathering windblown tailings for use in sand boxes and gardens. Then in 1988, an investigation revealed that tailings and other dusts had also been blown by the wind and had contaminated soils over a 571 acre area downwind of the mill site with lead, arsenic, cadmium and other toxic metals. Approximately 400 private homes, 35 apartment complexes, and 95 commercial buildings fall within the contaminated area. Roughly 2,500 people live in the affected zone.

Until the City of Midvale recently annexed additional land from surrounding unincorporated county property, the Sharon Steel Superfund site occupied approximately nearly one third of city territory. The land south and west of Midvale is used primarily for agricultural and commercial activities, while the land north and east is predominantly urban. The entire area is drained by the Jordan River, which flows immediately adjacent to the tailings pile. Also neighboring the tailings pile are wetlands that fall just outside the site boundaries.

The Salt Lake Valley has substantial groundwater resources consisting of shallow and deep aquifers that are used for various domestic, agricultural and industrial applications. Within a three mile radius of the site, there are several public drinking water wells that use the deep aquifer to serve approximately 440,000 people. While early studies found only the shallow aquifer directly under the tailings pile to be contaminated, recent data suggest that the shallow and deep aquifers may be hydraulically connected. To date, none of the public water supply wells have been contaminated.

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<sup>85</sup> July 1994 ROD at 2. Earlier EPA documents estimate the tailings pile to occupy a volume of 14 million cubic yards. (September 1990 ROD at 1.) However, the updated figure is considered more reliable in this case.

b. Background and Status of Cleanup

The Sharon Steel site, including both the mill facility and the off-site contaminated residential properties, was proposed for the Superfund National Priorities List in 1984, and finalized on the NPL on August 28, 1990. In the interim, the current site owner, under mandate from EPA and the Utah Department of Environmental Quality (UDEQ), began preliminary cleanup actions to control the most immediate risks, including: fencing the mill site, stabilizing the banks of the Jordan River, and spraying the tailings with a polymer to bind the contaminated dust particles. EPA also demolished the old mill building from 1992 to 1993.

Throughout site investigation, remedy selection, and remedial action, EPA served as the lead agency for the site. UDEQ, working under a cooperative agreement with EPA, served as the contracting agent for the technical remediation and provided oversight of all cleanup activities. Although the two agencies worked together at various stages in the remedial process, there has been a long history of interagency conflict over cleanup decisions ranging from action levels to institutional controls. As discussed later,<sup>86</sup> this interagency dynamic could be relevant to the efficacy of reliance upon institutional controls at the site.

EPA's RI/FS for the site began in 1985. In 1987, EPA, in cooperation with UDEQ, contracted with the Bureau of Reclamation (BOR) within the U.S. Department of the Interior to study the contamination and to design a remedy. With the help of BOR, EPA completed the initial Remedial Investigation for the site in 1988 and published a Feasibility Study in June 1989. A Proposed Plan was issued the following month, and a public hearing on the Plan was held in Midvale that August.

As a result of extensive public comment on the Proposed Plan, EPA decided to divide the site into two operable units, with OU1 encompassing the mill site, its tailings, and the contaminated groundwater underneath, and OU2 covering the residential and municipal soils contaminated by windblown tailings. According to EPA, the decision to divide the site into two OUs was based on the imminent threat presented by the residential soils and the need to further investigate the groundwater beneath the mill site.<sup>87</sup> Issuance of a ROD was postponed for one year to allow additional studies to answer questions posed by the public. Further RI/FS studies and reports concerning groundwater and residential soils were completed during 1989 and 1990. Baseline risk assessments for both soil/tailings and groundwater were also developed in 1990 to evaluate current and potential human health risks associated with site contamination in the absence of any remedial action; both risk assessments were completed prior to designation of the two operable units.

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<sup>86</sup> See Communication and Cooperation Among Levels of Government, in Results and Analysis of Case Studies, below.

<sup>87</sup> There is some speculation among site officials that the public's interest in expediting residential remediation was more because they perceived the work as a neighborhood beautification project and were eager to have their properties enhanced. Some residents, however, were genuinely concerned about the impacts of the contamination, primarily because area cattle had been dying.

i. *OU2: Residential Properties and Public Right-of-Way*

In 1989, as part of a baseline risk assessment for the site, EPA conducted a blood lead screening program to determine how many children living in OU2 had been affected by the elevated lead levels in their yards.<sup>88</sup> The study focused on children because they typically have the most acute exposure to soil contamination, and also because the effects of lead poisoning are most detrimental during the early developmental years. Of 292 residents who agreed to participate in the study, 128 children were randomly selected for testing.<sup>89</sup> In order to determine the extent to which soil contamination was responsible for any elevated blood lead levels found, the study also collected environmental samples from 123 of the participants' residences.<sup>90</sup> Results of the blood sampling released in 1990 showed that 23 children had lead levels exceeding 10 g/dL, the standard of safety set by the Center for Disease Control. The average level among participants was 5 g/dL, while the national average is 2.7 g/dL.<sup>91</sup>

The Feasibility Study for OU2 was completed on June 6, 1990 and a new Proposed Plan was issued that same day. The RI/FS concluded that surface soils within a 142 acre section of the residential area would require removal to prevent continued exposure to excessive concentrations of lead and arsenic. Outside of the affected area, background levels of the principal contaminants of concern were below 100 ppm lead and 20 ppm arsenic. Within the study area, surface soils had lead levels ranging from 33.8 ppm to 7,210 ppm, with a mean of 839 ppm, and arsenic levels ranging from 3.5 ppm to 3,520 ppm, with a mean of 101 ppm. It was estimated that contamination extended to a depth of at least six inches over a 119 acre area and to a depth of at least 12 inches over a 14 acre area. Since these figures were based on statistical modeling of the contamination done by BOR, each property would have to be tested individually before remediation.

A public hearing concerning the Proposed Plan was held in Midvale on June 14, 1990, and a ROD was issued on September 24 of the same year. The ROD called for excavation and

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<sup>88</sup> EPA funded the University of Cincinnati to conduct the sampling. A Technical Advisory Committee (TAC) was established to provide technical expertise and help ensure that the study met the needs of the Midvale Community. TAC representation included ATSDR, UDEQ, DOH, Salt Lake City County Health Department, the City of Midvale, and Citizens for Safe Future Midvale City (a community group discussed below in "History and Status of Community Involvement"). In addition, the Salt Lake City County Health Department was tasked to provide follow-up education to residents with elevated levels.

<sup>89</sup> EPA determined that 128 participants were needed to obtain a statistically valid sample.

<sup>90</sup> Environmental samples included interior and exterior dust, interior lead paint, and perimeter soil.

<sup>91</sup> Follow-up testing was conducted in September and October of 1998 to determine the usefulness of the technical remedy in reducing lead exposure. EPA actively recruited participants from households covered in the original study, but opened the program to all interested Midvale residents. Of the 341 residents who participated in the follow-up study, 286 were children, 29 were pregnant women, and 26 were nursing mothers. Environmental samples were collected at 183 of the 196 participating residences. Results released in 1999 revealed only one child with blood lead exceeding 10 g/dL. The average among participants was 3 g/dL, while the average among participants in the 1989 study was 5 g/dL. The environmental samples collected in 1998 are currently being analyzed.

removal of all uncovered residential soils exceeding 500 ppm lead (Pb) and 70 ppm arsenic (As).<sup>92</sup> These action levels – determined using an Integrated Exposure Uptake Biokinetic Model (IEUBK model) for lead, cancer risk assessment for arsenic, and hazard indices for arsenic and cadmium – were relatively low compared to similar sites in the area, which had action levels ranging from 600 ppm to 1200 ppm Pb. However, the OU2 action levels were determined necessary both to achieve a target blood lead level of 12.5 micrograms per deciliter (g/dL)<sup>93</sup> for 95% of exposed children between 0 and 3 years of age and to reduce the cancer risk associated with exposure to arsenic to an acceptable level. An action level for cadmium was not established since the distribution of all three contaminants of concern had similar patterns, so clean up of lead and arsenic would accomplish cleanup for cadmium as well. The ROD did not establish official action levels for commercial or municipal properties in OU2 either, although EPA informally set the action level for future excavation of unremediated properties at 2900 ppm Pb.

Following removal of contaminated soils, the ROD called for all excavated areas to be filled with clean soil up to the original grade and revegetated to their original condition. All soils removed from OU2 properties during the remedy were to be temporarily stored at the mill site, separate from the tailings pile, where they would be included in the final remedy for OU1. They were to be contained within a plastic liner to prevent redispersal before OU1 remediation.<sup>94</sup>

Because of the high cost estimates associated with excavating beneath pavement and structures, covered areas on OU2 properties were excluded from the remedy. Potential exposure pathways posed by future removal of pavement and structures by individual property owners were to be prevented through the implementation of institutional controls calling for testing and possible excavation of unremediated soils. These controls were to be in place prior to the commencement of the residential soil removals to ensure the integrity of the technical

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<sup>92</sup> Because vegetables grown in contaminated soil can incorporate lead and thereby present an additional exposure pathway, the ROD called for garden soils with Pb concentrations greater than 200 ppm and As concentrations greater than 70 ppm to be excavated down to 18 inches. Institutional controls were also prescribed to regulate installation of new gardens. However, in an Explanation of Significant Differences issued June 23, 1994, this component of the remedy was deleted based on new toxicological knowledge suggesting garden soils with lead levels between 200 and 500 ppm did not present significantly different health risks than garden soils with lead concentrations of 500 ppm. ESD at 1.

<sup>93</sup> After the action levels were recommended in April 1990, EPA Region VII received guidance from EPA's Office of Emergency and Remedial Response and the Office of Air Quality Planning and Standards indicating that a target blood lead level of 10 g/dL is appropriate for protection of human health. In response to this new information, EPA recalculated the action level for lead using the target level 10 g/dL for the most sensitive age group, children 0-3 years of age. The result of these new modeling efforts indicates that, at a clean up level of 500 ppm, 11% of children might exceed the target blood lead level of 10 g/dL.

<sup>94</sup> During remediation, excavated soils were placed directly on the tailings pile, not within a plastic liner.

remedy.<sup>95</sup> To provide a place for future disposal of excavated residential soils, a “citizens repository” could be created during the course of the remedial action.

In 1993, UDEQ began performing cleanups on residential properties pursuant to the remedy prescribed in the ROD. To determine specific remedial plans at individual properties, BOR sampled to calculate the average surface soil lead per property.<sup>96</sup> Testing revealed that the majority of properties in OU2 were contaminated with Pb levels between 500 and 1000 ppm. In keeping with limitations on Superfund authority, BOR did not test to determine if lead paint contributed to contamination levels detected. This may have been problematic, though, since many of the homes in Midvale are likely to be over 30 years old and might therefore have elevated lead levels due in part to deteriorating paint. During the testing process, BOR created a database of all site properties that included testing data, physical features of the properties, and information on the person who consented to have testing done.

The technical remediation at OU2 was done in five phases, with each phase covering a different segment of the affected area.<sup>97</sup> Occasionally, properties were remediated later than their assigned phase because certain residents initially refused soil testing but later consented to participate in the remedy. Due to poor interagency relations with EPA and UDEQ, the City of Midvale elected to assume responsibility for soil remediation on affected municipal properties. City public works employees received 40 hours of Occupational Safety and Health Administration (OSHA) training to ensure their safety during work in the contaminated area. They subsequently remediated one section of roadway and an adjacent park strip, as well as several grassy areas surrounding Midvale City Hall. All excavated soil was put on the OU1 tailings pile to be included in the remedy for that operable unit. According to the City, the only uncovered municipal properties left unremediated in OU2 were two traffic islands, each estimated to have lead levels of 62 ppm.

On average, each residential property took between five and six weeks to remediate. In most cases, engineers “chased the contamination” until they found soil below the specified action levels, which on some properties entailed excavating down to 42 inches.<sup>98</sup> In a limited number of cases, engineers were compelled to stop digging before locating clean soil because hard surfaces impeded further excavation.

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<sup>95</sup> As discussed below in Implementation of Institutional Controls, the City of Midvale promulgated Contaminated Soils Remediation Regulations (CSRRs) in 1994 pursuant to the selected remedy, but later repealed the controls with the approval of EPA.

<sup>96</sup> The Agency usually tested between 0-2", and in some cases between 0-6", at up to 13 zones per yard. It was assumed that the average lead concentration of surface soils would be consistent with that of the deeper soils.

<sup>97</sup> Phase I included all municipal properties in the operable unit. Phases II through V covered residential properties.

<sup>98</sup> Based on information gathered during the Remedial Investigation for OU2, EPA had anticipated that excavation to 24" would be sufficient in most cases.

Since Phase I of the residential cleanups commenced prior to the availability of air quality data for OU2, health and safety protocol required site engineers to perform their initial duties dressed in full protective gear to avoid inhalation of possible contaminants. When air quality data became available during the course of Phase I, no violations of air standards for suspected contaminants were found, so engineers ceased wearing protective gear. However, entering the community in protective gear after the residents had lived with the contamination for many years without apparent harm alienated the community from EPA and UDEQ and further strained relations between the City and those agencies. This dynamic might have been prevented or minimized with comprehensive community outreach efforts prior to the use of protective gear.

Because of the long duration of the remedy, UDEQ employed several different contractors for different phases. One community member reported that the Phase III contractor violated its obligation to return residential landscaping to its original state. The interviewee said that several old trees were removed without residents' consent and that mature landscaping was ruined without repair, causing resentment on the part of the community.<sup>99</sup> Otherwise, throughout the course of the remedy, most residential properties were restored to their original condition, and in many cases were improved with new landscaping. Many community members were reportedly pleased to have work done on their property, because they perceived the installation of new lawns and vegetation as agency-financed economic revitalization of Midvale. In the event that property owners were unsatisfied with the condition of their yards, they each received a one year warranty allowing them to file a claim with UDEQ for any damage to or alteration of their property contrary to the remedial plan (*e.g.*, if trees die).

The OU2 soil excavations were completed in 1998, after five years of remedial activity and expenditures totaling approximately \$25 million. For properties remediated during the first two phases of cleanup, EPA issued "clean letters" to individual home owners at the conclusion of the technical remedy stating that "the cleanup as done is protective of human health and the environment and the enactment of the Contaminated Soils Remediation Regulations [CSRRs] by Midvale City provides for the long term protection of human health and ensures that the remedy remains protective."<sup>100</sup> The letters did not explain the terms of the CSRRs or the fact that OU2 residents had a responsibility to contact the City should they choose to excavate under covered areas. As discussed below in Implementation of Institutional Controls, these letters were later replaced by a second round of "clean letters" stating simply

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<sup>99</sup> UDEQ officials were not aware of any property damage that was not repaired or replaced to the satisfaction of either the property owner or UDEQ. If, however, there is resentment among community members, there could be negative implications for institutional controls at the site. This relationship is discussed further in Community Awareness, Acceptance and Participation in Institutional Controls, found in the Results and Analyses of Case Studies, below.

<sup>100</sup> As discussed below in Implementation of Institutional Controls, the Contaminated Soils Remediation Regulations, enacted by the City of Midvale on May 31, 1994, established soil testing protocols for remediated and unremediated areas as well as requirements for remediating detected contaminants of various concentrations.



that the “cleanup as done is protective of human health and the environment.”<sup>101</sup> Due to the time of issuance, properties remediated during the final three phases of cleanup only received the second letter.

EPA acknowledges that the presence and activity of heavy machinery disrupted Midvale residents throughout the duration of the remedy. Aware of the disturbance, EPA plans to delete the site from the NPL as promptly as possible in order to return the City of Midvale to its usual state of affairs.

*ii OU1: Mill Tailings, Contaminated Soils, Wetlands, and Groundwater*

OU1 is defined by the Sharon Steel property boundaries and covers approximately 264 acres. About one third of the OU falls within Midvale City territory, with the remaining two thirds on surrounding unincorporated county land. Of the 264 acres, 74 acres are not contaminated and can be developed ostensibly without much need for institutional controls. This portion of the OU is split between the City of Midvale and the County at a ratio of one third to two thirds, respectively. The contaminated area is divided between the City and the County in the same proportions.

During the remedial investigation, the tailings pile, which constitutes the largest portion of OU1, was found to average 5,470 ppm Pb and 320 ppm As, while background concentrations in the area are below 100 ppm Pb and 20 ppm As. Arsenic concentrations in groundwater samples taken from on-site monitoring wells ranged from 2.5 to 246 g/L, with an average of 28.14 g/L, while the regulatory Maximum Contaminant Level (MCL) is 50 g/L. Monitoring wells where As concentrations exceeded the MCL were located exclusively within the tailings. No other contaminants of concern were detected in groundwater samples.

The FS and Proposed Plan for OU1 were completed in May 1992, following incorporation of public comments and additional analyses of an initial FS and Proposed Plan issued in October 1990. A public hearing on the second Proposed Plan for OU1 was held in Midvale on June 17, 1992, and in July 1993, EPA issued a ROD for the operable unit. In the ROD, EPA selected an on-site remedy for cleanup of the mill tailings, soils, and wetlands, but, based on a difference in opinion with UDEQ, the Agency also provided a contingency alternative to allow UDEQ to implement an off-site disposal remedy for the contaminated soils and tailings pile.

The selected remedy called for construction of a five-foot multi-layer vegetated soil cap over the entire tailings pile, which was estimated to occupy nine million cubic yards spread over 200 acres. Also to be excavated and capped along with the pile were: 1) contaminated residential soils removed from OU2 during implementation of the Superfund remedy; 2)

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<sup>101</sup> The second letters were issued after the repeal of the Contaminated Soils Remediation Regulations in response to a request made by the City of Midvale.

approximately 132,000 cubic yards of soils from the former mill area (excavated soil would be replaced with clean fill to prevent any physical contact with contaminated soils in the area); 3) approximately 43,600 cubic yards of contaminated wetlands sediments (the wetlands were to be restored to their original state after dredging); 4) approximately 22,300 cubic yards of tailings stored on the west side of the Jordan River; and 5) any tailings found within 150 feet of the center line of the Jordan River. The cap was to be designed to eliminate direct exposure to, and dispersion of, the tailings, and to reduce percolation of water through the tailings, thereby reducing the potential for leaching of metals into the groundwater below. The cap's design would allow pedestrian traffic, but to ensure its integrity only structures specified during remedial design would be permitted on the cap.

Measures were also prescribed to divert stormwater runoff, to protect against flood-induced erosion, and to control subsurface recharge to the site. The cap, which was constructed at a four to one slope, was structured in "surfaces" and "valleys" to enable all surface waters except precipitation that descends the slope of the cap into the wetland to drain westward into the Jordan River. An interceptor trench was also constructed along the eastern edge of the tailings to divert groundwater flow away from the tailings and into the Jordan River, as long as monitoring data confirms that this groundwater meets surface water discharge standards. Because the flow of water is upstream away from the cap, these provisions should eliminate the possibility of seepage from the cap.<sup>102</sup> To ensure the safety of the shallow groundwater migrating westward toward the Jordan River, and potentially northward as well, the ROD called for a shallow groundwater monitoring system to be installed along the northern and western peripheries of the tailings pile. To eliminate potential on-site exposure pathways, the use of groundwater on the site was to be prohibited through deed restrictions.

Based on the engineering cost estimates that EPA received during the OU1 RI/FS, the Agency believed that the cost to implement the selected remedy would be substantially lower than the State's favored alternative, which included offsite disposal of contaminated soils and tailings. However, before selecting the capping option, the State wanted to definitively determine the market value of offsite disposal by putting out a bid for the work. Therefore, prior to issuance of the ROD, EPA and the State agreed to institute a contingency alternative in the ROD whereby they could jointly conduct a market value investigation to determine the cost differential between on-site and off-site alternatives. The contingency process established a methodology and specific dates by which the State and EPA would work together to reach consensus on the this issue. Based on the conclusions made during this process, EPA, in consultation with UDEQ, would then award a contract for the agreed upon remedial design and action.

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<sup>102</sup> Rip rap was also installed along the banks of the Jordan River to prevent the River from redirecting itself to run through the cap, because the River originally flowed directly through the capped area. During the 1950s, the River was diverted to accommodate the large volume of tailings generated by the milling operation. EPA does not believe that the River will return to its original path. However, the Agency believes that a major flood could cause the River to bring about a seepage problem.

Like UDEQ, the City of Midvale objected to the capping alternative and favored relocation of the contaminated soils and tailings. The City's position, however, was that the cap would pose excessively onerous development restrictions on 200 acres of prime valley real estate. While the capped area could accommodate a golf course or park, this prospect was unappealing to the City and its residents because Utah already has the highest per capita golf course rate in the country. Since OU1 lies on the fringe of Midvale property, the area is not particularly well located for a park either. Portions could be well-suited for a riverwalk or a wetlands-based recreational resource, but the City and its residents would have preferred to see it used for some sort of income-generating commercial development.

Once bids were solicited for off-site disposal, it became clear that the contingency alternative would be financially prohibitive. Several contractors who bid on the work estimated the cost to range between \$150 million and \$200 million. EPA had already stated its commitment to spend \$30 million out of the \$62 million received in settlement with responsible parties on OU1 remediation, but any remaining funds would have to come from the State. UDEQ, therefore, consented to the capping alternative which would be within EPA's budget. UDEQ began implementing the selected remedy in 1995, and construction was completed in November 1996. Natural grasses were replanted and revegetation has since taken hold. There remains a chain link fence, erected prior to the remedy, approximately 100 feet from the cap boundary. Small warning signs are mounted on the fence to caution against entry. In total, the technical remedy for this operable unit cost approximately \$30 million.

In 1997, EPA began monitoring the groundwater wells, and results show elevated levels of metals at the edge of the site. The type of institutional controls needed for the OU is yet unresolved, but O&M will clearly be necessary to monitor groundwater as well as the integrity of the cap. EPA may also elect to do additional groundwater studies in response to fluctuating contaminant levels in two monitoring wells adjacent to the cap.

c. Types of institutional controls

i. *OU2: Residential Properties and Public Right-of-Way*

Because the selected remedy at OU2 left contamination in place under paved areas and structures, institutional controls were deemed necessary to protect against harmful exposure in the event of future excavation. According to the ROD, institutional controls would be implemented "to require building permits prior to construction during removal or replacement of pavements or foundations."<sup>103</sup> They would also "be employed to regulate the installation of new gardens."<sup>104</sup> The remedy called for detailed descriptions of institutional controls to be produced during the Research Design phase and enacted by the appropriate local governments prior to implementation of the Remedial Action.

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<sup>103</sup> ROD at 17.

<sup>104</sup> *Ibid.* This requirement was later repealed in a 1994 Explanation of Significant Differences. ESD at 4.

On May 31, 1994, the City of Midvale enacted the institutional controls prescribed for OU2 as Contaminated Soils Remediation Regulations (CSRRs), which established soil testing protocols for remediated and unremediated areas as well as requirements for remediating detected contaminants of various concentrations.<sup>105</sup> Under the regulations, a non-fee permit was required for any excavation done on private land within OU2. To obtain a permit, the applicant had to submit a detailed project plan for review by the City. While projects conducted by the City or its contractors did not require a permit, they too had to be reviewed by city staff assigned responsibility for administering the CSRRs.

In remediated areas, only projects involving the disturbance of more than one cubic yard of unremediated soil required testing to assess the levels of lead and arsenic in the soil. For these projects, a tier system was established that outlined options for remediating soils of various threshold pollutant concentrations. Depending on the contaminant levels, options ranged from no action to disposal at a RCRA Subtitle D Facility, dilution to concentrations below action levels for the OU, and capping with 12 inches of soil and vegetation or an uninterrupted hard surface. In cases of extreme contamination, an OSHA qualified contractor would be required to perform the remediation.

In unremediated areas, all projects required testing to assess lead and arsenic levels in the soil. Those found to be below the action levels for the OU did not require further action, while those exceeding action levels required removal or capping with an uninterrupted hard surface. All soils removed from unremediated areas would be handled by a contractor approved by the Utah Office of Occupational Safety and Health (UOSH) and transported according to applicable terms and conditions set forth by the U.S. Department of Transportation.

Along with the CSRRs, the City of Midvale issued a Health and Safety Plan for the OU2 area, which set forth a policy to be followed by all municipal employees and contractors working in the impacted area. This plan was part of a coordinated effort to ensure the safety of workers and the containment of contaminated soils, and included 40 hours of OSHA training for all public works employees of the City. Pursuant to the CSRRs, the City was also required to conduct a public education campaign to caution residents of the threats associated with exposure to contaminated soils left on-site after the technical remedy.

To alleviate the financial burden associated with implementing institutional controls, EPA set aside approximately \$520,000 to cover the City's cost of administering the CSRRs.<sup>106</sup> The City did not have direct access to these funds, but could seek individual disbursements on a case-by-case basis. Specifically, funds were intended to finance costs of soil testing and

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<sup>105</sup> As discussed below in Implementation of Institutional Controls, the City of Midvale repealed the CSRRs in 1998 with the approval of EPA.

<sup>106</sup> The amount available will have to be amended in light of the repeal of the CSRRs. Funds will still be provided for administering the excavation regulations concerning the public right-of-way.

disposal at a RCRA Subtitle D facility,<sup>107</sup> city staff time spent administering the controls, and environmental engineer oversight at OU1.<sup>108</sup> To date, the City has spent approximately \$70,000 of the allocated funding. Most expenditures have covered city staff time for administering the ordinance, limited soil sampling in the public right-of-way, and salary for an environmental engineer temporarily hired on staff. The City also obtained approval to use this fund's money to purchase a computer system to compile a database of properties affected by the CSRRs.

City officials also negotiated a grant from the U.S. Department of Housing and Urban Development (HUD) to fund the acquisition, demolition, and revitalization of buildings in the Superfund area. The purpose of this grant was to facilitate economic development in Midvale and elimination of blight in relation to the City's Superfund status. All individual projects are required to be pre-approved by the HUD regional office. Of the \$265,000 originally allocated by HUD, \$54,000 remained at the time of this study.

*ii OUI: Mill Tailings, Contaminated Soils, Wetlands, and Groundwater*

To date, no institutional controls have been established for OU1, but the City, UDEQ and EPA all agree that measures will be necessary to ensure the protectiveness of the cap and the safety of the groundwater. EPA is currently investigating the possibility of instituting a deed restriction to prohibit certain construction activities as well as planting of deep-rooted plants and trees that threaten to puncture the cap. A deed restriction would also likely contain groundwater use restrictions to protect against ingestion of contaminants.<sup>109</sup> Lastly, there may be some restrictions on activity in the former smelter area to protect against harmful exposure to subsurface toxins.

In addition to these controls, O&M will be necessary at OU1 to maintain the integrity of the technical remedy. In a departure from normal practice, EPA has already proposed to fund UDEQ to conduct O&M at OU1 for five years, hoping that a developer will purchase the site

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<sup>107</sup> While the CSRRs were in place, standard protocol would have been for citizens to deliver unremediated soil samples to the City for testing. Where necessary, the City would then dispose of any contaminated soils at a suitable facility. If private citizens were to incur any direct costs of testing and/or disposal, the City would be required to seek reimbursement from EPA on their behalf.

<sup>108</sup> EPA funding for engineer oversight was only specified for OU1, because the need for oversight at OU2 was considered an implicit cost of administering the institutional controls. Originally, the City planned to hire a full-time environmental engineer for a period no longer than two years. However, there was not enough work for a full-time engineer, so the City contracted with an independent consultant instead. The City spent \$50,000 on this consultant's oversight of the technical remedy at OU1 and sought reimbursement from EPA. However, an EPA Region VIII attorney later ruled that the selected consultant was ineligible for EPA funding based on a contractual detail pertaining to a prior relationship with the City of Midvale. As such, the City has had to cover the costs of engineer oversight out of its general budget.

<sup>109</sup> The Salt Lake Water Conservancy District recently proposed to install drinking water wells along the Jordan River from Utah Lake up to the Great Salt Lake. These wells would access the valley's shallow aquifer, which was found to be contaminated under the OU1 tailings pile.

during this time and take responsibility for O&M in the future. However, the State currently has no O&M responsibilities at the site and has not made any assurances to accept this role. It is probable that UDEQ will consent to conduct O&M for a five year period, in which case the State will need to formally apply for a site-specific cooperative agreement with EPA. O&M duties will likely include: 1) monitoring groundwater contamination below the cap; 2) monitoring and maintaining the cap and its vegetative cover;<sup>110</sup> 3) monitoring and maintaining the drainage ditches on and around the cap;<sup>111</sup> 4) working with BOR to regulate the water level in the wetlands through water ducts into and out of the Jordan River; 5) stream bank erosion protection; and 6) site security.

#### d. Background and Status of Enforcement Efforts

Three responsible parties (RPs) have been identified at the site. They include: 1) Sharon Steel Corporation (Mining Remedial Recovery Company [MRRC], a company formed during bankruptcy proceedings of Sharon Steel Corporation, is the current owner of the mill site); 2) UV Industries, Inc. and UV Industries Inc. Liquidating Trust - the former owner and operator of the mill site; and 3) Atlantic Richfield Company - a generator of hazardous substances disposed of at the mill site and a potential former operator of the mill. General notice letters were sent to these parties on August 28, 1995 and requests for information were sent on May 12, 1988; no special notice letters were sent.<sup>112</sup>

EPA and the State of Utah reached settlement with all three RPs after a federal lawsuit was filed requesting both reimbursement of response costs incurred at the site and injunctive relief requiring the defendants to perform remediation at the site. Through these settlements, EPA collected a total of \$62 million to cover the three companies' obligations at both the Sharon Steel Superfund site and the neighboring Midvale Slag Superfund site.<sup>113</sup> Settlement funds were divided into two separate accounts, one for each site. The settlements did not include any obligation for administering the institutional controls, but in the short term EPA plans to fund O&M out of remaining settlement money, which totals approximately \$12 million.

#### e. Background and Status of Reuse

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<sup>110</sup> The cap was designed to last 30 years. During that period there will likely be floods and storms when monitoring and repair will be needed.

<sup>111</sup> One of the drainage ditches adjacent to the wetland has already begun to erode. The site's current owner, Mining Remedial Recovery Company (MRRC), places high priority on its repair, as the eroded ditch could degrade into a wetland area and thereby prohibit future development. However, the company has not acted to maintain the ditch, because it contends that O&M is the State's responsibility. EPA plans to install diverter pipes to mitigate the erosion.

<sup>112</sup> See 42 U.S.C. § 9604(e).

<sup>113</sup> Mining Remedial Recovery Company settled for \$22 million, and both UV Industries and Atlantic Richfield Company settled for \$20 million.

To date, no redevelopment has occurred at OU1, although MRRC recently sold five acres outside the capped area to the neighboring City of West Jordan. According to MRRC, several prospective purchasers have considered buying the site, but each backed out when they learned of the liabilities associated with its Superfund status. In 1997, a foreign company tried to purchase the entire property for reuse as a country club with a five-story hotel, two office buildings, a condominium, and a golf course. However, the deal fell through because the company was not prepared to follow the prospective purchaser process required by EPA. Apparently, EPA wanted the company to make assurances on the property in the form of a \$1.25-1.5 million cash trust with the Agency and by opening all domestic and foreign corporate books for EPA examination. As a foreign company, the prospective purchaser was not previously aware of the liability issues associated with CERCLA and opted out of the purchase.

According to MRRC, there is still hope for redevelopment of OU1, most likely in the form of a golf course or park. Presently, MRRC is considering a joint venture with the same foreign company, whereby MRRC would retain ownership of the site and the other company would develop a golf course on the capped area. If this deal goes through, MRRC will likely use the areas surrounding the cap to build a large office complex or residential developments. Technically, it might be possible to build certain structures on the cap using a design such as slab on grade that does not require construction of a foundation.<sup>114</sup> However, the cost of importing materials for this type of design would likely prohibit use of the cap for anything other than a golf course or park. Initially, local residents and city officials had hoped for a remedy that would allow more development options, because they believed that one of the best opportunities for revitalizing the area in the wake of its Superfund status lay in extensive redevelopment of OU1. However, the City wants to ensure that the remedy remains protective and, therefore, is willing to accept necessary limitations on site redevelopment.

For the most part, OU2 is still occupied by residential homes and municipal properties, as it was prior to the Superfund remedy. Several interviewees reported, however, that the aforementioned foreign company has options on, and may have already purchased, several private homes adjacent to the capped area for redevelopment as commercial properties including shops and a theater. Ostensibly, the company plans to develop these properties in conjunction with OU1.

In recent years, OU2's Superfund status and associated institutional controls caused certain residents to have difficulty financing property transactions. For a short period of time in the early 1990s, the Salt Lake County Assessor declared all properties in OU2 to be worth either \$100 or no money at all. As such, these properties were virtually unmarketable. The assessments were quickly amended in response to strong public outcry, and the market value of OU2 properties returned to previous levels. The cost of property transfer, however, remained temporarily elevated due to the lending community's apprehension about residual contamination. During the time when the initial EPA "clean letters" were in place outlining

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<sup>114</sup> The City of Midvale has heard conflicting opinions on this matter. Initially, EPA indicated that the cap would not accommodate any type of structure or infrastructure.

ongoing environmental concerns, underwriting costs for property transactions increased slightly in response to the increased administrative burden associated with investigating the controls. Rates have since returned to normal following the issuance of new EPA letters certifying the OU2 properties to be clean.

According to city staff, concern about diminishing property values was part of the motivation for later seeking repeal of the CSRRs. UDEQ, however, maintains that residents would experience greater ease selling and financing their properties with institutional controls in place, since they could point to the controls as a guarantee for controlling any residual contamination. The Agency received statements from bankers to that effect, explaining that the CSRRs were not binding restrictions on the use of their property and, therefore, should help rather than hurt property sales. UDEQ contends that lifting the CSRRs has put a cloud over the property transaction climate in Midvale that the residents and city staff have yet to discover.

Since the summer of 1998, the City of Midvale has been making adaptations to the public-right-of way in OU2. Work is currently underway to extend Rio Grande Street, which runs directly through the Phase IV remedial area. Prior to excavation, the City tested covered soils and found them to be well below background lead levels for the area. The City also plans to extend Holden Street, which lies along the boundary between OU1 and OU2.

#### f. History and Status of Community Involvement

Ever since Midvale territory came under the authority of the Superfund program, there has been an climate of intense community and city resistance to the remedy and institutional controls. Residents resent the City's distinction as a Superfund site and the disruptions associated with state and federal presence in their community. Many have expressed frustration with the length of time that the Superfund process has taken and the effect it has had on Midvale's economic vitality and community image.

In particular, residents feel victimized by the stringency of the remedy at OU2, because the action levels in their neighborhood were considerably lower than those at other sites nearby. In contrast to communities in other parts of the country with similar levels of lead contamination, Midvale residents do not believe that contamination in their neighborhood ever posed a danger to human health.<sup>115</sup> The consensus among residents seems to be that they have lived in Midvale all their lives and nothing is medically wrong with them. As such, the general sentiment shared by residents is that the State and EPA overreacted to the residential contamination and that, from a public health standpoint, any cleanup was a waste of money.<sup>116</sup>

In an effort to heighten awareness about site contamination, associated health risks, and

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<sup>115</sup> See section IV.C.1.b, Background and Status of Cleanup, Tri-State Mining District Sites, below.

<sup>116</sup> Many residents who were skeptical about the risks of lead contamination were nonetheless pleased to have work done on their property, due to the aesthetic value added by installation of new lawns and vegetation.



cleanup activities, UDEQ, the lead community relations agency for the site, stationed a full-time community relations officer in Midvale throughout OU2 cleanup. For the most part, however, questions posed to the community relations officer concerned status and aesthetic impacts of the technical remedy on residential properties. In April 1992, UDEQ published a community relations plan for the residential properties outlining, among other things, strategies for increasing public involvement in site activities and decision-making. One key goal involved fostering public meetings with EPA and UDEQ officials to share information and ideas about the Superfund process. In 1997, EPA, in conjunction with UDEQ, began holding quarterly community meetings in Midvale.

EPA and UDEQ also met all CERCLA and NCP requirements for public participation throughout remedy selection and technical remediation. Beginning in 1985, the agencies issued a series of fact sheets and press releases, and posted warning signs in both Asian and English languages to accommodate the mixed ethnic composition of Midvale. Fact sheets and press releases addressed issues such as the Superfund process, suspected contamination risks, findings and status of the Remedial Investigations and Feasibility Studies at both operable units, and details of the Proposed Plans for the site. In 1985, the Midvale City Council established a Tailings Committee, later called the Community Liaison Council, to disseminate site information to interested citizens.<sup>117</sup> In 1987, EPA, the State and Midvale officials worked together to establish three Superfund information repositories – two in Midvale and one at the DOH offices. EPA and the State of Utah also cooperated between 1989 and 1992 to provide regular informational updates to a list of contacts and interested parties, including elected state officials, news media, and over 1,200 Midvale residents.

Also pursuant to CERCLA, EPA and UDEQ held public meetings at major milestones during remedy selection and technical remediation to update interested parties and to field related concerns. Attendance at these meetings was initially high but tapered off as the remedy progressed. As discussed previously in Background and Status of Cleanup, public comments at a 1989 meeting concerning the original Proposed Plan for the site prompted the State of Utah to reject EPA's preferred remedial alternative and divide the site into two operable units. Following that meeting, EPA conducted interviews with Midvale residents and business people to determine their concerns with respect to the site.<sup>118</sup>

Also in response to the 1989 meeting, a Technical Advisory Committee (TAC) was created to keep participants, residents, and other interested parties informed of technical activities and project status at the site. The TAC, which consisted of representatives from DOH, the Salt Lake City and County Health Departments, the City of Midvale, the U.S. Geological Survey, BOR, and the potentially responsible parties, met one to two times per month from 1989 to 1992 to discuss project status, ongoing technical studies, future studies,

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<sup>117</sup> According to one of the original members of the Tailings Committee, the Community Liaison Council evolved into the community group called Citizens For A Safe Future Midvale City, discussed two paragraphs below.

<sup>118</sup> The Agency had conducted similar community interviews during 1983 and 1985.

and current data interpretations in an effort to resolve technical differences in opinion as they arose.

Apart from attendance at public meetings, the City of Midvale did not encourage increased community involvement in the Superfund decision-making process. City officials in office at that time asserted that they represented the community and saw little need for involvement by community groups. The former Mayor of Midvale, who was in office during the construction phase of the remedy and enactment of the CSRRs, thought a Technical Assistance Grant (TAG) – a mechanism for encouraging community participation provided under CERCLA – was unnecessary because “the City was interested in the welfare of the residents too.”<sup>119</sup>

Nevertheless, a small community group, called Citizens for a Safe Future Midvale City, was organized by community residents and received a TAG in 1989 to lobby for the removal of tailings from OU1 as opposed to the selected capping remedy. The group was not successful in persuading EPA to select the off-site disposal alternative, and some members quit because they did not feel they could make a difference with EPA.<sup>120</sup> The City contends that EPA ignored the TAG report entirely. As a result, some local residents believe the TAG process is merely an appearance tactic and needs to be re-examined to make it an effective communication tool. Others, however, believe that EPA has been helpful and receptive to the community and the efforts of the group.

Citizens for a Safe Future Midvale City still exists, although its focus has changed since OU1 remediation. Now its members are most interested in finding ways to minimize the tailings pile’s ramifications on economic vitality in the area. In 1997, the group hired an independent consulting firm to do a two-fold study examining the cap and associated O&M requirements. A report issued in April of that year raised a current question of concern to the group: who will have responsibility for O&M at OU1. The group is also in the process of requesting more funding (approximately \$50,000)<sup>121</sup> to investigate redevelopment options for OU1. With its new outlook, Citizens for a Safe Future Midvale City is likely to have a role in decisions concerning institutional controls at the site.

Citizens for a Safe Future Midvale City has not been involved with institutional controls at OU2, including the CSRRs. According to the group’s president, there has never been much interest in participating in the Superfund decision-making process except where commercial redevelopment issues have been involved.

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<sup>119</sup> J. Donald Poulsen, personal communication, October 23, 1998.

<sup>120</sup> EPA did actively consider removing the tailings pile, and asked BOR to prepare designs for both capping and disposal alternatives. BOR engineers prepared cost estimates for both alternatives and both designs were put out to bid. Based on the cost differential between the two designs, both EPA and UDEQ favored the capping alternative.

<sup>121</sup> \$50,000 is the maximum amount allowed for a TAG.

## 2. Selection and Administration of Institutional Controls

### a. Process for Identifying Institutional Controls

From the early stages in the remedial design for OU2, both EPA and UDEQ agreed that institutional controls would be required to reduce risk of potential exposure pathways to unremediated soils left below foundations and paved areas. The agencies further agreed that effective controls would sufficiently protect OU2 residents from harmful exposure, and that excavation under covered areas would be excessively costly and unnecessary.

The City of Midvale, on the other hand, strongly opposed the concept of institutional controls at the residential properties, because city officials and community members perceived them as restricting property rights and imposing a stigma on their neighborhood. As such, both EPA and UDEQ became responsible for urging the City Council to cooperate with their plan for institutional controls. While the City continued to oppose the idea of regulations on residential properties, EPA made clear that failure on the part of the Council to implement the necessary controls would indefinitely stall the remedial process and extend the duration of state and federal presence in the City. The Council, therefore, ultimately obliged and agreed to enact a city-wide ordinance in an effort to propel the technical remedy and return Midvale to its normal state of affairs.

The process of drafting the ordinance was difficult because EPA, UDEQ and the City of Midvale, had trouble reaching agreement on the proposed controls. For a period of approximately a year and a half, high level management from both agencies and the Midvale City Council met almost weekly with a facilitator to negotiate details of the institutional controls program. According to city officials, whenever the Council reached consensus with one of the agencies, the other would tend to disagree, thereby considerably delaying the selection and implementation of the controls. As a result, the ordinance, entitled Contaminated Soils Remediation Regulations, went through seven or eight drafts before it was actually passed on May 31, 1994. In the opinion of one current city official, the resulting institutional controls program may, to some extent, be less a reflection of sound risk management than a product of state and federal conflict of interest.

### b. Implementation of Institutional Controls

By 1997, roughly 3 years after the implementation of the CSRRs, the City had developed plans to work with EPA and UDEQ to eliminate the controls on private properties. While the City had objected to the need for institutional controls since the early stages of the remedial design, the process of actually seeking legal repeal of the CSRRs was initiated upon recommendation of an independent consultant who was hired to analyze the need for area-wide controls. The conclusion of the consultant's study was that a case-by-case evaluation of exposure risks at individual properties with clean fill in place would reveal that blanket testing requirements were unnecessary. Upon receiving the consultant's results, the City of Midvale approached EPA concerning repeal of the CSRRs.

While the CSRRs were enacted at the municipal level and could therefore be repealed by city ordinance alone, the City of Midvale chose to involve EPA in the repeal process for two principal reasons. First, EPA had given the City funding to administer the CSRRs, and city staff feared that a post-repeal audit of the grant would find the City in substantial noncompliance and require all disbursements to be repaid to EPA. Second, city officials felt they had an obligation to ensure that any decisions made about institutional controls would be environmentally sound. Since EPA had required institutional controls to be enacted in the first place, and because EPA was in the best position to evaluate the real environmental hazards present from residual contamination, the City felt it appropriate to consult EPA concerning its intention to lift the ordinance. City staff, therefore, approached EPA and asked officials to re-assess the need for ongoing controls in light of new information supplied by the independent consultant hired.

Following the City's request, the site RPM assigned an EPA Region VIII toxicologist to do a second risk assessment. The toxicologist worked with BOR to conduct this analysis using BOR's pre-remediation property data, which was assumed to apply to unremediated areas as well. The agencies chose to base their evaluation exclusively on lead levels because those tended to dictate arsenic levels at the site. To determine exposure risks at each property, EPA and BOR identified the percentage of each lot that was unremediated and calculated the ensuing risk if: 1) either 50% or 100% of unremediated surface soils were exposed, and 2) children were to experience random chronic exposure to contaminated material.<sup>122</sup> The decision to use only surface composite values was based on the assumption that habitual contact would only occur with shallower soils. In most cases, the 50% exposure factor was used because of the low likelihood of a property owner excavating all unremediated areas. However, in cases where more than 70% of the property was covered, the 100% factor was used to add a degree of safety; this decision was based on the difficulty of obtaining accurate soil samples at highly-covered properties and the resulting lack of confidence in the contamination data. Lastly, in cases where unremediated areas had lead concentrations above 4000 ppm, BOR recommended that risk managers consider the potential for acute exposure; one property fit this criterion.<sup>123</sup> At all other properties, risk exposure results were below the 500 ppm action level for lead. BOR recorded individual property data used to perform these calculations in a computerized database.<sup>124</sup>

Based on the toxicologist's assessment that area-wide institutional controls were not necessary in light of the low residual risk at most properties, EPA and BOR both supported the

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<sup>122</sup> This methodology assumes that children will spend equal time on all portions of the property, and calculates risk of chronic exposure based on the property's average contaminant levels. The methodology does not evaluate the risk of acute exposure to individual hot spots. As such, the protective standard could be met if certain exposed soils exceeded action levels established for the site but those levels were balanced out by low contaminant levels elsewhere on the property.

<sup>123</sup> BOR recommended that risk managers either remediate properties with a potential for acute exposure or leave institutional controls in place. Neither option was implemented at the one property of concern – instead, the City agreed to informally monitor the use of that property's yard.

<sup>124</sup> See section IV.B.3.a, Analysis of Successful Institutional Controls, below.

City's initiative to repeal the CSRRs. As such, the repeal process was not as difficult as the City had anticipated. The only strong objection came from UDEQ officials, who thought it prudent to leave the controls in place since unremediated soils posed a continued risk that could not be definitively assessed without extensive testing of areas covered by pavement and structures. UDEQ also challenged the assumption used in the risk assessment that children would spend equal time on all portions of their exterior property. They argued that such a determination could not be made without conducting a study of the behavioral patterns of Midvale children, particularly since the assumption used in the model may not apply to a low-income community without many parks or recreational facilities. Officials found it more likely that in the case of Midvale, any soils excavated from unremediated areas would be left in piles on the property and possibly used for recreational purposes, thereby posing a greater risk of exposure than calculated.<sup>125</sup> UDEQ suggested that a more logical way to evaluate the need for institutional controls would be to leave them in place for five years and then reassess their efficacy during the site's five year review. However, EPA decided to proceed with the repeal process immediately, based on BOR's risk calculations. Despite UDEQ's strong opposition, the CSRRs were lifted on August 11, 1998 via city ordinance and replaced with regulations governing excavation within city rights-of-way. On that day, the City held a public ceremony where officials ran the CSRRs through a paper shredder.

The new regulations for excavation within the city rights-of-way establish a procedure whereby any person seeking to perform work on public transportation corridors or drainage pipes must obtain a permit from the Midvale Public Works Department. While the regulations apply city-wide, there is a section that specifically establishes provisions for project review in Sharon Steel OU2. Pursuant to these provisions, any project involving more than five cubic yards of unremediated soils requires testing of the soil to assess levels of lead and arsenic. Depending on the concentration of contaminants found, certain remedial procedures, including dilution, disposal at a RCRA Subtitle D facility, and capping, must be followed. The stringency of these requirements differs between the residential district and the commercial/industrial zones.

To ensure that the technical remedy remains protective at the one property where current lead levels exceed 4000 ppm, the City has agreed to work with the current owner to explain her options if she wants to excavate under her walkway. Officials also went on record with a commitment to informally monitor the use of that property. The City elected not to implement an official institutional control at this property, because it seemed illogical to enact a municipal ordinance concerning only one home.

After the repeal of the CSRRs, the City asked EPA to issue new "clean letters" stating that each property had been fully remediated.<sup>126</sup> In response, EPA issued letters stating that the

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<sup>125</sup> This input from the UDEQ toxicologist was vital to development of a methodology for calculating risk of acute exposure at properties with lead levels exceeding 4000 ppm.

<sup>126</sup> These letters replaced previous ones, discussed in Background and Status of Cleanup, which stated reliance on the CSRRs to protect human health in the long-term and ensure that the remedy remains

“cleanup as done is protective of human health and the environment.” The letters explain that exposed soil not covered by permanent structures contains less than 500 ppm lead and 70 ppm arsenic. The letters do not, however, explicitly state that contamination may remain under permanent structures. Presently, the City is in the process of filing these letters with the Salt Lake County Recorder of Deeds.

At the time the CSRRs were enacted, the City made a commitment to conduct a public education campaign to caution residents of the threats associated with exposure to contaminated soils. This program was never instituted, and as a result, public understanding of the CSRRs was low throughout the time they were in effect. Because there has been a high rate of city staff turnover, it was not possible to definitively determine why the education campaign was neglected. Current city staff speculate that it may have been the result of many factors including a degree of mismanagement in the city government,<sup>127</sup> lack of conviction in the importance of institutional controls, and an intent to challenge the need for those controls.

c. Operation of Institutional Controls to Date

While the CSRRs were in place, virtually no residents came forth to determine the requirements they had to follow. The only serious inquiries about the nature and implications of the CSRRs came from title companies handling property transactions. On several occasions, title company representatives discovered the CSRRs while property transfers were underway and then contacted city staff to ascertain their meaning and ramifications. Because the City failed to conduct the required public education campaign, most individual residents were not aware of the CSRRs and thus had no reason to inquire about requirements governing their property.

Immediately prior to the repeal of the CSRRs, city staff inadvertently detected three separate instances of failure to comply with the regulations. In one case, a resident who did not know about the CSRRs was conducting unpermitted construction for a sewer line. Once the City learned of this situation, officials raised the issue with the property owner and the contractor was able to work around the unremediated areas. In another case, a resident removed his patio and left unremediated soils exposed for a day and a half. When this came to the City’s attention, officials contacted the property owner and he covered the soil immediately. In the third incident, the Utah Department of Transportation (UDOT) failed to coordinate with UDEQ as required concerning excavation and removals for construction in a city right-of-way. The City learned of this violation when a staff member drove by the construction site and found UDOT workers sitting in an excavated hole in the pavement eating their lunch. The City immediately contacted UDEQ and sent an inspector to the site to stop the construction activity. The soil in the hole was later tested and showed no contamination. EPA never heard about any of these instances of failed institutional controls, nor did the Agency

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protective.

<sup>127</sup> Until recently, the City of Midvale had not filed a quarterly report – as required – since 1994. It is possible that city officials also lost track of their responsibility to conduct the public education campaign.

know of any implementation problems while the CSRRs were in effect and under city control.

d. Outlook for Operation of Institutional Controls

i. *OU2: Residential Properties and City Right-of-Way*

Although no official institutional controls remain on the residential properties in OU2, there is still a pressing need to monitor the property where covered surface soils exceed 4000 ppm Pb. While current city staff have agreed to take responsibility for ensuring the maintenance of the technical remedy at that property, the inevitability of staff turnover and associated lapses in institutional memory suggest that safety concerns may arise in the future. In the absence of any official property restriction, there is no guarantee that current or subsequent city officials will uphold their stated commitment to control hazardous soil removals at that property.

In contrast, the likelihood of requirements governing excavation in the public right-of-way coming to the attention of the appropriate parties is comparatively high, because the language specific to OU2 is imbedded in a more general regulation that governs all work in the public transportation corridors.<sup>128</sup> Since the regulation establishes a system whereby city contractors must obtain a permit for a fee, there is a clear incentive for officials to enforce the ordinance. There is, however, a potential for the City to overlook the provisions specific to OU2, as they are not directly linked to the revenue-generating terms. To date, there has already been one instance where UDOT proceeded with excavation in a restricted area without approaching the City for testing. However, this incident occurred prior to the issuance of the new regulations, at a time when restrictions governing the public right-of-way seemed little more than an afterthought in the CSRRs and no permit was needed. Under the new system, there appears to be greater likelihood of the City knowing and upholding the restrictions governing OU2.

ii. *OU1: Mill Tailings, Contaminated Soils, Wetlands, and Groundwater*

As mentioned previously in Types of Institutional Controls, the City of Midvale accepts the fact that institutional controls will be necessary to maintain the integrity of the technical remedy at OU1. Officials have indicated a willingness to cooperate with the selected controls as long as they do not excessively prohibit commercial development in the area and do not involve the residential community. EPA expects the controls at OU1 to be relatively uncontroversial.

As discussed, O&M at OU1 will include responsibility for administering institutional controls selected for the site. EPA has already proposed a contingency agreement with UDEQ

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<sup>128</sup> Midvale City Ordinance No. 8/11/98, an ordinance establishing regulations for excavation within the city rights-of-way.

whereby it would fund the State to conduct O&M for a five year period. EPA hopes that the property will be sold in that time and that the new site owner will accept responsibility for ongoing O&M. However, the current site owner, MRRC, is currently considering a joint venture with a developer whereby it would retain ownership of the site. Having reached a settlement agreement with EPA, MRRC believes that the State should assume ongoing responsibility for O&M. Contention could, therefore, arise in the future concerning ongoing responsibility for O&M.

1. Analyses

- a. Analysis of Successful Institutional Controls

With the repeal of the CSRRs and the impending institutionalization of the most recent “clean letters” with the County Recorder of Deeds, there is no official mechanism for preserving records on the contamination that remains throughout OU2 properties. During the course of its involvement at the site, however, BOR developed two different databases that may turn out to be an effective mechanism for accomplishing that goal. Together the programs are designed to maintain comprehensive records on site cleanup activity and status. BOR will retain one copy of each program in its Provo, UT office, and another will be sent to EPA. Although these programs were not required by the ROD, they may turn out to be the only institutional control left in place at OU2.

The first program is an Arc View 3.0 database designed to consolidate all the data BOR gathered on each property and to create a lasting information resource for the City of Midvale, UDEQ and EPA. This database allows users to access the precise location of an individual property, the name and address of the person who approved the remedial design, a photo of the property, pre- and post-remedial sample results, and a scanned image of the EPA “clean letter” issued after remediation. The most recent set of “clean letters” is currently being entered as well. Information in this database can be accessed either by selecting a particular property on a map or by searching by query. To date, only the BOR project team knows how to use the Arc View program, but for user efficiency, the photos, sample results, and EPA “clean letters” can be accessed from a CD ROM in WordPerfect without requiring the users to load the entire program.

The second program was created to include the risk calculations and associated data for determining if institutional controls were necessary. It contains a series of spreadsheets, databases, and maps, each compatible with the Arc View database. This program contains maps of each property showing the property boundaries and features that were left undisturbed during remediation. By querying this program, users can access the average surface Pb concentration for each property, the areas of undisturbed features on the site, the property exposure area, and the calculated soil Pb concentrations assuming 50% and 100% removal of covered areas.

While the actual usefulness of these programs has not yet been tested, it is significant that site records are being memorialized in such a comprehensive and technologically-



advanced manner. Since the CSRRs have been repealed, the only official record of site contamination currently in effect is the most recent series of “clean letters” issued by EPA, which state a conjecture of safety based on current technical knowledge and selected risk assumptions. The letters do not acknowledge residual contamination levels or the risk assessment process used to reach these conclusions. As such, they do not allow residents or prospective purchasers to objectively evaluate the property conditions in light of new technical knowledge or alternative risk assessment methodologies. The databases, however, objectively record both pre- and post-remediation testing data and, thus, may become the only lasting record of potential health hazards in the residential area.

To enhance the effectiveness of the databases, it would be beneficial to provide copies to the local property offices and to ensure their accessibility to the public. The likelihood of property owners or real estate agents raising contamination concerns with prospective future owners or tenants seems rather low considering the attitude toward mining waste in the Midvale area. Nevertheless, having the BOR databases on hand at the offices would allow for a greater possibility of prospective purchasers identifying contamination hazards well into the future, particularly if public outreach were conducted to ensure widespread knowledge of the databases’ existence. Having copies available to the public in places such as the local public libraries would guarantee citizens the ability and autonomy to investigate properties of concern. Furthermore, the physical presence of a database system or the appearance of the database software on an existing computer system could alert residents to the existence of the BOR programs, thereby raising awareness among the public of local contamination concerns.

#### b. Analysis of Problems to Date

During the time that the CSRRs were in effect, there were two principal shortcomings of the institutional controls program. The first was failure on the part of the City to conduct the required education campaign to inform residents of the risks associated with residual contamination and the requirements governing excavation in unremediated areas. Second, there were at least three noted instances of residents’ failure to comply with the required soil testing procedure established in the ordinance. Each of these shortcomings will be addressed in this section, as will the repeal of the CSRRs. Technically, repeal of the ordinance is not a failure of the institutional controls program since EPA approved lifting the controls after reevaluating their efficacy. Nevertheless, the repeal merits consideration here in light of the fact that institutional controls were selected as an integral component of the remedy at OU2 and they are no longer in place to serve their intended function.

When the CSRRs were being developed, EPA and UDEQ deemed it essential that the City conduct a public education campaign to caution residents of the dangers associated with residual contamination and to notify them of the regulations governing excavation of unremediated soils. The City of Midvale agreed to implement this education program when it enacted the CSRRs on May 31, 1994, but never upheld its commitment to do so. While no one could provide a definitive answer why the education campaign was not conducted, some current city staff speculate that there was never any intention to do so. It is clear that the City Council

enacted the CSRRs under pressure from EPA and UDEQ and never believed that they were necessary. Since city officials were longtime residents of Midvale, they had the same skepticism as other residents about the health hazards of mining waste. As such, officials believed the regulations posed an unfair imposition on the City and its residents and assigned the whole institutional controls program low priority.

Throughout the course of remedy selection and technical remediation, EPA and UDEQ conducted public outreach activities as required under CERCLA. It is difficult to say why these tools were not more effective in raising public awareness, particularly when turnout at early public comment sessions was high and proved integral to remedy selection. One possibility is that residents intended only to use those events to address concerns about the status and value of their properties, not to learn about health risks and their associated responsibilities. Another likely reason is the late juncture at which the more comprehensive education efforts were introduced. By the time the quarterly community meetings were initiated in Midvale, the technical remedy at OU2 was nearly complete. In addition, EPA and UDEQ had already taken a number of actions, such as sending workers into Midvale in full protective gear that, though required under Superfund, alienated the community and, in the residents' eyes, made a mockery of the Superfund program. Without substantial outreach efforts conducted by locally elected officials whom the residents trusted, community members were predisposed to distrust both EPA and UDEQ.

Lack of public awareness of the CSRRs, and possibly lack of conviction in their importance, eventually led to three known instances of residents' failure to comply. Upon discovering these violations, city staff took immediate action to reduce the risk associated with the activities underway. However, the fact that residents were not adequately informed of the regulations previously indicates a shortcoming of the institutional controls program. At the time when the instances of failure occurred, the CSRRs were still officially considered an integral part of the remedy. As such, there should have been a more dependable method of notifying those subject to the rules. Ostensibly, the required public education campaign would have served that purpose in the short term. The initial round of EPA "clean letters" also could have alerted current residents to the residual risk and the CSRRs.<sup>129</sup> However, in a situation such as this where institutional controls were intended to protect against harmful exposure in the long term, it would have been appropriate to establish a standardized mechanism, such as annual letters from the City to OU2 residents, reminding them of the regulatory requirements affecting their properties.

The failures of the institutional controls program to date seemingly bear less direct relevance to the City of Midvale than they once did in light of the recent repeal of the CSRRs. An issue of lingering concern, however, is what implications the repeal and the subsequent issuance of revised EPA "clean letters" will have on current and future Midvale residents. First, there is the danger that a potential flaw occurred in the revised risk assessment due to the

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<sup>129</sup> This does not apply to owners of properties remediated during the final three phases of cleanup, because they did not receive the initial "clean letters."

assumption, considered questionable by UDEQ, that residents will have equal contact with all exposed surface soils. Children may instead have disproportionately high contact with soils excavated from unremediated areas if those soils are not dispersed evenly throughout the property.<sup>130</sup> Regardless of the efficacy of the assessment, though, the fact remains that many properties have residual contamination above selected action levels under pavement and structures. But the repeal of the CSRRs coupled with the second set of EPA “clean letters” certifying the properties to be clean could give the impression that there is no risk to excavating anywhere in OU2.<sup>131</sup> As such, a resident could feasibly relocate a driveway and create a sandbox in its place using unremediated soils with lead levels exceeding 500 ppm. Children would then play in the sandbox without parents knowing that they are being exposed to dangerous contaminants.

### c. Analysis of Potential Future Problems

EPA, UDEQ and the City of Midvale all agree that there is a need to monitor activity at the residential property in OU2 where residual lead levels exceed 4000 ppm. With the CSRRs lifted, however, there is no mechanism in place to ensure that city staff become aware of plans to uncover buried soils on that property. Consequently, there is no guarantee that excavated soils will be handled appropriately. Although, city staff discovered three failures of the CSRRs and promptly acted to reduce the associated risk, there is no way of knowing how many other failures went undetected, particularly since the City admits that the three known violations were discovered inadvertently. The City has gone on record with a commitment to informally monitor the property of lingering concern. However, in light of the City’s past opposition to the entire institutional controls program, its commitment to vigilant oversight at that property could be questioned. As time passes and current city staff leave their positions, the likelihood of institutional memory prompting the requisite monitoring will further decrease. A deed notice would, therefore, be a more reliable mechanism for alerting current and future residents of the property in question to the residual risk and the need to dispose of contaminated soils in a suitable facility. While a deed notice would not serve the purpose of ensuring preventative measures prior to property transfer, this shortcoming could be easily mitigated by educating the current property owner.

Even if residents at the property in question or other Midvale properties choose to properly dispose of contaminated soils, there still is no residential soil repository in place as provided in the ROD. There is one accessible RCRA Subtitle D facility in the area, although it charges per ton tipping fees for use and is a sufficient distance from Midvale to pose an

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<sup>130</sup> Several interviewees reported a tendency for Midvale children to use piles of dirt for recreation. In addition, children’s exposure to contaminated soils could be further increased if a favorite toy – such as a jungle gym or swing set – is located in an unremediated area.

<sup>131</sup> While the letters do not claim that unremediated soils are risk-free, they do not acknowledge the potential for there to be contaminant concentrations above site action levels in unremediated soils. It might be possible for a resident to infer a risk based on the language in the letter, but the inherent risk is not explicit and cannot be assumed to be evident to most Midvale residents.

inconvenience, and maybe even a deterrent, for residents who wish to remove contaminated soils. Prior to repeal of the CSRRs, at least the financial strain of disposal fees could have been alleviated through EPA funding set aside to cover residents' costs of implementing institutional controls. However, funding has now been curtailed, placing both the financial and logistical burdens of disposal on individual residents.

As time progresses, though, the likelihood of residents taking protective measures to control the risk of residual contamination on their properties will presumably diminish. EPA's latest round of "clean letters," combined with the pervasive disbelief among Midvale residents and city officials that a threat ever existed in their community, will likely perpetuate a potentially misleading sense of security about residential properties in OU2. Without an official mechanism for notifying residents of the residual risks in their neighborhood, the likelihood of awareness of contamination being passed along to future residents is low. Had federal, state, or local officials imparted a sense of understanding about contamination risks on Midvale residents, concern about the dangers present in their neighborhood could have alerted generations to come, even in the absence of an official notification mechanism. However, the discontinuance of the residential institutional controls program, the nature of site record keeping, and the common attitude toward the threats of mining waste will likely allow the collective memory of residential Midvale as a Superfund site to fade in the years to come.

**C. Tri-State Mining District: Cherokee County (Kansas) and Oronogo-Duenweg Mining Belt (Jasper County, Missouri) Sites**

1. Background and Description of Sites

Substantial portions of Cherokee County, Kansas, Jasper County, Missouri, and Ottawa County, Oklahoma have been designated federal Superfund sites. These sites are part of a larger area, called the Tri-State Mining District, that covers the southwestern corner of Missouri, the southeastern corner of Kansas and the northeastern corner of Oklahoma. For administrative purposes, EPA designated the contaminated areas within the three states as separate Superfund sites. The Kansas and Oklahoma sites were listed in 1983 and the Missouri site was listed in 1990. The Missouri portion of the Tri-State Mining District also includes mined areas in Newton County, Missouri, however, the Newton County portion of the Tri-State District has not yet been listed on the NPL.

The Kansas and Missouri sites were selected as case studies of institutional controls at Superfund sites in part due to the similarities in remedies at the two sites, including the types of institutional controls implemented and proposed to be implemented. The two sites are discussed together to facilitate comparison of the results when similar institutional controls are implemented by different state and local governmental entities and community members. The Oklahoma site was not included because institutional controls have not yet been implemented at that site and because it is administered by EPA Region VI, whereas the Kansas and Missouri sites are administered by EPA Region VII.

a. Type of Sites, Location, Contamination

Ore was discovered in the Tri-State Mining District in 1848. Mining for lead and zinc ore and concentrates began in Jasper County in the 1850s, and in Galena, Kansas in the 1870s. At one point, seventeen smelters were located in Jasper County; at the turn of the century, only one smelter remained active, and it closed in 1937. In Galena, smelters operated from 1890 through 1960. Mining in both areas continued into the early 1970s and produced more than 500 million tons of mining waste.<sup>132</sup>

Lead contamination in the Tri-State Mining Area occurs in two principal forms: in the waste and spoils left from the numerous lead mines in the area, locally referred to as “chat,” and as wind-deposited contamination from the many smelters that operated in the area. Chat tends to be located in the less developed areas, although it has been widely distributed around the area as gravel for use in construction and road beds. In addition, wind-blown lead from the smelters in Galena and Joplin often was deposited in residential areas and other developed properties. For example, soil lead levels in residential yards in the vicinity of the former Eagle Picher smelter in Joplin exceeded 5000 ppm.

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<sup>132</sup> Cherokee County OU 7 ROD.

Cherokee County and Jasper County are both large area sites where lead is the principal contaminant of concern, although cadmium, zinc and other metals may be of concern in specific areas. The two sites are in the same geologic region and are geographically similar, but differ in government structure and in socioeconomic conditions. Cherokee County with about 22,000 residents, is less densely populated than Jasper County which has approximately 87,000 residents. Joplin, Missouri is a city of 42,700, and is the economic center of the region, including much of Cherokee County, while Galena is a city of approximately 3,500. Galena is economically depressed and losing population, while Joplin's economy and population are growing. In Galena the average home is valued at \$9,000, which makes some houses worth less than the cost of the soil cleanup. Joplin and the larger Jasper County area are gaining both white and blue collar jobs and substantial new development is occurring in the area.

b. Background and Status of Cleanup

Because of their large size and multi-media contamination, both the Cherokee County and Jasper County sites are divided into multiple subsites, designated areas and operable units.<sup>133</sup> A number of operable units at both sites are media-specific, while some in Cherokee County are divided by municipality. These case studies focus primarily on the remedial projects involving the removal of lead-contaminated soils from residential and commercial properties in the cities of Galena, Kansas and Joplin, Missouri. EPA selected remedial actions for these residential properties in two records of decision (RODs) in 1996: 1) the residential yard clean up operable units (OUs 2 and 3) for Jasper County, and 2) the residential yard cleanup operable unit (OU7) for Cherokee County. The decision to focus on these operable units was based not only on their relatively advanced stage in remedial action, but also on the proportionately high relevance of their institutional controls to the remedies selected and the local communities.

The RODs for the residential cleanup operable units in Galena and Joplin are similar, particularly with respect to the institutional controls prescribed. EPA has the lead at both sites and has chosen the U.S. Army Corps of Engineers (the Corps) as the remedial action contractor for both sites. The remedial designs for the residential yard OUs in Galena and Jasper are essentially identical and the physical removal of contaminated soils has been conducted in the same manner in both cities. The Galena residential cleanup was completed in December, 1998.

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<sup>133</sup>The Cherokee County site is divided into seven OUs: alternative water supply for Galena (OU1); Spring River Basin (OU2); Baxter Springs Subsite (OU3); Treece Subsite (OU4); Galena groundwater and surface water (OU5); Badger, Lawton, and Waco (OU6); and Galena residential soils (OU7). There are currently four Records of Decision (RODs) for this site, and each ROD addresses one or more operable units. The RODs were compiled in December, 1987 (OU1); September, 1989 (OU5); July, 1996 (OU7); and August, 1997 (OUs 3 and 4). To date, there are no RODs for OUs 2 and 6.

The Jasper County site is divided into four OUs: mine and mill wastes (OU1); smelter-contaminated residential yards (OU2); mine waste contaminated residential yard soils (OU3); and groundwater (OU4). EPA has issued two RODs for Jasper County, one in August, 1996 (OU2) and one in September, 1998 (OU4). To date, there are no RODs for OUs 1 and 3.

The Joplin residential cleanup, which includes a much larger number of properties, was approximately 50 percent completed at that time.

Relatively early in the process of studying the contamination in the Tri-State Mining District, ATSDR, in cooperation with the local health departments, began testing children in the area to determine their blood lead levels. ATSDR found that approximately 15 percent of the children living in areas downwind of the former smelters in Joplin had elevated blood lead levels (*i.e.*, 15 g/dL or higher) while no cases of elevated levels were found in children living in nearby cities that had no smelters or lead mining. Slightly fewer children in Galena had elevated blood lead levels (11 percent had levels between 5 and 15 g/dL), but still higher than the control group. The ATSDR study also included testing lead levels in the interiors of some of the houses. The finding that interior lead levels were low helped link the elevated blood lead levels in the children to mining wastes or smelter residues. This study became a key factor in EPA's remedy selection for both cities, providing substantial evidence of the need for removal of contaminated soils at residences, despite the expense.

Before the health study was complete, EPA Region VII formed a team of staff from EPA, ATSDR, the Missouri Department of Health, and the Missouri Department of Natural Resources to determine priorities for remediation, and to plan and coordinate activities in Jasper County. After using three models they decided that the threshold for critical, time-sensitive removals of soils would be a soil lead test result of 2500 ppm at a single point in a yard at a home where children reside, or at a daycare facility. Approximately 300 homes and daycare facilities in Jasper County and 60 homes and daycare facilities in Cherokee County met this standard and were remediated during this stage. High child impact areas, such as daycare facilities, where groups of children played consistently and probably denuded the landscape, exposing bare soils, became priorities for remediation. The time-critical residential cleanup began with the homes of children with the highest blood lead levels and proceeded in descending order. In response to community concerns about cleanups appearing to occur randomly, EPA altered the work plan for the regular phase of cleanup to remediate houses with children first, regardless of their blood lead levels.

EPA used soils from outside the mining district to establish the baseline for determining the amount of contamination. Soils from outside the mining district have lead levels from 20-180 ppm. EPA used the Integrated Exposure Uptake Biokinetic Model to determine the action level for residential cleanups. There was substantial controversy about how to use the results from the IEUBK model, with a citizens' group claiming that the model called for an action level of 240 ppm of lead, the State of Missouri claiming that the action level should be 1000 ppm, and EPA noting that it had used action levels of 500 ppm at other sites. EPA selected 800 ppm as the action level for this site, based on prior research showing that lead in soils was 30% bioavailable, which yielded an exposure level of 240 ppm of lead. The citizens' group claimed, however, that a study on mine waste in Jasper County showed that it is 40% bioavailable, and requested that EPA reduce the action level to 600 ppm to compensate for the higher bioavailability. Although the State agreed to this level, EPA has not, on the grounds that the 40% figure has not been scientifically validated. EPA has proceeded to remediate properties

based on the 800 ppm standard. The citizens' group considers the issue to still be open and contends that the action level is not based on sound science.

In Galena, Kansas, the first step in cleanup was to limit exposure to the contaminated groundwater by providing an alternate water supply, which was accomplished by establishing a new rural water district and connecting about 500 homes in rural areas (OU1). The second step was to deal with about 900 acres of contaminated mine waste, or chat, within an area of about 1.5 square miles (OU5). The remedy involved recontouring the chat piles and revegetating the land both to protect human health by reducing the risk from direct contact with the mining wastes and to improve surface water quality for aquatic life. Streams were also re-channelized and stabilized as part of the remedy for this operable unit. A follow up study by the Kansas Biological Survey indicates that the remedy is resulting in ecological benefits. Exposure to the contaminated groundwater was also limited through source control, which included removing mine waste rock and chat from the surface and using it to fill the pits, shafts, and subsidences around the site. Use of the wastes as fill was determined by the level of contamination and the size of the waste in order to prevent contamination of ground or surface water.<sup>134</sup>

Residential cleanups in Galena commenced after completion of remedial actions for these operable units. Two other municipalities in Cherokee County – Baxter Springs and Treece – have yet to be remediated, although EPA issued a ROD in 1998 (OUs 3 and 4) for residential remedial action in Treece similar to the actions at Galena. The cleanup in Baxter Springs will include mine waste cleanup on the edge of the community with limited residential cleanups in this rural area. Contamination of the same shallow aquifer at Baxter Springs and Treece required a technical impracticality waiver for achieving of ARARs and included the use of institutional controls.

The process for remediating residential and commercial properties in both Galena and Joplin included soil testing, removal of contaminated soils to meet site-specific standards established for the two sites, backfilling with clean soil and implementation of institutional controls. During remediation, the Corps excavated to 12 inches and retested the soils at that level. When lead levels exceeded 1500 ppm Pb at the one foot depth, the Corps placed an orange plastic barrier fence over the contaminated soils and backfilled with clean topsoil.<sup>135</sup> In yards with a garden, the Corps excavated to a depth of two feet in the garden area before retesting. Similarly, if the soils at a depth of two feet had lead levels above 1500 ppm, the orange plastic barrier fence was laid down. In either case, the garden area was backfilled with two feet of clean top soil. Where the slope of the land allowed, as was the case with ditches, the Corps backfilled with clean soil rather than excavating and refilling in such low areas. No testing or remediation was conducted below paved areas. In addition, except for churches, daycare facilities, and schools, no commercial or industrial properties were tested or remediated, because the risk of exposing the target population of children under the age of six

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<sup>134</sup> Cherokee County OU5 ROD at 19.

<sup>135</sup> The RODs for both OUs define clean soil as the Missouri “any use soil level” of less than 240 ppm of lead.



was low at such properties. The average cost of a residential cleanup in Galena, Kansas, was approximately \$11,500, compared to EPA's original estimate of \$12,000.

The cleanup program is voluntary and, although most property owners agreed to have their soils tested, a few refused. In Galena, 1500 properties were tested and 28 refused. In Jasper County, 6000 properties had been tested, with 200 refusals, as of April, 1999 (the program is on-going in Jasper County). All tested properties received a letter stating whether or not the soils were found to be contaminated. If contaminated, the Corps made an appointment to visit the property with the owners to show them what would be cleaned up. For properties that tested below the action levels established in the RODs, the Corps prepared a map of the property showing the location and levels of any contamination detected in the soils. EPA also sent a letter notifying the owners or tenants that soil contaminations levels on their property were below the action level for remediation.

In both Galena and Joplin, some property owners agreed to the testing, but declined to have the work done on their property despite detection of contaminants in concentrations above action levels selected for the site. In Galena, 31 property owners declined cleanup compared to 666 who accepted and were remediated. To date, in Jasper County, with the project still in progress, 120 owners have declined while 1600 have been remediated. Some declined cleanup because it would only affect the portion of the property where contaminated soils are located. Apparently, these owners thought that the principal benefit of the cleanup would be to improve the appearance of the property; they were not concerned about the hazard posed by contaminated soils. The Corps attempted to convince them to have the work done by explaining that this would be the only opportunity to have the contaminated soils removed.

In Galena, the Corps also asked the City to help encourage residents who initially declined cleanup to change their minds, but the City was able to contact only two of those who had declined. The Corps then took responsibility for calling the declining property owners, and some accepted after a personal call, while others still declined. A few property owners could not be located to obtain consent for testing. As the Galena project neared completion, six owners had not yet been located. Finally, after EPA submitted a press release regarding the need for all properties in the community to be tested, the Corps posted letters on the doors of those properties stating that EPA wanted to test the soils on the properties and that they would be tested unless the owner responded within four days. When none responded, all six properties were tested and four were found to contain lead. To date, EPA and the Corps have not decided how to proceed at those four properties.

After remediation was completed, EPA issued a letter stating the property was remediated and, if applicable, explaining the presence of the orange barrier fence and providing a phone number to call if the fence is encountered during later excavation. The post-remediation letter also included a copy of a map of the property delineating areas of pre- and post-remediation contamination, with the lead levels and barrier placement marked. The Corps also informed the Galena city government that the orange barrier fence indicates that soils beneath the fence are contaminated (above 1500 ppm lead) and gave it an information sheet

that it can make available to the public. Similar fencing is also being used in Joplin and presumably the Corps will provide the same information to Joplin city officials when the Joplin soil removal project approaches completion.

As part of the Galena project, the Corps established a fenced repository for contaminated soils excavated during residential cleanups. After completion of cleanup in Galena, the repository will be fenced and locked but may be opened for disposing soils excavated after remediation. The State has agreed to provide long term operation and maintenance of the soil repository. A similar repository exists in Jasper County, with a similar agreement with the State of Missouri. Plans to dispose of contaminated soils in Missouri also include possibly burying some of the soils under a new bypass road to be constructed at the edge of Joplin.

When cleanup work is complete, EPA will receive a complete set of records from the Corps including: a database; maps marked with contamination levels, areas of orange fencing, and paved areas; photographs of the sites before and after cleanup; videos; and a final comprehensive Remedial Action Report. The Corps will also retain one copy of these records at its district office.

#### c. Types of Institutional Controls

Institutional controls were first selected in the Tri-State Mining District in the 1987 ROD covering use of shallow groundwater for drinking water in Galena. The ROD selected institutional controls to restrict the development of shallow aquifer drinking water wells to attempt to prevent future residents from using the shallow aquifer. The current residents were provided a public water supply distribution system that used the deep, potable aquifer for water supplies. EPA selected these institutional controls to augment the engineering control, which was construction of the alternate water supply/public distribution system.

EPA expanded the use of institutional controls in the 1989 ROD addressing the contaminated groundwater and surface water in the Galena subsite. The extensive area of potential groundwater contamination is located in a karst-like geological formation with extensive underground mine workings, which makes it difficult to predict groundwater flow. This has been the basis of a series of technical impracticability waivers for cleanup of groundwater in the Tri-State Mining District.<sup>136</sup> Because EPA determined that no practical engineering controls were available to achieve ARARs, the Agency selected institutional controls to reduce the human health risks associated with drinking water from the shallow aquifer water wells. Institutional controls selected in the 1989 ROD included the same

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<sup>136</sup> See 40 C.F.R. §300.430(a)(1)(iii)(B), (D) and (F) and (e)(7)(ii) and (e)(9)(iii)(F)(1) and (f)(1)(ii)(C)(3). Such waivers are used when the selected remedy is unable to achieve the legally applicable, or relevant and appropriate requirement for cleanup under state and federal laws. In the 1989 ROD for Galena, ARARs for cleanup of the shallow aquifer were the maximum contaminant levels under the Safe Drinking Water Act.

restrictions on drilling shallow aquifer wells as in the 1987 ROD as well as new institutional controls directed toward implementation of a program for local governments to control commercial and residential development on capped mine waste piles.

A wide variety of institutional controls were mentioned in the various RODs for the two sites, but some of the RODs do not clearly state which controls were actually selected. Controls selected in the Tri-State Mining District sites include: groundwater use restrictions; health education to raise public awareness of lead risks, methods of avoiding exposure, and mitigation measures; zoning, including special use permits for day care centers; placement of land use restrictions on deeds for residential properties that refused cleanup and on properties with residual subsurface contamination in excess of action levels; land use restrictions to protect constructed portions of the remedy, such as channelized streams and backfilled mine shafts; creation of a groundwater management district to limit use of the contaminated shallow aquifer for drinking water; ordinances and regulations to control the use of contaminated water and soil; deed restrictions to prevent future residential development on undeveloped mill waste areas exceeding action levels without first remediating the homesites; establishment of an environmental construction code; and production of maps of contaminated areas.

The RODs for residential cleanups at both sites rely on health education programs that have been, and are currently being, implemented by the state and local health departments. These programs are targeted at residents and health professionals to help reduce exposure to lead. For example, according to the Galena ROD these education programs “will address the risks associated with interior paint and dust, consumption of garden vegetables, and residual levels of lead and cadmium in soils below 800 ppm and 75 ppm, respectively.”<sup>137</sup> While sometimes excluded from the universe of institutional controls, this study includes health education because it is an institutional method of inducing people to modify their behavior to avoid exposure to the contaminants.

State and local officials are also considering using institutional controls, in addition to those selected in the RODs. For example, with EPA funding, Jasper and Newton County officials are creating an Environmental Master Plan (EMP) for both counties that would integrate land use controls in the area and controls on development in areas with mining, milling or smelting wastes. The State of Missouri is considering if it has any authority to require property owners to notify prospective purchasers that their yard is contaminated with heavy metals pursuant to a Missouri real estate law that requires disclosure of known defects. Also, county ordinances may be passed to require those who haul or sell dirt for fill to test it for contamination and provide the results to the buyer. Jasper County, the State of Missouri, and EPA are considering the concept of taking environmental easements on contaminated properties owned by persons that refuse cleanup. Finally, EPA is considering additional methods of implementing the selected institutional controls, such as issuing unilateral administrative orders under CERCLA that will order property owners to allow EPA to sample their yard soils and to put a notice of the results in the County Recorder of Deeds Office.

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<sup>137</sup> Cherokee County OU 7 ROD.

EPA is also considering using environmental easements as institutional controls in Kansas and Missouri for the residential properties where the owners refused cleanup. An environmental easement would involve a property owner agreeing to not use the property in specific ways that could compromise the remedy or that might expose people to the residual contamination. The easement would constitute a grant of a property right to another party to enforce the terms of the restriction. Of particular concern is who would hold the easement. EPA interprets Section 104(j) of CERCLA, which requires the state (or political subdivision) to assume ownership of any real property interests acquired during a cleanup, as including such an easement. The state and local governments in Jasper and Cherokee Counties, however, may not have authority to take title to an environmental easement.

Other types of institutional controls are being considered by the local governments and the states. The Cherokee County appraiser's office, for example, has purchased a GIS and is considering a partnership effort with the Cherokee County Health Department (CCHD) whereby health officials could use the system to identify homes where multiple children have had elevated blood lead levels. Using the GIS and Health Department data, the County may be able to determine the cause of the elevated blood lead levels.<sup>138</sup> The GIS could also be used to identify and keep records of unremediated vacant lots,<sup>139</sup> residences where owners refused cleanup, remediated mine waste piles, capped piles, and other undeveloped lands that have or may have elevated soil lead levels. The County could also incorporate into the GIS the EPA data showing which properties were cleaned up, where any residual contamination remains after remediation, and where the contamination was left at depth with an orange barrier beneath the clean topsoil. This would be a useful tool for real estate agents, municipal employees, and state staff to keep track of the location of contamination and to work with developers and health officials.

Another institutional control intended to limit the use of the shallow aquifer relies on an existing Kansas law requiring property owners in certain areas to obtain a permit prior to drilling a well or using groundwater. EPA wants to ensure that the Cherokee County site area is included when these special aquifer areas are designated by the State. The State may take the lead in implementing this control because the law is already in place. Missouri has a similar law, the Missouri Well Drillers Act, which allows the state to designate special aquifers that may be unsuitable for use as drinking water. The Missouri Department of Natural Resources is contemplating designating the shallow aquifer in Jasper County unsuitable for drinking.

One institutional control that has been successfully implemented by the City of Joplin and the State of Missouri was the development of a regulatory program for daycare centers. The City asked the State Health Department to set a state-wide standard for what could be considered a safe level of lead in daycare center yards.<sup>140</sup> After the Health Department set the

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<sup>138</sup> CCHD may provide funding for training county staff on the use of the GIS.

<sup>139</sup> EPA decided to not clean up vacant lots because no current residents were exposed.

<sup>140</sup> The City of Joplin felt that a state-wide standard would protect both public health and the municipal daycare industry by preventing facilities from relocating to other areas of the state to avoid

standard at 500 ppm (it is now proposing to reduce the standard to 400 ppm), the City added a provision to its zoning ordinance requiring daycare centers to obtain a “special use permit,” the prerequisites for which included that all soils at the facility must be tested and be below 500 ppm. If a daycare facility is found to be in violation of any permit condition, the permit is suspended and the facility must go through the court system to reapply.

d. Background and Status of Enforcement Efforts

Remedial actions for most of the OUs at both sites are being conducted by EPA, using the Superfund Trust Fund and some funds from settlements with responsible parties. The RPs include some of the companies that operated mines and smelters in the District. Negotiations with potentially responsible parties are conducted based on the subsite, designated area, and on the particular OU. Initiating negotiations with any one PRP depends on identifying which PRP was involved at each subsite, designated area, or operable unit. The PRPs overlap considerably throughout the Tri-State Mining District.

Settlements have been reached with some of the Cherokee County PRPs for some of the subsites. Negotiations over the remaining Cherokee County subsites have been complicated because of the seven OUs and the four RODS, each of which discusses institutional controls slightly differently. This leads to some confusion and has made institutional controls one of the difficult issues in the negotiations. EPA deliberately selected non-specific institutional controls to allow as much latitude as possible in negotiations over institutional controls with PRPs and to provide flexibility to the local government agencies who will be responsible for implementing and maintaining the controls.

Notice letters were also sent to chat haulers alerting them to their possible liability under Superfund as PRPs if they continue to use chat for inappropriate purposes. EPA believes that haulers and builders who use contaminated mining wastes could be held liable under CERCLA, but awareness of potential liability within the business community has been effective as a deterrent to date, serving as an ad hoc institutional control. There are, however, some concerns that awareness and education may not be sufficient, particularly when chat is hauled outside the Superfund sites, where the knowledge is not as high. In at least one instance, a developer in Webb City used dirt excavated from under a chat pile for construction and the dirt was found to have lead levels greater than 1500 ppm. EPA instructed the developer to stop using such material and to clean up the areas he contaminated.

e. Background and Status of Reuse

The purpose of the residential property remediation program is to allow the current residential use to continue. The cleanup is conducted in a manner that allows the residents to continue to live in their houses while the work is being done. For these reasons, reuse is not an issue for the cleanups of residential properties.

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contamination restrictions.

Reuse is, however, an issue for mined areas and chat piles that were remediated. In Cherokee County, some proposals for industrial development have been considered in the former “Hell’s Half Acre” mined area, however, no new development has taken place in the Galena area. Because the area is economically depressed, no new residential development has occurred in the recent past. Residential and some other types of development are now inappropriate in remediated mined areas due to the hazards associated with open mine shafts. EPA’s remedial action goals did not include elimination of these physical hazards. Many shafts were backfilled as a matter of construction efficiency, but some remain open and some backfilled shafts reopen through erosion and subsidence.

Chat continues to be used as fill material and gravel for construction in both states. In Jasper County, the Missouri Department of Transportation (MoDOT) is cooperating with EPA in remediating some mined areas by using chat and other contaminated soils in the road bed and shoulders of a major bypass. Joplin officials want to encourage brownfields redevelopment in the contaminated areas along the new roadway. EPA is negotiating with MoDOT to enter into a Prospective Purchaser Agreement covering MoDOT’s purchase of the right-of-way for the new bypass highway. In the PPA, EPA intends to agree that the construction activities in developing the highway bypass will mitigate the risks at the Jasper County Superfund site because the road surface will effectively contain the metals contamination in the mining wastes.

EPA, the State, and the County agree that institutional controls will still be needed to ensure that the land use remains consistent with the fact that the road bed will contain heavy metals. In the event of future commercial development along the highway corridor, as desired by the City and the County, institutional controls will be used to protect human health. Residential developers along the highway would have to ensure that soils are below the action levels, which EPA expects will be incorporated into the institutional controls. EPA expects, for example, that the Environmental Master Plan and its enabling rules, regulations, zoning, or ordinances will specify action levels for commercial, industrial and residential developments. In addition, developers and new owners may want to enter into prospective purchase agreements with EPA to limit their liability for the past contamination. However, EPA believes this is unnecessary because the institutional controls will protect the developer. EPA’s reasoning is that as long as the development is in accordance with the institutional controls, the development should pose no risks to human health and the environment, in which case EPA would take no action under Superfund.

#### f. History and Status of Community Involvement

Formal public meetings were held as required by CERCLA and the NCP at major milestones in remedy selection, including when a remedial action plan for an OU was proposed. EPA also established a toll-free telephone number for both sites to answer community questions and address community concerns. In addition, the RPMs for both sites made frequent visits to the communities throughout the cleanup process.

Media coverage of site activity has been particularly important to community awareness throughout the Tri-State Mining District. The Galena Sentinel has done a good job of disseminating information to the Galena community, including regularly publishing fact sheets on the front page. The Joplin Globe, through reporter Wally Kennedy, has also covered the Cherokee County site and has covered the broader issues of contamination in the Tri-State Mining District extensively. All interviewees agreed that the stories by Wally Kennedy were important to informing both the Galena and Jasper County communities, but there clearly has been more coverage of Jasper County. During some periods the Globe carried front page stories about the sites every week. In addition, the Baxter Springs Citizen and Miami, Oklahoma Herald covered the Cherokee County site, as did television stations in Pittsfield, Kansas and Joplin.

One significant distinction in the two sites is the degree of involvement by the respective communities. Residents of Joplin and Jasper County have been more involved in all aspects of the process than those of Cherokee County. In particular, there was greater interest in the action level and cleanup standards in Jasper County. EPA has held informal public meetings throughout the process at both sites, but the meetings in Missouri generally have had much higher attendance. Attendance at some early meetings in Cherokee County was high, but attendance declined as cleanup progressed. EPA also received fewer requests for public meetings in Cherokee County. EPA is considering conducting a comparative study that would examine how the varied degree of community involvement at the two sites affected the process.

Possible explanations for the difference in community interest include that Galena residents live in a socio-economically depressed area, and in a small community (about 5,000). Joplin residents, in contrast, live in an area with an expanding economy and a relatively large population (over 50,000). Even though the two communities are neighbors and suffer the same legacy of environmental damage from mining, milling and smelting, they are in different states and receive different benefits from their respective state governments.

Despite the generally low level of community involvement at the Cherokee County site, a task force of representatives of federal and state agencies and the local community met regularly through the signing of the ROD to help coordinate activities in Galena. But no one in Cherokee County expressed interest in establishing a Community Advisory Group or requesting a Technical Assistance Grant, although EPA offered both these public participation mechanisms as required under CERCLA.

In contrast, Jasper County citizens welcomed these and other opportunities to participate in the Superfund decisionmaking process. A CAG was established early in the process and soon expanded its issues beyond Superfund – this group is considered by various observers to have been quite effective in its role. Jasper County also has a separate citizens' group, the Jasper County Superfund Site Coalition (Coalition), which has received a TAG. In addition, an ad hoc group of five city officials formed a citizens' task force, to provide members a forum to address specific concerns posed by the City's status as a Superfund site.

The existence of multiple groups gives evidence of the high level of community interest and involvement in Jasper County. EPA staff note that community involvement in the cleanup process in Jasper County has been strong not only compared to Cherokee County but also to sites in other parts of Region VII.

The Coalition was particularly involved in the decision-making process concerning the action levels for residential yards. Specifically, it focused on the health effects of the contamination rather than the engineering side. To assuage concerns about the effects of institutional controls, the Coalition put a banker, Realtor®, chat hauler, and doctor, among others, on its advisory board. It also used the TAG to hire well-qualified technical advisors, including a toxicologist and a biochemist from Kansas State University, which enabled the group to participate effectively in the EPA and state decision-making process. The Coalition was reportedly good at communicating with the public.

The original task force of Joplin officials was joined in early 1995 by Jasper County officials and representatives from the real estate community, banks, the school board, and city and county health departments. The members all represented groups who were directly affected by the presence of EPA. The task force met monthly over the course of three to three and a half years and, because some of the members were public officials, all meetings were open. Members believe their participation in the decision-making process was effective because they made an effort to develop contacts with EPA, the State, and ATSDR officials. Their greatest success has been in instituting lead health education in local schools.<sup>141</sup>

The task force recently disbanded and reformed into a two-county board charged with developing the regional Environmental Master Plan.<sup>142</sup> The group needed to reorganize in response to the issue of institutional controls because, although Joplin had zoning and health codes that would allow for implementation of the controls, the remaining portions of Jasper and Newton counties do not have such authority, and the members thought it did not make sense to confine institutional controls to Joplin. The task force thought it was important to broaden the scope of institutional controls and to devise a system, the EMP, for exporting institutional control capacity to other local government entities. Community interest in, and commitment to, resolving the issue of institutional controls is demonstrated by the fact that community members who were not task force members became involved in meetings about the EMP.

According to EPA staff, the Superfund cleanup has opened a door for communities like Galena and Joplin to rebound economically from an environmental legacy that they had not expected to overcome. The opportunity for revitalization provided by the Superfund program has caused the communities to become engaged and think in terms of overall area improvement schemes, such as the EMP.

Many interested parties, including the Coalition, consider the residential cleanup in

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<sup>141</sup> See section IV.C.2.b, Implementation of Institutional Controls, below.

<sup>142</sup> *Ibid.*



Jasper County to be a success and attribute much of that success to EPA's regional office approaching the project as a partnership with the local community. They commend the Region for listening to residents, for holding many meetings, and for avoiding being dictatorial. EPA staff add that continuity in Agency staff assigned to the site (the RPM has remained the same throughout the project) and frequency of visits has been critical in gaining community support.

## 2. Selection and Administration of Institutional Controls

### a. Process for Identifying Institutional Controls

Attorneys from the EPA Office of Regional Counsel (ORC) and the RPMs for the sites were largely responsible for conceptualizing the institutional controls specifically mentioned in the RODs for the Cherokee County and Jasper County sites. They discussed these and other options extensively with the states, ATSDR, the local governments, and the public. Institutional controls have also been a significant point of discussion during negotiations with PRPs. One ORC attorney said that the language in the RODs was intentionally kept vague and minimal to allow for flexibility as the cleanup progresses. This attorney also acknowledged that this strategy has caused problems in the PRP negotiations because PRPs are reluctant to agree to assume unknown costs. Some PRPs provided extensive analyses of several specific institutional control options in the Feasibility Study for OUs 3 and 4, Baxter Springs and Treece, in Cherokee County. This part of the FS analyzed the proposed institutional controls in terms of the nine criteria for remedy selection under the NCP. The analysis covered such institutional controls as property-based land use restrictions, zoning, developmental permit systems, subdivision regulations, an environmental construction code, dedicating mined land for parks or other public uses, and environmental master planning, as is being done at the Jasper County site.

The ORC attorney explained that it was difficult to identify institutional controls that would be effective at sites so large as these. This person noted that nationally more effort has been directed at developing and implementing institutional controls at smaller sites, such as landfills and individual facilities, but that institutional controls may be even more critical to protecting public health at large area mine sites. Different issues arise different types of sites and it is important to note the implications of these differences for the use of institutional controls. For example, environmental easements would be easier to implement at a single site owned by a single RP than at hundreds of parcels of property within a mining site.

Although the institutional controls mentioned in the RODs may have been primarily the result of internal EPA deliberations, other interested parties contributed many new ideas, some of which are likely to be implemented. The EMP, for example, developed from an idea that Joplin's city planner had been considering for years.

The Jasper County Superfund Site Coalition has also proposed additional institutional controls, including requiring soil testing when residential property changes hands. The Coalition has further proposed requiring anyone who provides fill material to disclose the

source of the fill – specifically whether or not it is chat – and requiring testing and disclosure of the results for lead and cadmium. Similarly, the Coalition proposed requiring developers and others to test soils before excavating or moving soils and, if the results exceed action levels, requiring the soil to be removed to the repository or covered with one foot of clean soil. Finally, the Coalition would like a prohibition on drinking water wells in contaminated parts of the shallow aquifer and a requirement that all drinking water wells be tested for metals (currently only coliform testing is required). The State and EPA are not sure that the State has the authority to completely ban shallow aquifer wells. Nevertheless, the Coalition asserts that the County has authority under existing law to pass these controls because they are similar to county ordinances requiring permits for septic tanks. The Coalition believes that the local governments will encounter less resistance if they rely on their authority to protect the public health and safety than if they use zoning, as currently planned by EPA and the local governments.

#### b. Implementation of Institutional Controls

Some, but by no means all, of the planned institutional controls have been implemented at each site. Health education programs have been, and continue to be, implemented at both sites. Letters explaining where contamination has been left in a yard have been issued to property owners whose properties have been remediated and Galena City officials have been given information explaining that the orange barrier fencing indicates that soils beneath the fence exceed 1500 ppm of lead. Some institutional controls, including land use controls in Missouri, are in the process of being implemented. Other controls are still in the development phase, with EPA, state and local officials considering how to implement them.

#### i. *Health Education*

Both Cherokee and Jasper counties, in cooperation with their respective state health departments, EPA, and ATSDR, have instituted a series of health education programs. In both counties, health education began with the blood lead testing programs, which were reportedly instrumental in generating community interest and involvement in, and support for, the cleanup. Initially, it was difficult to encourage participation, because the general attitude throughout the Tri-State Mining District was that lead did not pose a risk. A typical parent's reaction was, "I've lived here all my life and I'm fine." But community outreach combined with complimentary testing ultimately was successful in generating participation.

In Cherokee County, 672 children were tested between October, 1994 and September, 1996. More children were tested in the first year, because by the second year most children had been tested and the emphasis changed to follow up education. Testing was conducted in WIC (woman-infant-child) and other area clinics, and at City Hall, with children being identified through WIC, other clinics, and the local Head Start program. Initially, most children came from WIC, but then word of mouth increased awareness of the testing program. Department staff report that the program was well received due to the testing staff's commitment to responding to questions and concerns from the public, although some parents still would not

allow their children to be tested.

EPA gave CCHD a small grant to provide information on lead to homes where children under 6 had venous blood lead levels above 15 g/dL. After the early time-critical response action ended, the CCHD became less involved with the cleanup. Its funding for lead-related activities was severely reduced, limiting the department's capability to offer information or assistance to residents who call with questions. Since the fall of 1997, however, EPA has had a cooperative agreement with the CCHD that provides money for supplies and record keeping pertaining to blood-testing efforts. CCHD also used EPA funding to buy a High-Efficiency Particulate Air (HEPA) vacuum, which residents can use to clean their homes of potentially lead-contaminated dust. Department employees bring the vacuum to a person's home, provide an in-house demonstration and pick it up when the resident is finished. In addition, CCHD staff are developing a fact sheet describing the HEPA vacuum and its benefits. The department will also perform home assessments, including evaluating dust levels and areas of bare soils, for families with children with high blood lead levels. EPA is helping this effort by providing testing equipment to the County.

In carrying out the testing and outreach activities, CCHD learned that lifestyle plays a substantial role in children's lead levels. For example, the amount of time they spend playing with dirt varies. Some also live in poorly maintained or dirty homes where the residents are reluctant to take additional protective measures, even after education and in-home demonstrations, because of the extra work involved. Finally, over time children and families move from one town to another, making it hard to identify and eliminate the source of high blood-lead levels.

As part of EPA's five year review of the residential cleanups in Galena and Joplin, the Agency will try to find and retest the children who participated in the original study, and will also test new children from newborns to six years old. EPA will use the latter test results to assess the effectiveness of the selected remedy, with the goal being that fewer than five percent of the children would have blood lead levels of 10 g/dL or higher.

The next level of health education has been to inform the public about lead, its risks and how to avoid and mitigate those risks. To this end, EPA, ATSDR and the local governments developed several fact sheets and distributed them widely. These fact sheets covered: lead and its health effects; appropriate uses of chat, such as aggregate in concrete and road beds, that was given to quarries, construction companies, and state transportation agencies; raised bed gardening to avoid lead-contaminated soils; and methods of avoiding lead (this was sent to childcare providers prior to the testing program). The content of these fact sheets is essentially the same for both sites, but the methods of distribution varied due to the differences in the two counties. One CCHD staff person was particularly aggressive and innovative in distributing the fact sheets, putting them in church bulletins, grocery bags and in the Galena newspaper, which reproduced one on the first page. The Cherokee and Jasper County health departments have each distributed fact sheets to day care centers and preschool parents, and have also provided training in lead awareness to health professionals, many of whom had not understood the

potential for exposure or the associated risks.

The administrator of the CCHD has also spoken about lead awareness to a local civic group. The department is hoping to have more opportunities to speak at other events, especially to educators because it is easy to mistake lead poisoning symptoms for Attention Deficit Disorder, and CCHD wants to teach educators to recognize symptoms so they can start mitigation measures. The county U.S. Department of Agriculture (USDA) extension agent is helping by using a videotape on lead to “train the trainers.” CCHD has also produced two videotapes on the history of mining in the area and problems associated with mine waste that emphasizes the need for blood lead testing of children. These videotapes have been shown at schools, clinics and other locations.

In Jasper County, many entities – including city and county health departments staff, the Citizens’ Task Force (CTF or task force), and the schools – have been involved in developing and distributing educational materials. Programs in the schools were among the early successes. Because a member of the school board was also a member of the task force, with the assistance of ATSDR the task force was able to develop and deliver programs for kindergarten and first grade students in just a few months. Lead avoidance is now a regular part of the kindergarten curriculum. Lead education is also part of the ninth grade health curriculum, when the focus becomes what the students need to know when they become parents. The schools absorb the costs of reproducing approximately 3,000 copies of one to two page fact sheets. Teachers use creative methods, including demonstrations, to teach how to avoid exposure to lead. One excellent example of the innovative materials produced locally is a children’s coloring and story booklet called “Pb Possum,” produced by the CTF and distributed throughout Jasper County. The County obtained a grant from the National Association of County and City Health Officials to conduct a community needs assessment and as a result produced and distributed 22,000 copies of a lead education pamphlet. These education efforts were aided by extensive press coverage, particularly by the Joplin Globe and its reporter, Wally Kennedy.

To facilitate the health education programs, ATSDR funded three positions for health professionals in Jasper County to be shared by the city and county health departments, and one and a half positions in Cherokee County for several years. After the ATSDR funding ended, the respective counties and states have continued to provide funding for some, but not all, of these positions. Currently, CCHD is working under an EPA grant intended for education, but it has learned that it needs to combine testing with education in order to be effective, so EPA is providing money to the State to buy a blood analyzer. Cherokee County will then use its grant money to buy kits to use the machine. The blood analyzer is expected to entice people to participate, because it provides instantaneous results.

Other education programs have been developed and offered, particularly by the CTF in Joplin and Jasper County. For example, one member of the task force was a Girl Scout leader who created a special local merit badge, called “No Lead,” that girl scouts can earn by teaching younger children about lead avoidance measures. Recent efforts include the family and

consumer sciences coordinator at the USDA Extension Service educating more than 300 people about lead risks. EPA and ATSDR also educated Realtors®, bankers and lenders about lead issues and what the cleanup would accomplish.

In addition to these programs, the county health departments convened a conference attended by representatives of Jasper, Newton and Cherokee counties, the states (including Oklahoma), and both EPA regional offices, where they shared ideas on outreach and health education. The counties have maintained these contacts and schedule regular conference calls to discuss their current activities.

## *ii Land Use Controls*

Although the residential cleanup RODs for both sites state that land use controls will be among the institutional controls used, neither Cherokee nor Jasper County currently has zoning. Kansas law authorizes counties to implement zoning, but Cherokee County has not enacted a zoning system. EPA and the County have discussed various options, including EPA funding for creating a zoning system, but zoning would still need to be authorized within the County. Local governments in Kansas have “home rule” authority, meaning that they have broad authority to legislate to protect the interests of their citizens, including the adoption of zoning, but zoning, like any other regulatory program, is unpopular in Cherokee County. Still, the county commissioners seemed willing to consider establishing zoning when EPA discussed it with them several years ago. Since then new commissioners have been elected, so these discussions will have to be renewed. In addition, a model ordinance creating an environmental construction code, which some think might be more acceptable than zoning, has been prepared by some of the PRPs and reviewed by the County Commission.

EPA has delayed implementing institutional controls in the Baxter Springs and Treece subsites (OUs 3 and 4 of the Cherokee County site), because the controls are difficult to implement without substantial local government support. In addition, EPA is seeking support from the PRPs in implementing institutional controls at these subsites, but the PRPs have been hesitant. Another difficulty stems from EPA’s desire that the institutional controls implemented be similar throughout the County.

Regulators on the Missouri side share a similar interest in harmonizing institutional controls throughout the region. The City of Joplin, Jasper County, Newton County and several other municipalities,<sup>143</sup> through a reconstituted citizens’ task force,<sup>144</sup> have begun working on an Environmental Master Plan, which is intended to provide a comprehensive framework for implementing institutional controls and managing environmentally sensitive areas, currently

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<sup>143</sup> Local governments participating in the EMP include the cities of Neosho, Granby, Joplin, Webb City, and Oronogo, as well as Newton and Jasper Counties.

<sup>144</sup> The task force was reconstituted in 1998 in order to broaden its membership to include both counties so it could manage the process of creating the EMP. Additional members include community representatives, bankers, Realtors® and lenders.

defined as “compromised areas.” The area governments believe it is essential to create a framework that they all can support before instituting institutional controls, such as zoning or health regulations, that might otherwise be difficult to impose. The plan also provides an opportunity to holistically manage a range of environmental problems facing the area. Jasper and Joplin officials, for example, would like the plan to eventually include all types of contaminated areas, wetlands, and non-point source pollution issues. EPA has provided \$200,000 for drafting the EMP because it will improve the effectiveness of institutional controls at the Jasper County site. Using a portion of this funding, the task force hired a consulting firm to develop a first draft of the plan. Some of the remaining funding will be used to purchase a GIS to map the two counties and create databases of contaminated areas. County officials plan to generate graphic representations of environmentally sensitive properties in both counties.

Most other institutional controls – such as zoning, city and county regulatory provisions, and deed restrictions – are being held in abeyance while the local governments develop the EMP. As such, the only land use control currently in place at the Jasper site is the special use permit for daycare centers. Despite some public protest over special testing requirements for daycare facilities – and a desire to approach institutional controls on a regional basis – the City decided early in the process that the health of its children was more important than property values and enacted the requirement. Nevertheless, since the special use permit applies only within the City of Joplin, the City is concerned that some daycare providers may relocate to one of the eleven incorporated communities abutting the City that do not have similar requirements or to unincorporated areas in the County. This is one reason why the City supports a regional approach for managing environmental risks.

The Jasper County Superfund Site Coalition hopes that the following institutional controls will either be included in the EMP or instituted after it is in effect: 1) restrictions on drilling drinking water wells in the shallow aquifer (this would apply primarily to unincorporated areas in the counties); 2) mandatory soil and water testing for lead upon property transfer (some Realtors® oppose this provision); 3) testing and disclosure rules on soil transported by haulers; 4) requirements that developers test soils before construction and that soils exceeding an established action level of 240 ppm lead be excavated and disposed in a repository or covered with a one foot layer of clean top soil (some think the latter option would be problematic due to future landscaping, gardening, utility work, and natural invertebrate mixing of soils). The Coalition has been working on a recommendation for a safe barrier layer level, and believes that many of these institutional controls could be implemented through the existing building and health codes.

#### *Property Law-Based Controls*

EPA has not yet decided how to deal with properties that were tested and found to have lead levels exceeding the action level but whose owners refused to have the property remediated. EPA attorneys want these properties to have institutional controls attached to the property, referred to as “running with the land,” but have yet to determine an appropriate and

workable mechanism. Among the issues they are considering is how to impose institutional controls on property owners who would not even accept free remediation, what legal mechanism would be used, and how the controls would be monitored and enforced. They have considered ordering the landowners to record some form of deed restriction or requiring them to grant an environmental easement restricting use of the contaminated soils. Ordering landowners to record restrictions or to grant a property interest to another party would not, however, guarantee that they would actually record the restriction or make the grant, and enforcement of such orders might be considered excessive government interference. It is unclear whether authority for an environmental easement exists. Who would hold and enforce such an easement is another major outstanding issue. Finally, EPA is also considering how it might use the Missouri law requiring sellers to disclose known defects in property.

### c Operation of Institutional Controls to Date

Health education appears to be working well in Jasper County and Joplin. Articles published by The Joplin Globe have contributed substantially to a climate of awareness by publicizing the need for education and including much of the relevant health information. Health education also appears to be working in Cherokee County, but perhaps somewhat less effectively. As discussed above in Section IV.C.2.b., Implementation of Institutional Controls, CCHD staff found it more difficult to track children's exposure in Cherokee County since families tend to change residences fairly frequently. In addition, some local pharmacists and doctors in the County do not believe that lead exposure is a problem in the area.

The use of fact sheets and the coloring/story book "Pb Possum" have been effective at both sites in increasing the public's, particularly young children's, awareness of lead risks and how to avoid exposure. The health education programs and community acceptance of residential cleanups was aided significantly by the timely release of the ATSDR blood lead level studies for the two sites, which revealed that 11-15% of the study population had elevated blood lead levels. These studies, using a control group from a nearby town outside the mining district that had no children with elevated blood lead levels, conclusively demonstrated that the primary source of lead exposures was soil, not paint. Without the studies, EPA would have had more difficulty convincing residents of the necessity of cleanup based on the IEUBK model alone.

When the task force in Jasper County initially began to implement its health education campaign, it could not find any pre-existing materials that would serve its purpose. Therefore, the task force took the initiative to develop the "Pb Possum" coloring book and other materials that would be meaningful to the area. Although the group wanted the materials to be site-specific (*i.e.*, about chat), it also wanted to develop tools that would be useful in other areas such as Kansas, Oklahoma, and eastern Missouri. The group has succeeded in meeting this goal, as the materials are used throughout the mining district.

The fact sheets and other publications, including newspaper articles, about acceptable and unacceptable uses of chat have apparently reached the quarries, chat haulers, developers,

and landscapers, because unsafe uses of chat have largely ceased in Jasper County. Fear of liability has also dissuaded these enterprises from making chat available for residential purposes. Those who used chat as fill in the past have asked EPA to reimburse them for their lost income, but EPA has refused. Despite the widespread distribution of the fact sheets, some residents throughout the Tri-State Mining District continue to perceive chat piles as a source of recreation and entertainment, riding off-road vehicles on them. Some think this reflects some residents' reluctance to lose their cultural heritage. But this lack of concern or knowledge may indicate that the outreach efforts have not been as successful as hoped in dispelling long-standing misconceptions. EPA has tried to inform the public that the risks from incidental, infrequent, recreational exposure to the mining wastes is relatively low compared to the human health risks from residential exposure, but that combining both sources of exposure would compound the risks.

d. Outlook for Operation of Institutional Controls

Multiple agencies at different levels of government will need to cooperate and coordinate activities in order to successfully implement the remaining institutional controls, yet this can be difficult logistically even when the agencies have the same goals. For example, although the State of Missouri requires all daycare facilities to obtain a permit from the State, when the City of Joplin first implemented its special use permit for daycare facilities, the State did not know about the ordinance or its purpose and thus was not prepared to help enforce the requirements. Now state staff know about the ordinance, and notify providers when they apply for a state license that if their facility is in the City of Joplin, they must have their yard tested and apply for a special use permit. However, there is still a problem of inconsistency with the eleven other municipalities and unincorporated areas in the Superfund site that do not have the same permit requirement. Joplin is hoping that this issue will be addressed if the state issues new rules for childcare facilities, because city officials anticipate that the Division of Social Services will issue a rule stating that bare soils in excess of 400 ppm lead present a health risk to children.

The regulatory imbalance between Joplin and its surrounding jurisdictions extends beyond the special permits for daycare facilities to most types of institutional controls. The City wants to avoid having developers choose to locate projects outside the City simply to avoid stricter rules, which is one reason why it wants the EMP to cover both counties, Joplin and other municipalities. Many local government officials are also concerned that people who live outside Joplin will not receive the same degree of protection as residents of the City. Initially EPA staff hoped the State would join them in forcing the local governments to implement the proposed controls, but the State, like EPA, does not have authority to require localities to implement institutional controls.

The EMP has a high potential for effectiveness and for harmonizing current disparities among counties and municipalities, but the local governments are just beginning a long process before it is implemented. The outlook is good because of the active involvement of the citizens' task force and city and county officials. When the EMP is in place, it should be easy



for developers to screen for environmental hazards at properties that have been tested. The EMP could also be designed to help identify areas that have not been tested or remediated and that are likely to be contaminated. Joplin officials believe the EMP is critical to the future success of the Superfund remedy and institutional controls because it will provide the only mechanism to invoke protective regulations that are now absent except in the City of Joplin. One key to the future effectiveness of the EMP will be including the public in its development, so that the public understands its purpose, the need for it, and their responsibilities under it.

Several interviewees noted that successful institutional controls depend on people who engage the community and spread awareness. Many attribute the successes to date to the commitment of the staff working at the sites, such as EPA's RPMs and local officials. But, as EPA and ATSDR recognize, the long-term effectiveness of the institutional controls – particularly the health education programs – will require continuing efforts to remind residents of the risks throughout the area. Ongoing efforts may be difficult to sustain, however, especially if funding and staff resources lapse as time progresses and priorities in the area change. For this reason, the Jasper County Superfund Site Coalition has strong reservations about the ability of education to reduce exposure over the long term where remediation does not remove lead. Greater clarity on this issue may emerge in 2000, when EPA plans to fund ATSDR and the county health departments to conduct another health study to determine the effectiveness of the soil remediation actions and, to the extent possible, the effectiveness of health education programs.

Overall, the future operation of institutional controls is expected to be more successful in Missouri than in Kansas because of Missouri's strong local government infrastructure and its support for institutional controls and environmental improvements, evidenced by the efforts to create the EMP. The outlook in Kansas is less positive due to the lack of government infrastructure to deal with these issues and the comparatively lower community interest and commitment.

### 3. Analyses

#### a. Analysis of Successful Institutional Controls

One interviewee summarized the common opinion about the experience to date with institutional controls at both sites: "institutional controls need committed people. That is the reason why health education has been successful – because a lot of staff in many agencies (federal, state and local government) have been committed to it." Pb Possum, the Girl Scout merit badge and the EMP are examples of innovative local community-created solutions, while the integration of blood-lead testing and lead awareness education involved all three levels of government and was aided by excellent coverage in the largest newspaper in the area.

There was also widespread agreement that where contamination affects many people and large areas, remediation must be coupled with education and outreach activities to achieve public health protection. Several people also noted that continued education will be

particularly vital at these two sites, because engineered remedies may never completely remove the risk and because chat and lead-contaminated soils are so widely dispersed throughout the region.

The results of the health studies, showing that children living in homes in the affected areas had elevated blood-lead levels, were generally agreed to be the single most important factor in convincing residents of the risk and therefore the need for the residential cleanup. But the results alone might not have had any impact without the concurrent extensive outreach efforts, including explanation of the test results to parents, distribution and publication in newspapers of fact sheets about the effects of lead, and press coverage of the issue. Demonstrating that EPA's actions were based on sound science and illustrating the real risks posed by the lead contamination in soils was critically important in engaging the community and generating widespread support for protecting children from exposure to lead. This education did not eliminate the general sentiment against restrictions on property rights, but did reduce it.

EPA's community relations official also believes that community acceptance at both sites was greatly facilitated by early interviews of residents conducted by EPA staff. Similarly, the constant presence of EPA's On-Scene Coordinator and Remedial Project Manager at both sites, from the early program of removals from the areas of highest exposure through the most active stage of cleanup, helped gain community acceptance. Their availability to talk to groups to explain the risks and what the cleanup was designed to achieve was instrumental in convincing Realtors® and bankers, among others, to accept the program. For example, by explaining the action levels and cleanups to bankers, EPA was able to assure them that lead in soils was not a financial risk to them and they therefore continued making loans. Community acceptance of the cleanup and institutional controls was further enhanced by EPA's regularly held informal community meetings that began early in the remedial process. EPA tried to make the meetings accessible to the public by holding them from 3 to 7 p.m. and by making provisions for entertaining children, including with information about lead.

Community self-initiative was also instrumental in making institutional controls such as health education useful. For example, the "Pb Possum" coloring book was envisioned by the task force and immediately set in motion by motivated people willing to take charge of specific tasks. Similarly, the task force created and instituted a lead awareness curriculum for kindergarten and first grade in only two to three months so that it would be ready for the next incoming class. Task force members understood the importance of making things happen efficiently and took it upon themselves to accomplish that goal.

Other reasons given for why the cleanup programs have been successful include the willingness of the regulators to accommodate community concerns, such as preserving large trees and other landscaping features. Local officials noted that EPA's Region VII office has made a real effort to establish meaningful partnerships with state and local officials and never took authoritarian positions as they had heard other regional offices had done.

Regulators also recognized the importance of focusing on remedies that did not sacrifice the economic viability of the community. That is why EPA chose to approve, and publicize through fact sheets, alternate uses for chat, rather than simply prohibit its use. EPA also made a point of hiring local contractors to perform remedial work in order to support the local economy – according to the Agency’s community relations officer, this commitment enhanced public acceptance of the remedy. Yet another noted success was an innovative partnership between EPA and Missouri Department of Transportation (MoDOT) that integrated the remedy with an economic development project. MoDOT was constructing a bypass road through a mining area and, although it would have preferred to use clean soil to avoid liability, the two agencies decided to align their interests for the greater good of the area. The result was that MoDOT will use as much mining waste as possible in the road bed and soil from residential yards will be used for the shoulders. Thus, a significant volume of mining waste that might have remained in place will be covered by the impervious road surface.

A significant reason for the success of institutional controls to date at the Jasper County site is that the local governments have decided that implementing needed controls is part of their responsibility to protect the health and safety of their citizens. Thus, the City and County are actively developing their own institutional controls rather than relying on EPA to advance controls designed by federal officials. Furthermore, the local governments are taking a holistic approach to their environmental and development problems. Joplin officials, for example, realized early in the process that they wanted neighborhood revitalization to proceed along with the residential remediation and blood lead level reduction. Since many of the affected homes were in economically depressed neighborhoods, city officials aware of environmental justice concerns wanted to use the Superfund cleanup as a tool for revitalization. The City has used its community development block grants to this end, in addition to a \$2 million HUD grant for lead screening and education near the Superfund site. The City also broadened the revitalization program beyond the scope of the Superfund cleanup to include three low-income census tracts. In addition, the City is planning for brownfields redevelopment along the new bypass corridor through the formerly mined area.

When Joplin and Jasper County officials initially thought about expanding to a regional approach for the EMP they met some resistance from outlying areas that were not concerned about Superfund issues. But these jurisdictions soon realized that they too could benefit from participation in the EMP, because it offered a mechanism for managing their own environmental problems, such as non-point source water pollution in the City of Neosho. In the case of Neosho, discussions with Jasper and Joplin convinced the City Council to pass an ordinance in support of the EMP. Quarterly meetings have been critical to fostering regionalism by offering an opportunity for regular contact, which assures members that progress is being made and that their needs are being met by the plan. These meetings have been particularly important because Joplin was initially perceived to be so large that its needs were controlling. The meetings provided the opportunity to develop personal relationships that have been helpful in reaching solutions in situations charged with political controversy.

The Tri-State LEAD (Lead Education And Discussion) Group is another example of

regional cooperation and local governments taking responsibility for institutional controls. Group members from Kansas, Missouri, and Oklahoma health departments meet regularly to share ideas about lead education. One notable result is that the “Pb Possum” coloring/story book is now used in all three states. Through the LEAD Group, the local health departments are able to work together on important initiatives such as this when state political issues might otherwise impede multi-state cooperation.

Local government has also taken the initiative to integrate the soil cleanup project with efforts to prevent exposure to lead from indoor sources. Joplin government officials have consistently taken the position that the EPA remedy does not adequately protect children’s health because it does not address lead paint issues. When the City raised this issue at an environmental justice forum in February 1996, EPA informed the City that it had no authority or responsibility for indoor lead problems. To close this loophole, Jasper County sought and received a \$2 million HUD grant as part of a nation-wide lead paint pilot program.

b. Analysis of Problems to Date

The process used to determine what institutional controls should be implemented raises concerns. Of primary importance is the fact that the RODs specify land use controls that could not be implemented in Cherokee County or in some of the Missouri jurisdictions outside of Joplin. This failure to assure that local governments would have the capacity to implement the institutional controls before they selected could have jeopardized public health. On the other hand, EPA staff now perceive it as a mistake to specify institutional controls in a ROD because controls need to be developed later in the process with input from responsible parties who will be asked to pay for them and, in some cases, to implement them. The ROD is, however, the decision document and should contain all of the components of the remedy that are essential to protecting public health.<sup>145</sup> It is also the principal vehicle through which the public learns about the remedy and can participate in the decisionmaking process. Therefore, the ROD should, to the greatest degree possible, specify the institutional controls that the Agency plans to use to protect the public from risks that will remain after construction of the physical remedy.

The plan to rely on land use controls at these sites also raises concerns about the efficacy of the institutional controls. Certainly, at the time the RODs were signed, EPA could not be certain that the planned institutional controls would be effective, because there was no mechanism in place to implement zoning – one of the key institutional controls in much of the affected area. Only a few cities in the area have zoning systems in place and there currently is no county-wide zoning in Cherokee, Jasper or Newton counties, although each has authority to implement zoning. In addition, Missouri has 1<sup>st</sup>, 2<sup>nd</sup>, and 3<sup>rd</sup> class counties, each of which have different levels of authority. Hence, applying uniform controls regionally could be impracticable because the counties might not have the authority to impose the same types of controls.

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<sup>145</sup> See 40 C.F.R. §300.430(f)(1)(i)(A) and (ii)(A).

Assuming that issues about authority to implement zoning are resolved, reliance on zoning as an institutional control presents other potential problems. First, local officials note that zoning and other land use controls are likely to be unpopular in Cherokee County and much of Jasper County outside of Joplin. Since, it is generally more difficult to assure compliance with unpopular rules than with regulations that enjoy widespread support, EPA should expect, and plan for, a relatively high level of non-compliance with land use controls in the areas outside of Joplin. Furthermore, zoning can be changed relatively easily and may be likely to do so in the face of political pressure, particularly if future zoning officials have less confidence in the risk of residual contamination than current officials do.

Despite the extensive program of removing contaminated soils, the cost of removal has lead EPA to leave substantial areas that are not currently used for residential purposes untested and unremediated. No testing or remediation was done at commercial or industrial properties, or at vacant properties, with the exception of one local developer's property with existing plans for development. Although some owners of vacant lots asked for testing, EPA and the Corps had to refuse because the cost of remediating vacant lots would be prohibitive. These properties, and the extensive amount of rural land in the area that was not tested, pose a problem concerning future development. In fact, the failure to test and remediate many categories of properties presents potentially higher future risks than at properties where contaminated soils were left buried under clean soils, because there is no knowledge of what risks may be present and no mechanism to alert owners to the potential risk. In addition to instituting a mechanism to raise awareness at these properties, EPA needs to devise a way to deal with 1) properties known to be contaminated where owners refused the remedy; and 2) properties known to be contaminated where owners cannot be located to obtain consent to remediate.

Experience throughout the country has shown that land uses can change dramatically over time, and that property that is currently used for commercial or industrial purposes may be changed to residential use, even within a few years. The decision not to test commercial, industrial and vacant properties, based on assumptions that existing uses that reduce the likelihood of exposure will continue, is therefore problematic. The absence of effective land use controls means that EPA has no guarantee that untested and unremediated properties will remain in their current use. The other institutional control planned to deal with this issue is the education program, part of which includes fact sheets that explain that lead contaminated soils exist throughout the Tri-State Mining District, but the long-term effectiveness of educational efforts is unknown.

An additional concern is that residents may assume that the Superfund project will accomplish more than it actually will, specifically that when it is finished it will have removed all the lead-contaminated surface soils in the area. The lack of information about lead levels at unremediated properties could allow people to be unknowingly exposed to lead-contaminated soils in the future.

Rural residents may have less knowledge and understanding of contamination because it

is largely perceived as an urban problem. This presents difficulties for those trying to spread awareness in rural areas. Joplin and Jasper county officials think that even in their area it took an influx of residents from more urban areas to spread awareness in this case. They emphasized that environmental agencies need to develop better methods of reaching rural populations. They cautioned that this will be a challenge because even with the considerable scope and depth of educational efforts made in the Tri-State Mining District, some segments of the population remain unconcerned. They point specifically to the community needs assessment completed in Jasper County a few years ago, which surveyed residents about lead contamination and the Superfund site. The responses revealed that people were concerned, but that knowledge of site risks was low. Based on these results, local officials decided to distribute a one-time newsletter to inform the community about lead issues. This project has also demonstrated the importance of news media in reaching those who have little information about health risks.

*i. Cherokee County Site*

According to some interviewees, the lower community involvement in Cherokee County has reduced the effectiveness of the institutional controls implemented to date, particularly the health education. As discussed above, Cherokee County residents have been less interested in lead issues and less involved in developing and distributing educational materials. In contrast to Jasper County, where community members took great initiative to advance lead education, in Cherokee County the health education campaign was implemented by CCHD, ATSDR, and EPA, with residents being more passive recipients. What effect this reduced involvement will have is unclear, but there is concern that over the long term residents of Cherokee County will be less knowledgeable about lead risks and methods of avoiding and mitigating exposure.

Ironically, much of the resistance to educational efforts that CCHD encounters comes from medical professionals, such as pharmacists and doctors, who were not previously aware of the health effects of lead exposure. Active participation by health professionals will be critical, however, to ongoing efforts to control lead exposure, particularly once federal funding stops; in the future, it will be up to medical professionals to ensure that health and developmental problems related to lead exposure are diagnosed during routine checkups. In the past, the state of Kansas has helped and supported CCHD's lead awareness and avoidance efforts, but funding for the lead paint testing program was cut in September 1998, which could significantly hamper future efforts to detect, monitor, and control lead problems. Health education in Cherokee County is further hampered by a paucity of permanent physicians; many local health professionals are medical students who work for a relatively short time in a socioeconomically depressed area in exchange for reducing their student loans.

*ii Jasper County Site*

The method and time frame for implementing institutional controls has caused some controversy. The Jasper County Superfund Site Coalition wanted the City and County to implement institutional controls aggressively by adding them to new development ordinances,

and submitted a proposal to do so in October 1997. The local governments, however, wanted to wait until they had a better idea of what would be needed based on the specifics of how the Superfund situation developed. Specifically, they wanted to avoid haphazard selection and application of institutional control regulations. Local government officials also wanted to make sure that property values would be protected and wanted to proceed without alarming their citizens, so they decided to err on the side of caution where property values were concerned. The citizens' group objects that this decision was not adequately protective of public health, since it prioritized property values over health. The local governments hope that the EMP will satisfy all concerns and provide the necessary support to implement needed institutional controls.

#### b. Analysis of Potential Future Problems

The selected remedies rely heavily on institutional controls, including health education, but at the time the RODs were issued, methods to implement all the necessary institutional controls did not necessarily exist. Although efforts are being made to create the necessary mechanisms or to implement alternative institutional controls, the process of implementing them will take years and they may not be in place when active remediation is complete. This increases the risk of exposure to the contamination that has been left in place. In addition, despite the general satisfaction with the results of the health education efforts, there is uncertainty about the effectiveness of health education at reducing risk over the long term. There is concern that health education has been effective to date because of the obvious EPA presence in the area, which has kept the issue in the news, but that when the attention to the issue drops effectiveness will decrease and more children will be exposed. Some interviewees noted that if the blood lead testing as part of EPA's five year review shows that health education was not effective as a remedy, an entire generation of children will have had their health compromised.

One category of likely future problems arises from the gaps in coverage of the planned institutional controls. Despite the large amount of effort and money spent on remediating residential properties, chat piles, and mined areas, large areas of undeveloped land remain contaminated and much of that area has not even been tested. Some areas that have been tested have lead levels exceeding 1000 ppm. Yet there is no mechanism in place to provide notice of known contamination or to warn owners or prospective purchasers of the need to test soils before using the land for certain purposes. These areas of known and potential contamination could pose potential future health threats if children move to unremediated properties or if mined lands are developed. Somewhat paradoxically, revegetation of contaminated areas may create problems by disguising the residual contamination, while large, obvious chat piles could help caution informed individuals.

Of additional concern are state laws in both Missouri and Kansas that could inhibit the transmission of knowledge about known contamination. Missouri law presents a barrier to dealing with these problems, because it prohibits both the state registry of contaminated sites and deed notices from including lead contamination that resulted from mining activities.

Cherokee County can require property owners to file deed notices of lead contamination, but Kansas law prohibits real estate agents from disclosing information that might be detrimental to the owner's interests, which could include information about contamination. Thus, both states currently lack reliable mechanisms for long-term record keeping of, and notification about, the existence and location of known contamination.

Some gaps also exist in the system of institutional controls governing remediated properties, specifically the orange barrier fencing installed to warn property owners that deeper soils have lead levels exceeding 1500 ppm. EPA explained the purpose of the fencing in its construction completion letters to property owners, but there is no mechanism to assure that this information will be passed on to future owners or lessees. EPA's assumption appears to be that such notification will happen regularly. While it may occur in the majority of cases, notifying prospective purchasers or lessees of the existence of contamination may not be in the economic interests of the owner and some owners should be expected to fail to disclose the purpose of the fencing. In the future, a new owner or user could encounter the buried orange barrier fence and, not knowing its purpose, remove it. Without the original EPA letter explaining its purpose, the fence becomes a less effective control. An attempt was made to mitigate this problem by providing information about the fencing to the city governments, but a resident would not necessarily contact the City to find out why a plastic fence is buried in his or her yard. Nor is there a mechanism for the City to publicize this information. A potential mitigation measure might be to record the EPA letter in the property records, but property owners can be expected to object that this will reduce the marketability of their property. Another solution for future residential sites of this nature might be for the Corps to mark the fencing with "lead hazard" warnings, to indicate that it is a protective mechanism, not some unusual landscaping design.

In general, the term "institutional controls" seems to have a negative connotation among property owners. This could pose problems when the agencies begin to implement more restrictive types of institutional controls. Property owners in the area are particularly sensitive about property rights and can be expected to object to being required to record notices of contamination or restrictions on the use of their property. Educational efforts about the particular institutional controls that will be used and why they are needed could help improve public acceptance of the institutional controls as it did with the cleanup itself.

The Environmental Master Plan appears to be a useful innovation and the progress to date has been good, but there are many issues yet to be resolved. The Missouri local governments, unfortunately, have no model for developing the EMP and do not know of any similar programs from which they can learn how to resolve the many outstanding issues. The task force and its consultants are creating the EMP starting with a master plan developed by Joplin several years ago, but need to expand its scope to suit the needs and conditions of the larger area involved in the plan. The task force recognizes that it would be better to include Kansas and Oklahoma in the EMP, since the contamination extends across political boundaries. But enabling legislation in the states differs, meaning solutions in the three states also differ. Joplin and Jasper county officials believe that lack of government infrastructure is a common



problem throughout the nation. Their long-term goal is to convince Missouri to adopt broad legislation encompassing all state agencies and lower levels of government that will enable and support the use and enforcement of institutional controls to protect the public against environmental risks.

Joplin officials would like to see information sharing about environmentally sensitive areas improved. They note that it is impossible to protect people and the environment if the contaminated or polluted areas cannot be identified and records kept of their location. Now every time someone wants to develop an area or initiate a project, the developer has to start by doing Phase I or Phase II investigations. Officials expect the GIS to help considerably by making information available about known sources and locations of contaminants. Still, awareness of the existence and capabilities of the GIS will need to become widespread so people know to take advantage of it. In particular, information should be targeted at developers, lenders, and contractors who are regularly and intimately involved in development and property transactions.

Contaminated ground water is a significant issue in the rural areas of Jasper County. To manage this problem, EPA will be connecting all but a few of the existing homes to the existing rural water district. But this leaves open the question of what to do about future development on vacant lands with contaminated ground water. Individual homeowners will not be able to drill deep enough (about 1000 feet) to reach the clean aquifer and may expect to be able to use the shallow aquifer, which historically had been the primary source of drinking water for private wells. The lack of any regulatory mechanism to deal with this issue is a significant gap in the system of institutional controls. Fortunately, according to Jasper County staff, awareness of the potential for contamination is rising among home buyers and increasing numbers are requesting non-mandatory testing for heavy metals. Realtors® are also encouraging testing to avoid potential liability. However, local government staff see it as a major problem that the ROD is solely oriented to reducing existing risks, such that EPA does nothing to remove the risk if no one is currently exposed. They object that EPA does not have good plans or ideas of how to reduce the risk of future exposure to the contamination left in place, noting that the existing and planned institutional controls are primarily aimed at areas tested and remediated, ignoring the potentially higher risks associated with contamination in areas that have not been tested because they are currently undeveloped. They note that such areas will not necessarily remain undeveloped, yet no institutional controls are in place to notify potential future owners and users of the need to test.

Similar issues are raised by EPA's failure to categorically address open mine shafts, which were closed only when they were used as a repository for excavated residential soils or chat piles. These open shafts present a significant threat of injury, particularly to people who relocate to the area will not be aware that it is riddled with hundreds of open shafts, yet there appear to be no current plans to create a system for warning residents and visitors of the hazards. Thus, although a system of institutional controls has been planned to manage many of the residual risks at the Cherokee County and Jasper County Superfund sites, some of the risks that will remain at these sites after construction is complete have not yet been addressed.



## **IV RESULTS AND ANALYSES OF CASE STUDIES**

The preceding case studies of the Bridgewater, Sharon Steel, Cherokee County, and Jasper County<sup>146</sup> Superfund sites include ELI's analyses of successful institutional controls at each site, problems that have been encountered to date, and problems that may arise in the future. This section presents ELI's analyses of the following common themes that arose from the individual case studies: communication and cooperation among levels of government; the level of specificity about institutional controls in RODs; compensating for human errors in implementing institutional controls; monitoring and oversight of institutional controls; community awareness, acceptance, and participation in institutional controls; and planning and budgeting for institutional controls. The distinctions between these issues are not necessarily clear and some aspects, such as the importance of public awareness, understanding and acceptance of institutional controls, are relevant to, and discussed with respect to, several themes.

### **A. Communication and Cooperation Among Levels of Government**

As discussed above, institutional controls often require local government resources and authority to implement. Moreover, at each level of government, several agencies may be involved in the implementation process: EPA, natural resource damage trustees, and ATSDR at the federal level; environment, natural resource and health agencies at the state level; and zoning authorities, registries of deeds, and county health and transportation departments at the local level. The need for involvement by all levels of government to ensure that institutional controls are selected, implemented and maintained properly raises many challenges from a coordination and cooperation perspective. At sites that encompass more than one state or locality, the challenges are even greater.

While these challenges have been met at some sites, the process could be improved at others. Over the long term, additional measures may be needed to ensure that all levels of government work together to ensure the efficacy of institutional controls. The case studies provide numerous examples of the importance of inter-governmental and intra-governmental cooperation in selection, implementation and operation of institutional controls. The results of inadequate coordination and cooperation can be serious. For example, institutional controls can be selected that a local government does not have the authority, interest, commitment or resources to implement or maintain, thereby undermining efforts to achieve a protective cleanup remedy.

#### **1. Selection of Institutional Controls**

Cooperation among federal, state, and local governments in the selection of institutional controls is critical to their long-term efficacy. However, the remedy selection process outlined

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<sup>146</sup> The Cherokee County and Jasper County sites were discussed together due to the similarities in the remedies and institutional controls at the two sites.

in CERCLA and the NCP does not require or necessarily facilitate such efforts. CERCLA requires EPA to consult with affected states before determining an appropriate remedial action and, in most cases, the state must agree to pay for ten percent of the remedial costs of government-funded cleanups and for all future operation and maintenance of the remedy.<sup>147</sup> The NCP further provides that for fund-financed cleanups, states are required to assume operation and maintenance of the remedy, including ensuring that any institutional controls are in place, reliable and will remain after initiation of operation and maintenance.<sup>148</sup> Institutional controls are often implemented by a local government, however, and a state may not be able to guarantee that they will be put in place and administered. Because the NCP does not provide for consultation with the local governments when institutional controls are under consideration as a component of the cleanup, at some sites they are not consulted until after the remedy is selected. As a result, a remedy may be selected without careful analysis of whether a particular institutional control is feasible given the authority and resources of the local government.

Furthermore, EPA has limited recourse after the ROD has been issued if a local government is unable or declines to implement institutional controls. Aside from efforts to work with the local government, EPA may have no option but to revise the remedy selected and issue an Explanation of Significant Differences that adopts either new remedial work or new institutional controls. This is a time consuming process that clearly makes seeking cooperation from local governments even more critical.

The need for early cooperation in the institutional control selection process is highlighted by the selection of zoning a control for the Cherokee County and Jasper County sites. After zoning was selected in the RODs, it was determined that neither of the counties had zoning authority in place that would enable them to implement the institutional controls.<sup>149</sup> As a result, state, federal and local government agencies have had to consider various options for moving forward to ensure a protective remedy. In Kansas, EPA and Cherokee County have discussed the possibility of EPA providing funding for the establishment of a zoning system. But even with such funding, zoning will still need to be authorized by the County. Although the county commissioners have previously indicated a willingness to consider establishing zoning, new commissioners have been elected since the first discussions between the County and EPA and, therefore, discussions will have to be renewed. In Missouri, an environmental management plan is in development that will allow for zoning restrictions on properties with lead levels that exceed established standards. Although the local, state, and federal governments are working cooperatively in both states to address the problem, it could be difficult, if not impossible, to implement the institutional controls selected for the sites,

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<sup>147</sup> 42 U.S.C. §9604(c).

<sup>148</sup> 40 C.F.R. §300.510(c)(1). The NCP recognizes that institutional controls may be used to supplement engineering controls and, in some cases, may be the sole remedy if active measures are not practicable based on the balancing of trade-offs among alternatives that is conducted during the selection of a remedy. 40 C.F.R. §300.430(a)(1)(iii)(D).

<sup>149</sup> Of the counties and municipalities covered, only the City of Joplin, Missouri had a zoning system in place at the time.

particularly since zoning is likely to be unpopular in Cherokee County and much of Jasper and Newton counties outside of Joplin. Earlier coordination may have avoided the reliance on institutional controls that were not possible to implement under the existing zoning systems, or at least started the process for addressing the barriers to zoning more quickly.

## 2. Implementation of Institutional Controls

Inter- and intra-governmental cooperation in implementing institutional controls is also key to their success. At the Bridgewater site, the Town that owned most of the site had to enact a special ordinance that authorized it to restrict its own use of the site. Although the Town was not consulted about the selection of the institutional controls, it was willing to cooperate and make the effort to pass a special ordinance in this case. It is very possible, however, that another municipality would not be so cooperative under similar circumstances. The Plymouth County Registry of Deeds also had to make special efforts to record the restrictions authorized by the Town, since initially it was not familiar with the type of restrictions imposed on contaminated sites. A local registry without the interest and motivation of the Plymouth County office may have declined to record the restrictions, thereby resulting in failure or delay in providing notice to prospective purchasers of the property.

At the Tri-State sites, implementation of the education programs for the Jasper County and Cherokee County sites has required extensive cooperation and produced notable results. The health education efforts at these two sites have required coordination among state, city and county health departments, ATSDR, USDA Extension Service, and EPA. EPA has provided grant money to the counties and the counties have worked to coordinate their efforts. The efforts reflect considerable local initiative and may exceed the requirements in the ROD. Efforts include the development and dissemination of the “Pb Possum” coloring book, Girl Scout merit badges, and a lead awareness curriculum. The strong local support for the education institutional controls at these two sites shows the importance and effectiveness of cooperation in ensuring that institutional controls selected in RODs are successfully implemented.

## 3. Operation of Institutional Controls

The importance of coordination between states and local governments in the operation of institutional controls was evident in Missouri when the City of Joplin first implemented its special permit for daycare facilities, which requires providers to test the soil in their yards for contamination. The special use permit is an example of an institutional control implemented by a municipal government on its own initiative. The state agency that deals with day care providers did not know about the ordinance or its purpose and thus was not prepared to help enforce the requirements. Although the state staff now know about the ordinance and notify providers when they apply for a license in the City of Joplin that they must have their yards tested and apply for special use permits, the lack of early coordination could have undermined an effective institutional control. Furthermore, eleven surrounding municipalities and the County do not have similar requirements. The lack of a collaborative and consistent approach

could cause child care providers to locate their facilities outside the City simply to avoid stricter rules, resulting in less protection for residents outside the City. Since the State does not have the authority to require localities to adopt institutional controls, coordination and cooperation become critical. This situation also illustrates the importance of a variety of agencies cooperating to implement institutional controls, because in this case the relevant state agency was not the environmental agency.

Also of concern, when institutional controls are implemented by a local government but not at its own initiative, they may not be fully implemented. Therefore, it is important that the local government is comfortable with and supports the institutional controls that it must operate. For example, the local government responsible for implementing the institutional controls for the Sharon Steel site initially opposed restrictions on residential properties and only agreed to enact a city-wide ordinance in order to move the remedy forward and accelerate the site's deletion from the NPL. After the ordinance was passed, the City devoted very little attention to administering the controls and did not perform the required education campaign to inform residents of the risks associated with residual contamination and the requirements governing excavation in unremediated areas. The failure of the City to follow through on its agreement may have led to the documented failures, discussed above, to comply with the soil testing procedures established in the ordinance. Notably, EPA did not know about the violations, despite the fact that it is responsible through the five year review process for ensuring that the remedy is effective.

By contrast, the education efforts at the Tri-State Mining District sites demonstrate the benefits attainable through coordination among all governments involved in ensuring the effective operation of institutional controls. As discussed above, multiple agencies at both the Cherokee County and Jasper County sites worked together to conduct both traditional and innovative outreach efforts, few of which would have been possible or as successful without the substantive and financial contributions of each of the participating parties. Furthermore, by maintaining intergovernmental communication across the state border throughout this process, communities in Kansas and Oklahoma have benefitted from public education tools developed in Missouri. Without this coordination, public health officials likely could have implemented health education programs in compliance with the terms of the RODs, but they probably would have operated with far less enthusiasm and support and resulted in significantly less effective institutional controls.

In sum, the case studies consistently demonstrated that the entities responsible for implementation and operation of institutional controls must support the controls selected and have the authority, resources and commitment to enforce them. Because institutional controls may be essentially an unfunded mandate and can conflict with other interests of a locality or state, such as economic development, local acceptance is particularly important.

Given the critical importance of governmental cooperation, EPA should consider various options for routinizing or encouraging such cooperation and coordination. Several options could be explored, including whether the NCP should be amended to require

consultation or even agreement from local and state governments, or other implementing entities, before institutional controls are relied upon as part of a remedy. EPA, the states and local governments could also develop a model process, including model cooperative agreements, that would help facilitate the selection, implementation and maintenance of institutional controls. The models could be set out in guidance or regulations. Finally, consideration should be given to how to fund the additional duties that local governments or other entities will be asked to undertake in implementing institutional controls at NPL sites.

## **B. Level of Specificity about Institutional Controls in RODs**

The level of specificity regarding institutional controls in RODs varies considerably among the sites selected for the case studies and the sites screened for potential case studies. Typically, however, the language describing the types of institutional controls that will be relied upon to prevent exposure to residual contamination is general or vague.

The level of specificity about institutional controls in RODs raises concerns from several perspectives. General language that does not describe specific institutional controls can undermine the effectiveness of those controls by providing little guidance to state and local governments, by precluding public input in the development of specific controls, and by limiting the ability of EPA and the public to ensure that appropriate controls are implemented and maintained. In contrast, however, detailed and specific language on institutional controls may limit flexibility, mandate controls that may not be feasible or practical, and deter creative implementation and operation of institutional controls by local governments, or other implementers, unless EPA coordinates extensively with state and local governments regarding the controls prior to issuing the ROD.

The problems with general ROD language were apparent in the site selection process for this study, when RODs were used as the basis for selecting sites to consider for potential case studies. ELI frequently found that the general statements about institutional controls in the RODs provided only minimal information about the institutional controls that were in place at a particular site. This made it difficult to determine whether institutional controls were in place at a site and, if so, what types of controls. In addition, follow-up interviews and research revealed that at some sites the institutional controls referenced in the RODs had not been implemented. For example, the educational programs prescribed for the Bridgewater site were never implemented because EPA and the State determined that they were not necessary. Although the decision may not have resulted from vague language in the ROD, the lack of specificity may have made it easier to ignore or bypass the institutional control.

The Bridgewater case study revealed that the use of general language about institutional controls in RODs may necessitate substantial post-ROD work. The Bridgewater ROD stated only that:

“Institutional controls (*e.g.*, deed and land restrictions) will be required legal instruments as part of the remedial action to

prevent the use of on-site groundwater for all water use purposes and to protect human health.”<sup>150</sup>

Thus, the ROD provided an example of institutional controls but did not dictate which controls would be used, with the exception of educational programs that the ROD stated “will be undertaken.”<sup>151</sup> For the Bridgewater site, the specific institutional controls were developed by EPA with assistance from the RPs and the Massachusetts Attorney General’s Office after the ROD was issued. The parties developed a Declaration of Restrictions that imposed numerous detailed institutional controls including restrictions on land use, groundwater use and excavation. For example, the Declaration used zoning restrictions as a reference point for permitted uses and also listed the specific permissible uses in an appendix to the Declaration. The Town provided input including a request that the Declaration specifically list permissible municipal uses of the property that were broader than the permissible private uses. As a result, the Declaration provides that the property can be used for fire stations and other municipal uses. All of the parties, including EPA, the Town, the State and the RPs, worked together to develop institutional controls based on the open-ended ROD language.

It is important to recognize, though, that cooperation can not be expected at every site. When institutional controls are selected post-ROD, an established process is not in place to resolve conflicts. For example, if the State and EPA had not been able to agree on a mechanism for restricting groundwater use at the Bridgewater site, an administrative process would not have been readily available for resolving the impasse. At Sharon Steel, high level management from EPA, the State, and the City used an independent facilitator to help them reach consensus on the selection of institutional controls after a series of confrontational and unsuccessful meetings on the issue. This process took approximately a year and a half, with meetings scheduled almost weekly. While the City ultimately adopted a municipal ordinance agreed to by all parties, the control was later repealed with EPA approval. Since the terms of the controls had not been specified in the ROD, the City was able to reverse a decision it made through this cooperative process undertaken by all three agencies. Thus, even controls yielded through coordinated post-ROD processes may not endure where the spirit of cooperation is not as strong as it has been at sites like Bridgewater.

In addition, the post-ROD selection of specific institutional controls can impede EPA and state negotiations with RPs. RPs may be able to leverage the general language if they are reluctant to agree to pay for or implement institutional controls because the remedy has already been selected and, in some cases, settlement agreements already reached. In other cases, RPs may be reluctant to agree to perform a remedy selected in a ROD if specific institutional controls have not been mandated. At the Tri-State sites, for example, the RPs were reluctant to agree to assume unknown costs and, as a result, settlement negotiations were impaired. One of the attorneys interviewed for the Tri-State sites case studies offered the opinion that the vagueness in the ROD language left too much discretion to the RPs given that EPA wanted

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<sup>150</sup> ROD at 36-37.

<sup>151</sup> ROD at 37.



them to implement the institutional controls.

The use of general language about institutional controls in RODs also raises concerns about the opportunity for public input and participation. Although institutional controls are often considered an integral part of the remedy for a site, agencies are not bound by the public participation requirements governing remedy selection when controls are selected after issuance of the ROD. As such, EPA, states, and local governments have tremendous latitude to determine if and to what extent they wish to involve affected communities. At the Bridgewater site, for example, the public was effectively closed out of the process for selecting institutional controls, because they were chosen through informal discussions between EPA and the State, independent of the remedy selection process. While post-ROD selection of institutional controls does not necessarily dictate that public input will be limited, lack of an established, publicly accountable participation procedure leaves considerable discretion to agencies on this matter. In addition, since public participation is not required by law or regulation, any decision to provide opportunity for post-ROD public input is not enforceable.

Negotiating institutional controls outside of the ROD process can also lead to poor documentation of the selected controls. For example, at the Sharon Steel site, although the City was charged with primary responsibility for implementing the controls (the CSRRs) and provided information about them in response to questions from the public, the CSRRs did not appear to be included in the site's public information repository located in a Midvale public library. The repository is intended to provide the public with the information needed to understand the government's response at a Superfund site, yet by negotiating the institutional controls after the ROD this important aspect of the remedy apparently was not included in the repository.

Despite the problems with using general language in RODs, several of the EPA and state staff interviewed emphasized the importance of providing ample flexibility for states, municipalities and RPs to select controls that are feasible and practical given site-specific conditions. More general language in the ROD also gives local governments the flexibility to adjust institutional controls over time and to adapt to changing local conditions. Some staff further noted that institutional controls should not be detailed in RODs because they need to be developed later in the process with input from RPs who may be asked to pay for or implement them. But, in the view of some staff interviewed, not enough discussion with the state and local governments about institutional controls has occurred at the time the ROD is finalized to enable the selection of specific controls. At the sites studied, it was certainly true that only limited information was available about the feasibility of specific institutional controls at the time the RODs were issued. The lack of zoning systems in Jasper and Cherokee counties and the minimal input from the local government at the Bridgewater site evidence this fact.

In addition, use of general language in the RODs also reduces the risk of over- or under-inclusion of institutional controls. In the case studies, some institutional controls that were selected in the RODs were later determined to be unnecessary. At the Sharon Steel site, institutional controls in the form of a city ordinance were implemented but later revoked, and

at the Bridgewater site the education institutional controls were not implemented at all. Conversely, a ROD could also be under-inclusive and fail to include specific institutional controls that are needed. Without re-opening the remedy selection process and issuing an ESD, EPA would have limited recourse for requiring additional institutional controls. Nevertheless, as discussed below, these issues of insufficient information at the time a ROD is signed could be solved in ways that do not take a critical aspect of a remedy out of the established public process of decisionmaking.

There are several options for dealing with these competing concerns over the level of specificity in RODs with respect to institutional controls. First, earlier coordination of federal, state and local government efforts should help resolve these concerns by vetting issues of feasibility when they can best be incorporated into decisionmaking. Additional mechanisms for working out the details of institutional controls prior to the completion of a ROD should also be considered. In particular, a more detailed review and analysis of potential institutional controls could be undertaken in the RI/FS process, as was done for OU4 at the Cherokee County Site. Such investigation of institutional controls should be part of the RI/FS if institutional controls will be an essential part of the remedy. At a minimum, the legal research as to existing authority for specific types of institutional controls under consideration could be done at that stage. Preliminary discussions with potential implementers of institutional controls, particularly local governments, could also be held during the RI/FS process. Finally, if detailed institutional controls are developed post-ROD, EPA should consider establishing a process that would allow for the resolution of disputes and an opportunity for public participation or comment.

### **C. Compensating for Human Errors in Implementing Institutional Controls**

Institutional controls, unlike engineering controls, rely heavily on humans to implement, oversee, and administer them. Zoning rules, for example, are established by zoning boards and overseen by local government staff. Land use restrictions included in deeds must be recorded in the appropriate property records by the Recorder of Deeds. Additionally, the system of deed records, whether computerized or more traditional, is created and maintained by ordinary people. The potential for human error in implementing institutional controls must, therefore, be considered in deciding what controls to use at a site.

These case studies revealed several instances where institutional controls were not implemented as intended. Some of these failures can be attributed to errors by the people implementing the controls. In this context, human error encompasses failures to act as well as acts of commission.

The RODs for the Bridgewater, Cherokee County and Jasper County sites specified that educational programs would be conducted as part of the remedy selected, yet none were conducted at the CEC Bridgewater site or at the Sharon Steel site in Midvale. The ROD for Bridgewater did not specify who would be responsible for educating the public, but EPA officials acknowledged having at least partial responsibility for the decision not to conduct the

educational programs. EPA staff attribute their failure to implement the programs to a lack of community interest in the site. Yet this perceived lack of interest might have been, at least partially, a result of a lack of information about the site that could have been cured by educational programs. By not establishing clear responsibility for who would implement the educational programs, the ROD increased the likelihood that this aspect of the remedy would not be implemented.

This omission is also an example of the familiar problem that humans tend to put more effort into tasks that other people are focusing attention on and tend to ignore tasks that no one else seems to care about or where the purpose is not readily apparent. Residual hazardous substances are a classic example of a problem that is not readily apparent, and the tasks associated with implementing institutional controls are unlikely to be the focus of widespread public attention in many cases. Thus, decision makers should plan for a relatively high probability that the person charged with the responsibility to implement an institutional control will fail to do so because that task is not a high priority for that person or because it is a task without a specific deadline and can therefore be postponed indefinitely.

In contrast to the situation at Bridgewater, the City of Midvale was specifically charged with educating its citizens about the risks associated with exposure to soils contaminated with lead and about the purposes and requirements of the Contaminated Soils Remediation Regulations. In this case, city officials agreed to implement the institutional controls, including enacting the CSRRs and educating the public, even though they opposed the rules. Despite this commitment, the City did nothing to educate its residents about the CSRRs or the risks of exposure to lead. People who oppose something or who do not believe a task is necessary are, of course, less likely to carry out that task than those who support it or who agree that it is needed. Current city staff speculate that failure to conduct the education program in Midvale may have been an oversight within the city government, or an intentional decision made due to lack of conviction in the importance of institutional controls. This situation illustrates the importance of independent monitoring and oversight of institutional controls to assure that the entities or individuals that are responsible for implementing them fulfill their responsibility.

The possibility of human error in implementing institutional controls is of greater concern where a single person is charged with responsibility for implementing a control. Independent oversight is even more important in such a situation because there is no organizational mechanism to ensure the individual performs her or his responsibility. Another option is to assign shared responsibility for implementing the institutional control to two or more people, yet this strategy raises the possibility that neither will take the necessary action because each will assume that the other is faithfully carrying out his or her duties. The latter problem may be partially alleviated by setting out the respective responsibilities in writing. A third strategy is to create more than one type of institutional control, each of which operates in a different way, and to make different people responsible for implementing each institutional control. This avoids the problem that a shared responsibility may be treated as no one's responsibility, and deals with the potential failure of any single institutional control by having

a system of overlapping controls that protect people against exposure to residual hazardous substances.

Humans are also the receptors of institutional controls, which creates the possibility that a control could fail due to the nature of the person it is intended to affect. Institutional controls typically work by modifying the behavior of people who might, absent the institutional control, allow themselves to be exposed to hazardous substances left in place at a site. For example, the terms of a deed restriction may prohibit the owner from using the property for residential purposes. In itself this restriction on the owner's property rights will not prevent an owner from building a home on the property; instead, it relies on the owner's respect for the rule of law and the fear of the consequences of violating the rule, to cause the owner to choose to use the property in ways that are consistent with the restriction. Similarly, health advisories, or other notices that indicate a site may pose a risk to human health under certain circumstances, work by providing information to potential users who are then expected to make rational choices about their own behavior that will reduce their risk of exposure to the hazardous substance. For these reasons, decision makers must also consider the potential for human error by the people whose behavior the institutional control is intended to affect.

In the Tri-State Mining District, some people continue to ride off-road vehicles on lead-contaminated chat piles and use chat as gravel for driveways or other inappropriate uses despite the wide distribution of fact sheets explaining the risks of exposure to chat. EPA and local health officials propose several explanations for why some people ignore the recommendations for how to avoid exposing themselves, all of which may be reduced to the element of individual free will. To the extent that institutional controls rely on individuals modifying their behavior, which every institutional control does to some extent, there is the possibility that some of the targeted individuals will not act as desired.

The failure of Midvale city officials to educate residents about the purpose of, need for, and requirements of the CSRRs meant that few residents knew about the rules. The low public understanding of the requirements is likely one reason why there were no known instances of voluntary compliance with the CSRRs during the four years that the rules were in place. The three known cases of violations of the rules can all be attributed to lack of knowledge that the rules existed. City officials were unaware of any other situations where residents may have excavated soils without complying with the rules, but also had no monitoring system that might have revealed if such violations were occurring. It is also possible that some residents knowingly violated the rules because they thought the rules were an unwarranted interference in their use of their property, as was the prevailing opinion. Individuals are generally less likely to comply with rules that they do not understand, that they oppose or that they consider unnecessary.

The possibility of human error can be increased by staff turnover at implementing agencies. This can be particularly important where records and other methods of transmitting knowledge are not well developed, routinized or reliable. There has, for example, been a complete turnover of the city staff responsible for the CSRRs in Midvale, Utah. Although the

new staff have made special efforts to become familiar with the CSRRs and the issues surrounding them, they do not know why some actions were taken or not taken. It appears that this lack of knowledge has not caused any actual problems, and it is moot now that the CSRRs have been repealed. It is, nonetheless, indicative of a potentially grave loophole in the administrative structure governing institutional controls.

The potential for loss of knowledge due to turnover also increases as the number of knowledgeable staff decreases. There may be reason for concern in Galena, Kansas, where the city manager alone is being relied on to transmit knowledge about the purpose of the buried barrier fencing to future residents. Relying on a single person to transmit crucial information risks losing that information if the person leaves without fully transferring the information to her or his successor. Institutions can mitigate against this loss of knowledge by keeping complete records and memorializing the information in written form. The Corps, for example, has helped the City of Galena accomplish the latter function by providing an information sheet explaining the purpose of the fencing.

Because institutional controls necessarily depend on individuals to implement them, there is a strong element of human judgment involved. This may be primarily a strength of institutional controls because it affords the opportunity to adjust them to new circumstances and to apply them rationally in accordance with the actual risks at a site. Nevertheless, the judgment of any individual may be questionable in a specific situation and a poor judgment about implementing institutional controls could cause people to be exposed to hazardous substances. This study revealed no such incidences of judgments by individuals that caused people to be exposed to risks, but the decision by Midvale officials to not educate residents about the CSRRs may have contributed to the two instances where residents exposed potentially contaminated soils without testing them first. Educational programs would not have guaranteed that the residents would follow the CSRRs procedures of bringing soil samples to the City for testing, but their absence made it less likely that the residents would know that the rules existed or there was funding in place to alleviate the financial burden of testing.

One method of reducing the risk that institutional controls will fail due to human error is to build redundancy into the institutional controls. Rather than using a single institutional control, a system of institutional controls can be created that provides a fail-safe function. Two or more institutional controls, operating in different ways so that they are less likely to fail for the same reasons, or under the same circumstances, can increase the probability that the controls will be successful in protecting people from the residual hazardous substances at contaminated sites. Similarly, giving responsibility for implementing each institutional control to a different institution or individual reduces the risk that human error will cause a complete failure of the institutional controls. If one person makes a poor judgment or fails to implement a particular control, a second person implementing a different institutional control may prevent people from being exposed to the contaminants. Implementing multiple institutional controls can also address problems associated with the receptors of the institutional controls, because individuals who are not affected by one type of institutional may change their behavior in response to another type. The level of redundancy should depend on the risks at the site,

accounting for the expected duration of the risks, the potential consequences of exposure, the population that may be exposed, the capabilities of the implementing entities and individuals, and the potential exposure pathways.

#### **D. Monitoring and Oversight of Institutional Controls**

Institutional controls, like other elements of a Superfund remedy, need to be monitored to assure that they are serving their intended purpose. At present, however, there is no routine and consistent approach to ensuring that this takes place. At fund-financed cleanups the state must take responsibility for operation and maintenance of the remedy, including assuring that institutional controls “are in place, reliable, and will remain in place after the initiation of O & M.”<sup>152</sup> The case studies revealed that the states vary in their capability to fulfill this responsibility. At other sites EPA will have the responsibility for monitoring and assuring the effectiveness of institutional controls.

Although EPA is required to review the remedy at least once every five years if contamination is left on-site, this may not be frequent enough to avoid failures of institutional controls. At a minimum, the remedial project manager and the assistant regional counsel, or the corresponding state officials, should initially verify that every chosen institutional control is established as required or, if circumstances prevent a control from being implemented, that an equivalent control is put in place. Depending on the nature of the controls and the risks at the site, EPA or state staff, as appropriate, may need to monitor the operation of the controls during the period before the first five-year review, as part of the five-year review, and in the interim between five-year reviews. Such monitoring and oversight should include verifying that the control is in place and operating as intended, and that nothing is limiting its effectiveness. Some regions and states may be doing this already, but a more uniform and routine approach could improve the effectiveness of institutional controls across the entire Superfund program.

The failure to carry out the educational programs in Midvale, and to a lesser extent in Bridgewater, illustrates the importance of independent oversight of institutional controls to ensure that the entities or individuals responsible for implementing controls fulfill their obligations. The complete failure to implement an agreed-upon control, as occurred in Midvale without EPA staff being aware that the educational programs were not being implemented, undermines the foundation of the system established to protect people from being exposed to hazardous substances left in place at a site. In Midvale, fortunately, no one appears to have been affected by the City’s failure to educate the public about the Contaminated Soils Remediation Regulations, but some residents did disturb soils in the area covered by the CSRRs and could have been exposed.

Monitoring and oversight of the operation of institutional controls is equally essential in order to assure that successful controls continue to be effective. Several interviewees noted the

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<sup>152</sup>40 C.F.R. §300.515(c)(1)(1998).

importance of this oversight in the context of the educational programs in Cherokee County and Jasper County, which were generally agreed to be successful. EPA therefore needs to develop a system that assures that the operation of institutional controls is regularly monitored at every site that has controls.

In order to guarantee that institutional controls have their intended effect in the short and long term, EPA should consider developing a set of standard practices for monitoring and overseeing their implementation and operation. State and local governments would be essential partners in developing these standard monitoring practices, since they will be the implementing agencies in most cases and because, at fund-financed sites, the state will also be overseeing the controls. The wide variety of types of institutional controls, from legally binding restrictions on the use of property included in deeds to warnings and educational programs, means the Agency would need to determine an appropriate monitoring method and frequency for each type of control used. The threshold review would include determining whether the control was actually implemented and is operating. An additional measure of success could be to gauge whether people or the environment have been exposed to residual hazardous substances. In many cases, though, this would be difficult to determine, especially in the short-term, since the effects of many contaminants are not readily apparent or recognized. EPA or the state will, therefore, need to periodically investigate the status of each institutional control to ensure that it remains in operation as intended. Another element of the oversight system could be to increase the amount of information available to the public about controls that are in place and to rely, in part, on public oversight of the controls. To facilitate such public monitoring, EPA might consider establishing regional and national databases of the controls in place and making them publicly available.

The frequency of monitoring will also need to vary depending on the type of control. For some controls, such as deed notices and restrictions, it may be sufficient to initially verify that they have been put in place as agreed and then to check that they are still in place and functioning properly when each five-year review is conducted. For other controls, such as warning signs, educational programs, and zoning, more frequent monitoring would be advisable, because the status of these controls is more likely to change in fewer than five years.

These case studies demonstrated that monitoring and oversight of institutional controls is essential to assuring that they operate as intended to protect humans and the environment from exposure to residual hazardous substances. The case studies also revealed that EPA has not yet made such monitoring and oversight a regular, consistent and routine part of the staff responsibilities for Superfund sites. Moreover, simply requiring states to include oversight of institutional controls as part of their operation and maintenance duties at fund-financed sites may not be sufficient to ensure that the controls remain effective. With the increasing use of institutional controls at Superfund sites, the need for a system for monitoring and oversight of the controls becomes more critical. EPA needs to work with state and local governments to establish standard monitoring and oversight methods and procedures.

## **E. Community Awareness, Acceptance and Participation in Institutional Controls**

Community involvement in the Superfund decision making process has been recognized by Congress and EPA as fundamental to the efficacy of remedy selection due to the range of effects various remedial alternatives can have on public health, land use options, and financial burdens carried by municipal agencies and area residents. Opportunities for public participation in remedy selection, therefore, have been built into agency procedures through required notice and comment provisions, public meetings, and public availability of site documents. However, as discussed above, selection of specific institutional controls often occurs after issuance of the ROD and is, therefore, not governed by the public participation requirements in place throughout the rest of the decision making process. This gap in the public involvement raises concerns due to the great relevance of community awareness and acceptance of institutional controls to their efficacy and longevity.

More so than engineering controls, institutional controls have great potential to affect the daily lives of community members, either directly or indirectly. At sites like Sharon Steel, Cherokee County and Jasper County, where the sites encompass substantial portions of residential neighborhoods, institutional controls may be necessary to regulate activity on property owned by non-responsible parties. In such cases, the successful day-to-day operation of the controls relies heavily upon the active cooperation of the owners, residents and other users of the property. If the public is not given an opportunity to participate in selection of the controls governing their neighborhoods, the likelihood of residents supporting and complying with the terms of the institutional controls could decrease. Conversely, when community concerns are incorporated into the process of selecting institutional controls, the resulting program may be more acceptable to area residents and have a higher probability of being successful.

Even at sites where institutional controls are not imposed on residential property, community interests and opportunities can be strongly affected. For example, the excavation restrictions that will be necessary to maintain the cap on the non-residential portion of the Sharon Steel site will undoubtedly limit development options, thereby affecting the economic growth and vitality of the community. Area residents have already expressed strong discontent with this result and have been pressuring their local officials to devise a strategy for opening the land to industrial development. While Midvale City officials have expressed their intention to maintain controls on the cap, it is feasible that under political pressure local officials in a similar situation could heed public opinion and alter the institutional controls accordingly. It is, therefore, critical that community members have the opportunity to participate in the decision making process governing selection of institutional controls, at least in part to reduce the likelihood that residents will oppose them in the future.

Since EPA does not have authority to require states and localities to incorporate public participation into post-remedial selection of institutional controls, strategies built on cooperation will be essential to promote adequate opportunities for community involvement.



Public participation in the development and implementation of institutional controls could be encouraged both during agency presence at the site and upon completion of construction of the remedy. While actively involved with the site, EPA officials could try to work with the agencies most likely to implement institutional controls to explain the benefits of public participation and to offer suggestions for ways to incorporate it into the decision making process related to specific institutional controls. In many cases, such agencies will be well aware of the need for, and benefits of, public involvement but may desire other assistance. For example, local government officials typically involve the public in zoning decisions, but may welcome assistance in explaining how a particular zoning decision is necessary to protect public health at a site. EPA may at other times need to begin by encouraging the concept of public participation. The Agency may also need to emphasize the importance of selecting mechanisms that comport with the needs of the local residents.

Once institutional controls are selected, it is fundamental to their success that community members to whom the controls apply understand their terms and the importance of compliance. Oftentimes, public education is prescribed as an institutional control to accomplish this purpose, but research indicated that in practice education may be overlooked. For example, the local ordinance establishing institutional controls for Sharon Steel prescribed a public education campaign, yet the city government never made an effort to fulfill this obligation. As a result, public awareness of the controls was low, and there were two noted instances of failure on the part of residents to comply with the regulations.<sup>153</sup> When city staff inadvertently detected the violations, residents were informed of the rules that applied to their properties and they promptly took action to control the risks. However, it is possible that other violations escaped detection and that people, including children, may have been exposed to hazardous substances as a result. The fact that residents who were notified of the regulations agreed to comply may imply that the violations resulted from lack of information, as opposed to lack of faith in the importance of the controls. But without adequate education efforts, residents are not empowered to protect themselves or their community.

Though education may not seem as important at sites like Bridgewater where the institutional controls are confined to municipal and private industrial property, there are no guarantees that land use will remain consistent with current conditions. It is conceivable, for example, that the private property at the Bridgewater site could eventually be converted to residential developments, in which case public knowledge of the risks present in the area would become essential if the groundwater is still contaminated. As such, it is important to consider broad parameters when determining where education is needed. Public education campaigns designed for sites like Bridgewater will have to address an additional concern. When there is little connection between institutional controls and normal activities of residents, community members are less likely to take advantage of opportunities to participate in educational efforts. This was the case at Bridgewater, where public education was prescribed as an institutional control but was later eliminated by EPA due to a perceived lack of interest in the community.

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<sup>153</sup> As discussed above in section IV.B.2.c, Operation of Institutional Controls to Date, the third noted instance of failure was committed by the Utah Department of Transportation, not by Midvale residents.

In designing public education campaigns, there are likely to be a variety of constraints that should be considered on a case-by-case basis. Public attitude toward contamination is one key example that arose repeatedly in the course of this research. At Sharon Steel, for example, even though contamination issues were directly relevant to the community, few residents showed much interest in efforts made by EPA and the State to explain the risks present on private properties. Like residents of Cherokee County, the Midvale community had prided itself on its mining culture for generations and had never seen visible evidence of health effects associated with tailings. Residents at both sites were, therefore, predisposed to doubt claims that public health was in jeopardy. At sites with constraints such as public skepticism or lack of interest in contamination issues, the types of tools selected for community education become important.

The use of sound science to communicate public health threats was a useful part of public education programs in the Tri-State Mining District. Prior to selection of the remedy, several health agencies cooperated to conduct a blood lead screening program that tested hundreds of area children to assess whether contamination was actually affecting public health in the region. At the same time, the agencies gathered environmental samples from the residences of test subjects to determine the extent to which any elevated blood lead levels could be ascribed to soil contamination. The results of the screenings demonstrated to believers and skeptics alike that lead contamination was a legitimate public health concern.

In designing public education tools, it is also important to consider who will be best received by the local community. In some cases, residents may be more likely to trust their local health officials than federal or state agencies. In Cherokee County, for example, where the local community is relatively insular, the county health department worked successfully with local residents to educate them about lead exposure through the blood lead screening program and additional informational materials. By contrast, at Sharon Steel, EPA and UDEQ took responsibility for outreach and education, but failed to garner public interest and attention despite the early availability of blood lead data and other information similar to that which was available in Cherokee County. Even the presence of a community relations officer stationed permanently in Midvale during the course of the remedy had little effect. According to several interviewees in Midvale, residents were inclined to doubt any counsel offered by EPA or the State because they felt alienated by initial actions taken by those agencies in their community. While city staff might have built upon good community relations to raise awareness about site risks, officials failed to carry out their promise to conduct this education.

In the context of public outreach, local government agencies have a second advantage over EPA and the states. Due to their familiarity with the local population, county and municipal agencies are often better equipped to tailor educational modules to the specific needs of the community. In Cherokee County, for example, the principal informational materials were written to comport with the educational levels of typical area residents, and a separate resource was developed for medical professionals. Local terms such as “chat” were used, which made the materials more relevant to Cherokee County residents.

Local media coverage can be another significant source of information on contamination issues, particularly since newspapers and broadcasts are already integrated into many residents' daily routines. Throughout the course of remedy selection and remediation in Cherokee County and Jasper County, a local reporter closely followed key cleanup decisions and activities and published regular articles in the leading area newspaper. In many cases, articles appeared on the front page. On occasion, the paper also published site fact sheets verbatim. While it is impossible to gauge definitively the results of this extensive media coverage, research suggested that community awareness of site risks was higher in the paper's principal distribution area than anywhere else studied for this report. During the course of the interview process, local government officials and community representatives alike repeatedly expressed gratitude to the newspaper for raising and maintaining public awareness and concern about site risks. Residents, in this case, were fortunate to have a member of the press interested and concerned enough to take responsibility for closely following site activities.

While recognizing that media coverage of site decisions and activities is beyond the control of government staff, regulators could consider assessing alternative strategies for capturing public attention that make use of institutions already integrated into residents' daily lives. In Cherokee County, the health department took the initiative to distribute site fact sheets in grocery bags at local supermarkets on the premise that most households could be reached efficiently in this manner. This strategy was particularly important in Cherokee County given the socioeconomic structure of the local population and the likelihood that residents would not steadfastly follow news media as did many of the residents of metropolitan Joplin. This is an example of an initiative that can accomplish much with little effort and can be easily replicated at other sites.

Agencies should also consider opportunities to work with community members to support and facilitate their involvement in educational efforts. As evidenced by the task force created in Jasper County, citizens can serve as an invaluable resource base for widespread outreach efforts. This is in part due to the sheer numbers of people available to help and also because residents are not constrained by bureaucratic procedures governing agencies. Members of the task force, recognizing the opportunity to be pro-active in addressing educational needs, accepted individual responsibility for implementing initiatives within their respective capacities and established significant programs within a short time. For example, immediately upon deciding that a lead education coloring book would be a useful tool for reaching area youth, the task force capitalized on the artistic ability and good will of one member to produce the book. Similarly, upon recognizing the need to institute a formal lead education curriculum in local schools, the task force developed several programs designed for different age groups and put them in place by the beginning of the next academic year. Naturally, community education efforts of this type only work where awareness and concern on the part of residents is high, but government officials can facilitate community interest and involvement through early education. As evidenced by Jasper County, devoting agency resources to timely and well-designed outreach efforts at the onset of agency involvement at a site can increase community awareness substantially without further straining government staff or budgets.

Even teaching modules as innovative and potentially effective as those implemented by the task force face a major constraint common to all institutional controls, which may, in fact, be the central issue to consider when evaluating the efficacy of public education as an institutional control. In light of the administrative and financial burdens of conducting ongoing educational programs to address Superfund concerns, most outreach campaigns are designed only to raise awareness of site concerns in the short-term. This limitation raises questions about how to maintain awareness over the long term. When the initial blitz of media coverage and public education ends, there may be no infrastructure to ensure that public awareness of site concerns continues over time. While Jasper County plans to continue lead education in schools, and other similar programs may follow suit, there is no guarantee that such campaigns will remain in place as long as may be necessary. This limitation is of particular concern at sites with contaminants such as lead that do not attenuate naturally over time. At these sites, residual contamination can constitute a significant public health issue for many generations.

Increased involvement by local health agencies is one important means of addressing these concerns, as they are well situated to maintain relations with residents after a site is delisted and EPA and state agencies reduce their involvement with the site. Under such circumstances, however, it is important to consider how resource constraints and political pressures might affect the capacity of local health agencies to pursue necessary educational efforts over time. Institutional knowledge of residents has the potential to serve as another important mechanism for transmitting knowledge of site risks in the future. In a climate of public awareness and concern, residents will likely educate their children, who can in turn educate their own children. There is, however, no guarantee that this type of exchange will actually occur, especially in rapid growth areas where new residents enter the community after formal education efforts have ended.

There are no easy answers to this problem. The task of devising strategies to function *ad infinitum* is daunting at the least, if not impossible. Nevertheless, it remains critically important to consider these factors, not only when designing public education programs, but also when evaluating the efficacy of relying on community awareness to perpetually protect against exposure to contaminants of concern.

## **F. Planning and Budgeting for Institutional Controls**

One of the RODs reviewed for this study included an estimate of the annual costs of implementing institutional controls, but this was a notable exception and it still did not explain the basis for the estimate. RODs typically do not discuss institutional controls in any detail. At most the ROD specifies what type of institutional control is planned, but rarely includes what actions or funds will be required to implement the control. One of the functions of a ROD is to explain how the selected remedy is cost-effective,<sup>154</sup> but this explanation is incomplete if the costs of an essential element are not included.

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<sup>154</sup> 40 C.F.R. §300.430(f)(5)(ii)(D)(1998).

The absence of cost estimates for implementing institutional controls is understandable because most controls will be implemented by state and local governments, individuals, and private entities, and EPA staff are not familiar with the activities that these entities will need to undertake to implement the controls. The first task in estimating institutional control costs, therefore, is to determine what institutions or individuals will implement the controls chosen for a site, what activities will be involved in implementing each institutional control, and what the frequency of those activities will be. Then the costs of performing each task must be estimated on an annual basis.

Annualizing the costs of implementing institutional controls is preferable because most controls will require periodic action, such as monitoring land use, updating records and responding to requests for information, or presenting educational programs. Institutional controls must operate as long as the hazardous substances would present an unacceptable risk to receptors, which may be for only a few years, but in many cases will be indefinite. The costs of implementing institutional controls are therefore analogous to the costs of operation and maintenance of an ongoing pump and treat groundwater remedy. Accounting for these costs on an annual basis would clarify for the typical ROD reader that institutional controls do not operate automatically but require staff time and money to be effective. This and other studies of institutional controls have not revealed any cases where this analysis has been performed for a Superfund site, a state cleanup program site, or a federal facility cleanup. Such analyses of the activities and tasks necessary to implement institutional controls and estimates of the costs of carrying out those activities and tasks would put implementation of selected controls on a substantially better foundation.

In addition to the direct costs of implementing institutional controls, their use can impose substantial indirect costs on communities, property owners, prospective purchasers and developers by limiting the way a site may be used. In reality, the restrictions on use are the result not of the institutional controls but of the fact that the site contains residual hazardous substances that could present unacceptable risks if the site were to be used for one of the prohibited uses. Nevertheless, the public, owners, lenders, and developers focus on the implications of the institutional controls rather than the contamination. In any case, relying on institutional controls instead of completely removing or treating the contamination imposes continuing costs in the form of lost opportunities to use the site in ways that might produce higher social benefits than the uses that are compatible with the level of cleanup and residual hazardous substances.

The Sharon Steel tailings pile provides one example of this tradeoff between costs of remedial action and lost opportunities due to restricted options for use of a site. Estimates of the cost of completely removing the tailings, transporting them to another site and disposing of them in another landfill varied from \$150 to \$200 million, which was considerably more than the \$30 million that EPA had committed to spend for on-site disposal. The difference in costs is large relative to the cost of the chosen remedy (\$30 million), and choosing the off-site disposal option would have been controversial and difficult to defend as meeting the CERCLA requirement for cost-effectiveness. The on-site disposal remedy did, however, make the site

unsuitable for construction of large buildings that would require foundations. This restricted reuse options for the site to open space, commercial uses that do not require large structures, and other low intensity uses such as a golf course. The City and the citizens' group both strongly opposed the on-site disposal option because they believed the City needed, and that the site was best suited for, higher intensity commercial development. The Superfund law does not, however, allow for a comparison of the relative social benefits of various remedial action options, and thereby restricts EPA to considering the narrower measure of cost effectiveness of the remedy. The burden of the restrictions on use of the site, therefore, falls on the property owner and the community, with the owner reaping potentially lower profits from use of the property and the community receiving lower social benefits from the allowed uses than would have been possible if no restrictions existed.<sup>155</sup> In order to better account for the indirect costs of restricted site use, EPA and Congress should consider including the relative social benefits of the different alternatives as a criterion for choosing the appropriate remedial action.

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<sup>155</sup> For purposes of illustrating the different values, it is useful to compare the social benefits from two types of development proposed for the Sharon Steel site: a golf course, as is the most frequently discussed option given the remedy that has been chosen; and a shopping mall or other high intensity commercial development, as desired by the City and citizen group members. As a worst-case scenario, using the relatively low discount rate of three percent, the shopping mall type of development would need to yield an annual stream of social benefits of \$6.33 million dollars per year more than the golf course option over a twenty year lifetime to have a present value equal to the \$170 million difference in cost of the two types of remedies. At a higher discount rate of seven percent, the excess social benefits from the higher intensity development would need to be only \$4.15 million per year over twenty years in order to equal the present value of the maximum difference between the costs of the two remedies. At the extreme of a ten percent discount rate, the difference in annual social benefits would need to be only \$2.97 million to equal the present value of the extra \$170 million cost of the complete removal option. In other words, if a high intensity development could have produced benefits to the public that would exceed the benefits of a golf course by more than \$6.33 (or \$4.15 or \$2.97 depending on which discount rate is determined to be appropriate) million annually, then the amount above \$6.33 million represents lost public benefits and can be considered to be an indirect cost to the public of leaving the tailings in place. If these benefits were spread across the 44,000 people who lived within a two mile radius of the site in 1990, then the highest intensity development would need to produce more than \$144 per person in additional annual benefits above the benefits of a golf course to equal the additional cost of complete removal. It is not possible to speculate in the abstract whether an unspecified development could generate this much additional value. But it is important to recognize that land use restrictions may reduce the benefits that people living and working near the site will receive from reuse and that this reduction could be substantial.

## V. CONCLUSION

Institutional controls are a method of last resort, used to prevent exposure to hazardous substances when permanent treatment, destruction, or removal of the contaminants is not feasible. EPA has been increasing its use of institutional controls at sites cleaned up under the Superfund program, yet there has been little research into, or analysis of, the effectiveness of such controls. The four case studies covered in this report reveal that institutional controls can, at least in the short term, be effective at reducing human exposure to residual hazardous substances. Because ELI was unable to discover NPL sites where institutional controls had been in operation for longer than about five years, this study could not directly evaluate the long-term effectiveness of institutional controls. On the other hand, these case studies also reveal that the effectiveness of the controls depends on many factors that, although they may function as needed most of the time, can fail to work as expected. The case studies examine the potential for failure of the controls used at the sites as well as the actual instances of failure.

Analysis of the reasons behind the failures that occurred with some controls used at the study sites, and of weaknesses in other controls that the research revealed may lead to future failures, is important because such failures could allow people to be exposed to contamination left in place at Superfund sites. ELI's analysis of why controls have failed or might fail in the future suggests some measures that could improve the effectiveness of institutional controls. These include more extensive consideration of institutional controls during the RI/FS, early consultation with local governments and any other organization that may be responsible for implementing controls, improving coordination among federal, state and local governments in the selection, implementation and operation of controls, better budgeting and funding of the tasks associated with implementing and operating controls, increasing public participation in the selection of controls, educating the public about controls to be used and in use at a site, and monitoring and enforcing the controls.

These case studies demonstrate that there are many obstacles to the long-term effectiveness of institutional controls. In order to avoid these obstacles EPA, states, local governments, responsible parties, non-governmental organizations, and the public need to devote more attention and resources to improving the selection, design, implementation, operation and oversight of institutional controls. Unless there is improvement in the use of institutional controls it is likely that institutional controls will continue to fail at some sites and that eventually one or more of these failures will cause people to be exposed to residual hazardous substances. Thus, the current practice for implementing institutional controls cannot assure that they will meet the goal of protecting public health and the environment for as long as the residual contamination remains hazardous.

## **VI. RECOMMENDATIONS**

This section summarizes the recommendations made in the previous section, Results and Analyses of Case Studies. The bases for these recommendations are explained in that section.

### **I. Inter-Governmental Coordination**

- Early cooperation among federal, state, and local governments in the selection of institutional controls is critical to their long-term efficacy. Coordination between federal, state and local governments is also important to the successful implementation and operation of institutional controls. EPA should, therefore, encourage such cooperation and coordination and seek ways to make them routine. Consultation with, or agreement from, local and state governments should be required before institutional controls are relied upon as part of a remedy.
- Consideration should be given to how to fund the additional duties that local governments, or other entities, will be asked to undertake in implementing institutional controls at NPL sites.
- EPA, the states and local governments could develop a model process, including model cooperative agreements, that would help facilitate the selection, implementation and maintenance of institutional controls.
- When enacted at the local level, certain types of institutional controls can be easily repealed. Active support by all implementing agencies is, therefore, critical to the efficacy and durability of an institutional controls program. Pressure from federal or state agencies, while sometimes necessary to achieve local government cooperation, may not be a reliable mechanism for promoting long-term implementation of institutional controls. EPA should develop and choose institutional controls that local governments support and are likely to implement over the long term.

### **B. Institutional Control Selection**

More detailed investigation and analysis of potential institutional controls should be conducted during the RI/FS. This should include, at a minimum, legal research into existing authority for specific types of institutional controls under consideration. Potential implementers of institutional controls – including local and state government agencies – should be consulted during the RI/FS concerning their authority, interest and support for institutional controls.

In choosing institutional controls, greater consideration should be given to methods of mitigating the potential for human error in implementing and



complying with institutional controls. Responsibility for carrying out specific institutional control tasks should be clearly assigned and memorialized in public documents.

Implementation of institutional controls would be improved by including in RODs analyses of the activities and tasks necessary to implement those controls and estimates of the costs of carrying out the necessary activities and tasks.

Leaving hazardous substances in place at a site and relying on institutional controls to manage the associated risks often imposes burdens on local communities by limiting development options and imposing administrative tasks that can be costly to local governments and communities. Therefore, the real long-term financial and socioeconomic costs of institutional controls should be evaluated and considered when selecting and budgeting for a remedy that will include institutional controls.

Comparing the relative social benefits of the different remediation alternatives would provide more comprehensive and realistic information about the consequences of cleanup options than simply comparing the costs of the alternatives.

Decision makers should consider the population that will be subject to the institutional controls and seek to avoid choosing institutional controls that the targeted group will find difficult to accept, understand or obey.

### **C. Long-Term Monitoring and Enforcement**

Implementation and operation of institutional controls should be subject to independent, periodic monitoring and oversight.

Systems of integrated institutional controls are likely to be more effective over the long term than a single control. Decision makers should consider choosing multiple institutional controls that operate in different ways and that are implemented by different entities or individuals in order to reduce the risk of any control failing. The level of redundancy should depend on the risks at the site, the expected duration of the risks, the potential consequences of exposure, the population that may be exposed, the capabilities of the implementing entities and individuals, and the potential exposure pathways.

### **D. Public Awareness and Participation**

Community awareness, acceptance and compliance with institutional controls is essential to their success. EPA, states, and local governments can enhance public awareness and acceptance of institutional controls by increased public

participation in their selection.

The public's overall experience with a Superfund remedy can affect its support for, and compliance with, institutional controls. The effectiveness of institutional controls may, therefore, depend to a certain extent on public perception of the entire site investigation and cleanup process. Throughout the Superfund process, cleanup staff therefore need to seek ways to improve public understanding of the risks associated with a site, ways in which the cleanup reduces those risks, and how institutional controls will further reduce the risks.

Comprehensive and well-designed community outreach efforts and educational programs can help generate public awareness, acceptance, and support of institutional controls. To be most effective, outreach efforts and educational programs should be tailored to meet the needs of a particular community, taking into account what tools will be most effective at achieving the goals and which agencies residents are most likely to trust.

Although educational programs can be effective in instilling widespread understanding of site risks, it is still unclear whether such programs can be maintained over the long term or whether information and understanding of ways to avoid risks will be shared from generation to generation. Greater attention therefore needs to be focused on generating such long-term understanding of how to avoid persistent risks.

Information tools such as computer databases can be useful in maintaining knowledge and awareness of site risks when coupled with comprehensive outreach efforts to make the public aware of the availability of the information.

## APPENDIX A: DEFINITIONS

**Action Level** - A specific chemical concentration that triggers a cleanup action.

**Agency for Toxic Substances Disease Registry (ATSDR)** - A federal agency within the Center for Disease Control charged with the duty to prevent exposure and adverse human health effects and diminished quality of life associated with exposure to hazardous substances from waste sites, unplanned releases, and other sources of pollution present in the environment.

**Cap** - A layer of clay or other relatively impermeable material installed over contaminated material to contain hazardous substances, prevent entry of rainwater, minimize leachate, and protect against harmful contact with the contents.

**Cleanup** - Actions taken to deal with a release or threat of release of a hazardous substance that could affect humans and/or the environment. The term “cleanup” is sometimes used interchangeably with the terms remedial action, removal action, response action, or corrective action.

**Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)** - A federal statute passed in 1980, and amended in 1986 by the Superfund Amendments and Reauthorization Act, that governs investigation and remediation of sites contaminated with hazardous substances.

**Deed Notice** - A non-enforceable, purely informational document filed in public land records that alerts anyone searching the records to important information about that property.

**Deed Restriction** - A proprietary institutional control such as a conservation easement or a restrictive covenant that is legally enforceable against subsequent owners.

**Discount Rate** - The return on foregone present consumption that is sacrificed to secure future consumption

**Explanation of Significant Differences (ESD)** - As a result of new information submitted during the remedial design/remedial action process, EPA may make a significant change to a component of the selected remedy. If this change does not fundamentally alter the overall approach intended by the remedy, EPA publishes a document that provides an explanation of any significant differences and the reasons for those changes.

**Feasibility Study (FS)** - Description of potential cleanup alternatives for an NPL site and analysis of their practicability. The Feasibility Study usually recommends selection of a cost-effective alternative. The study usually commences as soon as the Remedial Investigation is underway, and together, they are commonly referred to as the “RI/FS.”

***Geographic Information System (GIS)*** - A computer system designed to allow users to collect, manage, and analyze large volumes of spatially referenced and associated attribute data. GIS's are used for solving complex research, planning, and management problems.

***Institutional Controls*** - Legal and administrative mechanisms designed to prevent exposure to contamination left on site after remediation. Institutional controls can provide a certain degree of safety in the absence of adequate financial or technological resources to thoroughly clean contaminated sites. Examples of institutional controls include: deed notices and restrictions, conservation easements, zoning, groundwater restrictions, soil testing and removal requirements, and public information tools – including educational campaigns – designed to increase awareness of site risks.

***Integrated Exposure Uptake Biokinetic Model (IEUBK)*** - A model that predicts blood lead concentrations for children exposed to lead in their environment. The model can be used to determine what action levels are necessary to reduce the risk of elevated blood lead levels in children to a desirable percentage.

***Maximum Contaminant Level (MCL)*** - The maximum permissible level of a contaminant in water delivered to any user of a public system. MCLs are enforceable standards.

***National Contingency Plan (NCP)*** - Regulations that provide the organizational structure and procedures for preparing for, and responding to, discharges of oil and releases of hazardous substances, pollutants, and contaminants.

***National Priorities List (NPL)*** - EPA's list of the most serious uncontrolled or abandoned hazardous waste sites identified for possible long-term remedial action under Superfund. The list is based primarily on the score a site receives from the Hazard Ranking System.

***Operable Unit (OU)*** - Sites with multiple geographic regions, or those that require a variety of remedial activities to be taken, may be divided into several operable units. Typically, operable units are addressed individually or in logical groupings during the remedy selection process, and multiple RODs may be issued. Sometimes dividing a site into several operable units expedites site cleanup.

***Operation & Maintenance (O&M)*** - Activities conducted after remedial action is completed to ensure that the action remains effective. O&M often involves monitoring activities and repair of degrading engineering controls.

***Potentially Responsible Party (PRP)*** - Any individual or company – including owners, operators, transporters, or generators – potentially responsible for, or contributing to, contamination at a Superfund site. Whenever possible, through administrative and legal actions, EPA requires PRPs to clean up hazardous sites they have contaminated.

**Proposed Plan (PP)** - A plan for a site cleanup that is available to the public for comment. Proposed Plans are issued after the Remedial Investigation and Feasibility Study are conducted.

**RCRA Subtitle D Facility** - A facility permitted under the Resource Conservation and Recovery Act to treat, store, or dispose of hazardous wastes.

**Record of Decision (ROD)** - A public document that explains which cleanup alternative(s) will be used at National Priorities List sites.

**Remedial Design (RD)** - A phase of remedial action that follows the Remedial Investigation/ Feasibility Study and includes development of engineering drawings and specifications for site cleanup.

**Remedial Investigation (RI)** - An in-depth study designed to gather data needed to determine the extent and nature of contamination at a Superfund site; establish site cleanup criteria; identify preliminary alternatives for remedial action; and support technical cost analyses of alternatives. The remedial investigation is usually done with the Feasibility Study. Together they are referred to as the “RI/FS.”

**Removal Action** - Short term immediate actions taken to address releases of hazardous substances that could affect humans and/or the environment and, therefore, require expedited response.

**Responsible Party (RP)** - Any individual or company – including owners, operators, transporters, or generators – deemed responsible for, or contributing to, contamination at a Superfund site. Whenever possible, through administrative and legal actions, EPA requires RPs to clean up hazardous sites they have contaminated.

**Risk Assessment** - Qualitative and quantitative evaluation of the risk posed to human health and/or the environment by the actual or potential presence and/or use of specific pollutants.

**Tailings** - Residue of raw material or waste separated out during the processing of mineral ores.

**Technical Assistance Grant (TAG)** - Under CERCLA, Technical Assistance Grants of up to \$50,000 are provided to citizens’ groups to obtain assistance in interpreting information related to cleanups at Superfund sites or those proposed for the National Priorities List. Grants are used by such groups to hire technical advisors to help them understand site-related information for the duration of response activities.

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**1616 P Street, NW, Suite 200  
Washington, DC 20036  
Phone: (202) 939-3800  
Fax: (202) 939-3868  
Website: [www.eli.org](http://www.eli.org)**