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Institutional Controls for Contaminated Sites: Help or Hazard?*

Mary R. English & Robert B. Inerfeld**

Introduction

Federal Superfund law was built on the failure of institutional controls. The inability of zoning regulations and private land use restrictions to control development at Love Canal near Niagara Falls, N.Y., led to construction of a school on an abandoned industrial dump containing 21,000 tons of highly toxic chemical wastes and to the construction of adjacent houses. By 1978, more than 25 years after industrial activities had stopped, contamination had migrated into the basements of local homes and had been carried by a rising water table to the surface of the school yard. A public emergency was declared, and the site was soon in the spotlight of national attention.[1]

Over past decades, many activities have contaminated sites, as has defense-related activities of the U.S. Departments of Defense and Energy. Some complied with applicable regulations; others were outside the law. All sites can pose problems for not only those responsible for their cleanup, but also for communities and local governments responsible for wise land use. Handled well, such sites can be reintegrated into the community; handled poorly, they remain blighted and unproductive "brownfields".

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1 Robert Hersh et al., Linking Land Use and Superfund Cleanups: Uncharted Territory, 65-6 (June 1997).

In the wake of Love Canal, the 1980 federal Superfund law[2] addressed our most seriously contaminated sites. According to the National Priorities List (NPL), approximately 1,200 sites are being cleaned up under U.S. Environmental Protection Agency (EPA) guidance. In addition, thousands of other sites have known or suspected contamination, many being handled under similar state programs.

Initially, the Superfund program was authorized for five years with a $1.6 billion revolving fund; by the late 1980s, there was a growing realization that it could take decades and a trillion dollars to clean up NPL and other contaminated sites.[3] Some technical difficulties have also become apparent, especially if deep soils or groundwater are contaminated. Remediating sites to background or non-detect levels is increasingly recognized as often infeasible or impractical. Goals are more likely to be risk-based, i.e. with the primary aim is to minimize health and environment risks rather than eliminate contaminants. With increased emphasis on risk-based standards, and growing recognition that some sites simply cannot be fully cleaned up, institutional controls have become important.

This discussion primarily reviews recent articles on the efficacy of institutional controls. Although interest in such controls has grown rapidly during the 1990s, few empirical studies address their efficacy. Two exceptions are surveys conducted by the Association of State and Territorial Solid Waste Management Officials and the International City/County Management Association.[4] Both surveys of state or local officials point to important problems, such as inexperience with institutional controls, confusion about allocation of responsibility, programmatic deficiencies and insufficient funding.

These studies are a start, but because both had limited sets of respondents, further systematic investigation is needed. Nevertheless, society may not be able to wait. Much can be learned now by reflecting on what is already known. In parallel, much more needs to be understood about the institutions that do or might be responsible for

2 More formally, the Comprehensive Response, Compensation, and Liability Act (CERCLA).

3 E. William Colglazier et al., Hazardous Waste Remediation: The Task Ahead (U.Tennessee 1991).

4 Christine Gaspar & Denise Van Burik, *Local Government Use of Institutional Controls at Contaminated Site* (Int'l. City/County Mgmt. Ass'n 1998).

institutional controls. How durable are they? What is their track record of fulfilling obligations such as oversight and enforcement? How effective are their information storage and retrieval systems? Such questions are considered only in passing but must also be addressed if we are to better assess the strengths and limitations of our safeguards.

What Are "Institutional Controls"?

At the core, institutional controls prevent exposure to contaminants. Even if hazardous substances remain in the environment, risks will be minimized if the chain from hazard to health effect is broken by severing exposure pathways (ingestion, aspiration and dermal contact).

One or more controls may be adopted to serve related but different purposes. In many instances, the main goal is to prevent exposure to contaminants by placing constraints on the use of sites through deed restrictions and zoning changes. For example, if a residually contaminated site is used for industrial rather than residential purposes, people (especially vulnerable people such as children and the elderly) will, in many cases, be at lower risk of exposure. Restrictions might also be placed on new building construction to prevent disturbing soils and spreading contaminants. In other instances, exposure through drinking water may be the primary concern, in which case institutional controls might include, for example, testing well water, restricting new well digging, and providing alternative water supplies. In addition, off-site migration of contaminants may necessitate ongoing monitoring as part of the remedial measures. While monitoring is often treated as distinct from institutional controls, we include it here because it does not reduce contamination; instead, it is intended to prevent exposure.

Institutional controls must be implemented to prevent exposure to residual contaminants. Such institutional controls are heavily relied upon by the actions of an organization or individual. In most cases, these actions must be maintained not only in the short-term but for as long as hazards remain on the residually contaminated site. Unlike elimination of contaminants, institutional controls leave a legacy of responsibility that can extend far into the future.

Often, this legacy falls to the states rather than to EPA. Under CERCLA and its implementing regulations, EPA may acquire a

property interest in order to conduct a remedial action only if the state will accept transfer of the interest upon completion of the remediation.[5] Furthermore, the regulations require that if a remediation is financed by the revolving fund rather than by a potentially responsible party, the state must assume responsibility for maintaining any institutional controls included as part of the remedy.[6]

Requisite Characteristics of Institutional Controls

When accompanied by appropriate treatment, cleanup, and containment measures, institutional controls can serve as ongoing safeguards to human health and the environment. They must, however, meet high standards if they are to succeed in preventing exposure to residual contaminants.

First, an institutional control must be effective. It must accomplish its intended purpose, such as limiting future site uses or monitoring for migration of contaminants. Second, it must be appropriate. An institutional control may operate precisely as intended but still not protect human and environmental health. For example, if the institutional control successfully restricts site access but contamination migrates beyond the site. Third, it must be verifiable. For example, if a monitoring system is put in place to determine whether groundwater contamination is spreading, that monitoring system will itself require monitoring to verify that the agreed-upon sampling, testing, and reporting protocol is being followed. Fourth, it must be enforceable. If an institutional control is not being carried out as intended, corrective measures must be available. For example, if a site restricted to industrial use is to be sold and converted to mixed commercial/residential use, public agencies or private citizens must have the legal means to prevent that conversion or require further cleanup.

Institutional controls should be durable. The total package of institutional controls at a site must prevent exposure to residual contaminants for as long as exposure poses a risk, or until the residual contaminants are remediated. Lastly, institutional controls should be flexible; in other words, they should be adaptable to a variety of sites

5 *See* 40 C.F.R. 300.510(f).

6 *See* 40 C.F.R. 300.510(c)(1).

and surroundings. While an institutional control often will require some site-specific tailoring, it should be cut from a common cloth if it is to be readily put into place, monitored, and enforced.

Scope of the Following Analysis

The following provides a critical review of four principal types of institutional controls: 1) deed restrictions based on common law; 2) deed restrictions based on relatively new state statutes; 3) local land use controls such as zoning; and 4) other controls such as fencing, notification systems, and monitoring.

Not discussed here in depth, but important for federal or state Superfund sites, are consent decrees and administrative orders. Consent decrees are negotiated with the potentially responsible party(ies); in contrast, administrative orders are unilateral expressions of the regulatory agency's authority. In both cases, restrictions can be placed on the use of the residually contaminated property with relative ease and can carry the threat of penalties if violations occur. However, both consent decrees and administrative orders have the distinct disadvantage of limited applicability. Typically, they do not bind subsequent land owners or users not named as a party in the order or decree.[7] Thus, while these enforcement documents can be used for restricting uses (as well as for other purposes), it has been recommended that they be supplemented with other instruments such as those discussed below.[8]

As will become evident, however, there are many holes in the armor of most institutional controls. The task we all face is to search for ways to mend these holes and use only institutional controls that have a good chance of preventing exposure to contaminants, now and in the future.

Deed Restrictions Based on Common Law

The body of common law that applies to restrictions on property use is that of servitudes, "the most complex and archaic body of American property law remaining in the twentieth century."[9] A

7 U.S. Envtl. Protection Agency, Workgroup on Institutional Controls, **Institutional Controls: A Reference Manual**, (draft March 1998).

8 *Id.*

9 Susan F. French, *Toward a Modern Law of Servitudes: Reweaving the Ancient*

servitude is a burden resting upon one estate for the benefit of another estate or person.[10] Within the context of institutional controls, servitudes are provisions attached to deeds which restrict property use by forbidding such activities as soil disturbance, well drilling, or residential development; they may also enable access to property for the purpose of monitoring, testing, and remediating if necessary.[11]

There are several different servitude devices, a few of which can be used as institutional controls: restrictive covenants, equitable servitudes, and easements. Sometimes referred to collectively as "deed restrictions," they all serve the same basic purpose — they create rights, responsibilities, and restrictions affecting ownership and use of land. In addition, they all have the ability to be permanent: If certain conditions are met, their burdens and benefits may "run with the land" to successive owners. However, each has somewhat different rules regarding how they can be created, interpreted, and terminated.

Restrictive Covenants

Restrictive covenants impose restrictions on the owner or user of a property. To be enforceable, they must comply with a complicated set of legal rules which have evolved over centuries.

Courts have established four technical prerequisites that must be met for a covenant to be a real covenant, or a "running covenant at law" (i.e., running with the land and enforceable against successors): (1) the covenant must be in writing and enforceable between the covenanting parties; (2) the covenanting parties must intend to bind successors; (3) the original and successor parties must stand in "privity of estate" with each other (i.e., there must be a relationship between these parties); and (4) the benefit and the burden of the covenant must "touch and concern" the land.[12]

Most restrictive covenants, if properly established, will satisfy the first three requirements. The final requirement, however — the requirement that the covenant "touch and concern" the land — can pose difficulties for covenants intended as ongoing institutional

Strands, 55 S. Cal. L. Rev. 1261-1319 (1982).

10 Black's Law Dictionary (6th ed. 1990).

11 Susan C. Borinsky, *The Use of Institutional Controls in Superfund and Similar State Laws*, 7 Fordham Envtl L. J. 1 (1995).

12 *Id.*

controls. Clearly, a restrictive covenant "touches and concerns" the burdened party's land. If it does not touch and concern the land of the covenant holder — as would usually be the case with a restrictive covenant for a contaminated site — the covenant still may be enforceable over time.[13] This area of law remains murky, however, creating uncertainty about whether restrictive covenants will be durable institutional controls.[14]

Moreover, restrictive covenants can be extinguished if they are successfully argued in court — for example, by arguing the doctrine of changed conditions or to various defenses such as laches (waiting unreasonably long to sue for enforcement), acquiescence (failing to enforce similar restrictions against other violators), or relative hardship (the harm to the defendant outweighs the benefit to the plaintiff).[15] And, even if the covenant is upheld, restrictions on property use have tended to be strictly constructed in favor of the property owner.[16]

If a restrictive covenant fails because it does not meet the four requirements mentioned above, it still may be enforceable as an equitable servitude. First, however, the court must find that an equitable servitude exists.[17] In addition, equitable servitudes share many of the limitations of restrictive covenants.

Equitable servitudes

Equitable servitudes were developed in England in the mid-1800s. Historically, they restricted the use of land and were enforced in courts of equity, normally by issuance of an injunction. To determine whether equitable servitudes are enforceable, courts have adopted prerequisites from the law of easements and the law of covenants.[18] Like easements, equitable servitudes have somewhat more relaxed requirements than restrictive covenants. Like restrictive covenants, however, restrictions on land uses through equitable servitudes are not liberally interpreted in court and may not be enforceable if a successful case is brought based

13 Edward E. Chase, In American Law of Real Property (Arthur R. Gaudio ed. 1991).

14 French, *supra* note 9.

15 Chase, *supra* note 13.

16 *Id.*

17 Krista J. Ayers, *The Potential for Future Use Analysis in Superfund Remediation Programs,* 44 Emory L. J. 1503-39 (1995).

18 French, *supra* note 9.

on arguments such as changed conditions, laches, acquiescence, or relative hardship.[19]

Easements

An easement is an interest in another's land entitling the easement holder to either use or control the land in a specified way. In easement terminology, the burden rests on the servient estate for the benefit of another estate or person. Easements can be freely granted, or some form of payment can be required. At contaminated sites, the easement typically would be freely granted as part of an agreed approach to remediation and would be held by EPA or the state government.

Two kinds of common law easements can be used as institutional controls: negative easements and affirmative easements. Negative easements impose a duty on the owner or occupier of the servient tract to refrain from certain uses of the property. Affirmative easements give the holder of the dominant tenement the right to use or go on the land of another for a particular purpose — for example, allowing government officials to monitor and test for contamination.[20]

With contaminated sites, easements are usually in gross. An easement in gross is created without regard to any land owned by the holder of the easement; it does not need to "touch and concern" that particular land. In contrast, if land owned by the easement holder will benefit by the specified conditions, the easement is called appurtenant. While English common law traditionally has prohibited easements in gross, American law has allowed them for certain purposes. Nevertheless, problems can be encountered over time with easements in gross, especially if they are transferred.

Despite the fact that easement burdens generally "run with the land," in some states an easement in gross might be considered as personal to the holder of the easement and might be canceled upon transfer of title.[21] It is clear that, to be transferred from one holder to

19 Chase, *supra* note 13.

20 French, *supra* note 9. CERCLA specifies that when contaminated federal property is sold or transferred, the deed must contain an environmental access easement assuring that the government can conduct future remediation if necessary; 40 U.S.C. §. 9620(h)(3).

21 Robert Hersh et al., Linking Land Use and Superfund Cleanups: Uncharted Territory (June 1997).

another, easements in gross must be explicitly assigned; however, courts have taken several positions on the questions of assignability.[22] In addition, if the holder of an easement fails to take timely legal action against a violation of the easement, a court may terminate the easement on a finding of abandonment or misuse.[23]

Easements under common law appear to be more capable than real covenants or equitable servitudes of withstanding court challenges and remaining durable. It is important, however, that they be clearly written with explicit provisions concerning intent, notice, and assignment. And even then enforceability, especially of use restrictions embodied in negative easements, is not absolutely assured.

Deed Restrictions Based on Statutory Law

To make deed restrictions more secure, they can be backed by legislation rather than relying on common law. Conservation easements provide a possible model for statutory easements concerning residually contaminated property. In addition, a few states have enacted statutes specifically enabling use restrictions for contaminated property.

Conservation easements

Statutes authorizing conservation easements and establishing the rules for their use have been enacted in every state except Alabama, Oklahoma, and Wyoming.[24] These easements traditionally have been used to protect areas with historic, environmental, recreational, scenic, or agricultural value. Typically, the easement is held by a non-profit or governmental entity that has an interest in restricting development on the property.

In general, a conservation easement prohibits the landowner from significantly altering the existing natural, open, scenic, or ecological condition of the land. Each conservation easement has specific provisions detailing what the landowner or occupier can and cannot do to and on the land. A conservation easement also gives the holder of the easement the affirmative right to inspect the land to determine compliance with the restrictions.[25] Conservation easements are

22 Chase, *supra* note 13.

23 French, *supra* note 9.

24 John Pendergrass, *Use of Institutional Controls as Part of a Superfund Remedy: Lessons from Other Programs*, 26 Envtl. L Rep. 10109-23 (1996).

available to a governmental body whose purpose includes protecting natural resources or maintaining or enhancing air or water quality. Furthermore, they are required to run with the land and are binding on subsequent owners of the servient estate.[26]

The Uniform Conservation Easement Act (UCEA) was approved in 1981National Conference of Commissioners on Uniform State Laws. Such proposals must be adopted by legislatures to become effective, but, by the mid 1990s, it had been adopted in fourteen states and the District of Columbia.[27] The UCEA specifies that a conservation easement is valid even though it is not appurtenant, is assignable, is not traditionally recognized at common law, imposes a negative burden, does not touch or concern real property, and is without privity of estate or contract.[28]

Conservation easements are not an ideal institutional control for contaminated sites. Their most fundamental drawback has to do with their purpose. They can be used only for certain goals and those often do not fit the goals of an institutional control at a contaminated site.[29] In addition, violations of conservation easements cannot always be redressed. In the case of a violation, the easement holder only has a limited amount of time (defined by the statute) in which to bring suit to restrain or reverse the owner's action. In addition, if the easement holder fails to act, no third party may bring suit against the owner.[30] Moreover, as with use restrictions based on common law, there is a lack of uniformity among the states with respect to conservation easements.[31] Furthermore, some state statutes enabling conservation easements do not authorize the federal government to hold these easements.[32] Finally, some state statutes limit the duration of

25 Gerald Korngold, *Privately Held Conservation Servitudes: A Policy Analysis in the Context of in Gross Real Covenants and Easements,* 63 Tex. L. Rev. 433-95 (1984).

26 Ayers, *supra* note 17.

27 Pendergrass, *supra* note 24.

28 Karen A. Jordan, *Perpetual Conservation: Accomplishing the Goal Through Preemptive Federal Easement Program,* 43 Case W. Res. L. Rev. 401-89 (1993).

29 George Wyeth, Personal Communication (1997).

30 *See* Pendergrass, *supra* note 24.

31 *See* Ayers, *supra* 17.

32 *See* Jordan, *supra* note 28.

conservation easements rather than allowing them to exist in perpetuity.[33]

Statutory provisions for contaminated property

A few states have adopted statutes designed specifically to restrict use of contaminated property through easements and other deed restrictions. For example, Minnesota has a voluntary cleanup program in which remediators are released from future cleanup liability if property owners agree to use restrictions that bind their successors. Michigan sets cleanup standards based upon use categories and with use restrictions recorded in restrictive covenants that by statute run with the land. Statutory provisions of Ohio's Voluntary Cleanup Program of 1994, and California's Expedited Remedial Action Reform Act of 1994 provide for use restrictions that run with the land. Also, Connecticut, in a program to encourage brownfields reuse, allows cleanup to less-than-residential standards, provided that the owner agrees to an "environmental use restriction" to run with the land.[34] Connecticut also provides that if a court finds that an environmental use restriction is unenforceable, the property owner must abate the pollution to levels acceptable for residential or recreational uses.[35] In addition, Massachusetts has adopted a statute creating a class of statutory easements exempt from historic doctrines that limit their effectiveness.[36]

Statutes such as these can overcome many of the limitations associated with common law servitudes, and, unlike state statutes providing for conservation easements, they are tailored to contaminated sites. But problems remain, both for sites in states that do not yet have such statutes and for sites where statutory uniformity is desirable, such as NPL sites. Lack of uniformity in statutory authority can complicate (and thus escalate the cost) deed restrictions included as a part of a remedial approach. A federal statute providing for use restrictions at contaminated sites, especially NPL sites, is needed. While such federal legislation has been considered, none has yet been enacted.

33 *Id.*

34 *See* Borinsky, *supra* note 11.

35 *Id.*

36 *See* George Wyeth, *Land Use and Cleanups: Beyond the Rhetoric*, 26 Envtl. L. Rep. 10358-66 (1996).

Local Land Use Controls

The apparatus of local land use regulation (eg. comprehensive plans, zoning, subdivision controls, building codes, and construction permits) can be used to restrict the use of contaminated sites. While not originally intended to prevent exposure to contaminants, these mechanisms have become part of the armory of institutional controls. However, it is questionable whether they should be exclusively relied upon for the reasons given below.

First, it is not clear whether local governments can effectively enact the zoning amendments that typically might be used with a contaminated site. While special permits (also called conditional use permits or special exceptions) are a well-accepted tool to add flexibility to land use controls, it remains to be seen how courts will react to challenged local zoning changes that are products of a remediation approach for a contaminated site. Although local zoning ordinances are enacted within the framework of state enabling legislation, courts have overruled such ordinances if they violate the purpose of the ordinance (for example, if they promote narrow interests rather than the public health, safety, and welfare) or if they are deemed to be unconstitutional, particularly under the due process and equal protection clauses of the Fourteenth Amendment or the "takings" clause of the Fifth Amendment. Institutional controls based on zoning are vulnerable to changing legal interpretations of what is a constitutional land use regulation.

Second, local governments can repeal or modify any ordinances that they create. In no other area of American law are there such frequent requests for amendments to the law as with land use, and decisions about land use have been among the most controversial and contested issues in many communities.[37] Thus, zoning may be the most unreliable of all governmental institutional controls.[38]

Zoning statutes, in some states, stipulate that decisions concerning local zoning ordinances must be made within the context of a comprehensive plan. However, the constraints on a local government's ability to rezone property are, in practice, often largely procedural: A

37 *See* Hersh, *supra* note 21.

38 *See* David F. Coursen, *Institutional Controls at Superfund Sites*, 23 Envtl. L. Rep. 10279-83 (1993).

notice must be issued, the application to change the ordinance must be reviewed by the planning commission, and a public hearing must be held. To the extent that local governments lack specific standards that must be applied to rezoning requests, they have considerable discretion to amend and reamend zoning ordinances. In essence, decisions about the zoning ordinance ultimately are made in the political rather than the administrative arena. Especially when decisions are made in such an arena, they tend to favor the more powerful local interests.[39] Rezoning is often sought to enable a more intensive, profitable use, which may be supported by local officials as beneficial for the local tax base.[40]

Third, a zoning ordinance that restricts uses of a contaminated site may be modified at some future date by a zoning variance or exception. Variances, traditionally intended only for conditions of undue hardship, are becoming increasingly common. Studies have shown 63% to 85% approval rates for use variances by boards of appeal. There is no reason to assume that these rates will be different in the future.[41] Variances and exceptions are decided by boards of appeal and planning commissions whose members often come from the business interests that drive local development: developers, building contractors, real estate agents, etc. Such variances and exceptions could jeopardize institutional controls that have been implemented through zoning, especially if the underlying reason for the use restrictions is forgotten over time.[42]

Fourth, apart from whether zoning ordinances are susceptible to amendments, variances, or exceptions, there remains the question: Can local governments effectively enforce institutional controls that rely on zoning, especially over the long term? Zoning is enforced through local agency staff review of site plans in advance of construction and inspection after construction to determine whether it was built according to plan. In theory, building inspectors regularly visit all buildings in a locality to ensure that they remain in compliance with the building codes. When violations are discovered, localities can revoke

39 *See* Timothy Beatley, **Ethical Land Use: Principles of Policy and Planning** (1994).

40 *See* Hearsh, *supra* note 21.

41 *Id.*

42 *Id.*

building permits or issue a "stop work" order for a building under construction, and they can bring an enforcement action, and levy civil penalties against persons in violation and threaten criminal proceedings for already completed buildings or similar actions.[43]

Nevertheless, conventional local land use controls are apt to encounter problems with some complex issues that may arise with residual contamination. For example, the traditional "front line" of land use controls — the granting and denial of building permits — may be inadequate to deal with situations such as monitoring the conditions of a paved parking lot used to cap contaminated soils, assessing how well landscape buffers keep people from contaminants at sites that have become recreational, and noticing a change to a non-conforming use at a site where no construction has taken place.[44] Further, planning commissions do not routinely examine deed restrictions when doing comprehensive planning, which could lead to recommending inappropriate zoning changes. Similarly, local building officials ordinarily do not consult property transfer instruments when issuing construction permits and could inadvertently issue permits that would allow for the disturbance of contaminated soil.[45]

To implement effective institutional controls at contaminated sites, local governments will have to go beyond the traditional mechanisms of zoning and building code enforcement. These added responsibilities will require a broader and more coordinated system of implementation and enforcement that could prove difficult for local governments to carry out.[46] Local governments will incur extra costs with these extra duties. Without supplementary funds, local governments are especially unlikely to be enthusiastic about attempting to introduce more effective systems for monitoring and enforcing institutional controls.

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43 *Id.*

44 *Id.*

45 *See* Borinsky, *supra* note 11.

46 *See* Hearsh, *supra* note 21.

Other Types of Institutional Controls

In addition to restrictions imposed through statutory or common law instruments, various other actions should be thought of as institutional controls, because they reduce the likelihood of exposure to residual contaminants through continued human vigilance rather than cleanup.

Fences and Signs

Physical access to a contaminated site can be prevented with fences and warning signs. These are often temporary measures to bar access before and during cleanup, but they also can be used as a long-term institutional control. To be effective, however, they must be durable and effective. The fence must keep out people, pets, livestock, and possibly wildlife. All signs must be easily understood by all, including children and foreignors.

Notification

When contamination remains on-site or in groundwater, notification to various people may be needed. A deed notice is one common mechanism. A deed notice alerts prospective site purchasers to residual contamination and the responsibilities they would assume. Other people may also need notification, however: the site's tenants, neighboring property owners and their tenants, community organizations, local real estate agents, municipal building inspectors and engineering departments, and other regulatory and planning agencies. Local or state governments may be called upon to implement these wider notification systems. For example, most states have groundwater classification systems that help people determine the water quality of the area in which they live. Nonetheless, when groundwater migrates from a contaminated site, the local health department may need to notify nearby property owners who use private wells so that their water can be tested for contamination.

Monitoring

When a site cleanup has been completed but some contaminants remain, on-site or off-site monitoring may be needed to determine whether contaminants have migrated through groundwater, surface water runoff, soil erosion, or airborne particles. Monitoring may be

conducted either for a specified time period or until a specified reduction in contamination is attained. Issues to be resolved include the sampling collection and analysis methods, the number of spots to be sampled, and the sampling frequency. The resolution of these issues depends on site-specific circumstances, including a schedule for monitoring and clear allocation of monitoring responsibilities.[47]

Groundwater can be especially troublesome. Groundwater contamination plumes can move from long to short distances per day depending on the hydrogeological conditions. The rate and direction of movement can be difficult and expensive to predict with any degree of certainty, partly because the flow of groundwater is subject to changing consumption patterns (e.g., from drinking water, irrigation, livestock watering, and industrial use), and these patterns cannot always be anticipated.[48]

If monitoring shows that contaminated groundwater has begun to migrate off-site, potential users should be alerted and alternate water supplies may be needed. For example, if private wells are contaminated or at risk, residents may be provided with bottled water until their well water is determined to be unpolluted or until they have been hooked up to the public water supply. Nevertheless, while restrictions can be placed on the drilling of new wells on private property, no state has the authority to restrict the use of existing private wells. Furthermore, private well owners are not required to have their wells tested.[49] In addition, states that provide free testing primarily check for nitrate contamination, which entails a relatively inexpensive test, but testing for numerous chemical contaminants can be expensive and technically difficult.[50]

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47 Memorandum from Dominic H. Frinzi, Jr. *on Institutional Controls* (Mar. 19, 1996) (on file with author).

48 *Superfund Reauthorization Hearings Before the Subcomm. on Commerce, Trade, and Hazardous Materials of the House Comm. on Commerce* (May 23, 1995) (statement of Velma M. Smith, Friends of the Earth).

49 *See* Pendergrass, *supra* note 24.

50 *Id.*

Conclusion

The institutional controls described above are becoming increasingly routine in site remedies, and concern about their ability to prevent exposure to residual contaminants is growing. Clearly, creative options for improving institutional controls are needed. In crafting these options, a few key messages are clear:

- Deed restrictions should, if possible, be grounded in statutory rather than common law. If common law instruments must be used, easements are generally preferable to restrictive covenants or equitable servitudes.
- Deed restrictions should be clearly written, with explicit statements of intent, notice, and assignability.
- Local land use controls such as zoning should supplement other institutional controls; they should not be the primary means by which use restrictions are imposed.
- With institutional controls, including, but not limited to, deed restrictions and local land use controls, periodic checks should be required to ensure that conditions are being met and to allow timely enforcement if they are not. Similarly, monitoring, such as monitoring groundwater contamination, should be done according to a predetermined schedule.
- Responsibility for monitoring and other follow-up checks should be allocated to an entity that can be expected to remain in existence, with assignability of duties if it does not. Special funding arrangements may be needed to ensure that these responsibilities can be carried out.

While not startling, these messages are difficult to effectuate. Moreover, as yet they are not sufficiently understood by the various federal, state, and local officials who may be called upon to implement institutional controls (whether or not those officials were involved in decisions that led to the controls). A much keener and more widespread understanding is needed, by both officials and lay citizens, of the promises and perils of institutional controls and what can be done to improve them.

Despite the best of intentions, remediation plans and institutional controls, residual contaminants at some sites will continue to pose high

risks. In such cases, the site (or the severely contaminated portions of the site) should not be released for private use. The ultimate form of institutional control is ownership by an organization that is likely to stay intact, with good records and orderly arrangements for transfer of responsibilities, if necessary. While government agencies are by no means ideal, they may come closest to meeting these requisites. Thus, government ownership should be considered for sites (or portions of sites) with especially serious residual contamination. While this policy has been followed for some sites, especially those within the U.S. weapons complex that became contaminated as a result of government activity, it is by no means assured in the current era of privatization. A key question — and one that cannot be tackled here — is what risk level merits full government ownership and control?

Government ownership of highly contaminated sites does not eliminate the need to consider some of the institutional controls discussed above, such as monitoring and physical access restrictions, but it simplifies questions concerning who legally controls use of the property. Furthermore, severely contaminated sites whose initial remediation plans have relied on institutional controls for lack of an appropriate technology should be periodically revisited (as is called for under the National Contingency Plan), to determine whether cost-effective cleanup technologies have since been developed.

Despite improvements in cleanup technologies, the need for institutional controls is not likely to go away. For better or for worse, they are an essential part of many remediation plans. It thus becomes all the more important to ensure that they meet the criteria identified above: that they are effective and appropriate; that they can be verified and enforced; and that they remain durable for as long as significant risks from exposure to residual contaminants remain. If institutional controls can be crafted to meet these criteria, they will be a significant help to risk-based approaches to contaminated sites. If they cannot, contaminated sites will be an unseen potentially significant hazard.