April 17, 2003 *CTC*/DP-CL1466-03

U.S. Army Environmental Center
ATTN: SFIM-AEC-ATT
5179 Hoadley Road
Aberdeen Proving Ground, MD 21010-5401

SUBJECT: Draft Program Management Plan and Draft Work Breakdown Structure (CDRL A001), dated April 15, 2003

REFERENCE: (1) Task No.: 318 "Unexploded Ordnance (UXO), approved March 25, 2003

(2) Contract Number DAAE30-98-C-1050

Dear Sir:

Concurrent Technologies Corporation (*CTC*) is pleased to submit one (1) copy of the Subject Deliverable in accordance with the Reference (1) Task under the Reference (2) Contract. If you should require technical clarification, please call the Director of Advanced Technologies, at (814) 269-2810. For contractual issues, please call the undersigned at the above direct dial number.

Very truly yours,

// Original Signed //

Manager, Contract Resources

/bem

Enclosures: as stated

cc: SFIM-AEC-ETT
SFIM-AEC-ETD
Shaw Environmental & Infrastructure

UNEXPLODED ORDNANCE (UXO) TASK 318

Draft Program Management Plan
and
Draft Work Breakdown Structure

April 15, 2003

Requests for this document shall be referred to:

Office, Assistant Secretary of the Army
ASA (I&E) ESOH
1235 Jefferson Davis Highway
Crystal Gateway 1
Suite 307
Arlington, VA 22202-5819

Contract No. DAAE30-98-C-1050
Task No. 318
CDRL No. A001

Prepared by
National Defense Center for Environmental Excellence (NDCEE)

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ACRONYM LIST

AEC	Army Environmental Center
AFB	Air Force Base
ARDEC	Armaments Research and Development Engineering Center
ARL	Army Research Laboratory
BRAC	Base Realignment and Closure
CBA	Cost benefit analysis
CDRL	Contract Data Requirement List
CERCLA	Comprehensive Environmental, Response, Compensation, and Liability Act
CRREL	Cold Regions Research and Engineering Laboratory
CTC	Concurrent Technologies Corporation
DACA	Days After Contract Award
DTLOSM	Doctrine, Training, Leader Development, Organization, and Solider
DoE	Department of Energy
DoD	Department of Defense
DoDIC	DoD Identification Code
DoI	Department of the Interior
DQOs	Data Quality Objectives
EAD	Environmental Assessment Division
EMI	Electromagnetic induction
EOD	Explosive Ordnance Disposal
EPA	Environmental Protection Agency
EQT	Environmental Quality Technology
ESTCP	Environmental Security Technology Certificate Program
DGPS	Digital Global Positioning System
HE	High Explosive
IFS	Integrated Facilities System
IPR	In Progress Review
ITRC	Interstate Technology Regulatory Council
JUXOCO	Joint Unexploded Ordnance Coordination Office
MACA	Months After Contract Award
MCX	Mandatory Center of Excellence
MNA	Mission Needs Analysis
MNS	Mission Needs Statement
NAOC	National Association of Ordnance and Explosive Waste Contractors
NAVEOD	U.S. Navy Explosive Ordnance Disposal
NAVEODTECHDIV	Naval Explosive Ordnance Disposal Technology Division
NDCEE	National Defense Center for Environmental Excellence
NFADB	Navy Facilities Assets Database
NFESC	Naval Facilities Engineering Service Center
OE	Ordnance and Explosives
OEW	Ordnance and Explosive Waste
OMEMS	Ordnance munitions and Electronics Maintenance School
PDA	Personal Digital Assistant

PDR	Preliminary Design Review
PMP	Program Management Plan
POC	Point of Contact
POP	Period of Performance
PPE	Personal Protective Equipment
PVC	Polyvinyl Chloride
QA	Quality Assurance
QC	Quality Control
RCRA	Resource Conservation and Recovery Act
RIMS	Range Information Management System
SERDP	Strategic Environmental Research and Development Program
SOP	Standard Operating Procedure
SOW	Statement of Work
TACOM	Tank-Automotive Armaments Command
TBD	To Be Determined
TM	Technical Monitor
TSWG	Technical Support Working Group
USACE	United States Army Corps of Engineers
USACE-MCX	U.S. Army Corps of Engineers Ordnance and Explosives Mandatory Center of Excellence and Design Center
USAEC	United States Army Environmental Center
USAFRL	United States Air Force Research Laboratory
USGS	United States Geological Survey
UXO	Unexploded Ordnance
UXOCOE	Unexploded Ordnance Center of Excellence
WBS	Work Breakdown Structure
WES	Waterways Experimental Station

1.0 INTRODUCTION

1.1 Program Management Plan

This Program Management Plan (PMP) provides technical, management, schedule, and cost data associated with Task No. 318, Unexploded Ordnance (UXO) Task. It describes the approach, resources, and processes by which the contractor, Concurrent Technologies Corporation (*CTC*) through the National Defense Center for Environmental Excellence (NDCEE), will establish and execute the project described in the Work Breakdown Structure (WBS) and the Task Descriptions of this PMP. This PMP is considered a working document and will be revised and updated as required to correspond with necessary changes in the program execution. Any revisions of the PMP will be submitted to the Government for concurrence and approval.

This document is submitted in fulfillment of Contract Data Requirements List (CDRL) A001, Program Management Plan (PMP) and Work Breakdown Structure (WBS) for the National Defense Center for Environmental Excellence (NDCEE) Contract DAAE30-98-C-1050, Task No. 318, UXO. The labor resource plan is based upon the WBS discussed in Section 2.0 that was prepared in accordance with CDRL A001 of the Statement of Work (SOW). The resource plan addresses each month of the project.

This PMP also describes the organization, practices, and techniques that will be used to manage the project. An organization chart identifying the names of *CTC* personnel, their role/task responsibility, and their involvement in Task No. 318 is provided in Section 3.0. In addition, Section 3.0 also contains a personnel contact table, which will be updated to include Government stakeholders once the Technical Monitor, in accordance with the SOW, has approved them. A deliverables table and a projected Task schedule have been provided in Sections 4.0 and 5.0 respectively of this document. These items identify project milestones as well as, projected start and completion dates.

Section 6.0, Subtask Descriptions, provides the WBS for each subtask that is required to accomplish the SOW. This section also describes the technical approach, corresponding levels of effort, estimated schedule, resource allocation, and expenditure curve for each subtask.

A Task risk assessment and risk management plan was developed and is included in Section 12.0.

1.2 Contract Data

Client	Defense Contracts Command-Washington
Contract Start Date	March 26, 2003
Contract Number	DAAE30-98-C-1050
Task No.	307
Contract Type	Cost Plus Fixed Fee
Completion Date	September 30, 2004

1.3 Project Summary

Military readiness and homeland security depend on the ability to properly train military personnel and test military equipment. A direct by product of these activities is UXO. Management of UXO is a complex issue that encompasses a wide range of technical areas including, but not limited to, corrosion, fate and transport mechanisms, geographic information systems, and process and manufacturing systems. Mitigation of these issues is further compounded by the fact that the total amount of UXO and the total contaminated land area are not known. One estimate provided in the UXO 2001 Report to Congress approximates that over 11 million acres in the U.S. could potentially be contaminated with UXO. In addition, with constant reevaluation and restructuring of military lands and encroachment issues, much of this property poses a potential threat and hazard to human health and the environment.

The current NDCEE FY02 UXO Task (Task N.307) is ongoing and follow-on recommendations have not yet been developed; as such, most of the FY03 subtasks are stand-alone and subsequently do not directly build on the FY02 UXO program. However, two (2) of the FY03 subtasks (Subtask 5, Field Deployment of Electronic UXO Recovery Database, and Subtask 6, Environmental Chamber Migration Testing) directly build on the FY02 Program. Specifically, this FY03 UXO Task, as described herein, will leverage all current and past UXO projects conducted under ESTCP/SERDP, Army Environmental Quality Technology (EQT) Program and other relevant efforts during execution of the SOW.

The other FY03 subtasks will address the Army's need to prevent pollution and greatly reduce environmental liabilities and costs associated with UXO on ranges. The following list outlines the 11 technical subtasks of FY03 Task 318, which are further described in more detail in Section 6.0 of this PMP.

- Assess the extent of the UXO problem with shallow water areas on ranges and assess technological and regulatory issues associated with remediation
- Survey and evaluate the geology, water, and vegetation resources at UXO contaminated sites to support UXO R&D efforts
- Support the development of a dual-mode navigation tool for hand-held or man-portable sensors

- Support the field deployment of an electronic data collection device for better managing UXO recovery data
- Increase understanding of UXO movement through subsurface soil due to natural thermal cycling effects through environmental chamber testing
- Assess and evaluate the type and rate of corrosion and those associated factors that influence corrosion susceptibly of certain munitions based on their design
- Assess and evaluate dud rate characteristics of certain munition types and investigate and report on the influence of environmental variables on dud rates
- Evaluate potential technologies for incorporation into munitions design that would enhance detectability of UXO from those munitions
- Investigate and develop a database for dud rates and low order detonation rates for a variety of ammunition types
- Assess the extent of UXO "dud" problem associated with the use of old inventory by the U.S. Department of the Interior for avalanche control in mountainous regions
- Develop a computerized cost trade-off tool for evaluating potential UXO activity costs for remediation projects.

1.4 Statement of Work

See Appendix A for the complete SOW, dated February 27, 2003, and corresponding CDRLs.

2.0 WORK BREAKDOWN STRUCTURE

As part of the PMP, a Work Breakdown Structure (WBS) was developed and is shown in Figure 1. Upon approval of the PMP by the Government, the associated WBS will serve as a basis for program and technical planning, scheduling, cost estimating, resource allocation, performance management, configuration management, and status reporting. The WBS will be updated as required to correspond with necessary changes in program execution, and modifications will be explained in the monthly reports. All changes in the WBS will require Government approval prior to execution.

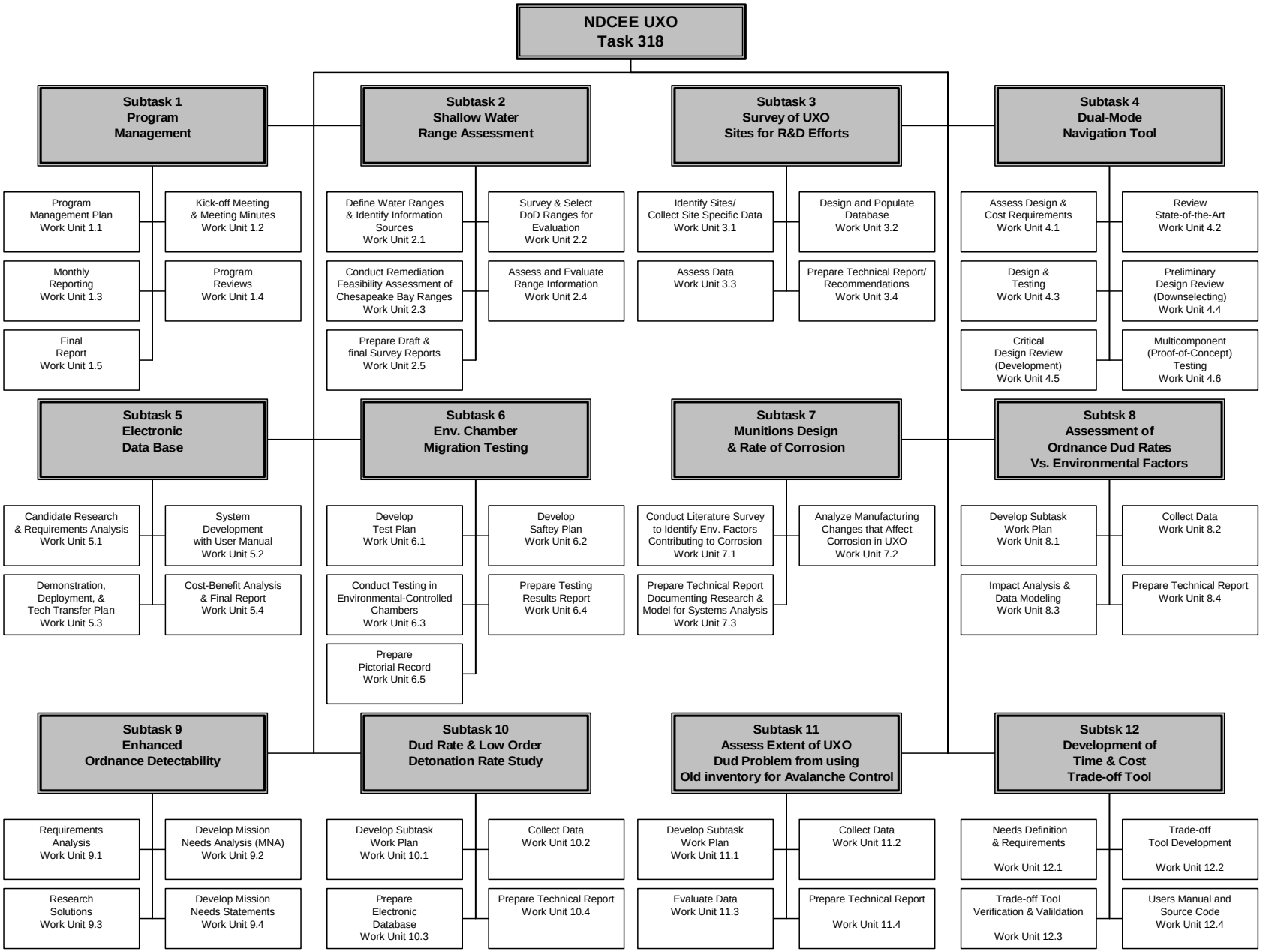

Figure 1. WBS for UXO Task No. 318

3.0 TASK ORGANIZATIONAL STRUCTURE

3.1 *CTC* UXO Team

The UXO Tasks 307 and 318 will be completed by the *CTC* UXO Team, under the direction of the Program Manager. The NDCEE Program Manager, will provide senior management overview. Technical leads, senior technical advisors, a business analyst, and administrative assistant will assist with the day-to-day program management, technical, financial, and administrative operations. The Task Management Organizational Chart is shown in Figure 2. In addition, a dedicated staff of specialized personnel will conduct work within the subtasks using the *CTC* matrix management system. Background descriptions of *CTC* personnel are provided in Appendix B List of Personnel.

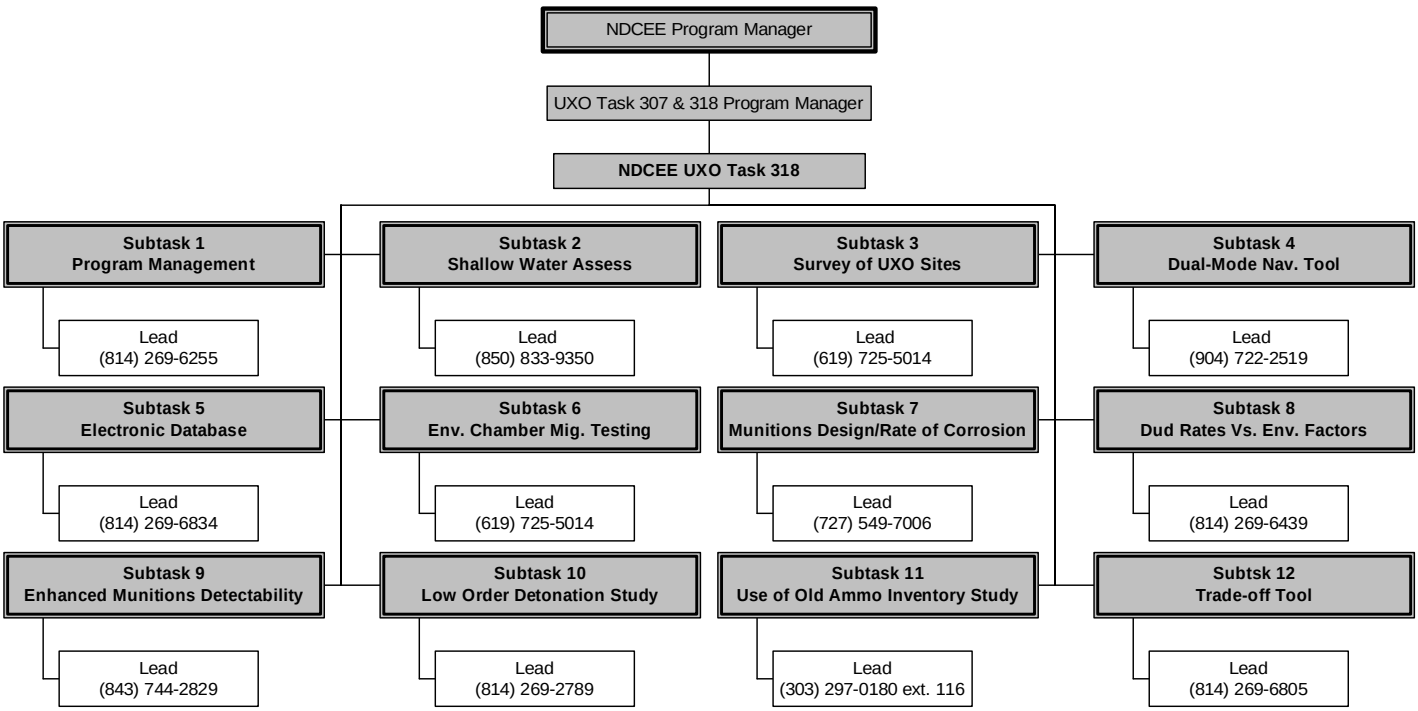

Figure 2. UXO Task No. 318 Organizational Chart

3.2 Task Communication

All Leads will have direct control and authority over the daily management activities for their subtask, including management of their subtask team and discussions with Government stakeholders. The Leads will directly report to the UXO Program Manager who reports directly to the NDCEE Program Manager and the UXO Task Technical Monitor. Preliminary task personnel contact information is provided in Table 1.

Task Responsibility (Organization)	Phone
Technical Monitor (USAEC)	(410) 436-6865
NDCEE Program Manager (*CTC*)	(814) 269-2877
Project Manager (*CTC*)	(814) 269-2810
Government Project Stakeholders	TBD
Subtask 1 Lead (*CTC*)	(814) 269-6255
Subtask 2 Lead (*CTC*)	(850) 833-9350
Subtask 3 & 6 Lead (*CTC*)	(619) 725-5014
Subtask 4 Lead (*CTC*)	1-888-226-5962
Subtask 5 Lead (*CTC*)	(814) 269-6834
Subtask 7 Lead (*CTC*)	(727) 549-7006
Subtask 8 Lead (*CTC*)	(814) 269-6439
Subtask 9 Lead (*CTC*)	(843) 744-2829
Subtask 10 Lead (*CTC*)	(814) 269-2789
Subtask 11 Lead (*CTC*)	(303) 297-0180 ext. 116
Subtask 12 Lead (*CTC*)	(814) 269-6805

*TBD = to be determined

Table 1. Task Personnel Contact Information

3.3 Government Stakeholders

The UXO Task Technical Monitor (USAEC) and the *CTC* UXO Team, will recommend potential stakeholders for invitation onto the UXO Project Team. NDCEE will contact all identified potential stakeholders to inform them of the efforts under Task 318 and invite them to participate as technical experts for review of activities and deliverables. Invitees will include representatives from the federal and DoD governmental agencies, state regulators, industry and academia, including representation from, but not limited to, the following organizations:

- U.S. Army Environmental Center (USAEC), Aberdeen Proving Ground, Maryland
- U.S. Navy Explosive Ordnance Disposal (NAVEOD) Technology Division, Indian Head, Maryland
- U.S. Air Force Research Laboratory, Tyndall AFB, Florida
- U.S. Army Corps of Engineers (USACE), Huntsville, Alabama
- U.S. Army Corps of Engineers (USACE) Waterways Experimental Station (WES), Vicksburg, Mississippi
- Technical Support Working Group (TSWG) for NDCEE

- U.S. Army Aberdeen Test Center, Aberdeen Proving Ground, Maryland
- Environmental Security and Technology Certification Program (ESTCP)
- Strategic Environmental Research and Development Program (SERDP)
- U.S. Naval Facilities Engineering Service Center (NFESC)
- Joint UXO Coordination Office (JUXOCO).

Invitations will be tendered to the designated POCs to join the UXO Project Team to provide guidance, expertise, and DoD-wide synergy during the execution of the project.

4.0 ITEMS/DATA TO BE DELIVERED

NDCEE will deliver all items and data (contract deliverables) as specified in Table 2 of this PMP in accordance with the Government's SOW. The delivery schedule is based on the contract award date, March 25, 2003. Deliverables will document the specific technical parameters used for measuring the technical progress of this project. Ten working days have been allotted by NDCEE in the appropriate Subtask schedules, for Government review of test and safety plans.

Table 2. UXO Task 307 Contract Deliverables

Subtask	Item	SOW Ref.	CDRL No.	DATE DUE (DACA[1] unless otherwise noted)	Calendar Date (based on March 25, 2003)
1	**Program Management Plan and WBS**	**3.1**	**A001**	**30**	Thursday, April 24, 2003
1	**Monthly Progress, Status, and Management Reports**	**3.2**	**A002**	**Day 15 of each month throughout the life of this Project**	Day 15 of each month throughout the life of this Project
1	**Kick-off Meeting Minutes/ Meeting Minutes**	**3.3**	**A003**	**45**	Friday, May 9, 2003
1	**In Progress Review (IPR)**	**3.3**	**A004**	**Approximately 4 Months after award and at Approximately 5-month intervals thereafter.**	August 2003[2] February 2004[2] September 2004[2]
2	**Technical Summary Report (Shallow Water on Ranges)**	**3.4.1**	**A005**	**518**	Tuesday, August 24, 2004
2	**PowerPoint Presentation (Shallow Water on Ranges)**	**3.4.1**	**A030**	**488**	Sunday, July 25, 2004[3]
3	**Technical Report (Survey General Trends)**	**3.4.2**	**A006**	**518**	Tuesday, August 24, 2004
3	**PowerPoint Presentation (Survey General Trends)**	**3.4.2**	**A030**	**488**	Sunday, July 25, 2004[3]
4	**Technical report (Navigation Tool SDP)**	**3.4.3**	**A007**	**518**	Tuesday, August 24, 2004
4	**Test Plan (Navigation Tool Testing)**	**3.4.3**	**A008**	**120**	Wednesday, July 23, 2003
4	**Test Report (Navigation Tool Testing)**	**3.4.3**	**A009**	**60 days after completion of testing**	TBD
4	**PowerPoint Presentation (Navigation Tool Testing)**	**3.4.3**	**A030**	**488**	Sunday, July 25, 2004[3]
5	**System Documentation including Software, Source Code and User Manual(s) (Field-Deployable Database)**	**3.4.4**	**A010**	**488**	Sunday, July 25, 2004[3]

[1] DACA – days after contract award.
[2] *CTC* suggests that the Task 318 In-Process Reviews be held in conjunction with the Task 307 IPRs and other Program Reviews that are tentatively scheduled for August 2003, February 2004, and September 2004.
[3] Due dates that occur on a weekend will be delivered the prior Friday.
TBD – To be determined.

Table 2. UXO Task 307 Contract Deliverables (Continued)

Subtask	Item	SOW Ref.	CDRL No.	DATE DUE (DACA[1] unless otherwise noted)	Calendar Date (based on March 25, 2003)
5	**Technology Transfer Plan (Field-Deployable Database)**	**3.4.4**	**A031**	**488**	Sunday, July 25, 2004[3]
5	**Summary Technical Report (Field Deployable Database)**	**3.4.4**	**A011**	**518**	Tuesday, August 24, 2004
5	**PowerPoint Presentation (Field Deployable Database)**	**3.4.4**	**A030**	**488**	Sunday, July 25, 2004[3]
6	**Test Plan (Chamber Testing)**	**3.4.5**	**A029**	**60**	Saturday, May 24, 2003[3]
6	**Safety Plan (Chamber Testing)**	**3.4.5**	**A012**	**60**	Saturday, May 24, 2003[3]
6	**Test Report (Chamber Testing)**	**3.4.5**	**A013**	**60 days after completion of testing.**	TBD
6	**Pictorial Record and PowerPoint Presentation (Chamber Testing)**	**3.4.5**	**A014**	**60 days after completion of testing.**	TBD
7	**Technical Report (Corrosion Assessment)**	**3.4.6**	**A015**	**518**	Tuesday, August 24, 2004
7	**PowerPoint Presentation (Corrosion Assessment)**	**3.4.6**	**A030**	**488**	Sunday, July 25, 2004[3]
8	**Technical report (Dud Rate Vs. Envn. Factors)**	**3.4.8**	**A021**	**518**	Tuesday, August 24, 2004
8	**PowerPoint Presentation (Dud Rate Vs. Envn. Factors)**	**3.4.8**	**A030**	**488**	Sunday, July 25, 2004[3]
9	**Technical Report (Enhanced Detectability)**	**3.4.9**	**A022**	**518**	Tuesday, August 24, 2004
9	**PowerPoint Presentation (Enhanced Detectability)**	**3.4.9**	**A030**	**488**	Sunday, July 25, 2004[3]
10	**Technical Report (Dud Rate & Low Order)**	**3.4.10**	**A023**	**518**	Tuesday, August 24, 2004
10	**MS ACCESS database (Dud Rate & Low Order)**	**3.4.10**	**A024**	**488**	Sunday, July 25, 2004[3]
10	**PowerPoint Presentation (Dud Rate & Low Order)**	**3.4.10**	**A030**	**488**	Sunday, July 25, 2004[3]
11	**Technical Report (Avalanche Control)**	**3.4.11**	**A025**	**518**	Tuesday, August 24, 2004
11	**PowerPoint Presentation (Avalanche Control)**	**3.4.11**	**A030**	**488**	Sunday, July 25, 2004[3]
12	**Software and User manual (Trade-off Tool)**	**3.4.12**	**A026**	**488**	Sunday, July 25, 2004[3]

[1] DACA – days after contract award.
[2] *CTC* suggests that the Task 318 In-Process Reviews be held in conjunction with the Task 307 IPRs and other Program Reviews that are tentatively scheduled for August 2003, February 2004, and September 2004.
[3] Due dates that occur on a weekend will be delivered the prior Friday.
TBD – To be determined.

Table 2. UXO Task 307 Contract Deliverables (Continued)

Subtask	Item	SOW Ref.	CDRL No.	DATE DUE (DACA[1] unless otherwise noted)	Calendar Date (based on March 25, 2003)
12	**Technical Report (Trade-off Tool)**	**3.4.12**	**A027**	**518**	Tuesday, August 24, 2004
12	**PowerPoint Presentation (Trade-off Tool)**	**3.4.12**	**A030**	**488**	Sunday, July 25, 2004[3]
NA	**Final Report**	**3.17**	**A028**	**548**	Thursday, September 23, 2004

[1] DACA – days after contract award.
[2] *CTC* suggests that the Task 318 In-Process Reviews be held in conjunction with the Task 307 IPRs and other Program Reviews that are tentatively scheduled for August 2003, February 2004, and September 2004.
[3] Due dates that occur on a weekend will be delivered the prior Friday.
TBD – To be determined.

5.0 PERIOD OF PERFORMANCE

The period of performance for the NDCEE UXO Task No. 318 is 555 calendar days after contract award (DACA). The completion date of this effort corresponds to the NDCEE Contract end date of September 30, 2004. A summary of the task schedule is shown in Figure 3. The schedules for each individual subtask are contained within Sections 6.1 through 6.12 of this document, within their respective subtask descriptions.

5.1 Task Schedule

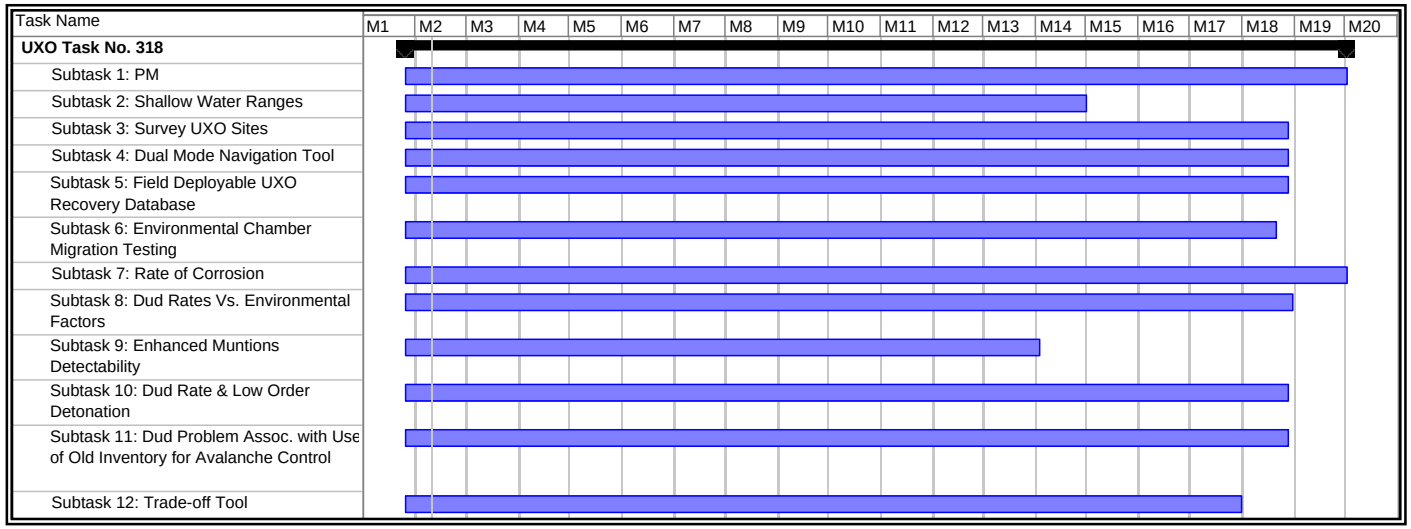

Figure 3. UXO Task No. 318 Schedule

5.2 Task Resources

Concurrent Technologies Corporation

Contract No. DAAE30-98-C-1050
Task Number: 08372.318
Unexploded Ordnance

Description	Total Proposed	Mar-03	Apr-03	May-03	Jun-03	Jul-03	Aug-03	Sep-03	Oct-03	Nov-03	Dec-03	Jan-04	Feb-04	Mar-04	Apr-04	May-04	Jun-04	Jul-04	Aug-04	Sep-04
Level of Effort (Hours)																				
Professional Level 5	3,353	0	123	126	134	145	188	173	166	169	233	264	198	171	167	177	206	186	252	281
Professional Level 4	9,047	0	120	320	377	564	641	570	594	835	688	590	553	493	488	633	653	286	265	381
Professional Level 3	11,333	0	208	477	543	610	786	778	839	994	852	953	714	615	653	759	601	299	295	364
Professional Level 2	8,554	0	132	178	339	407	497	578	581	628	601	690	591	585	667	636	496	368	304	279
Professional Level 1	1,383	0	13	28	28	28	65	126	139	94	102	114	108	64	75	84	81	49	99	86
Technician Level 3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Technician Level 2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Technician Level 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Administrative Level 2	2,868	0	78	130	119	137	190	183	135	179	163	212	176	141	135	144	213	183	115	239
Administrative Level 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Hours	36,540	0	674	1,258	1,540	1,890	2,366	2,408	2,454	2,899	2,638	2,822	2,339	2,067	2,184	2,431	2,248	1,370	1,328	1,629

Table 3. Resources Table for the UXO Task 318

5.3 Travel

There are several travel needs required to complete the UXO Task 318. The following table provides an outline of the expected travel. It is noted that additional travel may be required to attend meetings, as requested or directed by the Government.

Table 4. Supporting Travel Schedule

Origin	Destination	Subtask	Purpose	No. of Trips	No. of Persons	No. of Days	No. of Nights
Johnstown, PA	St. Louis, MO	Program Management	Participate in 2004 UXO/Countermine Forum with Other Organizations that have been Required as Project Stakeholders for the UXO Task by the Government.	1	2	6	5
Largo, FL	St. Louis, MO	Program Management	Participate in 2004 UXO/Countermine Forum with Other Organizations that have been Required as Project Stakeholders for the UXO Task by the Government.	1	1	6	5
Johnstown, PA	Washington, D.C.	Program Management	Participate in 2003 & 2004 SERDP/ESTCP Conference with Other Organizations that have been Required as Project Stakeholders for the UXO Task by the Government.	2	2	4	3
Largo, FL	St. Louis, MO	Program Management	Participate in 2003 & 2004 SERDP/ESTCP Conference with Other Organizations that have been Required as Project Stakeholders for the UXO Task by the Government.	2	1	4	3
Johnstown, PA	Charleston, SC	Program Management	Participate in Interstate Technology and Regulatory Cooperation (ITRC) Session (2003) to Gather Information and Review with the Subtask Leads.	1	1	5	4
Johnstown, PA	Washington, D.C.	Program Management	Attend UXO In-Process Review to Present Technical Status of Program.	1	3	3	2
Johnstown, PA	Washington, D.C.	Program Management	Attend NDCEE In-Process Review to Present Technical Status of Program.	1	3	3	2
San Diego, CA	Washington, D.C.	Program Management	Attend NDCEE In-Process Review to Present Technical Status of Program.	1	1	3	2
Denver, CO	Washington, D.C.	Program Management	Attend NDCEE In-Process Review to Present Technical Status of Program.	1	1	3	2
Fort Walton Beach, FL	Aberdeen, MD	Shallow Water Range Assessment	Identify and Define Data Bases Associated with Shallow Water Ranges	1	1	3	2
Johnstown, PA	Aberdeen, MD	Shallow Water Range Assessment	Identify and Define Data Bases Associated with Shallow Water	1	1	3	2

			Ranges				
Fort Walton Beach, FL	Aberdeen, MD	Shallow Water Range Assessment	Selection of DOD Shallow Water Ranges for Evaluation	1	1	3	2

Table 5. Supporting Travel Schedule (Continued)

Origin	Destination	Subtask	Purpose	No. of Trips	No. of Persons	No. of Days	No. of Nights
Fort Walton Beach, FL	Washington, D.C.	Shallow Water Range Assessment	Participate in 2003 SERDP/ESTCP Conference with Other Organizations that have been Required as Project Stakeholders for the UXO Task by the Government	1	1	5	4
Fort Walton Beach, FL	Johnstown, PA	Shallow Water Range Assessment	Attend UXO In-Process Review to Present Technical Status of Subtask	1	2	3	2
Fort Walton Beach, FL	Washington, D.C.	Shallow Water Range Assessment	Attend UXO In-Process Review to Present Technical Status of Subtask	1	1	3	2
Fort Walton Beach, FL	St. Louis, MO	Shallow Water Range Assessment	Participate in 2004 UXO/Countermine Forum with Other Organizations that have been Required as Project Stakeholders for the UXO Task by the Government	1	1	5	4
Fort Walton Beach, FL	Johnstown, PA	Shallow Water Range Assessment	Attend UXO Task Wrap Up Meeting in Accordance with SOW	1	1	3	2
Jacksonville, FL	Sunnyville, CA	Dual-Mode Navigation Tool	Meet with Trimble Corp, Manufacturer of GPS Systems, to Conduct Requirements Analysis for Dual-Mode Navigation Tool	1	1	3	2
Jacksonville, FL	Johnstown, PA	Dual-Mode Navigation Tool	Attend UXO In-Process Review to Present Technical Status of Subtask	1	1	3	2
Jacksonville, FL	Washington, D.C.	Dual-Mode Navigation Tool	Attend UXO In-Process Review to Present Technical Status of Subtask	1	1	3	2
Jacksonville, FL	Johnstown, PA	Dual-Mode Navigation Tool	Attend UXO In-Process Review to Present Technical Status of Subtask	1	1	3	2
Jacksonville, FL	Huntsville, AL	Dual-Mode Navigation Tool	Travel to Meet with US Army Corps of Engineers Subject Matter Experts and Review Work of Various Local Positioning Systems	1	1	3	2
Jacksonville, FL	Aberdeen, MD	Dual-Mode Navigation Tool	Travel to Aberdeen Proving Ground for Evaluating Rented GPS Systems	1	2	5	4
Jacksonville, FL	Aberdeen, MD	Dual-Mode Navigation Tool	Travel to Aberdeen Proving Ground for Multi-component Proof of Concept System	1	2	5	4
Jacksonville, FL	Johnstown, PA	Dual-Mode Navigation Tool	Attend UXO Task Wrap Up Meeting in Accordance with SOW	1	1	3	2
Johnstown, PA	Huntsville, AL	Electronic Data Base	Conduct Requirements Analysis to Determine Projected Uses for the Field-Deployable Unit	1	3	4	3
Johnstown, PA	Huntsville, AL	Electronic Data Base	Demonstrate the Beta Field-Deployable UXO Data Collection System	1	3	4	3
Johnstown, PA	Huntsville, AL	Electronic Data Base	Deploy the UXO Data Collection System	1	3	4	3

Table 5. Supporting Travel Schedule (Continued)

Origin	Destination	Subtask	Purpose	No. of Trips	No. of Persons	No. of Days	No. of Nights
Johnstown, PA	Washington, D.C.	Electronic Data Base	Demonstration of Handheld Field-Deployable System at NDCEE Program Review	1	2	3	2
Tampa, FL	Aberdeen, MD	Munitions Design & Rate of Corrosion	Review and Analyze Manufacturability and Corrosion of Munitions Data	1	1	3	2
Tampa, FL	Newark, NJ	Munitions Design & Rate of Corrosion	Review and Analyze Manufacturability and Corrosion of Munitions Data	1	1	3	2
Tampa, FL	Huntsville, AL	Munitions Design & Rate of Corrosion	Review and Analyze Corrosion of UXO Data	1	1	3	2
Tampa, FL	Johnstown, PA	Munitions Design & Rate of Corrosion	Attend UXO In-Process Review to Present Technical Status of Subtask	2	1	3	2
Tampa, FL	Johnstown, PA	Munitions Design & Rate of Corrosion	Attend UXO Task Wrap Up Meeting in Accordance with SOW	1	1	3	2
Tampa, FL	Washington, D.C.	Munitions Design & Rate of Corrosion	Attend UXO In-Process Review to Present Technical Status of Subtask	1	1	3	2
Denver, CO	Picatinny Arsenal, NJ	Dud Rates vs. Environmental Factors	Attend TACOM-ARDEC Meeting to Discuss Dud Rate Issues	1	1	3	2
Denver, CO	Huntsville, AL	Dud Rates vs. Environmental Factors	Attend UXO-COE Meeting to Discuss UXO and EOD Information Collection for Root Cause and Data Gap Analysis	1	1	3	2
Denver, CO	Indian Head, MD	Dud Rates vs. Environmental Factors	Attend NAVEODTECH Meeting to Discuss UXO and EOD Information Collection for Root Cause and Data Gap Analysis	1	1	3	2
Denver, CO	Washington, D.C.	Dud Rates vs. Environmental Factors	Participate in Stakeholder Meeting with Interstate Technology and Regulatory Cooperation (ITRC) Session (2003) to Gather/Present Dud Rate Information	1	1	4	4
Charleston, SC	Johnstown, PA	Enhanced Munitions Detectibility	Attend UXO In-Process Review to Present Technical Status of Subtask	1	1	3	2
Charleston, SC	Johnstown, PA	Enhanced Munitions Detectibility	Attend UXO In-Process Review to Present Technical Status of Subtask	1	1	3	2
Charleston, SC	Washington, D.C.	Enhanced Munitions Detectibility	Attend UXO In-Process Review to Present Technical Status of Subtask	1	1	3	2
Charleston, SC	Johnstown, PA	Enhanced Munitions Detectibility	Attend UXO Task Wrap Up Meeting in Accordance with SOW	1	1	3	2
Charleston, SC	Aberdeen, MD	Enhanced Munitions Detectability	Secure access to DoD Databases for Use in Obtaining Data on Munitions	1	2	2	1
Charleston, SC	Aberdeen, MD	Enhanced Munitions Detectability	Research for Requirements Analysis	1	1	5	4
Charleston, SC	Aberdeen, MD	Enhanced Munitions Detectability	Research for Mission Needs Analysis for Various Ordnance	1	1	5	4

Table 5. Supporting Travel Schedule (Continued)

Origin	Destination	Subtask	Purpose	No. of Trips	No. of Persons	No. of Days	No. of Nights
Charleston, SC	Aberdeen, MD	Enhanced Munitions Detectability	Research for Sensor Solutions	1	1	5	4
Denver, CO	Charlotte, NC	Low Order Detonation Study	Participate in Stakeholder Meeting with Interstate Technology and Regulatory Cooperation (ITRC) Session (2003) to Gather/Present Dud Rate Information	1	1	4	3
Denver, CO	Aberdeen, MD	Low Order Detonation Study	Attend USAEC/Ordnance Brigade Meeting to Discuss Ordnance Dud Rates and Procedures	1	1	3	2
Denver, CO	Eglin, AFB. FL	Low Order Detonation Study	Attend AFRL Meeting to Discuss Ordnance Dud Rates and Procedures that Influence the Dud Problem	1	1	3	2
Denver, CO	Washington, D.C.	Low Order Detonation Study	Participate in Stakeholder Meeting with Interstate Technology and Regulatory Cooperation (ITRC) Session (2003) to Gather/Present Dud Rate Information	1	1	4	3
Denver, CO	Aberdeen, MD	Low Order Detonation Study	Attend USAEC Meeting to Discuss Ordnance Dud Rates and Procedures	1	1	3	2
Denver, CO	Washington, D.C.	Low Order Detonation Study	Attend UXO In-Process Review to Present Technical Status of Subtask	1	1	3	2
Denver, CO	Johnstown, PA	Low Order Detonation Study	Attend UXO Task Wrap Up Meeting in Accordance with SOW	1	1	3	2
Denver, CO	Huntsville, AL	Use of Old Ammo Inventory Study	Attend OMEMS Meeting to Identify Information for Root Cause Analysis and Evaluation	1	1	3	2
Denver, CO	Denver, CO	Use of Old Ammo Inventory Study	Field Surveys at Identified Sites to Collect Information on the Types of UXO Encountered	2	1	5	4
San Diego, CA	Denver, CO	Use of Old Ammo Inventory Study	Field Surveys at Identified Sites to Collect Information on the Types of UXO Encountered	2	1	5	4
Denver, CO	Johnstown, PA	Use of Old Ammo Inventory Study	Attend UXO In-Process Review to Present Technical Status of Subtask	1	1	3	2
Denver, CO	Washington, D.C.	Use of Old Ammo Inventory Study	Attend UXO In-Process Review to Present Technical Status of Subtask	1	1	3	2
Denver, CO	Washington, D.C.	Use of Old Ammo Inventory Study	Participate in Stakeholder Meeting with Interstate Technology and Regulatory Cooperation (ITRC) Session (2003) to Gather/Present Dud Rate Information	1	1	4	3
Johnstown, PA	Washington, D.C.	Trade-Off Tool	Stakeholders Meeting to Discuss Design Needs and Requirements	1	4	2	1
Johnstown, PA	Cape Cod, MA	Trade-Off Tool	Demonstrate and Field Test the Trade-off Tool	1	2	5	4

6.0 TASK DESCRIPTIONS

The UXO Task is divided into one program management subtask and eleven technical subtasks. The primary objectives of the technical subtasks, as listed in SOW Sections 1.3.1 – 1.3.12, are outlined below, with further detail outline in Sections 6.1 through 6.12:

- Perform a comprehensive survey using existing data, former reports to Congress by the Services, and document the real extent of non-tidal and tidal shallow water on ranges, and tidal wetlands and emergent wetlands on ranges. The goal is to assess the extent of the UXO problem on some specific ranges, and infer and identify technical issues in the remediation of similar ranges, and associated regulatory issues, both State and Federal. Successful accomplishment of this subtask depends upon gaining access to Government data, draft and final reports, surveys, and other information that contributes to the objectives of the SOW. After completing a comprehensive survey, the effort will result in a survey (technical) report (reference Section 1.3.1 of the SOW [27 February 2003]).
- Perform a comprehensive survey of both active and former ranges to: 1) compile location and real extent of ranges; 2) determine range hydro-geologic conditions (underlying soil types and strata) using existing data, maps, and surface geophysical methods; 3) determine water/vegetation proportions and interspersion on ranges; 4) determine type and extent of vegetative cover; 4) determine wetlands types and wetland/watershed ratio (if applicable); and, 5) determine topography. The data will ultimately be used to assess if a need exists for additional types of standardized UXO test site(s), and to make recommendations to the Government. The task will result in a technical report and database (reference Section 1.3.2 of the SOW [27 February 2003]).
- Develop a dual-mode navigation tool for hand-held or man-portable sensors. The first mode will implement maximum absolute accuracy attainable in areas inaccessible/inappropriate for DGPS for logging/locating of anomalies in search mode and would permit efficient reacquisition. This will include reviewing work to date characterizing various systems and selection of an appropriate technology, and additional development work of existing systems to meet the objectives. The second mode will be a local positioning mode with highly accurate relative positioning to create local maps of single anomalies with the operator being able to toggle between the two modes. The development effort will also include data management. This will be an incentive for hardware development effort with a series of go/no go decision points, and implementation of a technology transfer plan as part of the effort (reference Section 1.3.3 of the SOW [27 February 2003]).
- Demonstrate a field-deployable application that would allow recording of UXO data in the field using a Personal Digital Assistant (PDA) or standard laptop computer, which then can be directly uploaded into and

synchronized with the UXO Recovery Database to improve the accuracy of data collection, reduce costs, and also provide a framework for real-time UXO data management. The objectives of this subtask include: 1) using a commercially available off-the-shelf application or develop a software application for entering UXO recovery data in the field using a PDA/ laptop and uploading directly (in synchronization) to the UXO Recovery Database; and, 2) demonstrating operation of application by entering "canned" data into a PDA and a laptop and downloading into the UXO Recovery Database (reference Section 1.3.4 of the SOW [27 February 2003]).

- Assess and evaluate the potential for "surface migration" of buried UXO using an environmental test chamber, and to compare the results from the chamber tests to results from actual field-testing conducted as part of NDCEE Task No. 307 (UXO) (reference Section 1.3.5 of the SOW [27 February 2003]).
- Coordinate, analyze, and report on past and ongoing studies regarding UXO corrosion under various environmental conditions, in order to understand what factors influence the rate of UXO corrosion as an important element in evaluating UXO environmental risk at U.S. military installations. It is critical to DoD to understand the rate and mode of UXO corrosion as a basis for predicting when chemical constituents may be released from UXO. This information will provide prioritization capabilities and enable cost effective management with the limited resources available. The subtask will focus on metal and manufacturing processes for munitions over time and will lead to describing how the effect of changes in munitions manufacturing over time will effect corrosion of specific types of ordnance in wet soils. The various types of munitions will be assessed for their potential for corrosion susceptibility and those which are most prone to corrosion identified while describing why the munitions are prone to corrosion and what mechanisms may be responsible for such corrosion (reference Section 1.3.6 of the SOW [27 February 2003]).
- Gather information on the influence of environmental variables on dud rates as well as calculate and model as necessary to evaluate the impact analysis of 120-mm HE and 120-mm M-931 (non HE filled practice round) to assess the conditions that cause these rounds to split open (reference Section 1.3.8 of the SOW [27 February 2003]).
- Evaluate technologies that might be used to make future DoD UXO more detectable. Research and evaluate the potential of a low-cost, simple, light weight component(s) that could be attached or inserted into future DoD munitions before they are fired to aid in detection in the event that they do not detonate.(reference Section 1.3.9 of the SOW [27 February 2003]).
- Estimate dud rates and low order detonation rates for a variety of ammunition types. This effort is a follow-on effort to two previous studies on dud and low order rates from ammunition. Previous efforts relied solely on the Ammunition Stockpile Reliability Program; this effort

includes munitions used on a regular basis (taken from Annual Expenditure Reports), and from estimates of the expected use of legacy ammunition and war reserve ammunition in the future. This subtask will also find other avenues for researching the duds and low order rates, and will also identify any data gaps or any limitation of the data. The subtask will assess dud and low order detonation rates for a variety of subsets of the total set of ammunition items for which data was gathered. The subtask includes preparation of a database used to produce the data; this database will allow the user to determine dud and low order detonation rates as an item, in combination or a subset (reference Section 1.3.10 of the SOW [27 February 2003]).

- Assess the extent of the UXO "dud" problem associated with the use of old inventory by the U.S. Department of the Interior (DoI) for avalanche control in mountainous regions in order to determine if there is a better solution. Specifically, determine what type of rounds, type of gun being used to fire these rounds, cost of these rounds, cost of the gun (replacement), number of rounds fired a year by location, number of Dud rounds, and input from the DoI and commercial sources for possible replacement(s) guns/shells. A survey of two different areas will be undertaken to determine the number and type of UXO at these two sites. The information gathered will be assessed to determine if new fuzes for the rounds will reduce the UXO problem and if there are any other possible solutions that meet DoI needs (reference Section 1.3.11 of the SOW [27 February 2003]).
- Develop a straightforward, spreadsheet level time and cost estimation tool to allow trade-off calculations at the project level and at various stages of UXO mitigation. The tool will not be a rigorous accounting package, but will allow estimation of relative costs and gains. The tool will be validated based on actual site data and from known cost-estimating models (reference Section 1.3.12 of the SOW [27 February 2003]).

6.1 Subtask 1 Program Management

Subtask 1 Program Management provides dedicated personnel with commensurate experience in conjunction with accepted financial and management control activities required to properly manage the NDCEE UXO Task 318. Subtask 1 is further divided into five work units to accomplish the requirements of the SOW (dated February 27, 2003).

Subtask 1 Overview

The Work Units for Subtask 1 are shown in Figure 6 and are described in more detail below.

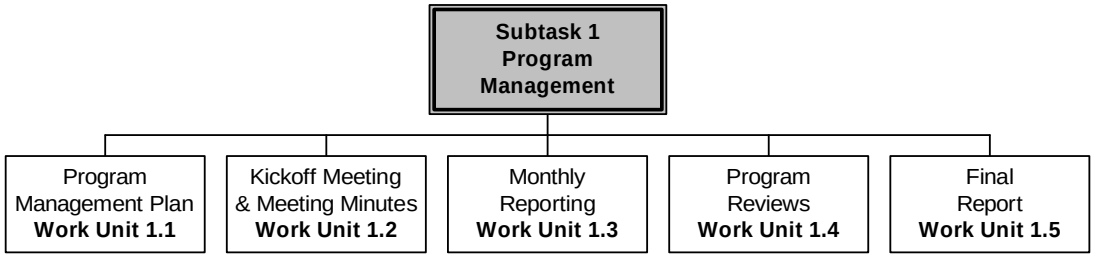

Figure 4. Subtask 1 WBS

- Develop a Program Management Plan (PMP) to act as the Technical and Management work plan, in accordance with CDRL A001,
- Complete a kickoff meeting with an experienced Project Team, including Government stakeholders, and submit meeting minutes for review and approval, in accordance with CDRL A003
- Prepare monthly reports, in accordance with CDRL A002, to document project progress and manage the technical, cost, and schedule approach to accomplish the UXO Task 318 SOW
  - Systematic interfacing with the Government
  - Management and coordination of all Subtasks
- Coordinate and host three In Progress Reviews (IPRs) and a "wrap-up" review meeting in accordance with CDRL A004
- Submit a summary final report, in accordance with CDRL A028.

6.1.1 Work Unit 1.1 Program Management Plan (PMP)

Approach

The NDCEE has prepared and developed this Program Management Plan (PMP), in accordance with CDRL A001 (DI-MGMT-81117), which addresses the activities and associated milestones required by the SOW and describes the management approach to executing and controlling this task. It includes and describes specific management plans and controls, technical approaches to be taken, the corresponding levels of effort required for each subtask, a project schedule with milestones, risk management, and a projected expenditure curve. This PMP contains a project organization chart depicting the names, types and the expertise of personnel assigned to each task, including contractor personnel and their involvement in the task.

This PMP includes a Contract Work Breakdown Structure (CWBS) that indicates resources and project tasks, which serve as a basis for program and technical planning, scheduling, cost estimating, resource allocation, performance management, configuration management, and status reporting. A Gantt chart that defines each project phase, schedules, and deliverables will also be included. The PMP will be revised and updated, as required, to correspond with necessary changes in task execution. Any leasing of equipment, or changes in cost, schedule or scope of the SOW that were not included in the approved proposal will require written approval from the Government prior to initiation. This PMP is considered a working document, subject to change as necessary.

This Draft PMP has been prepared and submitted to the Government within 30 days after contract award (DACA) and the Government will have up to 30 days to review and comment. The Final PMP will be submitted 30 days after receipt of Government comments on the Draft PMP.

6.1.2 Work Unit 1.2 Kickoff Meeting & Meeting Minutes

Approach

To ensure timely execution of task activities and to accomplish the requirements of the SOW, NDCEE will conduct a task kickoff meeting with Project Team members, including but not limited to, Government representatives from the following organizations:

- U.S. Army Environmental Center (USAEC), Aberdeen Proving Ground, Maryland
- U.S. Navy Explosive Ordnance Disposal Technology Division (NAVEODTECHDIV), Indian Head, Maryland
- U.S. Air Force Research Laboratory, Tyndall AFB, Florida
- U.S. Army Corps of Engineers (USACE), Huntsville, Alabama
- U.S. Army Corps of Engineers (USACE) Waterways Experimental Station (WES), Vicksburg, Mississippi
- Technical Support Working Group (TSWG) for NDCEE
- U.S. Army Aberdeen Test Center, Aberdeen Proving Ground, Maryland
- Environmental Security and Technology Certification Program (ESTCP)
- Strategic Environmental Research and Development Program (SERDP)
- U.S. Naval Facilities Engineering Service Center (NFESC)
- Joint UXO Coordination Office (JUXOCO).

The USAEC Technical Monitor will suggest Points-of-Contact (POCs) to NDCEE from the aforementioned organizations and others, as appropriate, who will be contacted and invited to participate as a member of the UXO Project Team.

The Kickoff Meeting is proposed to be held via video-conferencing at the *CTC* facility in Johnstown, Pennsylvania within 30 DACA. Within 15 days following the meeting (and all subsequent major meetings), the NDCEE will prepare and distribute minutes of this meeting for review and approval, in accordance with CDRL A003 (DI-ADMIN-81505). Also, the NDCEE will actively participate in UXO related information exchanges, including the 2004 UXO Countermine Forum, the 2003 and 2004 ESCTP/SERDP Technical Symposiums and Workshops, and two ITRC UXO Meetings (2003 and 2004).

In addition to maximize team communication, the NDCEE will prepare and distribute minutes of all related UXO Task 318 face-to-face meetings and teleconferences conducted during the period of performance (POP).

6.1.3 Work Unit 1.3 Monthly Reporting

Approach

The NDCEE will prepare and submit to the Government, by the 15th day of each month, a report that describes task activities for the previous month and anticipated activities for the upcoming month, and compares the current status of the actual task costs and progress to the proposed task schedule and resources. This report will specifically contain the following information:

- Schedule, technical, travel and cost status
- Highlights of work planned by NDCEE during this period
- Discussions of any problems or obstacles encountered and the actions taken to remedy the situation
- Highlights of work planned by the contractor for the next reporting period.

The NDCEE will submit this report to the Government, in accordance with CDRL A002 (DI-MGMT-80227), in both hard copy and electronic format using Microsoft Word. Also, biweekly teleconferences will be held with the UXO Project Team to ensure timely dissemination of task information among the team members.

6.1.4 Work Unit 1.5 Program Reviews

Approach

The NDCEE will coordinate three UXO In Progress Reviews (IPRs) and a "wrap-up" review during the POP of this Task. *CTC* recommends that the UXO Task 318 IPRs be held in conjunction with the UXO Task 307 IPRs and other Program Reviews that are tentatively scheduled for August 2003, February 2004, and September 2004. Holding the IPRs for both UXO Tasks, 307 and 318, along with other Program Reviews (i.e., NDCEE Program Reviews) will maximize the potential for Governmental and stakeholder participation during the reviews.

Following the proposed schedule above, the first IPR will take place approximately five months after contract award (MACA), the second IPR will take place approximately six months after the first IPR, and the third IPR shall take place approximately seven months after the second IPR. The IPRs are scheduled to be held in Johnstown, Pennsylvania, Washington D.C., and Johnstown, Pennsylvania, respectively, and in accordance with the other tentatively scheduled IPRs/Program Reviews. Travel, attendance, and participation in the IPRs have been provided for primary technical personnel.

The NDCEE will prepare a comprehensive status report for presentation at each IPR, in accordance with CDRL A004 (DI-ADMIN-81373). Specifically, quad charts will be prepared for the overall UXO Task 318 and each Subtask, which will be accompanied by additional slides, if necessary, to provide additional information (e.g., resource curves, detailed Gantt charts with subtask work percentage complete, products/ milestones, accomplishments, etc.).

6.1.5 Work Unit 1.5 Final Report

Approach

The NDCEE will prepare a Final Summary Report for all activities conducted under this effort within 548 DACA, in accordance with CDRL A028 (DI-MISC-80508). The report will include a summary of all subtasks and accomplishments, data summary, lessons learned, costs, and conclusions and recommendations. In addition, the final reports for each subtask will be included in the Final Summary Report as appendices. A final report will be submitted 30 days after receipt of Government Comments on the Draft.

6.1.6 Subtask 1 Schedule

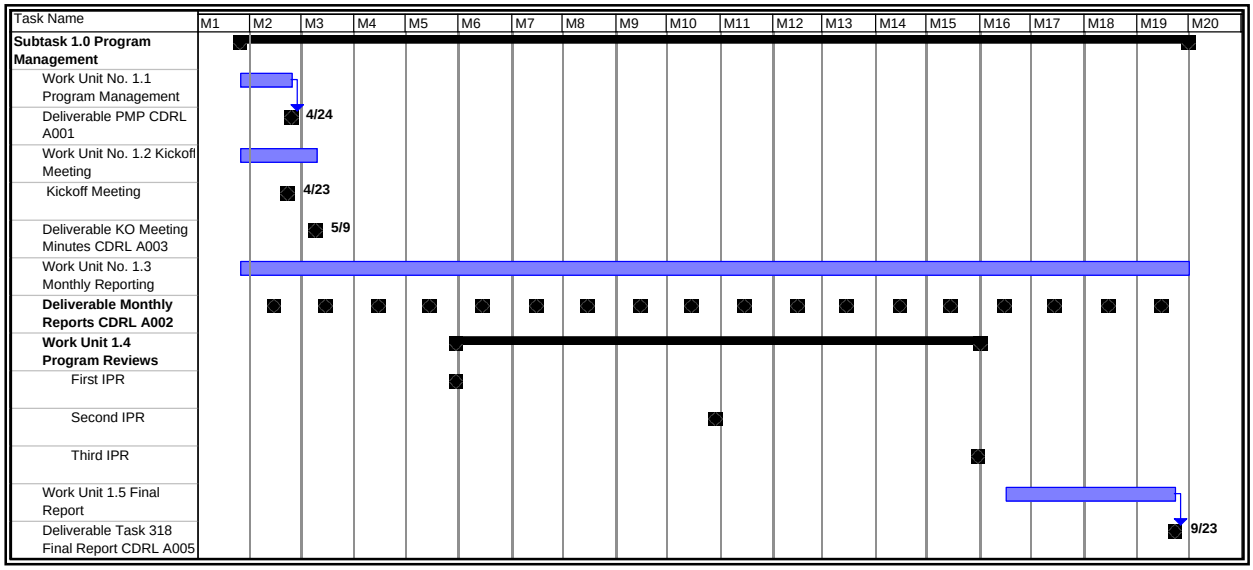

Figure 5. Schedule for Subtask 1 Program Management

6.1.7 Subtask 1 Resources

Concurrent Technologies Corporation

Contract No. DAAE30-98-C-1050
Task Number: 00372.318
Unexploded Ordnance
Program Management

Description	Total Proposed	Mar-03	Apr-03	May-03	Jun-03	Jul-03	Aug-03	Sep-03	Oct-03	Nov-03	Dec-03	Jan-04	Feb-04	Mar-04	Apr-04	May-04	Jun-04	Jul-04	Aug-04	Sep-04
Level of Effort (Hours)																				
Professional Level 5	652	0	32	20	14	14	42	38	14	14	14	42	41	17	18	18	46	44	98	126
Professional Level 4	110	0	4	3	1	2	18	10	2	2	2	18	10	2	2	2	18	2	2	10
Professional Level 3	992	0	64	41	37	38	80	68	40	39	39	77	67	40	41	41	79	51	55	102
Professional Level 2	995	0	102	50	42	42	72	71	35	35	35	64	64	35	35	35	64	55	55	104
Professional Level 1	471	0	12	17	17	17	34	30	18	18	18	30	30	18	18	18	30	18	58	70
Technician Level 3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Technician Level 2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Technician Level 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Administrative Level 2	714	0	40	46	30	30	58	58	25	25	25	53	53	25	25	25	53	25	25	93
Administrative Level 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Hours	3,934	0	254	177	141	143	304	275	134	133	133	284	265	137	139	139	290	195	293	505

Table 5. Resources Table for Subtask 1 Program Management

6.2 Subtask 2 Assess Extent of Shallow Water on Ranges, Identify and Assess Technological Impediments to Remediation, and Associated Regulatory Issues

The results of Subtask 2 will provide an enhanced understanding of relevant and available information on UXO contaminated shallow water on ranges and will serve to quantify the magnitude of this unique problem. It will provide knowledge on the area encompassed by those active and former DoD shallow water ranges located in tidal, non-tidal and emergent wetlands. It will identify technical remediation and associated regulatory factors that impede cleanup of shallow water ranges and will result in the establishment of a searchable database that facilitates follow-on efforts to plan, program, budget, and execute programs to deal with this complex issue. And, it will provide the basis for identifying research and development needs that can help solve the technical challenges posed by UXO in shallow water ranges. A special emphasis will be placed on two shallow water ranges in the Chesapeake Bay Watershed and include a remediation Feasibility Assessment for each that provides remediation options, their costs, and their potential environmental impact. For the ranges surveyed, an evaluation of the effectiveness and failures or shortcomings of existing engineering and institutional controls will be presented.

Subtask 2 Overview

Subtask 2 is organized into five work units to accomplish the required objectives as depicted in Figure 10 and described below.

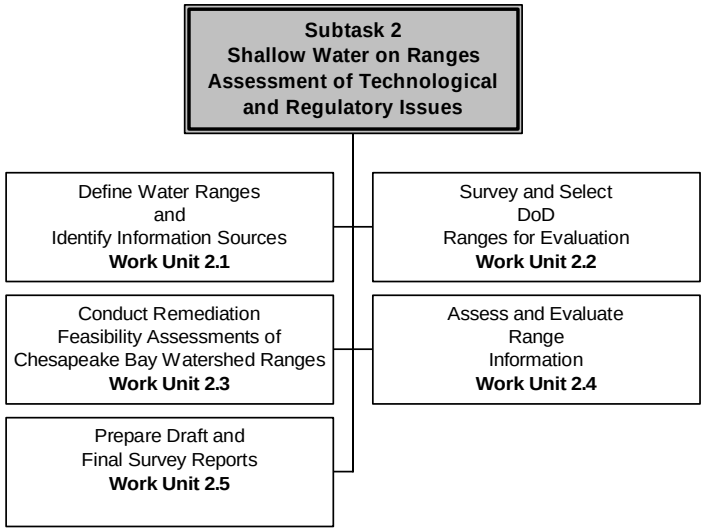

Figure 6. Subtask 2 WBS

The following provides an overview of the five work units:

- Using the established definition of shallow water ranges identify information sources that are pertinent to Subtask objectives and that can serve to meet the goals of determining the extent of the shallow water range UXO contamination problem and provide insight into remediation alternatives and contribute to formulation of cleanup strategies.
- Survey, assess, and evaluate information sources identified in Work Unit 2.1 that provides a logical representation of the broad shallow water range problem. During this process two ranges in the Chesapeake Bay Watershed will be selected to serve as case studies for detailed analysis and inclusion in the survey report.
- Conduct a Remediation Feasibility Assessment of two Chesapeake Bay Watershed shallow water ranges, one of which will be a tidal wetland. From this effort remediation options will be derived that will include cost analysis and environmental impact. The effectiveness and failure or shortcomings of existing engineering and institutional controls will be assessed.
- The remainder of the ranges identified under Work Unit 2.2 will be assessed and their status (e.g., active, closed, transferred, or transferring, etc.) determined, where they are located, their real extent, and physical descriptions of each to include surface water, depth, and presence of wetlands.
- Prepare draft and final survey reports that present the results of assessments and evaluations conducted under Subtask 2. The final survey report will provide valid documentation that can be used by Government decision makers to plan, program, and budget for future remediation and cleanup of shallow water ranges. The survey report will be submitted in accordance with CDRL A005 (DI-MISC-8050). Information generated by this effort will be incorporated into an easily searchable electronic database that will form the knowledge base for any required follow-on efforts.

The above work units as shown in the Subtask 2 WBS in Figure 10 are described in greater detail in following sections (Sections 6.2.1 – 6.2.5).

6.2.1 Work Unit 2.1: Define Water Ranges and Identify Information Sources

Approach

For purposes of this Subtask shallow water ranges are defined as ranges that are covered with 10 feet of water or less and may be wholly or partially covered with water as a function of seasonal or meteorological fluctuations.

NDCEE personnel will conduct a comprehensive search of the retrievable literature sufficient to identify all significant published reports with focus on UXO in or on shallow water ranges and select documentation resulting from this search that contributes to achieving subtask objectives. Sources of information to be examined will include, but not be limited to, legacy data, Government reports, UXO databases, and information obtained from participating stakeholders and subcontractors. Additionally, efforts will be made to identify and retrieve unpublished reports, informal studies, and interview persons knowledgeable on the subject and document these interviews.

To assist in this process and to ensure a broad range of technical expertise is available, NDCEE will establish a stakeholder group with membership consisting of persons with experience in and responsibility for shallow water ranges. Active participation and an effective dialog among participants will be strongly encouraged. Efforts will be made to effectively integrate Stakeholders into all aspects of the Subtask. Major elements of this Work Unit include identification and retrieval of:

- Published literature/Government Technical Reports/General Accounting Office reports, etc. that document the real extent of non-tidal and tidal water on ranges, and those with emergent wetlands.
- Draft reports, unpublished literature, research communications and documentation including SERDP/ESTCP and Service-sponsored work, pertinent Web sites, etc.
- Personal interviews with Government, contractor, and other personnel knowledgeable in the area or who have some degree of oversight responsibility for shallow water ranges.
- Periodic interactions among members of NDCEE and stakeholders to review status, identify information and sources, and to determine its quality and applicability to the goals of the Subtask.

The product of this Work Unit will be a bibliographic listing and hard copies of information that will be used to survey, select, conduct feasibility assessments, and assess and evaluate the shallow water range issue in later Work Units.

NDCEE will utilize subcontractors to assist in compiling existing data from their archives to eliminate duplication of effort wherever possible.

6.2.2 Work Unit 2.2: Survey and Select DoD Ranges for Evaluation

Approach

NDCEE personnel will survey, assess, and evaluate information sources and documentation identified and acquired during Work Unit 2.1 and to use this information to identify and select ranges for more detailed evaluation. Literature and other documentation identified and gathered will be:

- Reviewed and analyzed with an emphasis on determining the national magnitude and related challenges of shallow water on ranges.
- Evaluated to identify steps, if any, which are being taken to alleviate UXO problems on shallow water ranges.
- Used to determine the technologies being employed to identify and remediate UXO contamination on shallow water ranges.

During this effort information on the magnitude of the shallow water range issue will emerge and will include the identification of two shallow water ranges within the Chesapeake Bay Watershed to serve as case studies, one of which will be a tidal wetland.

The product of this Work Unit will be a general listing of DoD shallow water ranges and two ranges in the Chesapeake Bay Watershed that meet the requirements indicated above.

6.2.3 Work Unit 2.3: Conduct a Remediation Feasibility Assessment of Two Chesapeake Bay Watershed Ranges

Approach

NDCEE personnel will analyze the two identified Chesapeake Bay Watershed ranges from Work Unit 2.2 and conduct a remediation feasibility assessment of each. The remediation assessment will:

- Identify remediation options, if any, and identify technological limitations to remediation.
- Include cost analyses and potential environmental impacts of these options, if any are identified.
- Include indications of the effectiveness, failure or shortcomings of existing engineering and institutional controls.
- Identify technical shortcomings of detecting, characterizing, and remediating UXO in or on shallow water ranges.
- Identify and discuss key regulatory implications for these ranges.

NDCEE will prepare a draft remediation feasibility assessment of the two Chesapeake Bay ranges that compiles the information and results of the assessment discussed above. The feasibility assessment will be incorporated into the draft summary report.

6.2.4 Work Unit 2.4: Assess and Evaluate Range Information

Approach

NDCEE personnel will assess and evaluate some specific ranges identified in Work Unit 2.2, excluding the two ranges selected from the Chesapeake Bay Watershed, and their status determined. Information derived during the analysis will include:

- The status of the range (i.e., active, closed, transferred, or transferring, etc).
- The location, real extent, and physical descriptions to include surface/near surface water and its variability, depth, and presence of wetlands.
- State and Federal regulators, regulatory mechanisms, and interested stakeholders for ranges included in the report.
- Any remediation requirements that serve as drivers and any technical and/or regulatory impediments to successful implementation and execution of remediation activities.
- The effectiveness, successes and/or failure or shortcomings, of existing engineering and institutional controls.
- Key regulatory implications for these ranges.

6.2.5 Work Unit 2.5: Prepare Draft and Final Survey Reports

Approach

NDCEE will prepare a draft survey report that compiles the information obtained during execution of each previous Work Unit. The report will reflect the assessment, evaluation, and analysis of the shallow water range issue. The draft survey report will be provided to the Government for review and approval.

NDCEE will prepare a final survey report on shallow water ranges that reflects the comments and guidance of the Government. The final report will provide valid documentation as to the magnitude of the shallow water range issue, technical and regulatory factors that impede or limit cleanup, and can be used by Government decision makers to plan, program, and budget for future UXO remediation and cleanup of such ranges.

6.2.6 Subtask 2 Schedule

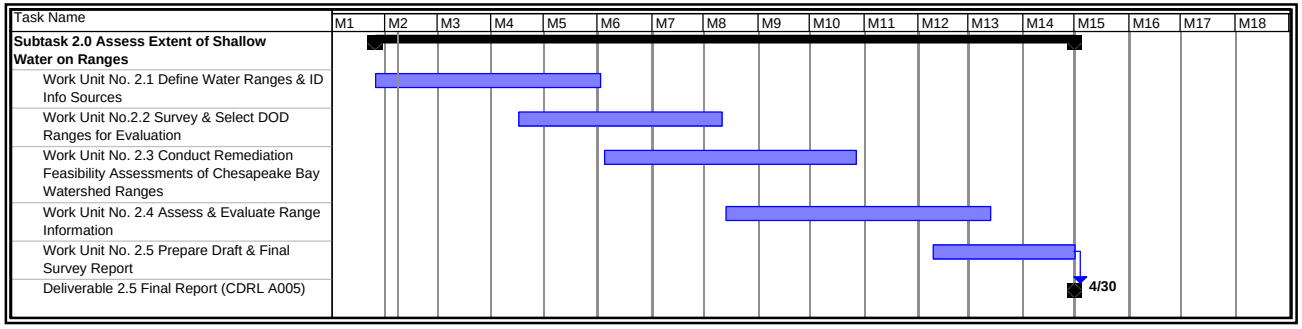

Figure 7. Schedule for Subtask 2 Assess Extent of Shallow Water on Ranges

6.2.7 Subtask 2 Resources

Table 6. Resource Table for Subtask 2 Assess Extent of Shallow Water on Ranges

Concurrent Technologies Corporation

Contract No. DAAE30-98-C-1050
Task Number: 00372.318
Unexploded Ordnance
Shallow Water Range Assessment

Description	Total Proposed	Mar-03	Apr-03	May-03	Jun-03	Jul-03	Aug-03	Sep-03	Oct-03	Nov-03	Dec-03	Jan-04	Feb-04	Mar-04	Apr-04	May-04	Jun-04	Jul-04	Aug-04	Sep-04
Level of Effort (Hours)																				
Professional Level 5	194	0	4	4	6	10	16	16	16	16	18	20	18	14	10	16	10	0	0	0
Professional Level 4	1,010	0	32	44	48	76	48	36	36	36	70	86	60	43	47	78	88	0	8	24
Professional Level 3	1,859	0	7	47	101	153	111	149	165	163	148	172	116	71	179	183	94	0	0	0
Professional Level 2	439	0	0	0	4	10	20	9	24	38	30	74	70	70	40	40	10	0	0	0
Professional Level 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Technician Level 3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Technician Level 2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Technician Level 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Administrative Level 2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Administrative Level 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Hours	3,502	0	43	95	159	249	195	260	291	303	266	352	264	198	276	317	202	0	8	24

6.3 Subtask 3 Survey and Compilation of Geology, Water, Vegetation and Other Relevant Factors at UXO Contaminated Sites to Identify General Trends to Support Research & Development Efforts

At many UXO-contaminated sites, the site-specific requirements for remedial design and action follow the Comprehensive Environmental Response, Compensation, and Reliability Act (CERCLA) process; that is, removal alternatives will be guided by the scoping and characterization of UXO contamination survey results during the site inspection, remedial investigation, and feasibility study phases. These surveys rely predominately on the ability of technologies to detect, localize, and characterize UXO.

Difficulties in positively identifying the presence and type of UXO exist and are related to site-specific factors/characteristics. The site-specific factors include soil, land use, geology, hydrogeology, vegetation, wetlands types, wetland/watershed ratio, topography and terrain. These factors can interfere and limit UXO detection technologies. Therefore, as a first approximation, this task will perform a survey of current and former UXO-contaminated sites in the U.S. and identify within each site the geographic and site-specific factors.

Subtask 3 Overview

Subtask 3 is divided into four work units to accomplish the required objectives as depicted in Figure 14 and described below.

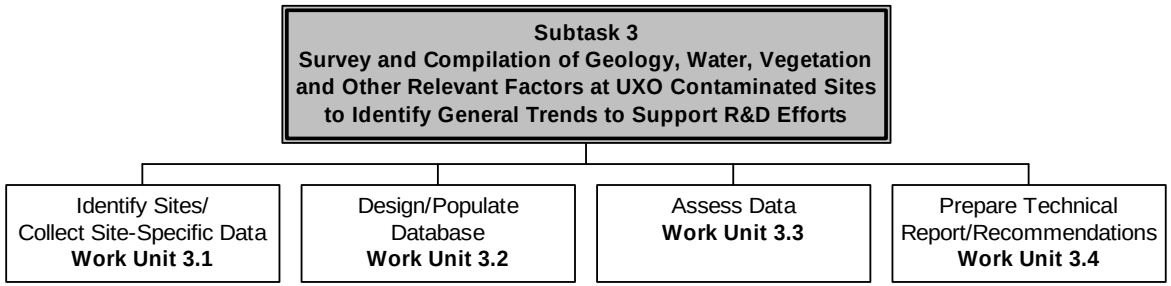

Figure 8. Subtask 3 WBS

The following provides an overview of the four work units:

- Conduct technical literature and Internet searches for the names, locations, and existing information of active and inactive UXO sites and ranges throughout the United States. Collect information for site-specific factors (i.e., soil types, land use, geology and hydrology, vegetation, size, and topography).
- Design, build and populate a standard database with existing or previously collected information on UXO sites and ranges throughout the U.S.
- Perform an assessment of the data that compares and contrasts the differences of the UXO sites in the U.S. Perform a comprehensive assessment of both active and former UXO sites and ranges and compile a database of locations and real extents of ranges. This information will then be used to determine the locations for possible additional standardized UXO detection test sites. This information will also improve the selection of detection equipment based on the site-specific differences.
- Prepare a summary report of the findings of this Subtask by compiling pertinent information and establish a knowledge base essential for the research and development.

The above work units as depicted in the Subtask 3 WBS in Figure 14 are described in greater detail in the following sections (Sections 6.3.1 to 6.3.4).

6.3.1 Work Unit 3.1 Identify Sites and Collect Site-Specific Data Approach

This task focuses on researching historical and current data to determine the locations and names of active and inactive UXO sites within the United States. NDCEE will use data from the following sources as well as other sources that may yet be identified. These examples are not intended to be all-inclusive:

- Soil Survey Reports and Soil Sampling Reports
- Forest Service Reports
- USGS Maps
- State and Local public domain maps
- Range Information Management System (RIMS), Environmental Assessment Division (EAD), Argonne National Laboratory, Illinois, if available
- Individual Services' Real Property Inventories, (i.e., Army – HQ Army Integrated Facilities System (IFS), Navy – Navy Facilities Assets Database (NFADB), and the Air Force's Real Property Asset (RPA) database, if available)
- Geological/Topography Reports
- Removal Action Reports.

NDCEE will determine site-specific factors including: soil, land use, geology, hydrogeology, vegetation, wetland types, wetland/watershed ratio, topography and terrain. For example, the following data will be collected:

- Soil Data
- Land Use Data
- Geology of Site
- Topography of Site
- Vegetation of Site
- Hydrology of Site
- Size of Site

NDCEE will utilize subcontractors to assist in compiling existing data from their archives to eliminate duplication of effort wherever possible.

6.3.2 Work Unit 3.2 Design and Populate Database

Approach

NDCEE will design and structure a database and subsequently enter this information into it. NDCEE will make every effort to utilize existing relevant data from previous work performed for the DoD, analyze that data and incorporate it into the final database. A database will be populated with information found primarily in thorough searches of information and technical reports from projects where UXO has been recovered.

6.3.3 Work Unit 3. 3 Assess Data

Approach

NDCEE will assess the data by evaluating database elements, and interpreting the collected information. A comparison of the information will be conducted and differences between the UXO sites will be extracted. Examples of such comparisons and differences between UXO sites will be based on the collected information. NDCEE will make the following comparisons based on the collected information:

- Soil Data
  - Deep
  - Shallow
  - Organic
- Land Use Data
  - Urban
  - Rural
- Geology of Site
  - Alluvial
  - Weathered in place
  - Wind Carried
- Topography of Site
  - Mountainous
  - Hilly
  - Flat
- Vegetation of Site
  - Wooded
  - Grassland
  - Barren
- Hydrology of Site
  - Wetlands ratio
  - Submerged
  - Dry
- Size
  - Under 500 acres
  - 500-5,000 acres
  - Over 5,000 acres

6.3.4 Work Unit 3.4 Prepare Technical Report and Recommendation

Approach

NDCEE will use the technical database and analyzed information to provide a comprehensive report on all UXO sites within the continental U.S. This information and database will be for R&D purposes only.

6.3.5 Subtask 3 Schedule

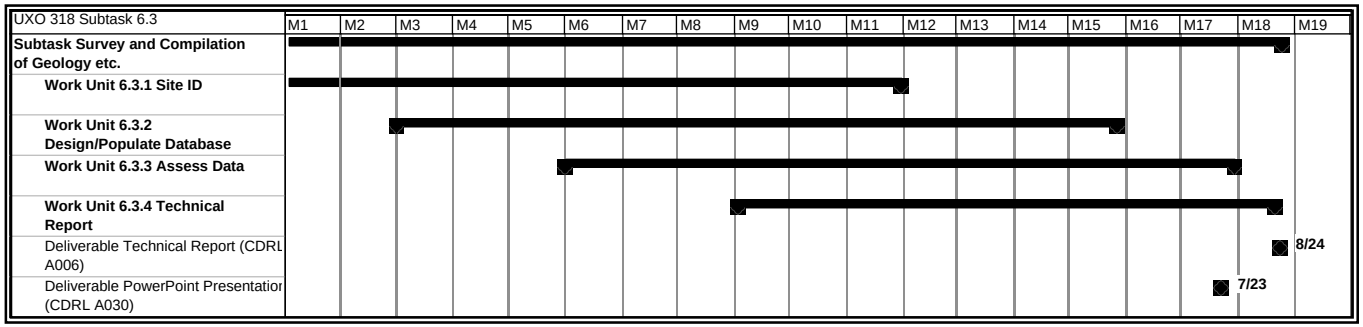

Figure 9. Schedule for Subtask 3 Survey of UXO Contaminated Sites to Identify General Trends

6.3.6 Subtask 3 Resources

Table 7. Resource Table for Subtask 3 Survey of UXO Contaminated Sites

Concurrent Technologies Corporation																			
Contract No. DAAE30-98-C-1050																			
Task Number: 00372.318																			
Unexploded Ordnance																			
Survey of UXO Sites for R&D Efforts																			
Description	Total Proposed	Mar-03	Apr-03	May-03	Jun-03	Jul-03	Aug-03	Sep-03	Oct-03	Nov-03	Dec-03	Jan-04	Feb-04	Mar-04	Apr-04	May-04	Jun-04	Jul-04	Aug-04	Sep-04
Level of Effort (Hours)																			
Professional Level 5	216	0	6	12	20	21	23	12	6	6	7	7	7	11	13	15	10	11	14	15
Professional Level 4	1,587	0	10	51	82	143	161	145	142	121	86	60	60	61	69	64	78	65	99	90
Professional Level 3	932	0	4	93	90	69	69	69	41	41	34	36	39	48	48	48	43	37	56	67
Professional Level 2	300	0	0	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	0	0
Professional Level 1	18	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Technician Level 3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Technician Level 2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Technician Level 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Administrative Level 2	90	0	2	2	2	7	7	7	7	7	7	7	7	7	7	2	2	2	2	6
Administrative Level 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Hours	3,143	0	23	179	215	261	281	254	217	196	155	131	134	148	158	150	154	136	172	179

6.4 Subtask 4 Dual-mode Navigation Tool (Improved Navigation)

The execution of Subtask 4 will result in the development of a prototype navigation tool for accurately determining the location of UXO objects. This tool will be handheld or man-portable and will allow two levels of accuracy. In the absolute mode, accuracies on the order of 0.1 m root mean square (rms) could be achievable. In the relative mode, accuracies could reach 0.01 m rms.

Subtask 4 Overview

Subtask 4 is organized into six work units to accomplish the required objectives as depicted in Figure 18 and described below.

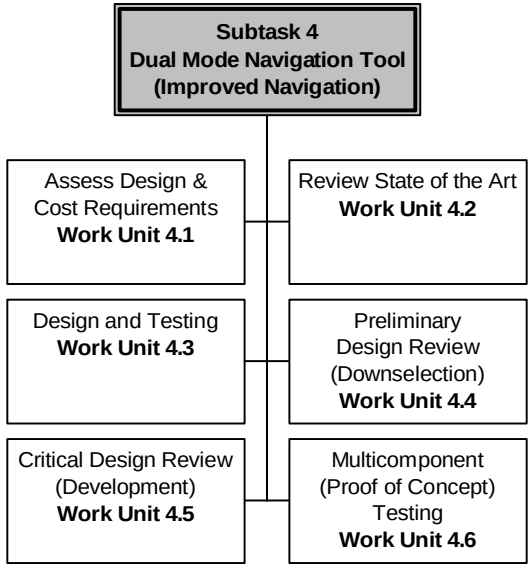

Figure 10. Subtask 4 WBS

The following provides an overview of the six work units:

- Assess Design/Design Cost Requirements: the goal of this activity is to determine the technical and performance specifications of the Dual-mode Navigation Tool.

- Review Current State-of-the-Art: the goal of this work unit is to assess the current state-of-the art in positioning systems and positioning system manufacturers.
- Design and Testing: the goal of this work unit is to develop preliminary designs delineating the components of systems that would meet the technical performance and operational requirements for the Dual-mode Navigation Tool. The design(s) will be evaluated through a series of laboratory testing with an emphasis on signal degradation measurement.
- Preliminary Design Review (PDR): the preliminary design(s) of the sub-systems that produced the best test results will be reviewed by the stakeholder team and the task monitor to ensure that all the requirements and specifications have been addressed in the design and are potentially achievable.
- Critical Design Review: the goal of this work unit is to further refine/define the preliminary design with additional detail and specifications, resulting in a critical design from which components/modules can be selected for future development to physical (packaging) and functional specifications. The critical design will be reviewed by the stakeholder team and task monitor prior to multi-component testing.
- Multi-component (System) Testing and Evaluation: the goal of this work unit is to integrate the aforementioned breadboard systems and to perform field testing under operational conditions.

The above work units as depicted in the Subtask 4 WBS in Figure 18 are described in greater detail in the following sections (Sections 6.4.1 to 6.4.6).

6.4.1 Work Unit 4.1 Assess Design/Design Cost Requirements

Approach

The NDCEE team will determine the technical and performance specifications of the Dual-mode Navigation Tool based on input from the stakeholder team and UXO personnel/EOD technicians.

Performance factors, which may affect requirements, include signal propagation effects, communication (both voice and data), interface specifications for commonly used survey instruments, processor requirements for determining positions at the proper update rate for man-portable applications, potential geographical scenarios, and input from the user community regarding operator interfaces, displays and other user features.

The NDCEE team will establish the stakeholder team composed of leaders in the field of positioning systems/GIS and users of these systems. As previously stated, this team will be leveraged to provide input to

help ensure the proposed requirements will best serve the end-user. Notably the subtask team will leverage the ESTCP project entitled "Innovative Navigation Systems to Support Digital Geophysical Mapping," being conducted by a PE, of the U.S. Army Corps of Engineers (USACE) - Huntsville, which is investigating and evaluating current positioning systems.

In addition to technical design requirements, cost drivers will be determined to identify cost trade-off opportunities. The NDCEE team will document the results of this work unit in the System Decision Paper.

A trip to the NDCEE IPR for briefing Subtask 4 is scheduled under this work unit.

6.4.2 Work Unit 4.2 Review Current State-of-the-Art

Approach

The NDCEE team will compare the specification for current state-of-the-art positioning systems against the design requirements identified in Work Unit 1 to determine which of these systems, if any, can be modified to meet the design specifications, or if a "bottoms-up" design will be required. In particular, the cost vs. performance for these systems will be evaluated. The results of the aforementioned ESTCP project will be considered and incorporated as appropriate into this work unit. The NDCEE team will document the results of this work unit in the System Decision Paper.

A trip to the NDCEE IPR in Washington, D.C. is scheduled under this work unit.

6.4.3 Work Unit 4.3 Design and Testing

Approach

Design requirements will be met by modifying existing hardware and/or by bread boarding using either electronic hardware modules/subassemblies or discrete components, depending on the availability of electronic modules for the technologies selected. Bread boarding with discrete components will be a more labor-intensive process; therefore, modification will be the preferred approach, if possible.

The design will incorporate the applicable specifications for each of the components, including identification of currently available components (manufacturer, part number, etc.), either modular or discrete. Preliminary circuit designs will be generated to the degree required for functional testing. The components will be

configured to provide both modes of operation and may utilize more than one type of technology, such as laser and RF. The NDCEE team will generate a draft Test Plan for the component and multi-component testing, which delineates the test procedures and evaluation criteria in accordance with CDRL A008, and will submit these test plans for Government review within 120 days after contract award (DACA).
The NDCEE team will document the results of the component testing in a draft Test Report in accordance with CDRL A009, which will be submitted within 60 days of testing completion. The Test Report will be used to make a go/no-go decision regarding the feasibility of these technologies to meet the requirements and the initiation of subsequent work units.

6.4.4 Work Unit 4.4 Preliminary Design Review (PDR)

Approach

The stakeholder team and task monitor will be requested to review the preliminary design(s). The optimum preliminary design will serve as the basis for the critical design. The NDCEE team will submit design documents to the Government and the stakeholder team prior to the preliminary design review. The NDCEE team will make every effort to establish a face-to-face meeting of the stakeholder team to conduct the PDR. If schedules or travel restrictions make this meeting infeasible, a teleconference and/or videoconference will be conducted.

The preliminary design will be subjected to a functional/physical audit against the specifications and requirements. A trip to the NDCEE IPR in Johnstown, Pennsylvania will be taken under this work unit for briefing this subtask. In addition, the NDCEE IPR will be suggested as a potential opportunity to conduct the face-to-face PDR meeting. The NDCEE will record and report the results of the PDR in the draft System Decision Paper.

6.4.5 Work Unit 4.5 Critical Design Review

Approach

The NDCEE team will ensure that the critical design is reviewed by the stakeholder participants and task monitor prior to multi-component testing, to ensure that the design meets the stated specifications and requirements. All proposed modifications received during the critical design review will be documented in the meeting minutes and the draft System Decision Paper, and incorporated into the design, where feasible.

6.4.6 Work Unit 4.6 Multi-component (System) Testing and Evaluation

Approach

The primary purpose of this testing is to determine if the functional prototypes can operate in proximity to each other without cross-coupling/mutual interference that could degrade their functionality and to evaluate if the integrated system meets the established requirements to the greatest extent possible.

Since this subtask is a hardware design effort, and software development is not part of this subtask, only physical effects (attenuation, phase shift, etc.) of the position data signals will be evaluated. Positional accuracy will be extrapolated from the measured physical affects.

A trip to Aberdeen Proving Ground will be made to perform field evaluations under a variety of operational scenarios. The NDCEE team will note any system deficiencies and will recommend potential solutions. Also, a determination as to the feasibility, including both technical and cost, of implementing a Dual-mode Navigation Tool utilizing the critical design components will be provided.

The NDCEE team will generate a Test Report (CDRL A009) that documents the results of the multi-component testing that will be submitted within 60 days after completion of the multi-component testing. A 20-minute Microsoft PowerPoint presentation documenting the background, approach and results of this subtask will be prepared in accordance with CDRL A030. The System Decision Paper, which will be prepared in accordance with CDRL A007 (DI-MISC-80508) and will be submitted within 518 DACA, will be developed under this work unit.

6.4.7 Subtask 4 Schedule

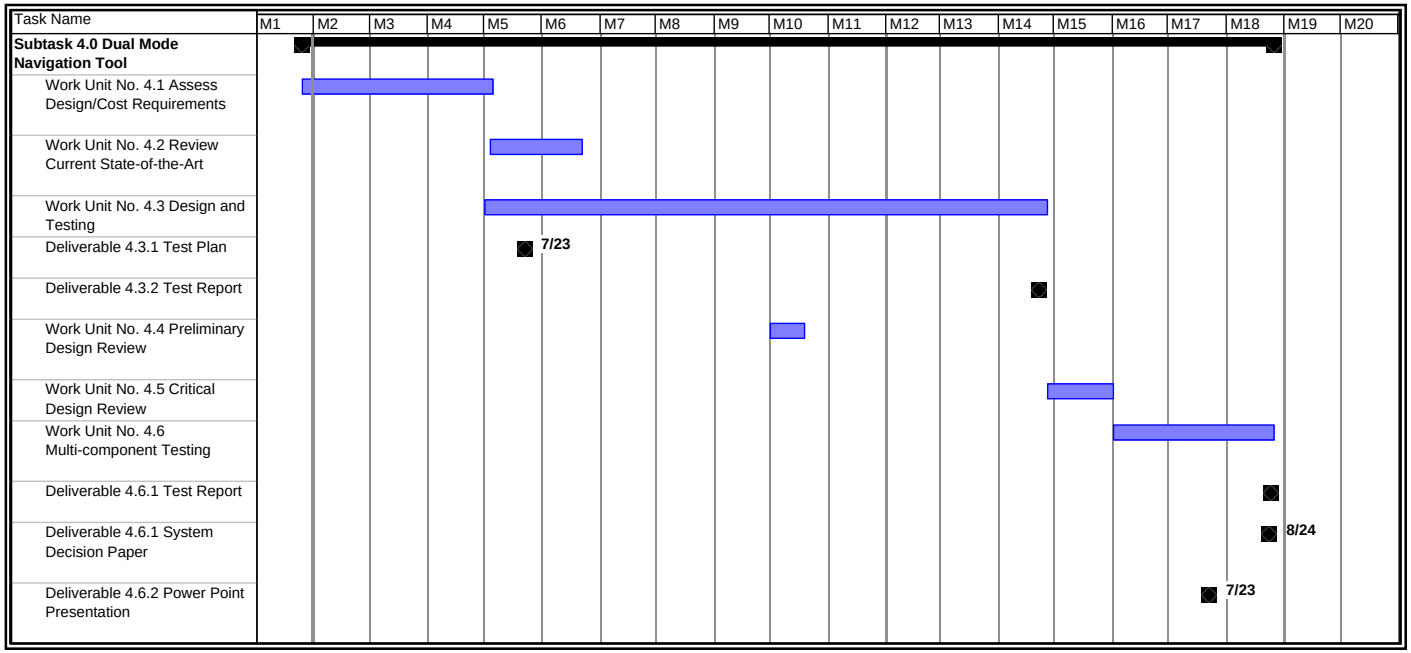

Figure 11. Schedule for Subtask 4 Dual-mode Navigation Tool (Improved Navigation)

6.4.8 Subtask 4 Resources

Table 8. Resource Table for Subtask 4 Dual-mode Navigation Tool

Concurrent Technologies Corporation																			
Contract No. DAAE30-98-C-1050																			
Task Number: 00372.318																			
Unexploded Ordnance																			
Dual Mode Navigation Tool																			
Description	Total Proposed	Mar-03	Apr-03	May-03	Jun-03	Jul-03	Aug-03	Sep-03	Oct-03	Nov-03	Dec-03	Jan-04	Feb-04	Mar-04	Apr-04	May-04	Jun-04	Jul-04	Aug-04	Sep-04
Level of Effort (Hours)																			
Professional Level 5	324	0	14	15	15	15	15	14	15	15	14	13	13	13	13	15	32	31	31	31
Professional Level 4	1,910	0	0	105	105	185	218	57	57	232	232	57	57	57	57	201	198	28	29	35
Professional Level 3	1,440	0	16	106	106	106	131	43	43	158	158	43	43	43	43	190	172	12	12	15
Professional Level 2	285	0	0	40	35	25	31	8	8	26	25	8	8	8	8	30	25	0	0	0
Professional Level 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Technician Level 3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Technician Level 2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Technician Level 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Administrative Level 2	410	0	0	30	30	45	50	10	10	30	30	10	10	10	10	25	42	22	22	24
Administrative Level 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Hours	4,369	0	30	296	291	376	445	132	133	461	459	131	131	131	131	461	469	93	94	105

6.5 Subtask 5 Field Deployment of Electronic Data Collection for UXO Recovery Database

The results of Subtask 5 will result in the development of a field-deployable system that will allow recording of UXO recovery data in the field using a Personal Digital Assistant (PDA). From the field deployable system, the data will be directly uploaded into, and synchronized with, the UXO Recovery Database. In comparison to the development of written reports, this will improve the accuracy of data collection and transcription, reduce data entry costs, and provide a framework for real-time, electronic UXO data management.

The objectives of this subtask include: 1) using a commercial-off-the-shelf (COTS), or custom-developed software application, to develop a system for onsite entry of UXO recovery data into a PDA/laptop; 2) demonstrating operation of the application through beta and field testing; and 3) transferring this newly developed technology to the government with the results of a cost-benefit analysis. Ultimate benefits of this subtask include timely and cost-effective access to UXO recovery data, improved access to information for making decisions regarding OE projects, and minimization of the cost and risk of manually transcribing UXO recovery data to the UXO recovery database. This will improve predicting UXO recovery depths, making OE risk predictions, conducting OE sampling, as well as improving OE sweep efficiencies. By expanding the UXO recovery database and allowing easier manipulation and accessibility to the data, the Government can gain an understanding regarding munitions historical penetration nature and use this enhanced understanding to identify the best UXO detection technology for restoration related projects.

Subtask 5 Overview

Subtask 5 is organized into four work units to accomplish the required objectives as depicted in Figure 22 and described below.

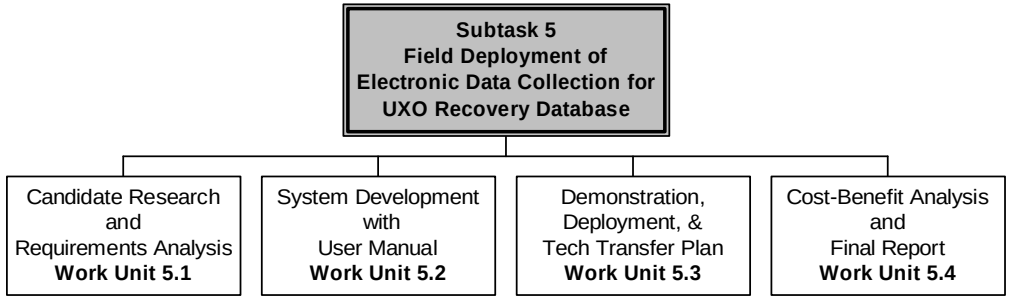

Figure 12. Subtask 5 WBS

The following provides an overview of the four work units:

- Work Unit 1: Candidate Research and Requirements Analysis will consist of gating input from key stakeholders and broad research to determine application requirements and the best approach to achieve subtask objectives.
- Work Unit 2: System Development with User Manual will support the development of a wireless field application for on-site entry of UXO recovery data along with all system documentation and a User Manual.
- Work Unit 3: Demonstration, Deployment, and Technical Transfer Plan will be comprised of conducting beta and field testing; demonstrating and deploying the system; preparing a plan for transfer of the application to the Government; and, delivery of the system with documentation.
- Work Unit 4: Cost-Benefit Analysis and Final Report will constitute leveraging the U.S. Army Cost and Economic Analysis Center (CEAC)-compliant CBA methodology and reporting indicators such as payback and return on investment of the system along with a summary of all task activities.

The above work units as depicted in the Subtask 5 WBS in Figure 22 are described in greater detail in the following sections (Sections 6.5.1 to 6.5.4).

6.5.1 Work Unit 5.1 Candidate Research and Requirements Analysis

Approach

Work Unit 5.1, Candidate Research and Requirements Analysis, will consist of conducting research to identify candidate hardware and software systems, providing support for the selection of the best candidates, and garnering stakeholder input for the development of system requirements. The possibility of incorporating a Geographical Information System (GIS) interface will also be researched in this work unit. Research and requirement definition is the first and most critical step in the development of the Field Deployable UXO Recovery Database application.

The objectives of this work unit are to identify the best hardware/software system candidates for development and to determine requirements for the system that will best meet the needs of end users. The end product of this work unit will be a System Requirements Document that will be used internally in the development of a Design Document and Test Plan as well as in the development of the field-deployable system.

A stakeholder meeting will be conducted during the early stage of the project (e.g., month 2 or 3) to solicit input from key stakeholders. Stakeholders such as the USACE – Huntsville, Navy, other USACE organizations, and National Association of Ordnance and Explosive Waste (OEW) Contractors (NAOC), will be encouraged to participate to assure quality input toward the development of the field-deployable system. This meeting will be held via teleconference and will facilitate communication of multi-service expectations. NDCEE personnel will provide research results and recommendations for candidate systems. Stakeholders will provide input toward the requirements and end-user scenarios for the development of the System Requirements Document. Effective communication will provide valuable insight for management of this subtask.

The Requirements Document will include specific sections for definition of general system requirements (hardware and software along with development tools and languages) and user interface requirements for data entry, quality control, and system administration. An additional end-user scenarios section will be included to provide insight for the development team as to who may be using the system and for what purpose.

The System Requirements Document will be completed in draft form and provided to the stakeholders for review. Comments will be addressed in the development of an interim final document. However, revision of the document will continue through the beginning of Work Unit 5.2 in order to resolve programming issues that may arise during the initial phases of development. Discrete packages associated with this work unit are described below.

- Collection and organization of information for candidate systems and GIS interface.
- Development of recommendations and presentation at Kickoff meeting with key stakeholders to determine best candidate system and requirements for development.
- Development of the Draft Systems Requirements Document based on non-biased research and stakeholder input.
- Development of the Interim Final System Requirements Document based on review and comment from stakeholders.
- Continued refinement of the System Requirements Document as development of the system begins.
- Completion of the Final System Requirements Document with programming issues resolved.

6.5.2 Work Unit 5.2 System Development with User Manual

Approach

Work Unit 5.2 will lead to the development of the Field Deployable System for the UXO Recovery Database and developing a User Manual to assist in training end users. The objective is to provide the Government with a portable system that can be used for onsite entry of UXO recovery data during UXO excavation. The product of this work unit will be a Beta Field Deployable System that can be reviewed and tested.

Initiation of this work unit will include development of a Design Document based on the Requirements Document from Work Unit 5.1. This work unit will also allow for the procurement of hardware and software tools required. Specifically, a PDA field unit and a Windows CE Toolkit will be procured. At the end of the task, the PDA field unit will be transitioned to the government.

Actual programming of the system will begin with a Prototype System for stakeholder review. Based on comments received on the prototype, programming of the Beta System will commence. Programming the Beta System will constitute the majority of Subtask 5 and specifically of Work Unit 5.2.

Development of the User Manual will occur during the final stages of Work Unit 5.2. The User Manual will provide general use instructions for the Field Deployable System. It will be written in a manner consistent with the technical level of understanding for projected end users. Screen shots will be provided, where possible, to assist in ease of use and understanding.

Work Unit 5.2 is expected to last approximately nine months, beginning in Month 6 and ending in Month 14. As stated above, the beginning of this work unit will overlap Work Unit 5.1 for two months. This is necessary to refine the System Requirements Document based on the resolution of potential programming issues. In addition, Work Unit 5.3 will commence during the final two months of this work unit to allow for testing, demonstration, deployment, and transition activities that are associated with development. Discrete packages associated with this work unit are described below.

- Development of the Design Document and procurement of required hardware and software.
- Development of the Prototype System.
- Collaboration with key stakeholders to review prototype and respond to comments.
- Commencement of Beta System programming.
- Continuing beta programming coordinated with development of the User Manual.
- Collaboration with key stakeholders to review beta and respond to comments.
- Revision of Beta Version and production of Final Version.

6.5.3 Work Unit 5.3 Demonstration, Deployment and Technical Transfer Plan

Approach

Work Unit 5.3 will consist of planning and executing demonstration, deployment and technical transfer of the Field-Deployable System. The objective is to ensure that the system meets the needs of the government and that users are appropriately trained in system use. The product of this work unit will include the system, all system documentation including source code, and a user manual, as well as a Technical Transfer Plan for deployment of the system.

Demonstration and deployment will commence with development of a Test Plan based on the System Requirements Document in Work Unit 5.1. Revision of the Test Plan will follow a stakeholder review and comment period, after which execution of the Test Plan will begin.

The Beta Test will overlap system development in Work Unit 5.2 to allow resolution of development issues that may arise during testing. When all issues are resolved, the system passes from Beta Version to Final Version.

The Field-Deployable System Final Version will be used for the demonstration. Three NDCEE experts will travel to Huntsville to demonstrate the Final Version. Field deployment of the Final Version will also require

three NDCEE experts to travel onsite to an undetermined location (assumed Huntsville) to perform data entry in a live UXO excavation scenario.

Development of the Technical Transfer Plan will be based on results of the previous demonstration and deployment. The stakeholders will review the plan and issues will be resolved prior to final delivery of the Technical Transfer Plan.

The Deliverables for Work Unit 5.3 include:

1. Field-Deployable System Final Version with PDA Field Unit and documentation including source code, and User Manual
2. Technical Transfer Plan.

Work Unit 5.3 is expected to last approximately six months beginning in Month 13 and overlapping Work Unit 5.2 for the first two months. This overlap will provide the opportunity for resolution of development issues that may arise during testing, demonstration, and deployment of the system. This work unit will also overlap Work Unit 5.4 for the final four months of the Subtask. Discrete work packages associated with this work unit are described below.

- Development of the Test Plan based on the System Requirements Document.
- Revision of the Test Plan based on Stakeholder review.
- Execution of the Test Plan.
- Demonstration and Deployment of the Final Version, Development of the Technical Transfer Plan.
- Delivery of Final Version System with documentation including source code, user manual, and delivery of the Technical Transfer Plan.
- Stakeholder review and resolution of comments.

6.5.4 Work Unit 5.4 Cost-Benefit Analysis and Final Report

Approach

Work Unit 5.4 will consist of conducting a Cost Benefit Analysis (CBA) and summarizing task activities. The objective is to provide the government with a basis for production and use of the field-deployable system. The product of this work unit will include a Summary Technical Report with the CBA results.

All task activities will be summarized in the Final Report. The CBA will be CEAC-compliant and will include recommendations and justification for the newly developed technology. It will be conducted using multiple approaches and will provide traditional indicators such as payback and return on investment.

Work Unit 5.4 is expected to last approximately four months and will be conducted during the final months of this Subtask. It will overlap with Work Unit 5.3. Discrete work packages associated with this work unit are described below.

- Initiation of the CBA.
- Completion of the CBA.
- Development of the Draft Summary Technical Report.
- Response to review and comment from key stakeholders.

6.5.5 Subtask 5 Schedule

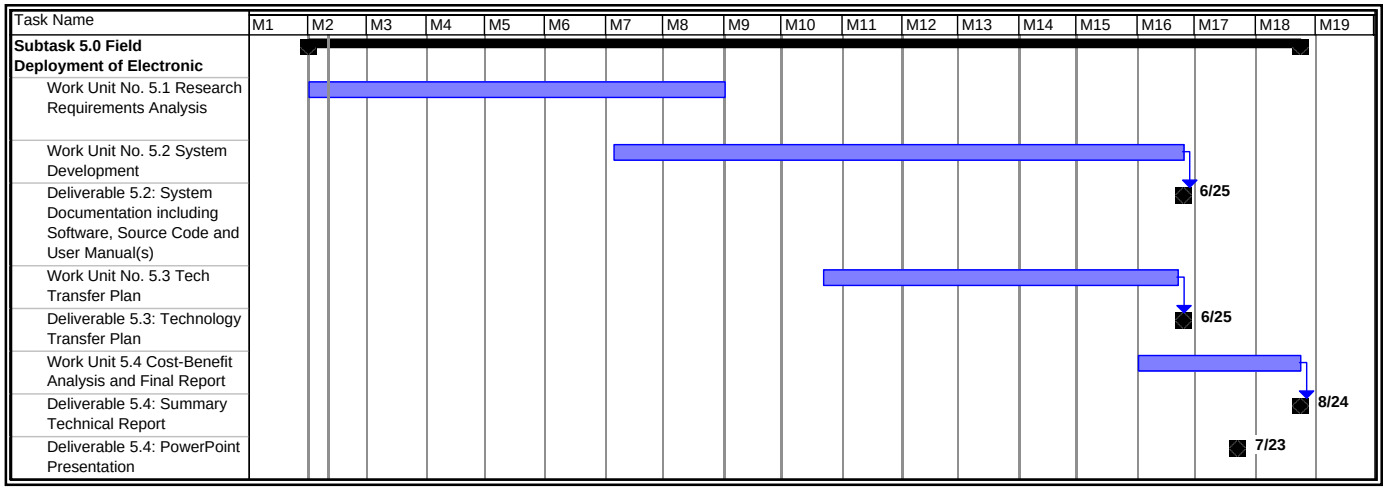

Figure 13. Schedule for Subtask 5 Field Deployment of Electronic UXO Recovery Database

6.5.6 Subtask 5 Resources

Table 9. Resource Table for Subtask 5 Field Deployment of Electronic UXO Recovery Database

Concurrent Technologies Corporation																				
Contract No. DAAE30-98-C-1050																				
Task Number: 00372.318																				
Unexploded Ordnance																				
Electronic Data Base																				
Description	Total Proposed	Mar-03	Apr-03	May-03	Jun-03	Jul-03	Aug-03	Sep-03	Oct-03	Nov-03	Dec-03	Jan-04	Feb-04	Mar-04	Apr-04	May-04	Jun-04	Jul-04	Aug-04	Sep-04
Level of Effort (Hours)																				
Professional Level 5	216	0	2	2	4	4	10	12	12	16	20	20	16	17	13	17	13	13	13	12
Professional Level 4	20	0	0	0	0	0	0	0	0	0	0	0	0	0	5	5	5	5	0	0
Professional Level 3	473	0	4	8	8	14	24	28	28	28	26	26	27	48	57	56	36	25	23	7
Professional Level 2	2,309	0	6	18	28	90	95	153	172	150	156	156	124	136	262	212	171	153	154	53
Professional Level 1	894	0	0	10	10	10	30	95	120	75	83	83	77	45	56	65	50	30	40	15
Technician Level 3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Technician Level 2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Technician Level 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Administrative Level 2	80	0	0	0	0	2	6	6	6	6	6	8	8	6	4	8	2	2	2	8
Administrative Level 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Hours	3,992	0	12	38	50	120	165	294	338	275	291	293	252	272	397	363	277	228	232	95

6.6 Subtask 6 Environmental Chamber Migration Testing

The purpose of this subtask is to assess and evaluate the potential for surface migration of buried UXO in environmentally controlled chambers. The results from this study will be compared to the results from actual field-testing conducted as part of NDCEE Task 307.

In cold climates, the yearly freeze-thaw cycles can cause buried UXO to migrate towards the surface of the soil. It is hypothesized that the heat-chill temperature cycles experienced in warm climates in conjunction with other geophysical environmental conditions such as soil salinity can also cause buried UXO to migrate towards the ground surface. Surface migration of UXO (in both the cold- and warm-climate regions) is problematic when range areas that have been reported cleared to a certain depth may, in fact, no longer be considered cleared the previously specified depth. This phenomenon is suspected to occur when undetected UXO, or UXO buried to a certain depth, move to the surface due to freeze-thaw cycles or heat-chill cycles. Ultimately, frost-thaw and the heat-chill temperature cycles could cause a "heave" phenomenon, i.e., the lifting of buried UXO towards the soil surface. This phenomenon represents an important risk management factor that must be considered by the regulatory agencies during UXO clearance operations.

It is further hypothesized that this phenomenon is directly related to the nature of the UXO (i.e., shape, type, and composition) and to soil types and soil factors, such as soil temperature, soil salinity, soil volumetric moisture, and soil-water potential. Accordingly, the migration of buried ordnance as a function of shape, ordnance type and composition, and soil types will be further assessed under controlled environmental conditions using chambers, and validated models. The results from both the chamber and the field studies will allow for a better understanding of the UXO migration phenomenon and the mechanisms and factors that cause migration.

The Chamber testing will duplicate Task 307 migration test site parameters in an environmental test chamber and assess the potential for migration of buried ordnance both as a result of consecutive freeze/ thaw and heat heave cycles. Prior to testing, a test plan will be developed to describe the design of test plots (three plots) and equipment to measure soil parameters that contribute to frost heave in controlled environment chambers to simulate two cold-climate DoD sites and heat heave to simulate warm-climate DoD sites. The goal will be to quantify the movement of buried ordnance during both phenomena. The design will include methods to measure the movement of buried ordnance to coincide with simulated freeze-thaw temperature cycles in cold-climate sites and simulated heat-chill temperature cycles in warm-climate sites. The setup and the experiments will be in test cells or test boxes containing three soil types that have been characterized by a soil scientist. Two soil types will represent cold-climate sites and the third soil type will represent a warm-climate site. The soils will be properly packed under the supervision of a soil scientist to replicate as closely as possible the actual soil bulk density in the field. The test soils will represent three soil types with

different soil textures (i.e., various proportions of silt, clay, and sand), moisture content, and soil-moisture potential; three important properties that may influence the occurrence of a heave phenomenon and thus cause the uplifting of buried UXO. The test cells will be designed to be large enough to accommodate placing ordnance of different shapes and sizes in various depths ranging from surface to three feet deep. A reasonable number of freeze-thaw cycles and heat-chill cycles will be applied to the soil to simulate the actual field conditions. It is anticipated that 10 cycles will be applied during a fourteen-month period. Factors such as snow cover, rainfall, and vegetation (simulating the actual conditions in the cold and warm climate sites) will be considered in the test plan. A simulated "worst case scenario" will be conducted and the results documented. Results from this study will quantify the heave displacements of buried UXO and will be used to validate the most prominent available predictive model.

Subtask 6 Overview

Subtask 6 is organized into five work units to accomplish the required functions as depicted in Figure 26.

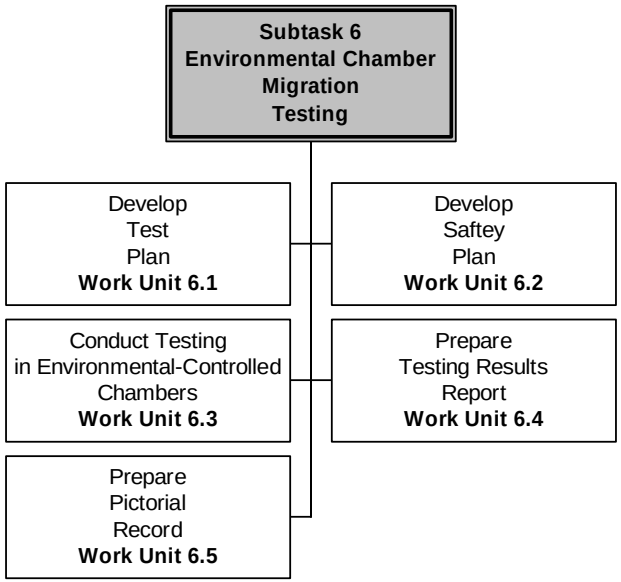

Figure 14. Subtask 6 WBS

The following provides an overview of the five work units:

- The Test Plan will be developed to ensure thorough preparation, quality assurance, and data validity. The Test Plan will be tailored to test under chamber conditions by delineating the test execution process in order to ensure that appropriate, meaningful data is collected, retained and archived with an emphasis toward validation of existing models.
- The Safety Plan will be developed and tailored to the specific conditions of chamber testing. Accordingly, it will ensure the safety of both personnel and equipment while meeting all local and DoD safety policies and procedures.
- Testing will be conducted in order to provide scientific, repeatable, and quantifiable data on inert ordnance training shapes of differing sizes, shapes and composition in test chambers. The migration chamber testing will be performed in a manner very similar to field migration testing (FY02 Subtask 08) that an accurate correlation of data from both sources can be made. Each ordnance training shape will be fitted with Hall effect sensors, linear transducers and back up visual monitoring system of PVC pipe to monitor movement. The PVC pipe will allow for visual determination of movement. Some ordnance shapes will not be fitted with PVC piping in case the PVC piping would restrict potential sideways displacement. In addition, soil moisture content, temperature and soil-matric potential will be monitored at several depths within the test cell with all data collected hourly on data-loggers.
- A detailed technical report will be prepared on the findings from the chamber study. The data obtained from the chamber testing will supplement and complement the data obtained from Subtask 8 (NDCEE Task307) and will be used in validating the most promising applicable model.
- A pictorial record will be maintained throughout the task to ensure each phase is thoroughly documented.

The above work units as depicted in the Subtask 6 WBS in Figure 26 are described in greater detail in the following sections (6.6.1 to 6.6.5).

6.6.1 Work Unit 6.1 Develop Test Plan

Approach

It is essential to prepare a thoughtful and comprehensive Test Plan before conducting any testing in environmental chambers, have a thorough understanding of the UXO and soil parameters that cause heave effects and subsequent migration of UXO, and identify the relevant parameters vis-à-vis UXO migration and prepare a parameter test matrix. This work unit addresses all these critical and important factors prior to conducting the tests in chambers.

A Test Plan is required prior to conducting testing in environmental chambers. The following summary of tasks and requirements from the Government-provided SOW correlate to and are addressed (in whole or in part) by Subtask 6, Work Unit 6.1.

The objectives of Work Unit 6.1 are:

- Identify potential UXO migration parameters, including soil parameters and parameters related to UXO shape, type, and composition. These parameters are the same parameters identified in Subtask 8 (NDCEE Task 307), UXO migration, field-testing at three DoD sites.
- Develop a test matrix to be included in a Test Plan.
- Prepare and deliver a Test Plan in accordance with CDRL A029 (DI-MISC-80508).

The Test Plan will be designed to assess the effect of the parameters identified and selected in the test matrix with an emphasis on the controlled environmental conditions that exist in test chambers. The Test Plan will contain applicable sections for each test plot, two plots simulating the cold-climate region and one test plot simulating the hot-climate region.

NDCEE will coordinate with the US Army Cold Regions Research and Engineering Laboratory (CRREL) to use their environmental chambers for the execution of this Subtask to simulate the environmental conditions for two sites in the cold-climate region and one site in the hot-climate region.

Additionally, NDCEE will conduct a site visit to ensure the test plan contains all site-specific requirements. Travel will be in conjunction with a site visit for UXO Task 307 Subtask 8.

NDCEE, working with CRREL, will describe all aspects of testing to include, as a minimum, data to be assessed/collected, methods used, data reduction and analysis, usage of any testing devices and probes to include description. Additionally, a listing of all devices and probes to be purchased, leased, on hand, or received on loan from a vendor, description of all calibration procedures and calibration equipment used, quality assurance/quality control (QA/QC) procedures and methods will be compiled in the test plan.

The activities involved in this work unit include the following:

- Developing the Test Plan
- Assessing test parameters

- Identifying data requirements
- Writing the Test Plan
- Discussing the Safety Issues and standard laboratory protocols
- Discussing the PPE
- Discussing the SOPs
- Approving the Test Plan
- Modifying the Plan by incorporating Government comments
- Designing the Freeze-Thaw and Hot-Chill Migration Tests
- Perform a site visit, addressing considerations for soils and parameters for testing and conditions in chambers
- Obtaining access to the test location at CRREL
- Determining how the tests are to be controlled under the chambers conditions
- Describing the use of inert ordnance target shapes differing in shape, type and composition
- Discussing the degaussing of test munitions
- Discussing caliber nomenclature
- Presenting the needed laboratory and chamber work sheets
- Describing the work space issues
- Coordinating with CRREL personnel and other appropriate parties
- Describing storage
- Describing the contract support provided
- Addressing the safety certifications for handling residues, if any
- Discussing any required permits
- Discussing data to be collected/assessed
- Discussing equipment and methods
- Discussing data reduction and analysis
- Addressing mobilization of equipment and equipment description
- Describing the calibration procedures
- Describing the calibration equipment used
- Defining DQOs and QA/QC procedures
- Describing the Cold and Heat Heave Testing

The goal of the Test Plan is to ensure thorough preparation before chamber testing is conducted. A detailed plan will ensure that valuable test data will be obtained at the desired quality level allowing for the validation of existing models. In addition, having a viable Test Plan, with DQOs and detailed procedures, will minimize costly errors while maximizing the quality and timeliness of the results collected, ensuring appropriate,

meaningful data is collected, retained, and archived. The Test Plan will also delineate the test execution process, requiring consideration be given to cover uncertainties and the incorporation of contingency plans.

6.6.2 Work Unit 6.2 Develop Safety Plan

Approach

It is prudent and necessary to have a Safety Plan in place to delineate a thorough description of the safety measures required when working in laboratories and chambers in order to ensure safe working habits. The Safety Plan will contain all safety aspects, to include all safety devices and personal protective equipment requirements when working in laboratories/chambers. Recognizing that CRREL maintains a current Health and Safety Plan, this NDCEE Safety Plan, as required under this Subtask, will be tailored specifically to UXO migration chamber testing. All safety issues will be addressed in accordance with this specific safety plan for chamber testing.

The activities involved in this work unit include the following:

- NDCEE will coordinate with CRREL regarding safety measures in chambers
- NDCEE will review the CRREL-developed Safety Plan
- NDCEE will submit, incorporate comments accordingly, and obtain the approval of the Safety Plan by DoD
- NDCEE will submit draft copy of the Safety Plan to the Government
- NDCEE will incorporate appropriate Government comments
- NDCEE will submit the final Safety Plan to the Government

The benefit of developing a Safety Plan is to prevent unnecessary injuries and exposure to potential hazards associated with working in laboratories/chambers and to ensure compliance with DoD as well as CRREL's local policies and procedures.

6.6.3 Work Unit 6.3 Conduct Testing in Environmental Chambers

Approach

Chamber testing is required to determine the environmental conditions causing potential UXO migration, and to compare the results from the chamber study to the results from the ongoing field study contracted under NDCEE Task 307. The chamber study will produce data under controlled environmental conditions simulating many cycles of freeze-thaw and heat-chill in a short time compared to testing in the field. The data from the chamber study is expected to calibrate existing migration models. Additionally, the chamber data will complement the data to be generated from the ongoing field-testing.

The objective of Work Unit 6.3 is to conduct testing in environmentally controlled chambers to assess and evaluate the potential for migration of buried UXO. The objectives are to: 1) Conduct freeze-thaw UXO migration testing in chambers by simulating two test plots in two separate environmental conditions representing cold-climate region, and 2) Conduct hot climate (salt heave) testing in chambers by simulating one test plot simulating environmental conditions at hot-climate region.

The Technical approach for conducting the chamber work can be summarized as follows:

- NDCEE and CRREL will conduct tests using inert, stamped training ordnance in accordance with the approved Test Plan as provided by DoD.
- Tests will be performed considering three soil parameters (soil temperature, soil moisture, soil-water potential) determined from the identification of potential UXO migration that are related to soil and will be included in the test matrix in the Test Plan.
- NDCEE and CRREL will measure the displacement of the buried ordnance by at least two methods. Displacement will be recorded in real time using dataloggers. It is important to measure ordnance displacement by more than one method to provide duplicate methods in the event the primary method fails or encounters interference and noise and to compare reproducible results.
- The soil at each test cell will be probed at 8 depths in addition to air measurement: 0 (surface), 2”, 6”, 12”, 18”, 24”, 36”, and 48”. The cost estimate will be based on using temperature and volumetric water-content probes and heat dissipation matrix water potential sensors attached to dataloggers.
- DoD will provide all the inert, stamped ordnance items at no cost to NDCEE. This includes (a) the degaussing of inert ordnance test targets to remove any remnant magnetic signature, (b) caliber nomenclature, (c) munitions target stock or lot number, and (d) size/weight of ordnance targets.

NDCEE and CRREL will conduct ordnance testing in test cells housed in a controlled environment chamber where a minimum of 10 cycles will be simulated by freezing the soil each time to 3-ft. depth. Heat heave testing will be conducted in test cells housed in a controlled environment chamber in which a minimum of 10 cycles will be simulated heating and chilling the soil each time to 3-ft. depth. NDCEE and CRREL will monitor data collected in real time using dataloggers.

NDCEE and CRREL will use the data and results from this testing to quantify the environmental conditions affecting the heave phenomenon as it relates to UXO migration. The data generated from the chamber study under controlled environmental conditions will complement the data generated from the actual field testing (NDCEE Task 307) and will serve to validate existing models and determine what factors may affect UXO migration. Proper monitoring, both electronically and visually, will produce quality data to determine when and under what conditions the migration is the greatest. The chamber study will allow simulation of many cycles of both freeze-thaw and heat-chill in a relatively shorter time than the field-testing. However, both chamber data and field data will be required for calibrating and validating migration models.

From the test data, NDCEE and CRREL will draw preliminary conclusions regarding the major factors contributing to UXO migration due to thermal cycling effects. The collected data and resulting conclusions will then be available to site managers to aid in their understanding of UXO migration and allow them to more efficiently and accurately assess UXO clearance depths over time, depending on temperature cycles and other data.

6.6.4 Work Unit 6.4 Prepare Test Report

Approach

The technical report is required to present data, findings and results to facilitate transfer of knowledge. The ultimate users of the technical report will be DoD site managers and decision-makers.

The technical report will include as a minimum the following requirements:

- Aim and objectives
- DQOs and methods used
- Test data
- Test results supported by data
- Problems encountered
- Solutions to problems and lessons learned

- Tables and charts of equipment calibrations
- All necessary calculations
- Tables and charts of results
- Significant data and data analysis
- Raw data
- Chamber temperature data
- Soil temperature data
- Soil moisture data
- Soil-water potential data
- UXO movement monitoring data
- Metadata data
- Soil characterization data
- Any other applicable data
- Any other applicable data and analysis
- Model validation
- Photographs and drawings required for adequate description

NDCEE and CRREL will use the data results and findings to validate the most promising model. Subsequently, the data results and findings can then be used by the Government and DoD decision makers and regulatory agencies to aid in making efficient and accurate determinations of the depth of UXO clearance and incorporate the knowledge gained into the UXO exposure and UXO risk maps. The report will be used to help DoD site managers account for UXO migration in their UXO remediation plan and overall aid in better management of ranges with respect to UXO. A thorough Test Report will ensure the validity of the data collected, allow for the test to be replicated and allow for the possibility of new UXO migration theories to emerge without duplication of effort.

6.6.5 Work Unit 6.5 Prepare Pictorial Record

Approach

A requirement exists to show pictorially all the steps followed in the installation of equipment and testing in chambers. The pictures will help the decision-makers in their assessment of the UXO migration every step of the way during testing.

The objective of Work Unit 6.5 is to document activities of Subtask 6 and develop a pictorial record as well as prepare and present the finding to DoD.

This work unit specifies that NDCEE will:

- Provide a pictorial record of all the steps during the testing that will be created and maintained, electronically over the duration of testing. This pictorial record will include documentation on the test plots and test cells, the ordnance to be utilized (prior to burial), the electronic monitoring devices, and the relevant environmental control conditions during testing in chambers. The pictorial record will also show ordnance and electronic monitoring devices being installed, or buried, and the ordnance retrieval process.
- Provide CD ROM disks that contain all color still pictures taken during the tasks.
- Prepare a 20-minute Microsoft PowerPoint presentation that will summarize the testing activities and conclusions at the completion of the chamber study.

An accurate, concise, and purposeful pictorial record will offer a visual account for the steps followed during testing. The pictures will be easily accessible and useable by NDCEE and DoD to present the testing procedures and important findings in conferences and decision-making meetings.

6.6.6 Subtask 6 Schedule

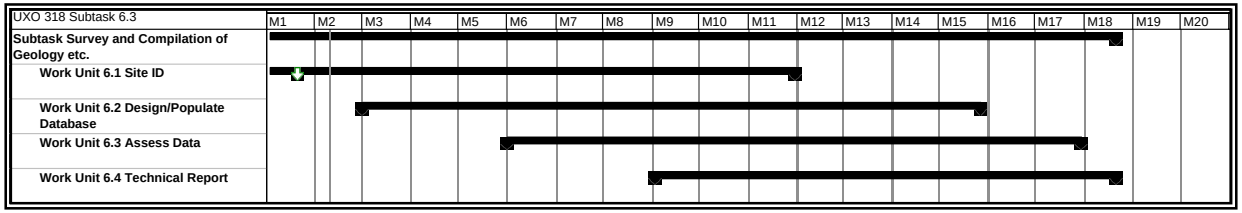

Figure 15. Schedule for Subtask 6 Environmental Chamber Migration Testing

6.6.7 Subtask 6 Resources

Concurrent Technologies Corporation																			
Contract No. DAAE30-98-C-1050																			
Task Number: 00372.318																			
Unexploded Ordnance																			
Environmental Chamber Migration Testing																			
Description	Total Proposed	Mar-03	Apr-03	May-03	Jun-03	Jul-03	Aug-03	Sep-03	Oct-03	Nov-03	Dec-03	Jan-04	Feb-04	Mar-04	Apr-04	May-04	Jun-04	Jul-04	Aug-04	Sep-04
Level of Effort (Hours)																			
Professional Level 5	216	0	8	12	14	21	19	17	11	9	9	9	9	9	7	7	7	7	18	23
Professional Level 4	510	0	4	22	28	32	65	51	29	23	23	23	23	23	23	23	17	23	25	33
Professional Level 3	248	0	2	5	9	13	67	13	11	13	11	13	11	13	11	13	7	7	6	23
Professional Level 2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Professional Level 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Technician Level 3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Technician Level 2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Technician Level 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Administrative Level 2	19	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2
Administrative Level 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Hours	993	0	15	40	52	67	152	82	52	46	44	46	44	46	42	44	32	38	50	101

Table 10. Resource Table for Subtask 6 Environmental Chamber Migration Testing

6.7 Subtask 7 Assessment of Munitions Design/Type and Rate of Corrosion and Factors which Influence Corrosion Susceptibility

The results of Subtask 7 will provide a thorough understanding of corrosion susceptibility of munition items by determining the environmental factors and design and manufacturing process changes over time that affect rates of corrosion of UXO. By understanding the rates of corrosion, the Government can make better-informed decisions on the prioritization of remediation efforts and can optimize the process, thus reducing costs while maximizing personnel safety and minimizing environmental risk. This assessment can contribute to developing a better methodology for predicting the corrosion behavior of certain munitions.

Subtask 7 Overview

Subtask 7 is organized into three work units to accomplish the required objectives as depicted in Figure 30 and described below. The focus of the subtask will be on conventional ordnance items. Chemical ordnance and mines are not a part of the subtask. No corrosion testing of any ordnance items will be conducted.

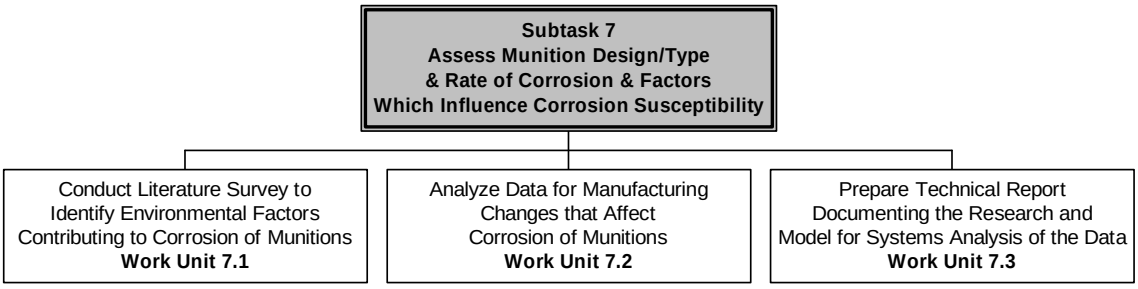

Figure 16. Subtask 7 WBS

The following provides an overview of the three work units:

- Perform a literature study including SERDP and non-classified public data to identify environmental factors contributing to corrosion of UXO in wet soils.
- Conduct a detailed systems analysis including ARDEC data to determine how munition design and manufacturing process changes over time affect corrosion of UXO.
- Prepare a Technical Report that documents the research and provides details on how the combined effects of environmental factors and design and manufacturing process changes over time affect corrosion of UXO.

The above work units as depicted in the Subtask 7 WBS in Figure 30 are described in greater detail in the following sections (6.7.1 to 6.7.3).

6.7.1 Work Unit 7.1 Conduct Literature Survey to Identify Environmental Factors Contributing to Corrosion of Munitions

Approach

In evaluating UXO environmental risk at U.S. military installations, it is important to understand the environmental factors that influence the rate of UXO corrosion. There have been past studies regarding UXO corrosion under various environmental conditions, and current studies are ongoing. NDCEE personnel, with the help of stakeholders, will identify and request final reports of past studies of UXO corrosion in order to ascertain the factors that influence the rate of UXO corrosion. Specifically, NDCEE personnel will request interim information and the final report concerning the ongoing SERDP Compliance Project 1226 (UXO Corrosion – Potential Contamination Source) to facilitate a better understanding of UXO casing perforation resulting from corrosion.

NDCEE personnel will establish a stakeholder group consisting of Government subject matter experts in the areas of munition design changes and UXO corrosion. Major stakeholder organizations will include SERDP, Picatinny Arsenal, ARDEC, the U.S. Army Corps of Engineers, academia, and representatives from the munitions manufacturing industry. NDCEE personnel will initiate and hold teleconferences with these stakeholders to establish familiarity with past and ongoing UXO environmental corrosion studies to determine the important environmental factors and munition design changes that affect UXO corrosion.

Visits are planned to information repositories located at AEC (Baltimore), Picatinny Arsenal (Newark) and the U.S. Army Corps of Engineers (Huntsville) to talk to subject matter experts and locate and review required information.

6.7.2 Work Unit 7.2 Analyze Data for Manufacturing Changes that Affect Corrosion of Munitions

Approach

NDCEE personnel will conduct a comprehensive systems analysis, based on known corrosion principles, using data provided by ARDEC and others, to establish a thorough familiarity of how design and manufacturing process changes over time have affected corrosion susceptibility. Available reference information and existing models, if available, for predicting corrosion behavior will be evaluated and utilized in the systems analysis. Specifically, NDCEE personnel will request from ARDEC information and the final report outlining their research on the

effects of design and manufacturing changes on the type and rate of corrosion on munitions. NDCEE personnel will communicate with personnel recommended by the Government to gain a fuller understanding of the basis for the ARDEC data provided, and will analyze the various types of munitions for their potential for corrosion susceptibility to identify those that are most prone to corrosion.

6.7.3 Work Unit 7.3 Prepare Technical Report Documenting the Research and Model for Systems Analysis of the Data

Approach

NDCEE personnel will prepare a Technical Report that will document the reviews of studies on the effects of environmental factors on the rate of UXO corrosion as well as research on how design and manufacturing changes affect corrosion of UXO. The Technical Report will identify how design and manufacturing changes affect the degree, rate, type and probable location of corrosion on ordnance; why certain ordnance is prone to corrosion and what mechanisms may be responsible; which munitions would be suitable for corrosion testing study; and the basis for suitability. The combined effects of environmental factors and design and manufacturing process changes on corrosion will be evaluated. The process model for accomplishing the systems analysis will be described.

NDCEE personnel will prepare an outline for the Technical Report, documenting the class of munitions and the types of munition changes that will be addressed, for the Government to review. NDCEE personnel will revise the outline based on Government comments. NDCEE personnel will prepare and submit to the Government a draft report in both hard copy and electronic format (Microsoft Word) 518 days after contract award in accordance with CDRL A015 (DI-MISC-80508). Thirty days after receipt and appropriate incorporation of Government review comments, NDCEE personnel will deliver a final report to the Government in both hard copy and electronic format (Microsoft Word).

A draft 20-minute PowerPoint presentation summarizing the activities and conclusions of this assessment will be developed by NDCEE personnel and submitted to the Government 488 days after contract award in accordance with CDRL A030 (DI-MISC-80508). The final version of the presentation will be delivered 15 days after receiving Government review comments.

6.7.4 Subtask 7 Schedule

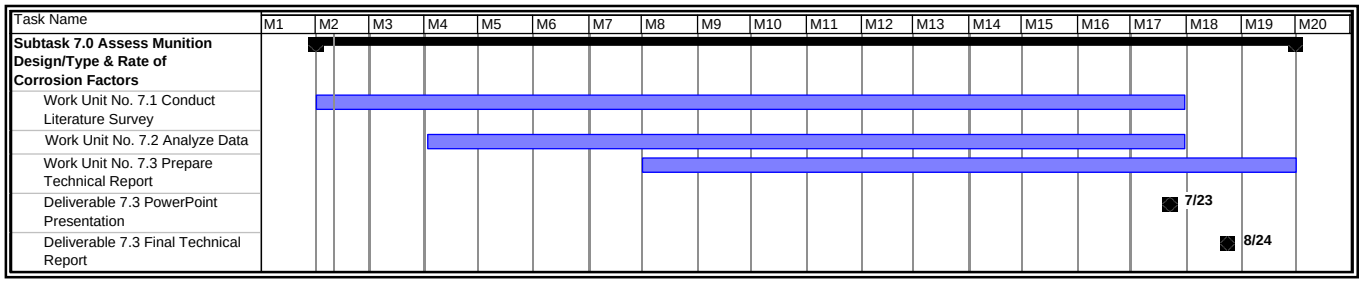

Figure 17. Schedule for Subtask 7 Assessment of Munitions Design/Type and Factors of Corrosion Susceptibility

6.7.5 Subtask 7 Resources

Table 11. Resource Table for Subtask 7 Assessment of Munitions Design

Concurrent Technologies Corporation																			
Contract No. DAAE30-98-C-1050																			
Task Number: 00372.318																			
Unexploded Ordnance																			
Munitions Design and Rate of Corrosion																			
Description	Total Proposed	Mar-03	Apr-03	May-03	Jun-03	Jul-03	Aug-03	Sep-03	Oct-03	Nov-03	Dec-03	Jan-04	Feb-04	Mar-04	Apr-04	May-04	Jun-04	Jul-04	Aug-04	Sep-04
Level of Effort (Hours)																			
Professional Level 5	386	0	6	7	7	8	10	11	28	28	35	30	29	30	29	31	31	23	23	20
Professional Level 4	1,542	0	6	8	7	13	39	49	97	127	116	131	131	132	133	137	165	100	44	107
Professional Level 3	523	0	0	22	20	13	15	15	48	35	57	50	50	50	49	52	34	8	5	5
Professional Level 2	318	0	0	0	0	6	6	6	28	29	22	27	27	27	21	21	37	45	0	16
Professional Level 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Technician Level 3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Technician Level 2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Technician Level 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Administrative Level 2	150	0	0	0	0	0	0	0	0	8	0	0	0	0	0	0	30	64	0	48
Administrative Level 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Hours	2,919	0	12	37	34	40	70	81	196	227	230	238	237	239	232	241	297	240	72	196

6.8 Subtask 8 Assessment of Ordnance "Dud Rates" Versus Environmental Factors

The results of Subtask 8 will assess how environmental variables (e.g., soil type and plasticity, soil depth, rock hardness or other factors) may cause the inert120 mm HE mortar round and the 120 mm M931 practice round to split open upon impact. Engineering/physics evaluations using simple linear equations will be used to estimate the affect of soil and rock properties on the integrity of these rounds. These analyses may be supplemented with computer models and corroborated by comparison to collected field data.

Subtask 8 Overview

Subtask 8 is organized into four work units to accomplish the required objectives as depicted in Figure 34 and described below.

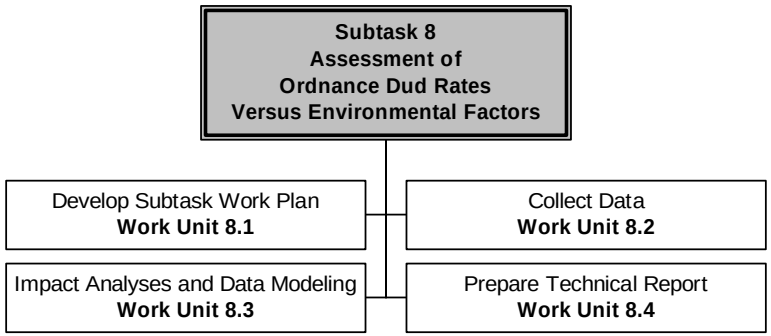

Figure 18. Subtask 8 WBS

The following provides an overview of the four work units:

- Develop Subtask Work Plan – The goal of this work unit is to prepare a work plan that outlines the technical approach for the following subtask activities: assemble a stakeholder group; identify information types and sources; collect site- and ordnance-specific data and information; conduct a thorough technical review and evaluation of the collected data; conduct ordnance impact analyses using engineering/physics methods and computer model simulations and compare results to the collected environmental data; and, develop a final technical report to document subtask activities and findings.
- Collect Data – The goal of this work unit is to collect as much information as possible about the 120 mm HE mortar round and the 120 mm M931 practice round, including engineering design and specifications, impact analysis methods and computer models, UXO attributes, site characteristics and

environmental variables to identify potential correlations between ordnance dud rates and environmental factors. The collected data will be maintained in electronic format to facilitate data input, access, management, review and analysis for assessment of potential factors that could affect dud and low order detonation rates for these mortar rounds.

- Impact Analyses and Data Modeling – The goals of this work unit are to conduct impact analyses of the 120 mm HE and the 120 mm M931 mortar rounds to assess potential environmental conditions that could cause the ordnance to split open upon impact and to compare these results to collected data to help identify and assess potential correlations between ordnance dud rates and environmental factors. Technical evaluations will include a data gap analysis to identify data limitations as well as engineering/physics analyses and computer modeling to assess relationships between dud rates and environmental variables (e.g., soil types, rock hardness and soil plasticity).
- Prepare Technical Report – The goal of this work unit is to prepare a technical report and a Microsoft PowerPoint presentation that documents subtask activities and findings, including identification of the various environmental conditions that could cause dud rounds to split open upon impact.

The above work units as depicted in the Subtask 8 WBS in Figure 34 are described in greater detail in the following sections (6.8.1 to 6.8.4).

6.8.1 Work Unit 8.1 Develop Subtask Work Plan

Approach

The Subtask Work Plan will delineate the rationale and approach to assemble an informed stakeholder group, develop data quality objectives, identify and locate different information types and sources, conduct impact analyses using pertinent engineering/physics analytical approaches and existing computer models, compare impact analysis results to the collected data, and develop a final technical report. An initial stakeholder group will be identified and selected members of this group will review the Subtask Work Plan to provide input and ensure that subtask activities are consistent with the stated subtask goals and objectives. The NDCEE will coordinate with ARL, ARDEC and other DoD organizations in the planning and execution of this subtask.

6.8.2 Work Unit 8.2 Collect Data

Approach

Published and unpublished records, reports and other information on dud and low order detonation rates for the specified ordnance, site characteristics and environmental factors will be collected from identified sources. This data will be maintained in electronic format to facilitate technical review and evaluation activities. NDCEE personnel will teleconference with and travel to four face-to-face meetings with UXO, Explosive Ordnance Disposal (EOD) and ordnance/munitions experts from the U.S. Army Ordnance Mechanical Maintenance School, 61st Ordnance Brigade, the U.S. Army Ordnance Munitions and Electronics Maintenance School (OMEMS), 59th Ordnance Brigade, the Army Research Laboratory (ARL), the U.S. Army Tank-Automotive Armaments Command, Armaments Research and Development Engineering Center (TACOM-ARDEC), the U.S. Army Research Laboratory, the U.S. Army Corps of Engineers Ordnance and Explosives Mandatory Center of Excellence and Design Center (USACE-MCX), the U.S. Army Environmental Center (USAEC), the U.S. Navy Explosive Ordnance Disposal Technology Division (NAVEODTECH), or the U.S. Air Force Research Laboratory (USAFRL) as part of data collection and evaluation activities.

6.8.3 Work Unit 8.3 Impact Analyses and Model Data

Approach

Technical review and evaluation activities will include engineering and physics analyses as well as existing computer model simulations of the 120 mm HE and 120 mm M931 mortar rounds to assess environmental conditions (e.g., soft soils, bedrock, peat, vegetation and water) that could cause these rounds to split open upon impact (assuming the round is a dud). Any finite difference modeling that may be conducted will not be applied in a Monte Carlo fashion; only so many runs as necessary to bound realistic scenarios will be conducted. The results of the engineering/physics analyses and computer model predictions will be compared to the collected data for these rounds that impacted either hard rock (specifications will be provided by the government) or 1-12 inches of silty/clay soils in an arid/northern climate. The NDCEE will coordinate with the Army Research Laboratory and ARDEC to obtain engineering and physics analytical approaches and relevant computer models for conducting impact analyses as well as engineering specifications and impact angles for the ordnance under consideration.

6.8.4 Work Unit 8.4 Technical Report

Approach

In support of meeting the objectives of this subtask, the NDCEE will prepare a final summary technical report in accordance with CDRL A021 (DI-MISC-80508) that documents subtask activities and findings, including identification of the various site environmental conditions that could cause dud rounds to split open upon impact. The draft summary report will be delivered to the Government in electronic (Microsoft Word 2000) and hard copy formats for review and comment. The NDCEE will deliver the final technical report to the Government within 30 days after receipt and appropriate incorporation of Government review comments. The NDCEE will prepare and submit a draft 20-minute Microsoft PowerPoint presentation that summarizes subtask activities and conclusions in accordance with CDRL A030 (DI-MISC-80508) and will deliver the final version within 15 days after receipt of Government review comments. As part of work unit activities, NDCEE personnel will attend In-Process Reviews (IPRs) to provide timely subtask reviews and to facilitate stakeholder discussions with subtask team members as well as an UXO Task wrap-up meeting as part of subtask completion activities.

6.8.5 Subtask 8 Schedule

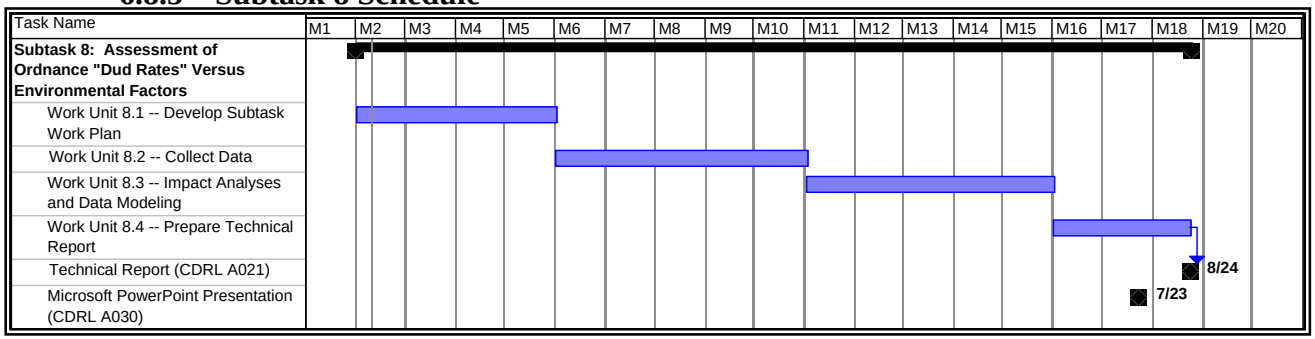

Figure 19. Schedule for Subtask 8 Assessment of Ordnance "Dud Rates" Versus Environmental Factors

6.8.6 Subtask 8 Resources

Table 12. Resource Table for Subtask 8 Assessment of Ordnance "Dud Rates" Versus Environmental Factors

Concurrent Technologies Corporation

Contract No. DAAE30-98-C-1050
Task Number: 00372.318
Unexploded Ordnance
Dud Rates vs. Environmental Factors

Description	Total Proposed	Mar-03	Apr-03	May-03	Jun-03	Jul-03	Aug-03	Sep-03	Oct-03	Nov-03	Dec-03	Jan-04	Feb-04	Mar-04	Apr-04	May-04	Jun-04	Jul-04	Aug-04	Sep-04
Level of Effort (Hours)																				
Professional Level 5	239	0	11	12	12	11	11	11	15	16	16	16	19	15	15	14	14	13	12	13
Professional Level 4	631	0	13	28	34	34	36	24	37	38	51	76	80	39	36	35	30	16	16	18
Professional Level 3	1,014	0	17	25	47	57	69	48	60	76	103	167	89	46	42	58	34	24	24	28
Professional Level 2	298	0	1	1	1	1	13	13	17	37	41	53	21	17	13	25	17	9	9	9
Professional Level 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Technician Level 3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Technician Level 2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Technician Level 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Administrative Level 2	346	0	4	7	7	7	17	18	30	33	30	31	28	22	18	27	19	16	14	18
Administrative Level 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Hours	2,528	0	46	73	101	110	146	114	159	200	241	343	237	139	124	159	104	78	75	86

6.9 Subtask 9 Enhanced Munitions Detectability

DoD ordnance items are designed stringently to function. However, ordnance items do fail to function properly either as a dud or a low order detonation, creating various hazards such as delayed or induced detonation of the explosive charge. These hazards do exist on military ranges and will continue to contaminate ranges as long as ordnance items fail.

Eliminating all failed ordnance is obviously a goal of the DoD, but since eliminating all failures is difficult and possibly not a realistic expectation, efforts to reduce the risks posed by failed ordnance can help to reduce the cost, time, and regulatory issues surrounding remediation of military ranges.

The goal of the Enhanced Munitions Detectability Project is to reduce the threat posed by UXO through the identification of potential solutions to instrument ordnance so that items that fail to function as designed can transmit telemetry about their condition to a portable hand-held receiver. This subtask will investigate the potential of using sensor technologies inserted into ordnance which can instrument basic status of the ordnance and report that status if the ordnance fails to fully function. The solutions developed should be able to report the status of the ordnance in areas such as no function, low order detonation, live fuzes, etc.

Subtask 9 Overview

Subtask 9 is organized into four work units to accomplish the required objectives as depicted in Figure 38.

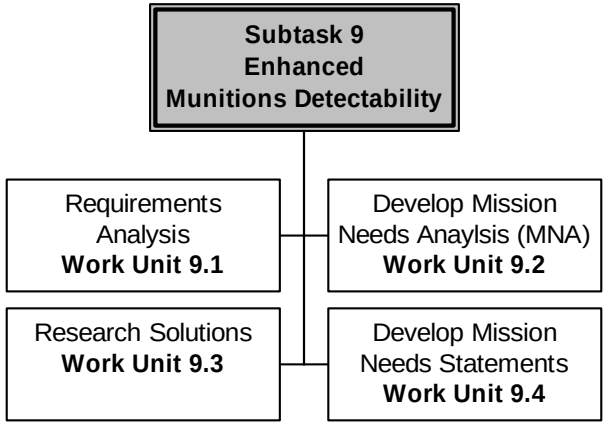

Figure 20. Subtask 9 WBS

The following provides an overview of the four work units:

- A requirements analysis will be conducted to define the operating environment parameters under which any sensor would be required to function. NDCEE personnel will then conduct a literature review to determine what other efforts have been accomplished which are of a similar sensor technology goal.
- From the data collected during the requirements analysis, a Mission Needs Analysis will be developed for five categories of ordnance, specifically for 1) large caliber, 2) medium caliber, 3) rockets and missiles, 4) kinetic penetrators, 5) mortar ammunition. Based on the parameters defined for the object sensor technology, non-material and material solutions will be researched.
- Once all of the research priorities and guidance documents are developed, NDCEE will research potential solutions.
- Results of this research will be compiled into a Mission Needs Statement for each candidate sensor technology, per ordnance category. These supporting acquisition documents, MNAs and MNSs, will be incorporated into a Final Report (CDRL A022), that NDCEE will develop detailing the entire project, methodologies, and outcomes. In addition, a PowerPoint presentation will be developed to accompany the final report.

The above work units as depicted in the Subtask 9 WBS in Figure 38 are described in greater detail in the following sections (6.9.1 to 6.9.4).

6.9.1 Work Unit 9.1 Conduct Requirements Analysis

Approach

In order to properly assess determine if and how to integrate sensor technology into ordnance, it is critical to first identify the operating parameters required of any sensor technology.

NDCEE will investigate the limitations for a sensor such as space, power, interface, and other applicable limitations. NDCEE will also identify the operating conditions required for a sensor such as g-forces, shock, heat, vibration, and other related conditions. NDCEE will also conduct a literature review of past-related efforts in order to leverage this data and reduce duplication of effort.

NDCEE anticipates the need for as many as two trips to the Aberdeen Test Center may be required to complete this task. These trips will be leveraged to include Naval EOD Technology Division, Naval Surface Warfare Center Dahlgren, and Picatinny Arsenal. Any information needed from White Sands will be gathered using electronic means.

The outcome of this work unit is a requirements document outlining the necessary operating parameters and properties required of the technology solution.

6.9.2 Work Unit 9.2 Develop Specific Mission Needs Analysis

Approach

Once the general scope of the problem is identified by the requirements analysis, specific research and identification of parameters associated with the specific ordnance categories must be accomplished in order to focus the research. It will be important to the scope of follow on test and demonstration efforts (later years) to identify commonalities and critical differences affecting sensor integration amount in the various ordnance categories to determine if there might be a single solution, multiple solutions, or a requirement to develop dedicated ordnance specific solutions.

NDCEE will study each category of ordnance to determine the sensor integration issues surrounding each category. This study will seek to determine the commonalities and differences between ordnance category fuzing and instrumentation. The purpose of this is to determine if there are any issues that would drive the research into solutions. If it can be determined that one solution can be developed to meet the needs across all categories of ordnance this will save significant development, deployment, and maintenance costs.

Using the data gathered under work unit 11.1 and this subtask, NDCEE will develop a specific sensor Mission Needs Analysis (MNA) for the following categories of ammunition: 1) large caliber, 2) medium caliber, 3) rockets and missiles, 4) kinetic penetrators, 5) mortar ammunition. The MNA documents will be developed based on an evaluation of the issues identified by the requirements analysis and the specific ordnance sensor requirements in accordance with CJCSI 3170.01B *REQUIREMENTS GENERATION SYSTEM*.

NDCEE anticipates the need for one (1) trip to the Aberdeen Proving Grounds (visit ATC and Ordnance School) to complete this task. This trip will be leveraged to include Naval EOD Technology Division, Naval Surface Warfare Center Dahlgren, and Picatinny Arsenal. Any information needed from White Sands will be gathered using electronic means.

The outcome of the MNA process will be clearly defined solution research priorities, which focus the work to be to identify solutions under Work Unit 9.2.

6.9.3 Work Unit 9.3 Identify Solutions

Approach

Once all of the research priorities and guidance documents are developed, the work of researching potential solutions can begin.

Using the output of the requirements analysis, the literature review, and the MNA NDCEE will investigate potential non-material and material solutions to instrumenting ordnance for enhanced detection. NDCEE will work with government agencies such as the Aberdeen Test Center, U.S. Army Ordnance School, Picatinny Arsenal, White Sands Missile Range, and Strategic Environmental Research and Development Program to gather data. NDCEE will use extensive contacts within the ordnance and EOD communities to gather information. NDCEE will also contact ordnance vendors and ammunition plants to discuss the problem and gather data.

Should any non-material solutions be identified, NDCEE will recommend a Doctrine, Training, Leader Development, Organization, and Soldier (DTLOSM) analysis be conducted as part of follow-on efforts. This kind of analysis would be helpful under future efforts in support of deployment of the final identified technology or methodology.

Material solutions developed by NDCEE will leverage as much as possible commercial off the shelf solutions in areas of sensor and receiver technologies. Any solutions proposed will be characterized by a set of parameters developed under the MNA process and will include, but will not be limited to system interface, survivability, scalability, interoperability, cost, implementation timeline, and ease of use.

NDCEE has the expectation and assumption that the Technical Monitor will ensure the appropriate agencies provide the NDCEE research team with access to applicable data. This access is the highest program risk associated with the successful completion of the Enhanced Munitions Detectability Project, which makes the commitment of the Technical Monitor to ensure access critical.

NDCEE anticipates the need for one (1) trip to the Aberdeen Proving Grounds (visit ATC and Ordnance School) to complete this task. This trip will be leveraged to include Naval EOD Technology Division, Naval

Surface Warfare Center Dahlgren, and Picatinny Arsenal. Any information needed from White Sands will be gathered using electronic means.

The identification of potential solutions, both material and non-material, will provide the baseline information needed to develop Mission Needs Statements that will focus test and demonstration of prototype ordnance sensor systems

6.9.4 Work Unit 9.4 Mission Needs Statements

Approach

Once all of the parameters of the sensor environment, ordnance instrumentation needs, and available solutions are identified, correlating all of this effort into a focused path forward will become important.

NDCEE will correlate all of the data gathered through the previous work units by ordnance category, sensor solution, and anticipated prototype development issues to create a Mission Needs Statement (MNS) for each of the candidate technologies. Each Mission Needs Statement will summarize the decision factors relevant to each ordnance sensor capability shortfall and will address the technology under consideration for satisfying the mission effectively. Each Mission Needs Statement developed will justify in analytical terms the actions required to resolve the detectability shortfall in each ordnance category and identify the tasks required to pursue a technology opportunity for addressing the detectability of each ordnance category. By using this approach the MNS can be used to formulate a FY04 test and demonstration program. The MNSs shall be attached to a Final Technical Report (CDRL A022).

The output of this process will be a Mission Needs Statement (MNS) for each of the candidate technologies, which can be used to formulate a FY04 test and demonstration program to work with ordnance users, ordnance and sensor vendors, and others to develop working prototype sensor systems. The MNSs shall be attached to a Final Technical Report, which will be developed and formatted in accordance with CDRL A022 (DI-MISC-80508).

6.9.5 Subtask 9 Schedule

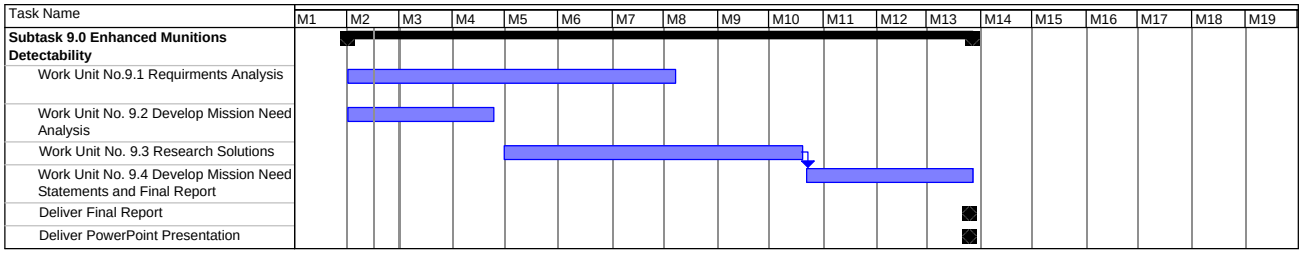

Figure 21. Schedule for Subtask 9 Enhanced Munitions Detectability

6.9.6 Subtask 9 Resources

Table 13. Resource Table for Subtask 9 Enhanced Munitions Detectability

Concurrent Technologies Corporation																			
Contract No. DAAE30-98-C-1050																			
Task Number: 00372.318																			
Unexploded Ordnance																			
Enhanced Munitions Detectability																			
Description	Total Proposed	Mar-03	Apr-03	May-03	Jun-03	Jul-03	Aug-03	Sep-03	Oct-03	Nov-03	Dec-03	Jan-04	Feb-04	Mar-04	Apr-04	May-04	Jun-04	Jul-04	Aug-04	Sep-04
Level of Effort (Hours)																			
Professional Level 5	216	0	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12
Professional Level 4	342	0	3	3	3	3	3	63	3	63	19	20	22	29	39	29	23	3	5	13
Professional Level 3	1,010	0	39	32	32	32	36	85	44	102	54	54	50	50	75	55	41	67	71	91
Professional Level 2	3,204	0	20	46	206	206	226	264	242	252	228	228	232	232	232	232	132	66	70	90
Professional Level 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Technician Level 3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Technician Level 2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Technician Level 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Administrative Level 2	414	0	15	21	21	21	23	44	16	31	20	20	26	28	28	28	24	11	17	24
Administrative Level 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Hours	5,186	0	89	114	274	274	300	468	317	460	333	334	341	350	385	355	231	158	174	229

6.10 Subtask 10 Dud Rate and Low Order Detonation Rate Study

The results of this subtask will provide a more accurate and reliable study of dud rates and low order detonation rates for a broad spectrum of ammunition types by leveraging the results of previous studies and incorporating additional data sets from multiple information sources, specifically including the ordnance/fuze combinations that are being evaluated under the NDCEE FY02 Task 307, Subtask 7. Subtask activities will include: assessment of dud and low order detonation rates for a variety of ammunition types or subsets for which data were collected; a data gap analysis to identify data limitations (i.e., Navy and/or Air Force specific munitions); preparation of an electronic database (e.g., Microsoft ACCESS) that will allow the user to determine dud rates and low order detonation rates as an item, in combination or as a subset, in accordance with CDRL A024; and, preparation of a technical report to document subtask activities and findings, in accordance with CDRL A023.

Subtask 10 Overview

Subtask 10 is organized into four work units to accomplish the required objectives as depicted in Figure 42.

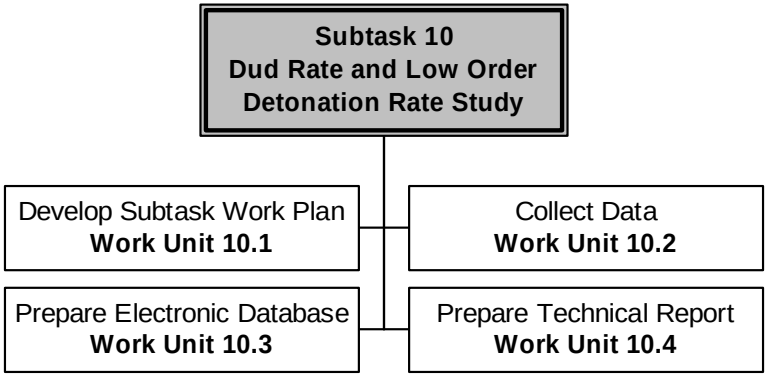

Figure 22. Subtask 10 WBS

The following provides an overview of the four work units:

- Develop Subtask Work Plan – The goal of this work unit is to prepare a work plan that outlines the technical approach for the subtask activities as well as assemble a Stakeholder Group, identify information types and sources, and delineate other approaches for researching dud rates and low order detonation rates.

- Collect Data – The goal of this work unit is to collect as much information as possible for as wide a variety of ammunition types. Data and information from published and unpublished reports, records and documents will be collected.
- Prepare Electronic Database – The goals of this work unit are to develop a database in Microsoft Access and enter the collected data into a user friendly Dud Rate and Low Order Detonation Rate Database, in accordance with CDRL A024. A data gap analysis will be performed. Statistical analyses will be included in the database.
- Prepare Technical Report – The goal of this work unit is to prepare a technical report that documents subtask activities and findings, in accordance with CDRL A023.

The above work units as depicted in the Subtask 10 WBS in Figure 42 are described in greater detail in the following sections (6.10.1 to 6.10.4).

6.10.1 Work Unit 10.1 Develop Subtask Work Plan

Approach

The Subtask Work Plan will delineate the rationale and approach to: identify and assemble an informed stakeholder group; develop data quality objectives; identify and locate different information types and sources; conduct technical reviews and evaluations of the collected data to enable selection of UXO as an item, in combination or as a subset; and, develop a final technical report. An initial stakeholder group will be identified and selected members of this group will review the Subtask Work Plan to provide input and to ensure that subtask activities are consistent with the stated subtask goals and objectives. NDCEE will leverage previous experience with similar data collection and analysis tasks (including NDCEE Task 307) and interaction with informed stakeholders within the DoD and UXO communities.

6.10.2 Work Unit 10.2 Collect Data

Approach

Data and information from published and unpublished reports; records and documents will be collected for as many ammunition types as possible, excluding small arms ammunition (i.e., smaller than .50 caliber). Data will be sorted and compiled according to munitions size (e.g., 20 mm and 40 mm), family (e.g., grenades, mines and pyrotechnics), type (e.g., HE, Smoke and Illumination), Department of Defense Identification Code (DoDIC),

and other pertinent information as identified. NDCEE personnel will teleconference with and conduct five face-to-face meetings with UXO, EOD and ordnance/munitions experts from the U.S. Army Ordnance Mechanical Maintenance School, 61st Ordnance Brigade, the U.S. Army Ordnance Munitions and Electronics Maintenance School (OMEMS), 59th Ordnance Brigade, the U.S. Army Tank-Automotive Armaments Command, Armaments Research and Development Engineering Center (TACOM-ARDEC), the U.S. Army Corps of Engineers Ordnance and Explosives Mandatory Center of Excellence and Design Center (USACE-MCX), the U.S. Army Environmental Center (USAEC), the Naval Explosive Ordnance Disposal Technology Division (NAVEODTECHDIV), or the U.S. Air Force Research Laboratory (USAFRL), as part of data collection and evaluation activities.

6.10.3 Work Unit 10.3 Prepare Electronic Database

Approach

The results of previous Phase I and Phase II studies will be leveraged and augmented by incorporating additional data sets and multiple information sources not previously included, and specifically including the ordnance/fuze combinations that are being evaluated under Subtask 7 of NDCEE UXO Task 307. A data gap analysis will be performed to identify data limitations (e.g., specific Navy and Air Force munitions) and statistical analyses will be conducted to assess data quantity and quality.

NDCEE will prepare a Dud Rate and Low Order Detonation Rate Database in accordance with CDRL A024 (DI-MISC_80508) that will combine the results of this and previous efforts to allow the user to determine dud rate and low order detonation rate as an item, in combination or as a subset. At a minimum, the database will consist of the following fields: DoDIC, Size (e.g., 20 mm and 40 mm), Model Number, Family (e.g., grenade and pyrotechnic), Type (HE, HEI, and HEI-T-SD), Dud Rate, Low Order Detonation Rate, Fuze(s) and Number of Rounds Fired.

6.10.4 Work Unit 10.4 Prepare Technical Summary Report

Approach

In support of meeting the objectives of this subtask, NDCEE will prepare a final summary technical report in accordance with CDRL A023 (DI-MISC-80508) that documents subtask activities and findings. The draft summary report will be delivered to the Government in electronic (Microsoft Word 2000) format for review and comment. NDCEE will deliver the final technical report to the Government within 30 days after receipt and

appropriate incorporation of Government review comments. NDCEE will prepare and deliver a draft Microsoft ACCESS Database that combines the results of the Phase I and Phase II Studies of Ammunition Dud Rate and Low Order Detonation Rates in accordance with CDRL A024 (DI-MISC-80508). The final database will be delivered 60 days after receipt of Government review comments. NDCEE will prepare and submit a draft 20-minute Microsoft PowerPoint presentation that summarizes subtask activities and conclusions in accordance with CDRL A030 (DI-MISC-80508) and will deliver the final version within 15 days after receipt of Government review comments. As part of work unit activities, NDCEE personnel will attend In-Process Reviews (IPRs) to provide timely subtask reviews and facilitate stakeholder discussions with subtask team members as well as a UXO Task wrap-up meeting as part of subtask completion activities.

6.10.5 Subtask 10 Schedule

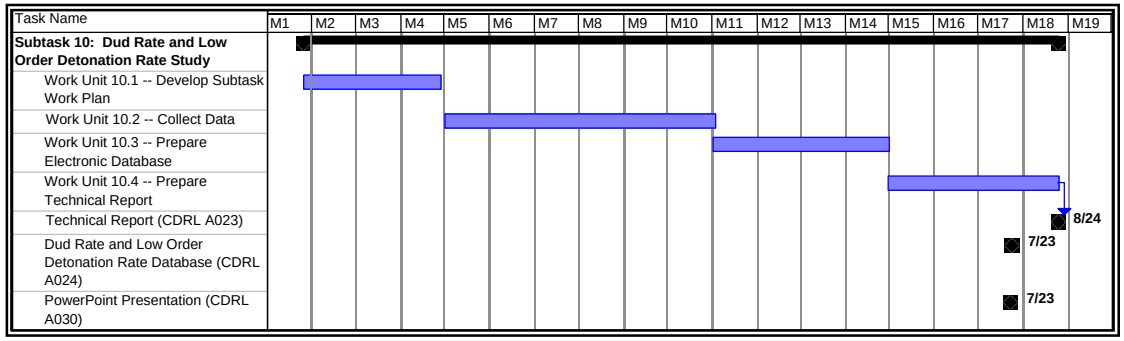

Figure 23. Schedule for Subtask 10 Dud Rate and Low Order Detonation Rate Study

6.10.6 Subtask 10 Resources

Table 14. Resource Table for Subtask 10 Dud Rate and Low Order Detonation Rate Study

Concurrent Technologies Corporation																			
Contract No. DAAE30-98-C-1060																			
Task Number: 00372.318																			
Unexploded Ordnance																			
Low Order Detonation Study																			
Description	Total Proposed	Mar-03	Apr-03	May-03	Jun-03	Jul-03	Aug-03	Sep-03	Oct-03	Nov-03	Dec-03	Jan-04	Feb-04	Mar-04	Apr-04	May-04	Jun-04	Jul-04	Aug-04	Sep-04
Level of Effort (Hours)																			
Professional Level 5	288	0	13	14	15	13	13	14	15	15	16	19	18	16	21	19	19	18	17	17
Professional Level 4	661	0	16	22	26	34	25	36	36	36	36	61	70	70	58	39	24	27	23	22
Professional Level 3	1,434	0	22	44	42	79	118	115	133	115	103	135	144	133	90	47	35	35	23	21
Professional Level 2	354	0	3	3	3	7	9	29	29	33	35	51	25	20	36	21	15	15	13	7
Professional Level 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Technician Level 3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Technician Level 2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Technician Level 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Administrative Level 2	379	0	7	10	10	14	13	24	26	24	24	48	27	26	36	22	22	22	14	10
Administrative Level 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Hours	3,116	0	61	93	96	147	178	218	239	223	214	314	284	265	241	148	115	117	90	77

6.11 Subtask 11 Assess Extent of UXO "Dud" Problems Associated with the Use of Old Inventory Ordnance by the U.S. Department-of-Interior for Avalanche Control in Mountainous Regions - Is There a Better Solution?

The results of Subtask 11 will provide comprehensive, in-depth and consolidated information on the extent and potential causes of UXO associated with the use of old DoD inventory ordnance for avalanche control and will identify possible new solutions to meet avalanche control needs. This information will enable the Government to modify existing, or develop new, technical and/or administrative requirements that will help mitigate the causative factors for this UXO, which will ultimately lower the dud rates and correspondingly reduce the UXO safety hazards and UXO clearance costs associated with this avalanche control practice.

Subtask 11 Overview

Subtask 11 is organized into four work units to accomplish the required objectives as depicted in Figure 46.

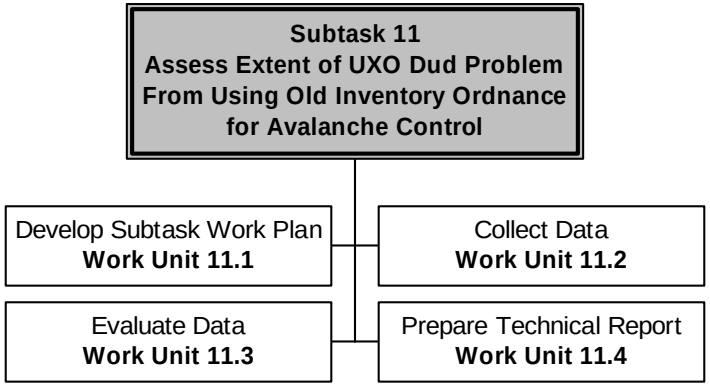

Figure 24. Subtask 11 WBS

The following provides an overview of the four work units:

- Develop Subtask Work Plan – The goal of this work unit is to prepare a work plan that outlines the technical approach for the subtask activities as well as assemble a Stakeholder Group, identify information types and sources, and conduct technical review and evaluation of the collected data.
- Collect Data – The goal of this work unit is to collect published and unpublished information and field data to enable a thorough assessment of the extent of UXO-related problems associated with the use of

old DoD inventory ordnance for avalanche control activities as well as possible replacement ordnance and delivery systems.

- Evaluate Data – The goals of this work unit are to conduct a detailed technical review and evaluation of all collected information and UXO field survey data to assess the extent of UXO-related problems associated with the use of old DoD inventory ordnance, to identify potential causative factors for this UXO, and to delineate possible new solutions to meet avalanche control program needs.
- Prepare Technical Report – The goal of this work unit is to develop a technical report and a PowerPoint presentation that documents subtask activities and findings.

The above work units as depicted in the Subtask 11 WBS in Figure 46 are described in greater detail in the following sections (6.11.1 to 6.11.4).

6.11.1 Work Unit 11.1 Develop Subtask Work Plan

Approach

The Subtask Work Plan will delineate the rationale and approach to assemble an informed stakeholder group, develop data quality objectives, identify and locate different information types and sources, conduct in-depth technical reviews and evaluations (including pertinent statistical analyses) of the collected data, and develop a final technical report. An initial stakeholder group will be identified and selected members of this group will review the Subtask Work Plan to provide input and ensure that subtask activities are consistent with the stated subtask goals and objectives. The NDCEE will leverage experience with similar data collection and analysis tasks (including NDCEE Task 307) and interaction with informed stakeholders within the DoI, DoD and UXO communities to develop the subtask work plan and conduct subtask activities.

6.11.2 Work Unit 11.2 Collect Data

Approach

Private, state and federal avalanche control organizations that may use old inventory ordnance for avalanche control practices will be surveyed to collect the following information: ordnance used, delivery system(s) used, and deployment or use data as well as input for possible replacement ordnance and delivery systems, suggested new or modified technical actions and administrative requirements, and alternative technologies or approaches that could minimize or eliminate UXO-related problems, but still meet avalanche control program needs. NDCEE personnel will teleconference with and travel for four face-to-face meetings with DoI personnel to

review avalanche control needs and current practices and problems, and with UXO, EOD and ordnance/munitions experts from the U.S. Army Ordnance Mechanical Maintenance School, 61st Ordnance Brigade, the U.S. Army Ordnance Munitions and Electronics Maintenance School (OMEMS), 59th Ordnance Brigade, the U.S. Army Tank-Automotive Armaments Command, Armaments Research and Development Engineering Center (TACOM-ARDEC), the U.S. Army Corps of Engineers Ordnance and Explosives Mandatory Center of Excellence and Design Center (USACE-MCX), the U.S. Army Environmental Center (USAEC), the Naval Explosive Ordnance Disposal Technology Division (NAVEODTECH), or the U.S. Air Force Research Laboratory (USAFRL) as part of information collection and evaluation activities. An initial review of the collected data will be conducted to select two primary and two secondary (i.e., alternate) locations for conducting UXO field surveys.

NDCEE personnel will travel to two locations, as identified from preliminary data review activities, within the western mountains (e.g., Colorado and Utah) to conduct UXO field surveys. The purpose of these surveys is to collect and catalog UXO field data to verify data trends collected from published and unpublished information sources. UXO remediation at these field sites will not be conducted. Qualified personnel will collect pertinent information on UXO encountered at the sites and this data will be used to help assess potential causes for the observed dud problems. Before going into the field, NDCEE personnel will prepare and deliver to the Government for approval a signed Health and Safety Plan and a Field Survey Plan. To facilitate data input, access, management, review and analysis, all collected information will be entered into a UXO Avalanche Control Database.

6.11.3 Work Unit 11.3 Evaluate Data

Approach

A data gap analysis will be performed to identify data limitations, while statistical analyses will be conducted to assess data quantity and quality, and to help identify potential correlations between dud rates and identified variables, such as ordnance and UXO attributes (e.g., fuze type), deployment data (e.g., number of live rounds, number of dud rounds, gun types and associated costs), UXO incidents and response actions, and other program data. Statistical analyses will be conducted to assess data quantity and quality, and to help identify potential correlations between UXO-related problems from the use of old inventory ordnance and other identified variables. The results of the technical evaluations will be used to assess the extent of UXO-related problems from old inventory ordnance and to formulate recommendations for changes to, or development of new, technical and operational procedures or protocols.

6.11.4 Work Unit 11.4 Develop Technical Report

Approach

In support of meeting Subtask 11 objectives, the NDCEE will prepare a final summary report, in accordance with CDRL A025 (DI-MISC-80508), that documents sub task activities, including data collection and analysis activities, evaluation of the collected data and information to assess causative factors for the UXO, and recommendations for changes to the old DoD inventory ordnance usage program to mitigate UXO-related problems. The draft report will be delivered to the Government in electronic format (Microsoft Word 2000) for review and comment. The NDCEE will deliver the final technical report to the Government within 30 days after receipt and appropriate incorporation of Government review comments. The NDCEE will prepare and submit a draft 20-minute Microsoft PowerPoint presentation that summarizes subtask activities and conclusions in accordance with CDRL A030 (DI-MISC-80508) and will deliver the final version within 15 days after receipt of Government review comments. As part of work unit activities, NDCEE personnel will attend In-Process Reviews (IPRs) to provide timely subtask reviews and facilitate stakeholder discussions with subtask team members as well as an UXO Task wrap-up meeting as part of subtask completion activities.

6.11.5 Subtask 11 Schedule

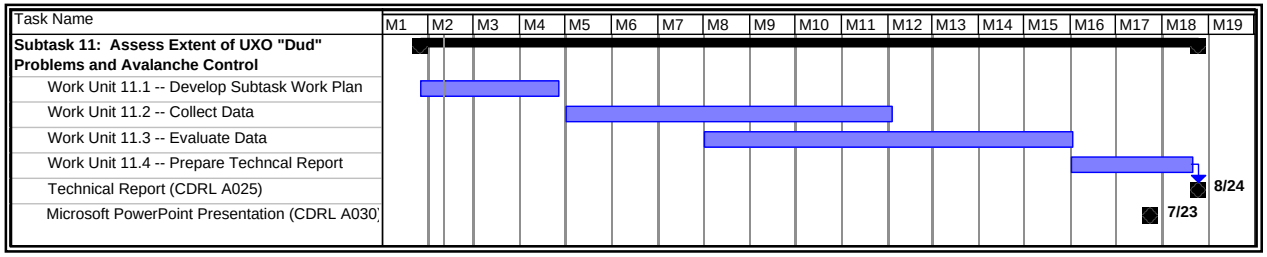

Figure 25. Schedule for Subtask 11 Assess Extent of UXO "Dud" Problems Associated with the Use for Avalanche Control

6.11.6 Subtask 11 Resources

Table 15. Resource Table for Subtask 11 Assess Extent of UXO "Dud" Problems Associated with the Use for Avalanche Control

Concurrent Technologies Corporation																			
Contract No. DAAE30-98-C-1050																			
Task Number: 00372.318																			
Unexploded Ordnance																			
Use of Old Ammo Inventory Study																			
Description	Total Proposed	Mar-03	Apr-03	May-03	Jun-03	Jul-03	Aug-03	Sep-03	Oct-03	Nov-03	Dec-03	Jan-04	Feb-04	Mar-04	Apr-04	May-04	Jun-04	Jul-04	Aug-04	Sep-04
Level of Effort (Hours)																			
Professional Level 5	234	0	13	13	13	13	14	14	13	13	13	13	13	13	13	13	13	14	14	13
Professional Level 4	342	0	28	21	20	19	19	22	24	23	18	13	21	18	19	20	17	17	14	9
Professional Level 3	724	0	30	29	16	15	56	111	114	104	60	38	20	15	16	16	26	33	20	5
Professional Level 2	52	0	0	0	0	0	5	5	6	8	9	9	0	0	0	0	5	5	3	0
Professional Level 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Technician Level 3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Technician Level 2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Technician Level 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Administrative Level 2	206	0	9	7	7	7	15	15	14	14	20	14	6	6	6	6	18	18	18	6
Administrative Level 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Hours	1,558	0	80	70	56	54	108	167	170	162	119	86	60	52	54	55	79	87	68	33

6.12 Subtask 12 Development of Time and Cost Trade-off Tool

This subtask will result in the development of a Cost Trade-off Tool in the form of a spreadsheet. In short, the tool will provide a user straightforward time and cost estimates to allow project trade-off calculations at various stages of UXO mitigation (e.g., detection and characterization, technology selection, excavation, removal, etc). The tool will allow estimation (i.e., engineering estimates) of relative costs and proficiency gains. The tool will allow the Government to straightforwardly and consistently evaluate the potential cost and time of various approaches for UXO mitigation at a project site. Upon completion of this subtask, the Government will be able to quantify the cost effectiveness of various remediation/ assessment approaches in selection of the best UXO mitigation approach for the resources allocated and situation encountered.

Subtask 12 Overview

This subtask will be divided into four work units to accomplish the required objectives as depicted in Figure 50. Each work unit is further described in detail below.

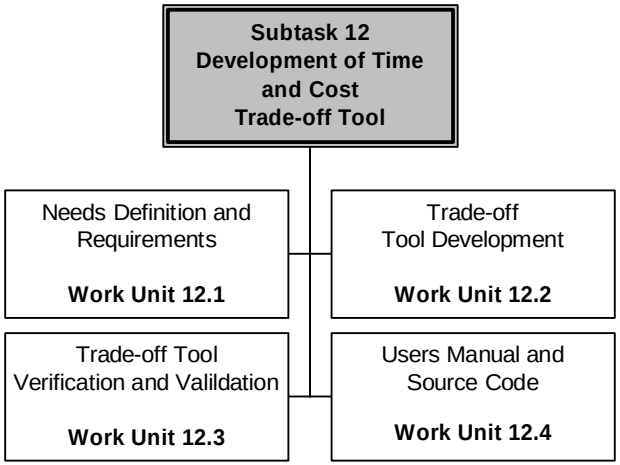

Figure 26. Subtask 12 WBS

The following provides an overview of the four work units:

- A design specification and requirement meeting will be conducted with stakeholders/end-users to identify the specific features and capabilities of the tool to meet the users requirements. These

requirements will include, but are not limited to, software preference (e.g., Excel, Lotus), input and output formats, reporting requirements, calculation needs, data sources, etc.

- NDCEE will develop the actual spreadsheet Trade-off Tool in three phases, which include: Design Data Input; Report Output Design; and, Programming and Calculations.
- Following development, the trade-off tool will be verified against the original design requirements and validated for accuracy against a known standard or reference. This will be accomplished by first confirming the original design criteria against the users needs requirements, and secondly by comparing the calculation results of the spreadsheet with the software tool RACER.
- The Trade-off Tool spreadsheet will be supported with a Users Reference Manual providing step-by-step instructions in how to use the estimating tool. All cost algorithms and macros developed within the spreadsheet shall be provided in a Source Code document as an Appendix to the Users Reference Manual.

The above work units as depicted in the Subtask 12 WBS in Figure 50 are described in greater detail in the following sections (6.12.1 to 6.12.4).

6.12.1 Work Unit 12.1 Needs Definition and Requirements

NDCEE will conduct a design specification and requirement meeting with stakeholders/end-users to identify the specific features and capabilities to meet the user's requirements. These requirements will include, but are not limited to, software preference (e.g., Excel, Lotus), input and output formats, reporting requirements, calculation needs, data sources, etc. One design review meeting will be conducted via teleconference within 60 days of NTP. The goal of this step is to identify as many desired features for the tool as possible. General Requirements and Key Features, as presented in the SOW will be reviewed as a starting point for this stakeholder meeting. Moreover, POCs will be contacted to participate in the meeting to help fill information gaps, answer questions, and indicate the key features that they desire.

General Requirements and Key Features

In accordance with the SOW, the tool will be designed to meet, at a minimum, the following key requirements: 1) A baseline "as currently performed" estimate; 2) Changes (i.e., efficiency gains) incurred using more costly (i.e., more efficient) survey techniques; 3) Time trade-offs for confirmation sensors at various stages of mitigation; 4) Cost/time comparisons to mechanical removal, either as a stand-alone tool for impact areas or as

a first step to be followed by geophysics; and, 5) Time trade-offs for post-processing applications versus the number of targets detected discriminated and excavated (i.e. technology proficiency). The tool will be designed to address a number of cost variables to include, but not limited to: site type, size, and technology used.

In accordance with these requirements, the Trade-off Tool will include, at a minimum, the following a Key Features:

- A baseline time and cost estimates
- Multiple technology alternatives/scenarios (Stand alone or in combination)
- Performance indicators (decreased false alarms, increased Pd)
- Impacts (Time, explosives used, cost of standoff requirements)
- Type of Removal
- Type of post-processing applications
- Process Efficiency calculation(s) (targets excavated/discriminated)

6.12.2 Work Unit 12.2 Trade-off Tool Development

Phase I — Design Data Input

NDCEE will develop the Trade-off Tool in three phases. The
Needs and Requirements Information Summary developed under Work Unit 12.1 will provide the basis for the Phase I preliminary report design; incorporating the stakeholders required reporting outputs, formats, report layout, precision requirements, etc. NDCEE will conduct one design review meeting via teleconference and provide a draft design report to the stakeholders for review and approval.

Phase II — Report Output Design

Phase II will consist of the design of the data input portion of the spreadsheet. NDCEE specialists will develop the spreadsheet utilizing a single workbook with multiple supporting spreadsheets for data input, calculations, and reports. Data input would be simplified where possible with pull-down menu selections or check boxes to reduce data entry errors. Default values for common assumptions would be "built-in" for standard calculations and assumptions. Users will be able to customize the assumptions as needed. Once the required inputs and outputs are clearly defined, the required calculations can be constructed during Phase III.

Phase III — Programming and Calculations

Calculations developed by programmers for the tool will be password protected to prevent inadvertent changes by users. Programmed macros will be used to simplify repetitive and routine tasks. Users will be provided pull down menus and check boxes where appropriate.

Calculations would be developed in separate spreadsheets to be eventually locked and hidden to prevent users inadvertently changing the formulas. Calculations would be verified and validated in Work Unit 12.3.

6.12.3 Work Unit 12.3 Trade-off Verification and Validation

NDCEE will validate any calculations in the Trade-off Tool against any comparable calculations in the cost-estimating model RACER. Specifically, test data will be entered into the spreadsheet and one of the RACER's ordnance cost sub-models (i.e., Ordnance & Explosive removal action) to verify any comparable calculations. NDCEE will coordinate and support the appropriate Government agency, in order to gain access to and appropriate training for the RACER tool.

NDCEE will also validate the Trade-off tool against actual report calculations using actual site data from at least three recently completed mitigation sites and associated reports. NDCEE will contact, coordinate with, and request from the appropriate site personnel, relevant cost and performance data along with the appropriate report cost calculations for validating the Trade-off Tool. All calculations, at a minimum, would use test data as inputs to validate all calculations.

Next, in order to verify that the user's needs and specifications have been reflected in the final design, the specification list from Work Unit 12.1 will be compared with the final design. Also, consenting stakeholders would be provided a prototype working copy for 'Beta' evaluation. Feedback from the Beta testers would be used to verify the design.

NDCEE shall train (four) analysts in use of the Trade-off Tool. A two-hour classroom training session will be held at NDCEE's Johnstown facilities, or other mutually acceptable location, on the use of the Trade-off Tool.

6.12.4 Work Unit 12.4 Trade-off Users Manual and Source Code

NDCEE will prepare a user manual and source code. In accordance with CDRL A026, NDCEE shall submit a draft version (electronically) for Government review prior to final submittal. Government acceptance and

approval will be in writing only. NDCEE will incorporate Government comments and submit the final document 15 days after receipt of the comments.

The Trade-off Tool spreadsheet will be supported with a Users Reference Manual providing step-by-step instructions in how to use the estimating tool. All cost algorithms and macros developed within the spreadsheet shall be provided in a Source Code document as an Appendix to the Users Reference Manual.

Deliverables

The NDCEE will develop a spreadsheet and any supporting executable code such as Macros along with the user/reference manual, and documented source code. The draft code and user manual will be delivered to the Government no later than 488 days after task award in hard copy and electronic format in accordance with CDRL A026. The NDCEE will deliver the final code and manual within 60 days after receipt of Government comments.

The findings of this subtask will be documented in a final technical report. The report will summarize the overall effectiveness and usefulness of the spreadsheet tool. The report will also include recommendations on the future deployment of the Trade-off Tool and potential improvements in future versions of the tool.

The NDCEE will deliver the draft final technical report in electronic format and hard copy 518 days after task award in accordance with CDRL A027 (DI-MISC-80508). The NDCEE will deliver the final report 30 days after receipt of the Government comments. A draft 20-minute PowerPoint presentation summarizing the activities and conclusions of this study will also be developed in accordance with CDRL A030 (DI-MISC-80508). The final version of the presentation will be delivered 15 days after receiving Government review comments.

6.12.5 Subtask 12 Schedule

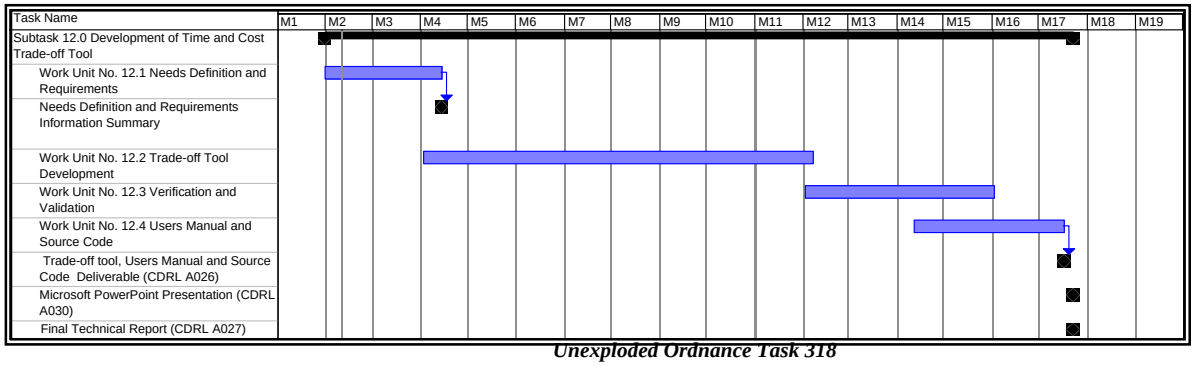

Figure 27. Schedule for Subtask 12 Time and Cost Trade-off Tool

6.12.6 Subtask 12 Resources

Table 16. Resource Table for Subtask 12 Time and Cost Trade-off Tool

Concurrent Technologies Corporation																			
Contract No. DAAE30-98-C-1050																			
Task Number: 00372.318																			
Unexploded Ordnance																			
Trade-Off Tool																			
Description	Total Proposed	Mar-03	Apr-03	May-03	Jun-03	Jul-03	Aug-03	Sep-03	Oct-03	Nov-03	Dec-03	Jan-04	Feb-04	Mar-04	Apr-04	May-04	Jun-04	Jul-04	Aug-04	Sep-04
Level of Effort (Hours)																			
Professional Level 5	174	0	3	3	3	3	3	3	10	10	60	64	4	4	4	0	0	0	0	0
Professional Level 4	382	0	4	13	23	23	9	27	81	84	35	45	19	19	0	0	0	0	0	0
Professional Level 3	684	0	3	25	35	21	11	35	118	120	59	142	58	58	3	0	0	0	0	0
Professional Level 2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Professional Level 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Technician Level 3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Technician Level 2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Technician Level 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Administrative Level 2	60	0	0	6	11	3	0	0	0	0	0	20	10	10	0	0	0	0	0	0
Administrative Level 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Hours	1,300	0	10	47	72	50	23	65	209	214	154	271	91	91	7	0	0	0	0	0

7.0 GOVERNMENT FURNISHED PROPERTY AND ASSISTANCE

It is NDCEE's understanding that with proper coordination and funding support, as required, the Government will provide NDCEE personnel access to all relevant information, records, and documents necessary to accomplish the SOW. In addition, NDCEE will also have access to the required Government sites, including Government escorts, if applicable, to complete the testing requirements of the SOW.

In addition, it is also NDCEE's understanding with proper coordination and funding support, as required, the Government will supply NDCEE with all the ordnance items to be used for testing in Subtask 6: Environmental Chamber Migration Testing. In addition, personnel at the designated testing sites will be accessible to NDCEE personnel for approval of the test and safety plans and clearance for access to the testing sites in order to conduct all necessary actions associated with field testing for Subtasks 6, (e.g., U.S. Army Cold Regions Research and Engineering Laboratory). NDCEE will provide all additional necessary personnel, facilities, buildings and materials, except where identified otherwise, and provide the required expertise to conduct the work described in the SOW for this Task.

8.0 TESTING REQUIREMENTS

NDCEE will conduct all testing under this SOW in accordance with contractor-prepared, Government-approved test and safety plans and Health and Safety plans. In addition, NDCEE will notify the Government Technical Monitor at least 15 business days prior to the start of testing.

9.0 INSPECTION, SUBMITTAL, AND ACCEPTANCE

Before submittal to the Government, *CTC* senior management will conduct a review of, critique, and approve of all deliverables, including reports and test data. Distribution of information generated in this project will employ the use of electronic mail, telephone conferences, and facsimile messages to keep all participants informed of progress while reducing environmental impact of the project. The final acceptance of the services and data deliverables called for herein and provided by the NDCEE will be by the Contracting Officer on the advice of the Defense Contract Command.

The release of any data, conclusions or information pertaining to the UXO task, any subtasks, and/or generated results, in any publication, briefing or public forum, will be submitted by the NDCEE for review and approval to the Government prior to such release.

10.0 HAZARDS INFORMATION

All ordnance items that will be used for the UXO Migration subtask will be certified inert by the Government prior to being used for testing in support of meeting the requirements of that task.

11.0 SECURITY

As designated by the Government, the information contained in Appendix A of the SOW is Business Sensitive and will be appropriately protected throughout the execution and reporting of this Task. All other Task information, not directly related to or incorporating the information in Appendix A of the SOW is unclassified, public information unless designated differently by the Government.

12.0 PROJECT RISK ASSESSMENT/PROJECT RISK MANAGEMENT

The following section qualitatively details the processes required to ensure that this project will managed to proactively aim to reduce, minimize, or eliminate project risk. A large part of effective risk management is the acknowledgement that each project has certain risks, or uncertainties associated with it, which may affect the project in ways that cannot be specified in advance. It is important to attempt to identify the risks, to the maximum extent possible, and understand and accept risks that are inherent in the project, as well as prepare for responding to risk. This risk assessment/management plan qualitatively identifies and documents risk that may occur throughout the project, and documents the procedures that will be used to manage the risk (plan for contingencies). It also presents, where appropriate, who will be the responsible party for risk management activities.

This risk management plan is broadly framed based on the needs of this project. The plan is provided to minimize events that threaten the project and directed to satisfy quality management elements. Specifically, this risk management plan will cover who is responsible for managing various areas of risk, how the risk identifications will be maintained, and how contingency plans will be implemented. The following describes specific items of interest that were considered to minimize project risk.

The UXO Program Manager will be ultimately responsible for identifying, documenting, and effectively responding to project risk. The UXO Program Manager, when necessary, will delegate risk identification and risk responsive measures to appropriate assistant project managers, subtask leads, and/or other responsible persons.

This project can be considered a project of "moderate" risk. That is, the project management team has consciously decided to accept risk and risk events associated with routine project activities. The following can be considered reason for this project to be considered moderate risk:

- The project team has an established relationship with the Government organization.
- The project team is familiar with completing technically complex projects.
- The project team is familiar with completing administratively complex projects.
- The project team has access to needed resources to complete the project.
- The project team believes this project is not in a state of a "hot" regulatory climate.
- The project team believes that an unacceptable exposure to liability does not exist.

Even though the project risk is moderate, events that can have a critical effect on the viability of the project will be monitored carefully. Project threats that require attention during project management activities that may escalate the project to high risk include the following:

- Expansive decisions that go beyond project scope, budget, and schedule.
- Costly problems imposed on the project by unforeseen external forces.

In the event of an unacceptable risk or contingency, the following are pre-defined action steps to be taken by the project team to minimize risk and maintain project viability:

- Identify project change
- Analyze the effects of the change
- Develop a response strategy
- Communicate the strategy and gain endorsement for the change
- Revise the Project Management Plan/Work plan and monitor the effects of the change.

Table 29 further identifies the risks associated with this Task. In addition, the level of risk is detailed and action for response and communication are also outlined.

Table 17. Project Risk Assessment/Risk Management

No.	Risk Identification	Risk Quantification	Risk Response	Risk Communication
1.	**Budget/Financial Performance Risk** – Government to Government funding in support of testing.	Moderate	The Government and the NDCEE have worked to clearly identify the support required from the Government UXO Agencies to support execution of this task and funds have been set aside for this support (i.e., CRREL for Subtask 6 support).	This is an external risk. Subtask Leads will be directed to report any problems/successes as they occur through biweekly calls with the Program Manager. In addition, they will be documented through monthly reports, IPRs, and final reports.
2.	**Information Gap Risks** -- Access to Government supplied reports, documentation, and information, personnel and test sites are required.	Moderate	NDCEE has established relationships with relevant Government UXO organizations. NDCEE must work to maintain and further develop these relationships.	A log of all information requests will be maintained to outline materials/access requested, agency responsible, and agency POC. In addition, receipt of materials/access or refusal of cooperation will be reported to the Program Manager and then subsequently to the TM.

Table 29. Project Risk Assessment/Risk Management (Continued)

No.	Risk Identification	Risk Quantification	Risk Response	Risk Communication
3.	**Project Risks** -- Technically complex subtasks exist.	Moderate for Subtasks 4 and 6. Low for remaining Subtasks.	The project team is familiar with completing technically complex projects. Subtask 4 is an R&D task for the development of a prototype, which is dependent on technical feasibility of the actual design. The amount of significant and transferable data obtained for Subtask 6 is dependant on obtaining access to the testing facility and is further dependent on that testing facility receiving Government funding for this task.	Problems/successes will be reported as they occur through biweekly calls with the Program Manager. In addition, they will be documented through monthly reports, IPRs, and final reports.
4.	**Schedule Risks** – Schedule risks exist.	Moderate for Subtasks 4 and 6. Low for remaining Subtasks.	Subtask 4 schedule risk is dependent on the technical risk and will be controlled through efficient execution of technical work and maintaining accurate reporting on subtask status to both the Program Manager and the Technical Monitor. NDCEE has already identified the Government Testing facility to complete Subtask 6 and will work to maintain and further the relationship to successfully complete the subtask requirements.	Problems/successes will be reported as they occur through biweekly calls with the Program Manager. In addition, they will be documented through monthly reports, IPRs, and final reports.
5.	**Project Risks –** This is a large task with multiple subtasks resulting in an administratively complex project.	Low	The project team — in particular the project management team — has the knowledge, experience, and track record for successfully completing administratively complex projects.	Problems/successes will be reported as they occur through biweekly calls with the Program Manager. In addition, they will be documented through monthly reports, IPRs, and final reports.

Table 29. Project Risk Assessment/Risk Management (Continued)

No.	Risk Identification	Risk Quantification	Risk Response	Risk Communication
6.	**Regulatory Risks --** Regulatory climate, control, and consideration risks exist.	Low	All handling of ordnance in order to complete the required work/testing outlined within this Task will be accomplished within the auspices of all necessary certified DoD personnel.	Problems/successes will be reported as they occur through biweekly calls with the Program Manager. In addition, they will be documented through monthly reports, IPRs, and final reports.
7.	**Personnel Risks –** Personnel/Staff changes	Low	The Program Manager has authority to ensure time allocations for team members are available. In addition, each subtask lead is responsible for assuring their teams are available for their allotments. Additional team members will be identified as the task is executed. All documentation, including monthly reports and meeting minutes, are maintained on the task level in order to minimize information loss as a result of staff turnover	Problems/successes will be reported as they occur through biweekly calls with the project/stakeholder team. In addition, they will be documented through monthly reports, IPRs, and final reports.
8.	**Deliverable Risks** -- Planned tasks not completed on time due to one of the aforementioned.	Low/Moderate	Maintain development team composition throughout task execution and use risk management concepts to anticipate any problems with potential schedule affects.	Problems/successes will be reported as they occur through biweekly calls with the project/stakeholder team. In addition, they will be documented through monthly reports, IPRs, and final reports.

13.0 ISO/EHS DOCUMENTATION

Quality Assurance for this program will be accomplished in accordance with *CTC*'s internal ISO 9000 and ISO 14000 procedures. The table below lists the internal and external references identified for use in this project.

Table 18. ISO/EHS Documents

Title	Publication Date
CTC Project Management	11/26/01
CTC Procurement Manual	3/03
CTC Property Manual	8/01
CTC Control of External Documents	2/6/02
CTC Control of Local Documents	6/7/02
CTC Client Supplied Property	4/24/02
CTC Deliverable Documents	4/11/02
CTC Control of Measuring and Test Equipment	5/31/02
CTC Receiving Inspection	4/24/02
American National Standard Practice for Occupational and Educational Eye and Face Protection	1/1/89
Control of Hazardous Energy	2/13/96
Electrical Safety Work Practice	7/1/98
Hazardous Communication Standard	2/3/96
Job Hazard Analysis	1/1/92
Model for Quality Assurance in Design, Development, Production, Installation, and Servicing – ISO 9001: 1994	8/1/94
Personnel Protective Equipment for General Industry	7/1/98
Statistics for Experimenters: An Introduction to Design, Data Analysis, and Model Building	1978
CTC Client Surveys	1/4/02

APPENDIX A
UXO Task No. 318 SOW, dated February 27, 2003
and
Contract Data Requirements Lists (CDRLs)

APPENDIX B
List of Personnel

Name/Organization	Background Description
UXO Program Manager (CTC)	The UXO Program Manager is responsible for the leadership and management of large, complex tasks and company operations in the areas of Treatment and Remediation, Process Engineering and Syst Engineering. He is the Project Manger for the UXO FY02 Project (NDCEE Task No.307) and has a leadership role in support of the NDCEE and *CTC*'s Environmental Remediation Services initiatives He was the Program Manager for the *CTC* tasks to achieve environmental regulatory closure of the U. S. Army BRAC sites at Vista and Camp Pedricktown. *CTC* is the Prime Contractor for the tasks and regulatory closure of Rio Vista was achieved on January 2002. With has over 30 years of experience in program and projec management, plant and system design, installation, startup testing, troubleshooting and operations in the environmental, manufacturin nuclear and chemical areas. He has a B.E. in Chemical Engineerin an EMBA, and is a Registered Professional Engineer.

Name/Organization	Background Description
Subtask 9 Lead (CTC)	With has over 20 years of experience with Unexploded Ordnance. He has over 10 years of experience as an instructor for UXO Identification, marking, reporting, and disposal. He has developed curriculum for classroom, field, and senior leadership UXO courses. He developed several UXO guides for troops to use in the field, based on the "Order of Battle" for the theater involved. He developed procedures for Improvised Explosive Devices and Nuclear, Biological, or Chemical materials. He has hands-on, operational experience with UXO in the field and has developed, scripted, and orchestrated numerous exercises involving UXO. While on active duty, he was a recognized expert in emergency response to Weapons of Mass Destruction (WMD)/Anti-Terrorism and participated in the emergency response planning for the Atlanta Olympic Games. He developed the first U.S. Air Force-wide planning template for emergency response to WMD and is certified under the Department of Justice in WMD Response. He is very familiar with the Resource Conservation and Recovery Act (RCRA) and the Range Rule disparities between the legislation and the Department of Defense. He is a nationally certified Hazardous Materials Emergency Response Incident Commander and Technician Instructor.

Name/Organization	Background Description
Subtask 2 Lead (CTC)	He plays a lead role in the identification, development, implementation, and management of projects with a focus on technical and environmental programs. His current emphasis is on UXO detection, characterization, and remediation technologies. He also specializes in identification, evaluation, and execution of programs related to military research, development, test, evaluation, and training range operation and sustainment. He is trained as a Biologist/Biochemist with more than 32 years experience in conducting and managing research programs that address critical technical issues faced by the military and private sector. He established the first environmental research program in the U.S. Air Force to deal with the environmental consequences of test, evaluation, training, combat use, and disposal of air-delivered weapons. He has served as Principal Air Force member of a Joint Service Panel to develop environmentally acceptable disposal procedures for the national stockpile of conventional munitions; Chairman of a multi-agency group responsible for medical and environmental evaluation of depleted uranium as kinetic energy penetrators; and as the senior official to increase technical focus on technology developments to deal with UXO and mines likely to be encountered by deployed combat forces. He also served as the Program Manager for development of a ground penetrating radar system to meet UXO detection and discrimination requirements of the U.S. Air Force. Recently he served on the Operational and Environmental Executive Steering Committee for Munitions and played a lead role in preparation of the DoD Munitions Action Plan. Prior to joining *CTC*, he was the Deputy Director of the Air Force Air Expeditionary Forces Technologies Division with technical and managerial oversight of 200 government and contract employees. He has a B.A. in Biology/Botany, an M.A. in Plant Physiology and Biochemistry, and a Ph.D. in Plant Biochemistry. He has been active in teaching chemistry at a local community college and is a Faculty Associate for the University of West Florida.

Name/Organization	Background Description
Subtask 7 Lead (CTC)	He is responsible for providing technical and management leadership for several major projects. These projects include Advanced Distributed Learning, De-manufacturing of Electronic Equipment for Reuse and Recycling, Corrosion Measurement and Control, Non Hazardous Solid Waste deconstruction and demolition. All of these projects were operated for the Department of Defense and the Environmental Technology Verification of Pollution Prevention Technologies operated for the Environmental Protection Agency. He holds a B.S. in Electrical Engineering (Honors) from Johns Hopkins University and a M.S. in Metallurgy and Materials Science from Lehigh University. He has more than 20 years of Manufacturing Engineering and Design and R&D experience. His work with Western Electric, Sandia National Laboratories and Lockheed Martin Corporation includes: electronics design and testing, corrosion control, organic and inorganic finishing, environmental control, technology transitioning and the demonstration, validation and implementation of new UXO and environmental remediation technologies. He participated as a member of Lockheed Martin's Advanced Environmental Systems' (LMAES) UXO project team and was involved in UXO remediation efforts at DoE's Idaho National Environmental Laboratory site. He also served as a member on the LMAES Kaho'olawe UXO proposal team. For that project, He was responsible for identifying the various technologies associated with UXO remediation, which applied to ground and aerial detection, ordnance disposal, and UXO site command control.

Name/Organization	Background Description
Subtask 1 Lead (CTC)	She is responsible for a variety of project management tasks, including maintaining budgets and schedules, organizing meetings, and preparing and executing test plans. Her duties also include the procurement of materials and subsequently the development of the final test reports. She is currently the Subtask Manager for UXO FY02 Subtask 5, QC Protocols for Technology Operators. Within the Environmental Assessment group, she performs environmental and occupational health risk assessments and provides technical support through statistical analysis of environmental data and quality assurance reviews. As a result of these tasks, she has extensive experience in data collection and evaluation. She holds a B.S. in Geo-Environmental Engineering from the Pennsylvania State University and is currently enrolled in a Geographic Information System (GIS) Certificate Program for ESRI's Arc View Software. She has experience in researching UXO detection and characterization technologies to best meet environmental, operational, and UXO consideration criteria.

Name/Organization	Background Description
Subtask 11 Lead (CTC)	He develops and manages technical projects that include investigation, assessment, and remediation of hazardous and toxic compounds at contaminated sites to meet risk-based cleanup standards. He is the Subtask Manager for UXO FY02 Subtask 3, UXO Remediation Technologies. He also manages GIS programs for information analysis, data evaluation, and technical or environmental management. He also is involved in assessment and redevelopment plans for Brownfield sites and pollution prevention programs for commercial, industrial and manufacturing facilities. He is the Technical Manager for development of a risk-based closure plan for selected work centers at the Tobyhanna Army Depot and an innovative cleanup approach that combines physical particle separation and stabilization to reduce soil lead concentrations at the Fort Dix small arms firing range. He holds a B.S. and a M.S. in Geology from Virginia Polytechnic Institute and Virginia State University and is a licensed geologist in the states of Arizona, Pennsylvania, and Virginia. He is a Certified Professional Geologist by the American Institute of Professional Geologists and a Certified Hazardous Materials Manager (CHMM) by the Academy of Hazardous Materials Managers. He currently is an active member of the Interstate Technology Regulatory Council (ITRC) UXO-OE Working Group (Geophysical Prove Out and Historical Records Review teams) and the ITRC Small Arms Team (SMART) Working Group. He has directed rehabilitation and maintenance projects at active DoD small arms firing ranges in New Jersey and has experience researching and evaluating UXO detection technologies. He has also conducted UXO investigation, assessment and removal projects in New Mexico and Montana.

Name/Organization	Background Description
Subtask 8 Lead (CTC)	He is a Project Engineer providing expertise in Weapons of Mass Destruction (WMD), Counter/Anti-Terrorism, and Explosive Ordnance Disposal response and training. He is currently a Subject Matter Expert for the Weapons of Mass Destruction - Response Element Advanced Laboratory Integrated Training and Indoctrination (WMD-REALITI) Program, which teaches advanced laboratory skills to the nation's top response teams. He has over 14 years of operational and training experience in the U.S. Navy Explosive Ordnance Disposal/Special Operations arenas including seven years of experience as a Chemical, Biological, Radiological, Nuclear, and Explosives (CBRNE) planner, instructor and exercise designer/evaluator. While at EOD Training & Evaluation Unit Two, he was the Lead Instructor for Weapons of Mass Destruction (Nuclear, Chemical, Biological) and was designated a Master Training Specialist by the Chief of Naval Education and Training. He has also researched and developed Render Safe Procedures for Improvised Explosive Devices that contained either Nuclear, Biological, or Chemical materials. He has trained and performed practical evaluations on over 500 DoD EOD front line operators as well as bomb squads from various police departments, the FBI, Secret Service, British and Israeli Armies. As a DoD qualified, UXO Range Safety Supervisor, he planned, coordinated, and supervised the removal, transport and disposal of UXO from numerous sites throughout the world. These UXO activities also included riverine and ocean environments. As the Leading Chief Petty Officer at Guantanamo Bay, Cuba, he planned, coordinated, and supervised the removal, transport, and disposal of over 13,000 pieces of ordnance, almost all of which were in an "armed and dangerous condition", with no injuries to personnel.

Name/Organization	Background Description
Subtask 10 Lead (CTC)	He has over 20 years of experience with Unexploded Ordnance (UXO) and Weapons of Mass Destruction (WMD) as a Project Manager, Master Explosive Ordnance Disposal (EOD) Technician, Master Technical Training Specialist (AF & Navy Certified), Environmental Manager, and Forensic Ballistic Testing Operator. He was the lead Project Manager who developed the International De-miners Guide To UXO Identification, Recovery, and Disposal known as **ORDATA** in support of the worldwide Humanitarian De-mining efforts for the Office of the Secretary of Defense (OSD) Special Operations/Low Intensity Conflicts (SO/LIC). He has experience as a Six Sigma Quality Manager. He was the Subject Matter Expert (SME) Lead Instructor/Evaluator, Naval School Explosive Ordnance Disposal, in the detection and identification of Weapons of Mass Destruction (nuclear, chemical, and biological) and Improvised Explosive Devices (pipe bombs, car bombs, letter bombs, etc.). He was named U.S. Air Force Instructor of the Year. Course audiences included U.S. Joint Service Military, Special Operations Command, FAA, FBI, ATF, Secret Service, FEMA, Nuclear Emergency Search Team (NEST), Defense Technical Response Team (DTRG), and U.S. Postal personnel. He has Developed Lesson Training Guides; Conducted Formal Classroom Instruction; Conducted Demonstration Methodology Instruction; Evaluated Performance of Knowledge, Skills, and Abilities; Trained U.S. Joint Service EOD, Foreign military, and Civilian Law Enforcement in the practical application of tools and techniques used to Neutralize UXO and root cause analysis of Dud Rates or Low Order Detonations. He was the NAVEODTD command Environmental Assistant. He is RCRA Management Certified and HAZWOPER Certified. He has managed Hazardous Waste sites including (Less Than 90 Day Storage Facilities, Thermal Treatment Facilities, OB/OD sites, Active Training Ranges, and a Pink Water Facility). He has designed, coordinated, and performed forensic ballistic tests using High-speed Flash Photography, High-speed Flash Radiography, and Digital Computer Topography (CT) on Shaped Charges, Explosive Ordnance, and experimental and/or un-fielded explosive driven tools. While on active duty, he safely handled multiple live IEDs, cleared hundreds of ranges, thousands of UXO, tens of thousands of OE and debris, and performed OB/OD disposal operations.

Name/Organization	Background Description
Stakeholder	He is a subject matter expert in Explosive Ordnance Disposal (EOD) and Weapons of Mass Destruction (WMD). He wrote the DoE Region 6 WMD response plan for Nuclear and Radiological WMD threats or actual incidents. He managed the distribution and calibration of electronic radiation detection equipment issued to 65 local and state Bomb Squads throughout five western States. He is familiar with GPS, UXO detection equipment and UXO removal procedures. He was a member of the 1999 Foster Wheeler Adak ordnance clearance and remediation project in Alaska. He developed safety procedures for EU disposal and wrote the in-service EOD recruiting guide that was used in both the Pacific and Atlantic Fleets. He managed the recruiting, retention, and required manning at each of the five EOD Units of the Pacific Fleet. He directed the training and evaluation for hazardous EOD operations throughout the Western Pacific. He conducted many military training classes, utilizing military explosives, on land and underwater. He also was responsible for response to all types of explosive ordnance incidents. He served as a quality assurance inspector with oversight of seven Pacific Fleet EOD Units. He developed exercises to evaluate the performance of detachments to safely perform EOD procedures for conventional, nuclear, chemical, and underwater ordnance. He holds an A.A. from the University of Phoenix and a B.S. in Liberal Studies from Regents College in Albany, New York.

Name	Background Description
Subtask 5 Lead (CTC)	He is responsible for technical support and direction in all aspects of risk sciences related to environmental projects. He is currently the FY02 Subtask Manager for Subtask 1, Program Management and Subtask 4, UXO Recovery Database. He defines risk assessment objectives and implements project-specific methodologies consistent with the risk assessment paradigm. He performs numerous technical tasks and provides technical direction to staff for conducting data evaluations, managing environmental databases, completing exposure/toxicity/risk assessments, carrying out risk calculations, working with Federal, State, and DoD personnel on environmental tasks, and writing reports. He holds a B.S. in Biology from the University of Pittsburgh and a M.S. in Environmental Science and Management from Duquesne University. He is also a Certified Hazardous Materials Manager (CHMM). He is responsible for the technical aspects of the U.S. Army's Rio Vista BRAC site closure task, which achieved regulatory closure on January 22, 2002. He also has experience in researching UXO detection and characterization technologies with expertise in the use of K-9 technologies for humanitarian de-mining. His database management experience includes acting as a key team member responsible for envisioning, developing, and expanding both the Toxicology Excellence for Risk Assessment's (TERA's) award-wining International Toxicity Estimates for Risk (ITER) database, and *CTC's* UXO-Detection and Characterization Expert System (UXO-DCES) Database.

Name	Background Description
CTC	He manages the activities of process engineers involved in various technology demonstration and validation efforts. He is the UXO FY02 manager for Subtask 02, Neutralization Technologies. He is an accomplished project manager currently managing technical projects in varied areas. These projects range from corrosion protection of ordnance to evaluation of new laser-based metallic surface modification technologies. He has experience in the evaluation of new and emerging technologies to meet specific goals. He holds a B.S. in Mechanical Engineering from the Ecole Nationale Superieure d'Arts et Metiers in Paris, France, a M.S. in Mechanical Engineering, and a Ph.D. in Materials Science and Engineering from Clemson University. He has experience in researching the applicability of various radar-based technologies to locate and identify UXO.
Subtask 4 Lead (CTC)	He is responsible for managing the Materials and Process Partnership for Pollution Prevention and the Pollution Prevention Initiative Tasks under the NDCEE, with a total value of approximately $15.4 million. He also managed a number of sub-tasks under this effort, including evaluating cyanide-free plating and stripping products and installing micro filtration equipment at a DoD site. He holds a Bachelor and Master of Electrical Engineering degree from the University of Detroit and a MBA from Canisius College in Buffalo, New York. He has extensive experience in DoD design, development and testing programs, including an RF-linked, frequency-hopping chemical agent detector system. He has investigated a variety of UXO detection technologies and is currently involved in developing a database of UXO recovery information and electromagnetic testing effects on munition fuses. He has experience with using and interfacing a variety of sensors, electromechanical packaging, and testing and evaluation in accordance with military specifications. He is a member of the Project Management Institute and the Institute of Electrical and Electronic Engineers.

Name	Background Description
Stakeholder	He is a Senior Operations Analyst for *CTC's* San Diego Office. He is responsible for development and execution of UXO projects. He is a retired U.S. Navy Captain with 27 years of leadership and experience in the U.S. Navy Special Operations Community culminating his career as the Commander of Pacific EOD Forces. Additionally, he was the Commanding Officer of two large and extensive shore installations. He is experienced in strategic planning and military security issues with a specialization in Hazardous Material Management. He also specializes in environmental remediation on UXO projects. He additionally is an adjunct professor of business (undergraduate and graduate programs) at National University, San Diego, CA. He holds a B.A. in European History from Michigan State University, a B.S. in Adult Education from Southern Illinois University, an M.A. in Soviet Studies and Strategic Planning from Naval Postgraduate School, an M.S. in Administration from Central Michigan University, an MBA in Business from Hawaii Pacific University, and an MSIS in Information Systems from Hawaii Pacific University. He is also a Certified Hazardous Material Manager, Master's Level, (ACHMM), a Certified Quality Manager (ASQ) licensed as California commercial blaster, and serves as a member of the California State Baldrige Award assessment team.

Subtask 4 Lead (CTC)	He is the Manager of Southwest Operations for *CTC* and is currently the manager for UXO FY02 Subtask 8, UXO Migration. He is responsible for the oversight of each project delivered from the San Diego office. He has an extensive military background, serving as the head of the Engineering Department on five different U.S. Navy ships. He has an Associate of Applied Science degree in Air Conditioning Technology, a Bachelor of Technical Education degree, and a Master of Arts degree in Public Policy from Trinity College in Hartford, Connecticut. He was a certified Force Protection/Anti-Terrorism Principal Advisor while on active duty. He was the certifying authority on explosive detection canines at the Naval Submarine Base, New London, Connecticut, while serving as the base Security Officer and Director of Public Safety. These canines were frequently used in support of Presidential visits in the Northeastern United States. He served on various shipboard nuclear weapons safety councils and committees, as well as shipboard safety councils and committees. He is experienced in working with the Federal Bureau of Investigation (FBI), the Naval Criminal Investigative Service (NCIS), Federal Emergency Management Agency (FEMA) and other state and federal agencies.

Name	**Background Description**

Subtask 12 Lead (CTC)	He is responsible for providing economic and management systems oversight for several major projects. These projects included the Environmental Security Technology Certification Program development of the Environmental Cost Analysis Methodology (ECAM[sm]), and the Sustainable Green Manufacturing program's development of the Environmental Management Assessment System Excel Self Assessment Model (EnSAM[tm]). He has conducted cost benefit studies for the Recovery and Reuse of HMX/RDX from Propellants and Explosives for Naval Surface Warfare Center Crane, Indiana. He has prepared Cost Benefit studies for De-manufacturing of Electronic Equipment for Reuse and Recycling program and various other programs operated by the NDCEE. Since its adoption in 1998, the NDCEE has conducted over 130 technology assessments under his oversight and using the ECAM methodology. He has also conducted site assessment of technology programs operated Environmental Technology Verification of Pollution Prevention Technologies operated for the Environmental Protection Agency. He drafted the Department of Defense Report on Pollution Prevention Demonstration projects in support of Vice President's Gore's National Performance Review. He also authored the Draft Policy Option "Life Cycle Costs," for the President Clinton's President's Council on Sustainable Development. He also co-authored the Annual (LCA) Life Cycle Software Review. He holds a M.B.A from the University of South Florida (Honors) and a BS degree (Honors) from Alfred University. He has more than 20 years of finance and cost analysis experience. Over the last ten years he has been the principal economist for NDCEE cost benefit studies. He has authored several papers on LCA software tools and the costs/benefits of pollution prevention technologies.