



INSTITUTE FOR DEFENSE ANALYSES

**2015 Review on the Extension of the  
AMedP-8(C) Methodology to New Agents,  
Materials, and Conditions**

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## Executive Summary

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In 2009, in support of the Office of the Surgeon General (OTSG), the Institute for Defense Analyses (IDA) produced the final draft of a North Atlantic Treaty Organization (NATO) planning guide documenting a methodology to estimate casualties from chemical, biological, radiological, and nuclear (CBRN) weapons. That document, *Allied Medical Publication 8(C): NATO Planning Guide for the Estimation of CBRN Casualties, (AMedP-8(C))*, promulgated in March 2011, included the parameters to estimate casualties caused by three chemical agents, five biological agents, seven radioisotopes, nuclear fallout, and prompt nuclear effects. Each year since 2009, OTSG has sponsored IDA to publish an annual review exploring and recommending extensions of this methodology to new agents, materials, and conditions. For 2015, as part of this continuing analysis, OTSG asked IDA to review policy and doctrine for managing “orphan” CBRN materials.

The concept of orphan material is best described in radioactive sources, where orphan sources are described as materials not under regulatory control. A review of policy across the Department of Defense and Joint and Service doctrine determined that there is generally very good policy and doctrine for the management of found chemical warfare material, incomplete policy and doctrine for abandoned radioactive materials, and limited policy and doctrine for biological materials. CBRN materials discovered in conjunction with a military operation would likely be managed under Weapons of Mass Destruction (WMD) Elimination doctrine; however, radioactive sources not associated with a suspected WMD site, such as an abandoned industrial source, are not well addressed.



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# 1. Introduction

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## A. Background

In 2009, in support of the Office of the Surgeon General (OTSG), the Institute for Defense Analyses (IDA) produced the final draft of a North Atlantic Treaty Organization (NATO) planning guide documenting a methodology to estimate casualties from chemical, biological, radiological, and nuclear (CBRN) weapons. That document, *Allied Medical Publication 8(C): NATO Planning Guide for the Estimation of CBRN Casualties, (AMedP-8(C))*, promulgated in March 2011, included the parameters to estimate casualties caused by three chemical agents, five biological agents, seven radioisotopes, nuclear fallout, and prompt nuclear effects. Each year since 2009, OTSG has sponsored IDA to publish an annual review exploring and recommending extensions of this methodology to new agents, materials, and conditions. For 2015, rather than perform a review extending the casualty estimation methodology to new agents, OTSG asked IDA to review doctrine and policy related to responses to “orphan” CBRN materials.

## B. Objective

The objective of this year’s annual review was to assess doctrine, policy, and historical responses to orphan CBRN materials and to identify potential improvements. This analysis looked at specified responsibilities in policy documents as well as techniques described in doctrine. This review originated from perceived differences in institutional training for management of orphan radiation sources and observed practices. This training placed responsibilities on health physicists and health physics technicians, among others, to secure and take responsibility for orphan sources, when in practice these groups were usually called in as advisors while another person (an installation or operational commander’s representative) actually performed the required duties.

The concept of an orphan source is best described in terms of radioactive material. The International Atomic Energy Agency (IAEA) defines an orphan source as “a radioactive source which is not under regulatory control, either because it has never been under regulatory control or because it has been abandoned, lost, misplaced, stolen, or otherwise transferred without proper authorization.”<sup>1</sup> The United States Nuclear

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<sup>1</sup> *IAEA Safety Glossary: Terminology Used in Nuclear Safety and Radiation Protection*, 2007 ed. (Vienna, Austria: IAEA, July 2007), 186, [http://www-pub.iaea.org/mtcd/publications/pdf/pub1290\\_web.pdf](http://www-pub.iaea.org/mtcd/publications/pdf/pub1290_web.pdf).

Regulatory Commission (NRC) has a more complete but less inclusive definition that states:

The term “orphan source” generally refers to a sealed source of radioactive material contained in a small volume — but not radioactively contaminated soils and bulk metals — in any one or more of the following conditions:

- In an uncontrolled condition that requires removal to protect public health and safety from a radiological threat
- Controlled or uncontrolled, but for which a responsible party cannot be readily identified
- Controlled, but the material's continued security cannot be assured. If held by a licensee, the licensee has few or no options for, or is incapable of providing for, the safe disposition of the material
- In the possession of a person, not licensed to possess the material, who did not seek to possess the material
- In the possession of a State radiological protection program for the sole purpose of mitigating a radiological threat because the orphan source is in one of the conditions described in one of the first four bullets and for which the State does not have a means to provide for the material's appropriate disposition<sup>2</sup>

Chemical and biological weapons and agents are not as well described as orphan material; however, munitions with an unknown fill may be considered recovered chemical or biological warfare material.<sup>3</sup>

## C. Scope

This analysis is a quick look at existing doctrine and policy for the management of orphan CBRN materials, both in administrative (garrison) and operational scenarios. The assessment addresses responsibilities, authorities, and, where available, techniques for managing orphan chemical and biological materials, and radiation sources. Nuclear weapons and related materials are a special case and beyond the scope of this document.

This assessment concentrates on responsibilities within the Department of Defense (DOD) and the Department of the Army. Where appropriate, it touches on recommendations at the national and international levels.

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<sup>2</sup> “Orphan Sources,” U.S. NRC, last modified March 30, 2015, accessed October 6, 2015, <http://www.nrc.gov/materials/miau/miau-reg-initiatives/orphan.html>.

<sup>3</sup> “Recovered Chemical Warfare Material Program (RCWM-P),” Assistant Secretary of the Army for Installations, Energy, and Environment, accessed October 6, 2015, <http://www.asaie.army.mil/Public/ESOH/rcwm.html>.

## **D. Document Organization**

This document is organized into five chapters. The first provides the background, objectives, and scope of the research. Chapter 2 provides an overview of existing policy and doctrine relevant to the management of orphan CBRN materials. Chapter 3 discusses chemical, biological, and radiological material in greater detail. Chapter 4 lays out overarching observations from the analysis of doctrine and policy, and Chapter 5 provides conclusions and recommendations.



## 2. Overview

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### A. Policy Guidance

When assessing policy and doctrine within DOD, a general methodology is to first review DOD Directives (DODDs) and DOD Instructions (DODIs), which establish policy at and across the Department and generally apply to all DOD Components.<sup>4</sup> Chairman of the Joint Chiefs of Staff Instructions (CJCSIs) and Manuals (CJCSMs) establish policies, procedures, and guidance not containing joint doctrine or concerning employment of forces in joint operations, and apply to the Joint Staff, Defense Agencies, Services, and Combatant Commands.<sup>5</sup> The Services and Military Departments typically implement DOD policy through regulations and instructions, such as Army Regulations (ARs) or Air Force Instructions (AFIs).

Doctrine generally describes how to perform a function. Joint Publications typically describe how a Combatant Command will plan, employ forces, and execute a Joint mission. Multi-service and Service-specific publications address tactics, techniques, and procedures for performing a function or set of functions.

Ideally, policy at the DOD level would establish requirements and programs to perform a DOD function. Service-specific regulations would establish authorities, responsibilities, and procedures to execute DOD policy. Doctrine, where needed, would describe “how” to perform that function.

### B. Policy Findings

Policy documents partially establish overall guidance for handling orphan CBRN material. Policy guidance largely falls into one of two areas: (1) Environmental protection or (2) Surety. DODI 4715.06, *Environmental Compliance in the United States*, establishes policy, assigns responsibilities, and provides procedures for achieving and maintaining environmental compliance in the United States.<sup>6</sup> DODI 4715.05 similarly establishes policy for environmental compliance outside the United States.<sup>7</sup> Two additional DODIs,

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<sup>4</sup> DODD 5025.01, *DoD Issuances Program* (Washington, DC: DOD, October 2014).

<sup>5</sup> CJCSM 5701.01E, *Formats and Procedures for Development of CJCS, JS, and J-Directorate Directives* (Washington, DC: CJCS, September 2011).

<sup>6</sup> DODI 4715.06, *Environmental Compliance in the United States* (Washington, DC: DOD, May 2015).

<sup>7</sup> DODI 4715.05, *Environmental Compliance at Installations Outside the United States* (Washington, DC: DOD, November 2013).

4715.07 and 4715.08, deal with environmental remediation and restoration. DODI 4715.07 establishes the Defense Environmental Restoration Program (DERP) and states it is DOD policy to “identify, evaluate, and where appropriate, respond to a release or threat of a release into the environment from DOD activities or DOD facilities involving” hazardous substances, pollutants or contaminants, or hazardous waste, specifically with regard to DOD activities within the United States.<sup>8</sup> DODI 4715.07 also expands the DOD Executive Agent authority of the Secretary of the Army for chemical demilitarization to include the responsibility for recovered chemical warfare material at DERP sites. DODI 4715.08 similarly establishes policy for environmental contamination outside the United States.<sup>9</sup> With the exception of the responsibility of the Secretary of the Army for recovered chemical munitions, these DOD issuances focus on hazardous materials and wastes as an environmental threat and do not specifically address responsibilities for CBRN hazards. Although there are issuances addressing CBRN consequence management, no specific CJCS issuance addresses orphan CBRN materials.

Surety regulations generally deal with the safeguarding of nuclear, chemical, and biological materials. DODD 3150.02 addresses nuclear weapons surety, but is directed at nuclear weapon systems and not at radiological material as such.<sup>10</sup> ARs 50-1, 50-5, and 50-6 address biological, nuclear, and chemical surety, respectively. AR 50-1 addresses biological surety, with an emphasis on regulated biological select agents and toxins. AR 50-5 establishes responsibilities within the Army for responding to radiological accidents and incidents, giving overall responsibility to the Deputy Chief of Staff for Operations and responsibility for developing policy and guidance for response to radiological accidents and incidents to the Deputy Chief of Staff for Logistics. AR 50-6 likewise addresses chemical surety. AR 50-1 and AR 50-6 assign responsibility to the Assistant Secretary of the Army (Installations and Environment) (ASA(I&E)) for oversight of programs relating to recovered biological and chemical warfare material, respectively.

AR 200-1 tasks the Commander, U.S. Army Corps of Engineers with providing Army DERP support to installations for hazardous, toxic, and radioactive waste. It also tasks the Commanding General, U.S. Army Materiel Command with executing low-level radioactive waste (LLRW) management, to include disposal.<sup>11</sup>

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<sup>8</sup> DODI 4715.07, *Defense Environmental Restoration Program (DERP)* (Washington, DC: DOD, May 2013), 2.

<sup>9</sup> DODI 4715.08, *Remediation of Environmental Contamination Outside the United States* (Washington, DC: DOD, November 2013).

<sup>10</sup> DODD 3150.02, *DoD Nuclear Weapons Surety Program* (Washington, DC: DOD, March 2015).

<sup>11</sup> AR 200-1, *Environmental Protection and Enhancement* (Washington, DC: Army, December 2007).

## C. Doctrine

Doctrine regarding orphan CBRN materials is limited. Doctrinal guidance can be found in various CBRN publications, explosive ordnance disposal (EOD) publications, and engineer publications. The first two primarily address CBRN munitions; the last deals with disposal of hazardous waste and hazardous material, but provides no direct procedures for disposal of CBRN hazards.

Army Techniques Publication (ATP) 3-11.23 describes tactics, techniques, and procedures for weapons of mass destruction (WMD) elimination operations. Although much of this publication focuses on the elimination of WMD programs, it also provides doctrine for isolation, exploitation, and destruction of WMD material in general.<sup>12</sup>

EOD support to CBRN devices or materials is described in ATP 4-32. This doctrinal publication includes guidance to units discovering potential CBRN devices as well as EOD units responding to a discovery, and describes the basics of response both within the homeland and in military operations.<sup>13</sup> Additional practices for specialized CBRN units are found in ATP 3-11.24, *Technical Chemical, Biological, Radiological, Nuclear, and Explosives Force Employment*.<sup>14</sup>

Approved doctrine normally informs formal institutional training within the Army. The U.S. Army Medical Department Center and School sponsors the Radiological Hazards Operator Course for junior officers and senior enlisted personnel within the health physics and related fields, as well as in nuclear and counterproliferation and CBRN military specialties. These include the specialties that are assigned to technical CBRN units such as the 20th Chemical, Biological, Radiological, Nuclear, and Explosives (CBRNE) Command. The course provides the skills and knowledge required to prepare for and respond to a radiological incident in a tactical environment. The training is conducted at either Idaho Falls or Oak Ridge National Laboratory and includes training in tasks to package radiation sources in preparation for movement.<sup>15</sup> Similarly, the U.S. Army Chemical, Biological, Radiological and Nuclear School conducts two radiation safety courses for all Services, the Radiological Safety Course (RADSAFE) and the Operational

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<sup>12</sup> ATP 3-11.23, *Multi-Service Tactics, Techniques, and Procedures for Weapons of Mass Destruction Elimination Operations* (Washington, DC: Army, November 2013).

<sup>13</sup> ATP 4-32, *Explosive Ordnance Disposal (EOD) Operations* (Washington, DC: Army, September 2013).

<sup>14</sup> ATP 3-11.24, *Technical Chemical, Biological, Radiological, Nuclear, and Explosives Force Employment* (Washington, DC: Army, May 2014). (FOUO).

<sup>15</sup> *Program of Instruction for 6H-F43/322-F36, Radiological Hazards Operator Course* (Fort Sam Houston, TX: Academy of Health Sciences, U.S. Army Medical Department Center and School, 2015), <http://www.cs.amedd.army.mil/FileDownloadpublic.aspx?docid=174c830a-2523-44e7-8635-be72fcf3c80e>.

Radiation Safety Course (OPRAD), both of which include disposal of radiation materials in their programs of instruction.<sup>16</sup>

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<sup>16</sup> Home page, U.S. Army Chemical, Biological, Radiological, and Nuclear School, accessed May 17, 2016, <http://www.wood.army.mil/newweb/chemical/index.htm>.



### 3. Management of Specific CBRN Materials

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#### A. Chemical Agents

The management of orphan or recovered chemical munitions is well covered in policy and doctrine. DODI 4715.07 clearly gives the Secretary of the Army responsibility for recovered chemical warfare material, and AR 50-6 clearly delegates that responsibility to the ASA(I&E), now the Assistant Secretary of the Army for Installations, Energy and Environment (ASA(IE&E)). The ASA(IE&E) has established the Recovered Chemical Warfare Material Program (RCWM-P).<sup>17</sup> The U.S. Army Chemical Materials Activity operates the Non-Stockpile Chemical Materiel Project (NSCMP), which maintains the capability to assess and treat recovered chemical warfare material.<sup>18</sup> An example of their highly successful work is provided on the U.S. Army Chemical Materials Activity's website:

In summer 2008, the U.S. Army Non-Stockpile Chemical Materiel Project (NSCMP) managed destruction of recovered chemical warfare materiel (RCWM) at Schofield Barracks, Hawaii. NSCMP was tasked by the office of the Deputy Assistant Secretary of the Army for Environment, Safety and Occupational Health, DASA (ESOH), to provide operational planning and testing of the Transportable Detonation Chamber (TDC) TC-60. The TDC explosively treats RCWM on site in a blast containment vessel, while capturing any vapor with redundant air filtration systems. Operators treated the last of the 71 recovered items on July 30, with an outstanding safety and environmental record. Operations were enhanced by NSCMP's assessment of the items, which aided in safe handling and storage.<sup>19</sup>

Operationally, ATP 3-11.23 lays out a process for WMD elimination activities that applies very well to chemical weapons. The publication details roles for general purpose forces; technical forces, such as CBRN reconnaissance; and specialized forces, such as EOD or elements of the U.S. Army 20th CBRNE Command.<sup>20</sup> Among the capabilities of

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<sup>17</sup> "Recovered Chemical Warfare Material Program (RCWM-P)," Assistant Secretary of the Army for Installations, Energy, and Environment, accessed October 6, 2015, <http://www.asaie.army.mil/Public/ESOH/rcwm.html>.

<sup>18</sup> "Non-Stockpile Chemical Materiel Project (NSCMP)," U.S. Army Chemical Materials Activity, last modified September 6, 2012, accessed October 13, 2015, <http://www.cma.army.mil/nscmp.aspx>.

<sup>19</sup> "Success Stories," U.S. Army Chemical Materials Activity, last modified September 6, 2012, accessed October 13, 2015, <http://www.cma.army.mil/successstories.aspx>.

<sup>20</sup> ATP 3-11.23, *Multi-Service Tactics, Techniques, and Procedures for Weapons of Mass Destruction Elimination Operations*.

the 20th CBRNE Command are the ability to package, transport, and dispose of CBRNE munitions and devices.<sup>21</sup>

## **B. Biological Agents**

The management of orphan or recovered biological munitions is covered in much of the same policy and doctrine as chemical munitions. DODI 4715.07 also gives the Secretary of the Army responsibility for recovered biological warfare material, and AR 50-1 clearly delegates that responsibility to the ASA(I&E), now ASA(IE&E). However, there is no “recovered biological warfare material” or similar program. Biological surety regulations generally implement the requirements of the Code of Federal Regulations (CFR) for the management of biological select agents and toxins (BSAT). CFR 42 §73.5 governs reporting and security requirements for BSAT identified in the course of clinical diagnosis.<sup>22</sup>

ATP 3-11.23 in general does not differentiate between types of WMD for elimination activities. The roles of general purpose, technical, and specialized CBRN forces apply equally to biological material.

## **C. Radiological Material**

There is generally less specific policy and doctrine within DOD for the management of recovered radiological material. DODI 4715.06 names the Army as the lead agent for environmental compliance related to LLRW. AR 200-1 gives specific roles for management of radioactive waste to the Corps of Engineers and U.S. Army Materiel Command. Neither the DODI nor the AR provide detail as to whether an intact radioactive source would be considered “radioactive waste.”

The same general doctrine previously described for biological and chemical hazards applies to radioactive materials in the context of WMD elimination. The roles of general purpose, technical, and specialized forces also apply in the context of nuclear and radioactive WMD elimination. Although the same capabilities would apply to found or recovered material, elimination doctrine does not directly address this activity. Interestingly, Department of the Army Pamphlet (DA Pam) 600-4 recognizes packaging,

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<sup>21</sup> Home Page, 20th CBRNE Command, accessed October 13, 2015, [http://www.cbrne.army.mil/pages/about\\_capabilities.htm](http://www.cbrne.army.mil/pages/about_capabilities.htm).

<sup>22</sup> Code of Federal Regulations Title 42: Public Health, accessed October 14, 2015, <http://www.ecfr.gov/cgi-bin/retrieveECFR?gp=&SID=8a4be60456973b5ec6bef5dfeaffd49a&r=PART&n=42y1.0.1.6.61>.

storage, and disposition of radioactive waste, as well as decommissioning of radioactive material facilities, as tasks of U.S. Army Health Physicist, Area of Concentration 72A.<sup>23</sup>

Within the United States, the Nuclear Regulatory Commission has established a memorandum of understanding with the Department of Energy on the management of certain orphan materials.<sup>24</sup> The Department of Energy, through Los Alamos National Laboratory, supports the Off-Site Source Recovery Project, which acts to recovery beta- and gamma-emitting sources with a process for registering and requesting assistance in the recovery of orphan sources.<sup>25</sup>

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<sup>23</sup> DA Pam 600-4, *Army Medical Department Officer Development and Career Management* (Washington, DC: Army, June 2007).

<sup>24</sup> "Orphan Sources," U.S. NRC.

<sup>25</sup> "Off-Site Recovery Project," Los Alamos National Laboratory, accessed October 14, 2015, <http://osrp.lanl.gov>.



## **4. Observations and Discussion**

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### **A. Legal Requirements and Compliance**

DOD policy for management of hazardous CBRN materials largely addresses minimizing environmental or health hazards as an implementation of federal environmental protection law within the United States or host nation environmental law for overseas installations. The various DOD Instructions emphasize compliance with federal, state, or tribal requirements and with international agreements with host nations. Most of these instructions do not apply to militarily unique operations, such as active ranges or during military operations. DOD and Army policies establish requirements for the safeguarding of DOD-owned materials through surety programs and recovery of chemical munitions.

### **B. Application of Policy to Installations and Military Operations**

Army policies establish the responsibilities of installation commanders for ensuring environmental compliance. The U.S. Army Corps of Engineers is tasked with specific responsibilities for hazardous material management, including radioactive waste, as part of the DERP. The U.S. Army Materiel Command similarly has specific responsibilities for the management of LLRW. Within the context of installation management, policy appears adequate for managing hazardous materials.

Surety regulations establish very good controls of known chemical and biological material in a research or diagnostic setting, including management of specimens ultimately determined to contain a biological select agent or toxin subject to regulatory requirements. While there is a clear responsibility and program for managing recovered chemical warfare material, there is much less guidance for the unlikely event of recovering potential biological warfare materials.

Much of the DOD-level environmental policy, such as DODI 4715.05 and 4715.06, does not apply during contingency operations.

### **C. Application of Doctrine to Orphan Materials**

There is little or no doctrine specific to orphan CBRN materials. Doctrine for WMD elimination and for the employment of technical CBRN capabilities largely addresses the exploitation, isolation, removal, or destruction of WMD programs or production capabilities. In an operation in which there is an expectation of encountering CBRN material, the discovery of potential CBRN weapons would almost certainly be a

commander’s critical information requirement and would be rapidly communicated through command channels, and elimination doctrine would provide good guidance on management of the event. The discovery of small amounts of material, such as an abandoned industrial radiation source, is not well addressed in doctrine. The technical capabilities discussed in doctrine for management of a larger scale WMD site also apply to management of a smaller event, but this is not well emphasized in doctrine. Institutional training, such as the Radiological Hazards Operator Course, places students in an artificial setting without many of the installation or operational specialties that would normally be present in a response, possibly confusing a normal advisory role. Table 1 provides a summary of doctrine and policy related to orphan materials discussed in this paper.

**Table 1. Summary of Doctrine and Policy**

<b>Agent Type</b>	<b>DOD Policy</b>	<b>Service Policy</b>	<b>Doctrine</b>
Chemical	DODI 4715.07: Army responsible for recovered chemical warfare material	Army Regulation 50-6: ASA(I&E) to provide oversight to recovered chemical warfare material	ATP 3-11.23 (multi-service) provides procedures for elimination operations
Biological	DODI 4715.07: Army responsible for recovered biological warfare material	Army Regulation 50-1: ASA(I&E) to provide oversight to recovered biological warfare material	ATP 3-11.23 (multi-service) provides procedures for elimination operations
Radiological	DODI 4715.06: Army is lead agent for low-level radioactive waste.	Army Regulation 200-1: Gives roles for management of radioactive waste to U.S. Army Corps of Engineers and U.S. Army Materiel Command	ATP 3-11.23 (multi-service) provides procedures for elimination operations

## 5. Conclusions and Recommendations

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Policy and doctrine only partially address the concept of orphan CBRN material. Policy largely covers environmental protection and DOD responsibilities to protect the environment and remediate damage, both in the United States and on overseas installations. Those policies largely extend U.S. legal requirements to DOD installations, and provide guidance on the applicability of host nation requirements, but generally exclude tactical operations. Specifically, there is no Joint or Service doctrine or DOD or Army policy governing roles of specific personnel, including health physicists or health physics technicians, in the recovery of orphan radiation sources.

There are very clear policy and established programs for the management of recovered chemical warfare materiel. DOD-level policy places specific responsibilities on the Army, and the Army has assigned that responsibility to an Assistant Secretary, with execution falling on the U.S. Army Chemical Materials Activity. Biological material responsibility is less clear; although the Army has the same responsibilities for recovered biological weapons, in fact there is very little in place to support this requirement. This is almost certainly a function of the significant period of time between the U.S. conclusion of offensive biological warfare programs and the demilitarization of U.S. chemical stockpiles; there is less perceived need for a system to recover biological weapons. Surety requirements for both chemical and biological materials are designed to minimize the risk of these materials leaving the control of approved research facilities. There is less specific guidance for radiation sources. Nuclear surety requirements address the control of materials within nuclear weapons programs, and various regulations address the control of materials in nuclear reactors. National-level programs such as the Off-Site Source Recovery Project are applicable to radioactive sources discovered on a DOD installation.

In the operational setting, doctrine is limited and largely addresses WMD elimination operations. Technical CBRN units such as the 20th CBRNE Command have the ability to safely manage a variety of materials. CBRN materials discovered during military operations, but outside of a suspected WMD site, can be managed by the same forces. The 20th CBRNE Command has the capability to package and transport hazardous materials.

To summarize:

- The concept of an “orphan source” is well established for radioactive materials.

- Chemical and biological hazards weapons and agents are not as well described as orphan material; however, munitions with an unknown fill may be considered recovered chemical or biological warfare material.
- While there is a clear responsibility and program for managing recovered chemical warfare material, there is much less guidance for the unlikely event of recovering potential biological warfare materials.
- Much of the DOD-level environmental policy, such as DODI 4715.05 and 4715.06, does not apply during contingency operations.
- No specific CJCS issuance addresses orphan CBRN materials; issuances addressing CBRN consequence management appear sufficient.

Policy at both the DOD and Service level should more clearly articulate responsibilities for managing recovered or orphan CBRN materials.

- The RCWM-P should serve as a model.
- For materials such as a recovered industrial radiation source, that are not part of a weapon system, policy and doctrine should emphasize isolation, cordon, and compliance with national standards and programs within the United States and compliance with host nation agreements for overseas installations.
- For weaponized materials, ensuring that existing doctrine for elimination and technical CBRN forces includes management of CBRN materials discovered incidental to other military operations may be sufficient.
- Doctrine could be extended to clearly address orphan medical or industrial radiation sources in an operational setting.
- Training, specifically the Radiological Hazards Operator Course, needs to emphasize a response team approach and ensure that responsibilities of students are clear in an actual response.



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## **Appendix B. Abbreviations**

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AFI	Air Force Instruction
AMedP-8(C)	Allied Medical Publication 8(C)
AR	Army Regulation
ASA(I&E)	Assistant Secretary of the Army (Installations and Environment)
ASA(IE&E)	Assistant Secretary of the Army for Installations, Energy and Environment
ATP	Army Techniques Publication
BSAT	Biological Select Agents and Toxins
CBRN	Chemical, Biological, Radiological, and Nuclear
CBRNE	Chemical, Biological, Radiological, Nuclear, and Explosives
CFR	Code of Federal Regulations
CJCS	Chairman, Joint Chiefs of Staff
CJCSI	CJCS Instruction
CJCSM	CJCS Manual
DA Pam	Department of the Army Pamphlet
DASA (ESOH)	Deputy Assistant Secretary of the Army for Environment, Safety and Occupational Health
DERP	Defense Environmental Restoration Program
DOD	Department of Defense
DODD	DOD Directive
DODI	DOD Instruction
EOD	Explosive Ordnance Disposal
IAEA	International Atomic Energy Agency
IDA	Institute for Defense Analyses
LLRW	Low-Level Radioactive Waste
NATO	North Atlantic Treaty Organization
NRC	U.S. Nuclear Regulatory Commission
NSCMP	Non-Stockpile Chemical Materiel Project
OPRAD	Operational Radiation Safety Course

OTSG	Office of the Surgeon General
RADSAFE	Radiological Safety Course
RCWM-P	Recovered Chemical Warfare Material Program
TDC	Transportable Detonation Chamber
U.S.	United States
WMD	Weapons of Mass Destruction

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