

**Overview of the  
Mandatory Center of Expertise  
and  
Design Center for Explosive Ordnance  
Engineering**

**Prepared For**

**Department of Defense Explosives Safety Board  
Twenty-Fourth DoD Explosives Safety Seminar**

**28-30 August 1990**

by

**Robert G. Wilcox, MCX Manager**

**U.S. Army Corps of Engineers  
Huntsville Division  
Huntsville, Alabama**

# Report Documentation Page

*Form Approved  
OMB No. 0704-0188*

Public reporting burden for the collection of information is estimated to average 1 hour per response, including the time for reviewing instructions, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Washington Headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington VA 22202-4302. Respondents should be aware that notwithstanding any other provision of law, no person shall be subject to a penalty for failing to comply with a collection of information if it does not display a currently valid OMB control number.

1. REPORT DATE <b>AUG 1990</b>	2. REPORT TYPE	3. DATES COVERED <b>00-00-1990 to 00-00-1990</b>			
4. TITLE AND SUBTITLE <b>Overview of the Mandatory Center of Expertise and Design Center for Explosive Ordnance Engineering</b>		5a. CONTRACT NUMBER			
		5b. GRANT NUMBER			
		5c. PROGRAM ELEMENT NUMBER			
6. AUTHOR(S)		5d. PROJECT NUMBER			
		5e. TASK NUMBER			
		5f. WORK UNIT NUMBER			
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) <b>U.S. Army Corps of Engineers, Huntsville Division, ,Huntsville,AL,35807</b>		8. PERFORMING ORGANIZATION REPORT NUMBER			
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)		10. SPONSOR/MONITOR'S ACRONYM(S)			
		11. SPONSOR/MONITOR'S REPORT NUMBER(S)			
12. DISTRIBUTION/AVAILABILITY STATEMENT <b>Approved for public release; distribution unlimited</b>					
13. SUPPLEMENTARY NOTES <b>See also ADA235006, Volume 2. Minutes of the Explosives Safety Seminar (24th) Held in St. Louis, MO on 28-30 August 1990.</b>					
14. ABSTRACT <b>see report</b>					
15. SUBJECT TERMS					
16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT	18. NUMBER OF PAGES	19a. NAME OF RESPONSIBLE PERSON
a. REPORT <b>unclassified</b>	b. ABSTRACT <b>unclassified</b>	c. THIS PAGE <b>unclassified</b>	<b>Same as Report (SAR)</b>	<b>10</b>	

## **ABSTRACT**

### **Overview of the Mandatory Center of Expertise**

**and**

### **Design Center for Explosive Ordnance Engineering**

On 5 April 1990, HQUSACE established Huntsville Division Corps of Engineers as the Mandatory Center of Expertise (MCX) and Design Center for Explosive Ordnance Engineering to respond to formerly used and active Defense sites which are contaminated with explosive ordnance. This paper provides descriptive overview of the mission including: What is explosive ordnance? - What is explosive ordnance engineering? - What is the MCX? - What is the Design Center and how will it function? - How big is the mission?

## WHAT IS EXPLOSIVE ORDNANCE?

The use of explosive shells in warfare predates the Revolutionary War. Occasionally dangerous pieces of ordnance are still found on old Civil War battlegrounds. These shells are as potentially lethal as the day they were manufactured.

As technology progressed since that time, the human race has sought better ordnance to gain advantages over adversaries. This required facilities for research, development, manufacture, testing, storage, transportation, and disposal of new weapons, and areas for training with new and improved weaponry. All of these activities resulted in lands being contaminated with unexploded ordnance, military chemicals, and explosive waste (explosive ordnance per AR75-14).

In 1986 Congress decided that explosive ordnance is a form of contamination that should be regulated under the Comprehensive Environmental Restoration and Compensation Liability Act (CERCLA). Chapter 160 of the Superfund Amendments and Reauthorization Act amended CERCLA and established the Defense Environmental Restoration Program (DERP). The program goals for DERP are:

a. The identification, investigation, research and development, and cleanup of contamination from hazardous substances, pollutants, and contaminants.

b. Correction of environmental damage (such as detection and disposal of unexploded ordnance) which creates an imminent and substantial endangerment to the public health or welfare or to the environment.

c. Demolition and removal of unsafe buildings and structures, including buildings and structures of the Department of Defense at sites formerly used by or under the jurisdiction of the Secretary.

These goals gave rise to three Corps of Engineers Missions: Hazardous and Toxic Waste (HTW), The Explosive Ordnance Engineering, and the Unsafe Debris.

The Secretary of Defense has the responsibility to carry out CERCLA response actions for releases of hazardous substances at:

a. Each facility or site owned by, leased to, or otherwise possessed by the United States and under the jurisdiction of the Secretary.

b. Each facility or site which was under the jurisdiction of the Secretary and owned by, leased to, or otherwise possessed by the United States at the time of actions leading to contamination by hazardous substances.

c. Each vessel owned or operated by the Department of Defense.

DoD's response to a., above, is embodied in the Installation Restoration Program. The Formerly Used Defense Sites Program corresponds to b., above. CERCLA response action is required at any site currently or formerly used by the Department of Defense that is contaminated by hazardous or toxic waste, explosive ordnance, or unsafe debris.

Explosive ordnance is anything designed to damage personnel or materiel through explosive force, incendiary action, toxic effects. A policy letter dated 5 April 1990 from HQUSACE defines explosive ordnance as: bombs and warheads; guided and ballistic missiles, artillery, mortar, and rocket ammunition, small arms ammunition, antipersonnel and antitank land mines, demolition charges, pyrotechnics, grenades, torpedoes and depth charges, containerized or uncontainerized high explosives and propellants, nuclear materials, chemical, and radiological agents, and all similar or related items or components explosive in nature or otherwise designed to cause damage to personnel or materiel. Soils with explosive constituents will be considered explosive ordnance if the concentration is sufficient to present an imminent safety hazard.

Explosive ordnance, given exposure to people, usually provides an imminent or substantial endangerment to the public or to the environment. Congress has decided that the DoD should clean it up.

There is a tendency to associate CERCLA response actions with hazardous and toxic waste. However, there are three separate and distinct goals under DERP. They are not equivalent. They are not hierarchical in that explosive ordnance and unsafe debris are not subsets of HTW. Each type of contamination has negative impacts, but they are very different. There is a tendency to think of explosive ordnance as a type of very reactive hazardous waste. This notion is misleading and results in programmatic waste and inefficiencies. No one appears to lump unsafe debris with HTW. Why then, would one assume explosive ordnance is a form of HTW just because it is regulated under CERCLA?

The fundamental differences between HTW and explosive ordnance are discussed below:

### **Mobility**

Hazardous and toxic waste is generally mobile, moving through the environment via many pathways: ground water, surface water, air paths and direct contact. Some forms of HTW will bioaccumulate and attack human welfare through food chain routes.

Explosive ordnance is basically non-mobile. Only the direct contact route is pertinent to explosive ordnance.

### **Targets**

HTW attacks the welfare of anyone who: drinks, swims, bathes, or eats meat or vegetables irrigated with contaminated water. HTW can effect people who breathe air in the vicinity of

a contaminated site and HTW can effect people who use the site through dermal contact. In general, HTW casts a broad net for far ranging target populations.

Explosive ordnance on the other hand, requires nearly direct personal contact on the site to produce harm.

### **Negative Effects**

In general, HTW produces long term health effects which are population significant. The dynamics of exposure pathways, dose/response characteristics of individuals, interactions of exposures with carcinogenic, and other necrotic stimuli from industrial and domestic origins make it difficult to establish clear cause/effect relationships for the individual. However, the pervasive nature of this contamination and statistical assessments make it very clear that the effects of HTW are a serious national concern.

Explosive ordnance leaves no doubt about cause/effect in the case of an accident. It really doesn't matter if you're over weight or a heavy smoker. A mishap involving explosive ordnance can cause immediate death or injury.

### **Control**

An individual's control over HTW exposure is nonexistent. Even a trained professional does not carry out normal day-to-day activities on guard against inadvertent exposures. The paths of exposure are too related to survival needs of the individuals to control potential exposures.

Explosive ordnance on the other hand, does not relate itself to survival needs such as eating, drinking, and breathing. It does however, arouse curiosity. In children this can be lethal, but it is controllable in adults. Explosive-ordnance- contaminated land, if properly managed, can be productive and provide no threat to human welfare without extensive remediation.

### **Administrative**

The USEPA is unquestionably the lead agency regulating an HTW site. They have promulgated regulations, delegated authority to the states and retained certain authorities.

DOD is the recognized national expert in matters relating to the safe handling and disposition of military munitions and ordnance. DOD and Army regulations governing transportation, storage, maintenance, inspections, safety, and security in handling of military munitions and ordnance are very stringent and provide maximum protection for personnel and the environment. Furthermore, Section 300.120(C) of the Final National Contingency

Plan states that DoD is the removal response authority for incidents involving military weapons and munitions. The USEPA has concurred in the preparation of AR200-1 which requires that clearance of conventional ordnance from private lands be conducted under Ammunition and Explosives Safety Standards (AR385-64).

### Overlapping Areas of Concern

Soil that is contaminated with explosives provides the most significant area of overlapping concern. Explosives are dangerous at high concentrations in soil. Figure 1 provides a theoretical way to differentiate an HTW project from an explosive ordnance project. Nitro-Aromatics will usually fail the Bureau of Mines Gap Test at approximately 10% by weight in soil. This would correspond to providing an imminent and substantial endangerment as referenced under the second Goal of DERP. Safety concerns would extend to approximately .1% by weight because sampling techniques cannot assure a representative sample. At concentrations below that the explosives are typical HTW compounds that produce long term health effects. Primary explosives (ie. lead azide) are extremely dangerous and may propagate in soil at almost any detectable concentration. The problem with this approach is that the type of study will not be determined until the study is underway. The initiating problems will be the determining factor i.e., if the study is in response to a contaminated well or regulatory pressure under RCRA or CERCLA it will be an HTW study. If it is in response to neighborhood children playing with the little red rocks that just happen to be flammable, it will be an explosive ordnance project. Under either scenario, the other component of the contamination must not be ignored.

## WHAT IS EXPLOSIVE ORDNANCE ENGINEERING?

The Explosive Ordnance Mission has two major objectives:

- a. To reduce risk to the general public through CERCLA response actions for sites contaminated with explosive ordnance.
- b. To execute response actions for sites contaminated with explosive ordnance with minimum risk to government personnel and contractors.

Explosive Ordnance Engineering is interdisciplinary planning, study, design, and remedial action involving explosive ordnance contamination in accordance with CERCLA and the National Contingency Plan. Various reports which facilitate programmatic planning require engineering and other professional disciplines. These reports are - Site inspections, engineering reports (remedial investigations), feasibility studies, engineering evaluations, and cost analysis, miscellaneous route surveys, and others.

Explosive ordnance engineering is not explosive ordnance disposal. The MCX is not an alternate national bomb squad. Required disposal activities will be carried out with FORSCOM Explosive Ordnance Disposal resources or contract services.

## **WHAT IS A DESIGN CENTER?**

As Design Center, Huntsville Division will centrally manage the Explosive Ordnance Engineering Mission for the Formerly Used Defense Sites Program. Initially, projects will be executed at Huntsville Division. As the mission grows, proposals will be considered from the geographic Divisions to nominate explosive ordnance design districts. Decentralization of the execution is envisioned in the long term.

## **WHAT IS AN MCX?**

An MCX is an element within the Corps of Engineers with demonstrated technical capability in a specialized area which must be utilized by other Corps field offices. It is inefficient to develop capabilities at all Field Operating Activities (FOA) therefore, a center of expertise was established to focus the existing expertise within the Corps of Engineers. The MCX was established by HQUSACE to respond to the Department of the Army's responsibilities in executing projects at sites contaminated with explosive ordnance. Huntsville was selected because of experience with remedial response at several sites contaminated with explosive ordnance. Although Huntsville Division is the only MCX, other agencies will have major roles in this program. If agreements can be reached Missouri River Division, the Toxic and Hazardous Materials Agency and the Navy Technical Center for Explosive Ordnance Disposal will be other major players. Huntsville Division will provide the focal point for the existing expertise and serve to disseminate expertise to the FOAs supporting the DERP.

## **HOW LARGE IS THIS PROGRAM?**

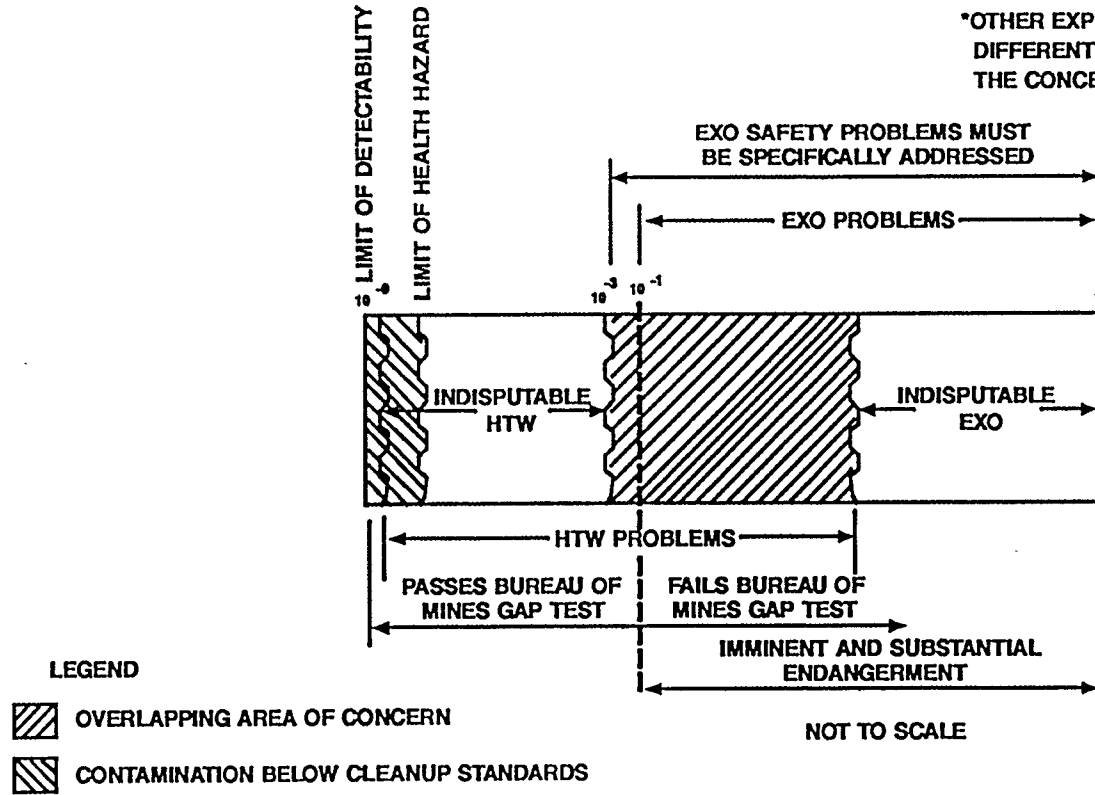
A key word search was conducted on the DERP - FUDS data base (Currently, 7,050 suspected former military sites are in that data base) to locate former DoD sites that are potentially contaminated with explosive ordnance. The key words used were "range", "bomb", "artillery" and others. Huntsville Division identified 941 potential sites. It must be mentioned that many sites that are potentially contaminated give no clues to that effect in the site name. Many sites have not been identified to the original data base. Contamination has been discovered on some sites that have been evacuated and determined that the site was ineligible for DERP funding based on field studies and record searches. All of these situations have occurred after the search was conducted. It serves to provide little confidence that the total program scope is before us at this time.

These sites have a very high probability that some remedial action will be necessary. Although most sites were swept and disposed of with restricted use provisions in the deeds, many sites of former military activity have been developed into subdivisions, parks, and colleges. This type of development provides a higher risk of fatal exposures to explosive ordnance. Remedial actions at these sites could easily cost several BILLION dollars.

Other programs will need the services of the the MCX and Design Center for Explosive Ordnance Engineering. Among them are the Installation Restoration Program and Base Closures. At this time there is no estimate of the scope of those programs. It is sufficient to say that we have a very large task ahead of us and we will need a lot of help from the safety professionals of the Department of Defense.

# EXO AND HTW CONTAMINATION IN SOIL

\*OTHER EXPLOSIVES WILL FAIL GAP TEST AT DIFFERENT CONCENTRATIONS. HOWEVER, THE CONCEPT REMAINS VALID.



1727

FIGURE 1



# EXPLOSIVE ORDNANCE ENGINEERING

## GEOGRAPHIC DISTRIBUTION

### DERP - FUDS

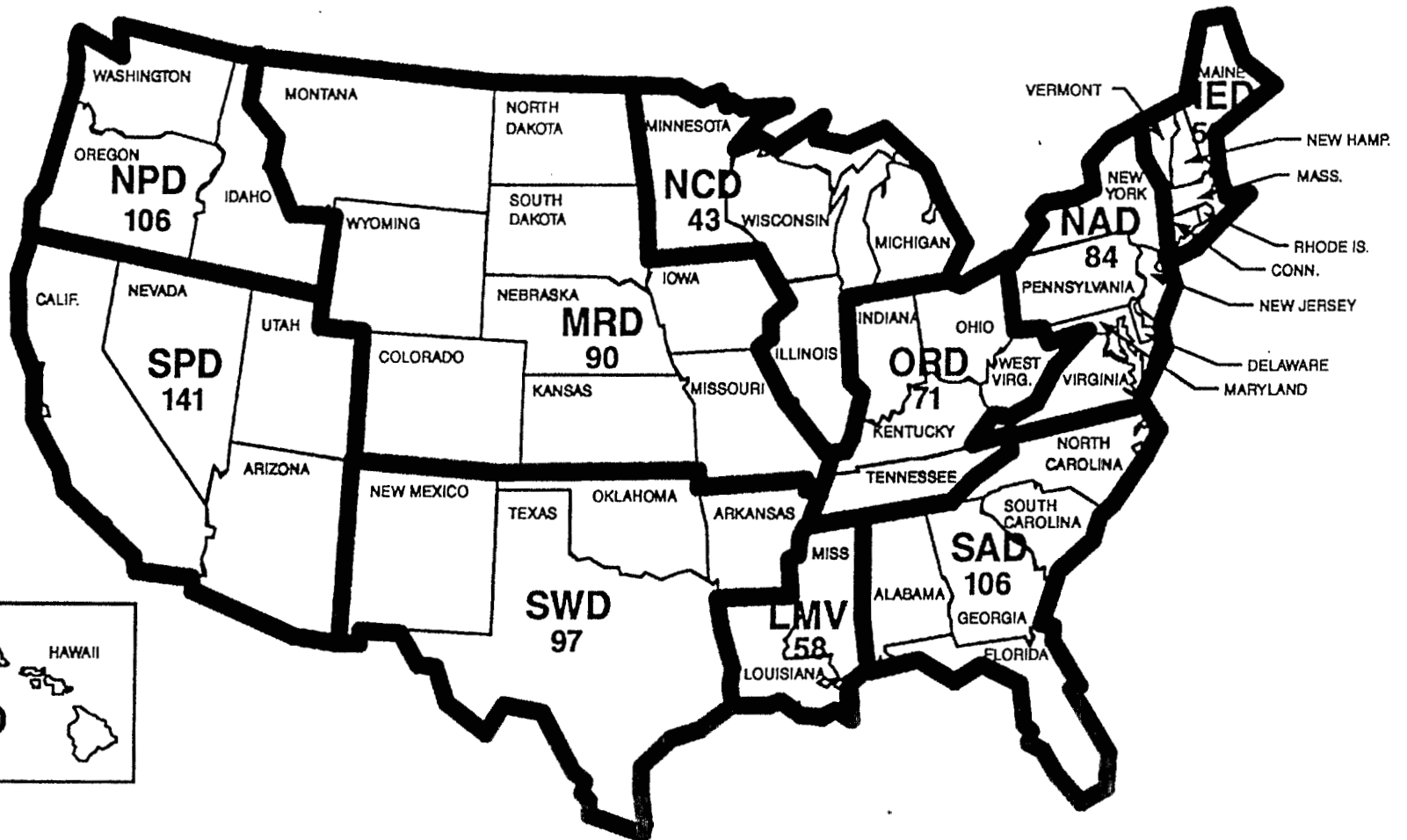


FIGURE 2  
1728