

# MANAGING UNEXPLODED ORDNANCE ON FEDERAL LANDS

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OVERSIGHT HEARING  
BEFORE THE  
COMMITTEE ON  
NATURAL RESOURCES  
HOUSE OF REPRESENTATIVES  
ONE HUNDRED THIRD CONGRESS  
SECOND SESSION  
ON  
MANAGING UNEXPLODED ORDNANCE ON  
FEDERAL LANDS

HEARING HELD IN SEASIDE, CA  
MAY 2, 1994

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# MANAGING UNEXPLODED ORDNANCE ON FEDERAL LANDS

MONDAY, MAY 2, 1994

HOUSE OF REPRESENTATIVES,  
COMMITTEE ON NATURAL RESOURCES,  
*Washington, DC.*

The committee met, pursuant to notice, in Council Chambers, City Hall, Seaside, California, at 9:30 a.m., Hon. George Miller (chairman of the committee) presiding.

## OPENING STATEMENT OF HON. GEORGE MILLER

Mr. MILLER. The committee will come to order for the purposes of conducting a hearing on Managing Unexploded Ordnance on Public Lands.

Although this issue has received little public attention, we will hear a great deal more about it in the future. For decades, military bases and public lands have been used for weapons testing and training. Many of these bases and test areas are now closing and must be shifted to broader public use.

Lands strewn with unexploded ordnance, once thought to be remote, are now in demand. For years, we gave little thought as to future use of these lands. It is now time for us to take a close look at this issue. Today's hearing will discuss how much Federal land is contaminated with unexploded ordnance and the effectiveness of existing cleanup technologies.

In a 1993 report, this committee took a first step in addressing unexploded ordnance. That report examined the problems of environmental contamination on our Federal public lands. Although we identified a large range of cleanup problems, a few presented huge, unquantified costs to the Treasury. One of these huge, unquantified costs is the cleanup of unexploded ordnance. Millions of acres are contaminated with ordnance, including munitions from pistols, rifles and artillery, as well as bombs from naval, aerial and ground bombardment.

The problem of contamination by unexploded ordnance is not limited to military bases. For years, the military has tested weapons on public lands withdrawn from the Department of the Interior.

The Department of Defense now wants to return some of these lands, but cannot guarantee that they have been cleared of ordnance. In some instances, ordnance has contaminated public lands and Indian lands adjacent to test areas, as bombs stray past the designated target area.

Our changing defense needs lend greater urgency to our search for successful ordnance cleanup technologies. Base closings are on

the minds of communities throughout California, including here in Fort Ord and at Mare Island in my own district. The management of these base closings and development of their resources is critical to the future of these communities. The potential use of these lands is clearly limited if unexploded ordnance remain.

Here at Fort Ord, the base closing process is well underway. As our witnesses will explain, some of the land at Fort Ord will be transferred to the State and to private entities, but the U.S. Government will retain title to a majority of the land contaminated with unexploded ordnance. Regardless of who owns the land, the Federal Government will retain the liability for any ordnance found here.

Cleaning up Federal lands in general will mirror the process here at Fort Ord. First, we must ascertain the nature and the extent of the unexploded ordnance contamination. Department of the Interior agencies have begun inventory efforts, hampered by poor recordkeeping. Once we know what's out there, we have to decide how much of it to clean up, and this poses a much tougher question.

Finding and clearing unexploded ordnance is difficult, dangerous and expensive. In some cases, it may not be worthwhile to clean up heavily contaminated land. These areas will have to be closed to public use. But if we decide to leave explosives on the land, we must ensure that the public is protected into the future.

Many people have looked narrowly at the need to clean up a single site. Some have put substantial efforts in developing new technologies for cleanup. What this hearing today will address are some of the broader policy questions. How do we clear the ordnance, how much it will cost us, and how do we go about it in a timely fashion?

[Prepared statement of Mr. Miller follows:]

## Opening Statement of Chairman George Miller

### Committee on Natural Resources

#### "Managing Unexploded Ordnance on Public Lands"

Seaside, California

May 2, 1994

Good morning, ladies and gentleman. Welcome to the Committee on Natural Resources hearing on "Managing Unexploded Ordnance on Public Lands."

Although this issue has received little public attention, we will hear a great deal more about it in the future. For decades, military bases and public lands have been used for weapons testing and training. Many of these bases and test areas are now closing, and must be shifted to broader public use.

Lands strewn with unexploded ordnance, once thought to be remote, are now in demand. For years, we gave little thought as to future use of these lands. It is now time for us to take a close look at the issue. Today's hearing will discuss how much federal land is contaminated with unexploded ordnance and the effectiveness of existing clean-up technologies.

In a 1993 report, this Committee took the first step in addressing unexploded ordnance. That report examined the problems of environmental contamination on our federal public lands. Although we identified a large range of clean-up problems, a few presented huge, unquantified costs to the Treasury. One of these huge, unquantified costs is the clean-up of unexploded ordnance. Millions of acres are contaminated with ordnance, including munitions from pistols, rifles and artillery, as well as bombs from naval, aerial and ground bombardment.

The problem of contamination by unexploded ordnance is not limited to military bases. For years, the military has tested weapons on public lands withdrawn from the Department of the Interior. The Department of Defense now wants to return some of these lands, but cannot guarantee that they have been cleared of ordnance. In some instances, ordnance has contaminated public land and Indian lands adjacent to test areas, as bombs stray past the designated target area.

Our changing defense needs lend greater urgency to our search for successful ordnance clean-up technologies. Base closing is on the minds of communities throughout California, including here at Fort Ord and at Mare Island in my own District. The management of these base closings and development of their resources is critical to the future of these communities. The potential use of these lands is clearly limited if unexploded ordnance remains.

Here at Fort Ord, the base closing process is well underway. As our witnesses will explain, some of the land at Fort Ord will be transferred to state and private entities. But the U.S. government will retain title to the majority of the land contaminated with unexploded ordnance. Regardless of who owns the land, the federal government will retain the liability for any ordnance found there.

Cleaning up federal lands in general will mirror the process here at Fort Ord. First we must ascertain the nature and extent of UXO contamination. Department of the Interior agencies have begun inventory efforts, hampered by poor record-keeping. Once we know what's out there, we have to decide how much of it to clean up. This is a much tougher question.

Finding and clearing unexploded ordnance is difficult, dangerous, and expensive. In some cases, it may not be worthwhile to clean up heavily contaminated land. These areas will have to be closed to public use. But if we decide to leave explosives on the land, we must ensure that the public is protected in the future.

Many people have looked narrowly at the need to clean up a single site. Some have put substantial effort into developing new technologies for clean-up. What this hearing will address is some of the broader policy questions. How much land will we clear of ordnance? What will it cost us? How can we protect the public? Have some of our lands been sacrificed permanently for corroding bombs?

I look forward to learning the answers to these questions here today.

Mr. MILLER. I am delighted to bring the Natural Resources Committee to Monterey County, to Seaside, and I want to thank the city of Seaside for making these facilities, rather unique facilities available. Usually, public officials have a barrier between themselves and the audience, but this is a very inviting facility and hopefully it will facilitate some of the questions and answers that we will have in this hearing.

We're here at the insistence of my colleague in the Congress, Congressman Sam Farr, who has taken over the struggle of cleaning up Fort Ord and getting its reuse completed on a timely basis. I am delighted to be here and delighted that Sam has also chosen to be a member of our Committee on Natural Resources.

Sam, thank you and you're recognized for any statement you might make.

#### OPENING STATEMENT OF HON. SAM FARR

Mr. FARR. Thank you very much, Mr. Chairman. I'd like to welcome you and the committee to where California government began, here in the Monterey Peninsula, and with that, to this unique City Chamber Hall. Councilwoman Ellen Rucka is here and Mayor Lance McClair was here just a moment ago. We'd like to thank you for allowing us to use your facilities.

It's a great pleasure to have this first-of-a-kind hearing in the United States right here in our own backyard. Fort Ord is being closed. Fort Ord is a military base with about 28,000 acres, almost the size of the city and county of San Francisco. I want to thank you, Mr. Chairman, for coming here to review the burden that we all have in realizing the extent of lands contaminated with unexploded ordnance throughout the United States, but particularly here because we have about an 8,000-acre firing range not many miles from where we're sitting right now that is contaminated with unexploded ordnance.

Fort Ord has been around since the early 1900s. It served as a training and a staging facility for infantry troops and for naval forces. Unexploded ordnance, including artillery shells, hand grenades, anti-tank weaponry, are the most obvious ones to be able to find at Fort Ord and create incredible environmental problems.

Today, we're going to learn more about the extent and the magnitude of the unexploded ordnance contamination on our military bases and on other public lands. The high cost of current cleanup technology severely restricts the transfer of the land back to the community for any kind of redevelopment project.

In the case of Fort Ord, the 8,000-acre impact area will be transferred from the Department of the Army to the Department of Interior. No construction or other uses that would penetrate the surface of the ground or exert heavy ground pressure will be allowed on those 8,000 acres.

I'm very interested in hearing from the Bureau of Land Management how the land will be used and from the unexploded ordnance cleanup technology experts that are here today about current research efforts.

I think we have a lot to learn from Fort Ord. One of the things that we ought to learn is that we can turn these liabilities into assets, because we are at a point in our development in the world

where the United States is very conscious about its need to be environmentally sensitive and create even degrees in environmental management.

And I believe that Fort Ord is going to allow us to provide technology training for jobs of the future. As California moves from much of its military and defense contract reliance into new forms of job creation and job development, I think the green technology, using the liabilities that we're finding from past government experiences can prove assets for us in helping to provide training for the future.

Just this year, earlier this year, then-Deputy Secretary William Perry was here at Fort Ord. He designated Fort Ord as a model base closure and realignment initiative for the country. Other base closure cleanups in many ways will mirror the process at Fort Ord. We will learn more about this from the Fort Ord Base Commander, Colonel Ellzey, who is going to speak to us this morning.

The Western Governors' Association has also selected Fort Ord as a DOIT Demonstration Site, and we will learn more about their activities today.

Given the relatively pristine environment of this area and the competing demands for tourism, for economic redevelopment, agriculture and environmental activism, the Fort Ord base closure will, I believe, provide an excellent model not only for this area, but for the entire country.

Local public reaction to base closure has been carefully monitored. Most recently, the community has come together with Senator Mello's Joint Powers Authority, creating a single governing entity for Fort Ord. It will be a consortium of local governments that will jointly, via the Joint Powers Authority, determine Fort Ord reuse policy.

We also have a high level of community involvement in the post-closure governance of environmental risk and assessment management. This has been critically important in ensuring a smooth transition. I look forward to hearing from the Fort Ord Reuse Group and from the Fort Ord Restoration Advisory Board, as well as from Monterey County's Environmental Health Officer, Walter Wong.

In defining such questions as how clean is clean and in setting sound environmental regulatory policy, we have worked closely with the EPA and CAL-EPA. I'm glad to see that both of them have representatives here. In fact, I think it's a first-of-its-kind roundtable regulatory entity that has been able to deal with the cleanup issues at Fort Ord and, I've been told, has done it under budget and ahead of schedule, which is really remarkable.

To deal with the unexploded ordnance and other environmental problems at Fort Ord, the University of California has proposed the establishment of a Cooperative Institute for Environmental Remediation and Policy. The Department of Defense has authorized \$4 million for the project, but the funds have not yet been released. I'd like the DOD representatives here to tell me when will these funds be released.

The idea behind this institute is that the cleanup process itself can become a source of technology transfer and economic development, while providing the Department of Defense with information

and experience that can expedite cleanup at military bases worldwide.

I think we'll learn today how the University of California could play a crucial role in cooperation with the Department of Defense, the Western Governors' Association, local community groups and others that are interested in research and in testing of the new unexploded ordnance cleanup technologies and in the formulation of a national policy on cleanup.

So, Mr. Chairman, as the newest member of your Natural Resources Committee and also a member of the Armed Services Committee, I very much look forward to hearing from today's witnesses and working with you on this very important issue that has started with today's hearing.

[Prepared statement of Mr. Farr follows:]

Opening Statement of Congressman Sam Farr  
Committee on Natural Resources  
"Managing Unexploded Ordnance on Public Lands"

Seaside, California

May 2, 1994

Good morning Mr. Chairman, ladies and gentlemen. It is a great pleasure to host this important hearing which as you know is the first of its kind. I would especially like to thank Chairman Miller for holding this hearing in the district, so near Fort Ord, where we have an 8,000 acre firing range impact area that is contaminated with unexploded ordnance.

Since its establishment in the early 1900's, Fort Ord served as a training and staging facility for infantry troops and naval forces. Unexploded ordnance including artillery shells, hand grenades and anti-tank weaponry is the most ubiquitous and intractable environmental problem at Fort Ord.

Today we will learn more about the extent and the magnitude of UXO contamination on our military bases and on other public lands.

The high cost of current cleanup technology severely restricts the transfer of land back to the community for any kind of redevelopment project. In the case of Fort Ord, the 8,000 acre impact area will be transferred from the Department of the Army to the Department of Interior. No construction or other uses that would penetrate the surface of the ground or exert heavy ground pressure will be allowed. I am very interested in hearing from the BLM on how the land will be used and from UXO cleanup technology experts on current research efforts.

I think we have a lot to learn from Fort Ord:

In 1993 then Deputy Secretary William Perry designated Fort Ord as a model base closure and realignment initiative for the country. Other base closure cleanups will in many ways mirror the process at Fort Ord. We will learn more about this from Fort Ord Base Commander Colonel Ellzey.

The Western Governors Association has selected Fort Ord as a DOIT Demonstration Site. We will learn more about their activities today.

Given the relatively pristine environment in this area and the competing demands of tourism, economic redevelopment, agriculture and environmental activism,

the Fort Ord base closure will I believe provide an excellent model for the country.

Local public reaction to base closure has been carefully monitored. Most recently, the community has come together and Senator Mello's Joint Powers Authority Bill was passed. This will create a consortium of local governments that will jointly via a Joint Powers Authority determine Fort Ord re-use policy.

We have a high level of community involvement in the post-closure governance of environmental risk assessment and management. This has been critically important in ensuring a smooth transition. I look forward to hearing from The Fort Ord Reuse Group and the Fort Ord Restoration Advisory Board as well as Monterey County's Environmental Health Director.

In defining questions such as: How clean is clean? and in setting sound environmental regulatory policy we have worked closely with EPA and CAL-EPA. I am glad to see them here today.

To deal with the UXO and other environmental problems at Fort Ord, the University of California has proposed the establishment of a Cooperative Institute for Environmental Remediation and Policy. The DOD has authorized \$4 million for the project but the funds have yet to be released. I would like the DOD representatives here to tell me when these funds will be released.

The idea behind the institute is that the clean-up process itself become a source of technology transfer and economic development while providing the Department of Defense with information and experience that can expedite cleanup at military bases worldwide. We will learn today about how UC could play a crucial role in cooperation with DOD, the WGA, local community groups, and others, in research and testing of new UXO cleanup technologies and in the formulation of clean-up policy.

Mr. Chairman, as a member of the Natural Resources Committee and the Armed Services Committee, I very much look forward to hearing from today's witnesses and to working with you on this important issue.

**PANEL CONSISTING OF DAVID NAWI, SOLICITOR, PACIFIC SOUTHWEST REGION, DEPARTMENT OF THE INTERIOR; LEWIS D. WALKER, DEPUTY ASSISTANT SECRETARY OF THE ARMY, ENVIRONMENT, SAFETY AND OCCUPATIONAL HEALTH, DEPARTMENT OF DEFENSE, ACCOMPANIED BY PETER MURPHY, ESQ.; JAMES M. SOUBY, EXECUTIVE DIRECTOR, WESTERN GOVERNORS' ASSOCIATION; JIM AUSTRENG, CALIFORNIA ENVIRONMENTAL PROTECTION AGENCY, AND SPOKESPERSON, MILITARY MUNITIONS WASTE WORKING GROUP, FEDERAL ADVISORY COMMITTEE TO DEVELOP ON-SITE INNOVATIVE TECHNOLOGY (DOIT COMMITTEE); AND JULIE ANDERSON, DIRECTOR, FEDERAL FACILITY CLEANUP OFFICE, ENVIRONMENTAL PROTECTION AGENCY, REGION 9, ACCOMPANIED BY JOHN CHESTNUTT, REMEDIAL PROJECT MANAGER FOR FORT ORD**

Mr. MILLER. Thank you. We will begin with our first panel, made up of Mr. David Nawi, who is the Regional Solicitor, the Department of Interior; Mr. Lewis Walker, who is the Deputy Assistant Secretary of Defense for Environment, Safety and Occupational Health, Department of Defense; Mr. Jim Souby, who is the executive director of the Western Governors' Association, accompanied by Jim Austreng, who is the chairman of the Military Munitions Waste Working Group; and Julie Anderson, who is the Director of the Federal Facilities Cleanup Office, U.S. Environmental Protection Agency, who will be accompanied, also, by John Chestnutt, who is the remedial project manager for Fort Ord.

Welcome to the committee. Your full statements will be placed in the record in their entirety, and you can proceed in the manner in which you're most comfortable here.

David, we'll begin with you. If you have additional exhibits or what have you, they also will be made part of the record of this hearing. Obviously, to the extent to which you can please summarize your remarks and make the pertinent points to allow time for questions. It's a fairly long witness list here, and others have concern that they haven't been on it. So we're trying to balance it all out here.

So, David, we'll begin with you.

#### **STATEMENT OF DAVID NAWI**

Mr. NAWI. Thank you very much. Good morning, Mr. Chairman and Congressman Farr. It's a great pleasure to be here and present the views of the Department of the Interior on the issue of unexploded ordnance on Federal lands managed by the Department of the Interior.

Unexploded ordnance, or UXO, on the surface and in the sub-surface lands managed by Interior is primarily a legacy of military training during the periods of World War II and the Korean action. However, incidents continue today with accidental or emergency release of aircraft munitions.

Additionally, while current military base closure actions provide opportunities for the transfer of lands to Interior, some of these lands are contaminated with unexploded ordnance. Public domain lands have been used for military training for many years. When

the military no longer needs the lands, the surface of the lands is cleared and administrative jurisdiction returned to Interior.

The subsurface, however, has usually not been cleaned up for a variety of reasons, including technology limitations, cost and the very low risk from accidents caused by UXO in the subsurface. These hidden risks are of concern to our land managing agencies and the general public, as they restrict the reuse of the lands, and they present risks both to the public and to employees of the Department of Interior.

The need to clean up military bases before they are closed is driving technological advancements in detection and location technologies. Additionally, there is increasing use of Interior-managed lands by the general public, and consequently, a potential for increased exposure to UXO that may remain on or under the surface of the lands. Therefore, this is a most opportune time to look at the UXO situation on the lands managed by Interior.

Turning, first, to the scope of the problem. Interior agencies manage more than 10 million acres of formerly used Defense sites that are potentially contaminated with UXO, primarily in the subsurface. The Bureau of Land Management manages over 6 million acres of former maneuver areas with impact ranges at 118 sites nationwide, mostly in the western states.

Approximately 1.3 million of the 6 million acres are known to contain unexploded ordnance. The remaining 4.7 million acres need additional study before they can be certified as free from UXO.

The surface of these lands was cleared of UXO prior to return to BLM administration, but through natural processes, such as erosion and frost heaving, some formerly subsurface UXO may now be on the surface. The Fish and Wildlife Service manages an estimated 3.7 million acres of land, with documented or suspected UXO on 24 statutorily-created refuges.

Portions of a number of Indian reservations are also contaminated with UXO. This contamination has been primarily through the accidental release of munitions. An initial review of National Park System lands indicates only two sites which may be contaminated with UXO.

Insular areas of the United States have significant munitions waste problems dating from World War II. These munitions are found on the surface, in the subsurface, and underwater.

Turning next to the risk to the using public. The primary focus of Interior's management of contaminated lands is on the safety of the public and of Interior's own personnel. To understand the level of risk to persons on UXO-contaminated lands, we must first understand the nature of the problem. The primary consideration in risk assessment is exposure to the hazard. Except for the insular areas, the contaminated lands are generally remote and only occasionally used by ranchers and recreationists. Therefore, there is only limited exposure to the hazard.

Additionally, as I mentioned earlier, the surfaces of the lands were generally cleared of UXO before military transfer to the Department of Interior. Although natural factors may cause exposure of subsurface UXO, the military has been very responsive in removing these items as they are found.

Therefore, we believe there is very little opportunity for a person to come in contact with UXO and limited risk to the general public. Exceptions to this general analysis do not apply to the insular areas and Alaska, and lands which are simultaneously within a wildlife refuge and active military range. In these situations, there is a greater potential that munitions may be on the surface.

Most of the UXOs on Interior-managed lands are World War II or Korean vintage and, therefore, not likely to detonate unless there is an outside stimulus. Such a stimulus might include tumbling in a streambed after being exposed by water erosion, striking with a piece of equipment, or significant heat, as exposure to a campfire.

Although these actions occur through recreational use, their likelihood, we believe, is extremely remote. What is more likely and our biggest concern stems from the unpredictable human factor; that is, someone may find a UXO and cause it to detonate. Examples would be picking up or digging out a partially exposed munitions to take home as a souvenir or throwing it in a fire to see what happens.

The initial disturbance, bouncing around while transporting, or attempt to dismantle the munitions all could cause it to detonate.

The vast majority of any UXO on Interior-managed lands are buried at a depth that no one would expect to find and disturb them. As long as the UXO are left undisturbed and buried, they are not a risk to anyone. It is significant that the risk associated with the cleanup of UXO in the subsurface with current technology is much greater than leaving the buried items in place and cleaning up the UXO that is moved to the surface by natural geological forces.

Turning next to management considerations. It becomes apparent that the most critical management action is to keep the surface clear of UXO. But there is in this connection a technological and practical problem. That is how to monitor over 10 million acres to determine if anything has come to the surface or was missed when the land was initially cleared.

The military services retain liability and responsibility for cleanup of UXO. Funding for clearance of UXO is through the Defense Environmental Restoration Program, with the U.S. Army Corps of Engineers assigned the task of cleanup of formerly used Defense sites.

The military funds research and development of new technologies to solve UXO problems through the Strategic Research and Development Program and has become very interested in solving these problems as they relate to military base closures. These new technologies are also applicable to the former Defense sites managed by Interior.

It is our understanding that there are currently no systems that can scan large acreage to detect, locate and identify UXO on the surface. Airborne systems that should be able to detect and locate large metal objects or concentrations of metal are only now becoming available, but they are still not developed to the point where they can discriminate between UXO and other types of metal.

The technology that allows an accurate look into the subsurface is getting better, but the need for all-terrain use, sensing large

acreage, as well as the large number of false returns and the costs remain problems. Subsurface clearance with current technologies may, for example, cost over \$100,000 per acre for land which will be of very little value even after cleanup.

The Department of Interior is working actively on technology problems through the Federal Advisory Committee on the Development of On-Site Innovative Technologies. This committee is a partnership of the Western Governors' Association, the Departments of Energy, Defense, Interior, and the U.S. Environmental Protection Agency. Its purpose is to demonstrate and commercialize technologies for the remediation of hazardous waste, including UXO.

On the lands they administer, the Interior agencies have the responsibility for managing the public's exposure to risk from UXO, including controlling access, monitoring for UXO on the surface, and notifying the military's Explosive Ordnance Disposal Team when exposed UXO are found or when there is a requirement to clear a site to depth.

Controlling access where UXO might exist is best done by not providing services that encourage use of the area and by refusing to grant authorizations in or across areas that may contain UXO.

We also believe education of authorized users of UXO-contaminated areas is a fruitful avenue to pursue. Users must understand that if they find UXO, they should not touch it, but should mark the area and report the sighting to the local land manager.

Any activities that require heavy equipment or digging into the subsurface require clearance to an appropriate depth by a military Explosive Ordnance Disposal Team. Activities such as building fence lines, rights-of-way for pipelines, pole sites for power lines and similar action require such clearance.

Turning to base closure opportunities. We believe that one of the opportunities presented by military base closures is the retention of sensitive habitat and open space on Department of Defense lands by transfer to the Department of Interior agencies. This may also have the added benefit of reducing the cost to the military of closing the base.

This can happen in Fort Meade, Maryland, with the lands being added to the Patuxent National Wildlife Refuge. Another opportunity is here at Fort Ord, as you are aware and as you will be discussing later this morning. It should be understood that the Department of Interior will not take over management of any base closure lands until the lands are appropriately cleared of UXO and other hazardous materials or access is restricted so that there will be minimal risk associated with the proposed reuse of the area.

The issue of risk associated with the proposed reuse of an area is best resolved through an open dialogue with base closure personnel, the future land managers, involved local interests, and potential users of the area. The dialogue should provide an understanding of the nature of risk to all stakeholders in the reuse of the land and provide the land manager with information concerning the degree of risk the stakeholders are willing to accept.

This can be accomplished through the local ReUse Committee established to make recommendations on the disposition of military lands on base closing. A Fort Ord Restoration Task Force has also

been established to address environmental considerations of the closure of this base.

We have come a long way in the past few years in understanding the UXO problem, the limitations on the clearance technology, and in developing working relationships between the military and Interior agencies. We anticipate and look forward to continued coordination with the military to establish priorities for our UXO clearance needs and to ensure that technologies are developed to solve our problems.

This concludes my statement. I will be glad to convey to appropriate persons in the Department any concerns you may have, and I'll be glad to answer any questions you may have.

[Prepared statement of Mr. Nawi follows.]

MAY 2 1994

STATEMENT OF DAVID NAWI, REGIONAL SOLICITOR FOR THE PACIFIC SOUTHWEST REGION, UNITED STATES DEPARTMENT OF THE INTERIOR, BEFORE THE SUBCOMMITTEE ON OVERSIGHT AND INVESTIGATION, COMMITTEE ON NATURAL RESOURCES, UNITED STATES HOUSE OF REPRESENTATIVES, ON THE SUBJECT OF UNEXPLODED ORDNANCE ON THE PUBLIC LANDS.

Thank you for the opportunity to present the Department of the Interior's views on the issue of unexploded ordnance (UXO) on Federal lands managed by Interior agencies. Unexploded ordnance (UXO) on the surface and in the subsurface of lands managed by the Interior Department is primarily a legacy of military training during the periods of World War II and the Korean action. However, incidents do continue today with accidental or emergency release of aircraft munitions. Additionally, while the current military base closure actions provide opportunities for the transfer of lands to Interior, some of these lands are contaminated with UXO.

Public domain lands have been used for military training for many years. When the military no longer needs the lands, the surface of the lands is cleared and administrative jurisdiction returned to the Department of the Interior. The subsurface, however, has usually not been cleaned up for a variety of reasons including technology limitations, cost, and the very low risk from UXO in the subsurface. These hidden risks are of concern to our land managing agencies and the general public, as they restrict the reuse of these lands and present risk to the public and our own employees.

The need to clean up military bases before they are closed is driving technical advancements in detection and location technologies. Additionally, there is increasing use of Interior-managed lands by the general public and consequently a potential for increased exposure to UXO that may remain on or under the surface of these lands. Therefore, this is an opportune time to look at the UXO situation on the lands managed by Interior.

I will address the scope of the problem, the risk to the using public, management considerations and finally the opportunities that exist due to base closures.

#### Scope of the Problem

Interior agencies manage more than 10-million acres of formerly used Defense sites that are potentially contaminated with UXO, primarily in the subsurface.

The Bureau of Land Management manages over 6 million acres of former maneuver areas and impact ranges at 118 sites. Approximately 1.3 million of the 6 million acres are known to contain unexploded ordnance; the remaining 4.7 million acres need additional study before they can be certified as free of UXO. The lands which are known to contain unexploded ordnance are one-half of one percent (0.5%) of the lands managed by the BLM. The surface of these lands was cleared of UXO prior to return to BLM

administration, but through natural processes, such as erosion and frost heaving, some UXO may be on the surface.

The Fish and Wildlife Service manages an estimated 3.7 million acres of land with documented or suspected UXO on 24 refuges. These lands were placed in refuge status by statute. Two examples of refuges with UXO are the Alaska Maritime National Wildlife Refuge (some of the Aleutian Islands have battlefield munitions from World War II), and the range area at Fort Meade, Maryland (a base closure under Public Law 101-519). The Desert National Wildlife Refuge, Cabeza Prieta National Wildlife Refuge, and others are still active military range areas.

Portions of a number of Indian reservations are contaminated with UXO. This contamination has been through accidental release of munitions. An example is the Walker River Reservation adjacent to the Navy's Bravo-19 range near Fallon, Nevada. A report on the extent of UXO contamination on Indian reservations will not be available until the Fall of 1994.

An initial review of National Park System lands indicates only two sites which are contaminated with UXO.

United States-related insular areas have significant munitions waste problems dating from World War II. These munitions are found on the surface, in the subsurface, and underwater.

#### Risk to the Using Public

The primary focus of Interior's management of lands contaminated with UXO is the safety of the public and our own personnel. To understand the level of risk to persons using UXO-contaminated lands, we must first understand the nature of the problem.

The primary consideration in risk assessment is exposure to the hazard. The contaminated lands are generally remote and only occasionally used by ranchers and recreationists, except for lands in the former and current United States insular areas. Therefore, there is only a very limited exposure to the hazard. Additionally, as mentioned above, the surface of the lands were cleared of UXO before the military transferred the lands to the Interior. Although wind and water erosion, frost heaving, and other natural forces may expose subsurface UXOs, the military has been very responsive in removing items when they are found. Therefore, there is very little opportunity for a person to come into contact with UXO and limited risk for the general public.

The exceptions to this are the battlefields of World War II in the United States insular areas and Alaska, and lands which are

simultaneously within a wildlife refuge and an active military range. In these situations, munitions may be on the surface.

Most of the UXOs on Interior managed lands are of World War II or Korean vintage and, therefore, not likely to detonate unless there is an outside stimulus. A stimulus might include such things as tumbling in a stream bed after being exposed by water erosion; striking with a piece of equipment, such as a shovel or tent peg; or significant heat such as a campfire over a near-surface UXO. Although actions incidental to recreational use might cause a detonation, the likelihood is extremely remote.

What is more likely, and our biggest concern, is that someone may find a UXO and cause it to detonate. Examples would be picking up or digging out a partially exposed munition to take home as a souvenir or throwing it in a fire to see what happens. The initial disturbance, bouncing around while transporting, an attempt to dismantle the munition, or the heat of a fire could all cause it to detonate.

The vast majority of any UXO on the Interior managed lands are buried at a depth that no one would find and disturb them. As long as the UXOs are left undisturbed and buried, they are not a risk to anyone. Herein is a significant point - the risk associated with cleanup of UXO in the subsurface, with current technology, is much greater than leaving the buried items in

place and cleaning up the UXO that is moved to the surface by natural geologic forces.

#### Management Considerations

From the discussion of risk, it becomes apparent that the most critical management action is to keep the surface clear of UXO. But herein lies a technology shortfall: How to monitor over 10-million acres to determine if anything has come to the surface.

The military services retain liability and responsibility for clean up of UXOs. Funding for clearance of UXOs is through the Defense Environmental Restoration Program with the U.S. Army Corps of Engineers assigned the task of clean up of formerly used Defense sites. The military funds research and development of new technologies to solve UXO problems through the Strategic Research and Development Program and has become very interested in solving UXO problems as it relates to military base closure. These new technologies are also applicable to the former Defense sites managed by the Interior.

It is our understanding that there are currently no systems that can scan large acreage to detect, locate, and identify UXO on the surface. We understand that airborne systems that should be able to detect and locate large metal objects or concentrations of metal are only now becoming available, but they are still not

able to discriminate between an abandoned car body and a 2000-lb bomb.

The technology that allows an accurate look into the subsurface is getting better, but the ability for all-terrain use, sensing large acreage, the large number of false returns, and the cost remain problems. Subsurface clearance with current technologies may, for example, cost over \$100,000 an acre for land that would be valued at \$100 an acre after cleanup.

Interior is working on the technology problem through the Federal Advisory Committee on the Development of On-site Innovative Technologies. This committee is a partnership of the Western Governors' Association, the Department of Energy, the Department of Defense, the Environmental Protection Agency, and the Department of the Interior. Its purpose is to demonstrate and commercialize technologies for the remediation of hazardous waste, including UXO.

The Interior agencies have the responsibility for managing the public's exposure to risk from UXOs, including controlling access, monitoring for UXOs on the surface, and notifying the military's explosive ordnance disposal teams when exposed UXO are found or when there is a requirement to clear a site to depth. Controlling access to areas where UXO may exist is best done by not providing services that encourage use of the area, and by

refusing to grant use authorizations in or across areas that may contain UXO. Uncontrolled access areas which are likely to be used by campers and off road vehicles can be cleared to a greater depth than areas where less intensive use is expected.

Education of authorized users of UXO-contaminated areas is another important consideration. Users must understand that if they find UXO, they should not touch it, but should mark the area and report the sighting to the local land manager.

Any activities that would require heavy equipment or digging into the subsurface would require clearance to the appropriate depth by a military explosive ordnance disposal team. Activities such as building fence lines, rights-of-way for pipelines, pole sites for power lines and similar actions would require such clearance prior to entering the lands.

#### Base Closure Opportunities

One of the opportunities presented by military base closures is the retention of critical habitat and open space values on the Department of Defense (DOD) lands by transfer to Department of the Interior agencies. This may also have the added benefit of reducing the cost to the military of closing the base. We have already mentioned the closure at Fort Meade, Maryland, with the

lands being added to the Patuxent National Wildlife Refuge. Another opportunity is here at Fort Ord.

It must be understood that the Department of the Interior will not take over management of any base closure lands until those lands are appropriately cleared of UXO and other hazardous materials or access is restricted so there will be minimal risk associated with the proposed reuse of the area. The issue of risk associated with the proposed reuse of an area is best resolved through open dialogue with the base closure personnel, the future land manager and the potential users of the area. The dialogue should provide an understanding of the nature of the risk to all stakeholders in the reuse of the land and provide the land manager with information concerning the degree of risk the stakeholders are willing to accept. This can be accomplished through the local Re-use Committee established to make recommendations on the disposition of the military lands on base closing. A Fort Ord Restoration Task Force has also been established to address environmental considerations of the closure of this base.

Summary

We have come a long way in the past few years in understanding the UXO problem, the limitations of the clearance technology, and developing working relationships between the military and the Interior agencies.

We anticipate continued coordination with the military to establish priorities for our UXO clearance needs and to insure the technologies are developed to solve our problems.

This concludes my statement. I will be pleased to answer your questions.

Mr. MILLER. Thank you. Mr. Walker.

#### STATEMENT OF LEWIS D. WALKER

Mr. WALKER. Mr. Chairman and Mr. Farr, it is my pleasure to appear here this morning on behalf of the Department of Defense and to discuss the issue of unexploded ordnance on public lands.

The Army currently controls 12 million acres of land, of which 6.6 million are withdrawn lands. The Department of the Army, along with the other components of the Department of Defense, is committed to being a careful steward of all lands entrusted to its control. As a part of our stewardship responsibilities, we execute the Defense Environmental Restoration Program, known as the DERP.

This program consists of three components—the Installation Restoration Program, which cleans up active military posts; the formerly used Defense Sites Program or the FUDS Program, which addresses contamination of sites formerly controlled by DOD; and, the Base Realignment and Closure Cleanup Program, which cleans up contamination at installations targeted for closure.

These programs are executed in compliance with the Comprehensive Environmental Response, Compensation and Liability Act and the Resource Conservation and Recovery Act and other applicable environmental laws.

These environmental laws usually come into play when unexploded ordnance have resulted in the release of contamination into the environment. When such releases occur, the Department cleans up the contamination following regulatory requirements.

As a general matter, however, we view the UXO as a safety issue rather than an environmental issue. More often, the unexploded ordnance exist in the ground without a release of contamination that threatens human health or the environment. In circumstances where there has been no such release and where the unexploded ordnance does not pose a safety threat, there may be no reason to remove the unexploded ordnance.

This is especially true when the actions required to remove the unexploded ordnance have adverse impacts on a sensitive ecosystem. For example, here at Fort Ord, about 15,000 acres of land containing unexploded ordnance are slated for transfer to the Bureau of Land Management. This land, which BLM would keep as open space, constitutes one of the last surviving tracts of California marine chaparral habitat.

Given that the proposed reuse by BLM would include control of public access, with little chance of subsurface disturbance of the unexploded ordnance, we must consider whether the extensive unexploded ordnance remediation is warranted because of the damage that it may pose to an extremely fragile ecosystem.

Clearly, however, our overriding concern is determining the appropriate level of remediation, which will be in ensuring that the area is safe for expected exposure to pedestrian access.

With this philosophy in mind, we are assessing the scope of the unexploded ordnance issues on withdrawn lands. At this time, no withdrawn lands on active Army installations have been returned to the Interior Department. The DOD and the Department of Inte-

rior are currently evaluating public domain lands to be returned at BRAC installations.

There are two Army BRAC sites containing withdrawn lands—Fort Wingate, New Mexico, 21,880 acres, and Umatilla Depot Activity in Oregon at 8,280 acres. Both sites have been evaluated. Concerning the Former Use Defense Site Program, preliminary assessments have either been completed or are in the process at approximately 6,400 sites. We estimate that about 500 sites may have unexploded ordnance waste.

There are approximately 1,600 sites remaining to be assessed. Of these remaining sites, we estimate an additional 100 new sites will be identified. We do not currently identify which FUDS properties involve public domain lands. The priority for evaluation and clean-up is based on the perceived safety hazard and not upon property ownership.

The timing and priority for cleanup of FUDS sites is based on a ranking according to their safety hazard. We use the same preliminary assessment procedures for the Ordnance Explosive Waste Sites as we do at all other FUDS sites. During the preliminary assessment stage of each site, if the ordnance explosive waste potential exists, a risk assessment questionnaire is prepared to aid in prioritizing further action at the site.

The questionnaire considers the potential magnitude and probability of an incident at the site. This assessment is used to determine the need for further evaluation or action.

Current DOD regulations require a clearance plan be presented before leasing, transferring or disposing of property where ammunition and explosive contamination is known or suspected. The determination to clear the ammunition or explosive to a given depth will depend on the availability of technology, proposed land use, and other environmental considerations, such as endangered species and cultural resources.

Beyond any regulatory requirements, the criteria for removal will be based on the planned end use of the land. DOD land clearance guidance establishes the following clearance depths required for various reuse scenarios; commercial/residential/utility construction, cleaned to a depth of 10 feet, close to unrestricted use; farming/recreation/vehicle parking, cleaned to a depth of 4 feet; livestock grazing/wildlife preserve, cleaned to a depth of 1 foot.

I would like to mention our strong commitment and ongoing involvement with the Fort Ord community. We are working closely with a wide variety of stakeholders to ensure that they are an integral part of the decision-making process. Also, DOD policy is to establish a Restoration Advisory Board or their equivalent at all BRAC installations where property transfer is envisioned.

These Boards were created to ensure better public input and representation. Each Board is co-chaired by a representative selected by the local community.

Turning to the issue of unexploded ordnance clearance technology. I want to emphasize that the Department is committed to using innovative solutions to this difficult issue. Technologies currently being used are site-specific and vary from high-tech "bioremediation," if you have contamination, to low-technology "incineration" or destruction in place.

We are currently involved in extensive testing of unexploded ordnance detection and remedial technologies. Starting next month at Jefferson Proving Ground, Indiana, we will test and evaluate some 40 innovative technologies at a 120-acre controlled test site. This site is separated into a 40-acre area for evaluating ground-based systems and an 80-acre area for airborne system testing.

This test site represents contamination scenarios found at military impact ranges, munitions testing facilities and the formerly used Defense sites. We are also working with the Western Governors' Association, the Develop On-Site Innovative Technology Committee, the DOIT, to expedite unexploded ordnance demonstration at the Jefferson Proving Ground and other sites.

In addition, this year, the Strategic Environmental Research and Development Program has funded cleanup projects dealing with unexploded ordnance. Some of the most promising unexploded ordnance detection technologies include airborne photographic imaging, ground-penetrating radar, and side-scanning sonar. The optimum detection method at any given site will depend on conditions at that location.

Site evaluation will analyze the characteristics of the ordnance that may have been used at the location, taking into account surface and subsurface geology, soil characteristics, terrain and vegetation.

Cleanup of ordnance begins with searching, locating and identifying suspected hot spots using one or more of the detection methods identified. Spots identified are identified and verified, and they are marked. Munitions within 1 foot of the surface are excavated by shovel and removal by hand. Munitions deeper than 1 foot are excavated using conventional earth-moving equipment to remove most of the soil. Final removal is accomplished by hand.

Once a munition is uncovered, it is either detonated in place or removed and detonated at another location. After excavation, soils are sifted and examined and the area is backfilled after it is found to be ordnance-free.

In the Formerly Used Sites Program, there have been no accidents or injuries resulting from UXO cleanup efforts by the Department of Defense. Although not on the public domain lands, the Spring Valley Formerly Used Defense Site in Washington, DC, provides a sterling example of the Department's expertise in the remediation of unexploded ordnance and our commitment to protect human health, safety and the environment.

Spring Valley is a densely populated residential area where over 150 World War I vintage chemicals were found in 1993. As part of our Formerly Used Defense Sites responsibility, the Army took control of the site and safely removed the munitions to safe storage at Pine Bluff Arsenal in Arkansas. We are continuing investigations at Spring Valley to ensure that no additional munitions remain on-site.

The Department will apply the same capability and commitment that it displayed at Spring Valley to unexploded ordnance of mili-

tary origin whenever and wherever it poses a threat to human health and safety.

With that, Mr. Chairman, that concludes my remarks and I'll stand ready to respond to questions.

[Prepared statement of Mr. Walker follows:]

STATEMENT BY  
LEWIS D. WALKER  
DEPUTY ASSISTANT SECRETARY OF THE ARMY  
(ENVIRONMENT, SAFETY AND OCCUPATIONAL HEALTH)  
OASA(I,L&E)

BEFORE THE  
COMMITTEE ON NATURAL RESOURCES

SECOND SESSION, 103RD CONGRESS

REGARDING  
UNEXPLODED ORDNANCE (UXO) ON PUBLIC LANDS

2 MAY 1994

NOT FOR PUBLICATION  
UNTIL RELEASED  
BY THE NATURAL  
RESOURCES  
COMMITTEE

Good morning, Mr. Chairman and Members of the Committee.

It is a pleasure for me to appear today on behalf of the Department of Defense to discuss the issue of unexploded ordnance on public lands.

The Army currently controls over 12 million acres of land of which 6.6 million (53.8%) is withdrawn land. The Department of the Army, along with the other components of the Department of Defense (DOD), is committed to being a careful steward of all lands entrusted to its control. As part of our stewardship responsibilities, we execute the Defense Environmental Restoration Program or DERP. This program consists of three components: the Installation Restoration Program which cleans up active military posts; the Formerly Used Defense Sites or FUDS Program which addresses contamination of sites formerly controlled by DOD; and the Base Realignment and Closure Cleanup Program (BRAC) which cleans up contamination at installations targeted for closure. These programs are executed in compliance with the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), the Resource Conservation and Recovery Act (RCRA) and other applicable environmental laws. These environmental laws usually come into play when Unexploded Ordnance (UXO) have resulted in a release of contamination into the environment. When such releases occur, the Department cleans up the contamination following applicable regulatory requirements.

As a general matter, however, we view UXO as a safety issue rather than an environmental issue. Very often, UXOs exist in the ground without a release of contamination that threatens human health or the environment. In circumstances where

there has been no such release and where the UXO does not pose a safety threat, there may be no reason to remove the UXO. This is especially true when the actions required to remove the UXO would have an adverse impact on a sensitive ecosystem. For example, here at Fort Ord, about 15,000 acres of land containing UXOs are slated for transfer to the Bureau of Land Management (BLM). This land, which BLM would keep as open space constitutes one of the last surviving tracts of California Marine Chapparral habitat. Given that the proposed reuse by BLM would include controlled public access with little chance of subsurface disturbance of UXO, we must consider whether UXO remediation is warranted because of the extensive damage that it may pose to an extremely fragile ecosystem. Clearly, however, our overriding concern in determining the appropriate level of remediation will be ensuring that the area is safe for the expected level of pedestrian access.

With this philosophy in mind, we are assessing the scope of the UXO issues on withdrawn lands. At this time, no withdrawn lands on active Army installations have been returned to the Interior Department. DOD and the Department of the Interior are currently evaluating Public Domain lands to be returned at BRAC installations. There are two Army BRAC sites containing withdrawn lands: Fort Wingate, New Mexico (21,880 acres), and Umatilla Depot Activity, Oregon (8,280 acres). Both sites are being evaluated. Concerning FUDS, preliminary assessments have been either completed or are in progress at approximately 6,400 sites. We estimate that about 500 sites may have ordnance explosives waste. There are approximately 1,600 sites remaining to assess. Of these remaining sites we estimate an additional 100 new sites will be

identified. We do not currently identify which FUDS properties involve public domain lands. The priority for evaluation and cleanup is based upon their perceived safety hazard and not upon property ownership.

The timing and priority for the cleanup of FUDS sites is based on a ranking according to their safety hazard. We use the same preliminary assessment procedures for Ordnance Explosive Waste (OEW) sites as at all other FUDS. During the preliminary assessment stage of each site, if an OEW potential exists, a risk assessment questionnaire is prepared to aid in prioritizing further action at the site. The questionnaire considers the potential magnitude, and probability of an incident at the site. This assessment is used to determine the need for further evaluation or action.

Current DOD regulations require a clearance plan be presented before leasing, transferring, or disposing of property when ammunition and explosives contamination is known or suspected. The determination to clear the ammunition or explosives to a given depth will depend on the available technology, proposed land use and other environmental considerations such as endangered species and cultural resources. Beyond any applicable regulatory requirements, the criteria for removal will be based on the planned end use of the land. DOD land clearance guidance establishes the following clearance depth requirements for various reuse scenarios:

Commercial/Residential/Utility Construction – 10 feet; Farming/Recreation/Vehicle parking -- 4 feet; Livestock grazing/Wildlife preserve -- 1 foot.

I would like to mention our strong commitment and ongoing involvement with the Fort Ord community. We are working closely with a wide variety of stakeholder's to

ensure that they are an integral part of the decision making process. Also, DODs policy is to establish Restoration Advisory Boards, or their equivalent at all BRAC installations where property transfer is envisioned. These boards were created to ensure better public input and representation. The Board is co-chaired by a representative selected by the local community.

Turning to the issue of UXO clearance technology, I want to emphasize that the Department is committed to using innovative solutions to this difficult issue. Technologies currently being used are site specific and vary from high tech "Bioremediation" to low tech "Incineration" or destruction in place. We are currently involved in extensive testing of UXO detection and remediation technologies. Starting next month at Jefferson Proving Ground (JPG), Indiana, we will test and evaluate some 40 innovative technologies at a 120-acre controlled test site. The site is separated into a 40-acre area for evaluating ground-based systems and a 80-acre area for airborne systems. This test site represents contamination scenarios found at military impact ranges, munitions test facilities and FUDS. We will also be working with the Western Governors' Association, Develop On-site Innovative Technology (DOIT) Committee to expedite UXO demonstrations at JPG and other sites. In addition, this year the Strategic Environmental Research and Development Program (SERDP) has funded cleanup projects dealing with UXOs. Some of the most promising UXO detection technologies include airborne photographic imaging, ground-penetrating radar, and side scan sonar. The optimum detection method at any given site will depend on conditions at that location. Site evaluation will analyze the characteristics of the ordnance that may

have been used at the location, taking into account surface and subsurface geology, terrain, and vegetation.

Clean up of ordnance begins with searching, locating and identifying suspected hot spots using one or more of the detection methods identified. Spots identified and verified are marked. Munitions within one foot of the surface are excavated by shovel and removed by hand. Munitions deeper than one foot are excavated using conventional earth moving equipment to remove most of the soil. Final removal of the munitions is accomplished by hand. Once a munition is uncovered, it is either detonated in place or removed and detonated at another location. After excavation, soils are sifted and examined and the area is backfilled after it is found to be ordnance free.

There have been no accidents or injuries resulting from domestic UXO cleanup efforts by the Department of Defense.

Although not on public domain lands, the Spring Valley FUDS in Washington, D.C., provides a sterling example of the Department's expertise in the remediation of UXO and our commitment to protection of human health, safety, and the environment. Spring Valley is a densely populated residential area in Washington, D.C., where over 150 World War I vintage chemical munitions were found in 1993. As our part of our FUDS responsibilities, the Army took control of the site and safely removed the munitions to safe storage at Pine Bluff Arsenal in Arkansas. We are continuing investigations at Spring Valley to ensure that no additional munitions remain on the site. The Department will apply the same capability and commitment that it displayed at

Spring Valley to UXO of military origin wherever it poses a threat to human health or safety.

Mr. MILLER. Thank you. Mr. Souby.

#### STATEMENT OF JAMES M. SOUBY

Mr. SOUBY. Thank you, Mr. Chairman, Mr. Farr. First of all, let me start by saying that our 18 member States and our 3 Pacific flag territory members are all heavily impacted by Defense activities. I think all of our Governors understand how important those activities are, but they also are beginning to recognize the costs of those activities. So I want to convey to you their appreciation for convening this hearing and also for your committee's work on making this issue more visible to the public.

Last year, the Western Governors' Association entered a partnership with four Federal agencies. It's been mentioned here. The DOIT Committee was formed under the Federal Advisory Committee Act. Our four partners are the Environmental Protection Agency, the Department of Defense, the Department of Energy, and the Department of the Interior.

The reason we entered into this partnership was that over the course of the last four or five years, as we've come to understand the waste problems facing the West, we realized that unless we got involved in a positive and also sometimes in a bully pulpit way we weren't going to see enough activity on cleanup in the West.

The four areas that our region has waste problems in or extensive waste problems in are, of course, mining waste, contaminants at military bases, mixed radioactive and hazardous waste, which are contained primarily at Defense Weapons Complex sites throughout the West and then, of course, munitions waste.

The reason we picked these four waste streams is, first of all, of course, they are problems for all of our member States, but secondly, many of the technologies and many of the solutions to these waste problems will be applicable across these waste streams. So it seemed important to us to serve as a catalyst for cooperation across the Federal agencies and between the public and private sectors and between the Federal Government, local government, tribes and others.

So our partnership, the Committee to Develop On-Site Innovative Technologies partnership is, in fact, a mechanism to catalyze more action and more cooperation between all the players.

Mr. Chairman, you asked three questions of me, and I'd like to answer them very quickly. The first question was the nature and extent of unexploded ordnance. You've heard the numbers here, which I think do accurately describe the extensiveness of this particular problem. I'd just like to quickly cite the problem from a state perspective and I picked for my testimony South Dakota, because one doesn't think of South Dakota necessarily as an area that would have tremendous munitions waste problems, but in fact, it does.

Within that State, there are 19 different sites with potential unexploded ordnance contamination. They include a whole array of different types of facilities. The sites are located throughout the State, some very close to urban areas, just as Fort Ord is here in California, and at least 2 of the sites are on Native American lands. So the point of my testimony here is to tell you that, as you

know, this problem includes a lot of people and a lot of different people have a stake in the outcome of these cleanup exercises.

The second question you raised and asked us to answer was the effect of changing land use on demand and need for UXO clearance. That's a tough one to answer. Although I agree with our Federal partners and colleagues that land use planning should play an important part of that equation for future cleanups, we or the Western Governors have not taken an official policy on that issue.

We want to stay conservative. It's hard. We can't predict the future sufficiently to know that we can allow unexploded ordnance to remain close to the surface or to continue to reach the surface. So we would like to see a very aggressive posture on the part of our Federal partners and the Federal Government on cleanup issues.

The reason we formed the DOIT Committee is we recognized that will require technology. We do understand that the cost situation here is difficult for the country to deal with. So new technologies are in order, those that would be faster and cheaper and more efficient at finding munitions and cleaning them up.

The third question you asked had two parts to it. The first was the status of the UXO technology and I'd like to turn to my colleague to answer that question in a moment. You also asked us to recommend principles that might govern the Federal Government's activities in this area, and I'd like to provide some ideas for you.

There are eight that I have mentioned in my testimony and the first has been mentioned here by several of the witnesses, and that is the involvement of a wide array of stakeholders, people who have an interest in this problem. In all of these cleanup activities, we have found that without early and thorough participation of those interested parties in the cleanup, you're likely to see delays and you're likely to see misunderstandings and you're certainly not going to have the public support for some of the expensive funding requirements that facilities are going to need to clean up. So the first principle would be wide involvement of stakeholders.

The second principle would be that the Federal Government honor its financial obligations to clean up these sites. We're very nervous about rumblings. There are a number of committees, in view of the budget problems that the Federal Government is facing, there are a number of executive branch committees that are looking into ways to not fund full cleanups and to find substitutes, and that would concern us greatly. Like I said, we can't predict future uses with perfection. We want to make sure that these cleanup activities remain funded.

The third principle we would recommend would be that, wherever possible, you treat the munitions and munitions waste on-site. When you move this stuff around, I guess, anywhere in the country, and I can speak for our region, you incur additional delays and problems. People don't want waste shipped into their community. If you have a waste site in the local area, we would recommend that, if at all possible, you treat that waste there. Whatever the technical requirements are, you take care of that on-site.

We're working with all four of our Federal partners to find technologies that will allow you to do that, that are portable, efficient and cost-effective.

The fourth principle is to encourage inter-service, inter-agency, and, I might say, inter-governmental, state, tribal, whatever, cooperation. Our observations in the first year in working with our Federal partners, with the tribes and the other stakeholders we have involved, and there are a significant number of them in this partnership we've created.

Quite simply, we're amazed at the lack of exchange of information. It's not because anybody isn't being diligent. It's because they're focused within their agency lines and within their particular areas of interest. One of the soft benefits we've seen from the DOIT process already is the fact that we've got a whole array of agencies meeting together. So we would want any actions you took to encourage more of that type of inter-agency cooperation. It removes a lot of barriers.

The fifth principle is to make sure you encourage local initiatives and innovative approaches, just like I'm sure we'll hear about here at Fort Ord with the local community. The Federal agencies and the States don't have all the answers. We find that all of our sites that are in the DOIT process, that local folks, the local university or the local campus of the state university have tremendous ideas about how to effect cleanup more efficiently and effectively. We would want to continue to encourage that type of interaction.

The sixth principle is that when off-site treatment is necessary, the likely destination for those wastes and the transportation corridor, if, in fact, they're going to be highly dangerous, or transportation requirements involved, the local citizens must be consulted early. This will reduce the potential litigation, the not-in-my-backyard type syndromes. People are willing to take on these cleanup issues if they recognize that there's a large benefit and return for that and if they understand the problem. If they don't, the answer is immediately no, don't ship that stuff my way, and the Western Governors represent that same perspective, which I'm sure the Department of Energy can testify to with respect to radioactive wastes.

If we don't know what the issue is, we don't want that stuff coming into our States. We need to be partners and informed on those types of transportation issues.

The seventh principle, and I'm sure you'll hear it all day long, is we don't have cost-effective and efficient technologies right now. It's been referenced by the two previous witnesses. The Federal Government can play a tremendously valuable catalyst role in funding technology development, but you want to make sure that that technology development process doesn't fall into the current trap.

That is, if you look at the funding stream for most large-scale Federal technology development programs, there will be a large appropriation at the top and there will be a very small stake at the bottom where that money hits the community of interest, which would be the private sector, universities, what have you. A lot of the money seems to be eaten within that funnel. So you want to make sure that any resources that are applied to technology development get out to the people who will compete and develop efficient technologies.

The eighth principle is to keep in mind markets. This problem will not be solved simply by Federal agency action. There's got to be a commercial opportunity here that will create a wider investment, and I think the international market, overseas market, not to mention the various ranges in the West will provide that market if we make sure the private partners, as well as the public and economic partners are involved.

I'll be happy to answer any questions about the DOIT Committee and about what we're up to. I would like to turn to my colleague, Jim Austreng, from the California Environmental Protection Agency, who is the spokesperson for the Munitions Working Group, to give you a few thoughts about technology, per se.

[Prepared statement of Mr. Souby follows.]

**TESTIMONY OF JAMES M. SOUBY  
EXECUTIVE DIRECTOR, WESTERN GOVERNORS' ASSOCIATION  
BEFORE THE HOUSE COMMITTEE ON NATURAL RESOURCES  
SEASIDE, CALIFORNIA**

**MAY 2, 1994**

Mr. Chairman, thank you for inviting me to testify today before the Committee. My name is Jim Souby and I am the executive director of the Western Governors' Association. The governors of 18 western U.S. states and three Pacific flag islands are the members and board of directors of the Association. The issue the Committee addresses today, unexploded ordnance, is very important to the governors and the West. As you know Mr. Chairman, most of the bombing and artillery ranges where unexploded ordnance is a concern are located in this region.

You have asked me to address three questions and I am happy to provide the Committee my views on these questions. I must preface my remarks with the caveat that the member governors of the WGA have not to date taken an official position on these issues and therefore, while I have a sense of the governors' views, my remarks should be viewed as mine alone.

The first question you raise is the nature and extent of the unexploded ordnance on western lands. Although the Committee is well aware of the issue, it is important to point out that unexploded ordnance, referred to as UXO, is located on land owned by federal, tribal, private, and occasionally state concerns. Within the federal system, we are talking about not just lands owned and controlled by the Department of Defense but Interior as well. For

instance, in South Dakota there are 19 different sites with potential UXO contamination. They include a former ordnance depot, an active Air Force base, and former gunnery and bombing ranges. These sites are located throughout the state, from sparsely populated range land to the outskirts of Sioux Falls. At least two sites are on Native American reservations. The majority of the sites are Formerly Used Defense sites which are already back in public hands.

As the Committee knows, there are some 2 million acres of land managed by the Bureau of Land Management, 15 national wildlife refuges, and some 900 Formerly Used Defense Sites that are contaminated by UXO. UXO problems are not confined to explosive potential but include soil and water contamination and rocket motor fuel disposal and cleanup as well. Other ordnance problems include chemical and biological weapons and stockpiles.

As I stated at the beginning of my testimony, the WGA has taken no official position on UXO issues, including future land use for lands contaminated by UXO. However, the governors' positions and views on similar issues are instructive. The key issue on future land use decisions is the paramount need for the active involvement of a broad array of local community interests in these discussions. Land use decisions will affect the local community for years to come and facilitated discussions on options, including the time and costs involved in locating and remediating UXO to make lands safe for those land uses, should be a necessary first step before narrowing the decision framework. These discussions should include other affected interests, such as adjacent tribal governments, when appropriate.

Other federal agencies with regulatory responsibility or interest in future land use decisions such as EPA and the Corps of Engineers should be at the table from the beginning as well. Not bringing all the relevant agencies to the table can lead to frustration and delay. For example, Castle Air Force Base developed a land reuse plan after extensive public hearings and discussions. After all the land use decisions were reached, the Fish and Wildlife Service, which had not been involved in the discussions, determined that potentially there was a threatened and endangered species of fox living on the base. If this is true, the reuse plans might have to be revisited.

Land use decisions should be informed, but not driven, by budgetary constraints. An acceptable answer to future land use is not to put up a fence for all eternity because there is not the money to locate and address the UXO problem. Land use decisions will have a major budgetary impact. For example, the Umatilla Army Depot in northeastern Oregon is slated for closing. A total of 1,750 acres of the 20,000 acre facility are thought to contain UXO. Clearance costs range from \$1.2 million for surface clearance, \$13.7 million for clearance to five feet, and for clearance to 20 feet the costs are estimated to be roughly \$900 million.

The second question the Committee raises is the effect of changing land uses and demand for land on the need for UXO clearance. As the Committee is well aware, the West is one of the fastest growing regions of the country. During the 1980s, the West's population grew by over twenty percent. That includes nearly four and a half million migrants from other regions of the country and newly arriving immigrants. In addition to the increase in numbers

is the change in lifestyles with an increased emphasis on recreation. Off road vehicles, mountain bikers, naturalists, and others are going further and further into the back country to get away from already crowded recreation spots. The correlation between this increase in population into the back country and an increase in unauthorized trespasses onto restricted areas containing UXO has not been investigated. Anecdotal evidence is available however which highlights the concern of opening up areas for new uses.

For example, Fort Douglas and property in Red Butte Canyon are located on the foothills above Salt Lake City. The federal government recently decommissioned the property and turned it over to Salt Lake county and the University of Utah. This area has been closed to the general public since World War I. Two days ago volunteers started cutting a two mile trail into the canyon so the area can be opened and used to satisfy a growing demand for recreation. Although no written records exist, retired personnel claim this area was used as a cannon target area during World War II and the Korean War.

The final question the Committee asks is in two parts. The first is the status of UXO technology. The second is the principles which should govern federal clean up policy.

Last year western governors formed a partnership with the Departments of Defense, Energy, Interior and the Environmental Protection Agency. Four governors sit on the Committee with the Secretaries of those agencies to guide that effort. The committee is called to Develop On-site Innovative Technology or DOIT Committee. The focus of that Committee is to improve how

innovative technologies are developed and deployed to clean up federal waste sites in the West. The DOIT Committee formed four working groups of state, federal, tribal, environmental, and industry representatives to develop consensus ideas for ways for both state and federal governments to improve policy governing technology and waste cleanup.

One of the working groups formed by the DOIT Committee is focusing on munitions problems. The spokesperson of that group, Jim Austreng of the California Environmental Protection Agency's Base Closure Group, is with me today to answer the technology part of your final question. Before turning to Jim, I want to answer your question about the principles which should govern federal UXO cleanup. I have eight principles to suggest.

- ▶ The first principle I have mentioned already. That is the involvement of a wide array of stakeholders in future land use discussions, including local community as well as other affected interests and other federal agencies with potential interest.
- ▶ The second principle is that the federal government must honor its financial obligations to clean up these sites, including Formerly Used Defense sites already returned to private use.
- ▶ The third principle is, wherever possible and appropriate given the constraints of available technology, treat the munitions and munitions waste on site. Transporting the wastes to another site

raises safety issues as well as equity questions for the receiving jurisdictions and their citizens and is likely to incur delay and higher costs.

- ▶ The fourth principle is to encourage inter-service and interagency sharing of information, technology, and approaches for UXO cleanup. Too often money is wasted on redundant efforts by different agencies with the same goal. Along these same lines, uniformity of policy and approaches by different services and agencies for UXO cleanup will help citizens, state and local governments, and technology developers provide meaningful input and avoid confusion. The DOIT Committee's Munitions Working Group has demonstrated on a small scale the "soft" benefit of this cooperation.
  
- ▶ The fifth principle is to encourage local initiative and innovative approaches. While uniformity is important, local initiative and innovative approaches which are supported by the local community should be encouraged. For example, the State of Hawaii is expected to finalize a memorandum of understanding with the Navy this week for cleanup of UXO on Kaho'olawe Island. In order to have more local control on the cleanup decisions, the State has asked that the lands be turned over to State control before cleanup begins rather than after it is finished. I understand that other military facilities are entertaining similar notions, for example at Treasure Island in California, a community managed

cleanup model is being considered. This model would turn over more decisionmaking on cleanup standards and funding to local stakeholders.

- ▶ The sixth principle is that when off site treatment is necessary, the political jurisdiction and local citizens of the host community must be consulted about the proposed shipments and their views incorporated into the decision framework..
- ▶ The seventh principle is provide funding for the development and testing of more cost-effective technologies. Given the price of conventional clearance using today's technologies, costs will be prohibitive. New, cheaper technologies are urgently needed.
- ▶ The eighth and final principle I would suggest is to encourage the consideration of opportunities for exporting innovative technologies to other countries during the design and testing of new UXO technologies.

The DOIT Committee's Munitions Working Group is identifying model new approaches and technologies for UXO cleanup that relate to many of these principles. They will evaluate the test of these new approaches at several facilities in the West over the next two years. Their final report is due to the Committee in 1996. I'll now turn it over to Jim who will answer your questions on current UXO technologies and regulations.

**STATEMENT OF JIM AUSTRENG**

Mr. AUSTRENG. Mr. Chairman, committee members, as Mr. Souby mentioned, I am here today representing the Military Munitions Waste Working Group under the DOIT Committee. The Working Group first met in May 1993 and issued its initial report to the DOIT Committee in November 1993. To reduce duplication costs, I've only attached the executive summary to my written testimony, but would offer, under separate cover, a copy of the full report and ask that that be included in the record.

The Working Group is operating under a fact-finding mission to identify cooperative efforts of performing more cost-effective cleanups in ordnance-related waste and commercialization of new technologies. The Working Group has identified seven categories or waste streams associated with ordnance.

Considering the topic of this hearing, I will limit my discussions to unexploded ordnance. Within that fact-finding mission, we identified or categorized these issues into administrative and technology. I will briefly touch on a few key items of the administrative problems that we saw to help and assist in developing more cost-effective strategies.

As you've already heard, there is confusion in the regulatory arena on how to address this issue. It's one of the items we've identified. The Working Group's consensus was that perhaps in the Superfund reauthorization bill, the definitive language on how this issue would be addressed could be included in that bill. I refer you to the text of our report to identify other issues and other ways.

You've already heard the lack of stakeholder involvement. Historically, these issues have gone on and our cleanup has proceeded without the involvement of the stakeholders and we've had to backpedal to find out what had been done and if that's acceptable to the local stakeholders.

Another key issue is the placement of untrained and unqualified persons in key positions. This is similar to a bill that one of your constituents has recently submitted, Mr. Richardson, House Bill 3572, requiring certification of personnel doing preliminary assessments. We are of the like mind that people in the decision-making role should be qualified, trained and licensed in order to have that position, and that was the consensus of the Working Group.

From a technology standpoint, we know there are plenty of technologies out there. However, as you've already heard, there is no one technology, no panacea, that can address all the problems that we face. We are in the process of working with various technology vendors and short of excavating the soil to whatever depth, the consensus of the Working Group was that nobody will sign a 100 percent clearance paper unless they can sieve that soil. So there are restrictions and limitations to that technology. What it boils down to is a risk management, decision-making process—what do you do with that uncertainty.

You've already heard also that the advancements in airborne technology, three-dimensional ground-penetrating radar, etc., are on the horizon. The Working Group has not developed any consensus statement on which to choose, but we are operating in somewhat of a scenario where it allows a black box to come in so we

can proceed with the technology rather than trying to limit that technology.

We have developed various sites to try this at. Currently, we're in the implementation of the development plan with these installations that have been identified by the Working Group. We hope we can proceed with developing these technologies.

With that, I will end my presentation on the Working Group, and I'll offer any answers to questions you may have.

[Prepared statement of Mr. Austreng follows:]

**JIM AUSTRENG  
CALIFORNIA ENVIRONMENTAL PROTECTION AGENCY  
AND  
SPOKESPERSON OF  
THE MILITARY MUNITIONS WORKING GROUP OF  
THE COMMITTEE TO DEVELOP ON-SITE  
INNOVATIVE TECHNOLOGIES**

Mr. Chairman and Committee Members, as Mr. Souby mentioned, I am here today representing the Military Munitions Waste Working Group which was formed under the Development of On-site Innovative Technology (DOIT) Committee.

The Working Group first met in May of 1993 and issued its initial report to the DOIT Committee November 1993. To reduce duplication costs, I have attached only the Executive Summary to my written testimony. However, I would like to provide the Committee members, under separate cover letter, a copy of the full report and request that the report be included in the hearing records.

The Working Group is operating under a fact finding mission to identify cooperative methods of performing more cost effective cleanup of ordnance related waste and commercialization of new technologies.

The Working Group has identified seven waste streams associated with munitions. Because this hearing is concerned primarily with Unexploded Ordnance, I will limit my discussion to that issue.

The Working Groups's efforts include the identification of impediments to cleanup. These impediments can be separated into two broad categories, namely:

1. Administration of cleanup, or process requirements, impediments
2. Technology impediments

Before discussing the findings on technology, I would like to highlight some of the key administration, or process issues the Working Group identified. These are:

**ADMINISTRATION/PROCESS ISSUES:**

- a. **Confusing Regulatory Requirements:** The Working Group found unexploded ordnance cleanup efforts (UXO) are often delayed due to uncertainties in the jurisdiction of both state and federal regulatory authorities. These delays not only postpone reuse of affected areas, but increase cost of remediation.

One option the Working Group identified to reduce this uncertainty is to include definitive language in the pending Superfund reauthorization bill which identifies how UXO cleanup efforts will be addressed. However, I refer you to the Working Group Report for a complete discussion on suggested options to address this issue.

- b. **Lack of Stakeholder Involvement:** The Working Group found that clean up efforts are often undertaken without the involvement of local stakeholders. Including both local stakeholders and all relevant local, state, and federal regulatory agencies early on will reduce time spent in reaching decisions and ensure broader acceptance of outcomes.
  
- c. **Placement of untrained/unqualified personnel in key decisionmaking roles.**

### TECHNOLOGY

With respect to technology, the Working Group found that many technologies exist for locating surface exposed and buried UXO. However, no technology is available at this time which will allow for the identification of items buried. Consequently, significant time and costs are added to remediation efforts. Additionally, debris can mask signals and prevent identification of UXO.

The Working Group also found that short of 100% excavation, uncertainties about the effectiveness of identification and removal of UXO always remain. Consequently, risk and decisionmaking plays an integral role in selection of actions to be taken.

The Working Group recognizes that no panacea currently exist for the detection and identification of UXO. However, several advances in technology have been made recently. Some of these advancement include:

- i. Adaptation of airborne systems to survey large expanses of property.
- ii. Three dimensional ground penetrating radar imaging.
- iii. Improved data analyzers to help differentiate signals.
- iv. Multi-Sensor and surface towed systems.

I do want to note that the above listing does not constitute the extent to which the Working Group will focus its technology review efforts. Rather the Working Group is operating in a mode that will leave the door open for "black box" solutions. Our intent is not only to find ways to advance current technologies, but to provide avenues for the research and development of otherwise unproven technologies.

In developing the Working Group Report, the members identified candidate sites where technologies could be tested with the goal of both learning and sharing information. We want to test new stakeholder involvement models, new regulatory approaches and better mechanisms to share results of technology tests in order to speed commercialization.

We are currently developing implementation plans to test various technologies and processes at four federal facilities. We are encouraged by the interest of all parties, including this Committee, on improving ways to cleanup contaminated properties and look forward sharing the information we will gain.

Thank you for the opportunity to testify before the Committee. I will be glad to answer any question you may have on the Working Group's efforts.

**MILITARY MUNITIONS WASTE WORKING GROUP REPORT TO  
THE FEDERAL ADVISORY COMMITTEE TO DEVELOP ON-SITE  
INNOVATIVE TECHNOLOGIES (DOIT COMMITTEE)**

November 30, 1993

## EXECUTIVE SUMMARY

This report presents the findings of the Military Munitions Waste Working Group in its effort to achieve the goals directed under the Federal Advisory Committee to Develop On-Site Innovative Technologies (DOIT Committee) for environmental restoration and waste management.

As a result of military base closures after each major conflict and previously acceptable disposal practices, millions of acres of non-Department of Defense Federal lands and State, tribal, and private lands are potentially contaminated with ordnance explosive waste. Many of these lands are now accessible to the general public and could pose a risk to the public's health and safety. Therefore, an effort should be made to develop, demonstrate, and field technologies which will reduce the public's risk in a better, faster, safer, and more cost effective manner than provided by current technologies.

### Waste Stream Areas of Concern

The Military Munitions Waste Working Group identified the following seven areas of concern associated with the ordnance (energetics) waste stream:

1. Unexploded ordnance
  - Stockpiled
  - Disposed - at known locations, i.e., disposal pits
  - Discharged - impact areas, unknown disposal sites
2. Contaminated media
3. Chemical sureties/weapons
4. Biological weapons
5. Munitions production
6. Depleted uranium
7. Rocket motor and fuel disposal (open burn/open detonation)

Because of time constraints, the Military Munitions Waste Working Group has focused on unexploded ordnance and contaminated media with the understanding that remaining waste streams will be considered as time permits.

### Barriers and Shortcomings

The current approaches, processes, and technologies for locating, identifying, and remediating ordnance waste were reviewed and weaknesses analyzed. The Military Munitions Waste Working Group found that the Department of Defense and the Department of Energy are already undertaking major programs to address the technological shortcomings. The approaches and processes shortcomings appear to be receiving less emphasis. These are areas that the Military Munitions Waste Working Group identified where the DOIT Committee could provide the greatest "value added" for environmental restoration and waste management of ordnance-related problems.

The Military Munitions Waste Working Group identified the following specific problem areas:

- I. **Barriers:** Identified barriers are divided into two categories, regulatory/institutional and technical. Many of the barriers were found to affect all four working groups, for example, high permitting costs, disincentives for use of innovative technologies, liability, and procurement.

#### Regulatory/Institutional Barriers

- Procurement restrictions.
- Lack of regulations for remediation of unexploded ordnance.
- Misapplication of existing hazardous waste regulations to unexploded ordnance.
- Limited effectiveness of deed restrictions to protect future land users.
- Uncertainty as to how to assess and manage risk.
- Reluctance to award contracts or select/recommend technological approaches where there is a perceived risk in promoting a new approach, i.e., the decisionmaker gets no reward for an approach that produces good results with new technology.
- Lack of Environmental Protection Agency grant funds to process Research Development and Demonstration permits or Hazardous Solid Waste Amendment reviews.
- Placement of untrained/unqualified personnel in key roles and as decisionmakers who decide what actions should/should not take place.
- Classified technologies and information not available to solve unclassified problems.

**Technological Barriers**

- Sensitivity to clutter of unexploded ordnance detection equipment.
  - Size and mobility of equipment, e.g., terrain limitations.
  - Inability of sensors to look at large areas cheaply.
  - Inadequate trained labor force.
2. Additional shortcomings include:
- Lack of early involvement of stakeholders.
  - Lack of a uniformly accepted data base for information sharing.

**Potential Actions to Overcome Barriers and Shortcomings**

1. Provide funding to support early stakeholder involvement.
2. Recommend Comprehensive Environmental Response, Compensation, and Liability Act reauthorization include specific requirements for remediation of unexploded ordnance contaminated sites.
3. Recommend that the National Contingency Plan be modified to specifically address ordnance contamination.
4. Recommend the Department of Defense issue policy directives that clarify the waste munitions versus hazardous substance response issues.
5. Recommend an Ordnance Committee be appointed to advise the National Response Team on matters concerning ordnance contaminated sites.
6. Establish regulations for restoration of sites contaminated with unexploded ordnance.
7. Streamline procurement requirements.
8. Provide incentives for use of innovative technologies.
9. Reduce the threat of enforcement action if a technology does not reach its objective.
10. Establish a listing of existing data bases for information and reports on ordnance and explosive waste detection, identification, and remediation. If this listing does not meet the requirements of the organizations working with ordnance and explosive waste, encourage the establishment of an "Ordnance Remediation Information and Analysis Center."
11. Encourage and support technology development and training.

### Demonstration Selection Criteria

The Military Munitions Waste Working Group developed demonstration selection criteria based on the Ad Hoc Committee's criteria, with additional criteria the group members thought appropriate. The criteria include site, technology, evaluation and contractor categories.

### Identified Demonstration Sites

Eight sites were identified as the initial potential demonstration for consideration by DOIT sites based on the selection criteria and ongoing Department of Defense research and development or technology demonstrations. These sites will be augmented as appropriate to provide a full range of sites to meet the DOIT Committee's demonstration goals.

The technological innovations in the field of ordnance explosive waste detection, identification, and remediation appear to be more evolutionary than revolutionary. The primary issues are the abilities of the technology and operators to perform as advertised and to provide all stakeholders with an understanding of the limitations and uncertainties involved with remediation. Therefore, stringent test situations need to be established to evaluate the effectiveness and efficiency of the existing systems and evolutionary improvements to these systems. These results must be repeatable to be accepted by the scientific and stakeholder communities.

We have identified the need for two test/demonstration site categories:

- Controlled test sites are designed and constructed to replicate actual field situations with all parameters precisely known, using inert munitions and munitions waste. These sites will be used to accurately evaluate the test results from technologies in research and development.
- Uncontrolled demonstration sites are sites with actual contamination where most, but probably not all, of the contaminant characteristics are known. Evaluating the effectiveness and efficiency of the demonstrated technologies will be less accurate. These sites provide a variety of environmental settings in which to demonstrate technologies which have already been proven under controlled test site environmental conditions. These sites shall have explosives safety controls established to protect authorized observers during the conduct of the demonstrations.

Both site categories are suitable for demonstration of the DOIT clean up approaches and methodologies, including stakeholder involvement.

Documentation of the tests and demonstrations at both the controlled and uncontrolled sites will provide credentials for the technology and the company. This documentation will provide the information necessary for a site manager to proceed with confidence when contracting for innovative technologies.

The initial eight sites for DOIT consideration are:

- Jefferson Proving Ground, Indiana: FY 1995 Army base closure. Research and development technology testing/demonstration for subsurface unexploded ordnance.
- Yuma Proving Ground, Arizona: Active Army facility. Research and development and applied technology testing/demonstration for surface unexploded ordnance.
- Fort Ord, California: FY 1995 Army base closure. Applied technology demonstration for contaminated media and surface and subsurface unexploded ordnance.
- Kaho'olawe Island, Hawaii: Navy formerly used Defense sites. Applied technology demonstration for contaminated media and surface and subsurface and underwater unexploded ordnance.
- Castle Air Force Base, California: FY 1995 Air Force base closure. Research and development and applied technology testing/demonstration for contaminated media and subsurface unexploded ordnance.
- Sierra Army Depot, California: Active Army demilitarization facility. Research and development and applied technology testing/demonstration for contaminated media, demilitarization processes, and subsurface and underwater unexploded ordnance.
- Black Hills Ordnance Depot, South Dakota: Army formerly used Defense site. Applied technology demonstration for surface and subsurface unexploded ordnance.
- Sunflower Army Ammunition Plant, Kansas: Partially active and partially shut down Army ammunition manufacturing facility. Research and development and applied technology testing/demonstration for contaminated media.

#### Subsequent Reporting

This report has been written as a "living document." Working Group's efforts not included in this report, e.g., review of the Department of Defense's National Test Bed concept, will be provided as an attachment. A full report will be made available when appropriate.

Mr. MILLER. Thank you. Ms. Anderson.

#### STATEMENT OF JULIE ANDERSON

Ms. ANDERSON. Good morning. I'm the Director of U.S. EPA's Federal Facility Cleanup Office. We are an office that oversees the cleanup of all closing bases in the western United States, and we also work on all other bases that are listed on the National Priorities List.

Fort Ord is both a closing base and a National Priorities List site. So we are working actively on Fort Ord. You asked us here today to address three primary areas. One of which is the role of EPA at Fort Ord, the second of which is the regulatory status of unexploded ordnance, and the third is the role of land use and remedy selections. I'll take each one of those in turn.

First of all, regarding EPA's role at Fort Ord, we have five primary functions that we serve. The first of those functions is selection of the cleanup actions with DOD that will be employed at this base. We do this jointly with DOD. If we can't come to agreement with DOD on remedies to be selected, EPA must make the decision, and that applies to unexploded ordnance.

The second area is entering into enforceable agreements that specify cleanup schedules for the base. They also provide our oversight and approval authority for the technical work being conducted on that base. We entered into an enforceable agreement with Fort Ord in 1990 and it does lay out the schedule for full cleanup of the base.

The third area that we're involved in is concurring on uncontaminated parcel determinations. Under the 1992 CERCLA law, DOD is required to identify for closing bases those parcels that are uncontaminated and can be transferred on to new uses without further action. We've just gone through the beginning process of that with Fort Ord. We've identified about 13,000 acres of uncontaminated property which we did concur on.

At this point, EPA did not concur on DOD's recommendation that the UXO-affected parcels be considered uncontaminated. It's our feeling that that ran contrary to the intent of the law, which was to make available those parcels which did not have safety concerns and would not need additional cleanup activities.

The fourth area that EPA is involved in is concurring on parcels that do contain contaminants, but all necessary remedial actions have been taken before those parcels are transferred to new owners.

The CERCLA law requires that DOD issue a covenant for properties that contain contaminants, that all necessary remedial actions have been taken on those parcels before they're transferred to new owners outside the Federal Government. So for parcels that are contaminated with unexploded ordnance that are going to be transferred to new users other than Federal agencies, EPA has a role in concurring with DOD on that covenant, that all necessary remedial actions have been taken. That must be done before those parcels can be transferred to those new non-Federal users.

The last area that we're involved in is consulting on contaminated properties that are going to be transferred between Federal agencies. This would apply to, for instance, transfers of unexploded

ordnance contaminated areas between DOD and BLM. While DOD is not required to make a covenant that all necessary remedial action has been taken prior to transferring that property to BLM, they are required under guidance that we have jointly developed within DOD and EPA to fully disclose the condition of that property before they transfer it to a new owner, whether that owner be Federal or non-Federal.

So in the case of BLM accepting this property, DOD will need to work with EPA to make disclosure of the environmental status of that property.

The second primary area you asked me to talk about was the regulatory status of unexploded ordnance at Fort Ord. There are two primary laws that address the threats posed by unexploded ordnance at Fort Ord and other military bases. The first of those is the CERCLA law or Superfund law. Superfund has a broad-reaching authority to require response actions wherever there has been a release or a threatened release of hazardous substances, and those substances are defined by the Clean Water Act, Clean Air Act, RCRA. They're really quite broad-reaching.

We also have the ability to require action for pollutants or contaminants, which are an additional subset of materials that could pose problems with unexploded ordnance. We feel that that broad-ranging authority will capture most of the concerns raised by unexploded ordnance, and at Fort Ord we are using the CERCLA authority to address unexploded ordnance.

RCRA is the other primary law. That's the Resource Conservation and Recovery Act, which addresses threats posed by unexploded ordnance. The RCRA status at this point, its applicability to open bases, remains pending right now, because RCRA primarily addresses the cleanup and handling of waste materials, and there remains a debate as to at what point unexploded ordnance on active bases becomes a waste.

Congress recognized this issue and asked EPA to clarify the regulatory status of waste as it applies to the RCRA law, and we are in the process of doing that right now. However, what I would like to add here is that for Fort Ord, which is a closing base and where property is going to be transferred to new owners, there is very little debate at this point that this material is a waste, unexploded ordnance. It has been discarded and is a waste; therefore, it is subject to cleanup under RCRA, as well as CERCLA. So we have two authorities that we can use at Fort Ord to require cleanup of UXO.

At this point, what we're doing is integrating both of those laws into one comprehensive cleanup action that will take into account all the requirements of both laws.

The last area that you asked us to address here was the role of future land use and selecting remedies at Fort Ord and other closing bases. The important point I'd like to point out here is that under the laws that we're dealing with, remedies are to be selected considering future land use possibilities. At this point, DOD, as the lead agency for cleaning up this base, is required to consult with the community and determine what their future land use needs will be for this property.

Once we know those needs, we can then craft cleanups that will have standards that will be fully protective of both human health

and the environment for that end use. So we are actively working with DOD and the communities at this point to learn what their desired end uses are and at that point, we will be suggesting clean-up standards that will apply.

In conclusion, I would like to just add that we feel that safety of both the current users of Fort Ord and any future users is of primary concern to EPA and certainly to DOD and our State agencies, as well. We are very interested in ensuring that whatever cleanup actions are taken at this base will be fully protective of both human health and of the very sensitive environmental nature of this base.

[Prepared statement of Ms. Anderson follows:]

STATEMENT OF  
JULIE ANDERSON  
DIRECTOR, FEDERAL FACILITIES CLEANUP OFFICE  
U.S. ENVIRONMENTAL PROTECTION AGENCY  
REGION 9  
BEFORE THE COMMITTEE ON NATURAL RESOURCES  
U.S. HOUSE OF REPRESENTATIVES

MAY 2, 1994

Good morning Chairman Miller and Congressman Farr, my name is Julie Anderson. I'm the Director of the Federal Facilities Cleanup Office for Region 9 of the U.S. Environmental Protection Agency, covering California, Arizona, Nevada, Hawaii, and the Pacific Islands. My office is responsible for overseeing the cleanup of hazardous substances at closing military bases, and at any other federal facility listed on the Superfund National Priorities List of hazardous sites. At this time, my office is involved with the cleanup of approximately 45 Department of Defense (DOD), Department of Energy (DOE), and NASA facilities.

Fort Ord is both a closing base and is included on the Superfund National Priorities List. The Army has formed a cleanup team with U.S. EPA and the State of California, charged with implementing the "Fast Track Cleanup" component of President Clinton's 5-Point Plan for revitalizing communities affected by base closure. One of the most challenging cleanup issues facing this team is to ensure that unexploded ordnance found throughout Fort Ord is managed in a manner that is protective of both human health and the environment, consistent with the proposed future land uses, and in compliance with Federal and State laws.

**EPA'S ROLE AT FORT ORD**

I've been asked today to address EPA's role at Fort Ord. U.S. EPA has a significant role in the cleanup of military bases, particularly at those listed on the National Priorities List. The primary responsibility for funding and performing cleanups at all military installations, however, has been delegated to the Department of Defense by Executive Order 12580.

**Remedy Selection:** The Superfund law (CERCLA), as amended, requires EPA and DOD to jointly select all remedial actions taken to clean up military bases included on the National Priorities List, such as Fort Ord. If DOD and EPA are unable to agree on the selection of cleanup actions, EPA is authorized to choose the action which DOD must implement.

**Enforceable Agreements:** The Superfund law also requires EPA and DOD to enter into enforceable agreements (referred to as Federal Facility Agreements) specifying base cleanup schedules. We entered into this Agreement with Fort Ord, the Army, and the State of California in 1990. The Agreement not only spells out the cleanup schedule for the base, but also establishes an oversight and approval role for EPA and the State in all phases of Fort Ord's investigation and cleanup.

**Concurrence on Uncontaminated Parcel Determinations:** DOD is also obligated to meet requirements under Section 120(h) of the Superfund law related to transfer of property at Fort Ord. As Fort Ord is a closing base, DOD is required to identify uncontaminated property on the base in order to facilitate property reuse. This

identification of property is based on a review of historical records, aerial photographs, and other available information. For bases on the National Priorities List, DOD's identification of uncontaminated parcels is not complete unless EPA concurs with DOD's findings. If concurrence is received, DOD can transfer the property by deed, and these parcels can then be reused without restriction. The requirement to identify uncontaminated property applies to closing bases regardless of whether property is being transferred to another federal agency or to any other party.

On April 19, EPA concurred with the Army that 60 parcels at Fort Ord, comprising over 13,000 acres (or 47% of the base), are uncontaminated. The Army had also requested EPA's concurrence that 30 other parcels containing unexploded ordnance be considered uncontaminated pursuant to Section 120(h)(4) of CERCLA. EPA responded that we did not agree that property containing unexploded ordnance should be considered uncontaminated. Furthermore, we believe that the health and safety risks presented by unexploded ordnance are not compatible with the intent of 120(h)(4) to make available only that property which is unaffected by environmental concerns and is suitable for future use without restriction.

**Concurrence that All Necessary Remedial Actions Have Been Taken on Contaminated Lands Prior to Their Transfer to Non-Federal Owners:** Another significant property transfer requirement under the Superfund law is applicable whenever any federally-owned property impacted by hazardous substances is transferred "to any other person or entity"--that is, a party other than the federal

government. This clause, Section 120(h)(3), requires DOD (in the case of Fort Ord) to provide a covenant in the deed of transfer that: 1) all necessary remedial actions have been taken prior to transferring the land, and 2) if contamination requiring cleanup is discovered after property is transferred, DOD will perform the cleanup. For property requiring cleanup, before DOD can make this covenant, EPA must concur that all necessary cleanup actions are in place and operating properly.

**Consultation Prior to Transfer of Property To Other Federal Agencies:** It is EPA's opinion that the requirement that DOD provide the Section 120(h)(3) covenant (with EPA concurrence) applies whenever DOD wishes to transfer ordnance-impacted land outside federal hands. In contrast, it appears that transfers of such lands between federal agencies (e.g., DOD to BLM) can proceed without the need for prior cleanup or covenants. It is EPA's understanding that if properties are transferred between federal agencies prior to cleanup, DOD retains responsibility to complete all necessary investigations and cleanup actions. EPA retains its authority to jointly select remedial actions for these properties. In addition, EPA and DOD together have drafted procedures to ensure adequate environmental consultation and early disclosure of environmental conditions for properties undergoing transfer. To date, EPA Region 9 has consulted on the transfer of two Air Force properties to other Federal agencies.

As EPA has not concurred with DOD's conclusion that ordnance areas are uncontaminated, it is our expectation that response

actions will be taken by the Army to address threats to public health and the environment resulting from unexploded ordnance. Potential actions range from institutional controls restricting public access to removal of unexploded ordnance. EPA will be working with the Army, with input from the local community, to evaluate which approaches are most appropriate to ensure that public health and the environment are protected under the reuse scenarios considered at areas impacted by unexploded ordnance on Fort Ord.

In summary, EPA's role at Fort Ord includes oversight, remedy selection, establishment of enforceable cleanup schedules, concurrence on clean parcel determinations, concurrence on property transfers outside the Federal government, and consultation on all property transfers between Federal agencies.

#### **REGULATORY STATUS OF UNEXPLODED ORDNANCE**

Threats to human health and the environment posed by unexploded ordnance may be addressed by either CERCLA or the Resource Conservation and Recovery Act (RCRA).

**CERCLA:** CERCLA, or Superfund, provides authority to take response actions to address "hazardous substances" plus other materials known as pollutants or contaminants. Constituents within unexploded ordnance may well be regulated under the Clean Water Act or Clean Air Act and therefore would be hazardous substances under CERCLA.

As discussed above, a CERCLA response action must be protective of human health and the environment. In addition, the

action must comply with Federal laws and more stringent State laws. California law is similar to Federal laws relating to ordnance. The State is developing its own definition of unexploded ordnance which may be more stringent than Federal law.

**RCRA:** At facilities which treat, store or dispose of hazardous waste, certain corrective action (i.e., cleanup) requirements apply for releases of hazardous waste or constituents from any solid waste management unit. Because Fort Ord is regulated as a hazardous waste storage facility, RCRA corrective action requirements will extend to certain discarded materials.

There has been some debate surrounding the question of whether unexploded ordnance is discarded and therefore qualifies as a RCRA waste. Congress recognized the uncertainty surrounding this issue and required EPA, through the Federal Facilities Compliance Act of 1992, to clarify RCRA regulatory applicability of unexploded ordnance. As a result, EPA, in consultation with DOD and the States, is now working to define when unexploded ordnance becomes a RCRA waste.

However, in any case, if training and research and development activities cease on a parcel impacted by unexploded ordnance and the parcel is transferred, the unexploded ordnance would be considered discarded, thus a solid waste subject to RCRA statutory authorities.

In the CERCLA Federal Facility Agreement for Fort Ord, EPA, DOD, and the State of California have agreed to conduct CERCLA response actions in a manner which integrates the corrective action

(cleanup) requirements of RCRA with those of CERCLA. This ensures that activities such as site investigations, cleanup alternatives analyses, community involvement, and remedy selection--elements common to both RCRA and CERCLA cleanup processes-- are addressed in a single, comprehensive effort.

#### **THE ROLE OF FUTURE LAND USE IN REMEDY SELECTION**

Under Superfund, a range of future land use options can be considered in the selection of cleanup remedies. In the development of cleanup alternatives, the lead agency, in this case DOD, is responsible for working with the community and its reuse group to determine likely reuse scenarios for the base. These scenarios, in turn, will help dictate the appropriate level of cleanup required. Fort Ord's basewide investigation is still underway, meaning that, with respect to unexploded ordnance, the Army has further work to do in terms of defining the extent and volume of ordnance, coordinating with the community, and developing cleanup alternatives which are protective of future land uses as prescribed by the local reuse group. The public will have an opportunity to review and comment on the proposed remedy, and EPA will ultimately either concur with it, or select an alternate remedy in the event of non-concurrence.

In conclusion, the safety of current and future users of Fort Ord is of primary concern to EPA and the entire Fort Ord team. EPA is committed to ensuring that decisions regarding the cleanup of unexploded ordnance consider such issues as compliance with Federal and State laws, community reuse plans, technology constraints,

cost, and, most importantly, the protection of human health and the environment. Thank you for the opportunity to address this Committee. I will be happy to answer any questions you may have.

Mr. MILLER. Thank you. Thank you very much to all of you for your testimony. Mr. Nawi, let me ask you, and if you need help from the land managers, feel free to grab Ed or somebody on this. I'm looking at a chart that suggests that there's roughly about 6 million acres of Formerly Used Defense Sites in the inventory of BLM and I don't know whether it's in the ballpark. I don't want to say it's exactly accurate.

But of that, it appears that there's roughly about 1.3 million acres where there is unexploded ordnance, and then there's about 5 million acres that sort of "in play," where we might suspect that there are some and where we simply don't know. But "don't knowing," I guess, at the moment, is not a good column to be in if you're a land manager.

Now, these lands are already in BLM inventory, as I understand it. Is that correct?

Mr. NAWI. Yes, that's correct.

Mr. MILLER. So the Fort Ord situation is not in this number.

Mr. NAWI. That is correct.

Mr. MILLER. How were the decisions made with respect to these lands in terms of the receipt of these lands and the kinds of issues that were raised both by Mr. Walker and Ms. Anderson here in terms of cleanup and conditions of these lands? I assume these lands have been transferred over a long period of time to BLM.

Mr. NAWI. Yes. That's correct, Mr. Chairman. The lands were transferred over a long period of time. In our belief, historically, no matter when the lands were transferred, the military made efforts to clear the lands of surface unexploded ordnance.

The extent to which that clearance might have been carried out would determine future use and also the extent to which there was a suspicion of other unexploded ordnance that might have come to the surface or not been caught. That is the greater the likelihood in the mind of BLM that there might be something there, the greater the likelihood of very restricted access. That's what BLM would do.

Mr. MILLER. So you're saying that in the case of these lands where unexploded ordnance would have been an issue, that, in fact, an effort was made to remove surface ordnance prior to the transfer of these lands.

Mr. NAWI. That is correct.

Mr. MILLER. But beyond that action, in most cases, actions have not been taken.

Mr. NAWI. That's correct. Mostly the subsurface problem is addressed when there are specific actions contemplated on the land that would impact the subsurface.

Mr. MILLER. Ms. Anderson, is that different from what we can expect today?

Ms. ANDERSON. I think at this point what we would indicate here is that we don't have a great deal of information right now on what the subsurface conditions are at these properties. And we need to get as much information as we can before we're going to be able to move into evaluating what kind of cleanup opportunities would be most productive and preventative for these properties.

Mr. MILLER. But you mentioned that it's clear—and I don't know that it's really clear, but it seems to be clear—in your mind, that both RCRA and CERCLA apply to these lands.

Ms. ANDERSON. At Fort Ord.

Mr. MILLER. Were those taken into consideration in these past transfers of land from DOD inventory to—

Ms. ANDERSON. For the Formerly Used Defense Sites? I don't believe that that's the case. At this point, we've had very little involvement with DOD's activities on Formerly Used Defense Sites. I think our concerns here would be that we feel that CERCLA probably would apply to the cleanup of Formerly Used Defense Sites because those materials are clearly discarded at this point, if they've been transferred to new users, Formerly Used Defense Sites.

So the CERCLA applicability would be present. The RCRA applicability would be questionable.

Mr. MILLER. What does that mean to those lands?

Ms. ANDERSON. That means that if there has been a hazard associated with unexploded ordnance on those Formerly Used Defense Sites, they would need to be investigated and a determination would need to be made as to whether or not they pose a risk and they need to have cleanup action taken.

Mr. MILLER. Are they put on a par on the same level with the base closure or transfer like Fort Ord?

Ms. ANDERSON. Base closures obviously have a whole separate degree of profile attached to them right now.

Mr. MILLER. I guess what I'm asking is, Can we leave some of these Formerly Used Defense Sites alone for a while while we concentrate on base closures or do you think that Superfund, RCRA, requires us to be diligent in the inventory?

Ms. ANDERSON. I think Superfund clearly requires diligence in the inventory of those materials. But in terms of what their current uses are, since they were Formerly Used Defense Sites, they've been transferred to new owners, the current uses may not be as critical as the up-in-the-air situation involved with closing bases right now, where we know these properties are going to be transferred to new uses. We have to be particularly diligent with those.

Mr. MILLER. Do the two laws give us the leeway to take that common-sense approach?

Ms. ANDERSON. The CERCLA law, I think, gives us full latitude.

Mr. MILLER. When we're competing for dollars and we're looking at the location of a site like Fort Ord or some of these other sites in populated areas, you've got to pick and choose here.

Ms. ANDERSON. Yes, certainly. We agree with you there.

Mr. MILLER. Can you pick and choose without violating the law?

Ms. ANDERSON. The risks associated with the sites are going to be, I think, what is going to drive which sites get most attention. Certainly, base closures have a degree of visibility associated with them that I think they will have a large proportion of the funds transmitted their direction.

But for the other sites which may have threats associated with them, what we would need to do is look at the risks associated with those threats. And if, at this point, it remains a rather low level concern, then we could potentially put that off to some future date.

But if there is a high degree of concern associated with a formerly used site, then we'd want to make sure that that's raised to the top of the pecking order to receive funds, as well.

The MILLER. Mr. Walker, do you want to comment on that?

Mr. WALKER. I just want to clarify, Mr. Chairman, that we're concerned and we give special interest to both programs, the base closure, because the objective is to get these lands back to use, so they're beneficial for the local communities.

On the other hand, the formerly used sites are lands that we need to address equally because many of those sites are already in private hands. There is no restricted access. It could pose a real safety problem. We certainly work with the Department of the Interior if it has problems on the lands that have been turned over to Interior.

These are formerly used sites, and that's what the program has been structured to deal with. We want to make sure there's equal footing for both programs. We move out and keep up the pressure on both areas.

Mr. MILLER. Yes. Probably those of us who have base closures think they're different.

Mr. WALKER. Yes. But when you're a former site in the middle of a community, then I have a serious problem, too.

Mr. MILLER. There's no doubt about it. I'm asking because I'm assuming that some of these sites are remote. And, as you point out, there is a safety problem. The question is, What is that safety problem? You weigh that against a site like Fort Ord where not only are you concerned about safety, but you're also concerned about the economic reintegration of the facility into the community.

My question really is, Does Superfund and RCRA allow us to make those distinctions?

Ms. ANDERSON. I believe Superfund—

Mr. MILLER. Or does somebody come along and say you're violating the law because you're not giving this remote site the same attention you're giving Fort Ord under the law?

Ms. ANDERSON. No. The Superfund law, I think, does allow latitude with regard to the timing of taking actions on these sites. And while we would certainly feel that all these sites that pose a risk ultimately need to be addressed, for us I think the primary concern is going to be which ones have the greatest degree of risk associated with them right now.

As Mr. Walker indicated, some of these Formerly Used Defense Sites are in private hands. If they have risks associated with them now, I think that they would need to be addressed now and CERCLA would allow that to occur. But if, on the other hand, they've been transferred to an agency and really there isn't a great degree of exposure to those, perhaps those can take a back seat to more pressing issues, such as base closure.

Mr. MILLER. On these lands, Mr. Walker, does your liability just continue to run with the land, the Department of Defense, whether it's in BLM's hands or a state's or somebody else?

Mr. WALKER. It remains with us, Mr. Chairman. You cannot hide from the fact that many of the projectiles out there have our markings. So they're ours. We can't hide.

Mr. MILLER. That's the most candid I've ever heard a witness be in this place. Thank you.

Mr. WALKER. Unfortunately, I wish we could, but sometimes you cannot. We do not hide from that responsibility. We take it very seriously. The thing is we're constantly—since we have a fixed budget, as you well know—setting priorities.

The remoteness is considered in our priority system. We try to deal with the worst threat first, but there are many sites out there. A constant concern over priorities is what we have to worry about. The base closure is our priority. As for the formerly used sites, we must also address them.

Congress has funded both programs to deal with the problems but we still have limited resources.

Mr. MILLER. Let me ask one more question and then I'll turn it over to Congressman Farr. This issue of acceptance and how clean is clean and what is clean. Ms. Anderson raised it in terms of the expected end use, and yet, certainly with respect to BLM, those end uses are being reviewed all of the time.

The lands become candidates for different use on a regular basis. Mr. Nawi, how do you determine to accept land in a state of cleanliness, if you will, whether you go 1 foot or 4 feet or 10 feet deep? How do you make that determination? Do you get a right to come back later to DOD if the use changes and ask for additional clean-up?

Mr. NAWI. We think the question you're asking goes to a very valid consideration here. That is, the end use could change by classification or sometimes simply quantitatively—greater use of the same nature for which the land was originally set aside.

Our practice has been to accept the lands based on surface clearance and to impose appropriate restrictions. To the extent that there are particular activities contemplated which we think require subsurface clearance, we would go back to the military, and they have been forthcoming in carrying out that responsibility through the Corps of Engineers.

Mr. MILLER. Now, in the case of Fort Ord, you're going to have how many acres eventually?

Mr. NAWI. It's 28,000 acres and we've heard that 13,000 have been cleared.

Ms. ANDERSON. Right.

Mr. NAWI. So we have 15,000 acres that are what?

Ms. ANDERSON. That remain contaminated, either with UXO or other hazardous substances. Those would have to be cleaned up or at least some sort of remedial action put in place before they could be transferred to new owners.

Mr. MILLER. But the expected use of most of that land is now habitat, reservation and limited pedestrian use. Is that correct?

Ms. ANDERSON. For those contaminated acres.

Mr. MILLER. That's the current expectation.

Ms. ANDERSON. For 8,000 acres.

Mr. MILLER. For 8,000 acres. Should the community values change or the Endangered Species Act change or the species flourish and the community wants to do something else with that land or surrounding uses change, do you have the right to reenter here with the Department of Defense?

Ms. ANDERSON. Yes. The CERCLA law requires a review every five years to ensure that the remedies selected are still adequately protective.

Mr. MILLER. So that's available to the community, and then the question is funding.

Ms. ANDERSON. Right.

Mr. MILLER. If additional work was to be determined.

Ms. ANDERSON. That's correct.

Mr. MILLER. Thank you, Mr. Farr?

Mr. FARR. Thank you, Mr. Chairman. I just want to note a little historical irony here. I see in the audience my father, Fred Farr. When he was the first attorney in Seaside, one of his cases about 40 years ago was representing two young boys who had walked into Fort Ord property when it wasn't properly noticed or fenced, picked up a box to take home to their mother, and on the way, dropped it and it blew off their legs and arms.

He had to ask permission of the Federal Government to sue them on behalf of the family for negligence on the Army. So here we are today in Seaside talking about these incredible laws of protection that have been developed since those early days when there wasn't much protection. And I appreciate the fact that this has all come home.

The question I have for Mr. Nawi is, Have the unexploded ordnance in Fort Ord, have all of the surface ordnance been removed?

Mr. NAWI. I'm unaware of the status at this time. We would be glad to get that information and provide it to the committee.

Mr. FARR. Maybe our later panel can address that.

Mr. WALKER. That will be addressed by the Fort Ord Commander, Mr. Farr.

Mr. FARR. For you, Mr. Walker, how many bases in California that are closing are contaminated and what, in your opinion, are the worst cases, the worst sites?

Mr. WALKER. There are several closing here and each is being addressed in its own degree of use and merit. Speaking for the ones I know about in the Army that we're closing in California are Sacramento Army Depot, Fort Ord, the Presidio of San Francisco.

Surprisingly, and this is strange to say, these are some of our cleaner installations that have problems. This in no way compares to Rocky Mountain Arsenal or some of the others where we are doing extensive cleanup. But I think the programs, at least here in the State of California, are progressing very well and we've identified the clean parcels.

We also have identified what we need to do in the various clean-up scenarios of the properties that have contamination. Further, we are dealing with the Fort Ord firing range, and its transfer.

Mr. FARR. How does Fort Ord compare to the other properties in the State?

Mr. WALKER. I think work is progressing very well in the turn-over. Finally, uses have been identified and also what cleanup requirements are needed. I think we're doing very well at that and working with the State and the Federal EPA.

Mr. FARR. Is it considered a priority just based on contamination?

Mr. WALKER. This has a very high priority.

Mr. FARR. Is there one that's more contaminated?

Mr. WALKER. I wouldn't say there's one more contaminated. I think that Fort Ord has the standard things that you find on an installation, such as landfills, and probably spill areas. I think that the people from Fort Ord will provide detail on this aspect.

But I've always been impressed with the urgency and the progress that we've been making on the cleanup here at Fort Ord. I don't know that it has ever been a real concern that we haven't given every effort to make sure it's cleaned up on schedule including working with the regulators. We have made a lot of progress here.

Mr. FARR. I wanted to ask Mr. Souby one question, Mr. Chairman, and that will conclude it for this panel. You mentioned the involvement that all the State Governors have in this and the opportunity for technology transfer. Do you know of any States that are committing State dollars into helping this technology transfer, or are you relying totally on Federal cleanup dollars and Federal science dollars to do the work?

Mr. SOUBY. I think the State of California, and maybe Jim can answer the question, has a relatively significant commitment in terms of dollars for technologies. New Mexico has a commitment; Colorado has a commitment. I don't have that list right before me, but generally speaking, yes, the States are committing resources; but not to the same extent as the Federal Government. I don't think they see the unexploded ordnance issue as their own particular issue.

Mr. FARR. I think the question goes beyond the issue of putting money into the regulatory aspects, but into the——

Mr. SOUBY. No. I'm talking about specifically technology.

Mr. FARR. Technology.

Mr. SOUBY. Yes, sir. Specific technology development programs. A lot of these are match programs with a national lab, for example, in New Mexico, or a State-funded university program to obtain innovative new technologies that otherwise wouldn't come up through the screening process.

I would be happy to get you further information about that, but I am aware that those programs are under way. And then as you mentioned, there are other barrier-oriented programs. For example, we have ten States that are working right now on their own to develop a new interstate regulatory regime that would create a regulatory market that would be more accepting for technologies that come through a cleanup trial, for example, at Fort Ord.

Arizona would sign into this protocol, and then a contractor who wanted to take that technology to Yuma, for example, some characterization technology, would not face that same immense regulatory barrier in Arizona. The information garnered to California would be accepted in Arizona.

Mr. FARR. How long would it take to have that in place?

Mr. SOUBY. Well, we have reached agreement with EPA and amongst the ten States on an initial protocol. All ten States have agreed to the list of questions. We need to find some demonstration sites and actually run it through with some real technologies and see what glitches develop in the field.

We're working with the environmental community to make sure that they are satisfied that this process in no way would cause them to feel that we just want all our stakeholders satisfied. We estimate probably in 18 months after we start some demonstrations, and we're about to start some field demonstrations in the next month or two.

Mr. FARR. Is Fort Ord one of those?

Mr. SOUBY. Fort Ord is on the candidate list. We're meeting with Colonel Ellzey tomorrow to discuss what the program would be about. The Commander would have to agree to allow an array of stakeholders to participate in the process. For example, regulators from out-of-state may want to come aboard to look at how that technology, in fact, is being utilized and get a firsthand glimpse.

A lot of this is confidence-building amongst regulators, as well as the public and the environmental community. But if they agree with those terms and conditions, which we don't feel are excessive, we hope Fort Ord does become a partner from our initial 19-site candidate list.

Mr. FARR. I'm very encouraged by the vision. I hope you will move as quickly as possible because I think that's where we develop the ability to have technology transfer to other parts of the United States and other parts of the world.

Mr. MILLER. Mr. Walker, let me just ask you one question. In terms of a committee that has jurisdiction for public lands, during the war with Iraq, we saw a number of munitions that were used that used heavy metals, uranium and so forth, armor-piercing artillery. Are we going to confront the problem of that kind of contamination, radioactive contamination, on the public lands?

Mr. WALKER. We have dealt a great deal with the use of new munitions on our testing ranges. We are also making sure that we manage these correctly and deal with the problems. A lot of these offer superior performance that you don't want to be without. You also have to understand their capabilities and impacts. We have a study going on right now to evaluate the environmental consequences of these new munitions.

Mr. MILLER. Are we confronted with the cleanup of those in the near term? I don't know where they were tested.

Mr. WALKER. The testing, yes, we are. We're managing testing and making sure we have recovery in place at Yuma Proving Ground. They were used at Jefferson Proving Ground, and that's being addressed. Also, we're very carefully managing the testing site at Aberdeen Proving Ground in Maryland.

Mr. MILLER. . Are we confronted with that in California?

Mr. WALKER. The Army has not used them in California, sir.

Mr. MILLER. But are some of the testing protocols being changed recognizing—

Mr. WALKER. Yes, we are. We have studies under way.

Mr. MILLER [continuing]. That these lands are going to move back and forth between the—

Mr. WALKER. We have identified the ranges they will be used on so we can manage the type of control needed. At Jefferson Proving Ground where the Army is moving its activities to Yuma, we made sure that no new lands would be used. They are tested on currently used ranges and then only in designated areas.

We are constantly monitoring impacts, and we have not found anything disturbing. We are continuing to monitor it to make sure that we don't. We're looking at other kinds of munitions that don't have these characteristics. Maybe these would be a substitute material that would be favorable.

What is being developed still has heavy metal problems. That's a concern, as well.

Mr. MILLER. Thank you. Thank you very much to this panel. If you don't mind, we would like to possibly submit additional questions to you in writing as we proceed with this matter. Thank you for your time and for your testimony.

**PANEL CONSISTING OF LESTER K. ROSENKRANCE, ARIZONA STATE DIRECTOR, BUREAU OF LAND MANAGEMENT, DEPARTMENT OF THE INTERIOR; MAJ. RALPH WAY, U.S. MARINE CORPS, TWENTYNINE PALMS, CA; ANDREW E. HOOPER, CHIEF, ADVANCED TECHNOLOGY OFFICE, YUMA PROVING GROUND; AND LORA LEE MARTIN, DIRECTOR, PROGRAM AND POLICY DEVELOPMENT, FORT ORD PROJECT, UNIVERSITY OF CALIFORNIA**

Mr. MILLER. The next panel will be made up of Lester K. Rosenkrance, who is the State Director of Arizona Bureau of Land Management for the Department of Interior; Major Ralph Way from the U.S. Marine Corps, Twentynine Palms; Mr. Andrew E. Hooper, who is the Chief of Advanced Technology Office of the Yuma Proving Ground; and Lora Lee Martin, who is the director of program and policy development for Ford Ord Project of the University of California.

Am I correct that we're going to be using this screen over here during this panel? I think we're going to have to ask one of the cameras to move here.

Welcome to the committee. Again, your written statements will be included in the record in their entirety and the exhibits that you have in support of that. You can proceed in the manner in which you're most comfortable. To the extent to which you can summarize so that we can continue to have an opportunity for questions, it would be appreciated. Mr. Rosenkrance, we'll begin with you.

#### **STATEMENT OF LESTER K. ROSENKRANCE**

Mr. ROSENKRANCE. Thank you, Mr. Chairman. I really appreciate the opportunity to present the Bureau of Land Management's views on public lands it administers that are contaminated with unexploded ordnance. I will summarize the statements that we have here.

Contaminants are a legacy that the BLM has inherited from a lot of maneuvers and different things that were done by the military early in the century. In the 1950s and 1960s, a number of these lands did return to BLM.

BLM inherited many unexploded ordnance problems that existed on those lands at that time. All services of the military currently use about 16 million acres of withdrawn public domain lands nationwide. BLM manages 269 million acres of public lands, most of which is in the West and in Alaska.

As stated earlier, approximately 1.3 million acres are known to contain unexploded ordnance and another 4.7 million acres could possibly contain unexploded ordnance. The military did visually clear the surface of these sites before returning the lands to the BLM. However, the subsurface was generally not cleared of unexploded ordnance.

The BLM focuses its management of these unexploded ordnance-contaminated lands on risk reduction. That is limiting the public's exposure. We recognize there is risk to the public, and we minimize that risk through either closing the tracts completely to all public use, limiting public access to existing roads, trails and so on to keep them out of the areas. And we provide a lot of public information and public education, brochures, pamphlets, training. And BLM people are trained and conduct patrols of some of these areas to make sure people are not using them or using them in a dangerous way. They're also patrolled by our law enforcement desert rangers.

The priority for cleanup is based on exposure of the public to hazard. Therefore, cleanup of the unexploded ordnance in residential and industrial areas and even farming areas is considerably higher priority than cleanup on rangelands, remote areas and wilderness areas that have little public use, with little or no surface disturbances.

We would like to clean up all the unexploded ordnance on public lands, but this is not feasible today, as you've heard earlier. The need for better technologies that can be used to clear large acreage, especially subsurface unexploded ordnance areas, is essential.

BLM is actively working with the Corps of Engineers and other military agencies and the Federal advisory committee on the development of innovative on site technology to develop new technology methods of detection and removal of unexploded ordnance from surface and subsurfaces.

Specifically, the BLM is coordinating our UXO-contaminated-contaminated land inventory with the Corps of Engineers and setting priorities for site characterization and remediation action. We're working through the committee on development of innovative off-site technology. The Corps of Engineers and Department of Defense contractors develop a risk-management model that can be applied to the BLM-managed lands.

We're also working with the private sector to make our site characterization and remediation requirements known. This provides potential contractors with information necessary for research and development efforts and for estimating the commercial potential of their proposals.

That pretty well concludes my statement, and I'll be glad to answer any questions.

[Prepared statement of Mr. Rosenkrance follows.]

MAY 2 1994

STATEMENT OF LESTER K. ROSENKRANCE, ARIZONA STATE DIRECTOR,  
BUREAU OF LAND MANAGEMENT BEFORE THE SUBCOMMITTEE ON OVERSIGHT  
AND INVESTIGATION, COMMITTEE ON NATURAL RESOURCES, UNITED STATES  
HOUSE OF REPRESENTATIVES ON UNEXPLODED ORDNANCE ON THE PUBLIC  
LANDS.

Thank you for the opportunity to present the Bureau of Land Management's (BLM) views on the public lands it administers that are contaminated with unexploded ordnance (UXO).

Contaminants are the legacy of authorized military use of the public lands. In the 1950's and 1960's when the military services returned lands to Department of the Interior jurisdiction, the BLM inherited any UXO problems that existed on the lands. This is no longer the case. Currently the lands must be cleared prior to transfer of jurisdiction to the BLM.

We are in the process of transferring more Department of Defense lands to Interior jurisdiction through the Base Realignment and Closure program which is known as BRAC.

The military currently uses 16 million acres of withdrawn public domain lands nationwide with almost 10 million of these acres potentially contaminated with UXO.

Of the 269-million acres of public lands managed by the BLM, approximately 1.3 million acres are known to contain UXO and another 4.7 million acres could possibly contain UXO. A total of 118 sites may be involved. The military cleared the surface of these sites before returning the lands to the BLM. However, the subsurface was generally not cleared of UXO. Not only do we need

to continue to monitor the management and clean-up of already contaminated areas, but we must continue to carefully consider proposals to expand areas that the military is currently using as impact ranges.

Management of risks associated with UXO is a partnership between the BLM and U.S. Army Corps of Engineers. The military retains liability for the contamination of these lands and the Corps of Engineers is the agency assigned the mission of clean-up of all formerly used Defense sites. The BLM is responsible for the day to day management of these lands in a manner that does not place the public at risk.

The BLM focuses its management of these UXO-contaminated lands on risk reduction, that is, limiting the public's exposure to the risk from UXO. Generally, this means that BLM does not authorize activities in these areas, or if an activity is authorized, a military explosive ordnance disposal team accompanies the authorized user, when appropriate, to ensure safety. Additionally, we monitor the lands for any UXO items which may become exposed. Those which pose a hazard are removed by an explosive ordnance disposal team.

We would like to clean up all UXO on all BLM-managed lands, but this is not currently feasible or possible due to technology and funding limitations. The Corps' list is based on exposure of the

public to hazards; therefore, clean-up of the UXO in residential and industrial areas, and even farming areas, is considerably higher priority than clean-up of rangeland.

To do our job well, the BLM managers need information about what is on the land. We need the military to perform site characterizations on all formerly used Defense sites to detect and locate UXO and other dangerous wastes. Without good site characterization, the BLM managers will overly restrict use of the formerly used defense sites to ensure the public's safety. This may prove a problem for applicants for rights-of-way and other uses of these lands.

There is no available technology for large area surface and subsurface detection and location of UXO. Known UXO areas should be scanned periodically to determine if subsurface UXO has become exposed. But without adequate technology for the detection and location of UXO on airborne platforms, it is not feasible to do these periodic scans. These surface scans must be able to detect and accurately locate UXO so that a ground team can go to the location and remediate whatever gave a return to the sensor on the airborne platform. Identification of UXO or scrap metal would also be a major benefit, but it is not likely in the immediate future.

The subsurface detection and location of UXO has greatly improved over the last few years, but these ground-based systems are limited by terrain, soil conditions, and the vastness of the acreage to be covered. Existing subsurface detection and location systems can usually provide an adequate check for small sites (hundreds of acres) and rights-of-way.

If technology improvements could provide for large area site characterization, lands that are certified as clean could be opened for public use. Those lands which are known to contain UXO could be entered into the Corps of Engineer's priority system.

While the BLM is waiting for clean up of the lands, the UXO risk is managed through limiting the public's exposure to the risk. Management actions include limiting uses and users in the UXO area, official closure of the lands when necessary, education of BLM personnel and the public to the hazard, and contacting explosive ordnance disposal teams to remove any UXO that are found.

The BLM is actively working with the Corps of Engineers, other military agencies, and the Federal Advisory Committee on the Development of Innovative On-site Technology (DOIT Committee) to improve our interim management of UXO and eventually obtain the remediation of these sites. Specifically, the BLM is:

- Coordinating our UXO-contaminated land inventory with the Corps of Engineers and setting priorities for site characterization and remediation action.
  
- Working through the DOIT Committee, the Corps of Engineers and Department of Defense contractors to develop a risk assessment model that can be applied to the BLM-managed lands.
  
- Working with the private sector, through the DOIT Committee, to make our site characterization and remediation requirements known. This provides potential contractors with information necessary for research and development efforts and for estimating the commercial potential of their proposals.

This concludes my statement. I will be pleased to answer your questions.

Mr. MILLER. Thank you. Major Way?

#### STATEMENT OF MAJ. RALPH WAY

Major WAY. Good morning, Mr. Chairman, Mr. Farr. I have a slide presentation to describe the cleanup of unexploded ordnance at Twentynine Palms, California. It includes the technical difficulties encountered due to terrain and vegetation.

[Whereupon, a slide presentation was made.]

Major WAY. This is a map of the Marine Corps Air Ground Combat Center at Twentynine Palms. The base is 932 square miles. Of this, 900 square miles are used for live-fire training and maneuver warfare training.

This is a photograph of the Rainbow Canyon Training Area, which houses Range 601. It's a high-explosive submunition range. On this range, some of the most sensitive fused ordnance items in the world are delivered by aircraft and artillery.

This is a photograph of the terrain on Range 601. It's a view from the top of the plateau and the target hill, looking toward the southeastern portion of the range. This photograph depicts the amount of unexploded ordnance and ordnance residue that remains on the range.

This is a photograph of the explosive ordnance disposal technicians preparing to conduct a range clearance operation. In the conduct of the range clearance operation, explosive ordnance disposal technicians will form a line, usually double arm's length, and move between the established boundaries of the range.

The flags carried by the explosive ordnance disposal technicians are used to mark unexploded ordnance as it is located. This enables the technicians to relocate the items when the sweep is completed.

Mr. FARR. That's only for surface.

Major WAY. Yes, sir. This is a photograph of an M-42 anti-material submunition. It's concealed by a tumbleweed. M-42 submunitions are delivered by 155-millimeter and eight-inch artillery projectiles. Each 155-millimeter projectile contains 88 of the submunitions, while the 8-inch contains 180. It demonstrates the difficulty presented by vegetation when conducting range clearance operations.

This is a photograph of the retrieval of the M-42. Whenever an ordnance item is located, it must be investigated and prepared for disposal. This is a photograph of the artillery-delivered area of the mine, ADAM. This mine is delivered by 155-millimeter projectiles; each projectile contains 36. This type of munitions dispenses seven hair-thin trip wires up to 28 feet in length. And this is a photograph of the trip wire coming out.

Mr. FARR. So they shoot them, and then they land, and then the wires come out.

Major WAY. Yes, sir. This is a photograph of the anti-armor mine system, RAM, and an M-42 submunition laying side by side. The RAMs are also delivered by 155-millimeter projectiles. Each projectile contains two mines, and two of these mines incorporate an anti-disturbance feature. And they're not marked, so you don't know which one it is.

Mr. MILLER. This is a volunteer operation or what?

Major WAY. Yes, sir. This is a photograph of an explosive ordnance disposal technician investigating an unexploded ordnance item. The terminations must be made on all unexploded ordnance to the term and condition that the item is in, whether it's armed or unarmed.

This is a photograph of a Mark 118 Rockeye anti-armor aerial-delivered submunition. The Rockeye is delivered by aircraft cluster bombs. Each cluster bomb contains 247 submunitions. Ordnance items can be located in any position. In this example, a Rockeye must be dug up to determine the condition and present configuration.

This is a photograph of a sweep line in rough terrain on a hillside. The rocky and hilly terrain increased the difficulty of maintaining consistent coverage by the sweep line. Regardless of the terrain, all items must be investigated.

This is a photograph of a bomb live unit, Blue 97. It's an aerial-delivered anti-armor submunition. It's partially concealed by loose rock. The Blue 97s are delivered by aircraft cluster bombs. Each cluster bomb contains 202 submunitions. This photograph also demonstrates the difficulty of working in and around loose rock and vegetation. Materials such as loose rock and vegetation must be removed in order to work on the munitions and determine what condition it's in.

This is just a photograph depicting the collection of ordnance items to be prepared for disposal. Once a designated area has been swept, explosive ordnance disposal technicians will consolidate the items collected with the items previously marked and destroy them by detonation.

This is just a shot of a detonation.

That concludes my presentation on our operation at Twentynine Palms.

Mr. FARR. How long does it take to move through one of those sectors? That original map you had, how much area was that?

Major WAY. The original map was—of just the range? That one range is 9 square kilometers and the target area in the middle is 1 kilometer. During the last clearance operation we conducted, about 14 days, we did eight-tenths of that one area and took out over 7,000 submunitions. The difficulty stems from the risk involved because the RAM sets up a magnetic field that you have to worry about and work around.

Mr. MILLER. Don't mind if I'm sitting here in disbelief, but hold on. So how long would it take you to—I still don't quite understand. In some of the size of the operations we're talking about here, it would take you how long? Give me a size, and tell me how long it would take you to clear 50 acres.

Major WAY. It would depend on the type of munitions involved, the type of terrain involved. There are a lot of site-specific factors that would have to be considered in order to develop a plan.

Mr. MILLER. You're dealing here with munitions that the trigger is motion or disturbance or trip wire.

Major WAY. Yes, sir.

Mr. MILLER. And often you're dealing with all of those, or do you know what kind of ordnance has been out there since you've last cleared it?

Major WAY. No. We keep track of what has been fired into the range, but we deal with all these simultaneously.

Mr. MILLER. Thank you.

Mr. FARR. Have you had any injuries?

Major WAY. No, sir, not on this particular operation.

Mr. FARR. Mr. Chairman, what's really kind of shocking about this is you think about all the countries around the world that have been buying these munitions and putting them out without knowing where they are, not keeping records, and people are walking through these fields all over the world.

Mr. MILLER. So you've done this without sustaining any injuries.

Major WAY. We did sustain one injury, sir, in 1990. We had a fatality. But since that time, we've disposed of in excess of 66,000 submunitions without any injuries.

Mr. MILLER. I want to get on with the rest of the panel here, but it's kind of hard to get over your slide show here. The testing is for the deployment, how the munitions deploy on impact, the pattern set up as per the specifications? Because obviously they're not being exploded by enemy personnel or the purposes for which they are deployed. They're lobbed in, they disperse in an anti-personnel fashion that the military wants them designed for.

But they're still live laying out there, right?

Major WAY. Yes, sir. They're deployed for training.

Mr. MILLER. The only guy that's getting the training is you.

Major WAY. Well, also, the artillery crews and the aircraft that deliver them, sir.

Mr. MILLER. Let me ask you this. On the submunitions, why do they have to be live, because what you're looking at is the deployment in terms of trip wires and those sort of things, whether or not they extend and deploy properly. Why does it have to be live? Are they all live in testing?

Major WAY. No, sir. Some of the submunitions are dummies, designed just for that, and then some of them are live, sir.

Mr. MILLER. Okay. Move on here, George. That's the end of your testimony, is that right, Major?

Major WAY. Yes, sir.

Mr. MILLER. Mr. Hooper.

#### STATEMENT OF ANDREW E. HOOPER

Mr. HOOPER. Mr. Chairman, thank you for inviting me to testify before the committee. The issue being addressed today, unexploded ordnance, is very important to Yuma Proving Ground and to the Test and Evaluation Command. Before I address the question of UXO, unexploded ordnance, at Yuma Proving Ground, I would like to make some general remarks about the technology problems associated with finding UXO.

It is hard to overstate the difficulty of the problem of unexploded ordnance remediation. The task is dangerous, as Major Way has pointed out, technically difficult, expensive, and multidimensional. The development of the systems that will allow us to quickly and easily detect and locate UXO will take decades of engineering development.

This type of development will be expensive, but the reward in land returned to the public, lives saved, and the technology spin-

offs that will occur will more than make up the costs. While sensor technologies, in fact, exist to detect UXO, much engineering development remains to be done before the effectiveness of the sensors will give us the probability of detection that will allow us to clear land with the required confidence, although we will try to ensure that the appropriate level of remediation is accomplished to ensure an area is safe for the expected use.

Sensor technologies to identify UXO are required. The area of target identification remains one of the most difficult unsolved problems that we have. Until we solve the target ID problem, it will be hard to determine the scope of the UXO problem.

We will simply not have the money to dig up every contact unless we have *a priori* knowledge that that contact is, in fact, UXO. If somebody were to come along and say I dropped 5 Mark-82 bombs on these 10 acres of land and you go out there with the current technology and you find 5 contacts, you have a pretty good idea that, in fact, those were the bombs. But if you didn't know that ahead of time, you would have no idea what you were looking at.

Typically, in a test-range environment or at a battle site, many metallic objects will have been driven into the ground, making detection and identification of UXO a formidable task. Finally, we have limited experience in the area of integrating technologies for detection and identification. We do know, however, that no one sensor system will solve the problem.

Multiple sensors providing multi-spectral data will have to be combined in order to increase the probability of detection and identification. This problem, while difficult, can be solved over time by enlisting the services of the military laboratories, private industry and the universities. Now, why those three?

The service labs have the technical knowledge of the munitions we've developed in the past. They have the technical knowledge of the present munitions and they know what we're going to be doing in the future. Industry has a large financial incentive due to the magnitude of the problem worldwide, not just in the United States. The universities have highly competent, yet low-cost research labor. They have that labor available to us to deal with the long-term research problems, and there are many long-term research problems.

Yuma Proving Ground does not have the classical UXO problem in terms of people just inadvertently stumbling across munitions and getting injured, although if they got onto Yuma Proving Ground, that would happen. The general public does not have access to YPG. However, we do generate UXO as an unavoidable consequence, a part of our mission, which is to test all present and future conventional munitions in the U.S. Army inventory.

Pertinent to this requirement to test munitions is a requirement to locate, identify and dispose of unexploded ordnance that is generated. We do this to meet range safety, environment and test support requirements. YPG is a test range with over 889,000 acres of land. The Army has conducted munitions, as well as other testing at YPG for over 50 years.

It is estimated by the YPG Environmental Office that over 250,000 acres are seriously contaminated with UXO, and that's as

a minimum. We have areas that are fenced due to the nature of the ordnance contamination, much like the contamination that Major Way showed you, the RAM, the Adam, the M-42 submunitions, the M-73 submunitions from the rockets, the hydro-70 rockets, those types of munitions we have in large quantity.

We are developing systems to clean up UXO because it is necessary to ensure the safety of our people, to clean the areas for reuse after test. In some cases, if you fire a munitions that has 9 submunitions and you count 11 or 12 munitions going off, you know that you have sympathetic detonations and you can't use the area anymore and you have to clean it up. And to meet what we anticipate will be required by future environmental regulations.

We also see these systems as having both military and civilian applications, since ordnance contamination is by no means confined to the military test ranges. Since some of this contamination is too dangerous to approach on land and the systems we are studying are airborne and have sophisticated sensor requirements, the objective here is to essentially map the location and type of ordnance on the surface.

In this way, we can quantify the surface problem and get a reasonable cost estimate to clean up the contamination. Otherwise, cost estimates are merely guesses.

The issue of finding and locating ordnance both on or below the surface is a sensor technology issue, not an EOD issue, explosive ordnance disposal issue. As you have seen from the testimony of Major Way, we know how to deal with UXO once it's found; that is, he knows how to deal with UXO once it's found. The issue is, Where is the UXO? In cases where it's very sensitive, where the munitions are very difficult to deal with, we would like to keep people away from them as much as possible.

YPG, in the Test and Evaluation Command, in cooperation with the Office of the Secretary of Defense and the Department of the Army, has assembled a technical team to investigate the sensor problems associated with the mapping of UXO. This team includes the Army Research Laboratory, the MIT Lincoln Laboratory people, the Jet Propulsion Laboratory and Sandia National Laboratory.

To evaluate progress, YPG, using funding from OSD, from the seat of Central Test and Evaluation Investment Program, specifically in that program, TTDND, which is the Test Technology Development and Demonstration Fund, we are using funds to establish and have established a 2- by 4-kilometer surface ordnance target range containing representative samples of shrapnel and many different types of inert ordnance. The various laboratories have already flown against this target array using synthetic aperture radar systems. We have had significant success in finding the ordnance, although the data is not presentable here.

That concludes my testimony, if you have any questions.

[Prepared statement of Mr. Hooper and attachments follow.]

#### UNEXPLODED ORDNANCE (UXO) AT YUMA PROVING GROUND (YPG)

Mr. Chairman, thank you for inviting me to testify before the committee. My name is Andy Hooper and I am the Chief of the Advanced Technology Office at Yuma Proving Ground. The issue that is being addressed today, unexploded ordnance, is very important to Yuma Proving Ground and TECOM. Before I address

the question of UXO at YPG, I would like to make some general remarks about the technology problems associated with finding UXO.

It is hard to overstate the difficulty of the problem of UXO remediation. The task is dangerous, technically difficult, expensive, and multidimensional. The development of the systems that will allow us to quickly and easily detect and locate UXO, will take decades of engineering development. This type of development will be expensive but the reward in land returned to the public, lives saved, and the technology spinoffs will more than make up the cost.

While sensor technologies exist to detect UXO, much engineering development remains to be done before the effectiveness of the sensors will give us the probability of detection that will allow us to clear land with the required confidence. Although, we will try to ensure that an appropriate level of remediation is accomplished to ensure the area is safe for the expected reuse.

Sensor technologies to identify UXO are required. The area of target identification remains one of the most difficult unsolved problems we have. Until we solve the target ID problem, it will be hard to determine the scope of our UXO problem. We will simply not have the money to dig up every contact unless we have a prior knowledge that the contact is, in fact, UXO. Typically, in a test range environment or at a battle site, many metallic objects will have been driven into the ground making detection and identification of UXO a formidable task.

Finally, we have limited experience in the area of integrating technologies for detection and identification. We do know, however, that no one sensor system will solve the problem. Multiple sensors, providing multi-spectral data will have to be combined in order to increase the probability of detection and identification.

This problem, while difficult, can be solved over time by enlisting the services of the military laboratories, private industry and the universities. The service labs have the technical knowledge of munitions past, present, and future; industry has a large financial incentive due to the magnitude of the problem; and the universities have highly competent yet low-cost research labor to deal with long-term research problems.

Yuma Proving Ground does not have the classical UXO problem in terms of people inadvertently stumbling across munitions and getting injured. The general public does not have access to YPG. However, we do generate UXO as an unavoidable consequence of part of our mission which is to test all present and future conventional munitions in the U.S. Army inventory.

Pursuant to this requirement to test munitions is a requirement to locate, identify, and dispose of the unexploded ordnance that is generated. We do this to meet range safety, environmental, and test support requirements.

YPG is a test range with over 889,000 acres. The army has conducted munitions as well as other testing at YPG for over fifty years. It is estimated by the YPG environmental office that over 250,000 acres are seriously contaminated with UXO. We have areas that are fenced due to the nature of the ordnance contamination. We are developing systems to clean up UXO because it is necessary to ensure the safety of our people, to clean areas for reuse after tests, and to meet what we anticipate will be required by future environmental regulations. We also see these systems as having both military and civilian applications since ordnance contamination is, by no means, confined to military test ranges.

Since some of this contamination is too dangerous to approach on land, the systems we are studying are airborne and have sophisticated sensor requirements. The objective here is to, essentially, map the location and type of ordnance on the surface. In this way we can quantify the surface problem and get a reasonable cost estimate to clean the contamination. Otherwise, cost estimates are merely educated guesses.

The issue of finding and locating ordnance both on or below the surface is a sensor technology issue not an explosive ordnance (EOD) issue. As you have seen from the testimony of Major Way, we know how to deal with UXO once it is found. The issue is, Where is the UXO?

YPG, the Test and Evaluation Command (TECOM), in cooperation with the Office of the Secretary of Defense and the Department of the Army has assembled a technical team to investigate the sensor problems associated with funding and mapping UXO. This team includes the Army Research Laboratory, MIT Lincoln Laboratory, Jet Propulsion Laboratory and Sandia National Laboratory.

To evaluate team progress YPG has, using funding from OSD, established a 2 x 4 Km surface ordnance target range containing representative samples of shrapnel and many different types of inert ordnance. The various laboratories have flown synthetic aperture radar systems against these targets with significant success.

# Surface Ordnance Detection/Location Requirements

Andrew E. Hooper

USAYPG

John Schnell

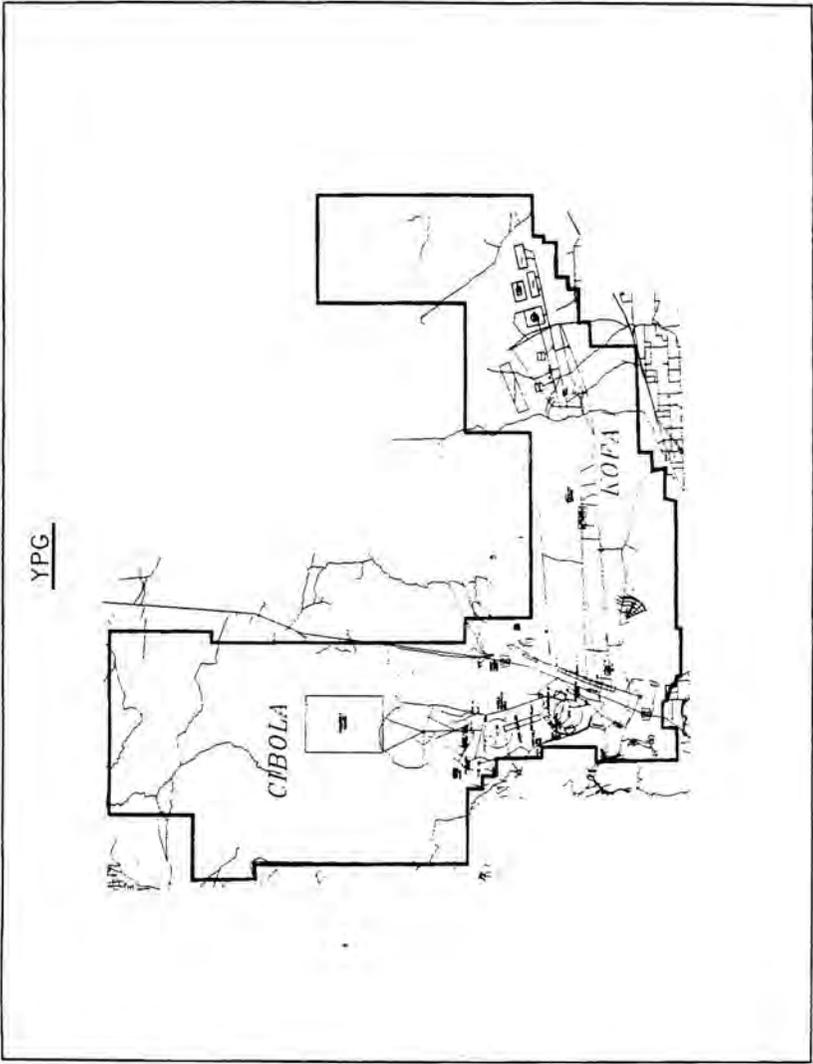
TECOM



# Requirement

- **Capability to locate, identify, and dispose of unexploded ordnance to meet range safety, environmental, and test support requirements**





# REASONS WHY

- RANGE SAFETY
- FUTURE ENVIRONMENTAL REGULATION
- WORLDWIDE PROBLEM MAKES THIS A DUAL USE TECHNOLOGY



# System Requirements

- Airborne
- Multi-sensor
- Detection of objects in clutter
- Eventual identification
- Mapping/Data overlay



# Problem Definition

- Technology Issue Vice EOD Issue
- Technology for Range Instrumentation
  - Sensors
  - Sensor fusion
  - Signal/Image Processing
  - Location/ID
- EOD
  - Render Safe
  - Demil
  - Disposal



# Technology Team

- ARL
- TECOM
- JPL

- SNL
- MIT/LL
- BRDEC
- YPG



# Surface Ordnance DEMO Site

- 2X4 KM
- Surface Ordnance
  - M42
  - M75
  - 105mm, 155mm, 500lb, etc.



# **First Tests**

(18,19,20 Feb 94)

- Sandia - 34.8GH SAR
- MIT/LINCOLN LABS -33.5 SAR
- Data Available



## **JPL Sensor Technology Assessment for Location of UXO**

- **Sensor technologies exist to detect UXO**
- **Sensor technologies are very limited for identification of UXO**
- **Limited experience in integrating technologies for detection and identification**
- **Multiple sensors are required to detect and ID objects**



# Applied Research Areas\*

- Detection of objects in the earth
- Signal processing at sensor data
- Target Identification
- Data fusion

\*Does not involve development of new theories--  
-Engineering problem



## **Summary**

**Research cooperation is needed between  
Private Industry, Military (Service )  
Laboratories and Universities**



The MILLER. Thank you. Ms. Martin?

**STATEMENT OF LORA LEE MARTIN**

Ms. MARTIN. Thank you, Mr. Chairman and Mr. Farr. I'm with the University of California and I'm employed by the Santa Cruz campus. We are one of the local universities that was mentioned in Mr. Souby's presentation that's interested in participating in this process.

What I'm going to give you is an overview of how a public entity is attempting to participate both in the reuse and the unexploded ordnance questions. My testimony will include why we're interested in Fort Ord to begin with, what the University of California proposes to do at Fort Ord, what barriers to this approach we have run into, and what our recommendations might be.

The University of California is interested in Fort Ord because it sits on the edge of what is becoming a global center for marine and environmental sciences. Surrounding this bay are over 18 institutions focused on environmental science, technologies research and international language capability.

So the closure of Fort Ord to us is an opportunity to bring those together, to use real estate at Fort Ord and create a center that brings industry, agencies, Federal agencies, State agencies and other universities and national labs together.

The exploration of environmental remediation and unexploded ordnance is one of the areas of expertise that we'll be developing at that site. We are proposing to create a center that will sit on 500 acres and in that center there will be an entity that Mr. Farr referenced, a Center for Environmental Remediation and Policy, a cooperative institute.

It will try to integrate public policy and public education with technologies and research. Specific to the unexploded ordnance issue, I'm going to pass on the technical information. That's in the written testimony. We have a proposal that Los Alamos has put forward, a phased approach, that they would work with us in a consortium that includes Lawrence Livermore National Lab, Los Alamos National Lab, Lawrence Berkeley National Lab, other University of California entities and campuses, such as UCLA, and then Federal agencies such as NOAA and USGS, and hopefully BLM.

What I want to talk to you about are the issues of developing and understanding the problem better, and I think we've heard up here that we don't quite know what the problem is, but we're going out and addressing it in some ways. It's dependent on the terrain, it's dependent on the type of ordnance, dependent on if we know what we've thrown out there and when we threw it out there, and the expertise of the people trying to approach it.

With Mr. Farr's leadership, there was \$4 million put into the 1994 National Defense Authorization Act for this sort of approach, a cooperative approach looking at the problems at Fort Ord as a case study, with the University of California, the national labs and other partners.

There are several parts of that proposal that include Superfund landfill sites, but, also, unexploded ordnance is included. What we have found in the exploration of developing this cooperative insti-

tute is that we have indicated interest from the Department of Defense and the Department of the Army. We have the university and its partners prepared and at the ready to begin working both on understanding the problem and proposing technologies and approaches, and we have funding now available.

But we are not able to proceed, and this is something that is quite distressing as we look at a country that's talking about public and private partnerships and a way to move the country forward to solve new problems and environmental issues.

It seems to be to us legislative and infrastructure barriers in the Federal Government. As we have moved forward in this process, we have found that the multi-perspectives brought to bear on these questions will be critical to better understand them and better recommend solutions.

Also, the integration of public policy and public education. We do need to bring our universities and our other agencies and our private sector to bear on these. I think we heard earlier in the testimony the issue that the private sector has the technologies. The other agencies are doing similar work, but the information is not flowing.

We are proposing a cooperative approach to this, using Fort Ord as a case study.

We're also looking at how we can develop environmental industries as a nation to compete on the global market and taking this crisis of unexploded ordnance at Fort Ord and turning it into an opportunity to let this global center be competitive on the world market.

So we're proposing, specific to Fort Ord, to use this to create jobs, products and services as a way to bring a cooperative effort to bear on the problem of unexploded ordnance and other issues, but also then to bring better solutions, hopefully solutions that can be used not only at Fort Ord, but across the country and across the world.

Also, in California, we're looking to integrate northern California cleanup. So Fort Ord has one set of problems. Our terrain brings many different kinds of questions than you might find at Mare Island, for instance, or Alameda or McClellan. And working together with the private and the public partnership to look at the problems across the State or the northern part of the State.

One thing I want to tell you that brought this to bear on us probably the strongest was when we had a meeting last year that included the Department of Defense, the Department of the Army, CAL-EPA, I think EPA was also represented, universities, industry and national labs. And in the meeting, we discussed for one day how we might approach cooperative efforts.

Finally, someone in the room said I'm going to take off my DOD hat and tell you that what you're talking about is critically needed, but we cannot do what you're talking about because of the regulations that exist that don't allow us to sit in the room and discuss this in a way that anybody might come back in the room later and want to compete for the solutions we've come up with.

That to us was very striking as we looked for better ways to solve the problems, both on lands that are being transferred into the Federal ownership, but also into the private ownership.

So the recommendations that we might have for you would be, as we approach these problems, to better balance the public policy and public education with the technologies and the techniques for approaching these problems. We propose to do that with cooperative multi-perspective efforts, such as the one the University of California is proposing.

The second recommendation would be to encourage and foster the collaborative, innovative approaches, providing flexible mechanisms to develop public and private partnerships; and finding ways that the Department of Defense can enter into these partnerships that they have an interest in. But we have procurement laws and other barriers that prevent us from doing this in a rapid format.

And, finally, look at remediation issues on Federal lands as a way to catalyze and foster the environmental industry and help this country become more competitive on the international market.

Thank you.

[Prepared statement of Ms. Martin follows:]

Written Testimony

of

Lora Lee Martin  
Director,  
Program and Policy Development  
University of California  
Fort Ord Project

before the  
House Natural Resources Committee

Hearing

"Managing Unexploded Ordnance on Federal Lands"

May 2, 1994  
9:30 a.m.

Seaside City Hall  
Seaside, California

Prepared in Consultation with:

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## TESTIMONY OF

Lora Lee Martin  
University of California  
Fort Ord Project

"Managing Unexploded Ordnance on Federal Lands"

May 2, 1994

Mr. Chairman, Committee members, Ladies and Gentlemen:

As you consider the oversight issues of unexploded ordnance on public lands I want to thank you for this opportunity to share the perspective of a public entity, the University of California, as we attempt to participate in a public private remediation strategy at Fort Ord. In this testimony I will give a brief overview of the perspective and resources that the University of California proposes to bring to the remediation efforts at Fort Ord and, through our efforts here, to the overwhelming cleanup issues of the Department of Defense nationwide.

I am Lora Lee Martin, Director of Program and Policy Development for the University of California's Fort Ord Project, and Director of Science Development for the University of California's Santa Cruz Campus. Since mid-1991, the University of California, through the leadership of its Santa Cruz campus, has joined the regional communities of the Monterey Bay in exploring reuse options for the Fort Ord Military Reservation which sits 35 miles south of our campus. After much effort, the local communities, as currently represented by the Fort Ord Reuse Group (FORG), in partnership with agencies such as the University of California and the California State University system, have proposed an exciting and important reuse strategy for the base: the development of an education, research, and technology complex. Central to this reuse strategy is the ability to build upon regional expertise in marine and environmental research thereby furthering, what many believe, is the emergence of the Monterey Bay region as a global center for marine and environmental technologies.

A key component of the University of California's proposed reuse strategy is the development of new techniques and technologies related to environmental remediation, including what we believe are critical components, the development of public private partnerships and the integration of related policy and public education issues. The University of California and our programmatic partners have proposed to the Department of Defense a collaborative arrangement whereby issues of base wide remediation would be addressed. In addition, through the leadership of Representative Farr and Chairman Dellums, funding of \$4 million was provided in the 1994 National Defense Authorization Act for purposes of this collaborative remediation

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effort, with a significant portion of the programmatic emphasis placed on the unexploded ordnance issues. Even though these funds have been identified; even though there is indicated interest by the Department of Defense in our proposal; and even though the University and its partners stand at the ready; the ability for this cooperative effort to proceed has been hampered by inherent obstacles to public private partnerships within the federal government. These barriers, developed with good intent but coexisting in a matrix of conflicting purpose, are perhaps one of the most significant challenges this country faces as we seek to address military related clean up issues through the development of innovative techniques and technologies.

My testimony provides:

- \*An introduction to a University of California proposed cooperative agreement with the Department of Defense for environmental remediation related activities on military bases.
- \*An overview of the ordnance related activities proposed by the University led effort.
- \*A discussion of the hurdles encountered by the University in bringing innovative, public private resources to the remediation effort, and
- \*Closing remarks and recommendations.

#### PROPOSED BY THE UNIVERSITY OF CALIFORNIA:

##### A COOPERATIVE AGREEMENT FOR THE DEVELOPMENT AND DEMONSTRATION OF ENVIRONMENTAL REMEDIATION TECHNIQUES, TECHNOLOGIES AND RELATED POLICY

Recognizing the overwhelming cleanup challenges related to national and international military base closures, the University of California has proposed to establish a cooperative agreement with the Department of Defense for the development and demonstration of environmental remediation techniques and technologies, and the related public education and policy issues. Prominent in this proposal are the challenges of unexploded ordnance.

This effort would combine science, technology, education and policy to develop scientifically sound approaches to environmental clean-up efforts. Specifically, the University of California desires to work in collaboration with the Department of Defense to use federal facilities, including Fort Ord, to address the many technical and policy problems of environmental remediation with the goals of increased effectiveness, decreased cost, and more timely impacts. This cooperative arrangement is a logical research and development interface for work related to the Western Governors' Association (WGA) DOIT Project (Demonstrating On-site Innovative Technologies) in which Fort Ord is one of 20 national demonstration project sites.

Related scientific and technical discussions have been hosted by the University of California since 1992, bringing together several campuses of the University of

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California (UC Santa Cruz, UC Berkeley, UC Los Angeles), national laboratories (Lawrence Berkeley Laboratory, Lawrence Livermore National Laboratory, Los Alamos National Laboratory), federal and state agencies (e.g., NOAA, USGS, federal and state EPA), and private business. One proposed objective of this effort would be to transfer perspectives and technologies between the public private sectors to facilitate new approaches to the Department of Defense's environmental remediation efforts that are sustainable, scientifically sound, and socially responsible. The proposed activities would include monitoring, assessment, clean-up, training, and related policy issues. This cooperative arrangement would draw talent from the public and private sectors, including the environmentally-related engineering programs within the University of California, and would have an initial focus on clean-up challenges related to the closure of Fort Ord as a case study. In northern California, there is great potential to link the complementary efforts at Fort Ord, the Alameda Naval Air Station, and McClellan Air Force Base, bringing the experiences of three branches of the military services, the challenges of coastal, bay, and inland sites, with their wide variation in soils and pollutants; and urban to rural policy considerations. The activities proposed for Fort Ord would also serve as a basis for attracting environmental technology firms to the Fort Ord area as part of the base reuse effort.

Thus far four specific Fort Ord potential projects have been identified, each integrating science, technology, education and policy components. The first three of these relate to ordnance issues at Fort Ord, the fourth looks at the issues of groundwater contamination in coastal environments and, though critical at Fort Ord, (the base landfill, a Superfund site, is leaking low levels of volatile organic compounds into the ground water supply of an adjacent community) will not be addressed in this testimony.

- Heavy metal contamination at firing ranges;

The firing ranges at Fort Ord, as at many bases, are characterized by high levels of lead in the soil, and covered by endangered flora and fauna that make lead removal complex. Recent federal reports show that lead is toxic at even lower concentration levels than previously realized, increasing liability exposure. Fortunately, lead can be fingerprinted isotopically and traced through the environment, including the food chain, to evaluate both the source and extent of risk in any specific natural environment. Lead also can be removed from soils through bioremediation. Fort Ord's location on the shore of the nation's largest marine sanctuary make it especially important to be certain of the environmental fate of its lead, and well-suited as a demonstration site for the characterization and removal of lead in a coastal zone.

- Unexploded ordnance;

Unexploded ordnance is the most ubiquitous and intractable environmental problem at Fort Ord, and is one of the reasons for selection of the base as a WGA/DOE Demonstration Site. Research and field testing of new applications of geophysical tools, including ground penetrating radar and electromagnetic techniques, to locate the ordnance over large expanses of land, and new technologies to neutralize or remove them, are

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especially well-suited and needed at Fort Ord, both on-shore, and perhaps, off-shore.

•Public policy:

Policy aspects related to base closure, and related offshore environmental problems in the Sanctuary, will also be addressed by collaborative research at Fort Ord. Included will be public reaction to the issues above, to assurances by military and regulatory agencies that remedial action is necessary and sufficient, and to post-closure governance issues related to environmental risk assessment and management. These issues take on added significance at Fort Ord by recognizing the region's relatively pristine environment and related history of environmental consciousness and because of the increased regional awareness of complementary demands of tourism, economic redevelopment, agriculture, and environmental activism in the region.

Of specific public policy significance at Fort Ord are the complex issues of habitat management; the potential impacts of remediation processes on endangered species; the complementary roles that the University of California's Natural Reserve System and the Bureau of Land Management (BLM) will be agreeing to take on through their participation in the Installation Wide Multi-Species Habitat Management Plan for Fort Ord, and the opportunities for collaborative efforts between these two institutions in the overall habitat management effort, particularly as aggressive remediation activities take place on BLM lands.

A FOCUS ON UNEXPLODED ORDNANCE:

The detection and handling of unexploded ordnance receives a special focus in the University of California's proposed activities at Fort Ord. We recognize that the transfer of ordnance contaminated lands to non Department of Defense entities poses real issues of science and technology. However the issues of public policy and public education must also weigh-in heavily as the country struggles with comprehending the immensity of the problem, the intricacies of the possible solutions, and the void of, or inability to, test needed technologies. These issues are often articulated through questions such as:

- "How clean is clean?";
- "What level of risk is acceptable? and at what cost?";
- "How should cleanup policies be impacted by land use decisions, or vice versa?";
- and one question particularly relevant to Fort Ord,
- "How does one weigh the issues of clean up requirements and needs to that of the preservation of natural land forms and endangered species?";

In our proposal to the Department of Defense, the University proposes to partner with the Department, with the newly established DOIT program of the Western Governors' Association, and with others to address questions such as these while simultaneously bringing technical expertise to the problem through our partnerships with other university campuses, national laboratories, federal and state agencies and private industry. Specifically with regard to the unexploded ordnance cleanup issues at Fort Ord, we submit the following suggested approach proposed by:

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Los Alamos National Laboratory; to be done through the University of California led consortium and in coordination with the Department of Defense and the DOIT effort:

**Detection:**

Efforts to locate munitions in waste disposal areas or other soil type disposals are highly dependent on geophysical techniques. Usually more than one technique is necessary to confirm that an indication of underground anomalies are correct. The techniques used are ground penetrating radar, magnetometers, soil resistivity, and acoustical methods. Each system detects a different type of signal, but between two systems one is able to find objects of differing density or of metal construction. This information is used to determine the location of fences for interim control of the area that might contain the hazardous material. Soil analysis such as that performed by Los Alamos for the Corps of Engineers at the Hawthorne Army Ammunition Plant will be incorporated; at that site, moisture, pH, metal content, and the presence of eight explosives were analyzed.

**Access:**

Extraction of the munition's energetic material from damaged and undamaged casings has been accomplished by various existing techniques such as straightforward disassembly and water jet cutting; other approaches are now being investigated and demonstrated, including cryfracture, water jet cutting and laser jet cutting.

**Treatment:**

Los Alamos has been involved in several treatment technologies. Los Alamos provided a technology to aid the U.S. Army Toxic and Hazardous Material Agency in a demonstration of incineration as an effective treatment technology for soils contaminated with explosives. It is not clear whether incineration will be an option for destruction of explosives and other energetic materials in the future. Los Alamos has looked at a complete set of alternative technologies for accessing and destroying a variety of such materials.

**A Phased Approach:**

**Phase 1:** This phase is for the purpose of conducting an on-site assessment of suitable technologies based on geology, past operational histories, and location. This will be a collaborative effort with safety and munitions personnel at Fort Ord. The Fort Ord Commander, the closure participants, and other stakeholders will also receive detailed briefings on the suggested approach and technologies available for identification and disposal of munitions. A set of options will be provided. These will include the handling and other steps that will culminate with the destruction of the munitions and return of the land to other beneficial uses.

**Phase 2:** A Survey with two or more detection technologies to identify the dispersion and boundaries of the projectiles and explosive materials.

**Phase 3:** Based on operational and safety needs of the closure personnel and the Fort Ord Commander, a pilot area would be chosen for demonstration of the approach and technologies. This will be followed by demonstration of munitions destruction technologies such as base hydrolysis to convert the solids to liquids, followed by biological treatment and subsequent destruction to innocuous materials by using hydrothermal processes.

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**Phase 4:** Transfer of technology to the private sector and complete destruction of the munitions at Fort Ord would proceed with a structured organization and dedicated facility.

In addition to the above suggested specifically by Los Alamos National Laboratory, we suggest to the Committee that there may also be related remediation issues in the marine environment, offshore in the prohibited and restricted areas so designated, found to the west of Fort Ord in the Monterey Bay National Marine Sanctuary. Our initial proposal does not reflect this, but we have begun discussions between the University of California and the Branch of Pacific Marine Geology of the U.S. Geological Survey in anticipation of this possibility and to explore the expertise that we might bring to bear upon the problem if it does exist.

**HURDLES TO PUBLIC AND PRIVATE TALENT BEING BROUGHT TO BEAR ON THE REMEDIATION EFFORT:**

Unfortunately, though clearly providing an innovative and needed approach to a complicated issue, the University of California's proposal has met with current Federal legislative and infrastructural barriers that have delayed the Department of Defense from establishing and implementing the cooperative agreement requested by the Administration and Congress. This delay, while the Department of the Army identifies a mechanism to establish the cooperative agreement, has prevented the Department of Defense from rapidly accessing the expertise of the University of California and its affiliated research partners. This rapid access is critical to effectively address the overwhelming problems of environmental remediation, including unexploded ordnance, on Federal lands.

The inefficiencies and difficulties in establishing this collaborative relationship illustrate a problem which has much broader implications than the University of California's proposal for the Fort Ord site. The Clinton Administration has staked much of its hopes for long term economic development on the success of meaningful public private partnerships. There is a belief that the best chance for the United States to become more competitive in international markets is for the public and private sectors to work together to develop, demonstrate, transfer and commercialize new technologies. However, existing legislation and some of the current federal infrastructure have the potential to delay or prevent these partnerships, thereby making much of this very worthwhile objective unobtainable.

A relevant illustration of these impediments occurred at a meeting held at Fort Ord in 1993 to discuss the University of California's proposed collaborative approach to military remediation needs. Attending that meeting were representatives of the University of California, the Department of Defense, the Department of the Army, relevant State of California and Federal agencies, representatives of the national laboratories, and representatives of the private sector. The meeting focused on the Fort Ord closure and how issues of environmental remediation might be more effectively addressed through multi-perspective teams of individuals and institutions. The discussions included environmental remediation challenges at Fort Ord and how the collective resources of the entities in attendance might be used to foster the development of new, innovative and more cost effective environmental remediation techniques and technologies. The attendees agreed that public private collaborations had the potential to significantly increase the effectiveness of

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environmental remediation efforts while expediting technology development and commercialization. The meeting, however, quickly bogged down when one of the federal officials present indicated, despite the critical need for collaborative approaches to these problems, that under current law the discussions could not continue without precluding private sector participants present at the meeting from participating in any subsequent partnerships. Though the meeting ended soon thereafter, it was clear to many or all of us in the room that the collective wisdom and experience from multi-perspective discussions such as these were crucial to expedite more effective and efficient remediation approaches.

Legislation designed to ensure the integrity of the competitive process has good intent as far as giving all relevant and technically qualified entities an opportunity to participate in Federal procurement. However, to encourage collective participation by public and private talent from across the country, particularly to address complicated issues such as those before this Committee, there needs to be modifications to the regulatory climate to foster these collaborative approaches. Such modifications should encourage participation from both the public and private sectors rather than inhibit it; should provide mechanisms to expedite the development of cooperative efforts through increased flexibility to the Federal government to enter into cooperative agreements on a sole source basis; and should foster rapid and needed technological advances through the development of public public (such as proposed by the University of California) and public private partnerships. These collaborative efforts, which promise to result in the development of products to address the complex issues of environmental remediation effectively, efficiently and timely, can also support the national need to move technologies rapidly to commercialization on the international market. As your Committee watches the Federal government increasingly transfer complicated remediation issues from the Department of Defense to agencies such as the Bureau of Land Management, I am certain that you will see increased need for more timely, innovative and cost effective solutions. I propose to you that these could be more likely achieved by providing increased flexibility to the Federal government to develop cooperative relationships and public private partnerships.

#### CONCLUSION:

In closing let me again thank you for this opportunity to provide testimony to this Committee. As you explore the issues of managing unexploded ordnance on Federal lands let me urge you to include in your consideration the critical needs of:

- Balancing the public policy and public education issues with those of available techniques and technologies.
- Encouraging and fostering collaborative and innovative approaches by providing flexible mechanisms to develop functional public private partnerships.
- Looking at the issues of remediation on Federal lands, including those of unexploded ordnance and more, as a means of increasing the competitiveness of the United States in the emerging environmental technologies industry.

This concludes my testimony. I am pleased and available to answer any questions you might have.

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Mr. MILLER. How does what Ms. Martin just said differ from what you're doing at Yuma?

Mr. HOOPER. Sir, I'm not having any trouble working with any private organization or university. As a matter of fact—

Mr. MILLER. I don't mean that. I'm trying to determine if we've got a duplicative or a parallel or unique process going on here. Should we have one process in terms of trying to focus technologies? We recognize as we heard in the previous panel and from your own panel, that there is this gap that's going to have to be filled if we're really going to get the remediation of these areas that is suitable to the public use of some of these lands. We've got to have a better detection system and location system.

In your testimony, is that what's going on there in terms of driving these technologies that we hope to have in hand, but we don't have today?

Mr. HOOPER. I'm not sure I understand.

Mr. MILLER. Is that a cooperative effort between the public and the private sector and the labs and others? That's what I'm asking.

Mr. HOOPER. Yes. Everything we're doing is a cooperative effort between the universities, between the private sector and other government agencies. My motivation is I have to develop systems like that to help clear the land at Yuma, because if I don't, eventually we won't be able to use the land.

Mr. MILLER. What prevents that kind of effort from being focused, in this case, on an area that's under closure and that we're trying to reintegrate into the public sector or even the private sector in some cases?

Mr. HOOPER. Nothing.

Mr. MILLER. But that transfer is not taking place, is it? You're doing at Yuma an ongoing part of the conduct of the range.

Mr. HOOPER. The transfer is easy once we figure out how to do it.

Mr. MILLER. I understand that. But what about the transfer of the process? While you're trying to figure out how to do it, what would prevent us from focusing on something like Fort Ord or one of these other areas where we expect public use and reintegration?

I get a sense that the military is doing this for their purposes, and I don't mean that in a pejorative sense. I mean that in the pursuit of technology. And, yet, we have these areas that are going to change use and ownership and stewardship. We're not focusing on those lands, and yet, there is a time-line problem there.

Yuma is going to continue its operations over a period of years, I assume, for the foreseeable future. And I don't get a sense that the process is being conducted in both arenas. There's a question there somewhere. It may be harder to detect than one of these small munitions, but it's there. I guarantee it.

Mr. HOOPER. Let me see if I can narrow in on what I think your question is. I said that the problem was multidimensional. You also brought up the question of whether the effort is duplicative. By multidimensional, I mean there's the surface problem, there's the underground problem, there's the underwater problem which divides up into the under freshwater lakes and rivers, which they have in many parts of the world and the United States, and there's under seawater.

Then the underground problem and the surface problem divide up into the various kinds of terrain that you have, because it's different. The soil conditions and the detection conditions at Jefferson Proving Ground are totally different than you will find at Yuma Proving Ground, at Twentynine Palms and in Alaska where they have unexploded ordnance and where they've tested it in the past.

All these things bear on the problem and I'm only working on one very narrow portion of the problem. Other people want to work on other aspects of the problem. The problem is so large, there's so many dimensions to it, it's very difficult to actually duplicate the effort.

Now, the technology transfer to other people is easy.

Mr. MILLER. That would suggest to me, and correct me if I'm wrong, that what you would need in a situation like Fort Ord or other situations is a parallel effort because all of the yields in either technology or information or understanding from Yuma or somewhere else may not be transferrable to this site.

Mr. HOOPER. Correct.

Mr. MILLER. So if we're in pursuit of, as Congressman Farr has tried to pursue here, a cooperative effort of the same thinking minds and disciplines, you can't put that off by saying, well, we're doing it at Yuma, we're doing it somewhere else.

Mr. HOOPER. No.

Mr. MILLER. So you do need a parallel effort.

Mr. HOOPER. You need multiple parallel efforts.

Mr. MILLER. How come we don't have one, Ms. Martin? You said there were the hurdles, but I'm not sure I understand them all.

Ms. MARTIN. Well, we've got funding identified for it. We've got partners prepared to approach the problem. We have been unable to find the way to develop the cooperative agreement with the Department of Defense and Department of Army. We have been told by attorneys and procurement officers within the Army that they can't sole-source that relationship, that there's no indicated need for that relationship, despite the legislative language. So we've sort of run into—despite the interest of folks high in DOD cleanup issues and Army—the regulatory barriers, the procurement barriers, all those other issues that have come to bear on this.

I don't know all the answers.

Mr. MILLER. I suffer this at Mare Island under a different subject, but I suffer this, too. That the legislative directive that Congressman Farr and I were successful in getting in Mare Island does not appear to be enough. We're going to have to go back into really sort of designer legislation to implement this with the Armed Services Committee or somebody this time around.

Ms. MARTIN. Yes. And there's two issues that come up for us. One, we've been at the table with our partners for two years discussing how we'd approach this and trying to open that dialogue with the Army and the issues here at Fort Ord. Going back with designer legislation will add another year to that process. We're trying to use this not only to look at issues at Fort Ord cleanup and DOD broader questions, but also as part of the reuse spin for the activities at Fort Ord. So we don't have the leisure of another year to go through the process.

We're prepared now to begin. We've got the partners, who are ready, and we've got the private industry folks who have been watching. But if we continue to make this a two- or a three- or a four-year process, I think we begin on reuses across the country to lose the interest.

Mr. MILLER. Theoretically, and theoretically is a big word in our profession, though, if we were able to construct it properly with the reauthorization legislation and were successful, it could be ready to go in October.

Ms. MARTIN. Mr. Chairman, I would propose that we're going to have this at bases all over the country.

Mr. MILLER. Right.

Ms. MARTIN. And what we heard earlier was the regional expertise, the local expertise, the issues of each site will be different. The, if I can use the term again, designer legislation approach is great if we're going to do that at each base. But perhaps there really needs to be a way that the Department of Defense and Army can have more flexible ways of entering into these cooperative agreements at these cleanup sites.

Mr. MILLER. I don't know if you're going to meet on this subject, but my situation is I'm doing all right on environmental remediation in terms of how they've constructed that with the Navy and with the personnel. We're not doing so well on the human services side of it. So we've had to go back now and try to think how we take what we thought was a legislative mandate and redesign that to get it implemented with respect to human services and the personnel dealing with the closure.

Here, it happens to be a munitions/environmental problem, and, there, the implementation. The Department of Defense was simply unable to process it. I don't know if it exists there in terms of the ability to process that directive. So, unfortunately, this is happening all over the country where those measures that were passed last year, the Department of Defense is simply unable to process them within their current guidelines and procedures. And the question is how do you sort of slash through some of that now legislatively. Otherwise, it doesn't appear it's going to happen.

Mr. Farr?

Mr. FARR. Yes. Just two questions. One, Mr. Hooper, is there any technology that the military possesses for detection of these unexploded ordnance that we use in warfare that have not been allowed to be used for cleanup?

Mr. HOOPER. I'm not aware of any, sir.

Mr. FARR. So that technology for detection is not classified and the equipment is available for—

Mr. HOOPER. I didn't say that.

Mr. FARR. The cleanup technology that you're using on the proving grounds, which is within the military family, is not really turning that land over to civilian use. You're just out there testing your devices. Is that same technology available for closed bases?

Mr. HOOPER. Yes, I think so. All technologies that we're currently using at Yuma Proving Ground would be available.

Mr. FARR. Well, could it be used for BLM and Department of Interior land?

Mr. HOOPER. The answer to the question is yes, but there are many facets to that question. Certainly, anything can be made available, but you're getting close to policy. The technical issues—

Mr. MILLER. That's what we do for a living.

Mr. HOOPER. The technical stuff can be used, no problem. As to whether something—

Mr. FARR. I think Ms. Martin brought up a point that your situation is different because you are an ongoing testing site. You're not only testing how to deploy these ordnance, but you're also testing how to detect them and then go in and remove them. The same thing with Twentynine Palms. The situation here is one where you have a different consortium of interests, people who would like to make a profit, investing in research, perhaps academic research that would lead to a technology that might be marketed by the private sector.

Mr. HOOPER. And I have that ongoing right now.

Mr. FARR. But funding to do that is not available, or at least we haven't been able to get it released to do what you're doing down there with Fort Ord and with all these other sites in northern California.

Mr. HOOPER. I'm not aware of—

Mr. MURPHY. Excuse me. Mr. Chairman, Mr. Farr, my name is Peter Murphy. I'm Mr. Walker's lawyer. I've worked pretty extensively with Ms. Martin on her proposal and the difficulty that we're running into on the cooperative institute is one of the Federal acquisition regulations. In essence, when the Department of Defense wants to procure services from an entity like this consortium to have them help with cleanup or help with research and development, under current regulations, that's something that has to be competed among various qualified bidders.

Mr. FARR. Did they have to do that in Yuma?

Mr. MURPHY. When you procure services.

Mr. HOOPER. We have to follow all of the Federal acquisition regulations. There's no question about that. If you're dealing with money, you have no choice but to follow the regulations. When you're dealing with cooperative research and development agreements, if you're classed as a laboratory for that sort of thing, then other arrangements can be made and you have to explore those one-by-one, on an individual basis each time.

Mr. MURPHY. We've worked very closely with UCSC to look at various options. There are a number of different statutory hurdles that we face in transferring funds to a university and/or transferring funds to anybody who wants to do work for us, and that's why we've worked with them to try and identify the procurement problems that currently exist.

As you well know, sir, this year's Authorization Act authorized some funds to be used for a demonstration project at Fort Ord, but it didn't contain very specific language telling us to ignore the restrictions that would otherwise be applicable to the procurement of services or research and development operation, and that's the barrier that we're running into here.

We've been working at identifying how to get around those, but currently it looks like we need a statutory fix to do that.

Mr. FARR. Would you work with the committee staff and Chairman Miller and myself, suggesting how we might get around that?

Mr. MURPHY. We've been doing that, actually, with the Office of the Secretary of Defense for a couple months now. We're expecting a formal request from the committee to do that, and one hasn't been forthcoming yet. But we certainly have indicated our willingness to do that.

Mr. FARR. A request from which committee, this committee?

Mr. MURPHY. The Armed Services Committee, sir.

Mr. FARR. The Armed Services Committee. All right. Do they know they're supposed to make that request?

Mr. MURPHY. Yes, sir. Mr. Walker has passed that on a couple times.

Mr. FARR [presiding]. Could you share with me what you've given to the other members or to the Chair? I'll try to push it. I have no other questions for this panel. I appreciate it very much. Chairman Miller had to leave. He has a huge day in Washington tomorrow, and he doesn't want to do the redeye that I'm going to have to do.

**PANEL CONSISTING OF COL. THOMAS F. ELLZEY, COMMANDER, U.S. ARMY GARRISON, FORT ORD, CA, ACCOMPANIED BY JAMES WILLISON, CHIEF, ENVIRONMENTAL AND NATURAL RESOURCES BRANCH, U.S. ARMY, FORT ORD; ROBERT BEEHLER, AREA MANAGER, HOLLISTER RESOURCE AREA, BAKERSFIELD DISTRICT OFFICE, BUREAU OF LAND MANAGEMENT, DEPARTMENT OF THE INTERIOR; DAVID WANG, CHIEF PROGRAM EXECUTIVE, OFFICE OF MILITARY FACILITIES, DEPARTMENT OF TOXIC SUBSTANCES CONTROL, CALIFORNIA ENVIRONMENTAL PROTECTION AGENCY; WALTER WONG, ENVIRONMENTAL HEALTH DIRECTOR, MONTEREY COUNTY, CA; THOMAS J. HENDRICKS, CO-CHAIR, FORT ORD RESTORATION ADVISORY BOARD (RAB), ACCOMPANIED BY JOE COCHRAN, FORT ORD ENVIRONMENTAL OFFICE, AND CO-CHAIR, RAB; AND JOSEPH A. CAVANAUGH, PROJECT COORDINATOR, FORT ORD REUSE GROUP (FORG)**

Mr. FARR. I've asked the first panel actually to be last because it's the local people that have more of a local focus on Fort Ord. I'd like to call up now Colonel Tom Ellzey, who is the Commander at Fort Ord, accompanied by James Willison, who is the Chief, Environmental and Natural Resources Branch of the U.S. Army at Fort Ord; Mr. Robert Beehler, who is the Area Manager of the Hollister Resource Area for the Bakersfield District Office of the Bureau of Land Management; David Wang, who is the Department of Toxic Substance Control Officer with the California Environmental Protection Agency; Tom Hendricks, who is co-chair of our local Civilian Fort Ord Restoration Advisory Board; Dr. Walter Wong, who is the environmental health director of Monterey County; and Joe Cavanaugh, who is the project coordinator for the reuse of Fort Ord lands.

If you could summarize your remarks, and I'll take the written testimony for the record. Just for the sake of time, be as brief as possible and summarize the points that you want to make to the committee.

**STATEMENT OF COL. THOMAS ELLZEY**

Colonel ELLZEY. Good morning, sir. Thank you for the opportunity to present my overview of the ordnance and explosive waste investigation and remediation at Fort Ord. Very quickly, I'd like to take you through a map review of Fort Ord, just so you know what we're dealing with. Morena to the north, Seaside to the south. The black dotted line is Fort Ord itself.

We'll go through this again. Sir, the heavy outline is Fort Ord itself. The dark outline is the land that is intended to be provided to BLM, Bureau of Land Management.

The red outline is the 8,000 acres of impact area. I'll go back through these colored areas in just a second, sir, when I get through my testimony.

Mr. FARR. We have a similar map on the back wall there that Mr. Cavanaugh brought in.

Colonel ELLZEY. I think Mr. Farr took us through the history of Fort Ord and how we got to where we are today very well. Needless to say, Fort Ord has been a training post for about 75 years. In 1990, Fort Ord was listed on the National Priorities List for hazardous waste due to soil and groundwater contamination.

In November of 1990, the Federal Facilities Agreement was signed by the Army, the EPA and the California EPA under CERCLA section 120. Fort Ord was placed on the base closure list in 1991. Some of our properties will be transferred to other military agencies in mid-1994. This situation led Fort Ord to initiate an archives search, identify and locate areas where ordnance may have been used.

The archives search was conducted in late 1993 and identified 25 areas outside the 8,000-acre impact range as potentially containing ordnance and explosive waste. The total acreage of those 25 sites is 2,150 acres.

Very quickly, to address some of the questions you asked, Mr. Farr. How much land is contaminated with UXO at Fort Ord? The Army is in the process, as I said, of investigating clearing the 25 potential ordnance sites, those 2,150 acres. Of that, we have cleared already as of today 1,000 acres, the remaining 1,150 acres to be completed.

You wanted me to describe the extent of contamination in both the impact range and other areas affected by UXO. Since the investigation and clearances are still in progress, it's difficult to accurately represent the full extent of the contamination. However, mostly pyrotechnics, small arms ammunition, firing devices and fuzes and a few high explosive rounds have been discovered during these investigations and clearance outside the 8,000-acre impact area.

A field investigation to determine the extent of contamination within the 8,000-acre impact area has now begun, although small arms, mortar rounds, grenades, antiarmor ammunition, artillery munitions and rockets are expected to be found in that area.

Your next question was, Has any cleanup been performed? Yes. Field work to investigate and remove UXO from 25 sites began in January. The following is a synopsis of the clearance activities to date, and sir, I'll refer you to the map. The areas in green are ten sites that have been cleared and no UXO discovered. That's about

1,000 acres. The five sites in yellow are known to contain UXO and clearance is physically under way today.

The red areas, the five sites are also known to contain UXO, and clearance is required. That's about 200 acres. The five potential sites in blue are approximately 650 acres and we're going to have to do our field investigation to find out whether or not they are contaminated, sir.

Mr. FARR. Now, will you remove all of the surface when they're cleaned?

Colonel ELLZEY. Yes, sir. They either contain no UXO, as the archives indicated, there was a range there that may have been used in the past, or what was there has been removed, consistent with reuse, 1 foot for the traffic in BLM, for example, down to 4 feet for other kind of uses that require that clearance down to the 4-foot level. So green means they're clean.

Mr. FARR. So all of the beach properties west of the highway have been—

Colonel ELLZEY. Cleared of UXO, unexploded ordnance, but there's still the round itself, the bullets and the lead that we have to clear up out there, about 18 inches deep. Yes, sir.

Mr. FARR. You have to clear all of that before the land can be transferred, say, to the State of California for State park or does that—

Colonel ELLZEY. The UXO is clear. The environmental concerns of the lead itself will have to be cleaned up, yes, sir. There are two issues. One is environmental, and one is unexploded ordnance.

Mr. FARR. I understand. But can you transfer that land as long as—or does it have to be cleaned before you can transfer it? The liability goes with you for cleaning it up regardless of—

Colonel ELLZEY. We have to clean it up, sir, before we can do the actual transfer.

Mr. FARR. So the title will not transfer until you've cleaned it.

Colonel ELLZEY. That is correct, sir.

Mr. FARR. Thank you.

Colonel ELLZEY. How much contaminated land will be transferred to BLM? Approximately 15,000 acres of land will be transferred to BLM. This consists of an 8,000-acre impact area and about 7,000 acres of other undeveloped land outside the impact area.

The Department of Defense ammunition explosive standards state that any real property which contains OEW must be cleared with the most appropriate technology to ensure protection of the public consistent with proposed end use of the property. And that standard is also incorporated in the Army draft regulation.

The fifth question you had, sir, was, What is the anticipated condition of the site upon transfer to BLM? In accordance with the DOD standards and the Army regulations I've just mentioned, the land will not be transferred to BLM until it is cleared of the OEW to a sufficient level to support the identified reuse. A land disposal site plan has been submitted and approved by the Department of Defense Explosive and Safety Board.

Question six, Will it be in compliance with Federal RCRA and CERCLA standards? Fort Ord has begun the remediation of all OEW areas outside the impact area as an emergency removal ac-

tion under the Comprehensive Environmental Response, Compensation and Liability Act. As a CERCLA site, Fort Ord is responsible for complying with the substantial proportions of applicable or relevant appropriate requirements, which includes the RCRA. The emergency removal actions are being coordinated with the parties to Fort Ord's Federal Facility Agreement.

The 8,000-acre impact area is not included in the emergency removal actions. That process to remediate that area is planned to follow the non-time-critical removal action process dictated by the National Oil and Hazardous Substance Pollution Contingency Plan, NCP, which includes a requirement to complete an engineering evaluation cost analysis, which we have not done.

Mr. FARR. So you don't know what the cost of the cleanup—

Colonel ELLZEY. No, sir. Until you do the physical look at the land, what we have now is the archive research that tells us what has gone out there in the past 75 years and where we expect to find it. And our estimate lies on that rough guess today.

Mr. FARR. I know Congressman Miller and I, we didn't get into it, but it's sort of the issue of when does it become cost-effective not to.

Colonel ELLZEY. Not to, yes, sir. And that certainly is not a Fort Ord issue and is not something that I would be able to tell you when that would happen, sir. That would be a DOD and a DA initiative.

Currently, the cost we have, as I explained earlier, is between \$50 million and \$150 million to clear the impact area.

Mr. FARR. For the 8,000 acres.

Colonel ELLZEY. Yes, sir.

Mr. FARR. \$150 million.

Colonel ELLZEY. The cost for the 2,000 acres is about \$8 million. Of that, we've cleared half. I know it's a broad band between \$50 million and \$150 million, but we just don't know yet. And we have \$10 million in the budget next year to work on that.

Mr. FARR. Is the intent to clean up the entire 8,000 acres?

Colonel ELLZEY. The intent is to transfer that land to the BLM per the current regulations, which say that for the habitat area they're going to use in the park systems to 1 foot surface down. Yes, sir.

Mr. FARR. And although BLM told us earlier that they have land with subsurface UXOs that they are managing safely, without having cleaned it up to the extent that you will be cleaning up the land at Fort Ord.

Colonel ELLZEY. Sir, I will be cleaning the land from the surface down to 1 foot for that habitat area.

Mr. FARR. Maybe I misunderstood the earlier statement. Have all the BLM lands that you've received been cleaned down to 1 foot?

Mr. ROSENKRANCE. No, all of it has not. A lot of it is very remote and has very little use.

Colonel ELLZEY. The last question, sir, was, Please describe any restriction on future use? Property transfer documents would notify

the reuser of the depth of remediation and will state that the property owner shall notify the Army if the reuse of land changes and requires excavating beyond the remediation depth.

That concludes my testimony.

[Prepared statement of Colonel Ellzey follows:]

**Testimony of the U.S. Army, Fort Ord  
Before the  
Committee on Natural Resources  
United States House of Representatives**

**May 2, 1993**

Good morning Chairman Miller, and members of the Committee on Natural Resources. My Name is Colonel Thomas F. Ellzey and I am the Commander of the U.S. Army Garrison, Fort Ord California.

Thank you for the opportunity to present an overview of the ordnance and explosive waste investigation and remediation at Fort Ord.

**U.S. Army Fort Ord, Site History**

Between 1917 and 1993, Fort Ord operated as a permanent installation under the Department of the Army and was primarily responsible for training infantry troops. Fort Ord consists of 28,000 acres located in Monterey County, CA. Approximately 75% of the land, 21,000 acres is undeveloped, while the remaining 25% is developed.

On 21 February 1990, Fort Ord was listed on the National Priorities List of Hazardous Waste sites due to soil and groundwater contamination. On 19 November 1990, a Federal Facilities Agreement was signed by the Army; the Environmental Protection Agency (EPA) and the California EPA under the CERCLA section 120. Fort Ord was placed on the base closure list in 1991. Some property will be transferred to other-than-military agencies in mid-1994. This situation led Fort Ord to initiate an archives search to identify and locate areas where ordnance may have been used.

The archives search was conducted late in 1993 and identified 25 areas outside of the 8000-acre impact range as potentially containing ordnance and explosive waste (OEW). These areas range in size from one acre to 1000 acres, although most of the areas are less than 200 acres. The total acreage of these sites is approximately 2150 acres. Investigation of these areas is in progress.

The 8,000-acre impact area is located in the south-central portion of Fort Ord. The other areas are to the north of the impact area and south east of the main garrison or to the east of the impact area.

OEW in and near the impact ranges include items such as grenades and anti-armor ammunition, mines, artillery and mortar rounds, rockets, and explosives. The impact and training areas are posted with warning signs and are off-limits to the general public. The potential investigation and cleanup of the 8000-acre impact area and other potential areas will be evaluated by the Army and their specialized contractors.

## Responses to Chairman Miller's questions

### 1. How much land is contaminated with UXO at Fort Ord?

The Army is in the process of investigating and clearing 25 potential ordnance and explosive waste (OEW) areas which were discovered as a result of an OEW archive search. The area remaining to be cleared is approximately 1,150 acres.

Fort Ord also contains an 8000-acre impact area, although it is unclear how much of that area will require clearance of OEW.

### 2. Please describe the extent of contamination in both the impact range and other areas affected by UXO?

Since the OEW investigations and clearances are in progress, it is difficult to accurately represent the full extent of contamination. Although, mostly pyrotechnics, small arms ammunition, firing devices, and fuzes have been discovered during investigations and clearance of areas outside the 8000-acre impact area.

A field investigation to determine the extent of contamination within the 8000-acre impact area has not begun, although, small arms ammunition, mortar rounds, grenades, anti-armor ammunition, artillery ammunition and rockets (both 2.36-inch and 3.5-inch) are expected to be found in that area.

### 3. Has any clean-up been performed?

Yes. Field work to investigate and remove UXO from the 25 sites began in January 1994. The following is a synopsis of clearance activities to date:

- a. 25 potential sites identified outside the impact area (2150 acres)
- b. 10 site cleared. No UXO discovered (1000 acres)
- c. 5 sites known to contain UXO - Clearance underway (300 acres)
- d. 5 sites known to contain UXO - Clearance required (200 acres)
- e. 5 potential sites require field investigation (650 acres)

### 4. How much contaminated land will be transferred to BLM?

Approximately 15,000 acres of land will be transferred to the BLM. This consists of the 8,000-acre impact area and approximately 7,000 acres of other undeveloped land outside the impact area.

The Department of Defense Ammunition and Explosives Safety Standard (DoD 6055.9 - Standard) states that real property which contains OEW must be cleared with the most appropriate technology to assure protection of the public consistent with the proposed end use of the property. This standard is also being incorporated into the Army Regulation 385-64 (U.S. Army Explosives Safety Program Draft).

**5. What is the anticipated condition of the site upon transfer to BLM?**

In accordance with DoD standards and Army regulations, the land will not be transferred to BLM until it is cleared of OEW to a sufficient level to support the identified reuse.

A Land Disposal Site Plan (LDSP) has been submitted to the Department of Defense Explosives Safety Board (DDESB) for their approval of the planned remediation, including depths of remediation. It is Fort Ord's understanding that depth standards are being developed by DDESB although they have not been finalized. In the interim, DDESB will offer site specific approval for clearance depths at Fort Ord.

**6. Will it be in compliance with federal RCRA and CERCLA standards?**

Fort Ord has begun the remediation of all OEW areas outside the impact area as an emergency removal action under the Comprehensive Environmental Response Compensation and Liability Act (CERCLA) 121 (e). As a CERCLA site, Fort Ord is responsible for complying with the substantive portions of applicable, or relevant and appropriate requirements (ARARs), which includes the Resource Conservation and Recovery Act (RCRA). The emergency removal actions are being coordinated with the parties to Fort Ord's Federal Facility Agreement (FFA).

The 8000-acre impact area is not included in the emergency removal actions. The process to remediate that area is planned to follow the non-time critical removal action process dictated by the National Oil and Hazardous Substance Pollution Contingency Plan (NCP), which includes a requirement to complete an Engineering Evaluation Cost Analysis (EE/CA).

**7. Please describe any restrictions on future use of the site.**

Property transfer documents will notify the reuser of the depth of remediation and will state that the property owner shall notify the Army if the reuse of the land changes and requires excavating beyond the remediation depth.

U.S. Army Fort Ord  
Colonel Thomas F. Ellzey, Commanding  
(408) 242-6518 Phone  
(408) 242-4146 Fax

Mr. FARR. Thank you very much. I just want to get one question cleared up before we go to the rest of the panelists. People are concerned with reuse, that either students at the new university or any other users of the property may be wandering around Fort Ord and find themselves in trouble with the unexploded ordnance. What is the likelihood of that happening with the thoroughness of your cleanup process?

Colonel ELLZEY. Sir, I think the likelihood is very remote. That area will be cleaned and is being cleaned today.

Mr. FARR. But the process to clean it will take some time. So how will you—

Colonel ELLZEY. Sir, we are releasing it in phases, and those phases are consistent with the environmental cleanup and also that cleanup of UXO. So as those phases progress and we've cleaned it up, we will turn those lands over.

Mr. FARR. Will you fence it off and patrol it?

Colonel ELLZEY. Sir, we do not intend to fence off the impact area at this time. The Army intends to—

Mr. FARR. Sign it?

Colonel ELLZEY. Signage, multi-language signs, the impact area. The UC campus is not within that, of course.

Mr. FARR. Yes, I know. But people will wander.

Colonel ELLZEY. Current Army policy is to use signage to restrict the access.

Mr. FARR. Is that what you do now?

Colonel ELLZEY. Yes, sir, we do. Of course, the post is closed, also.

Mr. FARR. You've had a lot of dependents of active duty military living there, children, young children, teenagers.

Colonel ELLZEY. We have thousands.

Mr. FARR. Did you ever have any problem with them wandering into the area?

Colonel ELLZEY. I'm not aware of anyone being injured in the impact area, sir.

Mr. FARR. Thank you. Thank you very much.

Colonel ELLZEY. Thank you, sir.

Mr. FARR. Mr. Beehler.

#### STATEMENT OF ROBERT BEEHLER

Mr. BEEHLER. Mr. Farr, it is my pleasure to be here today to talk about the project at Fort Ord and the Bureau of Land Management's involvement with Department of Defense.

As you know, the 28,000-acre Fort Ord is to be closed this year, and this base closure is clearly recognized by all those in this area as having a significant impact on the local economy. With these economic challenges also come environmental opportunities, and that is where my agency, the Bureau of Land Management, comes in.

Within Fort Ord, there is habitat for 45 special status botanical species, including seven species that may be dependent on Fort Ord alone for their survival. There are also a number of significant coastal vernal pool wetlands, excellent examples of native oak forests and rare native grasslands.

The challenge that we face is how to protect these habitats as required by the Endangered Species Act and still provide for the redevelopment of other lands to bring this community back economically from the base closure.

To help accomplish this goal, we have proposed that about 15,000 acres of habitat be retained in Federal management as the primary endangered species mitigation area which would allow the other portions of the base to be developed for economic recovery. About one-half of this habitat is land that is presently encumbered with unexploded ordnance and subsequently not available for immediate development.

Plans for these lands and other undeveloped Fort Ord lands will be developed through a coordinated management planning process. The BLM has successfully used this multi-agency cooperative approach in other parts of California to balance the need for protection of critical resources with necessary economic development of non-Federal lands.

The BLM management of this 15,000 acres is a key part of the Fort Ord Multi-species Habitat Plan, or HMP, developed by the U.S. Army and the Fish and Wildlife Service, along with BLM's assistance, to comply with Endangered Species Act requirements for habitat protection. The HMP applies scientific principles of conservation biology to establish biologically sound and manageable habitat reserves, while allowing other lands to be developed without additional mitigation.

This represents an ecosystem approach to endangered species management that fosters management of a healthy ecosystem rather than focusing on each individual species or population. The HMP was recently signed by the Bureau of Land Management, the Fish and Wildlife Service and the U.S. Army. The HMP stated that timely transfer of these lands and subsequent implementation of the HMP is critical to assure that regulatory requirements of the Federal Endangered Species Act and the California Endangered Species Act do not stall or preclude economic redevelopment at Fort Ord and subsequent economic recovery of our local communities.

The key to this entire effort is the soon to be signed Memorandum of Understanding or MOU between the BLM and the Secretary of the Army. The MOU officially sets up the transfer procedures to allow for implementation of the HMP, thus clearing the way for transfer and redevelopment of other lands at Fort Ord for the economic benefit of people in the Monterey area.

This directly translates into jobs, economic recovery from the base closure. The MOU defines in detail procedures for the transfer of the lands to the BLM from the Secretary of the Army. This includes the policy and process regarding clearance of unexploded ordnance from lands coming into BLM's ownership for public use.

I'd like to highlight three provisions of the MOU that speak specifically to the subject today. The first one is the Army will completely remove all hazardous ordnance to a standard sufficient to make the area safe for unsupervised pedestrian access and use of equipment on established fire lands for firefighting purposes. This action would be required to be completed prior to the transfer of management responsibility to the BLM.

The second is the Army will provide training to the BLM staff on how to identify hazardous substances. The BLM will promptly notify the Army when any potentially dangerous ordnance is discovered and the Army will be responsible for removing or detonating the device.

The third is the Army shall be responsible for all legal expenses and other liabilities in the event of an accident related to the discovery of unexploded ordnance. The unexploded ordnance cleanup will be conducted in a manner that will enhance the biological values of the area. Prescribed fires will be used to remove vegetation prior to unexploded ordnance cleanup.

To maintain a mosaic of different age classes, only about 800 acres or ten percent of the area will be burned each year. The rare plant species are fire dependent and should prosper in response to these prescribed fires. The entire process of ordnance clearance, land transfer may take up to 10-12 years.

Following the cleanup, these lands will become a significant part of the biological reserve for endangered species. By allocating these lands for limited access and development and primarily for habitat preservation, there will be substantial cost savings to the taxpayers, who will not have to pay for the deep, extensive unexploded ordnance cleanup. We believe this represents an excellent example where two important objectives—enhancing important rare species habitat and cleaning up unexploded ordnance—are being accomplished through an innovative approach that both minimizes taxpayer expenses and maximizes long-term public benefits.

While much more detail is contained in the Memorandum, which will be supplied immediately upon approval, final approval of both agencies, we believe these provisions clearly establish the military's role in removing and handling all unexploded ordnance and the BLM's role in managing the cleared lands for public use and preservation of the natural habitats that make these Fort Ord lands a significant contribution to the Nation's public lands.

Development of the coordinated resource management plan for Fort Ord, with full public involvement and participation with the BLM's many partners at the Federal, State and local level, including Monterey County, University of California Reserve System, and the California Department of State Parks and Recreation, which manages the beachfront property, will determine the future use and public enjoyment of these natural habitats.

This concludes my prepared statement.

[Prepared statement of Mr. Beehler follows:]

MAY 2 1994

STATEMENT OF ROBERT BEEHLER, AREA MANAGER, HOLLISTER RESOURCE AREA, DEPARTMENT OF THE INTERIOR, BUREAU OF LAND MANAGEMENT, BEFORE THE SUBCOMMITTEE ON OVERSIGHT AND INVESTIGATION, COMMITTEE ON NATURAL RESOURCES, UNITED STATES HOUSE OF REPRESENTATIVES ON UNEXPLODED ORDNANCE ON THE PUBLIC LANDS.

Mr. Chairman, it is a pleasure for me to be here today to describe a project on nearby Fort Ord where the Department of the Interior and the Department of Defense are working together cooperatively to the benefit of the environment and the local economy.

As you know, the 28,000-acre Fort Ord U.S. Army Base near here is slated to be closed this year. This base closure is clearly recognized by all those in this area as having a significant impact on the local economy. The Fort Ord Community Task Force organized by former Congressman Leon Panetta, now Director of the Office of Management and Budget, was tasked with the responsibility of developing a strategy for the reuse and redevelopment of the base. This included dealing with the anticipated loss of some 6,000 jobs and nine percent of Monterey County's population over the 18-month closure period.

But with these economic challenges also come environmental opportunities -- and that is where my agency, the Bureau of Land Management (BLM) came in. Many people locally or nationally are not aware that Fort Ord, which has been primarily used for light infantry training for the past 60 years, has, because of that less intensive use, significant and extensive maritime chaparral

habitats that many biologists consider to be the best remaining examples of this habitat type.

Within the Fort Ord ecosystem, there is also habitat for 45 special status botanical species, including seven species that may be dependent on Fort Ord for their survival. There are also a number of significant coastal vernal pool wetlands, excellent examples of native oak forests and rare native grasslands.

The challenge the Task Force faced was how to protect these habitats as required by the Endangered Species Act and still provide for the redevelopment of other lands to help bring this community back economically from the base closure.

To help accomplish that goal, the BLM proposed that about 15,000 acres of habitat be retained in Federal management as the primary endangered species mitigation area which would allow the other portions of the base to be developed for economic recovery. About one half of this habitat area was land that was currently encumbered with unexploded ordnance and subsequently not available for immediate development. Plans for these lands and other undeveloped Fort Ord lands would be developed through a Coordinated Management Planning process.

The BLM has successfully used this multi-agency, cooperative approach in other parts of California to balance the need for

protection of critical resources with necessary economic development of non-Federal lands. In 1992, the Task Force, under then Congressman Panetta's leadership, endorsed the BLM strategy and encouraged us to pursue management of the undeveloped Fort Ord lands.

Since then, with the support of this area's current Congressman, Representative Sam Farr, this effort has made substantial progress due to the cooperative efforts of the BLM, other Federal agencies, State, County, and local agencies, and the Defense Department's representatives in this matter, the U.S. Army and the Army Corps of Engineers. A major step was the County of Monterey's official endorsement of this strategy in August 1993.

The significance of the Fort Ord effort was emphasized by Dr. William Perry, now Secretary of Defense, when he visited Fort Ord in September 1993 as Deputy Secretary. In a meeting with Rep. Farr, and key Federal, State, and local officials, Secretary Perry indicated that Fort Ord can, and should be, a national "showcase" for other base closures in the country. We feel the Coordinated Management Planning strategy envisioned for Fort Ord will help achieve that goal.

The U.S. Fish and Wildlife Service supported this approach in its biological opinion required under the Endangered Species Act

issued in October 1993 on the disposal and reuse of Fort Ord. In addition to recommending the transfer of these biologically sensitive lands to the BLM to manage under the Coordinated Management Plan approach, the opinion requires that vehicle use be restricted to existing roads, and that the BLM lands to be acquired be closed to mining or other nondiscretionary actions that could compromise protection of the special status species.

The Army issued its Record of Decision on December 23, 1993, for the base closure, which recognized the BLM's Coordinated Management Plan approach, and proposed the transfer to the BLM of approximately 15,000 acres, consisting of the undeveloped area of the base depicted on the map supplied to the Subcommittee.

The BLM management of this 15,000 acres is a key part of the Fort Ord Multi-species Habitat Management Plan (HMP) developed by the U.S. Fish and Wildlife Service with the BLM's assistance to comply with the Endangered Species Act requirements for habitat protection. The HMP applies scientific principles of conservation biology to establish biologically-sound and manageable habitat reserves, while allowing other lands to be developed without additional mitigation. This represents an ecosystem approach to endangered species management that fosters management of a healthy ecosystem rather than focusing on each individual species or population.

That HMP was recently signed by the BLM, the Fish and Wildlife Service, and the U.S. Army. The HMP stated that timely transfer of these lands and subsequent implementation of the HMP is critical to assure that regulatory requirements of the Federal Endangered Species Act and the California Endangered Species Act do not stall or preclude economic redevelopment of Fort Ord and subsequent economic recovery of our local communities.

A key to this entire effort is the soon to be signed Memorandum of Understanding (MOU) between the BLM and the Secretary of the Army. The MOU officially sets up the transfer procedures to allow for the implementation of the HMP, thus clearing the way for transfer and redevelopment of other lands at Fort Ord for the economic benefit of people in the Monterey area. This directly translates into jobs and economic recovery from the base closure.

The MOU defines, in detail, procedures for the transfer of the 15,086.58 acres to the BLM from the Secretary of the Army. This includes the policy and process regarding clearance of unexploded ordnance from lands coming into the BLM's ownership for public use.

In the document, specific conditions are applied to transfer of developed lands, as well as undeveloped lands, to the BLM. Special conditions are clearly established for transfer of lands within the impact area, in the south-western part of the base,

basically bounded by Eucalyptus Road, North/South Road, South Boundary Road, and Barloy Canyon Road on your map. These are the lands likely to contain unexploded ordnance.

Without belaboring this Subcommittee with all the provisions of that Memorandum, let me highlight three provisions of paramount importance:

- o The Army will completely remove all hazardous ordnance to a standard sufficient to make the area safe for unsupervised pedestrian access and use of equipment on established firelines for firefighting purposes. This action would be required to be completed prior to transfer of management responsibility to the BLM.

- o The Army will provide training to the BLM staff on how to identify hazardous substances. The BLM will promptly notify the Army when any potentially dangerous ordnance is discovered. The Army will be responsible for removing or detonating the device.

- o The Army shall be responsible for all legal expenses and other liabilities in the event of an accident related to the discovery of unexploded ordnance.

The unexploded ordnance cleanup will be conducted in a manner

that will enhance the biological values of the area. Prescribed fires will be used to remove vegetation prior to unexploded ordnance cleanup. To maintain a mosaic of different age classes, only about 800 acres, or 10 percent of the area, will be burned each year. The rare plant species are fire-dependent and should prosper in response to these prescribed fires.

This entire process of ordnance clearance and land transfer should take 10 to 12 years. Following the cleanup, these lands will become a significant part of the biological reserve for endangered species. By allocating these lands for limited access and development, and primarily for habitat preservation, there will be substantial cost savings to the taxpayers who will not have to pay for deep extensive unexploded ordnance cleanup.

We believe this represents an excellent example where two important objectives, enhancing important rare species habitat and cleaning up unexploded ordnance, are being accomplished through an innovative approach that both minimizes taxpayer expense and maximizes long-term public benefits.

While much more detail is contained in the Memorandum, which will be supplied to the Subcommittee immediately upon final approval of both agencies, we believe these provisions clearly establish the military's role in removing and handling all unexploded ordnance and the BLM's role in managing the cleared lands for

public use and preservation of the natural habitats that make these Fort Ord lands a significant contribution to the nation's public lands.

Development of the Coordinated Ecosystem Management Plan for Fort Ord, with full public involvement and participation of the BLM's many partners at the Federal, State, and local level, including Monterey County, the University of California Reserve System, and the California Department of State Parks and Recreation, which manage the beachfront property, will determine the future use and public enjoyment of these natural habitats.

While we are excited about using this cooperative management approach at Fort Ord, it is not unusual. In California alone, the BLM has a number of cooperative efforts underway with Defense agencies, most notably the West Mojave Ecosystem Coordinated Management plan involving four bases representing all the Defense agencies.

This 9.4 million-acre ecosystem plan, the largest currently underway in the country, involves 11 cities, three counties, four State agencies, numerous interest groups as well as industry representatives, and seven Federal agencies, including the Army's

Fort Irwin National Training Center, the Marines' Twenty-nine Palms Base, the Air Force's Edwards Base, and the Navy's China Lake Weapons Center.

While the BLM manages 3.3 million acres of the West Mojave, the military is responsible for another 2.7 million acres of Federal lands, and the National Park Service administers about 300,000 acres. Another 3.0 million acres are private lands and the State of California is responsible for about 100,000 acres. Within this 9.4-million-acre planning area lies important wildlife habitat for the threatened desert tortoise and the 22 other Federal or State listed species, plus the additional 111 special status species that are the focus of the West Mojave Ecosystem Plan.

The goal is to develop a plan that can ensure survival and recovery of these species in large parts of these areas, which will allow economic development of appropriate private lands in the region to benefit the local and statewide economy.

These are the types of cooperative efforts that can be achieved between Interior and Defense Department agencies if both approach the task with the attitude that we can work together with local groups and local governments as equal partners and break down the institutional barriers that have caused problems in the past. Here in California, we can report to your Congressional

Subcommittee that process is working to the benefit of not only California, but all Americans as well.

This concludes my prepared remarks. I will be happy to respond to your questions.

Mr. FARR. Is that MOU signed?

Mr. BEEHLER. No, it is not.

Mr. FARR. It's in the draft stage. When do you expect to have that?

Mr. BEEHLER. We're waiting for the Army's response.

Mr. FARR. Pardon me?

Mr. BEEHLER. We're waiting for the Army's response, for the signature.

Mr. FARR. Colonel Ellzey, do you know when the—

Colonel ELLZEY. The exact date, no, I do not, sir. It has been staffed through the major headquarters and back to the Department of the Army for review. The exact date I cannot give you, sir.

Mr. FARR. How long—

Colonel ELLZEY. I can find out for you, sir, and pass that back to you. That's the answer you wanted, I'm sure.

Mr. FARR. Appreciate that. Thank you for your testimony. Mr. Wang, it's nice to have you back. I dealt with you when you were in Sacramento. It's nice to see you here.

#### STATEMENT OF DAVID WANG

Mr. WANG. Thank you, Mr. Farr. I want to thank you for the opportunity for allowing me to speak to you today. Specifically, the Committee has invited me to speak to you concerning CAL-EPA's role in the closure of Fort Ord and transfer of lands containing unexploded ordnance to the Bureau of Land Management and to discuss how CAL-EPA regulates UXO-contaminated land under Federal and State hazardous waste laws.

CAL-EPA is responsible for protecting public health and the environment. CAL-EPA's role in California's 22 closing military bases is to oversee DOD's investigation and cleanup of all contamination. We also help accelerate the transfer of cleaned or remediated parcels to other entities for reuse.

CAL-EPA's long-term objective at Fort Ord and other California closing bases is to achieve full remediation and provide opportunities for unrestricted reuse of all contaminated property. CAL-EPA will hold DOD fully responsible for cleanup of all UXO contamination, even if the final remedy is not anticipated for many years.

Unfortunately, there currently is no technology that can effectively and efficiently clean up UXO contamination. The available cost estimate indicates that cleanup of all UXO contamination at Fort Ord will be extremely expensive, more than \$800 million for Fort Ord alone. We're using a cost estimate from the Army Corps of Engineers, 10,000 acres per foot deep. That means that some of the UXO will be buried more than 10-20 feet deep and we want to clean up to 10 feet. That would require \$800 million.

However, in the short term, DOD and the regulatory agencies are conducting emergency removal actions to abate the most immediate threat from UXO. This work primarily consists of removing ground level ordnance outside of the principal 8,000-acre impact area. CAL-EPA is also in the process of obtaining maps of these UXO-contaminated areas, posting warning signs around contaminated areas, working with DOD on employee safety issues, and is striving to keep the local community apprised of UXO issues.

We are considering ordering the Army to construct a fence around major UXO areas. However, the fence may cost \$2 million to construct and have a negative impact on migratory animals. We're considering these factors, as well as the cost of maintaining the fence prior to making a final decision.

The short-term work involves only a small fraction of the total UXO contamination at Fort Ord. I want to emphasize that, in our opinion, it does not appear that long-term cleanup of all UXO contamination at Fort Ord will be feasible until new technology is developed that can effectively locate and remove all buried UXO at a reasonable cost.

Until such technology is developed, reuse opportunity and the public access to the 8,000-acre impact area will be severely limited. The complete UXO cleanup at Fort Ord would also have a significant environmental impact. The 8,000-acre impact area includes sand dunes, chaparral and other environmentally sensitive terrain that would have to be disturbed. A total of 17 endangered or threatened species have been identified at Fort Ord and cleanup work would almost certainly disturb the habitat of some of these species.

This impact would have to be considered as part of a long-term cleanup. The Federal Facilities Compliance Act of 1992 instructed the U.S. EPA Administrator to propose and promulgate RCRA regulations concerning the classification and handling of UXO as hazardous waste. The Act specified that the U.S. EPA Administrator consult with the Secretary of Defense and appropriate State officials and promulgate the regulation by April 1995.

CAL-EPA would be interested in meeting with U.S. EPA, DOD and officials from other States to develop an interim agreement on regulating UXO until the RCRA regulations are finalized.

I want to bring up one point. Currently the UXO buried in the soil at Fort Ord is not subject to any RCRA regulations.

Concerning cleanup levels, these levels are made based on health, resources, and ecological assessments that determine the threat that hazardous substances pose to human health and the environment. Regulatory agencies use risk assessment with future land uses in mind to determine cleanup levels that protect the public health and the environment.

On all cleanups, Department of Defense and regulators communicate with the affected communities throughout the whole process, and there must be a public comment period before making any final decisions.

Other factors that we consider when developing cleanup standards would include cost, community acceptance, effectiveness and conformance with applicable Federal, State and local regulations. Cost should be a balancing, but not an overriding factor in evaluating cleanup options.

CAL-EPA will work to ensure that all stakeholders are involved in the decision-making process.

In conclusion, I would like to make the following recommendations. Number one, Congress should support full funding for base cleanup efforts and funding of research and development of new cleanup technologies that effectively address UXO contamination.

Funding shortfalls in either of these areas may lead to prolonged delays in full cleanup and reuse of Fort Ord and other bases.

Number two, Congress should encourage U.S. EPA and DOD to work with the State to develop regulations governing UXO. Many States, like California, manage RCRA programs and will be directly affected by decisions involving the cleanup and use of UXO-contaminated land.

Number three, Congress should be supportive of all stakeholders, including local communities and future tenants, such as the BLM, becoming involved in the decision-making process, involving the short-term and long-term cleanup of UXO and reuse of UXO-contaminated properties.

Number four, Congress should make clear its desire that DOD investigate the possible presence of UXO on parcels where records indicate that UXO may have been released or disposed of in the past, and investigations should be required before any property is transferred to a reuse entity. There should be universal agreement that UXO is a hazardous substance. CAL-EPA is fully committed to addressing all public health and environmental issues at closing bases.

We will incorporate all UXO issues into the existing investigative and cleanup work at Fort Ord.

Thank you very much.

[Prepared statement of Mr. Wang follows:]

COMMITTEE ON NATURAL RESOURCES HEARING  
"MANAGING UNEXPLODED ORDNANCE OF FEDERAL LANDS"

MAY 2, 1994

MR. DAVID WANG  
CHIEF PROGRAM EXECUTIVE  
OFFICE OF MILITARY FACILITIES  
DEPARTMENT OF TOXIC SUBSTANCES CONTROL  
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## INTRODUCTION

Good morning. I would like to thank the members of the committee for allowing me the chance to speak to you today. My name is David Wang. I am Chief Program Executive of the California Department of Toxic Substances Control's Office of Military Facilities, which is a part of the California Environmental Protection Agency (Cal/EPA).

Cal/EPA Secretary James Strock last year designated me as the "single point of contact" for coordinating all the Agency's work on the cleanup and transfer of parcels at California's closing military bases. I also represent California on the Congressionally mandated Defense Environmental Response Task Force, the California Base Closure Environmental Committee, and the Western Governors' Association Federal Advisory Committee on development of cleanup technology for use at military bases. Cal/EPA has fostered a proactive relationship with the United States Environmental Protection Agency (U.S. EPA) and the Department of Defense (DoD) to address many issues that must be resolved before any productive reuse can take place at the closing bases.

The committee has invited me to speak today about Cal/EPA's role in the closure of Fort Ord and transfer of lands containing unexploded ordnance (UXO) to the Bureau of Land Management, and to discuss how Cal/EPA regulates UXO-contaminated land under federal and state hazardous waste laws.

## CAL/EPA'S REGULATORY ROLE

Cal/EPA is responsible for protecting human health and the environment from threats posed by hazardous substances. Cal/EPA's role at California's 22 closing military bases is to oversee DoD's investigation and cleanup of hazardous-substance contamination, and to help accelerate the transfer of clean or remediated parcels to other entities for reuse. Fort Ord is one of 10 closing bases in California that are on the National Priorities List (NPL), also known as the Superfund list. Even though U.S. EPA is the lead regulatory agency for

environmental cleanup at Fort Ord, Cal/EPA plays an important role by ensuring that all remedial work meets California state standards and that the interests of local entities are adequately considered.

Cal/EPA, U.S. EPA and DoD entered into a Federal Facility Agreement (FFA) for the cleanup of Fort Ord in 1990, one year before the base was designated for closure. The FFA established the roles and responsibilities for each agency and contained a schedule for investigation and cleanup of the base. However, the FFA did not cover UXO contamination. Regulatory agencies traditionally have not considered UXO at active federal facilities to be a hazardous waste in the conventional sense. The 1991 decision to close the base has made UXO contamination a critical issue because of the importance of making UXO-contaminated land available to civilian entities for reuse. We will be working with DoD and U.S. EPA to develop a process and schedule for restoration of areas containing UXO.

Cal/EPA's long-term objective at Fort Ord and other California bases is to achieve full remediation and provide the opportunity for unrestricted reuse of all contaminated property. Cal/EPA will hold DoD fully responsible for cleaning up all UXO contamination, even if a final cleanup is not anticipated for many years. Unfortunately, there currently is no technology that can effectively and efficiently clean up UXO contamination. The available cost estimates indicate that cleanup of UXO contamination will be extremely expensive -- more than \$800 million for Fort Ord alone.

In the short term, DoD and the regulatory agencies are conducting emergency-removal actions to abate the most immediate threats. This work primarily consists of removing ground-level ordnance outside of the principal 8,000-acre impact area that is known to contain extensive UXO contamination. Cal/EPA is in the process of obtaining maps of these UXO-contaminated areas, posting warning signs around contaminated areas, working with DoD on employee-safety issues and is striving to keep the local community apprised of UXO issues. We are considering ordering the Army to construct a fence around major UXO areas. However, a fence may cost \$2 million

to construct and have a negative impact on migratory animals. We are considering these factors, as well as the cost of maintaining the fence prior to making a final decision.

We are also examining the issue of development on lands adjacent to UXO areas. We were recently advised by the County of Monterey of a proposal to expand the parking lot at the Laguna Seca raceway. This parking lot is adjacent to a known UXO impact area. We will work with the Army to determine if UXO is present in the area proposed for the parking-lot expansion. Expansion of the parking lot may be delayed until a full investigation and any necessary remedial action is completed.

This short-term work involves only a small fraction of the total UXO contamination at Fort Ord. I want to emphasize that, in our opinion, it does not appear that long-term cleanup of all UXO contamination at Fort Ord will be feasible until new technology is developed that can effectively locate and remove all buried UXO at a reasonable cost. Until such technology is developed, reuse opportunities and public access to the 8,000-acre impact area will be severely limited.

#### **CLEANUP OF UXO CONTAMINATION**

The most serious hurdles to cleanup of UXO contamination at Fort Ord through use of existing technology are the high cost and the significant environmental impact.

The rule of thumb is that it costs approximately \$10,000 per acre per foot deep to clean up UXO contamination with existing technology. In other words, you would need \$10,000 to remove all UXO up to one foot deep in the ground over a one-acre area. However, UXO may be imbedded up to 15 to 20 feet deep in the ground. This buried UXO cannot be discounted because over the years it may eventually surface and create a safety hazard to future users. Using this rule of thumb, we estimate that remediation of the entire Fort Ord 8,000-acre impact area to 10 feet deep would cost \$800 million.

We currently estimate that the cost of cleaning up toxic contamination at all 22 California closing base to be \$2.5 billion (excluding the Fort Ord UXO). The \$800 million UXO cleanup at Fort Ord would add 30 percent to the overall statewide cleanup bill. Toxic cleanups at military bases already have to compete for funding with other federal priorities. You may recall that, in January, Congress rescinded \$507 million from military base cleanups and redirected it to disaster relief for the Northridge earthquake. A commitment to a complete UXO cleanup will increase the competition for federal funds.

Bear in mind that the \$800 million would not even provide for a complete UXO cleanup. Excavation activities below 10 feet would have to be prohibited because of the possibility of encountering UXO. Regular monitoring would be required in perpetuity to detect UXO that may be migrating to the surface. This needs to be considered in calculating the true long-term cost of a UXO cleanup.

A complete UXO cleanup at Fort Ord would also have a significant environmental impact. The 8,000-acre impact area includes sand dunes, chaparral and other environmentally sensitive terrain that would have to be disturbed. A total of 17 endangered or threatened species have been identified at Fort Ord, and cleanup work would almost certainly disturb the habitat of some of these species. This impact would have to be considered as part of a long-term cleanup.

## **TECHNOLOGY DEVELOPMENT**

We believe that the best way to bring about the cleanup and reuse of UXO-contaminated land at Fort Ord is to develop new cleanup methods and technologies that can remedy the problem at a reasonable cost and environmental impact.

Cal/EPA is actively working with the Western Governors' Association's Develop On-Site Innovative Technology (DOIT) Committee that is helping develop new technologies for cleanup of military bases. Jim Austreng of my staff is the committee's spokesperson and is present at this hearing to discuss technology-development matters.

In addition, Cal/EPA has recently begun a unique technology evaluation and certification program, and is involved in new and planned technology-demonstration projects at McClellan Air Force Base and the Alameda Naval Air Station. Cal/EPA is participating in a technology demonstration project at Fort Ord that is in the planning stages. We would be happy to make these programs available and render any other assistance to help develop technologies to better deal with the UXO problem.

## **RCRA REGULATORY ISSUES**

The last subject I would like to address is how Cal/EPA can use the Resource Conservation and Recovery Act (RCRA) and other laws to regulate cleanup of UXO contamination.

In 1992, U.S. EPA authorized Cal/EPA's Department of Toxic Substances Control to administer the RCRA program in California. That means that Cal/EPA has the full legal authority to oversee RCRA regulations for the storage, treatment and disposal of hazardous waste. In addition to RCRA, Cal/EPA also uses the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) to compel and oversee cleanup of past hazardous-substance contamination.

The Federal Facilities Compliance Act of 1992 instructed the U.S. EPA Administrator to propose and promulgate RCRA regulations concerning the classification and handling of UXO as hazardous waste. The Act specifies that the U.S. EPA Administrator consult with the Secretary of Defense and "appropriate State officials" and promulgate the regulations by April 1995.

The Department of Toxic Substances Control to date has not had any direct discussions with U.S. EPA over this issue. Cal/EPA would be interested in meeting with U.S. EPA, DOD and officials from other states to develop an interim agreement on regulation of UXO until the RCRA regulations are finalized.

It is imperative to understand that the new RCRA regulations will primarily govern how UXO will be stored, transported, treated and disposed after it is excavated. To the extent that these regulations are rigorous or flexible, they may affect the cost and difficulty of dealing with UXO once it is been excavated. However, the UXO buried in the soil at Fort Ord is not currently subject to RCRA regulations. RCRA regulations do not specify cleanup levels or contain guidance for determining when UXO must be removed from the ground. Similarly, CERCLA does not specify cleanup levels.

Removal decisions and cleanup levels are based on health, resource and ecological assessments that determine the threats that hazardous substances pose to human health and the environment. Regulatory agencies use the risk assessments with future land uses in mind to determine cleanup levels that protect public health and the environment. On all large-scale cleanups, there must be a public-comment period, and DoD and the regulatory agencies must consider all public comments before making any final decisions. Other factors that we consider when developing cleanup plans include cost, community acceptance, effectiveness, and conformance with applicable federal, state and local regulations. Cost should be a balancing, but not an overriding factor in evaluating cleanup options. Cleanup work must also conform with the California Environmental Quality Act. Cal/EPA will work to ensure that all stakeholders are involved in the decision-making process.

Fort Ord is a good example of the uncertainty involving regulation of UXO. The Department of the Army recently determined that parcels containing UXO were not contaminated. The Army contended that UXO is not a hazardous substance. Both U.S. EPA and Cal/EPA rejected the Army's determination that the parcels are uncontaminated and maintain that UXO is a hazardous substance.

It almost goes without saying that UXO is different than most of the hazardous substances regulated under RCRA and CERCLA. On the one hand, UXO is obviously explosive, and explosive wastes are unquestionably subject to RCRA. On the other hand, federal

environmental laws have evolved to deal primarily with the cleanup of toxic substances, such as metals or solvents, that can cause health or environmental problems if released into the environment. UXO presents an entirely different type of hazard. In overseeing the cleanup of UXO, the regulatory agencies and DOD will have to be prepared to develop new, common-sense approaches to deal with a problem that is unique to military facilities.

## RECOMMENDATIONS

In conclusion, I would like to make several recommendations to your committee on dealing with UXO contamination. Those recommendations are:

1. Congress should support full funding of base cleanup efforts, and funding of research and development of new cleanup technologies that effectively address UXO contamination. Funding shortfalls in either of these areas may lead to prolonged delays in full cleanup and reuse of Fort Ord and other bases.
2. Congress should encourage U.S. EPA and DoD to work with the states on development of regulations governing UXO. Many states, like California, manage RCRA programs and will be directly affected by decisions involving the cleanup and use of UXO-contaminated land.
3. Congress should be supportive of all stakeholders -- including local communities and agencies such as Bureau of Land Management -- becoming involved in the decision-making process involving the short- and long-term cleanup of UXO and reuse of UXO-contaminated properties.
4. Congress should make clear its desire that DoD investigate the possible presence of UXO on parcels where records indicate that UXO may have been released or disposed of in the past. An investigation should be required before any property is transferred to a reuse entity. There should be universal agreement that UXO is a hazardous substance.

Cal/EPA is fully committed to addressing all public-health and environmental issues at closing bases. We will incorporate all UXO issues into the existing investigative and cleanup work at Fort Ord.

Thank you for allowing me the opportunity to testify. I will be happy to answer any questions that you might have.

Mr. FARR. Thank you very much. Do you see any problems with the land that's been prioritized at Fort Ord from CAL-EPA's standpoint of delaying the transfer of that land to public or private use?

Mr. WANG. It's an iterative process and currently we are working with the base and the U.S. EPA to develop the base cleanup plans. In those plans we identify the priority for reuse parcels. Each time when the new reuse parcels become feasible, we will revise the plan to reflect the priority.

Mr. FARR. Have we run into any snags yet?

Mr. WANG. Currently, we have not. We appreciate the cooperative attitude from the base.

Mr. FARR. Thank you. Walter Wong.

#### STATEMENT OF WALTER WONG

Mr. WONG. Congressman Farr, I think the first thing that we'll probably do, especially you and members of your Natural Resource Committee should be commended for conducting this hearing, because even though there is a pressing need in California and other parts of the Nation to clean up contaminated closed bases for conversion to economic development and recovery, it's that the obstacles of cleaning up unexploded ordnance have never been discussed.

This is the first time that this has ever been discussed, and thus, you ought to be commended for initiating this.

On the issue of unexploded ordnance contamination, Fort Ord is an appropriate example because it contains the largest impact area with unexploded ordnance in the western United States, consisting of 8,000 acres. Whether they fence it or not, it will be abandoned because there is no access to it.

There are also 20 other smaller contaminated sites identified in Fort Ord. Some of these sites are in areas designated for transfer to State college or to the private sector. Thus, now I will respond to those questions that you asked me to analyze. What are the major problems with cleanup of unexploded ordnance?

First, of course, it's not clearly defined. Cleanup of unexploded ordnance is a safety issue and not covered under the Superfund toxic cleanup process or funding. Although Superfund requires these impact areas to be tested and mitigated for toxic leachate contamination, the total cleanup, oversight and declaration of clean for unexploded ordnance is the responsibility of the Department of Defense. There are no independent oversight or prescribed cleanup levels.

Second, the present cleanup methodology for unexploded ordnance is labor-intensive, time-consuming and unreliable for deeper contaminations. The cleanup process involves first burning the surface vegetation to allow personnel to walk safely on the surface, then the use of metal detectors to identify ordnance at the depth of four feet, and then ordnance are dug up.

The reliability issue occurs with deeper buried ordnance rising to the surface after years of being buried due to vibration of the soil. Such incidents have been reported in subdivisions in San Diego that were built on former military bases.

Finally, the other issue that has been probably spoken of by other speakers is the cleanup costs for unexploded ordnance are very expensive. You heard that the unexploded ordnance at the

8,000 acres is probably going to be about \$100 million or more. The unit cost ranges between \$7,000 to \$10,000 at a depth of 1 foot.

Funding of this type of cleanup is not really designated or secure. As an example, some of the money earmarked for cleanup in the Defense budget was just recently removed to fund the Los Angeles earthquake problems. So what's the solution? My recommendation, particularly to Congressman Farr and Congressman Miller, is the base problem that identified the issue of unexploded ordnance and cleanup on public land, particularly closed military bases, needs legislation that will place it in a high priority for public safety and economic recovery.

Provide adequate funding and establish levels of cleanup and oversight. Your committee should seriously consider the possibility of changing the definition of toxic contamination in the Federal Superfund law to include unexploded ordnance, and thus, the funding and the regulatory process is already in place and could be expanded to the cleanup of unexploded ordnance on public land.

If this suggestion is not feasible, other mechanisms to assure funding and oversight should be considered. The issue of unexploded ordnance affects public health, public safety, environment and the economy, and must be addressed in all base closures as a high priority. Otherwise, you're going to have parcels of land that have been declared clean of toxic contamination, but cannot be transferred because of unexploded ordnance.

Thank you.

[Prepared statement of Mr. Wong follows.]

PRESENTATION TO NATURAL RESOURCES COMMITTEE  
HOUSE OF REPRESENTATIVES  
BY WALTER WONG, DIRECTOR OF ENVIRONMENTAL HEALTH  
MONTEREY COUNTY  
MAY 2, 1994  
SEASIDE, CALIFORNIA

THE ISSUE OF UNEXPLODED ORDINANCE (UXO) ON PUBLIC LANDS

Chairman Miller, Congressman Farr and members of the Natural Resources Committee - I am Walter Wong, Director of Environmental Health for Monterey County. I would like to commend your committees on conducting this hearing on the issue of unexploded ordinance (UXO) on public lands. The issues of UXO at Fort Ord is applicable to any of the designated base closures in the nation. With the pressing need to clean-up contaminated closed bases for conversion to private use in order to achieve economic recovery in the affected communities, the obstacles to cleaning unexploded ordinance has not yet been publicly identified or discussed. This hearing is the first time this issue is being analyzed.

I hope my testimony today can duplicate my testimony of April 9, 1992 to the Subcommittee on Transportation and Hazardous Materials of the Committee on Energy and Commerce of the House of Representatives. At that hearing I testified on the needed changes to the clean-up process of Superfund designated toxic waste contaminated military bases such as Fort Ord. The result of all the testimonies was the passage of HR4016 by then Congressman, Leon Panetta, which resulted in requiring closed bases to designate uncontaminated or clean sites by April 1994; accelerated testing and clean-up without sacrificing public health, safety, and environment; EPA clearance of clean parcels, and allowing the parcelization of clean parcels.

On the issue of unexploded ordinance contamination, Fort Ord is an appropriate example because it contains the largest impact area with unexploded ordinance in the Western United States consisting of 8,000 acres that is going to be fenced and abandoned. There are also 20 other smaller contaminated sites identified at Fort Ord. Some of these sites are in areas designated for transfer to the State College or private sector.

The problems that need to be resolved on the unexploded ordinance clean-up need immediate attention in order to avoid situations in the future that will result in parcels of land that have been declared clean of toxic contamination cannot be transferred because of unexploded ordinances. The following are some of the problems:

1. Clean-up of unexploded ordinances is a safety issue and not covered under the Superfund Toxic Clean-up process or funding. Although Superfund requires these impact areas to be tested and mitigated for toxic leachate contamination, the total clean-up, oversight, and declarations of clean-up of unexploded ordinances is the responsibility of the Department of Defense. There are no independent oversight or prescribed clean-up levels.
2. The present clean-up methodology of unexploded ordinances is labor intensive, time consuming, and unreliable for deeper contamination. The clean-up process involves first burning the surface vegetation to allow personnel to walk safely on the surface. Metal detectors are used to detect ordinances to a depth of four feet. Ordinances that are detected are dug out of the ground. The reliability issue occurs with deeper buried ordinances rising to the surface after years of being buried due to the vibration of the soil. Such incidents have been reported in subdivisions in San Diego that were built on former military bases.
3. Clean-up cost for unexploded ordinances is very expensive. The estimated cost for cleaning the 8,000 acre impact area at Fort Ord to a depth of two feet is 100 million dollars. This cost and the liability issue is probably why the 8,000 acre impact area is going to be fenced and abandoned. Funding for these types of clean-up is not designated or secured. As an example, some of the money earmarked for the clean-up in the Defense budget was recently removed to fund the Los Angeles earthquake disaster fund.

Based on the problems that I have identified, the issue of unexploded ordinance clean-up of public land, particularly closed military bases, needs legislation that will place it into a high priority for public safety and economic recovery, provide adequate funding, and establish levels of clean-up and oversight. Your committee should seriously consider the possibility of changing the definition of toxic contamination in the Federal Superfund Law to include unexploded ordinances and thus the funding and regulatory process that is already in place could be expanded to the clean-up of unexploded ordinances on public land.

If this suggestion is not feasible, other mechanisms to assure funding and oversight should also be considered.

The issue of unexploded ordinances effects public safety, public health, environment, and economy and must be addressed in all base closures as a high priority issue.

Thank you for the opportunity to testify before your Committee.

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Mr. FARR. Thank you very much, Mr. Wong. Mr. Hendricks.

**STATEMENT OF THOMAS J. HENDRICKS**

Mr. HENDRICKS. Thank you, Congressman Farr. First, I'd like to go back to the first witness. There was a discussion regarding the fence out at Fort Ord. Although the Army doesn't plan to put a fence out there, Colonel Ellzey did not remind you that they do have concertina fence or concertina wire around most of that impact area. I would presume that they plan to leave that in place along with signage, which would be a deterrent.

The second would be on injuries in past years, and there have been injuries to teenagers back in the days when we had the M-79 grenade launcher, which is affixed to a part of a rifle. Many times, these did not explode and the kids would leave the housing areas and wander into one of the ranges that was fairly near a housing area, and I know of two instances where teenagers were maimed. No one was killed, fortunately.

Mr. FARR. When was that?

Mr. HENDRICKS. This was in the early to mid-1970s, right after—the M-79, I think, was developed for us for Vietnam. We were using them heavily with the basic trainees before the division came on board. So this would have been in the mid-1970s.

Mr. FARR. After those injuries were protocols developed to fence or patrol?

Mr. HENDRICKS. Colonel Ellzey mentioned, and this has also been mentioned on the archival a bit. Archives are records of ammunition issued by an ammo supply point to a unit that's firing on a range. When a round, particularly high-angle round or mortar, does not explode, it's called a dud, and that's recorded.

To go back for all the years that Fort Ord has been an installation and the number of ranges, and I think it was way above the number of 46 out there total, some of those were not high impact or high angle. Some of those were machine guns, where we're talking about ball ammunition.

But still when you take the number of rounds that have been fired and trying to go through those records, you're talking about one major, substantial task. And trying to remember when something was not exploded, when EOD did go in, or when a range fire may have exploded it. So the archives are a start. They are not going to be pure.

Did Fort Ord take remedial action? Yes. Any time there's an incident, any Federal agency, particularly the military, responds very rapidly to warn the kids, keep your kids out of the impact area, additional signage and the like. So, yes, that was done.

Mr. FARR. You obviously had a turnover in military dependent personnel. So you had new kids there every year and you're going to have new people that are going to have to do the warning process to very soon. And, hopefully, if this land gets transferred and reuse gets started as soon as we'd like it to, you're going to have to go through the educational process.

Mr. HENDRICKS. It will be a continual education process. Many times, signage will be torn down. They'll have people who are replacing it. You're going to have people who don't believe the signage, and they're going to wander in wanting to explore.

Even with a 10-foot-high, double-lined Cox fence, you would not be able to keep out people who want to get into the area.

Mr. FARR. Do you think that's going to be a more serious problem than it has been with military dependent personnel?

Mr. HENDRICKS. There's going to be a different challenge. The military dependents have been aware by hearing the machine guns chatter, by hearing the mortars fire and other rounds during the day that there is activity.

As usage continues to change at Fort Ord, with new people moving in and hearing about an impact area and not knowing what an impact area may be, there is a possibility that someone may decide to explore with their backpack one Saturday morning and go beyond the signage.

That possibility does exist. Does anyone here at this table or any of the panels you've heard today have an answer? I doubt it.

Mr. FARR. It exists right now, but the difference is that the base is closed and patrolled. The Army will still have responsibility for that area and have to work out protocols with the BLM to patrol it.

Colonel ELLZEY. Yes, sir, that is correct.

Mr. FARR. And will the advisory board that you're on, Mr. Hendricks, be playing a role in monitoring that?

Mr. HENDRICKS. We are going to get to the role that we hope to play, but I wanted to try to provide some answers on that fencing a bit for you.

Mr. FARR. Thank you.

Mr. HENDRICKS. I've knocked out the first nine slides with the departure of the chairman because you are very familiar with what we were going to see. So we can start with number nine. This starts with activities from 1992 to present and the planning process. Primarily, we wanted to show the plan that went from a strategy, and we're now focusing on the environment, the economic redevelopment, and education.

This slide shows the environmental protection, where we're dedicating large areas for environmental protection. More than 16,000 acres have been dedicated to the habitat management by Monterey County, Bureau of Land Management, University of California Natural Reserve System, and the California State Parks, with cooperation anticipated by the five cities that should have jurisdiction.

Fort Ord, as you know, is a national model. This was awarded in September 1993, following the visit by now Secretary of Defense Perry. It is a national model for base conversion. It was the only base chosen from the 1991 round of base closures for this status. It was chosen because of a very unique opportunity that we have to create quality jobs as part of the President's desire to expedite communities' rapid economic recovery from base closures.

The Restoration Advisory Board, this is a new animal that has come into the scene. The responsibilities will be to provide advice on environmental restoration issues to the Army and regulatory agencies, to conduct regular meetings, to review and evaluate documents, to provide input on priorities among sites and projects.

The Restoration Advisory Board is actually being transitioned from a Technical Review Committee. Now, the Technical Review

Committee has been in place since 1990 and they have conducted quarterly meetings. It is a 30-person membership and it consists of all elements, except citizens' representation. And this is what the RAB now is bringing into this. We are taking the 30 members, primarily technical individuals, and adding to that 12 and, with myself, 13 citizens from the community. This will be the Restoration Advisory Board.

This will continue to be the existing forum for information exchange as the TRC members transition to the RAB.

Mr. FARR. So you'll have 42 members.

Mr. HENDRICKS. There will be a 42-member Board.

Mr. FARR. Do you vote by consensus?

Mr. HENDRICKS. We will continue to operate by consensus, just as we did on the Task Force. Now, the purpose of the RAB is to promote community involvement, exchange of information between governmental agencies and communities, community review of progress and feedback, and the restoration will include the Superfund cleanup of asbestos, radon, underground tanks and UXO.

While we're on the UXO, we'd like to also mention that we have, again, discovered that there is funding available. We had applied early on when the Task Force was very active for a \$75,000 grant. The money is available. However, the Task Force was not a legal entity to which they could designate the funds.

Now that FORG, a governmental entity, is about to really come into being, we expect that we'll be able to apply for that \$75,000 to assist us in having technical assistance with the RAB, also. So that the Public Works Department of Fort Ord are not expending all of their monies to support us.

And by the way, I forgot to mention my co-chair for the Army is here, Joe Cochran is sitting up there.

This one shows how the Restoration Board on a closing installation is established. Coming down the left side over there, you see the Technical Review Committee as they transition into the RAB, and you will have the community co-chair, along with the installations representative, the state installation component, local government, citizens group, re-use committee, the Department of Defense transition coordinator, EPA representative.

We have had our initial meeting on February 7. The next meeting will be held on May 11. That's kind of what the Restoration Advisory Board will be looking like, and we'll continue to represent the community.

I'll be glad to answer any questions.

[Prepared statement of Mr. Hendricks follows:]

**FORT ORD  
RESTORATION ADVISORY BOARD**

The Fort Ord Restoration Advisory Board (RAB) is an outgrowth of the Fort Ord Community Task Force and evolved from the Environmental Pollution Clean-up Advisory Group. It is transitioning from the Technical Review Committee (TRC) of the local Base Realignment and Closure (BRAC) Project Team.

The purpose of the RAB is to:

- promote community involvement
- exchange of information between government agencies and communities
- community review of progress and feedback
- restoration includes:
  - Superfund (cleanup)
  - asbestos
  - radon
  - underground tanks
  - unexploded ordnance

**RAB RESPONSIBILITIES**

- provide advice on environmental restoration issues to the Army and regulatory agencies
- conduct regular meetings
- review and evaluate documents
- provide input on priorities among sites/projects

**RAB TRANSITION FROM TRC**

- Technical Review Committee (TRC)
  - Since 1990
  - Quarterly meetings
  - 30 person membership
  - Membership consists of all elements except citizen representation
- Has been the forum for information exchange
- TRC members transition to RAB members
- All closing installations must establish a RAB

**RAB CO-CHAIRPERSONS**

- Army Co-chair: appointed the BRAC Environmental Coordinator
- Community Co-chair: selected by elected officials

**RAB MEMBERS**

- BRAC Cleanup Team
- DOD Transition Coordinator
- Technical Review Committee (TRC)
- Installation Component
- State of California (Region 2)
- Environmental Protection Agency (Region 9)
- Local government
- Community Citizen Groups/ Individuals
- Reuse Committee (FORG)

**RAB MEMBERSHIP SELECTION PROCESS**

- Selection Committee
  - Community co-chair
  - USEPA representation
  - California EPA representative
  - Two current members of the TRC/RAB
  - Established selection criteria
  - Selected 12 community members and six alternates

**RAB MEETINGS**

- As needed during transition
- Quarterly meetings, open to the public, at convenient times and locations
- Workshops/site tours (as required)
- Pre-meeting agenda
- Public notification
- Public forum

**UNEEXPLODED ORDNANCE**

The Fort Ord inland firing range complex of approximately 8000 acres contains a vast amount of unexploded ordnance. There are many unanswered questions currently concerning the technology and funds available to undertake the immediate clean-up of this area. The Bureau of Land Management is scheduled to assume control of this area. The RAB will assist in monitoring the transfer, clean-up and restoration process. It should also be understood that should all 8000 acres be sanitized, not all 8000 acres should be transferred from BLM. Much of the acreage harbors endangered species, vernal ponds or the ground slopes are greater than 30% which would preclude construction. The community will probably best be served by long term management of this acreage by BLM.

**TECHNICAL ASSISTANCE GRANT**

As community RAB's become organized and functioning, funds (Technical Assistance Grant) are available. The Environmental Pollution Cleanup Advisory Group of the Task Force had applied for the \$75,000. grant, but the Task Force was not a legal entity. Now that Fort Ord Reuse Group (FORG) is a legal entity, the RAB will be re-applying for the grant. The purpose of the grants are to provide funds for RAB to hire consultants, as necessary, working for the community. These funds can play a vital part in community efforts and oversight.

Although on the 1990 BRAC list, Fort Ord is well ahead in planning and action. A host of technically proficient professionals, a community of environmentally sensitive volunteers, bolstered by clear-thinking elected officials provide impetus for these efforts.

Respectfully submitted,

Thomas J. Hendricks  
Co-Chair  
Restoration Advisory Board

Mr. FARR. Thank you very much. Just one reflection on the panel before you, particularly the panel with Lora Lee Martin and Mr. Hooper on technology transfer. Has your Board been involved with those discussions?

Mr. HENDRICKS. The Technical Review Committee, I think, has been involved. Is that correct, Joe?

Mr. COCHRAN. No, they have not been. They may have been as individuals.

Mr. HENDRICKS. But not as a group.

Mr. COCHRAN. The Technical Review Committee's purpose—

Mr. FARR. If he's going to speak, he's going to have to come up to a microphone and identify yourself, if you would. Everything the Federal Government does is on the record. So we want to keep it understandable.

Mr. COCHRAN. Fort Ord has a Federal Facilities Agreement with the EPA and the State of California, which was instituted about three, three-and-a-half years ago. And as part of that, we were to establish a Technical Review Committee of primarily technical people to look over what we were doing. It was basically a sanity check to make sure to outsiders who weren't intimately involved with our progress on cleanup, it made sense to them what we were doing.

Consequently, that particular group now has transitioned into the RAB. They weren't directly plugged into Lora Lee Martin's proposal with the Army. I think that primarily has been carried out directly with Department of Army people.

Mr. HENDRICKS. We see a need for them to be plugged in.

Mr. FARR. Could you just identify yourself for the record?

Mr. COCHRAN. Yes. Joe Cochran. I'm with the Environmental Office at Fort Ord.

Mr. FARR. Thank you. I would hope that you might become an advocate for the funds that we're trying to get released so that we can, indeed, take the cumulative knowledge that you've created here, not only in how do you clean it up, but how do you do it with the interface of a local community, with the questions that this panel has brought to the table about it's one thing to have property owned and operated by Federal entities and it's another to have property turned over to people who have no background with the history of it and now are responsible for what it contains.

I can see that there's going to be a need for a lot of community education, as well as just better technology implemented at the community level.

Our last witness today is Joe Cavanaugh, who is the Project Coordinator for the Reuse Group.

#### STATEMENT OF JOSEPH A. CAVANAUGH

Mr. CAVANAUGH. Thank you, Congressman Farr. Thanks for the opportunity to discuss issues related to unexploded ordnance at Fort Ord. I have three points to cover in my testimony today.

The first of these is concerned with land use planning issues as they relate to Fort Ord and the impact area, where the greatest concentration of unexploded ordnance exists.

This desirable area for development of approximately 8,000 acres, proximate to the cities of Seaside, Monterey and Del Rey Oaks, is an area which is encumbered not only with unexploded

ordnance, but also by concentrations of plants and animals which are protected by the Endangered Species Act. Our initial base reuse plan included residential and commercial development in the southwest corner of Fort Ord.

However, based upon the UXO and endangered species constraints, we modified our plan to define the area as open space, excluding any residential development and severely limiting our commercial development in the area.

There are at least three advantages that arise from this approach. One, avoidance of exorbitant costs of cleanup required to make the area safe for intensive reuse; two, the reservation of a large habitat management area for preservation of critical biological resources, which enables intensive development in other areas of the base; and, three, a cooperative planning approach which benefits the local community, the U.S. Army and the Bureau of Land Management, who will become custodians of the land.

The second point I wish to make today is to clarify that there is an existing U.S. EPA program to provide funding for local citizens groups to monitor cleanup activities at Superfund sites. My colleagues, Tom Hendricks, co-chair of the RAB, and Walter Wong, Monterey County's Environmental Health Officer, have spoken to you about the history of citizen involvement in Fort Ord reuse planning.

One of the difficulties we faced was that this EPA funding was not available to our local environmental cleanup group because of technical limitations in the EPA grant proposal regulations. This funding source should be made available to local RABs to enable these resources to be utilized by the local community.

Current regulations are too narrow and requirements too restrictive to enable local community groups easy access to these funds, and that's the point that Tom made earlier.

The third point I would like to make today is that communities impacted by base closures have a large number of Federal civilian employees who lose their job at the same time that the local economy is suffering from the overall economic impact of the base closure. Jobs are scarce and many hard-working, professionally trained individuals face long-term unemployment or relocation to another area.

We propose that a program be developed to train local residents, focusing on civilian employees targeted for layoff at the facility, to work in the environmental cleanup of the base. This will provide training and employment opportunities for individuals who otherwise would not have access to jobs in the depressed local economy.

In the past, contracts for cleanup have been awarded on a national level, frequently going to residents of other States who move into the area to fill these job slots. Several unique and innovative proposals have been put forward to achieve this goal, and we will be happy to share them with you as appropriate.

Thank you for this opportunity to provide these comments. I am available to provide additional information, answer questions or explore legislative initiatives to achieve the goals outlined today. Thank you.

[Prepared statement of Mr. Cavanaugh follows:]

Testimony for the House Committee  
On  
Natural Resources

Monday, May 2, 1994  
Seaside City Council Chambers

George Miller, Chair

Subject: Unexploded Ordnance  
Presenter: Joseph A. Cavanaugh, Project Coordinator  
Fort Ord Reuse Group (FORG)

Thank you for the opportunity to discuss issues related to unexploded ordnance at Fort Ord. I have three points to cover in my testimony.

The first of these is concerned with land use planning issues as they relate to Fort Ord and the impact area where the greatest concentration of unexploded ordnance exists. This desirable area for development of approximately 8,000 acres proximate to the cities of Seaside, Monterey, and Del Rey Oaks, is an area which is encumbered not only with unexploded ordnance but also by concentrations of plants and animals which are protected by the Endangered Species Act. Our Initial Base Reuse Plan included residential and commercial development in the southwestern corner.

However, based upon the UXO and endangered species constraints, we modified our plan to define the area as open space, excluding any residential development and severely limiting our commercial development in the area. There are at least three advantages that arise from this approach:

1. **Avoidance of the exorbitant costs of cleanup** required to make the area safe for intensive reuse.
2. **The reservation of a large habitat management area** for preservation of critical biological resources which enables intensive development in other areas of the base.
3. **A cooperative planning approach** which benefits the local community, the US Army and the Bureau of Land Management who will become custodians of the land.

The second point I wish to make today is to clarify that there is an existing US EPA program to provide funding for local citizen groups to monitor cleanup activities at Super Fund Sites. My colleagues, Tom Hendricks, Co-Chair of the Restoration Advisory Board, (RAB) and Walter Wong,

Monterey County's environmental health officer, have spoken to you about the history of citizen involvement in Fort Ord Reuse Planning. One of the difficulties we faced was that this EPA funding was not available to our local environmental cleanup group because of technical limitations in the EPA grant proposal regulations. This funding source should be made available to local RABs to enable these resources to be utilized by the local community. Current regulations are too narrow and requirements too restrictive to enable local community groups easy access to these funds.

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Thank you for this opportunity to provide these comments. I am available to provide additional information, answer questions or explore legislative initiatives to achieve the goals outlined for you today.

JAC/am

Mr. FARR. Thank you very much. I hope that you are aware that we just got \$800,000 released for the work force reduction here at Fort Ord, so that those individuals could be retrained.

Mr. CAVANAUGH. We're working on that and we have a meeting scheduled on Wednesday with the OET to work on that specific proposal with the \$800,000.

Mr. FARR. What I'd like to do in finishing this panel is perhaps go back and have the panelists just reflect on what you've heard this morning from the two panels ahead of you and that statement that you've all made that Fort Ord is a national model. What does it mean to be a successful national model and is there anything you've heard today that would lead this committee staff and myself to make recommendations for change in the way we approach those models?

There's two parts to the question. What is it that you think makes Fort Ord a successful national model? What is it that you've learned that we might even improve on that, other than a hell of a lot more money?

Mr. WONG. Congressman Farr, I think that Fort Ord is a good example because the obstacles you heard today are very gigantic about cleaning out unexploded ordnance. But the same things occur under Superfund. As you recall, your predecessor, Congressman Panetta, then got H.R. 4016 passed to speed up the cleanup, allow for parcelization and declaration of clean parcels and shortened the testing period.

That has made everyone in the United States, all bases, feasible for these reuse aspects of cleaning up and transfer. And Fort Ord has become a model because they are the first one. They had to set the pace, and they've done an outstanding job of complying with every one of the mandates of the Panetta bill.

I hope that the next bill will be a Farr bill on these unexploded ordnance, and Fort Ord, I'm sure, with their personnel will probably be the first to comply with that, also.

Mr. FARR. Thank you. Any other comments?

[No response.]

Mr. FARR. If not, thank you very much. This concludes the regular panel. It's 12:30 p.m. and we've been sitting in this room since before 9:30 a.m. As a prerogative of the Chair, I don't see this done in other congressional hearings, but if there are other people in the audience that have come here today that wish to make a comment, I'll afford that opportunity for you.

Anyone can submit for the record in writing their comments and that was announced when this committee hearing was announced. Is there anyone else who wishes to add something today?

[No response.]

Mr. FARR. If not, thank you very much for coming, and I appreciate the work. It gives us a lot of things to think about as we go back to Washington and make this truly a model. Thank you. This meeting is adjourned.

[Whereupon, at 12:32 p.m., the committee was adjourned.]

A P P E N D I X

MAY 2, 1994

ADDITIONAL MATERIAL SUBMITTED FOR THE HEARING RECORD

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**Military Munitions Waste Working Group Report to  
the Federal Advisory Committee to Develop On-Site  
Innovative Technologies (DOIT Committee)**

November 30, 1993

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#### APPENDICES

**Appendix A - National Department of Defense Environmental  
Technology Sites Program for Energetics under the  
Strategic Environmental Research and Development  
Program**

**Appendix B - Working Group List**

## EXECUTIVE SUMMARY

This report presents the findings of the Military Munitions Waste Working Group in its effort to achieve the goals directed under the Federal Advisory Committee to Develop On-Site Innovative Technologies (DOIT Committee) for environmental restoration and waste management.

As a result of military base closures after each major conflict and previously acceptable disposal practices, millions of acres of non-Department of Defense Federal lands and State, tribal, and private lands are potentially contaminated with ordnance explosive waste. Many of these lands are now accessible to the general public and could pose a risk to the public's health and safety. Therefore, an effort should be made to develop, demonstrate, and field technologies which will reduce the public's risk in a better, faster, safer, and more cost effective manner than provided by current technologies.

### Waste Stream Areas of Concern

The Military Munitions Waste Working Group identified the following seven areas of concern associated with the ordnance (energetics) waste stream:

1. Unexploded ordnance
  - Stockpiled
  - Disposed - at known locations, i.e., disposal pits
  - Discharged - impact areas, unknown disposal sites
2. Contaminated media
3. Chemical sureties/weapons
4. Biological weapons
5. Munitions production
6. Depleted uranium
7. Rocket motor and fuel disposal (open burn/open detonation)

Because of time constraints, the Military Munitions Waste Working Group has focused on unexploded ordnance and contaminated media with the understanding that remaining waste streams will be considered as time permits.

## Barriers and Shortcomings

The current approaches, processes, and technologies for locating, identifying, and remediating ordnance waste were reviewed and weaknesses analyzed. The Military Munitions Waste Working Group found that the Department of Defense and the Department of Energy are already undertaking major programs to address the technological shortcomings. The approaches and processes shortcomings appear to be receiving less emphasis. These are areas that the Military Munitions Waste Working Group identified where the DOIT Committee could provide the greatest "value added" for environmental restoration and waste management of ordnance-related problems.

The Military Munitions Waste Working Group identified the following specific problem areas:

1. **Barriers:** Identified barriers are divided into two categories, regulatory/institutional and technical. Many of the barriers were found to affect all four working groups, for example, high permitting costs, disincentives for use of innovative technologies, liability, and procurement.

### *Regulatory/Institutional Barriers*

- Procurement restrictions.
- Lack of regulations for remediation of unexploded ordnance.
- Misapplication of existing hazardous waste regulations to unexploded ordnance.
- Limited effectiveness of deed restrictions to protect future land users.
- Uncertainty as to how to assess and manage risk.
- Reluctance to award contracts or select/recommend technological approaches where there is a perceived risk in promoting a new approach, i.e., the decisionmaker gets no reward for an approach that produces good results with new technology.
- Lack of Environmental Protection Agency grant funds to process Research Development and Demonstration permits or Hazardous Solid Waste Amendment reviews.
- Placement of untrained/unqualified personnel in key roles and as decisionmakers who decide what actions should/should not take place.
- Classified technologies and information not available to solve unclassified problems.

*Technological Barriers*

- Sensitivity to clutter of unexploded ordnance detection equipment.
  - Size and mobility of equipment, e.g., terrain limitations.
  - Inability of sensors to look at large areas cheaply.
  - Inadequate trained labor force.
2. Additional shortcomings include:
- Lack of early involvement of stakeholders.
  - Lack of a uniformly accepted data base for information sharing.

**Potential Actions to Overcome Barriers and Shortcomings**

1. Provide funding to support early stakeholder involvement.
2. Recommend Comprehensive Environmental Response, Compensation, and Liability Act reauthorization include specific requirements for remediation of unexploded ordnance contaminated sites.
3. Recommend that the National Contingency Plan be modified to specifically address ordnance contamination.
4. Recommend the Department of Defense issue policy directives that clarify the waste munitions versus hazardous substance response issues.
5. Recommend an Ordnance Committee be appointed to advise the National Response Team on matters concerning ordnance contaminated sites.
6. Establish regulations for restoration of sites contaminated with unexploded ordnance.
7. Streamline procurement requirements.
8. Provide incentives for use of innovative technologies.
9. Reduce the threat of enforcement action if a technology does not reach its objective.
10. Establish a listing of existing data bases for information and reports on ordnance and explosive waste detection, identification, and remediation. If this listing does not

meet the requirements of the organizations working with ordnance and explosive waste, encourage the establishment of an "Ordnance Remediation Information and Analysis Center."

11. Encourage and support technology development and training.

### **Demonstration Selection Criteria**

The Military Munitions Waste Working Group developed demonstration selection criteria based on the Ad Hoc Committee's criteria, with additional criteria the group members thought appropriate. The criteria include site, technology, evaluation and contractor categories.

### **Identified Demonstration Sites**

Eight sites were identified as the initial potential demonstration for consideration by DOIT sites based on the selection criteria and ongoing Department of Defense research and development or technology demonstrations. These sites will be augmented as appropriate to provide a full range of sites to meet the DOIT Committee's demonstration goals.

The technological innovations in the field of ordnance explosive waste detection, identification, and remediation appear to be more evolutionary than revolutionary. The primary issues are the abilities of the technology and operators to perform as advertised and to provide all stakeholders with an understanding of the limitations and uncertainties involved with remediation. Therefore, stringent test situations need to be established to evaluate the effectiveness and efficiency of the existing systems and evolutionary improvements to these systems. These results must be repeatable to be accepted by the scientific and stakeholder communities.

We have identified the need for two test/demonstration site categories:

- Controlled test sites are designed and constructed to replicate actual field situations with all parameters precisely known, using inert munitions and munitions waste. These sites will be used to accurately evaluate the test results from technologies in research and development.
- Uncontrolled demonstration sites are sites with actual contamination where most, but probably not all, of the contaminant characteristics are known. Evaluating the effectiveness and efficiency of the demonstrated technologies will be less accurate. These sites provide a variety of environmental settings in which to demonstrate technolo-

gies which have already been proven under controlled test site environmental conditions. These sites shall have explosives safety controls established to protect authorized observers during the conduct of the demonstrations.

Both site categories are suitable for demonstration of the DOIT clean up approaches and methodologies, including stakeholder involvement.

Documentation of the tests and demonstrations at both the controlled and uncontrolled sites will provide credentials for the technology and the company. This documentation will provide the information necessary for a site manager to proceed with confidence when contracting for innovative technologies.

The initial eight sites for DOIT consideration are:

- Jefferson Proving Ground, Indiana: FY 1995 Army base closure. Research and development technology testing/demonstration for subsurface unexploded ordnance.
- Yuma Proving Ground, Arizona: Active Army facility. Research and development and applied technology testing/demonstration for surface unexploded ordnance.
- Fort Ord, California: FY 1995 Army base closure. Applied technology demonstration for contaminated media and surface and subsurface unexploded ordnance.
- Kaho'olawe Island, Hawaii: Navy formerly used Defense sites. Applied technology demonstration for contaminated media and surface and subsurface and underwater unexploded ordnance.
- Castle Air Force Base, California: FY 1995 Air Force base closure. Research and development and applied technology testing/demonstration for contaminated media and subsurface unexploded ordnance.
- Sierra Army Depot, California: Active Army demilitarization facility. Research and development and applied technology testing/demonstration for contaminated media, demilitarization processes, and subsurface and underwater unexploded ordnance.
- Black Hills Ordnance Depot, South Dakota: Army formerly used Defense site. Applied technology demonstration for surface and subsurface unexploded ordnance.

- Sunflower Army Ammunition Plant, Kansas: Partially active and partially shut down Army ammunition manufacturing facility. Research and development and applied technology testing/demonstration for contaminated media.

### **Subsequent Reporting**

This report has been written as a "living document." Working Group's efforts not included in this report, e.g., review of the Department of Defense's National Test Bed concept, will be provided as an attachment. A full report will be made available when appropriate.

## 1.0 INTRODUCTION

Over the span of history, military forces have trained and fought on this continent, resulting in millions of rounds of unexploded ordnance left on and in the land and under water. Live Civil War munitions found in Virginia adorn fireplace mantelpieces. Live World War I chemical munitions are found in a subdivision in Washington, D.C. Live World War II munitions are picked up in the deserts of California, Arizona, and Utah by souvenir hunters. Hunters "plink" at Korean War-vintage munitions left on a former artillery range.

Undocumented burial of obsolete munitions was an accepted practice into the Vietnam period. Historically, after each of this country's major military conflicts, the installations built to accommodate training requirements were closed and the lands transferred to other Federal agencies, States, or the private sector. Today, subdivisions are built on top of abandoned military installations, and recreational activities take place on former maneuver areas and ranges. A growing population increases the opportunity for contact with munitions waste, especially unexploded ordnance and buried munitions. Contaminants in soil and water also present problems when they migrate offsite.

In the aftermath of the Cold War, we are once again in a period of closing and transferring lands from Department of Defense control. Lands that were formerly used as defense sites are being reused in a variety of ways that put citizens at risk because of then acceptable past practices. It is estimated that more than 2-million ordnance contaminated acres are managed by the Bureau of Land Management, Forest Service, and Fish and Wildlife Service and on lands belonging to Indian Nations, States, and the private sector. For most installation closings in the past, the surface was "cleaned" and items not suitable for reuse were buried. The question now becomes: What are the risks on and in these lands and waters, and what is the best way to reduce or manage these risks?

Until recently, little effort was put into cleaning up what could not be seen on the surface. Remediation of ordnance and explosives waste-contaminated media receives benefits from the many technologies that the Environmental Protection Agency and others have developed over the past two decades for similar contaminants. Industry has developed specialized surface- and ground-penetrating sensors. However, the technologies related to unexploded ordnance are a different matter. The technology used for locating military munitions has not progressed much beyond the trained individual and backpack systems of World War II. The current suite of technologies is not suitable for sensing tens of thousands of acres in a variety of environmental settings.

Frustration over seemingly little progress in development and deployment of technologies to accomplish the cleanup task in a better, safer,

quicker, and more cost effective manner has led to the formation of a joint Federal-State effort named the Federal Advisory Committee for the Development of On-site Innovative Technologies (DOIT Committee) for environmental restoration and waste management.

The DOIT Committee was chartered through a memorandum of understanding among the Western Governors' Association; the Departments of Defense, Energy, and Interior; and the Environmental Protection Agency. The Military Munitions Waste Working Group, one of four topical groups established by the DOIT Committee, was chartered to investigate the development of onsite innovative technology for environmental restoration and waste management of military munitions waste, also known as ordnance and explosives waste or "energetics."

The initial task of the Military Munitions Waste Working Group was to determine the scope of the issue and discover what activity was already underway in this area (a membership list is attached in Appendix B). The very wide array of disparate issues found lead the Military Munitions Waste Working Group to initially limit its focus to unexploded ordnance, contaminated media, and demilitarization of munitions. The Military Munitions Waste Working Group also found a great deal of activity within the Department of Defense, the Department of Energy, and the commercial sector that was directly applicable to ordnance and explosives waste remediation.

The first issue the Military Munitions Waste Working Group considered was: What is the "value added" that the DOIT Committee could bring to any partnership? The second issue was: Should the Military Munitions Waste Working Group focus on specific technologies, or should it focus on the process of developing and deploying innovative technology? With increased knowledge of the problems, the state of the technology, and the development and testing programs already underway, the working group chose to follow the "process path." The working group determined there would be more value added by concentrating on the process of developing and deploying technology rather than on efforts to develop a few promising technology "enhancements." Concentrating efforts on developing a few technologies was too confining and duplicative of the Department of Defense programs already underway; additionally, the timeframe of the memo of understanding limited progress only to enhancements of existing technologies rather than truly innovative breakthroughs. Following the "process path" would lead the DOIT Committee to value added in the areas of partnering, including stakeholder involvement, information sharing, and risk understanding.

The Military Munitions Waste Working Group identified the lack of stakeholder participation as a weakness in the current technology development programs. Stakeholders in the eventual cleanup of sites were not present during the development and testing stages of the technologies and methodologies to be employed. Lack of participation generally leads to resistance to "new" technologies and methods by the local community, environmental groups, State environmental

regulators, and the commercial sector because knowledge, understanding, and ownership of decisions is missing. This impedes progress on remediation efforts. The DOIT Committee, however, can assist with the development of site-specific stakeholder groups that will work for understanding and formulation of remediation actions satisfactory to all concerned.

The Military Munitions Waste Working Group plans to work toward improving stakeholder participation by doing additional work in the area of information data bases by compiling a list of existing sources. If this proves unsatisfactory, the working group would like the DOIT Committee to pursue the option of an agency or institution establishing a "Ordnance Remediation Information and Analysis Center."

The understanding of risk associated with munitions waste is little known outside the explosives ordnance disposal community. Armed with information concerning issues such as risk, risk assessment methodology, site remediation prioritization based on risk, cost/risk reduction ratios, and risk/use of land, all stakeholders can make informed decisions concerning site restoration.

A scientific approach to testing technologies and systems in a controlled setting that could provide validated results was determined to be the best way to proceed with technology demonstrations. Many companies and consultants offer an array of technologies and systems to solve the ordnance and explosives waste problems. The Military Munitions Waste Working Group realized that there is, however, no appropriate way to validate the effectiveness and efficiency of these systems. To pick a site and do a demonstration without being able to evaluate the results is worse than useless — it is a waste of time and money.

The Department of Defense has reached the same conclusion and has proposed and received funding to establish a National Department of Defense Environmental Technology Sites Program for Energetics under the Strategic Environmental Research and Development Program (See Appendix A). The Military Munitions Waste Working Group supports this proposal and will work closely with the Department of Defense program office in selecting sites, test protocols, etc.

The Military Munitions Waste Working Group has initially identified eight potential sites for consideration in partnering with the Department of Defense agencies for demonstrations of stakeholder participation and technology. The working group attempted to select a spectrum of sites that represent major waste management problem areas and the variety of site problems. This report focuses on the criteria used to select these sites and provides background information on the sites.

This document is a living report that will change over time. Its preparation has been a major learning experience for the working group members, who should be considered as regional stakeholders. As knowledge grows, views may change. For example, additional demonstration sites will be added in the future, and some sites currently recommended may be dropped; two sites suggested at our May 1993 meeting have already been dropped.

## **2.0 MILITARY MUNITIONS WASTE WORKING GROUP CHARTER**

The mission of the Military Munitions Waste Working Group is to support the DOIT Committee in its efforts to expedite development and commercialization of innovative technologies for the investigation, remediation, management, and minimization of environmental waste at various former and current defense sites where military munitions contaminants exist. This mission will be accomplished through fact finding and information gathering related to site and technology demonstration criteria; through issue identification; and by promoting technology development, deployment, and commercialization. The Military Munitions Waste Working Group will also assist the DOIT Committee in establishing enduring partnerships with stakeholders to jointly advance new environmental cleanup technologies. At the direction of the DOIT Committee, the working group will identify approaches to assist the DOIT Committee in tracking the effectiveness and efficiency of demonstration projects.

## **3.0 DESCRIPTION OF PRIORITY WASTE STREAM PROBLEMS**

Munitions waste is a threat to human health and safety and to the general environment. This waste is found on formerly used defense sites that may now be under the control of a non-Department of Defense agency, Indian Nation, a State government, or the private sector; on former and current munitions manufacturing sites; on installations listed for base closure; and on installations that have an ongoing military mission.

In May 1993, the Military Munitions Waste Working Group identified seven problem areas associated with the presence and cleanup of facilities where unexploded ordnance and media contaminated with materials from the manufacture and use of munitions may exist. The seven primary areas of concern are unexploded ordnance, contaminated media, chemical sureties/weapons, biological weapons, munitions production, remediation of depleted uranium, and rocket motor and fuel disposal.

### **3.1 Unexploded Ordnance**

#### **3.1.1 Stockpiled Material in Magazine**

One traditional treatment method for demilitarization of conventional ordnance is open burn/open detonation. Incomplete destruction may produce unacceptable air emissions and contaminate soil and water resources (surface and ground water). An innovative technology to eliminate open burn/open detonation is needed.

#### **3.1.2 Disposed (known areas of disposal, e.g., disposal pits)**

Prior to the Vietnam conflict, disposal of ordnance by burial was a common and acceptable disposal practice. Records of these areas are incomplete. Past disposal areas may not now be recognizable as such. In some cases, disposal areas have been discovered in lands accessible to the general population. As with the unknown discharge areas, the explosive potential represents an acute threat to human health and the environment. Means to locate buried ordnance disposal sites are required.

#### **3.1.3 Discharged (unknown areas of disposal, e.g., ranges)**

These areas are characteristically large, and unexploded ordnance and metal debris are widely scattered. The extent of soil contaminated with explosive compounds and fragments is equally widespread. Locating unexploded ordnance, especially those that are subsurface or under water, is subject to uncertainties and can be very costly. The unknown presence and acute explosive potential adds a significant risk to any field activity where unexploded ordnance may exist. Additionally, remediation of subsurface munitions waste can be environmentally destructive. In high-density areas (more than 1000 items per acre), area recovery is used: the soil is excavated to the required depth, sifted for ordnance items, and then replaced and replanted. A less destructive means of locating and collecting discharged unexploded ordnance is necessary.

### **3.2 Contaminated Media**

Soil, surface, and ground water have been contaminated with explosive compounds and their decomposition products. Metal fragments are also widely spread in open burn/open detonation areas and on bombing/firing ranges. In many cases, the area that has been contaminated with explosive and metal debris is very extensive. Time and cost for restoration are considerable. Prior to reuse of the area and to protect resources from contamination, areas where these contaminants exist must be remediated. Advanced technologies are needed to identify areas of contamination in a more cost effective and accelerated manner and to remediate soils in situ without excavation and the resulting environmental destruction.

### **3.3 Chemical Sureties/Weapons**

As with conventional ordnance, burial of chemical weapons was an accepted disposal practice. The lack of accurate disposal records and the acute threat represent significant challenges to the restoration of lands that may contain buried chemical agents. Leaking stockpiles of chemical weapons also represent a threat to human health and the environment. While restrictions exist that prevent private handling of chemical ordnance, improvements in locating unexploded ordnance and technologies for detecting residues are needed.

### **3.4 Biological Weapons (waste handling only)**

During and after World War II, many biological weapons were developed. These weapons and weapon systems ranged from "incendiary bats" to highly toxic bacterial and viral agents. Although never used against an enemy force, complete weapon systems were developed. The status of the development, testing, storage and demilitarization facilities are unknown. Since these agents can be extremely hazardous, the complete characterization of the remediation situation is important. Technologies must be available to render any remaining problem areas safe.

### **3.5 Munitions Production**

#### **3.5.1 Environmental Restoration at a Site**

The problem is similar to that of contaminated media. It is unknown whether there may also be previously acceptable or unintentional disposal of unexploded ordnance at manufacturing sites as described earlier in this section.

#### **3.5.2 Waste Management with Discrete Stream**

Munitions production by the military and the private sector generate considerable amounts of hazardous waste. The management of ongoing waste streams associated with the production of munitions has been characterized by storage, transformation, and disposal. Recently efforts have been focused on recovery technologies and waste minimization. This redirection provides great opportunities for development of innovative technologies that could be carried into media restoration efforts.

### **3.6 Remediation of Depleted Uranium**

Because of its unique characteristics (i.e., mass and availability), depleted uranium is used as a penetrator mechanism in 30 millimeter (mm) munitions and, in some cases, as a shielding material for

armored vehicles. When these munitions impact a target or shielding, oxidation occurs with fragmentation and subsequent deposition of depleted uranium at the target site. Low levels of radiation are found at the site, and media can become contaminated with depleted uranium fragments and projectiles. Alpha particles are of the most concern since they can become airborne in wind-driven dust and can be inhaled. Technology is needed to neutralize, stabilize, or contain these materials in areas such as target ranges where the use of depleted uranium occurred.

### **3.7 Rocket Motor and Fuel Disposal**

With the reduction of military forces in the United States and worldwide, rocket motors are being removed from service and reduced in number. The motors are being shipped to munitions depots for storage and for disposal. The disposal method presently used is open burn/open detonation, which can result in explosions that scatter motor parts and contaminate the environment with unburned propellant. An effective and environmentally sound alternative to open burn/open detonation is required.

## **4.0 SHORTCOMINGS OF EXISTING APPROACHES, PROCESSES, AND TECHNOLOGIES**

### **4.1 Approaches**

#### **4.1.1 Stakeholder Participation**

There is general group consensus on the need to change the type of and schedule for public input on environmental remediation decisions. However, there is also some institutional sensitivity to increasing the public's access to cleanup discussions. Governmental agencies have widely divergent approaches and programs related to public participation.

The community of stakeholders, including most regulators, has not had the opportunity to be informed concerning unexploded ordnance, stored munitions, or media contaminated by the wastes produced in manufacturing munitions. Safety and security, as well as environmental factors, must be considered. Regulators and communities will be thrust into discussions and decision making without proper orientation or education regarding these unique wastes. Neighbors of munition plants or gunnery ranges may be cognizant of the current

mission at these facilities; however, they are facing the specter of installation closures and altered priorities at federal enclaves. There has not been a public forum for the exchange of information regarding the remediation of lands contaminated with unexploded ordnance or the energetic materials needed for their production.

#### **4.1.2 Information Sharing**

Regulatory decisions and stakeholder involvement cannot function in a vacuum. If there is to be informed input from communities, and if regulatory impediments are to be reduced, a program for the dissemination of information regarding the production, use, demilitarization, and disposal of munitions must be established.

## **4.2 Processes**

### **4.2.1 Decisionmakers Disincentive**

One of the barriers to the use of innovative technologies is the reluctance of those that award contracts or select/recommend technological approaches to accept the perceived risk in promoting a new approach. In addition, there is currently no incentive for a decisionmaker to use an innovative approach. The decisionmaker gets no reward for an approach that produces good results from new technology. If, on the other hand, the technology or approach does not meet expectations or projections, there is a disincentive.

### **4.2.2 Inadequate and Inappropriate Regulations**

The world of ordnance remediation, removals, and response actions is progressing faster than the regulatory framework that should have been implemented shortly after the Superfund Amendments and Reauthorization Act was published. The execution of the ordnance remediation program has overtaken the Environmental Protection Agency and Department of Defense policy/guidance to execution agents who are assigned ordnance and/or chemical munitions cleanup responsibilities. This results in regulatory ambiguities that cause those individuals responsible for cleanup efforts to fear damage to their careers and the potential for fines and penalties for executing in conformance with the norms and practices of explosives safety. These personal liabilities are grossly unfair to those who risk their lives to give us a cleaner and safer environment. Project delay, cost growth, and potential technical inferiority are certain results of these deficiencies in remedial action policy.

The Superfund Amendments and Reauthorization Act established the Defense Environmental Restoration Program in 1986. Under that law, the Secretary of Defense was given authority to address inactive or abandoned military sites that are contaminated with hazardous substances and sites that are contaminated with unexploded ordnance. The goals of the Defense Environmental Restoration Program are contained in separate, numbered paragraphs and are explicitly distinct under the law.

The magnitude of the potential cleanup of ordnance contamination at former defense sites (over 1000 sites) requires the promulgation of regulations that implement the second goal of Defense Environmental Restoration Program (10, U.S.C. 2701 et seq.) so that the cleanups can be uniformly and effectively performed. It also requires that the National Contingency Plan be revised to clearly define the roles and responsibilities of the Department of Defense as the removal response authority for incidents involving munitions, both conventional and chemical. Additionally, roles of the regulatory community must be clearly defined.

No implementing rules were promulgated under the second goal of the Defense Environmental Restoration Program, and current application of rules for hazardous substances to the response action for ordnance sites is inappropriate. It causes inefficiency, delay, and increased costs. Recent problems at Spring Valley and other formerly used Defense sites confirm the need for clarifying action.

This need for clarification must also be addressed by the Environmental Protection Agency, which has been directed to determine when munitions become a hazardous substance under the Federal Facilities Compliance Act. This determination will be helpful to the response personnel if it results in a clear delineation of which rules apply in a given situation. Explosives safety logically must be the controlling factor until the imminent hazard is eliminated. This would clarify the point at which munitions are subject to permitting requirements of the Resource Conservation and Recovery Act.

Because ordnance poses an imminent endangerment to the public that is clearly distinct from hazards posed by traditional hazardous substances, there is a need to establish an ordnance committee on the National Response Team. Through this team, ordnance issues can be discussed in a high-level forum that will pave the way for understanding throughout the environmental community, regulators, and response agencies.

## **4.3 Technologies**

### **4.3.1 Unexploded Ordnance**

Remediation of land and underwater areas that have been contaminated with military munitions waste [also known as ordnance explosive waste], which includes unexploded ordnance, involves a number of separate activities, each of which makes use of various technologies. Some of these activities, the technologies that support them, and their shortcomings of the technologies are briefly described in this section. Some innovative technologies that hold promise for improved performance will be discussed in a later section of this report.

### *Detection and Identification*

Contaminating munitions waste items or material, which may be located on or below the ground surface or under water, must be detected, located, and, if possible, identified during munitions waste survey or remediation operations. Surface searches are most often conducted by personnel walking in line abreast over the ground. Purely visual surface searches usually yield only mediocre success [measured in terms of the search-effectiveness probability]. Detection instruments — most commonly the magnetometer — are typically used by the search team to complement their vision. The principal difficulties associated with searching a surface for munitions waste contamination occur when surface or shallow buried hazards make a walking search especially dangerous to the search team, and when the search area is large. The first difficulty can be resolved by removing the requirement for personnel on the ground. This might be accomplished by developing platforms and instruments for aerial survey. Recent advances in robotics suggest that inexpensive, autonomous robots might also be developed for this purpose.

When the search area is large, interest is often concentrated on determining whether or not a munitions waste contamination problem even exists. If it does exist, interest is then focused on which subarea(s) of the site is contaminated. Search precision could be sacrificed for speed: detailed exploration on the ground would be conducted if a rapid surface search indicated the likelihood of munitions waste being present. There is an evident need for better, faster, and more reliable methods for surface surveys of contaminated areas or areas where contamination is only suspected. Once again, the development of platforms and instruments for aerial survey would appear to be appropriate. Airborne radar surveys of large areas may constitute a rapid and inexpensive means of locating surface munitions. Airborne infrared sensors that can detect the small temperature differences between surface metallic objects and the soil<sup>1</sup> may also prove useful for this purpose.

Searches for buried hazardous items are conducted by teams of individuals walking over ground and using a variety of detection instruments. The most important of these is the magnetometer, which measures local fluctuations of the Earth's magnetic field that are caused by the presence of ferrous-metallic objects; the electromagnetic induction detector, or "metal detector," which responds to the nearby presence of electrically conductive material; and ground-penetrating radar systems, which transmit pulses of electromagnetic energy into the soil and receive the signals reflected from the buried objects. Under certain conditions, other more exotic sensors, including infrared imaging systems, trace gas analyzers ("sniffers"), and

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<sup>1</sup> These temperature differences, which are most pronounced at dawn and dusk, result from differences between the thermal properties of the soil and the surface objects.

nuclear activation detectors, can be used. Unfortunately, typical burial depths and construction of munitions generally render these instruments ineffective.

In general, the sensitivity of the most commonly used subsurface detection instruments appears to be adequate to detect objects of sizes and at depths of greatest interest, at least under ideal conditions. The principal technical shortcomings of existing sensors are (1) slow sensor data collection and (2) contamination with clutter signals arising from sources such as shrapnel, communications wire, and locally magnetized soils (for magnetometers). The depth resolution of magnetometers and electromagnetic induction detectors is inadequate for reasons associated with the fundamental physics of these instruments. Improved mathematical techniques for fusion and computer processing of the sensor data may, however, improve both the horizontal and the depth resolution attainable with these sensors if a rapid and convenient method of acquiring the sensor data can be developed. Ground-penetrating radar systems are limited in the depths to which they can "see:" further, they tend to be somewhat delicate instruments that work best on smooth terrain, and they are not particularly well suited for use under rugged field conditions. Also, to date there is little evidence that airborne radars (or other sensors) can robustly detect buried ordnance under any but the most favorable conditions.<sup>2</sup>

An additional detection problem arises when there exists the possibility that unexploded ordnance contamination may include chemical warheads as well as conventional high-explosive bombs or shells. It is not presently possible to determine whether a detected item contains chemical warfare material until it is exposed and inspected, and even then it may be difficult to determine. The lack of a fieldable instrument that could make this distinction constitutes an important shortcoming of present technology. We remark, however, that research has been conducted at Lawrence Livermore National Laboratory and Idaho National Engineering Laboratory on the problem of distinguishing chemical from high-explosive munitions in the context of treaty verification. The potential applicability of this work to the problem of making such distinctions in remediation operations under field conditions should be investigated.

The problem of detecting and locating underwater unexploded ordnance contamination is unique. In some ways, the problem is easier, in others it is compounded. The viscous drag forces exerted on, for example, a bomb by its passage through water tend to reduce its depth of penetration into the bottom. Thus, most underwater unexploded ordnance will be found on, or very close

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<sup>2</sup> Conditions favorable to airborne radar systems are extremely dry soil, smooth terrain, and limited surface vegetation. Some desert regions of the southwestern United States could be surveyed (to a degree) by airborne radars at certain times of the year.

to, the bottom. In addition, the problems of shrapnel and other clutter sources are not nearly so severe as those occurring on a land target range. On the other hand, marine growth can obscure an item lying on the bottom, making its visual detection difficult.

Conventional methods for underwater survey use teams of scuba divers. Search rates obtained through these methods are slow — between 12 and 16 diver-hours per acre are requested — and search costs are high, typically several thousands of dollars per acre. The cost increases rapidly with search depth because of the increasingly severe limitations on divers' working time.

More efficient techniques for underwater search need to be developed. These techniques should make use of integrated suites of instruments, including visual (video cameras and laser line scanning equipment) and other sensors (e.g., magnetometer arrays) to support the search and reduce the need for divers. Boat-towed platforms rather than free swimming underwater vehicles would appear to be preferable for integrated underwater survey systems.

#### *Mapping*

Locations of contamination must be precisely marked and mapped so they can be relocated easily. Efficiency in survey and remediation operations is best served through the division of labor, i.e., when the detection and location task is performed separately from access and recovery, which is itself separate from the neutralization or demilitarization of the recovered items. In practice, therefore, an optimal capability would be to quickly mark and later relocate a detection "hit" with an accuracy of a few tens of centimeters, both horizontally and vertically, in a large (thousands of acres) area of reasonably rough terrain. The requisite horizontal resolution might be obtainable with a differential Global Positioning System; the vertical resolution is presently not reachable with most detection instruments.

#### *Removal*

Access to buried contaminating items is usually gained by excavating the locations of detector "hits." Excavation using machinery must give way to cautious and tedious hand excavation as the object is approached. Current detection and location instruments do not provide a sufficiently accurate estimate of the target depth to make the access and removal process efficient. Improved sensor data collection and processing might provide much more accurate estimates of target depth than are presently possible.

#### *Neutralization or Demilitarization*

Hazardous items may be neutralized by detonation in place, or they may be removed to a demilitarization facility located on, or at some distance from, the site undergoing remediation. Detonation in place which is often the only safe method for neutralization of explosive items, carries with it concerns for blast, noise, and vapor containment. Blast containment coverings tend to be heavy, bulky, and

difficult to position. Sand tamping for noise control is labor intensive and time consuming, and it creates problems with dust. Reliable mathematical models for predicting the noise impact on neighboring communities do not appear to be available, although their development should not be particularly difficult.

Demilitarization of removed explosive items is typically performed using incinerators or furnaces. Because of the necessity of preventing potentially harmful vapors from entering the atmosphere from these systems, air scrubbers are required. These items are expensive, often costing in excess of a million dollars. A need exists for rapid, inexpensive, and environmentally benign methods for demilitarization of recovered munitions.<sup>3</sup>

A problem is also associated with abandoned open burn/open detonation areas at which neutralization and demilitarization were carried out in the past without stringent environmental controls. The debris remaining in these areas can pose both explosive and toxic chemical threats. A need exists for the adaptation of present methods of soil cleaning (which are typically applied to the removal of hydrocarbon or heavy-metal contamination from soil) and development of new approaches to address the problem of removing specific explosive and toxic compounds from soils. Such approaches could be applied both to the remediation of abandoned open burn/open detonation sites and to that of other areas (including former range areas) contaminated by explosive compounds and their decomposition products.

#### 4.4 Contaminated Media

(Information for this section is not available at this time.)

<sup>3</sup> A special problem arises when disposing of chemical warfare material (also called chemical surety material). Such material is incinerated in special furnaces. Only three of these facilities exist - the Rocky Mountain Arsenal, the Chemical Munitions Disposal System (Tooele, Utah), and the Johnston Atoll Chemical Agent Disposal System.

## **5.0 INNOVATIVE APPROACHES, PROCESSES, AND TECHNOLOGIES**

### **5.1 Approaches**

#### **5.1.1 Stakeholder Participation**

The Federal Advisory Committee for the Development of On-site Innovative Technologies (DOIT) project includes a commitment to open the environmental remediation decisionmaking processes to broader public involvement. At every planning level, care has been taken to represent multiple viewpoints. Adoption of the Stakeholder Outreach and Participation Plan provided a blueprint for broad representation in the definition phases and subsequent technology search and demonstration phases. The Military Munitions Waste Working Group includes representatives from varying backgrounds as prescribed by the DOIT project.

Demonstrations ultimately recommended by the DOIT Committee will include broad stakeholder participation. Collaboration with existing groups, wherever appropriate, will be an important component in a successful demonstration. The Military Munitions Waste Working Group will have a role in putting in place a stakeholder plan that reflects the project goals.

#### **5.1.2 Information Sharing**

##### *Information Resources*

The Military Munitions Waste Working Group identified as a current problem a lack of readily available information on ordnance explosives waste detection and remediation technology and test results for the technology. Members suggested that the Western Governors' Association sponsor a consolidated data base for this topic area. Others said they regularly access a number of existing data bases.

The lack of a consolidated data base has been identified as a process shortcoming of ordnance explosives waste management. Therefore, the Military Munitions Waste Working Group intends to poll its mailing list of members and observers to develop a list of existing data bases, how to access them, and the key search words. If this effort does not appear to be satisfactory, the working group will pursue the possibility of a government agency, company or university willing to develop and maintain such a data base.

A preliminary study has led to the following conclusions.

##### *Contaminated Media*

Commercial public data bases and information services can provide most available documents on treatment technology, chemical

and biological issues, and social and health-related aspects of the Defense Environmental Restoration Program.

#### *Unexploded Ordnance*

Restricted data bases such as the Defense Technical Information Center can provide, directly to certain authorized users, available documents on target location and characterization, specific hardware performance, and general ordnance handling procedures. However, because of the potential for military applications or use by unfriendlies, much of the information will be available only on an as-needed, case-by-case basis and is releasable only by the contributor to the Defense Technical Information Center of the technical data. The formal process to obtain restricted data is well defined and generally available to potential authorized users.

#### *Risk Understanding and Acceptance*

A major information shortcoming identified by the Military Munitions Waste Working Group was the lack of stakeholder understanding of the risks associated with ordnance explosive waste and the relationship among risk, the possible reuse options for contaminated lands, and the limitations of current technology. The working group feels that this is an area where the DOJT Committee can add value to the Federal/State partnership through education of stakeholders. The working group would like to pursue this topic and develop a DOJT Committee information booklet that would be made available to stakeholders.

The full range of risks associated with ordnance explosive waste is not well known by the majority of stakeholders. Generally, risk may be thought of as containing the components of exposure (i.e., the chance that a person will come into contact with ordnance explosive waste) and the likelihood of an action/reaction event occurring (i.e., that the ordnance explosive waste will cause harm).

Information concerning real and perceived risks must be made available to stakeholders. Analysis methodology must be made available to assist stakeholders in understanding the relationship between the factors of risk reduction, technology limitations, costs, and environmental degradation. Since it is impossible technologically or financially, nor in many situations environmentally sound, to ensure 100 percent cleanup of subsurface or underwater contamination, a knowledgeable stakeholder group must reach a reasonable decision as to the degree of cleanup desired. This decision is primarily governed by balancing the desired reuse of the land against: the capabilities of available technology, increasing cost according to the

amount of risk reduction as 100 percent cleanup is approached, and the increasing damage to the environment that is the result of moving closer to 100 percent cleanup.

The U.S. Army Corps of Engineers and the Department of Defense Explosives Safety Board have information on this topic and are developing more sophisticated models. A major area of methodology development is the ability to prioritize the allocation of limited Corps of Engineers assets for cleanup of formerly used Defense sites based on the risk to humans. A partnership of the DOIT Committee, the Corps of Engineers, and the Department of Defense Explosives Safety Board would be effective in providing information to stakeholders.

The following information on the prioritization of formerly used Defense sites ordnance explosive waste risk was provided by the Corps of Engineers for inclusion in this report.

#### *PRIORITIZATION OF FORMERLY USED DEFENSE SITES ORDNANCE EXPLOSIVE WASTE RISK*

Formerly used Defense sites contaminated with ordnance explosive waste can be prioritized by risk reduction and cost of remediation. There are as many as 900 formerly used Defense sites contaminated by ordnance. Currently, there is no methodology available for determining where the limited dollars available for remediation can best be spent. Three risk/cost modules are being developed to aid decisionmakers in determining which sites to remediate in which order. Because of the large number of sites that must be remediated, there must be a methodology to quantify risk/cost and prioritize the sites. The methodology being developed will assist the decisionmaker in making objective and defensible decisions on which sites should be remediated given budgetary and other constraints.

The risk/cost theoretical formulation for the dispersed site module (ranges/impact areas) is nearing completion. The formulations of the non-dispersed site (burial pits and trenches) and the water site modules are projected for completion in early 1994. The risk/cost modules will allow a decisionmaker to determine the estimated cost for risk reduction at a site.

The prioritization methodology should be complete by mid-year 1994. The data necessary to operate the prioritization methodology is currently being gathered. The prioritization methodology will allow a decisionmaker to rank all sites according to the cost to reduce risk to an acceptable level, the amount of risk reduced for a given site, and by cost per risk unit reduced. This prioritization effort will allow a decision maker to make informed choices on the sequence in which sites are remediated, given risk reduction and budgetary constraints.

### *Declassification of Classified Reports and Technologies*

While the classification of technical specifications and the full capabilities of certain systems may need to remain classified, the technologies and analysis methodologies considered innovative may have been in use for years within the classified world.

The DOIT Committee does not seek, nor does it need access to, classified information, even though some members have clearances. The need is for government agencies to look at ways of assisting the DOIT Committee demonstrations and follow-on remediation efforts by providing unclassified information on systems application to a specific problem and declassified (sanitized) reports. Congress has already provided the statutory guidance to declassify systems and products. It now falls to the appropriate Federal agencies to place this guidance into practice.

## **5.2 Processes**

### **5.2.1 Decisionmaker Disincentives**

To promote innovative technologies and approaches to solving environmental problems, a policy change at the highest levels is recommended. A directive from agency Secretaries and Governors to encourage employment of innovative technologies will enable those that make the site decisions to do so without fear for their jobs/positions and will minimize the perceived risk of employing innovative technologies.

### **5.2.2 Inadequate or Inappropriate Regulations**

The Military Munitions Waste Working Group suggests the following actions be supported by the DOIT Committee:

- A formal recommendation that the Comprehensive Environmental Response, Compensation, and Liability Act reauthorization include provisions to address the development of regulations for remediation of unexploded ordnance contaminated properties.
- Recommend that the National Contingency Plan be modified to specifically address ordnance contamination including formerly used Defense sites. The modification of the National Contingency Plan will provide a format for response to ordnance contamination sites and establish roles and responsibilities for the Department of Defense and the regulatory community. The modification should affirmatively acknowledge that authorities and responsibilities for ordnance contamination abide with the Secretary of Defense. Specific consideration must be given to the imminent threats represented by the presence of unexploded ordnance. It is expected that the Applicable, Relevant, and Appropriate Requirements process in use

for Comprehensive Environmental Response, Compensation, and Liability Act response actions can provide an adequate forum and control for the Federal and State regulators' concerns.

- Recommend that the Department of Defense issue directives that clarify the waste munitions versus hazardous substances response issues within the Department of Defense and require National Contingency Plan compliance.
- Recommend that the Department of the Army promulgate implementing regulations through rulemaking procedures. Public input and agency comments will be essential to final rules.
- Recommend that an ordnance committee be appointed to advise the National Response Team on matters concerning ordnance and contaminated sites. This would foster discussion of ordnance issues and development of explosives safety policies consistent with congressional mandates under Defense Environmental Restoration Program.
- Request a meeting between the National Response Team and the members of the Military Munitions Waste Working Group and DDT Committee representatives to discuss issues and promote the establishment of the proposed ordnance committee.
- Recommend that interim regulations be issued as soon as practical to alleviate problems occurring while final rules are being established.

## **5.3 Technologies**

### **5.3.1 Unexploded Ordnance**

This section describes areas of technology development presently under consideration for improvement in speed and reliability, and reduction of cost and risk, in military munitions waste remediations. Emphasis is given to, and recommendations are made regarding, the problem of detecting subsurface items of unexploded ordnance.

The detection of buried unexploded ordnance, and thus the success of range clearance operations, is driven by available sensor technology. No existing sensor can detect every ordnance item under every conceivable condition, and it is not reasonable to expect this situation to change appreciably in the near future. The physical detection methods that the Military Munitions Waste Working Group believes will be most useful in the near term are those that are presently used in the explosive ordnance demolition.

community: magnetometry and electromagnetic induction detection. These sensors are sufficiently sensitive to detect isolated buried unexploded ordnance items of sizes and at depths of greatest interest (i.e., small items near the surface and larger items at greater depths) given adequate data — that is, data taken over a sufficiently fine spatial grid. The working group, therefore, asserts that *existing sensors can, in principle, be used as a basis for thorough clearance operations.*

While existing sensors can perform thorough searches, they generally cannot do so efficiently. Their greatest limitation is their sensitivity to clutter. When a sensor is operated with a sensitivity that permits reliable detection, the number of false alarms associated with the simultaneous detection of harmless objects, including soil inhomogeneities and shrapnel, can be excessive. Because each potential detection must be investigated via excavation, thorough clearance is often accompanied by low efficiency and high cost. The Military Munitions Waste Working Group believes that *reduction in false alarm rates is presently the area of greatest potential payoff from improving detection technology for buried unexploded ordnance.*

In addition, existing sensors are labor intensive. Although there are a few recently developed semi-automated techniques, range clearance requires a team of trained sensor operators to interrogate the surface over a fine grid to detect near-surface objects. Detection of deeply buried objects, especially in a cluttered environment, is difficult without computer data acquisition and processing. *Improvements in sensor data collection and processing will permit better sensor performance in the presence of clutter, enable greater speed in buried unexploded ordnance detection, and reduce both missed detections and false alarms.*

On the basis of these observations, the Military Munitions Waste Working Group believes that the efficiency and cost-effectiveness of range clearance operations would be improved through technology development efforts that are focused on remedying the deficiencies outlined above. The objectives of these efforts should be to refine sensor concepts and to develop methods for efficient sensor data acquisition and processing. The outputs of such a development effort should be technologies necessary to field a number of new range-clearance sensors and systems. Specifically, we see a need to further develop the following concepts.

#### **Smart Sensors**

False detections as a result of strong clutter signals are a major source of inefficiency in range clearance. Efforts should continue to develop data processing algorithms and sensor hardware improvements that will permit a hand-held unit, perhaps operating in conjunction with an onsite central data processing facility, to discriminate near-surface unexploded ordnance from clutter in near-real time.

#### *Distributed Sensor Networks*

Research should be directed toward the development of (1) technology necessary to acquire simultaneous position and (2) sensor data from multiple sensors and sensor data fusion and processing algorithms necessary to permit detection and precise location of objects (especially large, deeply buried objects) with rejection of clutter.

#### *Centralized Clearance Monitoring*

An effort should be made to assemble the software and hardware that would permit a central location to monitor and record the progress of multiple, independent search activities at a given site. We expect recent improvements in Global Positioning System technology and Geographical Information System software to be especially useful in this regard.

#### *Emerging Sensor Concepts*

New sensor concepts are continually being developed, and older concepts are being modified and refined. It is appropriate to monitor and evaluate these developments for use in range clearance. The Military Munitions Waste Working Group considers the following concepts to be particularly worth examining:

- Impedance topography processing techniques for resistivity mapping data;
- Ground-penetrating radar systems with small-aperture antennas used in a mode similar to that employed in biomedical acoustic imaging;
- Small, ground-based (robotic) and stable, very-low-elevation airborne platforms for autonomous detection of unexploded ordnance; and
- Sensor fusion techniques for combining data from multiple sensors.

The costs of such a technology development effort would be negligible compared to the cost of clearing a single range of modest size. Wise investments in research can thus have a great deal of leverage in improving the efficiency and reliability, and in reducing cost and risk, of range clearance operations.

#### **5.3.2 Contaminated Media**

(Information for this section is not available at this time.)

## 6.0 WORK FORCE PLANNING, TRAINING, AND EDUCATION ISSUES RELATIVE TO TECHNOLOGY DEPLOYMENT AND CLEANUP

The Nation's needs for remediation and restoration of lands and underwater areas that are contaminated with military munitions waste, including ordnance explosive waste, far outstrip the trained labor resources presently available to meet these needs. It has been said that *the number of all the trained explosive ordnance demolition specialists now living is insufficient to meet the expected future demand for their services.* It is unreasonable to expect that in the foreseeable future, the output of the Naval Explosive Ordnance Demolition Technology Center (where explosive ordnance demolition specialists are trained) will be increased so that such personnel will be available in the numbers required. At issue, therefore, is how to make optimal use of the available pool of trained explosive ordnance demolition specialists and how to develop an additional labor force capable of supporting this pool.

The basis for a supporting labor force already exists, or soon will exist, near the great majority of sites that will require munitions waste remediation. The negative economic effect on local communities of base closures would be alleviated to a considerable degree if laid off workers were retrained and employed in the remediation of the same facilities.<sup>1</sup> A longer-term benefit would also accrue if these workers, now trained and experienced, were used as an exportable labor force for employment in other remediation operations, including those conducted under Base Realignment and Closure, Defense Environmental Restoration Program, Installation Restoration Program, and other military and civilian programs. In short, the apparent problems of a shortage of trained explosive ordnance demolition specialists and high levels of unemployment near many sites to be remediated could, with planning and foresight, be substantially alleviated in the long term as well as the short term.

The Military Munitions Waste Working Group believes, therefore, that the proper approach to be taken in developing the labor force necessary to support the conduct of military munitions waste remediation nationwide is *to train local labor pools in the new skills needed for munitions waste remediation, and to use the existing group of explosive ordnance demolition specialists as the nuclei of these labor forces.* The explosive ordnance demolition specialists are a select group of individuals who have undergone extensive and costly training in all aspects of munitions identification, han-

<sup>1</sup> *The labor requirement for a moderately large (thousands of acres) unexploded ordnance remediation project amounts to approximately one man-week per acre, averaged over all the occupations involved. Thus a project of 5000 acres will require roughly 100 man-weeks of labor for completion.*

ding, and disposal.<sup>2</sup> Their knowledge and experience must be optimally used, both in the leadership and the direction of munitions waste remediation operations, and in the performance of those specific tasks for which they are uniquely qualified.

Certain activities in munitions waste remediation require specialized explosive ordnance demolition training and experience, but many tasks do not require this specialized expertise. The skills necessary for performing these tasks can be taught, given the development of appropriate courses of study, preparation of teaching materials, and definition of standards and requirements for skill certification. By building and employing remediation teams comprised of an optimal mix of explosive ordnance demolition specialists and trained local labor, the Military Munitions Waste Working Group believes that the present labor shortfall could be reversed and that remediation operations could proceed on a wider scale than would otherwise be possible.

An example of this approach involves remediation of sites contaminated with buried unexploded ordnance. The three following principal tasks are required:

- Identifying and marking surface unexploded ordnance items and determining and marking suspected locations of buried unexploded ordnance items.
- Accessing and recovering the items found at these locations, and
- Disposing of recovered munitions.

The first task, detecting and locating suspected unexploded ordnance items, does not require the skills of an explosive ordnance demolition specialist. This task, vitally important in a clearance operation, is presently best performed by individuals walking over terrain equipped with magnetometers, electromagnetic induction detectors, or other detection and location instruments. Missed detection of hazardous objects increases the post-clearance risk associated with the site. "False alarms," or detections of harmless objects or objects that are in fact not present, drive up the clearance time and cost because all suspected targets must be excavated. The second task, access and recovery of buried unexploded ordnance items must be directed by a trained explosive ordnance demolition technician, but much of this task can be performed by nonspecialist supporting personnel. The specific expertise of the explosive ordnance demolition specialist is required primarily in the third task, deactivation and safe disposal of the recovered munitions.

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<sup>2</sup> Explosive ordnance demolition training is focused primarily on ordnance disposal under wartime conditions rather than on environmental remediation per se. Thus the most critical individuals in the explosive ordnance demolition labor pool will be those who have both leadership skills and actual experience in munitions waste remediation.

A training course in locator operation and use could be developed and taught at community colleges to students with basic knowledge of elementary physics. Such a course, with a possible duration of two weeks, would comprise both classroom and field work. The classroom portion might involve lectures based on viewgraph transparencies and computer simulations (the "textbook" would be the collection of annotated viewgraphs), using modern multimedia computer techniques of the fundamental physics on which a locator operation is based. These computer demonstrations might include, for example, simulations of the modifications of Earth's magnetic field in the neighborhood of a ferrous bomb-shaped object — the physical basis for the operation of the magnetometer, the most commonly used detection instrument in unexploded ordnance survey work.

Field exercises, planned and integrated with the classroom work, might begin with simple demonstrations and experiments (an example would be using a compass to investigate the magnetic field around an exposed ferrous object). Experiments might continue using detection equipment operating around an exposed test object supported above the ground and culminate in actual searches for buried objects. Safe handling procedures could be emphasized, and the students could be introduced to common munitions and the special hazards associated with them.

Test materials and predefined success levels could be used to certify the students' capabilities in the location of buried unexploded ordnance items. Such certification standards should be developed by the Corps of Engineers, the Naval Explosive Ordnance Demolition Technology Center, and the Army Environmental Center.

In a similar fashion, specialized training courses could be developed for other skills needed in munitions waste remediation that do not require explosive ordnance demolition-specific expertise. For example, other courses could provide training for operations in environments contaminated by chemical waste, and in the use of more sophisticated suites of detection and location sensors. Such courses could be developed by technical experts working jointly with explosive ordnance demolition specialists and taught at local schools and community colleges. Using appropriate computer techniques, field demonstrations, experiments, and knowledgeable and experienced instructors, the courses could contribute significantly to the development of skilled labor pools, the conduct of remediation operations, and the economic betterment of communities — particularly those affected by base closures.

A program is currently being proposed by Lawrence Livermore National Laboratory to use Hawaiian environmental projects, such as the remediation of the Island of Kaho'olawe, as a basis for developing environmental knowledge and skills among the Native Hawaiian population. This program, which would include general scientific and specialized training courses as well as field work to reinforce classroom concepts, is being developed by Lawrence Livermore National Laboratory with participation from local gov-

ernment and Native Hawaiian organizations. The Lawrence Livermore National Laboratory program is consistent with the two goals that have been discussed here: assisting in the remediation itself and developing a skill base within the local population. This program merits further attention.

The Western Governors' Association could play an important role in developing a coherent education and training policy that is directed toward the solution of military munitions waste remediation problems and addresses short- and long-term critical economic issues. By bringing together representatives of affected communities, responsible Federal agencies, the technical expert community, the community of explosive ordnance demolition specialists, and local educational institutions, and by acting as the focal point for the effort in the Western United States, the Western Governors' Association could take an active leadership role in education and training policy development. This is an appropriate activity for the association, and the Military Munitions Waste Working Group recommends that it be vigorously pursued.

On May 14 and 15, 1993, the DOIT Committee's Ad Hoc General Criteria Working Group met to set up guidelines for the four DOIT Committee Waste Area Working Groups. The Military Munitions Waste Working Group reviewed the criteria and drafted further additions that were more specific to the working group. As a result of these meetings, a combination of the criteria from both the Ad Hoc General Criteria Group and the additional Military Munitions Waste Working Group criteria have been combined into a final list of criteria for the working group. The following is a list of the combined demonstration criteria used to identify the Military Munitions Waste Working Group's selected sites. The list is divided into four categories: site selection criteria, technology selection criteria, evaluation criteria, and contractor selection criteria.

## **7.0 CRITERIA USED TO IDENTIFY AND SCREEN POTENTIAL DEMONSTRATION PROJECTS**

### **7.1 Site-Selection Criteria**

- Federal site — preferably in the west.
- Current and future jurisdiction over the lands in the site.
- Not a security (classified) site.

- Any ongoing litigation or administrative action related to the site will not likely delay or prevent successful completion of a demonstration.
- Current and future land use of the lands in the site.
- Risk to the general public from energetics waste.
- The site is representative of energetics problems at government facilities and other sites.
- Public awareness concern about the problems at the proposed demonstration site and remediation of the site are supported by Federal, State, and local governments; responsible parties; and other stakeholders.
- Economic benefit to society from remediation of the site.
- Typical or reasonably challenging environmental situation for demonstration of the technology with respect to topography, vegetation cover, climate, threatened/endangered species, etc.
- The degree to which the following conditions exist at the site:
  - The site is characterized by a range of energetics waste disposal problems that may necessitate a suite of technologies, including those appropriate to preclude catastrophic failure.
  - A significant variety and volume of contamination are present to both challenge the technology and to facilitate a statistical evaluation of the effectiveness of the technology.
  - There is adequate access to the contamination.
  - There is an ability of selected demonstration sites to account for site-to-site variables and establish the range of effectiveness and cost for a technology.
  - The extent to which the required utilities and infrastructure (both human and physical) are available.
  - Location is adequately isolated to limit human and environmental risk from deployment of the technologies.

## 7.2 Technology Selection Criteria

- The technology, within a system's context, is potentially better, faster, or safer compared to conventional technology (some apply to treatment, others to characterization and monitoring, and some apply to both) including but not limited to:
  - Shorter timeframe.
  - Lower cost.
  - Lower detection limits for characterization technology.
  - Lower cost per unit of weight/volume.
  - Lower offsite migration potential.
  - Lower emissions.
  - No or fewer adverse byproducts.
  - Improved permanence of remedy.
  - Reduced residuals' disposal problems.
  - Reduced contaminants' concentrations in treated media.
  - Increased understanding of the range of operating parameters.
  - Improved reliability, and
  - Broad applicability.
- The proposed technology has the potential for successful demonstration in relatively short timeframe (i.e., years not decades).
- The proposed technology has the potential for timely commercialization.
- Proposed demonstration technology is supported by Federal, State, and local governments, responsible parties, the broader community, and all stakeholders.
- The technology has expected outcomes that are measurable and clearly understood.
- The regulatory process for the technology will not preclude a successful demonstration.
- The technology demonstration has quality assurance/quality controls built in.
- The technology demonstration includes comparison of multiple technologies or suites of technology, possibly including "test-offs/competitions."

## **7.3 Evaluation Criteria**

### **7.3.1 Technical**

- Did the technology achieve established test objectives?
- Did the demonstration project contribute to a better understanding of the usefulness of the technology?
- Were the test protocols adequate?
- Did the demonstration advance the technology?
- Are demonstrations broadly applicable to other sites?
- Is test data available?

### **7.3.2 Process**

- Were stakeholders appropriately involved? Did or could they play a significant role in light of the technical and complex issues involving the application of innovative technology?
- Did the demonstration contribute to the resolution of commercialization issues for the technology?
- Did the demonstration contribute to the improvement of the process of technology development and deployment?
- Did the demonstration provide adequate information for user adoption or adaptation?
- Did the demonstration further the business objectives of the private partners in the project?
- Did the project sponsors understand and address adequately the stakeholder concerns?

## **7.4 Contractor Selection Criteria**

- Ability of the contractor to do the work
  - Proven track record, and
  - Available resources.
- Partnerships are encouraged.

## 8.0 LIST OF POTENTIAL CANDIDATE DEMONSTRATION PROJECTS FOR THE DOIT COMMITTEE DECISION/RECOMMENDATION

Hundreds of candidate sites are available to select from for demonstrations. The U.S. Army Corps of Engineers lists as many as 900 formerly used Defense sites that are contaminated with ordnance explosive waste. Others estimate that there are more than 1,000 sites. Additionally, military base closures, as well as active facilities, provide another ready source of demonstration sites that need remediation for current activities to continue safely.

The technological innovations in the field of ordnance explosive waste detection, identification, and remediation appear to be more evolutionary than revolutionary. The primary issue is the ability of the technology and operators to perform as advertised. Therefore, stringent test situations need to be established to evaluate the effectiveness and efficiency of the existing systems and evolutionary improvements to these systems. These results must be repeatable to be accepted by the scientific and stakeholder communities.

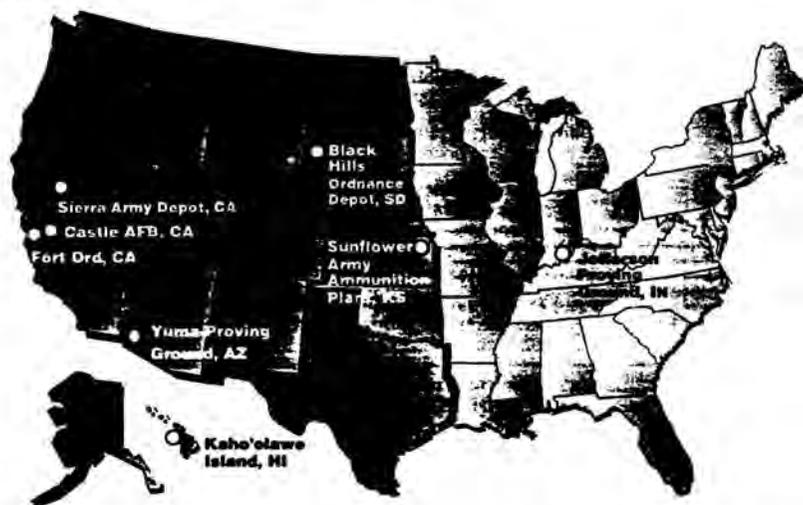
We have identified the need for two test/demonstration site categories:

- Controlled test sites are designed and constructed to replicate actual field situations with all parameters precisely known, using inert munitions and munitions waste. These sites will be used to accurately evaluate the test results from technologies in research and development.
- Uncontrolled demonstration sites are sites with actual contamination where most, but probably not all, of the contaminant characteristics are known. Evaluating the effectiveness and efficiency of the demonstrated technologies will be less accurate. These sites provide a variety of environmental settings in which to demonstrate technologies which have already been proven under controlled test site environmental conditions. These sites shall have explosives safety controls established to protect authorized observers during the conduct of the demonstrations.

Both site categories are suitable for demonstration of the DOIT clean up approaches and methodologies, including stakeholder involvement.

Documentation of the tests and demonstrations at both the controlled and uncontrolled sites will provide credentials for the

technology and the company. This documentation will provide the information necessary for a site manager to proceed with confidence when contracting for innovative technologies to remediate a site.



Using the knowledge of the members of the Military Munitions Waste Working Group and the screening criteria listed earlier, an initial set of eight demonstration sites has been identified for further consideration. The sites have been identified as appropriate to demonstrate innovative technologies under both controlled and uncontrolled field situations over a variety of characterization and remediation problems and in a range of environmental settings. The next step is to contact service/site officials, where this has not already been done, to determine the feasibility and parameters of a demonstration at those site. Additional sites will be identified until a full suite of demonstration sites has been identified that cover the full range of ordnance explosive waste problems and site environmental characteristics.

The most promising source of demonstration sites found was the Site Candidates list for energetics proposals that was developed in support of the National Department of Defense Environmental Technology Sites Program for Energetics (Appendix A). The Site Candidates list includes sites from the Model Base Closure Program, the Expedited Closure Program, the CERCLA National

*Military Munitions Waste Working Group's Identified Sites for Consideration as DDT Demonstration Sites*

Priority List, and Department of Energy technology test sites. The Department of Defense technology sites program is intended to establish a "national test bed" suite of sites for demonstrating and evaluating technologies. There would also be field condition demonstrations at actual cleanup sites. As this program is similar to the DOIT Committee effort, the Military Munitions Waste Working Group strongly endorses this concept. Most, but not necessarily all, potential DOIT Committee demonstration sites identified by the Military Munitions Waste Working Group will come from the Site Candidates list.

The following eight sites have been identified for consideration as DOIT Committee ordnance explosive waste demonstrations:

- **Jefferson Proving Ground, Indiana:** FY 1995 Army base closure. Research and development technology testing/demonstration for subsurface unexploded ordnance detection, identification, and remediation in a controlled test environment.
- **Yuma Proving Ground, Arizona:** Active Army facility. Research and development and applied technology testing/demonstration for surface unexploded ordnance detection, identification, and remediation in both controlled and uncontrolled test environments. This would also be a DOIT Committee process demonstration site.
- **Fort Ord, California:** FY 1995 Army base closure. Range and maneuver area. Applied technology demonstration for contaminated media, surface and subsurface unexploded ordnance detection, identification and remediation in an uncontrolled test environment. This would also be a DOIT Committee process demonstration site.
- **Kaho'olawe Island, Hawaii:** Navy formerly used Defense site. Applied technology demonstration for contaminated media, surface and subsurface, and underwater unexploded ordnance detection, identification, and remediation in an uncontrolled test environment. Extremely environmentally challenging. This would also be a DOIT Committee process demonstration site.
- **Castle Air Force Base, California:** FY 1995 Air Force base closure. Open burn/open detonation area. Research and development and applied technology testing/demonstration for contaminated media and subsurface unexploded ordnance detection, identification, and remediation in an uncontrolled test environment. This would also be a DOIT Committee process demonstration site.

- Sierra Army Depot, California: Active Army demilitarization facility. Research and development and applied technology testing/demonstration for contaminated media, demilitarization processes, and subsurface and underwater unexploded ordnance detection, identification, and remediation in both controlled and uncontrolled test environments. This would also be a DOIT Committee process demonstration site.
- Black Hills Ordnance Depot, South Dakota: Army formerly used Defense site. Applied technology demonstration for surface and subsurface unexploded ordnance detection, identification, and remediation. This would also be a DOIT Committee process demonstration site.
- Sunflower Army Ammunition Plant, Kansas: Partially active and partially closed Army ammunition manufacturing facility. Research and development and applied technology testing/demonstration for contaminated media. This would also be a DOIT Committee process demonstration site. Possible future demilitarization site for missiles is a research and development opportunity for missile fuels technology.
- Delta Range, Colorado, and Davis Range, Alaska: These two formerly used Defense sites, previously identified in the Military Munitions Waste Working Group report of May 14 and 15, 1993, have been dropped from consideration.

### **8.1 Jefferson Proving Ground, Indiana**

Jefferson Proving Ground is scheduled for closure by the last quarter of FY 1995. The facility's mission of evaluating ammunition and components produced for the Army is to be transferred to the Yuma Proving Ground in Arizona.

Jefferson Proving Ground has been used to test ammunition since May 1941. The Army estimates that 23 million munitions items have been tested at the Jefferson Proving Ground during this half century of operations and that as many as 1.5 million unexploded ordnance items may still exist within the boundaries of the facility. Additionally, there are areas contaminated by explosives, hazardous chemicals, and depleted uranium. Currently, reuse options are being identified and considered for Jefferson Proving Ground.

In FY 1993, Congress appropriated funds to perform an Unexploded Ordnance Technology Demonstration at Jefferson Proving Ground in FY 1994. The Army Environmental Center was tasked to create a controlled test site at Jefferson Proving Ground and to assess the state-of-the-art in unexploded ordnance detection, identification, and remediation technology by conducting multiple demonstrations and evaluating the results. This large-scale demonstration project will allow for a thorough investigation of unexploded ordnance technologies available within the private sector.

The DOD Committee will be kept abreast of this ongoing effort and will receive test results and the final report.

#### **8.1.1 Purpose/Goals of Demonstration**

This project is designed to assess the state-of-the-art in unexploded ordnance detection, identification, and remediation technology by conducting multiple demonstrations and evaluating results. Both research and development (prototype) systems and advanced technology systems will be included in this demonstration.

#### **8.1.2 Description of Project**

The demonstration site will contain two areas (40 acres and 80 acres), each with inert ordnance and other debris. The 40-acre area will be used to test and demonstrate man portable and surface-towed systems. The 80-acre area will be used to demonstrate airborne systems. The inert ordnance and debris will be serialized and accurately positioned for reacquisition. After system demonstrations, reliability and accuracy estimates will be generated. A comprehensive report will be written describing the technologies tested, results, and a comparison of technologies.

#### **8.1.3 Organization/Management**

This demonstration program is managed by the Army Environmental Center, Aberdeen Proving Ground, Maryland. Ms. Kelly Rigano, Program Manager at the Army Environmental Center, is a member of the Military Munitions Waste Working Group.

The Army Environmental Center has tasked the Naval Explosives Ordnance Disposal Technology Center, Indian Head, Maryland, to execute this program. The Naval Explosives Ordnance Disposal Technology Center Project Manager is Mr. Jerry Snyder.

#### **8.1.4 Timing/Schedule of Activities**

- |  |              |
|--|--------------|
| • Solicitation for and selection of technology demonstrators | 10/93 - 1/94 |
| • Preparation of the demonstration site                      | 10/93 - 4/94 |
| • Technology demonstrations                                  | 5/95 - 10/94 |
| • Final reports prepared                                     | 7/94 - 10/94 |

### 8.1.5 Estimated Costs/Funding Status

In FY 1993, \$5 million was appropriated for the Jefferson Proving Ground demonstration effort.

### 8.1.6 Selection Criteria

#### *Site Criteria*

- **Jurisdiction:** Department of the Army
- **Current and Future Land Use:** Jefferson Proving Ground can be broken into two areas: 50,950 acres north of the firing line and 4,315 acres south of the firing line. Environmental cleanup and reuse options are currently being considered for the area south of the firing line. The northern area cleanup and reuse issue is deferred until the Jefferson Proving Ground mission is terminated.
- **Potential Risk:** Risk is currently low since access is restricted to authorized personnel. The demonstration area will be verified as clean (safe) prior to placement of inert ordnance and demonstrators are permitted into the areas.
- **Representative Site:** Jefferson Proving Ground is representative of a large number of impact and training ranges around the world. The demonstration site will lay out ordnance at depths, locations, and orientations that ordnance is typically found at (when that ordnance is found on impact ranges or battlefields).
- **Current Public Awareness and Involvement:** The Jefferson Proving Ground Regional Development Board is a community group that addresses reuse issues and protects the interests of the community. The planned unexploded ordnance technology demonstration has not yet been presented to this board or any other community group. Contact with potential stakeholders is currently made through the Jefferson Proving Ground Public Information Office.
- **Economic Benefit to Society from Remediation of the Site:** The goal of the unexploded ordnance demonstration is to identify state-of-the-art detection and remediation technology. This technology can later be considered for further "real-life" demonstrations or for remediation type work.
- **Site Conditions:**
  - **Range of Contaminant Values:** The two demonstration areas will contain a wide variety of inert ordnance and debris. The inert ordnance will be accurately positioned at varying depths, locations, and orientations. The ordnance area layout will be based upon data from unexploded ordnance contaminated sites.
  - **Contamination Characteristics:** Only subsurface inert ordnance will be emplaced on each site.

- **Site-to-site Variables:** Soil type, moisture content, topography, and vegetative cover vary from site-to-site.
- **Environmental Variables:** Jefferson Proving Ground is situated within the southern fringe of the Central Lowland physiographic province, an area characterized mostly by low rolling landscape and nearly level plains. The geology is that of glacial till overlying bedrock, and consists of limestones and dolomite interbedded with shales. Soils at Jefferson Proving Ground have developed from glacially derived parent materials.
- **Access:** The demonstration sites will be located in the east/northeast section of Jefferson Proving Ground (north of the firing line). Access roads are of high quality.
- **Infrastructure:** The existing Jefferson Proving Ground infrastructure will probably be sufficient to accommodate the test facility.
- **Isolated Location:** Not a factor.

#### *Technology Criteria*

The Technical Demonstration Solicitation is currently (October 1993) being advertised in the *Commerce Business Daily*. Solicitation letters have also been sent directly to companies known to be performing work in this area. Specific demonstrator selection criteria are currently being generated.

- **Demonstration Period:** May through October 1994.
- **Potential for Timely Commercialization:** Commercialization is not a specific goal of this demonstration; however, the demonstration should assist the most promising technologies move toward commercialization.
- **Support for Technology:** Funding will be provided to those companies chosen to perform unexploded ordnance demonstrations at Jefferson Proving Ground. All viable technologies will be considered for demonstration.
- **Part of a Technology "Test-off or Competition:"** The goal of the unexploded ordnance demonstration is to identify state-of-the-art detection and remediation technology. Reliability and accuracy estimates will be generated for each system and comparisons between systems will be made.
- **Regulatory Process Issues:** None.

- **Quality Assurance/Quality Controls:** Demonstrator test data will be compared to actual data. Reliability and accuracy estimates will be generated.
- **Measurable Outcomes:** State-of-the-art unexploded ordnance detection and remediation technologies will be identified.

#### *Evaluation Criteria*

Demonstrator test data will be compared to actual data. Reliability and accuracy estimates will be generated.

#### *Contractor Criteria*

Not applicable.

## **8.2 Yuma Proving Ground, Arizona**

The Yuma Proving Ground is a portion of the Department of Defense's Test and Evaluation Range facilities that comprise over 50 percent of the Department of Defense's land holdings. To keep these facilities operating at full capability, a clean-as-you-use range cleanup capability must exist. The focus of this research and development and applied technology effort is the location, identification, and remediation of surface unexploded ordnance. The DOD Committee has been invited to participate as full partners with Yuma Proving Ground in its effort to develop and field range cleanup technologies.

### **8.2.1 Purpose/Goals of Demonstration**

Develop, test, and evaluate technologies for range cleanup of surface unexploded ordnance.

### **8.2.2 Description of Project**

Using a combination of small, controlled test sites and actual range facilities, a program will be developed to test surface munitions detection, mapping, and remediation technologies that are capable of operating on a continuing basis over large areas. Emphasis will be placed on airborne platforms for safety reasons. This site also has potential for future demonstrations relating to remediation of depleted uranium munitions waste.

### **8.2.3 Organization/Management**

This program will be operated by the Advanced Technology Office of the Yuma Proving Ground. The Program Manager is Mr. Andy Hooper, who is a member of the Military Munitions Waste Working Group.

**8.2.4 Timing/Schedule of Activities**

Initial planning is underway. At the September 30, 1993, meeting of the Military Munitions Waste Working Group, it was reported that a detection vehicle/technology has been recently declassified. The working group will work to establish contacts between the owners of this technology and the Yuma Proving Ground for a possible demonstration/test within the next few months.

**8.2.5 Estimated Costs/Funding Status**

This will be an continuing program. Funding has been made available through the Test and Evaluation Program starting in FY 1993.

**8.2.6 Selection Criteria***Site Criteria*

- **Jurisdiction:** Department of the Army
- **Current and Future Land Use:** The Yuma Proving Ground is an active test range that is currently engaged in testing current and future U.S. Army munitions and weapons systems. Yuma Proving Ground has been in use since the early 1940's. There are no competing land uses. Continued use of Yuma Proving Ground as a test range in an increasingly difficult regulatory environment will depend upon Yuma Proving Ground's ability to clean the existing test ranges and keep them clean. Total installation: 889,000 acres; contaminated range areas: in excess of 250,000 acres.
- **Potential Risk:** There is no offsite risk. There are significant risks to unauthorized persons who may inadvertently cross the range areas. There is an extreme risk to personnel engaged in cleanup of modern munitions.
- **Representative Site:** This site is representative of a number of test and evaluation ranges in desert environments worldwide, as well as battlefield situations that left unexploded ordnance on the surface.
- **Current Public Awareness and Involvement:** Awareness of the need for cleanup resides primarily within the military and the State of Arizona environmental office. A stakeholder effort would heighten public awareness and gain support for continuing efforts at cleanup, including technologies that possibly could not be tested at less remote locations.
- **Economic Benefit to Society from Demonstrations at the Site:** Improved cleanup technologies would allow continued use of the existing ranges, thereby minimizing

additional commitments of land resources to contamination as range facilities. The developed technologies also would be useful worldwide under similar environmental conditions to clear ranges and battlefields.

- **Site Conditions:**

- **Range of Contaminant Values:** The ranges are contaminated with a wide variety of Army munitions. Some have been in use since the early 1940's, and some are being tested for future use. These include depleted uranium and modern submunitions.
- **Contamination Characteristics:** Munitions waste is primarily unexploded ordnance and scrap from detonations on the surface and in the near subsurface. Cleanup will concentrate on surface munitions. Munitions below the surface will be left in place.
- **Site-to-site Variables:** This site is typical of range areas in a desert environment. Concentrations may be higher than at many ranges, and the occurrence of the more lethal modern submunitions will be higher.
- **Environmental Variables:** The environment is Sonoran Desert with sand, and rock, sparse vegetation, and a deep water table. Topography is rolling with arroyos, which makes it difficult for ground vehicles to traverse in a set grid pattern.
- **Access:** Access is provided by the existing Yuma Proving Ground road network.
- **Infrastructure:** The existing Yuma Proving Ground infrastructure is capable of supporting demonstrations of technologies associated with all forms of detection and remediation of unexploded ordnance.
- **Isolated Location:** The Yuma Proving Ground provides extremely remote test areas where essentially any technology can be tested safely. Attempts to test some of the more exotic technologies are more likely to meet resistance for environmental reasons than for safety reasons.

#### *Technology Criteria*

The facilities for demonstrations will be available for a wide variety of technologies and contractors. Some of the technologies to be tested will require millimeter accuracies using laser trackers. These tracking systems are available at the Yuma Proving Ground.

- **Test Date:** Test design could begin immediately with demonstrations to take place upon completion and acceptance of the test design.

- **Potential for Timely Commercialization:** There is a current demand for these technologies for cleanup of existing ranges, formerly used Defense sites, and battlefields on a worldwide basis. Examples where the technologies could be used are U.S. test ranges, formerly used Defense sites, Afghanistan, the Middle East, Pacific islands, Russia, and Bosnia.
- **Support for Technology:** The development for this technology is supported by the Department of Defense and other Federal land managing agencies.
- **Part of a Technology "Test-off or Competition:"** While this is not a test-off, a result of these demonstrations will be an evaluation of the effectiveness of the technologies being tested. These can be compared when determining which technology to apply to a specific cleanup problem elsewhere.
- **Regulatory Process Issues:** Arizona environmental regulators may be asked to waive certain requirements for the sake of knowledge gained from a certain test protocol. Therefore, it is essential that all appropriate Arizona offices are part of the stakeholders group.
- **Quality Assurance/Quality Controls:** Quality will be covered in the test protocols.
- **Measurable Outcomes:** Measurable outcomes will be covered in the test protocols.

#### *Evaluation Criteria*

Evaluation criteria will be developed by the Yuma Proving Ground with input from the local stakeholders group.

#### *Contractor Criteria*

Contractor criteria will be developed by the Yuma Proving Ground with input from the local stakeholders group.

### **8.3 Fort Ord, California**

Fort Ord is scheduled for base closure action under the second round of Base Realignment and Closure (BRAC II). Lands will be transferred out of Department of Defense control into public use. Only installation areas that cleanup technology is able to render safe will be available for planned reuse.

#### **8.3.1 Purpose/Goals of Demonstration**

This is primarily a demonstration of the stakeholder process and how it can be used during a base closure where there is a range area with munitions waste. This site will also be used for applied

technology demonstrations in an environment that is different from the environment at either Jefferson Proving Ground or Yuma Proving Ground.

### **8.3.2 Description of Project**

The demonstration will focus on range and maneuver areas. The partnership methodology will be used to arrive at a balance among future land uses, technology capabilities, and funding availability. The potential risk to users of the proposed end use of the lands is the controlling factor for determining this balance. Innovative technology to be demonstrated will include munitions waste detection and (partial) removal, both surface and subsurface over extensive acreage, and soils contaminant detection and remediation in the primary impact areas and where munitions stocks may have been buried. This is an environmentally challenging demonstration location because of concern for the habitat of threatened and endangered species.

Contact will be made with the site manager and the existing local base reuse committee known as the Fort Ord Task Force. By working with them, a new stakeholders group would be organized, if appropriate, to address the munitions waste issues. This group would undertake an analysis of the potential risk, proposed end use of the lands, and technologies and funding available.

The end product will be the cleanup of the range and maneuver areas sufficient to allow the proposed future use as determined by the Fort Ord Task Force. During this process, demonstrations of detection, identification, and remediation technologies for unexploded ordnance and contaminated media would be demonstrated for their effectiveness in this environmental setting of soils, terrain, vegetation, and threatened and endangered species habitat.

### **8.3.3 Organization/Management**

This demonstration would be conducted under the existing base closure organizational structure.

### **8.3.4 Timing/Schedule of Activities**

Activities could begin as soon as the site manager accepts the designation as a DOIT Committee demonstration site. Initial activity would be the establishment of the stakeholders group and potential risk analysis.

### **8.3.5 Estimated Costs/Funding Status**

The funding for this effort would come from the base closure fund, Defense Environmental Restoration Program funding, and possibly Strategic Environmental Research and Development Program funds. There is no estimate of the cost. Since cleanup has to be accomplished anyway, any additional costs associated with a demonstration of methodology would be minimal.

### 8.3.6 Selection Criteria

#### *Site Criteria*

- **Jurisdiction:** Department of the Army.
- **Current and Future Land Use:** The installation has been used as an infantry division base and training area since 1917. Current maneuver areas will most likely contain small arms blank ammunition and pyrotechnic grenades and flares. The maneuver areas may also have former but currently unknown impact or disposal areas. The range area will have munitions waste, including unexploded ordnance, ranging from small arms ammunition to 8-inch howitzer shells. The installation includes approximately 20,000 undeveloped acres; a maneuver area of approximately 12,000 acres and an 8,000-acre range area.
- **The Base Realignment and Closure environmental statement and the Fort Ord Task Force** are considering a variety of uses for the installation. Most of the installation will leave Department of Defense jurisdiction. Developed portions of the installation (approximately 8,000 acres) will be transferred to a variety of communities and users. The shore line will likely become part of the State Park System. The majority of the maneuver and range areas will likely remain as open space/recreation lands under the jurisdiction of another Federal agency (probably the Bureau of Land Management) or a State agency.
- **Potential Risk:** The risk from unexploded ordnance, both surface and subsurface, in the range area is very high. The risk from surface unexploded ordnance in the maneuver area will remain moderate until a surface sweep can be conducted; then it will be low. The risk from contaminated media in the range area is thought to be low.
- **Representative Site:** The range and maneuver areas are fairly typical of other Army installations that may be closing. These characteristics are replicated at other installations around the world.
- **Current Public Awareness and Involvement:** Local citizens and governments are deeply involved with the future use of this installation. Public safety when using the land after the base closes is a very important issue. Environmental interest groups are concerned about retention of the maritime chaparral ecosystem.
- **Economic Benefit to Society from Remediation of the Site:** Reuse of these lands will affect the local communities and the health of the threatened and endangered species habitat.

- **Site Conditions:**
  - **Range of Contaminant Values:** The range of contaminants and the variability of their density over a large area are significant. Additionally, there will be contaminated media in the more heavily used range impact areas.
  - **Contamination Characteristics:** Small arms blank munitions and pyrotechnics are thought to be in the maneuver area. The range area contains all calibers of munitions from small arms through 8-inch howitzer shells and possibly some bombs.
  - **Site-to-site Variables:** The munitions values and characteristics are fairly representative of Army installations.
  - **Environmental Variables:** Rolling hills with maritime chaparral habitat. State- and Federal-listed threatened and endangered species are located on the installation. The presence of threatened and endangered species is fairly representative; however, the habitat is not representative of most installations.
  - **Access:** Excellent.
  - **Infrastructure:** The existing infrastructure should be capable of supporting any demonstrations as well as the cleanup effort.
  - **Isolated Location:** The installation is fairly small and has surrounding communities and farms. There may be technology limitations because of the relative closeness of human presence.

#### *Technology Criteria*

- **Test Date:** Technology demonstrations could begin as soon as the stakeholders group is formed and the potential risk versus end use of the land is analyzed and understood.
- **Potential for Timely Commercialization:** Technology demonstrations will be of applied technology that has been proven in prior commercial use or has been used at Jefferson Proving Ground or Yuma Proving Ground. If the technology is viable in the environmental setting of Fort Ord, then it could be contracted to do cleanup work there or at similar environmental settings.
- **Support for Technology:** Support for the technology would be determined by the stakeholders group and the effectiveness of the technology in the environmental setting.
- **Part of a Technology "Test-off or Competition:"** This is not part of a test-off or competition.

- Regulatory Process Issues: To be determined.
- Quality Assurance/Quality Controls: To be determined.
- Measurable Outcomes: Technology enhancements that will satisfy the cleanup requirements of the stakeholder group and that are cheaper, better, safer, or faster than existing technology.

*Evaluation Criteria*

- Technical
  - Achieve Test Objective: To field demonstrate technologies that are cheaper, better, safer, or faster.
  - Add to Understanding of Tested Technology: This site would expand test data for existing technology to a different environment.
  - Demonstration Protocols Adequate: Demonstration protocols will be translated into future contract standards; therefore, were they adequate to achieve the desired result?
  - Demonstration Advance Technology: Did the demonstration advance the understanding or development of the technology being demonstrated?
  - Applicable to Other Sites: Are the results applicable to other sites with the same contaminant characteristics and environmental setting?
- Process
  - Stakeholder Involvement: Were the appropriate stakeholders involved?
  - Stakeholder Concerns Adequately Addressed: Did the stakeholders influence the design of technology demonstrations and eventual cleanup effort?
  - Contribute to Commercialization: Were there any significant technology advancements made that could be commercialized?
  - Contribute to Technology Development and Deployment: Were advancements made in development and deployment of technology?
  - Provide Information for User Adoption/Adaption: Were the results of demonstrations made public?
  - Further Business Objectives of Partners: Did the demonstration support the business objectives of the private sector partners?

*Contractor Criteria*

- **Proven Track Record:** The demonstration contractor should have a proven track record at other cleanup sites or the Jefferson Proving Ground or Yuma Proving Ground test sites.
- **Available Resources:** The contractor should have sufficient resources to clear a designated portion of the maneuver area and/or a portion of the range area.

**8.4 Kaho'olawe Island, HI**

The cleanup effort on Kaho'olawe Island is strongly supported by the Governor, congressional delegation, and peoples of Hawaii. Legislative language to make up to \$400 million over 10 years available for cleanup and conversion of the island into a State park recently passed Congress in the 1994 Defense Appropriations Act.

**8.4.1 Purpose/Goals of Demonstration**

This is primarily a demonstration of the stakeholder process and how it can be used during the cleanup of a range where the lands are to become a State park with public access. This site can also provide a test bed for research and development and applied technology demonstrations in a very challenging environment.

**8.4.2 Description of Project**

The cleanup and conveyance of this island to the State of Hawaii has been the subject of both Executive Order and legislation. This is a high profile cleanup issue, with congressional and gubernatorial support. The island is sufficiently isolated so that constraints on the use of innovative technologies would be limited by only environmental and cultural (religious, archeological, and historical) concerns. The situation on Kaho'olawe is well known, and a clearance plan has been prepared.

The partnership methodology will be used to ensure sensitivity to sites of cultural and religious significance on the island and to ensure that the appropriate level of cleanup for the end use of the lands is achieved. Innovative technologies to be demonstrated include: munitions waste detection and removal from the surface, subsurface, and underwater to depths required to accommodate intended land uses, over a large area (29,000 land acres plus underwater areas); and survey and cleanup of soil contaminants (explosive compounds and their decomposition products) in impact areas and where munitions stocks may have been buried. (Note, however, that no evidence exists that such stocks have been so disposed on Kaho'olawe). The island is composed of a variety of terrain and, in some cases, magnetically active soils that will challenge the demonstration.

#### **8.4.3 Organization/Management**

The demonstrations would be conducted under the current site manager with a stakeholders group, including the currently involved stakeholders and others as appropriate.

#### **8.4.4 Timing/Schedule of Activities**

A cleanup plan has been completed. Start of cleanup operations, including any demonstration projects, is dependent on congressional appropriations.

#### **8.4.5 Estimated Costs/Funding Status**

The 1994 Defense Department Appropriations Act contains \$400 million over 10 years for cleanup of the island and surrounding waters and conversion to a State park. In FY 1994, \$60 million is provided for cleanup. A portion of this funding may be available for the unexploded ordnance and contaminated media demonstrations.

#### **8.4.6 Selection Criteria**

##### *Site Criteria*

- Jurisdiction: Department of the Navy.
- Current and Future Land Use: The island has been a Navy ship, aerial gunnery, and bombing range since the 1930's. Some ground maneuvers have also taken place. Munitions waste includes everything from small arms munitions through 2,000-pound bombs and 16-inch naval gun shells. There has been no known use of chemical munitions.
- The island will become a State park for the protection of religious, archeological, and historically significant sites.
- Potential Risk: There is a significant risk to future users of the State park from surface munitions. Therefore, a detailed cleanup is needed. Subsurface remediation will be needed in areas of planned construction.
- Representative Site: This site represents some of the extremes in environmental settings that might be encountered during a cleanup effort. While this may be a singular U.S. site, there are similar sites in other parts of the world.
- Current Public Awareness and Involvement: The Protect Kaho'olawe 'Ohana (family) is a broadly based, though predominantly Native Hawaiian, group that has been active for many years in advocating the return of the

island to the State of Hawaii, the remediation of its ordnance contamination, and its future restoration and preservation. The Protect Kaho'olawe 'Ohana must be considered as an important stakeholder in military munitions waste demonstration projects on Kaho'olawe.

- Hawaii's congressional delegation, the Governor, other State officials, and the general public (who will make use of the educational and recreational opportunities of the park) are also involved with the future status of the island.
- **Economic Benefit to Society from Remediation of the Site:** This is an important religious and cultural site for the people of Hawaii. Cleanup of the island would restore a portion of their heritage.
- **Site Conditions:**
  - **Range of Contaminant Values:** There is a wide range of munitions waste type and density, including contaminated media in the primary impact areas.
  - **Contamination Characteristics:** In addition to surface, subsurface, and underwater unexploded ordnance, tons of scrap metal must be located and removed. In-situ treatment of contaminated soils in the impact areas is desired.
  - **Site-to-site Variables:** Munitions wastes vary from heavy concentrations in the impact areas to widely dispersed individual rounds throughout the island. Extreme site variables range between relatively flat plateau areas to deep canyons, from sparse dry-side vegetation to semi-tropical vegetation, and across a variety of soil conditions.
  - **Environmental Variables:** The site is a shield volcano with a variety of topographic features. Typical Hawaiian dry-side scrub vegetation with little vegetation at the higher elevations and some woodland.
  - **Access:** Access is limited and controlled. There is a small airfield at the Navy base camp. Resupply by sea is possible under calm conditions.
  - **Infrastructure:** A Navy base camp is located at the southwestern end of the island. Maui, about seven miles from the northwest end of Kaho'olawe, is the nearest developed island.
  - **Isolated Location:** Kaho'olawe is an island with the nearest occupied island, Maui, seven miles away. Most all technologies could be demonstrated if they are not destructive to the religious, archeological, and historical sites.

*Technology Criteria*

This site has been identified to demonstrate advanced technology systems at an environmentally challenging location. Is the technology suitable for these environmental situations? Is the technology better, faster, safer, cheaper for cleanup in this environment?

- **Test Date:** To be determined.
- **Potential for Timely Commercialization:** Most technologies demonstrated here will already be commercialized or about to be commercialized.
- **Support for Technology:** Do the stakeholders support use of the technology to be demonstrated?
- **Part of a Technology "Test-off or Competition:"** This is not part of a test-off or competition.
- **Regulatory Process Issues:** To be determined.
- **Quality Assurance/Quality Controls:** To be determined by the site manager and local stakeholders.
- **Measurable Outcomes:** To be determined by the site manager and local stakeholders.

*Evaluation Criteria*

- **Technical:**
  - Were test objectives achieved?
  - Did the demonstration add to the understanding of capabilities of tested technology?
  - Were the demonstration protocols adequate?
  - Did the demonstration advance the state of the technology?
  - Are the results from the demonstration applicable to other sites?
- **Process**
  - Was there appropriate stakeholder involvement?
  - Were stakeholder concerns adequately addressed?
  - Did the demonstration contribute to commercialization of the technology?
  - Did the demonstration and stakeholder involvement contribute to the development and deployment of the technology?
  - Were the results of the demonstration provided for the adoption/adaption of other users of the technology?

- Did the demonstration further the business objectives of private sector partners?

#### *Contractor Criteria*

- **Proven Track Record:** As this is the most environmentally challenging demonstration for technologies and most difficult to conduct due to its location on an island in Hawaii, technologies and companies must show successful demonstrations or operations at other less demanding locations before being invited to Kaho'olawe.
- **Available Resources:** The contractor must have sufficient resources to deploy the technology demonstration to Kaho'olawe. Onsite support cost support will be determined based on the Appropriations Act language.

## **8.5 Castle Air Force Base, CA**

Castle Air Force Base is a base closure (BRAC II) site. The Base is a National Priority List site and is in the final phase of a CERCLA remedial investigation. The open burn/open detonation area located on the Base may contain unexploded ordnance. Requirements include the investigation for unexploded ordnance and media contaminated with explosive compounds. The safety plan for remedial action has recently been approved.

### **8.5.1 Purpose/Goals of Demonstration**

To demonstrate innovative technologies that will improve (better, faster, safer, or cheaper) the remediation of open burn/open detonation areas. The proposed demonstrations and DOIT Committee involvement are narrow in scope as the cleanup process is fairly advanced.

### **8.5.2 Description of Project**

The open burn/open detonation area may contain unexploded ordnance and media contaminated with explosive compounds. Surface and subsurface detection is required. Small arms munitions are considered the primary type of unexploded ordnance that may be found. Instrumentation currently in use cannot detect unexploded ordnance with 100 percent accuracy. Improved detection ability for unexploded ordnance is needed as well as improved methods to analyze media in a cost effective manner. Stakeholder participation methodology will be demonstrated.

### **8.5.3 Organization/Management**

The DOIT Committee demonstration will work with the current cleanup efforts of the site manager and the base reuse committee, the Castle Joint Powers Authority. Suggestions of additional stakeholders will be made, if appropriate, and opportunities to demonstrate new technologies will be encouraged.

**8.5.4 Timing/Schedule of Activities**

Working relationships need to be established as soon as possible.

**8.5.5 Estimated Costs/Funding Status**

Funding would be provided through the base closure fund.

**8.5.6 Selection Criteria****Site Criteria**

- **Jurisdiction:** Department of the Air Force
- **Current and Future Land Use:** Castle Air Force Base began operation in 1941 as a flight training, aircraft maintenance, and fire training facility. The April 1993 Draft Final Remedial Investigation Workplan identified approximately 121 areas to be investigated for contamination, including the 85-acre open burn/open detonation area.

The local reuse committee has identified various options for Base reuse. The Air Force plans to release the Castle Air Force Base Record of Decision for closure in January 1994. This Record of Decision will describe how the property will be conveyed.

- **Potential Risk:** There is potential risk from unexploded ordnance and contaminated media from residual contaminants in the open burn/open detonation area from demilitarization of munitions.
- **Representative Site:** This site is typical of an Air Force installation where small arms munitions are the primary ordnance items being destroyed.
- **Current Public Awareness and Involvement:** Local citizens, businesses, and government are considered the principal stakeholders and have had involvement through the Base reuse committee.
- **Economic Benefit to Society from Remediation of the Site:** Maximum reuse of the Base lands and facilities is important to ameliorate the negative economic effect of Base closure.
- **Site Conditions:**
  - **Range of Contaminant Values:** A small variety of munitions types that is primarily concentrated within a few small areas.
  - **Contamination Characteristics:** Primarily small arms unexploded ordnance and contaminated media from residual chemicals after open burn/open detonation.

- **Site-to-site Variables:** High concentrations in open burn/open detonation pits with the possibility of ejecta throughout the remainder of the 85 acres.
- **Environmental Variables:** The site is small enough to be essentially uniform. It is located in Central California in the San Joaquin Valley.
- **Access:** Excellent.
- **Infrastructure:** The Castle Air Force Base infrastructure is adequate to support demonstrations.
- **Isolated Location:** Castle Air Force Base is located in central California, adjacent to Atwater, California (population 22,585). Surrounding communities include Winton (population 7,583), Livingston (population 7,103), and Merced, (population 56,000), which is approximately 8 miles south.

#### *Technology Criteria*

Is the technology better, faster, safer, cheaper for cleanup in this environment?

- **Test Date:** To be determined.
- **Potential for Timely Commercialization:** Proven technologies of the type to be demonstrated here are in demand for other base closures in the United States and around the world.
- **Support for Technology:** Do the Stakeholders support use of the technology to be demonstrated?
- **Part of a Technology "Test-off or Competition:"** This is not part of a test-off or competition.
- **Regulatory Process Issues:** To be determined.
- **Quality Assurance/Quality Controls:** To be determined by the site manager and local stakeholders.
- **Measurable Outcomes:** To be determined by the site manager and local stakeholders.

#### *Evaluation Criteria*

- **Technical**
  - Were test objectives achieved?
  - Did the demonstration add to the understanding of capabilities of the tested technology?
  - Were the demonstration protocols adequate?
  - Did the demonstration advance the state of the technology?

- Are the results from the demonstration applicable to other sites?
- Process
  - Was there appropriate stakeholder involvement?
  - Were stakeholder concerns adequately addressed?
  - Did the demonstration contribute to commercialization of the technology?
  - Did the demonstration and stakeholder involvement contribute to the development and deployment of the technology?
  - Were the results of the demonstration provided for the adoption/adaption of other users of the technology?
  - Did the demonstration further the business objectives of private sector partners?

*Contractor Criteria*

Criteria to be determined by the site manager and stakeholders.

## **8.6 Sierra Army Depot, California**

The Sierra Army Depot, located at Herlong, California, approximately 50 miles north of Reno, Nevada, is currently the site of a number of technology demonstrations. It is a major munitions demilitarization site. Both the States of California and Nevada are concerned with the environmental effects of the demilitarization process, including air and ground-water contamination. The DOI Committee should work with the Department of the Army to make this a major test facility for a wide range of ordnance explosive waste issues.

### **8.6.1 Purpose/Goals of Demonstration**

To demonstrate the stakeholder methodology in support of developing innovative technologies for the demilitarization of ordnance and the remediation of surface, subsurface, and underwater unexploded ordnance and media contamination.

### **8.6.2 Description of Project**

Initially focus on contaminated media demonstration projects, followed by innovative methods for demilitarization of munitions, and then underwater detection and remediation of unexploded ordnance. This would be a research and development and applied technology effort to clean up problems at the installation, but it would also provide a test bed for technologies that would be appropriate to a wide variety of installations.

### 8.6.3 Organization/Management

The research and development program would be managed by the Army Environmental Center. The site manager would work with a local stakeholders group to gauge support for the technologies and environmental concerns that need to be remediated.

### 8.6.4 Timing/Schedule of Activities

Activities are currently underway. The DOIT Committee would work with the Army Environmental Center and the site manager to bring additional technology demonstrations to the installation.

### 8.6.5 Estimated Costs/Funding Status

The Strategic Environmental Research and Development Program would be the primary source of funding. Additional funds might be available from Defense Environmental Restoration Program appropriations. Costs would be determined on an individual demonstration basis.

### 8.6.6 Selection Criteria

#### *Site Criteria*

- **Jurisdiction:** Department of the Army.
- **Current and Future Land Use:** The War Department acquired the initial lands in 1932. The State of California transferred Honey Lake to the War Department during World War II, with an additional 1,800 acres transferred from the Department of the Interior in 1958 for the open burn/open detonation area. Honey Lake was used as a bombing range during World War II. In 1976, the Department of Defense attempted to return Honey Lake to the State of California, but the State would not accept it until it could be certified as clean. The installation is currently, and will continue to be, used for the demilitarization of obsolete munitions.
- **Potential Risk:** Risk from ground-water contamination is potentially a major problem. The contamination plume from the open burn/open detonation area has moved 2,200 feet in the last 5 years toward the Depot. Additionally, the Carson Water District wants to pump water from the Bedell Flats area 6 to 10 miles east of the Depot. This pumping may accelerate the spread of the plume.
- **Representative Site:** This site has many problems that can be found at other sites, but the problems are magnified by the large quantities of munitions demilitarized at this location.

- **Current Public Awareness and Involvement:** There is public concern about environmental impacts from operations at the Depot. The organization of a stakeholders group would be a major DOT Committee contribution to the environmental efforts being made by the Army at the Depot.
- **Economic Benefit to Society from Remediation of the Site:** Remediation of the contaminants in the ground water would lessen the probability of problems with municipal water development planned for the area. Improved demilitarization processes would lessen the likelihood for contaminants to enter the environment and be transported off the installation. Establishing the Depot as a major test facility would aid the local economy.
- **Site Conditions:**
  - **Range of Contaminant Values:** A wide variety of ordnance and explosives waste.
  - **Contamination Characteristics:** Contamination includes soil and air media, unexploded ordnance and munitions waste in the surface, subsurface, and underwater.
  - **Site-to-Site Variables:** The primary variable is the presence of unexploded ordnance in Honey Lake and on the land.
  - **Environmental Variables:** The Depot is located at an elevation of 4,500 to 5,500 feet on a south facing bajada of the Skedaddle Mountains.
  - **Access:** Good access on highways and Depot roads.
  - **Infrastructure:** The Depot's existing infrastructure should accommodate most requirements for demonstrations.
  - **Isolated Location:** The location is sparsely populated; the Depot is the major population center in the area.

#### *Technology Criteria*

Is the technology better, faster, safer, cheaper for cleanup in this environment?

- **Test Date:** Tests are already underway.
- **Potential for Timely Commercialization:** The technologies to be tested/demonstrated are in demand at many active military installations and installations identified for base closure. The technologies are in demand world-wide.

- **Support for Technology:** The States of Nevada and California and the local citizenry are concerned with the environmental cleanup of the Depot.
- **Part of a Technology "Test-off or Competition:"** This is not part of a test-off or competition.
- **Regulatory Process Issues:** To be determined.
- **Quality Assurance/Quality Controls:** To be determined by the site manager and local stakeholders.
- **Measurable Outcomes:** To be determined by the site manager and local stakeholders.

#### *Evaluation Criteria*

- **Technical**
  - Were test objectives achieved?
  - Did the demonstration add to the understanding of capabilities of tested technology?
  - Were the demonstration protocols adequate?
  - Did the demonstration advance the state of the technology?
  - Are the results from the demonstration applicable to other sites?
- **Process**
  - Was there appropriate stakeholder involvement?
  - Were stakeholder concerns adequately addressed?
  - Did the demonstration contribute to commercialization of the technology?
  - Did the demonstration and stakeholder involvement contribute to the development and deployment of the technology?
  - Were the results of the demonstration provided for adoption/adaption of other users of the technology?
  - Did the demonstration further the business objectives of private sector partners?

#### *Contractor Criteria*

Criteria to be determined by the site manager and stakeholders.

## **8.7 Black Hills Ordnance Depot, South Dakota**

The U.S. Army Corps of Engineers, Huntsville Division, currently has an applied technology demonstration effort underway at the Black Hills Ordnance Depot. The DQIT Committee could form a partnership with the Corps of Engineers as part of an effort to develop stakeholder involvement and risk assessment methodology for remediation of formerly used Defense sites.

### **8.7.1 Purpose/Goals of Demonstration**

A partnership with the Corps of Engineers for use of stakeholders in applied technology demonstrations.

### **8.7.2 Description of Project**

The Corps of Engineers is testing existing aerial remote sensing technology to meet its remediation requirements for formerly used Defense sites. Black Hills is a Corps of Engineers remediation site.

### **8.7.3 Organization/Management**

Demonstrations would be managed by the Huntsville Division of the Corps of Engineers as technical ordnance manager, and the Omaha (geographical) District as the lead project manager.

### **8.7.4 Timing/Schedule of Activities**

The demonstration of aerial remote sensing is scheduled to be completed by the first quarter of FY 1994. Other demonstrations will be scheduled as appropriate. A new Broad Agency Announcement is being prepared for additional demonstrations.

### **8.7.5 Estimated Costs/Funding Status**

Funding would be from the formerly used Defense sites cleanup appropriations.

### **8.7.6 Selection Criteria**

#### *Site Criteria*

- Jurisdiction: Department of the Army
- Current and Future Land Use: Private ownership used for cattle grazing and hunting.
- Potential Risk: Primary risk is from unexploded ordnance in the open burn/open detonation area and any burial sites that may be on the installation.
- Representative Site: This site is representative of unexploded ordnance problems at a number of installations in the Western United States.

- **Current Public Awareness and Involvement:** The public is informed of the CERCLA process for ordnance remediation. The public realizes that site investigations will be carried out in FY 1994.
- **Economic Benefit to Society from Remediation of the Site:** Economic benefits will be evaluated during the study phases. They will accrue from risk reduction associated with land use.
- **Site Conditions:**
  - **Range of Contaminant Values:** Potential for small arms, conventional ammunition, bombs, grenades, mines, rockets, ammunition components, bulk explosives, and chemical agents.
  - **Contamination Characteristics:** Disposal sites are eroding and ordnance constituents are becoming exposed.
  - **Site-to-Site Variables:** Open burn/open detonation areas with widespread ordnance and explosives waste scrap and possible unexploded ordnance, also dump sites for ordnance explosive waste scrap within the open burn/open detonation area. Possibility of chemical warfare material buried in trenches or pits.
  - **Environmental Variables:** Weather and foliage effect sensors.
  - **Access:** Paved roads within the former Army depot. Dirt roads to the open burn/open detonation grounds.
  - **Infrastructure:** None.
  - **Isolated Location:** No. Private property.

#### *Technology Criteria*

- **Is the Technology Better, Faster, Safer, Cheaper for Cleanup in this Environment?** Yes, for current demonstration.
- **Test Date:** Completion of current demonstration by 1st quarter FY 1994.
- **Potential for Timely Commercialization:** Possibly.
- **Support for Technology:** Yes, though truth testing on the ground is still required.
- **Part of a Technology "Test-off or Competition:"** This is not part of a test-off or competition.
- **Regulatory Process Issues:** None.
- **Quality Assurance/Quality Controls:** To be determined by the site managers.

- **Measurable Outcomes:** To be determined by Corps of Engineers, Huntsville Division, and the site manager.

*Evaluation Criteria*

- **Technical**
  - Were test objectives achieved?
  - Did the demonstration add to the understanding of capabilities of the tested technology?
  - Were the demonstration protocols adequate?
  - Did the demonstration advance the state of the technology?
  - Are the results from the demonstration applicable to other sites?
- **Process**
  - Was there appropriate stakeholder involvement?
  - Were stakeholder concerns adequately addressed?
  - Did the demonstration contribute to commercialization of the technology?
  - Did the demonstration and stakeholder involvement contribute to the development and deployment of the technology?
  - Were the results of the demonstration provided for the adoption/adaption of other users of the technology?
  - Did the demonstration further the business objectives of private sector partners?

*Contractor Criteria*

Criteria to be determined by the site manager and stakeholders.

## **8.8 Sunflower Army Ammunition Plant, Lawrence, Kansas**

This plant is typical of a number of munitions manufacturing plants that have contaminated water and soils on the property. Additionally, the plant has been identified as a candidate for a national large rocket motor demilitarization facility.

### **8.8.1 Purpose/Goals of Demonstration**

To develop a national test site for contaminated media for research and development of advanced technologies and to remediate contaminated media at the site.

### 8.8.2 Description of Project

Innovative technologies to be demonstrated: Decontamination of waters containing nitrates, guanidine nitrate (guanidinium ion), ammonia, and sulfates. Presently, evaporative lagoons are used to hold waters that have previously been treated by alkaline hydrolysis to break down nitroguanidine; use of the lagoons is a short-term measure at best.

### 8.8.3 Organization/Management

To be determined between Army Environmental Center; Army Armament, Munitions, and Chemical Command; and the Corps of Engineers.

### 8.8.4 Timing/Schedule of Activities

Many studies and activities have taken place since the 1970's. The establishment of a national test facility is yet to be approved.

### 8.8.5 Estimated Costs/Funding Status

Funding would be provided through the Defense Environmental Restoration Program and the Strategic Environmental Research and Development Program.

### 8.8.6 Selection Criteria

#### *Site Criteria*

- **Jurisdiction:** Department of the Army
- **Current and Future Land Use:** The installation contains 9,065 acres plus 479 acres of easements. The Sunflower Army Ammunition Plant is a government-owned, contractor-operated, military industrial installation assigned to the jurisdiction of the Commanding General, Headquarters, U.S. Army Armament, Munitions and Chemical Command. The principal mission of the Sunflower Army Ammunition Plant is the mass production of solvent and solventless multi-base propellants. After the termination of production in mid-1971, the plant was placed in a standby status. In the period since standby began, other activities at Sunflower Army Ammunition Plant consisted of a major modernization program and the reactivation of a portion of the plant for the production of nitroguanidine.
- **Potential Risk:** There are a number of sites where ground water, surface water, and soil are contaminated with heavy metals, acid, chlorinated solvents, and ordnance compounds.
- **Representative Site:** This site is representative of this type munitions manufacturing plant in the United States and other countries.

- **Current Public Awareness and Involvement:** Surrounding residents, employees at the Sunflower Army Ammunition Plant, and State and Federal environmental regulators are aware of and sensitive to the issues at the plant. (It is unknown if there is a stakeholders group already formed.)
- **Economic Benefit to Society from Remediation of the Site:** Remediation at the site would reduce the likelihood of offsite contaminants affecting the health of humans, livestock, and farm products. The establishment of a test facility for research and development on the plant site would add employment opportunities in the local area. Remediation of similar sites in the United States and other countries would potentially make these sites available for other uses.
- **Site Conditions:**
  - **Range of Contaminant Values:** There is a variety of chemical contaminants associated with the manufacturing process.
  - **Contamination Characteristics:** Site characterization was completed by the U.S. Army Toxic and Hazardous Materials Agency in the 1980's. Fifty potentially contaminated sites were identified with heavy metals, acid, ordnance compounds, chlorinated solvents or other compounds, or a combination of these.
  - **Site-to-Site Variables:** The site variables relate to the types of contamination.
  - **Environmental Variables:** These are the contaminated media of surface water, ground water, or soil.
  - **Access:** Good.
  - **Infrastructure:** The infrastructure includes facilities at the Sunflower Army Ammunition Plant and in Lawrence (12 miles) and Kansas City (25 miles). The Plant has an existing hazards sensitivity testing lab and basic environmental analysis capability; a sequential batch, biotreatment waste water treatment plant focused on the treatment of nitrate-contaminated waste water; and igloos and magazines that are empty and available for use.
  - **Isolated Location:** Sunflower Army Ammunition Plant is a small installation that is no longer isolated by distance from encroaching suburbs.

#### *Technology Criteria*

**Is the Technology Better, Faster, Safer, Cheaper for Cleanup in this Environment?**

- **Test Date:** Tests and cleanup measures are already underway. The date of recognition as a "national test bed site" is yet to be determined.
- **Potential for Timely Commercialization:** The technologies to be tested/demonstrated are in demand at other United States facilities and similar facilities worldwide.
- **Support for the Technology:** Yes.
- **Part of a Technology "Test-off or Competition:"** This is not part of a test-off or competition.
- **Regulatory Process Issues:** To be determined.
- **Quality Assurance/Quality Controls:** To be determined by the site manager and local stakeholders.
- **Measurable Outcomes:** To be determined by the site manager and local stakeholders.

#### *Evaluation Criteria*

- **Technical**
  - Were test objectives achieved?
  - Did the demonstration add to the understanding of capabilities of the tested technology?
  - Were the demonstration protocols adequate?
  - Did the demonstration advance the state of the technology?
  - Are the results from the demonstration applicable to other sites?
- **Process**
  - Was there appropriate stakeholder involvement?
  - Were stakeholder concerns adequately addressed?
  - Did the demonstration contribute to commercialization of the technology?
  - Did the demonstration and stakeholder involvement contribute to the development and deployment of the technology?
  - Were the results of the demonstration provided for the adoption/adaption of other users of the technology?
  - Did the demonstration further the business objectives of private sector partners?

#### *Contractor Criteria*

Criteria to be determined by the site manager and stakeholders.

### **8.9 Delta Range, Alaska, and Davis Range, Colorado**

These two formerly used Defense site range areas were identified in the report of the May 14 and 15, 1993, Military Munitions Waste Work Group meeting. These sites have been deleted from the first round of demonstration sites as being too limited in scope and possessing a low risk to the general public.

These formerly used Defense sites will be remediated by the Corps of Engineers based on the planned end use of the lands as determined by the managing agencies and input from other stakeholders.

**APPENDICES**

**Appendix A - National Department of Defense  
Environmental Technology Sites  
Program for Energetics under the  
Strategic Environmental Research and  
Development Program**

**TITLE: NATIONAL DoD ENVIRONMENTAL TECHNOLOGY SITES PROGRAM FOR ENERGETICS****Project Description:**

**Technical Objective:** The technical objective of this program is to provide specific sites where emerging energetic contamination treatment technologies developed by DoD, DOE, EPA, and both public and private sectors can be comparatively demonstrated, and evaluated.

**Technical Approach:** The proposed approach will include:

- 1) Evaluate potential sites for inclusion in program. Key site selection criteria could include, but not be limited to: a) wide representative range of soil and groundwater energetics contamination; b) soil should range from sandy to thick clay, hydrogeological environment should at a minimum include a 40 ft permeable aquifer with impermeable bed rock formations; c) readily accessible from a major transportation hub; d) site support available with accessible utilities and assistance from the Director of Engineering and Housing (DEH) or comparable Office/District; e) site expansion capabilities to include laboratory and personnel support facilities.
- 2) Establish a technology selection/work group. The problem area work groups will consist of members from both the user and developer communities. Members primary responsibility will be to recommend technology selection criteria. Technology selection criteria would include, but not be limited to: a) emerging technologies developed from SERDP participants, as well as, those of other government agencies and the private sector; b) technologies which address current contamination problems; c) technologies which exhibit potential cost savings over currently used technology; d) technologies which have the potential to meet established clean up levels.
- 3) Establish regulatory and safety requirements.
- 4) Examine physical, chemical, and biological limitations through site characterization analysis.
- 5) Evaluate natural attenuation of existing contamination.
- 6) Review technology-contamination suitability and provide technology selection/fabrication/installation guidelines.

**Funding by Task:**

See attached funding table.

**Performers:**

In addition to DoD, DOE, and EPA, other principal partners in this initiative will be other federal agencies and services, as well as, both public and private sectors. The SERDP Executive Director will provide program oversight, and USATHAMA will provide program management. The technology selection and oversight board will consist of members from both the user and developer communities. On site execution and day to day oversight will be performed by private firm contractors and/or other government agencies.

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*Please note that the findings of the Military Munitions Waste Working Group Report do not necessarily reflect the views of every member of the working group. Some members were not able to participate in the development of the report, nor were they able to fully review its contents. This report does not represent the official view of any federal agency or department, state, or other group.*



April 8, 1993

Mr. Andrew E. Hooper  
 Advanced Technology Division  
 U. S. Army Yuma Proving Ground  
 ATTN: STEYP-MT-1  
 Yuma, AZ 85365-9110

Dear Andy:

It was a pleasure to see you at the Range Clearance Workshop in Monterey. We hope that you and YPG will succeed in providing leadership and focus to a critically important, but evidently somewhat disjointed, field of endeavor.

On the last day of the Workshop you requested information from the attendees which included (1) descriptions of the state of the art in range-clearance technology and (2) suggestions for further research. We participated in two of the groups created to compile that information and, in our opinion, these groups did not produce the data you requested. We found the group discussions to be rather chaotic and dominated by advocacy of special interests. Further, we did not find the results produced by these groups to be either focused or necessarily representative of the group consensus (when such a consensus existed).

We conducted a review of present and expected future technologies for detection and location of subsurface UXO, and we made certain recommendations regarding technology development, in preparing our Final Report to the Kaho'olawe Island Conveyance Commission. You have a copy of that document. Some additional thoughts are given in this letter.

Let us begin by throwing cold water on some of the ideas which are now in circulation but which we think will not prove to be particularly useful in detecting buried UXO. These include:

- Use of airborne sensors: while attractive because it would allow the rapid survey of broad areas, airborne detection of buried UXO via radar, magnetometry, or electromagnetic induction does not appear promising. We believe that at the present time there is no reasonable basis for the assertion that airborne sensors will play a significant role in range clearance.

Some success in airborne ground-penetrating radar has been demonstrated for very dry, sandy soils; but such soils are not representative of most UXO-contaminated sites. It is not yet clear whether these radars can be successfully used at arid sites such as YPG.

Magnetometric and electromagnetic induction sensor signals decay too rapidly with distance from the target object to make the use of airborne instruments practical. Furthermore, the spatial characteristics of these signatures change with target-to-observer distance.

- Use of wheeled-vehicle-mounted sensors: because typical ranges involve rough terrain, it is usually impossible to traverse a range with a wheeled vehicle and thus to employ a sensor system such as STOLIS. Such systems will be useful only in rare circumstances, although they may be suited for parts of some desert ranges (e.g., YPG) after vegetation has been cleared.
- Exotic mine-detection techniques: such methods will not be appropriate for locating buried UXO for several reasons. For similar reasons, airport explosive-detection schemes will not be useful in locating buried UXO.
  - The explosive in a UXO item is sealed in a metallic casing, thereby rendering ineffective such methods as nuclear magnetic resonance imaging, vapor (trace gas) detection, neutron activation, and x-ray activation.
  - Attenuation of signals by soils precludes the use of sensors which rely on x-rays, charged particle beams, neutron activation, thermal (IR) detection of variations in soil surface temperature, and (to a lesser extent) ground-penetrating radar.
- Acoustic detection methods: while there has been an extensive study of acoustic (seismic) methods in nondestructive testing, biomedical imaging, and geophysical exploration, to date there is no evidence that an acoustic UXO detection system has ever been developed, nor is there any evidence that acoustic methods have ever been successful in detecting small, shallowly buried objects in soil. It is unlikely that acoustic methods will lead to a useful sensor for buried UXO because of (1) the high false-alarm rate produced by natural inhomogeneities (rocks, tree roots, and natural variations in undisturbed soils), and (2) high

attenuation rates for acoustic signals in soil.

- Ground-penetrating radar: GPR has often been proposed as a means for detecting buried UXO. GPR is attractive in principle for several reasons, including high resolution (by generating a synthetic aperture, one can produce images of the subsurface environment), sensitivity (GPR is sensitive both to metallic and dielectric objects), and the fact that target depth estimates can be obtained directly. However,
  - GPR's sensitivity to nonmetallic objects can produce strong clutter and a high rate of false detections.
  - GPRs cannot penetrate soil to depths much greater than a meter, and then only under conditions rarely encountered in the field.
  - GPRs are delicate instruments unsuited for use in rough terrain such as that found in most range environments.

It has been suggested that GPR's high false-alarm rates can be overcome by exploiting its high resolution in target classification systems which would distinguish buried UXO from harmless objects. The technology of target classification is far too immature to permit this; further, even if one had a highly effective target classification system, depth limitations preclude GPR from being used for anything but shallow targets.

- IR imagery: the presence of a buried object distorts the flow of thermal energy into and out of soil as the land heats and cools during the course of a day; this distortion can be detected in IR images. The maximum temperature difference observed via this method is on the order of a degree, and the effect is most pronounced for near-surface objects (the surface temperature change is attenuated by roughly a factor of two for each 10-cm increase in target depth). This limited depth of detection is sufficient to preclude the use of this technique in UXO detection. In addition, one finds that there exist many natural phenomena which create comparable temperature distortions. These include vegetation-related shading and thermal plumes, surface irregularities, and soil inhomogeneities.

The detection of buried UXO, and thus the success of range clearance, is driven by the available sensor technology. No existing sensor can detect every ordnance item under every conceivable condition (e.g., one cannot detect a

40 mm shell at 40 feet),<sup>1</sup> and it is not reasonable to expect this situation to change appreciably in the near future. The methods we think will be most useful in the near term are in fact those which are presently used in the EOD community: magnetometry and electromagnetic induction (EMI) detection. These sensors are sufficiently sensitive to detect UXO in the situations in which it is typically found (i.e., small items near the surface, larger items at greater depths). We therefore assert that existing sensors can, in principle, be used as the basis for thorough clearance operations.

While existing sensors can perform thorough searches, however, they generally cannot do so efficiently. Their greatest limitation is their sensitivity to clutter. When the sensor is operated with a sensitivity that permits good detection, the number of false alarms associated with the simultaneous detection of harmless objects including soil inhomogeneities and shrapnel can be excessive. Because each potential detection must be investigated via excavation, thorough clearance is often accompanied by low efficiency and high cost. *Minimising the false alarms is presently the area of greatest potential improvement in UXO detection technology.*

In addition, the existing sensors are very labor intensive. Although there exist a few recently developed semi-automated techniques, range clearance requires a team of trained sensor operators to interrogate the surface along a fine grid to detect all near-surface objects. Detection of deeply buried objects, especially in a cluttered environment, is difficult without computer data acquisition and processing.

On the basis of these observations, we believe that the efficiency and cost-effectiveness of range clearance operations would be well served by a modest research program. The objectives of this research program should be to refine sensor concepts and to develop methods for efficient sensor data acquisition and processing. The output of such a research program should be the technology necessary to field a number of new range-clearance sensors and systems. Specifically, we see a need to develop the following concepts:

- **Smart sensors:** False detections as a result of strong clutter signals are a major source of inefficiency in range clearance. An effort should be made to develop processing algorithms and sensor hardware which will permit a hand-held unit to discriminate near-surface UXO from

<sup>1</sup> Not does one need to.

clutter in near-real time.

- **Distributed sensor networks:** Research should be directed toward the development of (1) technology necessary to acquire simultaneous position and sensor data from multiple sensors and (2) processing algorithms necessary to permit detection and precise location of objects (especially large, deeply buried objects) with rejection of clutter.
- **Centralized clearance monitoring:** An effort should be made to assemble the software and hardware which would permit a central location to monitor and record the progress of independent search activities at a given site. We expect recent developments in GPS technology and GIS software to be especially useful here.
- **Emerging sensor concepts:** New sensor concepts are continually being developed and older concepts are being modified and refined. It is appropriate to monitor and evaluate these developments for use in range clearance. Among the concepts we consider worthy of examination are:
  - impedance tomography processing techniques for resistivity mapping data;
  - ground penetrating radars with small-aperture antennas used in a mode similar to that employed in biomedical acoustic imaging;
  - small ground-based or very-low-elevation airborne platforms for autonomous detection of UXO; and
  - sensor fusion techniques for combining data from multiple sensors.

The funding necessary to support these activities is approximately \$2M per year over two to three years. After these initial studies, fieldable implementations of specific systems may be appropriate at costs ranging from \$200k to \$500k each. We note that these costs are negligible compared to the cost of clearing any single range of modest size; therefore, wise investments in research can have great leverage in improving the efficiency and reliability, and in reducing the cost, of range clearance operations. Some specific projects are suggested in the following.

**Advanced signal processing of magnetometric signatures:** It turns out that the magnetometer signature of a compact buried ferrous-metal object has a characteristic shape which is essentially independent of the object's size and depth. The amplitude of the signature is proportional to the quantity

$m/d^3$ , where  $m$  is the ferrous mass of the object and  $d$  is its depth. The spatial scale of this signature depends only on  $d$ . The problem with magnetometric detection is not the sensitivity of the instruments themselves, but rather the difficulty of separating signals from large (like bombs and shells) and small (like shrapnel) objects. There exists a new mathematical signal-processing technique which is ideally suited to the problem of sorting out those signals (standard techniques simply don't work) and providing estimates of object size and depth. This technique should be investigated both theoretically and experimentally.

**Data fusion in UXO detection:** Although sensor data fusion is a recently developed discipline, it has found applications in diverse fields including military target identification, remote sensing of natural resources, medical diagnosis, and robotics. The appropriateness of this discipline to UXO detection is clear, and its application to range clearance should be explored. Given the high false-alarm rates produced by existing UXO sensors, and the high costs associated with excavating these detections, it follows that even a modest improvement in sensor performance resulting from sensor data fusion can make the clearance procedure much more cost effective. Specific questions which should be addressed are (1) To what degree will data fusion improve sensor performance in detection of buried UXO? and (2) What combinations of sensors, processing, and operational techniques are appropriate for use in range clearance?

**Clearance-planning software:** The results of the efforts described in the foregoing could constitute the basis for accurate three-dimensional mapping of suspected UXO contamination at a given site. Together with topographic and vegetation data, and information on proposed land uses and constraints, the contamination data could be used to develop a clearance plan and to estimate the cost and the post-clearance risk. Planning software tools based on operations research (for optimization) and GIS techniques (for data organization and display) should be developed. Risk assessment could be handled through a software module which would incorporate the Risk Assessment Code approach presently used for that purpose. Improved risk-assessment models (e.g., those based on "excess deaths per lifetime" measures of risk) could be incorporated as they were developed.

Another activity which we believe would be very valuable is the establishment of an Ordnance Remediation Information and Analysis Center (ORRIAC), a

central repository of information on all aspects of ordnance remediation.

Let us conclude with a brief summary and some recommendations. These deal only with the UXO problem; mines and chemical-weapon hazards are not addressed.

1. What do we know; what can we do; what are our strengths? *The sensitivity of existing magnetometers and other detection instruments is more than adequate to permit the detection and location of isolated buried UXO objects of sizes, and at depths, of greatest interest, given adequate data (that is, data taken over a sufficiently fine spatial grid). In fact, greater sensitivity would make these instruments unusable in any but the most isolated environments.*
2. Where is improvement most needed? *Improvements in sensor data collection and processing will permit better sensor performance in the presence of clutter, enable greater speed in buried UXO detection and location, and reduce both missed detections (thereby improving the reliability of the search) and false alarms (thereby increasing the speed and decreasing the cost of clearance).*
3. How ought we to proceed? *Recommended research efforts, and a rough estimate of cost, were identified in the foregoing. Each of these efforts could be conducted by joint industry-university teams, advised by EOD specialists to ensure that the realities of field operations were constantly in the foreground of the researchers' thinking. It is important to avoid the "earth is a homogeneous half-space" syndrome.*

We hope you will find this perhaps overly lengthy discourse on UXO detection useful. We're looking forward to the next Range Clearance Workshop!

Best regards,

/s/

Kendall F. Casey, Vice President  
 Brian A. Baertlein, Senior Scientist  
 cc: file

# **FORT ORD TOXICS PROJECT**

P.O. Box 3115, Carmel, CA 93921 408 375-9464 Fax 408 375-0724

The Honorable George Miller  
 Chairman, Natural Resources Committee  
 U. S. Congress, House of Representatives

2 May 1994

**FROM:** Fort Ord Toxics Project, Curt Gandy, Lenny Siegel

**SUBJECT:** Hearing on UXO and Fort Ord Cleanup Issues

Chairman Miller and Representatives.

I learned today, that the Natural Resources Committee (House of Representatives) is holding a public hearing at Seaside City Hall regarding the unexploded ordnance (UXO) cleanup problem at Fort Ord, CA.

Since none of the local citizen's organizations (Fort Ord Toxics Project, Military Toxics Project or any other) with which Mr. Siegel and I are affiliated, have been asked to present comments or testify, I doubt that we will have an opportunity to address your committee's hearing today.

However, we have been intensively following the UXO issue both nationally and locally for some time now. Therefor, I believe it is appropriate that we offer some unsolicited comments in the hope that you and the Natural Resources Committee might find our comments useful and include them in the official record of this hearing:

1. In most climates and terrain, **buried UXO migrates to the surface**. In the Midwest, it is the freeze-thaw cycle. In Hawaii, it's erosion from rain. In the Chesapeake Bay, it's tidal action. According to the February, 1994 issue of "Smithsonian", World War I shells are still being found in France.

**Therefore, surface clearance is not a permanent solution for UXO contaminated areas designated for public access or species preservation.**

2. The chemicals from which ordnance is made and their explosive byproducts are toxic. Once exposed, the **toxic chemicals migrate horizontally**. This migration will eventually become linked with the water table. A 1993 study of the impact range at Camp Grayling, Michigan found, among other problems, heavy metal contamination in surface stream sediments.

**Therefore, Fencing off ranges may be insufficient to protect public health and the environment.**

3. The military and its contractors are working on a number of promising, but **largely unproven technologies** for range investigation, range remediation, and explosive disposal. Because range contamination has only recently been considered a serious environmental concern, **most of this research is relatively new**. Consequently, it is anticipated that there is a great deal of technological "low hanging fruit" awaiting development and demonstration. NOSIH (the Naval Ordnance Station, Indian Head) published a summary of those technologies a few years ago.

**A Congressional authorization of nearly \$35 million for munitions-related environmental R & D disappeared last year, at the hands of the Senate Appropriations Committee. Why this happened is not clear!**

4. Range remediation, as often suggested by the DOD and its entities, is akin to strip-mining. In order to eliminate UXO hazards, **whole tracts of land are proposed to be bulldozed** to significant depths. We believe an environmentally sustainable "checkerboard" or "phased" approach, similar to sustainable forestry methods, would help preserve the ecosystems threatened while reducing the toxic risks to the community. This approach would take longer, but it could also lead to long term local employment.

**We know of no research in this area of UXO remediation.**

5. In the **Federal Facilities Compliance Act**, the DOD's request to exempt munitions from hazardous waste laws was rejected by Congress. Instead, it directed EPA to write a rule determining **when munitions become waste**. Congress directed EPA to consult with DOD and the states, as well as citizens' groups, convened by the Military Toxics Project, who also sought to provide input. In September 1993, representatives of EPA, DOD, several states, and several community organizations met in a hotel near the Pentagon to discuss the substance of the rule. The community groups indicated a willingness to accept delays - from EPA's Congressionally mandated schedule - **if the public were to be involved in the rule-making early in the process!**

**However, since that time the EPA and the DOD have met and exchanged information repeatedly, with no public involvement!**

**The consequence:** Citizens' groups are concerned that DOD will have **undue influence** over the rulemaking and are considering **legal action** to force EPA to speed up its activity and resume full consultation with the public.

6. **Restoration Advisory Boards (RABs)** are being implemented at selected military bases across the United States. RABs are a result of local citizen's demands to be involved in the cleanup process, which Congress and EPA support. The process establishing RABs by the DOD was set out in a memorandum from The Deputy Secretary of Defense, **Subject: Fast Track Cleanup at Closing Installations**, Sept. 9, 1993.

All "Superfund" sites do not have a RAB. Also, all RABs do not have a "Superfund" site. However, Fort Ord has both. One theme common to both, is the issue of "stakeholder" involvement in the cleanup process. As is borne out in "GAO/RCED-94- 156 EPA's Community Relation Efforts Concerning Superfund" report, and also

"The Final Consensus Report of The National Commission On Superfund" by the Keystone Center and the Environmental Law Center of Vermont Law School, March 1, 1994; all of the above documents note that local "stakeholders" must be empowered to participate in the decision making process of cleanup and reuse of toxic and hazardous sites that are a legacy of DOD's activities.

**As RABs are being established now! The process and procedures that have been recommended and consensed to by the DOD and others are not being observed. This can only serve to disempower the "stakeholders" and doom the remediation process at BRAC installations to litigation and failure.**

7. We believe the EPA **must** clarify that range munitions are indeed a hazardous waste. Additionally, hazardous waste laws such as **RCRA** and **CERCLA** need to be riggered. **UXO** investigation ought to follow a process similar to toxic cleanups. We believe this will make true remediation of UXO more likely.

However, UXO cleanup would **not** necessarily be guaranteed. Technical infeasibility, excessive cost, or environmental damage might all become DOD justifications for limits on UXO cleanup.

**As it stands now, the military often argues, "state regulators and EPA have no say over ranges because range munitions are not hazardous wastes under the law."**

**I respectfully disagree with any concept that allows the DOD to simply walk away from any toxics problem that was created by the military with U. S. Taxpayer's money.**

I am grateful for this opportunity to share our concerns with you today, I suggest to the members of the Natural Resources Committee and the Congress:

**1) Mandate community involvement in the EPA rulemaking on munitions wastes, including UXO and insist that the EPA properly fund and staff the rulemaking effort.**

**2) Insist that ranges be studied for UXO toxics migration.**

**3) Provide full funding for innovative research into range investigation, range remediation, and UXO disposal. Full funding for the WGA/DOIT program.**

**4) Make it possible for the "Fort Ord Demonstration" by the WGA/DOIT group to actually develop a pilot program and demonstrate new technologies that can be employed in the UXO cleanup process needed here at Fort Ord and throughout the United States.**

**5) The DOD's community relations effort (RABs) must be more closely scrutinized. Some RABs, as they are currently operating, are ignoring current guidance on selection of members, group process and other issues of concern to the "stakeholders".**

**6) You must address the UXO issue and its economic impact on our local labor market. Our community is being seriously impacted by BRAC, we are losing quality sustainable employment. UXO as a hazardous substance will force some very specific and limiting constraints on the economic/environmental recovery of our community. UXO adds yet another dimension to the already uncertain future of closing military bases.**

**Make it mandatory through statute, that Federal, State, and County entities creating new jobs or contracting services, offer "right of first refusal" of those jobs to workers displaced as a result of BRAC activities, complicated by UXO cleanup.**

I thank you for this opportunity to present our concerns and comments to you in this form.

I would very much appreciate receiving any copies of the testimony presented at your hearing today. If I can be of any assistance to you, please do not hesitate to contact me.

Respectfully yours,

Curt Gandy  
Director, Fort Ord Toxics Project

FORT ORD REUSE GROUP

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Preliminary Draft

Summary of  
Base Reuse Plan

February 8, 1994

PRELIMINARY DRAFT  
Summary of  
Final Base Reuse Plan

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Introduction: Plan Strategy  
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Infrastructure

Acquisition Strategy

Infrastructure Finance

## Introduction

The Fort Ord Initial Base Reuse Plan (IBRP) was approved for submittal to the Department of Defense by the cities of Marina, Seaside, Del Rey Oaks, Monterey, Sand City and Monterey County in March, 1993. The IBRP has been revised based on information provided in the Environmental Impact Statement (EIS) for the disposal and reuse of Fort Ord and community input to reduce development in areas where environmental sensitivity and constraint is required.

This summary draft of the Base Reuse Plan (BRP) projects approximately 60,000 jobs and 20,000 additional housing units at Fort Ord in the 50-year period covered in the plan. This represents a reduction of jobs from the 180,000 jobs originally projected in the IBRP and creates an additional 4,000 housing units beyond the projections in the IBRP.

The Army plans to keep as much as 2,000 acres of Fort Ord for its Presidio of Monterey Annex to support the Defense Language Institute, the Naval Postgraduate School, the Coast Guard, and troops in the area.

Another 2,400 acres will go to university uses through a recent act of Congress. The California State University system will get approximately 1,300 acres to establish a Monterey Bay campus. The University of California will get approximately 1,100 acres, in addition to a 400-acre landfill research area, to establish a technology center associated with the University of California at Santa Cruz.

There will also be land for other schools and facilities and more than 16,000 acres will be committed to nature preserves and habitat resource management.

Approximately 3,000 acres will be available for private development.

This summary draft of the BRP will be utilized for public comment and hearings, including review by regulatory agencies, the US Army and the Fort Ord Task Force. By March, 1994 a Base Reuse Plan will be prepared from this summary draft, regulatory agencies and community input, and will be presented for approval to FORG and its member jurisdictions.

**PLAN STRATEGY**

The draft final plan is designed to implement the Community's desires to realize three strategic goals at Fort Ord:

- \* ENVIRONMENTAL PROTECTION
- \* ECONOMIC DEVELOPMENT
- \* EDUCATION

These goals were established as part of the Fort Ord Task Force Strategy, June, 1992.

The plan meets these goals in the following ways:

**ENVIRONMENTAL PROTECTION:** Dedicate large areas for environmental protection, more than 16,000 acres dedicated to habitat management by Monterey County, the Bureau of Land Management, University of California Natural Reserve System (UNRS) and California State Parks. The cities of Marina, Seaside, Sand City, Del Rey Oaks and Monterey anticipate that cooperative arrangements may be developed to provide habitat conservation measures benefiting habitat both on Fort Ord and in the respective cities.

**EDUCATION:** Develop Education as a vehicle for the creation of quality jobs. Collaborative planning includes the Naval Postgraduate School (NPS), the Defense Language Institute (DLI) and other marine institutions.

These educational institutions will be included at Fort Ord:

1. California State University Monterey Bay (CSUMB)
2. University of California, Santa Cruz (UCSC)
3. Monterey Peninsula Unified School District (MPUSD)
4. Monterey Peninsula College (MPC)
5. Monterey Institute of International Studies (MIIS)
6. Monterey College of Law
7. Monterey Institute for Research in Astronomy (MIRA)
8. Golden Gate University

**ECONOMIC DEVELOPMENT:** Create 60,000 quality jobs over the next 50-year time period.

**PHASING**

The key to the development of the plan is a phased implementation based largely upon infrastructure availability. Projecting over a 50-year period is beyond usual land use horizons; however, by presenting a plan for full buildout, the plan intends to insure long term protection of environmental resources and avoid common problems associated with unmanaged development, including traffic congestion and air quality. The projected

development phases listed below will vary based on infrastructure availability and market absorption.

The phasing of the plan has three major components:

Phase	Water Source
First 1995- 2005	<u>7,000 acre-feet/year</u> Well water under Water Agency Agreement (6,600 plus conversion of golf course irrigation to reclaimed water 400).
Second 2005-2025	<u>11,600 acre-feet/year</u> Conversion of well source to Salinas Valley Potable Water Transmission Project (6,600 replacement of well draft and 5,000 new supply) and/or desalinated and recycled water projects.
Third 2025-2045	<u>15,500 acre-feet/year</u> Desalinated water or combination of imported, recycled and desalinated water.

#### NATIONAL MODEL

In September of 1993, Fort Ord was awarded special status as a National Model for base conversion, the only base chosen as a model from the 1991 round of base closures. Fort Ord was chosen because of the unique opportunity to create quality jobs as part of the President's desire to expedite communities' rapid economic recovery from base closures.

## Land Use Planning Assumptions and Descriptions

The following land use planning assumptions were utilized in developing the preliminary draft of the Base Reuse Plan.

1. The Base Reuse Plan (BRP) reflects a regional, broad-based approach as it relates to land use and circulation.
2. Slopes greater than 30 percent are best suited for low intensity recreation, watershed, wildlife habitat, grazing purposes, and other open space purposes.
3. Scenic qualities and open space are valued resources worthy of protection. Areas of high natural resource value will be carefully evaluated in the consideration of various projected land uses.
4. Designated historic buildings and sites should be preserved.
5. Housing and property will be set aside to meet homeless needs in accordance with the McKinney Act.
6. A jobs housing balance should be an objective of Fort Ord Reuse Planning.
7. Provision shall be made for a mix of housing types.
8. Continued use of Fritzsche Airfield should be compatible with the surrounding area considering safety, noise and FAA regulations.
9. Land uses which support public transit, improved air quality, and the availability of low and moderate income housing are encouraged. This could be accomplished by higher density pedestrian oriented communities with mixed land uses.
10. Urban development should be well defined and compact.
11. Phased development will be based on the availability of urban services and infrastructure.
12. Open space and parks should be established between urban areas.
13. State Highways 1 and 68 and other roads will be given scenic highway, scenic corridor, or landscape treatment.
14. Development of transportation corridors and public transit should be an integral part of urban design.
15. The bike route along Highway 1 will be maintained and enhanced as a through route, and riding and hiking

- trails should be acquired and developed toward a goal of creating an area-wide trails system.
16. Cultural, recreational and sporting facilities should be included to support regional needs.
  17. A Biological Resource Management Program should be developed for rare, threatened and endangered species, wildlife habitat and wetlands.
  18. Potential for water augmentation through water conservation, reclamation and ponding should be explored. Water storage facilities should be designed to protect the underground aquifer.
  19. All development should be serviced by community water and sanitary sewer systems.

#### COASTAL POLICIES

1. The sand dune area and open expanse along Highway 1 and the Bay, and between the cities of Marina and Sand City, are classified as highly sensitive. Because much of the dunes area is a resource of unique and regional significance, the area is given special land use planning treatment.
2. The existing scenic north-south Beach Road adjoining Highway 1 on the west side should be retained and extended to connect with roads in Marina and Sand City. It will provide a "slow travel" alternative to Highway 1 for visitors (vehicular, bicycle or walking) to increase their experience of the coast and dune habitat. The plan maintains separate distinction for the scenic roadway as a controlled access and limited local road and not part of the new transportation network being planned as mitigation for the BRP land uses.  
  
The road will also provide future coastal linkage to coastal access roads in the cities of Marina at the north and Seaside/Sand City to the south.
3. All public beach and dune access should be available without charge to the public.
4. Public access to the beach should be limited to developed boardwalk and trail systems, which are sited to avoid disruption to the dunes.
5. Development of buildings and related facilities west of Highway 1 should be limited to only the disturbed area between the dune zone and Beach Road.

6. It is recognized that subsurface utilities to the Bay exist and need to be maintained. These and future subsurface utilities should be allowed as appropriate, together with such surface access, maintenance and replacement easements as are necessary.
7. Public coastal access should be provided, along with enhanced opportunities to experience the coastal dune environment, in accordance with the California Coastal Act.
8. Habitat enhancement should be increased over existing levels.



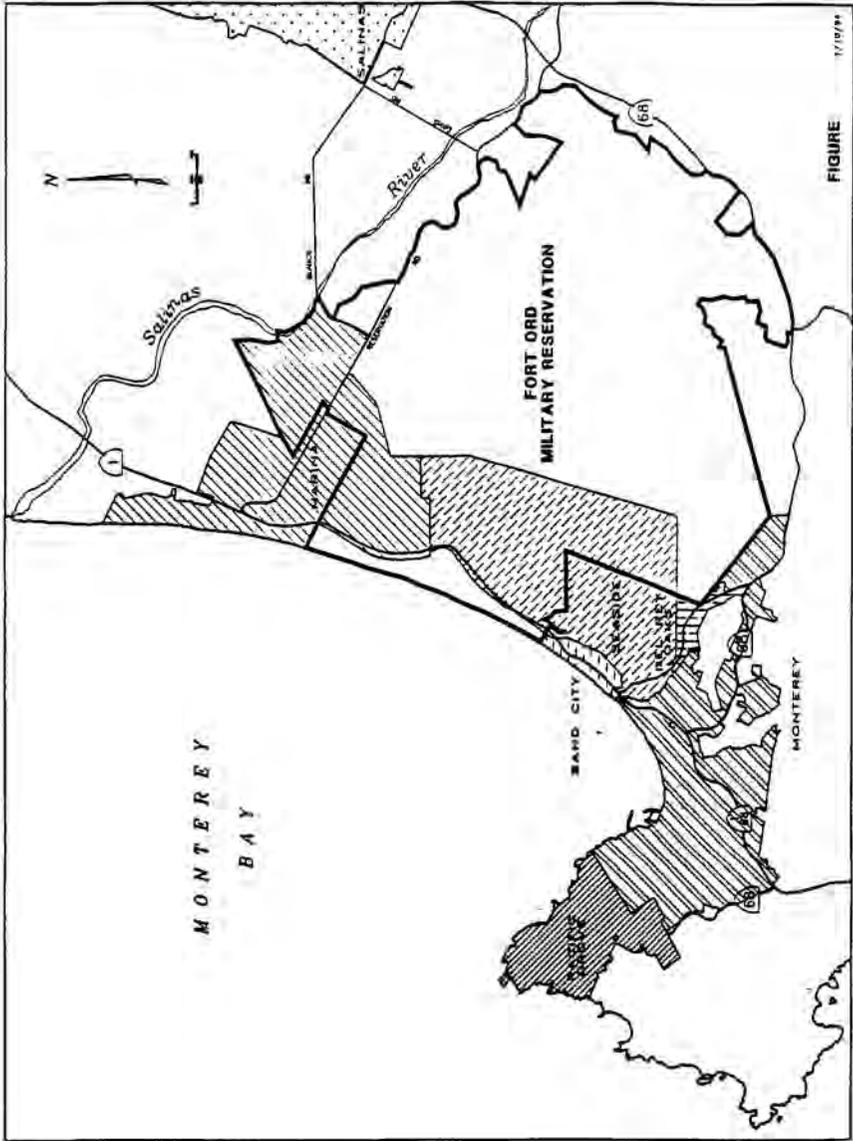
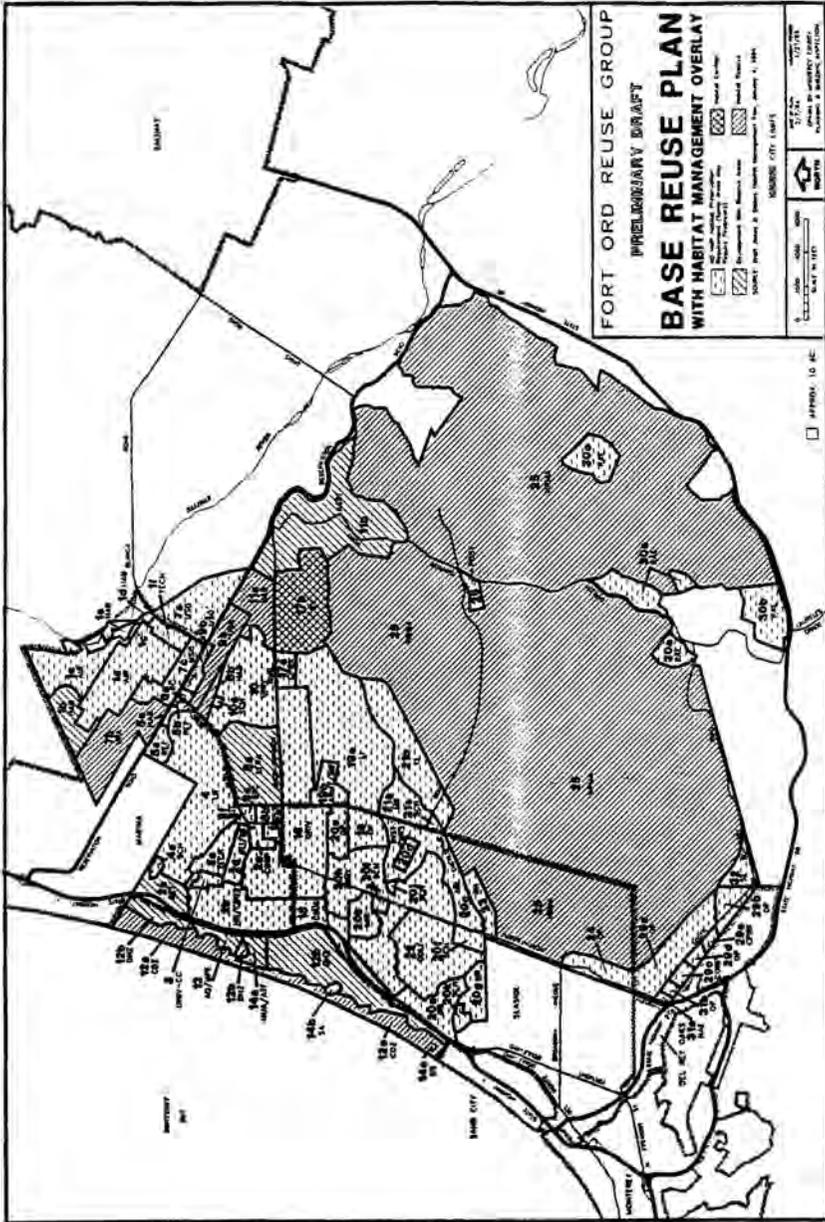


FIGURE 17/10/74





## FORT ORD REUSE GROUP BASE REUSE PLAN LANDUSE DEFINITIONS

<b>AGRI</b>	<b>AGRICENTER</b>	<b>MUA/ATF</b>	<b>MULTI USE AREA/ASILOMAR TYPE FACILITY</b>
<b>AIR</b>	<b>AIRPORT</b>	<b>NAE</b>	<b>NATURAL AREA EXPANSION</b>
<b>AQ/MRE</b>	<b>AQUACULTURE/MARINE RESEARCH</b>	<b>NRMA</b>	<b>NATURAL RESOURCE MANAGEMENT AREA</b>
<b>ARMY</b>	<b>ARMY PROPOSED PRESIDIO OF MONTEREY ANNEX</b>	<b>OP</b>	<b>OFFICE PARK</b>
<b>ARMY/MP</b>	<b>ARMY/MOTOR POOL</b>	<b>POST</b>	<b>POST ACADEMY</b>
<b>BTC</b>	<b>BUS TRANSFER CENTER</b>	<b>RAE</b>	<b>RECREATIONAL AREA EXPANSION</b>
<b>CBUS</b>	<b>CENTRAL BUSINESS DISTRICT</b>	<b>RC</b>	<b>RESERVE CENTER</b>
<b>CDZ</b>	<b>COASTAL DUNES ZONE</b>	<b>RET</b>	<b>RETAIL</b>
<b>CORP</b>	<b>CORPORATION YARD</b>	<b>RET/HR</b>	<b>RETAIL/HIGH RESIDENTIAL</b>
<b>DHZ</b>	<b>DISTURBED HABITAT ZONE</b>	<b>RH</b>	<b>RESORT HOTEL</b>
<b>DS</b>	<b>DESALINATION PLANT</b>	<b>RV</b>	<b>RV PARK/CAMPGROUND</b>
<b>GOLF</b>	<b>GOLF</b>	<b>SA</b>	<b>SERVICE AREA</b>
<b>HAB</b>	<b>HABITAT PRESERVE</b>	<b>SCH</b>	<b>SCHOOL</b>
<b>HR</b>	<b>HIGH RESIDENTIAL</b>	<b>SE</b>	<b>SCHOOL EXPANSION</b>
<b>HR/CBUS</b>	<b>HIGH RESIDENTIAL/CENTRAL BUSINESS DISTRICT</b>	<b>TECH</b>	<b>HIGH TECH BUSINESS PARK</b>
<b>INST/MIIS</b>	<b>INSTITUTIONAL/ MONTEREY INSTITUTE OF INTERNATIONAL STUDIES</b>	<b>UNIV</b>	<b>UNIVERSITY</b>
<b>LFRA</b>	<b>LANDFILL RESEARCH AREA</b>	<b>UNIV-CC</b>	<b>UNIVERSITY/COMMUNITY COLLEGE</b>
<b>LI</b>	<b>LIGHT INDUSTRIAL</b>	<b>URA</b>	<b>UNIVERSITY RESEARCH AREA</b>
<b>LR</b>	<b>LOW RESIDENTIAL</b>	<b>USO</b>	<b>UNIVERSITY/SCIENCE OFFICE</b>
<b>MR</b>	<b>MEDIUM RESIDENTIAL</b>		

## LAND USE POLYGON DESCRIPTIONS

For purposes of public discussion, the land use polygon descriptions are presented by land use jurisdiction. The polygon boundaries are subject to revision as the Base Reuse Plan is refined.

City of Marina

Polygon 1a: Gross Acreage: 390. Airport. (AIR) The current Fritzsche Army Airfield will be converted into a general aviation facility which will complement the adjoining University of California (UC) Center for Science, Technology, Education and Policy (STEP Center). The existing facilities will be reused and 31 acres in the polygon north of the runway will be available for new development desiring an airport location.

Polygon 1b: Gross Acreage: 130. Habitat Preservation. (HAB) This area will be acquired as part of the Fritzsche Airfield conveyance and will be managed for its habitat value by the University of California, except for areas needed for access or utilities (e.g. runway lighting). The area is retained by Marina as a buffer at the end of the runway but managed by the University of California Natural Reserve System as a coastal scrub/grassland habitat adjacent to University Research Area. Good potential exists for spine flower enhancement. This could also provide a link or corridor to riparian habitat of the Salinas river.

Polygon 1c and 1f: Gross Acreage: 313. Airport. (AIR) Most of this area will be available for business park, commercial, industrial and airport related uses which will provide income to help support the operations of the airport. 60 acres will remain undeveloped to provide clear areas required for aviation facilities.

Polygon 1d and 1e: Gross Acreage: 51. Habitat Preservation. (HAB) These areas include Fort Ord's riparian habitat of the Salinas River and the bluffs above the river.

Polygon 2a: Gross Acreage: 113. Retail. (RET) Sixty percent of this area will be available for retail, commercial and office uses. The remaining 40 percent will be protected open space for the sensitive species found in the area, including the Yadon's piperia, a locally rare plant that exists only in this area.

Polygon 2b: Gross Acreage: 334. High Density Residential/Central Business District. (HR/CBUS) This is a mixed use area which will provide opportunities for development of an urban core adjacent to both Highway 1 and the California State University (CSU) campus. This area

also boasts excellent bay views available for a combination of multi-family residential and commercial/office/cultural uses, much of which can be integrated to take advantage of pedestrian and transit opportunities as well as the excellent freeway access. Although non-residential development would probably precede much of the residential development, about 65 percent of the development would be for residential use combined with the parks and schools to serve the residential. The remaining 35 percent would be commercial/office/cultural uses, some of which may be separate from residential development. The maximum residential density would be 14 units per gross acre.

Polygon 2c: Gross Acreage: 111. High Tech Business Park. (TECH) This area will be redeveloped with business park uses, many of which will occur partially as a result of the nearby CSU campus and the UC Science, Technology, Education and Policy Center.

Polygon 2d: Gross Acreage: 82. Retail/High Density Residential. (RET/HR) This area would be available to provide a mixture of commercial and residential uses which would support the faculty, staff and students of the adjoining CSU campus. The maximum residential density would be 14 units per gross acre.

Polygon 2e: Gross Acreage: 40. Corporation Yard. (CORP) This area will contain public agency corporation yards currently planned by the City of Marina, the County of Monterey and the Monterey-Salinas Transit. This area also immediately adjoins the corporation yard planned for the CSU campus.

Polygon 2f: Gross Acreage: 7. Bus Transfer Center (BTC) This area will be used for a Bus Transfer Center.

Polygon 3: Gross Acreage: 30. Community College (UNIV/CC) This area will be used for a new community college campus.

Polygon 4: Gross Acreage: 665. Low Density Residential (LR) This low density residential area contains the existing Patton Park and Abrams Park subdivisions.

Polygon 4a: Gross Acreage: 16. School (SCH) This is the existing Patton School.

Polygon 5a: Gross Acreage: 59. Retail (RET) This area will be utilized for retail development.

Polygon 5b: Gross Acreage: 5. Retail (RET) This small area will be utilized for retail development.

Polygon 5c: Gross Acreage: 25. Habitat Preservation. (HAB) This polygon provides the corridor linkage from the

maritime chaparral around the airfield to the habitats in the interior. Restoration potential is good.

**Polygon 7b:** Gross Acreage: 345. University Research Area. (URA) One of the most important habitat management areas in the plan. Contains more sensitive species per square foot than anywhere else on Fort Ord. This will be held and managed as habitat by the University of California Natural Reserve System.

**Polygon 7c:** Gross Acreage: 139. University Office. (USO) Approximately 30 acres of this University Office Park will open space incorporated into landscape management, allowing for sensitive placement of structures and avoidance of any sensitive biological resources adjacent to habitat management areas.

**Polygon 8b:** Gross Acreage: 37. University Office. (USO) A small area (approximately seven acres) will be available for habitat management. Most of this polygon will be developed for university related facilities

**Polygon 8c:** Gross Acreage: 20. (BTC) This site will be used in conjunction with the Bus Transfer Center as a parking area.

**Marina/Seaside/Monterey County**  
California State University Monterey Bay

**Polygon 10 and 16:** Gross Acreage: 1263. University. The footprint proposed by the California State University as the site for its new Monterey Bay campus is located on approximately 1300 acres of land, of which 1000 acres is developed. On approximately 500 acres of the developed land are located 1253 housing units to be used for university housing. Approximately 200 of these units are intended for use as faculty family housing, the remaining 1053 units are intended for use as student housing.

The remaining 500 acres of developed land have numerous permanent and temporary (World War II vintage wooden) structures. Of the permanent three-story, concrete structures, 21 are planned for seismic upgrade and renovation into lecture/laboratory spaces. These will serve as the academic core of the university.

Additional facilities on this acreage include the following: 19 permanent, three-story, concrete structures that will be upgraded and renovated to serve as university residence halls (after upgrade and renovation, these structures will house approximately 1800 students); a lighted 8000 seat stadium surrounded by an eight-lane tartan surfaced running track and a small fieldhouse; a 24-lane bowling alley, a fully operational medical center; a bank building (Bank of

America) and numerous other permanent and temporary (WWII) buildings.

Other permanent single-story and multi-story concrete structures will be upgraded and renovated to meet the administrative space needs of the university. This area will also provide the sites where the university will construct new facilities including additional residence halls, a permanent library building, and a science center as necessary to accommodate a planned 25,000 full time equivalent (FTE) campus.

The 300 acres of open, undeveloped land physically connects the area containing the 1253 housing units and the academic core. This area is planned for eventual expansion of not only the university curriculum (e.g., a future environmental studies center) but also possible additional housing units to serve the needs of the students and faculty.

### Monterey County

Polygon 6a: Gross Acreage: 12. This area contains the existing US Army Reserve Training Center. If the Reserve Center is relocated, the proposed land use would be retail commercial.

Polygon 6b: Gross Acreage: 39. Habitat Preservation. This habitat area is to be retained by Monterey County (or transferred to UNRS) to provide further biological linkage/corridor connections between high value areas to the Northwest and Southwest.

Polygon 7a: Gross Acreage: 284. University Science/Office. (USO) This area is proposed for University of California educational, office and research purposes. Approximately 50 acres of this polygon will remain open space and will be incorporated into landscape management, providing opportunity for habitat enhancement. This is not critical for corridor linkage but has restoration/enhancement/public education potential.

Polygon 8a: Gross Acreage: 352. Landfill research area. (LFRA). The area formerly used for landfill would be used for remediation and reuse research. The landfill polygon will realize very limited development after it is remediated. The current concept which is under consideration is to restore sandy soils on the landfill cap and manage for species like sand gilia, spine flower and legless lizard.

Polygon 9a: Gross Acreage: 161. University research area. (URA) Another important habitat area with value both as a conservation area and as an important link in the corridor to the interior.

Polygon 9b: Gross Acreage: 46. University science/office. (USO) University science office facilities will be sensitively placed in these polygons to avoid important biological resources and to provide a manageable interface between the built and the open environment.

Polygon 10a: Gross Acreage: 7. School (SCH) This is a proposed site for an elementary school.

Polygon 11a: Gross Acreage: 174. Habitat preservation. (HAB) The parcel has valuable habitat and is critical in the corridor connection to the interior. The boundaries will be adjusted to preserve the corridor between polygons 9a and 25 through the westerly side of polygon 17b while establishing manageable boundaries with Polygons 7a, 10 and 11b.

Polygon 11b: Gross Acreage: 734. Agricultural Center. (AGRI) The agricenter will require approximately 200 acres of this polygon. The remainder will be set aside as open space/habitat. Boundaries will be adjusted to establish logical permanent boundaries between developable and undeveloped lands best held for habitat preservation.

Polygon 17a: Gross Acreage: 58. Parks and Recreation. (CPRK) Boundaries will be adjusted to accommodate significant biological resources.

Polygon 17b: Gross Acreage: 458. Parks and Recreation. (RV) The existing travel camp in this polygon will be rehabilitated, and minor improvements will be made to accommodate youth camp activities for 250 youths. Most of the area will be used for environmentally-oriented recreation and outdoor education to enhance the corridor connection between interior and coastal habitats to the North.

Polygon 19a: Gross Acreage: 778. Light Industrial (LI) with emphasis on light industrial uses supportive of educational objectives of the plan. More than 320 acres, located at the ecotonal edge between maritime chaparral and oak woodland will be preserved as open space/habitat.

Polygon 19b: Gross Acreage: 91. Army/Motor Pool (Army/MP) This area is the site of an existing Army motor pool recommended for retention in the POM Annex. Alternatively, the area would be used for light industry/offices supporting California State University. This is also a proposed site for a multi modal transportation center/MST transit operations facility

Polygon 21a: Gross Acreage: 133. (MR) Medium Density/High Density Residential as appropriate to improve the regional jobs/housing balance.

Polygon 21b: Gross Acreage: 362. Light industrial. (LI)

Polygon 21c: Gross Acreage: 14. Habitat Preserve (HAB). This 14-acre site has been requested by Monterey Peninsula College as a California Native Plant Society Plant Preserve.

Polygon 25: Gross Acreage: 13892. Natural Resource Management Area. (NRMA) Public lands managed by the Bureau of Land Management would remain in federal ownership.

These lands would be managed primarily to protect and enhance habitat for rare species.

These lands would also be available for public recreation and open space uses that are compatible with protection of the biological habitats. It is anticipated that there would be a system of trails for hiking, equestrian, and mountain biking enthusiasts, as well as opportunities for study and interpretation of the natural environments. Other public uses that are expected to occur here include environmental education, biological research, and wildlife fire training. Some areas may also be available for future development of facilities to support public and non-profit agencies such as schools, fire and law enforcement training, parks, etc.

Management guidelines for these lands would be established by a Coordinated Resource Management Plan (CRMP) which would be developed cooperatively by the BLM, local agencies and governments and the local community.

Polygon 26: Gross Acreage: 38. Law Enforcement Training. (POST) This area is to be used for law enforcement training, utilizing existing MOUT (Military Operations Urban Terrain) facility.

Polygon 30a, b, and c: Gross Acreage: 635. Parks and Recreation. (RAE) These are parking areas for Laguna Seca and will be sited and managed to optimize use of previously disturbed areas and minimize permanent damage to habitat. The size and location of these areas is subject to modification.

Polygon 32: Gross Acreage: 87. School/expansion. (SE) York School will construct a cross country course through this polygon resulting in minimal disturbance to the maritime chaparral habitat. Final polygon boundaries are currently being refined.

Monterey County/Sand City/Marina/Seaside  
 West of Highway 1

Polygon 12a: Gross Acreage: 404. Open Space. (CDZ) The undisturbed coastal dune zone is entirely preserved by the FORG plan.

Polygon 12b: Gross Acreage: 510. Parks and Recreation. (DHZ) Family campgrounds and day use facilities with controlled access to beach and dune habitat zone.

This polygon includes the existing Coastal Scenic Road connection between Sand City and Marina. This road is more fully described in the Land Use Planning Assumptions.

The existing scenic north-south Beach Road adjoining Highway 1 on the west side should be retained and extended to connect with roads in Marina and Sand City.

Polygon 13: Gross Acreage: 50. Aquaculture/Marine Research Center. (AQ/MRE) Area of previously disturbed dune zone, including the old sewage treatment plant, will be developed as an aquaculture facility. A small portion of this site may also be utilized for a desalination facility. The facility will not encroach into areas known to support sensitive species or those slated for dune restoration.

Polygon 14a: Gross Acreage: 57. Parks and Recreation. (MUA/ATF) The existing Stilwell Hall will be used as a multi-agency visitor center. Stilwell Hall may eventually be relocated or rebuilt due to coastal erosion, depending upon economic viability of moving and restoration versus replacement construction. New structures will be set back to observe coastal erosion rates.

A new world class Asilomar type facility and conference center may be built to house up to 300 overnight guest units, dining and support facilities and a variety of large and small meeting rooms.

Polygon 14b: Gross Acreage: 11. Parks and Recreation. (SA) The service area will use a previously disturbed area formerly the Ammunition Supply Point (ASP) to provide for equipment parking and storage.

Polygon 14c: Gross Acreage: 4. Desalination Plant (DS) This disturbed area is the site of an old sewage treatment plant. It is a possible site for a desalination plant, utilizing piping, parking and other existing facilities not currently in use. It would be designed and sited to minimize encroachment on the coastal dune habitat and viewshed.

**Monterey County/Del Rey Oaks**

Polygon 29a: Gross Acreage: 270. Office Park. (OP) This area is proposed for a combination of conference center, corporate headquarters, high tech business park, office park uses and commercial uses.

Polygon 31a: Gross Acreage: 15. Natural area expansion (NAE). The Natural Area Expansion polygon is designated to honor Monterey Peninsula Regional Parks District's request for an area to expand the Frog Pond on Fort Ord. The wetlands and ephemeral drainage in this area will be managed as open space/habitat.

Polygon 31b: Gross Acreage: 18. Office Park. (OP) This area is proposed for a combination of conference center and hotel. The area will be developed, allowing for sensitive placement of facilities and adequate buffer with the neighboring Natural Expansion Area (NEA).

**City of Seaside**

Polygon 15: Gross Acreage: 147. Commercial Business. (CBUS) This area is proposed for regional retail and commercial uses normally associated with a central business district.

Polygon 18: Gross Acreage: 110. Office Park. (OP) This area is proposed for office use with a small amount of medium density residential.

Polygon 20a: Gross Acreage: 194. Medium Density Residential. (MR)

Polygon 20b: Gross Acreage: 97. Medium Density Residential. (MR)

Polygon 20c: Gross Acreage: 313. Medium Density Residential. (MR)

Polygon 20d: Gross Acreage: 35. Institutional/MIIS (INST) This is the proposed site for Monterey Institute of International Studies. Approximately five acres will remain undeveloped.

Polygon 20e: Gross Acreage: 85. Office Park. (OP)

Polygon 20f: Gross Acreage: 50. School. (SCH) This is the site of the existing Fitch Middle School. Approximately 37 acres of the site will remain open space.

Polygon 20g: Gross Acreage: 96. High Density Residential. (HR)

Polygon 20h: Gross Acreage: 779. Army Enclave. (ARMY) The area is tentatively proposed for the Army Enclave. The final enclave outline will be negotiated between FORG, the City of Seaside, and the Army.

Polygon 20i: Gross Acreage: 16. School. (SCH) This is the site of the existing Stilwell Elementary School.

Polygon 20j: Gross Acreage: 8. School. (SCH) This is the site of the existing Marshall Elementary School.

Polygon 20k: Gross Acreage: 27. School. (SCH) This is the site of the existing Hayes Elementary School.

Polygon 22: Gross Acreage: 404. Golf Courses. (GOLF) Two existing championship golf courses: Black Horse and Bayonet.

Polygon 23: Gross Acreage: 91. Tourism. (RH) This area is proposed for resort hotels (approximately 1125 hotel rooms) and a convention center.

Polygon 24: Gross Acreage: 121. Commercial Business. (OP) This area is proposed for office use.

Polygon 25: Gross Acreage: 1179. Natural Resource Management Area (NRMA) Public lands managed by the Bureau of Land Management would remain in federal ownership.

#### Monterey County/City of Monterey

Polygon 29b: Gross Acreage: 92. Corporation Yard. (CORP) The area is proposed for a city corporation yard.

Polygon 29c: Gross Acreage: 30. Office Park. (OP) This area is proposed for a combination of corporate headquarters, high tech business park, office park and City corporation yard uses.

Polygon 29d: Gross Acreage: 25. Office Park. (OP) This area is proposed for a combination of corporate headquarters, high tech business park and office park uses.

Polygon 29e: Gross Acreage: 20. Community Park. (CPRK) This area is proposed for overnight camping and hiking. This area may be used as Highway 68 alternative corridor. If the area is used for highway purposes, the California Department of Transportation will provide the City of Monterey a community park site at another location.

## Infrastructure

FORG views the infrastructure systems required to support the FORG BRP as an integrated land use service network. This concept stems from the fact that the capability of any infrastructure system to properly serve its target urban areas is constrained by the capacity of the most limited subsystem. The plan will, therefore, be served by a matched set of infrastructure improvements so that water, wastewater drainage, transportation, solid waste, electrical, gas and communications systems will provide a cost effective response to the service requirements of the plan and, at the same time, minimize the cost of individual system elements.

Early indications are that the facilities to serve the plan in terms of defined supply, treatment capacity or disposal capacity are generally in place for the solid waste disposal, wastewater treatment, electrical and gas supply systems. In addition, the site soil conditions, topography and anticipated land use all favor a drainage plan involving recharge/reuse rather than off-site transport. This approach results in cost effective, environmentally effective and incrementally constructed drainage improvements.

Consequently, water supply and transportation are the infrastructure systems for which the facilities and their cost must be carefully balanced against the service demands of the plan. The first phase of base reuse has an immediately available ground water resource which will allow early phases of the planned land use to be served via the existing water supply system.

To provide water supply beyond these early reuse phases, additional water resources will have to be secured and new distribution systems constructed. Fortunately, a comparative water source, against which other water supply possibilities can be judged, is available from desalination of the ocean, a resource which is immediately at hand.

The transportation system is the remaining infrastructure element that is sensitive to the trips generated by the land uses set forth in the plan. A conceptual transportation network has been defined for which land capacities will be set by means of the regional TAMC Traffic Model. Rights of Way will be reserved for the ultimate highway or fixed-rail improvements but roadway improvements will be carefully staged to match reuse build-out. The capability to finance transportation improvements for ultimate plan requirements will require infrastructure construction reserves to be accumulated in advance. By early quantification and assignment of these costs, a financing program can be designed which balances transportation demand and timely

transportation funding to match the phased levels of development.

This summary of infrastructure planning and analysis, which will be constructed to insure that the service demands generated by the plan are met, also carries the connotation of "Strategic Engineering" whereby comprehensive infrastructure analysis as to cost and feasibility is played back against proposed land use intensity or spatial array of development. The FORG goal is one of cost effective, fiscally feasible, and environmentally sensitive infrastructure provision in support of the BRP.

## Property Acquisition and Disposal Strategy

Each of the FORG member governments is taking action to be sure that the three themes of the Base Reuse Plan will be achieved. In those cases where land will ultimately be in private ownership, the participating local governments intend to take certain key steps before the transfer to private owners takes place.

The local governments, using their normal planning and redevelopment process along with their police power over land use, will specify the land use entitlement that can be anticipated. The level of specificity will be comparable to the local government's General Plan. Each local government will also specify a program of implementation measures, public works projects and financing measures necessary to accomplish the goals and objectives of the BRP as they affect the individual parcels being sold. Buyers of land will thus have a realistic expectation as to the permitted land uses and a realistic understanding of their responsibilities to participate in financing public improvements and ongoing environmental impact mitigation programs.

### Infrastructure Finance

To implement this plan, a financing structure and plan will be developed. Potential sources of financing are described in the following paragraphs.

Federal Funds. Federal grants and direct Federal investment are being pursued actively and aggressively. In addition, every effort will be made to encourage the Federal Government to make direct investments in Fort Ord to remedy existing deficiencies or needs for remediation.

State of California. Economic development programs or other grant programs available from the State of California may be highly relevant to the process of reusing Fort Ord. Every opportunity will be explored to consider such sources of financing.

If Federal and State funds are insufficient, then the preference for locally-controlled financing is shown in the following paragraphs. Particularly in the early years after Fort Ord goes into private ownership, Monterey County and the affected cities may suffer fiscal distress. It cannot realistically be assumed that General Fund revenues will be available to finance Infrastructure at Fort Ord or that the local governments can participate in Federal or State loan programs unless the lending agency accepts as the sole source of payment a special tax on the land that benefits from the investment.

If federal and state funding are insufficient, then the only practical sources of financing relate to the development or redevelopment of Fort Ord. The preference for sources of financing is as follows:

- \* Development impact fees, collected at or near the time of development, will be used wherever practical to finance the expansion and capacity that are necessary to accommodate the demand for new capacity at Fort Ord. Demand should be met as closely as practical to the time when development will occur.
- \* Enhancements to development impact fees, such as borrowing (with interest) between development impact fee accounts or employing other comparable devices, will be used if traditional development impact fees, considered alone, would not produce sufficient cash in time to build each public improvement when it is required.
- \* Development-related bond financing (e.g., conventional special assessment bonds or Mello-Roos Community Facilities Districts), will be considered, if conventional development impact fees, or enhanced versions of these development impact fees, are incapable

of providing sufficient cash flow to fund an improvement when it is required. An example would be a major expansion of water supply that cannot practically be staged in small increments and that must be available early in the planning period, because a reliable water supply must be available before development can occur.

\* Redevelopment tax increment may be particularly applicable to reuse of Fort Ord, since the taxable assessed value of the military base is zero. As soon as a parcel comes under private ownership, the Monterey County Assessor's estimate of taxable assessed value is, in effect, the "increment" above the starting point of zero. Accordingly, if the parcel is in a redevelopment area, some or all of this increment (taxed at the 1 percent base tax rate) could be available for purposes of the redevelopment agency. At the same time, each local government will bear in mind that property tax assigned to a redevelopment agency is property tax that is not available to support the cost for ongoing services such as law enforcement, fire protection and general government.

103d Congress  
1st Session

COMMITTEE PRINT NO. 2

**DEEP POCKETS:  
TAXPAYER LIABILITY  
FOR  
ENVIRONMENTAL CONTAMINATION**

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AN INVESTIGATIVE REPORT

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MAJORITY STAFF REPORT  
OF THE  
SUBCOMMITTEE ON  
OVERSIGHT AND INVESTIGATIONS  
OF THE  
COMMITTEE ON  
NATURAL RESOURCES  
OF THE  
U.S. HOUSE OF REPRESENTATIVES

ONE HUNDRED THIRD CONGRESS  
FIRST SESSION



JULY 1993

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*George Miller, Chairman*

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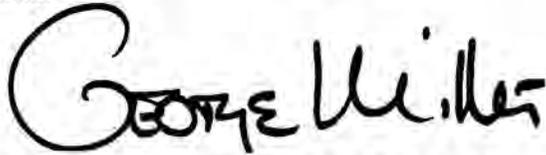
MEMORANDUM OF TRANSMITTAL

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COMMITTEE ON NATURAL RESOURCES,  
U.S. HOUSE OF REPRESENTATIVES,  
WASHINGTON, DC.

*To Members of the Committee on Natural Resources of the  
U.S. House of Representatives*

The Subcommittee on Oversight and Investigations has submitted the following report entitled, "Deep Pockets: Taxpayer Liability for Environmental Contamination," which is hereby made available to all Members of the Committee.

A handwritten signature in black ink that reads "George Miller". The signature is written in a cursive, slightly slanted style.

GEORGE MILLER, *Chairman.*

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## DEEP POCKETS:

### TAXPAYER LIABILITY FOR ENVIRONMENTAL CONTAMINATION

#### The Chairman's Summary

The federal government for over a century has encouraged, promoted, supported and subsidized activities that have resulted in severe environmental crises. Although there is no method in place to pay for mitigation of any of these serious environmental hazards — many of which pose significant danger to wildlife, economic activity, and even human safety — outdated government policies *continue* to underwrite creation of even more crises.

As a result of those outdated policies, inadequate oversight, and decades of neglect, the American taxpayer will be saddled with tens of billions of dollars in environmental clean-up costs for damage spread across federally owned lands in many, if not most, states.

This report highlights the policies that led to this massive environmental contamination and the tremendous costs taxpayers may face to mitigate it. In particular, the report examines antiquated mining laws that never required environmental restoration, irrigation policies formulated without regard for the impact of drainwater, acid drainage from mine sites, lands strewn with unexploded ordnance, uncapped oil and gas wells, and hazardous waste and radioactive materials awaiting clean-up.

A growing awareness of the need for policies that protect human safety and our natural resources compels a new effort to address the environmental impacts of past degradation. This report focuses principally on clean-ups that face the nation's leading federal landholder, the Department of the Interior. It does not address the significant liability facing the Department of Defense and Department of Energy's weapons program for widespread environmental contamination under their jurisdiction. This report's findings include:

- Tens of thousands of mine sites fail to comply with environmental standards. In addition to surface water run-off, leaching has contaminated groundwater.
- Hundreds of onshore oil and gas wells on federal lands may be improperly closed or contaminated with oil and drilling waste. The federal government may also face liability for closure of some offshore wells, particularly those that have been transferred to smaller operators.
- Approximately two million acres of Bureau of Land Management (BLM) land has been used for military training and weapons testing. At least 15 wildlife refuges are also contaminated by unexploded

ordnance. In many instances, no technology exists for clearing unexploded ordnance, which may range from munitions for rifles and pistols to bombs weighing hundreds of pounds.

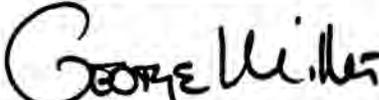
- Irrigation drainage from Bureau of Reclamation projects throughout the West has caused significant contamination in at least nine wildlife management areas. Millions of dollars will be required to change drainage patterns and to remediate environmental damage.
- The full extent of hazardous waste problems on federal land remains unknown. Although some landfills have received approved permits, extensive dumping of solid and hazardous waste has occurred on all federal lands.

Just as the true level of environmental damage is often unknown, the cost of mitigating these environmental and health catastrophes is difficult to estimate. Several examples illustrate the severity of the problem:

- Sixty abandoned mine sites on BLM lands are on the National Priorities List for clean-up under the Superfund program. The largest is the Clark Fork site near Butte, Montana, where BLM's liability will amount to \$100-300 million of a nearly \$1 billion estimated clean-up cost.
- The now-closed Midnite uranium mine, on the Spokane Indian Reservation in Washington State, contaminates neighboring waterways with radioactive run-off. The bankrupt mine operator plans to abandon water treatment efforts at the site this summer, leaving behind a minimal \$15,000 bond to reimburse clean-up costs of as much as \$107 million.
- One of BLM's most costly ordnance clearing problems lies on 15,000 acres at Davis Range in Alaska, a former Army site. A popular hiking spot for Anchorage residents, trails are swept each spring to remove unexploded ordnance that frost action may have brought to the surface during the winter.
- Radiation will make the clearing of unexploded ordnance at the active Department of Defense Aberdeen Proving Ground in Maryland extremely expensive and dangerous to clean up. The five-by-two-mile site is strewn with unexploded ordnance, including 82,000 kilograms of depleted uranium rounds.
- Harmful concentrations of selenium, arsenic, boron, cadmium, mercury and lead have been found in water contaminated by irrigation drainwater from the Bureau of Reclamation's Kendrick Project in Wyoming.

- Decommissioning the nuclear reactor on the nuclear ship *Savannah*, whose nuclear license expires in 1996, will cost the U.S. Maritime Commission an estimated \$76 million.
- The federal government has committed \$200 - \$300 million in federal dollars to nuclear decommissioning costs for various government contractors.
- At Lee Acres near Farmington, New Mexico, oil drilling wastes were dumped in a BLM-permitted municipal landfill, creating a Superfund hazardous waste problem. Private parties will pay only half the clean-up costs of \$10-12 million, leaving BLM to pick up the balance.
- Clean-up of the Iron Mountain mine in Redding, California, may involve a \$100 million expansion of a Bureau of Reclamation debris dam that receives run-off from the site.

This report identifies a number of estimated costs of cleaning up public lands from a variety of contaminants. No single dollar figure can be given at this time. A complete analysis of environmental contamination on public lands has never been completed. Some federal agencies have begun to assess damage under their jurisdiction, but with varying degrees of success or diligence. The report concludes that federal agencies must develop a comprehensive approach toward federal land management, one that minimizes the creation of new unfunded clean-up liabilities, while fairly and equitably sharing the costs of mitigating past environmental degradation. This must be done by pursuing private entities that are responsible for contamination of public lands, and by seeking adequate funding to protect public resources and human health and safety.

  
GEORGE MILLER  
Chairman

## Introduction

Throughout human history, the interaction of civilization with the natural environment has had adverse environmental effects. On the North American continent, westward expansion and the opening of the American West led to increasingly intensive use of natural resources and corresponding environmental impacts. A number of federal programs designed to encourage settlement of the West and development of federal resources also contributed to environmental degradation. New technologies involving modern toxic chemicals and creating radioactive waste exacerbated the problem still further.

Over the last few decades, the nation has become more aware of the far-reaching effects of human activities on the natural environment, and has begun efforts to reduce and repair those impacts. A wide range of environmental impacts from past activities on public land, however, have yet to be identified, let alone repaired or mitigated. In many cases, standards for clean-up have not even been developed.

Many federal agencies have barely begun to inventory the environmental hazards within their jurisdiction, and most have no assured funding mechanism to clean up environmental problems. The clean-up problems that these agencies may eventually have to address include not only the impacts of federal activities, but also the impacts of authorized and unauthorized private activities on public land. Where the responsible party cannot be found or cannot pay for clean-up, the costs will inevitably fall on the federal land manager.

The Committee on Natural Resources has initiated an effort to evaluate environmental damage and mitigation costs for which the federal government is or may become responsible. In the recent budget reconciliation bill passed by the House of Representatives, the Committee included a provision requiring that the President's annual budget submission to Congress include an estimate of the unfunded liabilities of the federal government.<sup>1</sup> Such an estimate will encompass a variety of federal responsibilities, including in particular an assessment of costs for cleaning up environmental contamination.

Determining the size of the problem is the first step toward solving it. Once an estimate of the potential clean-up costs is developed, the Administration and the Congress will be able to turn to the long-ignored problem of financing environmental restoration. The multi-billion-dollar size of this unfunded debt to the environment has not previously been addressed in the federal budget; it would be imprudent to continue to ignore the outstanding debt as environmental impacts and clean-up costs mount higher.

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<sup>1</sup>A more extensive provision, requiring the production of an "annual report" on the federal government's fiscal health, including income and debts, was included in the Senate version of the reconciliation bill.

This report surveys potential liabilities for environmental clean-up that may be incurred in the management of federal lands and water projects and the regulation of domestic nuclear power and nuclear materials. The information contained herein comes from a number of cited sources, plus hours of briefings by the staffs of the affected agencies and the Environmental Protection Agency. Where information obtained from various agencies was contradictory, the range of their various estimates is given. This report does not address the evaluation of a vast range of other federal clean-up responsibilities, such as activities of the Department of Defense and the Department of Energy weapons program.

The description here of environmental contamination and potential federal responsibility in the areas discussed is not exhaustive. Determining the full cost of unfunded environmental clean-up is virtually impossible, because in many cases federal agencies are not certain what contaminants lie on the millions of acres within their control. In addition, many clean-up standards, and the corresponding costs for remediation, are highly variable because the states set separate standards under the Resource Conservation and Recovery Act (RCRA)<sup>2</sup> or the Clean Water Act (CWA).<sup>3</sup> In some cases the federal government may assume the role of a "deep pocket" defendant, responsible for paying indeterminately large clean-up costs to meet stringent state standards, because no other responsible party can be identified.

This report also identifies some unanticipated clean-up responsibilities. For example, the cost of cleaning up abandoned mines has received considerable attention in recent years in connection with proposals for reform of the 1872 Mining Law. But little has been said about the contamination of federal lands with unexploded ordnance from military testing and practice ranges. The cost to clean up this latter contamination may even exceed the cost to reclaim abandoned mines on federal lands, although the lack of comprehensive surveys or clean-up standards makes it impossible to determine the expense of a full clean-up.

This report of potential liabilities frequently delves into areas that are currently or prospectively subject to litigation. Nothing contained in this report should be taken to assert a position one way or the other regarding the legal responsibility of the federal government for cleaning up any specific source of contamination. However, the potential for clean-up liability must be acknowledged and evaluated; the past position of some agency staffs, that contamination can be ignored until federal liability is proven, is short-sighted, impractical, and likely to result in far higher liabilities and costs.

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<sup>2</sup>42 U.S.C. §§6901-6992k. RCRA regulates the disposal of solid and hazardous waste. Standards for nonhazardous solid waste disposal are left to local regulators.

<sup>3</sup>33 U.S.C. §§1251-1387. The CWA regulates the quality of waters of the United States. The states are given primary jurisdiction to set standards for water quality, and may acquire primary authority to regulate individual discharges of pollutants.

## Active and Abandoned Mine Sites

One of the largest environmental remediation costs on federal lands will be cleaning up abandoned hardrock mining sites under RCRA, CWA, and the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA).<sup>4</sup> These mines are largely the result of private legal or illegal mining operations. Some were already present on land that was acquired by the federal government, but most were worked and abandoned while the land was in federal ownership. The abandoned sites pose a number of problems, ranging from simple safety hazards to hazardous chemical dumps to runoff of acidic mine drainage carrying toxic concentrations of heavy metals. The largest number of these sites are on Bureau of Land Management (BLM) lands, but clean-up costs will also be incurred at a significant number of mines on the national forests, and some sites in the national parks and in Indian country.<sup>5</sup>

### (a) National Park Service

More than 125 National Park Service (NPS) units contain abandoned mineral land sites, including hardrock mines, coal mines and oil and gas wells. Among the federal agencies with land management responsibility, only the National Park Service (NPS) has inventoried abandoned mineral lands on its property, developed a plan for evaluating the sites, and set priorities for addressing the associated health and safety and environmental problems.

NPS has identified about 10,000 hazards associated with more than 2,400 separate sites. Some NPS mine sites may require special attention to health and safety, historic preservation, and even reclamation of aesthetic values, due to high visitor use and the special mission of NPS. Taking these factors into account, NPS estimates the total cost of cleaning up abandoned mineral lands on NPS sites at \$200 million, without any budgeting for hazardous waste remediation that may be found

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<sup>4</sup>42 U.S.C. §§9601-9675. CERCLA established the Superfund program to assure that closed hazardous waste sites would be cleaned up, and that funds would be available for clean-up where responsible parties could not be found. CERCLA places full joint and several liability for clean-up on all operators and owners of hazardous waste sites, as well as others who may have contaminated them. Thus, the federal government may be liable under CERCLA for clean-up either because it owns a site (like the abandoned mines discussed in this section), or because it generated waste disposed at a private site (like the Bureau of Reclamation's waste disposal discussed in the Hazardous Waste section below).

<sup>5</sup>"Indian country" is a term that refers to several different categories of lands owned by or benefiting American Indian tribes. They include all territory within an Indian reservation whether settled by Indians or non-Indians; dependent Indian communities located on or off a reservation; and all Indian allotments located on or off a reservation. The nation's continuing trust responsibility to Indians in Indian country is administered primarily through the programs of the Bureau of Indian Affairs.

necessary during clean-up. This figure is based on a detailed inventory of about 5 % of the known sites.

The NPS mineral land reclamation program is acclaimed by other agencies for its planning and setting of priorities. The inventory of sites was accomplished in part by training Park Service personnel to identify potential problem sites when they encounter them. Once a site is identified, expert personnel can be brought in to evaluate the environmental and safety hazards. In some cases, NPS uses trained volunteers to evaluate sites. The inventoried sites are to be cleaned up under a designated order of priorities:

- 1) human health and safety;
- 2) mitigation of hazards to park resources;
- 3) preservation and interpretation of historic resources; and
- 4) preservation of wildlife habitat and endangered species.

To date, NPS budgetary limitations have restricted most NPS clean-up to the first priority, spending \$60,000-100,000 per year on stabilizing sites for human health and safety.

**(b) Bureau of Land Management and U.S. Forest Service**

Both BLM and the Forest Service report large numbers of abandoned mine sites. The Forest Service estimates there are 25,000 abandoned sites on national forests; the BLM has not estimated the total on its lands, which may add up to hundreds of thousands. In 1988, the General Accounting Office estimated that more than 400,000 acres of federal land are affected by unreclaimed mining sites. More than half of these acres consist of abandoned mine sites, where the 1988 estimate calculated clean-up costs at nearly \$300 million.<sup>6</sup> More recent agency estimates, however, indicate that this figure may be far too low. An EPA staff estimate of the total mine clean-up liability, using the questionable assumption that only 2 % of abandoned mines pose an environmental risk, sets the total at \$2.4 billion, some of which might be offset by mine operators or other responsible parties.

The Forest Service began an inventory in 1992 to identify abandoned mines that pose environmental hazards. A pilot program on the Deerlodge National Forest in Montana revealed that about 10% of the abandoned mines present serious environmental problems requiring reclamation. This and other data lead the Forest Service to conclude that the cost of cleaning up the most serious problem areas nationwide would total about \$250 million. However, the mitigation effort, as estimated by the Forest Service, would not meet EPA standards. The cost of meeting

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<sup>6</sup>General Accounting Office, "Federal Land Management: An Assessment of Hardrock Mining Damage," Briefing Report to the Chairman, Subcommittee on Mining and Natural Resources, Committee on Interior and Insular Affairs, House of Representatives, April 1988.

the EPA standards for remediating hazardous waste sites at Forest Service abandoned mines would likely run into the billions of dollars.

BLM has not estimated the total cost of cleaning up all abandoned mines. However, BLM is designing an inventory plan to identify problematic abandoned mine sites. Already 60 abandoned BLM mine sites are on the National Priorities List<sup>7</sup> for Superfund cleanup under CERCLA (some involve shared liability with the Forest Service or Bureau of Mines). The largest of these known liabilities is the Clark Fork site near Butte, Montana, where BLM's liability will amount to \$100-300 million of a nearly \$1 billion estimated clean-up cost.

Even BLM's Superfund liabilities could be dwarfed by the cost of providing storm water runoff control mandated by the Clean Water Act, which applies to mine sites on federal lands as well as other sources of storm water contamination. The staff of BLM's solid minerals division estimates it will cost \$60 billion to identify and sample storm water run-off at all mine sites on BLM land. It would then cost an additional unknown amount to trap and treat storm water from the sites where necessary.

EPA has, however, recognized the difficulty of mitigating the impacts of storm water run-off on federal lands, and has begun developing a general permit system for federal agencies to deal with abandoned mines, landfills and oil and gas wells. Under EPA's proposed regulatory scheme, a general permit would be issued for each land management area (e.g., a BLM state or district office, a national park, or a national forest), prioritizing clean-up requirements by watershed. This approach would save costs considerably over the individual mine site permitting scheme envisioned by BLM, and would allow the land managers to determine the highest priorities for storm water control and treatment according to the most affected watersheds. EPA staff estimates that the site inventory process under the general permit would cost only \$4,100,000 to \$11,900,000 in the first year for all Department of the Interior sites. Full remediation, however, would still cost billions of dollars.

Current mining operations may also add to future clean-up costs. A considerable number of active mine sites lie on BLM lands and the national forests. Since 1981, 26,000 plans of operations for hardrock mining have been filed with BLM. Out of approximately 1,600 currently active plans of operations, there are more than 500 producing mines. In addition, nearly 7,000 notices are "active" for mines disturbing less than five acres - where no plans of operation are necessary. The Forest Service estimates approximately 2,200 active mines lie on the national forests.

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<sup>7</sup>The Environmental Protection Agency developed the National Priorities List to identify those hazardous waste sites having the highest potential environmental impact and therefore warranting the highest priority for clean-up. Sites are ranked according to the amount and toxicity of waste, the likelihood of waste migration from the site, the proximity of human habitation, and other factors that determine the degree of risk.

Although most current mine operators on the national forests are bonded for reclamation and clean-up, the BLM has in the past imposed less stringent requirements for financial assurance. These less stringent bonding requirements have created a significant potential for the federal government to incur the cost of reclaiming current operations in the event of operator default or bankruptcy.<sup>4</sup> In addition, unanticipated problems may arise because none of the reclamation bonds cover potential future costs to meet water quality standards. If mine closure plans are completed, the agencies generally release the operators without imposing the obligation to meet environmental standards in the future. Problems that arise after closure will rest in the hands of the federal landowner.

(c) **Bureau of Indian Affairs**

There is great disparity in what the various federal agencies know about abandoned mine clean-up costs, as is evident in a comparison of the programs of the Bureau of Indian Affairs (BIA) and the NPS. Since the BIA has made no systematic effort to assess the extent of mine site problems, no good estimates are available for the potential extent of federal liability on lands within the BIA's responsibility.

Although the BIA has not inventoried mine sites in Indian country, BIA staff guess that the total clean-up costs for these sites might run in the \$100 million range. One notable uranium mining site, the now-closed Midnite Mine on the Spokane Indian reservation in Washington, poses known hazards to neighboring waterways from contamination with radioactive run-off. The mine operator plans to abandon the site this summer. The operator is bankrupt, but it is wholly owned by one of the largest mining companies operating on federal land. If liability for clean-up cannot be legally placed on the parent corporation, the operation will leave behind only the minimal \$15,000 bond required by BIA. This bond would not go far toward reimbursing clean-up costs that the BIA estimates at \$10-15 million, but others have judged as high as \$107 million. Such a result would potentially encourage other large mining companies to spin off subsidiary mining operators that would be solely liable for mine clean-ups on federal lands.

### **Unexploded Ordnance**

The federal government has long used public lands for military training and weapons testing. Changing defense demands have reduced the need for such sites. BLM or the U.S. Fish and Wildlife Service (FWS) now manage many of these old military sites that remain contaminated with unexploded ordnance. Such ordnance may include munitions from pistols, rifles and artillery as well as bombs from naval,

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<sup>4</sup>General Accounting Office, "Importance of Financial Guarantees for Ensuring Reclamation of Federal Lands," Testimony before the Subcommittee on Mining and Natural Resources, Committee on Interior and Insular Affairs, House of Representatives, March 7, 1989.

aerial and ground bombardment. Although the Department of Defense (DOD) is responsible for cleaning up the majority of contaminated sites, it is still the taxpayer who will pay the final bill. As more military bases close, the area of affected lands will increase.

Inventory and clean-up costs are difficult to gauge, because the technology does not yet exist to detect subsurface ordnance over a large area. Both sensors and ground-penetrating radar can locate subsurface ordnance, but these are costly to employ on a wide scale. Even when contaminated land is cleared, routine checks are required to ensure that no new ordnance has risen to the surface. Varying terrain and climate also hamper detection -- sensors towed across open land cannot be used in forested areas, and subsurface ordnance is difficult to locate in swamps or tundra.

Clean-up costs also vary widely depending on terrain, climate, the size of ordnance and the depth at which it is buried. Munitions become progressively more unstable and dangerous over time, but some more modern munitions present a new problem because they may contain depleted uranium. Several firing ranges require Nuclear Regulatory Commission (NRC) licenses for handling this radioactive material. Clearance costs might range from a few hundred dollars per acre to several hundred thousand dollars per acre for the central impact area of a firing range -- often hundreds or thousands of acres in size. Bomb disposal is also highly dangerous work; one disposal expert was seriously injured recently at the Yuma Proving Ground.

**(a) Bureau of Land Management**

BLM has not performed a comprehensive inventory of unexploded ordnance on its lands, but the agency estimates that about two million acres are affected, of which some 100,000 acres are heavily contaminated. BLM will soon request its field offices to identify Formerly Used Defense Sites on BLM lands, where unexploded ordnance might be present. By comparing survey results with sites already identified by the Army Corps of Engineers, BLM hopes to develop more definite statistics on the extent of the unexploded ordnance problem.

Although DOD bears much of the responsibility for clean-up, BLM must pay for clean-up at some sites. BLM estimates that one of the most costly will be clearing 15,000 acres at Davis Range in Alaska, a former Army site. Since the area is a popular hiking spot for Anchorage residents, trails are swept each spring to remove unexploded ordnance that frost action may have brought to the surface during the winter.

BLM is also responsible for clean-up on 13,500 acres at the Delta Range in Colorado. For 24 years, the Colorado Army National Guard used the Delta Range for mortar, rifle and howitzer training. Although the National Guard has conducted a surface sweep, significant subsurface contamination remains.

It is difficult to perform complete clean-up of unexploded ordnance. Although DOD has cleared 20,000 acres on former military sites so that they can be returned to

BLM, BLM has refused to accept jurisdiction because unexploded subsurface ordnance may remain. For example, at Cuddeback Lake Air Force Range in California, the Air Force will not certify that the lands are safe. Further clean-up would not only be costly, but would also potentially disturb the habitat of the endangered desert tortoise, which has moved into the region.

Military base closures will exacerbate the problem of unexploded ordnance on public lands. At Fort Ord in California, for example, BLM may acquire 17,350 acres of land, including 8,000 acres in the firing range impact area, where clean-up could run into hundreds of thousands of dollars per acre. Decisions concerning the site's future are complicated by the presence of endangered birds, mammals and plants.

Other military bases may revert to their prior land status within the next 10 years as their congressionally mandated designations for military use sunset. Affected bases included Nellis Air Force Base Range in Nevada, Goldwater Air Force Range in Arizona, and the Bravo 20 Range in Nevada--notorious for a large amount of unexploded ordnance.

#### (b) Island Refuges

FWS has documented contamination by unexploded ordnance on at least 15 wildlife refuges, with an additional 7 where ordnance is suspected. But as FWS inventory efforts continue, additional contaminated refuges may be identified. Wildlife may be suffering two separate impacts from past military use. Markers for military targets contain white phosphorus that ignites upon contact with oxygen. If the markers drop into swampland, the phosphorus may not burn until ingested by a bird. Wildlife also may trigger explosions.

The military is responsible for clean-up at all refuges.<sup>9</sup> At least one refuge, however, has already become a congressionally mandated sacrifice zone: the Culebra Wildlife Refuge located on a small island off Puerto Rico. Bombed between 1906 and 1976, unexploded ordnance now contaminates both land and sea. In 1976 Congress withdrew the island from naval use, but directed that no funds be spent for clean-up. Still other refuges continue to be used by the military, including Midway Atoll and Johnston Island in the Pacific.

#### (c) Radioactive Munitions

Through its regulation of the domestic nuclear industry, the Nuclear Regulatory Commission (NRC) has developed the Site Decommissioning Management Plan (SDMP), which identifies certain sites for high-priority clean-ups. The sites on

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<sup>9</sup>The military has already cleared some refuges, including the Laguna Atascosa Refuge in Texas, but monitoring for subsurface ordnance remains necessary.

the list are operated by entities licensed to use radioactive materials, but they have become severely contaminated. One of the most costly SDMP clean-ups will be of unexploded ordnance at the active DOD Aberdeen Proving Ground in Maryland. The five-by-two-mile site is strewn with unexploded ordnance, interspersed with 82,000 kilograms of depleted uranium rounds. Another site that may soon be added to the SDMP is DOD's Yuma Proving Ground, where DOD submitted financial assurances totalling \$153 million to the NRC to guarantee clean-up. Between five and ten other military ranges, not on the SDMP, present similar contamination problems.

## Uncapped Oil and Gas Wells

### (a) Onshore Wells

BLM regulates oil and gas leases on all federal and Indian lands; the agency is responsible for inspection and enforcement at approximately 112,000 oil and gas wells. The majority are on BLM land, but approximately 3,400 active and 2,400 inactive wells lie on Forest Service lands. Oil and gas activity is present on 64 national wildlife refuges. Although the BLM is responsible for inspection and enforcement of all wells, the Forest Service and FWS are responsible for clean-up costs from abandoned or improperly closed wells on their own lands.

Standards for closing oil and gas wells require that the wells be plugged correctly and the surrounding land reclaimed. Such closed wells are identified as "plugged and abandoned." In addition, many are temporarily closed, or "shut-in." Production might resume at shut-in wells depending on the price of oil or gas and royalty rates. The principal problem facing BLM is "orphaned" wells--wells that have been neither plugged nor abandoned and where the operator can no longer be located.

Each well operator must be bonded; bonds are available for individual wells, or for statewide or nationwide drilling activity. Since 1960, these bonds have been set at \$10,000, \$50,000 and \$150,000, respectively. Some states also set their own bonding requirements for wells on federal lands within the state. On Indian lands, operators must comply with bonding requirements established by the tribes.

Operators are required to submit plans to BLM for plugging wells and reclaiming surrounding land. Although BLM approval of these plans releases the operator from future liability, the bond is kept in perpetuity.

Many bonds are insufficient to cover the costs of necessary corrective action. The DOI Inspector General found that oil and gas lease operators were neither classifying wells correctly nor plugging them promptly upon closure.<sup>10</sup> BLM

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<sup>10</sup>U.S. Department of the Interior, Office of the Inspector General, "Inspection and Enforcement Program and Selected Related Activities, Bureau of Land Management," Audit Report No. 90-18. November 1989.

responded by increasing inspection and enforcement efforts.<sup>11</sup> In the past year, BLM has taken additional measures to reduce potential liability that might result from improperly abandoned or orphaned wells.

BLM inspects only major wells upon closure, because the agency lacks sufficient resources to examine all closures. BLM relies on the legal argument that well operators who receive closure approval but fail to follow submitted plans are not released from future liability. In the short term, the government may face litigation disputing post-closure liability. In the long-term, any delay in identifying these wells and locating responsible parties increases the likelihood that the federal government will ultimately be responsible for closure costs.

Such federal closure expenses have already been incurred on a regular basis. In FY92 BLM closed a total of 16 orphaned wells at a total cost of \$277,000. BLM anticipates expenditures in FY93 of \$359,650 for plugging wells. However, in FY88 a single well closure in North Dakota cost \$470,300. BLM acknowledges that other unidentified orphaned wells may exist. Federal funds have also been necessary to close wells properly in earlier years, but BLM has not kept statistics on the extent of the problem.

Historically, BLM has rarely called in bonds because operators prefer to take corrective action rather than default. Any operator forfeiting a bond has little hope of securing another one. Since 1990, BLM has found 26 companies in default and has taken steps to pursue the bond. In all but two cases, the companies paid the necessary costs. Of the remaining two, one operator failed to pay royalties of \$235 and filed for bankruptcy. The other operator forfeited a \$25,000 bond, of which \$8,898 was used by BLM for restoration costs. Forfeitures may increase in the future, however, because small operators may prefer to default rather than to abandon a well correctly.

Spillages of mercury, brine and oil drilling waste also pose potential liability to the federal government. Mercury pollution derives from manometers used for measuring gas pressure. Mercury has often been dumped when a manometer is serviced. Although non-mercury measuring devices began to replace them in the late 1980s, many old mercury manometers are still in use.

FWS has probably given the most attention to mercury pollution caused by pipeline manometers, estimating that this mercury is currently the single greatest unidentified contaminant in wildlife refuges. Two of the most severely contaminated refuges identified to date are D'Arbonne and Upper Ouachita, both in Louisiana. At Upper Ouachita, where oil and gas wells are still active, mercury levels have reached 142,000 parts per million (the acceptable level for mercury is 1/2 part per million). Clean-up will cost between \$40,000 and \$50,000 per well for 350-400 wells.

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<sup>11</sup>U.S. Department of the Interior, Office of the Inspector General, "Followup of Recommendations Concerning Inspection and Enforcement Program and Selected Related Activities, Bureau of Land Management," Audit Report No. 92-I-578, March 1992.

Although responsible parties can be identified in this instance, such identification may not be possible at all sites, particularly where mercury contamination has not yet been identified. FWS has also found significant problems with brine seepage and oil spills on refuge land. Arco was found liable for diesel and PCBs in Kenai National Wildlife Refuge in Alaska and thereafter spent \$44 million on clean-up.

According to BLM, mercury, brine and oil drilling waste on BLM leases pose no significant environmental problems. But since neither oil drilling waste nor elemental mercury is treated as hazardous waste under the RCRA, there are effectively no applicable standards suitable for measuring the severity of the environmental risk.

EPA anticipates that these unaddressed wastes will cause environmental contamination on BLM land, noting that a number of sites contaminated by oil and gas drilling waste have been added to the National Priorities List (NPL) for clean-up under Superfund.<sup>12</sup> The most costly is Lee Acres in Farmington, New Mexico, where drill operators dumped waste that polluted the groundwater. To date, \$5 million has been spent on clean-up, but there is evidence that the contamination has not yet been contained.

#### (b) Offshore Wells

The Minerals Management Service (MMS) monitors offshore oil and gas drilling on 5,837 leases in the Gulf of Mexico, the Atlantic and Pacific Oceans, and off the coast of Alaska. The relatively few offshore wells are much easier to regulate than those onshore, and the agency believes it possesses knowledge of day-to-day lease activity.

Several factors have contributed to concerns that the federal government may face liability for offshore well closure, particularly in the Gulf of Mexico, where MMS has estimated the total cost of removal of the existing 3,800 platforms at \$5 billion. Many of the Gulf wells are in declining production, and as they become less economically viable, major companies no longer find them cost-effective to operate. In many cases, this has resulted in the transfer of leases to smaller independent operators with lower overheads. But these independents are also less likely to have the requisite resources for closure. MMS is currently facing a logjam of about 1,000 applications to approve such lease transfers.

The transfer of leases has created a legal question whether the federal government can hold the *original* lessees responsible for closure costs. To date, only one lessee has gone bankrupt without recourse for closure costs. In December 1989, Alliance Operating Corporation, which had several Gulf leases, filed for Chapter 11 bankruptcy. MMS estimated that plugging and abandonment obligations for the

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<sup>12</sup>For a discussion of the NPL, see footnote 7 above.

Alliance leases totaled \$24.4 million. Alliance also owed \$1.8 million in back royalties. A settlement with Alliance's predecessor lessees provided for closure costs.

Over the past several years, competition for leases in the Gulf has diminished so much that smaller operators can also afford to win auctions at federal lease sales. Although successful applicants must provide evidence of sufficient resources to guarantee closure, these smaller operators are vulnerable to fluctuations in the price of oil and royalty rates. These factors make them more likely to go bankrupt, leaving the federal government with potential liability for closure costs.

MMS is neither funded nor authorized to cover end-of-lease costs. The agency is now developing several proposals to increase bonding and to provide innovative financing for well closures. In addition to regular bonding, MMS now holds supplemental bonds and other securities with a face value of \$71 million. But these measures will not affect existing smaller lessees. Unless the liability of the original, more solvent lessees is established in the law, the federal government might someday be left with the liability for closure.

### **Irrigation Drainage**

Irrigation is essential to farming throughout most of the West. Federal irrigation projects constructed and operated by the Bureau of Reclamation (BOR or BuRec) have historically recognized the value of this agriculture by providing an intentional federal subsidy to many western farmers. Irrigated agriculture can have negative environmental consequences, however. Drainage water from irrigated lands often carries toxic metals, minerals and salts leached from the soil. Depending on the concentration of these contaminants and the management of the drainwater, serious hazards to wildlife and the environment can result. In addition, the Fish and Wildlife Service has suggested that the hazards may extend to human health, when fish and wildlife consumed by humans accumulate high concentrations of drainwater contaminants.<sup>13</sup>

Irrigation drainage contamination often poses hazards to wildlife when irrigation return flows are used as a source of water for wildlife management areas. The Kesterson National Wildlife Refuge in California, for example, was designed to take advantage of drainage from irrigated farms in the San Joaquin Valley. But high levels of selenium in the drainwater caused deformities and mortalities among wildlife using the refuge.

After public outcry led to closure of the Kesterson refuge, DOI undertook to remediate this and other sites where drainage from federally supported irrigation

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<sup>13</sup>U.S. Fish and Wildlife Service, Division of Environmental Contaminants, "An Overview of Irrigation Drainwater Techniques, Impacts on Fish and Wildlife Resources, and Management Options," prepared for U.S. Environmental Protection Agency, Office of Policy, Planning and Evaluation, May 1992.

creates a substantial hazard to wildlife and the environment. A DOI survey of the western states is gradually leading to the development of remediation plans for several sites, but questions have been raised regarding other unidentified or unaddressed sites. In addition, since the process of cleaning up contamination from irrigation drainage is novel, and appropriate means for remediating these sites are uncertain, the costs of clean-up are currently impossible to estimate.<sup>14</sup>

The U.S. Geological Survey, BOR and FWS participate in the DOI task force on irrigation drainage problems. The task force screened BOR irrigation projects and identified 31 sites with potential contamination problems. Many of the most severely contaminated areas drain into national wildlife refuges that rely on irrigation drainage as a major source of water for wildlife. Of the initial group of 31, DOI determined that 24 sites warranted full reconnaissance surveys, after which the investigation contracted further to only 9 sites where detailed studies and remediation plans were judged necessary. These studies and plans are currently being prepared. Studies have been published on the Kendrick Project in Wyoming and the Middle Green River Basin in Utah, plus a partial study of the wildlife management areas of west-central Nevada.

Unfortunately, DOI's approach has tended to minimize the problem rather than giving an objective evaluation of contamination from drainwater. Serious contamination likely extends beyond the 9 sites already identified. Several other sites were eliminated in the original screening process because of DOI's lack of knowledge regarding the biological impacts of known contamination. A recent informal FWS survey has identified dozens of sites affecting national wildlife refuges where concerns about potential contamination have not been fully addressed. DOI may have to revisit many of these areas to determine how severe the problems are and whether remediation is necessary.

DOI also downplays the severity of contamination in the language used in the completed studies. For example, the abstract of the detailed study of water quality problems at the Kendrick Project in Wyoming states that: "Trace elements and constituents other than selenium were evaluated but generally were not at concentrations considered harmful to wildlife or humans." This is an elision of report language just three pages later that states, "Traces elements and constituents other than selenium were evaluated but, *except for arsenic, boron, cadmium, mercury, and lead in selected biological samples, were assessed to be at*

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<sup>14</sup>Further information on the problems of irrigation drainwater contamination and clean-up is outlined in a FWS report completed in May 1992 to assist the EPA in addressing contamination from irrigation drainage under the Clean Water Act. *Ibid.*

concentrations not harmful to wildlife or humans." (emphasis added).<sup>15</sup> A full examination of the entire range of contaminants is necessary before the extent of potential clean-up needs and the resulting costs can be evaluated.

Furthermore, the Department's survey has not examined other sites where federal involvement mandates a federal interest in the solution. For example, drainwater evaporation ponds in the Tulare Basin in California have selenium concentrations far higher than Kesterson's. Although the ponds are privately owned, some of the irrigation water drained into them is delivered through the federal facilities of the Central Valley Project. The FWS drainwater report identifies evaporation ponds as creating the most severe contamination problems.

The cost of remediation at these irrigation drainwater sites is unknown. The basic problem is that no one has determined what activities will be involved in the clean-up, or how much clean-up is required. Proposed partial fixes at some of the sites will total tens of millions of dollars. Remediation might cost as much as \$50-100 million at some sites, if cleaning up past contamination is necessary as well as ceasing ongoing drainage activity.

Indian lands have also experienced negative environmental consequences from irrigated agriculture. Many tribes rely exclusively on groundwater for drinking water, which may be contaminated by pesticides and other toxics. Little assistance has been provided to Indian tribes to identify and eliminate sources of contaminated drinking water.

The May 1992 FWS report identifies methods of improving management of contaminated agricultural drainage and mitigating the resulting environmental contamination. It mentions a variety of methods of source control (reducing water use or preventing drainwater from reaching the surface environment) to reduce contamination, as well as possible drainwater treatment methods. Eliminating or reducing ongoing contamination must be considered as an alternative to the cost of cleaning it up. Clean-up costs may make it uneconomic to continue irrigating certain lands that yield low-value crops but highly contaminated water.

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<sup>15</sup>U.S. Geological Survey, U.S. Fish and Wildlife Service, U.S. Bureau of Reclamation, and Wyoming Department of Environmental Quality, "Detailed Study of Selenium in Soil, Representative Plants, Bottom Sediment, and Biota in the Kendrick Reclamation Project Area, Wyoming, 1988-90," U.S. Geological Survey Water-Resources Investigations Report 91-4131, 1992.

## Hazardous Waste

In 1992 the National Research Council published a review of hazardous waste on BLM lands.<sup>16</sup> The report identified the chief sources of hazardous waste as:

- *Mineral extraction and beneficiation and process wastes and runoff;*
- *Oil and gas exploration and production;*
- *Municipal solid waste disposal facilities given permits or patented under the Recreation and Public Purposes Act of 1968 (R&PP);*
- *Pesticide application, storage and disposal by BLM and private users;*
- *Hazardous-waste treatment, storage and disposal facilities;*
- *Spills and leaks from vehicles, storage tanks and pipelines;*
- *Underground injection wells; and*
- *Illegal dumping of hazardous and solid wastes.*

To this list might be added the problem of unexploded ordnance discussed above, which technically qualifies as a hazardous waste as well.

The National Research Council's enumeration of sources of hazardous waste applies to other agencies' lands as well; even the BOR leases oil and gas wells on lands withdrawn for water projects, and battles problems with illegally dumped hazardous waste on lands leased out to municipal landfills or private enterprises. The discussion below addresses hazardous waste sources that have not been described in previous sections.

### (a) Known Hazardous Waste Sites

Several federal agencies issue permits for municipal landfills on public lands. BLM personnel estimate that only about 600 landfills have been authorized on BLM lands, with only about half of these still open. About 40 landfills have been permitted on BOR land. Most permitted landfills have lacked adequate fencing or security, so they are often subject to unauthorized dumping of hazardous waste.

The National Research Council study references a 1987 House Committee report concluding that 1,000 to 3,000 closed landfill sites exist on BLM lands.<sup>17</sup> This figure would include a substantial number of unauthorized dump sites. BLM has begun to sample the closed landfills, at a cost of approximately \$17,000 per site. So far, only 2 of 40 sites have revealed environmental problems requiring remediation.

<sup>16</sup>Committee to Evaluate the Hazardous Materials Management Program of the Bureau of Land Management, Board of Environmental Studies and Toxicology, and Commission on Geosciences, Environment, and Resources, National Research Council, "Hazardous Materials on the Public Lands," National Academy Press, 1992.

<sup>17</sup>Committee on Government Operations, "Landfills on Department of Interior Lands Violate Federal Environmental Standards," H. Rep. No. 100-457, November 24, 1987.

But with this many closed sites, even a low percentage of sites requiring clean-up will impose a significant cost on the agency.

BLM is also working to close or sell its active municipal landfills and dump sites, and bring them into compliance with federal solid and hazardous waste regulations. Since 1991, more than 100 leased sites have been closed or sold. The BIA has taken a similar approach, trying to ensure that existing landfills in Indian country that don't meet RCRA standards are capped and closed before more stringent requirements go into effect on October 9, 1993. BIA thus hopes to avoid requirements for improved closure and continued monitoring. This approach has not met with universal approval; several members of the Navajo Nation have served BIA with a 60-day notice of intent to sue over inadequate management and closure of the landfills on the Navajo Reservation.

BLM and EPA have agreed that approximately 300 hazardous materials sites on BLM lands require risk assessments under CERCLA. By far the most problematic of the landfill sites is the Lee Acres site near Farmington, New Mexico. As discussed above, oil drilling wastes were dumped in this BLM-permitted municipal landfill, creating a hazardous waste problem that has made the Superfund National Priorities List (NPL).<sup>18</sup> BLM estimates that the total clean-up cost for this site will be \$10-12 million, with BLM paying less than half.

BLM and other federal agencies regularly find and clean up illegal dump sites. Such sites are generally smaller than the permitted sites. The most expensive to clean up are:

- illegal drug laboratories;
- wire burning sites where copper salvage operations burn insulation off recovered wire; and
- areas where unused pesticides are discarded.

Agencies also occasionally discover hazardous materials sites on acquired lands, like the closed landfill discovered on lands acquired for the Cuyahoga Valley National Recreational Area in Ohio, which is now on the NPL. The Park Service has already spent over \$12 million on clean-up, but further work is necessary.

BOR shares liability for a number of hazardous waste sites both on and off federal land.<sup>19</sup> Out of 400 old construction dump sites, BOR staff estimates that

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<sup>18</sup>For a description of the NPL, see footnote 7 above.

<sup>19</sup>Over the past five years BOR has also operated a rapidly expanding "Hazardous Waste Technical Assistance Program," providing hazardous waste clean-up assistance to numerous other agencies. This program has grown from 18 full-time equivalents (FTEs) in FY88 to approximately 115 FTEs in FY93, with a budget rising from less than \$2 million to \$106 million over the same period. All costs are reimbursed by the agencies for whom the work is performed.

only about 20 will require environmental clean-up, at a cost of as much as \$500,000 each. At Arroyo Pasajero in California, BOR has been paying damages to the neighboring Anderson Ranch in years when drainage from a nearby Superfund mine site floods farm land, in part because of the effects of BOR project operations. The Corps of Engineers has proposed an \$89 million fix for the mine site; it is unclear whether BOR would share any responsibility for this clean-up. Another serious mine clean-up at the Iron Mountain site in Redding, California, may involve a \$100 million expansion of an existing BOR debris dam. Although the BOR dam merely receives run-off from the mine site, BOR staff suggested that EPA may find that BOR is liable, as an "operator" of a hazardous waste site, to pay for the dam expansion.

(b) **Uncertain Future Liabilities**

The degree of federal responsibility for cleaning up various hazardous waste sites is uncertain and has led to litigation in some instances. The BIA in particular does not investigate its potential responsibility for hazardous waste sites in Indian country until its liability has been firmly established in court. In a 1989 decision, the BIA was held responsible along with the Oglala Sioux Tribe for cleaning up dump sites on the Pine Ridge Indian Reservation.<sup>20</sup> Dispute has also arisen over liability for cleaning up old sheep dip vats on the Navajo Reservation, where BIA asserts it has no liability because it served only as an advisor, but the Navajo Nation maintains that BIA is responsible for clean-up because it had "primary jurisdiction" over the sheep dip vats.

In addition, there are a significant number of abandoned underground storage tanks located on Indian lands. Many have not been adequately closed, capped or removed; leakage may pose a threat to groundwater. The BIA has not surveyed underground storage tanks on Indian lands, despite the potential impact on tribal groundwater supplies. Due to the BIA's lack of interest in surveying these or other waste sites for which its legal liability has not been proven, no estimate could be developed for unfunded environmental clean-up costs in Indian country.

The extent of government liability remains unknown also with respect to Alaska lands that the federal government contaminated with asbestos and other hazardous wastes and later transferred to Alaska Natives. Although BLM's efforts to inventory Native lands are incomplete to date, there are known situations where contaminated buildings and property were conveyed to Alaska Native corporations as part of their entitlement under the Alaska Native Claims Settlement Act of 1971. The resolution of this problem may involve substantial cost to the federal government.

Waste sent to landfills off federal land and hastily closed landfills on federal land creates another problem of potential liability that is difficult to evaluate. BLM and BIA's efforts to close landfills this year will solve the immediate problem of avoiding RCRA compliance problems, but it will not address the underlying problem

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<sup>20</sup>*Blue Legs v. U.S. Bureau of Indian Affairs*, 867 F.2d 1094 (8th Cir. 1989).

of hazardous materials escaping into groundwater and the surface environment. Groundwater contamination may pose new liabilities in future years. In addition, BOR has already been identified for possible contribution to Superfund clean-ups at two landfills and one other site where BOR-generated PCB-laden oil was disposed of. Other similar sites may be discovered in the future, because BOR's oil wastes have been disposed of in many locations by many waste haulers.

In general, the cost for cleaning up each hazardous waste site does not reach the order of magnitude of the mine sites or unexploded ordnance disposal. As discussed above, BLM estimates that the largest landfill on BLM land will cost only \$10-12 million to bring into environmental compliance. But the enormous number of potential environmental hazards on public lands may produce a substantial budget impact, nonetheless.

### Radioactive Materials

Non-military radioactive materials are closely regulated by the federal government through the NRC. Although most of the costs of disposal of privately-used radioactive materials should not fall on the government, the long half-life of many radioactive materials makes it difficult to predict future federal liability. Unlike many other federal liabilities, radioactive materials cannot be cleaned up; the question is one of maintenance, surveillance, with an ultimate goal of permanent isolation from the environment.

#### a) Nuclear Reactors

Decommissioning of commercial nuclear reactors must be paid for by the plant licensee through financial reserves set aside during the life of the plant. However, recent premature shut-downs of reactors including those at Trojan in Oregon, Yankee Rowe in Massachusetts, and Rancho Seco and San Onofre, both in California, have prompted concerns that there may be insufficient funds for decommissioning. The federal government is *not* responsible for these costs, which fall to the utilities and/or their ratepayers. But the prospect of an appeal for a federal bailout cannot be ruled out.

Decommissioning can be pursued either through immediate dismantlement (DECON) or by placing the facility in a temporary, sealed condition that permits delayed dismantlement (SAFSTOR). If the SAFSTOR option is followed, the utility retains the spent fuel on-site until it can be sent to a federal storage facility. The SAFSTOR option effectively postpones major expenditures and allows the utility to build up its decommissioning fund through rate recovery until final DECON takes place. The simple fact of delaying clean-up may, however, pose new risks.

Despite the private responsibility for nuclear plant decommissioning, the government may eventually be sued over its inability thus far to provide a permanent storage site for spent nuclear fuel and other high-level waste. Study of the

prospective Yucca Mountain site for a permanent repository is more than a decade behind schedule. The delay has led some utilities to consider litigation compelling the government to share in the costs for storing the spent fuel after 1998 (the original date when the government intended to accept spent fuel).

The costs of the federal commercial nuclear waste management program are met through the Nuclear Waste Fund, which is constituted from a millage fee on nuclear electricity. A possible source of future federal liability in this program would arise if the Nuclear Waste Fund proves inadequate to meet the program's costs. Such a development could result from continuing premature shut-downs of reactors and the lack of license renewals for existing reactors, so that the fund has little income in the 2020 to 2040 time frame when costs for transportation and emplacement of wastes are expected to be high.

The Secretary of Energy is required by the Nuclear Waste Policy Act to assess the adequacy of the Nuclear Waste Fund fee annually, and adjust it as necessary to guarantee that sufficient funds are available when needed. However, assessments have been occurring only about every three to four years, and the Secretary has been unwilling to adjust the fee in the past for political reasons. The General Accounting Office has strongly recommended that the fee should be indexed for inflation, and the fee assessment responsibilities should be taken more seriously.

Non-power reactors (NPRs), many of which are university owned and operated, are less costly to decommission than larger, commercial reactors. Some 63 NPRs have already been shut down, but the federal government is responsible only if the educational institution is federally owned. The NRC estimated in 1990 that decommissioning the six remaining federal NPRs would cost \$145 million. Two have already closed, but the remaining four have no scheduled shut-down date. The most expensive of these will be the nuclear ship *Savannah*, whose license expires in 1996. In 1990, decommissioning costs were estimated at \$76 million. The U.S. Maritime Commission holds the license and will seek an appropriation specifically for decommissioning.

#### b) Nuclear Materials

The NRC and the states (where the states have agreements with the NRC to take over the licensing of nuclear materials) have issued some 26,000 materials licenses to institutions that handle radioactive material, including hospitals, research laboratories and industrial facilities. The majority of materials licensees are required to assure decommissioning costs as part of the licensing process. The government is responsible for all decommissioning costs in only 513 cases where the license is held by the federal government.

Recently, however, the federal government began to develop decommissioning cost-share agreements with government contractors. For example, a Tennessee-based Navy contractor, NPS Erwin, will have some of the decommissioning costs for its fuel production facility met by the federal government. In 1990, this and similar

guarantees to contractors totaled between \$200 - \$300 million in future federal commitments.

Over the past several years, the NRC has identified 46 materials licensees with highly contaminated sites, some of which are now on the NPL.<sup>21</sup> In 1990, the NRC implemented the Site Decommissioning Management Plan to clean up these sites. Only 3 of the 46 SDMP licensees are federal entities for which clean-up costs will be paid by the government. Two sites are located in Watertown, Massachusetts: Watertown Arsenal and a site owned by the General Services Administration. Sixty-five million dollars has been spent on clean-up at Watertown Arsenal, of which about half was used for the disposal of radioactive material. The most seriously contaminated federal site is the Aberdeen Proving Ground in Maryland, which is still in active use. The NRC anticipates that removal of unexploded ordnance and depleted uranium rounds at this site will be both highly dangerous and extremely costly.

(c) **Project Chariot**

In the 1950s the federal government considered carrying out the "Project Chariot" plan to use nuclear bombs to create a harbor in northwest Alaska. Although the bombs were not detonated, scattered nuclear weapons experiments and related activities left a legacy of lands contaminated with nuclear materials and deep mistrust among Alaska Natives due to concealment of the contamination by government agencies. A federal clean-up by the Department of Energy is planned, but the full scope of government liability has not been determined.<sup>22</sup>

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<sup>21</sup>For a description of the NPL, see footnote 7 above.

<sup>22</sup>The question of radioactive exposure to Alaska Natives is one aspect of a separate investigation currently being conducted by the Committee.

## Conclusion

Although this report provides only an overview of liabilities, not a precise assessment of the potential clean-up costs, it is apparent that these costs will play a significant role in future budget decisions. If all environmental liabilities are considered -- including remediation of highly contaminated DOB complexes and DOD sites<sup>23</sup> -- clean-up costs will rival the expense of the savings and loan bailout.

Clean-up cannot be ignored; it is now the responsibility of the Administration to develop a systematic response and to identify where Congressional action may be required. Initiatives to date have been uneven, dictated as much by agency culture as by any other force. For example, the NPS has developed the most creative response to clean-up, while the BIA has adopted an ostrich-like approach hoping the problem will vanish.

The Administration's response should address the following:

### a) Government-wide Standards

The absence of government-wide standards has led to wide disparities in agency findings. For example, the Forest Service failed to consider the cost of meeting EPA standards in their plans for remediation of abandoned mine sites. Thus, their estimates for clean-up may be significantly below what will actually be required.

### b) Methodology

Agencies have received no guidance on methodology for inventorying contamination or setting priorities. Agencies sometimes compiled inventories that they later found to be inadequate. For example, although the FWS compiled EPA standards in their plans for remediation of abandoned mine sites. Thus, their estimates for clean-up may be significantly below what will actually be required.

### c) Inventory

Inventory is essential not only to establish the extent of the problem and to identify priority sites, but also because the longer a problem remains unidentified, the greater the prospect that the federal government will be the only one left to clean it up. Although a detailed examination of every site is

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<sup>23</sup>In 1990, the Congressional Budget Office found that the costs of hazardous waste compliance and clean-up activities at federal facilities could exceed \$150 billion over the next three decades. Congressional Budget Office, U.S. Congress, "Federal Liabilities Under Hazardous Waste Laws," May 1990.

not required before beginning clean-up, an inventory to determine the scope of the contamination and the highest priority sites is necessary before clean-up can begin.

Agencies that have undertaken successful inventories have all recognized the importance of training existing staff. Both NPS and FWS sent questionnaires to their staff and provided training in how to respond. NPS prepared a videotape to train staff and volunteers on the identification of abandoned mine sites and other contaminants on NPS lands. By contrast, the BIA and BLM have taken little or no action to train staff in hazardous waste management, which is a significant contaminant problem both in Indian country and on BLM land.<sup>24</sup>

#### d) Funding Clean-Up

The federal government must explore innovative clean-up options. A "polluter pays" policy has already been adopted successfully to fund the Abandoned Mine Land Fund under the Surface Mining Control and Reclamation Act. Unless the Administration and Congress encourage polluter responsibility for public land uses, clean-ups may never be adequately funded.

Once agencies establish inventories and prioritize clean-up sites, it is important that these priorities are not altered either through legislative or executive action. Certain clean-up projects for which the government does not have legal liability have already received earmarked appropriations. Such appropriations relieve the polluters of responsibility and make it more difficult to budget for future clean-up. To continue this practice would ignore objective criteria established by agencies to ensure that the most severely contaminated sites receive immediate attention.

Many factors will influence how the clean-up moves forward:

- Clean-up requirements change and new technologies make it possible to achieve more stringent levels of clean-up. For example, the potential cost of cleaning up sheep dip vats was not anticipated when the vats were abandoned. Nor was the extent of contamination fully recognized.

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<sup>24</sup>Lack of training not only hampers the inventory and clean-up process, but also has health and safety consequences. A DOI Inspector General report found that 757 Department employees had been injured by exposure to hazardous materials since 1988. The report recommended that all appropriate staff receive training for handling hazardous materials. Office of the Inspector General, U.S. Department of the Interior, "Management of Hazardous Materials by the Department of the Interior," Audit Report, Report No. 93-I-873, March 1993.

- Agencies must evaluate the cost-effectiveness of identifying, locating and pursuing other responsible parties who might contribute to clean-up. Litigation costs may be greater than clean-up costs, yet agencies must also consider the fact that failure to pursue responsible parties encourages polluters to view the government as a "deep pocket" defendant.
- Existing policies may also be contributing to future clean-up problems. For example, BLM and BIA plan to seal or sell all landfills for which they are responsible by October of this year, yet there are no plans for future monitoring to provide prompt detection of any seepage into groundwater. The content of these landfills is unknown; they may contain hazardous waste mixed with municipal waste. Sealing them today may be creating tomorrow's Superfund site.

Of the range of environmental clean-up problems discussed in this report, irrigation drainage poses some of the most serious questions for federal policy. Irrigated agriculture is the only area in which the federal taxpayer intentionally subsidizes an activity that contaminates federal land, yet no clean-up requirements or pollution reduction standards are generally imposed on the beneficiaries. In most other areas, some steps have been taken to halt pollution on a program-wide basis,<sup>25</sup> yet irrigation of selenium-laden land, with no solution for handling the drainage, continues virtually unabated. The problem of clean-up cannot fully be addressed unless first policies are established to halt or reduce the ongoing contamination.

One of the most disturbing findings of this investigation was that the federal government is acquiring liability. For example, at Arroyo Pasajero near Huron, California, BOR is considering purchase of contaminated land for a wildlife management unit. Asbestos from the nearby Superfund site, the Atlas Mine, has polluted water flowing across the land. The BOR knows of the Atlas Mine pollution because it has already paid \$7 million in damages to the nearby Anderson Ranch for contamination from the mine that may be exacerbated by the BOR project. BOR land acquisition at Arroyo Pasajero will not only increase federal liability on those lands, but might also lead to the government acquiring greater responsibility for cleaning up the Atlas Mine itself, which lies on BLM land.

Budgeting for future clean-up could also be affected by congressional action to establish compensation funds for victims of actions for which the U.S. government may share culpability. In 1990, Congress approved the Radiation Exposure Compensation Act for uranium miners and individuals affected by immediate fallout from atmospheric nuclear weapons testing at the Nevada Test Site. The bill

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<sup>25</sup>The only other program described in this report where the government supports continuing creation of environmental contamination is the operation of military ordnance testing ranges. The unique nature of that program, where there is no alternative for meeting the important national security purposes of the ranges, renders it impossible to halt the ongoing contamination.

established a trust fund through which a qualifying person could receive between \$50,000 and \$100,000 depending on age at exposure, time exposed and the type of cancer developed. Congress may extend the Act to cover those exposed to radiation while working in the uranium mills. Future trust funds may be established to compensate other victims of U.S. government actions, including the residents of Rongelap Atoll in the Marshall Islands who were also exposed to high doses of radiation from nuclear testing.

Clean-up will cost tens of billions of dollars. It is clear that the era of federal bailouts has passed and the existing piecemeal federal response must be replaced by a new, cohesive approach to natural resource management. The Administration and Congress must incorporate clean-up into the annual budget process. Unless such action is taken, environmental clean-up may never be adequately funded.

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**Fort Ord Base Closure Management Proposal  
General Location Map**

Note: This map shows general location only, most of the area depicted as proposed for BLM management is closed for habitat mitigation for threatened and endangered species but there are portions of other management strategies within the dark line shown. In the rest of Fort Ord, outside the dark line, a number of other management strategies from development to protection to minor management are planned but not shown here due to the map scale.

1/8/81

## DRAFT

Inventory of BLM-Owned Formerly Used Defense Sites (FUDS)  
Contaminated with Hazardous Substances and UXOPage No. 1  
04/21/94

No. of sites	STATE	ACREAGE	HAZMAT_YES	HAZMAT_NO	HAZMAT_SUS	HAZMAT_UNK	UXO_YES	UXO_SUSPECT	UXO_UNKNM/N
21	AK	7537	732	0	2054	0	0	10	1370
19	AZ	81851	1	5	3243	78602	50000	4801	27050
39	CA	228605	16	9300	9952	209537	149450	77706	5236
1	CO	13500	0	0	13500	0	0	13500	0
1	ID	713	0	0	713	0	0	713	0
2	MT	20005	7000	13005	0	0	7000	0	13000
4	NM	1097779	0	0	8160	1089600	0	8160	1089600
18	NV	3018704	2	0	25464	2993081	0	24464	2994140
11	OR	880523	0	0	1	880405	877000	0	3523
31	UT	818142	0	0	24090	48472	210810	193990	594842
1	WA	3500	0	0	0	3500	3500	0	0
178		6171059	7751	22310	87177	5303197	1297760	323344	4728761

Total includes all hazardous materials,  
not just UXO.

acreage w/known  
UXO contamination

possible  
UXO contamination

DRAFT

Examples of UXO-Contaminated Sites Identified by BLM.

MILITARY MUNITIONS WASTE ON THE PUBLIC LANDS

The following are examples of waste munitions situations on the public lands:

1. Fallon, NV (Navy): 7,000 acres; BLM-managed (Total contaminated acreage outside of existing military reservations ("withdrawals") is 24,000 acres; however, 17,000 acres are included in a proposed expansion of the existing withdrawals.)
  - Ordnance has been dropped on BLM-managed lands outside the boundaries of military withdrawals since the 1940's.
  - The Navy has conducted a surface cleanup, but will not certify that the subsurface is clean.
  - The BLM has closed the 24,000 acres to public access for safety reasons.
  - The BLM will transfer these 7,000 acres, along with the 17,000 acres requested, to the Navy and terminate current recreation, grazing and mining uses unless a certification that the subsurface is free of munitions waste is received for the military.
  - Desert valley floor with sparse vegetation.

DISCUSSION: A search of the subsurface on these 7,000 acres should be made for UXO to determine if there really is a safety concern. Individual or widely dispersed ordnance could be removed and the lands opened to all normal uses. It is probably uneconomical to cleanup heavily contaminated areas. Heavily contaminated areas would be transferred to the Navy.

2. Colorado Army National Guard Range near Delta, CO: 13,502 acres; BLM-managed
  - This range was used for mortar, recoilless rifle, 155 howitzer, and 8 inch howitzer practice from about 1960-1983 and again in 1988-1989.
  - UXO has been found and detonated in place by the Fort Carson explosives ordnance disposal (EOD) personnel.
  - Within this range area, BLM has authorized grazing permits, mining claims, and oil and gas leases.
  - There have been requests for powerline and pipeline rights-of-way.
  - Guard/DOD will not certify lands are safe.
  - Low rolling hills with pinion juniper lined draws crossing the range area. Soils are cobbled sandy and very rocky. Low sage and various grasses predominate.

DISCUSSION: Search of the subsurface is needed to protect current and future authorized land uses.

## 3. California Desert Conservation Area: BLM-managed

- Large portions of the area were used for training during WWII.
- Small arms, tank, and mortar rounds are periodically found.
- The Imperial Sand Dunes area, including the heavily used off-road recreation areas, yield some UXO every few years.

DISCUSSION: This is a situation where there are hundreds of thousands of acres with widely scattered individual or small groupings of munitions waste. Shifting sand dunes periodically expose previously buried munitions. Many of these areas are heavily used by recreationists.

## 4. Davis Range, AK (Army): 15,000 acres; BLM-managed

- The withdrawal of 4,720 acres these lands expired September 26, 1976.
- The BLM issued a Special Land Use Permit (SLUP) to the Army for use of additional acreage. The SLUP expired September 13, 1973.
- The Army EOD has swept and cleaned this area, but will not certify the lands as safe because of subsurface contamination.
- This land is under BLM jurisdiction, but has not released the lands for State of Alaska or Native corporation selection until the safety issue is resolved.
- The hiking trails in this area are swept each Spring to remove UXO which has risen to the surface as a result of frost action. This is a popular hiking area lying between Anchorage and the Chugach State Park.
- Terrain is rolling foothills with boreal forest to tundra vegetation.

DISCUSSION: Once the lands are certified as safe, they would probably be made available for State or Native selection to satisfy their statutory land entitlement requirements.

## 5. Beale Air Force Base, CA (Air Force): BLM-managed

- A military withdrawal was revoked.
- UXO was found and the EOD swept and cleaned the area.
- The EOD will not certify that the lands are clean because the subsurface situation is unknown.
- The BLM has these lands under a "public safety" withdrawal.

DISCUSSION: There are demands on these lands for various uses or for transfer out of Federal ownership. Until these lands can be certified as clean, no use is being made of these lands.

6. Interstate 80 corridor in western Utah: over 1,000,000 acres, BLM-managed
  - this was a range area during World War II
  - lands lying between the current Hill Air Force Base Range, Dugway Military Reservation, and Wendover Ranges
  - possibly not all this area has had a surface sweep
7. Crow Flats, New Mexico: BLM-managed
  - this area lies east of McGregor Air Force Range
  - munitions waste are from World War II
  - do not know if this was part of the range or the munitions waste is from misses
8. The Knolls Special Recreation Management Area, Utah: BLM/DOD-managed
  - this is a sand dunes area used by off-road-vehicle recreationists
  - the special recreation area is BLM-managed; adjacent dunes are DOD-managed
  - this is part of the I-80 corridor mentioned at 7 above

The following are examples of waste munitions situations on public lands withdrawn for military purposes where the DOD wants to relinquish the withdrawal and the lands would revert to BLM-management:

1. Cuddeback Lake Air Force Range, CA (Air Force): 7,546 acres; Air Force-managed
  - This bombing range withdrawal has been relinquished by the Air Force and is no longer in use.
  - The military will not certify that the lands are safe and, therefore, the BLM has not revoked the withdrawal and accepted jurisdiction over these lands.
  - Approximately one-quarter of the range was used as impact areas, the remainder used as safety buffer zone.
  - The endangered desert tortoise have moved into this area. Any cleanup may have significant impact on the tortoise and probably could not be done.
  - Impact areas are dry lake beds.

DISCUSSION: A search of the subsurface (which does not affect the tortoise) should be made so that the knowledge is available as to how much of the range has subsurface UXO. Then a decision needs to be made as to the future of this tract - return to BLM, transfer to F&WS for tortoise sanctuary because too dangerous for other uses, or leave with DOD as a non-use area and let nature take its course.

2. Mountain Home Air Force Base, Idaho: DOD-managed
  - DOD wants to relinquish this withdrawal for a small arms range
  - DOD can not certify that the subsurface is clean, so DOI has not accepted the lands

The closure of military bases presents many problems related to munitions waste. Some examples are listed below.

1. Fort Ord, CA: 8,000 acre impact area as part of a 17,350 acres to be transferred from Dept. of the Army the Secretary of the Interior; Army-managed.
  - The EOD will sweep and clean the surface and certify as safe for surface uses only (recreation).
  - No construction or other uses which would penetrate the surface or have heavy ground pressure would be allowed.
  - Rolling hills with maritime chaparral habitat.

DISCUSSION: Knowledge of the distribution of subsurface munitions waste is needed to determine what surface activities can safely take place in which locations. Without this knowledge, more extensive areas will be marked off-limits than is probably necessary.

2. Fort Wingate, NM (Army): More than 1,100 acres; Army-managed

The entire installation is on withdrawn public domain. The test range and munitions disposal areas ( $\pm 1,100$  acres) are not planned for return to the BLM. The BLM plans to determine these lands as changed in character and not suitable for return to the public domain. The DOD will retain management and liability of these lands until they are cleaned and certified as safe for disposal.

## Summary Information Supplied by the Forest Service

\* Military Sites/Names that are/can be returned to NFS

A CHRONOLOGIC RECORD  
1891 - 1992

FOREST RESERVE	STATE	TYPE OF DOCUMENT	DATE APPROVED	DATE EFFECTIVE (if different)	CITATION	EFFECT
Cheyenne *	WY	E.O. 1192	APR 19, 1910			Crow Creek division transferred to Department of War.
Zuni *	AZ/NM	E.O. 1367	MAY 31, 1911			Land from Fort Wingate Military Reservation.
Banning	CA	E.O. 4081	OCT 3, 1924			Established from part of Fort Banning Military Reservation.
McClellan	AL	E.O. 4114	DEC 22, 1924			Established from part of Camp McClellan Military Reservation.
Jackson	SC	E.O. 4115	DEC 22, 1924			Established from part of Fort Jackson Military Reservation.
Pine Plains	NY	E.O. 4193	APR 10, 1925			Established from part of Pine Plains Military Reservation.
Tobyhanna	PA	E.O. 4194	APR 10, 1925			Established from part of Tobyhanna Military Reservation.
Upton	NY	E.O. 4195	APR 10, 1925			Established from part of Upton Military Reservation.
Lee	VA	E.O. 4196	APR 10, 1925			Established from part of Lee Reservation.
Eustis	VA	E.O. 4197	APR 10, 1925			Established from part of Fort Eustis Military Reservation.
Humphreys	VA	E.O. 4198	APR 10, 1925			Established from part of Humphreys Military Reservation.
Dix	NJ	E.O. 4199	APR 10, 1925			Established from part of Dix Military Reservation.
Meade	MD	E.O. 4200	APR 10, 1925			Established from part of Camp Meade Military Reservation.
Michigan	MI	E.O. 4243	JUN 5, 1925			Part of Fort Brady Military Reservation added.
Medicine Bow	WY	E.O. 4245	JUN 5, 1925			Land added from Fort Francis E. Warren.
Colorado	AZ	E.O. 4246	JUN 5, 1925			Part of Fort Huachuca Military Reservation added.
Savanna *	IL	E.O. 4247	JUN 5, 1925			Established from part of Savanna Military Reservation.
Knox	KY	E.O. 4248	JUN 5, 1925			Established part of Camp Knox Military Reservation.
Savanna	IL	E.O. 4458	JUN 15, 1926			Name changed to Bellevue-Savanna.
Nissoula *	MT	E.O. 4503	SEP 2, 1926			Part of Fort Nissoula Wood and Timber Reservation added.

Upton	WI	E.O. 4676	JUN 29, 1927		Executive Order 4195, dated, APR 10, 1925, revoked.
Berning	SA	E.O. 4776	DEC 2, 1927		None discontinued.
Pine Plains	NY	E.O. 4776	DEC 2, 1927		Executive Order 4081, dated OCT 3, 1924, rescinded.
Eustis	VA	E.O. 4776	DEC 2, 1927		Executive Order 4193, dated APR 10, 1925, rescinded.
Neade	ND	E.O. 4776	DEC 2, 1927		Executive Order 4197, dated APR 10, 1925, rescinded.
					Executive Order 4290, dated APR 10, 1925, rescinded.
Oix	IA	E.O. 4852	APR 6, 1928		Executive Order 4199, dated APR 10, 1925, rescinded.
Knox	NY	E.O. 4852	APR 6, 1928		Executive Order 4248, dated JUN 5, 1925, rescinded.
McClellan	AL	E.O. 4877	MAY 4, 1928		Executive Order 4114, dated DEC 22, 1924, rescinded.
Jackson	SC	E.O. 4884	MAY 17, 1928		Executive Order 4115, dated DEC 22, 1924, rescinded.
Lee	VA	E.O. 4916	JUN 23, 1928		Executive Order 4196, dated APR 10, 1925, rescinded.
Humphreys	VA	E.O. 4946	JUN 11, 1928		Executive Order 4198, dated APR 10, 1925, rescinded.
Tobyhanna	PA	E.O. 4976	OCT 10, 1928		Executive Order 4194, dated APR 10, 1925, rescinded.
Coronado	AZ	E.O. 5147	JAN 1, 1929		Huachuca District deleted by revocation Executive Order 4264, dated JUN 5, 1925, and Executive Order 4278, dated JUL 31, 1925.
Pisgah *	NC	Public Law 328	AUG 26, 1935		49 Stat. 800 Land added from Oteen Hosp.
Choctawhatchee *	FL	Public Law 668	JUN 27, 1940		54 Stat. 628 Forest transferred to War Department.
Desoto *	MS	Public Law 754	JUL 19, 1940	DEC 4, 1940	54 Stat. 655 54 Stat. 723 Authorize Land transferred to Secretary of War subject to reverter.
Desoto *	MS	Sec. of War	APR 11, 1947		Not Published Camp Shelby lands reverted to National Forest under Public Law 754, JUL 19, 1940, 54 Stat. 775.
Marquette *	MI	P.L.O. 523	OCT 4, 1948		13-F.R. 5950 Part of Fort Brady Target Range Military Reservation added.
Hewatha *	MI	P.L.O. 523	OCT 4, 1948		13-F.R. 5950 Part of Fort Brady Target Range Military Reservation added.
Lolo *	ID/MT	E.O. 10403	NOV 5, 1952		17-F.R. 10099 Portion added of Fort Missoula Military Reservation.
Kootenai *	MT	Interchange Order #1	OCT 1, 1969 OCT 8, 1969	NOV 27, 1969	34-F.R. 18955 Interchange with Corp of Engineer Libby Dam. Land added.
Kootenai *	MT	Interchange Order #2	JUL 20, 1971	SEPT 10, 1971	36-F.R. 18252 Land added. Corp of Engineer/FS Interchange.
Sequoia/Sierra *	CA	Sec. of Agr. and Sec. of Army	MAR 8, 1991 MAR 29, 1991		56 F.R. 22393 Deleted Pine Flat Lake. Added Lake Isabella

## MILITARY BASES THAT ARE/CAN BE RETURNED TO NATIONAL FOREST SYSTEM

## REGION 3

<u>Forest</u>	<u>Area Involved</u>	<u>Total Acreage</u>	<u>Type of Authorization</u>
CIBOLA NF NEW MEXICO	FT. WINGATE	5,956.5	PLO 999, EO 4208
(Description of Area being declared excess to Ft. Wingate Depot Activity)			
KAIBAB & COCONINO NEW MEXICO	NAVAJO ARMY DEPOT	26,000	PLO 59, 176, and 661

Language in PLO's and EO provide for reversion of most of area to NF.

## REGION 5

<u>Forest</u>	<u>Area Involved</u>	<u>Total Acreage</u>	<u>Type of Authorization</u>
LOS PADRES	HUNTER LIGGETT M.R.	45,700 ac.	Act of 7/26/56.
returned to NF by same act.			

## REGION 8

<u>Forest</u>	<u>Area Involved</u>	<u>Total Acreage</u>	<u>Type of Authorization</u>
<u>Kisatchie</u>	Louisiana NG	1,584	HR 5326
Authorized the Secretary of Agriculture to convey 1,587 acres KNF to Louisiana N1 Grd for 1,584 acres of NG lands - The Act contains a reversionary clause that would require the land to be returned to the U. S. Government when it is no longer used for training and support of the Louisiana National Guard.			
Choctawhatchee	<u>Eglin AFB, FL</u>	464,000	PL 76-668 - Act of June 27, 1940, transferred control and jurisdiction of the Forest Service to the control and jurisdiction of the War Department for use of military purposes 464,000 acres of the Choctawhatchee National Forest in Florida.

The Act provides for the return of the land to National Forest status when the land ceases to be needed for military purposes. 675 acres were returned in 1980 by Public Land Order.

<u>Forest</u>	<u>Area Involved</u>	<u>Total Acreage</u>	<u>Type of Authorization</u>
Cookson Hills LUP	<u>Camp Gruber</u>	28,122	28,122 acres of the Cookson Hills Land Utilization Project were transferred from the jurisdiction of the Secretary of Agriculture to the Secretary War at the onset of World War II. This was accomplished by a series of Executive Orders. One Executive Order 9282, provided that the lands would be returned to the Secretary of Agriculture for administration under Title III of B. J. Act when no longer needed for military purpose.

## OTHER ACTIONS INVOLVING NATIONAL FOREST SYSTEM AND MILITARY

## REGION 8

South Carolina	Union Bombing Range	Transfer of 1840 acres under Order No. 5 dated 7/8/47.
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## REGION 3

New Mexico	Fort Wingate,	Transfer of 30,191 acres from military to National Forest. EO #208 dated 4/20/25.
New Mexico	Sandia Base	PLO and 595 withdrew 18,135 acres of National Forest for military use on 6/7/43 and 7/17/49.
New Mexico	Fort Bayard Res.	GSA Transfer 3/22/54 involved 8840 acres to the Gila National Forest.

## Results of BIA phone survey of field staff

## ORDINANCE ON INDIAN RESERVATIONS

The emphasis of the request was to identify those Indian Reservations that had been impacted by military activities. Although the primary concern was for unexploded ordinance that may have been left on Indian lands, we also requested that any other concerns might also be brought to our attention. In most instances, our area people could not cite specific cases where live ordinance was actually found, but they related any instance of military presence. Our area people listed the following problems.

## ABERDEEN

Pine Ridge and Cheyenne River Reservations both had either gunnery and/or bombing ranges located on them.

## ALBUQUERQUE

Pueblo of Acoma and Pueblo of Laguna were the sites of old bombing ranges. No reported live ordinance.

Pueblo of Acoma and Pueblo of Suni border on Fort Wingate, an ordinance depot. No reported incidents.

Pueblo of Isleta and the Mesquero Apache Tribe both border major Air Force installations. No reported problems.

## ANADARKO

Some allotments adjoin the Army artillery range at Fort Sill, Oklahoma, but no reports of incidents involving live ordinance have been reported. The possibility might still exist.

## BILLINGS

No reported military related problems.

## EASTERN AREA

No reported military related problems.

## JUNEAU

No reported military related problems.

## MINNEAPOLIS

Keweenaw Bay Reservation had an Air Force jet aircraft out of KI Sawyer AFB crash in the 1980s. No reported problems related to incident.

**MUSKOGEE**

There are ordinance facilities in Oklahoma that might border on allotted land. No reported military related problems.

**NAVAJO**

Fort Wingate, an ordinance depot, is relatively close to the Navajo Nation border. The Navajo Nation is attempting to acquire at least a part of this deactivated facility. No reported military related problems.

**PHOENIX**

Chamehuevi, Fort Mojave, White Mountain Apache, Yohono O'odham, Walker River and Pyramid Lake reservations have experienced incidents with aircraft crashes, live ordinance, abandon equipment and old land mines.

Other reservations in this area are adjacent to military installations.

**PORTLAND**

Misqually reservation was shelled once by mistake and it is believed that Yakima reservation once had a bombing range. Tullalip had an ordinance facility. Metlakatla, Alaska once had a military facility, but the branch of service is unknown.

**SACRAMENTO**

No reported incidents related to military activity.

There are many other Indian lands that have potential problems related to military activities such as low-level flights, proposed bombing ranges, contamination for nuclear weapons plants and in the path of proposed or existing missile ranges. These may have a major impact on cultural resources.







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