

AD-A256 535

2



NAVAL POSTGRADUATE SCHOOL

Monterey, California



JUN 13 1992

THESIS

AN INVESTIGATION INTO IMPROVING
NON-NPL CLEANUP PROCESS

by

Mark E. Whitson

June, 1992

Thesis Advisor:

Richard A. Harshman

Approved for public release; distribution is unlimited

92-27964



4611

REPORT DOCUMENTATION PAGE			
1a. REPORT SECURITY CLASSIFICATION Unclassified		1b. RESTRICTIVE MARKINGS	
2a. SECURITY CLASSIFICATION AUTHORITY		3. DISTRIBUTION/AVAILABILITY OF REPORT Approved for public release; distribution is unlimited.	
2b. DECLASSIFICATION/DOWNGRADING SCHEDULE			
4. PERFORMING ORGANIZATION REPORT NUMBER(S)		5. MONITORING ORGANIZATION REPORT NUMBER(S)	
6a. NAME OF PERFORMING ORGANIZATION Naval Postgraduate School	6b. OFFICE SYMBOL (If applicable) 36	7a. NAME OF MONITORING ORGANIZATION Naval Postgraduate School	
6c. ADDRESS (City, State, and ZIP Code) Monterey, CA 93943-5000		7b. ADDRESS (City, State, and ZIP Code) Monterey, CA 93943-5000	
8a. NAME OF FUNDING/SPONSORING ORGANIZATION	8b. OFFICE SYMBOL (If applicable)	9. PROCUREMENT INSTRUMENT IDENTIFICATION NUMBER	
8c. ADDRESS (City, State, and ZIP Code)		10. SOURCE OF FUNDING NUMBERS	
		Program Element No.	Project No.
		Task No.	Work Unit Accession Number
11. TITLE (Include Security Classification) An Investigation Into Improving Non-NPL Cleanup Process (Unclassified)			
12. PERSONAL AUTHOR(S) Whitson, Mark Everal			
13a. TYPE OF REPORT Master's Thesis	13b. TIME COVERED From To	14. DATE OF REPORT (year, month, day) 1992 June	15. PAGE COUNT 96
16. SUPPLEMENTARY NOTATION The views expressed in this thesis are those of the author and do not reflect the official policy or position of the Department of Defense or the U.S. Government.			
17. COSATI CODES		18. SUBJECT TERMS (continue on reverse if necessary and identify by block number)	
FIELD	GROUP	SUBGROUP	
		Hazardous Waste-DoD, Non-NPL, NPL, DERA, Installation Restoration Program, DoD partnering with EPA.	
19. ABSTRACT (continue on reverse if necessary and identify by block number)			
<p>This research investigates the process required to remediate (cleanup) non-National Priorities List (non-NPL) hazardous waste sites. The research addresses the many laws and regulations on hazardous waste cleanup specific to Department of Defence and Navy processes to correct and remediate existing sites. The thesis gathered data through survey of the seven Engineering Field Divisions within the Naval Facilities Command organization. The survey provided opportunity to cover concerns of representatives currently involved in cleanup operations for the Navy. The research concludes that NAVFAC should actively endorse a broader use of partnering and teams to quicken the remediation process.</p>			
20. DISTRIBUTION/AVAILABILITY OF ABSTRACT <input checked="" type="checkbox"/> UNCLASSIFIED/UNLIMITED <input type="checkbox"/> SAME AS REPORT <input type="checkbox"/> DTIC USERS		21. ABSTRACT SECURITY CLASSIFICATION Unclassified	
22a. NAME OF RESPONSIBLE INDIVIDUAL R.A. Harshman		22b. TELEPHONE (Include Area code) (408) 646-2205	22c. OFFICE SYMBOL AS/Ha

Approved for public release; distribution is unlimited.

**An Investigation Into Improving
Non-NPL Cleanup Process**

by

Mark E. Whitson
Lieutenant Commander, Civil Engineer Corps, United States Navy
B.S.C.E., University of Washington, 1978

**Submitted in partial fulfillment
of the requirements for the degree of**

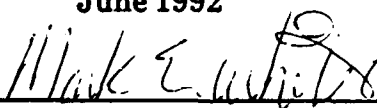
MASTER OF SCIENCE IN MANAGEMENT

from the

NAVAL POSTGRADUATE SCHOOL

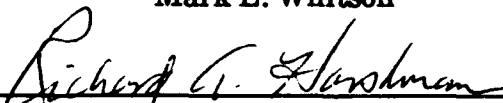
June 1992

Author:



Mark E. Whitson

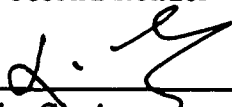
Approved by:



Richard A. Harshman, Thesis Advisor



William R. Gates, Second Reader



David R. Whipple, Chairman
Department of Administrative Sciences

TABLE OF CONTENTS

I.	INTRODUCTION	1
A.	BACKGROUND	1
B.	OBJECTIVES	2
C.	RESEARCH QUESTIONS	3
D.	SCOPE	4
E.	METHODOLOGY AND LITERATURE REVIEW	4
	1. Literature Review	5
	2. Telephone Interviews	6
	3. Survey Questionnaire	6
F.	ORGANIZATION OF THE STUDY	7
II.	HAZARDOUS WASTE CLEANUP PROCESS	8
A.	ORIGINS OF ENVIRONMENTAL LAW	9
	1. National Environmental Policy Act	10
	2. Resource Conservation and Recovery Act	11
	3. Comprehensive Environmental Response, Compensation, and Liability Act	15
	a. Cleanup Priority and Funding	17
	(1) National Priorities List (NPL).	17
	(2) "Superfund."	17
	(3) Non-NPL Sites.	18

	(4) Defense Environmental Restoration Program.	19
B.	INSTALLATION RESTORATION PROGRAM	20
C.	DEFENSE ENVIRONMENTAL RESTORATION ACCOUNT	27
D.	NON-NPL HAZARDOUS WASTE CLEANUP CONSTRAINTS	29
III.	SURVEY METHODOLOGY	33
A.	INTRODUCTION	33
B.	DEVELOPMENT OF DATABASE OF AGENCIES TO BE SURVEYED	34
C.	DEVELOPMENT OF THE SURVEY INSTRUMENT	34
	1. Research on Survey Methodology	34
	2. Development of the Survey Questions	37
IV.	SURVEY FINDINGS AND ANALYSIS	39
A.	SURVEY RESULTS	39
	1. Survey Responses	39
	2. Other Responses	50
	a. Manpower Constraints	50
	b. Community Relations Programs	51
	c. Maintaining the Database System	52
B.	ANALYSIS	52
	1. Process	52
	2. Contracting	56
	3. Manpower	58

V. CONCLUSIONS	59
A. RESEARCH QUESTIONS	60
B. CONCLUSIONS	62
C. AREAS FOR FURTHER RESEARCH	63
APPENDIX A	64
APPENDIX B	67
APPENDIX C	69
APPENDIX D	70
APPENDIX E	71
LIST OF REFERENCES	85
INITIAL DISTRIBUTION LIST	89

I. INTRODUCTION

A. BACKGROUND

For many years the Department of Defense (DoD) has used available land on bases/stations for the disposal of various materials and wastes. Since the long term health and environmental effects of the wastes were unknown, the open disposal continued for many years. However, once it was learned that the hazardous waste sites created potential problems to human health or the environment, the DoD ceased to advocate the indiscriminate disposal.¹ In 1975 DoD initiated the Installation Restoration Program (IRP) to cleanup and restore hazardous waste sites.

The Comprehensive Environmental Response, Compensation Liabilities Act (CERCLA) of 1980 [42 U.S.C. 9601 et seq.], commonly known as the Superfund Act, was enacted to provide for cleanup and restoration of the uncontrolled hazardous waste sites in the United States. The Environmental Protection Agency (EPA) is responsible for managing the CERCLA program, including promulgating regulations, compiling a list of

¹Hazardous waste is defined as waste which, because of its quantity; concentration; or physical, chemical, or infectious characteristics, may cause or contribute to an increase in mortality or pose a substantial hazard to human health or the environment when improperly treated, stored, transported, or disposed of.

hazardous waste sites, responding to emergencies, and controlling the use of federal funds to cleanup waste sites. Both private entities and federal agencies must comply with CERCLA requirements. The IRP is the DoD program to comply with these requirements. [Ref. 1]

CERCLA requires that all toxic waste sites on Federally owned property be cleaned in accordance with the act. Whether the sites are on the National Priorities List (NPL), commonly called the Superfund List, or on a local list for restoration, the numerous steps required to ensure restoration compliance are often very time consuming and costly. The Navy Facilities Engineering Command (NAVFAC) would like to move more quickly in solving known contamination problems. To achieve this objective, NAVFAC is currently investigating innovative ways to accelerate the process.

B. OBJECTIVES

The main focus of this research is to investigate ways to improve the Installation Restoration (IR) process for non-National Priorities List (NPL) sites located on Department of the Navy property. CERCLA mandates the milestones and phases to be accomplished on all NPL sites. For these sites, the most efficient method for cleaning toxic wastes is determined by mutual agreement between the Navy, the EPA and local officials. However, for non-NPL sites, CERCLA allows the Navy to interact directly with state and local regulatory officials

to determine the best course of action. The EPA has no involvement in non-NPL hazardous waste sites. Currently, all installation restoration projects are required to use the same process to accomplish the cleanup, regardless of whether the site is an NPL or a non-NPL site. This review requirement for non-NPL sites may cost the Navy additional funds and slow the restoration. This research will focus on improving the process for non-NPL sites.

This thesis will be a case analysis evaluating the way NAVFAC manages site restoration and, where appropriate, recommend changes to current Department of the Navy policies.

C. RESEARCH QUESTIONS

The primary research question is:

Can the non-NPL Installation Restoration process be improved such that actual remediation of hazardous waste sites can occur more quickly than current planning?

Subsidiary questions include:

- Can phases of the CERCLA mandated cleanup process be combined with other phases or eliminated from the process entirely?
- What NAVFAC policies prevent the site restoration process from moving faster?
- What are the legal implications of using a Turnkey type contract for site remediation?
- Is partnering with the federal, state, and local regulatory agencies a viable option for improving the site restoration process?

D. SCOPE

The major emphasis of this research was to collect the current policies on non-NPL cleanup employed by the various Engineering Field Divisions (EFD) and activities within the NAVFAC organization. To accomplish this task, all seven EFD were separately interviewed and queried as to the procedures employed to facilitate the non-NPL cleanup process. The survey addressed the subsidiary questions and gathered information on responsive ideas for improving the IR process, opinions about partnering with the regulatory agencies and evidence about past successful or unsuccessful remediation projects.

E. METHODOLOGY AND LITERATURE REVIEW

The methodology for conducting this research involved two distinct steps. Initially, the research concentrated on a thorough review of current literature, instructions, directives, reference materials and guidance dealing with non-NPL cleanup.

Next, a comprehensive survey instrument was developed. Survey literature was reviewed. Prior surveys in similar studies were reviewed for format and answer criteria. Professors and other professionals in the field of education assessment were counseled on appropriate survey questions. After developing the survey questions, telephone interviews

were conducted with all seven Engineering Field Divisions in the NAVFAC organization.

Further discussion of key areas of the research methodology employed in the thesis are presented below.

1. Literature Review

The initial sources of data for this thesis were developed through a comprehensive literature search. The search focused on three distinct areas. First, the field of survey methodology was reviewed to determine the format and style of the questions that would be used to gather the primary data. This portion of the review included careful attention to the design of survey questions and formats of surveys. The telephone interview method was selected in order to expedite data collection and to ensure a greater response.

A detailed examination of previous surveys used by graduate students at the Naval Postgraduate School, other institutions, educational professionals and general purpose studies was conducted.

The second area of literature research focused on hazardous waste cleanup within the Department of Defense. Information specifically concerned with non-NPL cleanup process and coordination with state and local regulators was reviewed. Applicable instructions and guidance for environmental management personnel were also reviewed.

Lastly, relevant literature on Total Quality Management and process improvement was reviewed.

2. Telephone Interviews

The data to be analyzed in this study was gathered primarily through telephone interviews. Telephone interviews provide information in greater depth and detail than written surveys. In addition, this method allows the interviewer to probe with additional questions when appropriate, to obtain more detailed information in areas of greater interest. Telephone interviews are also inexpensive. However, telephone interviews do have disadvantages. The length of an interview is usually limited and studies indicate that telephone interviews can result in less complete responses. [Ref. 2] Appendix C is a comprehensive listing of individuals and organizations contacted in this process.

3. Survey Questionnaire

The questionnaire was designed to assess the procedures employed by the various Engineering Field Divisions (EFD) to facilitate the non-NPL cleanup process and to gather ideas for improving the IR process. The complete questionnaire is included under Appendix B. Further queries regarding partnering with state and local regulatory agencies and individual success stories was also solicited. Appendix C lists those Engineering Field Divisions and activities that were contacted in the telephone survey.

F. ORGANIZATION OF THE STUDY

This thesis is organized into five chapters. Chapter I provides a general introduction to the area of study.

Chapter II provides background information concerning hazardous waste cleanup, the applicable laws and regulations and the directives and instructions the DoD and Department of Navy have issued to comply with the applicable laws.

Chapter III details the methodology employed in developing the telephonic interview questions. Chapter IV reviews the results of the telephonic interview in terms of commonalities and unique problems or experiences. Chapter V presents the conclusions and recommendations reached as a result of the research. The chapter also provides answers to the specific research questions.

II. HAZARDOUS WASTE CLEANUP PROCESS

Environmental legislation, laws, and regulations have grown at an exponential rate since their introduction in the late 1960s. With the introduction of each new law, the complexity and associated requirements of the cleanup process are further expanded.

The requirements of each phase of the cleanup process are different depending on the type of action contemplated. For example, one set of actions is required for "Superfund" projects, the cleanup of abandoned or inactive sites in which the former owners are unavailable, unwilling, or financially unable to cleanup the contamination. Another set of actions is required for Resource Conservation and Recovery Act (RCRA) projects, the corrective action designed to get the owners or operators of hazardous waste disposal facilities to pay for cleaning up contamination caused by their operations.

This chapter will first address the origins of the major environmental laws (National Environmental Policy Act (NEPA), Resource Conservation and Recovery Act (RCRA), Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), and the Superfund Amendments and Reauthorization Act (SARA)), and how these laws have impacted the DoD and DoN cleanup processes. It includes a review of the specific

directives and instructions that DoD/DoN have promulgated to implement the environmental laws. Second, it will discuss the Installation Restoration Program, which is the process by which federal facilities cleanup hazardous waste sites. Third, it will address the funding of the Installation Restoration Program. Finally, it will review the effectiveness of the non-National Priorities List hazardous waste cleanup program.

A. ORIGINS OF ENVIRONMENTAL LAW

The Department of Defense and the Department of the Navy must be responsive to a wide variety of environmental laws from the federal, state and local governing bodies. The military installations are required to comply with all of these laws. This is an enormous task for the DoD which has over 1800 installations in all 50 states, not including overseas installations [Ref. 3].

Promulgation of most federal environmental regulations is in response to legislation passed by the U.S. Congress. This section will describe some of the relevant federal laws and regulations that apply to hazardous waste and hazardous waste cleanup. A brief description of the Environmental laws and regulations discussed in this chapter is provided in Appendix D.

1. National Environmental Policy Act

In response to the increased environmental awareness at the end of The 1960s, the executive branch "Officially kicked off" the nations "environmental movement" when Executive Order 11472 was signed on 29 May 1969. Executive Order 11472 established the Environmental Quality Council and the Citizen's Advisory Committee on Environmental Quality. This executive action was closely followed by congressional legislation, the National Environmental Policy Act of 1969 (NEPA). [Ref. 4]

NEPA, signed into law on 1 January 1970, one year prior to the creation of the Environmental Protection Agency (EPA), provided the nation with the first major statement of environmental policy. The passage of this law was heralded as the beginning of an environmentally oriented legislative decade. [Ref. 5] NEPA was enacted to ensure that federal actions which affect the human environment are truly necessary (as opposed to expedient) and are undertaken in a manner designed to minimize adverse impacts. [Ref. 6]

NEPA provides for a national environmental policy committed to conducting federal activities in a way that will promote general welfare in harmony with the environment. It requires federal agencies to address the environmental consequences of their actions by preparing an Environmental Impact Statement (EIS). The act also created the Council on Environmental Quality (CEQ). [Ref. 7]

Unlike any other subsequent environmental regulations, NEPA is procedural rather than substantive in nature. It requires a documented evaluation of the potential impacts of actions which come under its regulation. Any action significantly affecting the environment requires the preparation of an Environmental Impact Statement. NEPA requirements apply to all decisions, not just to military construction. [Ref. 4]

While federal officials who are found guilty of violating NEPA will not go to jail, failure to adhere to the statute's procedural requirements can be costly in time and money. NEPA itself does not provide a cause of action. Violators of NEPA are not subject to fines, penalties, or criminal sanctions. Consequently, many erroneously assume that NEPA lacks teeth. In fact, NEPA can be a "true show-stopper" by seriously slowing if not stopping a proposed action until a judicially adequate Environmental Impact Statement is completed. [Ref. 6] Many recent court decisions unfavorable to the Navy can be traced to a failure to follow NEPA procedures [Ref. 4].

2. Resource Conservation and Recovery Act

The Resource Conservation and Recovery Act (RCRA), enacted as the 1976 amendment to the Solid Waste Disposal Act (SWDA), is the first comprehensive federal effort to deal with solid waste and hazardous waste. RCRA regulates hazardous

waste from "cradle to grave." The statute and regulations prescribe a hazardous waste management system applicable to those who generate, transport, treat, store or dispose of hazardous wastes which are not regulated by the Toxic Substances Control Act (TSCA) or Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). [Ref. 6]

The Act regulates the handling of hazardous wastes, primarily at current or future waste handling facilities, and is intended to provide for the environmentally safe disposal of waste materials. It addresses the gap left by the Clean Air Act (CAA) and Clean Water Act (CWA). These Acts only require that industry remove hazardous substances from air emissions and water discharges. [Ref. 5]

RCRA established five major elements characterizing the federal approach to hazardous waste management [Ref. 5]:

1. Classification of hazardous wastes.
2. Cradle to grave manifest system.
3. Standards for generators, transporters, and facilities which treat, store, or dispose of hazardous waste.
4. Enforcement through a permitting system.
5. Authorization of state programs to operate in lieu of the federal programs, if the state program is more restrictive.

Hazardous waste classification is a major element of RCRA. In order to be regulated, a waste must be both a solid and a hazardous waste. The actual physical state of the waste

means little according to the act, because liquids, sludges, or contaminated gasses are all considered solid wastes by RCRA definitions. [Ref. 7]

RCRA contemplates state implementation and federal oversight while the function is one of authorization, not delegation. States are authorized to develop their own hazardous waste programs. The state must have a statutory/regulatory framework and enforcement authority in place; it cannot simply administer the existing federal program. Most states have EPA approved RCRA programs. A few states like California, Connecticut, Iowa, etc. do not. Where there is no approved state program, the Environmental Protection Agency maintains control for all federal agencies, including DoD/DoN. [Ref. 6]

The requirements of RCRA concerning hazardous waste apply to those who generate, handle, transport, treat, store, or dispose of hazardous waste. Permits are required for treatment, storage or disposal on-site. Cleanup of contamination from past, as well as current operations are called corrective actions. Corrective actions may be required as a condition of a receiving a new RCRA treatment, storage, or disposal permit. Waste generators are required to ship their wastes off-site within 90 days after beginning accumulation or they must have a storage permit and comply with applicable storage standards. [Ref. 5]

The most common discrepancies of RCRA requirements by Navy commands include: improper labeling and storage, unapproved storage sites, excessive storage times (>90 days), failure to perform inspections, poor contingency planning and inadequate training. [Ref. 4]

The numerous RCRA enforcement provisions define "knowing endangerment," as a felony. "Knowing endangerment" is defined as [Ref.5]:

knowingly disposing of a hazardous waste to an unpermitted facility or violation of permit provisions or knowingly treating, storing or disposing of a hazardous waste without a permit

A violation can carry significant civil and criminal penalties. The amount of money sought in a penalty action is normally assessed through use of a matrix that evaluates the seriousness of the violation, any mitigation of the impact, and the existence of previous violations. Criminal sanctions can be imposed for specific violations. The maximum penalty is a \$50,000 per day for each violation and/or imprisonment for two to five years, depending on the violation. For a person who knowingly creates an "endangerment," the maximum penalty is \$250,000 per violation and 15 years in jail. [Ref. 6]

3. Comprehensive Environmental Response, Compensation, and Liability Act

The Resource Conservation and Recovery Act is thought of as the "cradle to grave" program which addresses current and ongoing hazardous waste activities, while the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) is a broad response program to address past or abandoned waste activities. The program seeks to:

[Ref. 6]

1. identify and quickly cleanup abandoned hazardous waste disposal sites that pose a threat to health of the environment;
2. negotiate with responsible parties to have them conduct the cleanup, if possible; and
3. recover the government's response costs by prosecuting identifiable responsible parties.

CERCLA was amended by the Superfund Amendments and Reauthorization Act 1986 (SARA). SARA modified CERCLA by establishing new priorities and timetables, modifying the rights of the parties in litigation, and restructuring the criteria for remedy selection. SARA also significantly altered federal facility compliance under CERCLA. Federal facilities are expressly subject to the provisions of CERCLA "in the same manner and the same extent, both procedures and substantively, as any non-governmental entity." [Ref.6]

CERCLA and SARA, frequently referred to as "Superfund," grant the federal government authority to

undertake activities under the directives of a National Contingency Plan (NCP) to cleanup dangerous, inactive disposal sites and emergency spills. It also includes authority to conduct investigations, test, and monitor disposal sites and implement remedial measures. [Ref. 5]

Responsible parties (e.g. owners, operators, previous landowners, generators, handlers, disposers, etc.) are expected to cleanup waste sites. CERCLA was legislated for situations where environmental damage had already occurred and responsible parties are unidentifiable, or lack the funds to cleanup a site. [Ref. 5]

As knowledge about the lethality of disposed substances grows, so do the cleanup requirements. The fact that previous practices were legal at the time of disposal does not diminish the requirements or obligation to cleanup a site. This portion of CERCLA is likened to a "skeleton in the closet." Even when organizations are currently complying with all environmental laws and regulations, they are liable for future changes in the legislation. [Ref. 4]

The U.S. Navy may cleanup its own sites provided it follows procedures consistent with the National Contingency Plan as provided by Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). The Navy, and for that matter any federal agency, may not use "Superfund dollars," the Department of Defense has established the Defense Environmental Restoration Account according to

legislation provided by Congress under the Superfund Amendments Reauthorization Act. The U.S. Navy may even be liable to pay for investigations and cleanups at off-base sites where base wastes were deposited. [Ref. 4]

a. Cleanup Priority and Funding

The extent CERCLA applies to cleaning up a specific hazardous waste site varies depending on whether the site is on the National Priorities List (NPL).

(1) *National Priorities List (NPL)*. Using a Hazard Ranking System (HRS), the EPA scores hazardous waste sites. The HRS evaluates the potential risk posed by the site based on: the quantity, toxicity, and concentration of waste at site; the potential for releases from the site; and the degree of risk to health and the environment. Specifically, the HRS examines the migration potential of contaminants in ground water, surface water, air, and the potential of exposure due to soil contamination. Evaluation of exposure pathways yield the site's "score." Sites which score above 28.5 on a 0 to 100 scale, are placed on the NPL. The EPA arbitrarily determined that 28.5 would be the NPL threshold. [Ref. 6]

(2) *"Superfund."* CERCLA created a funding mechanism for cleanup efforts to minimize expenditure of general tax revenues. CERCLA provides funds to finance response actions through the Hazardous Substance Response Trust Fund, funded by taxes on crude oil, certain petroleum

products, chemical feedstocks, and appropriations from Congress. Hence, the name Superfund. Only sites on the National Priorities List (NPL) are eligible for Superfund financing. [Ref. 6]

A listing on the NPL does not guarantee that Superfund funds will be used for the cleanup. In any event, Superfund financing is not available to cleanup federal facilities except in very unusual circumstances. Generally, if Superfund funding is provided, subsequent reimbursement to the Superfund account is required. [Ref. 6]

Some CERCLA cleanup costs are funded through the Defense Environmental Restoration Account (DERA) within DoD, which essentially is a specially designated Operations and Maintenance (O&M) reserve. However, expenditure of DERA funds is within the discretion of the Office of the Secretary of Defense. Sometimes the military department must expend its own funds for cleanups. When Navy funding has been approved, the Office of the Secretary of Defense (OSD) transfers an appropriate share of the DERA funds to the Navy Environmental Compliance Account (NECA). OSD distributes funds from the DERA account based on individual project priority related to each service's critical need. NECA is used for Navy CERCLA cleanup operations. [Ref. 6]

(3) *Non-NPL Sites.* While it is probably advantageous to have hazardous waste site on a federal

installation on the NPL list, the EPA has the ultimate approval on how the cleanup will be accomplished for NPL projects, after consultation with the service. Under CERCLA, EPA must select a cost-effective cleanup. If the site is not on the list, state regulatory agencies may control the cleanup. Cleanup actions controlled by states need not include cost-effectiveness as a selection criterion. Unfortunately, getting on the NPL is mainly a statistical matter. There is little an installation can do to "achieve" an NPL listing, other than cooperate and ensure the EPA gets all the relevant information to evaluate the site. [Ref. 6]

(4) Defense Environmental Restoration Program.

The Defense Environmental Restoration Program (DERP) is the authority for the Secretary of the Defense to carry out environmental restoration at military facilities. [Ref.6] DERP is centrally managed by the Office of the Secretary of Defense. Policy direction and oversight of DERP is the responsibility of the Deputy Assistant Secretary of Defense (Environment). Each individual defense component is responsible for program implementation. [Ref. 3]

The Superfund Amendments and Reauthorization Act (SARA) provides continuing authority for the Secretary of Defense to carry out this program in consultation with the EPA. Executive Order 12580 on Superfund Implementation, signed by the President on 23 January 1987, assigned

responsibility to the Secretary of Defense for carrying out the Defense Environmental Restoration Program within the overall framework of SARA and CERCLA. The Defense Appropriations Act provides the primary funding for DERP which is placed in the Defense Environmental Restoration Account. Funding for restoration work at bases scheduled for closure is provided by a separate Base Closure Account.

[Ref. 3] DERP has the following goals: [Ref. 8]

1. Identification, investigation, research and development, and cleanup of contamination from hazardous substances, pollutants, and contaminants. (Installation Restoration Program, IRP)
2. Correction of other environmental damage (such as detection and disposal of unexploded ordnance) which creates an imminent and substantial endangerment to the public health or welfare or the environment. (Other Hazardous Waste, OHW)

B. INSTALLATION RESTORATION PROGRAM

Physically cleaning up an abandoned hazardous site within the Department of Defense falls under the Installation Restoration Program (IRP). The IRP was established in 1984 to help identify, investigate, and cleanup contamination on DoD properties. The program is conducted under the auspices of CERCLA legislation of 1980 and SARA amendments of 1986. [Ref. 9] The IRP process consists of the following steps [Ref. 10]:

1. **Preliminary Assessment/Site Inspection (PA/SI)**. The goal of the PA/SI is to identify potential sites with hazardous waste contamination. The PA consists of a

review of available historical information (also known as a records search) concerning installation activities and land use; the SI is an on-site visit consisting of limited sampling and analyses designed to verify the preliminary findings of the PA.

2. **Remedial Investigation/Feasibility Study (RI/FS) and Record of Decision (ROD).** The RI is a detailed study that includes soil and water sampling to determine the nature and extent of contamination at a site. In addition, the RI includes a health assessment which estimates risks to human health and the environment as a result of the contamination. The purpose of the FS is to identify alternatives for remediation of cleanup strategy. When the methods by which the site will be remediated are agreed upon, the Navy prepares a Record of Decision (ROD) that describes the remedy selection process and the remedy method selected. For NPL sites, the ROD is forwarded to the EPA regional office for concurrence. If EPA disagrees with the Navy selection of remedial action, then the EPA will select a remedy. The Navy has final decision authority for non-NPL sites.
3. **Interagency Agreements (IAG).** The IAG is a formal agreement between the EPA, the state, and the Navy that establishes objectives, responsibilities, procedures, and schedules for remediation at each installation. DoD policy calls for IAGs to be negotiated as early as possible in the RI/FS process for all NPL and proposed NPL sites.
4. **Remedial Design/Remedial Action (RD/RA).** RD is the translating of FS into designs and specifications for site remediation. RA is the physical implementation of site remediation. RAs can include removing wastes from the site for off-post treatment or disposal, containing the waste on-site, or treating the waste on-site.
5. **Long term Monitoring (LTM).** Depending on the remedial alternative selected, LTM may be required to demonstrate that the remedy achieved its goal. The installation is responsible for funding LTM after the first two years.

A flow chart outlining the Installation Restoration Program (IRP) is provided as Figure 1.

INSTALLATION RESTORATION PROGRAM

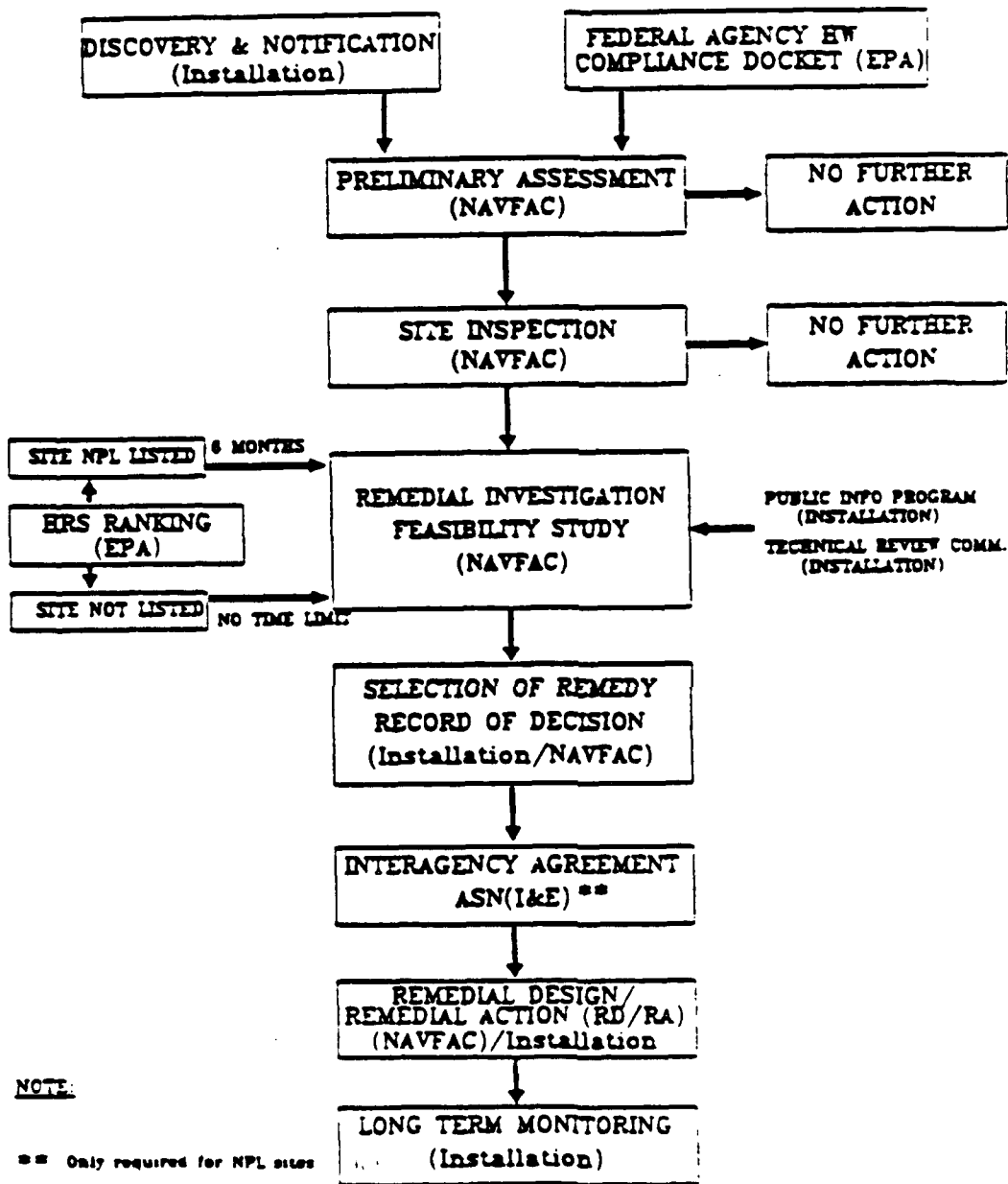


Figure 1 Source: Department of the Navy, Office of Naval Operations, OPNAVINST 5090.1A Environmental and Natural Resources Program Manual, ;p. 13-4, Oct 1990.

There are provisions throughout the process to ensure close coordination with regulatory agencies and the public. The Navy is required to enter into a Federal Facility Agreement (FFA) as early as possible after it becomes apparent that a Remediation Investigation/Feasibility Study for an NPL site is required. The Federal Facilities Agreement (FFA) is intended to improve communications between all parties by allowing EPA and the state to review all work documents and ultimately select any remedial action. FFAs at NPL sites are intended to outline the working relationship between the states, EPA, and Navy. FFAs are very negotiation intensive and are required (under CERCLA section 120) to be signed by the Assistant Secretary of the Navy (Installations & Environment). The EPA and appropriate state and local officials must have adequate opportunity to review and comment on assessments/studies and proposals for removal/remedial actions. [Ref. 10]

Based on the data derived from the Preliminary Assessment/Site Investigation, the EPA established Hazardous Ranking System (HRS) is applied to the site to evaluate the potential hazards to health and the environment. [Ref. 9] Those sites which score 28.5 or higher by the Hazardous Ranking System (HRS) are proposed for inclusion in the NPL. After a public comment period, they may be included in the final NPL. [Ref. 11]

While being listed (there are more than 1,000 NPL sites within the U.S.) may not at first seem like a benefit, being

proposed or listed on the NPL may be a blessing in disguise. Sites listed receive priority for IRP funding by the EPA. Conversely, those sites not proposed or listed are given very low priority by EPA, and in most cases, the individual states take control of remediations at non-NPL sites. [Ref. 9] Figure 2 provides a summary of the number of DoD installations and hazardous waste sites by service component.

INSTALLATION RESTORATION PROGRAM

Service	Number of Installations	NPL	Non-NPL
Army	1,265	36	10,578
Navy	247	26	409
Air Force	331	32	345
DLA	34	4	319
Totals	1,877	96	17,660

Figure 2 Source: U.S. Department of Defense, Defense Environmental Restoration Program, Annual Report to Congress for Fiscal Year 1991,;p. 6.

Department of Defense (DoD) and Navy policy is to conduct all IR response actions under CERCLA, the NCP, and EPA guidance. Because IR funds are limited, DoD policy is to prioritize all installation restoration efforts so that the worst sites are addressed and cleaned up first. [Ref.10] While one might assume that since non-NPL sites are considered low priority they receive little attention or funding, this has not been the case. The current funding profile has

A Technical Review Committee (TRC) is also established at each installation with an IR site. The purpose of the TRC is to review and comment on IR work plans and activities. The function of the public participation activities is to help ensure that the community will be informed of planned and ongoing restoration activities. These activities provide the opportunity for public comment on and input to technical decisions and while allowing environmental concerns to be addressed early during the remediation process. [Ref. 10]

The Defense and State Memorandum Of Agreement (D/SMOA) was implemented to facilitate active state participation in the IRP process. [Ref. 3] Before the D/SMOA was created many states could not actively participate in the IR process (review, comment and approval of various documents, inspection oversight, etc.) because they lacked funds or expertise. Therefore, a process was developed (D/SMOA) that allows the DoD to reimburse the states for up to one percent of the IR costs. The D/SMOA not only addresses state agency technical support at NPL sites, but also provides the process for work at non-NPL sites. Along with non-NPL reimbursement, the D/SMOA provides a process for DoD and the states to resolve technical disputes before judicial remedies are sought. [Ref.3]

Reimbursement is available through a Cooperative Agreement (CA) to those states that have signed D/SMOA. The Commander, U.S. Army Corps of Engineers, is the DoD Executive Agent for

enabled all the service components to address NPL and non-NPL sites alike. Specifically the majority of site closeout decisions in 1991 were for non-NPL sites. [Ref. 3]

An integral portion of the IR process (and a requirement of CERCLA) is maintaining an open and continuous dialogue with regulatory authorities and the public on all IR activities. This is achieved through Community Relations Programs, Technical Review Committees (TRC) and the recently established (in 1989) Defense and State Memoranda of Agreement (D/SMOA). [Ref. 10]

Implementation of a Community Relations Program is required at all military installations where Installation Restoration (IR) sites are located. The program consists of public information activities conducted throughout the planning and implementation of the IRP. The Community Relations Program requirements for each IR installation include [Ref. 10]:

- Community interviews
- A Community Relations Plan
- Information repository and administrative records
- A Proposed Plan (Remedial Action Plan) for each RA and a minimum 30 day public comment period for each proposed plan
- An opportunity for a public meeting on each proposed plan
- A Responsive Summary for each Proposed Plan.

negotiating D/SMOA and receiving, processing, and monitoring Cooperative Agreement (CA) applications. Each CA covers a two-year time period.

C. DEFENSE ENVIRONMENTAL RESTORATION ACCOUNT

The Superfund Amendments and Reauthorization Act of 1986 (SARA), amended title 10 USC 160 to provide continuing authority for the Secretary of Defense to carry out the Defense Environmental Restoration Program (DERP). The DERP was established in 1984 to promote and coordinate efforts for the evaluation and cleanup of contamination at DoD installations. The program consists of the following two major elements [Ref. 3]:

1. The Installation Restoration Program (IRP), where potential contamination at DoD installations and formerly used sites is investigated and, as required, site cleanups are conducted.
2. Other Hazardous Wastes (OHW) Operations, through which research development, and demonstration programs aimed at reducing DoD hazardous waste generation rates are conducted. [DoD Annual Report to Congress on DERP]

The Defense Environmental Restoration Account (DERA) was established to finance this program. Congress established a separate appropriation; Environmental Restoration, Defense (ER,D) under the Defense Appropriations Act. All sums are appropriated to carry out the functions of the Secretary of Defense relating to environmental restoration under any provision of law. This has allowed the DoD to accelerate the

cleanup action, add research and other components to DERP.

[Ref. 8]

DERA funds are made available to installations for the following types of actions [Ref. 11]:

- a. Management/review of Installation Restoration (IR) reports, studies, contracts, field inspections, etc.
- b. Development and printing of brochures/pamphlets describing the IR effort.
- c. Development and execution of community relations plans and support of the technical review committee.
- d. Other efforts directly related to the IR program, including salaries.

A project does not automatically qualify for DERA funding by being environmentally sensitive. Some examples of projects which are not eligible for DERA funding are [Ref. 12]:

- Closing or capping of existing sanitary landfills
- RCRA closures associated with current waste generation or disposal
- Construction of hazardous waste storage, transfer, treatment, or disposal facilities
- Testing, storing, disposing, or replacing PCB transformers
- Current hazardous waste disposal operations, including associated management and operational costs
- Operation, maintenance, repair of current hazardous waste treatment, storage, or disposal facilities

D. NON-NPL HAZARDOUS WASTE CLEANUP CONSTRAINTS

While the process may appear to operate efficiently on paper, in actuality there are problems with the process. The procedural framework directed by the NCP and CERCLA ensures that anyone who is concerned about a hazardous waste site will have a chance to make their concerns known. This holds true providing the federal agency responsible for the cleanup follows the procedures and advises the community and the responsible regulatory agencies of its actions. This has not always been the case. In the past, it was not unusual for military installations to keep silent about hazardous waste problems within the confines of their installation. [Ref. 13] When the public pressed for details, it was not unusual to be told to be quiet, it was none of their business [Ref. 14]!

Attitudes are changing. Today, DoD is better equipped to cleanup the hazardous waste sites with the increase in budget funding to cleanup the problems [Ref. 3]. However, impediments which prevent the process from proceeding expeditiously continue to persist. Conflicting, complex and overlapping regulations have lead to duplication of administrative effort, confusion over procedures and delays in site cleanup efforts [Ref. 15]. Many civilian environmentalists have the misperception that DoD does not comply with national environmental standards. These attitudes and "other agendas" used under the guise of environmental protection have contributed to impede the process [Ref. 16].

Additional problems, such as identifying the most effective method to contract the studies, investigations and eventual remediation (cleanup), have yet to be fully definitized. NAVFAC has developed a Comprehensive Long-Term Environmental Action Contract (CLEAN) designed to span the entire installation restoration process as required by CERCLA. These contracts are intended primarily to provide engineering services from initial studies through the design phase. CLEAN does not address the actual remediation (cleanup). Some of the advantages of the CLEAN contract are [Ref. 17]:

- it reduces the number of "handoffs" between phases
- increases contractor accountability
- accelerates the cleanup

Some individuals have proposed "Turnkey" contracting in an effort to expedite the process even further. Turnkey contracting uses the same Architect/Engineering (A/E) firm to perform the design and remediation (in this instance). The use of Turnkey contracts, commonly called design/build, may be considered prohibitive depending on the interpretation of laws which pertain to this issue.

The Comprehensive Environmental Response, Compensation, and Liability Act, section 119 (f) states [Ref.18]:

selection of response action contractors shall be in accordance with title IX of the Federal Property and Administrative Services Act of 1949 (Brooks Act).

The Brooks Act prohibits Architect/Engineers (A/E) from constructing facilities or buildings of their own design (Turnkey) [Ref. 19]. In addition, the Federal Acquisition Regulations clause 36.209, Construction Contracts with A/E firms states:

No contract for the construction of a project shall be awarded to the firm that designed the project or its subsidiaries or affiliates, except with the approval of the head of the Agency or authorized person.

Report language in the Senate Appropriations Bill of the 102nd Congress included five principles for a pilot program to expedite environmental cleanup. One of the principles is to "Use Turnkey contracts to cover more than one phase of any cleanup" [Ref. 20]. NAVFAC legal interpretation is that the above laws take precedence over the "report language" [Ref.21].

The first session of the 102nd Congress amended the General Military Law subchapter on Military Construction and Family Housing pertaining to Turnkey selection procedures. The law allows [Ref. 22]:

The Secretary concerned may use one-step Turnkey selection procedures for the purpose of entering into contracts for the construction of authorized military construction projects.

The Air Force has interpreted the amendment to take precedence over the Brooks Act and CERCLA and therefore they

will comply with the Senate Appropriations Bill "report language" [Ref. 23]. Due to the various interpretations, it appears the courts will ultimately decide this issue.

This chapter reviewed the origins of the major environmental laws and how the laws have impacted the DoD and DoN cleanup processes. The next chapter presents the survey methodology.

III. SURVEY METHODOLOGY

A. INTRODUCTION

The principle methodology employed in this study to gather current data involves a survey. The Random House College Dictionary defines survey as follows:

"1. to take a general or comprehensive view of or appraise, as a situation. 2. To view in detail, as in order to ascertain condition, value, etc. ... 8. a sampling, or partial collection, of facts, figures, or opinions taken and used to approximate or indicate what a complete collection and analysis might reveal". [Ref. 24: p.1323]

Most surveys employed in empirical research are random surveys, that is, surveys are sent to a randomly selected distribution of the targeted population with the expectation that only some portion of the surveys will be returned. In most cases this is satisfactory. However, one of the primary goals of this research is to develop a comprehensive understanding of the non-NPL cleanup process that is currently used by all the Engineering Field Divisions (EFDs) within NAVFAC. Secondary goals were to gather their opinions about impediments to the process and recommended methods to accelerate the process.

The survey methodology employed in this research required a 100% response rate and therefore cannot be considered a

random survey. Rather, the survey is totally comprehensive as suggested in the definition above. One further note on terminology is required. The terms "survey" and "questionnaire" are used interchangeably and for present purposes mean the same thing. A questionnaire is merely the tool used by a survey to collect the required information.

B. DEVELOPMENT OF DATABASE OF AGENCIES TO BE SURVEYED

The survey which was developed and telephonically processed to the Engineering Field Divisions is included in Appendix B.

A determination of which EFDs/EFAs to be contacted was made prior to developing and conducting the survey. NAVFAC has just commenced restructuring all EFDs and their related regional and administrative areas of responsibility [Ref. 25]. The scheduled completion of the restructuring is September 1995. The survey utilized the current NAVFAC command structure of seven EFDs, since the bulk of organizational changes are planned for the future.

C. DEVELOPMENT OF THE SURVEY INSTRUMENT

1. Research on Survey Methodology

The development of the survey used to gather data for this research began with an extensive review of the literature on survey design. One of the first issues to address was what form would the survey questions take, i.e., open or closed

format, scaler, filtered, etc. "Open" questions are designed to allow the widest latitude to survey recipients in responding to the survey question. An example of an open question would be: In your opinion what are the impediments to accelerating the non-NPL process? "Closed" questions, on the other hand, present a listing of options or preconceived responses for the survey respondent to choose from. The "scaler" type of question asks the recipient to assign a "score" to a particular question. This score normally ranges from 5 to 1 if numerically weighted or from frequently to seldom in verbal terms. Filtered or filtering questions involve the use of "no opinion" type responses or simple "YES/NO" responses. [Ref. 2: pp. 148-173]

Since the variations in the processes used by the EFDs were unknown, the basic methodological approach employed in the development of the questionnaire was the "open" response format. This format allows the recipient to reply to the questions in their own words. Additionally, filtering questions were developed to facilitate the response that did not apply to certain recipients but did apply in general. Finally, general purpose or information questions were included in the response data base.

A second methodological issue was who should be contacted in the survey process. In accordance with OPNAVINST 5090.1A, the EFDs are the first line of assistance for an Navy or Marine Corps activity when dealing with environmental

issues. While many activities assign/support a position for an environmental engineer or coordinator who is very knowledgeable about their site specific issues, the EFDs, due to their mission of serving many activities within a defined region, are the logical source of information regarding environmental policies of a particular region.

The third methodological issue was the data collection method to be employed in the survey. The various methods of data collection are presented in Table 1. below. The table lists the methods, a brief description of the method and summarizes the weaknesses and strengths of each method. The information summarized in Table 1 was derived from Measurement Errors in Surveys by Paul p. Biemer. [Ref. 26: pp. 237-250]

TABLE 1. DATA COLLECTION METHODS

Methods of Data Collection	Description	Advantages	Disadvantages
<u>Questionnaire</u>	Survey mailed to respondent	Data from large number of people. Standard for measuring change. Quick.	Measure attitudes not behavior. Requires honesty on part of respondent.
<u>Observation</u>	Agent observes activity to be measured.	Rich behavioral data.	Time consuming. Subjective.
<u>Telephone Interview</u>	Agent collects survey data via phone.	Similar to questionnaire	Consistency. Time consuming.

<u>Face to Face Interview</u>	Survey administered in presence of respondent.	Provides best data.	Time consuming. Interview bias.
-----------------------------------	------------------------------------------------------------	------------------------	------------------------------------------

Based on the time constraints as well as the length of the questionnaire on the non-NPL process, the telephone interview technique was selected. In addition to high reliability of the responses, this method allowed for the interviewer to ask the respondent to clarify or provide additional information on a specific topics.

2. Development of the Survey Questions

In this phase of development, two steps were undertaken. The first step was to review research literature on survey methodology. (Detailed in the previous section).

The second step was to contact professionals in the "environmental" field to provide additional guidance on the survey design. Field testing of the final product included having the survey reviewed by field personnel to determine if the survey was comprehensive, technically correct and addressed the primary areas of the non-NPL cleanup process.

The survey was given to Mr. Frank Vogl, who is the Environmental Coordinator for the Public Works Department at the Naval Postgraduate School in Monterey, CA., and Ms. Gail Youngblood, who is an Environmental Engineer for the Department of Engineering and Housing at Fort Ord in

Seaside, CA. Both recipients reviewed the survey and offered valuable additions to the proposed survey instrument.

This chapter provided the survey methodology. The next chapter presents the survey findings and analysis.

IV. SURVEY FINDINGS AND ANALYSIS

All the Engineering Field Divisions (EFDs) under the current NAVFAC organization responded to the survey. The head of each respective EFD's Installation Restoration Branch was contacted to find the best qualified respondent for the interview. This method of selection allowed the individual Division management to identify the most qualified person in their organization to complete the interview. The full text of the interviews can be found in Appendix E.

A. SURVEY RESULTS

The respondents provided in-depth insight into the organization of their respective departments and particular issues unique to each region. However, on many occasions the survey questions prompted the respondents to expound on issues not originally planned in this research. The first subsection will present the responses to the survey questions. The second subsection will present issues/responses which were not included in the survey questions.

1. Survey Responses

Question 1. Which EFD, is self explanatory. All of the EFDs responded to the survey.

Question 2. What is your position at the EFD?

The positions of the individuals interviewed ranged from GS12 Environmental Engineers, to a GM15 Environmental Branch Heads, the legal counsel from Western Naval Facilities Engineering Division (WESTDIV), San Bruno, CA and a Commander from Southwest Naval Facilities Engineering Division (SOUTHWESTDIV), San Diego, CA.

Question 3. What are the procedures employed by your EFD to facilitate the non-NPL cleanup process?

The purpose of this question was to investigate whether any of the Engineering Field Divisions (FFDs) were using a procedure other than what is prescribed by CERCLA and OPNAVINST 5090.1A.

All the EFDs used the procedures prescribed by CERCLA and OPNAVINST 5090.1A, the Environmental and Natural Resources Program Manual for both non-NPL and NPL sites. While both CERCLA and 5090.1A state that one needs only to work with the state regulatory agencies when addressing non-NPL sites, both Chesapeake Naval Facilities Engineering Division (CHESDIV) and Atlantic Naval Facilities Engineering Division (LANTDIV) keep the regional EPA advised "in the eventuality that the site goes NPL" [Ref. 27].

Question 4. What phases of the CERCLA mandated cleanup process can be combined with other phases or eliminated to speed up the process?

This question investigated whether the slow response of the non-NPL process can be attributed to the process and if so, where in the process should streamlining occur.

All of the respondents believed that the process could be streamlined. The opinions as to which phases to combine fell into two categories: Conduct the Preliminary Assessment (PA) and Sight Investigation (SI) simultaneously; and Start the design before the Remedial Investigation (RI)/Feasibility Study (FS) is completed.

Question 5. and 6. Do you ever enter into two party cooperative agreements with state or local regulatory agencies? If so, are the two party agreements modeled after the FFA's?

This question was designed to investigate the extent to which the EFD formally documents the agreements and schedule with the state or local regulatory agencies. This question was developed after discussions with the two professionals who reviewed the survey document. In the professional's experience with the state of California, two party cooperative agreements were used quite successfully. Question 6 was combined with question 5 since it was a follow-on to question 5.

The responses fell into two categories. Either the respondents did not use two party cooperative agreements at all, nor did they believe the two party agreements would help speed the process; or they used them and were very pleased with what the two party cooperative agreement provided to the process.

All of the EFDs, with the exception of those located in California (WESTDIV located in San Bruno, CA and SOUTHWESTDIV located in San Diego, CA), disliked two party cooperative agreements. It was their view that cooperative agreements/Federal Facility Agreements (FFA) do not add any value to the process [Ref.27]. Further, as stated by Mr. Frank Peters, Manager, Environmental Restoration Branch, Chesapeake Naval Facilities Engineering Division (CHESDIV), Washington D.C.

The FFA model language can be very restrictive and severe fines imposed if you fail to meet the schedule. You can't use that type of agreement when your funding availability is uncertain. [Ref. 29]

The EFDs located in California use a two party cooperative agreement (called the Federal Facilities/State Remedial Agreement (FF/SRA)) because it is mandated by California state law.

Question 7. What if any, NAVFAC policies prevent the non-NPL site restoration process from proceeding faster?

This question was developed to explore whether any NAVFAC policies were impeding the process.

The predominate response (5 of 7) was that none of the NAVFAC policies were an impediment to the process. However, on two of the five responses an additional concern was noted on future funding for manpower and the cleanup priority system. Mr. Frank Peters, Manager, Environmental Restoration Branch, Chesapeake Naval Facilities Engineering Division (CHESDIV), Washington D.C. stated:

Nothing NAVFAC is doing is creating a problem. However, funding priority may become a problem if funds become tight. Also manpower restrictions. The affect of the downsizing that CHESDIV will sustain is unknown as of yet. I would like to keep what I've got and get more people if possible. [Ref. 29]

Mr. Conrad Mayer, Director, Environmental Division, Northern Naval Facilities Engineering Division (NORTHDIV), Philadelphia, PA. had similar comments:

With the current funds availability, non-NPL is not a problem. But on the horizon, with the possibility of shrinking funds, getting the non-NPL work done might be a problem under the worst first priority system. The key is to get to the RA phase faster or as quickly as possible. He who gets out front first gets the funds. [Ref. 28]

Question 8. Do you think using Turnkey contracts for site remediation would quicken the process?

Turnkey contracts, synonymous with Design/Build is where one contractor is awarded a contract to design and construct a facility or perform the remediation (cleanup). The Senate Appropriations Bill of the 102nd Congress included report language which outlined five principles for a pilot program to expedite environmental cleanup. One of the principles is to "Use Turnkey contracts to cover more than one phase of any cleanup" [Ref. 20]. Since the survey respondents would be responsible for the development of the contract package and the subsequent Turnkey contract administration, this question explored whether the respondents thought Turnkey contracts would help speed the process.

A strong majority (five of the seven respondents) were in favor of using Turnkey type contracts for site remediation (cleanup). Typical favorable comments for using Turnkey contracts were:

Turnkey is certainly the way to go. However the Brooks Act prevents design and construction. Experience has shown us that doing less study of the problem and start the construction earlier, take your hits via the unforeseen site conditions/changes clause is the way to go. Everybody knows that once you let a contract you are going to have changes, it's just a fact of life. We ought to just accept that fact, study the problem less and get on with the remediation. [Ref. 30]

CERCLA requires that the study phase be done by an Architect/Engineer (A/E), however, there are good design/build contractors out there that do good work, like

Ground Water Technology and IT Ebasco. I certainly would like to try it. [Ref. 29]

Question 9. What are the limitations of using a Turnkey type contract for site remediation?

Many of the survey respondents indicated the primary limitation to using a Turnkey contract is the Brooks Act. Only one person elaborated further on this question. Mr. Peter Nakamura, Environmental Engineer, Pacific Naval Facilities Engineering Division (PACDIV), Pearl Harbor, HI. stated:

The biggest fear we have is conflict of interest. There is certainty the potential that the A/E could build-in more cleanup than is necessary. We would definitely have to watch out for that occurrence. [Ref. 31]

Question 10. Is partnering with the federal, state, and local regulatory agencies a viable option for improving the site restoration process?

Partnering, while not a new idea, is somewhat of a new concept for the contracting/construction industry. Partnering is an approach to conducting business that focuses on making long-term commitments with common goals for all parties involved to achieve mutual success. It is also an excellent vehicle to help attain total quality management (TQM) for construction projects. [Ref. 32]

Partnering is a term used to define an optimum relationship between a customer and supplier, not to be

confused with the formal legal entity, "a partnership," and its associated mutual liabilities. Partnering refers to long-term agreements between companies to cooperate to an unusually high degree to achieve separate yet complementary objectives. The relationship is based upon trust, dedication to common goals, and an understanding of each company's individual expectations and values. On most occasions in the United States the relationship is definitized in a written document, while in Japan the commitments are usually verbal. [Ref. 32]

All of the survey respondents were enthusiastic about using partnering as a means to proceed to remediation (actual cleanup) more quickly. The typical comment was:

Partnering, the sooner the better. Most problems have manifested themselves when regulatory agencies are brought in late. Many times they wish you had done previous investigations differently. Therefore, a lot of time is spent either negotiating the validity of your studies or performing another study that the regulatory authority dictates. [Ref. 33]

Question 11. If partnering is currently used, when is it implemented? Could it be implemented earlier?

While NORTHDIV is considering implementing partnering, only SOUTHDIV has actively implemented partnering/teaming at one of its NPL sites. This one site has already produced very positive results. "You can't implement teaming/partnering soon enough" stated CDR Tower [Ref. 34].

Question 12. What percentage of the impediments to the process is caused by changes in regulatory agents who monitor your work?

This survey question was developed from conversations with various NAVFAC environmental personnel during the NAVFAC Environmental Workshop held at San Diego, CA., 29-31 January 1992. Some of the Engineering Field Divisions have experienced a significant amount of personnel turnover within the regulatory agencies with which they interact. This question was developed to determine whether all the EFDs were experiencing the same type of problem.

Six of the seven Engineering Field Divisions have experienced an impact as a result of turnover of a Remedial Project Manager (RPM) within the regulatory agencies. This turnover of regulatory personnel has caused delays in the cleanup process because:

- the new regulators may be inexperienced and have to be trained before they become knowledgeable of the regulations, process, people and the hazardous waste sites. [Ref. 31]
- the new regulator often has a different agenda than the previous regulator. The new regulator has occasionally required the performance of additional studies prior to allowing the process to continue. [Ref. 27]

Question 13. What are your frustrations with the current process?

The purpose of this question was to gather a cross section of subjects that the operational manager felt were an

impediment to the DoD/DoN process. This was an opportunity for the survey respondents to discuss subjects not address in the prepared questions.

The responses focused on four major topics:

- Studying the Problem: We spend too much time studying the problem, involved in the process of regulator reviews and comments [Ref. 28]. The process isn't removal oriented, its process/study oriented [Ref. 31].
- CLEAN Contracts: CLEAN contracts, while good, need to be performance oriented with the goal to get to the end of design as soon as possible yet meeting all the wickets with the regulatory agencies [Ref. 31]. The CLEAN contract is a flexible contract yet we've imposed an inflexible management on top of it. It is a manpower intensive contract to administer [Ref. 30]. Having only one CLEAN contractor does not incentivize him to work faster, smarter or more efficiently. It would be to our advantage to have at least two CLEAN contractors at each EFD. The influence of competition would work to our favor. Also NAVFAC has not provided any policy on how to administer the CLEAN contract in the field. Each EFD is making up their own policies as they go along [Ref. 27].
- Standard Database System: The services lack a standard database system in which we can query to investigate if any other facility has a similar cleanup problem. We need to provide a technological transfer between the services [Ref. 30]. There is no feedback about what other EFDs are finding successful, likewise the other services. We need to pool the corporate knowledge and disseminate it to the field [Ref. 33].
- Manpower: Definitely going to need more people. The Remedial Project Managers (RPM) can handle a lot of jobs as we go through the study phases. However, when we transition to the Remedial Action (cleanup) phases the RPM will not be able to handle all the work. We will need more RPMs. As for the Resident Officer in Charge of

Construction (ROICC), we have yet to look at what type of impact the actual cleanup will have on them [Ref. 27].²

Question 14. Do you have any site remediation success stories that were accomplished smoothly? Why was the site remediation a success?

This survey question was developed from conversations with various NAVFAC environmental personnel and their desire to learn about innovative procedures others had developed. The responses were quite different and varied. Two "success" stories are worth noting:

- Both NORTHDIV and SOUTHDIV had requested to use an abbreviated review process for a specific site. Their respective regulators agreed and both projects proceeded to the removal phase expeditiously.
- SOUTHDIV utilized the United States Geological Survey (USGS) as a technical expert on one of its projects. The USGS has a high level of technical competence and capability in the geotechnical engineering field and is highly revered by both the regulatory authorities and the EPA. The state and EPA quickly approved the USGS remedial design and were very pleased with the final results.
[Ref. 28]

Appendix E documents the rest of the responses.

Question 15. Are there any failures which you would like to document so others do not fall into the same trap?

As with the success stories, one should also document occasions where the process seemed to fail and provide a

²Resident Officer in Charge of Construction is a Civil Engineer Corps Officer tasked with the contract administration, inspection and oversight of construction and maintenance contracts at a Naval installation.

"lessons learned" from which others can benefit. Again the responses were quite different and varied. Appendix E documents the responses.

2. Other Responses

On many occasions the survey questions prompted the respondents to expound on issues not originally planned in this research. However these responses are important as they are additional issues the Engineering Field Divisions must address. The issues include:

- manpower constraints
- using Technical Review Committees (TRC) and the Community Relations Program
- maintaining the database system.

a. Manpower Constraints

The NAVFAC organization restructuring and the realization that the organization is just beginning to address all of the hazardous waste sites has many of the individuals concerned about having adequate manpower to accomplish their tasks. Their concerns are:

Definitely going to need more people. The Remedial Project Managers (RPM) can handle a lot of jobs as we go through the study phases. However, when we transition to the Remedial Action phases, the RPM will not be able to handle all the work. We will need more RPMs. In the Resident Officer In Charge of Construction offices (ROICC) we don't know if we will need more people or just have the present people trained in site remediation. We are not even sure if the ROICC is the best place for those people. It might be that the Public Works Department would be the best location for them. [Ref. 27]

The effect of the downsizing is unknown as of yet. I would like to keep the people I've got and get more if possible. I just can't afford to lose any more of my people. [Ref. 29]

b. Community Relations Programs

The Community Relations Program and the Technical Review Committee (TRC) are two of the most positive aspects of the site remediation process, yet they must be continuously monitored. Both programs provided an excellent opportunity to disseminate information, project progress and present upcoming issues to the public. The comments were:

Technical Review Committees (TRC) and maintaining open communications with the community is a definite must. But sometimes it depends on the site and what point you are in the cleanup. Some communities have very little interest if the waste is not migrating off the installation. However, it's good to have the points of contact and advise them when dump trucks start rolling through their community. A lesson learned is to do the necessary "ground work" in the beginning for it will pay dividends when the Remedial Action (actual cleanup) takes place. [Ref. 27]

We use TRCs and found them to be very beneficial. Our Community Relations Committees have been very effective, it keeps the public informed. The public begins to realize that we are trying to fix the problems not "cover them up." [Ref. 28]

We use TRCs and Public Affairs extensively to keep the community involved and informed. It has been very advantageous. [Ref. 29]

We use TRCs and our Community Relations Plans quite extensively. They have been very helpful. The public wants to know what is happening on our installations and will it have an effect on them. [Ref. 31]

c. Maintaining the Database System

Maintaining the database (keeping it updated) and providing useful information about what other activities are doing is becoming a growing concern with the environmental people.

We lack a standard database system in which we could query what techniques other activities or even the other services are using. The database needs to provide what functions were performed, the resources used, additional project information and a technical transfer for lessons learned. [Ref. 30]

We in the NAVFAC organization have a big database problem. The Remedial Project Manager (RPM) is required to keep the various databases updated. If the RPM were to diligently do that, it would take up all of his time. The databases are complex and do not exchange information with one another. Also, if you want to find information about what others are doing, forget it. [Ref. 27]

It would certainly be nice to apply the lessons learned at other activities to your own situation, but the database we currently use just does not have that capability. [Ref. 28]

B. ANALYSIS

1. Process

The process, outlined by the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), is an effective format to manage the voluminous number of regulations, actions, reports and responses, required when cleaning up a hazardous waste site. However, the ultimate goal of site remediation seemingly takes forever to achieve.

There is a need to improve management of the process as was evident by the survey responses. Managing the process is broken into four subcategories:

- streamlining the process;
- "studying" the site;
- "partnering;" and
- use of a Federal Facilities Agreement for non-NPL site cleanups.

The Engineering Field Divisions (EFDs) are streamlining the process by conducting some of the steps concurrently. For instance, they have recognized that waiting for the completion of a facility-wide Preliminary Assessment (records search) prior to commencing site investigations of potentially hazardous waste sites is a loss of production time. Likewise, based on sound engineering judgement, remediation project managers (RPM) have determined it prudent in some circumstances to commence the design phase prior to the completion of the Remedial Investigation/Feasibility Studies. All these actions are an effort to proceed to remediation more quickly.

Throughout the survey there was an undercurrent of opinion that the process was too study oriented. This is based on the expressed opinions of Mr. Peter Nakamura of PACDIV, Mr. James Malone of SOUTHDIV, Mr. Conrad Mayer of NORTHDIV and the implied comments of others. While it is prudent to ensure that all phases of the process are

adequately addressed, there is a point of diminishing returns where additional studies or core borings add little marginal benefit to the reduction of uncertainty.

Understanding why the organization continues to rely on (require) additional studies rather than proceeding with the design and remediation is more a function of the educational and professional background of the decision makers rather than the process itself. Many of the decision makers/upper management have achieved their positions from within the NAVFAC organization. Many of these individuals' educational background, standard practice and experience was developed in traditional engineering services (e.g., designing and constructing roads, buildings, runways and harbor facilities) where uncertainty is reduced to manageable levels at the feasibility study phase [Ref. 37]. Therefore, one would reasonably expect that when faced with increased uncertainty as to the nature of the contamination and the geological structure with in it which resides, the automatic reaction of the "engineer" is to perform additional studies.

To alleviate the "study" trap, new philosophies concerning remediation and team building need to be pursued. One such innovation was the teaming of SOUTHDIV with the U.S. Geological Survey to jointly evaluate and eventually cleanup a hazardous waste site.

Partnering is another "innovation" which should be explored. The overwhelming support for partnering may be a

direct correlation with the express desire to eliminate the adversarial relationship that occasionally occurs between the federal government and the regulatory agencies [Ref. 28]. The EFDs are beginning to realize that taking a proactive approach, formulating working relationships earlier and disclosing goals and limitations, has a greater influence in moving a project through to completion [Ref. 34].

Federal Facilities Agreements (FFA) are generally considered as a means of developing partnerships, cultivating better understanding between the military installation and the regulatory agencies and building a sense of mutual trust. While only required on NPL hazardous waste sites, data from two California remedial Project managers indicated the process could be expedited if FFAs were utilized on non-NPL sites.

The state of California requires the use of a document similar to the FFA when cleaning up non-NPL sites. This document, called a Federal Facilities/State Remedial Agreement (FF/SRA) was viewed by the local RPMs as a useful document. However, the survey data did not reflect similar positive reactions from all the respondents interviewed. The results were just the opposite. [App. E, Question 5]

The overwhelming consensus was opposed to requiring a document like the FFA for use at non-NPL sites. The underlying sentiment that the FFA took too much time to draft and became too legally restrictive. Since non-NPL sites are smaller and usually only deal with the state regulatory

agencies (not the EPA), it is much easier to control the process by avoiding the use of the cooperative agreements.

2. Contracting

The survey results indicated there were two subcategories of contracting that concerned the respondents:

- Comprehensive Long Term Environmental Action Navy (CLEAN) contracting, and the administration thereof and
- Turnkey contracting.

The Comprehensive Long Term Environmental Action Navy (CLEAN) contracts are fairly new to the EFDs.³ In addition, these contracts are cost plus award fee (CPAF) contracts.⁴ Engineering Field Divisions are accustomed to processing firm fixed price contracts. Their lack of experience in working with CPAF contracts has increased the frustration level at the EFD.

The award portion of a cost plus award fee contract can be an extreme administrative burden if the fee determination (profit) is not structured correctly [Ref.35]. Under this type of contract, the fee negotiations (on a

³CLEAN contracts are designed to span the entire installation restoration process as required by CERCLA. These contracts are intended primarily to provide engineering services from initial studies through design. All seven EFDs have such contracts in force.

⁴Cost Plus Award Fee type contract is a cost-reimbursement contract that provides for a fee consisting of 1. a base amount fixed at inception of the contract and 2. an award amount, based upon a judgmental evaluation by the government.

quarterly, semiannual or yearly basis) are fairly complex and have a high administrative cost to the Navy. Currently, the Engineering Field Divisions contract administration expertise is not in the area of cost plus type contracts [Ref. 36]. The EFDs should be able to streamline the administrative burden of cost plus award fee contracts over the next several years.

Another comment concerning CLEAN contracts was that "there is no competition to incentivize the contractor." The cost plus award fee contract (CPAF) itself, if properly administered, should provide some incentive for the contractor. The advantages of a CPAF contract for the government is shared risk and a contractor motivated for superior performance achievement since the fee (profit) is negotiated. Here too, once the EFDs gain experience utilizing all the procedural tools available within a CPAF contract, their desire to have two or more contracts to promote competition may fade.

The overwhelming support for Turnkey contracts is driven by desire of the Remediation Project Manager (RPM) to have another "tool" with which to cleanup hazardous waste sites. The advantage of Turnkey contracts is the reduction of time to remediate a hazardous waste site [Ref. 38]. Throughout the interviews, there was an desire by all of the respondents to proceed to the remediation phase more quickly. The respondents viewed Turnkey contracting as a means to achieving these goals.

3. Manpower

Though not specifically asked by the survey, some of the respondents voiced a manpower concern. Part of the concern is manifest in the unknown; what will happen as a result of the future NAVFAC reorganization. Another portion of the concern has evolved from analyzing the current program and projecting future needs.

As the program progresses from Preliminary Assessment to Remedial Investigation and actual remediation, involvement by the remediation project manager (RPM) increases [Ref. 27]. Likewise, increased coordination and contract administration will be required of the Resident Officer in Charge of Construction (ROICC). The RPMs and ROICC staffs are typically working at capacity. From the opinions expressed in the survey, the added burdened means either more people are hired and trained to process the additional work or the same quality of work cannot be processed.

V. CONCLUSIONS

The process outlined by the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) appears to have been effective in remediating hazardous waste sites. However, the process will take an exceptionally long time before the actual remediation of a hazardous waste site is completed if allowed to proceed literally, step by step, (ie, waiting for the completion of one phase before commencing with the next).

Department of Defense non-National Priorities List hazardous waste sites, while seeming "less toxic," outnumber the NPL sites by almost 200 to 1. The Navy needs to investigate ways to streamline the process before any progress can be made on the substantial number of non-NPL sites.

The cleanup process alone can be very complex and confusing. The web of laws and regulations extend from the federal and state level to the local governments. New regulations and oversight impose more burdens on government agencies as they continue towards remediation of hazardous waste sites.

It is these complexities and issues that motivated this research.

A. RESEARCH QUESTIONS

This thesis began by asking the primary research question: Can the non-NPL installation Restoration process be improved such that actual remediation of hazardous waste sites can occur more quickly than current planning? As the Deputy Assistant Secretary of Defense for Environment stated in his annual report to Congress for FY91:

The Department has identified several areas where considerable interagency cooperation is required to streamline the restoration process. DoD is working closely with other Federal agencies and state regulatory authorities to implement procedures for moving sites rapidly from the investigation phase to cleanup.
[Ref. 3:p. v]

The process can be streamlined, not by eliminating steps but by conducting some steps concurrently. Performing the Site Investigation immediately upon suspecting the presence of a hazardous waste site and beginning the Remedial Design prior to completing the Feasibility Study are examples of methods currently used by some of the Engineering Field Divisions to streamline the process.

The Naval Facilities Engineering Command (NAVFAC) thus far has not made the process more complex by implementing additional policies. However, due to the dynamic nature of NAVFAC's business, there are issues specific to Installation Restoration Program which should be addressed including:

- what affect will the NAVFAC reorganization have on the respective Engineering Field Divisions Installation Restoration personnel

- providing EFDs with specific training on the Comprehensive Long Term Environmental Action Navy (CLEAN) contract addressing administration of Cost Plus Award Fee contracts.

Another contract issue is the legal implications of using Turnkey contracting for site remediation. NAVFAC has taken a conservative position in the interpretation of the various laws and currently does not authorize the use of Turnkey contracting. The Air Force meanwhile, has a more liberal interpretation and is proceeding with the use of Turnkey contracting in a few site remediations. This issue will not be decided until it is challenged in court. [Ref. 23]

Regardless of the law, the Engineering Field Divisions would like to use Turnkey contracting for site remediation. There are certain instances where performing the Remedial Design and Remedial Action via a Turnkey contract would be both advantages and expeditious to the government [Ref. 34].

The Annual Report to Congress for Fiscal Year 1991 on the Defense Environmental Restoration Program stated:

the Department was involved in an interagency effort to establish a team approach between DoD and the U.S. Environmental Protection Agency project managers for selecting remedies at NPL sites. [Ref. 3:p. v]

Yet only one Engineering Field Division has actively implemented partnering/teaming at one of NPL site. This site has already produced very positive results. Partnering the state and federal EPA, the Navy Remedial Program Manager, the

CLEAN contractor and the on-site representative is promoting teamwork, trust and commitment. Working as a team from the beginning, the individuals developed improved communication skills. Partnering is helping to reduce if not eliminate the adversarial atmosphere that many traditional regulatory/DoD relationships experience. In the past, problems have developed when the regulatory agencies entered the project late. Partnering should completely eliminate this problem. Some of the survey respondents predicted that the study and documentation phases could be cut by 50% if partnering was utilized.

B. CONCLUSIONS

Installation Restoration process can be improved. Advocating concurrence of phases to streamline the process, challenging the regulatory agencies to perform quick reviews and investing time in cultivating partnerships with the regulatory agencies are all grassroots innovations. What is required is the establishment of more pilot programs and a central clearing house for DoN to monitor and disseminate the results of the those programs to other interested parties.

New expedited environmental cleanup "pilot programs" are currently in progress at five selected installations within the United States. More installations need to participate in this program and share data on each others progress. Only by "cross-pollination" of information will NAVFAC personnel

improve their capability to deal with the difficult task of environmental cleanups on U.S. Navy installations/property.

C. AREAS FOR FURTHER RESEARCH

The demand for federal agencies to comply with environmental regulations is a reality. Federal agencies must learn to improve performance with current resource levels and retain personnel trained in environmental restoration.

Further research may consider the following areas:

- Perform a cost/benefit analysis to determine whether it is feasible for Navy installations to purchase a Gas Chromatograph/Mass Spectrometer to test unknown hazardous substances rather than contracting out for such tests.
- Investigate the pay differential between EPA, DoD, state, local and private sector "working level" Remediation Project Managers.
- Perform a manpower study to investigate the most effective placement of additional environmental engineers: whether in the ROICC office or the Public Works Department; whether the individual should be Government service or contractor hire.
- Perform a comparative analysis of two NPL site remediations. Investigate partnering/team building at MCAS Yuma and compare the results to another NPL site which is not using partnering.

APPENDIX A

Acronyms

A/E	Architect/Engineer
CA	Cooperative Agreement
CAA	Clean Air Act
CWA	Clean Water Act
CEQ	Council on Environmental Quality
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CHESDIV	Chesapeake Naval Facilities Engineering Division
CLEAN	Comprehensive Long Term Environmental Action Navy
CPAF	Cost Plus Award Fee
DERA	Defense Environmental Restoration Account
DERP	Defense Environmental Restoration Program
DOD	Department of Defense
DON	Department of Navy
DSMOA	DOD/State Memorandum of Agreement
EFD	Engineering Field Division
EIS	Environmental Impact Statement
EPA	Environmental Protection Agency
FFA	Federal Facilities Agreement

FF/SRA	Federal Facilities/State Remediation Agreement
GAO	General Accounting Office
HRS	Hazardous Ranking System
HW	Hazardous Waste
IAG	Interagency Agency Agreement
IR	Installation Restoration
IRP	Installation Restoration Program
LANTDIV	Atlantic Naval Facilities Engineering Division
LTM	Long Term Monitoring
MILCON	Military Construction
NAVFAC	Naval Facilities Engineering Command
NCP	National Contingency Plan
NECA	Navy Environmental Compliance Account
NEESA	Naval Energy and Environmental Support Agency
NEPA	National Environmental Policy Act
NORTHDIV	Northern Naval Facilities Engineering Division
NPL	National Priorities List
O&M	Operations and Maintenance
OHW	Other Hazardous Waste
PA/SI	Preliminary Assessment/ Site Inspection
PACDIV	Pacific Naval Facilities Engineering Division
RCRA	Resource Conservation and Recovery Act
RD/RA	Remedial Design/Remedial Action
RI/FS	Remedial Investigation/ Feasibility Study
ROICC	Resident Officer in Charge of Construction
RPM	Remedial Project Manager

SARA	Superfund Amendments and Reauthorization Act
SOUTHDIV	Southern Naval Facilities Engineering Division
SOUTHWESTDIV	South Western Naval Facilities Engineering Division
SWDA	Solid Waste Disposal Act
TQM	Total Quality Management
TSCA	Toxic Substances Control Act
TRC	Technical Review Committee
USGS	United States Geological Survey
WESTDIV	Western Naval Facilities Engineering Division

APPENDIX B

Survey Questionnaire

1. Which EFD?
2. What is your position at the EFD?
3. What are the procedures employed by your EFD to facilitate the non-NPL cleanup process?
4. What phases of the CERCLA mandated cleanup process can be combined with other phases or eliminated to speed up the process?
5. Do you enter into two party cooperative agreements with the state or local regulatory agencies?
6. If so, are the two party cooperative agreements modeled after the FFA's?
7. What, if any, NAVFAC policies prevent the non-NPL site restoration process from proceeding faster?
8. Do you think using a Turnkey type contract for site remediation would quicken the process?
9. What are the limitations of using a Turnkey type contract for site remediation?

10. Is partnering with the federal, state, and local regulatory agencies a viable option for improving the site restoration process?
11. If partnering is currently used, when is it implemented? Could it be implemented earlier?
12. What percentage of the impediments to the process is caused by changes in regulatory agents who monitor your work?
13. What are your frustrations with the current process?
14. Do you have any success stories which proceeded smoothly? Why was the site remediation a success?
15. Are there any failures which you would like to document so others do not fall into the same trap?

APPENDIX C

Respondents and Organizations

Patrick Burke	Western Naval Facilities Engineering Division (WESTDIV), San Bruno, CA, Legal Counsel.
Nina Johnson	Atlantic Naval Facilities Engineering Division (LANTDIV), Norfolk, VA, Head, Installation Restoration Section, GM13.
James Malone	Southern Naval Facilities Engineering Division (SOUTHDIV), Charleston, SC, Head, Installation Branch Restoration I, GM13.
Conrad Mayers	Northern Naval Facilities Engineering Division (NORTHDIV), Philadelphia, PA, Director, Environmental Division, GM15.
Peter Nakamura	Pacific Naval Facilities Engineering Division (PACDIV), Pearl Harbor, HI, Remedial Project Engineer, GS12.
Frank Peters	Chesapeake Naval Facilities Engineering Division (CHESDIV), Washington D.C., Manager, Environmental Restoration Branch, GM14.
Steve Tower	Southwest Naval Facilities Engineering Division (SOUTHWESTDIV), San Diego, CA, Head, Environmental Management, Commander, CEC, USN.
John Woodburn	Chesapeake Naval Facilities Engineering Division (CHESDIV), Washington D.C., Remedial Project Engineer, GS12.

APPENDIX D

- **Clean Air Act (1977).** Legislation designed to prevent, control and abate air pollution from stationary and mobile sources.
- **Comprehensive Environmental Response, Compensation, and Liability Act (1980).** Regulates cleanup of hazardous waste sites. Also known as "Superfund." Amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA).
- **Clean Water Act (1972-1987).** This Act regulates discharge of wastewaters from industrial facilities and sewage treatment facilities. It also regulates impacts to wetlands.
- **Hazardous and Solid Waste Amendments (1984).** Amendments to RCRA which include regulations on waste minimization, land disposal of hazardous waste, and underground storage tanks.
- **National Contingency Plan.** Regulations which implement CERCLA provisions for responding to releases of oil and hazardous substances including cleanup of NPL sites.
- **National Environmental Policy Act (1969).** Act requiring all Federal agencies to take into account environmental effects of proposed major actions through preparation of environmental assessments or environmental impact statements.
- **Resource Conservation and Recovery Act (1976).** RCRA establishes guidelines and standards for hazardous waste generation, transportation, treatment, storage, and disposal. Amended by HSWA.
- **Superfund Amendments and Reauthorization Act (1986).** This Act establishes standards for cleanup activities and also stipulates the conditions for off-site disposal of wastes. Also required federal agencies to comply with CERCLA in the same manner as any non-governmental entity.
- **Toxic Substances Control act of 1976.** Regulates PCBs, CFCs, asbestos; requires testing of chemical substances entering the environment and regulating releases where necessary.

APPENDIX E

Survey Responses

1. Which EFD?

Responses will be presented in the following order:

NORTHDIV
CHESDIV
LANTDIV
SOUTHDIV
WESTDIV
SOUTHWESTDIV
PACDIV

2. What is your position at the EFD?

See Appendix C.

3. What are the procedures employed by your EFD to facilitate the non-NPL cleanup process?

NORTHDIV	We use the same procedures as a NPL site, but only deal with the state regulatory authorities.
CHESDIV	Use the procedures set up by the CERCLA program for both NPL and non-NPL.
LANTDIV	Run both NPL and non-NPL the same. We keep the EPA involved in non-NPL because you never know if the site will get rated NPL.
SOUTHDIV	The procedure for non-NPL is the same as for NPL.
WESTDIV	The procedures are just like that used for NPL except we use a Federal Facilities/State Remediation Agreement (FF/SRA) which is a product of state law.
SOUTHWESTDIV	The procedure we use is what is prescribed by OPNAVINST 5090.1A with the exception that the state of California uses a document called the Federal Facilities/ State Remediation Agreement (FF/SRA).

PACDIV OPNAVINST 5090.1A states all cleanups regardless of "size" will proceed the same way.

4. What phases of the CERCLA mandated cleanup process can be combined with other phases or eliminated to speed up the process?

NORTHDIV Nice thing about a non-NPL site is you don't have to mess with the Federal Facilities Agreement (FFA) process.

CHESDIV (John Woodburn) The Site Investigation (SI) phase does not need to be as formalized as in the past. The SI can and should be run almost simultaneously as the Preliminary Assessment (PA). For the PA: when performing a records check or walking the site, if you see an area of potential contamination, go ahead right then and order core samples. Don't wait until its "time" to do the site investigation. Many of our PA/SI are so old (performed before SARA was enacted in 1986) that the information they provide really doesn't help with the Remedial Investigation/Design (RD). The Remedial Investigations (RI)/Feasibility Study (FS) are much more extensive than previous (pre SARA) studies were. PA/SI are really only used to evaluate whether there has been a release or not. They do not address the transport of the hazardous waste, the potential targets (receptors) or analyze the risk.

LANTDIV Can run some phases concurrently, like starting the design before the Remedial Investigation/Feasibility Study is complete. To do this it really depends on how confident you are in the findings you are receiving. I don't think one should proceed with the design early if you do not have any confidence in your results.

SOUTHDIV Overlap the Feasibility Study and the design. The EPA recognizes that this can be a viable option.

SOUTHWESTDIV None of the phases can be eliminated but some of them can certainly be run concurrently.

PACDIV The process is good for large sites with large contamination and large risk. But for small non-NPL sites, could combine the Preliminary

Assessment (PA)/Site Investigation (SI) phases. After the PA, go immediately into the SI and perform a Preliminary Risk Assessment. Depending on the results you know right away whether the site possesses risk to the environment and human health. If the site doesn't pose a risk, write it off. Now you have fairly good data to advise the community on what is out there.

5. Do you enter into two party cooperative agreements with the state or local regulatory agencies?

NORTHDIV We don't use cooperative agreements. Cooperative agreements or the Federal Facilities Agreement (FFA) is a document which is developed by a long negotiated process where everyone's legal counsel is involved. Those negotiations slow down the process. Since we are not required to use FFAs on non-NPL sites, we don't. What we have to find is a better way to keep the process moving yet keep the regulatory authorities happy.

CHESDIV No, have not used cooperative agreements and don't see the need for them. We keep a close working relationship with our regulators. If we need to determine cleanup levels (how clean is clean), we determine that by negotiating directly with the state based on the state's Applicable or Relevant and Appropriate Requirements. FFA model language can be restrictive and severe fines imposed if the schedule is not met. You can't accept that type of document when your funding is not guaranteed.

LANTDIV Have not entered into cooperative agreements. Don't think they will accelerate the process because of the negotiation effort involved to get one finalized. Would pursue using a cooperative agreement similar to a FFA only if it would be advantageous to do so. As of right now, I don't see where it would be advantageous. D/SMOA however have helped. The state of Virginia has accelerated the review process since the D/SMOA has been in place.

SOUTHDIV None of the states have CERCLA programs. Most of the work is on RCRA sites. Really don't use cooperative agreements.

WESTDIV For the state of California we use a document called a Federal Facilities/State Remedial Agreement (FF/SRA). the FF/SRA is a product of state law. California has its own mini-CERCLA program where in Utah they have no mini-CERCLA. I like using the FF/SRA procedure because it outlines who is responsible for what reviews in what time frame.

SOUTHWESTDIV Yes we do. As a result of state law in California we use a document referred to as the Federal Facilities/State Remedial Agreement (FF/SRA). From a layman's perspective the FF/SRA was a result of the federal installations not responding to the state's inquiries. To ensure that the state had some type of agreement with the federal installation, California passed the FF/SRA. The FF/SRA takes a considerable amount of time to negotiate yet does not add anything to the process.

PACDIV We don't use cooperative agreements. Hawaii's Department of Health is very understaffed, so adding additional negotiations or reviews into the process would not be advantageous for them or us. However, now that DoD and the state are working out their D/SMOA we are expecting more people to be working for the Dept of Health, which will hopefully speed up their reviews of our documents.

6. If so, are the two party cooperative agreements modeled after the FFA's?

Only two EFDs use a two party agreement: WESTDIV and SOUTHWESTDIV. The document (FF/SRA), mandated by California, is modeled after the FFAs.

7. What, if any, NAVFAC policies prevent the non-NPL site restoration process from proceeding faster?

NORTHDIV Currently with the funds availability, non-NPL cleanup is not a problem. But on the horizon, with the possibility of shrinking funds, getting the non-NPL work done might be a problem under the worst first priority system.

CHESDIV Frank Peters: Nothing NAVFAC is doing slows the process. The worst first priority may become a problem if funds get tight. Manpower restrictions: the effect of the downsizing is unknown as of yet. I would like to keep what I've got and get more if possible.

LANTDIV The biggest problem is that NAVFAC 02 policies are definitely affecting the program.⁵ NAVFAC does not allow the Remediation Action contract to be design/build yet the Air Force is doing it. If the Air Force is using design/build why can't we? Also, I can't convince NAVFAC, that in the interest of competition in contracting, it would be advantageous to have two Comprehensive Long Term Environmental Action Navy (CLEAN) contracts at each EFD. One CLEAN contractor does not incentivize him to work faster, smarter or more efficiently. Further, NAVFAC has not provided any policy on how to administer the CLEAN contracts in the field. Each EFD is making up their own policies as they go along. Another issue that needs to be addressed is ROICC support. During the CLEAN contract we don't use the ROICC. However, at remediation (the actual cleanup) we must have the ROICC involved. The question is how much training will the ROICCs need. How much more additional support will they require. Right now we don't know.

SOUTHDIV There are no NAVFAC policies that are a hinderance to the process.

WESTDIV NAVFAC hasn't issued any policies which delays the process in any way.

SOUTHWESTDIV There is nothing NAVFAC has published which impedes the process.

PACDIV It seems that most of the emphasis has been on the investigation, where the emphasis should getting to remediation sooner. We need more guidance on how to get to remediation faster. There also should be more emphasis on Community relations. People need to be informed as to what the threat is.

⁵NAVFAC 02 is responsible for promulgating contracting guidance and policies.

8. Do you think using Turnkey type contracts for site remediation would quicken the process?

NORTHDIV I don't like Turnkey contracts. If we were told to use them I don't know how we would implement them. We must control the process to be able to address the local community and the regulatory authority concerns. Other contract vehicles I would like to see are: two step contract with a technical review; unit price contracts. We used an estimated quantity-unit price contract twice and they worked very well.

CHESDIV Frank Peters: CERCLA requires the study to be done by an A/E while the FAR does not allow A/Es to do their own construction work. Certainly would like to try it. There are some good A/E contractors that can do Turnkey type remediation like Ground Water Technology and IT Ebasco.
John Woodburn: we've currently been using unit pricing-estimated quantity contracts and one can almost guarantee that you will run into changed site conditions, where change orders will be necessary to finish the project.

LANTDIV Turnkey contracting is worth a try, so long as we are taught how to administer the contract.

SOUTHDIV Turnkey is the way to go, however the Brooks Act prevents design and construct to be awarded to one contractor. Experience has shown that doing less studying of the problem is better. Start the construction earlier then take your hits via differing site conditions. It doesn't matter how well you study the problem, you are always going to have to change the contract because of differing site conditions. NAVFAC likes to write tight specs. It worked well in the construction world but in actuality tight specs will not limit the change orders which are a fact of life in a Remediation Action. We should use more unit type specs. Possibly more cost type contracts too. Even service type contracts. I initially thought the hazardous waste cleanup would have a major impact on the 04 (design) group. But we have found out that is not true. The major impact has been on 05 (construction) and as the work

moves along the Remedial Action phase, the ROICC will be heavily challenged.

SOUTHWESTDIV If we were to use Turnkey, I would advise that they be used on requirements type problems. In other words, this is what we know is the problem, tell us how you propose to fix the problem.

PACDIV Yes if properly structured, Turnkey could help us get to remediation in a much timelier fashion.

9. What are the limitations of using a Turnkey type contract for site remediation?

CHESDIV Have not even considered Turnkey since it is precluded by CERCLA and the Brooks Act.

SOUTHDIV Turnkey limitations; the Brooks Act.

SOUTHWESTDIV Turnkey is illegal. We need some legislative relief to allow us to use Turnkey.

PACDIV Biggest limitation is the fear of conflict of interest. There is a potential that the A/E will build-in more cleanup than necessary. We would definitely have to watch out for that occurrence.

10. Is partnering with the federal, state, and local regulatory agencies a viable option for improving the site restoration process?

NORTHDIV Partnering is a very viable option, absolutely.

CHESDIV Frank Peters: Partnering is not an entirely new concept. We always keep the states involved in our work. We bring them in at the end of the SI phase. Before the SI phase we have no real information to present.
John Woodburn: Partnering ...the sooner the better. Most problems manifest themselves when the regulators are brought in late. They wish you had done previous investigations differently.

LANTDIV Partnering could be helpful, but I don't see it as just one big meeting to encompass everything. Start small writing work plans

together. When it gets to the point after the RI/FS and you are dealing with another Regulatory authority, bring them in at that time to write the next phase of the plan. Partnering is definitely worth a try!

SOUTHDIV

Partnering is OK, but should be highly structured as to what is expected out of it and must get upper management (of both organizations) to sign up to the agreements.

WESTDIV

Partnering would be very good for the process. Currently to bring a document to final approval the state has 60 days to review and comment. The Navy, then has 60 days to incorporate the states comments. Then the state has 30 days to review the revised document. Finally there is the obligatory 30 additional days each agency can use if they get backlogged. Therefore, the approval of one document could potentially take up to 240 days. That is too much time. In partnering with the state regulatory agencies, recommend spending two to three weeks developing a relationship, cooperatively working out the language of the document. The reviews, comment and final approval process could be cut significantly.

SOUTHWESTDIV

Although partnering or teaming is just being considered at other locations, we at SOUTHWESTDIV are firmly committed to the concept and have implemented teaming/partnering at one of our NPL sites. We are just a little beyond the beginning of the process yet we are already witnessing very positive results. The biggest problem that we all have, the military, EPA, states, and even the private sector, is we are working in a very immature technology. There are over 1200 Superfund sites in the United States, yet only 65 have been cleaned up. There is not that much experience out there. There are no design manuals to tell you how to proceed. Not only is the industry immature but the people in the industry are also immature or inexperienced. Many of my Remedial Project Managers are in their 20s. The people they negotiate with are also in their 20s or early 30s and it's no different in the private sector. It is my observation

that many of the adversarial relationships that develop can be directly attributed to poor communications between the regulator and ourselves. If we can teach the regulators, the Navy and our consultants to work as a team, break down the barriers of distrust etc. we will experience positive results.

PACDIV Partnering would be a good idea, but we won't do it right now because Hawaii's regulatory authority is so short handed.

11. If partnering is currently used, when is it implemented?
Could it be implemented earlier?

NORTHDIV is just beginning to implement partnering with state and local regulatory authorities.

SOUTHDIV has fully implemented teaming/partnering on an NPL site at Marine Corp Air Station Yuma, Arizona. "The earlier the better. You can't start developing teamwork, trust and openness too soon." stated Commander Tower.

12. What percentage of the impediments to the process is caused by changes in regulatory agents who monitor your work?

NORTHDIV It is a continuous problem with both the state and the federal government. To keep up, it demands that we almost always continually shift the workload to get the work done. There really has not been an appreciable effect on when the work gets done.

CHESDIV I don't see much turnover at the state regulatory authorities. However, we do see a lot of turnover here at CHESDIV. The pay levels within NAVFAC are not on par with the same working level at other Federal agencies, i.e. the Department of Energy (DOE) and the EPA. At NAVFAC, working level is a GS12 while your working level counterpart at DOE and EPA are GS13 and a GS13/14 respectively. The maximum time a person has stayed at CHESDIV IR branch is two years. We invest so much time and money into these people and then they roll out.

LANTDIV Change in personnel with the regulatory authorities is definitely a problem. The EPA

changed a Remediation Project Manager (RPM) soon after the FFA was signed. The new RPM completely changed what was agreed to on the FFA and what LANTDIV was doing. The supervisor of the new RPM even agreed with the changes. A major problem is the regulators do not have a lot of experience. Many of the issues develop into an us versus them adversarial relationship. What's worse is the EPA is now using contractors to review our (contractors) work plans. The EPA's contractors tend to be even more inexperienced than the EPA.

SOUTHDIV

We see a lot of turnover at the EPA. A RPM stays in their position at the EPA for an average of one year. One hazardous waste site had three EPA RPMs in one year. It does have an impact on our program.

WESTDIV

Many people believe that the D/SMOA has meant that we are funding the training of their RPMs. The only problem with an RPM leaving is the unwritten understandings and agreements that went on between our RPMs and their RPMs. An RPM leaving does cause us to revisit past proceedings. However, to demand that everything be placed in writing eliminates the flexibility of the good working relationships that develop between the Navy and the state regulators.

SOUTHWESTDIV

Really haven't experience too much turnover in personnel with in the regulatory agencies.

PACDIV

In Hawaii and EPA Region 9, we haven't seen much turnover of personnel. However, in Guam, the turnover is approximately 25% per year. Its a big problem because many times the new person doesn't understand the program or much worse, doesn't understand the regulations.

13. What are your frustrations with the current process?

NORTHDIV

We spend all of our time negotiating Compliance agreements and gathering information, much more than is needed to get a cleanup done. Because of the current procedure, we do the "work" send it to the regulators for their check and comment, get

it back for modification and back to the regulators for comment again. We eat up a lot of time with no value added work. Partnering could solve a lot of this posturing by the two agencies spending time up front to develop good working relationships. We need to take a cooperative approach of working out the solutions together. We could possibly reduce the process time by 50%.

CHESDIV

Frank Peters: What we did earlier (pre-SARA) is not what we are doing now. It has taken us a while to get in line with SARA.
Manpower: We don't know how the down sizing will effect us, but I can't afford to loose any more manpower.

John Woodward: No technical support from NAVFAC.

No centralized training program.
No feedback about what other EFDs are finding successful, even the other services.
No coordination to pool the corporate knowledge and disseminate it to the field.
With the many turnovers within our shop and the almost routine hiring freezes, when someone leaves so goes the corporate knowledge on "his projects." By the time you do get the position filled it could be six to nine months. The new person has such a steep knowledge curve to climb, the loss of the original person means a subsequent delay in the project.

LANTDIV

DOD Manpower: Definitely going to need more people. The Remedial Project Managers (RPM) can handle a lot of jabs as we go through the study phases. However, when we transition to the Remedial Action (RA) phases, the RPM will not be able to handle all the work. We will need more RPMs.

In the ROICCs we don't know if we well need more people or just have people who are trained in site remediation.

Will also need help in design. This is a different type of design than brick and mortar.

Permitting issue with the state of Virginia is a problem. Right now the state is requiring us to containerize and ship all

water off site to be treated instead of allowing us to treat on site and discharging into the sewer system. OP45 and NAVFAC should help us resolve whether permit exemptions as delineated in CERCLA exist or not.

RPM are required to keep the database updated. With all the problems we are having with the database the RPM could potentially spend all of his time just keeping the database current.

No policy on how to perform invoice reviews on the CLEAN contracts (to what detail).

SOUTHDIV

I'm not at all happy with the CLEAN contract. It is a flexible contract but we have imposed an inflexible management system on top of it. It is a manpower intensive contract to operate.

Inconsistency with the regulatory agency, the almost constant changes in their personnel, Lack of a standard data system for use by the services that provides: the function that was performed; the resources used; project information; a technological transfer for lessons learned.

SOUTHWESTDIV

We certainly need to spend less time studying the problem but I don't agree with the folks back at NAVFAC that the Observational Method discussed in CH2M Hill's paper of April 1989 [Ref. 32] is a panacea for all site remediations. The observational method certainly has it's place but so does the process developed by the EPA called Data Quality Objectives which uses as one of its seven steps, statistical analysis to help determine data collection design.

PACDIV

The process isn't removal oriented, it's more process oriented/study oriented. Steps could be combined or consolidated. The CLEAN contract is not really geared for Remediation of the site. The CLEAN contract should be performance oriented with the goal to get to the end of design as soon as possible, yet meeting all of the objectives with the regulatory authorities.

14. Do you have any success stories which proceed smoothly?
Why was the site remediation a success?

NORTHDIV No clear successes or failures in either category. Of note is Brunswick, Maine, where the Navy believed that they had enough information to proceed with the Remedial Design (RD) so they challenged the state and requested to go to RD. The state agreed.

CHESDIV We use a lot of interim removals.

LANTDIV We have done some performance specs for Remedial Action Contracts on easy sites and they have proved to save time and money.

SOUTHDIV Albany, GA. We used a very abbreviated review process which the EPA agreed to. Although a very straight forward project, it went from initial scoping to feasibility to removal in 15 months.
At another site we used the United States Geological Survey (USGS) as our technical expert. The USGS has a high level of technical competence and capability in the geotechnical engineering field and were highly revered by both the state and EPA. The USGS recommended bioremediation of the fuel contamination. Both the state and EPA were very pleased with the results.

SOUTHWESTDIV Our biggest success story has been MCAS Yuma. Although it's just getting off the ground, we already are experiencing positive results because of Partnering/teaming. The "team," which consists of EPA and state regulators, the Navy, our CLEAN contractor and a consultant, are breaking down the barriers which separated each other and are building trust. If the early progress that this "team" has made continues, this project will be a huge success and a model for others to follow.

PACDIV We've combined some steps to get to Risk Assessment earlier. Immediately after the Preliminary Assessment we prepare a sampling plan for the Site Investigation. We also look at identifying areas for Interim Removal Actions. On Guam, we are using the Navy Civil Engineering Lab's new on site incinerator to dispose of PCB.

15. Are there any failures which you would like to document so others do not fall into the same trap?

NORTHDIV

Would like to call these lessons learned: We can't get all the answers to all the questions. We have to take some risk. The risk is that yes the method I choose for Remedial Action may not be the cheapest or the best, however, I'm not spending more time and money studying the problem. Partnering can play a pivotal role in this area. If you've established a cooperative professional working relationship up front, the regulatory authority realizes you are also trying to do what is best for the community and the environment.

We have found Technical Review Committees to be very beneficial. Community Relations Committees have also been very effective. It keeps the people informed. The public begins to realize that you are trying to fix the problem, not cover it up.

Our biggest delays are contractual: Negotiating with the A/E and developing the Invitation For Bidders (IFB) package.

CHESDIV

We had not kept the ROICC advised or involved when performing removal actions (interim cleanups) and that created some problems. For the future we will use the ROICC as our Contracting Officers Technical Representative (COTR). With the ROICC involved in the process we can also use the design A/E as Title 2 support.

PACDIV

Waste generated from Site Investigations, liquids/solids etc., what do we do with it? Guidance on what to do with that waste is not clear. Get to know your state regulators, they are the ones you have to please.

LIST OF REFERENCES

1. GAO (U.S. General Accounting Office), Efforts to Clean Up DOD-Owned Inactive Hazardous Waste Disposal Sites, GAO/NSIAD-85-41, U.S. Government Printing Office, Washington, D.C., April 1985.
2. Sudman, Seymour and Bradburn, Norman M., Asking Questions, Jossey-Bass, 1982.
3. U.S. Department of Defense, Defense Environmental Restoration Program, Annual Report to Congress for Fiscal Year 1991, Government Printing Office, Washington, D.C., February 1992.
4. NAVFACENGCOM, NAVFAC Briefing Sheet, Synopsis of Environmental Laws, undated.
5. Schumacher, Aileen, A Guide to Hazardous Materials Management, New York: Quorum Books, 1988.
6. Naval Justice School, Environmental Law Deskbook, Rev. 10/91.
7. Babos, Lt Jeffery C., Financial Management of Hazardous Waste Compliance and Mitigation Costs: Constraints and Implications, MS Thesis, Naval Postgraduate School, Monterey, CA, December 1991.
8. United States Code, Armed Services, Environmental Restoration, 10 USC 160, U.S. Government Printing Office, Washington, D.C., 1984.
9. NAVFACENGCOM, Navy Commanding Officer's Guide to Environmental Compliance, January 1991.
10. Department of the Navy, Office of Naval Operations, OPNAVINST 5090.1A Environmental and Natural Resources Program Manual, Washington, D.C., October 1990.
11. Department of the Navy, Deputy Chief of Naval Operations Letter Ser 453C/OU599632, Subject: FY91 Defense Environmental Restoration Account (DERA) Funds, 9 October 1990.

12. NAVFACENCOM, NAVFAC Briefing Sheet for short course on Environmental Compliance and Laws, undated.
13. U.S. Congress, Senate, Hearings before the Superfund and Environmental Oversight Subcommittee, Committee on Environment and Public Works, Federal Facility Compliance with Hazard Waste, 100th Cong., 2nd sess., U.S. Government Printing Office, Washington, D.C., 1988.
14. Satchell, Michael, "Uncle Sam's Toxic Folly." U.S. News & World Report, 27 March 1989.
15. GAO (US General Accounting Office), Hazardous Waste: EPA Cleanup Requirements-DOD Versus Private Entities, GAO/NSAID-89-144, U.S. Government Printing Office, Washington, D.C., July 1989.
16. Office of the Secretary of Defense, Memorandum for Defense and the Environmental Initiative (D&EI) Participants, Subj: Forum Proceedings, 28 Dec 1990.
17. NAVFACENCOM, Student Guide for Environmental Protection Course, Dec 1991.
18. 42 U.S.C. § 9619
19. 40 U.S.C. 541 et seq.
20. U.S. Congress, Senate, DoD Appropriations Bill, 102nd Cong., 1st sess., Government Printing Office, Washington, D.C., 1991.
21. Naval Facilities Engineering Command, Letter to Chief of Naval Operations (OP-45), Alexandria, VA, Subj: Expedited Environmental Cleanup Program, 12 March 1992.
22. 10 U.S.C.A. § 2862, Sec 2802.
23. Biggers, Rebecca, Naval Energy and Environmental Support Activity, Port Hueneme, CA, Telephone Interview, 11 May 1992.
24. The Random House College Dictionary, Revised ed., New York: Random House, 1980.
25. Commander, Naval Facilities Engineering Command, Letter to Commander, Western Naval Facilities Engineering Division, Alexandria, VA, Subj: Restructuring of the Engineering Field Divisions, 3 January 1992.

26. Biemer, Paul P. et al, Measurement Errors in Surveys, John Wiley and Sons, Inc. 1991.
27. Johnson, Nina, Head, Installation Restoration Section, Atlantic Naval Facilities Engineering Division, Norfolk, VA, Telephone Interview, 29 April 1992.
28. Mayer, Conrad, Director, Environmental Division, Northern Naval Facilities Engineering Division, Philadelphia, PA, Telephone Interview, 20 April 1992.
29. Peters, Frank, Manager, Environmental Restoration Branch, Chesapeake Naval Facilities Engineering Division, Washington D.C., Telephone Interview, 22 April 1992.
30. Malone, James, Head Installation Branch, Restoration I, Southern Naval Facilities Engineering Division, Charleston, SC, Telephone Interview, 22 April 1992.
31. Nakamura, Peter, Environmental Engineer, Pacific Naval Facilities Engineering Division, Pearl Harbor, HI, Telephone Interview, 6 May 1992.
32. Construction Industry Institute, In Search of Partnering Excellence, Austin: Bureau of Engineering Research, The University of Texas at Austin, July 1991.
33. Woodburn, John, Environmental Engineer, Chesapeake Naval Facilities Engineering Division, Washington D.C., Telephone Interview, 22 April 1992.
34. Tower, Steven, Commander, USN, CEC, Head, Environmental Management, Southwest Naval Facilities Engineering Division, San Diego, CA, Interview, 1 June 1992.
35. Sherman, Stanley N., Government Procurement Management, 2nd ed., Gaithersburg: Woodcrafters Publications, 1985.
36. Department of Defense, Office of the Assistant Secretary of Defense, Report of the Defense Environmental Response Task Force, Washington D.C., October 1991.
37. Brown, Stuart M.; Lincoln, David R.; Wallace, William A., Application of the Observational Method to Remediation of Hazardous Waste Sites, unpublished paper by CH2M Hill, April 1989.
38. Buckingham, Capt William W., An Investigation of the Application of the Design/Build Method to Military Construction Projects, MS Thesis, Air Force Institute of Technology, Wright-Patterson, OH, 1989.

39. Burke, Patrick, Environmental Legal Counsel, Western Naval Facilities Engineering Division, San Bruno, CA, Telephone Interview, 20 April 1992.

INITIAL DISTRIBUTION LIST

1. Defense Technical Information Center 2
Cameron Station
Alexandria, VA 22303-614
2. Library, Code 52 2
Naval Postgraduate School
Monterey, CA 93943-5002
3. Naval Facilities Engineering Command 1
200 Stovall Street
Alexandria, VA 22332-2300
Attn: Code 181
4. Professor Richard A. Harshman, Code AS/HA 1
Department of Administrative Sciences
Naval Postgraduate School
Monterey, CA 93943-5000
5. Professor William R. Gates, Code AS/GT 1
Department of Administrative Sciences
Naval Postgraduate School
Monterey, CA 93943-5000
6. NORTHDIV Contracts Office 4
Naval Submarine Base New London
Building 135 Box 26
Groton, CT 06349-5026
ATTN: LCDR Mark E. Whitson