Mitigating the Contractor's Risks Due to Community Involvement and Behavioral Issues in Hazardous Waste Remediation Projects

By

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Abstract

Construction firms must acquire new capabilities and knowledge in order to compete in the global hazardous waste remediation market. One such capability is the ability to effectively handle the public's involvement with a remediation project. Unlike typical construction projects, the public in recent years has become interested in every activity associated with remediation projects. Public interest can lead to oposition to remediation activities caused by differences of opinion between experts and the lay public. This opposition can have a significant impact on both the contractor and their client. The purpose of this research is to help the contractor mitigate these impacts.

In cases of public opposition, contractors often begin to resent the fact that their expertise and experience is unappreciated by the community they seek to serve. This resentment leads to the belief that the public is acting irrationally. This research shows that the public is not acting irrationally; in fact, the actions of the public can be well defined in a psychological context. With an understanding of public psychology contractors will be better equipped to anticipate and react to the concerns of the public.

In the past, the responsibility of interacting with the public has fallen on the client. Recently, however, contractors have realized that they can reduce their own financial risk and provide a beneficial service to their clients by handling all of the public involvement. As a highly visible party on the site, the contractor can greatly influence the opinions of the public. On many projects, contractors are also being asked to develop a community involvement plan. Although most current literature advocates involving the public in every major decision to the maximum extent possible, this suggestion is time consuming, costly, and grossly unnecessary. There can not be a generic method for interacting with the public. Instead this research provides some basic tools for developing a site specific community relations plan. Case examples are used to illustrate the findings of this research.

Thesis Supervisor: Charles H. Helliwell, Jr.
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Glossary of Terms

AMTL	Army Material Testing Laboratory
ANG	Air National Guard
ARARs	Applicable or Relevant Appropriate Requirement
ATSDR	Agency for Toxic Substances and Disease Registry
B/PB	Bechtel/ Parsons Brinckerhoff Joint Venture
BANANA	Build absolutely nothing anywhere near anything
CA/T	Central Artery/ Tunnel Project
CAA	Clean Air Act
CCHW	Citizen's Clearinghouse for Hazardous Waste
CDC	Center for Disease Control
CDM	Camp Dresser & McKee
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CRP	Community Relations Plan
CWA	Clean Water Act
DOD	Department of Defense
DOE	Department of Energy
DPH	Department of Public Health
EPCRA	Emergency Planning and Community Right-to-Know Act

ERP	Emergency Response Plan
FS	Feasibility Study
FWEC	Foster Wheeler Environmental Corp.
GTI	Groundwater Technologies Inc.
HRS	Hazardous Ranking System
HSWA	Hazardous and Solid Waste Amendment
IAFF	International Association of Firefighters
IRM	Interim Remedial Measure
MCCC	Modern Continental Construction Co. Inc.
MA DEP	Massachusetts Department of Environmental Protection
MHD	Massachusetts Highway Department
MMR	Massachusetts Military Reservation
MSDS	Material Safety and Data Sheet
NBH	New Bedford Harbor
NCP	National Contingency Plan
NEPA	National Environmental Policy Act (1969)
NFD	Norwood Fire Department
NGB	National Guard Bureau
NIABY	Not in Anybody's Backyard
NIMBY	Not in my backyard
NJDEP	New Jersey Department of Environmental Protection
NPL	National Priorities List
OTA	Office of Technological Assessment
PAH	polynuclear aromatic hydrocarbons
PCBs	polychlorinated biphenyls
PIP	Public Involvement Program
ppb/ ppm	parts per billion/ parts per million
PRP	Potentially Responsible Party
RA	Risk Assessment
RCRA	Resource Conservation and Recovery Act

RD/ RA	Remedial Design/ Remedial Action
RI	Remedial Investigation
ROD	Record of Decision
ROWARS	Right of Way And Remediation Services
SARA	Superfund Amendments Reauthoriztion Act
SCBA	Self-contained Breathing Apparatus
SSHO	Site Safety and Health Officer
Superfund	A trust fund established by CERCLA (See Chapter 2)
TAG	Technical Assistance Grant
TCR	Telephone Conversation Record
TERC	Total Environmental Restoration Contract
TSCA	Toxic Substances Control Act
U.S. ACE	United States Army Corps Of Engineers
U.S. EPA	United States Environmental Protection Agency
UMTRCA	Uranium Mill Tailings Remediation Control Act
VEP	Value Engineering Proposal
VOC	volatile organic compound

1. Introduction

1.1. Overview and Motivation

As concern for the quality of the environment has increased in recent years, the global construction industry has faced fundamental and far-reaching changes. These changes must not be a hindrance, as perceived by many global corporations. Instead, with creative corporate strategies and sophisticated management skills, they can provide new and exciting business opportunities. The hazardous waste remediation industry is one of these business opportunities which has enormous potential for construction companies. Nevertheless, while the construction industry already possesses many of the management skills necessary for remediation projects, it can not treat them as typical construction projects. Instead, it must acquire new capabilities and knowledge in order to compete in the global remediation marketplace.

One such capability is the ability to effectively handle the public's involvement with a remediation project. Remediation projects are different from typical construction projects in that the public is interested in every step of the process. This interest is shown in recent polls that suggest that hazardous waste is

more likely to provoke citizen concern about health-related risks than other environmental areas, such as air or water pollution.[1] As a result, the media, industry, government officials, and the general public have given the issue of hazardous waste considerable attention.

Despite all of the attention to this issue, considerably less attention has been given to improving the process of cleaning up hazardous waste. Due to technological, regulatory and administrative hurdles, the remediation process is relatively inefficient. With the constant development of new technologies and management skills, these inefficiencies are slowly being corrected.

Unfortunately, the public can not always afford to wait for the developments to take place. Contamination of a local site can have immediate potential adverse health effects on the community. The length of time required to completely remediate a site has also been shown to cause great mental stress and anguish on the public. Because of the public's concerns about potential adverse health affects, the public gets involved with a remediation project and begins to formulate their own opinions about what should be done. These opinions often differ significantly from the viewpoints of the experts, becoming a potential source of conflict. Frustrated by this conflict, the public loses faith in the process and distrusts those involved with a project. Public opposition to remediation activities can have a significant impact on both the contractor and their client. The purpose of this research is to help the contractor mitigate these impacts.

Public involvement with remediation projects begins with the discovery of contamination and doesn't end until the site is clean. The public may disagree with the findings of the risk assessment, oppose the remedial alternative selected, or

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[1] Charles Davis, *The Politics of Hazardous Waste* (Englewood Cliffs, NJ: Prentice-Hall, 1993) p.1.

disapprove of the remediation schedule. The public may stop the activities on a site. In any case, contractors often begin to resent the fact that their expertise and experience is unappreciated by the communities they seek to serve. This resentment leads to the belief that the public is acting irrationally. This research shows that the public is not acting irrationally, but in fact, the actions of the public can be well defined in a psychological context. With an understanding of public psychology and public organizational theory, contractors will be better equipped to anticipate and react to the concerns of the public.

In the past, the responsibility of interacting with the public has fallen on the client. Contractors have traditionally rejected the notion of getting involved with the public because public relations is not one of the traditional core competencies of construction firms. Recently, however, they have realized that they are putting themselves at great financial risk by leaving all of the public relations to the client. With every step, project managers must now think of the impacts their remediation activities will have on the public. As the public has stopped projects and opposed remediation methods, construction companies have been left with some of the liabilities associated with hazardous waste. Aside from their own interests, interacting with the public can provide a beneficial service to their clients. Through their actions, the contractor, a highly visible party on a site, can greatly influence the opinions of the public. As remediation experts are intimately familiar with a project, they can be a trusted resource for the public. In many cases, the contractor can provide services that the client is unable to provide.

Increasingly clients, as well, are recognizing the role of the contractor in public relations. If not interfacing with the general public directly, contractors are being asked to prepare public documents (e.g. newsletters and press briefings), interact with town officials and the media, and develop a public involvement program. Developing

these programs is a difficult operation because the issues surrounding public involvement are extremely complex and differ from site to site. In response, most handbooks and other generic literature advocate involving the public in every major decision to the maximum extent possible. While this method may be successful in allaying the fears of the public, educating and incorporating the public into decision making is time consuming and costly and often unnecessary. There is no generic method to interact with the public. Every site is different and requires differing levels of public involvement. This research examines the question of "how much involvement is enough?" from a practical standpoint, looking at a number of case examples to see what has worked in the past.

1.2. Explanation of Terminology

Words such as public, community, involvement, and risk are used frequently in this research and deserve a few words of explanation. Generally, there is little consensus among researchers regarding exact definitions for some of the terminology in this research. The following general descriptions provide a brief context for the way these terms are used.

The first concept requiring some explanation is the notion of public versus community. Webster's Dictionary provides the same definition for both terms: "the people in general."[2] This research follows Webster's definition and uses both terms interchangeably. However some researchers argue that the community is a subset of the public. Where as "public" refers to all people, "community" emphasizes that the people involved with the remediation project have common interests – typically, protection of human health in their neighborhood. Although the distinction is subtle,

[2] John Gage Albee, ed., *Webster's Dictionary* (Washington: Ottenheimer Publishers, 1978).

it can be argued that dealing with the public requires different strategies than dealing with the community.[3]

In contrast, few would disagree that there is a strong difference between public involvement and public relations. For example, the U.S. Army defines public relations as an effort to "influence opinions through socially responsible performance, based on mutual two-way communication." On the other hand public involvement is an effort to "involve citizens in the decision making process and to prevent or resolve citizen conflict through mutual two-way communication." Following the Army's definition, public relations and public involvement are two different approaches that have some common elements, such as strong communication skills.[4] In this research these two approaches are not enough to adequately describe the complex process of interacting with the public. Instead, Chapter 5 outlines several methods for public interaction, lessening the importance of the distinctions between public involvement and public relations.

The notion of risk is used frequently here, with varying interpretations. For the purpose of this research, the risks concerning the public are human health risks. This assumption is made as public opposition to remediation projects are generally due to concerns over increased danger to human health. For the contractor, risk is defined as financial risk. It is assumed here that increased public activity can create a greater financial burden for the contractor. It should be noted that a simplification is being made here: for, the public does care about financial risk (i.e., decreased local property values) and contractors do care about health risks (i.e., worker safety). The subject of risk is discussed at length in Chapter 3.

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[3] Douglas C. Karson, Public Relations Specialist, "Public Participation and Environmental Remediation Projects," lecture at MIT, Cambridge, April 7 1995.
[4] U.S. Army Toxic & Hazardous Material Agency, *Commander's Guide to Public Involvement in the Army's Installation and Restoration Program* (Washington: GPO, 1990), pp. 7-8.

Finally, it should be noted that this research was conducted from the contractor's perspective. Hence, the industrial owners or government agencies who oversee the remediation project are referred to as the clients. Most prior literature is written from the client's perspective, since as stated above, clients have traditionally held the sole responsibility of dealing with the public. However, as the contractor's role in public involvement continues to increase, contractor's will require new sophisticated management strategies that are vastly different from existing client strategies. In recognition of these strategic differences, this research keeps the contractor at the center of public involvement issues.

1.3. Objectives and Outline

Given that the public is extremely involved throughout the remediation process, it is to the advantage of the remediation contractor to mitigate the role of the public, in order to make the process go smoothly. Hence, the goal of this research is: to provide some theoretical background about the psychology of public involvement; to show how this background can be used to develop an effective community relations plan; and finally to use case studies to show applications of public involvement theory. While there are many micro case studies used throughout this thesis, one chapter is set aside to look in-depth at one site.

Chapter 2 outlines the remediation process and shows how trends in the remediation process and in general society have lead to the current situation of public involvement. Given these trends, this chapter outlines the contractor's role in effectively handling the public involvement process.

Chapter 3 presents theoretical background necessary to understand the psychology of the public. Conflicts are often created simply because of differences in

expert and lay public differences in opinions about decisions made on a site. This chapter outlines the decision making process and other important considerations for the public. By understanding the psychology of the public, contractors can more effectively anticipate and proactively address the concerns of the public.

Chapter 4 presents further theoretical background on community organizations. Typically, the public gets involved with remediation projects through groups or organizations since there is power in greater numbers of people. By understanding the goals and skills of community organizations, contractors can address legitimate concerns while working with groups to break down any existing misconceptions.

Chapter 5 outlines the process which contractors must go through to create a public involvement program. Although most community relations handbooks agree that this program is site specific, the strategies in these handbooks are static – they do not change with each situation. Before developing a plan, contractors need to make a judgment about the level of effort that will be required to adequately, but cost effectively, address the needs of the public. Some case studies are shown of projects that require differing levels of public involvement effort.

Chapter 6 presents an in-depth case study on the Norwood PCB Superfund Site. This site is an interesting case because it represents a somewhat typical remediation project. This case study provides a concrete example of how public involvement theory, as presented in the previous chapters, can be applied to a remediation project.

Chapter 7 provides a conclusion to this discussion. Some of the lessons learned, as well as future research topics are presented.

2. Trends: Why the contractor cares?

As the U.S. remediation market has grown to $10 billion per year, global construction corporations are facing a far different industry from just a decade ago.[5] While the industry has made tremendous technological advances, the challenges of remediation continue to build as corporations cope with an uncertain regulatory environment, changing social values, and stiff competition. As a result, contractors are being forced to make radical internal changes in order to adapt to these conditions. The goal of this chapter is two-fold. First, recent trends are examined to help explain the conditions facing remediation contractors today. Second, these trends are used to understand why the contractor's role in public involvement continues to increase. This chapter begins by examining several general social trends that have lead to increased public involvement. As a result of the public's increased concern for the environment, regulations over the past few decades have served to increase the public's involvement on a site. Understanding the social and regulatory trends, it is helpful to know where in the remediation process the public can get involved. The Superfund process is outlined in this chapter. It is important to remember how the

[5] William C. Anderson, "What is the future of Environmental Engineering?" *Engineering News Record*, 16 October 1995, p. E-14.

specific process itself can have an effect on the public. Lastly, this chapter concludes by summarizing the many ways that contractors must interact with the public during each phase of the remediation process.

2.1. Trends: Hazardous Waste and the Public

According to polls taken by the Gallup Organization, the American public is more concerned than ever about environmental problems facing the United States. Most Americans (78%) consider themselves to be environmentalists, concerned about environmental threats to the planet. Almost nine in ten respondents (86%) say they are taking active steps towards conserving natural resources. Despite the current economic recession, 71% favor protecting the environment at the expense of economic growth. As the general public continues to be greatly concerned about the environment, they will continue to play a significant role in shaping environmental policy.[6]

The two environmental problems that the public seems to be most concerned with is water pollution and hazardous waste. Almost two thirds of those polled (62%) are concerned "a great deal" with the contamination of soil and water by toxic waste. In these areas, most (62%) believe that not enough progress in handling hazardous waste has been made over the last twenty years and even fewer (60%) are optimistic about the next twenty years. While most people have expressed their own concerns about the environment, they do not have faith in others. A vast majority believes that general public (72%), government (75%), and industry (85%) are not worried enough about environmental problems.[7]

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[6] *The Gallup Poll* (Wilmington, Del: Scholarly Resources, 1991) p. 86-89.
[7] *The Gallup Poll* (1991) p. 86-89.

These statistics have significant impact on the remediation contractor. Globally, governments and business are not as concerned with hazardous waste as they are with other environmental problems. Solid waste management, for example, is considered to be the greatest environmental concern for most nations.[8] Accordingly, the global environmental market spends over six times as much on solid waste ($88.3 bil) than on hazardous waste ($14.7 bil).[9] Nevertheless, despite the world's overwhelming concern for other environmental problems, the public continues to view hazardous waste as the most significant threat to our planet's natural resources. The public's concern is what makes the remediation market so different from construction firms' traditional market segments. This concern is attributed to the fact that the public generally expresses the greatest amount of concern about issues that affect them directly. Hence, because the public perceives that a remediation project in their community will have a direct impact on their own lives, they feel compelled to get involved. Furthermore, as discussed above, the public gets involved because they believe that others are not concerned enough about the environment. Over the past few years, a major shift in social trends has occurred. Previously, people had adapted the concept of NIMBY (Not in My Backyard), opposed to any remediation facilities in their own neighborhood. Now people have shifted to NIABY (Not in Anyone's Backyard), opposed to any remediation facility anywhere. Some suggest that in the future, people will adapt the concept of BANANA (Build absolutely nothing anywhere near anything). Hazardous waste is moving from a local concern to a global concern.[10]

The irony of increased public concern about hazardous waste is that generally society is much safer than it was just a decade ago. Comments by Wildavasky

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[8] Jose-Marrie Figuerres, President of Costa Rica, address at MIT, Cambridge, 27 October 1995.
[9] "Confidence Grows in SEM Market," *Environmental Business Journal,* VI.8 (1993): 3.
[10] Citizens Clearinghouse for Hazardous Waste, Inc., *Rebuilding Democracy Through the Grassroots Environmental Movement* (Falls Church: CCHW, 1994) p. 15.

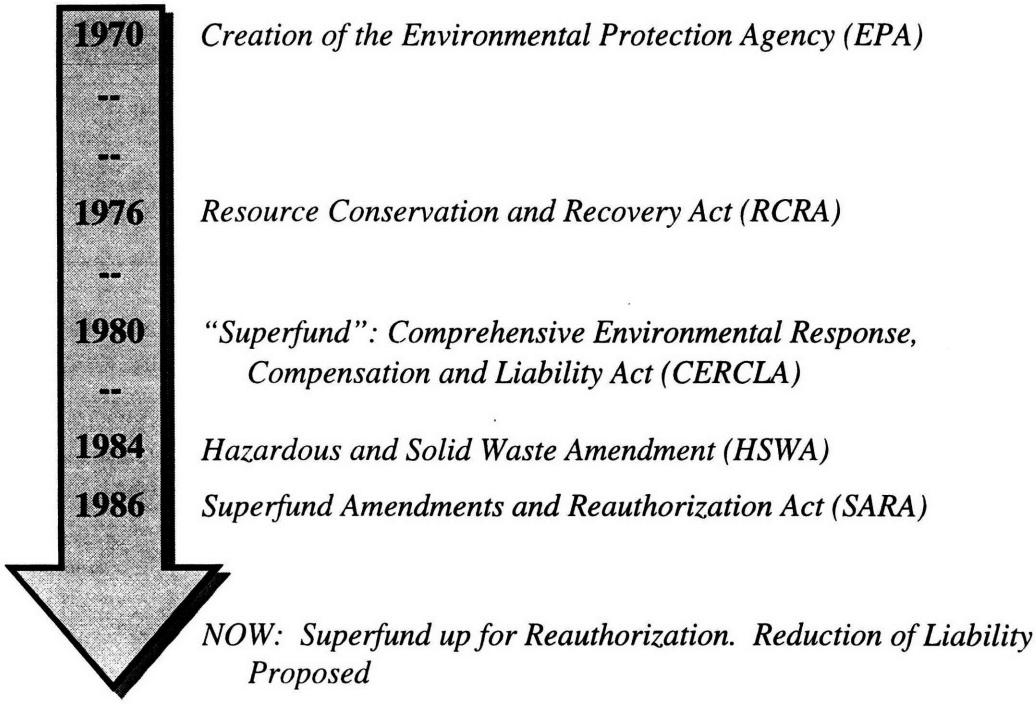


Figure 2-1: U.S. Environmental Legislation Timeline

summarizes this irony: "How extraordinary! The richest, long lived, most resourceful civilization, with the highest degree of insight into its own technology, is on its way to becoming the most frightened."[11] This fear must be factored into the contractor's public involvement efforts.

2.2. Trends: Environmental Legislation

With the public's interest in hazardous waste constantly increasing, our U.S. regulatory environment has also grown, reflecting the public's interest. Hazardous waste regulations have directly changed the way community members react to remediation projects. Because the environmental industry in the U.S. is driven by regulations, a review of these regulations is important to understand the atmosphere in

[11] A. Wildavsky as quoted in Paul Slovic, "Perception of Risk," *Science* 236 (1987) p. 280.

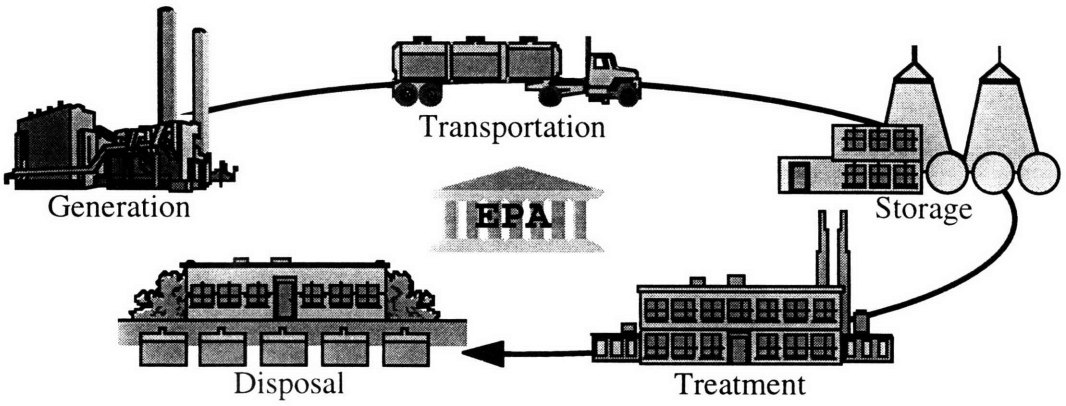


Figure 2-2: Overview of RCRA

which remediation contractors work in. A summary of these regulations is shown in Figure 2-1.

The first significant event in the creation of the remediation market came in 1970 when the Environmental Protection Agency (EPA) was formed. The EPA represented the first government body that had the authority to develop regulations, and implement and administer programs to ensure the protection of the environment. Prior to 1970 (beginning as early as 1938), a number of environmental laws were passed related to the regulation of water, air, solid waste, and other areas. However no laws were passed related to hazardous waste until 1976 when the Resource Conservation and Recovery Act (RCRA) was passed. The goal of RCRA is to protect human health and the environment by reducing waste, conserving natural resources, and eliminating the generation of hazardous waste. This "cradle to grave" act regulates hazardous waste from generation through transportation, storage, and treatment to final disposal. Figure 2-2 shows the RCRA management process.[12]

In 1980, the Superfund program was founded under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). CERCLA

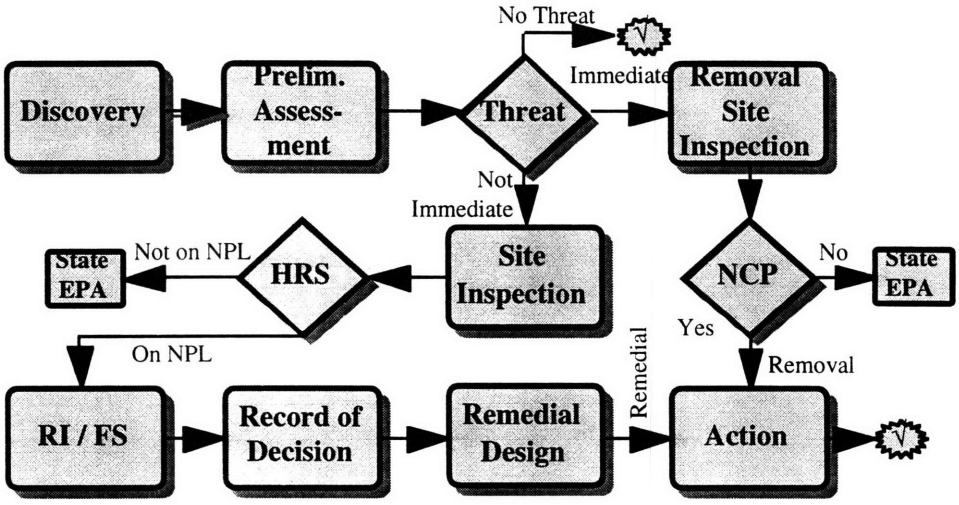
[12] U.S. Environmental Protection Agency, *Meeting the Environmental Challenge* (Washington: GPO, 1990) p. 14.

establishes joint, strict and several liability for hazardous waste. That is, anybody as a producer, owner, or operator of hazardous waste shares in the liability of clean-up. This legislation is significant for the contractor because as an operator of hazardous waste, the contractor has tremendous liability. CERCLA also establishes a trust fund, known as Superfund, to clean up waste until a responsible party can be identified. This act calls for a strong federal and state presence in the management of Superfund and the enforcement of regulations.[13]

In 1986, Congress passed the Superfund Amendments and Reauthorization Act (SARA) which, along with reauthorizing Superfund, provides a regulatory framework for the public to get involved with remediation projects. The public involvement portion of SARA, also known as Title III, the Emergency Planning and Community Right-to-Know Act (EPCRA), was developed in the aftermath of the 1984 chemical accident in Bhopal, India. This crisis-oriented act forces the contractor and industry to factor public opinion into their traditional methods of doing business. For example, SARA Title III mandates community involvement in emergency response planning and requires immediate public notification of a hazardous substance release.[14]

Currently the U.S. Congress, led by Senator Bob Smith, is considering a number of proposals to change and reinvent the Superfund program. A major component Smith's proposed changes is the reduction of retroactive liability. Liability in the new Superfund program will be more proportional and equitable. A second part of Smith's proposal has a profound impact on the public. Congress has proposed a more flexible system that allows for the selection of remedies based on a site's end-use. Smith proposes that local citizens, the ones who are most affected by

[13] Catherine Walsh, Camp Dresser & McKee, "Environmental Restoration Engineering," MIT, Cambridge, February 1995.
[14] Susan Cutter, *Living With Risk* (New York: Edward Arnold, 1993) p. 71.



Legend of Abreviations:

EPA:	Environmental Protection Agency
NCP:	National Contingency Plan
RI/FS:	Remedial Investigation/ Feasibility Study
NPL:	National Priorities List
HRS:	Hazardous Ranking System

Figure 2-3: Overview of the Superfund Process

the selection of cleanup remedies, should have a greater role in determining the future of Superfund Sites.[15] Future regulatory trends indicate that the public will become even more involved with remediation projects than they are today. In this environment, contractors must be prepared to interact with the public.

2.3. Overview of the Superfund Process

Public involvement on a remediation project is dynamic, changing with the phase of the remediation project. It is essential for contractors to understand that the particular process used for remediation can have a direct effect on the public. The Superfund process, as outlined in Figure 2-3, begins with the discovery of

[15] Bob Smith, "Time to Revamp Superfund," *Engineering News Record,* 16 October 1995: pp. E-6 to E-11.

contamination. [16] This stage is the first opportunity for the community to get involved, since often the contaminates are discovered by members of the community themselves. Therefore, the community gets involved with a project before the EPA and the contractor. Once contamination is discovered, a preliminary assessment is done. In this stage, the type of contamination is identified and the health risks are assessed. If it is determined that there is an immediate threat, then a removal site inspection is conducted. If the contamination is judged to be severe based on the national contingency plan, then the EPA follows through with the removal action. Otherwise, the state governments handle the immediate threat removal action.

At this point in the process, only the contamination which poses an immediate threat has been removed. Community members, being exposed to Superfund for the first time, are often unable to differentiate between the immediate removal action and the permanent clean-up of the site. As community members witness three separate activities on site (two site investigations and the removal action), they believe that the site is being totally cleaned-up. Briefing the community on the Superfund process itself during the early stages of the removal action is critical to avoid the confusion that may follow during the long period between the removal action and the remedial action. As illustrated by the case study on the Norwood PCB Superfund site in Chapter 6, the client's relationship with the community is either created or destroyed during this early stage.

Once the immediate threat has been removed, a site investigation is conducted for the non-immediate contamination. Based on the level of contamination determined by this investigation, the EPA ranks the site on the National Priority List (NPL) using criteria established by the Hazard Ranking System. Once a site is on the NPL, the

[16] This summary of the Superfund process was developed collaboratively by: Peter N. Caulfield, Jim Diggins, Jennifer Griffith, and Sumul Shah.

EPA conducts the remedial investigation and feasibility study (RI/FS) to generate a list of appropriate remedies. Before the most appropriate remedy is chosen from this list, the public is given a formal period to make comments on the list of remedies and on the Superfund process. It is during this stage where the public has the greatest formal opportunity to influence the design and choice of technology. With a remedy chosen, the decision making process is outlined in the Record of Decision (ROD), including documentation of why a particular remedy was chosen. With the ROD completed, the remedial design and remedial action is performed. Because there is little visible on site activity during remedial design, public interest tends to drop during this phase. However, the public's interest is renewed during the remedial action phase since most visible site activities occur during this phase.

2.3.1. Problems with Superfund

The Superfund process described above has been plagued with problems since its inception in 1980. Such problems include: redundancy, such as multiple site investigations performed; bureaucracy, as it could take several years to obtain a permit or place a site on the NPL; litigation, caused by potentially responsible parties; and internal conflict, fought between the numerous parties involved with a site.[17] To highlight the amount of bureaucracy in Superfund, a 1989 study shows that only 40% of the money spent on Superfund actually goes to clean-up. Conducted by the Office of Technology Assessment (OTA), Figure 2-4 shows the overall allocation of funds for Superfund.[18]

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[17] James P. Diggins, *Project Management Issues on Hazardous Waste Remediation Sites*, thesis (Cambridge: MIT, 1995) pp. 14-20.

[18] John B. Miller, "Transaction Costs in Superfund Cleanup as a Function of Joint Liability: Two Proposals for Change," *Federal Contracts Report*, 4 October 1993.

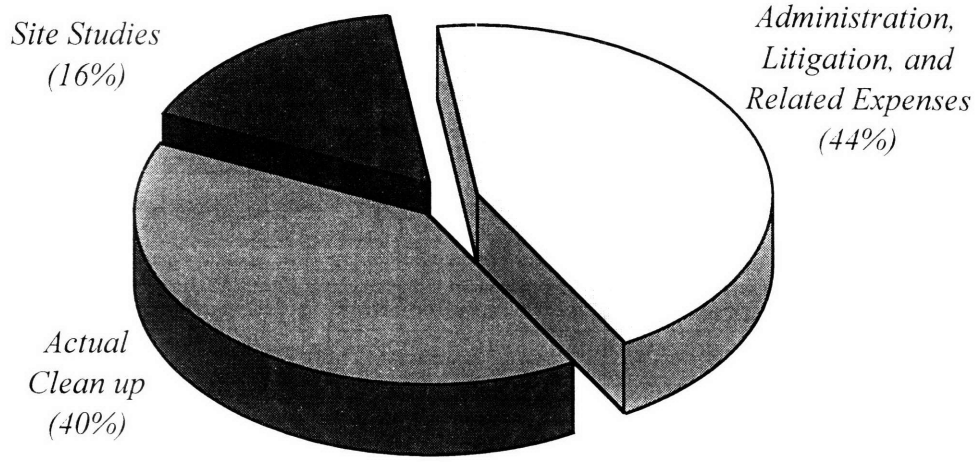

Figure 2-4: Superfund Expenditures

While technological advances continue to reduce the costs of actual clean-up, clearly efforts need to be made in reducing administrative expenses. Public involvement efforts constitute an ever increasing portion of the administrative funds expended. Public involvement funds are used by the EPA in the form of numerous community meetings, news bulletins, and technical assistance grants (TAG) where the EPA takes the time to educate the public about hazardous waste. Unfortunately, despite billions of dollars spent for public involvement activities, there is little evidence that these policies have been successful. Hence, the key to mitigating the risks from public involvement is not to spend more money or increase the public involvement effort. Instead the concerns of the public need to adequately addressed.

The Superfund process is long and fairly complicated, especially for people who are not intimately familiar with EPA practices. On many sites, the frustration of the community is increased by the process itself. The community needs to understand the process so they can provide input by working within the system.

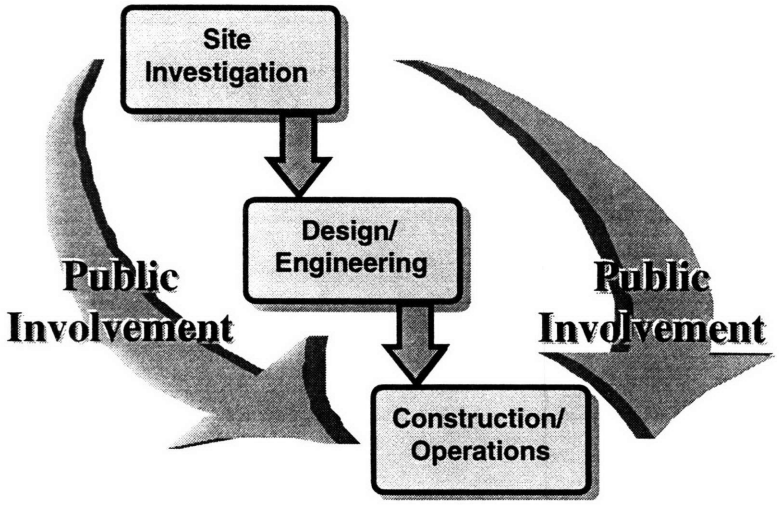

Figure 2-5: The Three Phases of Remediation

2.3.2. The Generic Model for the Remediation Process

Superfund, however, is not the only model for remediation projects. In an effort to use a much more simple model which applies to any remediation process, Figure 2-5 shows the model used for the purposes of this research. In this model, there are three distinct phases: site investigation, remedial design, and construction/ operations. Although the public gets involved with all three phases, it is important to note that the nature of public involvement changes with each phase or activity.

2.4. Implications for the Remediation Contractor

Given that public involvement is likely to increase in the future, the public will have greater effects on the time and cost to complete a remediation project. With the client currently performing most community relations activities, why should the contractor get involved? Below, a summary of the effects the public can have on the contractor is presented. These issues are discussed further in the following chapters. Note that public involvement is an issue which cross cuts all phases of remediation.

Site Investigation Phase

The objective of the site investigation phase is to generate data regarding the health risks to the public from the contamination on the site. The actions taken during the design and construction phases are dependent on this data. As shown in chapter 3, the public can have very different interpretations of this data than the experts. Often numerous site investigations are performed because of this disagreement in data.[19] Repeated site investigations add to the time and cost of a remediation project for the client. During this phase, contractors have the opportunity to provide a great service to their clients. Studies show that due to issues surrounding trust, the public is much more likely to accept the conclusions regarding risk when presented by the remediation contractor. By taking the lead role in public relations, contractors can have greater success with the public than the client.

Design Selection Phase

The choice of technology used for remediation has a direct impact on the level of public involvement. In New England, for example, the word "incineration" prompts significant public opposition.[20] Contractors can no longer design only on technical basis. They must consider the public with each decision made. Different choices of technology carry different perceived risks for the public. Again, the contractors can be vital in successful risk communication.

Contractors will also have to interact with the public when a site's end use affects the choice of technology. Site reuse has a major impact on the public. Take the Norwood PCB Superfund Site, for example, where the soil is to be capped. The public wants to know what affects this decision will have on human health, and what

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[19] Peter Nicholas Caulfield, *Innovative Methods for the Assessment of Hazardous Wastes on Remediation and Construction Projects*, thesis (Cambridge: MIT, 1996) pp. 10-15.
[20] Yohana Hunter, Director of Public Relations, Environmental Protection Agency, personal interview, Nov. 1995.

the costs and benefits are of the chosen technology. The public will rely on contractors to inform them about the technological solutions required to achieve a desired end use. Only with this information can the public make accurate decisions about choosing an end use for a site.

Construction Phase

The construction phase is where the contractor can have the greatest effect on the public and mitigate their own risks. Typically, the public is most involved when there is actual activity on site. Because the public trusts the contractor more than the client, the contractor can succeed in areas where the client can not. For example, as shown in an example from the Central Artery/ Tunnel Project in Chapter 3, the public is much more willing to accept value engineering proposals (VEP) from the contractor than the client.[21] By interacting with the public directly, contractors can have greater success with VEPs and increase their profitability.

The New Bedford Harbor Superfund Site case study, in Chapter 5, shows that the public can cause delays or even stop a project. Delays cost the contractor money. Stopping a project can leave the contractor with the liability for clean up, driving the contractor out of business. Clearly the contractor has a stake in the actions of the public. By dealing with the public directly, the contractor can mitigate their own risks.[22]

As shown in studies of three Department of Energy sites (Durango, Weldon Spring, and Salt Lake City Vitro), the contractor's "site personnel, approach, attitude and tone can have a major impact on public relations."[23] As the most visible and

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[21] Chris Barnett, Director ROWARS, Bechtel/ Parsons Brinckerhoff, personal interview, May 1995.
[22] Robert C. Ayres, *Risk Management in the Hazardous Waste Remediation Industry: Organization and Project Implementation*, thesis (Cambridge: MIT, 1995) pp. 47-68.
[23] Sheila Conway, "Innovative Approaches to Public Participation." *Hazardous Materials Control/Superfund, 92*, (Washington: Hazardous Materials Control Research Institute, 1992) p. 1052.

knowledgeable party on a site, the contractor will have to interact with the public. By understanding public psychology, contractors can provide additional service to their client by addressing the concerns of the public. This service not only benefits the client, but can also lead to improved relations between the client and the contractor.

All Phases - The Client

Finally, for all phases, contractors are increasingly being asked by their clients to handle all public relations activities. Industrial owners do not have specific expertise in risk communication. Furthermore, most clients now ask the contractor to implement a community relations plan (CRP). An ineffective CRP can cause increased public opposition. In order to be effective, contractors must be aware of the issues which this research has identified.

3. Public Psychology

> *"Logic doesn't work when dealing with the public."* Mr. Chris Barnett, a remediation manager at the CA/T.[24]

This chapter challenges Mr. Barnett's statement by attempting to define the "logic" behind the public's actions. As described in the previous chapters, public involvement can have serious effects on the progress of a remediation project. In the past, the client has tried to mitigate these effects by developing greater and more extensive community involvement programs. These programs have not only been costly, but also have been largely unsuccessful because they do not address the specific concerns of the public. With contractors now developing public involvement programs, they must have an understanding of the attitude and mentality of the public to anticipate and address issues raised by the public before these issues become major concerns. By addressing the public's concerns and keeping the public satisfied, the contractor is not only providing a greater service to their client, but also mitigating their own risks from public involvement. This chapter establishes the necessary

[24] Barnett, interview

theoretical background on public psychology and uses case examples to show how the theory has been applied on remediation projects.

3.1. Expert and Lay Judgments of Risk

Contractors, clients, and the lay public all have very different perceptions of hazardous waste. Each party begins the remediation process with a different set of values, preferences, attitudes, and goals. These inherent differences can have a direct impact on the outcome of a project and must be recognized at the onset. The differences between experts and lay persons are illustrated clearly in the field of risk assessment.

As can be expected, the public's main concern on remediation projects is the potential danger to their own health or the health of their family. These dangers are established formally by the risk assessment, a site-specific process used to establish and evaluate clean-up standards. Risk assessment can be described as the "assembly, evaluation, and interpretation of all pertinent scientific information about the toxicity, human experience.... and exposure to a particular chemical or physical agent."[25] The science of risk assessment is highly uncertain and subjective upon individual judgment as it is based on one's sense such as smell, taste, and sight.[26] This reliance on judgment leads to varying opinions about the conclusions drawn from risk assessment data. Potentially responsible parties (PRPs) believe that the risk on the site has been greatly exaggerated, while community members believe that the risk has been greatly understated.[27] As different parties have different interpretations about the risk

[25] Junius C. McElveen, Jr., "Risk Assessment in the Federal Government: Trying to Understand the Process," *Tulane Environmental Law Journal* 5 (1991) p. 47.
[26] Nancy Kraus, Torbjörn Malmfors, and Paul Slovic, "Intuitive Toxicology: Expert and Lay Judgements of Chemical Risks," *Risk Analysis* 12.2 (1992) p. 215.
[27] Jennifer Griffith, "Risk Assessment," working paper (Cambridge: MIT, 1994) sec. 2.4.3.

#	Questions Asked on Survey	Public Scale 1 to 10 1: Str. Disagree 2: Str. Agree	Toxicologists Scale 1 to 10 1: Str. Disagree 2: Str. Agree	Correlation -1: Negative Corr. 0: No Corr. +1: Strong Corr.
1	If you are exposed to a toxic chemical substance then you are likely to suffer adverse health effects	**7.6**	**4.6**	**0.05**
2	If you are exposed to a carcinogen, then you are likely to get cancer	**5.4**	**3.5**	**0.02**
3	It's not how much of the chemical you are exposed to that should worry you, but whether or not you are exposed to it at all	**5.0**	**2.3**	**0.06**
4	There is no safe level of exposure to a cancer-causing agent	**6.2**	**3.9**	**0.11**

Table 3-1: Responses of Toxicologists and Lay Persons to Questions About Dose-Response Relationships[28]

assessment, the conclusions drawn by the experts (the contractor) are often challenged.

In order to study the differences between experts and lay public views on risks, Kraus *et al.* examined issues related to dosages of chemical substances. The study shown in Table 3-1 found that the experts and lay public have fundamentally differing views. Generally, the experts in this survey (toxicologists) believe that "the dose makes the poison" – adverse health effects are dependent on the dosage. On the other hand, the public took a more "all or none" view of toxicity. The public believed that adverse health effects occur regardless of the concentration, dose, or amount of exposure to chemical substances. The implication is that statistics used by contractors (dosages, probabilities, or parts per million) are far less meaningful to the public than they are to the experts.

A broader conclusion reached by Kraus *et al.* from this study is that "different assumptions, conceptions, and values, instead of disagreements about facts might

[28] Kraus, Malmfors, and Slovic, p. 216.

underlie much of the discrepancy between expert and lay views of chemical risks."[29] If contractors recognize and address the public's assumptions and values, they will be far more effective in dealing with the public. The following section examines how the public views risks from remediation projects.

3.1.1. Factors that Influence Risk Perception

As shown above, the public's concerns about risk are not well correlated with expert judgments. Risk assessment is a complex subject, not completely understood by the experts, much less the public. On a technical level, there is still much debate among experts over technical limitations, terminology, and techniques. Those conveying risk information to the public understand that risk assessments are constructed from theoretical models based on assumptions and subjective judgments. Just as risk communicators understand the characteristics of risk assessment, they must also understand the strengths and limitations of public attitudes and perceptions. Listed below are a few non-technical considerations which influence the public's risk perceptions:[30]

3.1.1.1. Process: Who and How?

The process behind how the risk assessment is conducted (the "who and how") can be more important than the risk assessment itself. For example, many citizens groups have complained about the high turnover rate among EPA project managers. With every project manager that comes and goes, relationships must be rebuilt as the community must re-teach the EPA about the needs of the community. As community members have a long term-interest in the remediation project, they

[29] Kraus, Malmfors, and Slovic, p. 217.
[30] Paul Slovic, "Beyond Numbers: A Broader Prospective on Risk Perception and Risk Communication," *Acceptable Evidence*, ed. Deborah G. Mayo and Rachelle D. Hollander (New York: Oxford University Press, 1991) pp. 49-50.

need to feel that the project managers also have a vested interest in the site. According to this example, the community cares more about the "who" – the specific project manager – than what the EPA is doing.

3.1.1.2. Consent and Control

Technical risk models fail to consider democratic values such as community expectations about consent and control. Studies indicate that the public is willing to accept voluntary risks that are roughly 1000 times as great as involuntary risks that produce the same level of benefits.[31] Other studies of community willingness to accept hazardous waste facilities show the importance for the public to consent to the location of facilities and to control their management. In democratic nations, the public believes they have the right to influence decisions that affect them regardless of whether they actually exercise this right.[32] Hence, even if the public has no intention of getting involved, the lack of opportunity for involvement is cause for public concern.

3.1.1.3. Low Probability, High Consequence Events

A technical analysis of the impacts of catastrophic events or accidents account only for the direct harm to human health. This analysis, however, fails to consider the impacts of such events that extend far beyond direct harm. Consider, for example, the accident at Three Mile Island. Although there was little if any harm to human health, the accident devastated the corporation that owned the plant, prompted stricter regulations on the nuclear industry, and generated greater public opposition to the nuclear and related industries. Such so called "higher order" impacts are determined

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[31] Chauncey Starr, "Social Benefits vs. Technological Risk," *Readings in Risk*, ed. Theodore S. Glickman and Michael Gough (Washington: Resources for the Future, 1991) pp. 183-194.
[32] Daniel J. Fiorino, "Technical and Democratic Values in Risk Analysis," *Risk Analysis* 9.3 (1989): 295.

by what the event signals or forewarns. These events, which Slovic refers to as signal events, "serve as a warning signal for society, providing new information about the probability that something similar or even more destructive might occur."[33]

A recent example of a low probability, high consequence event that had tremendous higher order impacts is the 1995 Oklahoma bombing incident. The public believed that this event served as a signal to America, that the Unites States is not as safe as it used to be. According to the FBI, there is not much that can realistically be done to prevent such an incident from happening again.[34] Nevertheless, the President, led by public opinion, made great efforts to increase the security at all federal buildings across the country. The point here is not to debate this decision, but to simply show that the signal of an event has long lasting impacts on public decision making.

3.1.1.4. Other Risk Factors

In addition to the three factors presented above, Covello *et al.* have generated a list, shown in Table 3-2, of the major non-technical factors that are important to risk perception. Each of these factors create conditions that can cause increased or decreased public concern about risk.[35]

These factors are by no means the only concerns for the public. Remediation managers must also understand the complex decision making process that formulates the public's opinions. This process attempts to provide order to an uncertain

[33] Paul Slovic, "Perception of Risk." *Science* 236 (1987) p. 284.
[34] William Rogers, Area Construction Manager, Massachusetts Highway Department, "Reactions to an FBI briefing to the CA/T about tunnel security," October 1995.
[35] Vincent T. Covello, Peter M. Sandman, and Paul Slovic, "Guidelines for Communicating Information About Chemical Risks Effectively and Responsibly," *Acceptable Evidence*, ed. Deborah G. Mayo and Rachelle D. Hollander (New York: Oxford University Press, 1991) pp. 66-68.

❖ Potential for catastrophe	❖ Familiarity with risks
❖ General understanding of mechanisms or processes	❖ Personal control
❖ Voluntariness of exposure	❖ Effects on children
❖ Manifestation of effects on future generations	❖ Dread
❖ Trust in managing institutions	❖ Media attention
❖ History of accidents	❖ Benefits
❖ Reversibility	❖ Origin
❖ Detectability	

Table 3-2: Non-technical Factors that Influence Risk Perception

world.[36] The next section describes mental strategies used not only for risk assessment but for all areas of hazardous waste decision making.

3.2. Public Problem Solving: Heuristics & Biases

Contractors and clients are often confused and frustrated by the public reactions to hazardous waste risks. The public argues about increased cancer risks that are less than one in a million, but does not even address problems that contractors see as much more serious, such as solid waste management. The result: contractors dismiss the community as irrational.

One assumption that contractors make is that because the public doesn't agree with their actions, they must not understand these actions. However at many sites, like at the Norwood PCB Superfund Site, community members and abutting residents have taken the time to teach themselves about some of the technical aspects of remediation projects. Interviews with experts have shown that, in fact, the public is

[36] Slovic, "Perception of Risk," p. 281.

often able to remember particular studies, reports, and commitments regarding a site with an impressive amount of recall.[37]

When the public first gets involved with a project, they usually are unfamiliar with technical remediation issues.[38] In order for the public to voice an opinion or take a particular action, they must use their judgment. Judgment can be defined as "the cognitive aspects of the decision making process."[39] For either the contractor or the public, hazardous waste problems are decision problems – a preference in methodology is required among a number of alternative solutions. These decision problems are unique from other daily decisions because at least one alternative includes a threat to human health.[40] In order for the contractor to communicate their decisions to the community, they must not dismiss the public's actions as irrational. In fact, for the purposes of this research, it is assumed that the public is acting in a fully "rational" manner. The term rationality can be defined here as the decision making process that is expected to lead to the optimal result based on logic and the decision maker's values and preferences. It is therefore assumed that the public is getting involved with a remediation project for rational reasons (i.e. protection of their health, civic duty, etc.) and not for alterior motives, such as sabotage or individual harm.

In rational decision making, the following five steps are generally used to reach an optimal solution: (1) structure the problem or question, (2) gather information, (3) evaluate the information and search for alternates, (4) draw conclusions, and (5)

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[37] Billie Jo Hance, Caron Chess, and Peter M. Sandman, *Improving Dialogue with Communities: A Risk Communication Manual for Government*, New Jersey Department of Environmental Protection, Division of Science & Research (New Brunswick, NJ: Rutgers University, 1991) p. 5.
[38] Paul Slovic, Baruch Fischoff, and Sarah Lichtenstein, "Rating the Risks," *Readings in Risk*, ed. Theodore S. Glickman and Michael Gough (Washington: Resources for the Future, 1991) p. 61.
[39] Max H. Bazerman, *Judgment in Managerial Decision Making* (New York: John Wiley & Sons, 1994) p. 3.
[40] Baruch Fischhoff, Sarah Lichtenstein, Paul Slovic, Stephen Derby, and Ralph Keeney, *Acceptable Risk* (Cambridge: Cambridge University Press, 1981) p. 2

evaluate feedback, or results. Often rational decision makers do not follow all five steps and are satisfied with an acceptable solution, not necessarily the optimal one. Using these steps, there are generally two models that can be used to describe how decisions are made: prescriptive models and descriptive models. When decision makers can reach an optimal solution by using established methods, they are using a prescriptive model. Generally, contractors, engineers, and scientists rely on prescriptive models – hard data and well defined scientific techniques – when making decisions on remediation projects. For example, a toxicologist might use a mathematical model or established formula to determine the health risks at a site. On the other hand, the public does not have the time, energy, or ability to evaluate the data and learn about the science of remediation. The public uses descriptive models to reach a decision combining scientific information provided by the contractor with their own values and preferences.[41]

Since the systematic and time-consuming demands of prescriptive decision making are often not viable for the public, descriptive models must be used to formulate opinions and actions affecting remediation projects. Studies have shown that when people make judgments under uncertain conditions, they rely on a number of simplifying strategies or rules of thumb. Strategies that reduce complex decision making tasks to simple or standard judgmental operations are called heuristics.[42] Generally, heuristics can be useful in making quick decisions, but also can lead to severe and systematic errors. Consider the following example: Robert Page, an executive of a large remediation company in the U.S. once said about the organization structure of his firm that all managers should have between four to six subordinates.[43]

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[41] Bazerman, p. 5.
[42] Amos Tversky and Daniel Kahneman, "Judgment Under Uncertainty: Heuristics and Biases," *Judgment Under Uncertainty: Heuristics and Biases,* ed. Daniel Kahneman, Paul Slovic, and Amos Tversky (Cambridge: Cambridge University Press, 1982) p. 3.
[43] Robert Page, Former Chief Executive Officer, Kellog Rust Inc., personal interview, October 1994.

Using this heuristic can lead to major inefficiencies in the organization. What if an individual manager can handle ten or even twenty subordinates? Although using this heuristic may not produce the optimal organization structure, it is not viable to examine every individual manager's organizational unit. In order to handle the vast number of complex decisions related to organizational structure, this simplifying is useful for Mr. Page in producing general staffing guidelines. Moreover, the heuristic probably produces more good decisions than bad decisions. Decision theorists argue that heuristics are used because the benefit obtained by the time savings of the heuristic outweighs the disadvantages from the potential reduction in the quality of the decision.[44]

While the example above is of great concern to Mr. Page or anyone else involved with organizational structure of a firm, the focus of this thesis is on more general heuristics that affect almost everyone. Hence, the heuristics presented here, as studies have shown, can be generalized across the population and are not specific to individuals. The following sections describe how several heuristics used by the public on remediation projects can lead to severe biases in judgment. The public's use of these heuristics has several implications for the contractor. First, understanding the public's decision making process will make the public seem less irrational and aid in opening lines of communication. Second, with the knowledge that there are general biases that affect the public, the contractor will be able to better anticipate the public's reactions, and possibly address concerns before major problems arise. Finally, when the public does show signs of biases, contractors can communicate the origin of the bias and strive for an optimal solution.

[44] Bazerman, p. 7.

3.2.1. Anchoring and Adjustment

People often make judgments by starting from an initial value and adjusting to render a final decision. The initial value may be suggested by a person's background knowledge, from the presentation of the situation, or even from random information. For example, a construction estimator might arrive at a unit price by adjusting information obtained through his knowledge of other similar projects. This heuristic is a useful tool for the estimator who develop a unit price quickly without spending the time to do many detailed calculations. Studies have shown, however, that adjustments made from initial values are usually insufficient. Choosing different starting points yield different results which are biased toward the initial values. This phenomenon is called anchoring.[45] First, a few studies will be presented to show how powerful the effects of anchoring can be. Then, two case studies will be provided to show examples of how anchoring has affected the remediation process.

3.2.1.1. Studies of Anchoring

Formulation of Problem

In the following study[46] conducted by Russo and Schoemaker, over 100 executives of Fortune 500 companies were broken into three groups. Subjects in the first group were asked: "What is your best estimate of the prime interest rate six months from now?" Their average guess (in 1983 when the actual prime rate was around 11 percent) was 10.9 percent. The first group serves as a control group since the questions was posed without an anchor. The second group was asked: "(1) Do you believe that the prime rate will be above or below 8 percent? (2) What is your best estimate of the prime interest rate six months from now?" The third group was

[45] Tversky and Kahneman, p. 14.
[46] J. Edward Russo and Paul J.H. Schoemaker, *Decision Traps: Ten Barriers to Brilliant Decision Making and How to Overcome Them* (New York: Simon and Schuster, 1989) pp. 88-89.

asked the same questions as the second, except 14 percent was used as an anchor instead of 8 percent. The results are as follows:

Table 3-3: Results from Prime Interest Rate Survey

Unanchored Control Group	Anchored at 8%	Anchored at 14%
10.9	10.5	11.2

The results indicate that the anchor did influence the subject's estimate of the prime rate. Through the formulation of the problem (just by including 8 or 14 percent in the problem), subjects adjusted insufficiently from their reference point. Using an anchor in the formulation of a problem can be used strategically, especially in negotiations on construction projects. For example, if John wants to buy a product for $10, and Jane wants to sell the product for $20, studies of negotiations have shown that John and Jane will usually agree on the price in the middle – around $15.[47] A common tactic in negotiations is to change the anchor. For instance, John might say "twenty dollars is out of the question, and even fifteen dollars is too much." In this way, John has changed Jane's reference point to $15, and the final price is likely to be between $10 and $15. The Central Artery/ Tunnel Project, as discussed in Section 3.2.1.3 provides an example of the public's anchoring in remediation negotiations.

Incomplete Computation

Anchoring not only occurs when the reference point is part of the problem, but also when a person bases an estimate on the result of a partial computation. This effect is illustrated in the following study done by Tversky and Kahneman in 1974.[48]

[47] Richard Thaler, Professor, Sloan School of Management, class handouts from "15.312: Managerial Decision Making," MIT, Cambridge, Spring 1995.
[48] Tversky and Kahneman, p. 15.

Two groups of students had to estimate, within 5 seconds, a numerical expression that was given to them. The first group estimated the following product:

$$8\times 7\times 6\times 5\times 4\times 3\times 2\times 1$$

The second group estimated the following product:

$$1\times 2\times 3\times 4\times 5\times 6\times 7\times 8$$

In order to answer these questions rapidly, the students performed calculations on the first few numbers (assuming from left to right) and then derived an estimate based on extrapolation or adjustment. This procedure should lead to underestimation because only a few calculations were made, and adjustments based on these calculations are typically insufficient. Also, because the product of the first few numbers in the descending series is higher than in the ascending series, estimates from subjects in the first group should be larger than estimates from the second group. The results are as follows:

Table 3-4: Results from Incomplete Computation Survey

Median estimate descending series	Median estimate ascending series	Correct Answer
2,250	512	40,320

This study is useful in showing that anchoring not only can occur through the definition of the problem, but also can occur through the means and methods used to solve a problem. The bias that stems from anchoring, insufficient adjustment from the initial value, can effect experts as well as the public. For instance, either experts or the lay public may favor one alternative over another based on incomplete computations. When parties disagree about decisions made on remediation project, the

contractor or the client (and not the public) has the responsibility to review how the decisions were made.

Irrelevant anchors

Numerous studies have shown that people often assign credibility to random anchors. These anchors could in no way be perceived to provide useful information. In the following study by Russo and Shoemaker[49], college history majors were presented the following problem:

> 1. Write down the last three digits of your home phone number.
>
> 2. Add 400 to your answer and call this number year XXXX. Do you think Attila the Hun was defeated in Europe before or after A.D. XXXX?
>
> 3. In what year would you guess Attila the Hun was actually defeated?

The correct answer is A.D. 451, which very few of the respondents knew. However, subjects' estimates were dramatically affected by their own telephone number as an anchor. The subjects had no logical reason to pay any attention to their own telephone number when making their judgments. The results indicate otherwise:

Table 3-5: Irrelevant Anchors Survey Results

XXXX Range	400-599	600-799	800-999	1000-1199	1200-1399
Mean Response	629	680	789	885	988

This study shows that completely irrelevant information can have a significant effect on our judgments. This fact is useful to know for contractors that are dealing

[49] Russo and Schoemaker, pp. 90-91.

with the public who seem to be making irrational decisions. It is possible that the public is making decisions about remediation projects based on irrelevant facts used as an anchor. Understanding this phenomenon, the contractor is better equipped to communicate to the public simply by being able to eliminate the anchor from the public's decision making process.

3.2.1.2. *Case:* Qualitative Anchoring at Norwood

All of the examples above are numerical examples. However, complex qualitative judgments are affected by anchoring as well. In fact, some psychologists believe that very few organizations ever make decisions by extensively analyzing the problem. Instead, most organizations will develop alternatives that differ only incrementally from past decisions. For example, when a company is developing a new version of a product, they will start from the last version and make incremental improvements from there.[50]

On remediation projects, the public uses qualitative anchors frequently when dealing with uncertainty. At the Norwood PCB Superfund Site, the public, somewhat unfamiliar with hazardous waste, may have formed their opinions by anchoring on nuclear waste – an area that seems to be more familiar to the general public. There are plenty of movies and books which help the public formulate opinions about nuclear waste. The public, realizing that being exposed to PCBs is not as bad as exposure to nuclear waste, adjusts their opinions based on their initial value. The problem is, as discussed above, the public rarely adjusts far enough from their initial value. That is, for some members of the public, their opinion about remediation projects is not likely to stray far away from their opinion about nuclear waste. For example, off-site traffic police expressed concern that even working close to the site would have immediate

[50] Russo and Schoemaker, p. 92.

adverse health effects. By their actions and comments at community meetings, it is clear that fire fighters, police officials, and emergency response crews at Norwood used qualitative anchoring on the nuclear industry to express their concerns about working on hazardous waste remediation project.[51]

3.2.1.3. *Case:* Anchoring During Negotiations at the CA/T

The Central Artery/ Tunnel Project is major urban infrastructure revitalization project taking place in the heart of Boston. As such, the project will disrupt many of those who work and live near the city. Furthermore, as a $10 billion dollar project, taxpayers are very concerned about how their money is spent. Needless to say, community involvement on this project is extremely high. In order to minimize the impact the project would have on the public, thousands of mitigation measures have been taken. Because CA/T does not have uniform procedures for making concessions to the public, it is easy to back down and tell the public, "don't worry, we'll take care of it" during a public meeting in the heat of criticism.[52] A somewhat tenuous comment made by a manager can be taken to be an enforceable commitment by the public. As such, the cost of many small mitigation measures add up to increase the total cost of the project significantly. The following example shows how a community's use of anchoring added to the overall costs of the CA/T project.

The CA/T's construction package C09B3, performed by Modern Continental Construction Company, involves dredging a channel and constructing a casting basin, in preparation for future tunnel construction. Essentially, C09B3 involves removing large amounts of material - material that has been contaminated from three hundred years of systematic fill from local industry. The primary contaminates are petroleum

[51] Jim Diggins, Research Assistant, MIT, personal interview, March 1995.
[52] Barnett, interview

products, coal ash, lead, and even some PCBs.[53] With material excavation taking place a few feet away from the homes of a local artist's community, mitigation measures were obviously necessary. For example, one such measure involved the construction of a temporary bridge to mitigate traffic impacts on the sixty residents of the artist's community. Residents were also concerned about walking along local streets with increased truck traffic from the project. In response, the project agreed to dispose all material by barge rather than by truck. The manager who made this commitment was not at all familiar with the complications of transporting contaminated materials by barge. The process of loading the soil onto the barge, moving the soil to another location, taking the soil off the barge to test the material, and then reloading the material back on a barge to be taken to the materials final disposal site would cost the project an additional $4 million. When thinking about spending $4 million to satisfy sixty residents, the cost is extremely high compared to the benefits.

Clearly it was not in the best interest of the project to maintain this commitment. When the CA/T went back to the community, this time more knowledgeable managers, anchoring quickly became a major issue in negotiations.[54] Let's say that the project originally agreed to $1 million in mitigation measures for the artist's community. Then, in response to community pressure, a manager agrees to dispose all of the material by barge. With the additional mitigation measure, the manager believes that he has just agreed to a total of $2 million in mitigation measures. Final estimates come in, however, and the mitigation measures end up costing a total of $4 million. The manager than wants to go back to his first commitment, $1 million in mitigation measures. The public believes some additional mitigation measures are

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[53] Bechtel/ Parsons Brinckerhoff, *Specifications for Construction Package C09B3. I-90 Fort Point Channel Casting Basin & Material Testing, Draft* (Boston: MHD, July 1995).

[54] Barnett, interview. Note: The numbers presented in this section were approximated by Mr. Barnett for illustration purposes only. While the numbers are representative of what happened, they are not the actual costs involved.

warranted and wants to re-negotiate. The manager's starting point is $1 million and feels that the public's starting point should be $2 million, the agreed cost of the additional mitigation measures. He expects the final cost to be between $1 and $2 million. The public, however, feels that they were promised $4 million in mitigation measures and even the manager was comfortable with spending $2 million . The public wants to negotiate between $2 and $4 million.

At the time of publication, this issue had not been settled. The contractor still does not know whether they will be disposing dredged and excavated materials by truck or barge. Their contract provides unit prices for both options. Clearly the contractor has a vested interest in what the public decides. In the wake of a mistake made by a manager, anticipating the public's anchoring could have saved the project millions of dollars. If the manager had realized that the public's anchor was different than what he expected, he could have used several negotiating tactics to convince the public to change their anchor before further negotiating commitments.[55]

3.2.2. Availability

People often estimate the likelihood of an event by the ease with which instances or associations can be readily brought to mind. For example, an occurrence that is easily imagined, recent, or vivid will be more available from memory than an occurrence which is difficult to recall, old news, or bland. Hence, the more available occurrence will be judged to be more frequent than the less available occurrence. Using available information to judge probability or likelihood of occurrence is called the availability heuristic. Using this heuristic can be a useful tool since more frequent events are often laid open more easily in our mind than less frequent events. However, people judge frequency or probability of an likelihood of an event based on

[55] Thaler, class handouts.

the "ease" of retrieval, not on the total number of examples that come to mind. [56] Furthermore, this heuristic also produces errors in judgment because information's availability is affected by factors other than the frequency of the event.[57] The following experimental studies and case examples illustrate how the public can be powerfully affected by biases that stem from the availability heuristic.

3.2.2.1. Retrievability Studies and Norwood

Although the availability heuristic can be a useful tool, the ease in which information is retrieved can also produce severe and systematic errors. Consider the following study done by Tversky and Kahneman in 1983.[58] Subjects were given one of the following problems:

> A. In four pages of a novel (2,000 words), how many words would you expect to find that have the form _ _ _ _ *i n g* (seven-letter words that end in *ing*)?
>
> B. In four pages of a novel (2,000 words), how many words would you expect to find that have the form _ _ _ _ _ *n* _ (seven-letter words that have the letter *n* in the sixth position)?

Since the first problem is a subset of the second (all words with seven letters ending in *ing* also have *n* as the sixth letter), the number of words in Problem B must be greater than the number of word in Problem A. However, results from the study indicate that most people estimate more words for Problem A than Problem B. Words with the suffix *ing* are very common and therefore more retrievable than words that have *n* as the sixth letter.

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[56] Shelley E. Taylor, "The Availiability Bias in Social Perception and Interaction," *Judgment Under Uncertainty: Heuristics and Biases*, ed. Daniel Kahneman, Paul Slovic, and Amos Tversky (Cambridge: Cambridge University Press, 1982) p. 191.
[57] Bazerman, p. 9.
[58] Bazerman, p. 19.

Retrievability not only affects our vocabulary-search behavior, but also affects our information-search behavior. On remediation projects the public is more likely to approve solutions that they are familiar with. At a town meeting on the Norwood PCB Superfund Site, a resident proposed using a reinforced concrete pipe (RCP) to channel the water from a nearby brook away from the site.[59] RCP would also protect the brook from contaminated groundwater on the site. The resident proposed this solution because he was familiar with building systems. Since this information was retrievable, he believed his solution was extremely common and could not understand why the client was not considering this option. Information that is retrievable to the public is likely to carry more weight than solutions the public has never heard of or do not understand.

3.2.2.2. Recent Information

When people are making decisions based on available information, they are often biased in favor of the most recent information. All of the available information is not considered because recent events are more likely to remain in memory. As an example, the Internal Revenue Service (IRS) uses this bias to achieve a positive end. Every March, the IRS indicts highly visible people or corporations for tax evasion. With the news and media reporting the IRS's indictments, people will remember the dangers of income tax cheating when they file their own returns in April.

Although the IRS uses this bias effectively, relying on recent information can significantly hinder the remediation process. No matter how much information is given to the public, recent information will always be more powerful. Even in cases where the public has learned to accept the risks of a hazardous waste site, a recent

[59] U.S. Environmental Protection Agency, "EPA Superfund Program - Invitation for Public Comment on Approach to Soil Cleanup, Norwood PCB Superfund Site," EPA open house and presentation, Norwood, MA, August 7, 1995.

newspaper article or emergency incident could impact the public's opinion. The effects of this bias are not just limited to the public, engineers can also be fallible. For one large engineering company, when ever a problem arose, typically an engineer would be responsible to analyze the problem and develop a solution. If the expert gave an incorrect solution, as was often the case, the problem would have to be re-analyzed until an adequate solution was found. A manager of the company, who was unhappy with the number of incorrect solutions given, interviewed all of the engineers in order to understand what was happening. What he found was that, up to 50% of the time, the engineers first proposed solutions similar to ones used on other projects that they had been recently working on. The manager estimated that the bias towards recent information had caused the firm to lose $2.6 million a year from incorrect solutions proposed. His conclusion was that "[his] people are superbly trained engineers, but they've never been trained in making judgments." Whether one is an expert or a lay person, many alternatives should be considered unbiased by the most recent or familiar alternative.[60]

3.2.2.3. Vividness at Love Canal

One of the hardest availability biases to overcome is vividness. Because vivid experiences are highly memorable and available, people would give more weight to a single vivid experience than hundreds of pallid experiences. Consider the example of selecting a movie to watch. Any acquaintance telling you his or her opinion of a movie is likely to carry more weight than the opinion of dozens of movie critics.

Vividness can also have an effect in legal settings. Consider the following study by Reyes, *et al.*, who tested two sets of mock juries involved with a drunk driving case. Subjects were told that the defendant had run a stop sign while driving

[60] Russo and Schoemaker, p. 85.

home from a Christmas party and had collided with a garbage truck. No blood alcohol test was done, and the case was based on circumstantial evidence. Subjects were given a series of arguments by the defense and the prosecution. Each of the arguments was presented in a pallid style for one group of subjects and a vivid style for another group. For example:

> Pallid: "On his way out the door, the defendant staggered against a serving table, knocking a bowl to the floor."
>
> Vivid: "On his way out the door, the defendant staggered against a serving table, knocking a bowl of guacamole dip to the floor and splattering guacamole on the white shag carpet."

Subjects were asked to rate guilt right away, and then several days later. The results were that vividness had no effect on the judgments that were made immediately. Both juries voted the same way. Several days later, however, the jury remembered the vivid pieces of information and their judgments were significantly affected.[61] Generally, studies show that vivid newspaper reports or other pieces of information is likely to have a greater impact on a community than hundreds of scientific pieces of information to the contrary.[62]

Vividness is not only widely used in court rooms, but also by the public on remediation projects. Because vivid information tends to distort the public's perceptions of the dangers to human health associated with hazardous waste sites, this information is used by community organizations to assist in reaching their goals. Nowhere was this scenario more evident than at Love Canal in 1978, an incident considered by some to be the beginning of public involvement with hazardous waste remediation projects. Just having moved to Love Canal (near Niagara, NY), Lois Marie Gibbs' son developed asthma, epilepsy, blood disorders and urinary tract

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[61] Thaler, class handouts: "The legal signifance of guacamole."
[62] Thaler, class handouts.

problems. Investigating her son's health decline, Ms. Gibbs discovered that the school her son attended was built on 20,000 tons of toxic chemicals, dumped by a company owned by Occidental Petroleum. Several doctors agreed that her son's health problems were due to toxic chemical exposure. Looking for help, Ms. Gibbs approached people in the local, state, and federal government, but was told "there's no cause for alarm" and "if she didn't like living by the canal, she should move." Having never been in the public eye before, she approached other residents of Love Canal and found that there were many other sick children in the neighborhood. Love Canal residents mobilized focusing on getting attention and influencing policy makers to give the residents what they wanted.[63]

Figure 3-1: Lois Marie Gibbs - Vividness at Love Canal

As hazardous waste was not a major issue in the minds of the public at the time, a report about Love Canal would normally not have generated public interest. However, vividness was used to get attention. Ms. Gibbs personally approached the news media to describe how the Love Canal dump had destroyed her family. The image, shown in Figure 3-1, of a single mother holding her daughter stuck in the minds of the public. People became interested in Love Canal, because they felt that they could relate to the struggle of Ms. Gibbs.[64] Eventually, this vivid image reached the White House, as

[63] Citizens Clearinghouse for Hazardous Waste, Inc., *Ten Years of Triumph* (Falls Church: CCHW, 1994) p. 15.
[64] Mark Fraioli, Director, Student Sierra Club, personal interview, March 1995.

President Jimmy Carter came to Niagara, NY in 1980 to sign an Emergency Declaration to relocate the residents.

As a final note, the use of vividness can be advantageous to contractors as well. For example, a vivid personal story can help a remediation project manager to gain the trust of the public.

3.2.2.4. Availability Affects UNISER

Unfortunately a contractor's reputation can be destroyed by other firms, even if the contractor has developed an excellent relationship with the community due to the public's use of the availability heuristic. One such case existed in Rotterdam, the Netherlands. A small remediation contractor, UNISER, had an excellent reputation with its clients and the community as a whole. UNISER was known for performing high quality work. Their reputation changed, however, when they were caught illegally dumping hazardous materials into the Rhine River. Understandably, people lost faith in UNISER. The tragedy of the situation was that people began to distrust all small remediation contractors. Newspaper articles were highly vivid and retrievable by the public. A single incident caused by a single firm destroyed the reputation of the entire industry. Law abiding contractors, having control over only their own projects, can only regain the faith of the public with time. Contractors should be aware that highly visible current events that can have an impact on their projects.[65]

[65] N. Becher and A. Rappaport, "Hazardous Waste Management Policies Overseas," *Chemical Engineering Progress*, May 1990, pp. 30-39.

3.2.3. Representativeness

> *"Reagan doesn't have the presidential look"* - A United Artists executive dismissing the idea that Ronald Reagan be offered the starring role in the movie *The Best Man*, 1964.[66]

This decision was made by an executive who considered himself to be an expert in his field. After all, he had made hundreds of judgments about movie roles. People often judge the likelihood that event X belongs to set Y on the basis of how similar X is to the stereotype of Y.[67] In this case, the executive had to judge the likelihood that Ronald Reagan fit the presidential image for a movie role based on his stereotype of what presidents should look like. This heuristic is known as the representativeness heuristic.

The case example illustrated above regarding the Rotterdam firm UNISER shows, in addition to availability, how the representativeness heuristic can affect remediation projects. Although some companies may perform better than others, studies show that that the public tends to lump all good/bad companies and good/bad methods together.[68] In Rotterdam, UNISER created the stereotype that all small remediation firms are not ethical. As a result, many remediation firms were also judged to be unethical because they were similar in size or other characteristics to UNISER.

One bias that emanates from the representativeness heuristic is that people are insensitive to base rates and sample size. For example, in Rotterdam, the public failed to consider the base rates – it is much more likely to encounter a good remediation firm than a bad one. Sample size is another important fundamental in statistics which

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[66] Russo and Schoemaker, p. 74.
[67] Thaler, class handouts.
[68] Stuart A. Wright, "The NIMBY Syndrome: Environmental Failure and the Credibility Gap" *Hazardous Materials Control/Superfund, 90*, (Washington: Hazardous Materials Control Research Institute, 1990) p. 101.

is often ignored in our judgments. Advertisers have long realized the sample size is unimportant for the public. For example, in a famous commercial which proclaims that "Four out of five dentists surveyed recommend sugarless gum for their patients who chew gum," there is no mention of the total number of dentists surveyed.[69] Remediation projects rely on the use of statistics. For example, as part of the risk assessment, toxicologists survey the behavior of the community. In using statistics from these surveys, experts and lay persons alike need to pay attention to the base rates and sample sizes so that both parties understand the interpretation of the statistics.

3.2.4. Overconfidence

Knowledge can be broken into two categories: primary and secondary. Primary knowledge can be defined as how much you know. Secondary knowledge is how well you know how much you know. Numerous studies have shown that no matter how much primary knowledge we have, we tend to overestimate our secondary knowledge.[70] Whether an expert or a lay person, most people are grossly overconfident in their judgments based on heuristics. People are even overconfident in their inadequacies – in some situations, people believe themselves to be far more inadequate than any real evidence justifies.[71]

One way to test secondary knowledge is to ask people for degrees of confidence. In a study done by Russo and Schoemaker, a group of senior engineers were asked ten questions about industry-specific facts. While the subjects were familiar with the questions, they may or may not have known the exact answer. The

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[69] Bazerman, p. 23.
[70] Thaler, class handouts.
[71] Paul Slovic, Baruch Fischoff, and Sarah Lichtenstein, "Facts and Fears: Understanding Perceived Risk," *Societal Risk Assessment. How Safe is Safe Enough?*, ed. Richard Schwing and Walter Albers (New York: Plenum Press, 1980) p. 185.

objective of the study was not to test the engineer's knowledge, but to test how well they knew what they didn't know. For each of these ten questions, the subjects were asked to state high and low estimates which indicate a 90% level of confidence. With ten questions at 90% confidence, only one question, on average, should fall outside the high and low estimates. The results were that 50% of the engineers' answers fell outside of the target range. Similar studies of MBA students, physicians, and business mangers also show that people are overconfident in their judgments. Subjects were overconfident even when asked general trivia questions, where the subjects did not have high levels of primary knowledge. [72]

In all of the studies above, subjects were grossly overconfident despite being aware that their secondary knowledge was being tested. In most applications, however, people rarely consider their secondary knowledge. Experts and the lay public alike tend to be overconfident in their judgments on remediation projects, regardless of an individuals primary knowledge. The problem with overconfidence is that it prevents us from making accurate assessments of what we know and what additional information is necessary to make a judgment.[73] Because there is very little certainty in hazardous waste, conflicts arise when experts and the public are overconfident about differing interpretations of data, or differing opinions about alternatives. To counter possible conflicts, it is important to develop people's secondary knowledge, by developing degrees of confidence for decisions made.

3.2.4.1. The Confirmation Bias

A contributing factor to overconfidence is the confirmation bias: people tend to seek confirming evidence, rather than disconfirming evidence. Once initial opinions

[72] Russo and Schoemaker, p. 72.
[73] Slovic, "Facts and Fears," from Schwing and Albers, p. 185.

are formed, new evidence appears reliable if it is consistent with our initial impressions, while contrary evidence is dismissed as unreliable or erroneous.[74] The confirmation bias can have a major impact on remediation projects. Under ideal circumstances, conflicting opinions could be resolved through discussion and further information gathering to reach a compromise. However, studies show that people use additional information to preserve their initial judgment being extremely resistant to changing their beliefs when presented with contrary information.[75]

One method used to counter the confirmation bias is by willing to be wrong. David Ogilvy, Founder of the advertising firm Ogilvy and Mather International, believed in the practice of occasionally running advertisements that were perceived to be "bad." By this practice, the firm constantly challenges its notions of what good and bad advertising is. They learn more from their "bad" advertisements that are successful than they do from their "good" advertisements that are not. The famous Wendy's "Where's the beef?" commercial is an example of a successful advertisement that was perceived to be bad.[76] This strategy can be applied to remediation projects as well. Rather than searching for more confirmatory evidence, contractors should look for data that supports an alternative hypothesis, and then weigh both options. By showing the public that all alternatives have been equally considered, the contractor will be better equipped to justify their preference in alternative.

3.2.4.2. The Hindsight Bias and the Curse of Knowledge

Participation in the lottery in Spain is a national obsession. Although the lottery runs every week, the Christmas drawing is televised and the winners become celebrities overnight. The Spanish media asked one grand prize winner: "How did

[74] Slovic, "Beyond Numbers," p. 51.
[75] R. Nisbett and L. Ross, *Human Inference: Strategies and Shortcommings of Social Judgement* (Englewood Cliffs, NJ: Prentice Hall, 1980).

you do it? How did you pick your number? Why forty-eight?" The winner replied: "For seven nights in a row, I dreamed of the number seven, and since seven times seven is forty-eight, I had to get that number."[77]

Not only does the winner not know how to multiply, but he is also claiming credit for an event that occurred by pure chance. People often use their experiences to claim credit for events they had no control over, or they rationalize their mistakes. As people are overconfident of their own abilities, they are prevented from learning from their experiences. This effect is known as the hindsight bias. Another example of the hindsight bias occurs when football fans display the "Monday-Morning-Quarterback" Syndrome. With hindsight knowledge of the outcome of a game, people believe that they could have made better choices of plays.

The public is likely to be affected by the hindsight bias in many situations on remediation projects. On the Norwood PCB Superfund Site, for example, the public displayed the hindsight bias when EPA decided to change the soil remediation technology from the expensive solvent extraction method to the much cheaper capping alternative.[78] Although making this decision took a careful cost analysis by the EPA, some residents felt that they knew all along that solvent extraction would be too expensive. Like the football fan who knows better than the quarterback, the public is using their hindsight knowledge to gain overconfidence about their own analytical abilities. This overconfidence can create a rift between the contractor and the public.

A related effect is known as the "curse of knowledge." Studies show that people are unable to ignore information that normally should not be considered in

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[76] Thaler, class handouts.
[77] Russo and Schoemaker, p. 173.
[78] Caulfield, thesis, p. 44.

decision making.[79] For example, consider the implications of a judge instructing a jury to "disregard that last statement." Studies have shown that once knowledge is obtained, juries are unable to completely ignore information that was officially struck from the record. On remediation projects, the curse of knowledge has significant effects during the site investigation phase. Due to inefficiencies in the Superfund program, often many redundant site investigations are performed to provide further information or confirm prior studies. Unfortunately, conclusions reached from "independent" additional studies are often biased by prior studies. An example is the inefficient Contract Laboratory Program (CLP), where samples are required to be taken to a laboratory to confirm field analytical methods. Conclusions reached from laboratory results are often biased by the knowledge of the results from the field methods.[80] Having knowledge of prior results or field results has a significant effect on judgment and jeopardizes the value of confirmatory information.

People's search for confirmatory information, and biases due to hindsight knowledge cause people to become overconfident about the beliefs. People have a tendency to use information to support what they already knew, rather than learning from their experiences. Recognizing and addressing people's overconfidence can help break the dichotomy between contractors and the public.

3.2.5. Summary: Experimental Study of Biases

The following study is useful, as it illustrates many of the biases described in this chapter.[81,82] In 1978, Lichtenstein *et al.*, conducted a study of how people

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[79] C.F. Camerer, G.F. Loewenstein, and M. Weber, "The curse of knowledge in economic settings: An experimental analysis," *Journal of Political Economy*, 97 (1989) pp. 1232-1254.
[80] Caulfield, thesis.
[81] Paul Slovic, Baruch Fischoff, and Sarah Lichtenstein, "Facts and Fears: Understanding Perceived Risk," *Judgment Under Uncertainty: Heuristics and Biases*, ed. Daniel Kahneman, Paul Slovic, and Amos Tversky (Cambridge: Cambridge University Press, 1982) pp. 465-481.
[82] Slovic, "Facts and Fears," from Schwing and Albers, pp. 190-202.

perceive risk. Subjects in the study were asked to judge the frequency per year of 41 causes of death in the United States. Some of the subjects could be considered lay persons (students, business people, women voters), while others could be considered experts (toxicologists, environmental policy makers, etc.) The following sections describe the results of this study and other related studies.

General Findings:

Lichtenstein *et al.* discovered that rare causes of death were overestimated while common causes were underestimated. Table 3-6 shows a sample of over and under estimated causes of death. Note that all of the underestimated causes of death listed in Table 3-6 are, in reality, more frequent than those that were overestimated. Homicide, for example, was estimated to be as frequent a cause of death as stroke, although the latter claims 11 times as many lives. The errors in people's judgments can be attributed to biases emanating from the availability heuristic. Frequency of death was overestimated when events were vivid, dramatic, and sensational. However, when events are unspectacular, claim only one life at a time, or are common in nonfatal form, frequency of death was underestimated.

Table 3-6: Bias in Judged Frequency of Death

Overestimated	**Underestimated**
❖ Homicide	❖ Diabetes
❖ Hazardous Waste	❖ Stroke
❖ Auto Accidents	❖ Stomach Cancer

Correlation with News Coverage

In a related study in 1979, Combs and Slovic examined the reporting of causes of death in several newspapers. The results from this study indicate that newspapers

displayed similar biases based on the availability heuristic. For example, diseases take over 100 times as many lives as homicides. Yet, there were 3 times as many articles about homicides than about deaths from diseases. Generally, the biases between newspaper coverage and people's judgments were similar, displaying correlation between 0.89 and 0.85. From these results, it is tempting to conclude that media coverage biases people's perceptions of risk. However, it could also be argued that the media is influenced by people's judgments and values of what is important.

Anchoring

In the study by Lichtenstein *et al*, some subjects were first told the annual death toll from 1 cause (50,000 motor vehicle accidents for one group and 1,000 deaths by electrocution for another group) and then were asked to estimate the frequency of the other 40. As expected, subjects' estimates of frequency of death tended to be anchored on the original number. Due to anchoring on the initial value, the estimates of the two groups differ by as much as a factor of 5 in some cases.

Overconfidence: Experts versus Lay Persons

In another follow-up study to the one by Lichtenstein *et al*, subjects were asked to provide a high and low range with 98% confidence for their estimates of various causes of death. As expected subjects display tremendous overconfidence. While a well calibrated person should be correct 98% of the time, subjects were correct only 68% of the time.

In the studies above, the estimates from the experts were closer to the actual frequency of causes of death than the public's estimates. With the primary knowledge that the experts had, they were less prone to some of the biases described above. However, when experts were asked to state confidence levels, the experts proved to be far more overconfident than the general public. As a result, in the

confidence studies, experts had many more incorrect responses than the public for a 98% confidence level test.

3.3. The Role of Trust in Remediation

> *"Since the 1970s, I've watched a change. In the early days, when we came into a public meeting, we were believed. People walked away relieved or alarmed, depending on the message, but they believed us and felt that we were competent and had the best intentions. Now the presumption is that we're incompetent, that we have a hidden agenda, that they've got to find out the truth for themselves, and that the government is an obstacle in getting the truth."* NJDEP Assistant Commissioner Donald Deieso [83]

This statement by Donald Deieso represents the growing frustration felt by many people who interact with the public on remediation projects. As can be inferred from Deieso's statement, one of the most critical factors in this frustration is the lack of trust surrounding the management of technological hazards. While everyone recognizes that trust is an essential element in human interaction, the importance of trust has not been adequately appreciated on remediation projects. Research indicates that the public's acceptance of risks is strongly dependent on their confidence in risk management.[84] For example, the use of radiation and chemicals is much more acceptable in the medical field than for industrial applications. Medical technologies which pose significant risks, such as x-rays, are acceptable because of our high degree of trust for the doctors who manage these technologies. Since industry and government officials are not trusted, technologies such as solvent extraction and incineration are less likely to be acceptable.[85]

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[83] Hance, Chess, and Sandman, NJDEP, p. 5.
[84] Paul Slovic, "Perceived Risk, Trust, and Democracy," *Risk Analysis*, 13.6 (June 1993) p. 676.
[85] Slovic, "Perceived Risk, Trust, and Democracy," p. 676.

On remediation projects, the field of risk assessment is used to impose a rationality to the management of hazards. Industry and government officials have spent billions of dollars to develop probabilistic risk analyses for hazardous waste sites hoping that risk communication will reconcile the differences between experts and lay people. In fact, numerous government agencies have developed their regulatory efforts based on risk assessments. Despite this dependence on risk assessment, Paul Slovic points out that "there is little evidence that risk communication has made any significant contribution to reducing the gap between technical risk assessments and public perceptions."[86] The impotence of risk communication is based fundamentally on the lack of trust for the managers of risk.

3.3.1. The Contractor's Role - Who is Trusted in Society?

In determining trust, people are unable to separate technology from the carriers of technology.[87] The public's trust of the management of remediation projects is far more fundamental to the perceived success of a project than the choice of technologies or the technical risk on a site. Because trust is so important in remediation projects, as managers of the process, contractors can play a significant role in gaining the trust of the public. Table 3-7 and Table 3-8 are studies that show who in society the public trusts. Both studies indicate that industry representatives and government officials are not as credible as experts and consultants. Information received from independent experts is more readily believed than the same information from industry representatives.[88] Although currently most public involvement efforts are done by the client, the studies below demonstrate that the contractor is more trusted than the client and may be more effective in dealing with the public.

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[86] Slovic, "Perceived Risk, Trust, and Democracy," p. 676.
[87] Wright, pp. 101-102.
[88] Hance, Chess, and Sandman, NJDEP, p. 6.

	agree	dis-agree	don't know
If INDUSTRY REPRESENTATIVES assured me that the technology to ensure a safe and effective disposal of hazardous wastes had been developed, I think I would believe them.	**22**	**75**	**3**
If GOVERNMENT OFFICIALS assured me that the technology to ensure a safe and effective disposal of hazardous wastes had been developed, I think I would believe them.	**26**	**71**	**3**
If SCIENTISTS AND TECHNICAL EXPERTS assured me that the technology to ensure a safe and effective disposal of hazardous wastes had been developed, I think I would believe them.	**66**	**31**	**3**

Table 3-7: Credibility Survey[89]

HIGH	MEDIUM	LOW
• Knowledgeable local citizens • Health professionals • Safety/ emergency response professionals • Professors • Non-profit health organizations • Town officials	• News media • Environmental groups • Environmental contractors	• Industry representatives • Federal/ State government officials

Table 3-8: Who has credibility on remediation projects?[90]

Note from Table 3-8 that generally those in the medical profession are trusted more than environmental contractors. It is possible that the credibility of environmental contractors may improve as the public begins to view both professions as being in the business of improving the quality of human health. However, it is unlikely that industry's credibility will improve as they are seen as the cause of the problem. In fact, as industry develops safer technologies, the public seems to get more, not less, frightened of industry because of the uncertainties surrounding these

[89] Wright, pp. 101-102.
[90] Karson, lecture.

technologies.[91] Again, these future trends in public trust indicates contractors can be extremely beneficial in dealing with communities.

3.3.1.1. Trusting the Contractor at the CA/T

The Central Artery/ Tunnel (CA/T) Project provides an example of where the contractor's involvement with the public can succeed due to greater trust where the client has failed. One of the contracts, constructed by Modern Continental Company (MCCO) required utilities to be constructed under a street surface without disrupting local community traffic. The original contract documents called for two jacking pits to be constructed at both ends of the street underneath the existing Central Artery. With the jacking pits in place, the contractor would micro-tunnel underneath the streets to install utility lines. Although this method satisfies the requirement of minimizing traffic disruptions, it is much more expensive than using the cut-and-cover method of tunnel construction. Compounding these expenses, MCCO encountered a differing site condition making the micro-tunneling method too expensive to be practical. When the client reported this condition to the public, the public's response was: "With all of the soil borings taken at the site, you should have known about site conditions." Since the client was unable to convince the public to allow them to use an alternative method, the contractor decided to talk to the public directly. By carefully explaining the disadvantages of the old method and the advantages of the cut-and-cover method, the public backed down from their initial opposition. In this case, because the contractor was more trusted than the client, they were able to settle on reasonable construction terms with the public. Aside from providing a service to the

[91] Slovic, "Perception of Risk," p. 281.

client by improving their relationship with the community, MCCO retained a high percentage of the savings obtained by switching methods.[92]

3.3.2. Creation & Destruction of Trust

Trust is fragile. Although it takes a long time to establish trust, it can be destroyed by a single event. Once trust is lost, it may take a long time to rebuild or it may never be regained. "When it comes to winning trust, the playing field is not level. It is tilted towards distrust."[93] These characteristics of trust, which Slovic refers to as the "asymmetry principle", pose a significant threat to the development of a solid relationship with the community. Unfortunately, in circumstances of distrust, the only response a contractor can take is to be aware of the factors that inspire trust and be patient with the community.[94] In order to better understand trust, contractors must be aware of the following factors that affect trust:

1. Negative events are more available than positive events. Accidents and errors on hazardous waste sites are newsworthy events. How often does the news media report on remediation activities that are progressing well? In general, trust destroying events are often well defined incidents that are easy to recall for the community. Positive events are usually not as visible or as well defined. Because positive indistinct events are not available to the community, they carry little weight in forming the public's attitudes and opinions.[95]

2. Sources of negative news tend to be seen as more credible than sources of good news. For example, research by Kraus *et al*, examined people's confidence in animal studies. If an animal study showed that a chemical is carcinogenic, people

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[92] Barnett, interview.
[93] Slovic, "Perception of Risk," p. 281.
[94] Hance, Chess, and Sandman, NJDEP, pp. 5-19.
[95] Slovic, "Perceived Risk, Trust, and Democracy," p.677.

found the study to be informative about implications to human health. However, positive results from animal studies were generally not trusted. [96] As another example, during an emergency at the Norwood PCB Superfund Site, even uninformed sources were viewed as much more credible than the experts. This situation is discussed further in Chapter 6.

3. The confirmation bias also affects (dis)trust. People tend to ignore information and actions by those who are distrusted. Hence, by ignoring information from distrusted sources, people do not have the opportunity to evaluate disconfirming evidence. Furthermore, people are more likely to find ample confirmatory evidence for distrust than for trust. This is due to the fact that trust destroying events are more available than trust building events.[97]

4. Finally, studies have shown that negative events have a much greater impact on us than equivalent positive events. This issue is discussed in more detail in the next section.

These factors may seem discouraging to the remediation contractor trying to establish trust with the community. However the first step to improving relations with the community is to understand the root causes of public involvement while recognizing the need for careful management of the remediation process.

[96] Kraus, Malmfors, and Slovic, p. 218.
[97] Slovic, "Perceived Risk, Trust, and Democracy," p.679.

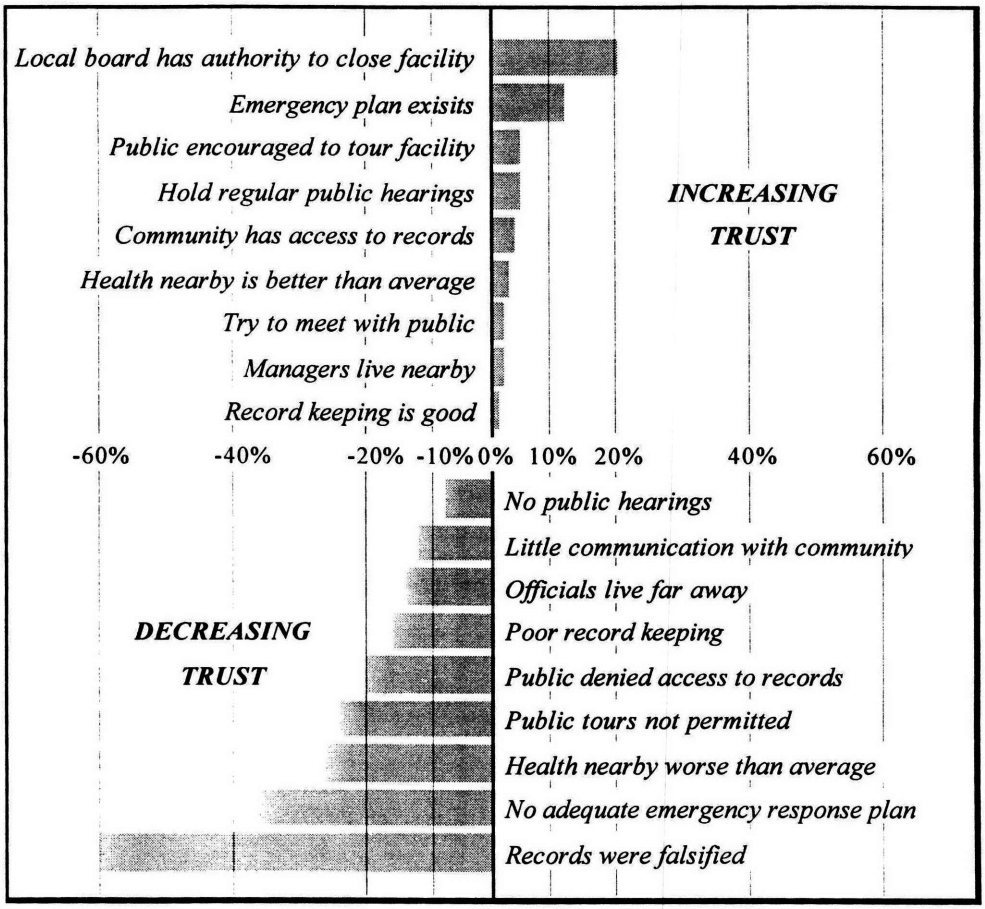

Figure 3-2: Differential Impacts of Trust-Increasing and Trust Decreasing Events[98]

3.3.2.1. *Study:* Trust factors

The following study illustrates the impact that various factors can have on the public's trust of a remediation project. Figure 3-2 presents a summary of research conducted by Slovic *et al.* The table shows the percent of people that would be significantly affected by the events listed. They found that the factor which had the greatest positive impact on the community's trust is if the community itself had the authority to shut down the facility. The factor that was most negative is if records were falsified, or lies were told. Slovic *et al.* also found that generally events presented in a negative light has a much greater impact on people's opinions than the

[98] Slovic, "Perceived Risk, Trust, and Democracy," p.676.

same event presented in a positive light. For example, a project manager living close to a remediation site has virtually no impact on the opinion of the public. However, a project manager living far away from the site is viewed to be not knowledgeable about the community and thus is distrusted. For example, at a public hearing related to the CA/T project, the project manager, Peter Zuk has been asked: "Mr. Zuk, you live in Danvers. What do you know about the residents of Boston?" In this case, the community does not feel that the project manager can address their concerns since he lives far away from the site.[99]

While the distance that a project manager lives from a site is not a factor that a contractor can easily change, other factors, such as allowing the public to have access to records or to tour the site, are readily changed. The negative factors listed below should be avoided where possible as they carry much more weight than positive events. This is not a general statement that the public should always have access to all remediation activities. That decision should be evaluated on a case-by-case basis. However, if distrust is rampant on a remediation project, this research presents a number of factors that can have differential impacts on gaining public trust.

3.3.2.2. *Case:* Otis Air National Guard

At the Otis Air National Guard Superfund Site, subjects were asked to rate the relative importance of the following factors in determining trust for officials responsible for managing remediation projects:[100]

- 50% Caring/ Empathy
- 20% Dedication/ Commitment
- 15% Honesty/ Openness
- 15% Competence/ Expertise

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[99] Barnett, interview.
[100] Karson, lecture.

The Otis Air National Guard study also discovered that generally caring and empathy, the most important trust determinate factor, is gauged in the first 30 seconds of meeting a project official. From these results, it should be noted that technical competence and expertise has the lowest influence on public trust of all of the factors listed above. This study is a disappointing revelation for contractors who rely on and take pride in their own competence. To gain the trust of the public, contractors must train themselves to pay attention to the non-technical factors that determine trust.

To understand the importance of this study, consider the following anecdote.[101] One woman, who resided near a remediation project, was concerned about the activities in her community. Noticing that construction activity was increasing, she approached the contractor to get explanations to questions she had. The contractor, failing to take the time to really understand the resident's questions, starting to explain the technical merits of the project. With her questions unanswered, the resident became angry and distrustful of the project. Despite their best efforts, the contractors could not gain the trust of the resident. Eventually, the resident became so frustrated that she stopped the project by getting federal legislators involved. With the project stopped, the contractors wondered what went wrong. As it turned out, the resident had just moved to Massachusetts from Florida, and was concerned about alligators in her backyard, a natural consideration for a Florida resident. The contractor, ridiculing her fear of alligators in Massachusetts, relied on their technical skills to satisfy the public. This case is an extreme example of how projects can be affected when contractors do not pay attention to non-technical factors.

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[101] Jack Carlson, U.S. Army Corps of Engineers, New England Division, personal interview, May 1995.

4. Public Organizations

> *"The government taught us how to behave. When only two or three of us went to negotiations, we got nothing. When we went with 40 people and said, 'If you don't give us what we want, we'll be here with 4,000 people tomorrow,' then we got what we wanted."* Petru Brait, Romanian coal miners union representative.[102]

Petru Brait's statement reinforces the notion that a united community with one voice can generate more influence than a handful of individual voices. Typically, on remediation projects, multiple citizen organizations get involved. In dealing with these organizations, a knowledge of public psychology of individuals is not enough. Contractors must also understand the characteristics of public organizations and how they operate.

In the wake of an unsuccessful remediation project, contractors and clients may ask themselves "what did we do wrong?" Most public involvement research focuses on this question. This chapter shows that it is important to determine not

[102] Petru Brait as quoted in *The Wall Street Journal*, October 24, 1994. Reprinted in Citizens Clearinghouse for Hazardous Waste, Inc., *Everyone's Backyard* (Falls Church: CCHW, Winter 1995) p. 23

only what the contractor or client did wrong, but also what the community organizations did right.[103] First, the operational structure of community organizations is looked at from a theoretical standpoint. Then, this theory is examined further by looking at a case study of one particular community organization. This chapter concludes by looking at several studies that have attempted to characterize the nature of the public.

4.1. Citizen Group Organization

Community organizations are typically on the outskirts of environmental decision making. The public does not have the power, resources, or skills necessary to influence decisions. As a result, citizen groups often rely on litigation or other extreme measures when decisions are made that seemingly ignore their legitimate claims. Not only do these measures end up unsuccessfully for the community, but they also frustrate contractors and their clients.[104] Nevertheless, conflict – both internal and external – is often the driver of a community organization. Organizations form only when people become dissatisfied with the decisions and actions of government, industrial firms, or remediation contractors. For community organizations to be successful, they face four major tasks: They must: (1) determine what they want; (2) obtain resources; (3) gain attention and create influence; and (4) act to influence the decisions of others.[105]

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[103] Marti Shanks and Melissa Murphy, "Understanding Effective Community Organizations," *Hazardous Materials Control/Superfund. 90*, (Washington: Hazardous Materials Control Research Institute, 1990) pp. 95-97.
[104] James E. Crowfoot and Julia Wondolleck, *Environmental Disputes* (Washington: Island Press, 1990), p. xiii.
[105] Crowfoot and Wondolleck, pp. 2-4.

4.1.1. The Four Tasks for Community Groups

The first task, determining the objectives of the organization, is often the most trying task for the community. Many organizations collapse during this stage because they can not reach consensus about their own goals. Community members bring different values and preferences to the organization, creating internal strife. Since the organization can not be all things to all people, it faces a difficult balancing act. The organization must limit the goals that it can accomplish while satisfying the concerns of its members.[106] In order to establish their goals, the organization must gather information to educate themselves about the remediation process. This education not only comes only in the form of technical knowledge, but also includes learning about the specific players involved in the remediation project.

With the objectives determined, the organization can not be maintained without adequate resources. While funding is clearly an important resource for community organizations, group leaders recognize that they will never be able match the funds of the contractor or their clients. Hence successful community groups tend to focus more on "service-raising" rather than traditional fundraising. For example, instead of renting halls for meetings, the organization turns to members who have access to rooms for no charge. Or, organizations recruit competent attorneys who can donate legal advice and service. In essence, an organization gains more from utilizing the capabilities of their members and their volunteered time than from funding alone. Furthermore, by contributing their own services, members feel an increased allegiance and dedication to the cause.[107]

The third task facing the community organization is to create influence by gaining the attention of other community members, the media, and politicians.

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[106] Crowfoot and Wondolleck, pp. 2-4.
[107] Shanks and Murphy, pp. 95-97.

Organizations use petitions, information sessions, and other non-related organizations to recruit new members. They rely on the media to provide coverage of their activities to raise community awareness. Also, since politicians feel accountable to their voters and view citizen groups to be representative of "the public", it is usually not difficult for community organizations to put pressure on elected officials. With the support of all of these parties, a small community organization can have a major impact on a remediation project.[108]

Given clear objectives, adequate resources, and sufficient support from others, the organization must then act to influence the parties involved with a remediation project. Influencing others involves conflict, something that community groups are no stranger to. However, in resolving this conflict, citizen groups are impelled to develop new skills. Carpenter and Kennedy, pioneers in the environmental dispute resolution process, state that "public disputes are commonly fought by people who are unfamiliar with negotiation but are compelled to negotiate."[109] Aside from negotiation skills, exercising influence requires developing a coherent plan or strategy, and taking specific actions to implement this strategy. These actions require strong decision making, discipline, and adaptability – all of which can be taxing on the community. Successful community organizations learn to remain active, even if there appears to be no activity on a remediation site. This strategy not only keeps alive the momentum of the group, but also helps in getting attention from others. Many community groups are unsuccessful because they react during the removal action phase and remain dormant until construction actually begins.[110]

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[108] Shanks and Murphy, pp. 95-97.
[109] Susan Carpenter and W.J.D. Kennedy as quoted in Crowfoot and Wondolleck, p. 1.
[110] Shanks and Murphy, pp. 95-97.

4.1.2. Community Groups and the Remediation Contractor

Just as performing these four tasks is necessary for the citizen group, understanding these tasks is important for the remediation contractor. How a group handles each of these tasks is a signal to the remediation contractor about the strength and resolve of the community. In order to anticipate potential problems, contractors can learn about the public's concerns by paying attention to the community organizations through each task. Although it is not possible for the contractor to follow the movements of every citizen group, looking for a few signals can be informative about the expected level of public involvement.

During the first task, when the community is defining their objectives, contractors can learn the major issues facing the community. Recall that community organizations are formed only when their members feel that their individual concerns are not being met. Hence, even minor concerns that are not addressed can cause the community to create an organization. By taking minor proactive steps to satisfy these individual concerns, the contractor avoids the major efforts required to satisfy an entire organization.

During the remaining tasks (attain resources, get attention, and act), the contractor can anticipate the skills that the public brings to their involvement with a remediation project. For example, if the public is politically connected, they could have a greater impact on the project. A technically competent public may be more thorough in digesting scientific information. The contractor should also recognize that most community groups remain dormant when there is no activity on site. When on site construction actually begins, the contractor should anticipate a renewed public interest.

4.1.3. *Case:* Citizen's Clearinghouse for Hazardous Waste

Citizen's Clearinghouse for Hazardous Waste (CCHW) is one of the largest environmental organizations in the United States. This case study on CCHW shows how this particular organization accomplishes the four tasks described above.

4.1.3.1. Background and Public Psychology

CCHW was founded in 1981 by Lois Marie Gibbs, a former Love Canal resident. During the 1970's, Ms. Gibbs pushed the federal government to relocate the Love Canal residents affected by hazardous waste. With the success of her activism, other people from around the country wanted help to fight similar battles. Ms. Gibbs formed CCHW as an "environmental justice center", empowering communities to protect themselves from environmental threats and build strong local organizations.[111] One activist once stated that "people [must understand] that in the long run they themselves are the only protection they have,... they can not look for salvation anywhere but in themselves."[112] As CCHW believes strongly in this statement, they do not get involved with remediation projects themselves. Instead, they try to build a movement from the bottom up, acting as an advisor and central resource for local groups.

Over the years, CCHW has worked in many environmental areas including toxic waste, solid waste, air pollution, incinerators, radioactive waste, pesticides, and sewage. One of the many movements which they are known for, is their "McToxics" campaign, where they pushed the McDonalds organization to give up using polystyrene packaging. McDonalds believed they could solve the problem by bargaining with CCHW. However, since they refused to represent others, CCHW put McDonalds in touch with hundreds of local groups who were conducting their own

[111] CCHW Pamphlet on activities.
[112] Ella Baker as quoted in CCHW, *Ten Years*, p. 2

"McToxics" campaign. McDonalds backed down when they realized that it would not be easy to strike a deal. On the legislative front, the organization was instrumental getting SARA Title III (Community Right to Know) passed.[113] In the past year, one of the organization's main efforts have been in its Stop Incineration Now (SIN) Campaign. They look to stop incineration everywhere, calling this year (1995) the "Year to Ban the Burn."[114]

CCHW is an alarmist citizen group that uses many of the psychological principles discussed in the previous chapter to convey its messages. The use of these concepts is shown below from a sample of statements from CCHW publications:[115]

"Everyone's Backyard (EBY)" The title of their newsletter reinforces the notion that hazardous waste affects everybody, hence helping to gain attention and recruit members.

"Any exposure, no matter how small, may lead to adverse health effects." While most toxicologists would disagree with this statement, it influences the way the public views risks. This influence is unfortunate because in some cases, a group's only source of technical information comes from CCHW.

"Dioxin...Incinerators...Landfills...Superfund." Qualitative anchoring is used to present the Superfund program in the same light as other terms which are negatively perceived.

"WANTED! Philip Shepherd is wanted for the participation in the destruction of Kentucky's land, air, water, and people." CCHW uses FBI style wanted posters to provide vivid descriptions of people who take actions contrary to the goals of the organization.

"The real issue is profits not science." Distrust is generated by claiming that the EPA is only interested in maintaining corporate profits and not protecting human health.

"It is doubtful they [industry] aims to live up to their promise."; *"With friends like the EPA, who needs enemies?"*; *"ATSDR* (Agency for Toxic Substance and Disease Registry) *has proven to be a huge failure."* A few more statements

[113] CCHW, *Ten Years*, p. 7
[114] CCHW, *Rebuilding Democracy*, p. 22
[115] Compiled from numerous CCHW publications

from articles that generate distrust for industry, the EPA, and other government agencies.

Regularly published negative articles significantly affect the public's trust of a remediation project.

4.1.3.2. CCHW and the Four Tasks for Community Groups

Citizen's Clearinghouse for Hazardous Waste helps start-up community organizations become strong forces. First, they aid other organizations in defining their objectives and obtaining information. When start up community organizations call them for help, CCHW will often hold workshops on how to structure an organization and help set the agenda for initial meetings. With these efforts, CCHW helps others get through the toughest task facing the organization. As for providing information, CCHW has an extensive library of handbooks, case studies, and technical guides for community groups to use. They will also assist in researching the corporations or government agencies involved with a remediation project, on the request of a local community group.

CCHW also provides information in how to accomplish the next two tasks: obtaining resources and creating influence. Aside from handbooks on these two topics, CCHW also has a network of 8,000 community groups that can be used as a resource for a new community organization. To gain attention and create influence, CCHW lobbies heavily to ensure that their agenda is addressed by the U.S. Congress. If their efforts are not successful, they use tactics such as blacklisting individuals who do not agree with their politics (e.g. the wanted poster described above, or publishing negative news about corporations.) With the connections they have established as one of the largest environmental groups, they are a resource for other organizations who need similar connections.

CCHW does not get involved with the final task, acting to influence others. Instead, they believe very strongly in helping others to help themselves. They hold intense strategy training and technical advice workshops. They will also assist in offering legal advice and support. They focus on creating a strong bond with other community organizations without getting involved themselves.[116]

4.2. Public Surveys

With every site, remediation project managers must ask themselves, "who is the public?" Is the public a few individuals? Is the public a national organization? This section uses several surveys to examine the question of who the public is on remediation projects. While the surveys presented earlier look at the individual, the first survey in this section shows a profile of several community groups. The second study looks for a patterns to the level of community involvement.

4.2.1. Profile of Community Groups

In 1991, the U.S. EPA conducted a survey in part to determine the technical experiences of 232 active citizens' groups and their demographic profile. Overall, most community groups (78%) identified the EPA as their primary contact, even though the EPA was the management lead at only one-half of the associated sites. The first part of this study examines the assumption of many contractors, as discussed in Chapter 3, that the community is unable to handle technical information. The results in Figure 4-1 and Figure 4-2 show that most of the people who joined community groups (64%) had at least some college education. Furthermore, half of the community groups surveyed (50%) could interpret data with adequate technical

[116] Compiled from numerous CCHW publications and from: Todd Hedgenback, Regional Hazardous Waste Coordinator, Sierra Club, personal interview, March 1995.

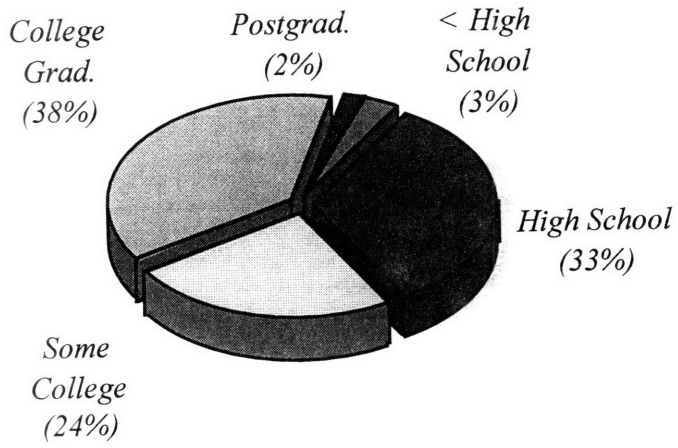

Figure 4-1: Community Group Members' Level of Education

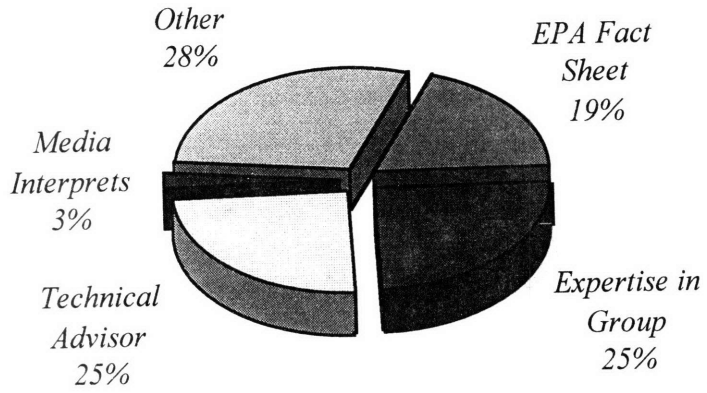

Figure 4-2: Methods Used to Understand Technical Data

ability either through an advisor or through expertise within the group. This study highlights the tremendous advantages that a group has over individuals in understanding technical information. With the greater numbers of the group, they are more likely to have the knowledge necessary to influence remediation projects.

The objective of the second part of this study was to obtain a demographic profile of many citizen groups and their members. A portion of this study is summarized in Figure 4-3 and Figure 4-4. A large number of community groups (47%) had over twenty members and most group members (76%) lived within five miles from a remediation site. These results display the NIMBY syndrome – the

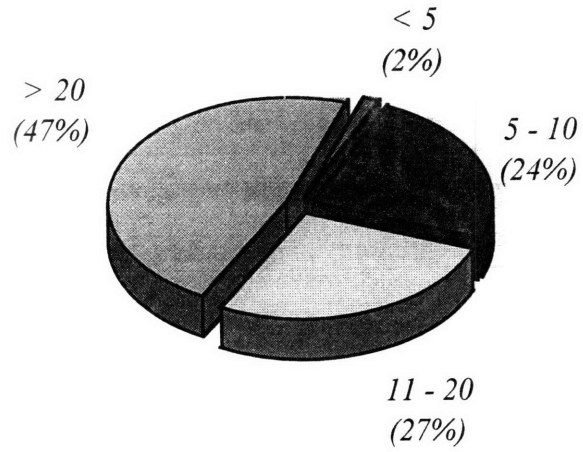

Figure 4-3: Number of Members in Community Organizations

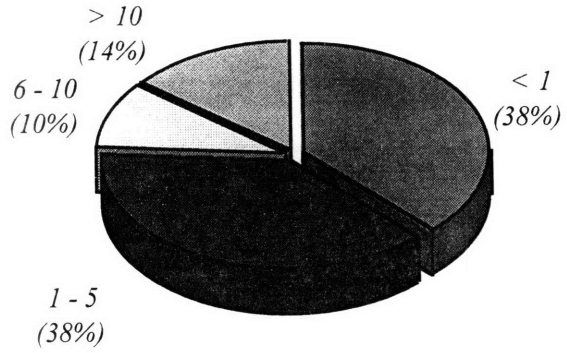

Figure 4-4: Distance from Site Members' Residences

public is mostly involved only with hazardous waste issues that affect them personally. Remediation projects in very close proximity to residential zones can expect to be faced with large amounts of public involvement.[117]

Other surveys also attempt to elicit a profile of the community members involved with remediation members. A survey by the Gallup Organization shows that the largest demographic category of people belonging to environmental groups are middle-income white women, over the age of 30. While there are many explanations

[117] Christine Roberts and Melissa Shapiro, "Superfund Technical Assistance Grant Program: Evaluation of Amendments to the Interim Final Rule," *Hazardous Materials Control/Superfund, 91*, (Washington: Hazardous Materials Control Research Institute, 1991) pp. 34-38.

for why this demographic is so prominent, other demographics are surprisingly absent from many community groups.[118] For example, despite the fact that many hazardous waste facilities are now being located in African-American neighborhoods, minorities remain largely absent from getting involved with remediation projects. Organizations such as CCHW are constantly working to include more minorities, saying that "pollution does not discriminate."[119]

4.2.2. *Case:* Westinghouse PCB Superfund Sites

From as early as the 1950's, the Westinghouse Electric Corporation manufactured electrical capacitors containing PCBs in their Bloomington, Indiana plant. Capacitors with defects were discarded in area landfills, resulting in eight Superfund Sites. The remedy selected, the destruction of the PCB-contaminated material in a municipal solid waste fueled incinerator, has resulted in community opposition. The EPA developed an extensive community relations program which included a public information center operated and maintained by the contractor, Jacobs Engineering Group. With the public information center, the contractor developed two databases to track community concerns. The first database contained information obtained through telephone conversation records (TCRs). The other tracked newspaper reports of local, regional and national news about the sites.

The Westinghouse study allows for a quantitative analysis of the relationship between newspaper articles and TCRs. They found that the number of telephone calls is casually dependent on the number of newspaper articles. A change in the number of newspaper articles is followed by a change in the number of TCRs. This lag between articles and calls may be due to the time it takes the public to decide to

[118] *The Gallup Poll* (1991) p. 86-89.
[119] CCHW, *Ten Years*, p. 43.

make a telephone call, following a newspaper article. If telephone calls increase with greater media attention, they decrease during specific calendar periods. The study also found that there is a decrease in activity during the summer months (July and August) and during the holiday season (November and December).[120]

This study did not examine what event (i.e. on-site activity, EPA held community event, etc.) caused an increase in calls or articles. This analysis could be the subject for further research. Nevertheless, this study is useful in presenting a pattern of public involvement.

[120] Rheta Smith, Sona Chambers, and John Perrecone, "Public Participation Patterns at a Superfund Site During Implementation of Remedy," *Hazardous Materials Control/Superfund, 92*, (Washington: Hazardous Materials Control Research Institute, 1992) pp. 1047-1049.

5. Development of a Plan

> *"An unavoidable trade-off exists between the number of people involved in a decision and the costs – in time, money, and organization, associated with making that decision."* Vig and Kraft.[121]

> *"Experience has shown that in the absence of a solid public involvement program, the resources required to address a hostile public and media... far surpass any effort normally expended up front in a progressive program."* The U.S. Army[122]

These statements represent the ongoing debate about how much public involvement is enough. While some argue that the resources required to adequately involve the public are far too extensive, others claim that these resources are well spent to prevent future conflicts. For those who develop public involvement programs, the concepts presented in the previous chapters serve as a general background for understanding the public. However, a public involvement program (PIP) must go beyond generic strategies – it must be tailored to meet the needs of each type of community and situation. Hence, the goal of this chapter is to give the contractor some tools in creating an adequate, yet cost-effective program. Most

[121] Vig and Kraft, *Environmental Policy in the 1990s* (Washington, DC: Congressional Quarterly, Inc. 1990).
[122] U.S. Army, *Commander's Guide to Public Involvement*, p. 11.

existing publications focus on describing specific activities that can be used to improve public relations. In contrast, it is argued here that before specific activities can be selected, contractors must step back and determine the level of effort that will be required to mitigate the concerns of the public. This chapter begins by describing the PIP itself and the current methods and literature for developing a PIP. Next, several models are presented for determining the level of effort required to involve the public. To show how these models can be applied to actual remediation projects, four case studies are presented. This chapter concludes by describing some further considerations in developing a public involvement program.

5.1. The Public Involvement Program

Currently, public involvement programs are created using the following three steps: research, planning, and implementation.[123] The first step, conducting thorough research about the community, is the key to developing and implementing an effective plan. Research begins by obtaining demographic information. To reach at a demographic profile of the community, the following factors should be considered:

- Number of residents and business that are potentially affected by the project
- Number of active community organizations that could be concerned about the project
- The visibility and proximity of the site to local residents and businesses
- The occupations of the public (i.e. Does the community rely on the facility at the site for employment?)
- The community's level of technical expertise or education
- The influence of local government and the media

[123] U.S. Army, *Commander's Guide to Public Involvement*, pp. 9-23.

- The history of public involvement in the town and the public's attitude towards environmental projects

Having captured some basic demographic information, the next research step is to interview community members. The most effective way to meet the needs of the people is simply to ask them what they expect from the PIP. Community interviews (local officials, the media, local activists, residents, etc.) are perhaps the only way to ascertain the expected level of environmental concern in the community. Furthermore, talking to the community can identify information channels and target audiences.

The second stage of developing a PIP is planning. Based on research conducted in the first stage, a community relations plan (CRP) is written to document specific actions that will be taken to meet the community's needs. The CRP has three components: site background, which provides information about site location, history, and a summary of past environmental concerns; community background, which describes the community demographics, history of public involvement, and summary of community concerns; and a description of the public involvement program, which includes the goals, objectives, activities, and techniques of the program.

After research has been conducted and a plan developed, the final step is to implement the program. Implementation is nothing more than carrying out the activities specified in the CRP. This three step process is widely used on Superfund Sites today. However, as we begin to understand some of the problems with this process, it becomes clear that some modifications are necessary. These modifications are discussed in Section 5.2.

5.1.1. Review of Public Involvement Guides

For every different state and government agency, there is a different set of guidelines for an effective PIP. Even researchers widely disagree on appropriate public involvement methods. This section outlines the wisdom and folly of public involvement handbooks.

5.1.1.1. What the guides are useful for

Although there are few widely accepted methods for developing a PIP, most researchers do agree on a few basic principles for effective communication, known as the *Seven Cardinal Rules of Risk Communication.* Because these principles are so widely accepted, they are repeated below, not as rules set in stone, but as guidelines for communication:[124,125,126]

1. Accept the public as a legitimate partner.
2. Plan carefully and evaluate your efforts.
3. Listen to the public's specific concerns.
4. Be honest, frank, and open.
5. Coordinate and collaborate with other credible sources.
6. Meet the needs of the media
7. Speak clearly, with compassion and simple, non-technical language.

Although many of these principles are somewhat obvious, they are consistently disregarded by community relations officials. Generally, public involvement handbooks are most useful in articulating common sense actions that are often

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[124] U.S. Environmental Protection Agency, Office of Emergency and Remedial Response, *Community Relations in Superfund: A Handbook* (Washington: National Technical Information Service, January 1992) p. 84.
[125] Covello, Sandman, and Slovic, pp. 67-69.
[126] Hance, Chess, and Sandman, NJDEP, pp. 11-19.

forgotten. They provide some useful tips by making broad statements about how to dress or prepare for public meetings, or when to release information to the media.[127]

Many government agency handbooks are also useful in providing suggestions based on what has worked in the past. For example, the EPA's handbook provides sample documentation formats and a case study to provide some initial guidance. This handbook also contains a list of 28 different activities such as workshops, site tours, and news conferences that can be used to mitigate the concerns of the public. For each of these activities, the handbook describes in detail the purpose, the recommended technique, the proper usage, and the benefits and limitations of the activity. This type of reference provides the contractor with a library of activities or techniques that can be used in the public involvement program.[128]

5.1.1.2. Problems with Guides

Beyond these basic principles, however, most handbooks fail to appreciate that developing a PIP is a complex operation that can not be developed by generic methods. Although all handbooks openly agree that all PIPs must be site-specific, the strategies in the guides are static – they provide no guidance about how to handle varying conditions. In fact, some recommendations may be completely inappropriate for a given situation. Below, four fundamental problems with current handbooks are presented.

1. Every agency publishes their minimum standards for public involvement. Often these minimum standards are used as the starting point, where additional measures are implemented only if there is community pressure to do so. Instead of

[127] U.S. Army, *Commander's Guide to Public Involvement*, pp. 31-60.
[128] U.S. EPA, *Community Relations*, pp. A-1 to A-40.

letting the community push the process, officials should attempt to anticipate the level of involvement at the onset and adjust their plan only if necessary.[129]

2. One phase where the reliance on minimum standards is evident is during a removal action. On many sites, guidelines for community relations are often inadequate during this phase. This research has stressed the importance of developing an adequate plan from the onset – for once trust is lost, it may be difficult to regain. Unfortunately, in the absence of many requirements during this phase, many feel that the technical risks associated with a removal action are too great to worry about the non-technical risks. As was the case at the Norwood PCB Site, the public is often ignored during this phase.[130]

3. A third problem is that current handbooks specifically exclude contractors from interacting with the public. Consider the following statements:

> *"One principle must be maintained throughout the program: contractors must never represent, or appear to speak for the Agency ... before the public, other government officials, or the media."* – EPA's policy for the contractor's role in public involvement.[131]

> *"The contractor ... will not directly contact community representatives or groups unless directly told to do so."* – Community relations guidelines for remediation services at the CA/T.[132]

Are these rules appropriate in all cases? This research has shown a number of instances (e.g., New Bedford Harbor Superfund Site, shown below) where the contractor can succeed in community relations activities where the client has failed.

4. The fourth problem is perhaps the most serious. The guides that do shy away from minimum standards, seem to advocate involving the public to the

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[129] Compiled from various handbooks.
[130] Compiled from various handbooks.
[131] U.S. EPA, *Community Relations*, p. 97.
[132] Central Artery/ Tunnel Project, *5th Annual Construction Contractors' Briefing* (Boston: Massachusetts Highway Department, 20 October 1994) p. 5.2.

maximum extent possible. For example, one agency believes that "the public should be involved in all aspects of all decisions whether [these decisions] are considered highly technical or economic."[133] This position is an easy one to take; however, as stated by Sherry Arnstein, "citizen participation is a little like eating spinach: no one is against it in principle because it is good for you."[134] Of course, ideally, citizens should participate in decisions that could affect them. However, involving the public in all decisions can be costly and time consuming. In response, this research agrees with many of the conclusions drawn by the Colorado Center for Environmental Management, who emphasizes that "an extensive community relations program is not necessary at all sites, nor is it always sufficient to allay public concerns."[135]

5.2. A New Model for Developing a Plan

> *"The public is too often wrong headed or too easily mislead and should steer clear of direct involvement in those areas of the policy process that should be governed by experience and appropriate technocratic expertise"* – John Pierce *et al.* [136]

> *"There is little hope for sound policy formulation in these programs until nationwide scientific literacy is actively practiced."* – Dorothy Howell[137]

Just as handbooks contain many different sets of rules, people have varying opinions about the role that the public should play on remediation projects. Some, like Pierce *et al.*, take the extreme approach that the public should stay away from remediation projects. This approach might work in some countries where the public

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[133] Hance, Chess, and Sandman, NJDEP, p. 33.
[134] Sherry R. Arnstein, "A Ladder of Citizen Participation," *The Politics of Technology*, ed. Godfrey Boyle, David Elliot and Robin Roy (New York: The Open University, 1977) pp. 240-241.
[135] Colorado Center for Environmental Management, *Environmental Decision Making: Conflict and Consensus* (Denver: CCEM, 1993) p. 279.
[136] John Pierce *et al*, *Citizens, Political Communication, and Interest Groups* (Westport, CT: Praeger, 1992).
[137] Dorothy Howell, *Scientific Literacy and Environmental Policy* (New York, NY: Quorum Books, 1992).

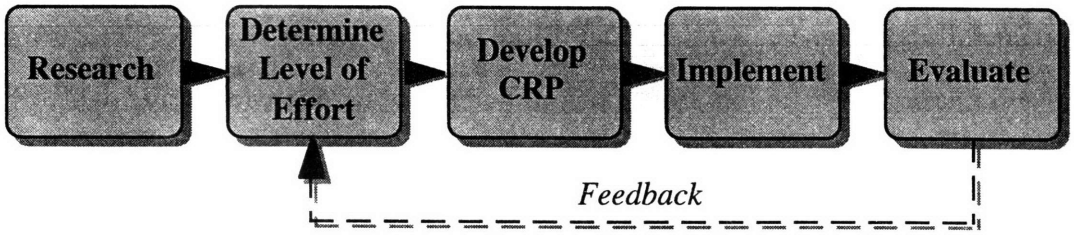

Figure 5-1: A New Method for Developing a PIP

looks to the scientific elite for guidance in policy matters.[138] Others, like Howell, assert that public involvement should be a technical education endeavor. Neither position is right or wrong – these arguments constitute a philosophical debate about the role of citizens in decision making. The objective here is not to debate the merits of these two arguments, but to note that some philosophical judgment is required for determining the level of public involvement at each site. Lacking this judgment, the current three step method (research, planning, and implementation) for developing a PIP is not adequate. The fundamental problem is that the specific activities are implemented without first determining a general philosophy for the level of public involvement.

In response to this deficiency, a new five step process for developing a public involvement program is shown in Figure 5-1. The first step, research, is critical for this new process. For it is this research on which all further activities are based. The second step is determining the appropriate level of effort required. This step is the focus of the remainder of this chapter. The next two steps, developing the CRP and implementation, are conducted based on philosophical decisions made in Step 2. The final step, evaluation and feedback, is important as the PIP is dynamic and can change based on shifting needs of the community. Feedback is discussed further at the end of this chapter.

[138] Slovic, "Perceived Risk, Trust, and Democracy," p.680.

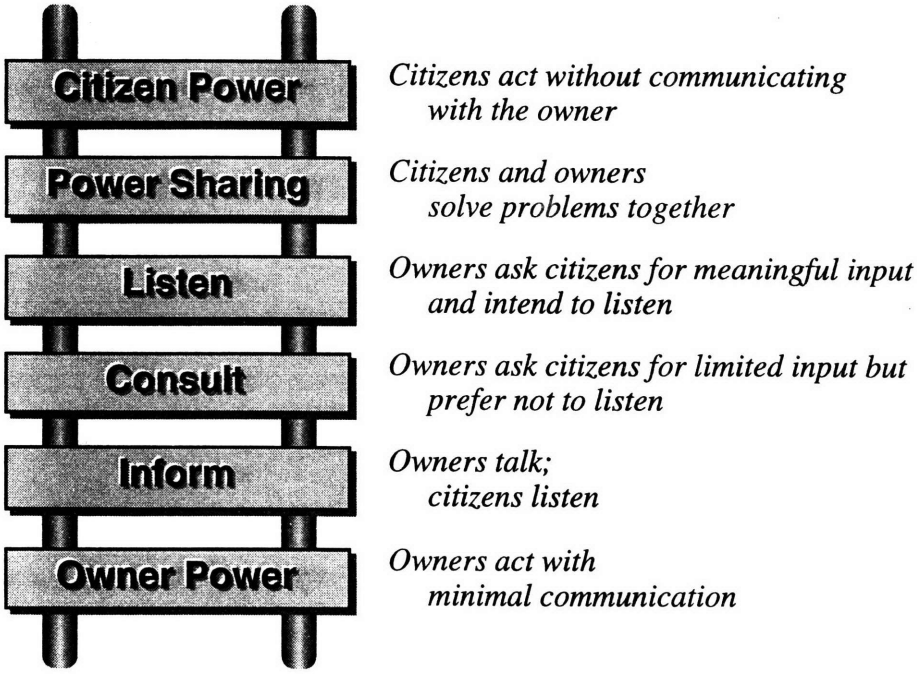

Figure 5-2: The Ladder of Public Involvement

5.2.1. The Ladder of Public Involvement

A useful tool to determine the appropriate level of public involvement is the "Ladder of Citizen Participation." This ladder was first developed in 1971 by the urban planner Sherry Arnstein. In her work, eight levels of participation were arranged in a ladder pattern with each step corresponding to the extent of citizens' power in determining the end product. Although the ladder concept is obviously a simplification of the process, it makes the important point that there can be gradations of citizen participation.[139] This ground breaking work by Arnstein was later applied to public involvement on environmental projects by the Environmental Communication Research Program at Rutgers University. Their ladder, which is currently utilized by the NJDEP, included only six gradations of citizen power.[140]

[139] Arnstein, pp. 240-241.
[140] Hance, Chess, and Sandman, NJDEP, p. 33.

The ladder presented here in Figure 5-2, also with six steps, has been modified from the Rutgers model.

5.2.1.1. Using the ladder

Based on the demographics, history of the community and the cost of public involvement, one of the six steps on the ladder must be chosen as the appropriate level of public involvement. In reality, there may actually be hundreds of different steps with much less sharp distinctions between them. Furthermore, some of the characteristics associated with one step may be associated with other steps as well.[141] Hence there is no well-defined community relations plan that corresponds to each step. Instead, the ladder should be used to create a philosophical basis for developing a plan. For example, deciding that "Inform" is the appropriate step implies that only minimal communication with the public would generally be sufficient or cost beneficial. Although the public may *want* a greater role in these cases, officials have judged "Inform" to be an adequate level of response. This underscores the importance of feedback. The objective of obtaining feedback is not to change the step according to what the public may want, but to re-examine the initial set of assumptions and values that lead to choosing the level in the first place.

5.2.1.2. Site classifications

The six classifications on the ladder specify the relative power and control that the owner and the public have. These steps range from the power being completely with the owner to power resting with the citizens themselves. Because there are very few circumstances where any party can have absolute control, most typical projects

[141] Arnstein, pp. 240-241.

will fall within the middle four categories. Below, each site classification is described:[142]

Citizen Power - Citizen power happens on sites where the owner is not involved at all. In these cases, the citizens take it upon themselves to investigate the site and to obtain some of the resources (not necessarily monetary resources) required to clean up the site. Although currently on remediation projects it is very rare for situations of citizen power to exist, some argue that in the future all sites will be managed by the citizens themselves.[143] An example of citizen power outside of remediation is a volunteer fire department.

Power Sharing - Situations where the owner, the public, and the contractor solve problems together are becoming increasingly more common. At this stage, they agree to share planning and decision making responsibilities through joint management boards or planning committees. Power sharing has become possible because of programs, such as the EPA's Technical Assistance Grant (TAG) program, which provide funding to the community to select or hire their own technical consultants, lawyers, and community leaders. With enough technical knowledge, the public has a meaningful opportunity to participate as an equal partner.

Listen - In this step the public still retains a high level of influence, although some tokenism becomes apparent. While citizens are allowed to advise and plan *ad infinitum*, by participating in advisory boards, informal meetings and public hearings, owners retain the right to make final judgments on the legitimacy or feasibility of the public's advice. One key difference here from the step above is that the public lacks the resources or technical knowledge necessary to be an equal partner.

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[142] Adapted from: Hance, Chess, and Sandman; and Arnstein.
[143] Discussion with Fred Moahvenzadeh, Director, Henry L. Pierce Laboratory, September 15, 1995.

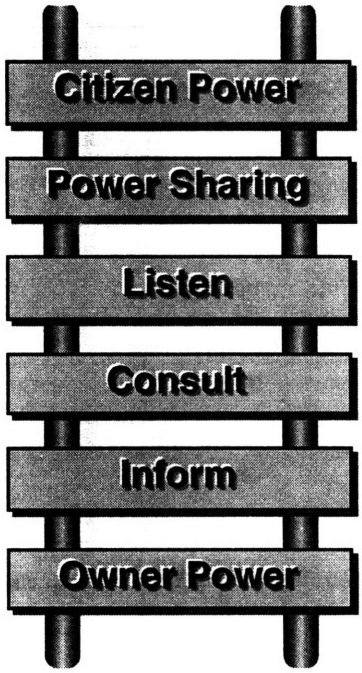
Consult - Typically, owners rarely perform functions that demand much interaction with the public. Hence, on a remediation project, "consult" is usually where owners start. In this stage, the owner holds public hearings and invites comments on formal proposals. However, the public is given no assurance that their ideas and concerns will ever be taken into account.

Inform - In this stage, the public gets all of their information from press releases and informational sources (newsletters, brochures, etc.). Although there may be some public meetings, the emphasis is on a one-way flow of information (from the owner to the public) with no channels provided for feedback.

Owner Power - In these cases, owners do not involve the public at all in the decision making process. In the United States, regulations such as SARA do not allow for owner power to be a likely scenario on remediation projects.

5.3. Micro-Case Studies

The following case studies serve as an example of each of the different classifications discussed above. In all but one of the case studies, the public involvement program matched the appropriate step on the ladder. The one exception is the New Bedford Harbor Site. This case study shows what should have been done at the site. Each of the six ladder steps are represented by a case study except for owner power. The United States legal system prevents owner power as a likely scenario. In other countries, however, this step may be more prevalent. Regardless, it is difficult to write a case study on Owner Power, since as the name suggests, there is very little information available about these sites.



Navajo Superfund Site

Otis Air National Guard Superfund Site

New Bedford Harbor Superfund Site

Norwood PCB Superfund Site

Central Artery/ Tunnel Project

None

Figure 5-3: Case Studies on the Ladder

5.3.1. *Case:* Citizen Power in New Mexico

One of the few cases of citizen power is on the Navajo lands in New Mexico. On this site the Agency for Toxic Substances and Disease Registry (ATSDR), was a critical player in public involvement. The ATSDR is a non-regulatory agency designed to research and evaluate health risks around hazardous waste contaminated sites. On the Navajo Superfund Site, the agency began by advising the community on the health risks associated with uranium contamination. Soon, however, the agency began to realize that public meetings, fact sheets, or newspaper articles were not effective in reaching the community. They were told by local leaders and Navajo staff that the community did not trust outsiders, especially government agencies. Not even knowing the local language, it became clear that someone else needed to handle community relations on the agency's behalf. On the recommendation of local leaders, ATSDR developed a community interaction program that worked through trusted

individuals – community health nurses, tribal leaders, council members, etc. The agency summarized the challenges of this program as follows:

> "Relinquishing control of something as fundamental as communicating basic health messages is difficult for any government agency. In some instances, though, as in this one, it may be the only way to get those messages out effectively. It is vital to listen to those who know their community best and act on their advice, even when it means removing yourself from the picture."[144]

Although rare, the Navajo Superfund Site serves as an example of citizens making decisions themselves about a uranium contaminated site on their lands. The owner, the EPA and the ATSDR, were completely removed from the picture, getting information only when community leaders passed it on. Citizen power as a step on the ladder is appropriate for this site primarily because Navajo residents did not have any trust for outsiders.

5.3.2. *Case:* Power Sharing at the Otis ANG Superfund Site

Project Overview[145]

The Massachusetts Military Reservation (MMR) is located on the upper western portion of Cape Cod. The MMR covers approximately 30 square miles located in towns of Bourne, Sandwich, and Mashpee. This site has been used for military purposes since 1911, containing the units from the National Guard, the Army, the Air Force, The Marines, and the U.S. Coast Guard. The Otis Air National Guard (ANG) Base is one of the military bases located at the MMR. Approximately 7 square miles of the MMR is the cantonment area, where aircraft runways, aircraft

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[144] Lydia Ogden Askew and Robert C. Williams, "Promoting and Evaluating the Effectiveness of Community Involvement in Agency Activities," *Hazardous Materials Control/Superfund, 92*, (Washington: Hazardous Materials Control Research Institute, 1992) pp. 1043-1046.

[145] The National Guard Bureau, the MA DEP, and the U.S. EPA, *Joint Public Involvement Community Relations Plan, Massachusetts Military Reservation* (Cape Cod, MA: National Guard Bureau Public Affairs, Otis ANG Base, June 1993)

and vehicle maintenance facilities, access roads, housing, and support facilities are located. This is also the area where most operations which used hazardous materials took place. The generation of these hazardous materials primarily occurred during the cold war between 1955 and 1972, when military operations were at a peak.

In 1982, the Air National Guard began to identify and evaluate potential areas of contamination at the Otis ANG Base. A preliminary assessment found 21 areas of contamination. By 1987, the contaminates were identified to include: volatile organic compounds (VOCs), polychlorinated biphenyls (PCBs), Polynuclear Aromatic Hydrocarbons (PAHs) and other semi-volatile organic compounds, waste oils, and metals. The soils at MMR are permeable and permit rapid groundwater flow. Hence, many of the residential wells within three miles of the MMR are contaminated with VOCs. In response the DOD provided residents with bottled water until a permanent water supply could be developed. The site was then added to the NPL in November 1989. In 1992, the Record of Decision was signed specifying groundwater treatment and a landfill cover system for soil contamination.

Obviously, the community's major concern about the site was in regard to potential health problems. The residents believed that the high rate of cancer on Cape Cod could be attributed to the contamination on the MMR. In addition to physical health problems, residents were concerned about the stress and mental anguish that people were experiencing from the potential of risk to public health. Other concerns for the public include frustration with the length of time for clean up and the lack of information being passed on to the community. The community relations program is discussed below.

Community Relations Plan[146]

[146] Karson, lecture.

In 1990, the Otis ANG community relations activities changed dramatically following the publication of the first community relations plan. It became clear that, prior to 1990, public involvement activities were woefully inadequate. Prior to 1990, the site met only the minimum National Guard Bureau (NGB) requirements. Public meetings were rarely held and news was published only about significant events. Only some documents were made available to the public through the local libraries. As a result, more than 90 percent of the residents were unclear of the status of any part of the project. In public meetings the residents were hostile and disruptive, accusing the NGB of secrecy and information hiding. Additionally, media coverage of the site was harsh, quoting only the community activists.

After 1990, the community pressured Otis ANG to change their procedures. Some of these changes implemented are listed below:

- The community demanded a single contact person on the base from whom the public could get information.
- Several public groups obtained a Technical Assistance Grant (TAG) to educate themselves about technical issues, allowing them to be equal participants.
- The community requested more regular meetings. In many cases, the public set the agenda for these meetings, or an objective mediator ran the meetings.
- Technical committee meetings were opened to the public and media with sub-committees formed with public representatives. Several management teams were created that involved the public in decision making. Otis ANG even worked with the public on design issues.
- Otis ANG began to implement many of the public's recommendations.

The activities gradually had a major impact on the public's perception of the project. News coverage of the project became fairer and the relationship with the public was less adversarial. Since 1990, trust has slowly been rebuilt.

Site Classification: Power Sharing

With enough technical knowledge from their TAG, the community was prepared to fully participate in decision making. Often setting the agenda themselves or using a mediator, the public and the client after 1990 began to participate as equal partners on sub-committees and management teams. Furthermore, the public's recommendations were often implemented by Otis ANG.

Power Sharing is an appropriate step on the ladder for this site because there are many towns and many residents who are affected by contamination from this site. The permanent residents of Cape Cod are constantly faced with a host of problems, frustrated by summer tourism traffic, artillery fire from the MMR, and groundwater contamination. With all of these concerns on the part of the public, it is not surprising that the community needs high levels of involvement with the remediation efforts on the base.

5.3.3. *Case:* Listen at New Bedford Harbor

Project Overview

The New Bedford Harbor (NBH), located 55 miles south of Boston, is home port for some of the largest commercial fishing fleets in the United States. In 1976, The U.S. EPA discovered high levels of PCB contamination generated by firms which manufactured electrical capacitors following World War II. The New Bedford Harbor Superfund Site covers approximately 18,000 acres with 240 tons of PCB contamination. The clients for this site, U.S. EPA and the U.S. Army Corps of Engineers, selected Perland Environmental Technologies, Inc. to be the remediation contractor.

Public involvement on this site brought the project to a stop and created major liability issues for Perland. Shortly after Perland was awarded this contract, the EPA reversed its previous policy of indemnifying remedial contractors working on Superfund Sites. Perland, now faced with much greater risk, used liability as a significant factor during remedial design. The remediation process used at NBH was: (1) dredge, (2) dewater, (3) incinerate and treat water. During all of these phases, there was concern about the risk of PCB air emissions. The potential for liability due to air emissions would be catastrophic for Perland. A part of Perland's response to minimize their liability was to design and construct a 19,000 square foot building to fully enclose the dewatering portion of the process. This building would also store sediment before incineration. To minimize their liability during incineration, Perland brought on a subcontractor with significant experience in the process, Weston. The incinerator that was to be used had a successful track record on PCB contaminated material.[147]

As the public became involved at NBH, incineration never happened. Because the project site was located in close proximity to residences and several businesses and clearly visible to the public, the EPA put forth a major community involvement effort initially. For example, the residents of New Bedford received a technical assistance grant to educate themselves about the remediation process.[148] However, the EPA reduced their efforts as there was minimal public involvement and media coverage until construction actually began. At the time, there was no reason to believe that the EPA's plan was inadequate until a small group of organized citizens became opposed to the project. This small group, having connections with the U.S. Congress, was able to exert tremendous influence on the outcome of the project.[149]

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[147] Ayres, pp. 47-67.
[148] Hunter, personal interview.
[149] Anonymous, Perland Environmental Technologies Inc., personal interview, November 1995.

If the public involvement efforts were perceived to be adequate, what went wrong? A further examination of the New Bedford community provides some of the answers. New Bedford is a community which relies heavily on its industries. Generally, people choose to live in industrial zones because of the town's employment opportunities. As employees of local industries, most residents trusted responsible parties' efforts to clean up the harbor. Public involvement at NBH was minimal because most residents trusted the parties involved with the site. However, for those residents who were not employed by local industries, the New Bedford community had a long history of battles with the federal government. In one incident, several years before the discovery of PCB contamination at NBH, the federal government mandated the construction of a sewage treatment plant. Many community members felt that the plant permanently damaged the local fishing industry and never recovered from their distrust of the federal government.[150]

From a cursory examination of the community, all factors (close proximity to residents, visibility, etc.) indicate that there should be a high level of public involvement on this site. Trust became the key issue in this case. For those residents that trusted the parties involved, there was minimal public involvement. However, for residents that fostered strong distrust for the government, the level of public involvement was indeed very high. For this small group of residents, the contractor recognized that they could have made a tremendous difference. With government budgets constantly shrinking, Perland felt that it had more experience and more resources in place to handle the public. Nevertheless, the U.S. EPA rejected Perland's offer to handle all public involvement efforts.[151]

Classification of Site: Listen

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[150] Anonymous, Perland, personal interview.
[151] Anonymous, Perland, personal interview.

Public relations efforts were minimal on the site because there was little visible signs of public interest in the project. However, proper research of the site indicates the community has a long history of involvement with environmental projects in the area. Hence, based on this history and because the site is extremely visible and close to residents, the EPA should have classified this site by using the "Listen" step on the ladder. Whereas the public was shut out of previous environmental decisions, the public should have been allowed to attain a high level of influence and participate in the decision making on this project. While the final decision should still rest with the owner, the community would have appreciated the opportunity to participate in choosing incineration as the remedial method.

5.3.4. *Case:* Inform at the Central Artery/ Tunnel Project

Project Overview

The Central Artery/ Tunnel Project is the largest and most complex highway project ever undertaken in the core of a major American city. The $7.9 billion project will improve north/ south traffic flow through Boston, by replacing the elevated Central Artery (I-93) with an underground expressway. The Massachusetts Turnpike (I-90) will be extended past downtown Boston to the Logan Airport through a new tunnel underneath Boston Harbor. In addition the project will carry I-93 across the Charles River, connecting several regional and local roadways. The entire task of building or reconstructing 7.5 miles of urban highway will be completed by the year 2005. When it is complete, it is estimated that the project will save $500 million annually from the reduction of accidents, late deliveries, and fuel burned by idle vehicles.[152]

[152] Central Artery/ Tunnel Project, *Project Summary*, (Boston: Massachusetts Highway Department, October, 1995).

This project is managed by the Massachusetts Highway Department (MHD) with 15% of the funding coming from the Commonwealth of Massachusetts and the remainder paid for by the Federal Highway Administration. Because MHD does not have the manpower or expertise to oversee this project, they have hired a management consultant, Bechtel/ Persons Brinckerhoff (B/PB) Joint Venture, to run the day-to-day design and construction activities. Additionally there are over 50 different government agencies overseeing the project and over 200 design, consulting, and construction firms directly employed by the project. With so many players involved with this project, it is extremely difficult to keep track of what commitments have been made to the public.[153]

Why Study the CA/T?

In addition to an improved transportation infrastructure, the project will also benefit the environment. The project will improve air quality, reducing Boston's overall carbon monoxide levels by 12 percent. The project will also create over 150 acres of new parks. In downtown Boston, 27 acres of open space for parks will be created by the removal of the elevated Central Artery. The largest park will be on Spectacle Island. This island, currently a trash dump, is contaminated with volatile organic compounds (VOCs), polychlorinated biphenyls (PCBs), polynuclear aromatic hydrocarbons (PAHs), waste oils, and metals. This contaminated site will be capped and re-used as a 105 acre recreational park.[154]

Because CA/T is not a typical remediation project, it is valuable to examine how remediation can affect a major construction project. With over 12.4 million cubic yards of excavation taking place over 12 years, hazardous material issues have

[153] William Rogers, personal interview, July 1995.
[154] Chris Barnett, "Material Disposal and Reuse Strategies," lecture notes, American Institute of Chemical Engineers, National Meeting, Summer 1995.

become a major barrier to completion.[155] The remediation costs are expected to be approximately $400 million dollars (roughly 5% of the total project cost). A city built on landfill, Boston is plagued with soil contamination from 300 years of industrial activity.

Remediation Operations

On the CA/T there are three separate divisions (one department in MHD, and two departments in B/PB) that handle environmental operations. Remediation, however, is not handled by any of these three departments. Remediation activities are managed by the ROWARS (Right-of-Way Assessment and Remediation Services) group that falls within the Geotechnical Engineering department. The ROWARS group is responsible for the following areas:

- Initial assessment/ right-of-way acquisition support
- Regulatory compliance
- Field assessment
- Development of plans and specifications related to removal of hazardous materials
- Management of remediation during construction
- Emergency response
- Close-out

Except for actual construction, the ROWARS group handles all phases of remediation, from acquisition of land to final re-use. With construction, ROWARS manages the subcontractors hired for remediation. Because of the tremendous liability associated with hazardous waste, B/PB hired a sub-consultant, Camp Dresser and McKee, to

[155] Barnett, personal interview.

handle all ROWARS issues. CDM's contract for these services is valued at approximately $50 million.

Site Classification: Inform

Being a major infrastructure project in the middle of a city, one would expect a great deal of public involvement with the project. Generally, the project does have one of the most extensive public relations programs of any other major project in the world. However, because the project is so visible and generates enough attention on other issues, remediation issues were kept at a very low profile. This strategy has worked thus far, as remediation issues have not been a major concern for the public in part because there have been very few emergency removal situations. Furthermore, most of the contamination is in industrial or other areas where there are few residents. The major remediation activity, for example, is on an island where the contamination is not likely to pose any threats to human health. Hence, a one dimensional program that simply informs the public is adequate for this project.

Recognizing that remediation would not be a major concern for the public, the project's public involvement program simply informed residents of hazardous material operations in their neighborhood. "We just didn't make a big deal out of [hazardous waste on the project]," according to ROWARS manager Chris Barnett, "and the public responded accordingly."[156] Although all factors indicate that the "inform" step on the ladder is appropriate for remediation on this project, some community members were not completely satisfied with this strategy. Consider the following statement by the Sierra Club, a major environmental organization:

[156] Barnett, personal interview.

> The public participation process was voluminous, extensive, shallow, and unrewarding. It was public participation in name only.... It was a sham."[157]

Even though the CA/T did not meet the needs of the Sierra Club, a higher step on the ladder would not have been effective. The costs associated with developing a more extensive PIP would have far outweighed the potential benefits. Thus, this case highlights the role of feedback. Obtaining negative feedback does not imply that a change in the program is necessary. What is implied, however, is that the assumptions and values used to determine the level of public involvement effort should be re-examined.

5.4. Further Considerations

5.4.1. Emergency Action or Incident

Using the guidelines described in the previous sections can be difficult, but highly effective under most circumstances given enough time to prepare for dealing with the public. During emergency situations, however, it is much more difficult to communicate with the public in a clear and concise manner. Such emergency situations include an emergency removal action or a site related accident. In these cases, the contractor is forced to immediately evaluate the potential threat to human health or the environment and develop stabilization or clean up alternatives.

One factor that emergency responders must consider is that the public perception of risk changes during an emergency situation. Many researchers have defined public risk to be the combination of hazard, the scientific analysis of health

[157] The Sierra Club, letter to the Central Artery/ Tunnel Project, 22 August 1990, published in *Final Supplemental Environmental Impact Report* (Boston: Massachusetts Department of Public Works, 1991) p. IV 5.5-92.

and environmental risks, and outrage, the non-technical factors which influence people's perceptions. While both hazard and outrage are important to people's risk perception, emergency situations add another element – time. The less time that emergency responders have to act, the more risky a situation may seem. Hence, in emergency situations, the following model can be used to describe risk perception:[158]

$$RISK = \frac{HAZARD + OUTRAGE}{TIME}$$

With this model, we see that emergency responders deal with many of the same issues described in this research, but in an accelerated fashion. Similar to normal operations, emergency responders need to spend time understanding the profile and history of the community. However, even in cases where there has been no history of public involvement, an emergency situation may cause a great deal of concern to the public. Hence, responders need to be prepared for any type of reaction – not just rely on whatever public involvement program is in place. While there are no generic methods for emergency situations, research has shown that there are three elements to successful emergency communication: speed, commitment and responsiveness, and candor.[159]

Speed: When incident happens, people want to get information as soon as possible. Unlike normal situations, timely information, even if incomplete or slightly inaccurate, is preferable to complete information that is provided too late.

Commitment and Responsiveness: When an incident occurs, people need to feel that the incident is taken seriously and that the emergency responders are in control of the

[158] Mark R. Carmon and Stephen J. Curcio, "Risk Communication: A Model for Emergency Responders," *Hazardous Materials Control/Superfund, 92*, (Washington: Hazardous Materials Control Research Institute, 1992) pp. 1033-1034.
[159] Ray Germann and L.D. Davis, "Communicating on the Frontlines: Case Studies of Public Involvement During Emergency Response," *Hazardous Materials Control/Superfund, 92*, (Washington: Hazardous Materials Control Research Institute, 1992) pp. 1040-1042.

situation. Contractors can demonstrate commitment by involving upper management and by using whatever resources necessary to solve the problem quickly. Furthermore, it is important to for every stakeholder (town officials, news reporters, community organizations, etc.) to feel that they are an important part of the process. This issue was handled particularly well during the recent Oklahoma bombing incident in 1995, when every stakeholder (law enforcement officials, government officials, etc.) stood unified behind the spokesperson delivering news to the public.

Candor: Trust becomes even more important during emergency situations. Trust is best achieved when emergency responders are caring, empathetic, honest, and clear.

5.4.2. Evaluation and Feedback

Obtaining feedback, the final step of developing a public involvement program, is one of the most difficult parts of establishing a community involvement plan. Often the adage, "no news is good news", is the only criteria that can be used for evaluation. Programs are deemed successful if the work a contractor is doing is not newsworthy or controversial enough to warrant coverage. Generally, the problem with evaluating community programs is that there is no baseline for measurement: every program operates in a different set of conditions. Hence, in absence of formalized evaluation instruments, feedback is best obtained by a very simple method: asking the community about how well programs are working and what can be done to change. Feedback can be obtained by examining the letters, telephone calls, and comments received from the public. For example, a large volume of letters may indicate the contractor was not effective in dealing with the community. However, if letters are all from attorneys, then the contractor's community relations activities did not reach the public at large.[160] Therefore, trends in the type of feedback received

[160] Askew and Williams, pp. 1043-1046.

may be as important as the specific content of the feedback in revealing how a plan has actually worked.

What ever method is used, community relations plans need to contain procedures for obtaining feedback from the public. This will enable the contractors to improve their services in the future, meet the concerns of the public, and check if a plan is working as expected. However, it should be reminded that just because the public may want a more extensive program, it may not be cost beneficial to increase the level of effort. Instead, feedback should be used to re-examine the philosophy and assumptions that lead to choosing the level of effort.

6. Case: Norwood PCB Site

6.1. Project Overview

The Norwood PCB Superfund Site is located off of Route 1, a busy highway, in Norwood, Massachusetts, approximately 14 miles southwest of Boston. The area south and east of the site primarily consists of commercial properties, while the area north and west of the site is a residential neighborhood known as the Meadow Brook Area. The Meadow Brook, a tributary of the Neponset River, borders the site to the north. The site itself consists of two lots covering 26 acres. The smaller lot contains an industrial gear manufacturing building owned by Grant Gear Works. The larger lot has been developed after the discovery of soil contamination into Kerry Place office park. A map of the site and surrounding area is shown in Figure 6-1.

The building owned by Grant Gear was built in 1942 for the Benedix Aviation Corporation to produce navigational control systems and conduct electronic research for the U.S. Navy. It was subsequently owned and operated by several companies who used the facility exclusively for the manufacture of electrical transformers and capacitors. The site is contaminated with Polychlorinated biphenyls (PCBs), which

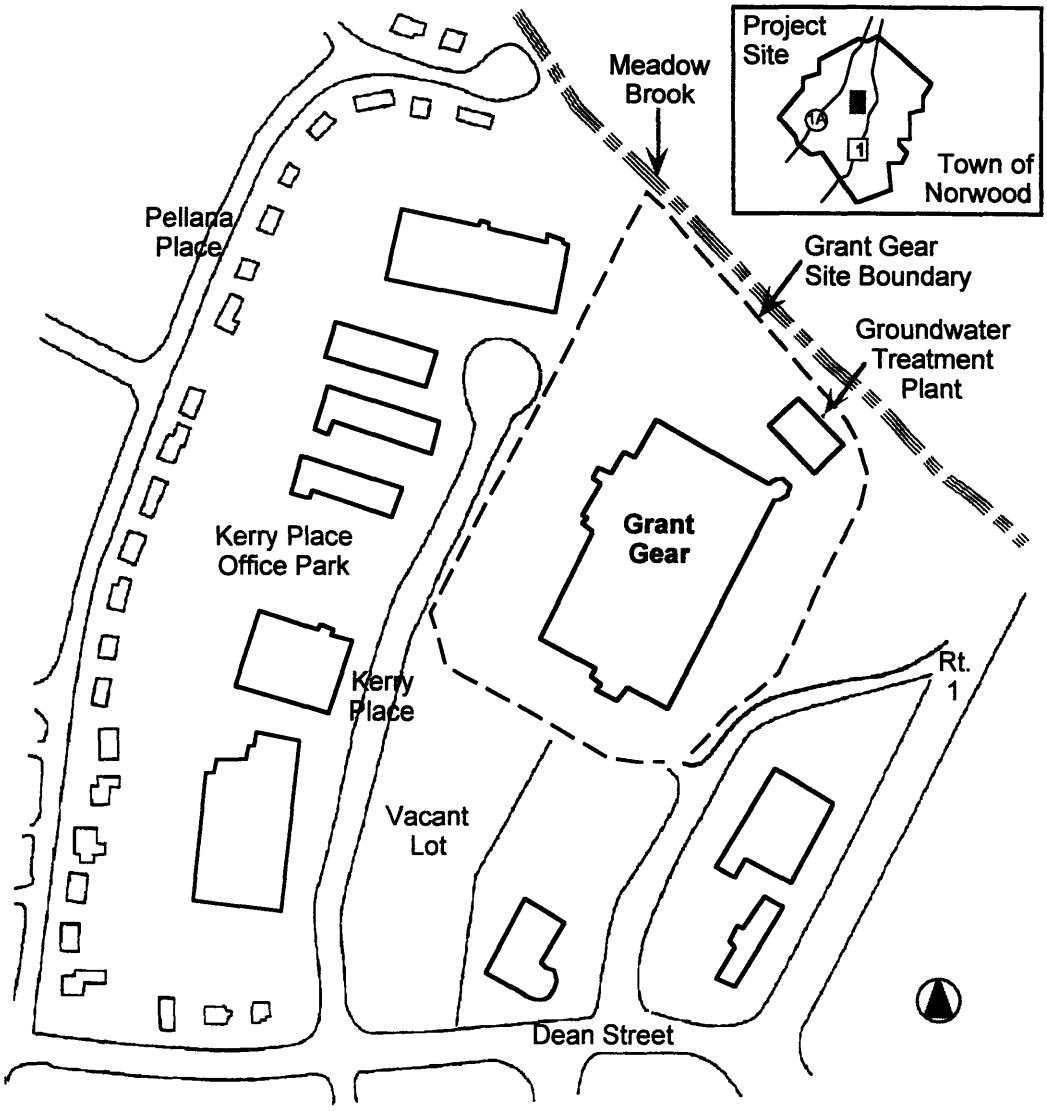

Figure 6-1: Norwood PCB Superfund Site Map

were widely used as insulators and coolants in electrical transformers and capacitors until 1977 when TSCA (Toxic Substances Control Act) banned their use.

The EPA learned about potential contamination on April 1, 1983, when a Norwood resident complained to the DEP that the field was contaminated with industrial waste. The initial investigation found no volatile organic compounds (VOCs) or radioactive contamination. Further investigation discovered that soil samples taken contained very high levels of PCBs. PCB contamination has been

discovered in the soil on-site, in the sediments along the Meadow Brook, and inside the Grant Gear building. Additionally, the groundwater beneath the site may be contaminated with VOCs. The town does not rely on groundwater for drinking purposes.

Grant Gear refused to fund the clean up since they did not use PCBs in their operation. Hence, on June 21, 1983 EPA authorized funds for an emergency clean up and soon thereafter began the removal action. The emergency clean up was designed to remove only 518 tons of highly contaminated soil because it was in an area heavily frequented by residents. Access to the Grant Gear property was restricted by a fence. As a protective measure, in 1986, the DEP constructed a cap consisting of a fabric liner covered with six inches of gravel to protect workers at Grant Gear from PCB exposure. These measures temporarily address PCB contamination until the remedial action, when a permanent solution to hazardous waste contamination would be implemented. In 1986, the Norwood PCB site was listed on the National Priorities List (NPL), qualifying it for federal funds under the Superfund program. The Remedial Investigation/ Feasibility Study (RI/ FS) began in 1987 to quantify human health risks and propose a number of remedial alternatives. The Record of Decision (ROD) was signed in 1989 identifying on-site solvent extraction as the preferred soil remediation technology. In this treatment process, the PCBs bond to a solvent which is used to wash the soil.[161]

Following the signing of the ROD, the site was in the remedial design phase until late 1993, when Foster Wheeler (formerly Ebasco) was selected to complete the remedial action. In 1994, FWEC began construction of a groundwater treatment facility and clean up of the Grant Gear building.[162] Although groundwater treatment

[161] *Sources:* Major Brian Baker, U.S. ACE, personal interview, May 1995; Patricia Sumner, FWEC, personal interview, May 1995; and other sources as cited in References: Norwood.
[162] U.S. EPA, "Fact Sheet, Norwood PCB Superfund Site - Countdown to Cleanup," Spring 1994.

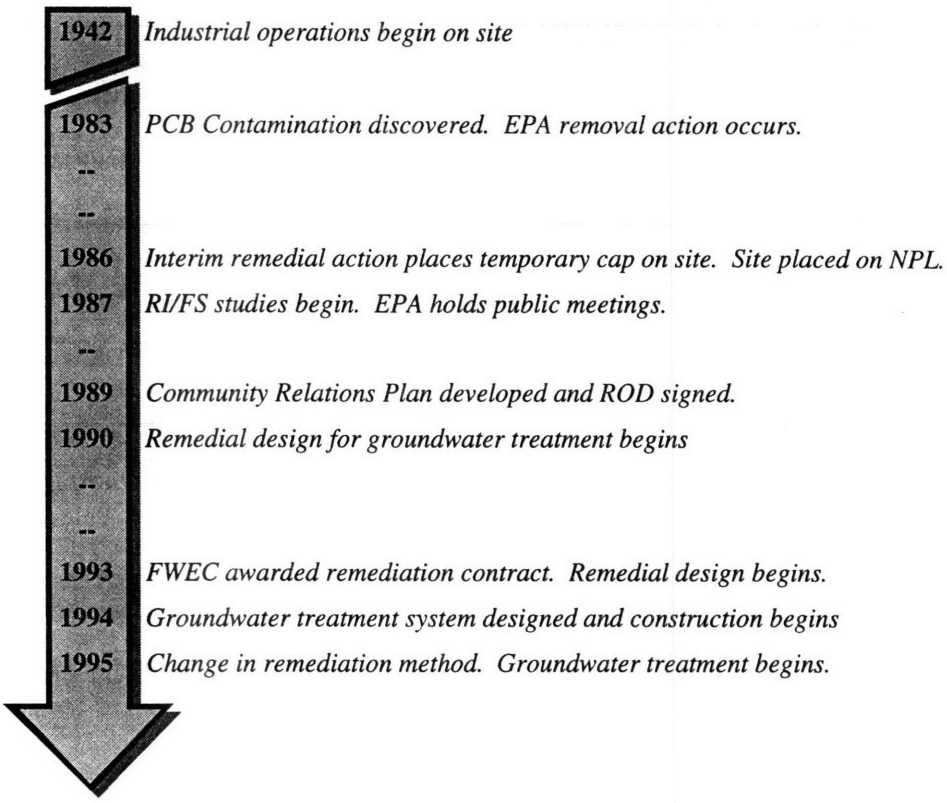

Figure 6-2: Norwood PCB Timeline of Activities

facility was completed on schedule in the fall of 1995, soil remediation using solvent extraction did not begin as scheduled. In August 1995, the EPA announced that the innovative solvent extraction method was too expensive, and a permanent cap would be constructed instead. This remedial alternative continues to be discussed to date.[163] Figure 6-2 shows a timeline which summarizes the history of the Norwood PCB Site.

6.1.1. Community Relations Organization and Program

Initially, in 1983 the state DEP was the only government agency involved with the investigation of the site. Once the removal action began, however, the EPA became responsible for the oversight of this remediation project. With U.S. Army Corps of Engineers providing technical assistance during the design phase, the EPA

[163] *Sources:* Major Brian Baker, letter to the author, 4 December 1995; and other sources as cited in References: Norwood.

decided later to assign the Corps to the management and administration of the project in 1993. In December of 1993, the Corps awarded a $260 million Total Environmental Restoration Contract (TERC) to Ebasco Services which has since been bought by Foster Wheeler Environmental Corporation (FWEC).[164]

Figure 6-3 shows the organization of community relations at Norwood PCB. Formally, the public's main interaction with the site is through the EPA, the official voice of the site. The DEP and USACE are supporting players in community relations, occasionally speaking to residents and maintaining a presence during town meetings. The contractor, FWEC, only provides background support of community activities. They interact with the public by answering some technical questions. FWEC is also charged with supporting the assembly of the community relations plan.[165]

The community relations plan (CRP) is a site specific plan designed to provide timely information and encourage communication between the EPA and residents, local officials, and employees who work with companies located on the site. The program also allows for the public to provide input to EPA decisions regarding site clean up. There are four main goals of the CRP:[166]

1. Provide timely, clear, and accurate information to area residents.
2. Keep local officials informed of site activities and enlist their support and participation in the CRP.
3. Provide opportunities for public involvement and discussion.
4. Ensure that local news media are informed of site activities and are provided with accurate information.

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[164] Diggins, thesis.
[165] Baker, personal interview.
[166] Ebasco Services, Inc., *Final Community Relations Plan for the Norwood PCB Site* (Norwood: Ebasco, 1989) pp. 14-15.

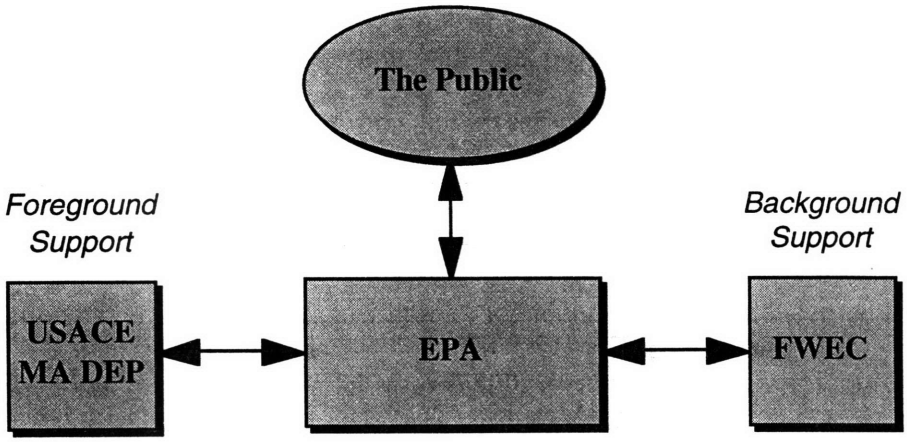

Figure 6-3: Organization Structure of Public Involvement at the Norwood Site

6.1.2. Community Profile

The town of Norwood has a population of approximately 30,000 residents. The residential area around the site is a tight-knit middle class neighborhood with single family homes. In addition to its residential areas, Norwood hosts many car dealerships and retail outlets along Route 1, a heavily traveled, divided highway. Given the residential character of the neighborhood, one would expect the public to be involved with this project.

There are three main types of organizations representing the interests of the public: the Norwood town government, several local newspapers, and one citizen's organization. The Norwood town government consists of a five-member Board of Selectmen, who appoint a General Manager to handle day-to-day affairs. As the Norwood town government is a trusted public resource for community members, town officials have been highly involved with this project from the beginning. There are 8 major newspapers and 12 radio and television stations that report on the activities at Norwood PCB. Town residents were less trustful of the media, as news

coverage seemed to be damaging the secure reputation of the town. There is only one neighborhood group representing the people at Norwood, the Meadow Brook Association. This organization is discussed further in Section 6.2.[167]

6.1.3. History of Community Concern

6.1.3.1. Emergency Removal Action in 1983

On June 8, 1983, the announcement of DEP's discovery of PCB contamination shocked the Norwood community as the site had been used for years as a children's playground. The fact that a neighborhood playground in a quiet New England town was contaminated with PCBs became a national news story. Local newspapers continued to cover the "PCB crisis" in Norwood on an almost daily basis until the clean up was completed in August. All of this media attention provided no benefits to the residents of Norwood. News stories were sensational and, at times, inaccurate. Constantly pursued by the media, the residents refused to talk to them.

Adding fuel to the fire was that the EPA's emergency clean up action did not include any community relations activities. Clearly the residents needed a trustworthy source to obtain accurate information that addressed their concerns. In response, the town of Norwood, lead by General Manager John Carroll, began an intensive education and information dissemination program. Beginning as early as June 11, 1983 (three days after the discovery of contamination), Carroll and other town officials hand-delivered over 17 letters to area residents explaining the status of EPA clean up efforts and other relevant information.

On June 16, 1983, the town held its first public meeting to discuss the discovery of PCB contamination. Attended by over 150 residents and government

[167] Ebasco, *Final Community Relations Plan*, p. 10.

officials, the public was highly concerned and frightened by recent events. Obviously, their main concern was that they or their children might suffer adverse health effects due to exposure to PCBs. Two programs were established to allay the public's fears. The first was a blood testing program conducted by the Massachusetts Department of Public Health (DPH). Beginning in early July of 1983, the DPH began the blood testing of 97 residents who had the most direct contact with the site. Public concern about the site was significantly reduced when the DPH announced that all of the blood samples taken showed normal levels of PCBs. The second program was conducted by the DEP to test the soil in yards that abutted the site, and other soils which originated from the site but were moved to other properties. Again, residents were relieved to know that the contamination appeared to be confined to the site.

In addition to the testing programs, the EPA's response to the PCB discovery also had a major impact on the public's opinion of the Superfund process. Extremely quick and incident free, the community expressed satisfaction with the clean up process. The only complaint that residents had was that they were scared and confused by the mixed messages given by local and federal officials regarding precautions to be taken during the removal action. While the U.S. Center for Disease Control (CDC) warned residents to close their windows and stay indoors, town officials stated that such precautions were not necessary. The state DEP and the EPA were also sending mixed messages. With summer temperatures exceeding 90 degrees, the EPA finally announced that individual precautions were optional as dust control measures were being used at the site.

Overall, public involvement was understandably high during the emergency action in 1983 given their concern about potential adverse health effects. Blood testing, soil sampling and quick and efficient operations reduced the public's concern

about the site. The action lacked, however, a single agency responsible for providing accurate and timely information to the public.[168]

6.1.3.2. Between the Emergency Action and the ROD: 1984 - 1989.

Following the 1983 removal action, public involvement with the site was low because residents believed that all of the PCB contamination had been removed from the site. A year after the emergency clean up in 1984, the EPA proposed the Norwood PCB Site for the National Priorities List (NPL) for the purpose of using federal funds to eliminate any long-term low-level risk associated with PCBs. Town officials were surprised to learn that all of the PCBs were not removed from the Grant Gear property. Noting that, according to the 1983 blood test results, nobody had been adversely affected by PCBs, the town believed that the "PCB issue was highly overrated." The town did not feel that remedial action was necessary because it created the impression that people's lives are in jeopardy.[169]

Although the community was confused from learning the PCBs still existed on the site, public involvement did not increase until 1986, when the DEP implemented an Interim Remedial Measure (IRM). Due to concerns about the safety of workers at Grant Gear, the IRM included constructing a fence and covering contaminated soils to limit access to highly contaminated areas. Since the use of IRMs are somewhat unusual, site activity in 1986 renewed the fears for some residents about potential adverse health effects.[170]

1987, the start of the RI/ FS, represented the first time the EPA had met with the general public since the 1983 emergency action. At that time, the major concern

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[168] *Sources:* Baker, Sumner, and other sources as cited in References: Norwood.
[169] Town of Norwood, *Selectmen's Meeting Minutes*, 23 October 1984.
[170] U.S. Environmental Protection Agency, *Norwood PCB Superfund Site Responsiveness Summary,* September, 1989.

for most residents was schedule delays and lack of communication about site activities. Community involvement with the project increased greatly, however, when preliminary results from the remedial investigation indicated high levels of PCBs in and along the Meadow brook. Because residents were concerned about children playing near the brook, town officials posted warning signs and authorized construction of fence along Meadow brook. Residents were also concerned that brook flooding during heavy rains may spread contamination into their yards and basements. Due to considerable public concern, several federal and state legislators got involved with the project to attempt to expedite the clean up of the brook. The activities at Norwood again received heightened media attention.[171]

Despite congressional and media attention, public involvement, for the most part, remained low to moderate through the RI/ FS process. Through several information meetings and public hearings, the RI/ FS process was the first time that the public had the opportunity to make formal comments about the site. Not surprisingly, the public expressed their great discomfort with the schedule and safety of EPA operations. What was surprising, however, is that the public feared the solvent extraction method, the EPA's preferred alternative. One resident expressed his concern about using a solvent to remove the PCBs from the soil as follows:

> "It has been my experience that the EPA and medicine find additional carcinogens every day of the week... you can't eat this and you can't do that. If we are resolving the PCBs, we shouldn't be letting other chemicals into the brook. Better left undone, than bring more chemicals in there in the process."[172]

In addition to the safety of using a solvent to remediate the soil, residents were also concerned about the reliability of this innovative method, having never been used

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[171] U.S. EPA, *Responsiveness Summary*; and other sources as cited in bibliography.
[172] Mr. Robert Evers as quoted in: U.S. Environmental Protection Agency, *Transcript of the August 24, 1989 Public Hearing*, September 1989.

before on this scale. Instead, many residents preferred on-site incineration because it is a proven technology. Ironically, the EPA did not consider incineration because they did not believe that the state or community would accept such a remedy.[173]

Soon after a series of public meetings in 1989, the EPA published their Responsiveness Summary, a document which summarizes and responds to major community concerns. Since 1989, design, construction, and operation have all commenced on the site. Through these phases of remediation, public involvement has remained relatively low despite ongoing visible site activity. This year, however, two separate events – a small emergency incident and a possible change in remedial alternative – have evoked some community reaction. These events are discussed below.

6.1.3.3. Emergency Incident Management[174]

On January 16, 1995 at 0410 hours, the Norwood Fire Department responded to a fire alarm at the Grant Gear Building. Six fire personnel entered the building wearing turn-out gear and self contained breathing apparatus (SCBA). By the time firefighters were inside the building, the fire had already been extinguished by the sprinkler system. Although the building was filled with smoke, the fire itself had been minimal, confined to a small area (approximately 25 square feet). As required, the contractor's Site Safety and Health Officer (SSHO), Patricia Sumner arrived on the site within a few hours of the incident. Through real-time air monitoring, Sumner determined that there were no readings above normal background levels were detected. Foster Wheeler work crews, wearing Level B protective gear, ventilated the building , removed 350 gallons of water from the Grant Gear floor, and constructed an outside storage area to secure all waste materials.

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[173] U.S. EPA, *Responsiveness Summary.*
[174] *Sources:* Baker, Sumner, and other sources as cited in References: Norwood.

Apparently, the fire started in, or near, a pile of polyethylene bags containing metal filings and rags that had been moistened with Limonene, a flammable solvent used to remove PCBs from the factory machinery inside the Grant Gear Building. The fire also affected a wooden crate containing machine accessories and there was also some water damage from the sprinkler systems. The source of ignition of the fire was never discovered.

As no injuries were sustained, there was no reason to believe that site personnel had any significant exposure to PCBs or Limonene for three reasons. First, personnel did not come into direct contact with Limonene. Second, all personnel used respirators which would prevent any inhalation exposure from the smoke. Third, PCB contamination in the building is in very low concentrations, with no PCBs in the air and only minute quantities on the factory machines. Because there was no dangers to human health and very minimal property damage, this incident should not have become a major issue. However, as discussed in Chapter 3, this incident, having a low probability of occurring and potentially high consequences, serves as a signal event. What the event signals or forewarns has a greater impact on the public than the direct harm from the incident. This emergency incident at Norwood served as a signal not just to the NFD, but to firefighters all across the country.

Among other warnings, this small fire signaled the importance of proper communication with emergency response personnel. Upset and confused by the handling of the fire, Norwood Town Selectman William Butters stated: "I think there was a hell of a lack of communication there and God knows what could have happened."[175] This communication gap resulted because the responding firefighters did not have any information on Limonene. "We don't know what the health hazards

[175] William Butters as quoted in: Bill Archambeault, "Butters questions handling of fire at Grant Gear factory," *Norwood Times*, 20 January 1995.

are," stated Captain Mark Boynton, "or if the firefighters should have their equipment cleaned or disposed of."[176] Fearing the unknown, firefighters believed that they had been exposed to toxic chemicals despite ample evidence to the contrary. This fear was amplified because responding fire personnel were not in possession of safety information about Limonene, such as the Material Safety and Data Sheet (MSDS) which outlines the health hazards. Firefighters lacked this information despite the fact that Sumner, the SSHO, had forwarded and discussed this information with the Norwood Fire Department on at least four separate occasions. Although the contractor had adequately communicated with the fire fighters, fears were raised because the flow of information had not reached the firefighters who were actually called to the scene.

To alleviate these fears, Foster Wheeler agreed to wash the firefighter's equipment despite the fact that no contamination was believed to have occurred. The equipment was cleaned of the solvent Limonene, using a soap solution, and screened for PCB Contamination using two types of tests. Both the immunoassay test and the off-site laboratory confirmatory analysis (EPA Methods 4020 and 8080 respectively) verified that the equipment was clean. Despite these results, testing the fire department's equipment, done by the contractor as a courtesy to the NFD, seemed to outrage town officials further. Town officials felt that if there was potential contamination on the equipment, than surely the firefighters themselves must have been exposed to PCBs. One town selectman stated: "I would think it would be mandatory that those firefighters should be checked."[177]

The results from the equipment testing did alleviate the immediate concerns of the NFD, but did not lessen second order concerns. In the aftermath of the incident

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[176] Mark Boynton as quoted in: Nell Porter Brown, "Firefighters fear toxins in Norwood fire," *Patriot Ledger*, 17 January 1995.
[177] Domenic Fruci as quoted in: Archambeault, "Butters questions handling of fire."

the Local 1631 Firefighter's Union and the International Association of Fire Fighters (IAFF) began "grumbling" about inadequate training to respond to a Superfund site.[178] The IAFF reviewed the accident and determined that the Superfund project's emergency response plan (ERP) had been badly neglected, failing to coordinate between fire personnel, police, and emergency medical personnel. Although the Norwood Fire Department had statutory responsibility for emergency response at the site, NFD was relatively small and did not have the necessary training to respond to the incidents at the Grant Gear site. To solve this problem, the Local 1631 demanded that the EPA fund hazardous material operations training for the firefighters.[179] Currently, several fire companies in Massachusetts have established a new national trend by threatening to not respond to hazardous waste clean up sites until they are properly trained.[180] At Norwood, firefighters were beginning to make such threats. With the Norwood PCB Site obviously requiring emergency personnel, they developed an extensive training program for the firefighters. The emergency incident at Norwood served as a signal to firefighters all across the United States that training provided by the EPA is a "resource that [they should] tap into."[181]

A small trash fire with minimal direct impacts had tremendous higher order impacts: the fears of the public, local government, and emergency response personnel about hazardous waste were raised; additional work was created for the contractor; and extensive training was provided to the firefighters.

[178] U.S. ACE, "Inspection Report," 17 January 1995.
[179] Dennis R. Brown, letter to Chief William Sullivan, 31 January 1995.
[180] "Local Holds Out for Haz-Mat Training," *International Fire Fighter*, November-December 1994.
[181] Major Brian Baker, U.S. ACE, New England Division internal letter. 17 January 1995.

6.1.3.4. Change of Remedy[182]

According to the 1989 ROD, solvent extraction, an innovative treatment technology, was expected to be used to clean up the 70,000 tons of contaminated soil on the property. However, in May of 1995, the Corps of Engineers received a estimate from the contractor that was approximately $55 million, double the cost previously anticipated. Desiring an equally protective, yet more cost effective solution, the EPA decided to change the remedy used for soil remediation. The alternate remedy has three components. First, contaminated soils outside of the site would be excavated and disposed on the Grant Gear property. Second, a multi-layered cap would be constructed over the portions of the Grant Gear property which are contaminated. Given that the property is expected to have a commercial end-use, the EPA is inviting re-developers to erect new facilities (i.e., building foundations, parking areas, etc.) in conjunction with the construction of the cap. The final component of this alternative is placing formal restrictions on future uses for the site and maintaining the cap. Maintenance entails careful inspection of the integrity of the cap every five years. The consolidation and capping alternative is expected to cost under $14.5 million, saving the project $40.5 million.

The community reaction to the proposed changes in remedy was surprisingly low to moderate. The public did feel that the EPA was backing out on its promise to completely remediate the site. However, at this point in the process (12 years after first discovering contamination on the site), the public was somewhat frustrated. Although the EPA invited the public to comment on the clean up approach, they public did not feel that their input would be valued. They believed that the EPA would do whatever it wanted to do anyway. Their main concerns - schedule and maintenance - were sufficiently addressed by the EPA.

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[182] U.S. EPA Open House and Presentation, August 7, 1995.

On August 7, 1995, the EPA held an open house and presentation on the proposed changes. Although the contractor was not invited to interact with the public at all, the project could have benefit by a limited role for the contractor. For example, one resident was discussing activities related to Meadow Brook with the EPA. When the public relations specialist made a statement that the resident disagreed with, he asked "have you been back there?" The EPA official unfortunately had not and responded by saying, "I do three or four public meetings a week." With this statement, she discounted a legitimate concern by a resident. In this case, the contractor could have had an impact because they are intimately familiar with the site. Being there everyday, the contractor would be better suited to understand and address this resident's concern.

The contractor could have also made a difference if the format of the meeting itself was changed. The format of the meeting consisted of a presentation by the EPA project manager and public relations specialist and then some time for questions and answers. In a large group, people's concerns tend to be elevated by listening to other people's concerns. For example, based on the concern of one resident, the group at the August meeting all became extremely concerned about several trees that the project would have to removed from the Meadow Brook Area. When the EPA project manager responded that it would not be possible to save the trees, the public became outraged. Later, USACE project manager Brian Baker spoke with the resident who first raised the concern and discovered that the resident really only cared about a few trees that provided some shade to his backyard. When Baker, familiar with the site, realized that most of the resident's trees could in fact be saved, the resident's concerns were satisfied. This example shows that an individual concern with a simple solution can turn into a major issue for a large group. Hence, instead of large group meetings, Foster Wheeler suggested that smaller groups would have been more

effective in mitigating individual concerns.[183] In a small group setting, several managers of the project could up stations where the public could come and ask the them questions about their area of expertise. Using this format, all of the residents would leave the meeting feeling that their own interests were at least listened to. A contractor, with expertise in a many areas, could be a valuable resource in this type of forum.

6.2. Public Psychology and Organization

Throughout this research, the Norwood PCB Superfund Site is used as an example to explain many of the theoretical principles guiding the public. These principles are revisited below in the context of this case study.

Expert vs. Lay Judgments of Risk – Section 3.1 shows that the public is expected to take an "all or none" view of toxicity. This is clearly shown at Norwood, where during the emergency action the public believed the contamination was highly dangerous ("all"). However, with the immediate threat contaminates removed, town officials believed that the hazardous waste issue was "overrated." For low-level contamination, the public did not believe there was any serious threat ("none").

Process: Who and How? – The specific people involved with the management of a project can be as important a factor for the public as technical considerations. Similar to many Superfund sites, there were several EPA project managers at Norwood through the life of the project.

Norwood PCB had several EPA project managers through life of the project. Town officials complained that every time they meet with the EPA they are dealing with a

[183] Patricia Sumner, FWEC, personal interview, 7 August 1995.

whole new set of faces. As a result, the EPA's relationship with the town had to be rebuilt with each new manager.[184]

Low Probability, High Consequence Events – The small fire at Norwood in 1995 served as an event which signals a greater catastrophe. While the direct harm (health and cost) was minimal, the event had tremendous higher order impacts. This event is discussed in detail above in Section 6.1.3.3.

Other Risk Factors: Familiarity – The public is more likely to accept risks that they or science in general is familiar with. The public was scared by the use of an innovative method at Norwood because they, nor anyone else, knew what the risks are associated with solvent extraction.

Qualitative Anchoring – The public was unable to fully comprehend the health hazards of contamination at Norwood. Hence, they used their perceptions of the nuclear industry to try to understand hazardous waste. This issue is discussed in detail in Section 3.2.1.2.

Retrievability – The public is more likely to accept solutions or remedies that they are familiar with, or that are "retrievable" in memory. While section 3.2.2.1 discusses one example of retrievability at Norwood, consider the public's preference for the choice of technology. During the RI/ FS process, the public preferred incineration because it is a proven technology that is widely used. At the time, incineration was discussed frequently and was therefore highly available in memory. Today, with ongoing national efforts to ban incineration, it is unlikely that the public would have preferred this alternative.

[184] Town of Norwood, *Selectmen's Meeting Minutes*, October 23, 1984.

The Hindsight and Confirmation Bias – In August 1995, when the EPA announced for cost reasons that it would not use the solvent extraction method, the public claimed that they "knew all along" that solvent extraction would be too expensive. In reality, the public does not have the means to perform a careful cost analysis of this innovative method. Two biases are evident here. First, as discussed in Section 3.2.4.2, the public believed, in hindsight, that they knew more than they could have feasibly known at the time. Second, since the public was opposed to solvent extraction, this new cost information served only to confirm their initial belief that the method was inappropriate.

Who is Trusted in Society? – This case study supports many of the conclusions drawn in Section 3.3 about who is trusted in society. As expected, town officials were viewed to be the most credible source of information for the public. The media was not as trusted due to their sensational stories that damaged the reputation of the town. However, faced with the 1995 emergency incident, the media's claim that firefighters were possible exposed to contamination was viewed as more credible than the federal government's claim that firefighters were not contaminated.

Norwood also raises another interesting issue about the public's trust for potentially responsible parties (PRPs). Most current research advocates removing PRPs from the public involvement process, since PRPs take away from the time the EPA can address the concerns of the public. Generally, there is little trust for PRPs since they are viewed to be the source of the contamination.[185] At Norwood, however, the presence of one of the PRPs, the owner of Grant Gear Works, seemed to beneficial. Since Grant Gear did not use PCBs in their operation, the owner was

[185] Ray Germann, "The Pros and Cons of PRP Involvement in Superfund Community Relations" *Hazardous Materials Control/Superfund, 90*, (Washington: Hazardous Materials Control Research Institute, 1990) pp. 88-91.

highly regarded. Furthermore, the owner was seen as a valuable resource since he was forced to teach himself about hazardous waste.[186]

Public Organizations – The only public organization that interfaced with this project was the Meadow Brook Organization. The organization was at its strongest during the removal action in 1983. Now defunct, the organization failed for several reasons, including the following: it attempted to tackle too many issues facing the town of Norwood in general; the few members that were in the organization had very specific concerns, some of which were adequately addressed by the EPA; and finally, it did not remain active when there was no activity on site.[187]

6.3. Classification of Site

As shown in Figure 6-4, public involvement at the Norwood PCB Site can be classified on the "Consult" step of the ladder. In the "Consult" step, owners ask the public for participation, but prefer not to listen. The owners reached out to the public through formal public hearings and invitations to comment on proposals. However, the public was well aware that their comments would not make a significant impact, as the EPA was "going to do what it wanted anyway."[188]

This stage is appropriate because, overall, there was fairly low to moderate levels of public involvement. Although the site is fairly visible located on a major highway, there are not many residents who are affected by the site activities. Furthermore, there are no major citizens' groups or other organized forces of public concern that are actively concerned about the project. Given these characteristics, the

[186] U.S. EPA Open House and Presentation, August 7, 1995.
[187] Ebasco, *Final Community Relations Plan*, p. 10.
[188] U.S. EPA Open House and Presentation, August 7, 1995.

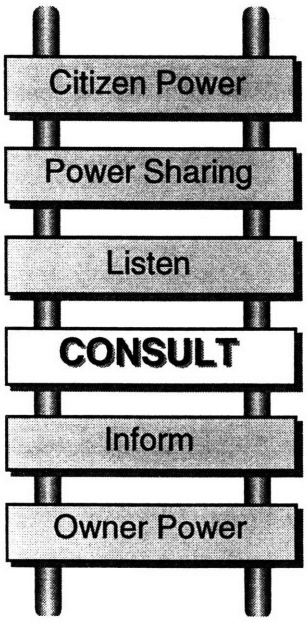

Figure 6-4: The Ladder of Public Involvement at the Norwood PCB Site

Norwood PCB Site can be considered a fairly typical site which does not demand much interaction with the public.

Other steps such as "inform", or "listen" would not have been appropriate for this site. "Inform" would not have been adequate at Norwood because the town has strong pride in its local government. Expecting to have some democratic control over the remediation process, the community needed to feel that it was at least being considered into the decision making process. In the absence of large number of concerned citizens, "Listen" would have required too much public involvement on this site, requiring additional costs while producing little extra benefits.

6.4. The Contractors Role

Overall, the contractor role in interacting with the public was minimal. The contractor was responsible for developing the CRP and supporting EPA public relations efforts. Also, the contractor's effective handling of the emergency incident had a major impact on the public. Beyond the general public, the contractor also

played a major role in coordinating with other agencies. In summary, the contractor's public involvement actions included:

- Maintaining a repository for information
- Making documentation available to the public
- Maintaining a mailing list for those concerned with the site
- Assist the EPA in preparing all published information
- Hold public meetings
- Prepare the CRP and responsiveness summary

7. Conclusions

7.1. Summary of Findings

This research shows that public involvement with remediation projects is likely to increase given the current social climate. Given this trend, contractors will increasingly be faced with the responsibility of interacting with the public. In order to successfully fulfill this responsibility, two steps must be taken. First, contractors must acquire knowledge about how the public gets involved with projects. Second, contractors must use this knowledge to acquire new skills needed to develop and implement a public involvement program.

To understand how the public gets involved with remediation projects, there are five major considerations:

1. Experts and lay persons have differing opinions about the risks associated with remediation projects. Experts must not dismiss the public as irrational, but instead, must understand the root causes of public concerns.

2. In judging risks, the public relies on many non-technical factors such as the process used, the amount of control the public has, and the probability for catastrophe. At times, these non-technical factors can be more important than scientific evidence.

3. When dealing with uncertain circumstances, the public relies on several heuristics to make judgments during uncertain conditions. Heuristics are useful tools but can lead to severe and systematic errors in judgment. By understanding the way which the public makes decisions, contractors will be better equipped to communicate with the public.

4. The public's trust of a remediation project can have a major impact on its success. Contractors are at a major advantage over their clients in gaining the trust of the public.

5. The public often acts, not individually, but through an organization. By understanding the strengths and weaknesses of an community organization, contractors will be better equipped to respond to the needs of the community.

The above considerations must be implemented on a case-by-case basis when developing a program for public involvement. This research has shown that current methods for developing a program are inadequate. Instead, using the five step method outlined in Chapter 5, contractors will be able to adequately address the concerns of the public without drawing on excessive resources.

7.2. Future Research

This research is by no means an exhaustive review of all of the issues surrounding the public's involvement with remediation projects. In general, this

research has relied on case illustrations to show the applicability of various academic theories to actual remediation projects. In order to understand these theories in full, a much more thorough analysis is warranted. Hence, two areas of further research are suggested.

First, many of the psychological principles developed in Chapter 3 have been studied extensively in the nuclear industry. There have been relatively few formal studies about how the public views risks or uses heuristics on remediation projects. This issue can be studied by conducting surveys of public opinion. These surveys could be modeled after similar ones conducted in the nuclear industry.

Second, Chapter 5 discusses a method for developing a plan that is based, in part, on thorough research of the demographics of the community. No research has been conducted however to indicate the relative importance of each of the demographic factors. For example, one such demographic factor is the proximity of the site to residential areas. Does this factor provide any indication of the amount of public involvement expected? If so, how important is this factor, relative to other factors, when determining the level of effort required to mitigate the concerns of the public? These questions could be answered by gathering the collective experience of those who specialize in public relations. Using a survey of these individuals a generic model could be developed which rates the importance of various factors based on past projects.

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