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DETERMINING CLEANUP STANDARDS

FOR HAZARDOUS WASTE SITES

A Thesis

Presented to

The Judge Advocate General's School, United States Army

The opinions and conclusions expressed in this work are those of the author and do not necessarily represent the views of the Judge Advocate General's School, the United States Army, or any other United States Government agency.

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39TH JUDGE ADVOCATE OFFICER GRADUATE COURSE

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DETERMINING CLEANUP STANDARDS FOR HAZARDOUS WASTE SITES

by MAJ William D. Turkula

ABSTRACT: In this thesis the author examines the process for determining cleanup standards for hazardous waste sites under the provisions of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980, 42 U.S.C. Section 9621 (CERCLA). Although Section 9621 of the statute purports to describe cleanup standards for hazardous waste sites, practical application has been far from uniform and has spawned controversy over the selection of an acceptable remedy and the selection process itself. The question of "how clean is clean?" is not an unanswerable question, but there presently exists little agreement between the federal government, the states, and the private sector as to what is the correct answer. The author concludes that cleanup standards for hazardous waste sites can not be defined in dogma, but a more efficient and effective process for selecting which remedies should be applied in a particular case should be developed.

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DETERMINING CLEANUP STANDARDS FOR HAZARDOUS WASTE SITES

I. Introduction

On November 28, 1990, Sandra DeVantier moved into her newly purchased house in the Love Canal neighborhood of Albany, New York. [1] Buying a house usually is a pretty ordinary event, but Ms. DeVantier moved into a neighborhood that was so polluted by hazardous waste [2] that it served as a *nom de guerre*, or rallying cry to clean up the environment. [3] Can Love Canal now be looked to as an example of a successful environmental cleanup effort? That, at least at present, appears to remain an unanswered question.

Whether or not buying property in Love Canal is a prudent investment is an individual choice. The response from mortgage lenders, however, has been less than enthusiastic [4]. The DeVantier purchase was for cash, underscoring mortgage lenders' reluctance to finance the

purchase of property at the infamous site. John Blyth, chairman of the New York Bar Association's Real Property Law Section was reported as saying "banks and secondary lenders are becoming increasingly wary about making loans on properties with an environmental problem." [5] Some of the lenders' reluctance is undoubtedly caused by the opposition to resettlement of areas like Love Canal by environmentalists. In a recent article, one commentator stated that Love Canal may be a negative, not positive, example for environmental cleanup.[6] The author stated that:

> Environmentalists have long opposed the resettlement of Love Canal, contending that the area is still not safe and that the habitability study was based on faulty methodology. They also fear that resettlement of Love Canal would set a dangerous precedent for other superfund (sic) sites, establishing a new -- and inadequate -- standard for safety.[7]

The Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) [8] was designed to deal with so-called Superfund sites like Love Canal. Among other things, Section 121 of that Act [9] describes the cleanup standards applicable to a hazardous waste site under the Superfund definition. [10] The statute itself does not spell out what constitutes an acceptable or safe level of contamination. It does, however, prescribe that

applicable federal and state standards will be used to determine such things as the amount of lead in water or the soil. These standards are generically called ARARs -- Applicable or Relevant and Appropriate Requirements. [11] They can include air emissions, water quality, soil percolation levels, movement of hazardous materials, and containment of contaminants. [12] Section 121 of CERCLA is the longest section of the statute and contains very broad as well as many specific requirements for removal of hazardous substances or the treatment of others which may fall under the statute's purview.

The degree of cleanup required under CERCLA for a given site is described in Section 121(d) as:

> (1) Remedial actions selected under this section or otherwise required or agreed to by the President under this chapter shall attain a degree of cleanup of hazardous substances, pollutants, and contaminants released into the environment and of control of further release at a minimum which assures protection of human health and the environment. Such remedial actions shall be relevant and appropriate under the circumstances presented by the release or threatened release of such substance, pollutant, or contaminant. [13]

The "relevant and appropriate" language of the statute is the source of the ARAR acronym. Although the term is inherently vague, it serves as an economical way to refer to the plethora of laws and regulations which may apply to

a site cleanup. The Court of Appeals for the 10th Circuit recently succinctly defined an ARAR as whatever cleanup standards the Environmental Protection Agency decides are applicable under a remedial cleanup plan. [14]

A. CERCLA and Other Federal Legislation

Legislation regarding cleaning up the environment from pollution and contamination caused by man exploded in the 1970's and early 80's. [15] The Solid Waste Disposal Act has been on the books, as amended by RCRA, since 1976, but the Congress realized that legislation alone fell short of the requirements to deal with what we had learned to be hazardous and toxic wastes. [16] In simple terms, as the title of the statute implies, the Act is a regulatory mechanism for the safe disposal of solid waste, as defined by the statute. As Love Canal graphically demonstrated, we can no longer simply dig a hole and bury our waste without fear of future consequences. Making sure we do not create future envirionmental messes by our means

of waste disposal, however, does not deal with the vexing problem of cleaning up the already contaminated sites all over the country.

While RCRA sets standards for regulating the handling of toxic or hazardous wastes, the "big stick" for cleaning up dangerous environmental sites falls under the broad scope of CERCLA and the Superfund. [17] The fundamental difference between RCRA and CERCLA is that CERCLA is designed to target and fund the cleanup of areas that are already contaminated, whereas RCRA is better viewed as a regulatory mechanism to avoid creating the same kinds of problems in the future. What can cause some confusion, however, is the corrective action requirements of RCRA which require present waste generators and handlers to take corrective action for disposal methods used in the past.[18]

A good deal of confusion also surrounds the interplay of the RCRA and CERCLA statutes. A good discussion of that interplay and differences between the statutes is found in The Environmental Law Handbook of 1989 published by Government Institutes, Inc. [19] The authors note that the EPA, when replying to information requests, provides a schematic drawing showing a circle labled as RCRA

surrounded by a larger and concentric circle labeled CERCLA. [20] The obvious implication that RCRA is somehow consumed by CERCLA is not entirely accurate. The key to the breadth of CERCLA is that unlike RCRA which regulates waste[21] , CERCLA covers any substance that falls within the broad purview of CERCLA's hazardous substance definition. [22] The Code of Federal Regulations section listing of presently identified "hazardous substances" under CERCLA has more than 700 entries and can be changed as the agency deems necessary.[23] Other substances which may not be on the list can include any other substance that can be reasonably determined to cause harm.[24] Therefore, just because a substance is not on the EPA's hazardous substance list does not mean it could not potentially be regulated under CERCLA. The concentric circle diagram offered by EPA to demonstrate the relationship between RCRA and CERCLA is overly simplistic, however, and conflicts between the statutes and their application persist.

B. State Legislation

The federal government is not alone in setting standards for environmental cleanup. Each state has some form of regulatory scheme dealing with creating or maintaining a clean environment.[25] These can be laws based on federal RCRA or CERCLA standards, or legislation peculiar to a particular state.[26] Not surprisingly, the laws are not all the same and some may conflict or overlap with their federal counterparts. All 50 states have some statutory provision for dealing with hazardous wastes[27]. Not all the statutes are of recent vintage or in response to federal environmental cleanup programs such as CERCLA or RCRA. The State of Washington, for instance, enacted a statute in 1909 making it unlawful "deposit, leave or keep" any "unwholesome substance" on land or waters in the state.[28]

Some states also have established environmental statutes which are different, more resrtictive or demanding than federal standards. These state laws have come in conflict with the federal government's prosecution of cleanup campaigns.[29] Colorado has been one of the most aggressive states in attempting to enforce state cleanup standards which may differ from federal requirements under

CERCLA. In the case of Colorado v. Idarado Mining Company,[30] Colorado challenged the EPA's cleanup program by insisting that the state's remedial plan for cleanup of mine tailings should be enforced over the EPA-selected remedies.[31] One issue addressed by the court in that case was whether or not the federal government can control remedial cleanup action under Section 121 of CERCLA, or whether Section 121(e)(2) of the statute allowed the state to independently select a cleanup plan.[32] The court, in essence, said that the remedial action plan mentioned in CERCLA is one selected by the federal government or its delegates, not the state.[33] The court went on to say permitting a state to select its own remedial actions under Section 121 would render the federal reservation of authority "irrelevant".[34] The Idarado case may serve as an indicator that at least the 10th Circuit may view Superfund cleanups as the sole responsibility of the federal government.[35] The Army faces a similar state authority challenge from Colorado over the cleanup of Rocky Mountain Arsenal in a case pending before the same district court which first heard the Idarado case.[36] It remains to be seen if the 10th Circuit's interpretation that CERCLA cleanup is a distictly federal remedy statute will directly affect the Rocky Mountain Arsenal case.

Whether the state can exercise control over the cleanup of a Superfund site, and what cleanup standards are enforceable, will be analyzed further as existing authority is examined to determine remedy selection and enforcement under CERCLA Section 121.

II. STATE AND FEDERAL CONFLICTS; RCRA vs. CERCLA?

There is no shortage of of litigation over environmental issues, but most of the focus has been on determining financial liability for cleaning up the mess. Notably, two recent texts, the Environmental Law Handbook[37] and A Practical Guide to Environmental Law[38] devote most of the dicussion about CERCLA to liability concerns. In the Environmental Law Handbook, Richard G. Stoll states "CERCLA's most basic purposes are to provide funding and enforcement authority for cleaning up the thousands of hazardous 'waste sites' created in the United States in the past and for responding to hazardous substance spills".[39] To date, the 10th Circuit stands virtually alone among the appellate courts in wrestling with the remedy selection process and enforcement authority of CERCLA Section 121.[40] Federal and state interplay under CERCLA and RCRA is presently unclear but evolving.

A. Are RCRA and CERCLA in Concert or Conflict?

In examining the interplay between the statutory schemes of CERCLA and RCRA it is important to remember that RCRA is an amendment to the Solid Waste Disposal Act.[41] As such, it affects thousands of sites, both big and small, and regulates the day-to-day handling of wastes.[42] CERCLA's scope is much broader and covers substances that may not even qualify as wastes under RCRA but are still considered "hazardous" for CERCLA regulation.[43] Furthermore, CERCLA, as amended by the Superfund Amendment and Reauthorization Act,[44] takes aim at the cleanup of sites listed on the National Priority List for Superfund cleanup.[45] Theoretically, the statutes do different things, but the tangle of statutes and regulations implementing the provisions of RCRA and CERCLA create apparently inevitable conflicts.

Section 121(e)(2) of CERCLA provides that a state "may enforce any Federal or State standard, requirement, criteria, or limitation to which the remedial action is required to conform under this chapter in the United States district court for the district in which the facility is located."[46] Does that mean the state is free to enforce

remedial standards of its own at a Superfund site when those standards may differ from those selected by the federal government? The initial answer from the courts appears to be "no". As noted earlier, the 10th Circuit in Idarado Mining[47] is the only appellate court to examine in depth the state's authority for remedy selection under CERCLA. The court's analysis is not focused on the fact-specific remedy itself but looks at the legal basis asserted by the state to require compliance with state requirements under CERCLA. [48] Use of the Idarado case as a vehicle for this federal/state conflict analysis is curious, considering that the United States appeared in the case only as *amicus curiae*.[49] In that case, the state brought action against private defendants for injunctive relief, among other claims, under Section 121 of CERCLA. Although the central decision of the 10th Circuit related to the authority of the district court to grant the state injunctive relief under Section 121. The court decided to tackle the state versus federal authority issue because "Failing to comply with CERCLA Section 121 and the NCP [National Contingency Plan] selection process would appear to carry far more significant consequences than amicus United States and the defendants are willing to admit."[50]

Although the Idarado case is not one where RCRA conflicts with CERCLA, it does clearly say that while CERCLA cleanup actions may have to comply with applicable state standards, it is a statute for federal enforcement and not one through which the state can enforce its independent remedial actions, whether under RCRA or some other state standard.[51]

The RCRA/CERCLA conflict of authority, however, is clearly at issue in the case of United States v. Colorado[52] involved the cleanup of Rocky Mountain Arsenal. The Idarado case is further relevant to this conflict resolution, not only because it is in the 10th Circuit, but because it also centers on who has authority to enforce cleanup at a CERCLA site. Reviewing the dispute between Colorado and the United States, the Bureau of National Affairs recently reported that "behind the conflicting legal positions lies the central question: Who will control the cleanup of the arsenal?" [53] Considering the 10th Circuit's reversal of the trial court's interpretation of state's rights under CERCLA in Idarado, the trial court's interpretation of state RCRA authority at the Rocky Mountain Arsenal site may not withstand similar appellate examination. Although litigation over cleanup of the aresenal began in 1983, Colorado and the United States

became adversary litigants in 1986 when Colorado sued the United States to enforce compliance with a state closure plan for Rocky Mountain Arsenal.[54] Since that time, the court has been consistent in finding that the state had RCRA enforcement authority at the site. [55] The United States maintains that because the arsenal is Superfund site, cleanup is exclusively under CERCLA. [56]

The clear issue the courts have to decide is whether or not Congress gave the federal government plenary authority for Superfund cleanup and how RCRA and CERCLA work together, if in fact they do. Some commentators contend that mixing RCRA and CERCLA to specify cleanup standards is a dangerous combination. In the Environmental Law Handbook [57], one author states that there is a trend toward a RCRA/CERCLA merger:

> From the perspective of one who is interested in assuring health and environmental protection, but who hates to see billions of dollars wasted on excessive cleanup efforts, there may be significant concerns with the trend toward presuming that RCRA requirements should be lifted and imported wholesale into CERCLA cleanups. This trend can have either or both of the following unfortunate results: (a) impose cleanup costs at old sites that have no reasonable relationship to the risks presented at the site; and/or (b) weaken RCRA requirements for current and new sites that often should not as a preventative matter be weakened. [58]

Whether or not RCRA requirements apply in a CERCLA cleanup action is a critical question in the debate over who has authority to determine cleanup standards at Superfund sites. This raises the question of "Who's the boss?" when we encounter situations like the Rocky Mountain Arsenal [59] and the cleanup requirements that are really necessary at that site. The Environmental Law Handbook[60] authors take the position that in some respects, RCRA and CERCLA are categorically different and should not be confused. They label CERCLA as a "response" statute and RCRA as a "regulatory" statute aimed at preventing the creation of messes CERCLA is designed to deal with.[61] "To impose RCRA standards at old sites will, however, often impose great costs where health and the environment could be fully protected for much less cost".[62] Under that rationale, the state/federal authority issue is compounded by the cost factors associated with remedy selection.

Is cost the proper citerion for determining cleanup remedies? In the agency commentary to the EPA Proposed Corrective Action Rule for Solid Waste Managment Units published in July, 1990, the EPA indicates that economic considerations are indeed a policy factor.[63]

EPA's goal in RCRA corrective action is, to the

> extent practicable, to eliminate significant releases from solid waste management units that pose threats to human health and the environment, and to clean up contaminated media to a level consistent with reasonably expected, as well as current, uses. The timing for reaching this goal will depend on a variety of factors, such as the complexity of the action, and the financial viability of the owner/operator[64]

The agency commentary goes on to say that, in the case of ground water, for instance, the water should be cleaned up to the point where it is safe to drink, regardless of whether or not the water will actually be consumed.[65] Not much farther along in the same paragraph, however, the agency says that "Alternative levels protective of the environment and safe for other uses could be established" when the water is not actually going to be used for drinking water.[66] That apparently contradictory language of the kind which led to harsh criticism of the EPA and its process for selection of cleanup standards. Chemical Engineering magazine quotes the Washington, D.C. environmental study group Clean Sites as saying: "The lack of a clear framework for remedy selection has led to repeated crtiticism of EPA for failing to comply with the law and for inconsistent levels of cleanup."[67] That comment was made in November 1989, seven months before the EPA published its commentary on the RCRA remedy selection process in July 1990. Although the Chemical Engineering article dealt pointedly with CERCLA cleanup standards and

remedy selection, the agency did little to allay criticism of its remedy selection process by saying, on one hand, we have to make all ground water drinkable, but on the other hand, not always.[68]

Although the EPA commentary on its proposed RCRA cleanup standards do not mention CERCLA, it is obvious from the language of the commentary that not all cases call for application of the same remediation standards. That does not settle the RCRA/CERCLA turf war between state and federal authority; it merely emphasizes that the same cleanup standards are not appropriate in all cases. Although the 10th Circuit has clearly said that CERCLA is a peculiarly federal bailiwick,[69] resolution of the direct conflict between federal and state authority at Superfund sites is yet to be determined. How we select a cleanup remedy, whether under CERCLA or RCRA, has been the subject of considerable study and will generate continuing debate.

II. THE NATIONAL CONTINGENCY PLAN AND SELECTION OF REMEDIATION STANDARDS

How to select a cleanup remedy for a hazardous/toxic waste site [70] has been the subject of rancorous debate among anyone involved in environmental rehabilitation. Clean Sites, a non-profit study organization,[71] collected a large group of people involved in environmental programs, including representatives from state and federal government, private industry, and citizens groups to explore the issues related to remedy selection for Superfund sites. The group was charged with the task of coming up with specific recommendations on how to determine uniform and workable standards for remedy selection at Superfund sites.[72] Clean Sites' focused its study on the National Contingency Plan[73] criteria for selecting a site cleanup remedy. The organization released a report in October, 1990 entitled "Improving Remedy Selection: An Explicit and Interactive process for the Superfund Program".[74] Those conclusions and recommendations will be examined further.

A. Criteria for Selecting a Remedy; the National Contingency Plan

Environmental statutes enacted by Congress get their "teeth" through the implementation provisions of the Code of Federal Regulations. Those regulations are the executive agency administrative rules first published in the Federal Register before publication as regulations which govern the administration of the statutory provisions.[75] Under CERCLA, the implementing regulations are referred to in general terms as the National Contingency Plan (NCP).[76] Regulations for determining remedy selection criteria essentially fall into three categories:

a. threshold criteria -- overall protection of health and the environment and compliance with appropriate relevant and apropriate standards (ARARs).

b. primary balancing criteria -- long term effectiveness, short term effectiveness, reduction of contamination by treatment, cost, and feasibility.

c. modifying criteria -- state acceptance and community acceptance.[77]

These criteria were the genesis of the Clean Sites[78] evaluation of the EPA remedy selection process. The Clean Sites study involved more than 90 participants from private industry, state, and federal government.[79] Unfortunately, none of the material in the report is individually attributable. It is published only as a compilation of the various participants. Nevertheless, the critical nature of the study suggests that, despite EPA funding for the project, neither bias in favor of the EPA, nor favor for private organizations, such as the co-sponsoring Andrew W. Mellon Foundation,[80] is apparent. The work is probably the most comprehensive and objective study on the matter of remedy selection. The text of the study is replete with bureaucratic platitudes, scores of acronyms, and broad generalizations of the problems of environmental cleanup, but it does spell out two conclusions for remedy selection. Those are:

1. EPA should develope a clear, comprehensive, and useful guide for selecting remedies.

2. EPA should develop a headquarters task force comprised of a select group of experienced

> senior employees to work directly with the regions.[81]

Those conclusions do not simply mirror the text of the study, which is highly critical of the EPA's present procedures in remedy selection. For instance, the study notes that the EPA states in its corrective action rules that toxicity and carcinogenic levels should be measured in powers of 10.[82] The Clean Sites study report states:

> **Several Participants felt that too much emphasis is placed on numerical representation of risk as a means of communicating risk to the public.** In many cases these numbers are meaningless to the community and only help fuel their fears and misunderstanding. The use of powers of 10 to express risk is also confusing. Some [study] participants did not fully understand what the numbers represented and which represented the greatest risk. (emphasis in original)[83]

Despite the criticism, EPA continues to express risk factors using the "powers of ten" rule. According to the EPA, a cancer risk of 1 in 10,000 is considered a level of contamination that is protective of human health, although

higher levels of protection are desireable.[84] In a recent consent decree entered in United States v. Seymour Recycling,[85] the EPA and the responsible parties agreed on health protective levels as high as 1 in 100,000 and 1 in 1,000,000. The ultimate question is the determination of what constitutes a "safe" level of risk.

In many, if not most cases, what risks may be present or the future consequences of a contaminated site a largely unknown and not prone to meaningful quantification or definition. In a recent book entitled "Chemical Contamination and its Victims" [86] the authors state:

> At the heart of the problem presently confronted by the courts in toxic tort suits is the inability to determine causation qantitatively when trans-scientific issues are involved -- when questions asked of science, such as the statistically significant effects of a chemical on human health, cannot be answered at the time.[87]

The authors point out that actual risk quantification for exposure to a toxin is morally and ethically impossible in most situations. We can not realistically expect to expose thousands of people to a toxic substance to see what might happen, so risk assessments have to be somewhat hypothetical and will change as we learn more over time.[88] Those hypotehical expressions of risk in powers

of 10 can be deceiving to many, because by increasing the value of the exponential factor does not always dramtically reduce the risk. Reducing a risk factor from 10 (-2) to 10 (-4) reduces the risk factor by 99 percent, but reduction by each additional exponential lessens risk by only less than one additional percent. For example, risk expressed as 10 to the (-4) power is the EPA benchmark for expressing a health risk of one in 10,000, or 99 percent free of risk. That means that we have only one additional percent to work with. So, if you add a zero to the 10,000, you have increased risk reduction by one additional tenth, or .1 percent. Emotionally, a risk factor of one in 100,000 may seem dramatically better than one in 10,000, but mathematically it is insignificant. Just how meaningful in terms of site cleanup is the requirement that risk factors be reduced more than 99 percent, or 10 (-4)? Even the EPA says it favors remedies to achieve risk factors greater than 10 (-4). The consent decree and Record of Decision (ROD)[89] in the Seymour Recycling case reflects that philosophy when the parties agreed to a "maximum excess lifetime cancer risk level of 1 X 10(-5) at and beyond the site boundaries and of 1 X 10(-6) at the site's Nearest Receptor...".[90] That statement related to present clean water standards, but only a few lines farther down in the decree, the parties recognized that future risk calculation

will be based on the most current data available from the Superfund Public Health Evaluation Manual and the EPA's Cancer Assessment Group.[91] That reference underscores the fact that, despite scientific efforts at risk assessment, we are largely guessing about acceptable levels of contaminant exposure. What might be acceptable now, based on our technology and information, may not be adequate in the future. The obvious danger of a consent decree like Seymour is that it is open-ended and leaves unanswered the question of when cleanup is complete. If we determine later that the standards set out in the decree are inadequate, who will be responsible for paying for the increased cleanup cost? If new technology only reduces risk by an additional .1 percent at a cost of $100 million, it is difficult to argue that such a level of cleanup is practical even if it is possible.

B. Centralizing the Remedy Selection Process

The Seymour case is an example of the fact that while we may find some assurances in mathematical expressions of risk, we really do not know what may be required or appropriate in the future. The EPA and the private parties

in Seymour selected a centralized source for reference regarding cleanup standards,[92] but the Idarado Mining and Rocky Mountain Arsenal cases demonstrate the dichotomy that exists over cleanup authority and applicable standards. The district court in the Rocky Mountain seems to favor state control over remedy selection authority, while the 10th Circuit in Idarado seems to say that the state has no authority in a Superfund cleanup case and has only limited authority to intervene in order to insist on state requirements.[93] According to the Clean Sites study on remedy selection,[94] "Even the best remedy selection process will be difficult to implement and will be prone to inconsistency under a decentralized program."[95] Is centralized remedy selection a practical alternative? Although Clean Sites' study group advocates that approach, there is an inherent contradiction in that position. CERCLA Section 121(f)(1) requires that the President establish regulations providing for "substantial and meaningful involvement by each State in initiation, development, and selection of remedial actions to be undertaken in that State." [96] If the remedy selection process is centralized with the EPA, what influence can the states have in the process? Although the 10th Circuit has held that states do not have jurisdiction to use CERCLA in their own right,[97] Section 121 does give the state

fundamental elements of control over federal cleanup activity. CERCLA provides:

> If the State does not concur in such selection, [of a remedy] and the State desires to have the remedial action conform to such standard, requirement, criteria, or limitation, the State shall intervene in the action under Section 9606 entry of the consent decree, to seek to have the remedial action so conform. Such Intervention shall be a matter of right. The remedial action shall conform to such standard, requirement, criteria, or limitation if the State establishes, on the administrative record, that the finding of the President was not supported by substantial evidence. If the court determines that the remedial action shall conform to such standard requirement, criteria, or limitation, the remedial action shall be so modified and the State may become a signatory to the decree. If the court determines that the remedial action need not conform to such standard, requirement, criteria, or limitation, and the State pays or assures the payment of the additional costs attributable to meeting such standard, requirement, criteria, or limitation, the remedial action shall be so modified and the State shall become a signatory to the decree.[98]

The statute also contains language that requires the federal government to give the affected state an opportunity for involvement and comment at various stages of the remdedy selection process, including the remedial investigation and site cleanup feasibility study.[99] Whether or not that comment and involvement will be recognized is subject to the court's determination. In the case of Johnson v. United States,[100] the court rejected

the opinions of two expert witnesses on the injury causation in a toxic tort case because the "experts" could do no more than quantify potential harm in hypothtical terms.[101] That case involved a suit by aircraft plant employees claiming damages from cancers caused by exposure to radio-luminescent instrument dials.[102] Although unrelated to CERCLA, thecourt's recognition of the inexactitude of risk quantification is directly analogous.

III. ANALYSIS OF REMEDIATION NETHODS SELECTION

Everyone wants a clean environment, but there is no clear consensus on how clean to make it. Study groups like Clean Sites do little to give us concrete bases on which to make fundamental decisions on remedy selection. That group recently observed:

> The remedy selection process used by EPA in administering the Superfund program involve the application of nine evaluation criteria developed using requirements of Section 121 and other factors. Numerous problems associated with the criteria and the remedy selection process have been identified in reports prepared by government agencies, congressional committees, and environmental and industry groups.

> These problems include inconsistency in decision-making, inconsistency in compliance with ARARs, lack of clear cleanup objectives, inadequate characterization of risk at sites, inadequate attention to environmental protection, inappropriate use of cost criterion (sic), failure to implement permanent and treatment rremedies, poor justification for selected remedies, and selection of unproven technologies.[103]

The nine criteria used by EPA leave the agency too much flexibility in site cleanup remedy determination, according to critics. Linda Greer, a congressional lobbyist with the Hazardous Waste Action Coalition, says that the problem relates to the EPA's present framework for the nine-factor analysis.[104] Those factors include:

* overall protection of human health and the eenvironment

* compliance with applicable or relevant and appropriate requirements (ARARs)

* longterm effectiveness

* reduction of toxicity

* mobility or volume of waste

* short-term effectiveness

* ease of implementation

* state acceptance of the plan

* local acceptance of the plan

* the cost[105]

In practical terms, remedy selection is largely driven by the economic considerations involved. Concieveably, site treatment that would result in a risk factor ranking of 1 X 10(-4) might cost $10 million while reducing the risk factor to 1 X 10(-6) might escalate that cost to twice that much. Depending on the remedy selected, and technology employed, it could cost $40 million to clean up a site to a given standard using one technology, while the same level of cleanup may cost ten times that much using another approach to the problem.[106] "In hazardous waste engineering, the uncertainties are often more than an order of magnitude," according to the American Council of Consulting Engineers[107]. The uncertainty lies in the fact that much of the contamination at any given site is underground, and finding out just what the contaminants are and how they might affect the environment are largely

unknown parts of the remedial equation.[108]

A. Cleanup Method Selection Criteria; An Enigma Within a Conundrum

The federal legislation we refer to as CERCLA gives only vague guidance as to what we have to do to meet environmental cleanup requirements. The statute states that the President (through EPA) "shall select a remedial action that is protective of human health and the environment, that is cost effective, and that utilizes permanent solutions and alternative treatment technologies or resourse recovery technologies to the maximum extent practicable."[109] In the same section, however, the statute says that if a preferred remedy is not selected, the President simply must publish an explanation of why it was not selected. If the remedy selected by the EPA is not acceptable to a state, and the EPA has made the requisite publication of why a certain treatment is not to be used, the state's only recourse under CERCLA is Section 121(f)(2)(B).[110] Under that provision, the state has a statutory right to intervene. It must show, however, that

the federal executive decision was not supported by "substantial evidence".[111] What constitutes "substantial evidence" at present remains a legal standard which no court has yet defined in an environmental case.

One of the study groups in the Clean Sites symposium[112] concluded:

> Despite clear Congressional intent and specific directives in the statutory requirement to use permanent remedies, the cleanups being prescribed by the Superfund program are virtually indistinguishable from those of previous years. In most cases, EPA is failing to use treatment at all, let alone use treatment to the "maximum extent practicable" as required by Superfund.[113]

"Treatment" rather than disposal or removal is a key word in the CERCLA legislation, but not one subject to easy definition for any particular site. The statute clearly says that treatment on-site, rather than removal, is the favored approach. It states, in pertinent part, that "treatment which permanently and sigificantly reduces" the problem is preferred over other potential remedial actions.[114] The people "on the ground" dealing with contaminated site remediation, however, do not seem to have a concrete grasp of what is required. Moreover, they

concede that permanent treatment is not always possible. "Permanence will not be achieved at all sites, but the statutory requirement to achieve permanence 'to the maximum extent practicable' suggests that the feasibility of achieving a permanent solution should be specifically evaluated at each site," according to the Clean Sites study.[115] What is practicable, that which is capable of being put into practice, and what is truly practical in terms of economics or technology, may not be the same thing.

B. The Practical Considerations of Toxic Site Cleanup

Study groups like Clean Sites[116] have the luxury of musing in Socratic fashion about environmental cleanup remedies. Hard reality, however, is something else. Everyone may want to clean up a contaminated site, but then they are faced with the question of who is going to pay for it. Recently, two national real estate developers found, to their chagrin, that a site selected for a multi-million dollar condominium development was contaminated by spills from a gasoline station that existed on the site many years

earlier. Calhoun Associates, a limited partnership, and Lincoln Properties, Inc. had fought a protracted legal battle for approval to build a high-rise condominium complex on several seemingly park-like acres next to one of the urban lakes in Minneapolis, Minnesota.[117] Although they overcame difficulties with city building permit requirements and site restriction complaints voiced by neighboring property owners, they ran directly into the problem of remediation of the construction site before any development could begin. The parties employed an environmental engineering firm to evaluate the property and design the necessary remediation methods, but when it came time to pay for the work, the developer, Lincoln Properties, and the land owner, Calhoun Associates, came to loggerheads over who would pay.[118] Under CERCLA liability standards, the problem is significant because former and present owners may be jointly and severally liable for cleanup at a a contaminated site.[119] As one author points out:

> It is important to note that this liability scheme applies not only to cleanup costs, but also to "natural resources damages." EPA and the states may assert claims for the damages that hazardous substance releases (including waste sites) have caused to federal or state-owned natural resources. These claims are to be defined and addressed under regulations which have been issued by the Department of the Interior.[120]

The "natural resources" damages refer to the effect or potential effect of contamination off the immediate site of concern. For instance, sealing the surface of a toxic waste site may prevent future direct human contact, but if the contamination has affected an aquifer, the effects of such contamination could be vast if not entirely incomprehensible in their effect on natural resources. That enourmous financial liability exposure can effectively thwart a cleanup effort even when the parties agree what should be done. In the Minneapolis case, the economic aspects of the liability issue, although small by comparison to other site cleanups, took precedence to the question of the appropriate remedy authorized by the potentially responsible parties. Braun Environmenmtal Laboratories, Inc. (BELI) was forced to file a mechanics' lien against the site because the developer and the landowner disagreed over who was responsible for the detection of the contamination and the remedial process employed. The property owner and the developer contended that BELI went far beyond what was authorized under their contract, but BELI countered they did only what was required by federal and state law and in accordance with the contract. Due to the petroleum contamination, the site could have greater problems than ever imagined.[121] In

that case, a $28,000 mechanic's lien caused a $3.5 million project to crunch to a halt because the potentially responsible parties could not agree on who had to pay for a site remediation everyone agreed had to be instituted.[122] Contract issues aside, this case underscores the role real dollars play in any site remediation process. As noted above, if the petroleum spill had affected a "natural resource", financial liability could have been enourmous.[123] CERCLA is replete with references to economic considerations in remedy selection. These are to be balanced against the protectiveness to human health and the environment. In fact, CERCLA Sections 121(b)(1)(E) and 121(b)(1)(F) specifically refer to costs of future remedial actions[124]. As discussed previously, "how clean is clean" may truly, and perhaps unfortunately, be a matter of money.

In the case of Love Canal,[125] no mortgage lenders seem willing to take the risk of financing home purchases in the area, despite the fact the area has been deemed fit for human habitation, at least by the state authorities in New York.[126] It is not surprising that we would look to something as denfinable as the economic impact of site cleanup when the scientific community often has little hard data on which to base risk assessment. With the exception

of asbestos exposure, there is a great deal of uncertainty as to what constitutes a health risk from exposure to an environmental contaminant.[127] Indeed, the EPA has been criticized for employing cleanup remedies that are unproven and of unknown value in attempting to rid the environment of pollutants. Although the EPA is encouraged to seek out new technologies[128], some critics claim the agency sometimes requires implementation of a remedial technology it has no idea will work.[129] Even the critics, however, are not in one camp. More than 90 government, academic, and industry representatives studying the subject during 1990 were unable to reach a consensus on how available or future technology ought to be applied at a cleanup site[130].

IV. ENVIRONMENTAL CLEANUP LITIGATION

In practical terms, site remediation may be driven more by public perception than technological considerations or risk assessment. "In setting standards, the regulator prefers to err on the cautious side. Consequently, the

public tends to confuse remote possibility with great liklihood."[131] In one recent case, *one* court apparently found that *to be* an acceptable position. In 1987, the New Jersey Supreme Court in Ayers v. Township of Jackson, determined that even though an expert witness could not quantify the extent of enhanced cancer risk from groundwater contamination from a landfill, the jury, which awarded more than $15 million in damages, "could reasonably have inferred from [the expert] testimony that the risk, although unquantified, was medically significant."[132] That kind of potential liability for what may be *unknown* risks certainly contributes to the decision of any site remediation. As noted in the "Environmental Law Handbook":

> Obviously, from the private responsible party's perspective, the answer to "how clean is clean" can make all the difference in the world to the most fundamental question: "How much do I Pay?" (emphasis in original)[133]

The author goes on to say that this kind of hysteria has resulted in "inexorable" escalation in cleanup costs in "almost total disregard of whether there will be further health/environment benefits at a site."[134] Practical cleanup standards appear largely indeterminable. According to one commentary:

> The law implicitly assumes that all sites are worth the cost of providing protction of human health and the environment. Beyond that, there there are currently no workable guidelines for the decision maker to determine the value of achieving higher levels of longterm effectiveness or a permanent remedy.[135]

The only judicial benchmark we have at present is the Idarado Mining case which holds that states, and concieveably private parties, may intercede in Superfund cleanups to urge greater levels of cleanup than determined appropriate by the EPA if they are willing to foot the bill. A state can incorporate a more rigid standard in a CERCLA cleanup plan "provided the state pays the additional costs."[136] With litigation over CERCLA cleanup standards and the authority of federal and state governments in its infancy, there is little guidance as to how the courts eventually will determine the legal basis of "how clean is clean".

V. CONCLUSION AND RECOMMENDATIONS

A. Conclusion

Remedy selection for hazardous waste sites will be determined by economic considerations over what may be considered optimum environmental considerations. CERCLA imposes cost liability for site cleanup under a Draconian determination of joint and several liability[137]
In Chapter 5 of the "Practical Guide to Envitonmental Law", *the author* contends:

> Issues relating to the imposition of joint and several liability under CERCLA have been perhaps the most hotly contested subjects of Superfund litigation. The government has insisted that in multiparty cases, liability is indivisible and the Government cannot be forced to bear the burden of proving each defendant's share.[138]

The Clean Sites study[139] on remedy selection and the process involved reached one fundamental conclusion: cost of cleanup is a reality that will determine to a large extent what remedies may be employed.[140] The question of how clean is clean presently remains unanswered, but when lenders are willing to finance mortgages in Love Canal, we may have a practical, if not esoterically acceptable, yardstick to measure the effectiveness of hazardous waste site cleanup efforts.[141] The director of planning for the Love Canal Area Revitalization Agency recently said *resettlement of the area against efforts to stop it is* "sort of like the change in tide. It may be slack water,

but the motion is the other way."[142] The question remains, however, as to what responsibility will be borne by the affected government or private sector landowner for future health risks at a site.

When we attempt to clean up a problem, we also face the problem of over-cleaning absent some standard of safety. The problem is acute in the chemical industry for the cleaning of chemical containers. A professor of chemical engineering at North Carolina State University stated that lack of clearly defined standards can result in excessive of use of cleanup mediums. "Without a clear definition of surface cleanliness, there is a tendency to overclean vessels using an excessive amount of solvent," said Professor Christine Grant.[143] Cleaning up one problem can create another. In New Brighton, Minnesota, the Army and the city face an ironic problem. The United States agreed to pay the City of New Brighton some $9 million for CERCLA response costs for cleanup of water contamination from a contractor operated munitions facility in the city.[144] Although there is now a water treatment facility in place to decontaminate the city's water source, tons of carbon from the plant's filters will soon have to be disposed of as a hazardous waste. The remedy for cleaning up the city's water, an activated carbon filter

system, has created a new problem. Now that the contaminants from the water are in the charcoal, what is to be done with the now contaminated charcoal? The city and the United States are, as of this writing, are negotiating the disposal of this newly-created hazardous waste and replenishment of the carbon filter system.[145]

Remedy selection at present is an inexact process of competing requirements for health and environmental protection, and the money available to achieve the desired standards of environmental well-being. There presently exists no standardized basis for deternining how clean is clean. The CERCLA statute itself states:

> The President shall select a remedial action that is protective of human health and the environment, that is cost effective, and that utilizes permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable.[146]

Definition of that broad language remains to be determined and boils down to the balancing of cost over protection of human health and the environment. Although it may be desireable to try to turn Love Canal into an environmental Garden of Eden, that just may not be practical or affordable.

According to the Clean Sites symposium study:

> The final remedy decision will always be subjective, but the more specific the evaluation of costs and benefits, the more sensible and defensible the cost-effectiveness determinations will be... [T]he alternative which achieves the site cleanup objectives at the lowest posible cost should be identified. Since all alternatives that meet objectives will protect human health and the environment, then this alternative represents the "floor" for the cost-effectiveness evaluation. In like manner, the cost of achieving a permanent remedy sets the "ceiling." If there are two or more permanent remedies, the lowest cost permanent remedy should be selected.[147]

That statement sounds good but does little to cement a practical reference for site remedy selection. The study group simply says we should clean up the environment, but do it as economically as possible. For the time being, hazardous waste site cleanup remains an amorphous goal which is undefined in practical terms.

B. Recommendations

CERCLA and RCRA requirements must remain distinct. Application of current RCRA standards to Superfund (CERCLA) sites for water quality, air emissions, and soil

contaminants are unworkable and entirely impractical. To create an effective remedy selection process, the following measures should be implemented:

1. The EPA should be soley responsible for remedy selection at Superfund sites. As provided by the statute, states may intervene to require stricter standards of cleanup if the state is willing to pay the cost.

2. Congress should amend 42 U.S.C. Section 9621 (d)(2)(A) of CERCLA to eliminate language ostensibly giving states power to insist on more stringent cleanup standards than may be proposed by the agency without *the state assuming the additional financial burden.*

3. Because of the uncertainty of injury causation from contaminants at a Superfund site, and the unknown financial liability of responsible parties, once remedy selection is determined, the responsible parties should be immune from any further liability once EPA selects a site remedy.

4. Once a site has been remediated to a level the EPA determines is acceptable, states should be free to pursue further measures they may deem necessary, witjout further expense to the site's responsible party or parties.

5. Numerical expressions of risk in mathematical exponentials should be eliminated because they are confusing and patently misleading. If EPA has determined that 99 percent of the risk has been eliminated, that should stand as a benchmark for cleanup standards.

6. Site cleanup standards must be site-specific and formulated with regard to the historic and future use of the site.

We have tried in the past to simply bury our messes or ignore them. We have to clean them up, but plenary federal authority over Superfund cleanups is the only practical alternative for dealing with past problems. We should view RCRA as the means to avoid the neccessity of CERCLA in the future, not as a hobble on the legs of CERCLA's progress.

[1] Silverman, *Resettlement of Love Canal Begins, But Banks Sour on Mortgages*, 21 Env't Rep. (BNA) 1590, (1990). (The Environment Reporter is a weekly loosleaf publication produced by the Bureau of National Affairs in Washington, D.C. Not all articles appearing in the publication are identified by author; some are attributable to the publication generally, and others to staff correspondents without personal identification.)

[2] A hazardous waste or substance is defined for the Comprehensive Environmental Compensation and Liability Act (CERCLA), 42 U.S.C. 9601 (Supp. V 1987), at 40 CFR Part 300.5 (1990), as any toxic or hazardous substance as listed or defined under other federal statutes including the Clean Water Act, 33 U.S.C. Sections 1251 *et seq.*, the Clean Air Act, 42 U.S.C. 7601 *et seq.*, the Solid Waste Disposal Act, 42 U.S.C. Sections 6901 *et seq.*, and the Toxic Substances Control Act, 15 U.S.C. Sections 2601 *et seq.* The definition is generally expansive but is narrowed by the various statutory and regulatory applications and requirements.

[3] Silverman, *supra* note 1, at 1591-1592. Even after 10 years of cleanup efforts at Love Canal, thousands of tons of hazardous waste remain there and some evironmental groups are still trying block resettlement of the area. *Id.*

[4] Note 1, *supra* at 1591.

[5] Id.

[6] Note 1, *supra*.

[7] Note 1, *supra* at 1592.

[8] Pub. L. No. 96-510, 94 Stat. 2767. CERCLA, also known as Superfund, is codified at 42 U.S.C. Sections 9601-9675 (1982 & Supp. V 1987).

[9] CERCLA or Superfund is often referenced by authors according to the paragraph numbers in the original legislation. Those numbers run from 100 to 175 and correspond to Title 42 of the United States Code Sections 9601 through 9675. For example, Section 121 the CERCLA legislation, referred to as the Act, corresponds with 42 U.S.C. Section 9621.

[10] 42 U.S.C. Section 9601(33) (Supp. V 1987). The footnote continued on next page.

Continued from previous page. definition of a hazardous substance under CERCLA is far broader than other environmental statutes and covers more than just waste. It refers to any substance that reasonably can be expected to cause any kind of adverse effects to living things.

[11] 42 U.S.C. Section 9621(d) (Supp. V 1987). The title Applicable Relevant and Approriate does not actually appear in the statute, but the language requiring such standards is called the ARAR requirement. These ARARs are regularly referred to as part of the applicable remdial actions to be taken st Superfund sites. Selection of ARARs is discussed in the text infra.

[12] 42 U.S.C. Section 9621(d)(2)(A)(i) (Supp. V 1987). This section incorporates several other statutes which specify standards for water quality, clean air, and other applications.

[13] Id. at Section 9621(d).

[14] Colorado v. Idarado Mining Co., 916 F.2d 1486 at 1495 (10th Cir. 1990).

[15] D. Sive & F. Friedman, *A Practical Guide to Environmental Law*, Preface [ix] (1987).

[16] Pu. L. No. 94-580, 90 Stat. 2395 *et seq*. The Solid Waste Disposal Act, as amended by RCRA, is codified at 42 U.S.C. Sections 9601 - 9657 (1982 & Supp. V 1987).

[17] See 42 U.S.C. Section 9621(d) (Supp V 1987). The statute clearly states that covers RCRA and a host of other statutory and regulatory mechanisms for environmental cleanup.

[18] See 42 U.S.C. Sections 6924(u), 6924(v) and 6928(h) (Supp. V 1987).

[19] J. Arbuckle et al., *Environmental Law Handbook*, (10th ed. 1990)

[20] *Id.* at 78.

[21] 40 C.F.R. Part 261.2(a) (1990). To be a hazardous waste under RCRA, the waste must be a solid waste under the definition.

[22] 42 U.S.C. 9601(14) (Supp. V 1987).

[23] 40 C.F.R. Part 302 (1990).

[24] *See* 42 U.S.C. Section 6901(22) (Supp. V 1987).

[25] In 1989, Clean Sites, an environmental non-profit study group based in Alexandria, Virginia, consolidated a summaries of environmentally related laws from each of the 50 states. The summary, entitled *A Report on State Hazardous Waste Laws*, is an undated loosely bound table of state laws available from Clean Sites at 1199 North Fairfax Street, Alexandria, Virginia.

[26] *A Report on State Hazardous Waste Laws*, Clean Sites, 1199 North Fairfax St., Alexandria, VA (1989.

[27] *Id.* at 5-7.

[28] Wash. Rev. Code Section 9.66.050 (1909).

[29] *See* K. Breslin, *Colorado Case Turns on Jurisdiction over Hazardous Waste Cleanup*, 21 Env't Rep. (BNA) 523 (1990). The focus of the article is the dispute between the United States and the State of Colorado over the cleanup of the Army's Rocky Mountain Arsenal site. Although has been little direct litigation in the area, the federal/state clash of authority also came up in cases in Ohio, New Mexico and Washington. *Id.* at 524, 525. Those cases, however, dealt with financial responsibility for cleanup costs, not who had the authority for remedy selection.

[30] 916 F.2d 1486 (10th Cir. 1990).

[31] *Id.* at 1488.

[32] *Id.*

[33] *Id.* at 1495.

[34] *Id.*

[35] The Idarado case focus was on the state's authority to invoke injunctive relief provisions of CERCLA, however, the court made it clear that CERCLA is a federal program and not one through which a state can create its own remedial plan for site cleanup. See 916 F.2d 1486 at 1496.

[36] United States v. Colorado, No. 89-C-1646 (D. Colo. 1989).

[37] J. Arbuckle, *Environmental Law Handbook* (10th ed. 1989), Ch. 3.

[38] D. Sive & F. Friedman, *A Practical Guide to Environmental Law* (1987), ch. 5.

[39] Note 34 *supra* at 75.

[40] Note 28, *supra*.

[41] 42 U.S.C. 6901 - 6991 (Supp. V 1987).

[42] *J. Arbuckle*, supra *note 34, at 93.*

[43] *Note* 2, *supra*.

[44] Pub. L. No. 99-499, 100 Stat. 1613 (1986).

[45] 40 C.F.R. Part 300.66(c)(2) (1990).

[46] 42 U.S.C. Section 9621(e)(2) (Supp. V 1987).

[47] 916 F.2d 1486 (10th Cir. 1990).

[48] *Id.* at 1491, 1492.

[49] *Id.* at 1486, 1494.

[50] *Id.* at n. 8.

[51] *Id.* at 1495.

[52] No. 89-C-1646 (D. Colo. 1989).

[53] 21 Env't Rep. (BNA) 523 (1990).

[54] United States v. Colorado, No. 86-C-1646 (D.Colo. 1986); United States v. Shell, No. 83-C-2379 (D. Colo. 1983). A good synopsis of the litigation history of the case is found at 21 Env't Rep. (BNA) 525 (1990). (Shell and the United States filed a consent decree in the case in 1988.)

[55] *Id.* at 524. The article traces Judge Jim R. Carrigan's role in the case since his first ruling in 1986 footnote continued on next page.

Continued from previous page. on the issue. The author notes that Judge Carrigan sees CERCLA and RCRA as different but not mutually exclusive.

56 *Id.*

57 Note 34 *supra* at 93.

58 *Id.*

59 United States v. Colorado, No. 89-C-1646 (D. Colo. 1989).

60 Note 54, *supra*.

61 Note 34, *supra* at 93.

62 *Id.*

63 21 Env't Rep. (BNA) 666 at 672 (1990), *Reprinting* 55 FR 30798 (1990).

64 *Id.*

65 *Id.* at 672.

66 *Id.*

67 D. Melamed, "*Fixing Superfund*", Chemical Engineering, November 27, 1989 at 31.

68 Note 62, *supra*.

69 Colorado v. Idarado Mining Co., 916 F.2d 1486 at 1495 (10th Cir. 1990).

70 *See generally*, note 2. As described in the statutes referenced in note 2, a hazardous waste site could be so defined under a multitude of statutes and regulatory measures. Hazardous waste is referred to in the remainder of the text as relating to all those applications, unless otherwise stated.

71 Clean Sites is a non-profit organization which periodically issues studies and information on environmental matters. In a recent publication, Improving Remedy Selection, (October 1990), a statement on the cover leaf says the organization offers mediation services to parties involved in site cleanups and is funded by footnote continued on next page.

Continued from previous page. government and private grants. Among its board of directors are listed Russell E. Train, chairman of the World Wildlife Fund, former Attorney General Archibald Cox, and officers of major corporations like Occidental Chemical and Syntex Corporation. Clean Sites' offices are located in Alexandria, Virginia.

72 *Improving Remedy Selection: an explicit and interactive process for the Superfund Program*, Clean Sites (1990). More than 90 people from private industry and state and federal government participated in the year-long study of remedy selection. *Id.* at A-1.

73 40 C.F.R. Part 300 sets out the goals and procedures for the federal Superfund cleanup program through the National Contingency Plan.

74 *Improving Remedy Selection*, Clean Sites, 1199 North Fairfax Street, Alexandria, Virginia (1990).

75 *e.g.* EPA Proposed Corrective Action Rule for Solid Waste Management Units, 55 FR 30798 (1990)..

76 40 C.F.R. Part 300 (1991).

77 Note 67, *supra* at 20-22.

78 *Id.*

79 Note 66, *supra*.

80 Note 67, *supra*, Acknowlegements.

81 *Id.* at 35.

82 *See* EPA Proposed Corrective Action Rule for Solid Waste Management Units, 50 FR 30798 (1990), as reported at 21 Env't Rep. (BNA) 666 at 667 (1990).

83 Note 67, *supra* at 29.

84 Note 76, *supra*.

85 United States v. Seymour Recycling Company, No. IP-80-457-C *consent decree* (S.D. Ind. 1988).

86 D. Schnare & M. Kautzman, *Chemical Contamination and Its Victims* (1990).

87 *Id.*

88 *Id.* at 87

89 United States v. Seymour Recycling Company, No. IP-80-457-C (S.D. Ind. 1988)

90 *Id.*

91 *Id.*

92 *Id.*

93 See Colorado v. Idarado Mining Co., 916 F.2d 1486 (10th Cir. 1990).

94 Note 67, *supra*.

95 *Id.* at 81.

96 42 U.S.C.. Section 9621(f)(1) (Supp. V 1987).

97 916 F.2d 1486.

98 42 U.S.C. Section 9621(f)(2)(B) (Supp. V 1987).

99 *Id.*

100 597 F. Supp. 374 (D. Kan. 1984).

101 *Id.* at 409-415.

102 *Id.*

103 Note 68, *supra* at B-17.

104 *Fixing Superfund*, Chemical Engingeering, November 27, 1989, 31.

105 Note 68, *supra* at B-7, C-2.

106 J. Arbuckle, *Environmental Law Handbook* (1989) at 86.

107 *Fixing Superfund*, Chemical Engineering, November 27, 1989 at 32.

108 *Id.*

[109] 42 U.S.C. Section 9621(a) (Supp. V 1987).

[110] 42 U.S.C. Section 9621(f)(2)(B) (Supp. V 1987).

[111] *Id.* at Section 9621(f)(2)(A).

[112] Note 68, *supra*.

[113] *Id.* at B-11.

[114] 42 U.S.C. 9621(b) (Supp V 1987).

[115] Note 68, *supra* at B-7.

[116] Note 68, *supra*.

[117] Interviews with Richard Johnston, president, Braun Environmental Engineering, Inc.(BELI), chief environmental engineer for the Lake Calhoun Associates/Lincoln Properties site in Minneapolis, Minnesota (July-August 1990). The author served as counsel to BELI during the settlement procedures over who would pay for the engineering costs expended on site cleanup and investigation. When the developer and the landowner failed to agree on payment to BELI, BELI served notice of a mechanic's lien on the site to force settlement or have the parties tied up in litigation while development stalled.

[118] *Id.*

[119] J. Arbuckle, *Environmental Law Handbook* (10th ed. 1989) at 95.

[120] *Id.*

[121] Note 108, *supra*.

[122] *Id.*

[123] *See* note 111, *supra*.

[124] 42 U.S.C. Sections 9621(b)(1)(E), (F) (Supp. V 1987).

[125] Note 1, *supra*.

[126] *Id.* at 524-25.

[127] D. Schnare & M. Kautzman, *Chemical Contamination and Its Victims* (1989) at 174.

[128] Note 68, *supra* at B-12.

[129] Melamed, *Fixing Superfund*, Chemical Engineering (August 27, 1989) at 30.

[130] Note 68, *supra* at 67.

[131] Note 116, *supra* at 67.

[132] Ayers v. Township of Jackson, 106 N.J. 557, 525 A.2d 287 (N.J. 1987).

[133] J. Arbuckle, *Environmental Law Handbook* (10th ed. 1989) at 87.

[134] *Id.*

[135] Note 67, *supra* at 114.

[136] Colorado v. Idarado Mining Co., 916 F.2d 1486 at 1496 (10th Cir. 1990)

[137] D. Sive & F. Friedman, *A Practical Guide to Environmental Law* (1987) at 119.

[138] *Id.* at 119.

[139] Note 67, *supra*.

[140] Note 67, *supra* at C-7.

[141] *See* Silverman, *Resettlement of Love Canal Begins, But Banks Sour on Mortgages*, 21 Env't Rep. 1590 at 1591 (1990).

[142] *Id.* at 1591.

[143] *Cleaning Vessels So as to Generate Less Waste*, CHEMENTATOR, (October 1990) at 19.

[144] See Note, *Government Owned-Contractor Operated Munitions Facilities*, 131 Mil. L. Rev. 8 (1991).

[145] Interview with David C. Roland, associate private counsel to the City of New Brighton, Minnesota, March 22, 1991.

[146] 42 U.S.C. Section 9621(a) (Supp. V 1987).

[147] Note 67, *supra* at 45.