ATP 3-11.37
MCRP 10-10E.7
NTTP 3-11.29
AFTTP 3-2.44

Multi-Service Tactics, Techniques, and Procedures for Chemical, Biological, Radiological, and Nuclear Reconnaissance and Surveillance

MARCH 2021

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Headquarters, Department of the Army

Foreword

This publication has been prepared under our direction for use by our respective commands and other commands, as appropriate.

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Army Techniques Publication No. 3-11.37	Headquarters Department of the Army Washington, DC
Marine Corps Reference Publication No. 10-10E.7	Marine Corps Combat Development Command Quantico, VA
Navy Tactics, Techniques, and Procedures No. 3-11.29	Navy Warfare Development Command Norfolk, VA
Air Force Tactics, Techniques, and Procedures No. 3-2.44	Air Force Civil Engineer Center Tyndall Air Force Base, FL

31 March 2021

Multi-Service Tactics, Techniques, and Procedures for Chemical, Biological, Radiological, and Nuclear Reconnaissance and Surveillance

Contents

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Preface

ATP 3-11.37/MCRP 10-10E.7/NTTP 3-11.29/AFTTP 3-2.44 provides fundamental tactics, techniques, and procedures for planning, preparing, and executing chemical, biological, radiological, and nuclear (CBRN) reconnaissance and surveillance (R&S). This publication is designed for use at the tactical level, but it also has implications at operational and strategic levels, to include the potential range of military activities and operations extending from military engagement, security cooperation, and deterrence in times of relative peace through large-scale combat operations (LSCO). It is applicable to conventional forces commanders and staffs at all echelons. It applies to Active and Reserve Components and supports command staffs, CBRN staff officers, CBRN enlisted personnel, and non-CBRN personnel who are performing or are assigned R&S missions or tasks.

The principal audience for ATP 3-11.37/MCRP 10-10E.7/NTTP 3-11.29/AFTTP 3-2.44 is the Army, Marine Corps, Navy, and Air Force commanders, staffs, and leaders executing or supporting CBRN reconnaissance and surveillance.

Commanders, staffs, and subordinates ensure that their decisions and actions comply with applicable United States, international, and in some cases host-nation laws and regulations. Commanders at all levels ensure that their Service members operate in accordance with the law of war and the rules of engagement. (See FM 6-27/MCTP 11-10C.)

ATP 3-11.37/MCRP 10-10E.7/NTTP 3-11.29/AFTTP 3-2.44 uses joint terms where applicable. Selected joint, Service, and multi-Service terms and definitions appear in both the glossary and the text. Terms and definitions for which this publication is the proponent publication are bold faced in the text and are marked with an asterisk (*) in the glossary. For other definitions shown in the text, the term is italicized and the number of the proponent publication follows the definition.

ATP 3-11.37/MCRP 10-10E.7/NTTP 3-11.29/AFTTP 3-2.44 applies to the Active Army, Army National Guard/Army National Guard of the United States, United States Army Reserve, United States Marine Corps, United States Marine Corps Reserve, United States Navy, United States Navy Reserve, United States Air Force, United States Air Force Reserve, and United States Air National Guard unless otherwise stated.

The proponent of ATP 3-11.37/MCRP 10-10E.7/NTTP 3-11.29/AFTTP 3-2.44 is the United States Army Chemical, Biological, Radiological, and Nuclear School. The preparing agency is the Fielded Force Integration Directorate, Doctrine Division, Maneuver Support Center of Excellence (MSCoE). Send comments and recommendations on DA Form 2028 (*Recommended Changes to Publications and Blank Forms*) to Commander, MSCoE, ATTN: ATZT-OPD-D, 14000 MSCoE Loop, Suite 270, Fort Leonard Wood, MO 65473-8929; by e-mail to usarmy.leonardwood.mscoe.mbx.cbrndoc@mail.mil; or submit an electronic DA Form 2028.

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Introduction

Russia, China, North Korea, and Iran are examples of CBRN-capable threats that represent a challenge to the readiness of United States (U.S.) forces across the range of military operations. It is highly anticipated that these threats will use multiple approaches in different phases to leverage CBRN to their advantage. CBRN R&S exists to provide the freedom of action for U.S. forces operating in CBRN environments. CBRN R&S capabilities across the Services provide an agile, adaptive team that enables these forces to fight and win in a complex CBRN environment. ATP 3-11.37/MCRP 10-10E.7/NTTP 3-11.29/AFTTP 3-2.44 presents principles and tactical-level tactics, techniques, and procedures related to CBRN R&S and describes how to employ CBRN R&S capabilities in support of operations. The tactical and technical guidance provided also support sound decision making for forces operating in CBRN environments.

The CBRN threats and hazards that are the subject of this publication are those that could create adverse effects due to accidental or deliberate release or intentional employment. CBRN hazards include toxic industrial chemicals, biologicals, and radiologicals collectively known as toxic industrial materials (TIMs).

The use of a trade or brand name in the provided text does not constitute endorsement of the product. ATP 3-11.37/MCRP 10-10E.7/NTTP 3-11.29/AFTTP 3-2.44 contains the following seven chapters and seven supporting appendixes:

- **Chapter 1** provides an understanding of the fundamentals of CBRN R&S operations and how they integrate with intelligence, surveillance, and reconnaissance (ISR) and with joint warfighting functions.
- **Chapter 2** defines the Department of Defense (DOD) four-tiered identification levels, provides a comparison to the North Atlantic Treaty Organization (NATO) identification levels, and addresses special considerations and decision-making linkages to CBRN identification.
- **Chapter 3** describes the relationship between the commander, the operations process, and CBRN R&S; highlights how CBRN R&S support large-scale combat operations; and describes the planning fundamentals and processes of CBRN R&S.
- **Chapter 4** describes preparation activities for conducting CBRN R&S, including troop-leading procedures.
- **Chapter 5** provides an overview of selecting and executing the approach, methods, types, forms, and tasks to conduct CBRN R&S.
- **Chapter 6** defines the requirements, roles, and responsibilities to conduct sample collection, management, and processing.
- **Chapter 7** describes the requirements and processes to conduct marking and reporting of hazards assessed during CBRN R&S.
- **Appendix A** provides a metric conversion list.
- **Appendix B** provides guidance on the advantages, disadvantages, and execution of dismounted CBRN R&S.
- **Appendix C** provides guidance on the advantages, disadvantages, and execution of mounted CBRN R&S.
- **Appendix D** recommends form and techniques used by aerial CBRN reconnaissance.
- **Appendix E** provides a framework for the integration of unmanned systems to CBRN R&S.
- **Appendix F** consists of a base set of procedures for sample collection and processing.
- **Appendix G** provides a foundational level of general threat recognition factors.

Based on current doctrinal changes, certain terms for which ATP 3-11.37/MCRP 10-10E.7/NTTP 3-11.29/AFTTP 3-2.44 is the proponent have been modified for the purposes of this manual. The glossary contains acronyms and defined terms. See introductory table-1, page x, for specific term changes.

Introductory table-1. Modified terms

Term	*Remarks*
field confirmatory identification	Modifies the definition.
presumptive identification	Modifies the definition.
theater validation identification	Modifies the definition.

Chapter 1

Fundamentals

This chapter introduces the joint ISR process and CBRN R&S tasks. It provides the fundamentals for how CBRN R&S is applied through the joint ISR process and CBRN operational planning and defines CBRN R&S principles.

JOINT INTELLIGENCE, SURVEILLANCE, AND RECONNAISSANCE

1-1. *Intelligence* is the product resulting from the collection, processing, integration, evaluation, analysis, and interpretation of available information concerning foreign nations, hostile or potentially hostile forces or elements, or areas of actual or potential operations. (JP 2-0) The joint intelligence preparation of the operational environment (JIPOE) process or intelligence preparation of the battlefield (IPB), managed by the joint intelligence staff (J-2)/major subordinate command (G-2)/brigade or below intelligence staff officer (S-2), is designed to account for probable, confirmed, and plausible enemy and adversary capabilities, actions, and intentions.

1-2. The intelligence function, influenced by the J-2/G-2/S-2 and with the direction of commanders, allocates and synchronizes intelligence assets and joint ISR to continuously determine the locations, strengths, and probable intentions of enemy forces. *Intelligence, surveillance, and reconnaissance* is an integrated operations and intelligence activity that synchronizes and integrates the planning and operation of sensors, assets, and processing, exploitation, and dissemination systems in direct support of current and future operations. (JP 2-01)

1-3. Joint ISR is an integrated intelligence and operations function that synchronizes and integrates the placement of sensors and assets. Joint ISR involves the processing, exploitation, and dissemination of information in direct support of current and future operations. The J-2/G-2/S-2 is responsible for identifying potential collection targets based on operational trends and prioritized collection requirements that are used to drive reconnaissance and security mission planning. The CBRN staff collaborates with the intelligence section to assess enemy CBRN capabilities and potential courses of action, the impact of current and projected weather, and the enemy intent to use CBRN weapons. Intelligence analysis is the key function that enables understanding of the area of operations (AO) and threat capabilities and of the critical operational impacts of these factors. Information collection and intelligence analysis supports the CBRN staff in preparing accurate threat assessments.

1-4. Medical, engineer, CBRN, civil affairs forces, and staff sections contribute to the joint ISR process through the reporting of analysis of the operational environment (OE) and variables relevant to their functions. The products of the CBRN staff analysis feed into IPB, the overall joint ISR process, and other staff section mission analysis results.

Note. For additional information regarding joint ISR and optimization, see ATP 3-55.3/MCRP 2-10A.8/NTTP 2-01.3/AFTTP 3-2.88.

1-5. Joint ISR capabilities support countering weapons of mass destruction (CWMD) by enabling the command to locate, identify, characterize, and assess weapons of mass destruction (WMD) networks and activities. It is supported by an information collection plan that identifies areas for collection that leverage integrated sensors/unmanned systems, electronic warfare, cyberspace, aircraft, and CBRN units that lead to real-time understanding of the CBRN environment during decisive action. Knowledge about the OE requires proactive and continuous R&S to acquire information. All source analysis of information from multiple sources becomes intelligence that provides answers to commander's critical information requirements

(CCIRs) concerning the enemy or adversary, weather, terrain, and civil considerations. It is critical that CBRN staffs contribute to joint ISR synchronization and integration planning, providing technical and subject matter expertise in collaboration with the J-2/G-2/S-2, operations directorate of a joint staff (J-3)/battalion or brigade operations staff officer (S-3), and civil-military operations directorate of a joint staff (J-9)/battalion or brigade civil affairs operations staff officer (S-9) to maximize CBRN-specific joint ISR coverage.

1-6. During the phases of the joint ISR process, the CBRN staff ensures the integration of CBRN R&S forces, their activities, and information collected when there is a CBRN threat or hazard. The CBRN staff provides input to the overall joint ISR process through collaboration. The staff ensures that CBRN priorities of effort are depicted in the collection plans to satisfy the information requirements, determine the best method(s) and asset(s) to collect the information, and maintain situational awareness of ongoing information collection.

1-7. This publication focuses on CBRN R&S. The terms R&S are, in many cases, used synonymously, yet they are two separate tasks of joint ISR operations:

- *Reconnaissance* is a mission undertaken to obtain, by visual observation or other detection methods, information about the activities and resources of an enemy or adversary, or to secure data concerning the meteorological, hydrographic, or geographic characteristics of a particular area. (JP 2-0)
- *Surveillance* is the systematic observation of aerospace, cyberspace, surface, or subsurface areas, places, persons, or things by visual, aural, electronic, photographic, or other means. (JP 3-0)

1-8. The purpose of CBRN R&S is to provide commanders with detailed, timely, and accurate information to inform commander's decisions or answer CCIRs. As information is collected from multiple CBRN R&S capabilities, it is analyzed and yields intelligence that supports answering the CCIRs concerning CBRN impacts to the commander's scheme of maneuver.

1-9. CBRN staffs contribute to the development of the CCIRs and, with the J-3/S-3 and upon the commander's approval, recommend CBRN named areas of interest (NAIs). The *named area of interest* is a geospatial area or systems node or link against which information that will satisfy a specific information requirement can be collected, usually to capture indications of adversary courses of action. (JP 2-01.3) CCIRs can be collected. NAIs typically indicate the selection of an enemy course of action or planned CBRN usage.

1-10. CBRN R&S capabilities detect hazards or anomalies from a sequential approach. Where possible, sensors and observation devices are used to detect hazards from stand-off distances. Stand-off detection then cues reconnaissance leaders to gather further detail on a specific location, potentially involving autonomous or semiautonomous unmanned systems to further interrogate the hazard or anomaly. These can be launched from modular payloads capable of being integrated with CBRN R&S units. If greater fidelity of information or sampling operations is required, CBRN R&S units directly provide assessment, characterization, and exploitation of hazards to provide information to CBRN staffs.

1-11. Once CBRN R&S collects information on CBRN-specific NAIs, the CBRN staffs process and interpret data provided from CBRN R&S elements to provide clarity to attain hazard awareness and understanding for commanders and staffs. The end state of CBRN R&S operations is intelligence that reduces ambiguity to enable the commander's decision making.

RELEVANCE TO JOINT AND SERVICE WARFIGHTING FUNCTIONS

1-12. While this manual focuses on CBRN R&S, the CBRN staff planner must understand how CBRN R&S is relevant to the joint and Service warfighting functions. A *warfighting function* is a group of tasks and systems united by a common purpose that commanders use to accomplish missions and training objectives. (ADP 3-0) Warfighting functions are the physical means that commanders use to execute operations and accomplish missions. Their purpose is to provide an intellectual organization for common critical capabilities relevant to all echelons and levels of warfare.

1-13. The joint and Service warfighting functions are—

- Command and control (C2).
- Intelligence.
- Fires.
- Movement and maneuver.
- Protection.
- Sustainment.
- Information (joint).

Note. For more information on the joint and Service warfighting functions, see JP 3-0.

1-14. To execute operations, commanders conceptualize capabilities that generate combat power. The warfighting functions make up the elements of combat power. CBRN R&S provides relevant data and information to support decision making across all warfighting functions.

COMMAND AND CONTROL

1-15. C2 encompasses the exercise of authority and direction by a commander over assigned and attached forces to accomplish the mission. Command includes both the authority and responsibility to use resources to accomplish assigned missions. Command at all levels is the art of motivating and directing people and organizations to accomplish missions. The C2 function consists of the architecture, organization, and system that support an efficient decision-making process.

1-16. Reconnaissance operations are essential to successful operations. Commanders at all levels rely on reconnaissance to achieve situational understanding; visualize operations in the context of mission and operational variables; develop the situation; and identify and create options to seize, retain, and exploit the initiative. CBRN R&S planning and operations must be integrated and congruent within overall reconnaissance operations, complementing maneuver reconnaissance operations while addressing CBRN-related CCIRs and rapidly cueing CBRN R&S operations against reports from traditional reconnaissance operations.

1-17. CBRN staff members are critical to supporting C2 by supporting the mission analysis, identifying critical facts and assumptions that aid in the development of the initial CCIR. The CCIRs are composed of priority intelligence requirements (PIRs) and friendly force information requirements, which facilitate timely decision making. PIRs are an information requirement necessary to understand the adversary or OE. PIRs identify information about the enemy, terrain, weather, and civil considerations that the commander considers most important and that will impact future decisions. Friendly force information requirements identify information about friendly forces and supporting capabilities; it is information that affects future courses of action and decisions from a friendly perspective.

1-18. Based on identified information requirements, staffs assign tasks to prioritize, manage, and develop the collection of information requirements leading to future decisions. As staffs identify the requirements necessary for successful execution, they recommend and assign tasks for units to conduct reconnaissance and provide answers that allow the commander to make decisions and capitalize on opportunities.

SUPPORT TO INTELLIGENCE

1-19. CBRN R&S directly supports the joint and Service warfighting function of intelligence. Intelligence provides commanders with an understanding of the OE. The intelligence function includes planning and direction, to include managing counterintelligence activities, collection, processing, exploitation, analysis, production, dissemination, integration, evaluation, and feedback. CBRN R&S provides raw data and, in some cases, processed information to inform military decision making across a broad range of tasks.

1-20. CBRN staffs use all available intelligence provided by the J-2/G-2/S-2 to conduct CBRN threat assessments to determine if units will confront CBRN threats and hazards. When CBRN staffs conduct threat assessments, they use all available collection platforms in conjunction with CBRN R&S forces to provide layered, redundant coverage that identifies enemy capabilities, opportunities, and intentions. See ATP 3-11.36/MCRP 10-10E.1/NTTP 3-11.34/AFTTP 3-2.70 for more information on threat assessments.

1-21. CBRN R&S feeds into intelligence fusion (see JP 2-0), providing the most accurate and complete depiction of what is known about an activity in the OE. CBRN forces can contribute to intelligence through site exploitation. *Site exploitation* is a series of activities to recognize, collect, process, preserve, and analyze information, personnel and/or materiel found during the conduct of operations. (JP 3-31) CBRN R&S elements and supporting/supported explosive ordnance disposal (EOD), engineer, or intelligence elements provide weapons technical information of WMD to staffs. CBRN R&S forces provide intelligence staffs technical and forensic information recovered from sensitive sites to support analysis. During processing and exploitation, raw data collected from CBRN R&S is converted into intelligence that can be readily used by commanders, staffs, and decision makers at all levels.

1-22. CBRN staffs must integrate with the J-2/G-2/S-2 intelligence staffs and be able to conduct their own analysis from multiple intelligence sources to support the information collection plan and confirm logical placements of CBRN R&S capabilities to answer CCIRs. Table 1-1 describes the types of intelligence and examples of how CBRN staffs may utilize them during joint ISR planning.

Table 1-1. Intelligence area contributions

Intelligence	***Definition***	***CBRN R&S contribution***
GEOINT	The exploitation and analysis of imagery and geospatial information to describe, assess, and visually depict physical features and geographically referenced activities on the Earth (JP 2-03).	GEOINT assists CBRN planners in understanding terrain effects on CBRN hazards and the downstream effects that make attack locations lucrative for enemy CBRN targeting. Furthermore, terrain analysis from GEOINT can provide insight into CBRN transfer and loading locations of agents onto projectile and missile warheads.
HUMINT	A category of intelligence derived from information collected and provided by human sources (JP 2-0).	Intelligence interrogation and source operations may provide critical details for WMD pathways, networks, capabilities, and delivery systems to friendly forces. HUMINT can be gained from understanding populations via nonlethal engagements through information operations.
SIGINT	Intelligence produced by exploiting foreign communications systems and noncommunication emitters (JP 2-0).	SIGINT provides CBRN staffs with unique opportunities to provide early warning and protection from CBRN attacks through the interception of critical enemy communications directing the transfer, load, or launch of enemy CBRN attacks.

Table 1-1. Intelligence area contributions (continued)

Intelligence	*Definition*	*CBRN R&S contribution*
TECHINT	Intelligence derived from the collection, processing, analysis, and exploitation of data and information pertaining to foreign equipment and materiel for the purposes of preventing technological surprise, assessing foreign scientific and technical capabilities, and developing countermeasures designed to neutralize an adversary's technological advantages (JP 2-0).	Assets from the National Ground Intelligence Center, Weapons of Mass Destruction Division, Asymmetric Warfare Group, Dugway Proving Ground, United States Army Combat Capabilities Development Command Chemical Biological Center, Edgewood, and other governmental agencies can provide substantial TECHINT on enemy CBRN development, tactics, techniques, procedures, and delivery systems. TECHINT is processed and disseminated through Army CBRNE companies as they conduct site exploitation operations.
MEDINT	Intelligence resulting from collection, evaluation, analysis, and interpretation of foreign medical, bio-scientific, and environmental information that is of interest to strategic planning and to military medical planning and can provide medical staffs with information to support medical CBRN planning (JP 2-01).	The National Center for Medical Intelligence is the only authorized organization that processes medical information into a finished MEDINT product. MEDINT assists CBRN planners in understanding potential dual-use medical and bio-scientific expertise, equipment, and facilities; endemic biological agents; and environmental and occupational conditions that may factor into threat assessments of the area of operations.

Legend:

CBRN	chemical, biological, radiological, and nuclear
CBRNE	chemical, biological, radiological, nuclear, and explosives
GEOINT	geospatial intelligence
HUMINT	human intelligence
JP	joint publication
MEDINT	medical intelligence
SIGINT	signals intelligence
TECHINT	technical intelligence
WMD	weapons of mass destruction

1-23. CBRN staff members are encouraged to utilize Department of Army Intelligence Information Systems and the United States Army Training and Doctrine Command (TRADOC) OE Data Integration Network (ODIN) Web site to conduct a thorough intelligence analysis in support of R&S planning. Additional information for the Marine Corps through the Marine Corps Intelligence Agency is available at the Intel link Web site. Resources available to the Air Force are the Intelink Web site and the local installation Intel Flight or Office of Special Investigations detachment. CBRN R&S should always integrate all-source intelligence analysis into planning to inform and answer CCIRs or to direct capabilities toward answering PIRs.

SUPPORT TO FIRES

1-24. The *fires warfighting function* is the related tasks and systems that create and converge effects in all domains against the adversary or enemy to enable operations across the range of military operations. (ADP 3-0) It includes tasks associated with integrating and synchronizing the effects of the types of fires with the effects of other warfighting functions. CBRN R&S is most closely nested with the fires warfighting function through the operations and targeting processes.

1-25. During the course of operations, CBRN R&S may identify high-payoff targets (HPTs). A *high-payoff target* is a target whose loss to the enemy will significantly contribute to the success of the friendly course of action. (JP 3-60) CBRN-specific HPTs are targets that could significantly shape the OE by degrading the enemy's freedom of action, enabling friendly forces, or preventing the use or access to CBRN, including TIMs and other WMD or supporting networks or items. CBRN HPTs are not limited to CBRN-dedicated weapon systems or stockpiles of CBRN agents or materials; however, they may include personnel, C2 systems, or logistical stockpiles.

1-26. CBRN-specific HPTs are differentiated from other targets due to their operational or strategic importance, including increased risk to friendly forces, destructive effects on strategic or operationally key terrain, and unique mitigation requirements. CBRN HPTs are identified and prioritized, driving the development of reconnaissance and targeting guidance and the allocation of reconnaissance and fire assets against prioritized targets. Through the joint targeting cycle or Service-specific targeting procedures, subsequent decisions are made on how to engage the target to meet the desired effect. (See ATP 3-60 or JP 3-60 for more information.) Targeting working groups analyze CBRN HPTs and develop options to engage them. The options to engage CBRN targets include the full range of air or surface fires, electromagnetic warfare, and cyber operations.

1-27. CBRN HPTs should be templated in time and space that is consistent with the latest known reporting requirements (such as assembly, staging, transportation, and maintenance), enemy doctrines and practices, and assessed enemy COAs. *Target areas of interest* are the geographical area where high-value targets can be acquired and engaged by friendly forces. (JP 2-01.3) By providing CBRN HPTs to the targeting group and emplacing target areas of interest during planning capabilities, the opportunity for fires or aviation assets to interdict CBRN attacks increases dramatically. Extreme caution should be exercised when targeting CBRN/WMD facilities, stockpiles of bulk materials, or large weapons stores because the consequence of execution could create a significant downwind hazard that might affect local populations or friendly forces.

1-28. The targeting process is used to identify, target, and exploit sensitive sites. It is analogous to, and can be embedded in, the process used by a fires cell in planning, preparing, and executing other time-sensitive or HPTs. Information collected from effective tactical site exploitation and technical exploitation supports follow-on operations and targeting and enhances force protection. For example, conducting a cordon and search or raid supported by CBRN R&S capabilities can produce information and intelligence that facilitates subsequent attacks targeting threat networks (see ATP 3-90.15).

Support to Movement and Maneuver

1-29. CBRN R&S capabilities are force multipliers that maneuver units throughout all phases of operations, providing early warning and situational awareness under CBRN conditions. Throughout operations, CBRN R&S elements are placed in the appropriate command/support relationships, in consideration of threat reporting and weighting maneuver formations according to the commander’s intent.

1-30. CBRN R&S supports the offense as part of a larger maneuver force or as a specialty unit directed by their respective headquarters. These assets, which are normally organized, allocated, and assigned at the platoon level, primarily perform information collection tasks directed at CBRN PIRs.

1-31. During defensive operations, CBRN R&S capabilities are assigned to deep and close areas to answer specific CBRN PIRs about enemy COAs. CBRN capabilities in friendly support areas monitor key lines of communication and logistics or sustainment nodes, including aerial ports of debarkation (APODs) and seaports of debarkation (SPODs).

1-32. CBRN R&S capabilities may provide early warning of CBRN attacks to the force. They allow maneuver units to rapidly exploit CBRN environments. CBRN R&S forces operate within the supporting range (within the maximum effective range of direct-fire systems) of maneuver elements to ensure that they are not quickly destroyed by the first engagement with the enemy.

1-33. Some CBRN R&S forces are capable of performing general reconnaissance, security, and tactical enabling tasks, such as route reconnaissance and the forward passage of lines. The ability to provide unit freedom of action increases with the amount of training and exercise integration with CBRN capabilities and the supported maneuver element. CBRN R&S forces execute local security for themselves, but they are more vulnerable to direct fires. As the forward line of troops (FLOT) advances and defeats enemy forces, small pockets of resistance may be bypassed or left behind. CBRN weapons caches, underground facilities (UGF), and WMD production facilities may be seized and require follow-on CBRN assessment or exploitation support by CBRN R&S forces. For example, CWMD task forces conduct small-scale control, defeat, disable, and dispose activities to defeat enemy protracted CBRN activities. Special reconnaissance of CBRN targets of interest may include site exploitation. If the tactical situation dictates, special reconnaissance may be conducted by follow-on forces.

Note. Combined Arms CWMD operations at the tactical level are described in ATP 3-90.40.

SUPPORT TO PROTECTION

1-34. In joint operations, *protection* is the preservation of the effectiveness and survivability of mission-related military and nonmilitary personnel, equipment, facilities, information, and infrastructure deployed or located within or outside the boundaries of a given operational area. (JP 3-0) Protection efforts must consider and account for threats and hazards in all directions, at all times, and in all environments. Protection integrates all protection capabilities to safeguard the force, personnel (combatants and noncombatants), systems, and physical assets of the United States and its mission partners. In addition to the primary protection task, commanders and staffs must coordinate, synchronize, and integrate additional protection capabilities and resources of unified action partners. The protection warfighting function enables the commander to maintain force integrity and combat power and mitigate risk to mission success.

1-35. Protection is a unique warfighting function because its tasks and systems have a collaborative and cumulative effect on actions across the levels of war and range of military operations. Service members conduct CBRN and non-CBRN tasks that contribute to the overall protection effort across a wide range of formations and echelons. Information collected by CBRN R&S operations is vital to overall protection efforts. Although primarily a protection function, the reconnaissance objectives for CBRN R&S and other reconnaissance organizations are frequently close or have the same objectives; therefore, CBRN R&S capabilities are usually task-organized to direct support of maneuver formations and support formations that are assigned maneuver tasks as their primary tasks.

1-36. CBRN R&S supports protection efforts by providing information on the scale, location, and type of CBRN strikes or TIM releases. CBRN surveillance throughout the AO enables rapid mitigation efforts to protect friendly forces. CBRN R&S complements maneuver reconnaissance efforts in the recon/counter reconnaissance fight, disrupting enemy targeting processes in the near fight while enabling friendly movement and maneuver to disrupt, degrade, and destroy enemy capabilities, to include CBRN-capable weapon systems.

1-37. Protection is a collaborative function that is reliant on both lateral and vertical coordination to execute comprehensive, integrated, layered, redundant, and enduring protection. CBRN staff members and CBRN R&S leaders must be cognizant of the support that CBRN R&S provides to protection activities. They must also contribute to the holistic execution of protection through actions, such as—

- Supporting JIPOE, including projected enemy courses of action.
- Supporting the development of protection priorities, critical asset and defended asset lists, and protection plans.
- Coordinating protection with partners.

1-38. The above actions drive information requirements. Reconnaissance will later validate the information requirements.

SUPPORT TO SUSTAINMENT

1-39. Robust sustainment capabilities are vital to the expeditionary, maneuver-centric manner in which U.S. forces fight. CBRN R&S supports sustainment efforts by conducting reconnaissance of potential logistic sites and routes, enabling the rapid establishment of support areas and contingency plans for alternate sites. CBRN R&S operations support situational awareness throughout the AO with respect to reported contamination, enabling route selection for logistic movement. CBRN R&S operations further support logistics by providing additional information on the type of CBRN hazard, thereby enabling medical treatment and medical support operations.

1-40. CBRN R&S elements play a role in the strategically vital task of theater entry by supporting APOD/SPOD openings, allowing the buildup of combat power and logistics to execute theater campaign plans. Historically, theater entry is a period of high risk for enemy employment of CBRN weaponry to prevent the establishment of significant friendly combat power.

1-41. CBRN R&S enables mobility and, where possible, supports the reconnaissance/counterreconnaissance fight and the fires/counterfight. Establishing friendly dominance in these areas disrupts and degrades the enemy fires operations and capabilities, reducing the risk to sustainment operations throughout the AO.

Support to Information

1-42. In joint operations, information encompasses the management and application of information, integrating information with other functions to change or maintain perceptions, attitudes, and other elements that drive desired behaviors and support decision making. The human and automated systems whose behavior the commander wants to affect are referred to as relevant actors; these individuals, groups, populations, or systems can help or hinder the success of an operation.

1-43. The information aspect of the suspected or confirmed use of CBRN weaponry can easily cause changes in the OE that far exceed the OE impacts of a conventional weapon system employment with equal or greater destructive or lethal effects. CBRN weapons can create strategic and political-level challenges through relatively limited employment.

1-44. In a complex and ambiguous OE, the attribution of CBRN use becomes very difficult, especially if deployed in an unconventional manner or by a proxy force supported by an aggressive deception campaign. An opposing force that is willing to violate international norms and conventions may see great opportunities in using CBRN weapons—specifically if they can be used to overwhelm government and civilian systems.

1-45. Effective CBRN strikes on friendly forces can demoralize troops, resulting in panic and a loss of confidence in the ability of their unit to defeat enemy forces. Historically, even disciplined troops have panicked and fled CBRN attacks after withstanding significant conventional combat. Psychosomatic casualties can overwhelm medical support, and service members may refuse to cross potentially contaminated terrain or leave positions of relative security.

1-46. The threat of CBRN attacks on civilian areas may be used to disrupt logistic activity, clog ground lines of communication, overwhelm resources that support friendly military operations, and achieve strategic effects by challenging civilian support of allied objectives in the AO. Enemy information activities directed toward achieving such objectives could amplify the civilian population's fear of CBRN strikes.

1-47. Two key ways in which CBRN R&S provides information support to friendly forces are by enhancing the commander's understanding of the OE and bolstering the confidence of friendly forces through accurate and timely reporting on the scope and scale of the CBRN hazard. This information enables maneuver and fires to counterattack, demonstrating that friendly forces can operate through and retaliate against enemy CBRN attacks. CBRN R&S supports friendly information activities by enabling conclusive attribution of CBRN attacks to enemy forces, capitalizing on global condemnation of CBRN usage to influence adversary perceptions and behavior. These capabilities, coupled with support to operational and strategic tasks designed to attribute responsibility for WMD employment, contribute to the information warfighting function by influencing adversary perceptions and behavior.

RELEVANCE TO CBRN FUNCTIONS

1-48. CBRN core functions are assess, protect, and mitigate and the integrating activity of hazard awareness and understanding. CBRN R&S principally relates to the CBRN assess function, but it also mutually supports the protect and mitigate functions. *Operational environment* is the composite of the conditions, circumstances, and influences that affect the employment of capabilities and bear on the decisions of the commander. (JP 3-0)

1-49. The assess function encompasses all of the capabilities to evaluate the potential for CBRN threats and hazards in the OE, detect and model CBRN hazards, and determine the characteristics and parameters of hazards throughout the OE that bear on operational and tactical decisions. Tasks conducted in the assess function provide necessary information for making proactive decisions in the OE. Through information collection and dissemination, CBRN R&S provides hazard awareness and understanding, allowing the commander to make proactive, risk-based decisions. The assess function addresses the progression of CBRN capabilities, from sensing hazards to assessing them at a distance to enable freedom of maneuver.

1-50. CBRN R&S enables the protect function by providing the commander with an understanding of threats and hazards within the AO, facilitating sufficient protective posture, and enabling freedom of maneuver.

1-51. CBRN R&S enables the mitigation function by correctly identifying the hazards, marking them to prevent cross contamination, identifying the extent of the contamination, and determining the presence on personnel and equipment before and after decontamination operations. Health surveillance (medical surveillance and occupational and environmental health) also enables the protection function by advising commanders on the health risks of CBRN hazards and medical countermeasures.

Note. See AFMAN 10-2503 and FM 3-11 for more information on CBRN functions.

CBRN RECONNAISSANCE OPERATIONS

1-52. CBRN reconnaissance are those missions undertaken to obtain, by visual observation or other detection methods, information on the suspected or confirmed chemical, biological, radiological, or nuclear threats and hazards in an AO. It is performed to support the commander's situational understanding. CBRN reconnaissance can provide a range of capabilities—from confirming or denying the presence of CBRN hazards to exploitation tasks. The capabilities required are driven by the priorities' dictated information requirements, requirements of the supported maneuver command, engagement/disengagement criteria, and tempo of operations. CBRN reconnaissance is a focused collection effort. It is performed in support of operations to provide information used in the intelligence preparation of the OE/IPB process and in support of the commander's ability to formulate, confirm, or modify the COA.

SUPPORT OF LARGE-SCALE COMBAT OPERATIONS

1-53. The enemy employment of CBRN relies on mechanisms and processes similar to conventional fires and effects. Weapon systems still require transportation, staging, placement, targeting, and employment. CBRN reconnaissance elements must be capable of integrating with and supporting the reconnaissance/counterreconnaissance fight, shaping the battlespace, and denying the enemy the opportunity to most effectively employ weapon systems.

1-54. CBRN reconnaissance efforts in counterinsurgency operations have focused on postdelivery assessment without a significant tactical threat. CBRN reconnaissance in support of LSCO may be executed in a high-threat environment, often in close vicinity to enemy forces with air capabilities and long-range fires. CBRN reconnaissance capabilities include specialized technologies and skills to collect CBRN information requirements, facilitating situational understanding to support follow-on decision-making efforts. They may also collect against other relevant information requirements.

1-55. CBRN reconnaissance efforts—from the individual Service member and section conducting actions on the objective to staff cells at theater and higher headquarters—must seamlessly integrate their unique technical capabilities and subject-matter expertise with the reconnaissance executed by CBRN R&S capable forces. Identifying the unique attributes of enemy activities associated with staging CBRN weapons and disrupting the deployment and targeting required support the disruption of enemy threat capabilities.

SUPPORT TO DISTRIBUTED OPERATIONS

1-56. Distributed operations describe an operating approach that requires new ways in which to educate and train forces and guide forces in the use of emerging technologies, enabling small units to function with greater operational initiative and independence. Adaptive enemies and a more complex environment are thought to require conventional forces to maintain the ability to decentralize decision making and distribute forces. The overarching goal of distributed operations is to maximize a commander's ability to employ tactical units across the depth and breadth of a nonlinear battlespace while creating an advantage over an adversary through the deliberate use of separate, coordinated, and interdependent actions.

1-57. Greater force distribution, necessitated by the development of adversary long-range precision fires, increases the likelihood of simultaneous, geographically distinct encounters with CBRN hazards. Compared to LSCO, distributed forces must remain agile and highly mobile, requiring smaller footprints and reduced sustainment burdens. CBRN R&S, in the form of task-organized CBRN enablers deployed forward with distributed forces, enables rapid confirmation (or denial) of suspected CBRN hazards. This influences immediate tactical and follow-on actions, such as force protection, scheme of maneuver planning, and resource allocation decisions.

PRINCIPLES OF RECONNAISSANCE

1-58. The CBRN fundamentals of reconnaissance, nested with the Army principles of reconnaissance, include the following:

- **Ensure continuous CBRN reconnaissance.** CBRN reconnaissance is conducted before, during, and after operations. Before an operation, CBRN reconnaissance focuses on filling information gaps about an adversary's CBRN capabilities, specific hazard considerations, and the terrain. During an operation, CBRN reconnaissance focuses on providing the commander updated CBRN information that verifies the presence of hazards. This information may include the location, type, persistence, extent, and other characteristics that may support situational understanding of the hazard. This provides commanders confirmation of which enemy course of action has been selected and whether or not the current friendly course of action is valid based on events in the OE. After an operation, CBRN R&S focuses on providing situational awareness regarding the area, extent, and duration of CBRN threats and hazards in the AO for planning forward movement, subsequent CBRN mitigation, and CWMD operations. CBRN R&S facilitates understanding of the extent and duration of hazards that impact the lines of communication and operations and affects operational reach and operational tempo. Through the surveying of decontamination operations, friendly units can quickly identify, segregate, decontaminate, and reconstitute combat power. Providing CBRN reconnaissance over extended distances and in multiple unit areas of operation requires unity of effort, to include synchronization across unit lines of communication, clear unit boundaries, and sustainment planning. The commander must determine where and when the maximum CBRN reconnaissance effort is required to pace the commitment of CBRN R&S forces.
- **Do not keep reconnaissance assets in reserve.** To provide layered, integrated, and echeloned coverage, CBRN reconnaissance assets should not be kept in reserve. Units maintained in the reserve are not responsive enough to answer CCIRs and retain the initiative. When committed, CBRN reconnaissance assets are applied in an economy of force to maximize coverage. CBRN staffs must understand and synchronize the relationship between asset availability, coverage area, operational reach, and operational need to achieve the maximum effect of CBRN R&S. At times, this requires commanders to withhold or position CBRN reconnaissance assets so that they are available at critical times and places. CBRN reconnaissance cannot be appropriately achieved when CBRN reconnaissance capabilities have been placed in the reserve. However, CBRN reconnaissance assets should be treated as committed assets with specific, assigned missions.
- **Orient on the reconnaissance objective.** Commanders orient their reconnaissance assets by identifying a reconnaissance objective in the AO. The *reconnaissance objective* is a terrain feature, geographic area, enemy force, adversary, or other mission or operational variable about which the commander wants to obtain additional information. (ADP 3-90) For CBRN reconnaissance, this applies to focusing sensors and assets on the critical, prioritized NAIs first, before cuing on secondary NAIs that support the scheme of maneuver during the current phase of operation.
- **Report information rapidly and accurately.** CBRN reconnaissance assets must acquire and report accurate and timely information on CBRN threats and hazards and other relevant information observed while performing their principle task of CBRN reconnaissance. Information may quickly lose its value. CBRN R&S elements report exactly what they see and, if appropriate, what they do not see. Seemingly unimportant information may be extremely important when combined with other information. Negative reports should be forwarded to higher headquarters

for review or collaboration because they may fill in gaps of the overall joint ISR picture. The CBRN R&S element uses communication protocols established in the supported unit standard operating procedure (SOP) to ensure timely and accurate information. CBRN R&S elements must have the proper communication equipment to support the integrated joint ISR.

- **Retain freedom of action.** CBRN reconnaissance assets must retain mobility to successfully complete their missions. If CBRN forces are decisively engaged, CBRN reconnaissance stops and they engage with direct fires, indirect fires, and close air support or they break contact. CBRN reconnaissance forces must have a clear engagement criteria that supports the commander's intent. They must employ proper movement and CBRN reconnaissance techniques and use overwatching fires and SOPs. Initiative and knowledge of the terrain and the adversary reduce the likelihood of decisive engagement and help maintain freedom of movement. When conducting CBRN reconnaissance, the CBRN R&S element adopts a combat formation designed to limit exposure to CBRN hazards. This provides the R&S element the maximum opportunity to move across terrain without the entire R&S element becoming contaminated. CBRN hazards are assessed by using a sequential, progressive method that minimizes exposure to hazards and mitigates cross contamination. CBRN R&S utilizes stand-off detection capabilities first. If more information is required within the contamination area, unmanned remote systems monitor the NAI. CBRN R&S personnel purposefully enter contaminated areas to assess threats and hazards when standoff or unmanned capabilities are exhausted or when the terrain is restrictive. The JIPOE/IPB process can identify anticipated CBRN hazard areas/locations.
- **Gain and maintain CBRN hazard understanding.** When an R&S element conducting CBRN reconnaissance detects or locates a CBRN hazard, it works to gather and maintain information about the hazard for reporting to its higher headquarters. CBRN reconnaissance provides detailed information about the risk associated with the hazard and provides the commander understanding to make informed decisions. CBRN R&S, with sufficient CBRN hazard understanding, finds routes that minimize cross contamination and expose assailable enemy flanks in offensive and defensive operations.
- **Develop the situation rapidly.** When a CBRN reconnaissance asset encounters a CBRN hazard, it must quickly determine the threat it faces. CBRN R&S rapidly marks contamination and develops bypass routes or seams in contamination to exploit the CBRN environment. For a new CBRN hazard, it must determine the type of hazard, CCIR, and PIR relevance and assess the extent of the hazard and its impacts on maneuver.
- **Integrate with and enable maneuver.** CBRN R&S elements frequently integrate with maneuver forces as an enabler to support decisive action. Marine Corps enhanced CBRN R&S sections are organic to major subordinate commands and Marine expeditionary units. CBRN reconnaissance operates in a capacity that, with dependencies from the supported unit, supports the higher command's mission. Maneuver elements integrate CBRN elements within their tactical formation scheme of maneuver and provide area security for CBRN R&S during missions. CBRN reconnaissance assets can conduct local security. The supported unit provides additional security to CBRN reconnaissance assets within the supporting range. CBRN units do not own AOs, but they maneuver through land-owning unit AOs to link up with and mutually support units. CBRN reconnaissance provides detection and early warning of enemy CBRN-related activities, enabling the commander's decision-making process and exploitation of the CBRN environment to support the commander's decisions. During security operations, CBRN reconnaissance mutually supports screens, guards, and cover forces within the scope of their capabilities.

1-59. The capability required is driven by the priorities dictated by the CCIR, supported maneuver command requirements, engagement/disengagement criteria, and tempo of operations.

SPECIAL OPERATIONS RECONNAISSANCE

1-60. The United States Army Special Operations Command possesses a limited capability to conduct CBRN reconnaissance and detection. The Army common equipment issued to each unit is used to detect the presence of most military chemical compounds and high levels of beta and gamma radiation. This equipment alerts the unit to the presence of significant levels of military chemical compounds and radiation (which may show false-positive readings) and maintains extremely high detection thresholds. Only the chemical reconnaissance detachment, chemical decontamination detachment, and decontamination and reconnaissance team possess the specialized equipment and training to deliver a presumptive analysis of a potential CBRN substance. It is this presumptive analysis that provides the commander data of such quality that operational decisions can be made by relying on this data (see ATP 3-05.11 for more information).

1-61. The United States Marine Forces Special Operations Command possesses a limited CBRN capability that primarily employs dismounted reconnaissance sets, kits, and outfits to fulfill their CBRN R&S capability conducted by Marine Forces Special Operations Command Explosive Ordnance Disposal (MARSOFEOD) operators supported by critical skills operators and special operations officers. The dismounted reconnaissance sets, kits, and outfits is located within the Marine Special Operations Company and is distributed to the Marine Special Operations Team level, enabling operators to conduct short duration chemical, biological, radiological, nuclear, and explosives (CBRNE) operations, as needed. The United States Marine Forces Special Operations Command employs this capability with organic MARSOFEOD operators, special operations capabilities specialist–EOD. MARSOFEOD operators are capable of providing CBRNE/counter-WMD support via detect, locate, identify, triage, nonintrusive threat assessment, intrusive threat assessment, and render-safe procedures for scenarios, including high-yield explosives, TIMs, chemical and biological warfare agents, nuclear materials of concern, and suspected WMDs. The MARSOFEOD operators are trained to conduct CBRNE threat mitigation against state-sponsored laboratories, conventional weapons, improvised weapons, and improvised explosive devices (IEDs). This mitigation includes special reconnaissance techniques, threat assessments, render-safe procedures, leak seals, and the packaging of ordnance and CBRNE-contaminated devices and containers (see MCO 3571.2H for more information).

1-62. *Special reconnaissance* (SR) is the reconnaissance and surveillance actions conducted as a special operation in hostile, denied, or diplomatically and/or politically sensitive environments to collect or verify information of strategic or operational significance, employing military capabilities not normally found in conventional forces. (JP 3-05) Special reconnaissance provides an additional capability with the collection of more refined information. Special reconnaissance may also include an assessment of chemical, biological, residual radiological, or environmental hazards in a denied area (see JP 3-05 for more information). Special reconnaissance missions can help obtain information that was previously unknown, or they can help refute or confirm specific information about a target that does not necessarily fall under the category of surveillance. Examples of these types of special reconnaissance missions include CBRNE agent confirmation; soil, water, or air surveys or samplings; mute reconnaissance drop zone or landing zone surveys; and any other specific data requirements. In most instances, such a mission is limited to the specific data or indicators required. Often, these missions require the operational detachment ALPHA to conduct mission-specific skill training or to accept augmentation by nonspecial forces subject matter experts (SMEs). Augmentation may entail a CBRNE team, topographic or civil engineers, and EOD or scientific specialists (such as toxicologists or meteorologists). When enablers (attached or organic) conduct a mission, special permission training is required for both the operational detachment ALPHA and the augmenters. Regardless of the brand of enablers (attached or organic), the operational detachment ALPHA is responsible for safe infiltration, security, exfiltration, and reactions to contingencies. Specialists focus on their specialty, whereas the operational detachment ALPHA supports them (see ATP 3-18.4 for more information).

Note. See ATP 3-05.11 and ATP 3-18.4 for more information on special operations forces CBRN and SR.

RECONNAISSANCE-PULL VERSUS RECONNAISSANCE-PUSH

1-63. *Reconnaissance-pull* is reconnaissance that determines which routes are suitable for maneuver, where the enemy is strong and weak, and where gaps exist, thus pulling the main body toward and along the path of least resistance. This facilitates the commander's initiative and agility. (FM 3-90-2) The commander uses the products of the IPB process in an interactive and repetitive way. The commander obtains combat information from available reconnaissance assets to determine a preferred course of action for the tactical situation presented by the mission variables of mission, enemy, terrain and weather, troops and support available, time available, civil considerations (METT-TC), or mission, enemy, terrain and weather, troops and support available-time available (METT-T). CBRN reconnaissance in support of offensive operations in the deep and close area are usually reconnaissance-pull focused. They rapidly identify CBRN hazards and mark only minimum essential areas to provide the maneuver commander flexibility and tempo to exploit the environment to their force's relative advantage.

1-64. *Reconnaissance-push* is reconnaissance that refines the common operational picture, enabling the commander to finalize the plan and support shaping and decisive operations. It is normally used once the commander commits to a scheme of maneuver or course of action (FM 3-90-2). The commander uses the products of the IPB process in an interactive way with combat information from reconnaissance assets in support of a COA. The main reason for preferring one method over the other is the time available. CBRN reconnaissance-push operations are executed to refine information regarding CBRN hazards, provide sufficient data to target enemy CBRN and delivery capabilities, or conduct CWMD missions.

1-65. CBRN reconnaissance operations involving the exploitation of sensitive sites fall underneath the subcategory of special reconnaissance. Even with long-range sensors, unmanned platforms, and aerial platforms, some CBRN-specific information can only be obtained via direct visual observation or other collection methods. CBRN enablers can be paired with special operations forces or task-organized maneuver forces in a CWMD role. CBRN site exploitation falls under the subcategory of poststrike reconnaissance as described in JP 3-05. Site exploitation is described in greater detail in ATP 3-90.15.

CBRN SURVEILLANCE OPERATIONS

1-66. CBRN surveillance is systematic observation used to confirm the initial and continued presence of CBRN hazards. CBRN surveillance facilitates situational understanding and maintenance of an accurate, high-fidelity, real-time picture of the OE as changes occur. When complimented by CBRN surveillance, all-source intelligence analysis provides a more complete assessment to assist commanders with their decision making. CBRN surveillance contributes to broader biosurveillance activities, supporting the timely detection of health-related hazards that impact the availability of combat power.

1-67. The principles of CBRN surveillance include—

- **Maintaining continuous CBRN surveillance on CBRN NAIs.** Once the CBRN surveillance of an NAI commences, CBRN surveillance must be maintained until the mission is completed or terminated by the higher commander. Commanders designate to whom the CBRN information will be reported and the means of communication that will be used. Continuous CBRN surveillance of NAIs requires multiple collection assets, a purpose (PIRs), and a location (NAI or TAI) for each CBRN capability. To provide layered, integrated, and echeloned coverage, CBRN surveillance is not kept in reserve. During information collection synchronization, CBRN collection capabilities that can best answer the CBRN-specific PIRs are selected. During integration, specific capabilities are tasked to perform these missions by using the tools developed during joint ISR synchronization to ensure continuous coverage.
- **Avoiding designating too many CBRN NAIs.** Continuous CBRN surveillance suffers as a result of excessive NAIs. Coordinators for surveillance assets should be present at joint ISR rehearsals to determine the appropriate tasking and ability to cover particular NAIs. CBRN staffs should provide CBRN surveillance assets a clear priority of NAIs by phase and change-of-mission requirements.
- **Providing continuous observation before, during, and after operations.** Within present capabilities, commanders strive to maximize CBRN capabilities—including processing and analyzing—to provide persistent observation before, during, and after operations. Before initial entry into a theater of operations, national assets are the major sources of CBRN information. Once in the AO, CBRN surveillance is deployed as early as possible to help focus CBRN reconnaissance efforts and provide early warning. During operations, CBRN surveillance supports target acquisition and contamination area boundaries and discovers information that cues CBRN reconnaissance, answers CBRN CCIRs, and assists the commander and staff in assessing operations. CBRN surveillance helps search for remnants of adversary CBRN capabilities or activity and provides information to begin subsequent CBRN planning.

- **Orienting CBRN surveillance to provide early and accurate warning.** One of the main purposes of CBRN surveillance is to provide early warning of imminent CBRN hazards. Together with JIPOE and IPB, commanders use CBRN surveillance to assess the most dangerous and most probable threats and hazards and ascertain the most likely location or direction from which these will come. They then orient CBRN surveillance assets to observe these locations for indicators of threat to friendly forces. Reports about the enemy or adversary must be timely, relevant, and accurate, with timely processing and dissemination. CBRN surveillance reports hazard indications to the medical staff, decreasing distribution times for effective prophylaxis. Units employ internal CBRN defense arrays to protect the force, especially at C2 and sustainment nodes.
- **Tracking and assessing key CBRN threats and hazards.** CBRN surveillance support for targeting includes tracking and assessing. Once a CBRN threat or hazard is detected, planning cells must consider the need to maintain visibility on the hazard or to leverage fires to interdict a CBRN attack before it is launched. Available intelligence and information collection abilities may be used to provide direct observation and tracking of threats and hazards.
- **Providing continuous, redundant, and overlapping coverage on critical locations.** Commanders integrate the capabilities of limited CBRN surveillance assets to provide continuous coverage of critical locations identified during planning. Commanders and staff continuously assess CBRN surveillance results to determine changes in critical locations requiring this level of coverage. The intelligence and operations staff work together to achieve balance in the use of CBRN capabilities with cueing, mixing, and redundancy in an attempt to use limited assets most effectively and collect the most critical information with the fewest assets as quickly as possible.
  - *Cueing* is the integration of one or more types of reconnaissance and surveillance systems to provide information that directs follow-on collecting of more detailed information by another system. (FM 3-90-2) Cueing helps to focus limited surveillance assets, especially limited ground CBRN R&S, which can seldom closely examine every part of a large area or location. Electronic, thermal, visual, audio, and other technical assets with wide-area surveillance capabilities that often work from space or aerial platforms can quickly determine areas of adversary concentration or areas in which there is no adversary presence. These assets may cue ground and air reconnaissance assets to investigate specific locations to confirm and amplify information developed by technical assets. For example, aerial capabilities can cover large areas and cue CBRN ground reconnaissance or unmanned aerial systems (UASs) once a CBRN hazard is identified. The commander may dispatch CBRN ground reconnaissance to verify the information and mark the area, or he may dispatch a UAS to verify the information for operational purposes. Similarly, a CBRN ground reconnaissance capability can cue CBRN surveillance capabilities. The key point is to use CBRN reconnaissance assets based on their capabilities and to use the complementary capabilities of other assets to verify and expand available information.
  - *Mixing* is using two or more different assets to collect against the same intelligence requirement. (FM 3-90-2) Mixing provides an increased probability of detection and confidence. Employing a mix of systems not only increases the probability of detection, but also tends to provide more complete information. For example, a standoff capability may detect and locate a CBRN hazard while the intelligence analysis and control element uses organic and supporting assets to determine its identity and threat to military forces and future plans. Employing a mix of systems is always desirable if the situation and available resources permit. Mixing systems can help uncover deception attempts by revealing discrepancies in information reported by different CBRN teams.

    - *Redundancy* is using two or more like assets to collect against the same intelligence requirement. (FM 3-90-2) Redundancy provides an increased probability of detection and confidence. Based on the PIR, the commander must decide which NAI justifies having more than one asset covering it. When more than one asset covers the same NAI, a backup is available. In the event that one asset cannot reach the NAI in time, the first asset suffers mechanical failure, or the adversary detects and engages the first asset, the backup asset is used to address the gap in coverage. Redundancy improves the probability of detecting and collecting the required information.
- **Reporting information rapidly and accurately.** Commanders may base their planning and tactical decisions on information obtained through CBRN surveillance efforts. Intelligence loses its relevance as it ages. Commanders establish the latest time information is of value (LTIOV) to guide timely reporting. The R&S element or other asset must accurately report what it observes, and they must report it in a timely manner. Using digital systems speeds the process and assists in accuracy, but the information should be redundantly reported with other systems to ensure rapid dissemination using the CBRN Warning and Reporting System (CBRNWRS). Speed is critical when conducting early warning and reporting of a CBRN incident.

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Chapter 2

Identification of Chemical, Biological, Radiological, and Nuclear Hazards

CBRN R&S operations provide commanders and staffs critical information concerning the identity, area/location, and duration of CBRN hazards to assist in situational understanding that enables the commander to make informed decisions. This chapter provides details on the DOD four-tier system for determining the identity of CBRN hazards and describes the difference in NATO levels of identification. The four identification levels are—presumptive, field confirmatory, theater validation, and definitive. This chapter discusses the implications of CBRN identification and describes the potential tactical-through-strategic decisions that may result.

IDENTIFICATION LEVELS

2-1. CBRN hazard detection uses commonly fielded CBRN detectors distributed throughout the force to alert personnel to the presence of hazards and initiate immediate survival actions. Although these detections influence decisions, they are performed as a reactive action and do not constitute CBRN R&S. Commanders and staffs must assess the immediacy with which tactical decisions must be made based on the OE, operational tempo, and current situation. In some cases, the impacted unit continues operations in elevated protective posture; in other situations, a more formal assessment of the hazard, to confirm or deny its presence, is performed as a follow-on action by CBRN R&S forces.

2-2. CBRN hazard identification is the process of locating, recognizing, and describing CBRN hazards through information collection using intelligence, health surveillance, survey and sampling procedures, and analytical equipment. The detection of hazards is implied throughout all levels of identification. The confidence and quality of CBRN hazard identification will depend on the—

- Quality of information from the detection or analytical equipment.
- Confirmation from different technologies' methodology.
- Analysis of supporting intelligence and indicators.
- Training of individuals using the detector or sensor.
- Time from release to detection.
- Purity of the sample.
- Environmental factors, such as a controlled laboratory versus a field environment.

2-3. The DOD uses four tiers to describe the different levels of identification that have the unique characteristics of who, where, why, and how. The four levels of identification for CBRN hazards are—

- Presumptive.
- Field confirmatory.
- Theater validation.
- Definitive.

DEPARTMENT OF DEFENSE IDENTIFICATION LEVELS

2-4. The DOD four-tiered identification levels are a sequential, scientifically rigorous means to positively identify CBRN and TIM hazards. (See figure 2-1, page 2-2.) The higher the level of identification completed on a CBRN hazard, the higher the confidence the command has that a CBRN attack or incident has occurred. Identification levels articulate the technology requirements, personnel, and training levels of those identifying

CBRN and TIM hazards and the location at which identification occurs. Technology has to meet the specificity, sensitivity, controls, and protocols to meet higher thresholds of identification levels. For specific technology requirements per identification level, refer to tables 2-1 to 2-4, pages 2-3 to 2-7.

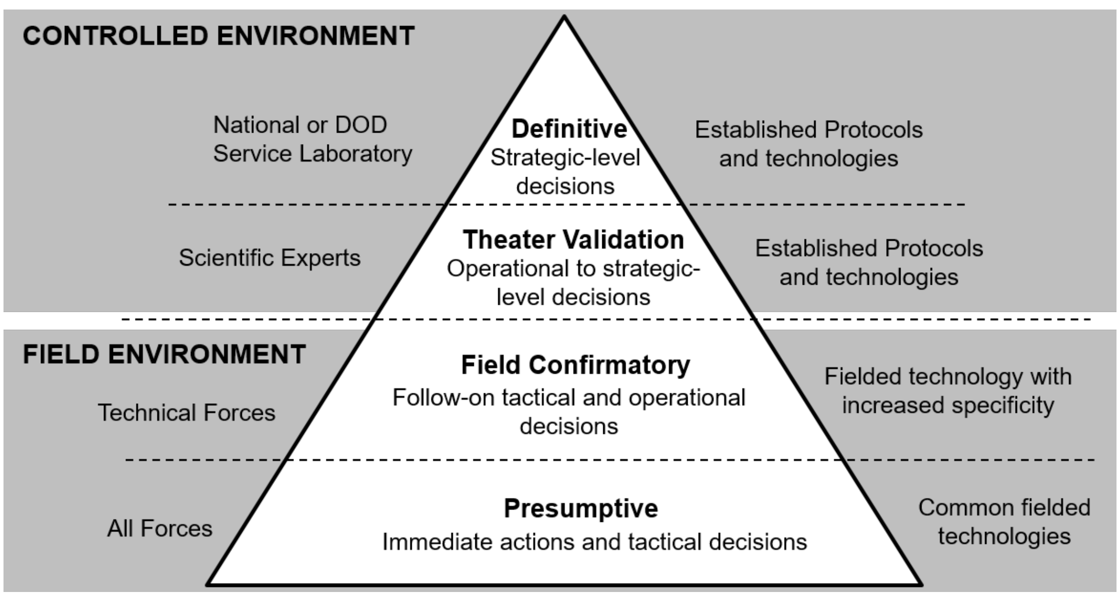
2-5. Forces that can identify agents are stratified based on their purpose, level of training, available equipment, and capability to conduct sampling and analysis operations at the higher levels of identification. At the lowest level (presumptive), all forces have the equipment and training to conduct the basic level of identification. Technical forces are specially trained and equipped forces that possess a higher degree of CBRN detection and sampling capability compared to conventional forces. Specific examples of the technical forces that are able to provide field confirmatory identification are in table 2-2, page 2-6.

2-6. Even though some personnel may have the requisite knowledge and equipment sets to sample CBRN agents, they may not have the correct packing, transportation means, or emergency decontamination support to be able to collect samples for laboratory submission. A sample identified in a field environment may have other materials within it that can confuse the results of identification. A sample identified in a controlled laboratory environment will help reduce the influence of external factors on results; therefore, it is critical for commanders and staffs to recognize organizational CBRN identification capabilities and limitations during decision making.

Notes.

1. Samples may not require analysis at all identification levels, depending on the agent and the decisions and actions taken after identification.

2. In figure 2-1, technical forces are specially trained and equipped forces that possess a higher degree of CBRN detection and sampling capability compared to conventional forces.



Legend:
DOD Department of Defense

Figure 2-1. CBRN identification

PRESUMPTIVE IDENTIFICATION

2-7. ***Presumptive identification* is the employment of technologies with limited specificity and sensitivity by all forces in a field environment to detect the presence of chemical, biological, radiological, and/or nuclear hazards with a low, but sufficient level of confidence to support immediate tactical decisions.**

2-8. Presumptive identification is obtained by using a single, commonly fielded device, material, or technology available to all U.S. forces to provide initial indications of a CBRN threat or hazard presence within minutes to one hour of detection. It is one of the first steps in providing commanders and staffs hazard awareness and understanding and in initiating force protective measures against CBRN threats, such as increasing protective posture. It is the only level of identification that does not involve sampling and collection. Although using multiple technologies is not required to presumptively detect a hazard, it is highly encouraged to prevent false positives that quickly overwhelm unit resources. To prevent the higher risk of false-positive identification, it is imperative that units train frequently on detection equipment. Table 2-1 provides further presumptive identification descriptors.

Table 2-1. Presumptive identification descriptors

Presumptive Identification		
Who	Chemical Biological Radiological	All forces
Where/Time-to-Results	Chemical Biological Radiological	Field environment
Technology Requirement	Chemical	Colorimetrics (for example, M8 paper, M9 tape) Photoionization detection (for example, MultiRAE) Ion mobility spectroscopy (for example, JCAD or ICAM) Reagents (for example, M256A2 kit)
	Biological	Handheld assays (Not available to all forces)
	Radiological	Handheld RADIAC survey equipment for the detection of beta and gamma ionizing radiation (for example, AN/VDR-2) Gamma and neutron dose detection and gamma dose rate detection (for example, AN/UDR-13)
Why	Chemical Biological Radiological	Determining the presence/absence of CBRN hazards (based on technologies) allows immediate protection measures or self-treatment and supports immediate tactical decisions. (See tactical decisions for example paragraphs 2-20 through 2-23.)

Legend:

AN/UDR-13	radiation detection device	JCAD	joint chemical agent detector
AN/VDR-2	radiation detection device	JP	joint publication
CBRN	chemical, biological, radiological, and nuclear	ICAM	individual chemical agent monitor
		RADIAC	radiation, detection, indication, and computation

FIELD CONFIRMATORY IDENTIFICATION

2-9. ***Field confirmatory identification* is the employment of technologies with increased specificity and sensitivity by technical forces in a field environment to identify chemical, biological, radiological, and/or nuclear hazards with a moderate level of confidence and the degree of certainty necessary to support follow-on tactical and operational decisions**.

2-10. Field confirmatory identification is obtained by using two or more technologies (see table 2-2) that use different analysis processes and are available to specially trained personnel and units in a field environment. The analysis of information (symptoms, source, physical form, odor, intelligence on the enemy's offensive CBRN capabilities, TIM facility intelligence) provides a higher degree of confidence in the identification of CBRN hazards. It may include the collection and analysis of samples, with the intent to find results within 1–48 hours of detection.

2-11. Field confirmatory identification can be used to prove or disprove previous presumptive results. It results in higher confidence levels to support future operations. This may include follow-on tactical decisions to exploit CBRN environments, mitigate risk to forces, or pursue a higher level of identification by collecting evidence for attribution purposes. Table 2-2 provides further field confirmatory identification descriptors.

Table 2-2. Field confirmatory identification descriptors

Field Confirmatory Identification		
Who	Chemical	All technical forces[1]: • Army: HAP, CRT, NBCRV platoons, BIDS platoons, CSTs, DRTs, CRDs, NDTs, and preventive medicine • Navy: Analysis conducted at theater validation level • Air Force: CBRN specialists[2] • Marine: Enhanced CBRN R&S sections
	Biological	All technical forces[1]: • Army: CSTs, AML, CARA, Role 3[2] medical treatment facilities units and veterinary services • Navy: Analysis conducted onboard specifically equipped ships (CVN, LHA/LHD, T-AH assets) • Air Force: CBRN specialists[3]
	Radiological	All technical forces[1]
Where/Time-to-Results	Chemical	Field environment
	Biological	
	Radiological	
Technology Requirement Multiple analyses involving at least two complimentary technologies	Chemical	Fourier transform infrared spectroscopy (for example, JSLSCAD, TruDefender) Gas chromatography/mass spectroscopy (for example, Guardian and CBMS II) Raman spectroscopy (for example, FirstDefender) Photoionization detection (for example, MultiRAE) Portable isotopic neutron spectroscopy
	Biological	Polymerase chain reaction (for example JBAIDS, Razor) Immunoassay[4] (for example, PR2 1800)

Table 2-2. Field confirmatory identification descriptors (continued)

Field Confirmatory Identification		
Technology Requirement Multiple analyses involving at least two complimentary technologies (continued)	Radiological	Handheld RADIAC survey equipment for the detection of alpha ionizing radiation (for example, AN/PDR-77 with DT-669) Handheld RADIAC survey equipment with increased sensitivity for the detection of beta- and gamma-ionizing radiation (for example, AN/PDR-77 with DT-695) Handheld scintillation-based gamma spectrometry (low specificity and sensitivity (for example, AN/PDR-77 with DT-616) Dose rate neutron- and gamma-detection devices (for example, AN/UDR-13/14) Handheld survey equipment for the detection of nonionizing radiation Radionuclide identification (for example, IdentiFINDER and AMD 100)
Why	Chemical Biological Radiological	Determine preliminary identification of CBRN hazards (based on technologies) to support follow-on tactical to operational decisions. For example follow-on tactical and operational decisions, see paragraphs 2-23 and 2-24.

Note.
[1] All technical forces will not be able to provide field confirmatory identification for each of the C-B-R aspects. For example, not all units have PCR technology. Some units have commercial off-the-shelf technology that others do not possess.
[2] Roles of care are defined in JP 4-02.
[3] Air Force CBRN specialists are defined in ATP 3-11.36/MCRP 10-10E.1/NTTP 3-11.34/AFTTP 3-2.70.
[4] Immunoassay alone cannot provide field confirmatory results.

Legend:

AFTTP	Air Force tactics, techniques and procedures	CVN	multi-purpose aircraft carrier (nuclear-powered)
AMD	radiation detection device	DRT	decontamination and reconnaissance team
AML	area medical laboratory		
AN/PDR	radiation detection device	HAP	hazard assessment platoon
AN/UDR	radiation detection device	JBAIDS	joint biological agent identification and diagnostic system
AN/VDR	radiation detection devise		
BIDS	biological integrated detection system	JP	joint publication
C-B-R	chemical-biological-radiological	JSLSCAD	joint service light-weight stand-off chemical agent detector
CARA	chemical, biological, radiological,		
nuclear,	and explosives analytical and	LHA/LHD	amphibious assault ships
remediation	activity	NBCRV	nuclear, biological, chemical reconnaissance vehicle
CBMS II	chemical, biological, mass spectrometer		
CBRN	chemical, biological, radiological, and nuclear	NDT	nuclear disablement team
		PCR	polymerase chain reaction
CBRNE	chemical, biological, radiological,	PDR	radiation detection device
nuclear,	and explosives	RADIAC	radiation, detection, indication, and computation
CONOP	concept of operations		
CRD	CBRN reconnaissance detachment	R&S	reconnaissance and surveillance
CRT	CBRNE response team	T-AH	hospital ship
CST	civil support team	TIM	toxic industrial material

2-12. Forward deployed Navy medical assets will continue to use the same shipboard assets (aircraft carriers and designated amphibious assault ships and hospital ships) to provide both field confirmatory and theater validation level analysis.

THEATER VALIDATION IDENTIFICATION

2-13. ***Theater validation identification*** **is the employment of multiple independent, established protocols and technologies by scientific experts in the controlled environment of a fixed or mobile/transportable laboratory to characterize a chemical, biological, radiological, and/or nuclear hazard with a high level of confidence and the degree of certainty necessary to support operational to strategic-level decisions.**

2-14. Using accepted quality assurance measures, theater validation quantifies the CBRN sample. It provides additional, critical information to support timely and effective decisions regarding assessment, protection, and mitigation measures and medical prophylaxis and treatment for affected units and personnel within 48–72 hours of detection. It can support preliminary attribution to implicate or support trace analytics for the source of the identified CBRN material. Table 2-3 provides further theater validation identification descriptors.

Table 2-3. Theater validation identification descriptors

Theater Validation		
Who	Chemical	Scientific experts[1] applying multiple independent, established protocols and technologies. Examples include the— • Area medical laboratory • CBRNE command CARA lab • CVN, LHA/LHD, T-AH, FDPMU • Role 3[2] medical treatment facilities
	Biological	
	Radiological	
Where/Time-to-Results	Chemical	Fixed or mobile laboratories with constant temperature and humidity controls; stable power supply deployed into a field environment (for example, AML or CARA)
	Biological	
	Radiological	
Technology Requirement Multiple analyses involving at least two complimentary technologies	Chemical	Gas chromatography-flame ionization detector Gas chromatography-electron capture detector Gas chromatography-mass spectrometer
	Biological	Culture and in vitro biochemical identification methods Enzyme-linked immunosorbent assay Polymerase chain reaction Electrochemical luminescence
	Radiological	Liquid-scintillation counting equipment Semiconductor-based gamma spectrometry (high specificity and low sensitivity) Scintillation-based gamma spectrometry (high specificity and low sensitivity)
Why	Chemical	Provide the highest level fidelity of identification available within theater to support operational-to-strategic decisions. For examples, see paragraphs 2-24 and 2-25.
	Biological	
	Radiological	

Notes.
[1] Scientific experts can be multinational and non-DOD unified action partners.
[2] Role 3 medical treatment facilities are defined in JP 4-02. Role 3 medical treatment facilities analyze clinical specimens and may not have chemical, biological, and radiological capabilities.

Legend:

AML	area medical laboratory
CBRN	chemical, biological, radiological and nuclear
CBRNE	chemical, biological, radiological, nuclear, and explosive
CARA	chemical, biological, radiological, nuclear, and explosives analytical and remediation activity
CVN	multi-purpose aircraft carrier (nuclear powered)
DOD	Department of Defense
FDPMU	forward-deployable preventive medicine unit
JP	joint publication
LHA/LHD	amphibious assault ships
T-AH	hospital ship
TIM	toxic industrial materials

DEFINITIVE IDENTIFICATION

2-15. ***Definitive identification*** **is the employment of multiple state-of-the-art, independent, established protocols and technologies by scientific experts in a nationally recognized laboratory to determine the unambiguous identity of a chemical, biological, radiological, and/or nuclear hazard with the highest level of confidence and degree of certainty necessary to support strategic-level decisions.**

2-16. Specific, quantified results—even at low levels with high data confidence and accuracy—are often the most critical data requirements at strategic decision-making levels. Definitive identification supports attribution to help implicate or point to the source of the identified material. It uses the highest level of quality assurance measures to achieve identification within 72 hours to 30 days of detection. The time-to-result may be the least-critical element. However, equipment sensitivity is significant at this level when given established requirements to identify and document exact hazard levels that pose potential acute or long-term health risks to forces and enable health surveillance. While some materiel solutions at tactical units can detect CBRN substances at extremely high sensitivity levels, laboratory-specific controls and higher-sensitivity materiel capabilities are needed to detect and identify low-level exposures to achieve the intent for strategic decisions and deployment health policies. Even if such exposures cannot be mitigated, if detected they can at least be appropriately documented per DODD 6490.02E and DODI 6490.03 requirements. Table 2-4 provides further definitive identification descriptors.

Table 2-4. Definitive identification descriptors

Definitive Validation		
Who	Chemical Biological Radiological	Scientific experts[1] applying multiple independent, established protocols and technologies, to include but not limited to— • Centers for Disease Control and Prevention • United States Army Medical Research Institute of Chemical Defense • United States Army Medical Research Institute of Infection Diseases • Armed Forces Radiobiology Research Institute • Navy Medical Research Center–Biological Defense Research Directorate • United States Army Combat Capabilities Development Command, Chemical Biological Center
Where/Time-to-Results	Chemical Biological Radiological	National, Department of Defense Service, or NATO equivalent laboratory
Technology Requirement Technologies are similar to the theater validation level, but with higher controls at fixed accredited facilities using established protocols and technologies	Chemical	Gas chromatography-flame ionization detector Gas chromatography-electron capture detector Gas chromatography-mass spectrometer
	Biological	Culture and in vitro biochemical identification methods Enzyme-linked immunosorbent assay Polymerase chain reaction Electrochemical luminescence Monoclonal antibodies
	Radiological	Liquid-scintillation counting equipment Semiconductor-based gamma spectrometry (high specificity and low sensitivity) Scintillation-based gamma spectrometry (high specificity and low sensitivity)

Table 2-4. Definitive identification descriptors (continued)

Definitive Validation		
Why	Chemical Biological Radiological	Determine the unambiguous identification of CBRN hazards via nationally recognized laboratories to support strategic decisions. See paragraph 2-25 for examples.
Note. [1] Scientific experts can be multinational and non-DOD unified action partners.		
Legend: CBRN chemical, biological, radiological, and nuclear DOD Department of Defense JP joint publication NATO North Atlantic Treaty Organization		

NATO IDENTIFICATION LEVELS

2-17. Table 2-5 provides a comparison of the levels of identification and NATO standard identification levels. The light grey cells indicate the NATO levels. It is important to note that NATO only has three levels of identification. The U.S. presumptive level of identification aligns with the NATO definition of *detection*—in CBRN defense, the discovery, by any means, of the presence of a CBRN substance.

Table 2-5. Level of identification comparison

Level of Identification	*Purpose*	*Type of Analysis*	*Who*	*Where*
No NATO equivalent				
Presumptive	Immediate actions	Common fielded technologies	All forces	Field environment
Provisional (NATO)	Tactical-level decisions	Established field protocols and technologies	Specialists with specific training	Field environment
Field Confirmatory	Follow-on tactical and operational-level decisions	Fielded technology with increased specificity	Technical forces	Field environment
Confirmed (NATO)	Operational-level decisions	Established protocols and technologies at field-deployed laboratories	In-theater experts on analysis and identification	Field-deployable laboratory
Theater Validation	Operational-to-strategic-level decisions	Established protocols and technologies at deployed laboratories	Scientific experts	Deployed, fixed, or mobile laboratory with constant temperature, humidity, and power
Unambiguous (NATO)	World court/ attribution	Established protocols and technologies at fixed laboratories	Specialists at fixed laboratories	National reference and forensic laboratory
Definitive	Strategic-level decisions (attribution)	State-of-the-art protocols and technologies	Scientific experts	Nationally recognized laboratory
Legend: NATO North Atlantic Treaty Organization				

CBRN IDENTIFICATION CONSIDERATIONS

2-18. The requirement for a specific command decision is the primary factor that determines the level of CBRN identification required for a sample. Additional factors that potentially influence the command staff as they determine the types and numbers of samples required and the level of CBRN analysis needed on each sample include—

- Higher identification levels that require support from low-density, highly-trained, technical CBRN units or assets.
- Higher identification levels that require more time to complete.
- The command/support relationship with supported and supporting units.
- CBRNWRS protocols.
- The type of CBRN reconnaissance and/or surveillance mission that will be performed to equip the R&S element with the right detection and identification devices.
- Logistics support, sample transfer, and technical escort requirements.
- Follow-on CBRN R&S missions.
- Sample management and collection plan maintenance.

2-19. When there is a need to identify possible treaty violations, the collection of evidence and the analysis of samples may require protocols that can withstand international scrutiny (procedures that establish a forensic trail). Although such evidence is required quickly, proof of the use of these agents must be so that it cannot be refuted.

TACTICAL DECISIONS

2-20. Tactical leaders must make sound and timely decisions in the heat of combat. Immediate actions, such as increasing mission-oriented protective posture, immediate decontamination, and self/buddy aid, are performed without prompting upon recognizing the employment, presence, or effects of CBRN agents. These actions are essential to protecting the force and are performed within seconds of recognizing CBRN hazard indicators.

2-21. Timely information, in the order of minutes to hours, is needed in tactical decision making. Tactical decisions are divided into two categories—immediate and follow-on.

2-22. Immediate tactical decisions build on immediate actions taken and address immediate force protection requirements and maneuver decisions that seek to exploit the CBRN environment to maintain an advantage over the adversary. Immediate tactical decisions are not risk-averse; instead, they seek to exploit immediate tactical opportunities. Examples of immediate tactical decisions include—

- The employment of the CBRNWRS to warn units.
- Tactical dispersion and contamination avoidance requirements.
- The evacuation and treatment of casualties.
- Additional medical resources.
- Maneuver decisions that allow units to retain the initiative (for example, changing from a frontal attack to an envelopment around a chemically contaminated area).
- The execution of immediate decontamination procedures.
- The employment of contamination mitigation equipment and/or strategies to limit the contamination of personnel and equipment operating in the contaminated area.

2-23. Follow-on tactical decisions are required when the technical force identification capability is required to exploit CBRN environments and mitigate risk to forces. Follow-on tactical decision examples include—

- Confirming or denying CBRN protection required for follow-on and flow-through forces.
- Task-organizing CBRN teams with specialized equipment and training.
- Establishing the length/duration of the stay time in a contaminated environment.
- Making decisions to exploit known or suspected WMD sites.
- Meeting requirements to detect and analyze a broader range of hazards, including traditional chemical warfare agents, TIMs, and nontraditional agents.

- Providing CBRN support to maneuver in subterranean environments.
- Surging sustainment assets to support CBRN mitigation operations.
- Increasing CBRN sampling and transportation to a theater validation laboratory.
- Determining appropriate medical countermeasures and treatments.

Operational Decisions

2-24. At the operational level of warfare, campaigns and major operations are planned, conducted, and sustained to achieve strategic objectives within theaters or other operational areas. The operational level links the tactical employment of forces to national strategic objectives. At this level, CBRN defense-related decisions include, but are not limited to—

- The verification of hazard reduction so that troops can reduce, modify, or eliminate the mission-oriented protective posture level.
- The commitment of a specially trained and equipped task-organized formation to support site exploitation, including forensics for evidence and attribution in pursuit of CWMD objectives.
- Contamination mitigation, including contamination control and decontamination.
- Revisions or updates to operational exposure guidance (OEG).
- Coordination with local or host-nation emergency first responders to mitigate hazards.
- The logistics and planning of casualty evacuation.
- Continuous monitoring and surveillance of deployed personnel for emerging or routine environmental hazards.
- Coordination with medical personnel to administer pre- or postexposure medical countermeasures or treatment.
- Meeting clearance decontamination verification and requirements.

Strategic Decisions

2-25. The strategic level of warfare is the level at which a nation determines national or multinational strategic security objectives and then develops and uses national resources to achieve those objectives. Strategic decision making requires the highest standards of intelligence fidelity and accuracy. CBRN defense-related applications and decisions at the strategic level include, but are not limited to—

- Strategic-level deterrence decisions.
- The commitment of CWMD task forces or multinational CBRN capabilities for support to rear areas to conduct site exploitation, including forensics for evidence and attribution.
- Forensic analysis of collected evidence for attribution purposes.
- The identification of agent variants that require different treatment protocols.

Chapter 3

Planning Activities

This chapter focuses on joint ISR planning activities and the key aspects and challenges of integrating CBRN information requirements and CBRN R&S elements into the joint ISR plan or information collection plan. Whether being executed by CBRN R&S leadership or by CBRN staff within a maneuver or intelligence unit, CBRN R&S planning is not an isolated effort; it is a subordinate aspect of planning for the supported maneuver command that is carried out by CBRN staff and the CBRN R&S leader. This chapter describes key considerations that must be addressed to ensure that CBRN R&S is complementary to, and synchronized with, other collection efforts. The demand for intelligence almost always exceeds the capability of available information collection assets. CBRN staffs work with intelligence staff collection managers and the operations section to ensure the best use of limited CBRN R&S assets. A good ISR plan must fit into and support the overall operations plan. As it is developed from the initial commander's guidance through the operations process, it is never an isolated effort; instead, it is synchronized within the overall collection and targeting efforts. The CBRN ISR plan positions and tasks CBRN R&S elements so they can collect the right information while sustaining or reconstituting them for follow-on operations. Plans must be flexible enough to handle shifts in priorities and to support branches and sequels, as required by the commander. This chapter provides critical planning fundamentals, the CBRN R&S planning process, CBRN R&S planning for large-scale combat operations, and special considerations for planning.

ROLE OF THE COMMANDER

3-1. The commander's objective is to gain and maintain a position of relative advantage against adaptive, capable, and determined enemies. Timely and accurate information provided by R&S operations is critical to allowing commanders to execute effective mission command. Commanders use the information gained from R&S operations to modify existing plans, develop new plans, and reallocate assets as they refine their direction, leadership, and assessment of reconnaissance and other operations.

3-2. *Mission command* is the conduct of military operations through decentralized execution based upon mission-type orders. (JP 3-31) Mission command requires visualizing the current situation and the desired end state and formulating an operational approach and concept of operations that are feasible, acceptable, and suitable in terms of available forces, the risk to forces and the mission, and operational and strategic guidance. Commanders and staffs use mission command by allowing and encouraging prompt action in uncertain environments. Commanders must recognize that tactical opportunities are brief moments that can only be seized and exploited by the subordinate leader at the point of action. Mission command is based on (and builds the mutual trust and shared understanding between) commanders, staffs, subordinates, and partners. The principles of mission command are competence, mutual trust, shared understanding, the commander's intent, mission orders, disciplined initiative, and risk acceptance.

3-3. The nature of military operations requires decisiveness at the point of action. Leaders should adapt their thinking, formation, and employment techniques to the specific situation they face. Agile, adaptive, and aggressive reconnaissance help develop the situation to set the conditions for future success.

3-4. CBRN leaders and staffs enable the supported commander's exercise of mission command by developing information requirements and indicators, supporting the task organization of reconnaissance assets immediately upon receipt of the commander's guidance. CBRN R&S elements take action to develop the situation; answer information requirements; identify, create, and exploit opportunities; anticipate change; and coordinate without requiring new orders.

THE OPERATIONS PROCESS

3-5. Commanders and staffs use the operations process to integrate tasks executed by organic and attached reconnaissance formations. CBRN R&S is a unique capability that is often not fully understood by maneuver leadership. As a result, units are frequently task-organized rather than employed as organic formations. It is imperative that CBRN R&S leaders and staffs are proactive at all phases of the operation process and that they seek collaboration with supported, higher, and adjacent units. In addition to the principles of mission command, commanders and staffs consider the following principles for the effective employment of the operations process:

- Commanders drive the operations process.
- Commanders and staffs collaborate to plan, prepare, execute, and assess operations.
- Commanders and staffs build and maintain situational understanding.
- Commanders and staffs encourage collaboration and dialogue.

3-6. Commanders drive the operations process. While the staff performs essential functions that amplify the effectiveness of operations, the commander is ultimately responsible for accomplishing assigned missions. Commanders encourage disciplined initiative through a clear commander's intent while providing enough direction to integrate and synchronize the force during decisive phases of the operation.

3-7. Understanding is fundamental to the commander's ability to establish the context of a situation. As part of the information collection efforts, reconnaissance operations are indispensable to building and improving the commander's understanding of the situation. As commanders refine their understanding, they must quickly formulate the CCIRs and keep them current, determine where to place key personnel, and arrange for liaison teams to contribute further toward improving their understanding.

3-8. As commanders begin to understand their OE and the tactical problem, they visualize potential solutions and their desired end state. The commander's visualization is the mental process of developing situational understanding, determining a desired end state, and envisioning an operational approach through which the force will achieve that end state. Assigning reconnaissance formations, including CBRN R&S elements, to collect the most pressing information requirements provides early situational understanding and provides the basis for developing plans and orders.

3-9. After commanders visualize an operation, they describe it to their staffs and subordinates to facilitate shared understanding and purpose. During planning, commanders ensure that subordinates understand their visualization well enough to begin course-of-action development. During execution, continuous reconnaissance and security tasks influence the commander's visualization. The commander describes modifications to their visualization in updated planning guidance and directives. These modifications result in fragmentary orders that adjust the unit mission. Commanders describe their visualization in doctrinal terms, refining and clarifying their visualization as circumstances require. Commanders express their visualization in terms of—

- The commander's intent.
- Planning guidance.
- CCIRs.
- Essential element of friendly information (EEFI).
- Reconnaissance guidance.

3-10. *Commander's intent* is a clear and concise expression of the purpose of the operation and the desired military end state that supports mission command, provides focus to the staff, and helps subordinate and supporting commanders act to achieve the commander's desired results without further orders, even when the operation does not unfold as planned. (JP 3-0) For reconnaissance operations, the commander's intent statement describes what constitutes success for the reconnaissance operation. This intent statement also includes the purpose, key tasks, and conditions that define the end state. Intent links the mission, concept of operations, and tasks to subordinate units. A clear commander's intent facilitates a shared understanding and focuses on the overall conditions that represent mission accomplishment. The commander's intent must be easy to remember and clearly understood by commanders and staffs two echelons lower in the chain of command. The more concise the commander's intent, the easier it is to recall and understand.

3-11. When describing the expanded purpose of the reconnaissance operation, the commander's intent does not restate the "why" of the mission statement. Rather, it addresses the broader purpose of the operation and its relationship to the force as a whole. (Often, incorporating how the operation relates to one or more of the fundamentals of reconnaissance can clearly convey the expanded purpose of an operation.)

3-12. Commanders provide planning guidance to the staff based on their visualization of the current situation, their experience, and their professional military judgment. Planning guidance uses context, clarity, and key details to reflect how the commander sees the operation unfolding. It broadly describes when, where, and how the commander intends to employ combat power to accomplish the mission within the higher commander's intent. Broad and general guidance give staffs and subordinate leaders maximum latitude, allowing subordinate echelon staffs to develop flexible and effective options in parallel, simultaneous, and complimentary efforts. Reconnaissance leaders must clearly understand the commander's planning guidance so they know what and when to report as they identify combat information, fill information gaps, and answer PIRs.

3-13. Based on their initial understanding of the OE and tactical situation, commanders and staffs develop information requirements for reconnaissance assets. Commanders visualize how reconnaissance capabilities will synchronize with national-level assets, partner forces, and special reconnaissance to contribute to the mission accomplishment of assigned missions while supporting the higher-level commander's intent. Accordingly, commanders direct reconnaissance and craft reconnaissance guidance to set conditions for mission success.

COMMANDER'S CRITICAL INFORMATION REQUIREMENTS

3-14. A *commander's critical information requirement* is an information requirement identified by the commander as being critical to facilitating timely decision making. (JP 3-0) The two key elements are PIRs and friendly force information requirements. A CCIR directly influences decision making and facilitates the successful execution of flexible military operations or the actions a commander takes at a decision point. Commanders decide to designate an information requirement as a CCIR based on likely decisions and their visualization of the course of the operation. During planning, staffs recommend information requirements for commanders to designate as CCIRs. During preparation and execution, staffs may recommend changes to CCIRs based on assessment. A CCIR is—

- Specified by a commander for a specific operation.
- Applicable only to the commander who specifies it (or his subordinates executing reconnaissance operations in support of the commander).
- Situation-dependent (directly linked to a current mission or to a decision that will create a new mission, branch, or sequel to the current mission).
- Time-sensitive.

3-15. Commanders establish the CCIR and update information requirements based on changing conditions. Commanders and their staffs first identify information gaps and continuously assess, adapt, add, and delete requirements throughout the operation. As they continuously plan, task, and employ collection assets to answer the commander's CCIR and other information requirements, commanders and staffs must—

- Develop and continuously update a list of intelligence requirements.
- Identify and update the CCIR.
- Tie the CCIR directly to the scheme of maneuver and decision points.
- Limit the CCIR to only the most critical intelligence and combat information needs.
- Seek higher echelon collections of (and answers to) information requirements.
- Ensure that the CCIR includes the LTIOV to ensure timely reporting and decision making.

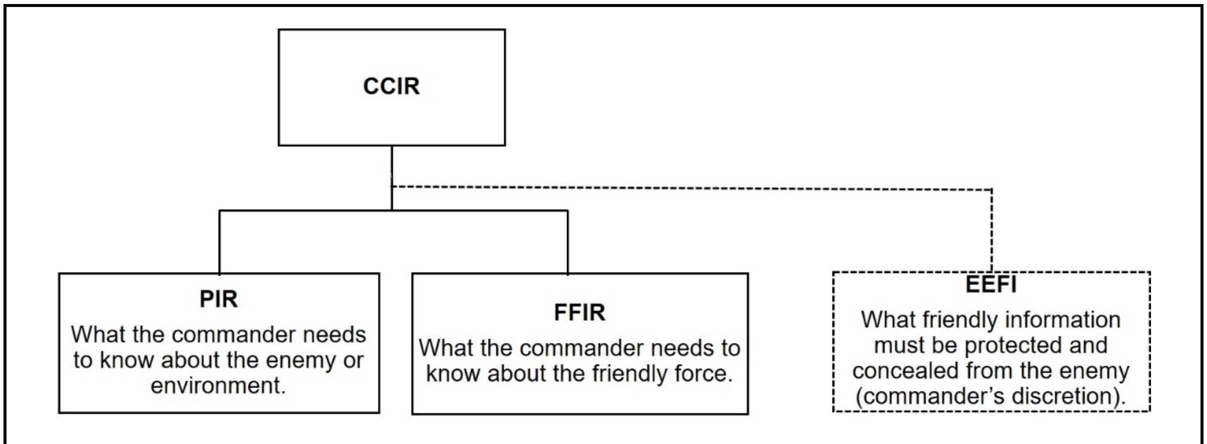
3-16. A *priority intelligence requirement* is an intelligence requirement that the commander and staff need to understand the threat and other aspects of the operational environment. (JP 2-01) PIRs determine the priority for reconnaissance operations and information collection, providing information that the commander needs to understand about a threat, enemy, or adversary or about the OE (such as terrain or civil considerations). PIRs become the central focus for CBRN R&S elements, and the staff normally ties PIRs to an NAI or a TAI.

3-17. A *friendly force information requirement* is information the commander and staff need to understand the status of friendly force and supporting capabilities. (JP 3-0) Friendly force information requirements identify the information about the mission, troops, and support available, and time available for friendly forces that the commander considers most important.

3-18. Commanders limit the number of CCIRs of their organic reconnaissance assets or task-organized teams who conduct reconnaissance tasks. With fewer prioritized CCIRs, subordinate units can apply greater concentrations of combat power and reconnaissance focus to each information requirement. At the same time, fewer prioritized CCIRs facilitate timely and accurate reporting and provide the commander the required information sooner than it would otherwise be provided.

3-19. The list of CCIRs constantly change throughout an operation. Through their staffs, effective liaison teams, the tactical network, and direct communications with their subordinate commanders, commanders constantly refine and develop their information requirements throughout the operations process as they add and delete CCIRs based on the information needed for specific decisions.

3-20. Commanders refer to information they want protected as EEFI. An EEFI is a critical aspect of a friendly operation that, if known by the enemy, would subsequently compromise, lead to the failure of, or limit the success of an operation and is therefore protected from enemy detection. Although EEFIs are not CCIRs, they have the same priority. EEFIs establish elements of information to protect rather than seek or collect. EEFI identification is central to prioritizing units, information, or activities, which allows security tasks to focus on the priorities. See figure 3-1.

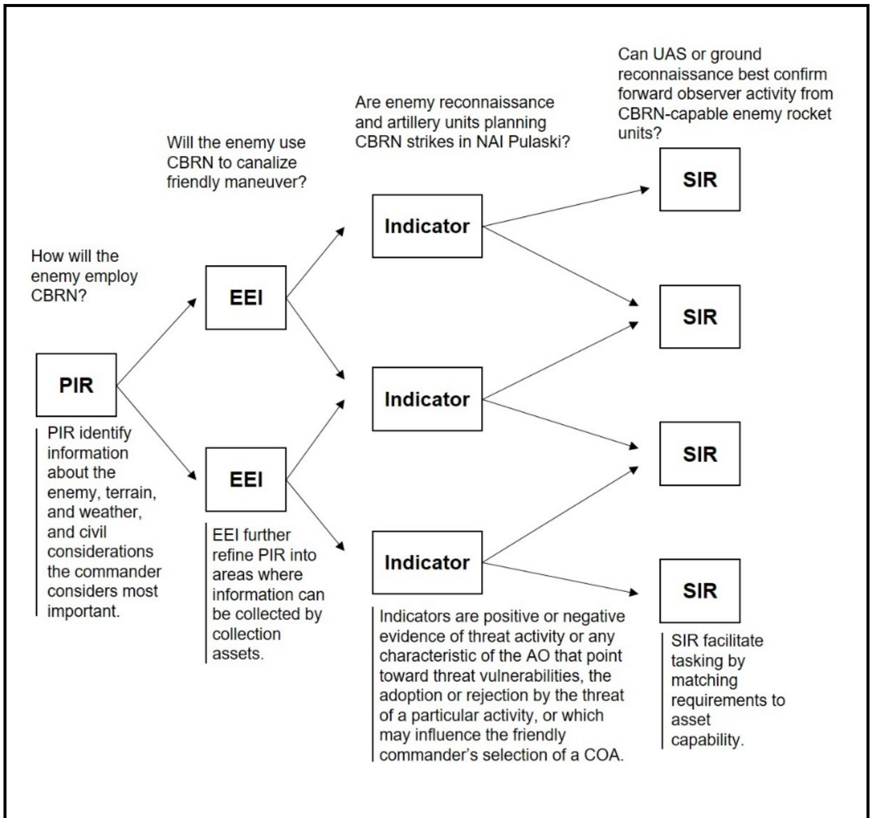


Legend:

CCIR	commander's critical information requirement
EEFI	essential element of friendly information
FFIR	friendly force information requirements
PIR	priority intelligence requirement

Figure 3-1. CCIR and EEFI

3-21. Staff further refines the commander's PIR into essential elements of information (EEI) (see figure 3-2). In turn, subordinate staffs and commanders designate EEIs that nest with the higher commander's PIR. After establishing EEIs, the squadron staff and troop commanders may establish indicators. Indicators are items of information that reflect the intention or capability of an adversary to adopt or reject a course of action. See JP 2-0 for more information.



Legend:

AO	area of operation	NAI	named area of interest
CBRN	chemical, biological, radiological, and nuclear	PIR	priority intelligence requirement
		SIR	specific information requirement
COA	course of action	UAS	unmanned aerial system
EEI	essential element of information		

Figure 3-2. Relationship of PIR to EEI and indicators

COMMANDER'S RECONNAISSANCE GUIDANCE

3-22. Reconnaissance tasks precede main body movement, minimizing the time available for troop-leading procedures for the CBRN R&S unit (including planning and rehearsal times, precombat checks and inspections, and maintenance); therefore, the commander sets reconnaissance priorities early. The commander sets priorities in the warning order (WARNORD), establishing focus, tempo, engagement/disengagement criteria, and displacement criteria. Missions without focus misallocate the collection capabilities of the CBRN R&S element. Wasting CBRN R&S elements can cause an enemy vulnerability or a catastrophic threat to remain undiscovered. Properly employing CBRN R&S requires CBRN R&S leadership and the CBRN staff of the supported maneuver commander to integrate considerations of CBRN threats and CBRN R&S assets into the joint ISR planning process.

3-23. Commanders provide clear reconnaissance guidance that offers freedom of action to develop the situation. They also provide adequate direction to ensure that their organic and attached reconnaissance organizations can accomplish stated reconnaissance objectives within the required timeframe. The commander's reconnaissance planning guidance provides a clear understanding of the organization task, purpose, and objective. Reconnaissance and security guidance explains focus; levels of detail required; levels of covertness; and guidelines for engagement, disengagement, and displacement of the organization. The commander develops his planning guidance based on the mission, timeline, and intent to satisfy information requirements and identify opportunities to seize, retain, and exploit the initiative. The commander specifies different reconnaissance guidance for each phase of an operation and adjusts the components of his guidance, when appropriate.

3-24. The commander's guidance consists of the following four elements:

- Focus.
- Tempo of reconnaissance.
- Engagement/disengagement criteria (if any), both lethal and nonlethal.
- Displacement criteria.

3-25. Focus defines the reconnaissance organization area of emphasis and prioritizes resources and time to support the commander's decision points. Focus helps balance the width and detail of reconnaissance operations to provide viable and useful information collection. Commanders and staffs assign reconnaissance objectives that directly support the commander's end state.

3-26. Tempo describes the level of detail and covertness required to accomplish reconnaissance operations. Tempo is described by four terms: rapid, deliberate, stealthy, and forceful. Rapid and deliberate are levels of detail and are mutually exclusive in all cases because one cannot be rapid and deliberate at the same time. However, reconnaissance organizations can oscillate between the two from phase to phase or even within subphases of an operation. Stealthy and forceful indicate mutually exclusive levels of covertness. Commanders choose the appropriate form of reconnaissance to accomplish the mission balanced with the other mission variables of METT-T/METT-TC.

3-27. Engagement criteria are protocols that specify the circumstances for initiating engagement with an enemy force. They can be either restrictive or permissive. The commander visualizes engagement criteria through analysis of the mission variables (METT-TC/METT-T). Engagement criteria should be defined using precise doctrinal terms. CBRN staff and CBRN R&S formations attached to maneuver elements must be proactive to ensure that the concept for conducting mitigation, render safe (with attached or organic EOD, as necessary), and sampling and for entering contaminated areas nests with the commander's intent and the tactical reconnaissance guidance of the supported reconnaissance echelon.

3-28. Displacement criteria define triggers for planned withdrawal, passage of lines, or reconnaissance handover (RHO) between units. As with engagement and disengagement criteria, the conditions and parameters set out in displacement criteria integrate the commander's intent with tactical feasibility. Conditions are either event-driven (for example, associated PIR are met, threat contact is not expected in the area, and observed NAIs or avenues of approach are denied to the enemy), time-driven (for example, LTIOV time triggers are met), or threat-driven (observation posts [OPs] are compromised). Failure to specifically dictate conditions of displacement, nested within the higher scheme of maneuver, will likely result in ineffective reconnaissance.

3-29. Commanders direct all aspects of operations by establishing the commander's intent, setting achievable objectives, and issuing clear tasks to subordinate units. Throughout the operations process, commanders direct forces by preparing and approving plans and orders; establishing command and support relationships; assigning and adjusting tasks, control measures, and task organization; positioning units to maximize combat power; positioning key leaders at critical places and times to ensure effective C2; allocating resources to exploit developing opportunities and to counter emerging threats; and committing reserves, as required.

3-30. Through leadership, commanders provide purpose, direction, and motivation to subordinate commanders, their staffs, and Service members. The commander's physical presence is necessary to lead effectively. During reconnaissance operations, the battalion and higher-level commander balances their time between leading the staff through the operations process and providing purpose, direction, and motivation to subordinate commanders and personnel forward of the command post.

3-31. Commanders continuously assess the situation to better understand current conditions and determine how the operation is progressing. Continuous assessment helps commanders anticipate and adapt the force to changing circumstances. Commanders incorporate the assessment of the staff, subordinate commander, and unified action partners into their personal assessment of the situation. Based on their assessment, commanders modify plans and orders to adapt the force to changing circumstances.

CBRN R&S SUPPORT TO COMMAND AND CONTROL

3-32. CBRN leaders and staffs enable the supported commander's exercise of mission command by rapidly fulfilling information requirements. The information obtained by CBRN R&S elements helps clarify the situation; answer information requirements; and assist the commander in identifying, creating, and exploiting opportunities and in anticipating change. The results of such operations improve the commander's understanding, visualization, and description of the operating environment, the terrain, local populations, and the enemy. Through effective information collection and continuous reconnaissance operations nested within the higher concept of operations, commanders develop the understanding required to achieve and maintain advantage over the enemy. Reconnaissance improves the commander's understanding and enables him to—

- Understand the tactical, human, and political dynamics within an AO.
- Visualize operations in the context of operational and mission variables (METT-TC/METT-T).
- Describe the commander's decisive operations in time, space, and purpose with a greater degree of detail, accuracy, and fidelity.
- Concentrate friendly strengths against enemy weaknesses.
- Assess progress through continuous reconnaissance, monitoring, and evaluation.
- Modify existing or developing plans and reallocate assets based on changing tactical situations.
- Achieve tactical depth.
- Identify and create options to seize, retain, and exploit the initiative.

3-33. Reconnaissance leaders must understand the overall OE and their commander's intent at least two echelons higher in the chain of command, be decisive, make plans quickly, exercise disciplined initiative (even disciplined disobedience), pass available information to subordinates, report to higher headquarters accurately and rapidly, and be responsive to changing conditions on the battlefield.

CBRN R&S PLANNING FUNDAMENTALS

3-34. The CBRN R&S information collection planning fundamentals provide CBRN staffs and planners the basic guidelines for how to employ CBRN R&S capabilities to optimize their use in support of joint ISR. The joint services use these planning fundamentals to mutually support one another and to synchronize CBRN R&S across multiple domains in the theater of operations. The following are the CBRN R&S planning fundamentals:

- **Support the JIPOE/IPB process and retain flexibility to answer multiple PIRs.** CBRN R&S is the process of using refined intelligence from multiple information platforms (resulting from intelligence analysis) to answer CBRN-focused critical information requirements. This process must be integrated with the overall JIPOE/IPB and joint ISR endeavors of the supported maneuver command. Every CBRN R&S mission is first and fundamentally an R&S mission. A CBRN R&S element, operating independently or as an attachment with a cavalry, infantry, special operations force, or other reconnaissance element, is responsible for conducting the range of fundamental reconnaissance tasks to support the commander's situational awareness. CBRN R&S provides support to measurement and signature intelligence (MASINT), technical intelligence, and other intelligence disciplines and may support answering a wide range of PIRs—not just CBRN-related PIRs. Throughout the course of a CBRN R&S mission, information is reported through standard mission command networks and postmission reporting. During the course of JIPOE/IPB, CBRN-related PIRs are integrated into the joint ISR planning process, ensuring that the allocation of joint ISR assets reflects the commander's priorities. As information is collected, it must be shared with the J-2/G-2/S-2 to provide a complete picture of enemy intent and possible CBRN employment. CBRN R&S capabilities are critical and extremely limited assets that must be postured to collect information on multiple NAIs or to target areas of interest, as required by the commander.
- **Task-organize and allocate CBRN capabilities by using the operational framework.** An operational framework is a cognitive tool used to assist commanders and staffs in clearly visualizing and describing the application of combat power in time, space, purpose, and resources during the concept of operations. It is imperative to CBRN staffs to plan and position CBRN capabilities to rapidly respond to CBRN incidents to develop combat information at the appropriate identification level required based on the mission. Using the

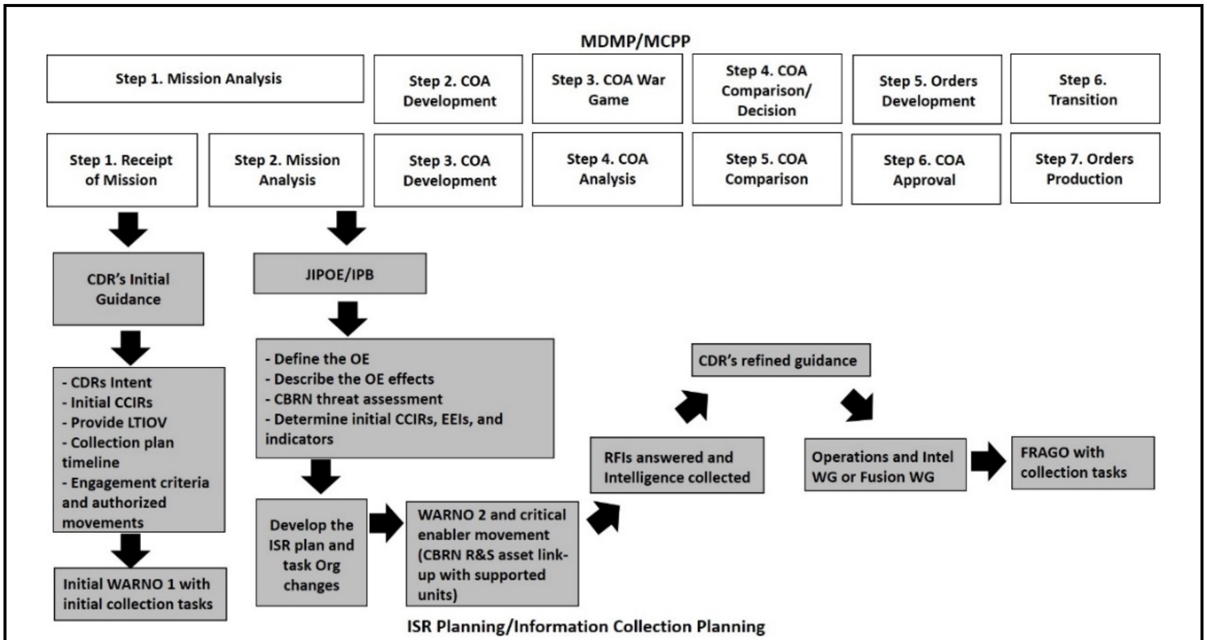
deep/close/consolidation/support operational framework during Joint Operation Planning and Execution System/military decision-making process (MDMP)/Marine Corps Planning Process (MCPP), CBRN staffs plan for the capabilities needed to achieve the appropriate level of identification. Most initial contact with CBRN and TIM hazards is made through conventional forces (such as infantry, armor, or cavalry formations) while conducting movement and maneuver. Technical CBRN support forces provide an increased detection and identification capability to refine the information that answers CCIRs and guides the commander's decision making. It is important that CBRN staffs clearly articulate, in mission orders, the locations at which the forces that are capable of each level of identification—and the locations at which essential elements of the sample management—reside. This establishes the framework for the sequential chain of custody after sampling operations are executed. Through backwards planning, CBRN staffs must account for the correct asset for detection with the requisite technology, sample media, supporting decontamination requirements, and transportation requirements to execute sample management procedures correctly. At the brigade/regiment/Marine air-ground task force (MAGTF) level and higher, commanders and staffs plan CBRN R&S to execute missions by using the deep/close/consolidation/support framework to broadly describe force allocation, organization, and capability. At battalion/squadron levels or lower, the decisive/shaping/sustaining or main and supporting effort frameworks are used within the concepts of operations to describe (in greater detail to the tactical commander) how CBRN capabilities support the scheme of maneuver.

- **Plan force allocations to meet CBRN R&S requirements across the range of military operations.** To maintain operational reach against a CBRN-capable adversary, CBRN R&S capabilities are planned to arrive early into theater to provide mission-essential CBRN assessment capabilities to the force. CBRN R&S units are placed in the time-phased force and deployment database to support the plan. The sustainable readiness model is used to determine unit readiness for deployment and accounts for the time that it takes for the Army National Guard, Air National Guard, and Reserve forces to constitute and deploy. Planners should project CBRN R&S capabilities to account for information collection requirements during joint reception, staging, onward movement, and integration (JRSOI); lodgment expansion; LSCO; and limited contingency and stability operations. Planners should coordinate with interagency, multi-Service, multinational, and coalition planners to address force requirements and capabilities.
- **Plan for command and support relationships that support maneuver and sustain CBRN R&S over extended distances and in multiple areas of operation.** CBRN capabilities are not allocated organic sustainment capabilities. When CBRN R&S elements are task-organized with maneuver formations during CBRN incidents, it allows commanders the freedom of action to retain operational tempo and to maneuver forces into positions of relative advantage. Conversely, during CWMD missions, maneuver provides security for the CBRN R&S to detect, identify, and exploit CBRN environments. CBRN units do not own AOs, but they must move and execute missions across multiple AOs to support commanders. Planners must account for the appropriate C2 and sustainment of CBRN R&S, especially in deep areas and across extended lines of communication.
- **Know the OE, and leverage it to the advantage of the R&S asset.** Understanding the strengths and weaknesses of each respective CBRN R&S asset is critical for planners at all levels. Mounted CBRN R&S platoons can move rapidly to identify and mark contaminated areas over large areas while maintaining tempo with mechanized forces. Dismounted reconnaissance assets can execute missions in restrictive terrain and in dense urban and subterranean environments, but at a slower tempo than mounted units. The use of unmanned reconnaissance is valuable when terrain is canalizing, in a low oxygen or hazardous environment, or favorable to enemy direct fires, such as urban terrain and subterranean facilities. Unmanned reconnaissance is of particular value when supporting breaching of contaminated obstacles. Aerial reconnaissance is effective at providing coverage across wide areas of open terrain while minimizing the risk from CBRN exposure and enemy direct and indirect fires. During aerial reconnaissance, the time in the area is limited by distance of travel and the operational capabilities of the platform. Planners must position CBRN R&S capabilities in positions of advantage to maximize their effects.

- **Maximize standoff capabilities from NAIs and target areas of interest to detect and identify at a distance.** CBRN R&S detects and identifies hazards outside of the contaminated area to the greatest extent possible. The optimization of standoff detection capabilities minimizes mitigation requirements and maximizes the early warning of CBRN hazards or attacks to commanders, allowing greater decisions space.
- **Provide layered surveillance coverage of areas in which CBRN attacks are probable.** Although CBRN detection arrays are viewed as mutually exclusive, when integrated, they reinforce and amplify the detection capability for the entire force. CBRN surveillance sensors are arrayed with both integrated and redundant coverages from CBRN and non-CBRN units. Non-CBRN units employ organic CBRN detection at probable sites of attack. CBRN unit sensor arrays augment detection and identification capabilities to provide greater area coverage.
- **Visualize where CBRN R&S capabilities are in time and space, and recognize where acceptable risk is assumed in information gaps.** There are never enough CBRN capabilities to provide coverage for every portion of the AO simultaneously. Through the orders production process, commanders and staffs prioritize, synchronize, and accept risk to place CBRN R&S capabilities where they are needed most.
- **Communicate with higher and lower echelons to mitigate coverage gaps and leverage multiple intelligence capabilities.** Commanders and staffs must articulate operational coverage and information gaps for synchronization and deconfliction at higher echelons. CBRN staff planners provide requests for forces to theater CBRN planners to leverage unified action partner capabilities. Planners must account for the effects of space and cyber domains to provide alternate collection means.
- **Establish a supporting mitigation plan before CBRN R&S missions begin.** A key planning assumption is that CBRN R&S capabilities are at greater risk for contamination. This requires an overall contamination mitigation plan that encompasses contamination control (limiting the spread) and decontamination (technical decontamination of sampling teams). CBRN R&S units use stand-off and remote identification capabilities to the greatest degree possible to identify contamination while minimizing the risk to forces. CBRN R&S capabilities that are in deep and close areas have greater risk to direct and indirect fires. Therefore, commanders (in conjunction with support staff) must make an informed, risk-based analysis on whether to continue to fight while contaminated or to mitigate hazards during an operational pause. A key consideration is the operational tempo of the supported unit.

CBRN R&S PLANNING PROCESSES

3-35. ISR planning (with CBRN R&S as a consideration) is executed simultaneously with the JIPOE/IPB, the Joint Operation Planning and Execution System process, and the development of CCIRs and PIRs with the J-2/G-2/S-2 (intelligence) staff. CBRN R&S planning follows a chronological process that incorporates several elements of the JIPOE/IPB process. The purpose of the overall joint ISR plan is to prioritize and assign missions to CBRN R&S capabilities to answer the commander's PIRs. PIRs are intelligence requirements, stated as a priority for intelligence support, that the commander and staff need in order to understand the adversary or other aspects of the OE. PIRs can be phase-based, are usually associated with a decision point, and are based on an adversary action or inaction or on the operational area that affects the overall success of the mission. The staff drafts PIRs for recommended additions to the commander's initial guidance during mission analysis. The JIPOE/IPB process refines the commander's information requirements about the adversary (to include CBRN capabilities), the adversary's purpose, and terrain and weather considerations. Figure 3-3, page 3-10, shows the work flow of how MDMP/MCPP and information collection planning run concurrently.



Legend:

CBRN	chemical, biological, radiological, and nuclear	JIPOE	joint intelligence preparation of the operational environment
CCIR	commander's critical information requirement	LTIOV	latest time information is of value
		MCPP	Marine Corps planning process
CDR	commander	MDMP	military decision-making process
COA	course of action	OE	operational environment
EEI	essential elements of information	org	organization
FRAGORD	fragmentary order	R&S	reconnaissance and surveillance
intel	intelligence	RFI	request for information
IPB	intelligence preparation of the battlefield	WARNORD	warning order
ISR	intelligence, surveillance, and reconnaissance	WG	working group

Figure 3-3. Information collection planning conducted parallel to MDMP/MCPP

RECEIVE THE MISSION AND MISSION ANALYSIS

3-36. During the receipt of a mission, the commander provides the staff guidance that he considers critical. The entire staff analyzes the CCIRs and then submits requests for information to higher echelons and WARNORDs to subordinate units. This information is maintained on running estimates and common operational pictures to ensure that all staffs maintain awareness of current CBRN information gaps. The staff then begins the process of mission analysis and JIPOE/IPB.

RECEIVE THE COMMANDER'S INITIAL GUIDANCE

3-37. Commanders communicate their plan by providing guidance and identifying information that they consider critical for decision making and mission accomplishment. The commander provides initial planning guidance, followed by more refined guidance as information gaps are addressed. The J-2/G-2/S-2 staff recommends the PIRs to the commander to address information gaps, which forms the basis for intelligence requirements. CBRN staff members, as subject matter experts on CBRN and potential enemy CBRN usage, advise and assist the J-2/G-2/S-2 and command surgeon's medical staff. This includes recommended guidance for CBRN collection assets to address information gaps. Commanders must consider risks for the placement of CBRN R&S capabilities as a collection platform and understand the acceptable level of risk for R&S activities. CBRN staffs and planners inform and advise the commander on how to best assess and mitigate CBRN hazards during operations. To initiate the planning effort, it is critical that the staff receives the commander's initial guidance on the—

- Initial approved CCIRs, to include PIRs staffed with the J-2/G-2/S-2.
- Initial timeline for collection planning and product development.
- Initial information collection focus to address information gaps and CBRN attack indicators.
- Commander's authorized movements to place CBRN R&S capabilities where they can best support information collection.

3-38. Upon conclusion of receiving the commander's initial guidance, the staff develops a WARNORD to initiate movement of R&S assets and follows up on information requests previously submitted to higher echelons during mission analysis. The staff seeks to answer as many of the commander's PIRs as possible. The PIRs that cannot be answered immediately are tracked on the draft ISR/information collection plan.

Define the Operational Environment

3-39. The OE is defined by identifying the AO and area of influence. The *area of operations* is an operational area defined by the commander for land and maritime forces that should be large enough to accomplish their missions and protect their forces. (JP 3-0) The *area of influence* is a geographical area wherein a commander is directly capable of influencing operations by maneuver or fire support systems normally under the commander's command or control. (JP 3-0) The AO and area of influence become the boundaries for joint ISR planning purposes. Coordination between adjacent units is required, along with a situational understanding of what the higher echelon is conducting in deep areas. To better synchronize all joint ISR efforts within the AO, CBRN staffs use the deep-close-support-consolidation framework.

Describe the Effects of the Operational Environment

3-40. During JIPOE/IPB, the planning staff identifies the operational and mission variables. Part of that process is describing the OE effects through the terrain analysis, civil considerations, and weather analysis/projected conditions that impact joint ISR/information collection. The output of this step in JIPOE/IPB is a modified combined obstacle overlay that describes the OE effects. Planners use the modified combined obstacle overlay to efficiently place CBRN mounted, dismounted, unmanned, and standoff capabilities to support situational understanding and freedom of maneuver.

Conduct the CBRN Threat Assessment

3-41. During JIPOE/IPB, the CBRN staff assists the J-2/G-2/S-2 in evaluating the CBRN capabilities of the adversary. The J-2/G-2/S-2 tends to focus their efforts on understanding the enemy scheme of maneuver. It is imperative that CBRN staffs provide subject matter expertise to describe how enemy CBRN use will shape friendly forces. The J-2/G-2/S-2, with the supporting staffs, create an adversary doctrinal template and situation template that show adversary force dispositions at a time and place relative to each course of action developed by the staff. CBRN staffs should provide substantive support to their conclusions with understanding of enemy CBRN systems, capabilities, and doctrine through a CBRN threat assessment that is shared with, or briefed to, the J-2/G-2/S-2 staff.

3-42. As described in ATP 3-11.36/MCRP 10-10E.1/NTTP 3-11.34/AFTTP 3-2.70, CBRN threat assessments address the following to direct CBRN-focused information collection:

- Addresses all CBRN threats and hazards in a who, what, where, when, why, and how methodology.
- Differentiates threats versus hazards. If the threat is considered a deliberate adversarial CBRN threat, CBRN staffs determine the adversary's capabilities, including preferred and likely delivery methods.
- Develops an assessment strategy for potential TIM hazards, if required. If TIM sites are damaged by friendly direct and indirect fires, an assessment and mitigation strategy is developed by the staff.

- Identifies opportunities to deliver, including where and when friendly forces are vulnerable.
- Determines enemy delivery intent, describing the enemy's desired tactical task. JP 6-0 provides joint standard, to refine that understanding see FM 6-0 for developing a proposed mission statement (chapter 9). It is important to understand which C2 level CBRN deployment/release authority decisions are made by the adversary as it may direct where intelligence operations focus efforts.

COMPLETE OPERATIONAL PLANNING

3-43. CBRN staffs and planners apply the CBRN threat assessment as each adversary course of action is developed and war-gamed. Enemy intent with CBRN attacks are described using tactical tasks or desired effects to maneuver commanders and staffs. During war gaming, planners describe how the allocation of CBRN R&S capabilities throughout the OE facilitate early warning and enable the interdiction of enemy CBRN usage. Upon completion of the operation order (OPORD), the CBRN annex should clearly articulate the adversary's planned use of CBRN and how joint ISR operations inform and provide indicators for use. Units tasked to support joint ISR operations must understand what they are looking for. CBRN planners develop an information collection plan that provides this information to tasked assets.

DEVELOP AN INFORMATION COLLECTION PLAN

3-44. The information collection plan is part of the parallel planning that is executed simultaneously with MDMP or MCPP. CBRN staff planners support the JIPOE or IPB process by answering the commander's PIRs. The process systematically analyzes the enemy's actions and intent. Some PIRs are satisfied during mission analysis, and others are unanswered. Unanswered PIRs are then delineated as EEIs, indicators, and specific information requirements, which is tracked via joint ISR planning. Requests for information or requests for support are sent to higher echelons if required collection capabilities are not organic to the unit. CBRN staffs determine CBRN-related information requirements and share them with the J-2/G-2/S-2. The output of information collection planning is an R&S collection matrix that—

- Identifies the PIRs, EEIs, and SIRs that need to be answered.
- Determines which specific type of CBRN threat or hazard is being collected.
- Determines the indicators (specific weapon systems, enemy actions, OE factors that increase likelihood of use) and SIRs (report location and/or message traffic regarding release authority or fire instructions over R-173M frequency modulation (commonly known as FM)-very high frequency (known as VHF) radios at 30 to 80 megahertz at a 20-watt output).
- Identifies non-CBRN and CBRN R&S units or capabilities tasked to answer the requirement.
- Provides an LTIOV for each SIR. LTIOV is critical for leveraging long-range fires to interdict CBRN attacks before launch.
- Prioritizes each SIR. This is particularly important when there is a lack of collection assets to address EEIs and SIRs. Subordinate units must understand where they can best utilize information collection assets to optimize their placement and synchronize them.
- Identifies and marks NAIs, as described in chapter 1, on the operations map by using the military grid reference system. Anticipated times and locations of enemy activity indicators are derived through the JIPOE/IPB process and portrayed as NAIs. These geographic areas and times of interest become focal points for collection requirements. The J-2/G-2/S-2, operations, and supporting staffs use the assessment of indicators to articulate and justify collection requirements/requests for forces to higher headquarters and to help subordinate commands understand where best to place listening posts (LPs)/OPs.
- Identifies the specific unit that has been tasked to answer each specific information requirement. This information should be disseminated in the CBRN appendix of the OPORD or in the tasks assigned to the subordinate units section of the OPORD.

3-45. Figure 3-4 provides an example of an R&S collection matrix containing CBRN-focused data.

PIR	C	B	R	N	E	Indicators	Specific Information Requirement	Required Int	LTIOV	Priority	NAI	Unit Tasked
Where are the enemy delivery systems for CBRN assets? *What assets are capable of employing CBRNE munitions?*	Y	Y	N	N	N	9A51	Report location, composition and disposition of a large flat- bed truck with 6 wheels, with a square collection of tubes on the truck bed.	IMINT		High	05	2-1 CAV SQDN
							Ask and report credible answers to the following question "Do you know where there is a large flat-bed truck with 6 wheels, with a square collection of tubes on the truck bed?"	HUMINT		High	05	2-1 CAV SQDN
							Report location of a KAMAZ-740, 210 hp diesel engine.	MASINT		High	05	2-1 CAV SQDN
How are TIC/TIMs stored in the AO? *Does the facility have standard material and warnings?* *Is the population affected by the facility?*	Y	Y	N	N	Y	Large containers	Report location and composition/disposition of cylinders/large drums or crates	IMINT		Medium	037	2-1 CAV SQDN
							Ask and report credible answers to the following question "Do you know the location of storage areas where there are large drums, cylinders or bulk storage crates of unknown substances?"	HUMINT		Medium	03	409 MI BN
	Y	Y	Y	Y	Y	Placards/markings/ labels with warnings	Report location and vehicle/facility description containing hazard placards	IMINT		Medium	03	1/63 CM
							Ask and report credible answers to the following question "Do you know the location of any facility or vehicle that have hazard signs?"	HUMINT		Medium	03	409 MI BN
	Y	Y	Y	Y	Y	People displaying symptoms	Ask and report credible answers to the following question "Do you know any areas where people have nausea, vomit, burning/itching skin/eyes?"	HUMINT		Medium	03	MCAS
Where is the enemy producing/storing CBRN munitions or weapons? *Where are the enemy's materials to produce CBRN munitions or weapons?* *Where are the areas that show activity related to production and testing?*	Y	Y	Y	N	Y	Glassware	Report location of sighted glassware (chemistry flasks or beakers).	IMINT		Low	03	1/63 CM
							Ask and report credible answers to the following question "Do you know anyone who has an unusual amount of glassware or chemistry equipment?"	HUMINT		Low	03	409 MI BN
	Y	Y	Y	N	N	Munitions leaking liquids with markings on tip (green for chemical, yellow for HE)	Report any conventional artillery munitions with unusual liquid leaking from tip; yellow marking on warhead itself, green bands around tip, overtly marked munition	IMINT		Low	03	2-1 CAV SQDN
							Ask and report credible answers to the following question "Do you know where there are any conventional artillery munitions with unusual liquid leaking from tip; yellow marking on warhead itself, green bands around tip, overtly marked munition?"	HUMINT		Low	03	409 MI BN
	Y	Y	Y	Y	Y	Medical Symptoms	Ask and report credible answers to the following question "Do you know where there are increased injuries of unusual nature; chemical burns, lost appendages, skin or eyes irritated, coughing or respiration issues, death?"	HUMINT		Medium	05	409 MI BN
							Report locations of increased injuries of unusual nature; chemical burns, skin or eyes irritated, coughing or respiration issues, death.	IMINT		Medium	05	MCAS

Legend:

AO	area of operations
BN	battalion
CAV	cavalry
CBRN	chemical biological, radiological, and nuclear
CBRNE	chemical biological, radiological, nuclear, and explosives
CM	chemical
HE	high explosive
hp	horse power
HUMINT	human intelligence
INT	intelligence
IMINT	imagery intelligence
LTIOV	latest time information is of value
MASINT	measurement and signature intelligence
MCAS	medical company area support
MI	military intelligence
NAI	named area of interest
PIR	priority intelligence requirement
SQDN	squadron
TIC	toxic industrial chemical
TIM	toxic industrial material

Figure 3-4. Example information collection matrix

3-46. After CBRN staff planners have developed a collection matrix, they ensure that it is nested with the J-2/G-2/S-2 staff's overall collection strategy. The matrix provides an objective method to task CBRN R&S capabilities; it also provides a tracking mechanism for ensuring that information requirements are satisfied. Understanding the tasking authority and command relationships is critical for planners to integrate CBRN units into R&S plans. There should be synchronization and parallel planning between higher units and units that control R&S collection assets. The CBRN staff are critical to ensuring that CBRN-related PIR and EEI are incorporated into the operations of the collective information collection enterprise. CBRN R&S leadership must ensure that their formations not only observe the narrow, technical indicators that are related to CBRN, but also that they maximize their contribution to the commander's intent by reporting all EEI within their AO.

COLLABORATION AND DIALOGUE

3-47. Throughout the operations process, commanders encourage continuous collaboration and dialogue among the staff and with unified action partners. Collaboration and dialogue aids in developing shared understanding throughout the force. To accomplish the requisite degree of collaboration and dialogue and to assist the commander in planning, executing, and assessing reconnaissance and security tasks, the staff should organize into an operations and intelligence working group.

3-48. The operations and intelligence working group is comprised of designated staff officers who coordinate and integrate information collection activities and provide recommendations to the commander and the S-3/assistant chief of staff, operations (G-3)/J-3. The operations and intelligence working group develops and refines the information collection plan as part of reconnaissance operations.

3-49. The exclusive use of organizational CBRN sensors limits hazard awareness and understanding. Integration across the spectrum of sensors (CBRN and non-CBRN) provides a more effective understanding of the CBRN OE. Situational understanding can only be achieved through the integration of capabilities across the warfighting functions. When operating in a CBRN environment, the tactical commander is challenged to make timely and informed risk-based decisions, supported by awareness and understanding, to ensure survivability while retaining freedom of action in accomplishing the mission.

3-50. The integration, collaboration, and synchronization of the warfighting functions primarily occur within the staffs. The integration of all-source intelligence and information incorporating CBRN sensing and detection capabilities provides a better picture of the OE and facilitation of situational understanding. The other staff sections coordinate and integrate the requirements of the CBRN staff.

3-51. The CBRN staff collaborates with the personnel section (assistant chief of staff, personnel [G-1]/ battalion or brigade personnel staff officer [S-1]) for the status of CBRN personnel and CBRN personnel assignments and by using advanced hazard prediction modeling for predicting CBRN casualties. Because of the fear and stress associated with CBRN operations, the chaplain section (echelons above brigade) or unit ministry team (brigade and battalion) should be contacted to provide religious support to military members, DOD employees, and authorized civilians and to provide advice on ethics and morale following a CBRN incident.

3-52. The assistant chief of staff, civil affairs operations (G-9), and associated civil affairs forces can provide civil environment considerations and analysis into the planning, operations, and targeting process. Civil affairs planners using CIM products and analysis can provide nonlethal targeting options to support the commander's end state when appropriate, and they can support lethal targeting with analysis of second and third order effects and mitigate the effects of lethal targeting on the civil environment and local population.

3-53. The command surgeon and medical staff should participate in the CBRN and intelligence staff working groups and meetings to execute health surveillance and coordinate behavioral/mental health support throughout the joint/allied force. All of this information feeds into the CBRN staff ability to prepare accurate threat assessments. The CBRN staff must be actively involved with G-2 staff analysis and planning in all phases of MDMP or joint planning by supporting CCIRs based on the commander's initial guidance and by nominating areas of interest and providing technical SME for likely enemy actions.

3-54. Additional staff members/teams that should be represented in the operations and intelligence working groups include, but are not limited to—

- Engineer officers.
- Air defense airspace management representatives.
- Aviation officers.
- Air liaison officers.
- Military intelligence commanders.
- S-3s/G-3s/J-3s.
- S-2s/G-3s/J-3s.
- Liaison office teams.
- Fire support officers.
- Signal officers.
- Space officers.
- Electronic warfare officers.
- CBRN officers.
- Sustainment cell representatives.
- Information operations officers.
- Civil affairs officers.
- Judge advocates (if available).
- Public affairs officers (if available).

SPECIAL PLANNING CONSIDERATIONS

3-55. As with subterranean and dense urban environments, OEs present challenges that require specific planning. Special planning considerations provide commanders and staffs with planning guidance for unique environmental conditions and CBRN R&S missions that pose increased risk to forces.

SUBTERRANEAN ENVIRONMENTS

3-56. CBRN reconnaissance of subterranean environments, particularly in UGF, is generally conducted in conjunction with a larger mission, operation, or campaign during which the majority of combat occurs on the surface. Most subsurface operations are conducted at the company level and below. Battalions and brigades must support forces that defend and control the terrain above subterranean environments. They must also support the smaller, tactical forces that exploit the inside of subterranean facilities, to include CBRN dismounted and unmanned systems. CBRN R&S forces enhance the ability for maneuver units to execute clearing operations in UGFs, supporting site exploitation operations while simultaneously monitoring oxygen quality, the presence of explosives, or poisonous gases.

3-57. UGFs are unpredictable hazards to CBRN R&S forces because of their complexity, depth, and construction. UGFs have the tendency to flood during rainy seasons and are frequently booby-trapped to prevent exploitation. UGFs may have multiple unknown access ports, increasing the risk of ambush to CBRN R&S elements. Planners must account for the expected degraded communications and navigation abilities associated with UGFs. UGFs have the increased risk of overpressure, peak pressure, and impulse pressure during explosive usage and small arms fire, as described in ATP 3-21.51. The blasts from pressure waves can damage CBRN protection equipment and severely injure personnel clearing UGFs. Without ventilation, CBRN hazards may linger or leach into the surrounding underground material, posing long-term hazards to forces. If the potential for contamination of a UGF exists or if it is a known WMD site, planners must ensure that technical decontamination support is established before entry and plan for use of protective masks or supplemental oxygen. Ultimately, commanders and staffs make an informed risk decision on whether to exploit UGFs or to secure them from the surface, preventing further use.

DENSE URBAN ENVIRONMENTS

3-58. Dense urban environments pose an increased risk to CBRN R&S forces due to terrain that supports enemy freedom of maneuver, troop concentration, and the canalizing effect of roads and alleyways. CBRN hazards have a tendency to linger longer in urban structures, such as parking garages and sewage drains, where the air is cooler and circulates through streets unpredictably. There is also an increased risk of collateral damage due to the large presence of noncombatant personnel and industrial facilities. Because of the risk to noncombatants and friendly forces, CBRN R&S forces must analyze and understand civil considerations (areas, structures, capabilities, organization, people, and events [ASCOPE]) to conduct centralized planning and decentralized execution in urban terrain. WMD facilities and TIM hazards should be identified during mission analysis of the orders process.

3-59. Using CBRN R&S forces in combination with maneuver forces affords the commander a significant force multiplier for survivability in dense urban terrain. CBRN R&S forces should be task-organized with supporting mounted and dismounted maneuver capabilities to execute missions in urban terrain. Mounted forces possess the speed, agility, and firepower to rapidly isolate CBRN sites, establishing an outer cordon. However, mounted CBRN R&S may be constrained by terrain (limiting stand-off detection capabilities) and are more vulnerable to targeting by enemy light forces.

3-60. Dismounted maneuver forces can effectively clear objectives of enemy personnel, establishing the essential security required for CBRN site exploitation operations. Organic dismounted CBRN platoons to infantry brigades and MAGTFs are best-trained and equipped to conduct CBRN R&S in dense urban terrain due to habitually established training relationships. However, dismounted CBRN R&S elements lack stand-off detection capability and have a slower movement and rate of identification. Additionally, host-nation emergency first responders may reduce the risk of the unintentional release of TIMs and minimize CBRN R&S requirements during stability operations. For more information on combined arms operations in urban terrain, see ATP 3-06/MCTP 12-10B.

COMMUNICATION

3-61. Communications are vital to reconnaissance operations. Reconnaissance elements conduct effective reconnaissance, but if they are unable to report their findings to their supported command, they are a wasted resource. Leaders must place the same emphasis in their communications plan as any of the other warfighter functions. Because of the extended frontages and distances over which reconnaissance elements operate, they must be experts at operating communication equipment, troubleshooting and improvising communication systems, and integrating with multi-Service or allied communication networks. Leaders must be capable of managing communication across multiple networks simultaneously.

3-62. The lowest element radio networks (typically platoons, sections, or crews) are critical to effective platoon C2. All elements within the platoon must have the ability to monitor and transmit on the radio network at all times. All reconnaissance elements in the platoon (sections, squads, or crews) must also have the ability to rapidly change to any other platoon network as required to coordinate contact points or hand over reconnaissance responsibilities.

3-63. The company-level (squadron or wing) radio networks are critical to company-level C2. The command post is the network control station, and the subordinate leaders send routine reports to the executive officer. Subordinate leaders converse with each other and coordinate key tactical actions of their elements; however, they use subordinate radio networks to pass routine messages that are of no interest to the commander.

3-64. Fires networks are frequently used to send calls for fire to the appropriate fire support officer or fires cell or directly to the supporting mortars. All reconnaissance elements must have the ability to switch to this network and coordinate indirect fires. Reconnaissance elements must also be ready to change to the networks of supporting elements, such as tank and mobile gun systems, to coordinate support by fire.

3-65. Administrative networks are used as required to send routine administrative and logistics/reports. This network also coordinates the resupply and evacuation of casualties.

3-66. Retransmission networks are required to support operations over extended distances. Retransmission networks should be established to support all missions requiring frequency modulation communications at extended ranges.

3-67. The primary, alternate, contingency, and emergency (PACE) plan is a communication plan that exists for a specific mission or task—not a specific unit—because the plan considers both intraunit and interunit sharing of information. The PACE plan designates the order in which an element moves through available communications systems until contact with the desired distant element is reestablished.

Visit, Board, Search, and Seizure

3-68. Maritime visit, board, search, and seizure operations are conducted onboard designated vessels to that are to be visited or boarded. Specific tactics, techniques, and procedures are used to search for evidence of contraband. See NTTP 3-07.11M for additional details.

Littoral Areas

3-69. Littoral areas are described as geographical areas from the ocean through the shore area, 14 miles inland. During joint forcible entry operations, littoral areas provide joint force commanders (JFCs) with opportunities to gain and maintain the initiative, placing friendly forces in positions of relative advantage through operational maneuver from the sea. These operations introduce significant-size forces into the rear or flanks of enemy forces. Littoral areas are described as having two parts: seaward areas controlled by naval assets from the open ocean to the shore and landward area inland from the shore that can be supported and defended directly from the sea.

3-70. Enemy CBRN capabilities may be employed against Navy and Marine forces as part of the enemy's antiaccess/area denial plan. Enemy CBRN attacks disrupt the synchronization of beachhead establishment and follow-on operations. United States Marine Corps CBRN R&S teams support freedom of maneuver in the littoral area, providing early warning and identification of CBRN hazards that impede Marine force freedom of action and flexibility. Planners integrate United States Marine Corps CBRN R&S elements with Marine maneuver elements as a combat multiplier before missions.

Sampling Impacts to Tempo

3-71. CBRN sampling supports follow-on decisions, such as mitigation strategies and medical treatment. Sampling is an essential element to attribution, providing legally sufficient evidence of the use of WMDs by adversaries. Collecting CBRN samples for exploitation is a deliberate operation that requires multiechelon coordination and synchronization. Site exploitation is costly in terms of time and security requirements. CBRN R&S forces that are in support of maneuver elements in enemy contact cannot overcommit time and efforts to sampling without the cost of operational tempo. The transportation of samples to analytical labs may be well out of range for most CBRN R&S capabilities operating in close and deep areas, and may further compromise security while operating in close proximity to enemy forces.

3-72. CBRN R&S (in a direct support role to maneuver in deep and close areas) provide agility to offensive maneuvers, rapidly confirming CBRN usage and identifying bypass routes around CBRN hazards. As a combat enabler, CBRN R&S facilitates a maneuver commander's risk decisions in and around CBRN hazards to retain the initiative. Commanders and staffs ensure that CBRN R&S elements understand when and where to collect a CBRN sample.

Reports

3-73. Reconnaissance elements communicate according to the established reconnaissance order or SOP, either at specified times in designated communications windows or immediately upon observation of a designated EEI. The decision to transmit is dependent on METT-TC. Frequent transmission may place reconnaissance elements at risk, while reporting too seldom can reduce the relevance of time-sensitive intelligence. To accomplish their missions, reports must be properly formatted. Even a partially received report is better understood if it is transmitted by using standard formats.

3-74. Code words or letters are used by transmitting stations to send vital information quickly, briefly, and securely. These letters and code words are identified during mission planning. They inform the receiving station of the situation on the ground without using long descriptions. Code words are also used to send vital information in a secure manner. Without knowledge of the meaning of the code words/code letters, the meaning of the message will not be known to any intercepting station or person.

3-75. Reports that must be standardized by CBRN R&S elements (if not already standard in their assigned formations) include, but are not limited to, the—

- Initial entry report.
- SITREP.
- Intelligence report.
- Battle damage report.

ELECTRONIC WARFARE

3-76. Electronic warfare is defined as the use of electromagnetic energy, directed energy, or antiradiation weapons to attack personnel, facilities, or equipment, with the intent of degrading, neutralizing, or destroying enemy combat capability and is considered a form of fires.

3-77. Electronic protection is critical to avoid compromising reconnaissance operations. Key tasks include—

- Using brevity lists.
- Masking antenna locations.
- Using directional antennas.
- Using the lowest possible output power.
- Using voice communication only when essential.
- Minimizing transmission time.
- Planning messages.
- Encrypting messages.
- Executing a destruction SOP in the event of compromise.

3-78. An electromagnetic pulse is a burst of electromagnetic energy moving out from the nuclear detonation that may interact with the earth's magnetic field to generate strong electromagnetic fields capable of causing damage to unprotected electrical or electronic equipment. The most susceptible systems are those using integrated circuits and transistors (such as computers, transmitters, receivers, intercom systems, satellite communications systems, and electronic countermeasures pods). The effects of an electromagnetic pulse will varies, depending on the altitude and location of the detonation.

3-79. An electromagnetic pulse induces current flow in all conductive materials in its path. Excessive currents are generated in unhardened antennas, long wire and cables, metal objects, radios, and electronic equipment, causing effects that range from temporary to permanent circuit disturbances to complete burnout. See TM 3-11.91/MCRP 10-10E.4/NTRP 3-11.32/AFTTP 3-2.55 for more information on EMP.

CBRN R&S SUPPORT TO LARGE-SCALE COMBAT OPERATIONS

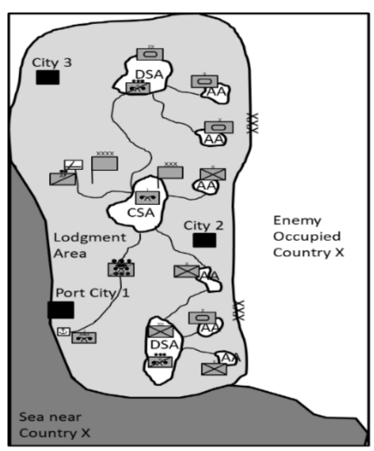
3-80. When LSCO begin, the JFC immediately exploits friendly capabilities across multiple domains and the information environment to gain the initiative. The JFC seeks decisive advantage by using all available elements of combat power to exploit the initiative, deny enemy objectives, defeat enemy capabilities to resist, and compel desired behavior. Within the joint combat operation model described in JP 3-0, offense, defense, and stability may occur simultaneously in the same AO. LSCO and campaigns normally include both offensive and defensive components. The defense is stronger, but the offense is decisive in LSCO. For the purposes of this manual, discussions are focused on how CBRN R&S forces adapt capabilities in support of each activity associated with LSCO.

CBRN Reconnaissance and Surveillance during Joint Reception, Staging, and Onward Integration

3-81. Attaining operational reach often requires seizing and retaining access in the face of enemy opposition. The intent of JRSOI is to project force, rapidly accumulating combat power as forces surge into the theater of operations. Force projection is differentiated between opposed and unopposed operations. Unopposed, the JFC retains more flexibility to assume risk for CBRN R&S coverage during the early stages of operations.

3-82. During opposed force projection, a CBRN-capable adversary may employ WMDs as part of their antiaccess/area denial plan. Conducting CBRN R&S during JRSOI is a challenge because CBRN R&S forces are extremely limited until all ground forces arrive into theater. The most important nodes that must be protected during JRSOI are APOD, SPOD, and assembly areas where forces occupy for follow-on operations. The synchronization of joint forces CBRN R&S capabilities is essential to the successful early warning of CBRN attacks on the key nodes that could potentially constrain force projection. The United States Air Force and United States Navy have localized organic CBRN R&S capability. It is important for JFC planners to provide an early initial CBRN R&S force package to the AO in which an adversary will actively contest force projection by using WMDs.

3-83. Figure 3-5 shows an example of how planners can use a CBRN area support company, hazard response company (HRC), and an Air Force survey team to support JRSOI. The HRC and area support company were templated early in the time-phased force and deployment data by JFC planners to support a contested JRSOI against a CBRN-capable adversary. The HRC has deployed its platoons for decentralized CBRN R&S operations, while the company command post is near the corps headquarters to ensure synchronized planning and CBRN R&S coverage with corps staff. The HRC mounted CBRN platoon protects the lines of communication along vulnerable routes, particularly between the SPOD and corps support area. The two hazard assessment platoons have established surveillance at division support areas, but they retain the flexibility to conduct CBRN dismounted reconnaissance at brigade AA. Each unit within the support areas and assembly area has deployed its organic CBRN capabilities to provide early warning of CBRN attacks. The area support company's primary mission is to ensure that enemy CBRN attacks do not impact the force flow from strategic support areas into the seaport. The area support company uses dismounted CBRN R&S platoons in a surveillance role. An Air Force survey team can conduct surveillance operations to ensure uninhibited JRSOI operations are executed. Upon request, the Air Force team can receive immediate assistance from Army area support or hazard response companies. JFC planners ensure that the United States Air Force survey teams retain CBRN planning and coordination responsibilities for operations at their respective APODs.



Legend:
AA assembly area
CSA corps support area
DSA division support area

Figure 3-5. CBRN R&S support to JRSOI

3-84. Planners must also consider CBRN R&S support during JRSOI for multinational operations. It is important to consider available host-nation first responder capabilities and responsibilities for APODs and SPODs. Host-nations first responders typically have more familiarity with the terrain and supporting capabilities available.

CBRN Reconnaissance and Surveillance in Offensive Operations

3-85. Offensive operations focus on breaking the enemy's will to resist and establishing control of the OE. JFC's leverage the full breadth of air, sea, and naval combat power to impose their will on adversaries. Offensive tasks are characterized by surprise, concentration, tempo, and audacity, leveraging all available combat power from the joint force. Forces in the offense employ the appropriate forms of maneuver to close with and destroy enemy forces and seize decisive terrain, with effective air and naval power supporting those efforts. Successful offensive operations depend on creating conditions for overmatching the adversary's weakness and exploiting areas of operational success. Effective offensive action capitalizes on accurate and timely joint ISR operations relative to enemy forces, weather, and terrain.

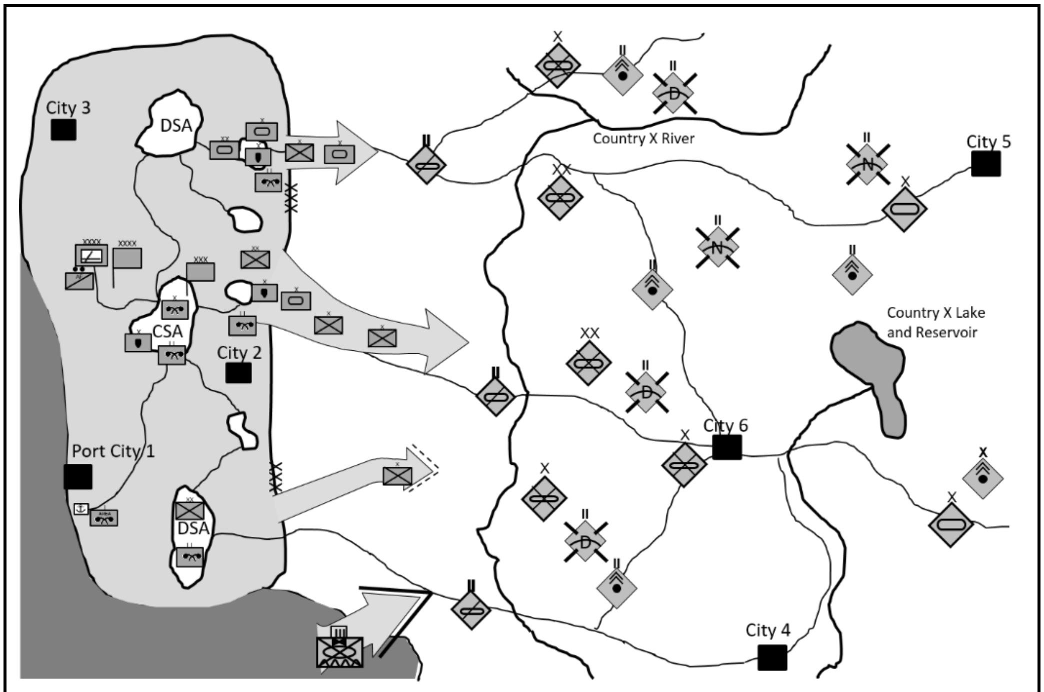
3-86. Marine and Army CBRN R&S capabilities, placed in appropriate command and support relationships, conduct movement and maneuver alongside ground forces to provide warning, identification, and technical advice regarding CBRN attacks. These actions provide reaction time and space to exploit the CBRN environment to the commander's advantage. CBRN staff planners and R&S capabilities thoroughly assess CBRN employment by adversary forces, leading to informed commander's decisions through hazard awareness and understanding.

3-87. Planners and staffs prioritize CBRN R&S efforts, particularly during offensive operations, to ensure that they can keep pace with the rapid movement and tempo of supported maneuver forces. Operational tempo in the offense is critical as CBRN hazards are employed to fix, disrupt, block, and defeat friendly forces. Enemy CBRN attacks, if effective, may set the conditions for enemy long-range artillery strikes that destroy friendly combat power. CBRN R&S capabilities seldom have time to conduct site characterizations and exploitations while in direct support of offensive operations, but may conduct site assessments when time is available. CBRN R&S elements may conduct small-scale exploitation and disablement operations in support of special operations forces that can quickly attack and withdrawal in a CWMD role.

3-88. Planners focus CBRN R&S capabilities on when and where CBRN hazards will disrupt decisive and shaping operations. Then planners consider which lines of communication to reconnaissance or survey to prevent early culmination of offensive operations due to loss of sustainment. Another consideration for CBRN R&S support is sustainment hubs such as support areas and forward arming and refueling points for aircraft.

3-89. As the FLOT advances, enemy CBRN weapons caches or WMD facilities may be abandoned or bypassed, leaving small defense pockets of resistance. The JFC should consider incorporation of CBRN R&S elements into CWMD task forces to support maneuver in the defeat of remaining enemy forces in rear areas. CBRN R&S forces, especially CBRNE companies, execute site exploitations to consolidate gains, preventing loss of WMD material to adversaries. Planners coordinate with host-nation emergency responders for TIM hazards that may impact the scheme of maneuver and local populations.

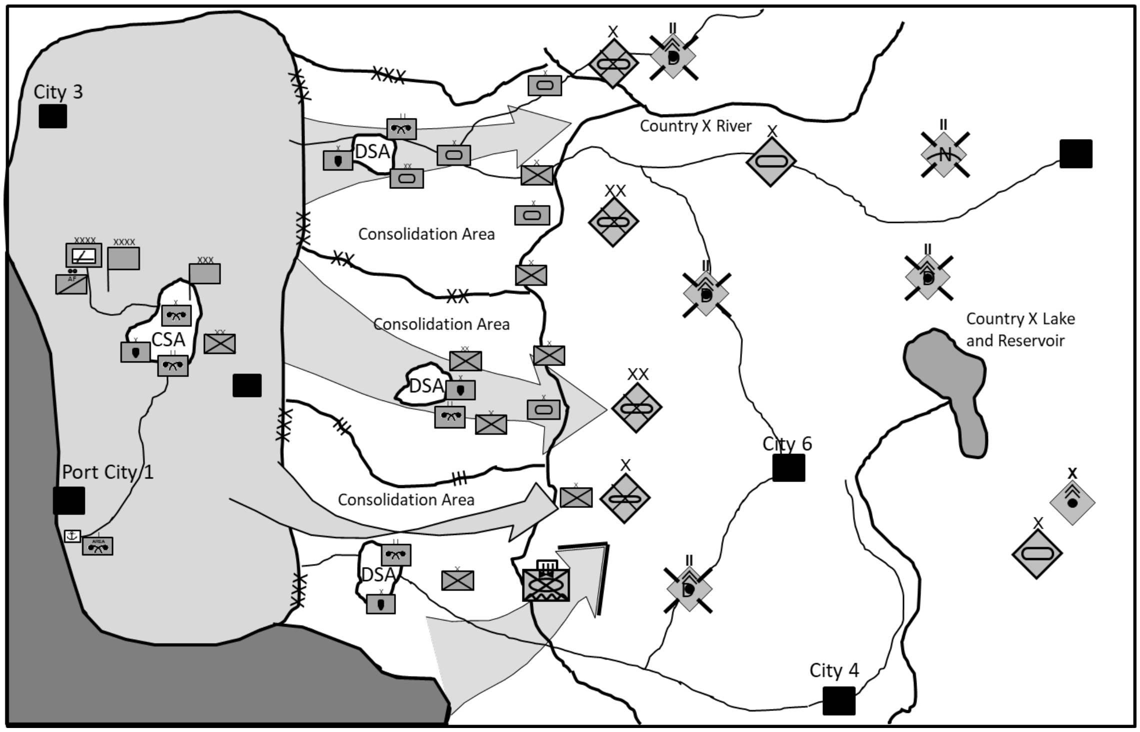
3-90. In figure 3-6, the JFC initiates offensive operations, with the decisive operation being an amphibious landing by a MAGTF and follow-on attack on the enemy southern flank. Shaping operations include an infantry brigade combat team conducting a feint in support of the amphibious landing and suppression of enemy air defense conducted by long-range fires and national assets. The Air Force and Navy shape the OE with targeted strikes against enemy high-value targets, artillery systems, and massed formations of armor and infantry. In the north, two Army divisions attack along the enemy front on two separate axis of attack, setting the conditions for the MAGTF's amphibious landing and subsequent attack along the southern flank. For CBRN R&S support, an Army CBRN brigade establishes a headquarters, conducts parallel planning with the corps staff, and operates in the corps support area. An Air Force survey team is tasked to support the APOD. An Army area support company provides support to the SPOD. A WMD coordination team augments the staff at the theater headquarters to provide technical subject matter expertise and coordination for CBRN R&S capabilities in support of CWMD. Each division is allocated a CBRN battalion, providing CBRN R&S planning, tasking, and logistical support to detached CBRN maneuver elements. Each Army brigade combat team uses their organic CBRN reconnaissance platoons and detection capability. The brigade combat teams are task-organized with a HRC, typically attached, that provides an additional mounted CBRN R&S platoon and two dismounted CBRN R&S platoons to support offensive operations. The MAGTF CBRN R&S capabilities provide early warning and situational understanding for Marine units and to the joint force. Individual service CBRN R&S capabilities may support another service's mission as requested or as directed by the JFC.



Legend:
CSA corps support area
DSA division support area

Figure 3-6. CBRN R&S support to offensive operations

3-91. In figure 3-7, page 3-22, the joint force's offensive operations are successful in driving enemy forces further east while simultaneously defeating adversary long-range strike and CBRN delivery capability. The FLOT has advanced to Country X River and the ground and air lines of communication have extended over a large tract of land that is critical to the sustainment of forces. At this point, JFCs must maintain logistical support for multiple wet-gap crossings across a large front. Some units may have been successful at seizing existing bridges and other forces may be air assaulted across the river, particularly in support of the MAGTF's operations. The divisions have relocated their support areas closer to maneuver forces to sustain them. CBRN R&S elements support the tactical enabling task of gap crossing, described further in the chapter. A major concern is the expanding rear area. Forces in the rear area are principally focused on missions that retain tempo for forces in contact. Other missions in the rear area focus on setting conditions to return areas to legitimate civilian authorities. In the rear areas, CBRN R&S elements conduct characterizations and exploitations of TIM facilities damaged throughout operations that may hinder freedom of action. Abandoned enemy CBRN weapon caches are secured or moved to controlled locations where they are exploited by CBRN R&S forces. Captured WMD production facilities that are out of range of enemy direct and indirect fires are cleared of enemy personnel. Small-scale disablement operations are executed by CBRN R&S forces. However, larger WMD or TIM facilities that the JFC considers beyond their scope of control are sequenced operations, initially secured for later stability operations.



Legend:
CSA corps support area
DSA division support area

Figure 3-7. CBRN R&S support in rear areas

CBRN Reconnaissance and Surveillance in Defensive Operations

3-92. Defensive operations are executed to defeat enemy attacks, gain time, economize forces, and develop conditions favorable for offensive or stability operations. While the offense is decisive, the defense is the stronger element and is persistently seeking ways to attrite and weaken enemy forces. Defensive operations are marked by intense preparation requiring effective logistical support to sustain over long durations.

3-93. The joint force's ability to maintain flexibility and mass effects are two characteristics of the defense that primarily concern CBRN planners. The most important friendly element to protect in a defensive operation is the reserve in an area defense or the mobile strike force in a mobile defense. The reserve or mobile strike force elements tend to be the decisive factor in a defense. They are the JFC's flexible force that positions and masses friendly combat power at critical points on the battlefield, causing the defeat of enemy offensive efforts. To protect this effort, CBRN R&S elements are incorporated into the reserve or mobile strike force to identify enemy CBRN attacks and aggressively exploit known CBRN environments to the JFC's advantage.

3-94. Survivability of forces in contamination areas are of vital importance during the defense. CBRN planners address the preservation of combat power through organic detection capabilities and focused surveillance efforts. CBRN R&S capabilities determine the type and extent of contamination from enemy CBRN strikes to inform the JFC's risk-based decisions on how long units can fight in CBRN conditions or how soon units must be reconstituted. CBRN R&S elements are trained and equipped to conduct surveillance in the defensive area most vulnerable to CBRN attacks. Forces that are in static defensive positions, support areas, and C2 nodes that give large electronic signatures provide the enemy with lucrative CBRN targets from long-range fires and asymmetric attacks. Mounted CBRN R&S elements conduct route reconnaissance along lines of communication to prevent the isolation of defending forces and the cut of crucial supply lines. The following are defensive tasks—

- *Retrograde* is a type of defensive operation that involves organized movement away from the enemy (ADP 3-90). The enemy may force these operations, or a commander may execute them voluntarily. The retrograde is a transitional operation that is not conducted in isolation. It is part of a larger maneuver scheme designed to regain the initiative and defeat the enemy. The three retrograde tasks are delay, withdrawal, and retirement.
- A *delay* is when a force under pressure trades space for time by slowing down the enemy's momentum and inflicting maximum damage on enemy forces without becoming decisively engaged (ADP 3-90). The JFC establishes delay lines and maneuvers units from one defensive position to subsequent positions back from the FLOT, slowing the enemy's approach.
- A withdrawal operation is a planned retrograde operation in which a force in contact disengages from an enemy force and moves in a direction away from the enemy. The JFC may or may not conduct a withdrawal under enemy pressure. Subordinate units may withdraw while the principle force remains in contact with enemy forces. Typically, this operation occurs after a tactical reverse or after a unit reaches its culminating point. Withdrawals are inherently dangerous because they involve moving units away from what is usually a stronger enemy force.
- *Retirement* is when a force out of contact moves away from the enemy (ADP 3-90). A retiring unit organizes for combat, but does not anticipate interference with enemy ground forces.

3-95. In delay or withdrawal operations, the friendly force must maintain a mobility advantage over the enemy attacker to successfully conduct retrograde operations. Planners should anticipate enemy CBRN attacks to fix friendly forces in place so that they can be decisively engaged or attacks that isolate one element from the main force so it can be destroyed piecemeal. CBRN R&S elements supporting retrograde operations reconnaissance areas to find bypasses around contamination, allowing the force in retrograde to escape.

CBRN Reconnaissance and Surveillance During Stability Operations

3-96. Stability operations may occur simultaneously with offensive and defensive operations. The joint force may be conducting major offensive operations, while forces in rear areas mitigate collateral damage and restore essential services. Until the defeat of enemy conventional forces, the joint force conducts minimum essential stability activities. Minimum essential stability activities should focus on protecting and facilitating personal security and the well-being of the population. Stability operations typically begin with large military force support and eventually transition civil authority and infrastructure back to legitimate authorities. Remaining pockets of enemy resistance are defeated and international and intergovernmental agencies assist in returning the OE to reestablishing essential services and infrastructure.

3-97. With the exception of CBRN R&S support to special operations forces, CBRN R&S capabilities conduct area reconnaissance that supports site assessment, characterization, and exploitation operations in the AO where there is a reduced risk of direct and indirect fires. Area reconnaissance operations for site exploitation are timely and require a security element to control access and clear structures of enemy forces prior to CBRN R&S entry. Sample management and technical decontamination requirements are planning considerations to ensure successful CBRN site exploitation.

3-98. Planners should clearly articulate in mission orders the locations where each level of identification for CBRN samples can occur, laying the framework for the sequential chain of custody once sampling operations are executed. CBRNE commands establish chemical, biological, radiological, nuclear, and explosives analytical and remediation activity (CARA) laboratories to conduct analytical support to all operational units. Planning staffs must account for the correct CBRN R&S asset for detection and identification, with the requisite of technology, sample media, supporting decontamination requirements, and transportation requirements to execute sample management procedures correctly.

3-99. CBRN R&S capabilities may be applied in stability operations to assess damages to TIM facilities that pose immediate risk to populations and support economic recovery. CBRN R&S capability provides additional support to emergency first responders during stability operations.

CBRN Reconnaissance and Surveillance during Tactical Enabling Tasks

3-100. The following sections are a discussion on tasks that are part of offensive operations and tactical enabling tasks. Not all tasks are included and some are specialized variations that are directly influenced by CBRN R&S.

Security Tasks─Screen, Guard, Cover

3-101. Security operations are those operations undertaken by a commander to provide early warning of enemy operations, and to provide the force being protected with time and maneuver space to react to the enemy. CBRN planners use the common security control measures described in FM 3-90-2 to depict the execution of security operations in LSCO. Ultimately, security operations protect the main force from surprise and reduce unknowns through joint ISR or information collection.

3-102. CBRN R&S supports security operations through the following security operation tasks of screen, guard, and cover:

- **Screen.** A *screen* is a type of security operations that primarily provides early warning to the protected force (ADP 3-90). The area of a screen tends to be larger and more permissive than a guard or cover operation. A screening force may be expected to—maintain continuous surveillance into the AO; maintain contact with enemy forces and report their activities; allow no enemy ground element to pass through the screen undetected and unreported; and impede, harass, repel, or destroy all enemy reconnaissance patrols within its capabilities. Screens may be moving, using methods described in FM 3-90-2 to execute them.
- **Guard.** A *guard* is a type of security operations done to protect the main body by fighting to gain time while observing and reporting information and preventing enemy ground observation of and direct fire against the main body (ADP 3-90). Units conducting guard missions cannot operate independently because they require additional support. A guard force may be expected to—maintain continuous surveillance into the AO; maintain contact with enemy forces; allow no enemy ground element to pass through the security area, impede and harass enemy forces; destroy the enemy advanced guard; cause the withdrawal of enemy reconnaissance patrols; or deploy the enemy main body.
- **Cover.** *Cover* is a type of security operation done independently of the main body to protect them by fighting to gain time while observing and reporting information and preventing enemy ground observation of and direct fire against the main body (ADP 3-90). Cover operations may operate out of range of the protected force so units must be organized within the enabling capabilities for independent operations.

3-103. The JFC will identify the boundaries of the security area, phase lines, screen or delay lines, and checkpoints to control operations. Contact points are established to facilitate coordination with flank units. NAIs developed by CBRN and intelligence staffs assist in the determination of the placement and use of CBRN R&S elements within maneuver formations. The JFC will determine initial LP/OP locations along or behind the screen line to ensure effective surveillance of NAIs. Displacement locations and criteria should be provided by the JFC. The JFC provides the time parameters for the security force, including when security missions begin, move into position, execute mission task, and end. Engagement criteria is provided to the security force, including CBRN R&S elements. Special requirements or constraints are provided by the JFC, such as guidance for CBRN R&S elements operating within the supporting range of maneuver units. Local security requirements are the tactical responsibility of CBRN R&S elements.

3-104. CBRN R&S capabilities, such as individually issued detection equipment and CBRN elements, are placed in forward positions with other Cavalry formations to detect CBRN hazards and provide early warning of CBRN attacks. Enemy CBRN attacks are anticipated to shape friendly forces (fix, disrupt, defeat) and the OE (block), creating favorable conditions for the adversary. Placing CBRN R&S capabilities in deep areas enables cavalry formations and other maneuver elements to exploit CBRN environments and expose enemy assailable flanks.

3-105. Prudent risk is a key factor in placing CBRN R&S capabilities in positions where they may be engaged through enemy direct fire. All units and systems performing R&S in forward areas are vulnerable to detection, engagement, and destruction by the enemy. When this occurs for CBRN R&S capabilities, it is difficult to reconstitute them without significant resources. Prudent tactical decisions for mission preparation in support of reconnaissance and security are further discussed in chapter 4.

Gap Crossing

3-106. Gap crossing in support of maneuver elements is similar to breaching in that ground forces are particularly vulnerable to CBRN attacks while moving through a breach lane or crossing at a bridge. The vulnerability of CBRN attack on wet-gap crossing operations is typically increased due to the static nature of bridging operations, making them targets for long-range fires and the use of CBRN to isolate the assault force that has already crossed the gap from the remaining force on the nearside. A CBRN attack on wet-gap crossings severs existing ground lines of communication, placing the assault force at risk of being cut off from logistic lines. The flow of fuel, ammunition, and logistical supplies may be halted until CBRN R&S can quickly assess the type and extent of contamination.

3-107. Figure 3-8 shows an example wet-gap crossing that would be managed at the division level or higher. The assembly area is established to the west, where a unit could be initially staged for crossing the gap by phase. Traffic control points are managed by military police and other elements to limit essential traffic along the two routes to each respective area and finally the crossing site. Subsequent holding areas and staging areas are created to sequence units as they cross according to the JFC's priorities. The final area before crossing the gap is the call forward area, where units conduct final staging and preparations for crossing. Engineer equipment parks and engineer regulating points are used by engineers to further manage the wet-gap crossing site and traffic flow.

3-108. Two CBRN dismounted platoons are positioned within the engineer equipment park, near the gap crossing in a surveillance role. They are positioned close to gap crossings to alert forces that are staging in the event of a CBRN attack, reduce the hazard by early warning. A third CBRN dismounted platoon supports surveillance in the AA. During CBRN attacks, they determine the limits of contamination along the routes. In the event of an attack, the CBRN platoons reconnaissance the routes across the wet-gap crossing from the assembly area and along the routes to the far side traffic control point to determine the area, type, and duration of hazard. They determine potential clean routes with the support of the engineer assets. Mounted CBRN platoons execute route reconnaissance faster, but dismounted platoons provide better point detection on the bridge and engineering equipment. For more information on gap-crossing sites, see ATP 3-90.4/MCWP 3-17.8.

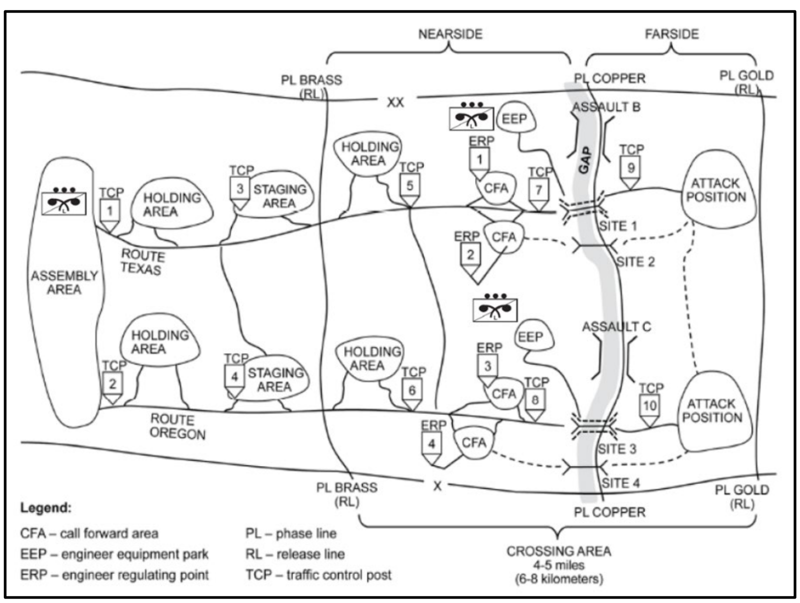


Figure 3-8. CBRN R&S support to gap-crossing operations

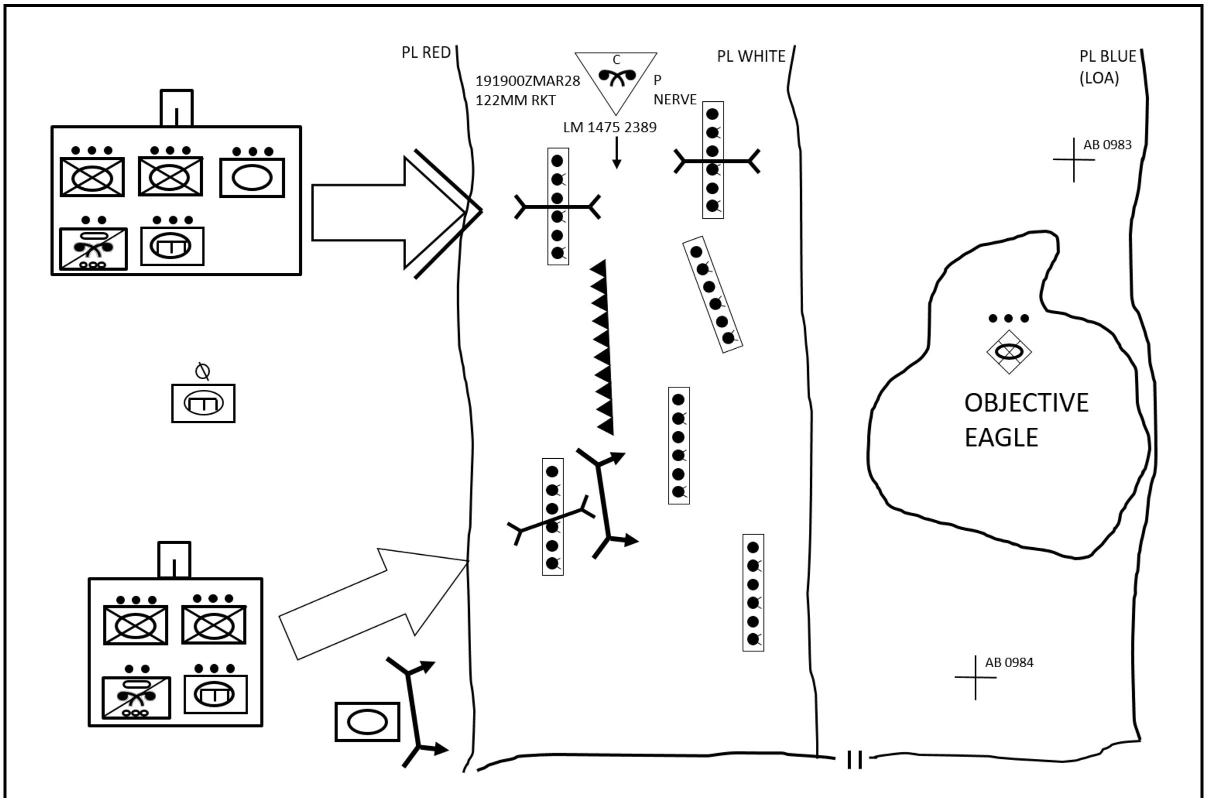
Combined Arms Breaching Operations

3-109. Combined arms breaching under CBRN conditions are high-risk operations and conducted by a brigade or battalion-size task force. Combined arms breaching operations are extremely vulnerable to CBRN attacks due to frequent enemy observation and increased complexity of an already hazardous OE. During the breaching of an obstacle, engineers and other maneuver elements assault through an obstacle that may constitute several explosive hazards, tank ditches, wire obstacles, and incorporated terrain to deny freedom of maneuver. The acronym SOSRA (suppress, obscure, secure, reduce, assault) describes the fundamentals of breaching an obstacle. CBRN attacks on an obstacle limits the maneuver force's ability to secure the obstacle, reduce a lane (thereby creating an opening for ground movement), and assault a larger ground force through it. Engineer elements are limited in reducing, proofing, and marking an obstacle lane if it is contaminated due to the increased CBRN risk to forces during dismounted operations. CBRN attacks are likely to be used to disrupt mobility operations transitions between obstacles.

3-110. Figure 3-9 illustrates how CBRN R&S elements can be placed into combined arms teams to aggressively exploit CBRN environments and penetrate enemy defensive obstacles. When prudent tactical risk has been accepted, CBRN R&S supports breaching to expose enemy assailable flanks and weak points. They can provide CBRN surveillance to combined arms breaching assets while securing the obstacle. When CBRN attacks occur during breaching operations, CBRN R&S capabilities identify the type and duration of contamination used on the obstacle, providing the maneuver commander with hazard awareness and understanding. Upon successful penetration of the obstacle, CBRN R&S assists in identifying the extent of contamination on friendly equipment and personnel, minimizing decontamination requirements.

3-111. An enemy mechanized infantry platoon is established on OBJ EAGLE and represents an enemy weak point along a larger obstacle belt. The battalion commander task organizes two combined arms teams with mechanized infantry, armor, engineer, and mounted CBRN R&S sections to breach the enemy obstacle, setting the conditions for follow-on forces to penetrate deep into enemy held terrain. CBRN R&S elements conduct surveillance on the nearside of the obstacle, using a stand-off or remote detection capability. In this scenario, the enemy recognizes the weakness in the defensive perimeter and deploys a persistent nerve agent strike using 122-millimeter rockets launched from a supporting enemy Prima rocket battery.

3-112. One CBRN R&S section follows and supports the main effort assaulting through the reduced lane onto OBJ Eagle and assesses contamination on the assault element on the far side. The second CBRN R&S section monitors the nearside of the obstacle. The CBRN R&S elements on the far side and nearside of the objective push data to the battalion CBRN cell to provide an understanding of the extent of the contamination and implied impacts to follow-on forces. Both elements help minimize cross contamination and allow the commander to assess prudent risk in fighting in a contaminated environment. The JFC's force is able to SOSRA into OBJ EAGLE, opening a penetration in the enemy obstacle.



Legend:

LOA	limit of advance	PL	phase line
Mar	March	RKT	rocket
Mm	millimeter		

Figure 3-9. CBRN R&S support to combined arms breaching

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Chapter 4

Preparation Activities

This chapter provides CBRN R&S preparation activities for CBRN leaders and units at the tactical level. CBRN R&S preparation includes those activities undertaken by the R&S element after they receive a mission from their higher headquarters, and prior to mission execution to improve their ability to conduct the operation. CBRN R&S preparation may include troop leading procedures, precombat checks and inspections, rehearsals, reconnaissance, coordination, and linkup with supported units.

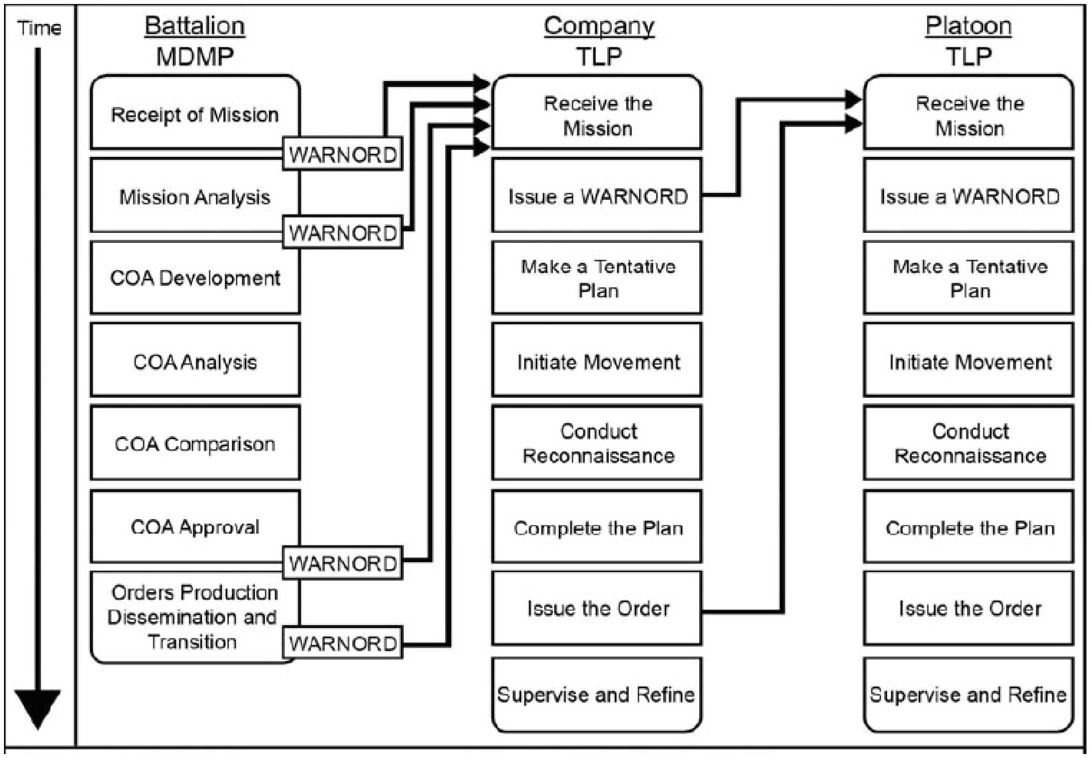
CBRN RECONNAISSANCE AND SURVEILLANCE MISSION PREPARATION

4-1. Planning and preparation overlap to ensure effective time management and synchronized efforts. As the higher headquarters commander and staff plan missions, CBRN units with R&S elements conduct preparations to execute missions. Joint force commands that control CBRN R&S forces execute the following tasks to support preparations:

- Issue WARNORD as incoming updates to the mission are received.
- Develop and issue OPORDs, giving the tactical unit two-thirds of the time available for preparation.
- Issue fragmentary orders to adjust the plan as necessary.
- Update and refine running estimates, troop to task matrixes, CBRN common operational pictures.
- Receive, submit, and track requests for information.
- Provide refined intelligence briefings to inform the most accurate enemy actions, locations, dispositions, and impacts to the CBRN R&S element.
- Coordinate for sustainment requirements to support CBRN R&S missions with the gaining unit staff.
- Receive confirmation briefs and issue the final approval of CBRN R&S element plans.
- Coordinate with command surgeon and medical staff for education/training, administration, and distribution of medical CBRN countermeasures and information on signs and symptoms of exposures to CBRN hazard.

4-2. Leaders ensure that all subordinate echelons have sufficient time for their own planning and preparation needs. Generally, leaders at all levels use no more than one-third of the available time for planning and issuing the OPORD. Leaders allocate the remaining two-thirds of it to subordinates.

4-3. CBRN R&S elements receive planned missions from their parent headquarters, or their supported command. CBRN R&S leadership use the troop leading procedures when they receive OPORDs from parent or supported units. TLPs provide leaders with a framework for tactical planning and preparation that works in parallel with MDMP/MCPP. Because of this, it is important for the higher headquarters to deliver the WARNORD to subordinates as soon as possible to facilitate parallel planning and synchronized execution. The importance of parallel planning is highlighted by figure 4-1, page 4-2, which shows the parallel sequences of MDMP/MCPP to the TLPs.



Legend:

COA	course of action
MCMP	military decision-making process
TLP	troop leading procedures
WARNORD	warning order

Figure 4-1. Parallel sequences of MDMP/MCPP to troop leading procedures

4-4. TLPs are supported by risk management. TLP consist of the following eight steps, as described in a CBRN R&S preparation context.

STEP 1: RECEIVE THE MISSION

4-5. The receipt of the mission may occur in several ways. Ideally, CBRN R&S forces receive a series of WARNORDs, the OPORD, and a mission briefing from their commander. CBRN R&S, as part of a larger information collection plan, usually receive missions during WARNORD 1, before the final OPORD arrives from a higher headquarters. Then they must take immediate action to conduct a tactical movement, establishing contact with the supported unit if they are not already collocated with them. Information in WARNORD 1 may only have the essential information to linkup the CBRN R&S element and supported unit for an upcoming CBRN R&S mission. WARNORD 2 follows from either the parent or the supported unit, (for example, a brigade combat team) providing the essential details of the mission to be executed.

4-6. After receiving an OPORD, CBRN R&S leaders give a confirmation brief to the supported unit commander, ensuring a clear understanding of the commander's intent and support requirements. TLPs may begin when a fragmentary orders is received via communication system, requiring the unit to adjust their plan in stride.

4-7. Upon receipt of the mission, leaders perform an initial assessment of the situation and allocate time available for preparations. Leaders identify critical times specified by higher headquarters and work back from them, estimating how much time each event will consume. Leaders then identify the times they must complete major planning and preparation events, including rehearsals using reverse planning. Preparations include unit load plans, logistical preparation, rehearsals, and initial movement.

4-8. Critical times might include times to load aircraft, cross the line of departure, the start point for movement, or linkup with security elements. Leaders ensure that all subordinate troops have sufficient time for their own planning and preparation needs.

4-9. Lastly, CBRN R&S leaders submit requests for information addressing questions or information gaps regarding the mission variables METT-TC/METT-T to the higher headquarters staff. This represents one of the last opportunities for the higher headquarters to push valuable updated intelligence about the enemy or OE to CBRN R&S forces prior to the start of the mission.

STEP 2: ISSUE THE WARNING ORDER

4-10. As soon as CBRN R&S leaders finish their initial assessment of the situation and available time, they issue a WARNORD to subordinates. Leaders do not wait for more information, but act on disciplined initiative until requests for information fill information gaps. They issue the best WARNORD possible with the information at hand and update subordinates as needed with additional WARNORDs. The WARNORD contains as much information as possible, providing the leader's planning timeline and follows the 5-paragraph OPORD format. For more information regarding WARNORD and OPORD formats, see FM 6-0.

STEP 3: MAKE A TENTATIVE PLAN

4-11. Once leaders issue the first WARNORD, CBRN R&S leaders develop a tentative plan that combines the mission variables and terrain analysis. To frame the tentative plan, leaders use the METT-TC/METT-T format, continuing the initial assessment performed in step 1.

- **Mission.** The mission is the task, together with the purpose, that clearly articulates actions to be taken and the reasons therefore. It is always the first variable commanders consider during decision making. A mission statement contains the who, what, when, where, and why of an operation.
- **Enemy.** The second variable to consider is the enemy. With the most up-to-date intelligence possible, CBRN R&S should understand enemy organizations, troop strength, equipment (especially equipment that may help positively identify agents at an NAI), known and suspected enemy locations, capabilities, vulnerabilities, and probable courses of action. CBRN R&S leaders should have a thorough understanding of enemy doctrine, systems, and the most recent tactics, techniques, and procedures. CBRN R&S leaders may set conditions for overmatch of enemy forces through understanding enemy weapon types, weapon system ranges and armor penetration in direct fire engagements. Leaders should understand how to defeat enemy capabilities through tactical dispersion, deception, electronic warfare, and camouflage systems.
- **Terrain and weather.** Terrain includes dominant natural features and man-made features that have direct influence or impacts on the mission. Leaders analyze terrain using the five military aspects of terrain expressed in the memory aid OAKOC:
  - **Observation and fields of fire.** R&S leaders consider movement to and from listening post /OP or NAIs. Leaders should determine whether R&S assets can maximize observation and sensing of NAIs from their LP/OP without revealing their positions or the deployment of unmanned systems that are within range. Tactical leaders ensure that CBRN R&S forces are able to execute missions within the supporting range of other maneuver or security elements should they become decisively engaged by enemy systems beyond their capability.
  - **Avenues of approach.** Leaders determine where the enemy may approach the NAI from. If in an urban environment, it is important to consider where the enemy may attack from using the population and structures to mask movement and maneuver. If an inner and outer cordon or hot/warm/cold zone is required for the mission, determine how it will impede movement by security elements and reinforcing units. During forward or rear passage of lines, all leaders in the CBRN R&S element should know the location and condition of the infiltration lane from the release point to the LP/OP, if applicable. Avenues of approach should be selected based upon minimizing friendly forces exposure to enemy observation, fields of fire, and possible ambush locations.

- **Key terrain.** Leaders identify terrain that can be used for navigation that identifies PLs, the line of departure, and the limit of advance (LOA). Boundaries of the route, area, or zone to reconnoiter should be clearly identifiable and understood. A plan should identify primary and alternate fighting positions, using lines of sight, low ground, and reverse slopes to their advantage. Leaders should identify rally points, casualty collection points, and planned decontamination points near water sources.
- **Obstacles.** Leaders identify natural and man-made obstacles that may restrict movement during missions. This may include local traffic along routes and water obstacles that must be forded. CBRN strikes are likely to be used at breaks and ends of enemy obstacle belts to surprise friendly forces attempting to reduce obstacles. Canalizing terrain that constricts maneuver through smaller roads, trails, and valleys are favorable for enemy CBRN attacks.
- **Cover and concealment.** Successful CBRN R&S relies heavily on blending into the terrain. Plans should maximize the use of covered and concealed terrain features such as wadis, draws, and spurs and prepared fighting positions. CBRN R&S forces use wood lines with heavy vegetation and existing terrain to protect themselves from direct and indirect fires. The enemy's optical capabilities must be taken into consideration, particularly if thermal imaging is used for target acquisition.

4-12. Weather should be accounted for using the higher command's chemical downwind message. Wind direction has a bearing on unmanned capability use, optic and sensor efficiency, downwind detection, spread of contamination, and decontamination efforts. Variables to consider include—

- **Troops and support available.** The need for close coordination with the supported unit is critical in the preparation phase. CBRN R&S capabilities operate in another unit's AO. It is imperative that CBRN R&S units maintain communications during movement and maneuver with the land owning unit and operate inside the supporting range of their direct or indirect fires. CBRN R&S capabilities operating forward of the supported unit's FLOT must understand the scheme of maneuver for the security force to reduce the possibility of fratricide. The CBRN R&S leaders coordinate movements with the supported unit, with a clear understanding of friendly obstacle emplacement, passage lanes, and friendly battle positions. CBRN R&S must be trained in calling for fire and requesting air support to defeat threats beyond their capabilities. The leader of the CBRN R&S asset should obtain a copy of the fire support overlay before departure or coordinate with the fire support officer to call for fire. CBRN R&S leaders must know which units can receive resupply for all classes of sustainment. They should know where they can recover damaged equipment and vehicles for repair or replacement. CBRN brigades, battalions, and companies may have to develop a supply push of unique CBRN sustainment items to support CBRN R&S elements that execute missions decentralized.
- **Time available.** CBRN R&S leaders assess the time available for planning, preparing, and executing tasks and operations. This includes the time required to assemble, rehearse, deploy, and maneuver units in relationship to the enemy and conditions on the battlefield. For radiological hazards, leaders consider turn back dose rate and OEG in determining time available in the hazard area. If a CBRN R&S asset is dismounted, greater dose-rates and exposure to radiation hazards may accumulate. For biological hazards, leaders should consider the potential for a time delay between biological hazard exposure and CBRN R&S personnel demonstrating signs and symptoms from biological hazard exposure.
- **Civil considerations.** *Civil considerations* are the influence of manmade infrastructure, civilian institutions, and attitudes and activities of the civilian leaders, populations, and organizations within an area of operations on the conduct of military operations. (ADP 6-0) The memory aid ASCOPE is used to address areas, structures, capabilities, organizations, people, and events to address civil considerations. CBRN R&S elements may be asked to assist host-nation emergency first responders or industrial hazardous materials (HAZMAT) teams in mitigating hazards. CBRN R&S element requires the characteristics of industrial facilities that may impact freedom of maneuver or require site assessment. CBRN R&S leaders must be aware of how receptive local populations are to friendly forces to address local security concerns and compromise of LP/OP positions, infiltration points, or rally points.

STEP 4: START NECESSARY MOVEMENT

4-13. Upon completion of the tentative plan, CBRN R&S leaders may have already moved to their supported unit locations or may still be with their respective CBRN headquarters. Several preparation activities are executed at the assembly area prior to movement. In the event that CBRN R&S units must move to a linkup site to liaison with their supported unit, they may conduct a tactical road march from the friendly assembly area to the gaining unit via movement control.

STEP 5: CONDUCT RECONNAISSANCE

4-14. When time and circumstances allow, or as directed by the higher headquarters, leaders personally observe the AO for the mission prior to execution. No amount of information from higher headquarters can substitute firsthand assessment of the mission variables from within the AO. If on ground reconnaissance is not possible, CBRN R&S leaders may leverage unmanned system video feeds and map reconnaissance supplemented by images and geospatial intelligence products.

Note. It is important to operate any unmanned systems within the proper frequency bandwidth established by the joint restricted frequency list in the higher OPORD. CBRN R&S should coordinate with the brigade aviation element or joint tactical air controller to establish or operate within a restricted operation zone to adhere to airspace coordination measures when utilizing UAS.

4-15. As directed, subordinate or other elements (such as scouts and CBRN R&S elements) may conduct reconnaissance while the leader completes other TLP steps.

STEP 6. COMPLETE THE PLAN

4-16. During this step, CBRN R&S leaders incorporate the results of reconnaissance into their selected plan to complete the order. This includes preparing tactical overlays to share with subordinate CBRN R&S leaders, refining the indirect fire target list, close air support, cyber and electronic warfare coverage, coordinating communications and signal requirements using PACE, and updating the tentative plan because of reconnaissance. At lower levels, this step may entail only confirming or updating information contained in the tentative plan. If time allows, leaders make final coordination with adjacent units and higher headquarters before issuing the order.

STEP 7: ISSUE THE ORDER

4-17. Small-unit orders are normally issued verbally and supplemented by digital and analogue tactical overlays, a sand table, geospatial intelligence, and other means. An order follows the standard five-paragraph OPORD format. Typically, leaders below company level do not issue a commander’s intent. They reiterate the intent of their higher and next higher commanders.

4-18. The ideal location for issuing the order is a point in the AO with a view of the objective and other aspects of the terrain. The leader may perform a leader’s reconnaissance, complete the order, and then summon subordinates to a specified location to receive it. Sometimes security or other constraints make it impractical to issue the order on the terrain.

STEP 8: SUPERVISE AND REFINE

4-19. Throughout TLP, leaders supervise mission preparations, refine the plan, coordinate with adjacent units, and supervise and assess preparations. Normally, unit SOPs state individual responsibilities and the sequence of preparation activities. To ensure that the unit is ready for the mission, leaders supervise subordinates and inspect their personnel and equipment.

Precombat Checks and Inspections

4-20. CBRN R&S leadership conducts precombat checks/precombat inspections) and readies equipment and personnel for the upcoming mission. The following are examples, but not exhaustive of important precombat checks/precombat inspections for CBRN R&S units prior to start of mission:

- Conduct before operations preventive maintenance checks and services for all equipment being taken on the mission to include protective masks and vehicle overpressure systems.
- Clean and lubricate all weapons, along with headspace and timing and/or test fire for weapons.
- Upload digital maps and overlays with physical alternatives in the event of cyberattack.
- Replenishment of all classes of supply to execute missions based upon days of supply mission requirements. Replenishment of CBRN sampling expendable items and decontamination supplies are critical.
- Execute communications checks for all digital, radio systems and communications security fill and timing.
- Conduct systems checks for any tactical electronic warfare equipment, ensuring that it does not interfere with communications.
- Ensure that IPE and decontamination requirements are met based upon the possible CBRN or TIM hazard.
- Review contaminated casualty collection plans and requisition human remains pouches for the contaminated casualty collection point.
- Clean all optics and sensor surfaces that may be used.
- Camouflage vehicles and tie-down vehicle antennas.

Rehearsals

4-21. A crucial component of preparation is the rehearsal. Rehearsals allow leaders to assess their subordinates' preparations. They may identify areas that require more supervision. Leaders conduct rehearsals to—

- Practice essential tasks and actions on the objective.
- Identify weaknesses or problems in the plan.
- Coordinate subordinate element actions (especially if executing with another unit or maneuver element).
- Improve Service member understanding of the concept of operations.
- Foster confidence among Service members.

4-22. Company and smaller sized units use the four types of rehearsals described in FM 6-0. Rehearsals include—

- Back brief.
- Combined arms rehearsal.
- Support rehearsal.
- Battle drill or SOP rehearsal.

OTHER CONSIDERATIONS

4-23. CBRN R&S forces must consider command relationships and account for the nuances of working for a supported unit to avoid becoming a burden for the supported headquarters. Movement control also needs to be considered.

COMMAND RELATIONSHIPS

4-24. Establishing clear command and support relationships is a key task in task organizing for any joint CBRN R&S operation. These relationships establish clear responsibilities and authorities between subordinate and supporting units. Some command and support relationships limit the commander's authority to prescribe additional relationships. Knowing the inherent responsibilities of each command and support relationship allows commanders to effectively organize CBRN R&S forces and helps supporting CBRN R&S leaders understand their unit's role in the organizational structure.

4-25. Army commanders build combined arms organizations using Army command and support relationships. Command relationships define command responsibility and authority. Support relationships define the desired purpose, scope, and effect when one capability supports another. JP 1 specifies joint command relationships and FM 6-0 specifies Army command relationships.

4-26. It is important for JFCs and CBRN leadership to understand joint command relationships and how these relationships impact R&S operations. For the purposes of this manual we will focus on operational control, tactical control, and support.

4-27. Operational control is the authority to perform those functions of command over subordinate forces involving—

- Organizing and employing CBRN R&S capabilities.
- Assigning tasks.
- Designating objectives.
- Giving authoritative direction necessary to accomplish missions.

4-28. Operational control normally includes authority over all aspects of operations and joint training necessary to accomplish missions. It does not include directive authority for logistics or matters of administration, discipline, internal organization, or unit training.

4-29. *Tactical control* is the authority over forces that is limited to the detailed direction and control of movements or maneuvers within the operational area necessary to accomplish missions or tasks assigned. (JP 1) Tactical control allows commanders below combatant command (CCMD) level to apply force and direct tactical use of logistic assets, but does not provide authority to change organizational structure or direct administrative and logistical support.

4-30. Support is a command authority in joint doctrine. A supported and supporting relationship is established by a superior commander between subordinate commanders when one organization should aid, protect, complement, or sustain another force. Designating supporting relationships is important. It conveys priorities to commanders and staffs planning or executing joint operations. Designating a support relationship does not provide authority to organize and employ commands and forces, nor does it include authoritative direction for administrative and logistic support.

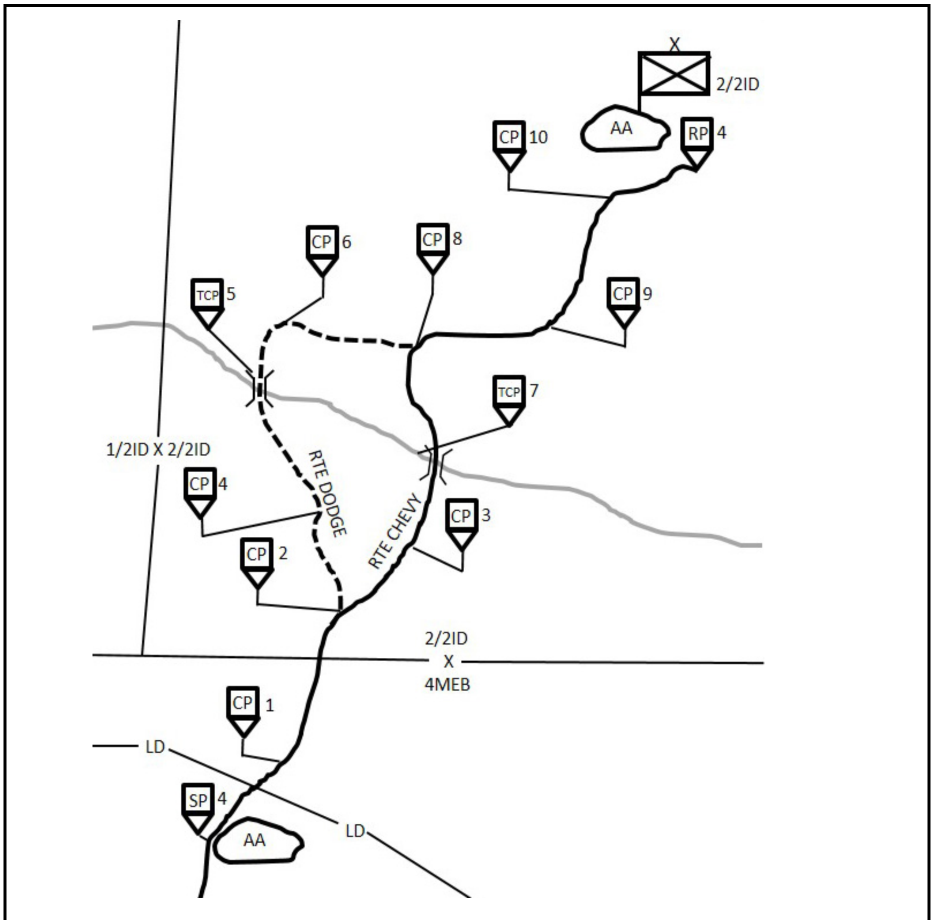
4-31. Direct support is the most common support category used by CBRN R&S. The CBRN brigade, battalion, or company will allocate their CBRN R&S platoons or teams to support a gaining unit (such as a cavalry squadron or brigade combat team). For more information regarding joint command and support relationships, refer to JP 3-0. For Army specific command and support relationships, refer to FM 6-0.

MOVEMENT CONTROL

4-32. *Movement control* is the planning, routing, scheduling, and control of personnel and cargo movements over lines of communications; includes maintaining in-transit visibility of forces and material through the deployment and/or redeployment process. (JP 4-01.5) As the next higher echelon (typically a battalion or company) plans and coordinates movement from assembly areas along designated routes, CBRN R&S forces denote start points, LDs, check points, traffic control points, and release points as graphic control measures on a map. The higher headquarters and the gaining unit should share the concept of movement sketch and track the subordinate element's movement until the unit has completed movement.

4-33. A tactical road march is a rapid movement used to relocate units within an AO to prepare for combat operations. CBRN R&S units must understand all unit boundaries they cross during tactical road marches to provide higher echelons an understanding of vehicle movement within their respective AO and to prevent fratricide.

4-34. CBRN R&S leaders use tactical graphics to provide mutual understanding of the OE, mission, and the locations of enemy or adversary and friendly forces in relation to themselves. Tactical graphics are depicted with graphic control measures specific to the mission. It is critical to mission success for CBRN R&S forces to be able to understand operational terms and graphics, and to plan missions using tactical graphics. The minimum essential graphics for a tactical road march are depicted in figure 4-2.



Legend:

AA	assembly area	RP	release point
CP	check point	RTE	route
ID	infantry division	SP	start point
MEB	maneuver enhancement brigade	TCP	traffic control post

Figure 4-2. Tactical road march graphic control measures

4-35. In figure 4-2 the CBRN R&S unit begins movement from the southern AA. The start point is a location on a route where the marching elements fall under control of a designated march commander, such as a security force that escorts the movement. A line of departure, in land warfare, is a line designated to coordinate the departure of attack elements. In this case, CBRN R&S elements are not attacking, but the use of the line of departure is used to report to the higher CBRN headquarters and gaining unit that initial movement has begun. The main route (route [RTE] CHEVY) is marked by a solid line, and the alternate route (RTE DODGE) is marked with a dotted line. The CBRN R&S leader or unit commander may designate checkpoints along the route to assist marching units in complying with the mission timetable. This allows tactical operations centers to track unit movement throughout the unit AOs. Checkpoints are established along the route where interference with movement might occur. Traffic control points are placed along the route where congestion, gap crossings, or confusion may occur. A release point is used, denoting the location on the route where marching elements are released from centralized control, typically at the end of the tactical movement.

4-36. If required, the CBRN R&S element's controlling headquarters coordinates with the supported unit to establish a predesignated contact point. In land warfare, a contact point (a point on the terrain that is easily identifiable) is where two or more units are required to make contact. This is particularly important if the gaining unit is in contact with enemy forces and may inadvertently engage the CBRN R&S element moving towards them.

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Chapter 5

Execution Activities

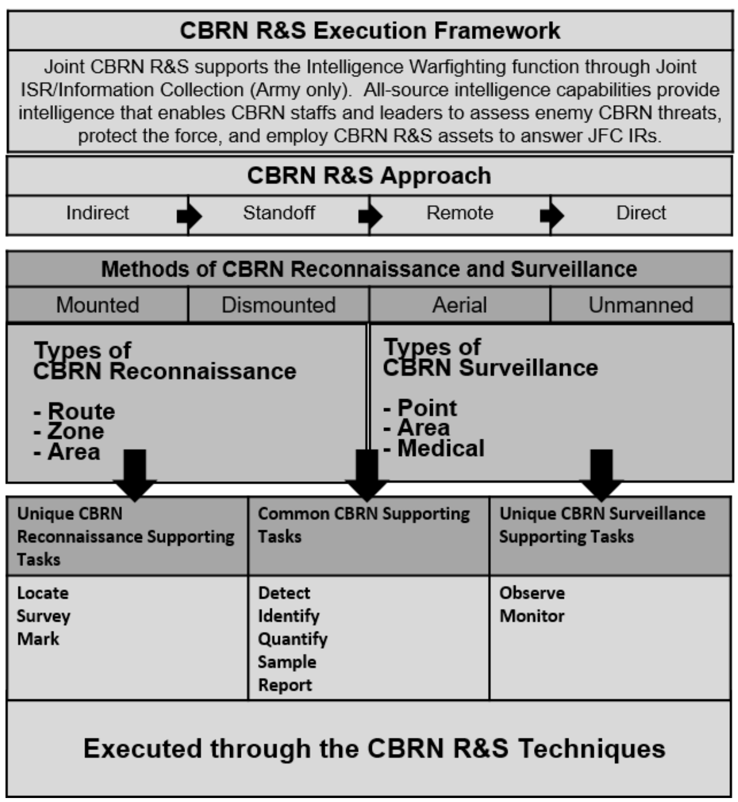
Chapter 5 provides an overview of CBRN R&S forms, modes, methods, tasks, and techniques used to conduct CBRN R&S missions. When conducting CBRN R&S missions, multiple variations of the types, methods, and CBRN R&S tasks and techniques can be used. CBRN R&S leaders plan and prepare their elements for missions, using execution activities as a guideline for actions on the reconnaissance objective or throughout the course of surveillance. There is no standard set or combination of execution activities that must be used. METT-C and METT-T is used during planning and preparation to determine the best course of action for their use. Specific guidance, acceptable risks, and time/terrain constraints are also factors that affect CBRN R&S mission execution. CBRN staffs and commanders use mission analysis and METT-TC/METT-T to determine when and where the different execution activities are appropriate to accomplish the mission. The operational tempo of supported forces, enemy disposition, level of sampling or detail at sites; available CBRN R&S forces, size of the area, zone, or route/location; type of terrain; and environmental conditions are all critical details that shape how a CBRN R&S mission is executed.

CBRN RECONNAISSANCE AND SURVEILLANCE APPROACH

5-1. CBRN R&S is executed with a progressive approach to maximize usage of all available information collection assets, minimize risk to forces, and create greater certainty of CBRN hazard presence. The tiers do not have to be executed sequentially, although they are designed to economize CBRN R&S capabilities and place them where increased CBRN threats are likely. Note that the four tiers provide incremental information fidelity through multiple technologies and sensors. See figure 5-1, page 5-2, for the CBRN R&S execution framework. The four tiers of the CBRN R&S approach are—

- **Indirect.** Indirect CBRN R&S describes the employment of technologies, sensors, and intelligence platforms that are not directly in the physical domain of the potential CBRN hazards. Indirect CBRN R&S is reconnaissance or surveillance that minimizes immediate risk to forces and provides information about an NAI that might cue follow-on CBRN R&S. An example of indirect CBRN R&S includes multispectral and hyper-spectral satellite imagery which is not in the direct physical environment, but can provide data on ground, water, and air conditions of the NAI without risk of contamination. A nuclear detonation can also be detected by space assets which are less likely to be affected by the nuclear detonation than ground based sensors. This minimizes risk, and provides sufficient details to cue a follow-on CBRN R&S mission in the physical environment.
- **Standoff.** Standoff CBRN R&S is the employment of technologies and sensors in the direct physical domain, within direct view of the potential CBRN hazard, while maintaining sufficient distance, time, and shielding to minimize risk to forces. Crucial to standoff capabilities is the weather and environment effects such as dust, fog, and vegetation that may obscure the line of sight for sensors. An example of standoff CBRN R&S is the use of the nuclear, biological, and chemical reconnaissance vehicle from an LP/OP on a potential CBRN hazard.

- **Remote.** Remote CBRN R&S is the employment of unmanned technologies and sensors in the direct physical domain of the CBRN hazard to gather information within a potentially contaminated area. The benefit of the remote CBRN R&S tier is that it provides greater fidelity of information from a more direct line of sight for optics and sensor employment, while not endangering forces to enemy fires or contamination. It also facilitates a more rapid assessment of the CBRN hazard over a large area. The downside of remote CBRN R&S is that the equipment, once potentially contaminated, may not be able to return to the controlling element until decontamination of the unmanned system is conducted. Unmanned ground or air sensors, stationary or mounted on unmanned vehicles can provide a remote approach to providing CBRN hazard information. An example of remote CBRN R&S is the employment of unmanned ground or air sensors, stationary or mounted on unmanned vehicles to gain CBRN hazard information on a particular area.
- **Direct.** Direct CBRN R&S provides the greatest fidelity of information about the CBRN hazard. However, the risk of CBRN R&S forces is greatest during direct CBRN R&S due to exposure to enemy fires and potential contamination. Often, direct CBRN R&S capability requires a dedicated security force and preplanned decontamination capability to mitigate risk. The time on NAIs and the proximity of enemy forces heavily impacts the risk decision to employ direct CBRN R&S. Direct CBRN R&S is the means for forces to conduct CBRN site exploitation and sampling operations. An example of direct CBRN R&S is the employment of a joint dismounted capability to conduct a site survey of potential contamination.



Legend:

CBRN	chemical, biological, radiological, and nuclear
IR	intelligence requirements
ISR	intelligence, surveillance, and reconnaissance
JFC	joint force commander
R&S	reconnaissance and surveillance

Figure 5-1. CBRN R&S framework

METHODS OF CBRN RECONNAISSANCE AND SURVEILLANCE

5-2. CBRN R&S within the physical domain of the hazard is executed through four primary methods. They are discussed in the paragraphs below.

MOUNTED

5-3. Mounted CBRN R&S operations are usually performed to rapidly gather information across large areas of terrain, keeping pace with maneuver forces, while minimizing the exposure of personnel to CBRN hazards. Many vehicles used to conduct mounted CBRN R&S have existing shielding and onboard air filtration systems. They may employ standoff, remote, and direct CBRN R&S capabilities to gather information on NAIs. See ATP 3-11.36/MCRP 10-10E.1/NTTP 3-11.34/AFTTP 3-2.70 for further descriptions of these assets and unit designations. See appendix C for more information on the execution of mounted CBRN R&S in support of the joint force.

DISMOUNTED

5-4. Dismounted CBRN R&S are operations conducted mainly on foot, with limited vehicular support. They facilitate greater employment of technologies within a hazard area to conduct CBRN supporting tasks such as detect, locate, and sample. They require greater time, security, and assumption of risk than mounted CBRN R&S operations. The following conditions may require dismounted CBRN R&S:

- Dense urban environments, restrictive terrain, or subterranean facilities are in the AO that would limit and encumber mounted operations.
- The employment of CBRN R&S forces to conduct area reconnaissance on an NAI of operational or strategic importance, requiring multiple samples and technologies.
- Assessment, characterization, and site exploitation in support of a larger combined arms CWMD operation.
- Potential presence of an enemy WMD weapons cache, transloading site, or production site.

AERIAL

5-5. Typically, aerial CBRN R&S operations are conducted during radiological surveys of large areas, such as dense urban environments where a nuclear strike has occurred. Aerial R&S operations cover a larger area in a shorter period than ground mounted and dismounted operations. It provides added protection for military personnel by limiting distance and time of exposure to take readings that can be converted into actual ground readings using an air-ground correlation factor. (See appendix D for more information on aerial CBRN R&S.)

UNMANNED

5-6. Unmanned CBRN R&S are conducted by leveraging technologies and sensors controlled from a different location within the AO through a communications infrastructure such as a link or electronic tether to detect and monitor potential CBRN hazards. These UASs and UGVs are typically recoverable. These systems minimize exposure of personnel to enemy direct and indirect fires and potential CBRN hazards. CBRN R&S elements may employ these systems from LP/OPs, maintaining their respective hide and defensive positions. Multiple unmanned sensors may be employed at multiple positions or vehicles in sustainment nodes to provide hazard awareness and understanding of eminent CBRN threats to personnel, supplies, and equipment.

CBRN RECONNAISSANCE AND SURVEILLANCE COMMON SUPPORTING TASKS

5-7. CBRN R&S elements are first and fundamentally reconnaissance formations, operating in contested terrain, in close proximity to enemy forces, and part of a limited, critical number of assets providing information to the commander and a critical operational phase. CBRN R&S elements are capable of many of the same reconnaissance tasks as cavalry, infantry, or armor reconnaissance elements. While conducting reconnaissance operations, CBRN R&S elements will capitalize on their observation of NAIs to answer all PIRs, in addition to their CBRN-specific tasks, CBRN R&S units may—

- Find and report all enemy forces within the zone.
- Engage or support engagement of enemy forces in the designated AO within the capability of the unit conducting reconnaissance, based on engagement criteria.
- Determine the trafficability of all terrain in the zone, including built-up areas.
- Locate and determine the extent of all contaminated areas in the zone.
- Inspect and classify bridges within the zone.
- Locate fords or crossing sites within the zone.
- Inspect and classify overpasses, underpasses, and culverts.
- Locate mines, obstacles, and barriers in the zone.
- Report reconnaissance information.

5-8. Based on priority the commander may direct the following:

- Reconnoiter all terrain within the zone.
- Reconnoiter specific terrain within the zone.
- Locate bypass around built-up area, obstacles, and contaminated areas.

5-9. The following describe the common CBRN supporting tasks executed in support of both R&S missions:

- **Detect CBRN hazards.** Detecting CBRN hazards is described as determining the presence of a CBRN hazard in the environment.
- **Identify CBRN hazards.** Identifying CBRN hazards is described as determining the specific CBRN hazard present in the environment. The identification levels are presumptive, field confirmatory, theater validation, and definitive. Further details on CBRN identification levels can be found in chapter 2.
- **Quantify CBRN hazards.** Quantifying CBRN hazards is described as determining the amount of the specific CBRN hazard present in the environment.
- **Sampling CBRN materials.** Collecting CBRN samples is described as obtaining a representative amount of the CBRN hazard for subsequent analysis. Environmental samples include air, water, soil, food, vegetation, and insects. They can include liquids, solids, or vapors. Clinical/medical specimens are collected only by medical providers. Further details on sampling can be found in chapter 6.
- **Report CBRN hazards.** Reporting is described as providing relevant information about the CBRN hazard and other related data. The commander's information requirements drive CBRN R&S. Reporting information derived from CBRN R&S provides answers to the commander's information requirements. Reporting must be timely, accurate, and as complete as possible to ensure effective and informed operational decision making and to support medical assessment and surveillance determinations.

SECTION I: RECONNAISSANCE TYPES AND TASKS

5-10. The three types of CBRN reconnaissance are route, zone, and area. This section describes each type as well as the unique tasks of CBRN reconnaissance-locate, survey, and mark.

ROUTE RECONNAISSANCE

5-11. *Route reconnaissance* is a type of reconnaissance operation to obtain detailed information of a specified route and all terrain from which the enemy could influence movement along that route (ADP 3-90). It is a type of reconnaissance that focuses along a specific line of communications, logistics, and travel (a road, railway, or cross-country mobility corridor). CBRN route reconnaissance provides new or updated information on route conditions such as obstacles and bridge classifications, and adversary and civilian activity along the route. A route reconnaissance includes not only the route itself, but also all terrain along the route from which the adversary could influence the movement of friendly forces. The commander normally assigns this mission when wanting to use a specific route for friendly movement or when information collection assets determine possible CBRN usage along a line of communication.

5-12. When the commander's JIPOE/IPB indicates that there is a high likelihood of contamination along the route, a unit (particularly a CBRN R&S element) is given the specific mission to conduct a CBRN route reconnaissance. The CBRN route reconnaissance proceeds faster than a CBRN zone reconnaissance. Once contamination is detected, the R&S element has the following options:

- Conduct a CBRN survey to define the boundaries of the contamination to determine the extent of contamination.
- Locate and mark clear bypass routes. (This does not require determining the entire extent of contamination.)
- Report and mark CBRN hazards along the route.

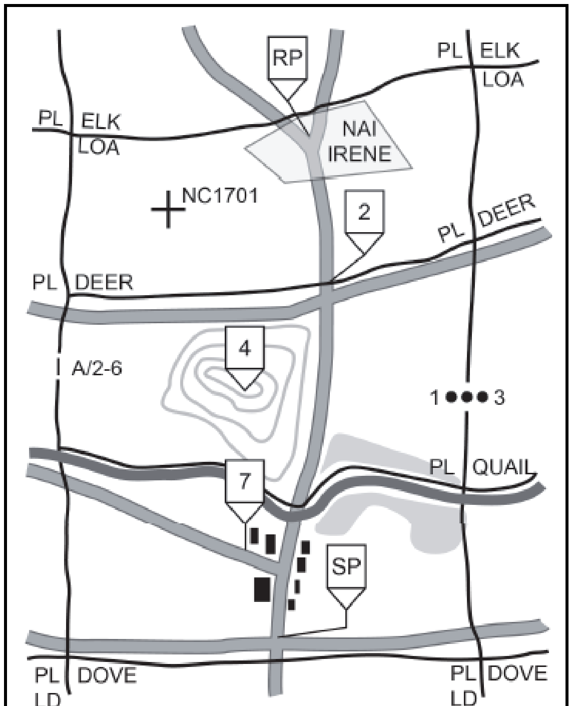
5-13. The following critical tasks are conducted during a route reconnaissance:

- Reconnoiter terrain along the route.
- Locate and mark the nearside and far side of contamination on the route.
- Report all information.

5-14. Typical CBRN route reconnaissance procedures are—

- Locate, survey, and report contamination that can influence movement along the route.
- Reconnoiter terrain that the adversary can use to dominate movement along the route, such as, choke points and ambush sites within the CBRN hazard area.
- Reconnoiter built-up areas, contaminated areas, and lateral routes along the route.
- Locate any fords, crossing sites, or bypasses for existing and reinforcing obstacles (including built-up areas) along the route that can be used to avoid or bypass the CBRN hazard.
- Identify obstacles in the execution of CBRN route reconnaissance.
- Report and mark CBRN hazards along the route.
- Conduct a CBRN survey to define the boundaries of the contamination.
- Report information according to the communication plan when initiating the CBRN route reconnaissance mission, including a sketch and a CBRN 4 report.
- Mark the contaminated area.
- Request decontamination support if necessary.

5-15. The minimum essential graphics for CBRN route reconnaissance include the area boundaries, providing situational understanding of adjacent unit operations. Unlike a tactical road march, phase lines are used for synchronization and movement control from the line of departure to the RP. Checkpoints are established along the route being reconnoitered or the CBRN R&S leader may use an identifiable terrain feature to maintain orientation and keep the higher headquarters abreast of the unit location. NAIs are established and enumerated where information, specific to the mission, is to be collected. Targets for field artillery may be placed on the tactical graphics where the CBRN R&S element may acquire enemy forces. The target numbers should be coordinated with and tracked by the higher headquarters fire support coordination officer. Figure 5-2, page 5-6, shows an example of what graphic control measures should be utilized by CBRN R&S elements conducting route reconnaissance.



Legend:
LD line of departure
LOA limit of advance
NAI named area of interest
PL phase line
RP release point
SP start point

Figure 5-2. Route reconnaissance control measures

ZONE RECONNAISSANCE

5-16. Zone reconnaissance is a type of reconnaissance operation that involves a directed effort to obtain detailed information on all routes, obstacles (existing and reinforcing), terrain, and enemy forces within a zone defined by boundaries. CBRN contaminated areas should be considered obstacles. The commander assigns a zone reconnaissance mission when the commander needs additional information on a zone before committing other forces in the zone. It is appropriate when the enemy situation is vague, existing knowledge of the terrain is limited, or combat operations have altered the terrain. See ADP 3-90 for more information on zone reconnaissance.

5-17. A zone reconnaissance is a deliberate, time-consuming process that requires a substantial commitment of resources. A zone reconnaissance may include several route or area reconnaissance missions assigned to subordinate units. A zone reconnaissance is normally conducted over an extended distance and starts from a line of departure. It requires all ground elements executing the zone reconnaissance to be employed abreast of each other. A reconnaissance unit cannot disregard terrain when focusing on the enemy. However, it minimizes its terrain reconnaissance to that which may influence an NAI, such as CBRN reconnaissance.

5-18. Previous reports or intelligence may indicate a high probability of past CBRN attacks within the zone. Once contamination is detected, the R&S element has the following options:

- Conduct a CBRN survey to define the boundaries of the contamination.
- Locate and mark clean bypass routes around the contaminated area within the zone.
- Terminate the mission and move to the coordinated decontamination point.

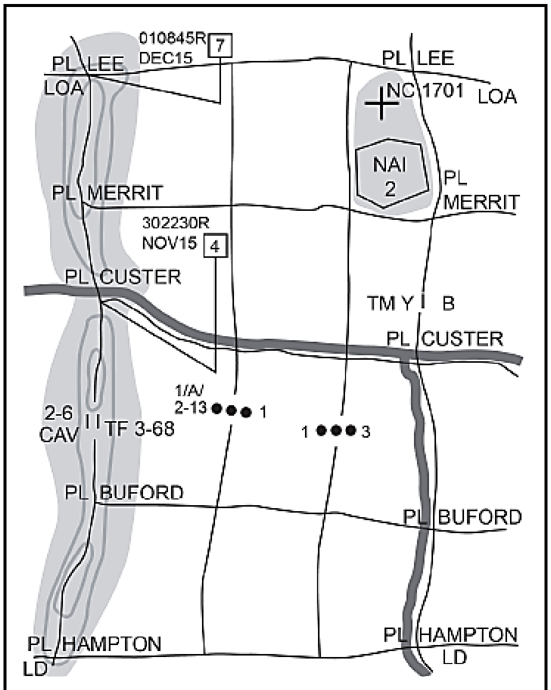
5-19. Unless specifically directed by the commander, critical tasks must be accomplished during a zone reconnaissance. The commander may direct the reconnaissance toward specific information requirement only, based on the time available and his intent. The following critical tasks are conducted during a zone reconnaissance:

- Reconnoiter terrain within the zone for CBRN contamination.
- Locate previously reported CBRN attack areas and determine if there is still a hazard.
- Locate possible contamination within the zone.
- Verify the location of commercial TIM facilities.
- Report information.
- Mark contaminated areas.
- Locate routes to bypass contamination.

5-20. The typical zone reconnaissance procedures are—

- Locate all previously reported CBRN attack areas and determine if there is still a hazard.
- Reconnoiter all terrain within the zone for contamination.
- Locate any fords, crossing sites, or bypasses for existing and reinforcing obstacles (including built-up areas) within the zone to avoid or bypass CBRN hazards.
- Identify and report all enemy CBRN delivery and storage capabilities within the zone.
- Identify and report all obstacles in the execution of CBRN zone reconnaissance.
- Report and mark all CBRN hazards within the zone.
- Locate and mark bypass routes for other forces if contamination is encountered.
- Conduct a CBRN survey to define the boundaries of the contamination.
- Report information according to the communication plan when initiating the CBRN zone reconnaissance mission, including a sketch and photographs if available, and CBRN 4 report.
- Mark contaminated areas.
- Request decontamination support if necessary.

5-21. The commander controls a zone reconnaissance by assigning an AO to the unit conducting the reconnaissance. (See figure 5-3, page 5-8.) The lateral boundaries, a line of departure, and a limit of advance define this AO. Within the AO, the force conducting the zone reconnaissance further divides the AO with additional lateral boundaries to define subordinate unit AOs. CBRN R&S elements are integrated with a unit that controls the AO. Subordinate AOs are not necessarily the same size. Phase lines and contact points, located where the commander determines that it is necessary for adjacent units to make physical contact, are used to coordinate the movement of elements operating abreast. The commander may further designate the time that this physical contact takes place. Checkpoints indicate critical terrain features and help to coordinate air-ground integration. The commander may use fire support coordination measures to control direct and indirect fires and use additional control measures as necessary. In addition, the commander assigning the zone reconnaissance mission must specify the route the reconnaissance unit uses to enter the AO. All control measures are on recognizable terrain when possible.



Legend:

CAV	cavalry
Dec	December
LD	line of departure
LOA	limit of advance
NAI	named area of interest
PL	phase line
TF	task force
TM	team

Figure 5-3. Zone reconnaissance control measures

AREA RECONNAISSANCE

5-22. *Area reconnaissance* is a type of reconnaissance operation that focuses on obtaining detailed information about the terrain or enemy activity within a prescribed area (ADP 3-90). This area may include a town, a ridgeline, woods, an airhead, or any other critical operational feature. The area may consist of a single point, such as a bridge or an installation. The primary difference between an area reconnaissance and a zone reconnaissance is that in an area reconnaissance, units first move to the designated area in which the area reconnaissance will occur. However, when the reconnaissance objective is the enemy force, a commander may forgo a detailed reconnaissance of the zone and focus assets on those NAI that would reveal enemy dispositions and intentions. In a zone reconnaissance the units start from a line of departure. Areas are normally smaller than zones and are not usually contiguous to other friendly areas targeted for reconnaissance. Because the area is smaller, an area reconnaissance typically takes less time to complete than a zone reconnaissance.

5-23. Examples of area reconnaissance missions assigned to a CBRN R&S elements are—

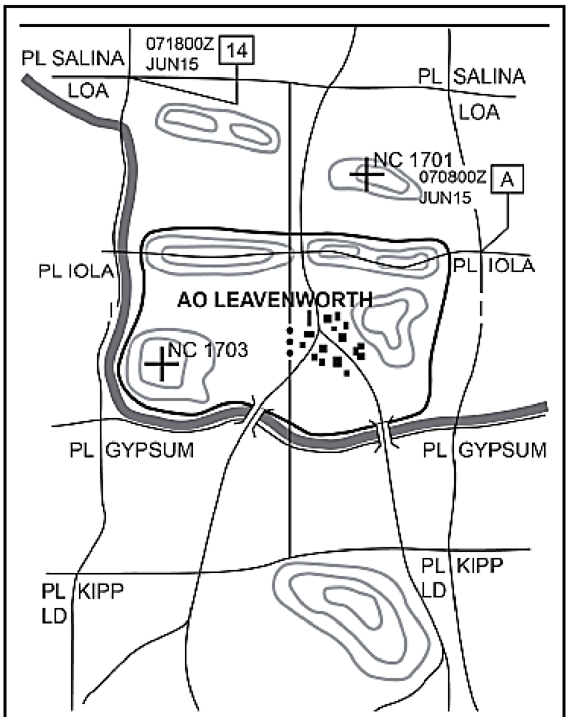
- Reconnaissance of a site where WMDs are being manufactured, filled, or stored; or precursors and components of WMDs are manufactured or stored.
- Contaminated areas whether intentional, accidental, or through collateral damage.
- During fixed-site operations (naval seaports, airfields, land component operations).

5-24. If contamination is detected, the CBRN R&S element performs a survey to define the boundaries of the contamination. If the CBRN R&S asset is supporting an offensive or defensive operations in the close or deep areas, locate and mark the hazard area and report the site, providing sufficient information to pass the site to another unit. If there is no contamination determined, the unit requests to terminate the mission.

5-25. The following critical tasks are conducted during an area reconnaissance:

- Locate and mark CBRN hazards within the area.
- Conduct a site survey (if required).
- Conduct sampling operations (if required).
- Locate bypass routes around identified contaminated areas.
- Report all information to higher and adjacent units.

5-26. The commander assigning an area reconnaissance specifies the area for reconnaissance with a single continuous line to enclose the area to reconnoiter. In figure 5-4, AO LEAVENWORTH represents the area the commander wants reconnoitered. Alternatively, the commander may designate the area by marking lateral boundaries, a LD, and a LOA. An area reconnaissance mission specifies the route to take in moving to the area. Upon completion of the area reconnaissance, the unit normally departs the area on a different route. The commander of the unit conducting the area reconnaissance mission uses control measures for a zone reconnaissance in the AO to control subordinate element operations. Figure 5-4 shows an example of an area reconnaissance control measures.



Legend:
AO area of operations
LD line of departure
LOA limit of advance
PL phase line

Figure 5-4. Area reconnaissance control measures

5-27. In special circumstances the CBRN R&S element may be required to undertake reconnaissance of a specific location of interest to the commander. These are generally called site assessments, characterizations, and exploitations. For more information, see ATP 3-90.15 and ATP 3-90.40.

CBRN RECONNAISSANCE UNIQUE SUPPORTING TASKS

5-28. CBRN R&S operations are executed, using the forms of R&S to describe the mission statement. There are unique CBRN R&S supporting tasks to execute missions. These support tasks may be specified or implied by JFCs within the OPORD or fragmentary order. When the commander requires detailed information on a suspected contaminated area, a CBRN survey may be directed. A CBRN survey determines the type, nature and extent of the CBRN hazards. This may include measuring radiation and concentration of chemical hazards, determining the presence of biological hazards, and sampling.

5-29. The tasks are—

- **Locate CBRN hazards.** Locating CBRN hazards is described as finding the place where the CBRN hazard exists. To locate CBRN hazards, the zigzag, lane, cloverleaf, or grid techniques can be used. Further details on these techniques are provided later in this chapter.
- **Survey CBRN hazards.** Surveying CBRN hazards is described as the active effort to determine the extent of contamination of CBRN hazards. This is typically in open terrain, where other units require freedom of maneuver. Both mounted and dismounted CBRN R&S units can execute this task. However, mounted CBRN R&S elements can conduct this task much faster when operational tempo is critical. When conducting a CBRN survey the nearside-far side, box, star, bounce and bypass, course leg, or preselected dose rate techniques can be used.
- **Mark CBRN hazards.** Marking CBRN hazards is described as the use of visual or other indicators to warn others of the presence of a CBRN agent in a particular area/location. When marking a CBRN hazard, hasty or deliberate techniques are used. The methods of marking are contingent upon specific unit SOPs and should address the possibility of marking a contaminated area within an obstacle or with unexploded explosive ordnance present. Further details on these techniques are provided later in this chapter.

RECONNAISSANCE TECHNIQUES

5-30. The CBRN reconnaissance techniques provide recommended and proven tactics they may apply to both mounted and dismounted CBRN reconnaissance. Appendix B and appendix C provide guidance specific to mounted and dismounted operations for each technique. The CBRN reconnaissance techniques are—

- **Zigzag.** The zigzag CBRN reconnaissance technique is used to locate contamination areas during route, zone, and area reconnaissance missions. The zigzag technique involves many turns, and a high level of maneuverability is required when conducting this technique.
- **Star.** The star survey technique is a very quick way to determine the rough limits of a contaminated area.
- **Cloverleaf.** The cloverleaf CBRN reconnaissance technique is used during mounted and dismounted operations. The R&S element moves in a cloverleaf pattern, with each leaf extending 50 to 200 meters from the starting point. This technique is not used in radiological contaminated areas due to the lack of shielding.
- **Bounce and bypass.** The bounce and bypass technique is used to locate the general boundaries of a contaminated area.
- **Nearside-far side.** The nearside-far side survey technique is normally used by an R&S element to determine the beginning and end of contamination along a route.
- **Triangulation.** The triangulation CBRN reconnaissance technique is employed by R&S elements to locate radiological contamination sources while dismounted.
- **Lane.** The lane CBRN reconnaissance technique is used to locate contamination areas during route, zone, and area reconnaissance missions. The lane technique requires traversing an area, searching for contamination. It delivers a very detailed coverage of an area in a short period.
- **Course leg.** The course leg technique is used to conduct an aerial reconnaissance survey mission to define the extent of a radiological hazard. The pilot flies a straight line between two checkpoints

(for example, from Point A [top of a hill] to Point B [top of another hill]). The aircraft only lands to obtain the air-ground correlation factor data.

- **Box.** The box survey technique is used to determine the general dimensions (length and width) of a contaminated area. It is best employed by three teams, and the process starts once a team enters the contaminated area.
- **Grid.** The grid CBRN reconnaissance technique is employed by R&S elements where speed and accuracy are important. It is employed by superimposing a grid over the R&S element maps, which enables them to rapidly communicate locations of contaminants, the location of where samples were collected, locations of casualties, and other pertinent information.
- **Preselected dose rate.** The preselected dose rate technique is used to determine the boundaries of radiological contamination while limiting and controlling exposure to R&S elements. Useful in surveying the presence of residual radiological contamination and neutron-induced radiation, this technique also permits the R&S element to avoid excessive radioactive hazard levels. When conducting a preselected dose rate technique, the element must be given OEG by the commander, with advice from the CBRN staff or health physicist, which includes a turn-back dose and turn-back dose rate.

CBRN RECONNAISSANCE EMPLOYMENT CONSIDERATIONS

5-31. Consider the following for CBRN reconnaissance missions:

- **Time available.** A key factor in CBRN R&S execution is the time available to conduct missions. CBRN R&S elements that are in support of maneuver must keep pace with the movement and maneuver of the supported unit. The time required to conduct an assessment versus an exploitation during area reconnaissance must be understood and conveyed by CBRN subject matter experts to leaders and planners. Because of this consideration, forces may be tasked to only assess CBRN threats, marking and reporting them for follow-on forces to characterize and exploit.
- **Key travel and execution times.** Estimate the time requirements for moving to the objective, reconnoitering the objective, establishing security and surveillance, completing assigned tasks while on the objective, moving to and through friendly lines, and conducting operational debriefings.
- **Security force requirements.** If conducting dismounted reconnaissance missions in locations where enemy direct fire is likely and individual protective equipment (IPE) is required due to a possible CBRN threat, JFCs task organize security forces to support CBRN area reconnaissance. At a minimum, CBRN reconnaissance assets execute the mission in supporting range of adjacent maneuver elements.
- **Essential and supporting tasks.** Ensure the assignment of all essential tasks to be performed on the objective, at danger areas, at security or surveillance locations, along routes, and during the passage of lines.
- **Technical decontamination requirements.** CBRN R&S elements execute missions based upon the planning assumption that they will be required to conduct the mission in a contaminated environment. Technical decontamination coordination is part of mission planning.
- **Sampling coordination.** If sampling is a task requirement to support CBRN reconnaissance, CBRN R&S force must know where to transport the sample to for safety, control, and increased identification requirements.
- **Primary and alternate routes.** Determine primary and alternate routes to and from the objective.
- **Supported unit link-up.** Determine the location where and when CBRN R&S will liaison with supported maneuver units.

- **Communications.** Consider the communications plan (PACE) and ensure that it supports communication with both the parent unit and gaining unit. If working with multinational partners, determine which communication means will work while maintaining communications security protocols. If working in subterranean or concrete structures, look at alternative means to communicate, such as landline communications, hand-and-arm signals, chemical lights, voice, whistles, radios, and infrared equipment such as strobes or infrared aiming lasers.
- **Logistical support.** CBRN reconnaissance assets may operate in deep and close areas with other units, detached from their parent unit for many days. Coordination for all classes of supply and replenishment are critical.

SECTION II: SURVEILLANCE FORMS AND TASKS

5-32. This section describes the types of CBRN surveillance (point, area, and health surveillance). It also describes the unique tasks associated with CBRN surveillance.

POINT SURVEILLANCE

5-33. The purpose of point surveillance is to provide intermittent or continuous observation of a specific place, structure, person, or object for a specified amount of time. This can be associated with, but is not limited to, a target area of interest or a NAI. Point surveillance ensures that time-sensitive critical operations can be conducted without unwarned encounters with CBRN hazards. It is important to note that detection of a hazard may occur before or after exposure to personnel. Point surveillance is most limited in the geographic scope of all forms of surveillance.

5-34. Point surveillance systems may be dismounted, fixed, shipboard mounted, or placed on mobile platforms. The technology used for point surveillance requires the agent or hazard to be directly in contact with the detector and equipment decontamination is a planning consideration. Point surveillance may require the detector to be within the hazard area to obtain readings. The reading may be routed to another output source remotely for analysis of the initial reading. In either case, a positive reading during point or area surveillance drives initiation of the CBRNWRS.

5-35. Operational examples of point surveillance systems include—

- **Dismounted surveillance**: an infantryman wearing a sensor while performing squad rushes to an objective.
- **Fixed surveillance**: a dry filter unit stationed at a control point on a forward operating base.
- **Shipboard surveillance**: an amphibious ship running sensors while launching amphibious assault vehicles.
- **Mobile platform surveillance**: a sensor mounted on a vehicle conducting operations in the vicinity of an NAI.

5-36. The sensors in point or area surveillance are usually focused into the wind or toward an area of concern. Warning of an upwind attack may come from a force's organic detection capability or from other assets monitoring the upwind area. When a unit lacks the necessary point or area surveillance capabilities, CBRN staffs inform commanders when the possibility of attack warrants an increased protective posture based on intelligence indications.

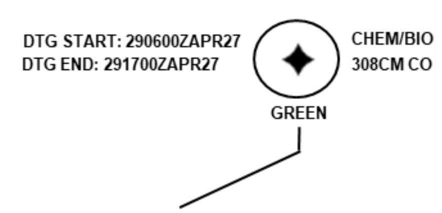
5-37. Tripod-mounted surveillance systems can be used in and around fixed-site installations to optimize the sensor field of view and to overcome obstructions from buildings and equipment. Consider using the roofs of existing buildings or structures to elevate the system. Key definitions that must be understood for fixed-site elevation include—

- **Sensor height.** Sensor height is the elevation at which the sensor is placed on the ground, building, or equipment to provide an unimpeded flow of air.
- **Ground intersect.** Ground intersect is the distance from the system that the lower tangent of 10 degrees will intersect the ground. The ground intersect is representative of the distance from the detector that will not be viewable in the field of regard. Always consider the ground intersect when elevating the system.

5-38. Shipboard operations provide a capability to alert, collect, and identify chemical, radiological, and biological agents to support maritime operations. Biological detection technology continuously monitors the air for a significant rise in particulate concentrations and/or biological mass. If a significant rise over the background is detected, the instruments will automatically collect an aerosol sample and alert the ship damage control central of the need to collect the sample and screen it using a handheld assay for a possible presumptive identification.

5-39. The maritime biological detection technology detects and identifies biological agents. It contains or connects to navigation, meteorological, and communications equipment that is used to identify the location and sense the conditions under which the agent was detected. The maritime biological detection technology has the ability to detect and identify many agents (bacteria, viruses, toxins) during a mission. Biological agent identification is limited by the available agent reactive assay strips housed within the identifier, the ability to collect enough material to reach the identification thresholds of the assay strips, and reagent interferents. It provides the ability to collect and save biological agent samples for later laboratory analysis.

5-40. The symbol for CBRN point surveillance uses the circular equipment sensor symbol descriptor provided in FM 1-02.2 with the type of sensor denoted to the right of the symbol and relevant staff information. The duration of the sensors use can be added to the left of the symbol showing a start and stop date time group. A status of the sensor may be provided on the bottom based upon unit SOP. For example, GREEN may mean fully operational, YELLOW may mean at location (but not currently monitoring) and RED may indicate detection of a CBRN hazard. A directional arrow is used to denote the exact location on the map where the sensor is located. An example of an individual point of surveillance has been provided in figure 5-5.



Legend:

BIO	biological
CHEM	chemical
CM	chemical
CO	company
DTG	date time group

Figure 5-5. Point of surveillance

AREA SURVEILLANCE

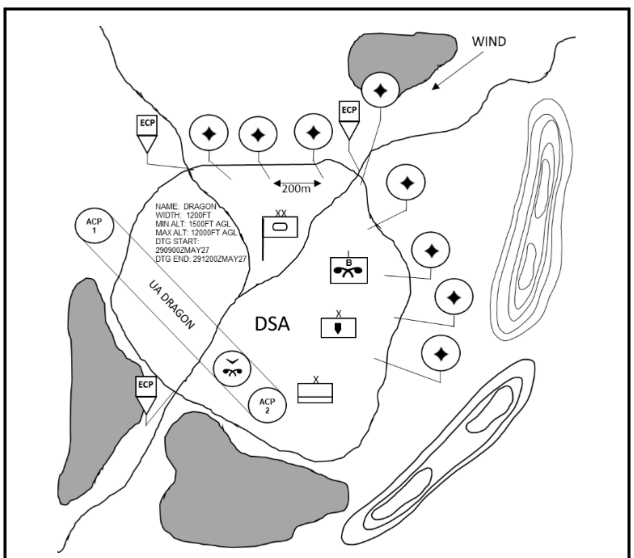
5-41. The purpose of CBRN area surveillance is to provide a greater detection capability in large areas leveraging sensors, optics, and detectors. The first warning of missile attack will come from space-based sensors, and will estimate a probable impact location. Area surveillance also provides warning of CBRN attacks and informs units when to increase protective posture. For sustainment nodes, area surveillance informs the direction of CBRN plumes, allowing units to avoid contamination before logistics assets are cross contaminated. CBRN area surveillance may also be redundant, temporary, or continuous observation of a specific prescribed geographic area. It can be associated with, but is not limited to, a CBRN target area of interest or a CBRN NAI. This area may include a town, neighborhood, cluster or group of buildings, or other man-made or geographic features. Unlike area reconnaissance, it does not include individual structures, such as a bridge or single building. The use of sensors (deployed in arrays) and standoff detection capabilities are key to the coverage of larger areas.

5-42. Area surveillance provides warning to friendly units, allowing them to avoid contaminated areas before they pose a hazard to resources. It may be conducted while positioned around the perimeter of a fixed site, such as an airbase. During the fixed site employment of sensors in support of area surveillance, the CBRN R&S asset considers the installation size as only one factor in determining the required number of detectors. The airflow is another factor that could affect the number of detectors required. Tall or large structures (dormitories, hangars, fuel tanks) can obstruct airflow. Terrain features (mountains, hills, valleys) may also obstruct or affect how the prevailing winds flow throughout the fixed site. Simulation and modeling capabilities aid in and maximize the positioning of detectors throughout the perimeter.

5-43. The CBRN threat also plays a major role in detector placement. For instance, if there is a threat of a line release upwind, then the sensors may be placed in the upwind side of an installation in a picket line. If the threat is from artillery, then the detectors could be placed in a box technique to ensure uniform coverage across the entire installation. These factors must be considered when emplacing the detector so that blind areas are minimized and the overlapping of detectors is maximized to ensure adequate coverage of the fixed site through point or area surveillance.

5-44. Vehicle-mounted employment can also be used in and around fixed sites and temporary perimeters. The advantages of vehicle-mounted systems are that they can be easily repositioned as needed to adjust to changing environmental conditions and threat. A single system provides a circular ring of coverage around an employed location. In this situation, the system should be located as close as possible to the center of the location with an unobstructed field of regard. If there is a high probability that an attack will occur because of an upwind release of a CBRN agent, the system could be placed on the upwind edge of the target to provide warning to other forces. Layered, redundant systems may be positioned around the location, providing coverage in depth within the perimeter.

5-45. In figure 5-6, a biological detection company has been tasked to provide area surveillance within a division support area. Using a picket line, systems have been emplaced along the northeastern portion of the division support area, understanding that the wind direction and air flow from higher ground will impact sensor efficiency. Note that not all of the biological sensors are running at once, allowing for phased maintenance and sensor coverage. The company has also emplaced chemical detector sensors that are collocated with biological detection, fostering dual threat hazard awareness and understanding. A CBRN unmanned aerial system has also been employed providing layered coverage across the southwestern portion of the division support area, where most logistical activities are occurring.



Legend:

ACP	airspace control point	ECP	entry control point
AGL	above ground limit	m	meter(s)
DSA	division support area	UA	unmanned aircraft
DTG	date time group		

Figure 5-6. Area surveillance control measures

HEALTH SURVEILLANCE

5-46. According to DODD 6490.02E, comprehensive, continuous, and consistent health surveillance shall be conducted by the Military Services to implement early intervention and control strategies using technologies, practices, and procedures in a consistent manner. Health surveillance includes medical surveillance and occupational and environmental health surveillance. *Medical surveillance* is the ongoing, systematic collection, analysis, and interpretation of data derived from instances of medical care or medical evaluation, and the reporting of population-based information for characterizing and countering threats to a population's health, well-being, and performance (JP 4-02). *Occupational and environmental health surveillance* is the regular or repeated collection, analysis, archiving, interpretation, and dissemination of occupational and environmental health-related data for monitoring the health of, or potential health hazard impact on, a population and individual personnel, and for intervening in a timely manner to prevent, treat, or control the occurrence of disease or injury when determined necessary. (DODD 6490.02E) CBRN R&S elements must integrate with the medical community, sharing information on CBRN and TIM hazards identified in the environment or that CBRN R&S teams may have been or were exposed to so that their exposure can be documented in the Service members' medical records. Sharing information on CBRN hazards facilitates early medical intervention of and potentially prevents the negative acute, latent, and chronic term physical effects of any HAZMAT exposures.

5-47. CBRN surveillance includes the integration of health surveillance. *Health surveillance* is the regular or repeated collection, analysis, and interpretation of health-related data and the dissemination of information to monitor the health of a population and to identify potential health risks, thereby enabling timely interventions to prevent, treat, reduce, or control disease and injury, which includes occupational and environmental health surveillance and medical surveillance subcomponents. (JP 4-02) *Medical surveillance* is the ongoing, systematic collection, analysis, and interpretation of data derived from instances of medical care or medical evaluation, and the reporting of population-based information for characterizing and countering threats to a population's health, well-being, and performance. (JP 4-02)

5-48. The systematic collection of health care information is essential to the surveillance process. Health surveillance includes medical, occupational, and environmental surveillance. This information is used to monitor the health of a population and to identify potential risks to health, disease, and injury, thereby enabling timely interventions to prevent, treat, or control exposure. The foundation of a health surveillance program is the determination of unit-specific illness and injury rates of public health significance.

5-49. Medical surveillance, derived from instances of medical care or medical evaluation, may provide the first indicator that a CBRN incident has occurred. If an incident is not detected directly, the first indication may be an increase of illness among the affected population. Some hazards induce symptoms after an incubation period (biological) or prolonged exposure (radiation and chemical). An influx of patients reporting similar symptoms may indicate that an incident has occurred. CBRN and medical staffs must synchronize efforts and establish a seamless, shared understanding of when CBRN threats and hazards are impacting force health. For more information about health surveillance, see ATP 4-02.7/MCRP 4-11.1F/NTTP 4-02.7/AFTTP 3-42.3.

5-50. The first evidence of a biological attack may be recognized by the medical community due to the number of patients with similar signs and symptoms seeking treatment. CBRN R&S capabilities may detect a biological incident during R&S activities before Service members show signs and symptoms due to time delay between biological hazard exposure and signs and symptoms developing. The sharing of information between CBRN staffs and the medical community is critical to identify CBRN hazards that may not have been identified through traditional (sensor) means and to inform the medical community so that medical treatment plans can be adjusted for the CBRN hazard.

CBRN SURVEILLANCE TASKS

5-51. The CBRN surveillance tasks are—

- **Monitor CBRN hazards.** Monitoring CBRN hazards is described as checking the environment for the presence of CBRN hazards. When monitoring for CBRN hazards, periodic or continuous techniques are used. Further details on these techniques are provided later in this chapter.
- **Observe CBRN hazards.** Observing CBRN hazards is described as watching a specific location or unit to determine the potential for the presence of a CBRN hazard using visual means.

CBRN SURVEILLANCE TECHNIQUES

5-52. The CBRN surveillance techniques are—

- **Periodic.** The periodic CBRN monitoring technique during CBRN surveillance missions consists of frequent checks of the environment for the arrival or presence of CBRN hazards.
- **Continuous.** The continuous monitoring technique during CBRN surveillance missions involves uninterrupted checking for CBRN hazards at a given location over a specified period of time.

Note. Both periodic and continuous can be conducted on the move. Maneuver forces observe and monitor their proximal location to detect CBRN hazards to support immediate protective action while in the assault and other maneuver missions.

- **Critical node.** The critical-node technique uses a set of detectors and/or monitors positioned around and throughout a specific high-value target to provide for the detection and early warning of a CBRN attack. Examples include aerial port of debarkation, SPOD, and mission command/C2 locations.
- **Area array.** The area array technique uses a set of CBRN detectors and/or monitors positioned within a given geographic space to provide for detection and early warning of a CBRN incident. They are positioned to complement and overlap each other in such a way as to increase the probability of detection of a CBRN hazard.

EMPLOYMENT TACTICS

5-53. The CBRN surveillance employment tactics are different between mounted and dismounted capabilities. Refer to mounted and dismounted appendixes for employment tactics (see appendixes B and C).

CBRN SURVEILLANCE CONSIDERATIONS

5-54. Consider the following for CBRN surveillance missions:

- Determine the number of detection and/or collection assets that are available and required. Land-force CBRN surveillance assets are employed in arrays designed to optimize the probability of detection consistent with large areas and critical sustainment nodes. Assets will be located based on METT-TC/METT-T factors, ability of the sensors, and the size of the critical asset to be protected.
- Place fixed-site CBRN surveillance assets on high ground or upwind of a location to provide CBRN detection and confirm or deny the presence of CBRN agents. Fixed-site CBRN operations focus on specified targets to include ports, aerial port of debarkation, or SPODs. CBRN detection assets are placed anywhere upwind or within the location to confirm or deny the presence of a CBRN agent. METT-TC/METT-T analysis will determine the number of systems required as point detectors for critical nodes such as logistics bases or major airfields and/or air bases, naval bases, or ports. CBRN detection systems can also be placed on ships for improved operational dispersion. Detectors and collection devices can be placed inside critical facilities to monitor for CBRN agents.
- Determine the size of the operational area to be covered and maximize the distance of the sensor to the alarm, allowing personnel to have maximum early warning of CBRN attack to don IPE/PPE.

- Examine the environment's effects on the sensor. CBRN R&S leaders account for proximity of objects that may impede air flow, such as buildings, and the proximity of activities that may distort air flow, such as helicopter and aircraft operations.
- Ensure that the sensor employment strategy accounts for the most likely means of enemy delivery to include delivery systems and delivery tactics.
- For naval operations, use CBRN sensors to monitor the AO while ships are underway, in port, and operating close to land masses.

SECTION III: BASIC RECONNAISSANCE SKILLS AND PRACTICES

5-55. CBRN R&S elements must be highly proficient in tactical fundamentals and able to seamlessly integrate with maneuver reconnaissance formations in order to successfully answer CBRN related PIR. Personnel or formations that are highly technically qualified on CBRN specific tasks, but a tactical liability or unable to accomplish the arduous tasks associated with the reconnaissance enterprise have little use in the challenging and dangerous environment in which reconnaissance is executed. These skills must be mastered by all CBRN R&S personnel and be rapidly executed in enemy contact.

MOVEMENT FUNDAMENTALS

5-56. Movement and maneuver techniques are selected based on the type of reconnaissance element conducting the operation, enemy expectations, the specific mission objectives for the reconnaissance operation, and METT-TC/METT-T. Mastery of movement and maneuver is critical to successfully getting to the reconnaissance objective, conducting reconnaissance of the assigned NAI, and safely returning to friendly lines.

INSERTION AND EXTRACTION METHODS

5-57. CBRN R&S elements can conduct waterborne insertion by inland and coastal waterways to provide speed, stealth, and flexibility in order to arrive at the reconnaissance objective. Key factors of waterborne reconnaissance include the beach landing site, environmental factors (such as waves, tide, fog) available drop site from debarking larger craft. Additional flexibility may be gained by conducting helocasting of assault craft.

5-58. Helicopters provide a variety of methods for inserting and extracting CBRN R&S elements. These methods include special purpose insertion and extraction system, fast rope insertion and extraction system, and air assault. Helicopter operations provide range and speed, but sacrifice stealth, impose weight/space limitation compared to vehicle operations, and are vulnerable against robust air defense systems.

5-59. Airborne operations are the fastest method of infiltration, but require detailed planning and significant coordination of resources. Units must plan for suppression of enemy air defenses, coordination of air platform, and contingency plans for in-flight emergencies. Airborne operations are highly vulnerable upon hitting the drop zone, and a suspected airborne infiltration often draws an aggressive response from enemy forces.

5-60. Vehicle operations allow the use of a wider range of CBRN R&S systems, which would not be feasible for dismounted operations. Vehicle operations allow for CBRN R&S to conduct reconnaissance ahead of rapidly moving armor or mounted formations, and cover large areas of terrain. Planning and preparation for a mounted mission starts long before a mission is assigned. Preparations include training and rehearsals such as mounted battle drills, laager/hide sites and vehicle maintenance. The distance from a base to the operational area, or even the staging (launch) site may require additional transportation. Various infiltration combinations of aircraft, rail line, or surface ships may be required to get the CBRN R&S element positioned to insert into an operational area. These infiltration combinations may also be used to increase the operational range of the mounted CBRN R&S element by decreasing the required distance for overland insertion.

TACTICAL MOVEMENT

5-61. Sound tactical movement is the essence of all CBRN R&S missions. The CBRN R&S element maneuvers in a way to accomplish the mission but minimize casualties and retains freedom of maneuver. Effectively employed, the guidelines in this section can help see the enemy first and observe them undetected. This helps to achieve a number of tactical goals, including retaining the initiative, confirming or denying the CCIR, and retaining freedom of movement to gain information. Tactical movement involves movement of a unit assigned a mission under combat conditions when not in direct ground contact with the enemy.

5-62. Leaders look at the terrain, foliage, structures, and other features along avenues of approach (and on objectives or key terrain) to identify sites offering cover (protection from the effects of direct and indirect fire) and concealment (protection from observation). Cover and concealment is just as vital as clear fields of fire. Terrain offers concealment from enemy observation and cover from enemy fires. Make maximum use of natural protection to accomplish their mission and avoid enemy detection. Use cover when possible. When no cover is available, use the concealment offered by trees, shadows, brush, and man-made structures.

5-63. Reduce the major signatures (audible, thermal, and visual) by shutting off vehicle engines and related systems such as heaters or older thermal sights when the vehicle is not moving or when not using the system (normally referred to as a short count). Further reduce visual and thermal signatures by erecting camouflage networks, and use foliage found in the AO to alter the natural box shape of the vehicle which helps hide a stationary vehicle visually and thermally. Networks tied to the vehicle reduce dust and exhaust signatures, and reduce the thermal signature while moving.

5-64. During the execution of reconnaissance, specific types of terrain features or regions will be encountered that increase risk to enemy fire. Identify and highlight enemy cover, concealment, and observation danger areas when conducting map reconnaissance, and analysis during TLPs. There is no perfect way to counter every danger area so leaders at all levels need to use disciplined initiative when reacting to danger areas.

5-65. As the CBRN R&S element executes reconnaissance and security missions, routes, or mobility corridors that provide access into the terrain between friendly elements to its flanks and rear are to be expected. These lateral mobility corridors pose a security threat by allowing the enemy to move into the terrain around the flanks unobserved. Leaders coordinate missions with adjacent units to prevent confusion, fratricide, or possible enemy exploitation. Lateral routes beyond one-half the distance of the maximum effective range of overwatching weapon systems should be avoided. It is critical that continuous surveillance of these mobility corridors to protect against infiltrating enemy forces be maintained.

CAMOUFLAGE

5-66. CBRN R&S elements need to stay undetected to complete the mission. In any terrain or environment, a key to remaining undetected is to use proper camouflage measures. The CBRN R&S elements ability to conceal itself is only limited by its imagination. The biggest threat during reconnaissance is detection.

5-67. Detection can be by direct observation (where the observer sees the subject with his eyes, either aided or unaided) or by indirect observation (where the observer sees an image of the subject and not the subject itself.) Indirect observation uses photography, radar, infrared, thermal imaging, and televideo.

5-68. Regardless of the method of observation, certain factors help the eye and brain identify an object. The six factors of recognition are—

- **Position**. This factor relates to the position of the object in relation to its surroundings. In addition, position is space relative to one object and another.
- **Shape.** Experience teaches people to associate an object with its shape or outline. At a distance, the outline of objects can be recognized long before the details of its makeup can be determined. Trucks, guns, tanks, and other common military items all have distinctive outlines that help to identify them.

- **Shadow.** Shadow may be even more revealing than the object itself. This fact is true when viewed from the air. Sometimes it may be more important to break up or disrupt the shadow than the object itself.
- **Texture.** Texture refers to the ability of an object to reflect, absorb, and diffuse light. It may be defined as the relative smoothness or roughness of a surface. A rough surface reflects little light and will usually appear dark to the eye or in a photo. A smooth surface such as an airstrip, although it might be painted the same color as its surroundings, would show up as a lighter tone on a photo. One of the most revealing breaches of camouflage discipline is shine. Shine attracts attention by reflecting light such as sunlight or moonlight.
- **Contrast.** Color is an aid to an observer when there is a contrast between the object and its background. The greater the contrast in color, the more visible the object is. Usually darker shades of a given color will be less likely to attract an observer's attention than the lighter shades.
- **Movement.** The last factor of recognition is movement. Although this factor seldom reveals the identity of an object, it is the most important one of revealing location. Movement is detected easily and usually through the observer's peripheral vision.

5-69. CBRN R&S elements avoid detection by concealment by some form of physical screen. Examples include—

- **Hiding.** Using thick vegetation or terrain features that screen vehicles from ground observation. In some cases, the screen itself can be invisible to detection and, at times, it is the overt screen that protects the activity or equipment from observation.
- **Blending**. Arranging or applying camouflage materials on, over, or around an object so that it appears to be part of the background. Blending distinctly man-made objects into a natural terrain pattern is necessary to maintain a normal and natural appearance.
- **Disguising**. Simulating an object or activity so that it looks like something else. Clever disguises will mislead the enemy as to identity, strength, and intention.

OBSERVATION

5-70. The timely and accurate collection and transmission of reports, imagery, video, sensor reporting, or hand drawn pictures of the objective, plays a key role in the success of follow-on missions. The purpose of reconnaissance is to provide an accurate description of enemy strengths, positions and capabilities so that the commander can make informed decisions.

5-71. Imagery principles to ensure maximum value of R&S are—

- Placement of letters or numbers on the image to correspond with the legend.
- Placing appropriate arrows and other graphics where needed.
- Ensuring the image has a title, including a name, DTG, and grid, for example,
- North-seeking arrow.
- Size of the picture (from east to west, north to south).
- Remarks page for details about what each number or letter means.

5-72. In the case of loss of communication or enemy compromise, an objective sketch may be the only piece of information about that objective available. The ability to draft a proper objective sketch is an extremely important skill. It is important to understand the basics of objective sketch production. Understanding the basics allows a novice or nonartist to draw an understandable objective sketch. Objective sketches may be panoramic or topographic.

TERRAIN ANALYSIS

5-73. Terrain analysis is the study and interpretation of natural and manmade features of an area, their effects on military operations, and the effects of weather and climate on these features. Terrain analysis is a continuous process. Changes in the OE may change the analysis of its effects on the operation or on threat COA.

5-74. Ideally, analysis of the military aspects of terrain is based on reconnaissance of the AO and area of interest. This starts with a map and imagery reconnaissance. Automated digital terrain tools can assist in the analysis of environmental factors and can display data over maps. These tools are generally held in the intelligence fusion cell. CBRN specific modeling may be used to assess potential hazard areas to complement terrain analysis. Terrain may be analyzed through the aspects of OAKOC described in chapter 4. CBRN staff must also consider terrain effects on CBRN usage, for example, porous soil and vegetation will absorb contamination at a higher rate than rocky or barren terrain, minimizing initial effects of a CBRN strike. However, changing weather conditions or vehicle or foot movement can later cause contamination in the soil to be released. The products of terrain analysis include—

- Cross-country mobility.
- Lines of communication.
- Vegetation types and distributions.
- Surface drainages and configurations.
- Surface materials.
- Subsurface (bedrock) materials.
- Obstacles.
- Infrastructures.
- Flood zones.
- Potential helicopter landing zones.
- Potential amphibious landing zones.

SECTION IV: RECONNAISSANCE HANDOVER AND PASSAGE OF LINES

5-75. RHO is the process of planning, preparing, and executing transfer of responsibility and information from one element to another to facilitate continued observation or surveillance of enemy contact or an assigned area. It may cover an area or zone, such as an AO NAI, TAI, AA, or any enemy elements. It involves transferring physical, visual, electronic, or digital observation in any number of combinations. Assets such as ground sensors and UAS may transfer. Scout platoons execute a handover with a designated RHO coordination point, phase line where reconnaissance responsibility transitions from one element to another known as the RHO line, or trigger such as visual contact with threat forces outside of the reconnaissance element's engagement criteria.

5-76. A successful RHO ensures that there are no violations of any of the fundamentals of reconnaissance. This transfer of responsibility and information prevents gaps or seams from emerging that the enemy can exploit. If conducting target handover, the receiving unit acquires the target before handover is complete.

5-77. Once the handover is complete during reconnaissance, the element transferring control either conducts a rearward passage of lines as the passing unit through the main body receiving responsibility, acts as the stationary unit in a forward passage of lines for the element receiving responsibility, or continues further into zone to continue their reconnaissance mission.

5-78. Reconnaissance and security tasks require the element conducting the handover to effectively coordinate with higher, lower, and adjacent units. Planning for these tasks requires the RHO coordination to start at the higher echelons and execute at the lowest element.

5-79. Key steps for successful execution of RHO include—

- Coordinating for redundant surveillance to assist in maintaining enemy contact.
- Determining location, timeline, and criteria for RHO.
- Preparing and understanding a multilayered communications plan between elements.
- Exchanging all plans and information gathered about the AO.
- Notifying troops of the progress of the handover.
- Identifying and coordinating for target handover, as necessary.
- Synchronizing indirect fires and exchanging fire support information.
- Selecting secure contact points or linkup points.
- Exchanging of relevant information and intelligence.
- Exchanging of equipment and information collection-related information.
- Coordinating transfer and acceptance of responsibility between units.
- Rehearsing.
- Recognizing signals.

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Chapter 6

Sample Collection, Management, and Processing

This chapter describes the purpose and tasks of CBRN sample collection and management. Samples may be collected in CBRN environments, during site characterization, or exploitation following the forensic science functions. The decision to collect a sample must be determined by the specific purpose—answering the CCIR, field confirmatory identification, attribution or mitigation, and the time required to apply the processes with the skill that will ensure the integrity of the sample. The decision to sample should be based on the deliberate planning that creates the sample management plan and guided by the forensic functions.

PURPOSE

6-1. The decision to collect samples should be made with a specific intent associated with answering CCIR. Many factors will influence the requirement to take samples and determine what level of identification is needed. Information about the levels of identification and the decisions impacted can be found in chapter 2.

6-2. Sampling allows the commander to make timely, informed decisions concerning the positioning, operating posture, radiation exposure management, tempo, and maneuver ability of his units and to select adapted protective measures (mission-oriented protective posture level, collective protection activation, restriction of movement). Sampling is conducted for tactical and/or operational purposes and it is also necessary to allow the medical services to provide the most appropriate health care, and guide the commander in selecting the most appropriate protective actions to implement for force health protection.

6-3. For strategic, military, and/or political purposes, there may also be a need to confirm, the definitive use of CBRN substance by an adversary or his intention to do so. Although such evidence is required quickly, the proof of use of these agents must be such that it cannot be refuted. This degree of certainty cannot be achieved by information obtained solely from the battlefield such as radiation detection, indication, and computation (RADIAC) detector responses or unusual numbers of casualties. In such cases, additional forensic sampling at the scene of incident may be required.

6-4. The tasks of site assessment, characterization, and exploitation take place within a greater tactical mission. These tasks use forensic functions and are tiered based on time and resources.

- **Site assessment.** A site assessment detects WMD and related materials, delivery systems, associated material, and technologies. A site assessment requires less time and resources. Site assessment may occur concurrent with tactical enabling tasks such as search and attack.
- **Site characterization.** Site characterization is a complete description and inventory of all personnel, equipment, material, and information discovered. It assists in determining the need for exploitation.
- **Site exploitation.** Site exploitation is a time-, resource-, and capability-intensive task. It is a series of activities to recognize, collect, process, preserve, and analyze information, personnel, and/or material found during the conduct of operations. It will require additional enablers that are not organic to the unit to exploit data, information, and materials obtained during the operation. This is most likely to be executed during operations to consolidate gains. Site exploitation supports the CWMD activities of defeat, disable, and dispose.

Note. See STANAG 4701 (AEP-66) for more information on sampling of biological, chemical, and radiological for NATO missions.

6-5. CBRN sample management is explained in paragraph 6-17. The need to evacuate samples to fulfill the commander's information, CCIRs, and PIRs drives the sample management process. Proper identification of CBRN hazards affect decisions such as the administration of effective medical countermeasures, troop movements, individual and collective protective postures, and selection of decontamination methods.

EXPEDITIONARY FORENSICS

6-6. In support of answering the commander's CCIR, CBRN R&S elements may be required to sample materials for site characterization or site exploitation. CBRN sampling and collection for forensics are essentially the same—following procedures to ensure the quality and integrity of what is collected and to establish facts. Forensic science should be applied at any level of sampling. In-theater agent identification may be done at the presumptive, field confirmatory and theater validation levels depending on the time available and the confidence required in the result. This chapter provides information for sample management conducted by CBRN R&S elements at the tactical level.

6-7. Forensic science is the application of multidisciplinary scientific processes to establish facts (see DODD 5205.15E). Applying forensic standards when detecting, collecting, processing, and analyzing materiel improves and standardizes processes and increases confidence in the answers discovered. While forensic science was originally oriented towards laboratory sciences, joint forces use the application of expeditionary forensics for many purposes, including site exploitation, support to intelligence, law enforcement, medical activities, protection, and survivability.

6-8. The decision to collect materials during site assessment or characterization should be made with consideration to time available and security of the site. Collected materials should be exploited at the lowest level possible to provide relevant information to the commander.

FORENSIC FUNCTIONS

6-9. Six forensic functions provide a framework for the tasks conducted during CBRN sampling. They are—

- Recognize.
- Preserve.
- Collect.
- Analyze.
- Store.
- Share.

6-10. These functions can be conducted in sequence, in parallel, or in any combination based on mission variables. CBRN sample management establishes procedures, guidelines, and constraints to protect and preserve the integrity of the samples that may have tactical, operational, or strategic implications.

Recognize

6-11. The recognize function of forensics is an important component of CBRN sampling. It involves locating and scrutinizing materials and determining if the materials have potential information value. CBRN R&S elements can capitalize on the information from earlier site assessments or characterization to plan what items of information value require sampling. Sketches and photographs from earlier entries assist in conducting systematic searches at the point of collection, to recognize the best location for a sample that will provide the most information value.

6-12. Information and materials potentially linked to the enemy are considered materials of interest and collected on-site. Forensic analysis establishes specific facts that can potentially be used to answer commander's information requirements, inform decision making, and promote greater situational understanding. Special procedures must be followed when materials identified for collection are CBRN materials or precursors.

6-13. During CBRN R&S, items of potential value are recognized as targets and directed for sampling. Recognizing what is of value for CBRN sampling must take into account sample collection priorities that may be established in the sample management plan. Samples fall under three priority categories—

- **Priority 1.** Bulk unitary agent, bulk binary and/or other precursor materials (such as drums, barrels, final laboratory products), to include munitions or other delivery devices/systems.
- **Priority 2.** Environmental samples (such as air, water, soil, food, vegetation, and insects) and medical specimens (for example, vomit) from areas of alleged CBRN use.
- **Priority 3.** CBRN defensive materials (such as IPE/personal protective equipment (PPE), antidote kits, decontamination equipment, detection equipment), CBRN research and development facilities/equipment, or CBRN test and evaluation facilities/equipment.

Preserve and Collect

6-14. The preserve and collect functions take into account the protection of materials and data beginning once those items are recognized as holding potential value through the process of acquiring the samples. Maintaining the integrity of any samples taken ensures purity for analysis or to be of value for attribution. Specific procedures must be followed to preserve any samples. Every effort should be made to process, collect, and package samples following guidance to ensure the integrity and quality of the sample (see appendix G for specific techniques for sample collection).

Analyze, Store, and Share

6-15. Analyze, store, and share can occur at various echelons for more detailed exploitation. The commander and staff must ensure that the CBRN R&S element is trained and equipped to perform the key tasks of conducting the sample collection and management. In some circumstances, commanders may require technical-level expertise (CBRN specialists, preventive medicine [PVNTMED]/public health personnel) in contrast to tactical forces that are CBRN-capable. PVNTMED/public health and CBRN R&S elements are responsible for environmental sample collection, but PVNTMED/public health is responsible for occupational and environment health sample collection and exposure surveillance.

6-16. The sample management database is a permissions-based, interoperable, web-based system used to consolidate all sampling and analysis results from site exploitation or other activities requiring laboratory analysis. It provides a means to catalog, store, and share all documentation and reporting associated with samples or collected enemy material, including photographs, videos, storyboards, laboratory reports, intelligence, and chain of custody. DD Form 3108 (*CBRN Sample Documentation and Chain of Custody*) provides information on the CBRN sample and the chain of custody (see figure F-6, page F-52). Laboratories input all sample collection, and custody tracking documents (to include sample splitting information) into the sample management database. Results of laboratory analysis results are recorded in the database and reported back to the JFC. The first entry point for the database may be at the theater level laboratory or a sample management facility if established. In the absence of a sample management database, each laboratory at every level must maintain a system or method to track, catalog, and store their respective data.

SAMPLING TASKS

6-17. The sampling tasks support sample management. Chemical, biological, radiological, and nuclear (CBRN) sample management is the process whereby CBRN samples are collected, packaged, transported, stored, transferred, analyzed, reported, safeguarded, tracked, and disposed. It begins with the decision to collect CBRN samples and continues to the reporting of information produced by the final analysis of that sample. This process includes safeguarding and prioritizing CBRN samples, tracking their movements and analytical status, and reporting the end result of sample analysis. The CBRN sample management process establishes procedures, guidelines, and constraints at staff and unit levels to protect and preserve the integrity of CBRN samples that may have tactical, operational, and/or strategic implications. (See figure 6-1, page 6-4.) CBRN R&S sample management priorities may be established by the commander to coincide with PIR. Sample management feeds into joint ISR planning. At each level of command, sample management operations must be precisely defined within the area or responsibility (AOR). Sample transport across an AOR must be deliberately planned, controlled, tracked, and executed at all levels.

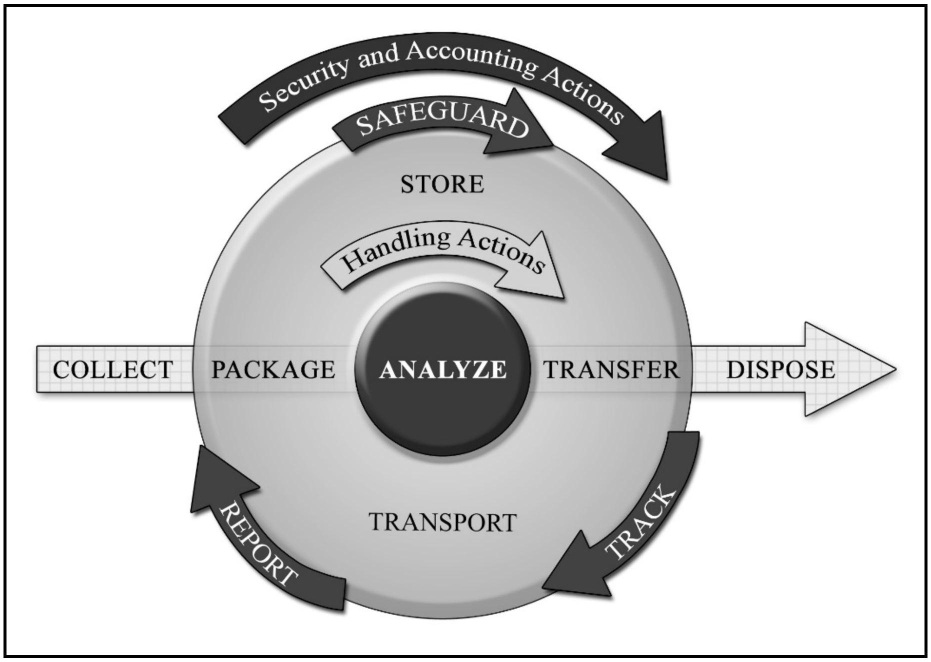


Figure 6-1. CBRN sample management process

6-18. The key CBRN sampling tasks form a process whereby samples are collected, packaged, transported, stored, transferred, analyzed, tracked, and disposed of. CBRN sampling tasks are nested within the forensic functions.

Collect

6-19. The decision to collect CBRN or precursor samples must be made with forethought of purpose. Some examples of questions that must be considered are—

- What materials may be available as grab samples such as prepackaged vials or petri dishes?
- How much material is available?
- Will the sample be for field identification or transferred to a laboratory?
- Where in the chemical or biological process is the best representative sample to be taken?
- What specific requirements are there for quantity or type based on supporting laboratory requirements or requirements of field identification equipment used?
- Are control, background, or split samples required?

6-20. Preparation of a sample collection order requires detailed coordination and careful execution. Unit missions, capabilities, and authorized equipment cause differences in how samples are collected and processed. The quality of any analytical evaluation is directly related to the quality of the sample or specimen and the degree of sample degradation that occurs before testing.

Package

6-21. Once the sample has been collected, proper packaging is based on what the collected material is (C-B-R or N, precursor or trace) and its state of matter (liquid, solid, or gas). Decontamination of each layer of packaging is instrumental to ensure the safety of those handling the package at each additional stage, and prevent cross contamination. Samples submitted for analysis must be properly packaged, labeled, and shipped so that they arrive in an analytically acceptable condition and according to any specific laboratory requirements. The sample label should be affixed to the sample container and each layer of packaging. Packaging procedures can be found in appendix G.

Transport

6-22. There are specific requirements to effectively transport a sample to the appropriate agency or transfer point. Collected samples may be transported to a sample transfer point, which may also be the decontamination point. Samples are generally escorted during the entire evacuation process to ensure safety and to maintain the chain of custody. CBRN sample escort by chemical, biological, radiological, nuclear, and explosives response team (CRT) personnel is preferred during the transport process, but may not always be practical due to the limited number of personnel. Other properly trained personnel can escort CBRN samples if equipped properly.

6-23. The transport task follows specific guidance established in the 42 CFR and 49 CFR parts 171-177, AFMAN 24-604/TM 38-250/NAVSUP PUB 505/DLAI 4145.3, the International Air Transportation Association (IATA) regulations, and domestic and international transportation laws governing the transportation of HAZMAT.

6-24. Sample evacuation within the joint operations area (JOA) shall be coordinated by the maneuver task force through the CCMD office for technical analysis and conducted using ground transportation or rotary- or fixed-wing aviation assets depending on sample priority and distance to sample collection points and/or the laboratory. Sample evacuation outside the JOA for definitive analysis should be coordinated through the joint task force (JTF) and conducted using United States Transportation Command strategic airlift assets, according to international HAZMAT transportation regulations. Upon arrival at a continental United States (CONUS) APOD, the sample escort team transloads the cargo onto CARA ground or rotary- or fixed-wing assets for movement to the final disposition laboratory designated by the CCMD or intelligence community.

Store

6-25. Those samples specifically designated for transport/delivery to theater or CONUS laboratories must be stored properly until they can be delivered to the laboratory. Biological samples or specimens must be kept cold (4-10° Celsius [C]), but never frozen.

Transfer

6-26. When samples are transferred from one unit or agency to another, a custody transfer occurs. The chain of custody (DD Form 3108) is critical because it provides an auditable trail of when and where the sample was taken. A custody transfer also occurs when supervision of the sample changes. Sample transfers or custody changes are documented. Each time the sample is transferred to another unit or agency, the receiving unit or agency must sign the document to show that they have received the sample. The least number of transfers maintains the integrity of the sample and minimizes the chance of the sample being compromised. Generally, at the minimum the—

- Transfer of samples occurs between the CBRN R&S element and the sample courier, between sample couriers at different levels, and between the sample courier and the receiving laboratory for first or subsequent analysis.
- Transfer of samples occurs between the escort team and the supporting laboratory or the destination designated by the commander (for example, sample transfer point in an adjoining AOR).

Analyze

6-27. Analyzing samples produces the information a commander requires to make decisions. Analyzing a sample to identify its characteristics begins on initial collection and can continue after it arrives at CONUS laboratories.

Report

6-28. Information is reported at every stage of assessment, characterization, and exploitation. Reporting should occur at the first recognition that material of value may need to be collected, when samples leave the collection site, when custody changes from the sample collection team to the escort team, when handed off at sample transfer point or turned over to a laboratory, and when results of analysis are available. Reporting results of collection on-site or the results of analysis of suspect CBRN samples can fulfill the CCIR. Reporting should occur as new information is discovered about a suspected CBRN hazard and its associated samples. Reports must include the totality of information about events leading up to the need for collection, description or photographs of the site, environmental conditions, weather conditions, and any other of a number of details that may be relevant to analysis of the samples.

6-29. Initial reports will not contain the depth of information that a commander needs to make long-term decisions. Initial reports can provide sufficient information to make immediate decisions needed to save lives and prevent further injuries. See examples of report forms in chapter 7.

Safeguard

6-30. Samples must be safeguarded during collection, transport, and storage. CBRN samples are hazardous. If released inadvertently, they could cause injury or death to those that are exposed to them. A sample must be safeguarded so that it is maintained to the standards that will ensure its viability until it can be analyzed at its destination laboratory.

6-31. Applying the aseptic techniques from biology is useful for the purposes of safeguarding CBRN samples. Aseptic techniques are practices and procedures to prevent transfer of contamination while collecting or analyzing samples. It involves applying the strictest rules to minimize risks to collection and handling teams.

Track

6-32. Sample tracking, reporting, and documentation begins at the point of collection and continues until final disposition of the sample. Samples must be properly labeled and marked to meet standards and should be accompanied by a strict chain of custody (DD Form 3108) maintained for every sample collected. The chain-of-custody document must accompany the sample during transport from the point of collection, through stopover locations, the receiving laboratory, and to final disposition of the sample. The chain of custody is critical because it provides an audit trail of when and where the sample was taken and by whom the sample was taken. Other supporting information such as the type of facility, terrain and weather, casualty symptom, and description of the sample should be kept with the sample. This may include notes and photographs from the collection. The sample collection team assigns an identification number and affixes it to the sample or its container to aid in identification and records the number on the chain-of custody form.

6-33. Continually throughout the sample management process, the sample must be tracked to ensure positive chain of custody, accountability, integrity of the sample, adherence to time schedules, and visibility of analytical status updates. The task of tracking is critical to supporting objectives established in the sample management plan.

Dispose

6-34. CBRN samples must be disposed of properly so that exposure does not occur to unprotected personnel. Once a sample is no longer required, it must be neutralized by the proper decontaminants or taken to an effective storage facility designed to safeguard the sample from inadvertent release. Disposal is documented and witnessed is accordance with local or Service policies.

ROLES AND RESPONSIBILITIES

6-35. The JFC responsible for the CBRN sample collection and identification, performs deliberate planning to develop the sample management plan and assign responsibilities when operations involve a known or likely requirement for sample collections.

SERVICE COMPONENT OR COMBATANT COMMAND

6-36. The Service component command or CCMD should specify, through an annex to the orders, a sample management plan that details samples for movement and transfer of samples. The geographic combatant commander identifies a theater sample manager to manage the movement of samples within theater and to definitive laboratories outside the theater based on feedback from the command surgeon, CBRN staff, and supporting laboratories. The sample management plan defines—

- CCIR and reporting requirements.
- Required analytical information requirements and coordination with the appropriate theater laboratory to identify any laboratory-specific requirements.
- Sample evacuation and movement guidance. Identify supporting sample transfer points or locations to deliver the sample.
- If a sample requires analysis at a definitive laboratory, the lead CBRN organization in the JOA coordinates with CCMD, intelligence community, United States Transportation Command, and JTF for intertheater movement. It coordinates the final disposition location (CONUS laboratory) with CCMD or the intelligence community for incoming samples.
- Final disposition instructions and ownership of materials collected.

6-37. The CCMD is responsible for the transfer of those samples requiring definitive identification analysis to a laboratory capable of conducting such. These laboratories may be outside the JOA (CONUS). The CCMD is also responsible for requesting and coordinating inter-theater HAZMAT packaging and compatibility waiver(s) as required. HAZMAT packaging waiver(s) and compatibility waiver(s) through its Service focal point (see AFMAN 24-604/TM 38-250/NAVSUP PUB 505/DLAI 4145.3, para 1.2.2).

COMBINED JOINT TASK FORCE/SERVICE COMPONENT COMMAND

6-38. The combined JTF or Service component command is responsible for the expedient transfer of samples requiring theater validation analysis to the nearest laboratory supporting theater validation inside the combined JOA. The command requests and coordinates intratheater HAZMAT packaging waiver(s). They coordinate hazardous diplomatic clearance for movement of samples across international borders/airspace.

6-39. The combined JTF or Service component command ensure that the HAZMAT declaration and hazardous diplomatic clearance are uploaded into Joint Operation Planning and Execution System (96 hours in advance) to ensure aircraft/aircrew meet the requirements. Requirements for packaging and movement are specified in AFMAN 24-604/TM 38-250/NAVSUP PUB 505/DLAI 4145.3. The combined JTF or Service component command coordinate transportation control number and build unit line number in the Joint Operation Planning and Execution System. The combined JTF or Service component command route the request through the Intratheater Airlift Request System. They then coordinate temporary climate-controlled storage (in theater) for samples awaiting transportation to theater validation laboratory or to CONUS for definitive identification.

UNITED STATES TRANSPORTATION COMMAND

6-40. United States Transportation Command is responsible for coordinating strategic airlift from intratheater aerial port of embarkation (APOEs) to CONUS-designated APODs. They also ensure aircraft/aircrew selected meet the requirements specified in AFMAN 24-604/TM 38-250/NAVSUP PUB 505/DLAI 4145.3.

TACTICAL COMMANDER

6-41. At the level of command where the specific CBRN R&S element is provided direct support, the commander has responsibilities for considering factors that will affect the CBRN R&S unit performing the sampling and security and support resources. Commanders, based on recommendation of the CBRN staff, provide the mission and task to take a sample to CBRN R&S element with the capabilities required to complete the task. The echelon for execution associated with the level of identification is outlined in the sample management plan or through mission orders. Other considerations include providing early guidance on the—

- **Exposure guidance**. OEG, military exposure guidelines, and individual protection guidance (see ATP 3-11.32/MCWP 10-10E.8/NTTP 3-11.37/AFTTP 3-2.46 further guidance).
- **Allocation of operational resources**. Missions may result in contamination of equipment, vehicles, and aircraft.
- **Intended use of host-nation assets**. The plan may require liaison with diplomats, firefighters, police, laboratories, medical personnel, and other host-nation assets.
- **Information management.** Media issues, such as rules for engaging the media regarding missions and explaining technical information. The requirement for secure communications, reporting chains, and reachback resources.
- **Logistics.** Designation of logistics priorities regarding safe handling and transport of samples and escort elements.

CBRN STAFF

6-42. The CBRN staff develops and implements the sample management plans for CBRN R&S elements. The preparation of this plan should be coordinated with medical and intelligence staffs to support the unity of effort for CCIRs. The CBRN staff may conduct or acquire the results of manual and/or computer-assisted modeling of potential area/location and downwind hazards. When practical, the modeling will be completed before the teams deploy. Depending on the type of mission, supporting tasks, and the resources available, the plan should address—

- **The information requirement and level of analysis needed to achieve it.** Not all of the samples taken in a JOA are meant to be evacuated to CONUS. Many factors will influence the requirement to take samples and determine what level of identification is needed. The commander's PIR will drive the prioritization of CBRN sample collection within the AOR.
- **SME support.** Augmentation to the staff with on-site military or civilian scientific advisors or off-site technical reachback capability to contact required subject matter experts.
- **Supporting laboratory and sample transport requirements.** The requirement to transport CBRN samples to supporting laboratories, while maintaining a chain of custody is of significant importance. Depending on the proximity of the supporting laboratory, the CBRN R&S element may be required to evacuate the sample directly to the laboratory. The need for air assets (for rapid transport of samples) must also be considered. The command must ensure that it has an executable plan to get the samples to the supporting laboratories. In some cases, dedicated assets are used to escort the samples. The priority for dedicated assets will likely go to escorting the samples from the theater back to the CONUS-based national laboratories for definitive analysis and identification.
- **The CCMDs sample management plan.** The sample management plan must include the escort of samples within the AOR. This may require using other available assets as sample couriers. At all times, the chain of custody must be maintained to ensure accurate reporting of the sample collection operation results. Safety and security for the courier and the sample package must be ensured.

6-43. It is important that CBRN staffs clearly communicate in mission orders the level of identification required which lays the framework for what collection efforts must be planned on-site, what CBRN R&S forces are capable to provide these answers, and plans for transfer and laboratory analysis of the samples. The commander may designate and allocate the necessary military assets to carry out the sample collection missions. The commander's staff serves as the nerve center and will command, coordinate, and control the operations associated with sample collection.

6-44. The responsibilities of the unit staff may include—

- Developing, implementing, and integrating the sample management plan with the higher headquarters plan to support CBRN R&S elements.
- Supporting CBRN R&S elements with transportation, interpreters, security, navigation and communications equipment, food, shelter, medical care, decontamination, hazardous waste disposal, and other functions needed to carry out the mission.
- Establishing report protocols with the higher CBRN staff and command.
- Maintaining reports.
- Routinely updating downwind modeling.
- Providing status reports to the operational commander and subordinate units affected by sample collection operations.
- Coordinating the escort of samples to regional and national identification laboratories for detailed analysis.
- Coordinating special storage, packaging, and handling requirements to ensure the integrity of samples and the safety of personnel escorting or handling the samples.

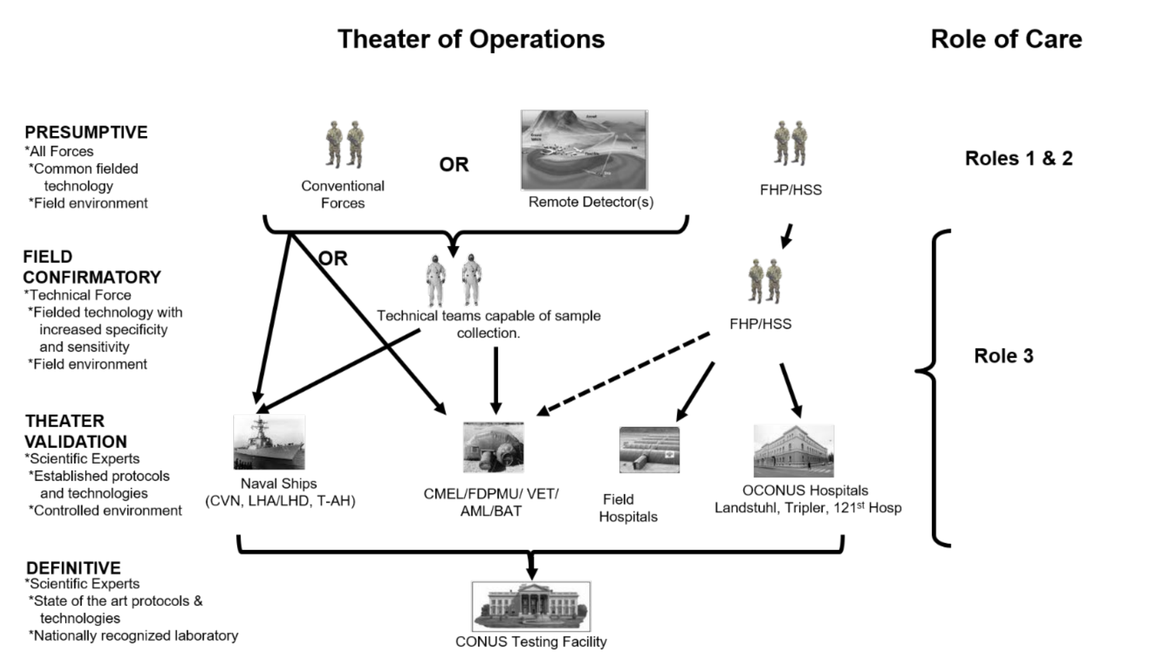
CBRN Elements

6-45. The CBRN R&S element is determined by the task assigned (for example, site characterization or exploitation), the time available, security of the site, and level of analysis required. A CBRN R&S element can be employed in subordinate teams such as decontamination teams, an initial entry team, an emergency backup team, and sample collection teams. The number or size of the CBRN R&S element is based on the size of the area/location, amount of personnel available, number of samples to be taken, transportation method, available seating/storage space, and the time available for sample collection.

6-46. The primary objective of sample collection during site exploitation is to acquire sufficient agents, precursors, and/or degradation products for laboratory identification. CBRN R&S elements may be augmented with personnel who are experts in related specialist areas, such as—

- A medical person who can assess health risks and address potential exposures before, during, and after site exploitation.
- An EOD technician.
- An intelligence expert familiar with CBRN programs of the target country.
- An interpreter.
- A technical scientist related to the type of CBRN threat encountered (biological, chemical, radiological).

6-47. Samples generated from CBRN R&S elements may be routed to a single sample control site (for example, area medical laboratory) that is responsible for receiving samples and providing theater validation identification. If necessary, the supporting laboratory prepares the sample for shipment to a CONUS laboratory for definitive identification. See figure 6-2, page 6-10.



Notes. Samples may not require analysis at all four levels of identification.

OCONUS medical research laboratories in Kenya, Egypt, Thailand, Cambodia, and Peru may be able to assist with definitive testing for some biological warfare and emerging disease agents.

Legend:

AML	area medical laboratory
BAT	biological augmentation team
CMEL	CARA mobile expeditionary lab
CONUS	continental United States
CVN	aircraft carrier, nuclear
FHP	force health protection
HSS	health service support
LHA	amphibious assault ship (general purpose)
LHD	amphibious assault ship
OCONUS	outside the continental United States
T-AH	hospital ship
VET	veterinary

Figure 6-2. Sample routing

6-48. CBRN R&S elements conduct, record, and report surveys of known or suspected CBRN sites and related incidents. They provide prompt estimates of the severity and extent of hazards using a CBRN warning and reporting message. GTA 03-06-008 provides an easy reference aid for CBRN warning and reporting messages. Additional responsibilities include—

- Collecting, documenting, and initially packaging any samples taken.
- Making prior coordination with intelligence and medical units.
- Adhering to special sample collection tasks provided by the unit commander in the OPORD.
- Coordinating and preparing for decontamination operations before beginning sample collection missions.

Sample Collection Personnel

6-49. Generally, the collection of environmental samples is conducted by PVNTMED detachment/personnel, CBRN personnel, damage control personnel, veterinary personnel, public health officers, technical intelligence collection teams, bioenvironmental engineering officers, or other specially trained personnel. Trained personnel ensure uniformity, viability, safety, and accountability in sample collection procedures.

Note. Medical specimens are collected by medical providers. (See ATP 4-02.7/MCRP 3-40A.6/NTTP 4-02.7/AFTTP 3-42.3 and ATP 4-02.84/MCRP 3-40A.3/NTRP 4-02.23/AFMAN 44-156_IP for biological hazards).

6-50. Before the decision to collect a sample has ever been made, key decisions must be based on—

- The security of the site.
- Any results and information from previous entry teams as to what materials might require sampling, or equipment for analysis on site.
- Any specific items of intelligence value that must be looked for.

6-51. Collecting samples and subsequent identification can provide the commander with information that supports the CCIR, indicates the enemy's or adversary's intentions or actions and potential impacts to current and future operations. While specific procedures vary, there are common guidelines that apply to any sample collection operation. Safety is the foremost concern during a sample collection operation. The sample area/location may be inherently dangerous and contaminated. The following common guidelines should be considered when CBRN R&S elements collect samples:

- Identify threats/hazards that could impact the sample collection operation. Develop a plan for minimizing or avoiding the threat/hazard, to include environmental and other threats/hazards in the immediate area (heat, cold, slipping, noise, electrical shock, venomous snakes, bug bites, rodents).
- Ensure that personnel involved in the operation are dressed in the appropriate level of protection for the associated threats/hazards.
- Ensure that the sample collection area/location is clear of secondary devices or triggered mechanisms that could destroy the sample or cause harm to the CBRN R&S element before the operation. Remain vigilant for the potential that these devices may be present. If any devices are found, immediately clear the area/location and inform the higher headquarters so that they can contact EOD assets to render the devices safe. Do not proceed with sample collection operations until notified that it is safe to do so.
- Ensure that backup personnel are dressed in the appropriate IPE/PPE, have monitoring devices, and are prepared to enter the area/location as an emergency rescue team.

SAMPLE ESCORT TEAMS

6-52. The sample escort team must be properly trained for the type of HAZMAT being transported (for example, CBRN agents, precursors, contaminated materials, or explosives).

> ***Note.*** United States Army technical escort teams should be comprised of a minimum of two personnel. At least one team member should be certified in AMMO-62 *Technical Transportation of Hazardous Materials,* if samples contain HAZMAT. The team should be certified in AMMO-67, *Hazardous Materials Familiarization and Safety in Transportation*.

6-53. Sample courier duties will be AOR dependent. Sample courier duties are as follows:

- Conduct coordination.
  - Obtain quick reaction force coverage.
  - Obtain movement clearance.
  - Obtain and carry detection and identification kits and equipment.
  - Obtain appropriate IPE.
  - Ensure that immunizations are up to date.
  - Begin prophylaxis if required.
  - Obtain approved decontaminant solution.
  - Establish a linkup point with the CBRN sample element.
  - Understand the rules of engagement.
- Conduct linkup.
  - Don IPE prior to the linkup.
  - Report the linkup to higher headquarters.

- Ensure package integrity.
  - Use detection and identification equipment to determine if the outside of the package is contaminated.
  - Ensure that the package is packed according to applicable guidance in AFMAN 24-604/TM 38-250/NAVSUP PUB 505/DLAI 4145.3.
  - Place in an additional transport bag/container as appropriate.
  - Conduct a surface wipe-down of the package.
  - Conduct self-decontamination if required.

Note. Once the package integrity is verified, ocular and respiratory protection is no longer required.

- Maintain the chain of custody.
  - Transfer the sample package using the appropriate chain-of-custody forms and procedures.
  - Report the transfer of custody to higher headquarters.
- Coordinate movement.
  - Report the departure and start of movement.
  - Coordinate with the applicable operations elements as required (for example, movement through unit sectors).
  - Provide a convoy/aircrew mission and safety briefing.
- Safeguard and transport the sample.
  - Be prepared to mitigate the effects of any potential inadvertent package breach.
  - Ensure that IPE/PPE is on hand during movement.
  - Maintain the sample at 1°C to 4°C.
  - Seal and repackage, if required.
  - Conduct decontamination of the package, if required.
  - Report any package breach.

TECHNICAL REACHBACK

6-54. Technical assistance is drawn from military/civilian national assets (on-site or through technical reachback). They will have detailed knowledge of the agents such as agent behavior, agent fate, signs and symptoms, and information on detection identification and personal protection and decontamination. Their expertise can be used for—

- Risk management.
- Interpretation of detection or analytical results.
- Decontamination and waste management.
- Risk communication and public affairs.
- Transportation of HAZMAT.
- Medical management of CBRN contaminated casualties.

6-55. The Laboratory Response Network and military environmental/medical laboratories will be identified to support sample management operations. These laboratories support theater validation identification and/or definitive identification as required. (See ATP 4-02.7/MCRP 3-40A.6/NTTP 4-02.7/AFTTP 3-42.3 for more information on the Laboratory Response Network.)

SAMPLE MANAGEMENT PLAN

6-56. The sample management plan is a product of a deliberate planning effort based on expected need to collect samples due to enemy capabilities. The command must ensure that executable plans are integrated from theater down to tactical collection elements, delegating appropriate elements to the task, execution of the task (when and where), and providing guidance for getting the samples to the supporting laboratories. The CCMD's sample management plan must include the escort of samples within the AOR or back to the CONUS-based national laboratories for definitive analysis and identification. This plan should include safeguarding and prioritizing CBRN samples, tracking their movements and analytical status, escorting the samples, and reporting the end result of the sample analysis. The CBRN sample management process establishes procedures, guidelines, and constraints at staff and unit levels to protect and preserve the integrity of CBRN samples that may have tactical, operational, and/or strategic implications.

6-57. At the operational level a sample management plan defines the strategies and methods to best fulfill the objectives of the commander. Each mission is unique; therefore, it requires a plan that is individually tailored to mission requirements. It accounts for the integration of the units conducting the collections, escorts, communication, and laboratories.

6-58. The sample management plan is drafted to contain the minimum considerations critical to the success of collecting samples to meet the commander's objectives. It includes the—

- Coordination with the theater surgeon or medical officer.
- Purpose and scope of the CBRN R&S operation, including the objectives, limitations, who should conduct the sample collection (CBRN personnel, PVNTMED personnel, tactical forces), and pertinent background information.
- Priority of the transport/evacuation of all samples to a laboratory for analysis.
- Appropriately trained personnel or forces to escort the samples to transfer point or laboratory.
- Movement clearances and rules of engagement for sample transport teams.
- Coordination between appropriate command and staff transportation authorities to help transport and transfer a sample across international borders or to another government agency.

Note. Such clearances and coordination should include consultation with the command servicing legal office to ensure compliance with international, U.S., and host-nation laws and with compliance with any agreements or arrangements established between the U.S. and the nations from and to which the sample is to be transported. The command should also coordinate with higher headquarters to obtain verification that the intended activities have already been coordinated with, or do not require coordination with, the U.S. Department of State.

- Specific sample requirements of supporting laboratories including—the number of duplicates required of each sample, the number of quality assurance/quality control and background samples to be taken, and the different laboratory requirements for processing (theater laboratory, host-nation laboratory).
- Time schedule (how long the sample collection mission will last).
- Documentation and disposition of samples.
- Supporting sample transfer point locations or locations to deliver the sample.
- Supporting assets (for example, security, decontamination, and medical).

6-59. At the tactical level, it becomes imperative that a sample management plan establishes priorities of collection to ensure that the most important samples are taken first. The most important consideration is that the sample accurately reflects the scene and that it has not been contaminated by the collection or handling process. A sample management plan that will yield the most accurate results must be constructed for each CBRN R&S operation—with considerations given to the sample media, associated key tasks, and sample collection techniques required to support a successful operation.

SAMPLE TRANSFER

6-60. The requirement to transport CBRN samples to supporting laboratories while maintaining a chain of custody is of significant importance. Under normal circumstances, the CBRN sampling element is responsible for the evacuation of their samples to a designated sample transfer point. However, depending on the proximity of the supporting laboratory, the CBRN sampling element may be required to evacuate the sample directly to the laboratory.

6-61. If a decision is made to transfer the sample(s) from one custodian to another, procedures established in the sample management plans or orders should be followed with appropriate documentation recording the details of the surrounding conditions that the sample was taken from, labeling, and chain of custody. If the transfer is to be made out of theater, a request for movement support is forwarded through the chain of command to the joint staff for validation. Once validated, an order is issued and the military services and DOD departments and agencies are tasked to provide support. Depending on the importance of the sample (for example, national security, MASINT, attribution), National Command Authority or joint staff directives will determine the type of airlift provided. Based on the requesting office (J-2 or J-3), coordination is made with the DOD and intelligence community to determine which definitive identification laboratory the samples will be taken to for further analysis.

6-62. The United States Transportation Command coordinates the intertheater airlift and identifies the APOE/APOD. Samples are packaged by the theater validation laboratory. The JTF personnel escort the samples to the APOE and onward to final disposition. The CARA coordinates the receipt of the sample(s) at the receiving APOD, and with each designated laboratory scheduled to receive the samples. A CARA advanced team deploys to the receiving APOD for final airfield coordination, and CARA aviation detachment deploys to the receiving APOD. Samples are transloaded from strategic airlift to CARA aircraft for movement to final disposition. The CARA advanced team deploys and makes final coordination at the receiving APOD closest to the designated laboratory and with local and state law enforcement agencies. Samples arrive at the APOD near the laboratory and are transloaded to ground escort vehicles for movement to the designated laboratory. After samples are turned over to the laboratory, the mission is complete.

LABELING AND CHAIN OF CUSTODY

6-63. Samples must be properly labeled and marked to meet the standards and should be accompanied by a strict chain of custody form that is maintained for every sample collected. The chain-of-custody document must accompany the sample during transport from the point of collection, to the receiving laboratory, and to the final disposition of the sample. The chain of custody will—

- Provide answers about the sample: When was it collected? Who has maintained custody of it? What has been done with it at each change of custody? What happened to it while in custody?
- Show each time that the sample is transferred to another individual, element, unit, or agency. The receiving person must sign the document to show that he received the sample.

6-64. To prevent confusion, a sample identification number is assigned to the sample. The identification number format should be established in theater sample management plans or SOPs. For more information on the sample identification number see appendix F.

Note. See appendix F for the new DD Form 3108 (*CBRN Sample Documentation and Chain of Custody)* for custody and transfer procedures.

Chapter 7

Marking and Reporting

This chapter provides information for marking and reporting CBRN hazard areas and contaminated materials. It also provides information managing CBRN information through the CBRNWRS and other tactical and medical reports. Both physical and digital marking is necessary to adequately warn forces of contaminated areas.

SECTION I: MARKING

MARKING CONTAMINATED AREAS

7-1. Once an area has been surveyed and contamination is located, the area is marked and a report is submitted to the requesting headquarters. Marking a contaminated area or equipment designates a hazard. A more detailed survey determines the extent and intensity of the contamination. Markings warn individuals and units visually, identify routes through or around contamination to maximize freedom of maneuver, and identify any other specific hazards that are dangerous to operators and maintenance personnel.

7-2. All forces use standard contamination marking signs to indicate the type of contamination. Markers are placed where they are most likely to be seen by approaching individuals and units. To prevent forces from missing posted markers and inadvertently entering contaminated areas, place adjacent marking signs at intervals of 10 to 50 meters, depending on the terrain. Through CBRN 4 reports, contaminated areas can be digitally marked on the common operating picture.

CONSIDERATIONS

7-3. Any Service member discovering contamination should place contamination markers where the markers are most likely to be seen by approaching military personnel and friendly forces. CBRN R&S forces that locate contamination will place the markers creating a buffer from contamination.

7-4. The CBRN signs should be placed at waist height, right-angled apex downward, with the front of the sign facing away from the contaminated area being marked and spaced at intervals of 10 to 50 meters depending on the terrain. Place the CBRN signs on fences, trees, rocks, poles, supplied marking sign poles, and other appropriate mounting mediums, or by putting the apex into the ground if a solid sign. This latter method should not be used if the other methods can be adopted, as the signs might be obscured by grass and other undergrowth and may be readily knocked down. Make sure the signs are clearly visible to the eye at a distance of approximately 50 meters in most conditions of visibility. If the signs are placed within a CBRN-contaminated area, the signs are to face away from the area of higher dose rate or higher concentration if such can be determined. The marking will indicate the general area of ground contamination but will take no account of downwind CBRN hazards. CBRN-contaminated areas may be of such extent that complete marking of the whole perimeter will be impracticable. Military units should therefore take into consideration that such areas might be marked only in the area of immediate concern.

7-5. Following a nuclear incident, radiological signs are to be placed on all probable routes leading into radiologically contaminated areas. When the dose rate is above 1 centigray per hour, radiological contamination signs showing the actual dose rate are to be placed on all probable route boundaries leading into the contaminated area. Lower radiation contamination levels normally are not marked even though long stays in areas of old contamination might produce significant doses. Military forces planning prolonged stays in an area during a nuclear attack should check the area with RADIAC instruments regardless of whether it is marked.

7-6. In the case of toxic industrial radiologicals, radiological signs are to be placed on all probable routes leading into contaminated areas. When the dose rate is above 2 micrograys per hour, signs showing the actual dose rate are to be placed. Also, move or correct the radiological sign periodically as radioactivity decays over a period of time.

CONTAMINATION MARKERS DESCRIPTION

7-7. **Color.** The primary and secondary colors of the CBRN marking signs are used to indicate the nature of the contamination hazard. The primary color refers to the color used for the background of the front surface of the marking sign. The secondary color refers to the color used for any markings and/or inscriptions (preferably on the front surface of the sign). In the case of danger due to CBRN contamination, the primary color, and the pattern of the signs by themselves will be the principal means of recognizing the type of contamination. As a safeguard, the words ATOM (for nuclear contamination), BIO (for biological contamination), or GAS (for chemical contamination), with the optional addition of a symbol where required by national authorities, is painted or written with the secondary color on the front surface. The language used for these inscriptions is selected by the forces erecting the sign. During joint operations, the language for inscriptions is English. The inscriptions are written parallel to the longer side of the sign.

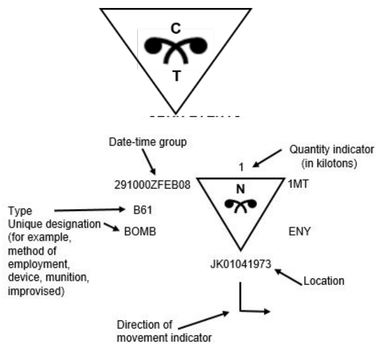
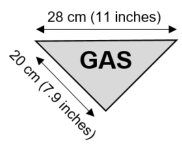
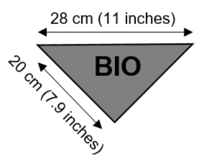
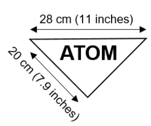
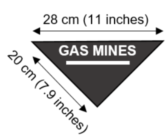
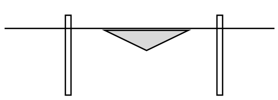
7-8. **Shapes and sizes.** CBRN signs should be—

- The shape of the sign will be a right-angled isosceles triangle.
- The base of the triangle will be approximately 28 centimeters (11 inches) and the opposite sides will be approximately 20 centimeters (8 inches).
- Triangles will be made of metal, wood, plastic, composition board, adhesive material, or any adequate material available.
- Existing stocks of colored triangular signs of slightly divergent shapes and sizes will be retained and used until stocks are exhausted.

Note. Infrared and visual beacons can also be used to assist in marking CBRN-contaminated areas. Beacons may be visible at night over a range of up to 1,500 meters. Chemical lights can be attached to flag clips and placed between the beacons.

7-9. Table 7-1 identifies symbols and markers used for marking contaminated areas.

Table 7-1. Contamination markers

Symbol or sign	***Definition***
	CBRN contaminated area or CBRN event. This symbol can be placed on the map in conjunction with a shape to mark the contaminated area. The “T” can be added to indicate toxic industrial material. The CBRN event is a graphic control measure for marking CBRN hazard areas. Other information may be added according to FM 1-02.2 or MIL-STD 2525D. • C–chemical • B–biological • R–radiological • N–nuclear
	Yellow background with red lettering • Name of agent (if known) • Date and time of detection • Date and time of detonation/release (if known) • Concentration (if known)
	Blue background with red lettering • Name of agent, if known • Date and time of detection • Date and time of detonation/release (if known) • Concentration (if known)
	White background with black lettering • Dose rate • Date and time of reading • Date and time of detonation/release (if known)
	Red background with yellow lettering and stripe • Chemical agent in mine • Date • Surface of marker facing away from minefield
	The perimeter of a contaminated area should be marked by a fence placed on all probable routes leading into the contaminated area at about 20 meters (66 feet) before the point where the presence of contamination was detected. Ten to 50 meters may be between signs based on the terrain. In the case of toxic industrial chemicals, mark the boundaries of the exclusion or isolation zones (see TM 3-11.91/MCRP 10-10E.5/NTRP 3-11.32/AFTTP 3-2.55). Warning signs may be attached waist high to a fence or using the M274 marking.

Legend:

ADP	Army doctrine publication	MCRP	Marine Corps reference publication
AFTTP	Air Force tactics, techniques and procedures	MIL STD	military standard
		NTRP	Navy tactical reference publication
BIO	biological	TM	technical manual
cm	centimeters		

INSCRIPTIONS

7-10. Additional details concerning the CBRN contamination, if known, are to be inscribed on each marking sign, preferably on the front surface. The extra details inscribed depend on the kind of CBRN contamination. Multiple CBRN contamination may exist in some operational areas. In this case, the contaminated area would be marked with the relevant marking signs, which would be placed adjacent to each other. Military forces follow CCMD or JOA standards for marking CBRN hazards. When those standards are not provided or when standard markers are unavailable, military forces conducting reconnaissance operations may use expedient markers. Contamination marking signs are annotated with important information that include—

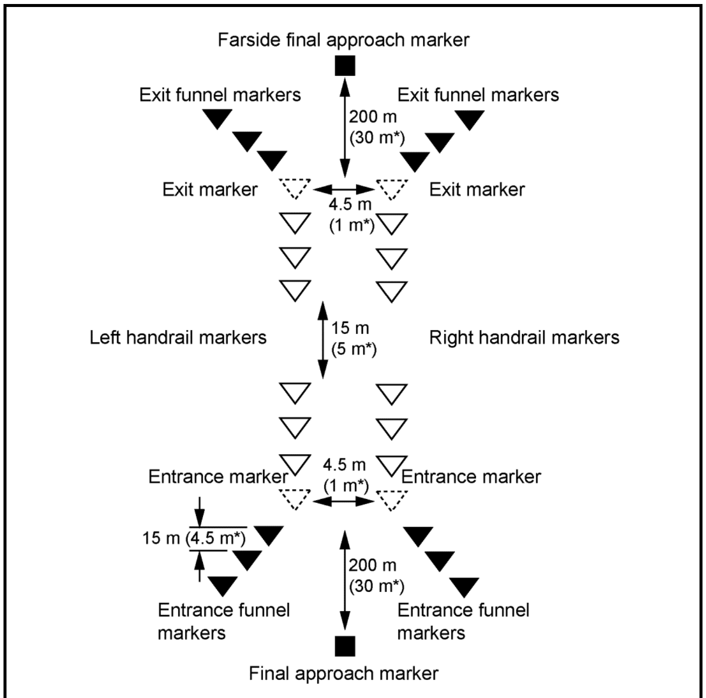
- **Chemical.** Post the name of the agent, if known, and the date and time of detection.
- **Biological.** Post the name of the agent, if known, and the date and time of detection.
- **Radiological.** Post the dose rate, the date and time of the reading, and the date and time of the burst, if known.

MARKING PASSAGE LANES AND BYPASS LANES

7-11. The purpose of a CBRN zone, area, or route reconnaissance is to identify and mark areas of contamination, to establish and mark clean lanes, and to sustain mobility for maneuver forces. Once an area is searched and contamination is located, the area is surveyed (if required), marked, and reported to requesting headquarters. A detailed survey determines the extent and intensity of the contamination to maximize freedom of action. Depending on the type of contamination (liquid, persistent, nuclear fallout), clean routes around contamination may create unacceptable delays for maneuver forces. Contamination is not necessarily uniformly distributed over an area and clean routes through the contamination may need to be identified. Whether using mounted or dismounted techniques, lanes are checked for the existence of contamination and marked.

7-12. Coordination should be made between movement control planners and enablers (such as CBRN and engineer) to identify critical aspects of mobility through contaminated areas. SOPs are updated with standard practices during combined arms operations. Marking of lanes is based on existing procedures established for clearing obstacles. These markers may be combined or replaced by contamination markers. Lane markers are spaced the width of the lane and in intervals of approximately 30 meters from the lane entrance to the exit as shown in figure 7-1. During periods of low visibility, lane markers may be identified according to the SOPs.

Note. See ATP 3-90.4/MCWP 3-17.8 for more information on combined arms mobility.



Note. The distance between markers is driven by mission variables. Distances shown are a recommendation.

Legend:

*	distance for dismounted lane
m	meter

Figure 7-1. Lane marking

7-13. Once routes are identified as uncontaminated or the contamination has been mitigated, the movement lane can be marked using standard lane-marking patterns to help a unit through a lane. Appropriate CBRN marking signs (chemical, biological, radiological) may be used along with standard lane markings. Far-recognition and final-approach markers in a standard lane-marking pattern help commanders smoothly change assault and follow-on forces into a column formation before passing through the lane. Lane marking requirements include the—

- **Entrance funnel markers.** Entrance funnel markers augment entrance marking. The V formed by the funnel markers forces approaching elements into a column formation and assists drivers and tank commanders in making last-minute adjustments before entering the lane.
- **Entrance markers.** Entrance markers indicate the start of a lane through a contaminated area. They signify the uncontaminated-side boundary of the contaminated area and the point at which movement is restricted by the lane width and path. Entrance markers also indicate the lane width. Therefore, it is critical for a maneuvering force to distinguish the entrance point clearly, since it signifies the point at which passing vehicles can no longer adjust their movement in reaction to the situation (direct and indirect fires) without jeopardizing the force. Entrance markers must be visually different from handrail markers to help a force distinguish this critical point in the lane. The distance between entrance markers must be the same as the width of the created lane. Entrance markers placed a minimum of 4.5 meters apart indicate a lane capable of supporting mounted movement, while markers placed a minimum of 1 meter apart indicate a dismounted lane.
- **Exit markers.** Exit markers indicate the far side limit of a lane through a contaminated area. For a passing force, the exit marker signifies the point at which movement is no longer confined to the lane path. Like entrance markers, exit markers must be distinguishably different from handrail markers; however, the exit may be marked the same as the entrance. Exit markers are placed to the left and right of an exit point and spaced the width of the reduced lane. This visual reference is critical when only a left handrail is marked. The combination of entrance, left handrail, and exit

markers gives the driver and the tank commander visual cues (entrance and exit points, lane width, and path) to pass safely along a lane.

- **Far-recognition markers.** Far recognition markers are highly visible markers located between the final approach marker and the friendly element. They are primarily used when passing large-sized (for example, Army battalion-size) forces through a lane where direct observation of the final approach marker is denied due to distance, visibility, or terrain. Far recognition markers should be different from the final approach marker. Far recognition markers indicate the point at which forces begin changing their formation to posture for the passage. A single far recognition marker may serve up to two lanes when located 200 to 400 meters apart. Once lanes are upgraded to two-way traffic, far recognition markers are required for each two-way lane. Far recognition markers should be visually alterable so that they can be distinguished from the far recognition marker of an adjacent lane. This assists the mission command/C2 of large formations when passing on several adjacent lanes. When a far recognition marker serves more than one lane, a guide or a traffic control point/post is collocated with the far recognition marker nearest the obstacle.
- **Final-approach markers.** Final approach markers are highly visible, more robust markers that augment the visual signature of entrance funnel markers. Units must be able to see the entrance funnel and/or the entrance funnel markers from the final approach marker. The final approach marker—
  - Provides the element commander with a highly visible reference point toward which to maneuver his formation.
  - Signals element commanders to begin changing to a column formation.
- **Handrail markers.** Handrail markers define the lane path through a contaminated area and indicate the limits of the lane width. As a minimum, mounted and dismounted lanes have a left handrail. Mounted and dismounted forces moving through a lane should keep the left handrail immediately to the left of their vehicle or person. The lane width is defined by the entrance markers. Therefore, when only the left handrail is marked, drivers use entrance and handrail markers to gauge the lane width and path. As the operation progresses, lane marking may be upgraded to include left and right handrails.

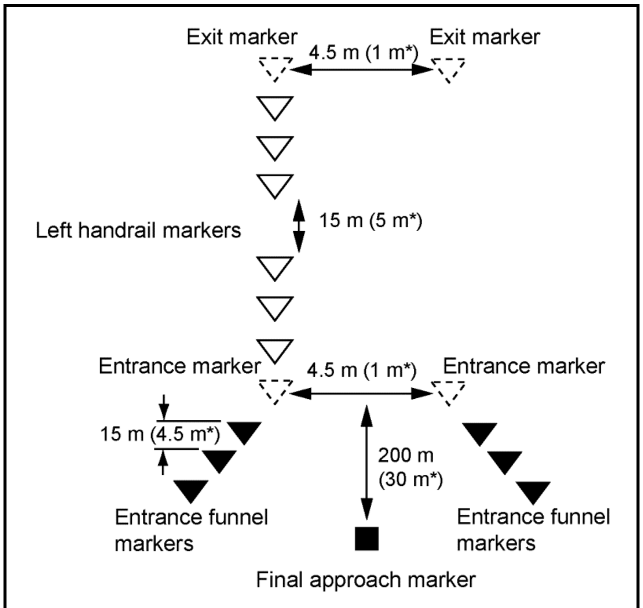
LEVELS OF LANE MARKING AND PATTERNS

7-14. There are two levels of lane marking for CBRN hazards-initial and intermediate. Each lane-marking level provides an increase in lane signature and capability. Lane requirements change over time as operations mature from the passage of the assault force to the passage of larger follow-on forces. Initial lane-marking requirements are driven by the nature of the fight through the CBRN hazard area. Initially, marking must be rapid, providing only the bare minimum signature needed to safely pass initial small units (company teams, platoons). This contrasts with lane requirements during later phases of an operation where larger units (battalion and above) require improvements to existing initial hasty marked lanes. Two-way traffic becomes a priority for the simultaneous forward passage of combat units and return traffic (ambulances, empty supply vehicles) necessary to sustain the force. With the increase in traffic, volume comes more diverse forces and levels of driver experience. Lane-marking limits must be clear to the most inexperienced driver or crewmember; do not assume they have knowledge of the unit SOP.

7-15. Commanders must be aware of how the lane needs of a force change with the operation so that they can anticipate lane marking and lane capability requirements. Integrating the levels of lane marking into the overall CBRN defense plan ensures that a unit's needs are satisfied. The forces necessary to mark and upgrade lanes must be allocated and tasked with that mission. The scheme of maneuver and the service support plan are the basis for analyzing lane requirements. The following paragraphs describe lane- marking patterns in detail and provide guidelines on when a commander should upgrade lane marking and lane capability.

Initial Lane Marking

7-16. The CBRN R&S element emplaces the initial lane-marking pattern (see figure 7-2) immediately after a clear path is identified through the CBRN hazard is determined. This is a signal to the supported unit commander that the lane is ready for traffic. Initial lane marking is kept to a minimum, focusing on the markings needed to pass immediate forces (company teams and smaller) through the lane to secure the point of penetration on the far side if needed. Normally, a security force observes the lane as it is being marked and does not need the greater visual signature for lane marking.



Note. The distance between markers is driven by mission variables. Distances shown are a recommendation.

Legend:

*	distance for dismounted lane
m	meter

Figure 7-2. Initial lane marking

Intermediate Lane Marking

7-17. Intermediate lane marking has two goals, increasing the lane signature to assist in the passage of larger combat forces, and providing sufficient marking for two-way, single-lane traffic. Upgrading initial lane marking to intermediate lane marking is triggered by one of two key events:

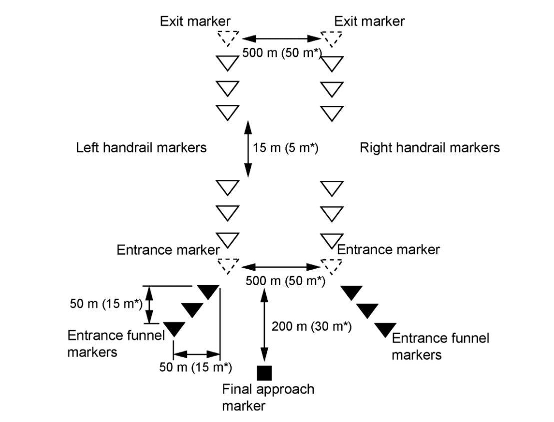
- Commitment of larger combat forces that are unable to directly observe the CBRN-hazard area as it was marked.
- Rearward passage of sustainment traffic (casualty evacuation and vehicle recovery).

7-18. Intermediate lane marking builds on the initial lane-marking pattern by adding right handrail markers, exit funnel markers, far recognition markers, and a far side final approach marker, see figure 7-1, page 7-5.

Bypass Marking

7-19. Bypasses are marked using the same lane-marking patterns, marking signs, and visual cues as a lane. However, marking a bypass around a CBRN hazard is much different from marking a lane through a CBRN hazard because the amount of room available for forces to maneuver must be determined. While lanes through a CBRN hazard are normally expanded to the left, bypasses are expanded away from the CBRN hazard.

7-20. Bypasses must show where it is safe to rapidly pass around a CBRN hazard, without unnecessarily restricting the force's ability to maneuver. To accomplish this, the marking unit will mark the bypass with a bypass-marking pattern (modified initial lane-marking pattern with right handrail markers added). The unit will perform reconnaissance and initially mark the bypass 500 meters wide to allow platoons to maneuver around the CBRN hazard. The width of the bypass is increased as time allows further reconnaissance. Limited visibility or additional CBRN hazards discovered at the flank of the CBRN hazard that is being bypassed may constrain the marked width of the path to less than 500 meters. (The right handrail markers must be visible from the left handrail markers.) In addition to bypass marking, units should consider establishing mobile guards on the friendly side of the CBRN hazard to prevent vehicles/personnel from entering it. Figure 7-3 provides an illustration of bypass marking.



Note. The distance between markers is driven by mission variables. Distances shown are a recommendation.

Legend:

*	distance for dismounted lane
m	meter

Figure 7-3. Bypass marking

Enhanced Marking

7-21. In times of reduced visibility (for example, darkness, fog, rain) enhanced visual marking can be used. Enhanced visual marking occurs by attaching sources of light where the actual marker is placed. The additional lights are attached using various means such as clips, wire, ties, and string. This includes—

- **Infrared markers (nonvisible spectrum).** Infrared markers cannot be seen unless using night-vision devices with infrared capability. They are attached to actual contamination markers. They can be used when friendly forces are equipped with night-vision devices that can see infrared. Marking with infrared markers may occur when a military advantage would be obtained, such as when an adversary does not have night vision infrared capability.
- **Visual spectrum lights.** These lights can include chemical lights or battery operated lights placed along with the actual contamination markers. They ensure markers can be seen in reduced visibility using the naked eye.

7-22. Another form of marking can occur by transmitting marker placement on shared digital formats for others to see on their various virtual maps. Examples of these include the use of overlay systems and various Service mission command/C2 suites.

URBAN AREA MARKING CONSIDERATIONS

7-23. When marking CBRN hazards in urban areas, additional steps should be considered. METT-TC/METT-T will drive how CBRN hazards are marked. Additional marking considerations are—

- Additional marking requirements may be required by the host country.
- Entryways of suspect buildings and other facilities that may be contaminated with CBRN agents/materials must be marked at critical points, for example, doorways and windows.
- Additional marking at intersections of roads leading to CBRN hazards may be required to funnel or steer traffic away from the hazard area.

MARKING CONTAMINATED EQUIPMENT

7-24. Mark equipment and material to protect personnel from accidental contamination. Place contamination markers on any unmarked equipment present in the attack area. Personnel using equipment after decontamination must take precautions against vapor, particulate, and liquid contamination that may be trapped inside filters, assemblies, and joints. The contamination could pose a hazard while equipment is being used or maintained. Figure 7-4 shows an example hazard warning tag that may be used.

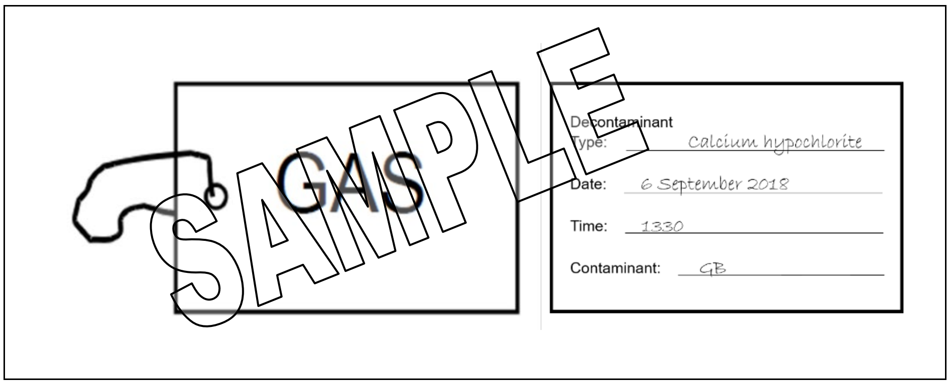


Figure 7-4. Example CBRN hazard warning tag

SECTION II: REPORTING

CBRN INFORMATION MANAGEMENT AND REPORT FLOW

7-25. CBRN information management focuses on obtaining relevant data about the operational area, which can be processed by the CBRN staff into operationally significant information. To be useful, CBRN information must be collected, reported, and evaluated. Once the CBRN information is evaluated, it can be used to update intelligence, plan force protection measures, initiate exploitation operations, or conduct WMD elimination planning. The volume of information collected and relayed disrupts communications and tactical operations if not properly managed.

7-26. CBRN collection, reporting, and evaluation are crucial to the mission. Service members and unit reconnaissance teams report observations, including postattack information through operations or control centers by the fastest available means of communication. Reporting potential CBRN incidents serves two critical functions, either of which permit dynamic retasking of forces to reduce or prevent exposure. The critical functions of reporting are—

- Informing the next level of command of the incident or potential incident.
- Informing the elements at risk within the unit or within the area affected by the potential hazard.

RECORDING OF CBRN R&S INFORMATION

7-27. Contamination, collection site, attack information, and other information may be collected by reconnaissance teams. This information from a survey or monitoring mission discovering chemical or radiological contamination may be collected on documentation such as DD Form 3038 (*Radiological Data Sheet−Route or Course Leg Technique)* and DD Form 3039 (*Nuclear Data Sheet–Monitoring or Point Technique),* (described in TM 3-11.32/MCRP 10-10E.5/NTRP 3-11.25/AFTTP 3-2.56) or DA Form 1971-2 (*Chemical Data Sheet−Monitoring or Survey)* the chemical data sheet shown in figure 7-5. These forms may be used to collect information for reporting via the CBRNWRS.

CHEMICAL DATA SHEET - ~~MONITORING OR~~ SURVEY
For use of this form, see ATP 3-11.37; the proponent agency is TRADOC.

DATE: 1 JUN 2010 | PAGE NO: 1 | NO OF PAGES: 1

UNIT: B/2-13
~~MONITORING OR~~ SURVEY TEAM NUMBER: 2ND PLT
MAP USED: 118
~~MONITOR OR~~ SURVEY TEAM MEMBER (Print Name): SGT Knuckles

LOCATION/TIME OF TEST OR INDICATION	TYPE DETECTOR USED: PAPER	TYPE DETECTOR USED: ALARM	TYPE DETECTOR USED: KIT	AGENT DETECTED
NV 58708 16191 / 0822	M8			Nerve
NV 58710 16198 / 0842			M256A2	Nerve
NV 58698 16202 / 0905			M256A2	Nerve

SAMPLE

REMARKS
Readings taken during site survey for assembly area.

DA FORM 1971-2 MAR 2017 PREVIOUS EDITIONS ARE OBSOLETE. APD LC v1.00ES

Figure 7-5. Sample chemical data sheet

CBRNWRS

7-28. During R&S activities, the CBRNWRS is used to speed communications using established systems and preformatted messages. CBRNWRS is an information management function that entails collecting and analyzing data from assessments within the operational area to support tactical operations. It provides quality information to the right person at the right time in a usable form to simplify understanding and decision making, which allows commanders and CBRN staffs to determine requirements on protective measures and plan CBRN operations.

> ***Note.*** The NATO conducts CBRNWRS activities according to STANAG 2103/Allied Tactical Publication (ATP)-45, and U.S. forces have implemented this agreement in TM 3-11.32/MCRP 10-10E.5/NTRP 3-11.25/AFTTP 3-2.56.

7-29. The CBRNWRS is most effective when visualized and implemented as a collective system of premission, mission execution, and postmission reports and messages. Sufficient information should be available before execution of R&S missions. Information supports the rapid and effective execution of tactical missions and reduces the impact of uncertainty. During the execution of R&S operations, collect valuable information to better assess the overall CBRN threat or hazard to the force and the execution of exploitation or WMD elimination operations. Table 7-2 represents reports and/or messages made at first contact, in reaction to contact, and at summaries of postmission activities.

Table 7-2. Reports and messages supporting CBRN R&S missions

Contact	***Reaction to contact***	***Postmission***

• SPOTREPs
• SALUTE reports
• Intelligence reports
  ▪ INTREPs
  ▪ Updated intelligence assessments
  ▪ Special intelligence products
• Aerial/ground images and geospatial products
• CBRN SITREP
• CBRN 1, 2, and 3 reports
• Meteorological data (estimated)
• UXO/IED reports
• CBRN technical reports
  ▪ Medical/health/safety
  ▪ Weapon systems
  ▪ Delivery systems
  ▪ Munitions
  ▪ Agents/hazards
  ▪ Modeling/effects
	• SPOTREPs
	• SALUTE reports
	• CBRN 4 report
	• Meteorological data (local)
	• UXO/IED reports
	• Preliminary technical report (EOD)
	• Assessment report
	• Chain of custody
		• Assessment report
		• CBRN 5 and 6 report
		• Complementary technical report (EOD)
		• Survey report
		• Laboratory analysis reports
		• Incident report
		• Survey forms (such as DA Form 1971-2)
		• IFAS

Legend:

CBRN	chemical, biological, radiological, and nuclear	INTREP	intelligence report
		SPOTREP	spot report
COMINT	communications intelligence	SIGINT	signals intelligence
EOD	explosive ordnance disposal	SALUTE	size, activity, location, unit, time, and equipment
HUMINT	human intelligence		
IED	improvised explosive device	UXO	unexploded explosive ordnance
IFAS	initial field account survey		

7-30. CBRNWRS capabilities include manual and automated processes in the creation; collection and control; dissemination; and storage and retrieval of information obtained from affected forces, coalition partners, and appropriate nongovernmental organizations and indigenous agencies. Capabilities may range from detectors and alarms that are not integrated to fully integrated sensors at selected locations, allowing the commander and CBRN staffs to anticipate future conditions and accurately assess risks. The vertical and horizontal exchange of CBRN-related information relayed through the CBRNWRS keeps different commands, agencies, coalition partners, and functional/staff personnel informed. The CBRN staff determines the need for specific types of CBRN information (for example, when and where the CBRN attack occurred).

OTHER TACTICAL REPORTS

7-31. Other tactical reports include unexploded explosive ordnance, spot reports, and size, activity, location, unit, time, and equipment (SALUTE) reports and system-specific reports. Any force may provide a spot or SALUTE report that includes information on contamination, locating CBRN ordnance, HAZMAT, or other suspicious activities (for example, clandestine laboratory). Sensor suites provide system specific reports containing component- and system-level detection and identification results.

TYPES OF CBRN REPORTS

7-32. The CBRNWRS consists of six standard reports for reporting CBRN incidents or attacks, or locating and reporting CBRN hazards within the OE. (See TM 3-11.32/MCRP 10-10E.5/NTRP 3-11.25/AFTTP 3-2.56 for detailed information on each report.) The CBRN 4 reconnaissance, monitoring, and survey report is the primary report format used by CBRN R&S elements to report information on located CBRN hazards.

> ***Note.*** The following is unique to the United States Army: In addition to the standard CBRN reports, other reports may be used to provide additional details regarding a CBRN attack or locating CBRN weapons or materials. These reports are specialized CBRN reports. Specialized CBRN reports are used by units to provide situational awareness to the supported command and staff during execution of operations or in support of CBRN exploitation.

MEDICAL CBRN REPORTS

7-33. Information from CBRN surveys may be used in reporting to PVNTMED or public health personnel CBRN medical incidents. Information is collected and provided to medical channels in a timely and adequate manner. The documentation and archiving of actual or potential CBRN exposures is required for health surveillance of potentially exposed personnel and to address future investigation.

7-34. An initial field account survey (IFAS) is documentation of on-site field information regarding CBRN hazards, detection results, exposures, symptoms, visual and witness information, and other details. The IFAS is available as electronic data fields in the Defense Occupational and Environmental Health Readiness System (DOEHRS).

7-35. The IFAS should be completed by PVNTMED or public health personnel and the chain of command involved in the incident. CBRN survey teams should work with PVNTMED to accurately report any hazards and exposures potentially received during surveys. The IFAS ensures that CBRN incident details and a roster of exposed and medically treated personnel are adequately captured. Details in the IFAS and the underlying reports (such as significant activities and roster) may be classified. Unit security personnel must review the IFAS and determine the classification.

7-36. The information in the IFAS is especially critical for documenting exposures to CBRN hazards and will typically need to be collected by units involved in an attack, and CBRN units or personnel involved in CBRN R&S or collection of CBRN samples. There may be multiple units completing separate IFASs. It is essential that CBRN personnel provide specific R&S results to appropriate force health protection personnel to complete the IFAS. Figure 7-6 is a sample document from the DOEHRS to capture information for the IFAS. This figure only shows a portion of the information on the IFAS that CBRN R&S personnel might submit to force health protection personnel.

Note. CBRN survey teams will not have access to DOEHRS. Tools to collect information for the IFAS may be obtained from the Army Public Health Center DOEHRS Resources page at https://phc.amedd.army.mil/topics/envirohealth/hrasm/Pages/DOEHRS_Resources.aspx.

Section 2: General Incident Information	
2.1 Incident Name	Belava DSA
2.2 CCIR/SigAct Number **See definition at the end of the form	
2.3 Incident Type (Check all that apply)	☒ Chemical ☐ Biological ☐ Radiological ☐ Nuclear ☒ Explosive ☐ Unknown ☐ Other (Specify) Industrial release from collateral damage of sulfer plant
2.4 Incident Type Description	TF Raider HE/CBRN MLRS attack
2.5 Incident Start Date/Time	2020/05/04 0712L (yyy/mm/dd) (1500)
2.5 Incident End Date/Time	2020/05/04 0728L (yyy/mm/dd) (1500)
2.7 How Incident Occurred (Check all that apply)	☒ Attack ☐ Accidental Release ☐ Unknown ☐ Other (Specify)
2.8 Brief Summary of Incident	At approximately 0630L DIV ISR reported imminent missile launch, all units immediately took shelter. At 0650 TF AMD began engaging enemy missiles, 8x missiles destroyed. 14x MLRS impacted in throughout TF Raider elements conducting movement to PL Blue at approximately 0700, 12x HE (submunition), 2x G-series CBRN agent. Initial BDA: 23x KIA, 72x WIA (24x CBRN casualties), 16x VEH NMC. TF Falcon and TF Strike exectued air and artillery strikes against 328ATP Artillery Division, estimated 12x 9A52 launchers and 2x command posts destroyed. All elements executed medevac and recovery operations and continued movement in dispersed formations to PL Blue.
2.9 Key units involved with Activity/ Operation	TF Raider, 87CSSB, 101CM CO
Section 3: Incident Details	
3.1 Exposure Route(s) (Check all that apply)	☒ Inhalation ☒ Skin Absorption ☐ Ingestion ☒ Skin and/or Eye Contact
3.2 Signs/Symptoms/Effects reported (If yes, answer 3.2.1 and 3.2.2)	◉ Yes ○ Unknown ○ No

Section 5: Detection Data	
5.1 Field Monitoring/detector results completed (If yes, answer 5.1.1 and 5.1.2) ***See definition at the end of the form	◉ Yes ○ No ○ Unknown
5.1.1 Who performed (Unit and POC person name)	2PLT/101CM CO // SFC Berry
5.1.2 List detector(s)/equipment used, date/time, location, list/summarize	JCAD, M256, MultiRae, First Defender
5.2 Samples collected and submitted for analysis (If yes, answer 5.2.1, 5.2.2 and 5.2.3)	◉ Yes ○ No ○ Unknown

Incident Reporting-Initial Field Account	Page 3 of 5
5.2.1 Who collected samples (Unit and POC person name)	2PLT/101CM CO // 1LT Rikard
5.2.2 Sample Types Collected (Associate samples below if available) (Click all that apply)	☐ Air ☒ Soil ☐ Water ☒ Wipe ☒ Other (Specify) Suspected missile fragments
5.2.3 Where (e.g. laboratory/location) samples were sent	DIA laboratory, Stuttgart, DE
Section 6: Hazard Mitigation and Controls	
6.1 Describe types of Personal Protective Equipment (PPE) (e.g., gloves, M40 mask, etc.) available? used?	M50 Mask / JSLIST (all pax in MOPP4 at time of strike and during recovery/response operations)

SAMPLE

Figure 7-6. Example IFAS

7-37. By completing the IFAS, medical providers and PVNTMED or public health personnel can properly investigate the exposure and work with medical providers so that appropriate medical follow-up and health surveillance is conducted. In addition, the information can provide valuable lessons learned that could help mitigate future health impacts from similar incidents. The form is completed as thoroughly as possible and submitted to the command surgeon/ PVNTMED or public health officer within 24 hours of an incident. PVNTMED or public health personnel will use information on the IFAS, along with other pertinent documents, when documenting a health-risk assessment summary of the incident.

Appendix A
Metric Conversion Chart

This appendix complies with AR 25-30 which states that weights, distances, quantities, and measures contained in Army publications will be expressed in both U.S. standard and metric units as shown in table A-1. For a complete listing of preferred metric units for general use, see Federal Standard 376B.

Table A-1. Conversion chart

United States Units	***Multiplied By***	***Equals Metric Units***
Centimeters	0.39370	Inches
Feet	0.30480	Meters
Fluid Ounces	29.57300	Milliliters
Pounds	453.59000	Grams
Quarts	0.94600	Liters
Inches	2.54000	Centimeters
Metric Units	***Multiplied By***	***Equals United States Units***
Liters	1.05700	Quarts
Meters	3.28080	Feet
Milliliters	0.03380	Fluid Ounces
Grams	0.03527	Ounces

A-1. Unit conversion factors are important to understand for recording different types of radiation measurement. Table A-2 illustrates the interrelationships of radiation and radioactivity units and measurement.

Table A-2. Units of radiation and radioactivity measurement

Measurement	***Description***	***Common Unit***	***SI Unit***	***Conversions***	***Remarks***
Radioactivity	The number of radioactive decay events per unit time.	curie (Ci)	becquerel (Bq)	1 Ci = 3.7×10^{10} Bq 1 Bq = 2.7×10^{-11} Ci	1 Ci equals 3.7×10^{10} atoms releasing radiation (disintegrations) per second. 1 Bq equals one disintegration per second.
Exposure	Amount of gamma and x- ray radiation traveling through air.	roentgen (R)	coulomb/ kilogram (C/kg)	1 R = 2.58×10^{-4} C/kg 1 C/kg = 3,880 R	Many radiation instruments measure in milliroentgen (mR) per hour.

Table A-2. Units of radiation and radioactivity measurement (continued)

Measurement	*Description*	*Common Unit*	*SI Unit*	*Conversions*	*Remarks*
Absorbed dose	Amount of energy absorbed per unit mass from ionizing radiation by objects or people.	rad (radiation absorbed dose)	gray (Gy)	1 rad = 0.01 Gy 1 Gy = 100 rads	For practical purposes, 1 roentgen = 1 rad in most body tissues. Medical impact of radiation is sometimes described in absorbed doses for beta and gamma radiation.
Dose equivalent	Medical impact of absorbed dose based on the type of radiation.	rem (roentgen equivalent man)	sievert (Sv)	1 rem = 0.01 Sv 1 Sv = 100 rems	1 rad =1 rem for beta and gamma radiation Dose limits are typically stated in dose equivalent.

A-2. Table A-3 provides selected factors to convert between common units and SI.

Table A-3. Selected conversion factors

To Convert From	*To*	*Multiply By*
Radioactivity		
Corrected counts per minute (ccpm)*	Disintegrations per minute (dpm)	Use the equation: dpm = (ccpm) divided by (probe efficiency in %)
Corrected counts per minute (ccpm)*	Disintegrations per minute (dpm) per 100 square centimeters (cm^2)	Use the equation: $dpm/100cm^2$ = (ccpm) multiplied by (probe factor)ǂ divided by (probe efficiency in %) efficiency in %)
curies (Ci)	disintegrations/second	3.7×10^{10}
becquerels (Bq)	disintegrations/second	1
curies (Ci)	terabecquerels (TBq)	0.037
terabecquerels (TBq)	curies (Ci)	27
curies (Ci)	gigabecquerels (GBq)	37
gigabecquerels (GBq)	curies (Ci)	0.027
curies (Ci)	becquerels (Bq)	3.7×10^{10}
becquerels (Bq)	curies (Ci)	2.7×10^{-11}
becquerels (Bq)	picocuries (ρCi)	27
picocuries (ρCi)	becquerels (Bq)	0.037
millicuries (mCi)	megabecquerels (MBq)	37
microcuries (µCi)	kilobecquerels (kBq)	37
kilobecquerels (kBq)	microcuries (µCi)	0.027
megabecquerels (MBq)	millicuries (mCi)	0.027
picocuries (ρCi)	millibecquerels (mBq)	37
millibecquerels (mBq)	picocuries (ρCi)	0.027
microcuries (µCi)	megabecquerels (MBq)	0.037
megabecquerels (MBq)	microcuries (µCi)	27

Table A-3. Selected conversion factors (continued)

To Convert From	***To***	***Multiply By***
	Exposure	
roentgens (R)	coulombs/kilogram (C/kg)	0.000258
coulombs/kilogram (C/kg)	roentgens (R)	3,880
milliroentgens (mR)	microcoulombs/kilogram (μC/kg)	0.258
microcoulombs/kilogram (μC/kg)	milliroentgens (mR)	3.88
	Absorbed Dose	
radiation absorbed dose (rad)	grays (Gy)	0.01
grays (Gy)	radiation absorbed dose (rad)	100
radiation absorbed dose (rad)	centigrays (cGy)	1
centigrays (cGy)	rads (rad)	1
millirads (mrad)	centigrays (cGy)	0.001
centigrays (cGy)	millirads (mrad)	1,000
millirads (mrad)	milligrays (mGy)	0.01
	Dose Equivalent	
milligrays (mGy)	millirads (mrad)	100
millirads (mrad)	micrograys (μGy)	10
micrograys (μGy)	millirads (mrad)	0.1
sieverts (Sv)	rems	100
rems	millisieverts (mSv)	10
millisieverts (mSv)	rems	0.1
millirems (mrem)	microsieverts (μSv)	10
rems	centisieverts (cSv)	1
centisieverts (cSv)	rems	1
microsieverts (μSv)	millrems (mrem)	0.1
millirems (mrem)	millisieverts (mSv)	0.01
millisieverts (mSv)	millirems (mrem)	100

* ccpm = corrected counts per minute (cpm of survey - cpm of natural background radiation near to where the survey was taken) where cpm = counts per minute.

‡ probe factor = 100 cm^2/size of probe in cm^2.

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Appendix B
Dismounted CBRN Reconnaissance and Surveillance

This appendix provides doctrinal guidance on how to tactically employ CBRN capabilities for dismounted CBRN R&S operations. It discusses advantages and disadvantages of dismounted CBRN R&S versus other methods.

OVERVIEW

B-1. Commanders, informed by the operational and mission variables, decide when to employ CBRN dismounted reconnaissance versus mounted reconnaissance. The commander must understand that a CBRN R&S capability is most vulnerable to CBRN hazards and enemy actions when conducting missions using the dismounted method. Dismounted CBRN R&S incurs greater risk to forces that can be mitigated by time, sufficient security, tactical considerations, and preplanned means to address contaminated equipment and possible casualties.

B-2. Dismounted CBRN operations maximize movement to objectives by using mounted platforms. The intent of movement platforms is to reduce the overall work-stress and increase efficiency for operations. Mounted and dismounted operations are frequently intermingled to support the overall reconnaissance objective. The vignette, page B-2, and figures B-1 and B-2, pages B-3 and B-4, provide an example of employment of dismounted CBRN R&S capabilities.

ADVANTAGES

B-3. Advantages of dismounted CBRN reconnaissance missions include—

- Permitting elements to benefit from the concealment offered by vegetation and terrain.
- Providing maneuver forces the capability to exploit narrow gaps between CBRN contamination, and enabling penetration of forces at an enemy's perceived denied terrain.
- Increasing distribution of CBRN sensors throughout formations to improve the likelihood of hazard detection.
- Retaining mobility, particularly in dense terrain and urban areas.
- Reducing visual or audio signature.
- Providing the ability to conduct reconnaissance operations when the CBRN hazard is in close proximity to adversary positions.
- Conducting reconnaissance operations in restricted terrain, such as dense urban environments and subterranean facilities.
- Providing the commander with more refined, tailored information collection capabilities that answer specific PIRs with a higher confidence.
- Manipulating and employing existing control mechanisms directly to reduce hazards, especially in TIM facilities.
- Making logistical support requirements easier due to no large equipment decontamination requirements.

DISADVANTAGES

B-4. Disadvantages of dismounted CBRN reconnaissance missions include—

- A slow rate of movement and increased time to complete the mission.
- A greater work/rest requirement and oxygen consumption rates to execute operations.

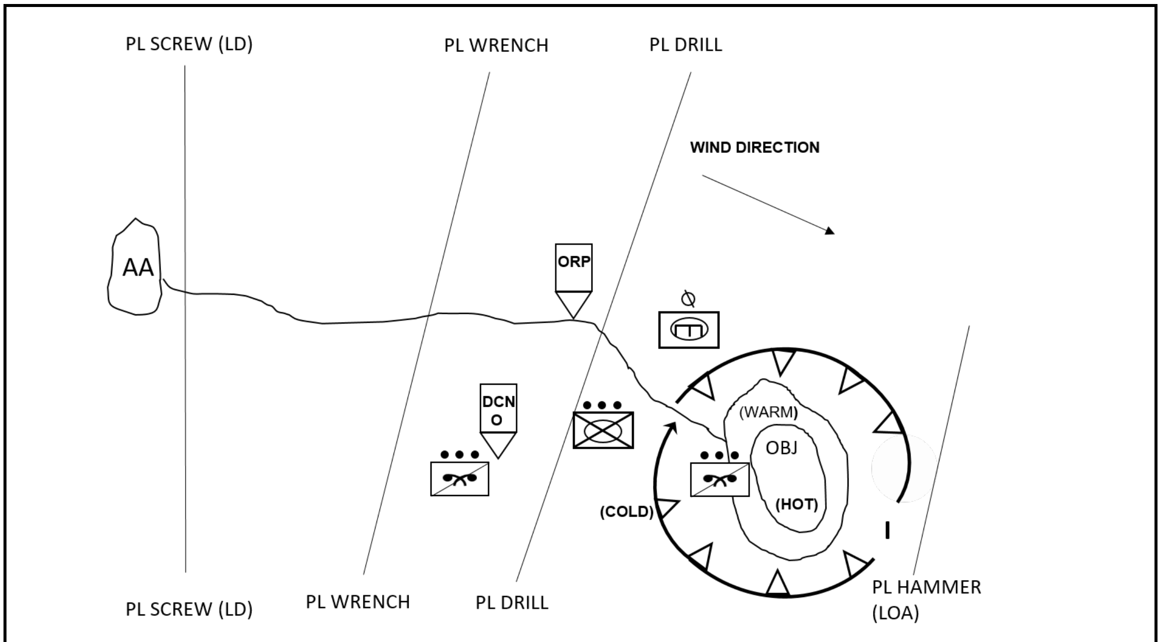
- An extensive requirement for detailed preliminary planning and coordination.
- Increased risks from conventional forces, weapon systems, and working in direct contact with CBRN threats/hazards.

CBRN R&S Vignette

The 61st Chemical Company (Hazard Response) is direct support to the brigade engineer battalion (BEB) of the 3rd Armored Brigade Combat Team/4th Infantry Division. The company's mounted nuclear, biological, chemical, reconnaissance vehicle platoon is operational control to the armored brigade combat team cavalry squadron, but it still retains its two organic hazard assessment platoons. The company is tasked to conduct area reconnaissance of a possible theater ballistic missile transporter erector launcher that was interdicted by close air support elements. The 3rd Armored Brigade Combat Team must maneuver in vicinity of the interdicted theater ballistic missile. The S-2 and brigade CBRN officer believe that the theater ballistic missile has been filled with VX due to several indicators, including the confirmed presence of an enemy decontamination truck at the theater ballistic missile location. A CBRN 3 report has already been completed by the brigade staff, predicting the possible hazard area so that units in the vicinity can be warned. The 61st Chemical Company (Hazard Response) is tasked by the brigade engineer battalion to execute area reconnaissance to determine the extent of possible CBRN contamination, providing freedom of maneuver to the 3rd Armored Brigade Combat Team. The company commander receives the order from the BEB S-3 and an intelligence brief from the battalion S-2. The company commander notifies the BEB commander and S-3 of the security and time requirements for the mission. One platoon of mechanized infantry and one engineer reconnaissance team are operational control to the 61st Chemical Company to provide security during the CBRN area reconnaissance. When the company team is formed and all key leaders are present, the company commander provides a WARNORD to the platoons. The latest intelligence and the mission and operational variables are communicated to the leaders; particular emphasis is placed on individual protective equipment, hot/warm/cold zone requirements, decontamination, and contaminated casualty treatment and evacuation. The main effort is assigned one hazard assessment platoon that conducts actions on the objective, including conducting the area reconnaissance and technical decontamination of personnel in the hot zone. The supporting efforts are the mechanized infantry platoon and engineer reconnaissance team that provide security in the cold zone. Another hazard assessment platoon will coordinate with the BEB decontamination team to provide operational decontamination support to the company team in the warm zone. All elements of the company team are given sufficient time to prepare before the line of departure. The details of the operation order are finalized and briefed to all elements of the company team. The company team conducts rehearsals, including a rehearsal of concept, clarifying actions on objective, and hazard mitigation. The company team crosses the line of departure and establishes an objective rally point and command post in the cold zone.

CBRN R&S Vignette (continued)

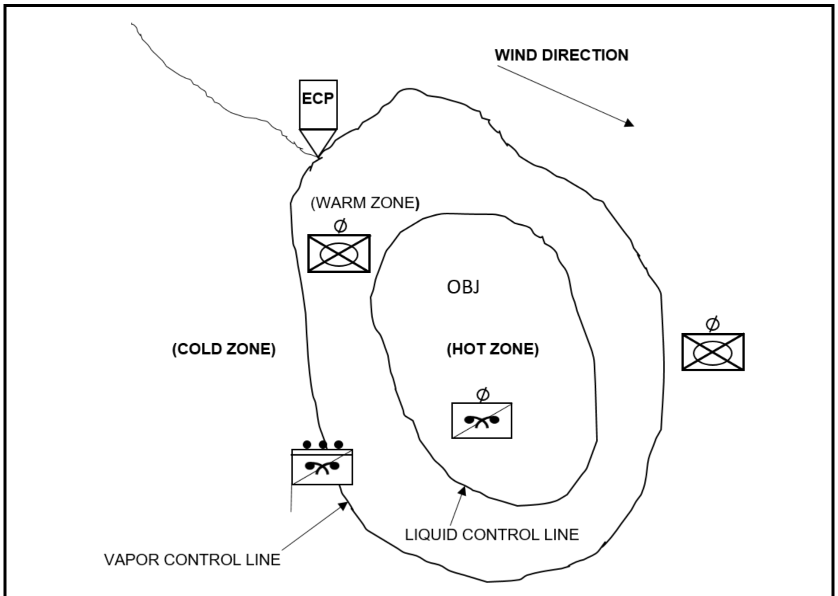
Simultaneously, the security element sweeps across the objective, using weapon optics to provide visual confirmation that no enemy personnel are present and minimizing cross contamination. Security positions isolate the objective from enemy forces. CBRN detectors within the security elements show no indication of VX. The hazard assessment platoon establishes the warm zone, hot zone, entry/exit locations, and technical decontamination station and is in constant communication with the company command post that relays all information to the BEB operations section. The area reconnaissance element conducts a site survey, confirming that the theater ballistic missile was filled with VX, but the dispersion of the contents was localized to the destroyed theater ballistic missile area and 150 meters toward the east of the objective. The hazard assessment platoon sends a CBRN 4 report, including each point at which positive detection was made. This information is immediately communicated from the objective through the company team and BEB operations section to the armored brigade combat team commander. The tactical decision is made to mark the contamination and bypass it. The hazard assessment platoon does not take a sample, but it marks the contaminated area with assistance from the engineer reconnaissance team and conducts technical decontamination. The company team then returns to the objective rally point and returns to the assembly area for debrief. Figure B-1 and figure B-2, page B-4, depict the execution of the area reconnaissance mission.



Legend:

AA	assembly area	O	operational
DCN	decontamination point	OBJ	objective
LD	line of departure	ORP	objective rally point
LOA	limit of advance	PL	phase line

Figure B-1. Example dismounted CBRN R&S



Legend:
ECP entry control point
OBJ objective

Figure B-2. Example zones for dismounted CBRN R&S

UNDERSTANDING THE MISSION

B-5. When given the mission, it is imperative that the dismounted CBRN R&S element fully understands the mission and the tasks associated with it. Many times a single word in a mission statement implies very complex troop-leading procedures. The mission statement often uses the forms to describe the mission task. When discussing the purpose, words such as confirm or deny can be insignificant when compared to words such as exploit and characterize. For example, At 091600JUN27, 1/61 CM CO conducts area reconnaissance at OBJ ZULU (LM 1234 5678) to exploit suspected enemy WMD cache. A thorough task analysis to understand specified and implied tasks is imperative when planning dismounted CBRN reconnaissance operations.

PRIORITY INTELLIGENCE REQUIREMENTS

B-6. Dismounted CBRN R&S, beyond any other CBRN R&S method, is the best-suited CBRN R&S method for gathering specific information at an NAI. Dismounted CBRN R&S elements must understand what information is essential to meet the commander's intent. Information has value to various organizations. The CBRN R&S element must understand the information the commander has deemed a priority for collection. The dismounted CBRN R&S element must also understand its specific information collection role in large-scale ground combat operations. Not every dismounted CBRN R&S element should conduct site exploitation, even though they may have the equipment to do so. For instance, a CBRN dismounted R&S element could be sent into a bunker facility to conduct a preliminary survey and provide information about the number of CBRN rounds, type of rounds, and their markings.

B-7. The commander provides success criteria for each mission, providing the LTIOV that correlates with a no later than time. A CBRN reconnaissance mission can be considered successful when the CBRN R&S element reports what it has found prior to the LTIOV.

B-8. Coordination with other elements, especially those that have the capability and mission to sample and package CBRN material, is critical to a successful mission. Capabilities such as security, decontamination, communications, sample transfer and transport, chain of custody, and the ability to escort samples play an important role in the success of a dismounted CBRN reconnaissance mission.

EQUIPMENT PREPARATION

B-9. Effective selection of key equipment to perform the CBRN reconnaissance mission can change the success or failure of a mission. Examples of criteria that can cause a CBRN mission to fail include—

- Taking the wrong equipment.
- Taking too much equipment.
- Failing to properly prepare the equipment (such as improper calibration, no air in the self-contained breathing apparatus, no batteries).
- Lacking enough sample collection containers.
- Having inappropriate decontaminants.

B-10. Determining if a CBRN R&S element is prepared for its mission is the tactical leader's responsibility and is verified by the commander, based on the level of acceptable risk. Noncommissioned officers are paramount to ensure equipment readiness and conduct individual and team training to execute missions. CBRN warrant officers inform the commander on the technical capabilities and limitations of equipment. Very rarely is an element completely prepared for every aspect of a mission. With the best intelligence available and an understanding of the operational and mission variables, equipment is employed to maximize CBRN R&S asset capability while minimizing risk.

EXECUTING DISMOUNTED CBRN RECONNAISSANCE OPERATIONS

B-11. Executing dismounted CBRN R&S should be conducted in a deliberate and controlled manner to ensure safety and success of the mission. Table B-1 provides an example of some procedures associated with executing dismounted CBRN R&S operations. The steps are divided into phases for easier understanding and, eventually, execution.

Note. Not all of the steps and supporting tasks in table B-1 are required to complete the reconnaissance missions.

Table B-1. Dismounted CBRN reconnaissance procedures

Step	*Supporting tasks*
Occupy ORP in vicinity of target area	• Approach the objective rally point from the assembly area, upwind. • Determine the initial predicted hazard/exclusion area. • Coordinate with existing security forces, to include obtaining updated intelligence and local weather. • Establish security. • Establish the CP location and command and control.
Conduct area survey	• Determine the IPE/PPE. • Conduct map reconnaissance of the objective (initial survey plan). • Perform leader's reconnaissance, assessing visual activity on the NAI. • Template the locations of the hot and cold zones and communicate them to supporting elements. • Establish outer cordon security to isolate the objective. • Establish the entrance control point with the entry/exit corridor or route. • Set up the emergency decontamination point. • Complete the plan. • Establish inner cordon security, minimizing forces in the warm zone. • Conduct first-entry procedures into the hot zone. • Conduct an initial assessment of the area. • Send the CBRN 4 report to higher headquarters, and determine the actions on the objective.

Table B-1. Dismounted CBRN reconnaissance procedures (continued)

Step	*Supporting tasks*
Conduct area survey (continued)	• Set up a technical decontamination lane. • Communicate site details when the initial survey team exits. • Determine the general location of the working zones (cold, warm, and hot).
Conduct sample collection (if required)	• Revise the sample management plan for the site based on the initial entry team assessment. • Conduct field confirmatory analysis. • Perform sample collection operations. • Collect, document, package, and secure items of intelligence value and track them on a proper chain of custody form (DD Form 3108 [*CBRN Sample Documentation and Chain of Custody]*).
Clear area	• Mark the contaminated area and address contaminated waste for future remediation. • Perform technical decontamination procedures. • Conduct decontamination of security forces in the warm zone, as required. • Send an initial closure report.
Return to assembly area	• Notify the remaining security force of the change of mission and link-up at the ORP. • Conduct tactical movement back to the ORP. • Conduct movement (ground or air).
Recovery	• Transfer samples and material, if collected. • Perform postoperational checks and services. • Conduct further decontamination, if necessary. • Submit a final closure report, and debrief the supported command.

Legend:

CBRN	chemical, biological, radiological, and nuclear	NAI	named area of interest
CP	command post	ORP	objective rally point
IPE	individual protective equipment	PPE	personal protective equipment

Tactical Movement During Missions

B-12. When the situation permits, dismounted CBRN elements conduct tactical movement to and from the objectives by using available vehicles to expedite ground movements. Vehicle movement also enables the dismounted element to bring a larger array of equipment to increase available capabilities at objectives. It is important for the dismounted CBRN element leadership to discuss what essential pieces of equipment must be taken on the mission. They must also determine where secondary pieces can be maintained to minimize space and weight during load planning. This is of particular importance if the dismounted element must conduct ground movement on foot for any substantial portion of the mission.

B-13. If the tactical situation requires a security force, the headquarters unit with areas of operations responsibility assigns security, with sufficient command and support relationships to accomplish the mission. One option is to establish a company team, with the dismounted CBRN R&S element as part of the team. For example, an infantry company has overall mission control but has a dismounted CBRN reconnaissance platoon task-organized for a specific mission. The critical planning factor is that the CBRN R&S element has tactical control of all actions in vicinity of the area of contamination. The security lead element controls the tactical placement of the security forces encompassing the exterior of the contaminated area to protect the dismounted CBRN R&S element. It is recommended that the link-up between security forces and the dismounted CBRN R&S element occur during deliberate mission planning.

Occupy An Objective Rally Point In Vicinity Of Target Area

B-14. A CBRN R&S element should approach a CBRN survey area from upwind. The CBRN R&S leadership determines the initial predicted hazard/exclusion area. The element stops prior to actually entering the suspect area or point at which to set up an objective rally point. The distance from the actual site is determined by various factors, such as local weather data/conditions and geography (altitude), terrain, suspected agents, security concerns, and size of the site. Guidance may be given by the higher command, but normally this distance is provided in element SOPs. It may also be based on a safe standoff distance provided in the Emergency Response Guidebook or other such documents.

B-15. Once the safe standoff distance is determined, the R&S element establishes 360 degrees of security around the objective rally point. The lead element solicits, from higher headquarters, last-minute intelligence updates on the objective. A command post is established to provide C2 of both the security and dismounted CBRN R&S elements from the objective rally point. The command post location will also serve as the element staging area for all actions on the objective.

B-16. To track downrange personnel and equipment, a log must be maintained of personnel and equipment that are in the hot zone or warm zone or that have been left in the hot zone or warm zone. At the command post, a log is kept concerning area operations and events, including entry times and expected exit times. The sample collection element keeps a log in the hot zone.

Conduct Area Survey

B-17. The CBRN R&S leadership assesses the initial IPE required for actions in and around the objective. The guidance may change as information is refined during the leader's reconnaissance. A map reconnaissance is the minimum requirement to conduct operations in a possibly contaminated environment, which incurs significant risk to troops and mission. Ideally, dismounted CBRN R&S leaders have a full common operating picture with supporting intelligence about the objective, known contaminants, and risk to forces.

B-18. The dismounted CBRN R&S element conducts a leader's reconnaissance to refine the plan and establish an initial assessment of activity at the NAI or objective. The key task during this reconnaissance is to determine the general location of the working zones (cold, warm, and hot). The CBRN R&S element leader identifies a general area for the entry control point, technical decontamination point, and entry and exit corridor or route. The leader templates the hot and cold zones and clearly communicates the zone meanings to supporting elements. Details include—

- Identifying the potentially safe route to the objective, void of physical hazards.
- Identifying the target area.
- Identifying contaminated and uncontaminated casualty collection points.
- Describing the area (types and the number of buildings, obstacles, types of containers, azimuths and locations in the area, potential hazards) by using photographs, sketches, and distances.

B-19. The CBRN R&S element assesses the exterior of the objective or NAI to ensure that they are at the proper location and to determine potential enemy resistance. The security element then isolates the outside of the objective by using the mission parameters to maintain safe distances from the objective; they also conduct monitoring of security forces. Security forces control internal and external movement inside the isolated area. The use of force and engagement criteria should already be established during mission planning.

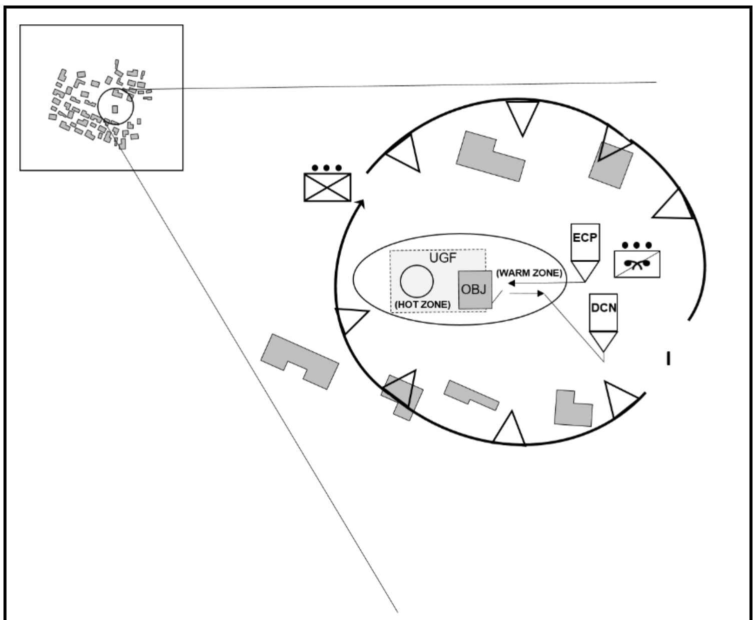
B-20. Before entry, the entry/exit corridor is established and communicated to all elements. An emergency decontamination point is established to provide a hasty means of decontamination and emergency extraction. A back-up entry element must be ready to conduct rescue. The back-up entry element serves as an emergency extraction element and a relief element, should assessment be extensive and the operation take more time than expected. At a minimum, a backup element will enter the area of suspected contamination in the same level of protection as the element in the hot zone.

B-21. Plan completion includes validating the initial planning guidance or modifying the plan to better fit the on-ground truth at the objective. Security or CBRN R&S forces may be repositioned to fit the OE. The CBRN R&S leaders determine the exact location for the entrance and exit corridor or route. A specific entry control point is established between the cold zone and warm zone. At the entry control point, a final check of personnel and equipment is conducted to ensure readiness before entry into the warm zone. If enemy presence at the objective exceeds the security force capacity, a decision should be made to displace or increase security forces at the objective.

B-22. The technical decontamination lane is set up in the designated exit route. The R&S element is self-sufficient in using technical decontamination. Technical decontamination allows the R&S element to rapidly process through a decontamination process, removing their contaminated IPE/PPE and equipment brought into the hot zone. Contaminated IPE/PPE and equipment taken into the hot zone is packaged for processing (monitoring/decontamination) at a supported decontamination site located away from the site.

B-23. A hot line is established to identify the transition between the hot zone and warm zone. This line may also be referred to as the liquid control line. The area between the cold zone and the hot zone is considered the warm zone. The line that transitions from the warm zone to the cold zone may also be referred to as the vapor control line. All of the decontamination processes occur in the warm zone. After the establishment of the hot, warm, and cold zones, anything in the hot or warm zone is considered potentially contaminated and must be checked. If contamination is detected, it must be decontaminated and rechecked for cleanliness before passing into the cold zone. In dense urban environments, the plan is adjusted using existing structures to establish the zones. In figure B-3, the suspected structure aboveground is the warm zone. A hot zone is established after determining that liquid contamination may exist in the underground portion of the suspected structure. The entry and exit corridors are located just outside the main entrance, as shown in figure B-3.

Note. When dealing with underground contaminated areas, exercise caution when establishing a vapor control line above the hot zone. If the contamination is lighter than the air, it will rise out of the underground facility.



Legend:
DCN decontamination
ECP entry control point
OBJ objective
UGF underground facility

Figure B-3. Example underground facility objective

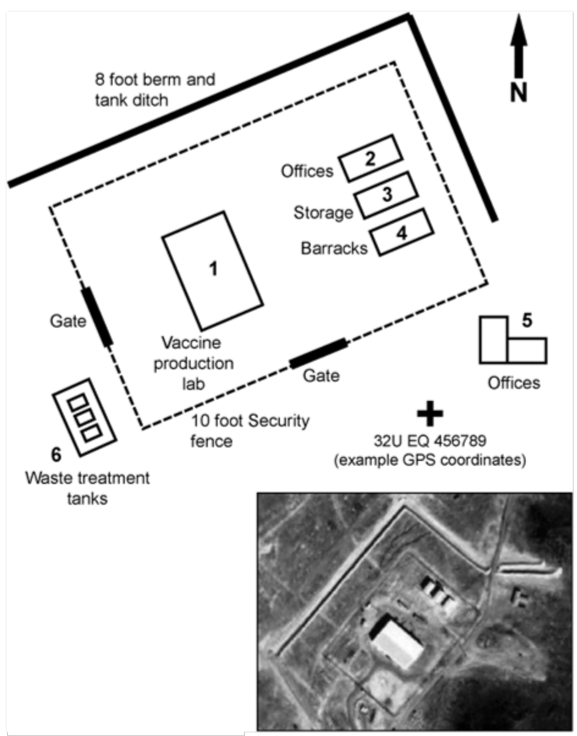
B-24. Security forces then conduct a sweep through the objective and use optics to maximize standoff distances. They maintain safe distances from suspected contamination and establish an inner cordon. Enemy or civilian personnel should be neutralized or detained according to the rules of engagement. Dismounted CBRN R&S should not be executed until the inner cordon is established. The inner cordon security force element must establish local security for dismounted CBRN R&S elements throughout the objective.

Engagement of enemy forces fleeing or counterattacking from the objective is extremely likely. If needed, security forces and detained personnel are decontaminated at the technical decontamination point.

B-25. An initial entry element is sent in to conduct a thorough initial area survey. The following are key tasks (in priority order) accomplished during the initial area survey:

- Determine radiological levels.
- Determine pH levels. (High pH levels will damage upper explosive limit/lower explosive limit and oxygen sensors).
- Monitor for upper explosive limit and lower explosive limit.
- Determine oxygen levels.
- Determine volatile organic compound levels.
- Reevaluate the appropriate IPE/PPE.
- Identify all structures in the area that are to be assessed.
- Determine priority of effort.
- Prepare an area sketch to include determining the Global Positioning System coordinates and other location identifying information (such as street addresses).
- Designate buildings by numbers and rooms by letters, or according to the SOP. (This is important later when assessing the material collected from the site).

B-26. Before entering a structure, a Global Positioning System coordinate of the structure will be taken and entered on a diagram/sketch form (see figure B-4). If there are streets located near the structure, the names of the streets and the proper address, if known, will be entered.



Legend:

GPS	Global Positioning System
lab	laboratory
N	north

Figure B-4. Example area sketch

B-27. The initial entry element consists of a minimum of two personnel. When unexploded explosive ordnance and IEDs exist, EOD personnel must be the initial entry element to render safe the devices. EOD personnel ensure that the area is clear of additional IEDs or booby traps. In the case of open areas (fields), a preliminary sweep is conducted to ensure the same. When it is not practical to clear all IEDs, booby traps, or similar devices from the area, the EOD element clears and marks a path to the sample collection area if sample collection is required. The initial entry element leader determines the best placement for the path. Duties are divided up among the element members to record the area, monitor the site for hazards, and communicate. If possible and manpower is available, additional personnel should be added to conduct the initial area survey.

B-28. In unknown environments, the initial entry element wears a level of protection determined by the element leader based on the expected enemy, CBRN hazard, and situation. If the use of Level A or Level B PPE using supplied air is required, multiple entries into the site may be necessary to conduct the initial area survey. This is driven by the capacity (time) of the air supply available and if decontamination is required after each entry.

B-29. The initial area survey varies between a rapid task or a drawn-out task, depending on the size and complexity of the objective or NAI. This is primarily a walk around the area and maximized visual observation of the internal contents of structures without entry. If possible, the survey R&S element should sketch out the structure as they move through it. If the structure is complex, this may be difficult but it will allow the R&S element to better document their findings and develop the sample collection plan. It also provides better clarity to those reading the assessment report.

B-30. As previously discussed, the element approaches the area from upwind. They use designated entry and exit corridors or routes when entering and leaving the hot and cold zones. To reduce the risk of becoming contaminated by an element coming from the contaminated environment, the team will not use the same route for entry and exit. See figure B-5.

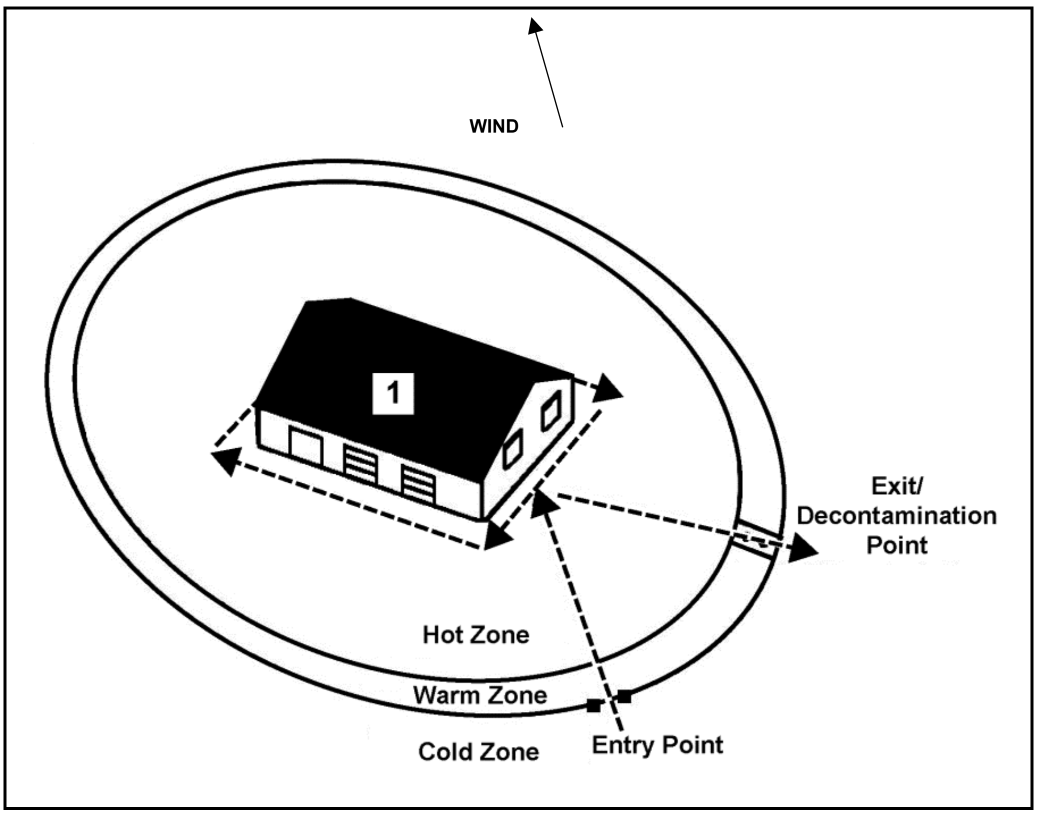


Figure B-5. Example building survey

B-31. The recorder, with guidance from the initial entry team leader, prepares the area sketch (see figure B-6). Once the area has been properly surveyed (when oxygen levels, upper and lower explosive limits, volatile organic compound levels, liquid/vapor hazards, and radiation levels have been determined), decisions can be made regarding the appropriate level of IPE/PPE for follow-on elements collecting samples or conducting presumptive or field confirmatory identification.

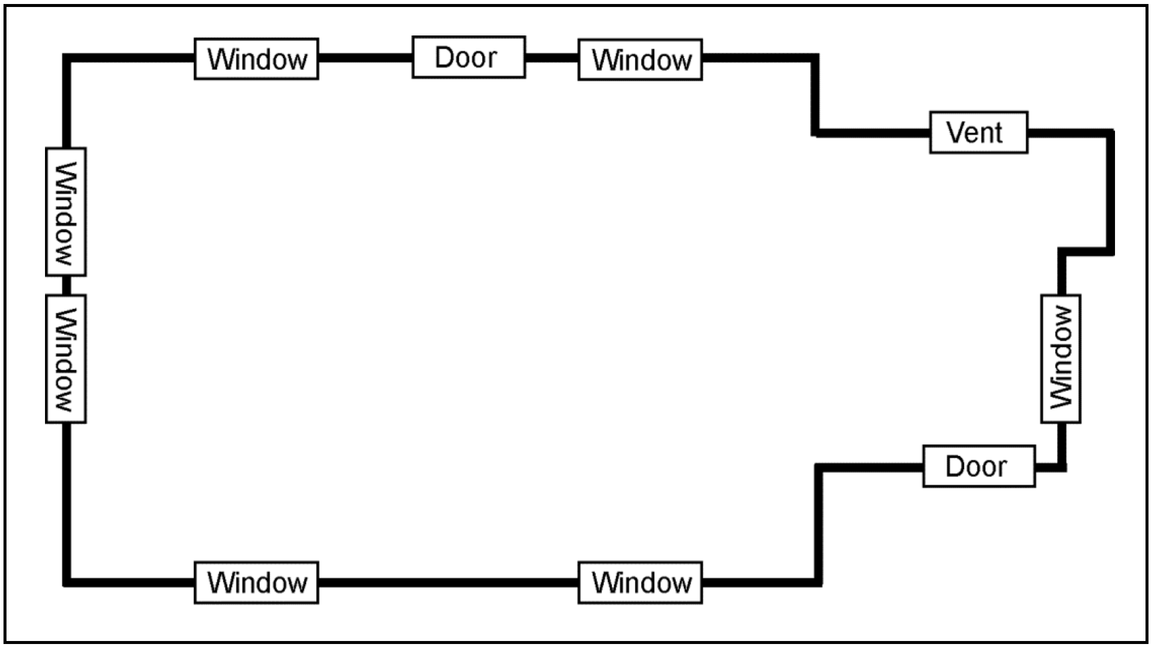


Figure B-6. Example initial building sketch

B-32. Unit SOPs should establish standardized methods (numbering/lettering buildings and rooms) for entry teams to use for recording and reporting information on sketches. For example, to assist in the initial area survey, all buildings in the area will be assigned a numeric designator (such as a grid reference graphic from higher headquarters). Within each building, all floors (including subfloors, rooms, and voids) are identified by numbering or lettering floors and rooms according to an established SOP. Entrances to each building are noted on the area sketch, along with the number of floors and if the building extends belowground. Each sketch needs a legend to define symbols used on the sketch. The sketch provides a structure for tracking collected material (samples, documents, and other items of interest).

B-33. The entry element marks the door with a slash. This indicates that an element has entered through that doorway. When they exit, they mark the same door, leaving an X. This indicates that an element has entered and exited. They will also place the room designation on the door. See table B-2, page B-12, for the marking scheme.

Table B-2. Door and entrance marking

Location	
When marking doors, place the markings on the door, if possible. This avoids confusion if doors are close to each other. The second location is on either side of the door. If there is a potential for confusion as to which door is being marked, an arrow in the information section of the marking can be used. The third location is on the floor immediately in front of the door in question. Route markings that indicate direction are placed on the walls at eye level to indicate the direction an element has moved. Colored chalk, tape, or permanent marker can be used to mark. When possible, markings will be large, clearly legible, and made at eye level. Additional information (unit searching, time in/time out) may be added. NFPA 1670 establishes marking systems for search and rescue incidents similar to examples in this table.	
The element has entered a room/passed through a doorway and has not exited. A single slash is placed on the door.	
The element has entered/passed through and has exited. This marking is a continuation of the original slash placed on a door where entry was made.	
The element has cleared the room and needs to be reviewed by follow-on elements. This could mean that there are potential samples or other items of interest to follow-on elements.	
Information provided at the base of the marking is reserved for things of immediate importance to an element making an entry, such as UXO, booby traps, flammable atmosphere readings, other possible dangers, or other information important to follow-on elements.	
The element has moved in the direction indicated. The design of the arrow is of little importance, as long as it clearly shows the direction of movement by the element.	
Legend: NFPA National Fire Protection Association UXO unexploded ordnance	

B-34. The initial entry element conducts first-entry monitoring of the area for the presence of a hazardous environment. First-entry monitoring can also assist in determining sample priorities. For confined space or limited ventilation areas, the initial entry element uses an appropriate detector to check the air quality for explosive hazards or a lack of oxygen. Before opening the door, the entry element uses the detector with the sampling probe, if equipped. The probe is slipped under the doorframe, if possible. If not, the element carefully cracks open the door, observes for booby traps, and inserts the probe into the room. The element uses the detector to determine the oxygen level in the room, to check if combustible gases are present, and to check if volatile organic compounds are present in the atmosphere. The element will also check radiation levels. A lack of oxygen (not applicable if the element is using self-contained breathing apparatus systems) or the presence of combustible gases or radiation above a predesignated level would cause the element to abort entry. If volatile organic compounds are present, the element will determine which compounds are present before making a determination if it is safe to enter and if a change in IPE/PPE is necessary.

B-35. If the detector readings are acceptable, the element proceeds. The element continues to check for booby traps as they open the door and carefully enter the structure. Once inside, the element gains situational awareness. The element should survey and assess the structure according to the sampling plan.

B-36. The initial entry element moves through the structure according to the tactical situation. While in the structure, the element makes radio checks with the command at regular intervals. During this radio check, the element apprises the CP of their location and actions. If the element loses communication with the command post, they will retrace their movement until communications can be reestablished. If communications cannot be reestablished, the element will execute their contingency for communications loss, such as sending the back-up entry element to reestablish communication.

CAUTION

In no instance should a single person be sent into the hot zone.

B-37. The initial entry element will use a search pattern to survey the room. The room should be divided into quadrants. The element should search the room by starting at the door and working from left to right. The initial sweep of the room is to observe for key items of interest and hazards. The element designates the room walls with numbers to better record what they see (see figure B-7 and figure B-8). The element will be alert to the presence of radiation (using a RADIAC detector) and chemical warfare agents (using chemical detectors such as the lightweight chemical detector/joint chemical agent detector). The element members continually check the device for readings.

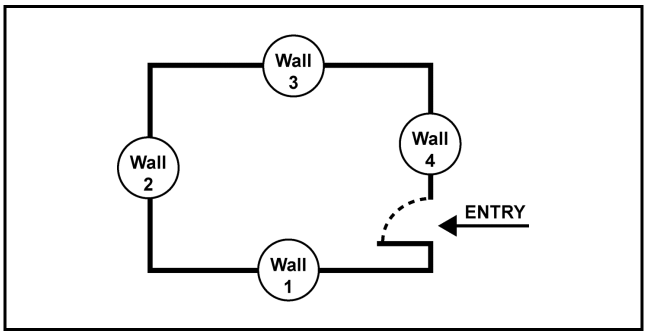


Figure B-7. Numeric designation of room walls

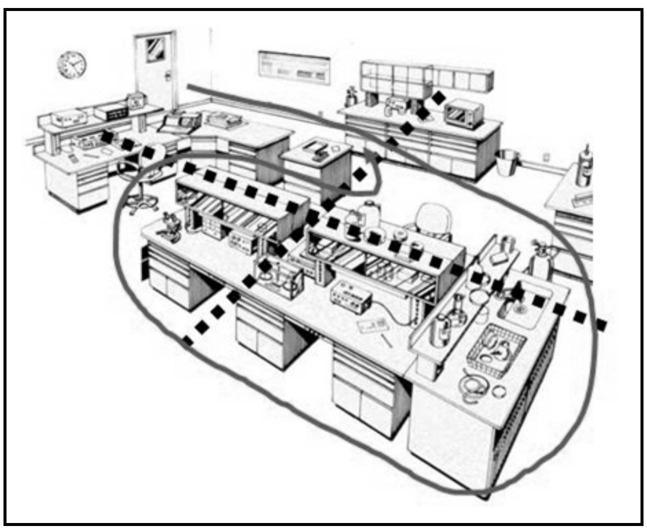


Figure B-8. Initial room sweep

B-38. The initial entry element should be alert for the presence of booby traps. The element should touch nothing during the initial sweep. They should note the location of closed containers and items of key interest. The initial sweep is to obtain information to facilitate detection and identification operations. The second element member documents the room with a digital camera or video.

B-39. The initial entry element marks safety hazards, access and egress areas, and challenges that may affect the operational effort of the sample collection element. Marking may be used according to the unit SOP. Each CBRN R&S element should have internal marking procedures in its SOP.

Note. Area survey rule of thumb—turn nothing off that is on, and turn nothing on that is off.

B-40. During the initial sweep of the room, the initial entry element should locate items of interest (warning signs, added or extra ventilation, markings on containers, chemical symbols or notation, paperwork, drawings, sketches). The element should look for items relating to CBRN, such as the following:

- Containment.
- Processing equipment.
- Waste disposal.
- Signs of release.
- Safety equipment.

B-41. The equipment can be varied and may never have been intended for the purposes for which it is now being used. Additionally, the safety considerations for handling and storing material may be very different from those of a western nation. Initial survey observations are to—

- Look for anything obvious while securing and during the initial survey of area.
- Determine if CBRN agents are being produced, stored, or weaponized at that location.
- Be alert for booby traps/IEDs.
- Note instrument readings and/or detections.
- Consider if the layout of the area is consistent with the facility (false walls/rooms).

B-42. When a suspicious item is encountered, the entry element must first assess the big picture, look for all hazards before proceeding, document its location and the surrounding area, and determine if it is an item of interest. The entry element should answer the following questions:

- Is this item CBRN-related and was it expected or unexpected?
- If it is not CBRN-related, is it hazardous and does it pose a threat?

B-43. The entry element looks for items of information value that may be taken as grab samples. When approaching the item of interest—

- Photograph/document the undisturbed item.
- Determine if the item is recognizable.
- Move toward the item.
- Watch for dangers.
- Record all actions with the item.
- Initiate detection procedures.

B-44. When the initial sweep of the room is complete, the entry element should proceed to the next room. Once the entire building has been surveyed, the entry element should move to the element control point. Depending on the size and complexity of the site, the initial surveys may take a short period of time or require a substantial amount of time. Depending on the IPE/PPE and detection equipment (based on the hazard) requirements, multiple trips may be required to complete the initial survey.

B-45. If possible, the R&S element should sketch out the structure as they move through it. This may be difficult if given a complex structure, but it will allow the element to better document their findings and develop the sample collection plan. It also provides better clarity to those reading the assessment report.

B-46. The initial entry element leader marks possible sample collection points by priority, but the priorities are subject to change based on METT-TC/METT-T. The preferred method is to use 3- by 5-inch cards, with number one as the top priority.

B-47. Using the diagram/sketch form, the sample element leader starts to sketch the layout of the area at which the sample collection is to take place. This is done in each room/area where sample collection is projected to occur. Particular attention is given to determining potential sample collection locations. Sketches should be made of the layout of the room/field, including the dimensions, measurements, and items that may be of interest. The diagram/sketch form may be used to brief the sample collection element and will be used for further analysis of the sample collection area. The sample collection element may use this form when conducting sample management operations. Relevant reference points, hazards, and control areas should be annotated on the form. Numbered index cards that are indicated in the diagram/sketch form can be linked with the photographic log, enabling sample collection locations to have a commonality throughout the operation.

B-48. On completion of photographing, filming, and surveying, the R&S element places documentation (with information facing outward so that it can be read) into a large zip-top bag. Photographic equipment is bagged unless equipment was placed in an underwater camera case before entering the contaminated area and was processed through technical decontamination. Care must be exercised when handling possibly contaminated equipment that contains sensitive electronics. If contamination is suspected on the device, use liquid crystal displays on video cameras and digital cameras to review area information without removing the photographic equipment from clear overpacks, a 6-milliliter bag, or zip-top bags.

B-49. After processing through technical decontamination, the initial entry team leader briefs the sample collection element members about the objective. They review digital photographs, video, and the diagram/sketch form. As part of the area overview, the initial entry team leader identifies all hazards noted. The initial entry element leader reviews possible sample collection points with the sample collection leaders to eliminate confusion on site about the potential sample.

B-50. Based on the initial area assessment, the element leader revises his plan for assessment and collection. The R&S element leader makes IPE/PPE adjustments based on the detection and identification of agents, as required. A priority of effort for sample collection may be developed. The dismounted CBRN R&S leader sends a CBRN 4 report to the higher headquarters and determines actions on the objective.

B-51. Based on METT-TC/METT-T, the R&S element leader may execute one of the following COAs:

- The element leader will call forward the sample collection element and begin sample collection operations. Ensure that the sample team brings all required equipment to the sample area. The sample collection team leader briefs his personnel on the sample collection plan. This occurs when limited time is available and adequate protection is available for the R&S element to stay longer. This method allows the leader to actually be present and show further sample collection and exploitation elements where to collect samples. A drawback is that the guidance and briefing to the arriving element is done while in protective posture. Providing an effective briefing in this type of situation is challenging for the R&S leader. This includes additional entry teams continuing the area assessment and rest periods per entry element.
- The sample collection team leader will process through technical decontamination with the EOD element and recorder. The sample collection team leader formulates the sample collection plan based on intelligence, photographs, and area sketches of the sample area. This method is used when there is enough time and equipment (such as IPE/PPE, dosimetry devices, and decontaminants) available.

Conduct Sample Collection

B-52. The dismounted CBRN R&S element conducts sampling, as required. The developments of a sample management plan and sample collection are further discussed in chapter 6 and appendix F.

Clear Area

B-53. Before exiting the area, the R&S element must communicate ahead to the decontamination station in the warm zone so that decontamination personnel are prepared to receive them. The contamination area and waste should be marked for future remediation.

B-54. The method of decontamination is determined based on the time available, threat level, and hazard agent and on the IPE/PPE worn. It is possible that no contamination was encountered in the hot zone and the R&S element leader can therefore forego conducting decontamination based on the findings of the entry elements and field analysis conducted. Before decontamination, a check is conducted of all personnel who were in the hot zone. Technical decontamination is then conducted for all applicable elements.

B-55. If the situation is permissive and the R&S element is supported by a decontamination unit, a thorough decontamination operation should be undertaken at or near the objective. Doing so limits the possible spread of contamination and negates the need for further decontamination operations.

B-56. An initial closure report, including the essential facts and findings, is sent to the higher or supported headquarters. This information should include sufficient information for immediate tactical implications or decision making. The potential duration of the hazard and the impact of contamination on the freedom of maneuver are priority.

Return To Assembly Area

B-57. Upon decontamination and displacement of the inner cordon elements, the CBRN R&S element notifies the outer cordon tactical leader to displace and link up at the ORP. The CBRN R&S and inner cordon security element conduct tactical movement back to the ORP. Upon link-up with all elements, the CBRN R&S element prepares for movement back to the assembly area.

Recovery

B-58. Service members should be evaluated by medical personnel, especially if they are suspected to have been exposed to HAZMAT. In the case of an infectious biological agent, consider quarantining personnel for the length of the incubation period for the suspected agent to prevent spreading.

B-59. All samples collected are transferred to designated collection points according to the theater sample management plan. The dismounted CBRN R&S element conducts postoperations preventive checks and services on equipment per the SOP. If any equipment requires additional decontamination, it is conducted as required. The dismounted CBRN R&S element leader should complete a final closure report of actions on the objective, facts, findings, and recommendations to the supported commander.

DISMOUNTED LOCATE TASK

B-60. To find suspected or actual CBRN hazards, the CBRN locate task is used. The staff passes information collected from the suspected or actual incident to the CBRN R&S element. When conducting dismounted CBRN reconnaissance, the CBRN R&S element assumes the appropriate protective posture according to current intelligence. The CBRN dismounted locate task requires more time and possible exposure to contamination than mounted operations. The CBRN locate task requires applied judgment based on METT-TC/METT-T. The mission, terrain, and adversary indicate the technique that should be used. Additional considerations for dismounted CBRN locate tasks include unexpected encounters, such as the adversary situation, type of agent, and need for decontamination operations. Upon locating the hazard, the CBRN R&S element reports findings and awaits follow-on orders, such as conducting survey operations.

B-61. There are five techniques used to locate possible contamination in the AOR. The techniques are zigzag, lane, cloverleaf, grid, and triangulation.

ZIGZAG

B-62. The zigzag technique is used to locate contaminated areas during route, zone, or area reconnaissance missions. Depending on the terrain, the distances could be large or small. The zigzag technique has a higher probability of detecting contamination because the surface area not traversed is less than that of other search techniques. The following are procedures for the dismounted zigzag technique (see figure B-9):

- The CBRN R&S element begins its search at the line of departure (start line), maintaining at least 25-meter intervals between personnel.
- The CBRN R&S element moves forward along a line that is oriented 45 degrees from the start line.
- The CBRN R&S element monitors identification equipment for indications of contamination.
- After the CBRN R&S element has moved 100 meters along the first zig, it turns 90 degrees and zags taking readings at each turn and repeating the process until the end.
- The distances could be larger or smaller depending on the terrain.
- The CBRN R&S element continues to zigzag until the CBRN R&S element has reached its limit of advance.
- The CBRN R&S element reports the results once the entire mission area has been searched.
- If the CBRN R&S element did not search the entire mission area, it begins a new sweep.
- The CBRN R&S element repeats the process until contamination is detected or the entire mission area is searched.
- The CBRN R&S element reports the results normally using CBRN 4 report.
- The CBRN R&S element coordinates for decontamination and medical support as required.
- The CBRN R&S element may transition to a CBRN survey if contamination is detected.

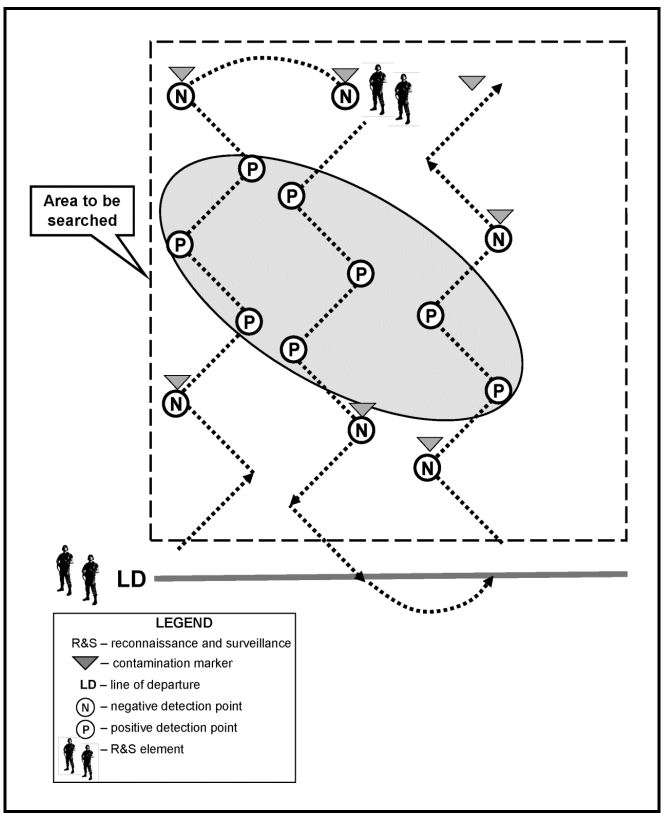


Figure B-9. Dismounted zigzag technique

LANE

B-63. The lane technique is used to locate contaminated areas. It is very similar to the zigzag technique, but it is primarily used during route reconnaissance missions. It can also be used for area reconnaissance of long, narrow pieces of terrain (such as defiles). (See figure B-10.) The following are procedures for the lane technique:

- The CBRN R&S element begins its search at the line of departure, maintaining an interval of less than 50 meters between personnel.
- The CBRN R&S element follows an azimuth for a designated distance.
- For narrow routes, the CBRN R&S element moves in a staggered column. Each CBRN R&S element moves along a line until it reaches the limit of advance.
- If the CBRN R&S element does not search the entire mission area, it begins a new sweep and repeats the process until contamination is detected or the entire mission area is searched.
- If contamination is detected on a route, the CBRN R&S element creates/submits a CBRN 4 report and moves on to the next lane.
- The CBRN R&S element reports the results after the entire mission area has been searched.
- The CBRN R&S element coordinates for decontamination and medical support, as required.
- The CBRN R&S element may transition to a CBRN survey if contamination is detected.

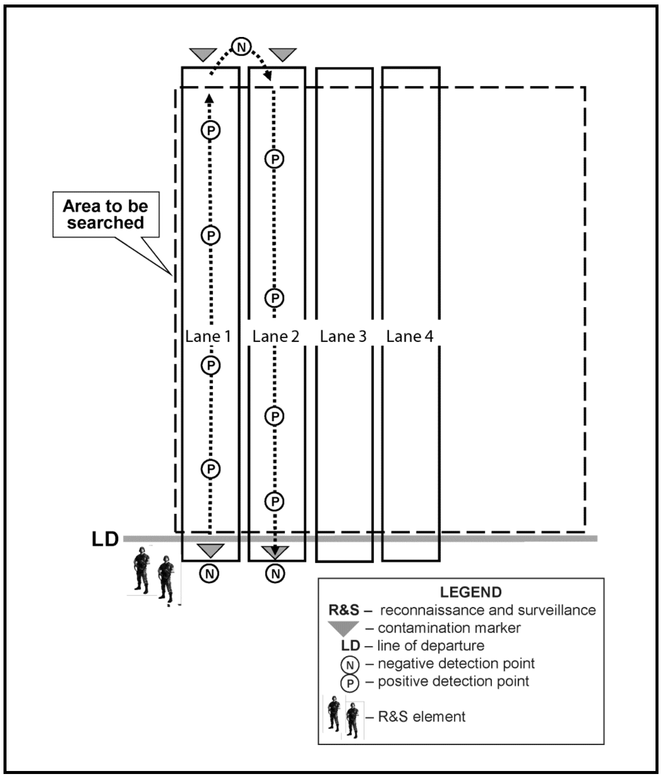


Figure B-10. Dismounted lane technique

CLOVERLEAF

B-64. The dismounted cloverleaf technique (see figure B-11) is time-consuming; however, it provides detailed coverage and information about an area. The following are procedures for the dismounted cloverleaf technique:

- The CBRN R&S element begins its cloverleaf at a starting point central to the area to be checked.
- The CBRN R&S element moves in a figure-8 pattern by using the start point as the center of the 8. If a second element is used, the second element conducts the same pattern by moving in a 90-degree direction from the first element. If only one element is conducting the cloverleaf, it completes one figure 8 and then conducts a second figure 8 at a 90-degree angle from the first figure 8.
- The CBRN R&S element monitors identification equipment for indications of contamination.
- The CBRN R&S element conducts a check at set intervals along its route or performs continuous monitoring for a radiological locate technique.

Note. Depending on the terrain, the distances could be large or small.

- If the CBRN R&S element does not search the entire mission area, it begins a new cloverleaf within the area not checked.
- The CBRN R&S element repeats the process until contamination is detected or the entire mission area is searched.
- The CBRN R&S element reports the results, normally by using a CBRN 4 report.
- The CBRN R&S element coordinates for decontamination and medical support, as required.
- The CBRN R&S element may transition to a CBRN survey if contamination is detected.

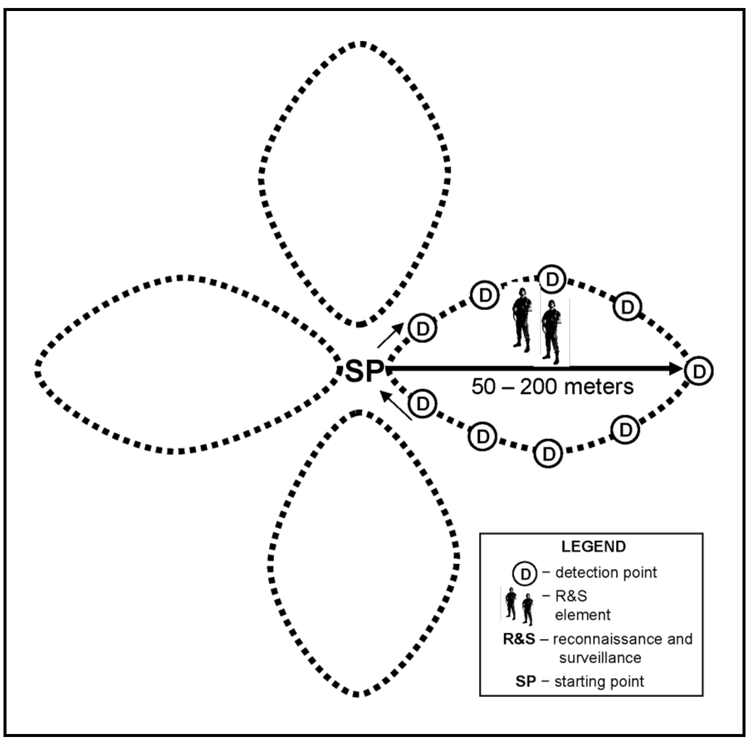


Figure B-11. Dismounted cloverleaf technique

GRID

B-65. When accuracy is important, the grid technique is employed by R&S elements that conduct dismounted reconnaissance. It is employed by superimposing a grid over the R&S team maps, which enables the team to rapidly communicate locations of detections, casualties, and areas at which samples were collected. Numbers and/or letters are assigned to each detection point, and each detection point is associated with a predetermined Global Positioning System location. (See figure B-12.) The grid technique may also be used for a site survey, such as within a building. (See figure B-13.) The following are procedures for the grid technique:

- The CBRN R&S element establishes the boundaries of the area to be checked.
- The CBRN R&S element preselects points within the area that it will check for contamination. (Normally the points to be checked are laid out in an evenly spaced grid pattern.)
- The CBRN R&S element conducts checks at each point within the grid.
- The CBRN R&S element reports the results, normally by using a CBRN 4 report.
- The CBRN R&S element coordinates for decontamination and medical support, as required.
- The CBRN R&S element may transition to a CBRN survey if contamination is detected.

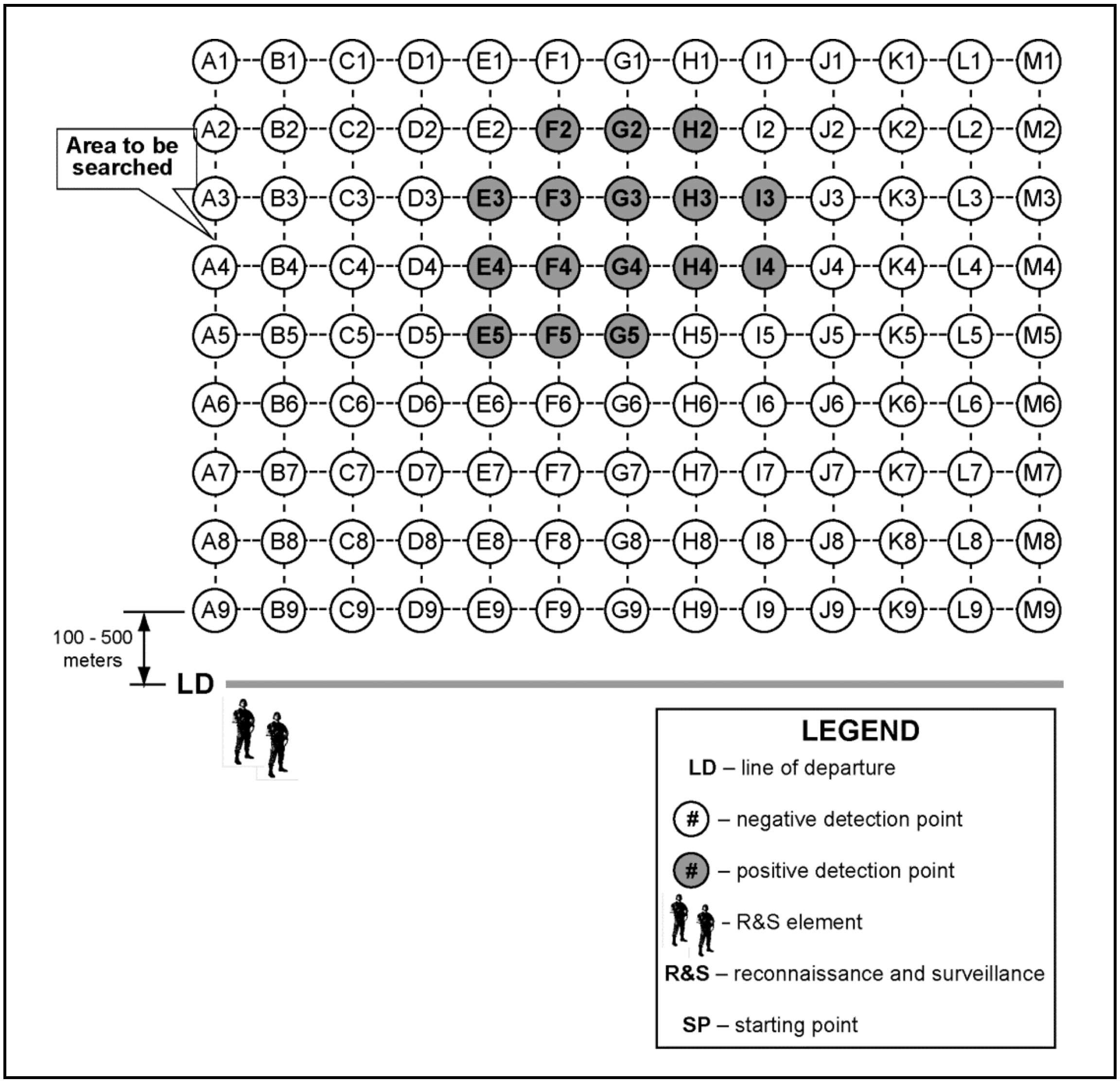


Figure B-12. Dismounted grid technique

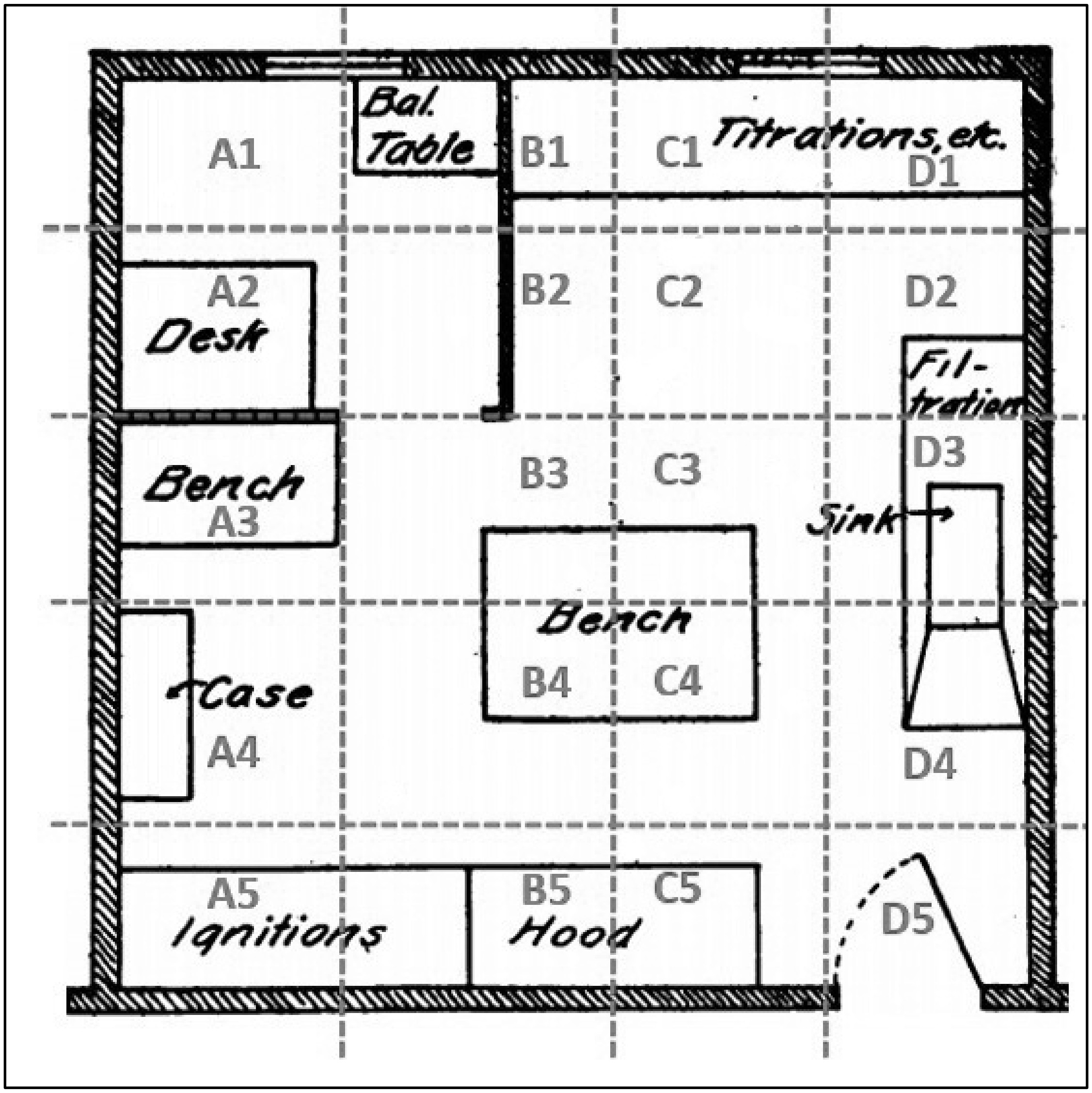


Figure B-13. Grid technique for a room

TRIANGULATION

B-66. The triangulation search technique is used to locate radiological sources that have been detected by some form of dosimeter or detector. (See figure B-14.) The triangulation technique strengths in locating radioactive sources lie with the small number of personnel (three) needed to accomplish the procedure. This ensures that personnel exposures remain as low as reasonably achievable (ALARA); it also ensures the ability to rapidly locate the radioactive source, even if buildings or other shielding materials are in the area.

B-67. Shielding effects from buildings may produce confusing dose-rate readings. The following procedures are used when obstacles are encountered along the triangulation legs:

- At the location of initial hazard recognition, the element leader takes readings in a semicircular sweep method, noting the directional heading of maximum exposure.
- From this heading, two additional personnel are sent out 100 meters in directions of +45 degrees and -45 degrees from the initial heading.
- The sweep method is performed by personnel to determine the direction heading of maximum exposure.
- If readings are less than 0.02 centigray per hour, personnel reverse their heading, travel back 60 meters, and perform the sweep method again.
- After three readings above 0.02 centigray per hour are obtained and plotted, an indication of which area contains the radiological source should be evident.

B-68. The following procedures are used for triangulation with obstacles:

- Walk along the obstacle, staying 10 meters away at all times. Take readings every 5 to 10 meters while facing the obstacle.
- Upon reaching the end of the obstacle, travel beyond the obstacle 20 meters, assume the direction of the original heading, and take the next set of dose rate readings by using the semicircular sweep method.
- If the largest dose rate reading does not point back toward the obstacle, provide the directional heading toward the largest reading. However, if the largest dose rate reading does point back toward the direction of the obstacle, provide the directional heading associated with the largest reading taken from behind the obstacle.
- In some situations, element members may reach the end of the obstacle and see that all dose rate readings were the same. Under these circumstances, personnel should continue to take readings at 10-meter intervals along the entire obstacle perimeter. If exposure readings in the direction of the obstacle remain constant, the source is located in the obstacle. However, if the dose rate readings do not remain constant, provide the directional heading (facing away from the obstacle) at the location of the largest dose rate reading.

B-69. The projected area at which the radiological source is located is used as the focal point for a cordon declaration by the incident commander.

Note. If at any time the dose rate is above 1 centigray per hour, stop immediately, note the location and direction of the reading, and leave the area. Adjustments to the triangulation legs must be made so that personnel exposure remains ALARA.

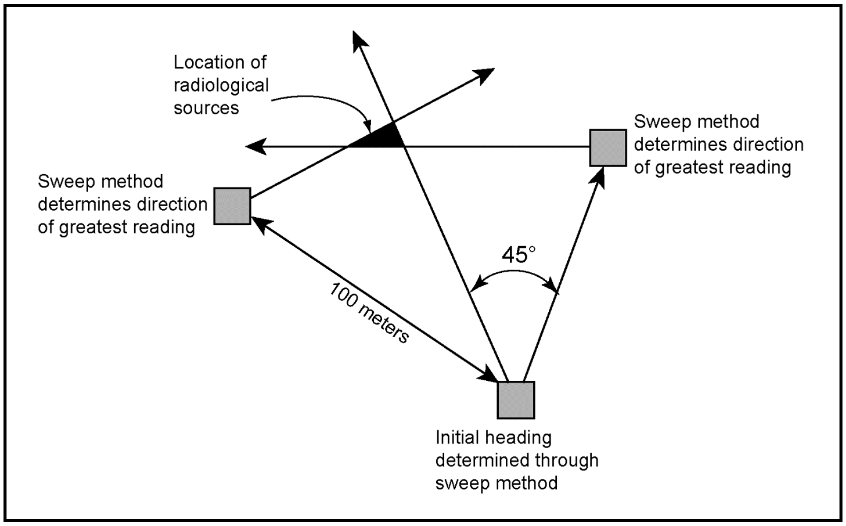


Figure B-14. Triangulation locate technique

B-70. Time challenges may exist when dealing with large sample areas that require the collection of many samples.

DISMOUNTED SURVEY TASK

B-71. The CBRN R&S elements conduct a survey to determine the extent of contamination of the CBRN hazard. The CBRN survey defines the boundaries of contaminated areas. The CBRN reconnaissance survey task used for dismounted reconnaissance is similar to that used for mounted operations, except for the distances covered and the duration of time spent in an area. A dismounted survey is configured in a minimum of two-man elements for personnel safety. One person conducts the survey, while the other person remains in overwatch as security.

B-72. Dismounted CBRN reconnaissance provides the tactical commander with accurate information pertaining to CBRN activity in the OE. This prepares forces to operate in the CBRN environment or, if possible, to avoid contamination. The commander considers the factors of METT-TC/METT-T to determine whether to conduct a dismounted survey.

B-73. A dismounted CBRN survey may be conducted upwind, downwind, or crosswind of the suspected area of contamination. The survey element remains mounted until, based on the assessed hazard, a point is determined according to the unit SOP. At that point, members of the survey element dismount, don the appropriate level of IPE/PPE and dosimetry devices, and initiate the predetermined dismounted technique.

B-74. Using an upwind approach, the members of the survey element reach the expected point of release (source) of the hazard quickly and are not exposed to the hazard until they are close to the release point. They do run the risk of being exposed to greater levels of contamination because the concentration of the CBRN agent or materials is greater at the release point. This is especially true for radioactive sources.

B-75. CBRN survey techniques require applied judgment based on METT-TC/METT-T. The mission, terrain, and adversary indicate the technique that should be used. There are six dismounted survey techniques that can be employed when contamination is located: nearside-far side, box, star, bounce-and-bypass, course leg, and preselected dose rate. The following are CBRN survey procedures:

- Locate the general boundaries of the contaminated area.
- Place warning markers at specified intervals around the contaminated area and at all entry points.
- Determine the intensity of the contamination.
- Report information by using a CBRN 4 report.

NEARSIDE-FAR SIDE

B-76. The nearside-far side dismounted survey technique (see figure B-15) is used by an R&S element when they enter a contaminated area. The nearside-far side survey technique employed by a dismounted element is similar to the technique used by the mounted element. The following are procedures for the dismounted nearside-far side survey technique:

- Each CBRN R&S element determines if they are in the contaminated area.
- If a CBRN R&S element is in the contaminated area, it moves back along its original path, checking for contamination every 50 meters until CBRN contamination is no longer detected.
- Once out of the contaminated area, the element moves away from the contaminated area an additional 20 to 50 meters and emplaces appropriate warning markers.
- Once the initial element has found the nearside boundary of contamination, it moves forward across the contaminated area, testing every 50 meters.
- When contamination is no longer detected, the R&S element moves forward another 20 to 50 meters and checks again.
- If no contamination is detected, it places a CBRN warning marker.
- This process is repeated until it is clear of the contamination.
- Each R&S element executes this process to determine the nearside and far side boundaries of the contamination.
- The CBRN R&S element reports the results, normally by using a CBRN 4 report.
- The CBRN R&S element coordinates for decontamination and medical support, as required.

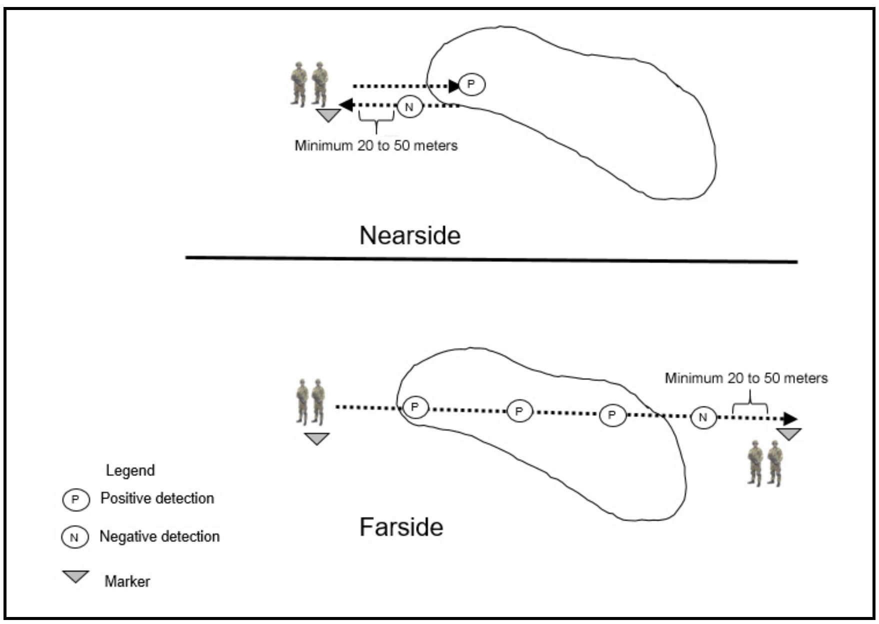


Figure B-15. Dismounted, nearside-farside survey technique

BOX

B-77. The dismounted box survey technique (see figure B-16) is used to determine the general dimensions (length and width) of a contaminated area. The dismounted box survey technique is best employed by three teams, and the process starts once a team enters the contaminated area. The following are procedures for a dismounted box survey technique:

- All teams in the reconnaissance element stop and check for contamination in their immediate areas.
- The first team to report contamination becomes the base element. If any other teams in the element are located in the contaminated area, they must back out of the contamination.

- All teams in the element should orient on the base team. At least one team should be to the left and one team to the right of the base team.
- The base team moves forward and finds the farside of the contamination. The crew continues to check for contamination every 50 meters.
- When the crew fails to get a positive reading, they proceed another 50 meters and establish the initial farside line.
- The team to the right of the base team places a CBRN warning marker to indicate the initial nearside line, moves forward 50 meters, and checks for contamination.
- The crew can determine two things at this point—contamination or no contamination. If contamination is detected, the team turns 90° to the right, moves 50 meters, and checks again.
- If no contamination is found, the team turns 90° to the left, moves forward 50 meters, and checks again. This process of going straight or turning continues in a boxlike movement until the team has crossed the initial farside line; this is the initial right limit of the contamination. The movement of the team depends on the orientation of the contaminated area.
- Once the team has reached the initial farside line, the team moves toward the base team while checking for contamination.
- The team to the left of the base vehicle executes the same movement as the team to the right, except its first turn will be to the left.

B-78. While the dismounted box survey technique may sound complicated, it is not difficult to execute. The reconnaissance unit leader must receive continuous reports from the other teams on their positive or negative findings. After reviewing these reports, the CBRN reconnaissance unit leader plots the findings to determine the contamination layout. When the CBRN reconnaissance unit leader is satisfied that the limits of the contamination have been determined, the unit locates the best route to bypass the contamination. Warning markers are erected around the contamination and along trails that lead into the contaminated area so that the bypass route is clearly marked.

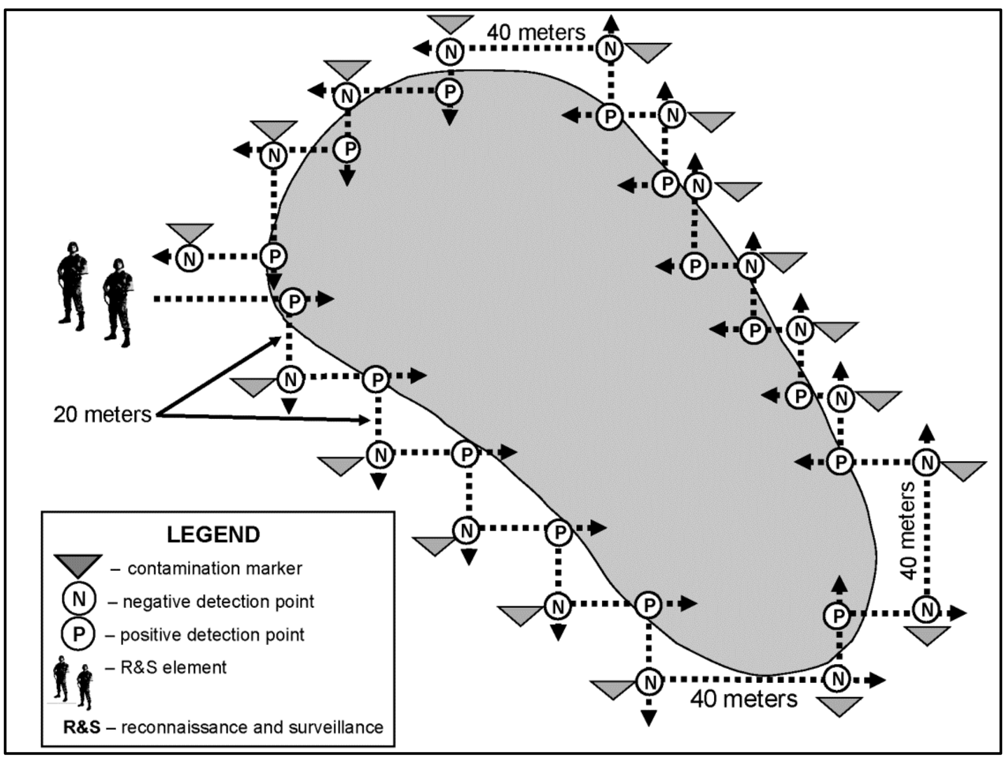


Figure B-16. Dismounted box survey technique

STAR

B-79. The dismounted star survey technique (see figure B-17) is a quick way to determine the rough limits of a contaminated area. The following are dismounted star survey technique procedures:

- The CBRN R&S element that encounters the contamination moves back from the contaminated area 50 meters from the initial positive reading. (This point is the base of the star.)
- The CBRN R&S element posts a warning marker and proceeds forward to find the far side, detecting every 50 meters until no contamination is detected.
- The CBRN R&S element proceeds another 50 meters, checks again so that no contamination is detected, and posts a warning marker.
- This ends the first leg of the star.
- The element turns about 135 degrees and travels in that direction, detecting every 50 meters.
- If no contamination is detected on this leg, the element does not travel any longer than the length of the initial leg.
- The element repeats this process until it arrives at or near the base of the star.
- This technique can be used by two or more elements to obtain more detecting points, increasing the accuracy of the survey.

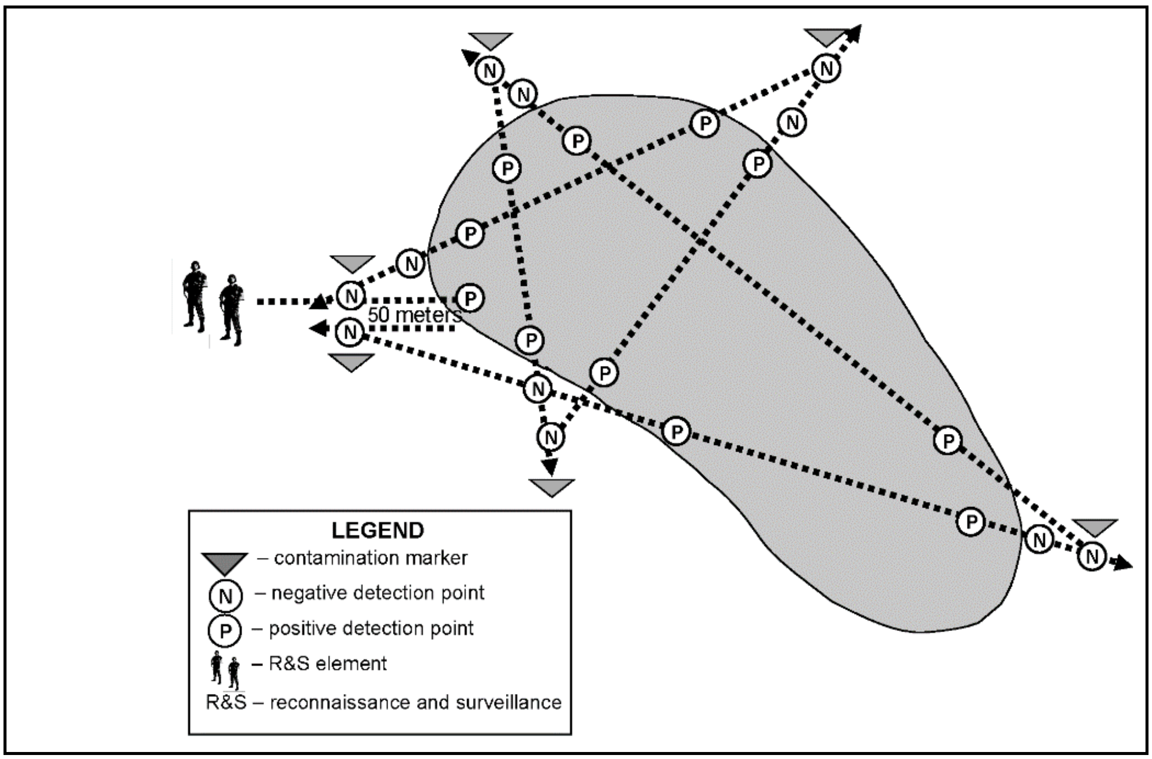


Figure B-17. Dismounted star survey technique

BOUNCE-AND-BYPASS

B-80. The bounce-and-bypass dismounted survey technique (see figure B-18) is used to locate the general boundaries of a CBRN contaminated area. The following are procedures for the dismounted bounce-and-bypass survey technique:

- The CBRN R&S element stops and checks for contamination in their immediate areas.
- If no contamination is detected, the CBRN R&S element proceeds forward, checking for contamination every 50 meters.
- When contamination is detected, the CBRN R&S element proceeds out of the contaminated area, checks for contamination every 50 meters, and places a CBRN marker 50 meters after no contamination is detected.
- The CBRN R&S element then turns in the cardinal direction toward the contaminated area, checking for contamination every 50 meters until contamination is detected again.
- Once contamination is detected, the CBRN R&S element proceeds out of the contaminated area and places a CBRN marker 50 meters after no contamination is detected.
- This process continues until no contamination is detected.
- The CBRN R&S element reports the results, normally by using a CBRN 4 report.
- The CBRN R&S element coordinates for decontamination and medical support, as required.

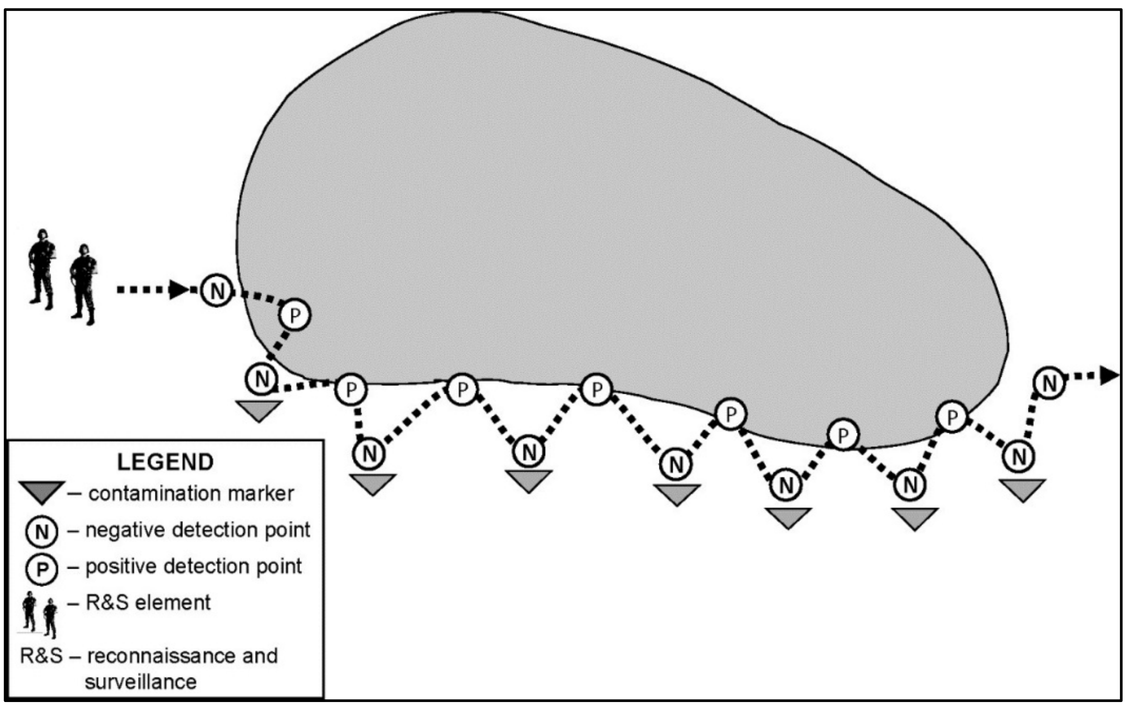


Figure B-18. Dismounted bounce-and-bypass technique

COURSE LEG

B-81. The course leg technique (see figure B-19) is used to find the extent and intensity of radiological contamination. The CBRN R&S element moves between two checkpoints; for example, from point A (the top of a hill) to point B (the top of another hill). Readings are taken at given intervals along the route between the two checkpoints. When conducting a dismounted radiological course leg, the element must be given a turn-back dose and a turn-back dose rate. Reporting the results of dismounted course leg techniques may be done in various ways. Normally, a survey data sheet (DD Form 3038) can be filled out and turned in to the tasking headquarters at the end of the mission, or the data can be sent via a CBRN 4 report. The following procedures outline the course leg technique:

- The CBRN R&S element reads the survey meter and records the dose rate at the start point of the course leg.
- The CBRN R&S element reads the survey meter and records the dose rate at each preselected interval along the course leg. Under no circumstances should the element continue further into a contaminated area if it reaches its turn-back dose or turn-back dose rate.
- The CBRN R&S element reads the survey meter and records the dose rate at the end point of the course leg.
- The CBRN R&S element reports the results, normally by using a CBRN 4 report.
- The CBRN R&S element coordinates for decontamination and medical support, as required.
- The CBRN R&S element rechecks and zeros the RADIAC meter before each course leg to ensure proper operation.

Note. Conducting dismounted radiological course legs versus mounted or aerial radiological course legs results in higher radiation doses to personnel. Further guidance on the radiological aspect of conducting a course leg technique can be found in TM 3-11.32/MCRP 10-10E.5/NTRP 3-11.25/AFTTP 3-2.56.

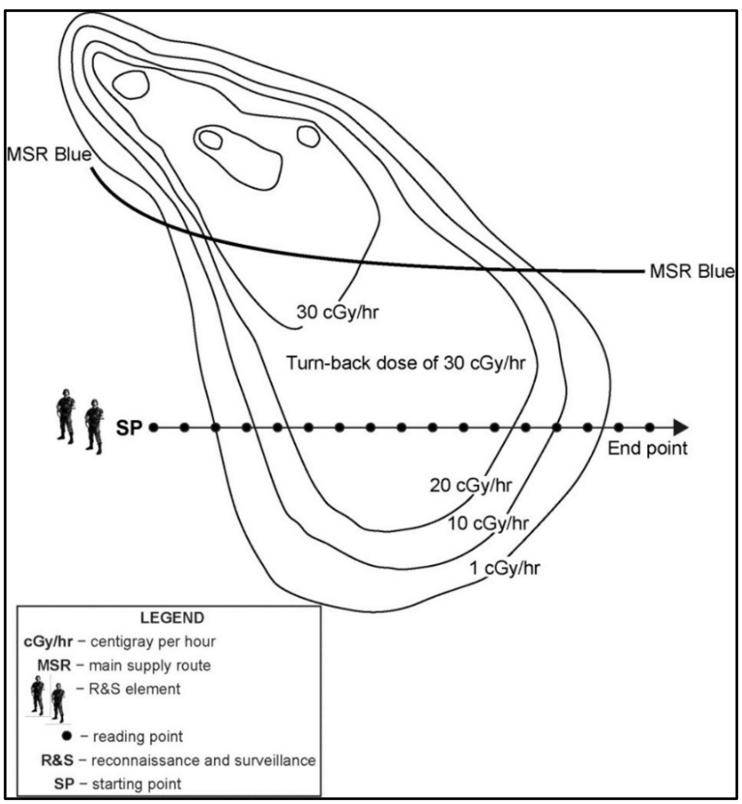


Figure B-19. Dismounted course leg technique

PRESELECTED DOSE RATE

B-82. The dismounted R&S element looks for a given dose rate or multiple given dose rates designated by the commander. This technique (see figure B-20) is used for old contamination and neutron-induced radiation. For old contamination that is greater than the time of attack (for example, H+48), the CBRN R&S element moves along a route or designated straight line in an area until it finds 1 centigray per hour and/or its designated dose rates. When conducting a dismounted radiological preselected dose rate technique, the element must be given OEG, which includes a turn-back dose and turn-back dose rate. Reporting the results of dismounted preselected dose rate techniques may be done in various ways. Normally, a survey data sheet (DD Form 3038) can be filled out and turned in to the tasking headquarters at the end of the mission, or the data can be sent via a CBRN 4 report. The following procedures outline and illustrate the preselected dose rate technique (see figure B-20, page B-28):

- The CBRN R&S element departs its start point and constantly monitors the survey meter while moving along its designated route. Under no circumstances should the element continue further into a contaminated area if it reaches its turn-back dose or turn-back dose rate.
- Upon locating a reading of 1 centigray and/or its designated dose rates, the CBRN R&S element records the dose rate and drops a radiological marker, if directed.
- The CBRN R&S element records its final reading upon reaching the end point of its route, its highest preselected dose rate, or the turn-back dose rate.
- The CBRN R&S element reports the results, normally by using a CBRN 4 report.
- The CBRN R&S element reports personnel exposure to its command for recording and annotation in their medical records.
- The CBRN R&S element coordinates for decontamination and medical support, as required.
- The CBRN R&S element rechecks and zeros the RADIAC meter before each mission to ensure proper operation.

Note. Conducting dismounted radiological preselected dose rate missions (versus mounted or aerial radiological preselected dose rate missions) results in higher radiation doses to personnel. Further guidance on the radiological aspects of conducting a preselected dose rate technique can be found in TM 3-11.32/MCRP 10-10E.5/NTRP 3-11.25/AFTTP 3-2.56.

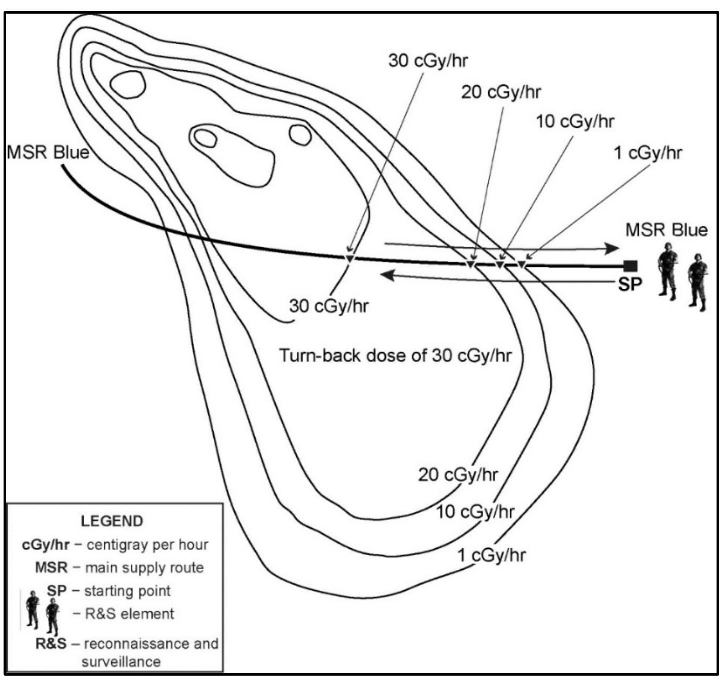


Figure B-20. Sample preselected dose rate technique

DISMOUNTED CBRN SURVEILLANCE

B-83. Dismounted CBRN surveillance operations are generally conducted in the same manner as mounted operations. Although the term dismounted defines this section, there will be times when the CBRN R&S element uses vehicles to get to or near the location at which the dismounted CBRN surveillance operations take place. Consideration must be given to the mode of travel, OP selection, sustainment and relief, security, and follow-on mission of CBRN surveillance operations.

B-84. Generally, a dismounted CBRN surveillance operation requires the CBRN R&S element to travel on foot to conduct operations. This is due to the close proximity of the area, buildings, roads, or personnel that the surveillance operation is targeting and to the METT-TC/METT-T factors that are favorable for the operation. When the CBRN surveillance operation is located at distances too far to travel on foot, another mode of transportation is used. Based on METT-TC/METT-T factors, the CBRN R&S element may travel by land vehicles, amphibious craft, or aircraft such as helicopters. When traveling by watercraft or airframe, the CBRN R&S element is dropped off at a predesignated location and then travels by foot from the drop-off point to the specified location. In that case, the need to protect and possibly conceal a vehicle is not an issue. However, when the CBRN R&S element is not being dropped off, vehicle safety and concealment must be considered. Additional considerations include—

- Providing additional security for vehicles.
- Taking caution to not be heard or seen by the adversary or others who may communicate arrival to the adversary.
- Dismounting at distances that will not alert the adversary to the arrival of the CBRN R&S element.
- Being compromised by civilians in the mission area.

B-85. CBRN surveillance provides observation of a specific area for indications of a CBRN incident. Based on JIPOE/IPB and vulnerability planning, these designated areas are typically NAIs. The commander prioritizes the use of available CBRN R&S elements against designated NAIs. The CBRN R&S elements monitor, watch, and listen to areas for indications of a CBRN incident. Surveillance may be conducted from OPs—positions occupied to observe a designated area. The CBRN R&S element occupying the OP reports indications of a CBRN incident or adversary activity. Surveillance may also be conducted by routine patrols through the operational area. This type of surveillance is normally conducted in rear areas along main supply routes (MSRs) and road networks.

SUPPORT AREAS

B-86. The areas of greatest vulnerability that require increased CBRN surveillance are large, fixed sites (for example, ports of debarkation); staging and marshaling areas; hubs; bases, assembly areas; MSRs; and sites involved in early force buildup activities, such as—

- **APODs**. Aerial port of debarkation fixed sites may be targeted to disrupt or inhibit U.S. military deployments. Because it is unlikely that the operational areas of an aerial port of debarkation will be contaminated at any one time, it is particularly important that the commander know the locations of hazard areas, working and parking area requirements, and the availability of runways and taxiways.
- **SPODs.** SPODs may also be attractive targets for CBRN attacks. CBRN attacks may result in the contamination of some operating surfaces, but the size of the contaminated area may be small compared to the size of the port. Conducting area reconnaissance at facilities within the port is important to sustaining throughput operations.
- **Gap crossing sites.** Gap crossing sites and the far and near sides of obstacles are viable targets for CBRN attacks due to their ability for the enemy to employ CBRN to isolate one portion of the force from another. The enemy can then defeat friendly forces in detail. CBRN R&S, particularly in a surveillance role, is used near these sites to provide rapid hazard identification and mitigation strategies that support engineer and sustainment operations, with the intent of reestablishment of ground lines of communication.

Observation Post Site Selection

B-87. The supported unit leader or the CBRN R&S element leader selects the general location for the OP. The leader considers METT-TC/METT-T factors and the information collection plan when determining the general positioning of the OP site.

Location Surveillance

B-88. Reconnaissance is the first step in location selection. Begin with a map reconnaissance. Use the map reconnaissance to determine initial surveillance areas that support the employment tactic; and then select primary, alternate, and supplemental surveillance locations within each surveillance area. Some rules of thumb for the CBRN surveillance include the following:

- Reconnoiter the detection areas and potential locations firsthand, if possible.
- Coordinate with the terrain owner before conducting the surveillance operation.
- Ensure that the CBRN R&S element includes the designated serial leaders.
- Select the location that provides the greatest concealment.

DISMOUNTED OBSERVE TASK

B-89. The CBRN surveillance task of observing is accomplished by two techniques—critical node and area array. Figure 5-5, page 5-13, and figure 5-6, page 5-14, depict what these two techniques look like using graphic control measures.

Critical Node

B-90. In support areas, dismounted CBRN R&S elements may be assigned CBRN surveillance missions to observe designated areas for CBRN incidents. MSRs and areas to be occupied by logistics and mission command/C2 facilities may also be checked for CBRN threats/hazards before their occupation. The following are critical-node technique procedures:

- Occupy observation points to overwatch the designated NAIs.
- Report all indications of a CBRN incident.
- Employ monitoring capabilities at NAIs, such as large sustainment areas, gap crossing sites, or on the far or near side of obstacles.
- Operate and perform operator maintenance on CBRN monitoring equipment.
- Conduct CBRN monitoring operations with multiple capabilities, providing redundant coverage.
- Provide data for the completion of CBRN reports.

B-91. The primary means of surveillance may be from OPs. An OP is a position occupied to observe a designated area. The mounted CBRN R&S element reports any indication of a CBRN incident or adversary activity. Another means of mounted CBRN surveillance is conducting routine patrols through the operational area. This is normally conducted in support areas along MSRs and road networks.

Area Array

B-92. An area array is established in order to maximize the probability of CBRN hazard detection over a large area of interest. The primary objective is to detect a hazard upwind of the operational area of concern and to provide the greatest potential warning to those in the hazard area. The specific architecture of the array is designed by the CBRN staff in close coordination with operations, intelligence and medical staffs. The following are procedures for conducting the area array observation technique:

- Consider the enemy situation, terrain, weather conditions, performance characteristics, and quantity of CBRN detector assets.
- Determine the appropriate separation distances between CBRN detectors.
- Operate and perform operator maintenance on CBRN monitoring equipment.
- Report all indications of a CBRN incident.
- Conduct CBRN monitoring operations.

DISMOUNTED MONITOR TASK

B-93. The CBRN surveillance task of monitoring is accomplished by two techniques─periodic and continuous. Following a CBRN incident, the periodic monitoring technique may be utilized over an extended period to determine whether hazardous effects remain in the area. The continuous monitoring technique is accomplished by employing CBRN detector assets uninterrupted over the duration of the monitoring operations.

- **Periodic.** As the name implies, periodic monitoring is accomplished by employing CBRN detector assets at predetermined intervals of time. Before an incident, the time between monitoring is based primarily on the threat assessment. When intelligence estimates deem that there is a reduced likelihood of a CBRN incident, the commander is more apt to call for periodic monitoring of the area of concern. In doing so, CBRN resources (equipment and personnel) are conserved and power consumption (fuel and batteries) is reduced.
- **Continuous.** Similar to periodic monitoring, the threat assessment is the prime factor in deciding to apply the continuous monitoring technique. When an incident is anticipated, continuous monitoring provides the greatest opportunity for warning the area of concern of impending hazardous conditions. During and immediately following a CBRN incident, the continuous monitoring technique is employed to note either the dissipation or proliferation of the hazard area and to estimate the duration of CBRN effects. Continuous monitoring places a much heavier burden on personnel (operators and maintainers) and logistics (detectors, batteries, fuel). These factors should be considered and adequately coordinated throughout the staff.

Appendix C

Mounted CBRN Reconnaissance and Surveillance

This appendix provides guidance and doctrinal recommendations for the execution of mounted CBRN R&S operations.

OVERVIEW

C-1. The CBRN R&S element must understand the tactical, operational, strategic mission, and end states. This understanding provides the R&S leader the background to recognize how the assigned information collection efforts fit into the CCIR. The CBRN R&S element must focus on the information the commander has deemed priority. Army CBRN R&S elements that integrate with other maneuver elements for security missions must be familiar with ATP 3-20.98, which provides specific guidance for tactical actions on contact with enemy forces. To integrate effectively with maneuver forces, habitual training relationships should be established before combat so that CBRN R&S elements can execute battle drills and maneuver in coordination with combat arms elements.

C-2. The mobility of mounted CBRN R&S elements makes them most effective in conducting zone, area, and route reconnaissance. Mounted CBRN R&S elements may also conduct point and area surveillance, but their use in surveillance does not capitalize on their mobility and protection from enemy fires. Some of the dismounted CBRN R&S methods and techniques disclosed in appendix B may be applied to mounted CBRN R&S operations, but at great expense to the mounted asset's advantages. Mounted CBRN R&S maximizes the mobility, protection, and speed at the expense of more definitive analytics and ease of sampling. Mounted CBRN R&S has the mobility to keep pace with maneuver forces along major frontages and to rapidly shift reconnaissance capabilities from one position to another. When given the mission, it is imperative that the CBRN R&S element fully understands the type of unit and mission it is supporting and the tasks associated with it. Mounted CBRN R&S elements may be attached to cavalry, armored, and infantry formations to provide early warning of enemy CBRN threats during security operations. To effectively execute mounted CBRN reconnaissance, they must understand the reconnaissance objective and how to use the full breadth of capabilities to answer information requirements. A thorough task analysis is imperative when planning mounted CBRN R&S operations.

C-3. Cavalry squadrons and armored or infantry battalions request mounted CBRN R&S support through their higher headquarters when staff analysis templates CBRN attacks by the enemy to block, disrupt, fix, or deny key terrain to friendly forces. The staff may also determine that the WMD-launching transporter erector launcher, multiple rocket launchers, or enemy CBRN units in the AO may contaminate significant maneuver areas when destroyed. Mounted CBRN R&S elements allow the maneuver commander to quickly confirm or deny CBRN presence at pace with the force and allow the commander to exploit opportunities where the enemy perceives a situational advantage. Mounted CBRN R&S capabilities execute missions in the deep and close areas where maneuver forces seek to retain the initiative, especially in offensive operations.

C-4. A key factor in mounted CBRN R&S execution is the time available to conduct the mission. The commander must recognize that there is increased risk to the R&S element and the main body when the pace of the reconnaissance is accelerated. Speed and momentum are typically critical to the successful execution of operations that the CBRN reconnaissance mission may support. Commanders must know when to employ mounted CBRN R&S over dismounted reconnaissance based on task-organized assets and the advantages and disadvantages of either asset. Mounted CBRN reconnaissance provides the tactical commander the ability to retain operational tempo.

C-5. The key tasks for mounted CBRN reconnaissance are detect, locate, identify, survey, sample, mark, and report. (Detailed information on sample collection is located in Appendix F; additional information on reporting and marking is located in Chapter 7.)

C-6. The commander considers the factors of METT-TC/METT-T to determine whether to conduct mounted reconnaissance. A mounted reconnaissance operation is conducted when—

- Operational tempo and time constraints based on METT-TC/METT-T are required for immediate tactical decisions. Mounted CBRN R&S provides rapid information about contamination to the maneuver commanders to adjust their plan based on presumptive identification (supporting immediate tactical decisions).
- Sample collection and site exploitation are not a priority. Although the mounted CBRN R&S asset has the capability to conduct sampling, a determination needs to be made on whether this is priority to support the immediate tactical needs of the JFC.
- The required reconnaissance is not constrained by terrain, such as dense urban terrain or subterranean environments.
- Terrain is relatively open (for example, the roadways or axis is capable of sustaining the type and weight of the vehicle used for the reconnaissance).
- Environmental conditions permit this type of reconnaissance. (Deep snow and muddy terrain greatly hinder mounted reconnaissance.)

ADVANTAGES

C-7. The following are advantages of mounted CBRN R&S:

- **Speed.** When time is limited, conducting the reconnaissance mission mounted without exiting the vehicle provides the commander faster feedback and the capability to cover large areas. Vehicles offer increased mobility in open terrain. Mounted reconnaissance may be conducted in high-mobility, multipurpose wheeled vehicles or nuclear, biological, and chemical reconnaissance vehicles. Remaining mounted allows the R&S element to conduct detailed CBRN reconnaissance at a speed greater than dismounted CBRN R&S could achieve.
- **Protection.** Vehicles provide the R&S element additional protection from CBRN and conventional hazards. These advantages depend on the specific vehicle employed. Reconnaissance vehicles may include the following:
  - Armor protection.
  - Enhanced navigation and communications capability.
  - Enhanced optics providing stand-off detection before entering contamination.
  - Firepower to defeat light-skinned armor vehicles and some infantry fighting vehicles.
  - Vehicle collective protection.
  - Meteorological data.

DISADVANTAGES

C-8. The following are disadvantages of mounted CBRN R&S:

- Loss of stealth due to the visual, noise, and thermal signatures of vehicles.
- Loss of accuracy to pinpoint actual contamination.
- Higher probability of false positives.
- Higher probability of false negatives.
- Decontamination requirements for personnel and vehicles.
- CBRN reconnaissance vehicles are often not equipped with dismounted reconnaissance capabilities for buildings or other places not accessible by vehicles.

COORDINATION

C-9. Coordination with other elements is critical to making the mission successful. Capabilities such as security, decontamination, sample transfer (when required) and transport, and communications can all play an important role in the success of a mounted CBRN reconnaissance mission. More information about coordination with security, including link-up points, passage of lines, and other planning requirements, are described in Chapter 4. Coordinate for contingencies, such as encountering hazards (IEDs) and medical evacuation. CBRN R&S crews should also know and understand the personnel recovery escape and evasion plan, casualty evacuation plan, and vehicle recovery plan in case their equipment is disabled in a combat environment.

EQUIPMENT PREPARATION

C-10. Effective identification of key equipment to perform the mounted CBRN reconnaissance mission is critical to the success of the CBRN R&S operation. Examples of equipment preparation considerations include—

- Weapon calibration, lubrication, head space, and timing.
- Ammunition distribution.
- Tie-down vehicle antennas.
- Night-vision system checks.
- Cleaning all optic lenses and sensor detection surfaces.
- Equipment preparation (for example, performing preventive maintenance checks and services on CBRN R&S platforms and calibrations on CBRN sensors).
- Proper and complete protective equipment.
- Air filters for vehicles.
- A sufficient supply of sample collection equipment, assays, detection equipment, and decontamination supplies.
- Adequate medical countermeasures (such as having antidote treatment nerve agent autoinjectors).

C-11. The commander determines if a CBRN R&S element is prepared for its mission. The commander bases the decision to employ the element on the level of acceptable risk. Rarely is an element completely prepared for every aspect of a mission. If any perceived risks that exist are acceptable to the commander, the mission should be executed.

EXECUTING MOUNTED CBRN RECONNAISSANCE OPERATIONS

C-12. During mounted reconnaissance operations, the commander may direct a CBRN R&S element to conduct a route, zone, or area reconnaissance mission. Mounted reconnaissance generally requires more decontamination assets to accomplish operational decontamination. Decontamination can be a resource-intensive operation and is typically conducted in a permissive environment. The aim is to gather information on the actual extent of the contamination to aid commanders in their decisions and to prevent U.S. and allied forces from unknowingly entering the contaminated area. Surveys require applied judgment based on METT-TC/METT-T. The mission, the terrain, and the adversary dictate which survey technique should be used. The detection equipment used to conduct surveys varies based on the CBRN threat or hazard. Equipment and system operating instructions are found in applicable operator, crew service, and technical publications. A complete survey occurs when the entire extent of the contamination has been identified. An incomplete survey occurs when the entire extent of the contamination has not been identified, such as when a survey to find a bypass route is conducted.

C-13. Executing mounted CBRN R&S operations should be conducted in a deliberate and controlled manner to ensure safety and success of the mission. Table C-1, page C-4, provides an example of some procedures associated with executing mounted CBRN R&S operations. These steps are divided into phases for ease in understanding and, eventually, execution.

Note. Not all of the steps and supporting tasks in table C-1 are required in support of CBRN R&S procedures.

Table C-1. Sample mounted CBRN R&S procedures

Step	*Supporting Tasks*
Integrate with Maneuver Units	• Conduct troop-leading procedures. • Conduct tactical movement to supported elements. • Conduct link-up with supported elements. • Integrate with supported unit tactical formation. • Adjust to supported unit communication plan.
Support Maneuver During Decisive Action	• Establish listening posts/observation posts or fighting positions. • Conduct tactical maneuver to engage targets or displace. • Determine engagement areas with interlocking sectors of fire and target reference points. • Coordinate with fire support elements for prepositioned targets in engagement areas. • Coordinate with close air support to defeat enemy elements.
Conduct CBRN Survey	• Identify chemical, biological, radiological, and nuclear contamination. • Locate the general boundaries of the contaminated area. • Mark contaminated areas, and establish bypass routes. • Report information using the CBRN 4 report. • Perform required decontamination.
Conduct Sample Collection (if required)	• Develop a sample collection plan in support of the higher headquarters sample management plan. • Perform sample collection operations. • Evacuate samples and material, if collected.
Conduct Recovery	• Conduct further decontamination, if necessary. • Perform preventive maintenance checks and services. • Reintegrate with the supported maneuver unit.

INTEGRATE WITH MANEUVER UNITS

C-14. Before mounted CBRN R&S operations, the CBRN unit should integrate with the supported maneuver unit. Mounted CBRN R&S supports the offense, defense, and stability operations by increasing the supported force capability of early warning of CBRN attacks and by facilitating rapid decision making by the commander to exploit opportunities in CBRN environments at tempo. Because CBRN units do not own or manage operational areas, mounted CBRN R&S elements must coordinate all activities with the headquarters that manages the operational area in which they conduct missions. This ensures that the mounted CBRN R&S asset is supporting the unit scheme of maneuver and prevents fratricide from friendly fires.

C-15. Integration should begin with the troop-leading procedures as soon as the mounted CBRN R&S leadership receives the mission. Contact and frequent communication with the gaining headquarters are critical to mission success. Before necessary movement to the gaining headquarters, the mounted CBRN R&S leadership should know the route, unit boundaries, radio frequencies, digital communications linkages, enemy disposition in operational areas, friendly unit locations/actions, and link-up points to ensure a successful link-up with the supported unit. When tactical movement is complete and link-up is achieved, the mounted CBRN R&S leadership refine the plan with essential information from the gaining unit.

C-16. The mounted CBRN R&S element, in coordination with the supported unit, identifies the supported commander's intent and desired end state thorough mission analysis. The mounted CBRN R&S element leadership determines the CBRN R&S techniques and tactics that support the commander's desired end state. If time is available, the CBRN R&S leadership should back brief the supported unit commander on how they will support the scheme of maneuver and attend rehearsals of concept drills. If not already completed, the mounted CBRN R&S leadership issues the final order; conducts rehearsals of actions on the objective; and reviews the reconnaissance objective, engagement criteria, communications PACE plan, personnel recovery plan, casualty evacuation, and decontamination plans.

C-17. Throughout maneuvers, the mounted CBRN R&S element may integrate tactical formations with other units. For example, if supporting a cavalry or armored task force, the mounted CBRN R&S element would integrate into their respective tactical formation where they can best provide early warning of CBRN attacks. Examples of integration with maneuver formations are displayed in figures C-5 and C-6, pages C-10 and C-11, and figure C-7, pages C-11. Leader-to-leader cross talk, planning, and rehearsals through battle drills are critical to successful integration. Not every leader understands the capabilities of mounted CBRN elements. It is highly encouraged to provide clarity on the mounted CBRN R&S platforms capabilities, limitations, and best employment tactics to create unity of effort.

C-18. The mounted CBRN R&S element are required to integrate into the supported unit PACE plan; therefore, communication is critical to mission success. The mounted CBRN R&S leadership should have the frequencies and call signs of surrounding units. The CBRN R&S asset should also be synchronized with the maneuver unit communications network to support integration, early warning, and mission agility if the supported commander requires dynamic tasking of the mounted CBRN R&S elements.

Support Maneuver During Decisive Action

C-19. During security operations, mounted CBRN R&S elements use LP/OPs to protect against enemy observation and engagement. The mounted CBRN R&S leadership should identify primary, alternate, and tertiary fighting positions because the unit may be required to move backward to break contact with enemy forces. Egress routes should be established, maximizing cover and concealment from enemy locations during displacement. Maneuver commanders should understand that the employment of mounted CBRN R&S elements is an informed, risk-based decision that may incur the loss of a critical asset if placed in a vulnerable position.

C-20. To support the commander, mounted CBRN R&S elements maximize their capability to maneuver and use the terrain to their advantage. Intervisibility lines, low ground, and cover and concealment are used to minimize the mounted CBRN R&S element signature. Mounted CBRN vehicle crews engage targets from hull defilade positions, using weapons systems to identify and engage enemy systems. Mounted CBRN R&S elements use vegetation and camouflage to break up their silhouette to enemy targeting. Vehicle antennas are tied down to prevent enemy observation in hide positions. The light line delineates where light discipline is enforced, and all elements will begin using night vision systems. Noise discipline is also mitigated using short count procedures during the start-up and shutdown of vehicle engines. Radio and electronic communications are minimized to prevent enemy identification. CBRN R&S leadership may communicate using hand and arm signals or flag systems to minimize electronic signatures.

C-21. Supported maneuver elements and mounted CBRN R&S elements should cross coordinate engagement areas with interlocking sectors of fire and target reference points. Mounted CBRN R&S units fight in tandem with, and complementary to, other maneuver forces. To maintain security, CBRN R&S capabilities execute missions within the maximum effective range (supporting range) of adjacent maneuver elements. Mounted CBRN R&S leaders must also be able to call for fire and coordinate for close air support to protect themselves.

C-22. During offensive operations, mounted CBRN R&S units blend capabilities with maneuver unit formations to screen the flanks of larger maneuver formations, support the decisive operation along an axis of attack, or conduct route reconnaissance along ground lines of communication. Mounted CBRN elements are best placed where the commander anticipates enemy CBRN attacks to deny key terrain. When the enemy force employs CBRN, the mounted CBRN R&S element rapidly develops the commander's hazard awareness and understanding, providing an exploitable route through or around contamination and exposing assailable enemy flanks. Mounted CBRN reconnaissance forces are also capable of conducting small-scale offensive tasks against Level II threats (small tactical units) and nonarmored bypassed forces in rear areas.

C-23. In the defense, mounted CBRN reconnaissance forces can conduct limited defensive tasks to provide early warning of enemy attacks, fight to gain time, and provide bypass routes to maintain force sustainment. During defensive operations, mounted CBRN R&S elements maximize stand-off distances, engaging enemy formations to bait them into friendly engagement areas. When the engaged enemy formation is lured into the engagement area, armor, cavalry, and infantry forces defeat the enemy.

C-24. Throughout decisive action, mounted CBRN reconnaissance elements in LPs/OPs detect the enemy and use fire support channels to direct engagement of the enemy at maximum range. This helps the unit at the LP/OP avoid detection and prevents the enemy from penetrating screen lines. As part of the security force, mounted CBRN R&S elements must be able to call for fire support and close air support to defeat enemy assets.

CONDUCT CBRN SURVEY

C-25. During potential CBRN attacks, mounted CBRN R&S capabilities provide an idea of where CBRN contamination may be based on staff-generated, projected downwind hazard plumes and existing warning and reporting data. Conducting an area reconnaissance and survey of detected contamination provides the JFC a more realistic hazard awareness and understanding of the extent of contamination.

C-26. The key tasks accomplished during the CBRN survey are listed below in priority order:

- Establish security for the CBRN R&S element.
- Detect and identify CBRN contamination.
- Locate the general boundaries of the contaminated area.
- Place warning markers at specified intervals around the contaminated area and along bypass routes.
- Report information by using the CBRN 4 report.
- Perform necessary decontamination.

C-27. The initial area survey could be a relatively rapid task or a more prolonged task, depending on the size and complexity of the area. Decisions can be made regarding the appropriate level of IPE/PPE for follow-on R&S elements collecting samples or conducting presumptive or field confirmatory identification.

C-28. During the CBRN survey, the mounted CBRN R&S element uses the survey techniques described in paragraph C-56 and marks the contaminated area according to unit SOPs. Markings should clearly delineate contaminated terrain from uncontaminated terrain and should be recognizable for other units while in IPE and overpressure. Marking contaminated grid locations (via a Global Positioning System) and potential bypass routes should be communicated to the supported commander. The CBRN 4 report format described in TM 3-11.32/MCRP 10-10E.5/NTTP 3-11.25/AFTTP 3-2.56 should be used to communicate the extent of contamination and bypass criteria.

C-29. If the situation is permissive and the CBRN R&S element is supported by a decontamination unit, a decontamination operation should be undertaken based on the extent of contamination on the vehicles. This limits the possible spread of contamination and negates the need for further decontamination operations.

CONDUCT SAMPLE COLLECTION (IF REQUIRED)

C-30. The mounted CBRN R&S element conducts sampling operations, as required. For more information on sample collection, refer to Chapter 6 of this manual.

RECOVERY

C-31. Upon completion of sampling operations, the mounted CBRN R&S element conducts decontamination operations to the extent required to minimize the risk of spreading contamination while balancing the tactical risk of enemy forces in the vicinity. CBRN R&S forces may displace to a secured fighting position before decontamination or may even be withdrawn from forward positions to undertake thorough decontamination operations, if necessary. It is important that the CBRN R&S leader communicate the hazard to friendly forces if the CBRN R&S element is suspected to be contaminated. The CBRN R&S element may also have to find a nonprimary, dirty route to take that mitigates the spread of contamination.

C-32. When required decontamination is complete, the CBRN R&S element may proceed to an assembly area and conduct postoperation preventive maintenance check and services. Upon completion of reconstitution and rearming, the mounted CBRN R&S element notifies the supported commander of their status and reintegrates with maneuver elements, as required.

MOUNTED CBRN RECONNAISSANCE TACTICAL FORMATIONS

C-33. The CBRN R&S element uses the most standard movement formations and techniques, consistent with ATP 3-20.98, to conduct tactical maneuver. Once at the mission area, the R&S element selects the appropriate CBRN survey technique (such as box or star) to perform its mission. CBRN reconnaissance leaders must exercise C2, maximize the use of terrain, and apply the following fundamentals of movement:

- Move on covered and concealed routes.
- Do not move directly forward from covered and concealed positions.
- Avoid likely ambush sites and other danger areas.
- Enforce camouflage, noise, and light discipline.
- Maintain all-around security, including air guards.
- Use terrain for protection.
- Avoid possible kill zones.
- Maximize vehicle capabilities, such as collective protection and standoff detections systems.

C-34. The flexible mounted reconnaissance platoon formations are: line, Vee, column, staggered column, wedge, echelon (left or right), coil, and herringbone. The selection of a ground movement technique is primarily based on terrain considerations and the likelihood of adversary contact. In large-scale ground combat, CBRN R&S elements integrate for security with larger combat arms formations. The CBRN R&S element mutually supports the task force or company team, providing early warning and facilitating immediate tactical decisions in a contested CBRN environment. The following tactical ground movement techniques provide a standard method of movement, but the CBRN R&S element must use unit SOPs and common sense in employing these techniques as they perform their missions and encounter different situations. The following rules apply to military personnel on foot and/or to vehicle crews using terrain for protection:

- Do not silhouette against the skyline; use intervisibility lines to conceal maneuver.
- Cross open areas quickly, with overwatch provided from other security elements.
- Maximize the use of cover and concealment; use low ground, prepared fighting positions, and secured routes as much as possible.
- Do not move directly forward from a concealed firing position.
- Avoid possible enemy engagement areas because it is easier to cross difficult terrain than fight the adversary on unfavorable terms.
- Avoid large, open areas, especially when they are dominated by high ground or by terrain that can cover and conceal the adversary.
- Use countermeasures, such as smoke and direct and indirect fire, to suppress or obscure suspected adversary positions.

C-35. Regardless of which technique is used, the leader provides the CBRN R&S element an order explaining what each member of the element will do. This becomes more critical as the likelihood of adversary contact increases. If possible, the CBRN R&S element leader should provide his element with the following information:

- The adversary situation as he knows or suspects it to be.
- The route or axis to be used and which vehicle will be the lead vehicle.

- The next overwatch position (the objective for the bounding element if an overwatch technique is used).
- What the overwatch does after the bounding element gets to the next position.

LINE

C-36. The line formation (see figure C-1) is applicable to most mounted platoon missions. It allows maximum reconnaissance forward and covers a wider AO. It requires the platoon to have some form of overwatch because vehicles only provide local security.

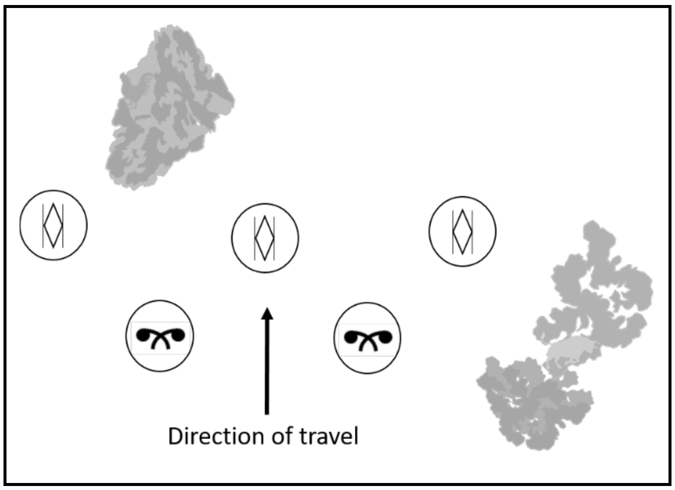


Figure C-1. Line formation

VEE FORMATION

C-37. The Vee formation (see figure C-2) affords good security, speed, and C2. This formation is used when contact is possible, but the unit must maneuver around canalizing terrain (such as hills, heavily wooded areas, and ridges) with speed. The lead of the Vee should be the more armored protected and lethal element, with the R&S element following in support. Both sides of the Vee move along covered and concealed routes for protection. The trail element provides observation of both sides of the Vee, allowing for greater C2 and overwatch of the forward elements. In the event of overwhelming enemy contact, the trail element establishes a base of fire, drawing fire away from the lead element, while the lead Vee element tactically withdraws from enemy engagement capabilities. The trail element of the Vee should always maintain visual contact with the lead element and may stop periodically to observe.

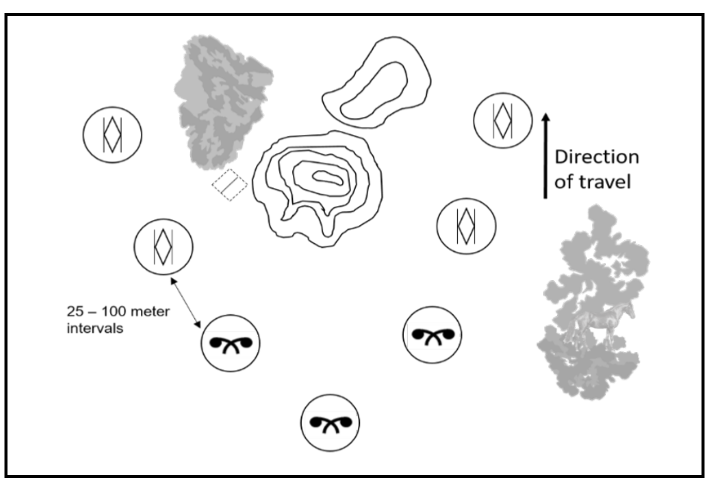


Figure C-2. Vee formation

COLUMN

C-38. The column formation (see figure C-3) is used for rapid movement when time is limited; however, it offers good fields of fire to the flanks but little to the front and rear. This formation is primarily used when no adversary contact is expected and time is critical. The column formation is used for road marches, for reconnaissance movement during limited visibility, and when passing through defiles or other restrictive terrain. The unit can deploy rapidly from the column formation into other formations, and the column formation simplifies control and provides good security.

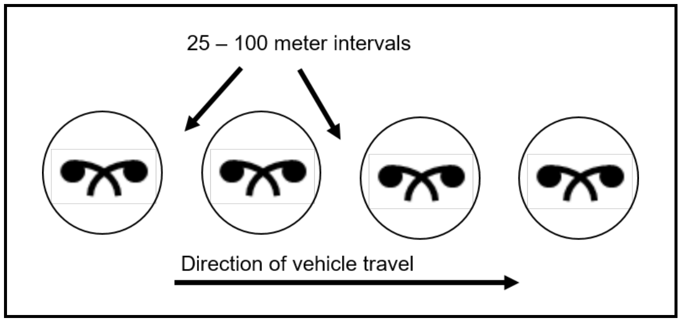


Figure C-3. Column formation

STAGGERED COLUMN

C-39. The staggered column formation (see figure C-4) is used for rapid movement across open terrain. It affords all-round observation and fields of fire. The unit leader positions himself to best control the unit. Reconnaissance vehicles should maintain 25–100 meter intervals and lateral dispersion. Each vehicle commander maintains observation of his designated sector. The exact distance between vehicles depends on METT-TC/METT-T, weather conditions, and visibility.

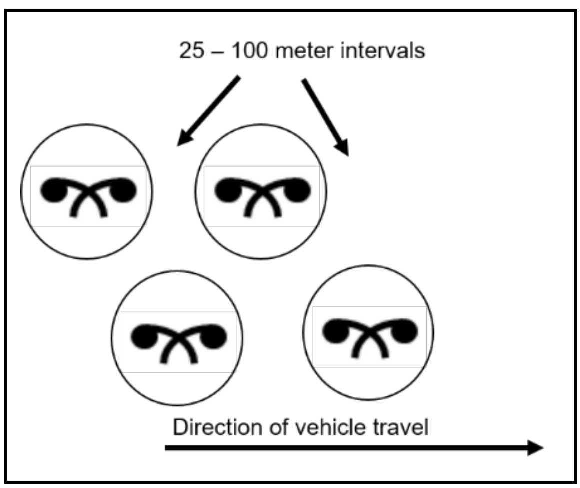


Figure C-4. Staggered column formation

WEDGE

C-40. The wedge formation (see figure C-5) is one of the most frequently used unit movement formations. It maximizes firepower and security forward, allowing for flexibility throughout maneuver. It also facilitates C2, particularly in the offense. Mounted CBRN R&S elements typically integrate with combat arms formations in a wedge to mutually support one another. Vehicle dispersion and intervals depend on METT-TC/METT-T and visibility. When spreading out in open, flat terrain, each vehicle operator must maintain visibility of the vehicle in front of him. Each vehicle maintains observation of predetermined sectors of fire, providing 360-degree security for the entire element. When enemy contact occurs, the lead maneuver force may establish a base of fire. Based on tactical considerations and assumed risk, the CBRN R&S element may support the offensive effort, providing limited firepower forward. A column of wedge formations is used when adversary contact is possible. It is best employed when traveling or when traveling overwatch conditions are warranted.

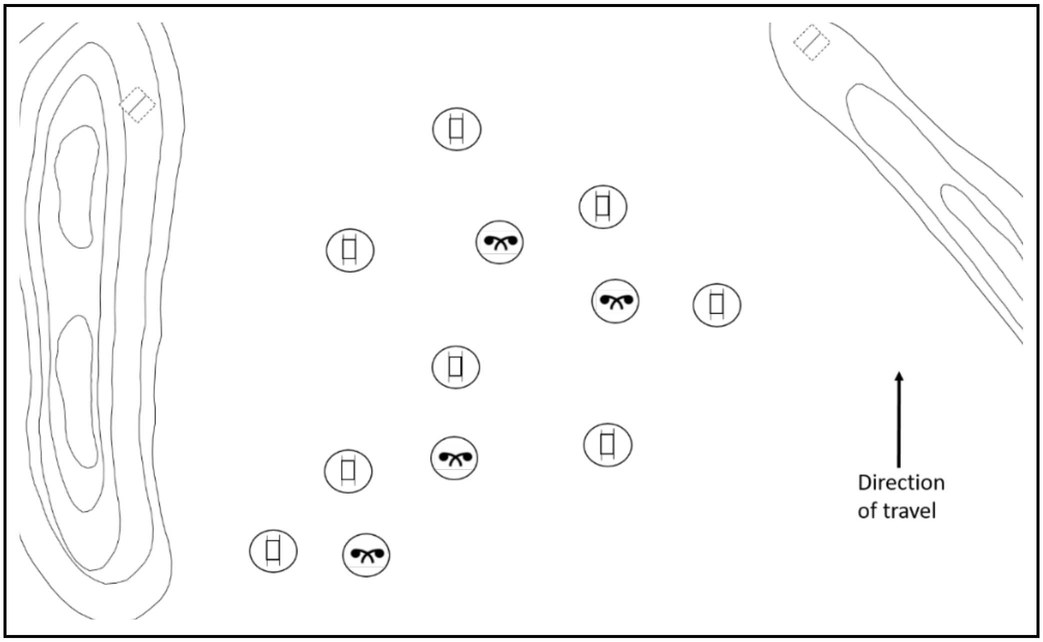


Figure C-5. Wedge formation

ECHELON (LEFT OR RIGHT)

C-41. The echelon formation (see figure C-6) provides coverage of an area. It provides flexibility and speed, but it does not provide sufficient security if adversary contact is possible without integration with another maneuver formation echelon. In figure C-6, the mounted CBRN R&S element is integrated with a platoon of infantry fighting vehicles to provide sufficient protection forward while enabling the CBRN R&S elements to provide early warning of CBRN attacks to adjacent units. Tactical dispersion is typically 25–100 meters, but is METT-TC/METT-T-dependent.

Note. Echelon right mirrors the formation of echelon left.

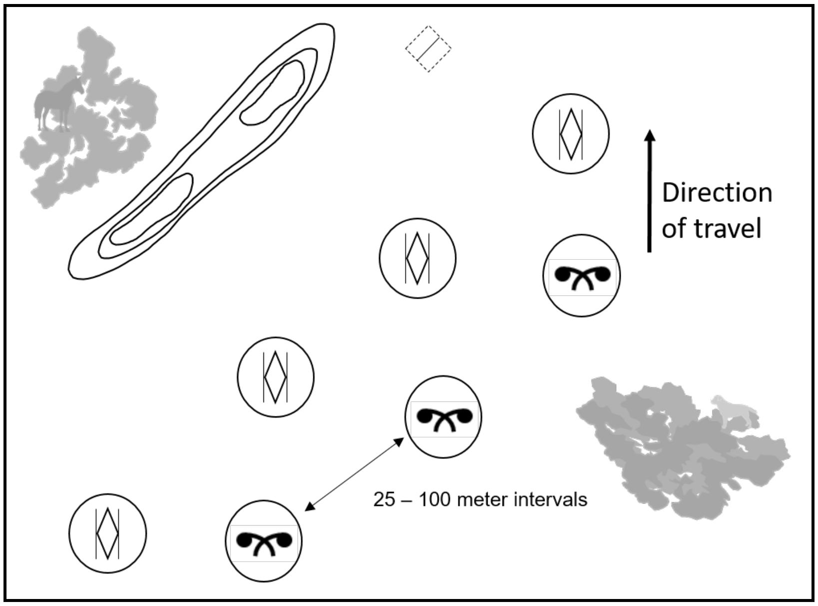


Figure C-6. Echelon left

COIL

C-42. The coil formation (see figure C-7) provides 360-degree security and observation when the mounted CBRN R&S element is stationary. It is useful for tactical refueling and resupply and when issuing element orders. Security, including air guards and dismounted personnel, is posted during the execution of CBRN reconnaissance tasks. The coil formation is used as follows:

- When visibility is limited, the element leader forms the coil. When the coil is complete, all vehicles stop, adjust for cover and concealment, turn 90° outward, and post security.
- During daylight, or when speed is essential, the element leader signals for vehicles to move into position and stop. All vehicles move directly to their assigned positions (as stated in the element SOP), seek cover and concealment, and provide security with interlocking sectors of fire.

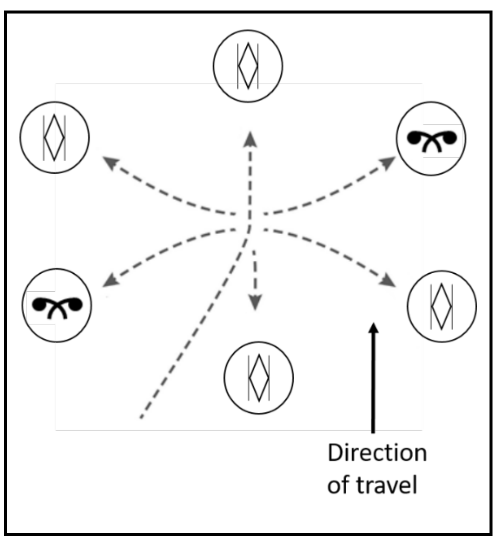


Figure C-7. Coil formation at the halt

HERRINGBONE

C-43. The herringbone formation (see figure C-8) is used to disperse the mounted CBRN R&S element when it is traveling in a column formation. The herringbone formation may be used during air attacks, when the element must stop during movement, or when personnel must dismount to conduct other CBRN reconnaissance tasks. The herringbone formation allows the mounted CBRN R&S element to move to covered and concealed positions from a road or an open area, and it establishes all-around security without requiring detailed instructions. Vehicles are repositioned as necessary to take advantage of the best cover, concealment, and fields of fire.

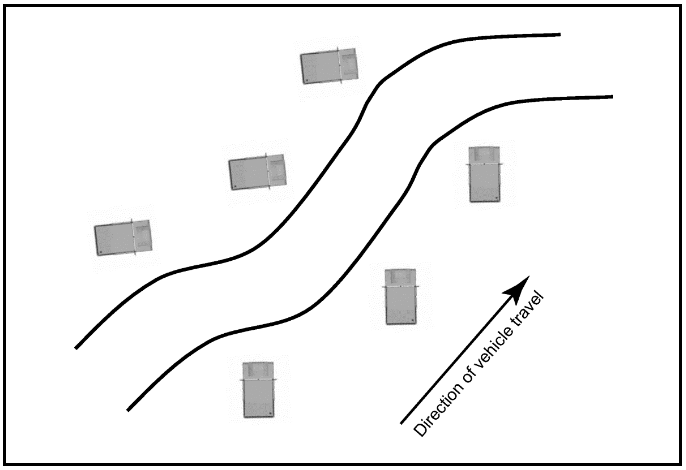


Figure C-8. Herringbone formation at the halt

MOUNTED CBRN RECONNAISSANCE MOVEMENT TECHNIQUES

C-44. In the conduct of most tactical missions, the CBRN R&S element moves under the mission command/C2 of the element leader. The CBRN R&S element may use one of three movement techniques to reach their objective—traveling, traveling overwatch, or bounding overwatch.

C-45. The selection of a movement technique is primarily based on terrain considerations and the likelihood of adversary contact. These techniques provide a standard method of movement, but the CBRN R&S element must use common sense in employing these techniques as they perform their missions and encounter different situations. The following rules apply to military personnel on foot and/or to vehicle crews using terrain for protection:

- Do not silhouette against the skyline.
- Cross open areas quickly.
- Do not move directly forward from a concealed firing position.
- Avoid possible kill zones because it is easier to cross difficult terrain than fight the adversary on unfavorable terms.
- Avoid large, open areas, especially when they are dominated by high ground or by terrain that can cover and conceal the adversary.
- Use active countermeasures, such as smoke or direct and indirect fire, to suppress or obscure suspected adversary positions.

TRAVELING

C-46. The traveling technique is employed when speed is necessary and adversary contact is not likely. The CBRN R&S element moves in a column formation, using the appropriate intervals based on visibility, terrain, and weapons ranges. When using vehicles, the CBRN R&S element moves continuously at a maximum safe speed. When the column stops, vehicles move into a herringbone or coil formation and dismount. The CBRN R&S element moves along covered and concealed routes, automatically contracting and expanding based on terrain and visibility. Local security is maintained according to the element SOP. Each vehicle posts an air guard. The CBRN R&S element leader locates where he can best exercise control.

TRAVELING OVERWATCH

C-47. The traveling overwatch technique is employed when adversary contact is likely (possible). The CBRN R&S element moves in a column formation, using the appropriate intervals and designated lead and trail elements. The trail CBRN R&S element moves continuously, following covered and concealed routes. When using vehicles, the lead element is approximately 50–100 meters ahead of the trail element, depending on terrain and vegetation. The trail CBRN R&S element moves at varying speeds, stopping as required to overwatch the lead element. Visual contact is maintained with the lead CBRN R&S element at all times. The trail CBRN R&S element overwatches at a distance that will allow it to fire or move to support the lead CBRN R&S element, if necessary. In wooded areas or restricted terrain, elements reduce the speed and intervals. In adverse weather conditions, the crew of the lead vehicle dismounts to verify route trafficability and maneuverability, and the trail CBRN R&S element provides overwatch. The CBRN R&S element maintains local security according to the element SOP.

BOUNDING OVERWATCH

C-48. The bounding overwatch technique is employed when adversary contact is expected. The intent of this technique is for the element to deploy before contact, giving it the ability to protect the bounding CBRN R&S element by immediately suppressing an adversary force. Considerations when using bounding overwatch include the following:

- The staggered column formation is the standard movement formation.
- When using the bounding overwatch technique, the overwatch element is assigned sectors to scan. The lead CBRN R&S element bounds forward, following a covered and concealed route.
- The bounding CBRN R&S element should avoid masking the direct fires of the overwatch CBRN R&S element, and it must not move beyond the effective supporting range of the overwatch CBRN R&S element. The bounding CBRN R&S element may be a single element or multiple CBRN R&S elements.
- The overwatching CBRN R&S element covers the progress of the bounding element from covered and concealed positions, offering observation and fields of fire against suspected adversary positions.
- Visual contact is maintained at all times. The length of a bound is based on terrain analysis and the ranges and fields of fire from the overwatching vehicles.
- When cresting a hill, entering an open area, exiting a defile, or moving through restrictive terrain, a crewmember dismounts from the vehicle. He moves forward on foot to a point from which he can observe all suspected and likely adversary firing positions.
- The CBRN R&S element maintains local security according to the element SOP.

C-49. Regardless of which technique is used, the leader gives the CBRN R&S element an order explaining what each member of the element will do. This becomes more critical as the likelihood of adversary contact increases. If possible, the CBRN R&S element leader should provide his element with the following information:

- The adversary situation as he knows or suspects it to be.
- The next overwatch position (the objective for the bounding element).
- The route of the bounding element to that position.
- What the overwatch does after the bounding element gets to the next position.

MOUNTED LOCATE TECHNIQUES

C-50. CBRN locate techniques are conducted to locate suspected or actual CBRN agents or hazards from an attack within the AOR. CBRN locate is conducted on a continuous basis to detect hazards along routes, in areas, or in selected zones or sectors of interest. Locate techniques can use standoff or unmanned capabilities to find contaminated areas. CBRN locate techniques require applied judgment based on METT-TC/METT-T. The terrain and the adversary dictate which technique to use and the level of detail possible. More than one technique may be executed during a single mission.

C-51. The CBRN R&S element chooses the mounted technique best suited to the terrain and mission objectives. Mounted CBRN reconnaissance techniques provide advantages and disadvantages. Table C-2 provides an overview of those advantages and disadvantages.

Table C-2. Mounted CBRN reconnaissance technique advantages and disadvantages

Technique	*Speed and Resource Requirements*	*Limit Contamination Contact*	*Detail of Results*
Zigzag	Fair	Fair	Good
Lane	Fair	Fair	Poor
Cloverleaf	Fair	Fair	Poor
Grid	Poor	Fair	Good
Nearside-farside	Poor	Poor	Good
Box	Poor	Good	Good
Star	Good	Poor	Fair
Bounce-and-bypass	Fair	Good	Fair
Course leg	Good	Good	Good
Preselected dose rate	Good	Good	Good
	Good = Area covered with a low amount of travel, personnel, and detection points	Good = Does not continue through contaminated area	Good = All contamination boundary limits found
	Fair = Area covered with a moderate amount of travel, personnel, and detection points	Fair = Does not return through contaminated area	Fair = Some of the contamination boundary limits found
	Poor = Area covered with a large amount of travel, personnel, and detection points	Poor = Returns through contaminated area	Poor = Contamination only generally located

ZIGZAG

C-52. The zigzag locate technique (see figure C-9) is used to locate contaminated areas during route, zone, or area reconnaissance missions. Depending on the terrain, the distances could be large or small. The zigzag technique may not be appropriate in urban areas. The zigzag locate technique has a higher probability of detecting contamination because the surface area not traversed by the R&S element is less than that of other locate techniques. The following are procedures for the zigzag locate technique:

- At the LD (mission start location), R&S elements come on line 200 meters apart and verify that there is no presence of ground contamination via point monitoring.
- The R&S elements start a parallel course toward the suspected contamination based on METT-T at a 45° angle to the left if the mission begins on the left flank area of concern boundary, or at a 45° angle to the right if the mission begins on the right flank area of concern boundary.
- The R&S elements move 500 meters along the first leg (zig). Upon completion of the first leg, elements turn 90° away from their direction of travel, remain on a parallel course, maintain a 200-meter interval, and complete the second leg (zag).

Note. The length of the zigzag legs can increase or decrease based on METT-T.

- When the R&S elements reach the LOA without finding contamination, both elements stop; the outer element bounds 200 meters around the inner element, toward the area of concern, and stops on line with the inner element at 180° from the inner vehicle's heading. Once the outer element is set in place, the inner element conducts the same bounding procedures. Both elements proceed in their direction of travel, continuing the process until the entire area of concern is covered or contamination is detected.
- Once ground contamination is detected by an R&S element, the other element stops and checks for ground contamination at their current location via point monitoring. The element that detected contamination conducts sample collection as required and sends a CBRN 4 report to higher headquarters.
- The R&S elements transition from the zigzag locate technique to the appropriate survey technique.

Note. Figure C-9 depicts a two-R&S element concept, but the zigzag locate technique can be executed with any number of vehicles based on their availability and the size of the area to be reconnoitered.

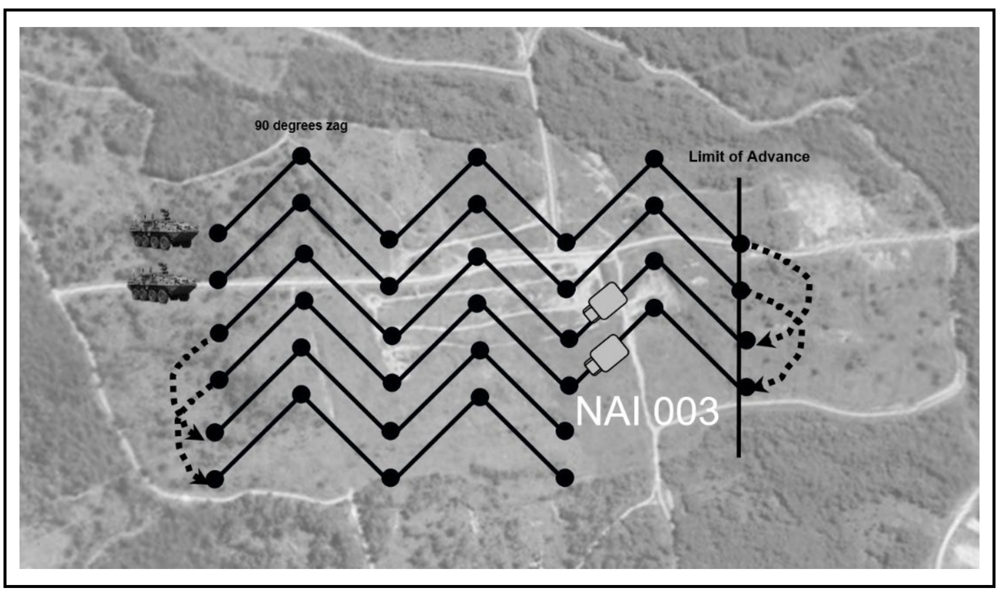


Figure C-9. Zigzag locate technique

LANE

C-53. The lane locate technique (see figure C-10, page C-16) is used to locate contaminated areas. It is very similar to the zigzag locate technique, but it is primarily used during CBRN route reconnaissance missions. It can also be used for area reconnaissance of long, narrow pieces of terrain, such as defiles. The lane locate technique allows the CBRN R&S element to use roadways that are generally parallel. The following are procedures for the lane locate technique:

- At the LD (mission start location), R&S elements come on line 200 meters apart and verify that there is no presence of ground contamination via point monitoring.
- The R&S elements start a parallel course toward the suspected contamination based on METT-T.
- When the R&S elements reach the LOA without finding contamination, both elements stop; the outer element bounds 200 meters around the inner element, toward the area of concern, and stops on line with the inner element facing the original start location (180°). Once the outer element is set in place, the inner element conducts the same bounding procedures. Both elements proceed in their direction of travel, continuing the process until the entire area of concern is covered or contamination is detected.
- Once ground contamination is detected by an R&S element, the other element stops and checks for ground contamination at their current location via point monitoring. The element that detected contamination conducts sample collection as required and then sends a CBRN 4 report to higher headquarters.
- The R&S elements transition from the lane locate technique to the appropriate survey technique.

Note. Figure C-10 depicts a two-R&S element concept, but the zigzag locate technique can be executed with any number of vehicles based on their availability and the size of the area to be reconnoitered.

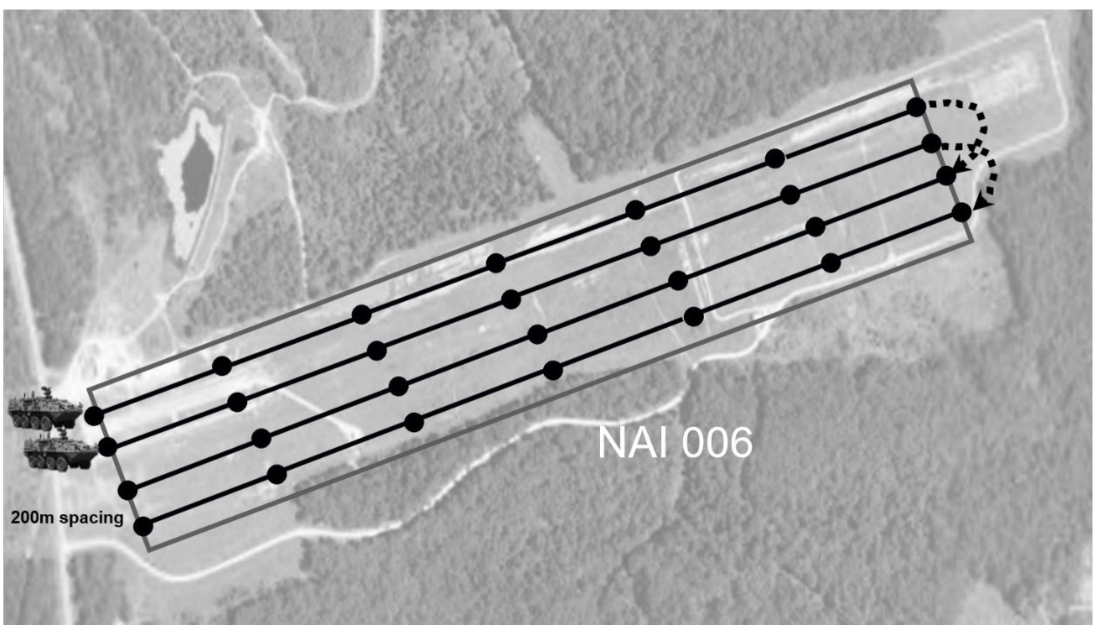


Figure C-10. Lane locate technique

CLOVERLEAF

C-54. The cloverleaf locate technique (see figure C-11) is primarily used in restricted access or terrain or so that sites for high-value facilities (command and control centers) are free of contamination. The cloverleaf locate technique is time-consuming; however, it provides detailed coverage and information about an area. The following are procedures for the cloverleaf locate technique:

- The R&S element begins its cloverleaf at a starting point of the area of concern. This location can be identified by an existing feature (such as a tree, bush, large rock, hill, or structure) or a reference marker placed by the R&S element.
- At the reference start location, the R&S element verifies that there is no presence of ground contamination via point monitoring.
- Using the reference as the center of the figure 8, the element moves in a figure 8 pattern while conducting point monitoring every 50–200 meters, based on METT-T. Once the element completes one figure 8 pattern, it continues to use the reference as the center and conducts a second figure 8 pattern that is perpendicular to the first pattern.
- If the entire area of concern was not covered, the R&S element conducts a subsequent cloverleaf locate technique.
- Once ground contamination is detected by the R&S element via point detection, the element conducts sample collection as required and then sends a CBRN 4 report to higher headquarters.
- The R&S element transitions from the cloverleaf locate technique to the appropriate survey technique.

Note. Figure C-11 depicts one R&S element, but the cloverleaf locate technique can be executed with two elements, with each element conducting one of the figure 8 patterns.

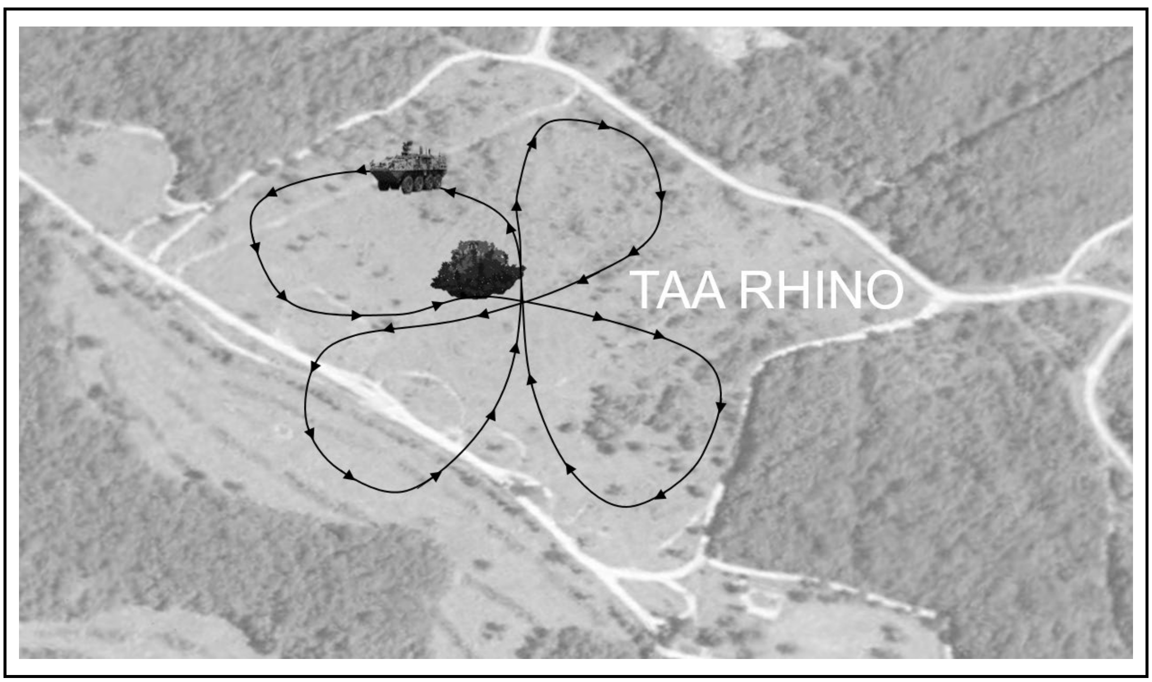


Figure C-11. Cloverleaf locate technique

GRID

C-55. The grid locate technique (see figure C-12) is employed by R&S elements conducting mounted reconnaissance, when accuracy is most important. It is employed by superimposing a grid overlay on a map of an area of concern, which enables rapid communication of detection locations, sample collection locations, and casualty locations. Numbers and/or letters are assigned to each detection location 100–500 meters apart in a uniformed pattern that is associated with predetermined grid locations. The following are procedures for the grid locate technique:

- The R&S elements coordinate grid boundaries and predetermined locations to be assessed for contamination with the supported command.
- The R&S elements conduct point monitoring at numbered/lettered detection locations assigned by the command.
- Once ground contamination is detected via point monitoring, elements conduct sample collection as required and then send CBRN 4 reports to higher headquarters.
- R&S elements notify the command of verified, noncontaminated casualty locations, as required.
- The R&S element transitions from the grid locate technique to the appropriate survey technique.

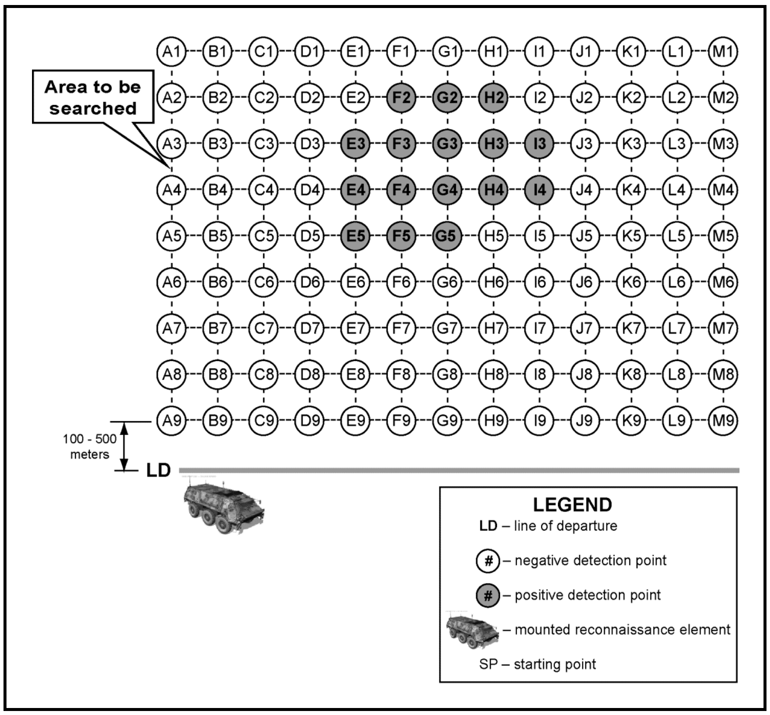


Figure C-12. Grid locate technique

MOUNTED SURVEY TASKS

C-56. CBRN surveys define the boundaries of contaminated areas. CBRN surveys require applied judgment based on METT-TC/METT-T. The mission, terrain, time, and adversary situation indicate the technique that should be used. There are six survey techniques that can be employed once the contamination is located—nearside-farside, box, star, bounce-and-bypass, course leg, and preselected dose rate.

C-57. CBRN survey techniques can be conducted by mounted or dismounted R&S elements. The distances suggested for each technique vary depending on METT-TC/METT-T.

NEARSIDE-FARSIDE

C-58. The nearside-farside survey technique (see figure C-13) is used by R&S elements to quickly determine the nearside and farside boundaries (length/depth) of a contaminated area, but the left and right limits (width) of contamination are not identified. This technique gets the R&S element in and out of the contaminated area in the shortest possible time. Based on command requirements and METT-T, R&S elements can shift to the left or right to determine the left/right side boundaries (width) of a contaminated area. The lateral spacing between R&S elements is important to quickly locate the boundaries of the contaminated area. Once the boundaries are located, clear bypass routes can be easily established. This survey technique is also used to determine the nearside, farside, and adjacent boundaries for routes. The following are procedures for the nearside-farside survey technique:

- The process starts once the R&S element detects the presence of ground contamination.
- Upon detection of ground contamination, the element conducts sample collection as required and then sends a CBRN 4 report to higher headquarters.
- The element backs up 200 meters and checks for ground contamination via point monitoring. If the result is a negative detection, the element backs up another 200 meters and checks for ground contamination via point monitoring.
- If the result is a negative detection, the element drops a CBRN warning marker to indicate the nearside line and then sends a CBRN 4 marker report to higher headquarters.
- The element moves forward and finds the farside of the contamination, checking for ground contamination every 200 meters via point monitoring.
- When the element obtains two consecutive negative detections (400 meters), the element drops a CBRN warning marker to indicate the farside line and then sends a CBRN 4 marker report to higher headquarters.
- The element has completed the nearside-farside survey technique given a requirement to find the left and right boundaries.
- The element determines the left and right boundaries by replicating the same procedures as for the nearside-farside across the width of the area of concern, approaching from either the left or the right side. (METT-T-dependent.)

Note. Figure C-13 depicts a one-element (vehicle) execution. When more than one element is used, spacing between elements is 200 meters, and actions are conducted concurrently.

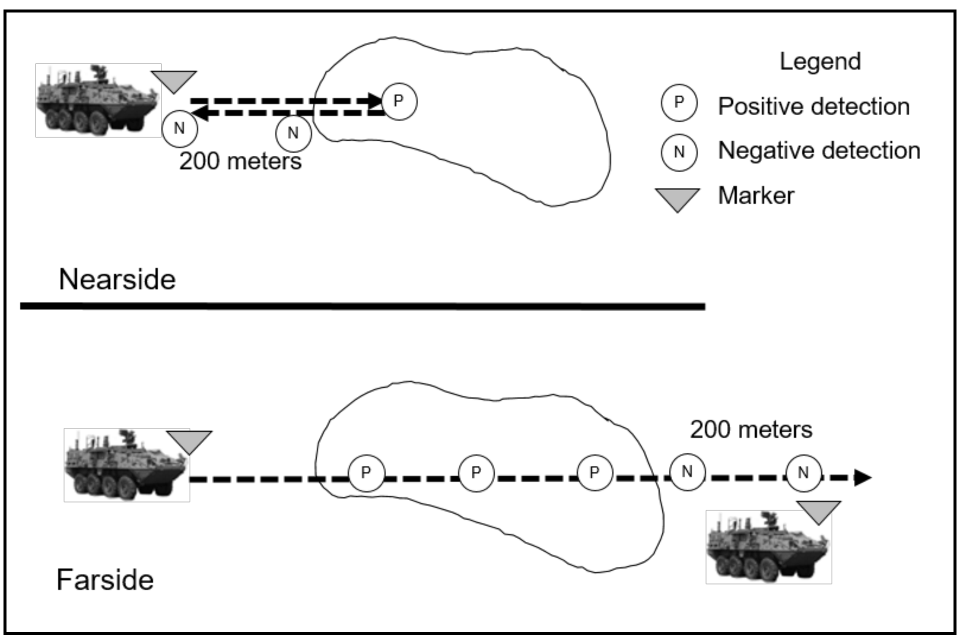


Figure C-13. Nearside-farside survey technique

BOX

C-59. The box survey technique is used to determine the general dimensions (length and width) of a contaminated area and to provide detailed information on the extent of ground contamination, but it is very time-consuming. At the LD (mission start location), R&S elements come on line 200 meters apart and verify that there is no presence of ground contamination via point detection. The R&S elements start a parallel course toward the suspected contamination by using the appropriate location technique (land, zig-zag, grid) based on METT-T. If the length of the reconnaissance area is covered without finding contamination, each R&S element increases the distance between vehicles by 200 meters and then returns toward the original start location. This process continues until the entire area of concern is covered or contamination is detected. Once contamination is detected, the R&S elements transition from the locate technique to the box survey technique.

Three-Element Survey

C-60. Using three vehicles (see figure C-14) requires the least amount of time to complete the survey process (dependent on vehicle availability).

- The process begins once an R&S element detects the presence of ground contamination. When ground contamination is detected by an element, the other two elements stop and check for ground contamination at their current location via point monitoring. The element that detected contamination is the base element.
- The base element conducts sample collection as required and then sends a CBRN 4 report to higher headquarters. If the other two elements did not detect the presence of contamination, they orient 200 meters to the left/right and on line with the base element, as appropriate. If another element detected contamination, they must back out of the contamination prior to orienting to the left/right of the base element.

Notes.

1. Element actions are identified independently, but they are conducted concurrently. Figure C-14 identifies the center element as detecting initial contamination; therefore, they are the base element. The base element, right side element, and left side element procedures describe the actions depicted in figure C-14.

2. Elements drop CBRN warning markers and then send CBRN 4 marker reports to higher headquarters at each negative detection location.

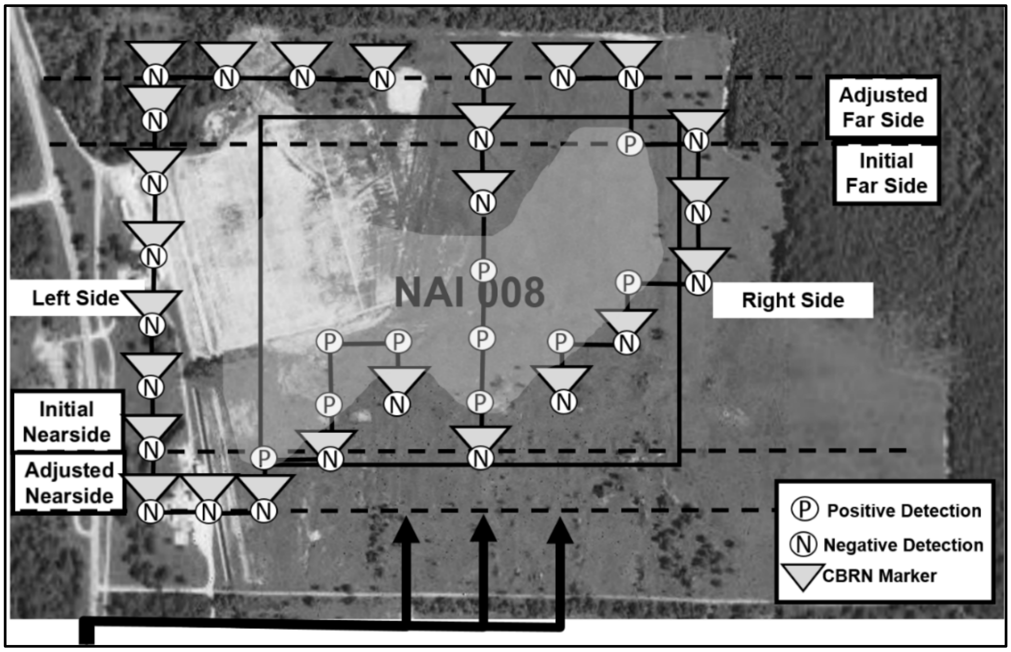


Figure C-14. Box survey technique (three-element survey)

Base Element

C-61. The base element establishes the initial nearside and initial farside lines.

- Upon detection of ground contamination, the element confirms via point monitoring (unless already using this protocol), conducts sample collection as required, and sends a CBRN 4 report to higher headquarters.
- The element backs up 200 meters and checks for ground contamination via point monitoring. If the result is a negative detection, the element drops a CBRN warning marker to indicate the initial nearside line and then sends a CBRN 4 marker report to higher headquarters.
- The element moves forward and finds the farside of the contamination, checking for ground contamination every 200 meters via point monitoring, dropping CBRN warning markers, and sending CBRN 4 marker reports to higher headquarters at each negative detection location. When the element obtains two consecutive negative detections (400 meters), the element drops a CBRN warning marker to indicate the initial farside line, sends a CBRN 4 marker report to higher headquarters, and provides overwatch for the other R&S elements.

Right Side Element

C-62. The element turns right for positive detections or left for negative detections (except for the first CBRN marker drop. The element makes directional left turns toward the contamination. Upon three consecutive negative detections (400 meters), if the element is moving toward the farside, they will not make directional left-hand turns; they will continue forward toward the farside. For consecutive positive detections that direct an element to a previously checked location, the element continues forward in lieu of turning right.

- When the base element detects contamination, the element stops and checks for ground contamination at their current location via point monitoring. (The element may have had to orient to the right of the base element.)
- Upon verification of a negative detection, the element drops a CBRN warning marker, sends a CBRN 4 marker report to higher headquarters, moves forward 200 meters, and checks for ground contamination via point monitoring.
- At this location, the element can either find contamination or not. (Element movement depends on the orientation of the contaminated area; go where the contamination takes the element.)

- Contamination is detected. The element turns 90° to the right, moves 200 meters, and checks for ground contamination via point monitoring.
- Contamination is not detected. The element drops a CBRN warning marker, sends a CBRN 4 marker report to higher headquarters, moves forward 200 meters, and checks for ground contamination via point monitoring.
- Contamination is detected. The element turns 90° to the right, moves 200 meters, and checks for ground contamination via point monitoring.
- Contamination is not detected. The element drops a CBRN warning marker, sends a CBRN 4 marker report to higher headquarters, moves 90° to the left, moves forward 200 meters, and checks for ground contamination via point monitoring.
- While moving toward the farside, as long as the element obtains negative detections within the area of concern, they continue to move forward, checking for ground contamination every 200 meters via point monitoring. The element drops CBRN warning markers and sends CBRN 4 marker reports to higher headquarters at each negative detection location until they reach the initial farside line.
- Once the element has reached the initial farside line, the element turns left toward the base element, continuing to check for ground contamination every 200 meters via point monitoring, dropping CBRN 4 warning markers and sending CBRN 4 marker reports to higher headquarters at each negative detection location until they are within 200 meters of the base element.
- The element detects contamination at any location along the initial farside line. The element turns 90° to the right, moves 200 meters, and checks for ground contamination via point monitoring.
- Contamination is not detected. The element drops a CBRN warning marker, sends a CBRN 4 marker report to higher headquarters, and establishes the adjusted farside line.
- The base element comes on line within 200 meters of the right side element.
- If the element surveys the entirety of the area of concern, the right side LOA is defined and element actions are complete. If there is remaining terrain to survey, the element must continue survey actions to discern if an adjustment to the right side LOA is required.

Notes.

1. If contamination takes the left side element past either the initial nearside or initial farisde lines, the process continues until contamination boundaries are defined and the result is an adjusted nearside line and/or adjusted farside line.

2. Right side element actions in relation to an adjusted nearside/farside line may change based on the orientation of contamination.

Left Side Element

C-63. The element turns left for positive detections or right for negative detections (except for the first CBRN marker drop). The element makes directional right turns toward contamination. Upon three consecutive negative detections (400 meters), if the element is moving toward the farside, they will not make directional right turns; they will continue forward toward the farside. For consecutive positive detections that direct an element to a previously checked location, the element continues forward in lieu of turning left.

- When the base element detects contamination, the element stops and checks for ground contamination at their current location via point monitoring. (The element may have had to orient to the left of the base element.)
- Upon verification of a negative detection, the element drops a CBRN warning marker, sends a CBRN 4 marker report to higher headquarters, moves forward 200 meters, and checks for ground contamination via point monitoring.
- At this location, the element can either find contamination or not. (Element movement depends on the orientation of the contaminated area; go where the contamination takes the element.)

- Contamination is detected. The element turns 90° to the left, moves 200 meters, and checks for ground contamination via point monitoring.
- Contamination is detected. The element turns 90° to the left, moves 200 meters, and checks for ground contamination via point monitoring.
- Contamination is detected (consecutive positive detections that direct an element to a previously checked location). The element continues forward 200 meters and checks for ground contamination via point monitoring.
- Contamination is not detected. The element drops a CBRN warning marker, sends a CBRN 4 marker report to higher headquarters, turns 90° to the right, moves forward 200 meters (along the initial nearside line), and checks for ground contamination via point monitoring.
- Contamination is detected. The element turns 90° to the left, moves 200 meters, and checks for ground contamination via point monitoring.
- Contamination is not detected. The element drops a CBRN warning marker, sends a CBRN 4 marker report to higher headquarters, and establishes the adjusted nearside line.
- The element continues to check for ground contamination along the adjusted nearside line via point monitoring every 200 meters, dropping CBRN warning markers and sending CBRN 4 marker reports to higher headquarters at each negative detection location until they reach the left side LOA or detect contamination (will require an adjusted nearside line).
- Contamination is not detected. The element drops a CBRN warning marker, sends a CBRN 4 marker report to higher headquarters, turns 90° to the right, moves forward 200 meters, and checks for ground contamination via point monitoring.
- While moving toward the farside, as long as the element obtains negative detections within the area of concern, they continue to move forward, checking for ground contamination every 200 meters via point monitoring. The element drops CBRN warning markers and sends CBRN 4 marker reports to higher headquarters at each negative detection location until they reach the adjusted farside line.
- Once the element has reached the adjusted farside line, the element turns right toward the base element, continuing to check for ground contamination every 200 meters via point monitoring, dropping CBRN 4 warning markers and sending CBRN 4 marker reports to higher headquarters at each negative detection location until they are within 200 meters of the base element.
- If the element surveys the entirety of the area of concern, the left side LOA is defined and element actions are complete. If there is remaining terrain to survey, the element must continue survey actions to discern if an adjustment to the left side LOA is required.

Notes.

1. If contamination takes the left side element past either the initial nearside or initial farside lines, the process continues until contamination boundaries are defined and the result is an adjusted nearside line and/or adjusted farside line.

2. Left side element actions in relation to an adjusted nearside/farside line may change based on the orientation of contamination.

Two-Element Survey

C-64. Using two vehicles may double the length of time it takes to complete the survey process.

- The process begins once an R&S element detects the presence of ground contamination. When ground contamination is detected by an element, the other element stops and checks for ground contamination at their current location via point monitoring.
- The element that detected contamination conducts sample collection as required and then sends a CBRN 4 report to higher headquarters. If the other element detected the presence of contamination, they must back out of the contamination.

Notes.

1. Element actions are identified independently, but they are conducted concurrently. Figure C-15 identifies the right side element as the element that detected the initial contamination. The right side element and left side element procedures describe the actions depicted in figure C-15.

2. Elements drop CBRN warning markers and then send CBRN 4 marker reports to higher headquarters at each negative detection location.

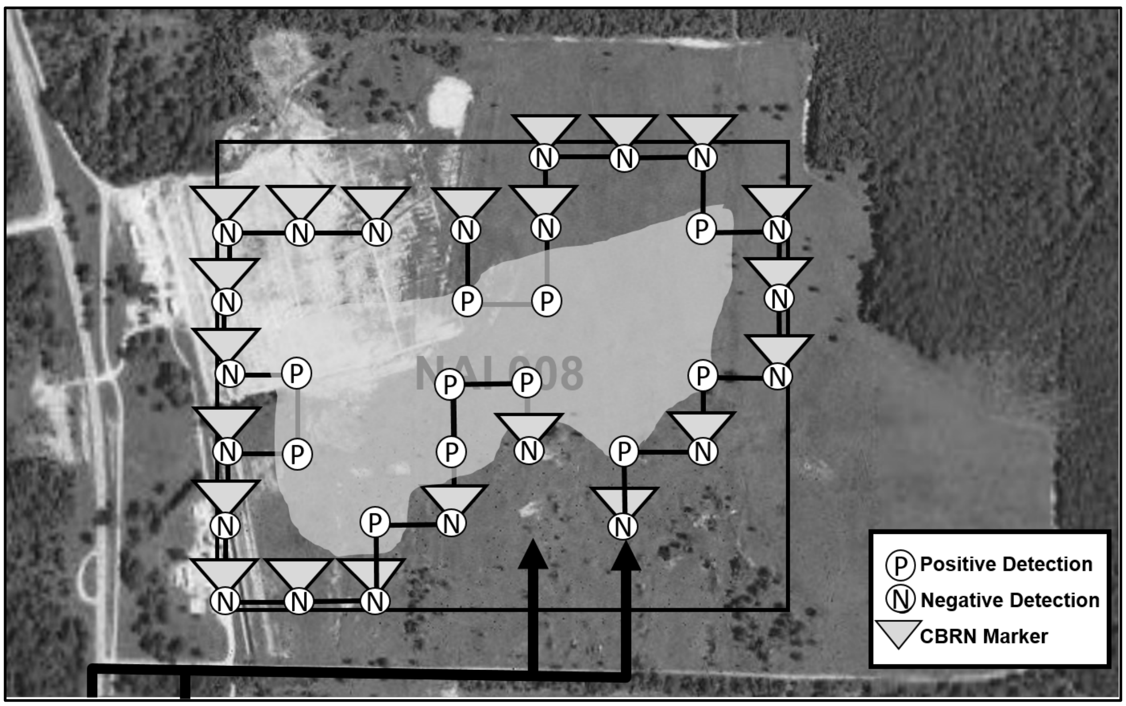


Figure C-15. Box survey technique (two-element survey)

Right Side Element

C-65. The element turns right for positive detections or left for negative detections (except for the first CBRN marker drop), continues forward for two consecutive negative detections, and makes directional left turns toward contamination upon three consecutive negative detections (400 meters). For consecutive positive detections that direct an element to a previously checked location, the element continues forward in lieu of turning right.

- Upon detection of ground contamination, the element confirms via point monitoring (unless already using this protocol), conducts sample collection as required, and sends a CBRN 4 report to higher headquarters.
- The element backs up 200 meters and checks for ground contamination via point monitoring. If the result is a negative detection, the element drops a CBRN warning marker and sends a CBRN 4 marker report to higher headquarters.
- The element moves forward 200 meters (initial positive detection location), turns 90° to the right, moves 200 meters, and checks for ground contamination via point monitoring.
- At this point, the element can either find contamination or not. (Element movement depends on the orientation of the contaminated area; go where the contamination takes the element.)
- Contamination is not detected. The element drops a CBRN warning marker, sends a CBRN 4 marker report to higher headquarters, turns 90° to the left, moves 200 meters, and checks for ground contamination via point monitoring.
- Contamination is detected. The element turns 90° to the right, moves 200 meters, and checks for ground contamination via point monitoring.
- Contamination is not detected. The element drops a CBRN warning marker, sends a CBRN 4 marker report to higher headquarters, and moves 200 meters.
- Once the element obtains three consecutive negative detections (400 meters) traveling in the same direction, the element turns 90° to the left, moves forward 200 meters, and checks for contamination via point monitoring.
- The process continues until the extent of contamination is defined and the element is within 200 meters of the left side element.

Left Side Element

C-66. The element turns left for positive detections or right for negative detections (except for the first CBRN marker drop), continues forward for two consecutive negative detections, and makes directional right turns toward contamination upon three consecutive negative detections (400 meters). For consecutive positive detections that direct an element to a previously checked location, the element continues forward in lieu of turning left.

- When the right side element detects contamination, the left side element stops and checks for ground contamination at their current location via point monitoring.
- Upon verification of a negative detection, the element drops a CBRN warning marker, sends a CBRN 4 marker report to higher headquarters, moves forward 200 meters, and checks for ground contamination via point monitoring.
- At this point, the element can find either find contamination or not. (Element movement depends on the orientation of the contaminated area; go where the contamination takes the element.)
- The element conducts a series of turns in a boxlike movement, replications the actions similar to those for the right side element.
- The process continues until the extent of contamination is defined and the element is within 200 meters of the right side element.

One Element Survey

C-67. Using one vehicle may triple the length of time that it takes to complete the survey process. Example shows the element beginning movement in a counterclockwise direction. The survey can be executed while moving in a clockwise direction, but all movements would be opposite of the example.

Notes.

1. The element turns right for positive detections and turns left for negative detections (except for the first CBRN marker drop), continues forward for two consecutive negative detections, and makes directional left turns toward contamination upon three consecutive negative directions (400 meters). For consecutive positive detections that direct an element to a previously checked location, the element continues forward in lieu of turning right. The procedures in the following bullets describe the actions depicted in figure C-16.

2. The element drops CBRN waring markers and sends CBRN 4 marker reports to higher headquarters at each negative detection location.

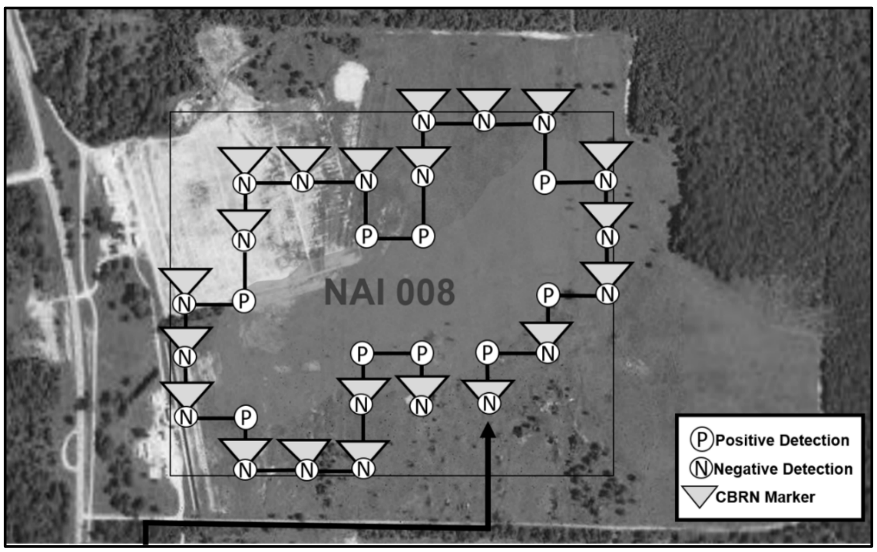


Figure C-16. Box survey technique (one-element survey)

- Upon detection of ground contamination, the element confirms via point monitoring (unless already using this protocol), conducts sample collection as required, and sends a CBRN 4 report to higher headquarters.
- The element backs up 200 meters and checks for ground contamination via point monitoring. If the result is a negative detection, the element drops a CBRN warning marker and sends a CBRN 4 marker report to higher headquarters.
- The element moves forward 200 meters (initial positive detection location), turns 90° to the right, moves 200 meters, and checks for ground contamination via point monitoring.
- At this location, the element can either find contamination or not. (Element movement depends on the orientation of the contaminated area; go where the contamination takes the element.
- Contamination is not detected. The element drops a CBRN warning marker, sends a CBRN 4 marker report to higher headquarters, turns 90° to the left, moves 200 meters, and checks for ground contamination via point monitoring.
- Contamination is detected. The element turns 90° to the right, moves 200 meters, and checks for ground contamination via point monitoring.

- Contamination is not detected. The element drops a CBRN warning marker, sends a CBRN 4 marker report to higher headquarters, moves 200 meters, and checks for ground contamination via point monitoring.
- Once the element obtains three consecutive negative detections (400 meters) traveling in the same direction, the element turns 90° to the left, moves forward 200 meters, and checks for contamination via point monitoring.
- The process continues until the extent of contamination is defined and the final CBRN warning marker is dropped within 200 meters of the first CBRN warning marker.

STAR

C-68. The star survey technique (see figure C-17) is a quick way to determine the rough limits of a contaminated area. The star technique is used to obtain contamination limits while providing commanders optimal time to make tactical decisions necessary for their operational execution and success. This technique can be used by two or more R&S elements to obtain more detecting points, increasing the accuracy of the survey. The following are procedures for the star survey technique:

- The process starts once the R&S element detects the presence of ground contamination.
- Upon detection of ground contamination, the element confirms via point monitoring (unless already using this protocol), conducts sample collection as required, and sends a CBRN 4 report to higher headquarters.
- The element backs up 200 meters and checks for ground contamination via point monitoring. If the result is a negative detection, the element backs up another 200 meters and checks for ground contamination via point monitoring.
- If the result is a negative detection, the element drops a CBRN warning marker to indicate the base (starting location of the star) and sends a CBRN 4 marker report to higher headquarters.
- The element moves forward, checking for ground contamination every 200 meters via point monitoring.
- When the element obtains two consecutive negative detections (400 meters), the element drops a CBRN warning marker to indicate the first leg of the star and sends a CBRN 4 marker report to higher headquarters.

Note. If no additional contamination is detected along the first leg, subsequent legs must be at least the length of the first leg.

- Based on METT-T, the element turns +/-135° of current heading orienting on the dropped CBRN warning marker and moves forward, checking for ground contamination every 200 meters via point monitoring.

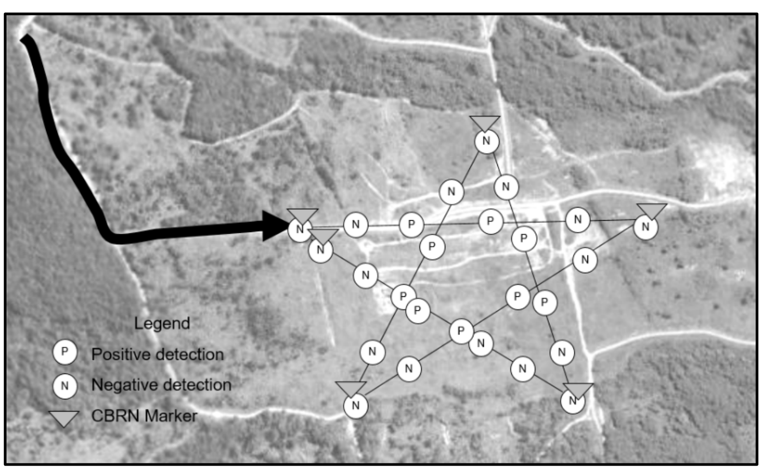


Figure C-17. Star survey technique

Note. Whichever direction (+/-135°) the element turns based on METT-T, all subsequent turns for the legs of the star must be in the same direction. (Direction movements must be consistent for the survey process to work correctly.)

- When the element obtains two consecutive negative detections (400 meters), the element drops a CBRN warning marker to indicate the second leg of the star and sends a CBRN 4 marker report to higher headquarters.
- The element turns +/-135° of current heading orienting on the dropped CBRN warning marker and moves forward, checking for ground contamination every 200 meters via point monitoring.
- When the element obtains two consecutive negative detections (400 meters), the element drops a CBRN warning marker to indicate the third leg of the star and sends a CBRN 4 marker report to higher headquarters.
- The element turns +/-135° of current heading orienting on the dropped CBRN warning marker and moves forward, checking for ground contamination every 200 meters via point monitoring.
- When the element obtains two consecutive negative detections (400 meters), the element drops a CBRN warning marker to indicate the fourth leg of the star and sends a CBRN 4 marker report to higher headquarters.
- The element turns +/-135° of current heading orienting on the dropped CBRN warning marker and moves forward, checking for ground contamination every 200 meters via point monitoring.

Note. If the process is conducted correctly, the element will be headed in the direction of the base (starting location of the star).

- When the element obtains two consecutive negative detections (400 meters), the element drops a CBRN warning marker to indicate the completion of the star and sends a CBRN 4 marker report to higher headquarters.

Notes.

1. Based on contamination, the element may drop a sixth CBRN warning marker and send a CBRN 4 marker report to higher headquarters. If the second negative detection in within 200 meters of the base CBRN warning marker, there is no requirement for additional CBRN warning markers or CBRN 4 reports. Once the element is within 200 meters of the base CBRN marker, it is considered a complete survey.

2. Figure C-16 identifies a one-element (vehicle) execution. When the area of concern exceeds the capabilities of one element, additional elements can execute concurrent stars where this technique is used to obtain more detection points, increasing the accuracy of the survey.

BOUNCE-AND-BYPASS

C-69. The bounce-and-bypass survey technique (see figure C-18) is used to locate the general boundaries of a CBRN contaminated area. The R&S element places CBRN markers at specified intervals around the contaminated area and at all entry points. This technique can also be used to support a radiological survey. The R&S element reports the intensity of radiation at the contamination boundary. The following are procedures for the bounce-and-bypass survey technique:

- The R&S element stops and checks for contamination in their immediate area.
- If no contamination is detected, the R&S element proceeds forward, checking for contamination every 50 meters.
- Once contamination is detected, the R&S element proceeds out of the contaminated area, checking for contamination every 50 meters and placing a CBRN marker 50 meters after no contamination is detected.
- The R&S element then turns in the cardinal direction toward the contaminated area, checking for contamination every 50 meters until contamination is detected again.
- Once contamination is detected, the R&S element proceeds out of the contaminated area and places a CBRN marker 50 meters after no contamination is detected.
- This process continues until no contamination is detected.
- A CBRN 4 report is submitted.

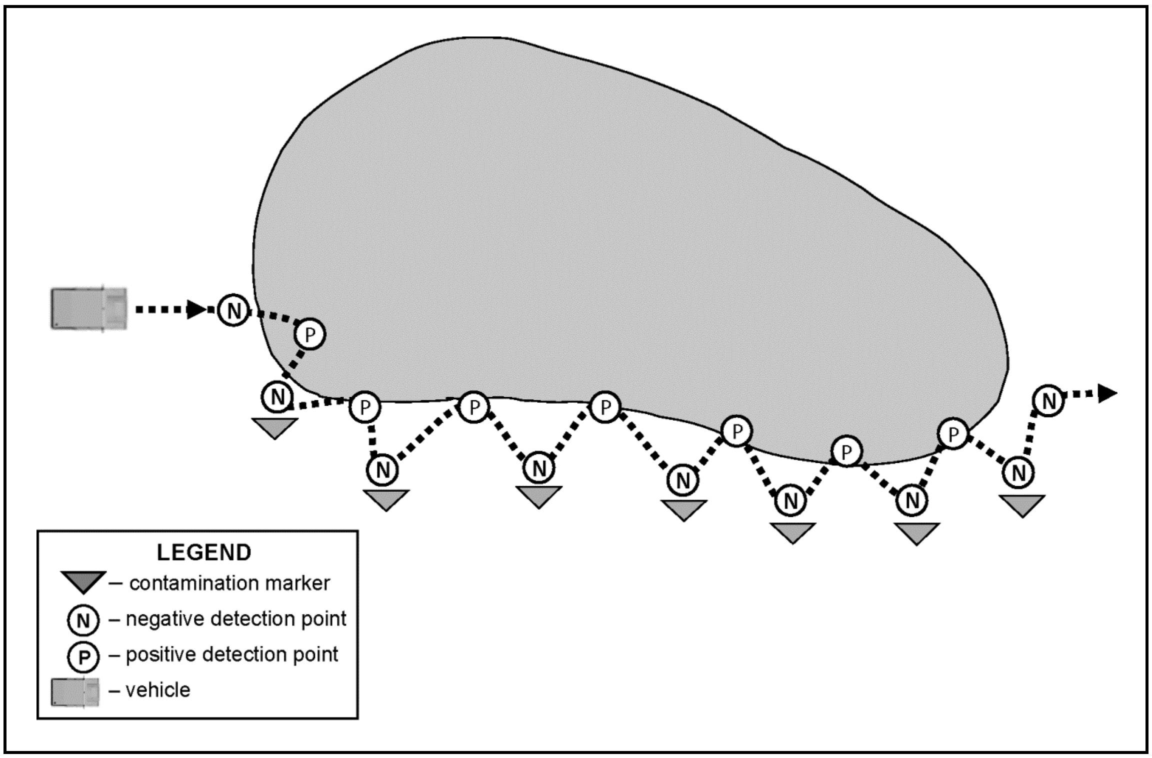


Figure C-18. Bounce-and-bypass survey technique

COURSE LEG

C-70. The course leg survey technique is used primarily during aerial reconnaissance (see appendix D) but may be conducted mounted. The course leg technique is used to find the extent and intensity of radiological contamination. The CBRN R&S element moves between two checkpoints; for example, from Point A (top of a hill) to Point B (top of another hill). Readings are taken at given intervals along the route between the two checkpoints. When conducting a mounted radiological course leg, the element must be given a turn-back dose and turn-back dose rate. Reports of the results of mounted course leg techniques may be submitted in various ways. Normally, a survey data sheet (DD Form 3038) is filled out and turned in to the tasking headquarters at the end of the mission, or the data is sent via a CBRN 4 report. Figure C-19 outlines and illustrates the course leg technique.

Note. Conducting mounted versus aerial radiological course legs results in higher radiation doses to personnel.

C-71. The following are procedures for the course leg survey technique:

- The CBRN R&S element reads the survey meter and records the dose rate at the start point of the course leg.
- The CBRN R&S element reads the survey meter and records the dose rate at each preselected interval along the course leg. Under no circumstances should the element continue further into a contaminated area if it reaches its turn-back dose or turn-back dose rate.
- The CBRN R&S element reads the survey meter and records the dose rate at the end point of the course leg.
- The CBRN R&S element reports the results by using the CBRN 4 report.
- The CBRN R&S element coordinates for decontamination and medical support, as required.
- The CBRN R&S element rechecks and zeros the RADIAC meter before each course leg to ensure proper operation.

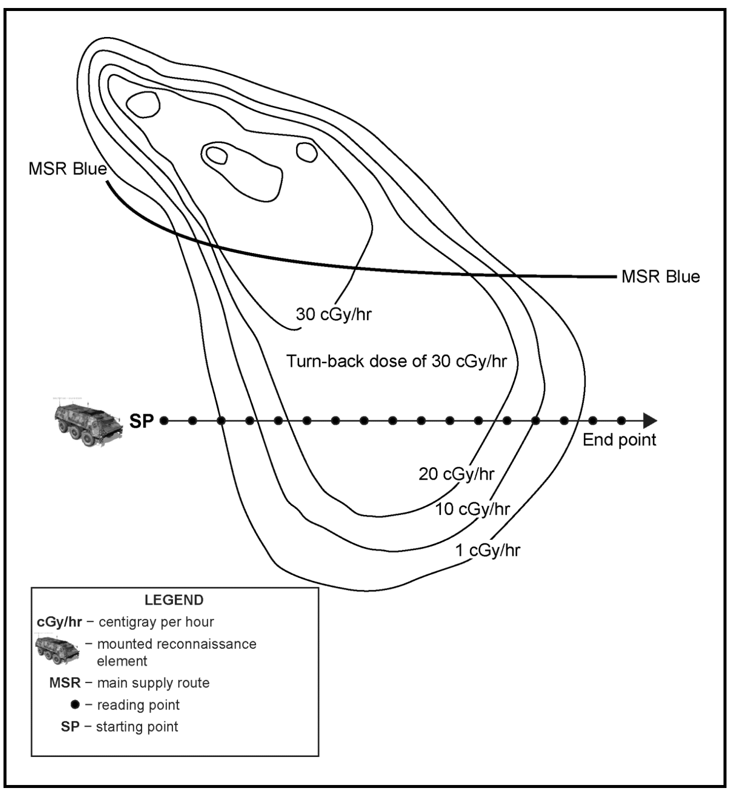


Figure C-19. Course leg survey technique

PRESELECTED DOSE RATE

C-72. The preselected dose rate technique (see figure C-20) is used as a form of route technique when the R&S element is sent along a route and told to report and/or mark at preselected dose rates. This is used for radiological surveys and, once multiple preselected dose routes have been conducted, the points can be correlated to show the contour lines of radiological contamination fallout.

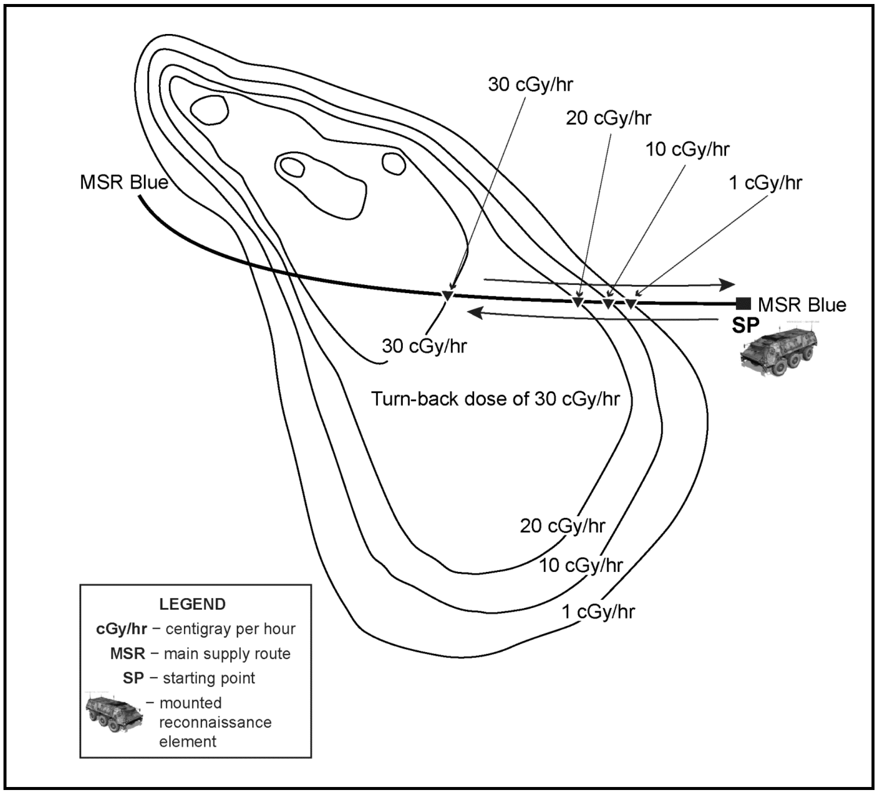


Figure C-20. Preselected dose rate technique

MOUNTED CBRN SURVEILLANCE

C-73. Reconnaissance is the first step in CBRN surveillance site selection. Begin with a map reconnaissance. Use the map reconnaissance to determine initial surveillance areas that support the employment tactic, and then select primary, alternate, and supplemental surveillance sites within each surveillance area. Some rules of thumb for the reconnaissance include—

- Reconnoiter the detection and surveillance areas and potential sites firsthand, if possible.
- Coordinate with the terrain owner before conducting the reconnaissance.
- Ensure that the CBRN R&S element includes the designated serial leaders, including—
  - **OP site selection.** The supported unit leader or CBRN R&S element leader selects the general location for the OP. The leader considers METT-TC/METT-T factors and the information collection plan when determining the general positioning of the OP site.
  - **Attack indicators.** Agents can be disseminated by using overt or covert methods. Explosive delivery systems or spray tanks (artillery, rockets, and detonating missiles) have a distinctive visual signature during the day and at night. Aircraft spraying agents have distinctive flight patterns and a signature of the liquid being released. While these indicators are not positive proof that an attack has occurred, they indicate an increased probability that it has. Depending on METT-TC/METT-T, the CBRN R&S element occupying the OP can survey the NAI to confirm or deny the presence of contamination.

C-74. CBRN surveillance is the systematic observation of aerospace, surface, and subsurface areas, places, persons, and things by visual, aural, electronic, or other means to detect CBRN incidents and hazards. The key tasks for CBRN surveillance are—observe, monitor, detect, identify, and report. Detailed information on sample collection is located in Chapter 6 and on reporting information in Chapter 7. CBRN R&S elements monitor their areas directly or indirectly by using detection capabilities to provide early warning. CBRN R&S elements, when given the mission to perform CBRN surveillance, observe specified areas for indications of CBRN incidents. This can be accomplished through direct visual means or the use of sensor and standoff capabilities.

C-75. All units are trained to perform CBRN surveillance operations (for example, detector emplacement within the unit perimeter). They can also be given the mission to perform CBRN surveillance by observing specified areas, such as NAIs, for indications of an attack. The goal of CBRN surveillance operations is to report information accurately and rapidly, including answering the requirements that prompted the surveillance operation.

C-76. CBRN surveillance can be supported by several systems equipped with umanned systems, remote sensing, standoff chemical agent detectors, and biological point detectors that can be integrated to form a detection network. After observing the indications of a CBRN attack during CBRN surveillance, the CBRN R&S element has the following options:

- Locate and mark clear bypass routes.
- Terminate the mission, and move to the coordinated decontamination point.
- Continue the mission.
  - Depending on the duration of the mission, the commander must consider sustainment of the CBRN R&S element by providing and maintaining levels of personnel and materiel required while continuing the operation throughout its duration.
  - Personnel considerations include replacing individuals for extended durations or providing food, water, and other perishables to replenish the CBRN R&S element.
  - Materiel considerations include the use of standoff and remote capabilities.

MOUNTED OBSERVE TECHNIQUES

C-77. The CBRN surveillance task of observing is accomplished by two techniques: critical node and area array.

CRITICAL NODE

C-78. In support areas, mounted CBRN R&S elements may be assigned CBRN surveillance missions to observe designated areas for CBRN attacks. MSRs and areas to be occupied by logistics and mission command/C2 facilities may also be checked for CBRN hazards before their occupation. The following are procedures for the critical-node technique:

- Occupy observation points to overwatch the designated area.
- Report all indications of a CBRN attack.
- Employ monitoring capabilities.
- Operate and perform operator maintenance on CBRN monitoring equipment.
- Conduct CBRN monitoring operations.
- Provide data for the completion of CBRN reports.

C-79. Mounted CBRN R&S elements observe specified areas or NAIs for indications of a CBRN attack. Based on JIPOE/IPB and vulnerability planning, the commander prioritizes the use of available collection assets against designated NAIs, and R&S elements employ observation and detection procedures on designated areas for indications of an attack.

C-80. The primary means of surveillance may be from OPs. Another means of mounted CBRN surveillance is conducted in support areas, assembly areas, and at the far and near side of gap crossings.

AREA ARRAY

C-81. An area array is established to maximize the probability of CBRN hazard detection over a large area of interest. The primary objective is to detect a hazard upwind of the operational area of concern and to provide the greatest potential warning to those in the hazard area. The specific architecture of the array is designed by the CBRN staff in close coordination with operations, intelligence, and medical staffs. Refer to Chapter 4 for more specific information on surveillance planning considerations and detector employment tactics. The following are procedures for the area array technique:

- Consider the enemy situation and capabilities, terrain, weather conditions, performance characteristics, and quantity of CBRN detector assets.
- Determine the appropriate separation distances between CBRN detectors.
- Operate and perform operator maintenance on CBRN monitoring equipment.
- Report all indications of a CBRN attack.
- Conduct CBRN monitoring operations.
- Provide data for the completion of CBRN reports.

MOUNTED MONITOR TECHNIQUES

C-82. The CBRN surveillance task of monitoring is accomplished by two techniques: periodic and continuous. Monitoring techniques are more commonly used for the surveillance of radiological hazards, but they may also be used for the surveillance of chemical hazards.

PERIODIC

C-83. As the name implies, periodic monitoring is accomplished by employing CBRN detector assets at predetermined intervals of time. Before an incident, the time between monitoring is determined based primarily on the threat assessment. When intelligence estimates deem that there is a reduced likelihood of a CBRN incident, the commander is more apt to call for periodic monitoring of the area of concern. In doing so, CBRN resources (equipment and personnel) are conserved and power consumption (fuel and batteries) is reduced.

C-84. Following a CBRN incident, the periodic monitoring technique may be used over an extended period of time to determine if hazardous effects remain in the area.

CONTINUOUS

C-85. Conversely, the continuous monitoring technique is accomplished by employing CBRN detector assets uninterrupted over the duration of the monitoring operations. Similar to periodic monitoring, the threat assessment is the prime determinant in deciding to apply the continuous monitoring technique. When an incident is anticipated, continuous monitoring provides the greatest opportunity for warning the area of concern of impending hazardous conditions.

C-86. During and immediately following a CBRN incident, the continuous monitoring technique is employed to note the dissipation or proliferation of the hazard area and to estimate the duration of CBRN effects.

C-87. Continuous monitoring places a much heavier burden on personnel (operators and maintainers) and logistics (detectors, batteries, fuel). These factors should be considered and adequately coordinated throughout the staff.

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Appendix D
Aerial Radiological Reconnaissance

This appendix provides aerial radiological reconnaissance tactics, techniques, and procedures. The aerial mode of reconnaissance provides speed and added protection to CBRN R&S elements when conducting their mission. Aerial radiological reconnaissance operations support commanders and their staffs by increasing situational awareness as they plan, coordinate, and execute follow-on CBRN R&S missions. Aerial reconnaissance enhances missions by providing rapid area assessments, obtaining combat information about indigenous population activities and resources, and providing meteorological and geographical characteristics of key terrain.

MANNED AERIAL RADIOLOGICAL RECONNAISSANCE

D-1. There is one form used to conduct manned aerial radiological reconnaissance—the route form. There are also two techniques used when conducting an aerial route—the course leg and preselected dose rate techniques. The joint CBRN staff briefs the pilot and the R&S element. All information concerning the mission (survey height, ground speed, routes, course legs, checkpoints) comes from the joint CBRN staff. The survey team leader and the instrument operator sit beside each other to aid in communications. The survey team leader must have communication with the pilot.

D-2. The aircraft flies to, and lands at, a specified area. The aircraft must land near the point of interest. The monitor dismounts, proceeds to the selected point, and takes the reading by using normal ground-monitoring procedures. When high dose rates do not permit this procedure, aerial dose rates are taken using an air-ground correlation factor. There are two methods for obtaining the air-ground correlation factor—direct determination and the use of standardized tables.

D-3. Direct determination is the preferred method and is accomplished as follows:

- An aerial dose rate is taken at a given point and height during the survey.
- The aircraft lands, and a ground dose rate is obtained at the same area.
- The air-ground correlation factor is obtained by dividing the ground dose rate by the aerial dose rate.
- New data must be obtained when the height changes 15 meters or more or when ground foliage or surface conditions vary significantly.

ROUTE

D-4. The aircraft flies between two checkpoints, following the route of a predominant terrain feature (a road, riverbank, railroad track) that connects the two checkpoints. The aircraft lands only to get the air-ground correlation factor data needed by the joint CBRN staff. The procedures are identical to those for a course leg survey; however, a straight flight direction may or may not be required. The following are the aerial route procedures:

- Determine the appropriate level of protection.
- Obtain OEG (turn-back dose and turn-back dose rate).
- Reconnoiter the route, and determine locations of contaminated areas along the route.
- Report all CBRN threats and hazards along the route.

Course Leg Technique

D-5. The aircraft flies a straight line between two checkpoints; for example, from point A (top of a hill) to point B (top of another hill). The aircraft only lands to obtain the air-ground correlation factor data. The following are the course leg procedures:

- The pilot maintains (as near as possible) a constant height aboveground, a constant ground speed, and a straight flight direction between the start and end checkpoints of each course leg.
- The pilot flies the aircraft on the proper course over the start checkpoint and on a straight path to the end checkpoint. Shortly before reaching the start checkpoint, the pilot alerts the monitor and gives the monitor the height aboveground.
- The monitor records the time and height aboveground. The monitor then rechecks and zeros the RADIAC meter before each course leg to ensure proper operation.
- The pilot gives the command "MARK" when the aircraft is directly over the start checkpoint. The monitor reads the survey meter, records the dose rate, and begins timing preselected time intervals.
- The monitor reads the survey meter and records the dose rate at each preselected time interval; for example, every ten seconds.
- The pilot alerts the monitor again when the aircraft approaches the end checkpoint. The pilot then gives the command "MARK" when the aircraft is directly over the end checkpoint.
- The monitor reads and records the final dose rate.

Preselected Dose Rate Technique

D-6. The R&S element looks for a given dose rate or multiple given dose rates designated by the control center team. This technique is used for old contamination and neutron-induced radiation. For old contamination that is greater than the time of attack (for example, (H)+48), the team moves along a route or designated straight line in an area until it finds 1 centigray per hour and/or its designated dose rates. When conducting a radiological preselected dose rate technique, the element must be given a turn-back dose and turn-back dose rate. Reports of the results of preselected dose rate techniques may be submitted in various ways. Normally, a survey data sheet (DD Form 3038) can be filled out and turned in to the tasking headquarters at the end of the mission or the data can be sent via a CBRN 4 report. The following are preselected dose rate technique procedures:

- The pilot maintains (as near as possible) a constant height aboveground, a constant ground speed, and a straight flight direction between the start and end checkpoints of each route.
- The pilot flies the aircraft on the proper route over the start checkpoint and on a path to the end of the checkpoint. Shortly before reaching the start checkpoint, the pilot alerts the monitor and gives the monitor the height aboveground.
- The monitor records the time and height aboveground. The monitor then rechecks and zeros the RADIAC meter before each route to ensure proper operation.
- The monitor constantly monitors the survey meter while moving along its designated route. Under no circumstances should the element continue further into a contaminated area if it reaches its turn-back dose or turn-back dose rate.
- Upon locating a reading of 1 centigray and/or its designated dose rates, the monitor records the dose rate and area.
- The pilot alerts the monitor again when the aircraft approaches the end checkpoint. The pilot then gives the command "MARK" when the aircraft is directly over the end checkpoint.
- The monitor reads and records the final dose rate.
- The CBRN R&S element reports the results, normally using a CBRN 4 report.
- The CBRN R&S element coordinates for decontamination and medical support as required.
- The CBRN R&S element rechecks and zeros the RADIAC meter before each mission to assure proper operation.

D-7. There are advantages and disadvantages of aerial reconnaissance versus ground reconnaissance for detecting radiological threats/hazards. The following are aerial radiological survey advantages:

- A large area can be surveyed quickly.
- Speed and flexibility enable surveys to be conducted over large unoccupied areas, adversary occupied areas, and areas not easily accessible to ground troops.
- Surveys can be conducted of areas at which dose rates exceed the commander's operational exposure guide and are dangerous to ground survey parties.
- Personnel are exposed to lower dose rates because of the distance the aircraft flies aboveground.
- Less equipment and personnel are required.
- A helicopter and a survey team can cover more terrain than ten trucks with ground survey teams.

D-8. The following are aerial radiological survey disadvantages:

- Dose rate readings are not as accurate as those obtained by ground surveys.
- Weather conditions, such as high winds and extreme temperatures, impact flight operations.
- Dose rates for specific points on the ground are not provided by aerial surveys.
- Resources must be coordinated between pilots and CBRN survey team members.
- Aerial radiological surveys may impact external operations (such as artillery missions).
- The availability of aviation assets are required to conduct operations.
- Vulnerability to adversary fires is increased.
- Terrain restrictions may impede landing to take ground readings to calculate the air-ground correlation factor.

D-9. Once collected, aerial survey data must be processed in real time, to include data validation, spectral analysis, and mapping, so that results can be obtained within the first few hours or sooner after landing. This is necessary due to the time constraints for effective response in the early stages of an incident or accident. Planning to collect and record aerial survey data includes defining survey parameters, such as the following:

- Sample time.
- Ground clearance.
- Speed.
- Line spacing on a grid map.

RECORD AND REPORT MANNED AERIAL RECONNAISSANCE MISSIONS

D-10. The joint CBRN staff relies on reports to construct and update contamination overlays, including the common operating picture. The CBRN R&S element must accurately record aerial radiological data because it may be used as evidence of violations of treaties and agreements. The CBRN R&S element uses DD Form 3038. Examples of nuclear data sheets can be found in TM 3-11.32/MCRP 10-10E.5/NTRP 3-11.25/AFTTP 3-2.56.

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Appendix E

Unmanned CBRN Reconnaissance and Surveillance

As force modernization efforts develop robotics and other technologies, CBRN reconnaissance elements add unmanned air and ground systems that enhance information collection capabilities. This appendix provides unmanned CBRN R&S troop leading procedures. Unmanned CBRN R&S provides hazard awareness and understanding without directly exposing forces to contamination. During offensive missions, CBRN R&S elements employ unmanned capabilities to provide early warning. In the defense, chemical and biological standoff and remote R&S technology provide detection capabilities to warn commanders of an approaching chemical or biological aerosol or vapor cloud or enemy indirect fire delivery of CBRN in sufficient time to implement protective measures before the actual contamination arrives. This appendix discusses the considerations, employment, and functions of standoff and remote capabilities.

OVERVIEW

E-1. The use of unmanned systems does not negate the need for the human involvement of reconnaissance, but it serves as a force multiplier and enables the speed, standoff, and accuracy of reconnaissance operations while expanding the depth of multidomain reconnaissance. Depending on the sensors employed, robotics can cue other robotics or troops to collect more detailed information through differing forms of contact. They can also provide redundancy by employing various forms of contact, such as electronic and visual, to collect information.

MISSION PLANNING CONSIDERATIONS

E-2. During a zone or area reconnaissance, the CBRN reconnaissance element integrates with cavalry, special reconnaissance, aerial, and intelligence to gain required information. During zone reconnaissance execution, UAS may fly in advance of the reconnaissance ground element to assist in developing the situation, increasing the tempo of reconnaissance, and reducing risk to the force. The dispersion of the reconnaissance element, limitations of unmanned air or ground systems speed, endurance, or range and size of the zone reconnaissance may prevent unmanned systems from covering the entire zone. As a result, the command element focuses the unmanned system collection on specific areas where unmanned system applications provide advantage over manned systems based on METT-TC/METT-T factors.

E-3. Mounted CBRN reconnaissance elements may use unmanned systems to conduct detection of CBRN hazards without increasing the risk of contamination inside vehicles or exposing vehicles to enemy fires. Unmanned CBRN reconnaissance elements may use unmanned systems to assess urban or subterranean structures, reducing the risk to troops from CBRN threats, enemy direct fire, and IEDs while maintaining the tempo of reconnaissance operations.

E-4. The use of CBRN sensors employed on unmanned systems can also enable a single crew or section with supporting robotic systems to accomplish missions that would otherwise require multiple CBRN reconnaissance elements. This capability enhancement provides flexibility to the supported maneuver commander in developing the task organization. Manned and unmanned teaming during initial site characterizations maximizes the capability of a reconnaissance team. A robot can be used to make initial entry in unknown conditions, such as in a subterranean environment that may have low oxygen. Initial readings from sensors attached to an unmanned system allow CBRN R&S teams to make IPE/PPE decisions that minimize the impact on Service members and the mission.

EMPLOYMENT CONSIDERATIONS

E-5. Unmanned systems provide an additional tool for accomplishing R&S missions while reducing the risk to Service members. The equipment limitations should be considered during mission planning. Unmanned systems can range from large vehicles that carry a sensor equivalent (or nearly equivalent) to manned platforms down to handheld devices with limited sensor payloads or unmanned ground sensors.

E-6. Unmanned CBRN R&S is conducted by leveraging technologies and sensors controlled from a different location within the AO through a communications link or electronic tether to detect and monitor potential CBRN hazards. Using an unmanned system, such as an UAS or unmanned ground vehicle, can provide standoff or remote sensing for CBRN hazards. This allows information collection to be conducted at a lower risk to personnel. CBRN R&S elements may gather all necessary/pertinent information to research and determine the positive identification of hazards without having to place CBRN elements at risk. Forces pair unmanned method of reconnaissance with mounted or dismounted methods to maximize information collection efforts and minimize risk to forces.

Note. Airspace control is a critical consideration for the employment of UASs. See ATP 3-52.1 and FM 3-52 for more information.

E-7. Many unmanned systems are fielded to different enablers or are in development. The type of system employed for a specific mission is oriented on the capabilities of the system, the availability of an unmanned system, and the OE. Examples of available systems include—

- Aerial systems.
- Wireless radio-operated robots.
- Fiber optic robots.
- Unmanned ground sensors.

E-8. CBRN R&S elements may employ unmanned systems from LPs/OPs, maintaining their respective hide and defensive positions. Multiple unmanned sensors may be employed at multiple positions or vehicles in sustainment nodes. This provides hazard awareness and understanding of eminent CBRN threats to personnel, supplies, and equipment. Unmanned sensors may be employed using techniques similar to those of mounted or dismounted CBRN R&S elements. The following common CBRN supporting tasks may be executed by unmanned systems:

- Detect the presence or absence of CBRN hazards. (The detection accomplished by unmanned systems can aid decision making for IPE decisions for exploitation teams.)
- Identify CBRN hazards (determine the specific CBRN hazards present). (This information could fulfill information requirements, allowing limited resources to focus on other information requirements.)
- Report CBRN hazards (automatic communications links or video feeds).

E-9. Although unmanned systems may be used for many R&S tasks, considerations of challenges and capabilities of available systems must be considered. Some of the considerations for employing unmanned systems include the—

- System capability to navigate in the AO (for example doors, stairs, rough terrain, high winds).
- Operational range of the system, including battery life.
- Time/protection benefit over a human team.
- Operator skill with the unmanned system.
- Hazards created by the unmanned system itself, such as electrical interference of radio operations.
- Line of sight and wired employment limitations.
- Use of a spotter and control operator.
- System ability to be decontaminated.
- Communication system limitations.

Appendix F

Sample Collection and Processing

This appendix provides basic information for CBRN sample collection and techniques for sample collection and processing. Some of the steps provided within each of the CBRN sample collection sections are very similar. This redundancy allows these sections to be removed and used individually with complete information.

SECTION I – OVERVIEW OF SAMPLE COLLECTION

F-1. The sample management plan described in Chapter 6 outlines the basic considerations for managing all of the actions related to collecting CBRN samples, from the point of collection to the final disposition. A variation of the plan should exist at each level of command, from the CBRN R&S unit through the CCMD. At the CBRN R&S element, the sample collection plan focuses on the planning conducted immediately before actual sample collection operations at a specific area. The plan is normally finalized by the R&S element leader after the execution of an initial area survey. At the CCMD, the plan should include the synchronization of resources, from the collection elements through the transfer of samples to the laboratory.

F-2. The CBRN R&S unit develops a sample collection plan that incorporates guidance from the higher headquarters sample management plan and that is specific to the mission. Because each CBRN sample collection is unique, each mission requires a specific plan and should be done in concert with the site assessment and characterization planning efforts and with consideration of the expected results of the sample collection. Proper sampling requires time and resources that might not be available at the current time. The following items are considerations for the sample collection plan:

- Mission, purpose and scope of the sample collection, including the objectives, limitations, and pertinent background information.
- Coordination with adjacent elements that may be on-site to support or to conduct similar or supporting sampling to deconflict operations, eliminate redundant activities, and reduce time on the objective. Other entities may include EOD, medical, and decontamination.
- Sample collection scheme including priority of samples, sample type, collection techniques, and number.
- CBRN materials, precursors, or types of contaminants expected to be encountered based on current intelligence. Expected sample collection sizes based on the material to be collected.
- Number of duplicates or splits required of each sample. In some cases, samples are sent to different laboratories for processing (theater laboratory, host nation laboratory).
- Determine number samples required (for example, blank/control, and background).
  - **Identify a blank/control sample.** Blank/control samples do not accompany the sample collection team to the target.
  - **Identify a background sample.** The background sample should not contain target analyte, yet still be geographically close enough to the sample site to be representative of environmental contaminants. Background sample is an opportunity to employ a composite sample (see section III).
  - **Identify a sample.** Procedurally, it should appear to be a repetition of background sample (same tool, same primary container, same matrix) and taken after background sample.

Notes.

1. It is advisable that priority 1 samples be collected after background samples to reduce the risk of contaminating the background sample with the target analyte.

2. A matrix is whatever substance the target analyte resides in (soil, water, leaves, solvent, painted surfaces).

- Projection of the amount of time the sample collection mission will require.
- Any specific requirements for sampling and/or packaging from the receiving laboratory.
- Sample documentation requirements. DD Form 3108 captures important information regarding the conditions during the sample collection, provides chain-of-custody tracking, and documents final disposition of the sample.
- Waste disposal plan, including if and how waste produced when collecting samples should be handled. For instance, waste could be left in the area or be collected, containerized, marked, and transferred to the decontamination or support element for proper disposal.

TYPES OF SAMPLES

F-3. The type of CBRN sample collection may vary based on the nature, source, type, and method of dissemination and location of the area. Normally, the best area for CBRN sample collection is where casualties have occurred, plants are wilted or discolored, or there are dead animals (fish or birds). This is not always the case when dealing with biological agents due to an incubation time period or with radiation due to the dose and time needed to cause signs and symptoms. There are several different types of samples, some of which may overlap. This section describes the types and its purpose.

CBRN

F-4. CBRN compounds include chemical and biological warfare agents, binary/precursor materials, radiological materials, and other TIMs associated with a CBRN program or industrial process. These samples include both bulk and trace level samples. Each of the C-B-R and -N categories may require unique sampling protocols described further in the section IV through section VII of this appendix.

- **Bulk.** Bulk samples may consist of solids, liquids, and powders taken from containers, tubs, or drums. They may also include materials such as stones, fixed structures (for example, buildings, paved surfaces), pastes, metals, carpet, or gels that are in the same room or structure that is being exploited (see paragraph F-6).
- **Trace.** Trace samples consist of wipe samples taken from potentially contaminated surfaces, fragments from munitions, empty laboratory vessels/containers, and so forth. Trace samples have little to no visible material from which to collect a sample.
- **Neat.** A neat sample represents a laboratory grade sample without any solvent. These samples would have a purity higher than can be expected in an improvised laboratory.

EXPLOSIVES

F-5. Many explosives are very sensitive and will detonate with very small amounts of friction and impact as well as being detonated by the static electricity stored up in the human body. In the case of homemade explosives precursor products may create a substantial safety hazard when they come into contact with other materials. Collecting samples of suspected explosive or energetic materials is inherently dangerous and should only be done by trained EOD personnel.

ENVIRONMENTAL

F-6. Environmental samples (air, water, soil, food, vegetation, and insects) are removed from common, natural materials, such as air, water, soil, or vegetation. Solid samples (powders, paints, metals) may be useful if collected at an incident scene, impact area, blast zone, operating facilities, and areas where runoff may collect.

- **Air.** Air sample collection is typically conducted to determine the presence of contamination. Air sample collection is also conducted to determine the background for comparison purposes. Considerations are—
  - The concentration of contaminants at a sample area depends upon the flow rate of the contaminant into the environment, the wind speed, and the physical state of the contaminant, the terrain contours, and temperature as a variable.
  - Natural and man-made terrain features such as hills, valleys, and rows of buildings, sometimes aid the CBRN sample collection team by channeling emissions.
  - When associated with a particular facility, the downwind side from the release point is a suitable place to collect a sample.
  - Aerosols may leave little residue. Water, vegetation, PPE (especially filters), and dosimetry devices downwind from the sample collection area may provide useful samples.
- **Water.** In the event of a CBRN incident, water sample collection may be necessary to determine that water supply sources have not become contaminated. Take a minimum of four samples; three samples of the suspected contamination and one control sample from a nearby unaffected (uncontaminated) area for reference. The additional samples allow for greater analysis of the contamination.
  - Collect samples at various depths to obtain the most complete assessment of the contamination. The upper layers of water may have lesser amounts of contaminants, due to higher temperatures that promote evaporation and decomposition.
  - At a minimum, collect samples from the water's surface and near the bottom of the water source. If an oil film, globules of organic materials, or a powder-like material is visible on the water's surface, ensure this material is sampled.
  - Snow samples should be collected from the layer of suspected exposure to chemical or biological agents. Coordinate with the weather officer to determine how much new snow has fallen to aid in determining how much snow should be removed before coming into contact with possible contamination. Snow sample surface area is 9 x 9 centimeters to a depth of no more than 1.3 centimeters.
- **Soil.** Soil samples are used to determine the nature and extent of contamination and to identify hazardous substance source areas.
  - Soil samples should be taken over a surface area 9 x 9 centimeters to a depth of no more than 1.3 centimeters (true required depth depends on absorption of substance into soil).
  - Samples should be taken as close to the center of contamination as possible. Samples may be taken near CBRN fatalities.
- **Vegetation.** Vegetables, plants, seeds, leaves, grasses, and grain matter should never be touched. These require using scissors and tweezers, forceps, or hemostat and should be collected in separate containers. Particular attention should be paid to the discoloration or withering of the matter.

BULK SAMPLE COLLECTION

F-7. A bulk sample is a quantity of material, sufficient to run laboratory analysis to determine the composition. The volume or quantity needed is dependent on the type of material and the type of analysis required. A bulk sample consists of suspicious powders, liquids, and solids. Bulk samples of building materials such as sections of carpet, office equipment, and supplies can also be taken. Coordinate with the receiving laboratory as to the bulk sample size, quantity, and type that can be processed and accepted. Other considerations include the hazard severity of the sample, the sample collection expertise, and transport requirements. Factors include—

- **Sample size.** Sealing and packaging large samples may become difficult.
  - Fabrics such as clothing and upholstery may be another source for sample collection. Using a scalpel, personnel should cut a piece no more than 9 x 9 centimeters. For carpeting, the sample should be no more than 3.8 x 3.8 centimeters. Attention should be paid when securing

  - this type of sample. If a fabric, upholstery, or carpet is stained or contaminated, limit the sample size to that required for follow-on analysis. Fabrics sample should consist of part of the stained area and part of the unstained area.
  - Samples from walls, vehicles, or other types of immovable objects should be taken by scraping the contaminated surface and collecting the scrapings into a sample container.
- **Sample quantity.** Collecting too much or too large of a sample may exceed the limit for laboratory personnel to process and their ability to properly dispose of unused contaminated portion of sample.
  - Filters from casualties, are of potential value due to the entrapment of agent inside the filter. Filters should be individually placed in sample collection bags. Each filter should be separately bagged and noted. When removing the filter from casualty ensure the casualty is deceased prior to removing filter from mask.
  - Stones should be no more than 6 to 13 millimeters. These samples should be placed in a plastic freezer bag. The volume of stones should be approximately 200 to 300 milliliters.
- **Sample safety.** Opening some containers may cause more harm when exposed to other elements in the immediate environment.
- **Sample collection expertise.** Collecting suspicious material may require higher levels of expertise and capacity to collect, contain, and limit further damage, harm, or contamination.
- **Sample transport.** Establishing and maintaining chain of custody of bulk materials when sample is transported by other means than the R&S element.

MEDICAL

F-8. Medical specimens are taken from animals or humans suspected of being infected/exposed to a biological or chemical agent/materials. Medical specimens may consist of, but are not limited to, physiological fluids (blood, urine, and saliva) from a patient or blood/urine/organ specimens from human or animals. Medical specimens collected from U.S. personnel should be done in accordance with joint or Service specific guidance for CBRN exposure, and only collected by qualified medical personnel.

F-9. Tissue specimens will only be collected when directed. If medical personnel augment the sampling team, then only medical personnel will secure the specimens. When involved in domestic operations the sampling team will not secure tissue specimens.

F-10. Where medical specimens cannot be taken then swipes will be taken of casualties. Sterile swabs are used to swipe nasal passage, ear, and the gum line.

F-11. Small dead animals (such as birds and rodents) are also sources of samples. Personnel should ensure the animal is dead prior to handling. Personnel will not handle carcasses by hand. Heavy tweezers, tongs, or forceps should be used to place the sample in a plastic bag. Air should be purged from the plastic bag, without damaging the sample, prior to closing it. Be aware of temperature requirements when processing biological hazard. Environmental samples suspected of containing a biological hazard and medical specimens must be stored and transported in a manner in order to maintain at temperature between 1-4 ºC.

SURFACE SAMPLE

F-12. The surface sample is primarily associated with contact hazards and consists of metals, dust particles, and/or unseen materials that collect on surfaces. These surfaces may include floors, windowsills, ledges, or automobiles. Due to the physical state of the surface, the sample collection team must be properly equipped should they encounter the following types of surfaces:

- Hard and smooth nonporous surfaces (the ideal surface).
- Soft rough porous substrates.
- Fragile substrates (a surface on which an organism grows or is attached).
- Oily and/or grossly contaminated surfaces.
- Dermal (pertaining to the skin) sample collection.

QUALITY CONTROL (BACKGROUND AND BLANK)

F-13. Quality control samples are intended to ensure that the target agent in the sample is specific to the operation location and is not a result of cross contamination or naturally occurring background components.

- **Background.** Background samples are required to identify any contaminants inadvertently introduced onto the collected sample by the sample team. These samples are collected away from the source area (upwind or uphill for environmental type samples) to isolate the effects of the source or site on the sampling process, to determine if the contamination is naturally occurring or not. Nonenvironmental background (wipe) samples (for example, inside room or facility) serve the same purpose and also provide additional information on other processes that may have been conducted in the same space.
  - The sample collection team collects at least two samples of soil, water, air, or vegetation from areas that are approximately 500 meters upwind of an alleged incident area to ensure no downwind hazards have contaminated the source or area where the background sample is taken. Clearly mark background and contaminated samples.
  - Background samples must closely resemble or be similar to those presumed to be contaminated and collected at an incident area. For example, if a CBRN sample collection team collects leaves from a tree in an incident area, the sample collection team should collect sample leaves from a tree of the same type outside the contaminated area. Background information for each collected CBRN sample must be detailed and clearly stated.
  - As a matter of practice, the background/control sample should be standardized as the first sample number during a sample collection mission.
- **Blank/control materials.** Collectors must submit unopened, pristine collection tools, materials, and containers from the same manufactures lot in order to rule out any intrinsic target signatures that may be present as an artifact from the manufacturing, storage, or transport process. Blank/control samples should be new/unused collection materials not taken into the collection area. If using non-standard/off-the-shelf/over-the-counter/non-sterile tools or primary containers it may be necessary to purchase duplicates. The blank sample will be the unopened version of whatever is employed.
- Non-environmental background samples must be taken inside the same room as the primary sample(s) are collected. The background sample is typically a wipe sample from a wall, back of a door, computer monitor, and opposite of where the pay sample is to be collected. A background sample should be collected from each different room/facility than the primary samples are to be collected from. This background sample provides indications of any additional contaminants present in the same working space, and can assist in determining what additional work may have been performed in the same space previously.

DUPLICATE SAMPLES/SPLITS

F-14. Sample splits may be required for a variety of reasons and should be considered during mission planning. The requirement for sample splits should be codified in the CCMD or JTF sample management plan or OPORD. If sufficient sample material/matrix is available, then splits may be requested, or directed by the chain of command. Coordinate with the theater validation laboratory to determine if duplicate samples must be taken on site, or if splits will be done by the laboratory. Sample splits enable multiple levels of analysis concurrently in order to obtain lesser confidence results quickly while waiting for higher level confirmation. Additional reasons for sample splits include, but are not limited to the following:

- Force protection analysis.
- Intelligence.
- Coalition Partners and host-nation sharing.
- International regulatory body (for example, Organization for the Prohibition of Chemical Weapons, International Atomic Energy Agency, World Health Organization).
- Archive samples.
- As directed by the CCMD or JTF commander.

PRIORITIES

F-15. Sampling priorities are established by the JFC consistent with force protection requirements and priority information requirements established by the CCMD. Samples fall under three priority categories based on where the samples were collected. These priorities are subject to change based on the tactical, operational, or strategic situation or intelligence requirements.

- **Priority 1.** Bulk agent, bulk binary and/or other precursor materials (such as drums, barrels, final laboratory products), to include munitions or other delivery devices/systems.
- **Priority 2:** Environmental samples (such as air, water, soil, food, vegetation, and insects) and medical specimens (for example, blood, tissue, nasal secretions, vomit, and urine) from areas of alleged CBRN use.
- **Priority 3:** CBRN defense materials (for example PPE, antidote kits, decontamination equipment, detection equipment) CBRN research and development facilities/equipment, or CBRN test and evaluation facilities/equipment.

SECTION II – SAMPLING PROTOCOLS

F-16. This section provides information on sample collection procedures for CBRN environmental samples in liquid, solid, or gas form and the associated requirements to package the sample for shipment to a supporting theater laboratory or evacuation to a CONUS-based laboratory. Sample collection is a key step in determining and documenting the presence of CBRN threats/hazards. Sample collection supports intelligence requirements, and the results are used to confirm or deny that an incident or an outbreak has occurred. The goal of CBRN sample collection is to collect a series of samples of suspected CBRN agents or materials that represent the original source, thus permitting CBRN incident analysis. Information collected while conducting CBRN sample collection is used to support protection, prevention, and treatment decisions. Sample collection, in support of military operations, is primarily for tactical use but may be used as evidence in an international criminal investigation if personnel are trained and the proper protocols are followed.

SAMPLE COLLECTION CONSIDERATIONS

F-17. Once the CBRN sample collection type has been determined, the number of CBRN samples that must be taken and the number of available personnel to support the sample collection operation are determined. The number of samples that must be taken and personnel available to support the sample collection operation are key factors in determining the technique to be used. Time constraints on the completion of objectives must also be adhered to. Three basic strategies for sample collection at a given target area are random, systematic, and judgmental.

- **Random.** Random, nonsystematic sample collection of the target or a portion of the target may be used when the specific area of concentration is unknown or when a suspicion drives area selection.
- **Systematic.** Systematic (or grid) sample collection is an objective strategy where samples are taken at predetermined intervals. Regular patterns of samples can rely on a grid structure or other type of regulated pattern that is superimposed on the target area. In some cases, the grid can literally be demarcated with string or stakes.
- **Judgmental.** Judgmental (or selective) sample collection is a subjective strategy where areas are selected based on the assessment or determination of the sample collection team. Often, judgmental sample collection is employed to take a series of grab samples from the areas considered to be the most likely areas of contamination.

F-18. The sample collection team should have enough sample collection equipment and consumables to take the assessed number of samples including the necessary types (vapor, soil, vegetation, snow, or water) and blank, background and duplicates. The appropriate sampling equipment for the different types of samples (chemical, biological, radiological, explosive, or fissile). At least one clean, unused version of any sample container should also be provided to each laboratory for use as a blank or negative control. For air samples, an unused air filter or cartridge should be provided to the laboratory as a blank. For surface samples, an unused swab, wipe, cloth tape, or vacuum filter should be provided as a blank. In addition, sample collection teams should be equipped with digital photography capability. Digital photographs of the suspect agent or scene are critical and may be sent electronically.

PLANNING

F-19. A sample collection plan is developed prior to initiating any sampling operation on a suspected CBRN facility, and is done in concert with the site assessment and characterization planning efforts. Sampling team personnel should make every attempt to coordinate with the appropriate laboratory prior to initiating sample collection operations to identify specific requirements for sample collection if not identified in the sample management plan. Requirements may include minimum quantity, container type and reporting requirements. The sample collection plan defines the following:

- Receive the mission, purpose, and scope of the sampling operation, to include: objectives, limitations, who should conduct the sample collection operation (CBRN personnel, PVNTMED personnel, tactical forces), and pertinent background information.
- Collect and review available intelligence (for example, imagery, mission/tactical support folder, incident reports, CBRN spot reports, EOD robot video) on the target site. Contact unit on-site for site-specific details such as current mission-oriented protective posture level.
- Review the CCIR, PIR, and reporting requirements.
- Identify available resources (for example, unit, point of contact), frequency and call-sign, or role name); on-site maneuver and/or security element, decontamination unit, combat engineer unit, signal and medical support, and EOD).
- Determine location and type of facility(ies) (for example, UGF, production, storage).

PREPARATION

F-20. While leaders plan and coordinate, subordinate leaders conduct precombat checks of personnel, their IPE/PPE (mask, filters, suits, boots, and gloves), individual equipment, and mission equipment. The sample collection team prepares sample identification labels, and any other documentation required. Prepare prepackaged sample collection tools in the cold zone. The goal is to maximize the quantity of time the R&S element is able to spend collecting samples in the hot zone by preparing the sample collection gear in the cold zone.

ACTIONS ON OBJECTIVE

F-21. Actions on the objective should be established by SOPs and the sample management plan. Actions may include, but are not limited to, the following:

- Link up with on-site security and EOD element.
- Conduct and external survey, internal survey (initial entry).
- Reevaluate PPE based on assessment of hazards identified during initial survey.
- Document the site through photos, videos, and sketches.
- Monitor equipment.
- Establish clean space outside of sampling space.
- Document actions in log and through communications to TOC.

F-22. Although specific sample collection procedures may vary, there are common guidelines that apply to any sample collection operation. Safety is the foremost concern during any sample collection operation as the sample area may be inherently dangerous and contaminated. Table B-1, page B-5, provides a list as an example for tasks that should be completed for actions on the objective. The following are examples of some of the minimum safety considerations:

- Do not conduct operations in a contaminated area without backup personnel present, who are partially dressed in the appropriate PPE, prepared to don complete PPE, and enter the area as an emergency extraction team.
- Identify physical/mechanical hazards that may affect the sample collection operations and adjust the plan accordingly to mitigate the hazard.

- Establish a decontamination area in the warm zone for personnel and equipment. Decontaminate sample collection R&S element members and sample containers according to applicable guidelines. Decontaminant may need to be adjusted based off finding of the sample collection R&S element (for example, a contaminant that reacts with standard decontaminants).
- Collect critical samples and those that are most likely to be lost, destroyed, altered, or overlooked first; and then move them to the staging area.

SECTION III – SAMPLE COLLECTION TECHNIQUES

F-23. Sample collection techniques are the methods in which the sample is removed from its original area and transferred to the sample container. The techniques are discrete, composite, grab, and surface. These techniques are associated with the physical state of the sample media.

- **Discrete.** The discrete technique is used when the sample media is soil. A discrete sample is collected from a single point to obtain a sample that accurately portrays the soil conditions at a specific area. Discrete samples are routinely collected to accurately portray the soil conditions at an area where a chemical spill has occurred and the spill is isolated to a very small area.
- **Composite.** The composite technique is a mixture of multiple samples collected from a defined area. The samples that make up the composite sample are called aliquots (an exact fraction of the whole). Composite samples are collected to accurately portray contaminants in soil in an area that may or may not be contaminated. Multiple aliquots are collected from the sample collection area identified from the sample plan, homogenized in a large mixing bowl, and treated as one soil sample. Composite sample collection produces an average value of an area when analyzed. Composite sample collection is commonly employed when analyzing environmental areas for pollutants or screening large numbers of samples, such as soil and bulk sample collection at multiple places within a specified area. This technique may be used when sample collection occurs at the point of a chemical-biological incident to increase the probability of obtaining a positive sample. A disadvantage to this approach is the risk of dilution of the chemical-biological agent to a concentration that is below the detection limit of analytical platforms.
- **Grab.** The grab technique is the basic and preferred collection technique in sample collection operations. Grab sample collection is defined as a single sample that is removed at a single point in time from one area. Grab samples are an optimal opportunity to collect containerized samples that can be expeditiously collected, for example Petri dishes of bacterial growth or vials of sample agents.
- **Surface.** Any sample taken from a surface, to analyze any potential loose particulate or liquid as a component of any ambient air flow or processes in the vicinity of the sample area.

COLLECTION ELEMENT STRUCTURE

F-24. Sample collection elements may be structured as either of two basic organizations. It is the responsibility of the persons involved in sample collection to work aseptically. The two R&S elements are—

- **Three-person sample collection element.** A three-person collection team is the optimum organization. It allows distribution of responsibilities between clean person, the sampler and a recorder. The sample team leaders provides initial quality assurance/quality control and efficient documentation of the sample collection operations that occur.
- **Two-person sample collection element.** A two-person sample collection team is the minimum size. It places a large load on the clean person to document and supply the sampler with the sample collection equipment needed, when needed. Using two people is more time and labor intensive than a team with three and requires slow and methodical actions to ensure sample integrity, safety, and proper documentation. The sample team leader will perform the duties as both recorder and clean person.

F-25. Basic procedures for each of this techniques are explained in the following paragraphs. Table F-1 references the specific sections where procedures for different samples are provided.

Table F-1. Section references

Section Title	*Page Reference*
Section IV – Chemical Sample Collection	Page F-20
Section V – Biological Sample Collection	Page F-26
Section VI – Radioactive Contamination Sample Collection	Page F-32
Section VII – Fissile Material Sampling	Page F-40

THREE-PERSON SAMPLE COLLECTION ELEMENT RESPONSIBILITIES

F-26. The three-person sample collection team consists of a sample team leader (recorder) (see table F-2), the sample collector (sampler) (see table F-3, page F-10), and the assistant sample collector (clean person) (see table F-4, page F-11). The following procedures are provided for three-person sample collection elements.

Table F-2. Sample team leader (recorder) actions

Before entering the actual sampling site the sample team leader will do the following	Develop a sampling plan to support the overall operational objectives after reviewing all reconnaissance information (such as sketches, photographic and video evidence, and verbal briefings). If possible, the sample team leader will review photos and video with lab personnel in person or using reachback capability, to prioritize and identify critical sampling locations and specific protocols to use.
	Make team assignments (sampler, assistant sampler).
	Brief the sampling plan to the sampling team.
	Ensure that PCIs and rehearsals have been properly completed.
	The sample team leader is next in the chain of custody. The sample team leader my pre-sign the chain of custody form (DD Form 3108 [*CBRN Sample Documentation and Chain of Custody]*) from the sampler or before the sampling mission or immediately after decontamination.
During sampling mission, the sample team leader will do the following	Exercises overall control, QA, and QC of sample collection.
	If mission dictates collect important information at the site. Such information might include, but is not limited to, notebooks with chemical formulas, computer hard drives, textbooks, photos.
	Determine search pattern of the site to identify all sampling points and to confirm sampling precedence. Sampling points may be marked by SOP such as with numbered index cards. The sample team leader will take the entire team on a walk-through of the site/scene to ensure all members know all the hazards, what needs to be sampled, and in what order.
	Direct where the sump and clean tarp are to be placed.
	Monitor team members for proper sampling techniques, quality control, packaging of samples, marking of samples, and safety.
	Sample team leader will avoid touching, moving, opening and/or rearranging objects/items in a target to avoid being contaminated.
	Maintains sample log notebook of samples and communication with C2 node. Annotates and maintains the sample, photograph, and video log if required.
	Periodically check other team members PPE during sampling operations; look for cuts/rips/tears, open seams, or gaps in PPE ensemble components (for example, jacket and trousers).
	Constantly monitor the sampling site (working area) for atmospheric changes, using vapor sampling detectors.
After sampling mission, the sample team leader will do the following.	Process LAST through decontamination station, unless an emergency situation exists such as potential contamination, heat injury, or low air supply.
	Transfer samples, collected documents and all logs and documentation to transload personnel for final packaging.
	Make sure all sampling team members safely process through decontamination line.
	Ensure chain of custody form is competed correctly and signed.
	Debrief sampling team.

Legend:

C2	command and control	QC	quality control
QA	quality assurance	PPE	personal protective equipment

Table F-3. Sample collector (sampler) actions

Sampler will do the following **before** the sampling mission.	Receive mission brief from sample team leader.
	Check PPE and assist sampler with PCI on sampling bag.
	Have at least two layers of nitrile gloves over PPE ensemble gloves.
	Be knowledgeable in sampling techniques and conduct rehearsals in accordance with sampling plan.
	The sample collector is the first person in the chain of custody. The sample collector must prefill chain of custody documents prior to the sampling mission or sign chain of custody form immediately after decontamination.
Sampler will do the following **during** the sampling mission.	Walk through scene/site with sample team leader to identify sampling points and hazards. Sampler will place his decontamination bucket (sometimes known as a kill bucket) and garbage bag away from the assistant sampler's set-up area.
	Assists clean person with setup. Sampler is considered clean unless they have touched anything at the target. Sampler may continue to assist clean person until the first sample is taken or they touch anything within the site.
	Identifies what will be needed to successfully collect samples. Informs clean person exactly what is needed to collect the sample using appropriate procedures.
	Uses laboratory film so that sample container caps will not come off. After the sample containers are decontaminated, the sampler will receive laboratory film from clean person and wrap the laboratory film around the cap of the container, ensuring the laboratory film covers the top of the container and the cap. Wrap in a clockwise direction, gently stretching the Laboratory film for a tight seal. The clockwise direction will tighten screw top caps more firmly.
	Places sample into an overpack held by the clean person. Be sure not to touch the outside of the overpack or the clean person.
	Never holds or moves a sample over the clean tarp. The sampler will never transfer a sample from sample collection utensil to initial package over the clean tarp. Takes samples as close to the original spot as possible to reduce spread of contamination.
	Removes the outer layer gloves, using proper glove removal technique, and secures a clean pair from the clean person. Sample collectors may wear several layers of gloves to save time, by peeling a layer off, but personnel's dexterity suffers with multiple layers. Glove removal will be done after each sample is taken, and before taking the next sample. Used gloves and used sample collection equipment will be discarded. Another technique that can be used when a limited supply of gloves exists, is to decontaminate gloves and hands after each sample collection iteration. Caution must be used when reusing decontaminated gloves as they may have become damaged or worn through physical use or interaction with the chemical being sampled.
	When material is identified by sample team leader for information collection, only the sampler will pick up the material, and place it in an appropriately sized sample collection bag. The assistant sampler will hold open the bag and sampler will place the collected material inside the bag, ensuring not to touch outside of the bag, or the assistant sampler. All materials shall be triple-bagged.
	Small containerized samples like Petri dishes may be taken as grab samples. The sampler will use laboratory film on the lid of the container, and then place sample inside appropriately sized plastic bag.
Sampler will do the following **after** the sampling mission.	Separate trash from equipment that can be reused if properly decontaminated. Evacuate contaminated trash for disposal. The sampler will NOT touch samples, or anything that stayed on the clean tarp during the mission.
	Sampler will be the last person through the sump, and will place trash bag/decontamination bucket inside sump/large 6 mil bag, and depending of mission requirements, leave them there, or take them to the personnel decontamination station.
Note. The sample team leader ensures the used sample collection equipment, decontaminate wipes, used gloves, and other trash from sampling are collected and placed in a hazardous materials container or marked plastic bag or trash can to prevent the spreading of CBRN contamination and for final disposal	
Legend: PCI precombat inspection PPE personal protective equipment	

Note. Laboratory film is commonly called Parafilm® which is a brand name. The use of the brand name does not constitute endorsement of the product

Table F-4. Assistant sample collector (clean person) actions

Assistant sampler will do the following **before** the sampling mission.	Receive mission brief from sample team leader.
	Conduct PCI on sampling bag and PPE. Prepares the equipment needed to collect samples. Assistant sampler may rearrange sampling bag to their preferred load plan for ease of use during mission. Unneeded items may be removed from sampling bag. Ensure all sampling containers are marked with a sample serial number.
	Conduct sampling rehearsals with sampler according to the sample plan.
	The assistant sampler is second in the chain of custody. The assistant sampler may pre-sign the chain of custody form before the sampling mission or immediately after decontamination.
Assistant sampler will do the following **during** the sampling mission.	Walk through scene/site with sample team leader to identify sampling points and hazards.
	Maintains control of the sample collection kit.
	Set down clean tarp and place sampling bag on clean surface.
	Will have at least one layer of nitrile gloves over PPE ensemble gloves.
	Set up a decontamination bucket off of the clean tarp surface. This bucket will be used as a place to decontaminate hands if needed.
	Prepare any and all equipment needed to collect samples and conduct down range identification and analysis.
	Hand all sampling tools to the sampler, ensuring not to touch any portion of the tools that will actually come in contact with the sample. Never touch the sampler while handing equipment to him/her. Never take any equipment back from the sampler to avoid cross contamination. If assistant sampler's hands come into contact with sampler or a suspected dirty surface, the assistant sampler will change gloves using proper glove removal technique.
	Receive sample in initial container from sampler. Sampler places sample in an over pack without touching the outside of the over pack, or touching the assistant sampler. Sampler announces "Sample XXX (sample number) Taken" The time will be annotated by the sampling team leader on the sampling log.
	Place sample in a secondary plastic bag, spray the overpacked sample with decontamination solution and seal the plastic bag. Repeat, so sample is triple-bagged. Assistant sampler removes all air from bag and seals the bag with tape.
	Annotate sample serial number on plastic bag, or most outer layer of package. Seal the most outer container/overpack with tamper-proof tape, not laboratory film.
	Announce, "Sample XXX Complete." The time will be annotated by the sample team leader on the sampling log.
	Prepare for the next sample.
	Continue providing sampling supplies to the sampler while packaging samples.
Assistant sampler will do the following **after** the sampling mission.	Gather all samples, bag and seal all documents/video recorders/cameras. Then collect samples, preparing for movement to transload site.
	Transfer samples, collected documents and all logs and documentation to transload personnel for final packaging.
	Process through decontamination line after the sampler.
	Receive debriefing from sample team leader.
Legend: PCI precombat inspection PPE personal protective equipment	

TWO-PERSON SAMPLE COLLECTION RESPONSIBILITIES

F-27. The two-person sample collection team consists of a sample collector (sampler) (see table F-5, page F-12) and the assistant sample collector (clean person) (see table F-6, page F-12). The following list provides the basic responsibilities of each person of the two-person sample collection team and may not be all-inclusive.

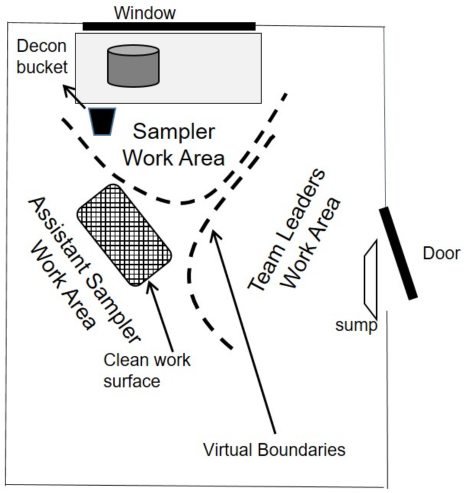
Table F-5. Sample collector actions

Two-Person Team Sample Collector Actions
Exercises overall control of sample collection.
Assists clean person with setup. Sampler is considered clean unless they have touched anything at the target. Sampler may continue to assist the assistant sampler until they take their first sample.
Identifies what will be needed to successfully collect samples. Informs the assistant sampler of exactly what is needed and collects the sample using appropriate procedures.
Uses laboratory film to ensure that the sample collection container cap will not come off. After the sample containers are decontaminated, he will receive laboratory film from the assistant sampler and wrap the laboratory film around the cap of the container, ensuring that the laboratory film covers the top of the container and the cap. Wrap in a clockwise direction, gently stretching the laboratory film for a tight seal. The clockwise direction will tighten screw top caps more firmly.
Places sample into an overpack held by the assistant sampler. Be sure not to touch the outside of the overpack or the assistant sampler.
Never holds or moves a sample over the clean tarp. The sampler will never transfer a sample from sample collection utensil to initial package over the clean tarp. Takes samples as close to the original spot as possible to reduce spread of contamination.
Removes the outer layer gloves, using proper glove removal technique, and secures a clean pair from the assistant sampler. Samplers may wear several layers of gloves to save time, by just peeling a layer off, but personnel's dexterity suffers with multiple layers. Glove removal will be done after each sample is taken, and before taking the next sample. All used gloves and used sample collection equipment will be discarded. Another technique that can be used when a limited supply of gloves exists is to decontaminate gloves and hands after each iteration of sample collection. Caution must be used when reusing decontaminated gloves as they may have become damaged or worn through physical use or interaction with the chemical being sampled.
The sample collector is the first person in the chain of custody. The sample collector must sign chain of custody form immediately after decontamination or prefill chain of custody documents prior to the sampling mission.

Table F-6. Assistant sample collector/recorder (two-person team)

Two-Person Team Assistant Sampler Actions
Prepares the equipment that is needed to collect samples.
Hands all sample collection tools to the sampler, ensuring not to touch any portion of the tools that will actually come in contact with the sample. Never touches the sampler while handing equipment to them. Never takes any equipment back from the sampler. This keeps the assistant sampler clean. If assistant sampler comes into contact with the sampler or a suspected dirty surface, the assistant sampler will change gloves using proper glove removal technique.
Maintains the sample log notebook.
Documents the collection effort with still and video recordings.
Is responsible for QA/QC.
Transfer samples, collected materials and all logs and documentation to transload personnel for final packaging.
The assistant sampler is next in the chain of custody. The assistant sampler may pre-sign the chain of custody form from the sampler before the sampling mission or immediately after decontamination.
Legend: QA quality assurance QC quality control

F-28. The left side of figure F-1 depicts how each individual of the sample collection team must stay within the boundary of their work space to avoid transfer of contamination. The right side of figure F-1 depicts the assistant sampler using a clean surface to prepare any tools needed.



Legend:
decon decontamination

Figure F-1. Sample collection team set-up

TRANSLOAD

F-29. Transload is the process of transferring any CBRN samples collected on a site, through the decontamination line and preparing them for transfer to a laboratory for further analysis. Transload occurs at the decontamination line. If available, a dedicated transload person inspects, decontaminates, and processes collected samples from a site. Transload personnel are the chain-of-custody link between the sample team and the recipient of the samples or a sample escort.

F-30. Transload personnel place the primary container inside a secondary container for transport to the cold zone where it is packaged and shipped to a laboratory for analysis. The transload personnel fills in the chain of custody form, assuming responsibility from the sample collection team. The transload personnel also signs the chain of custody form when transferring responsibility to the escort team or directly to receiving laboratory.

SAMPLE COLLECTION MEDIA TECHNIQUES AND GUIDELINES

F-31. Materials on site include vapor, liquids, solids or mixtures. These materials may be collected at the site to take representative samples to determine the nature of the hazard. The following sections provide techniques to take in several different media.

AIR/VAPOR SAMPLE COLLECTION

F-32. Air/vapor is a good sample matrix since it is a well-mixed medium. Air/vapor from a sample area contains a variable concentration of contaminants. The concentration of contaminants depends on the flow rate of the contaminant into the environment, the wind speed, the physical state of the contaminant, the terrain contours, and temperature as a variable. (See table F-7, page F-14.)

Table F-7. General procedures for air/vapor samples

When to sample	Perform sample collection as soon as possible after alleged use of a chemical, biological, and radiological agent.
Where to sample	The optimum place to obtain samples is as close to the emission source as possible. The farther away from the point of release, the more diluted the sample becomes from mixing with water, air, or environmental pollutants. Natural and man-made terrain features, such as hills, rows of buildings, and valleys, channel (concentrate) emissions. When these features are close to a particular facility, use the downwind side (if possible), as emissions remain concentrated due to the channeling affect. The sample collection reconnaissance and surveillance element determines the downwind area and collects environmental samples from that area. For collection in a possibly contaminated area, use a chemical agent detector kit to determine if a vapor hazard exists. Collect an air sample for laboratory analysis when a vapor, aerosol, or airborne particle hazard is unknown or suspected. Air samplers enable the reconnaissance and surveillance element to obtain vapor, aerosol, or airborne particle samples.
How to sample	Contaminants are sampled for later identification by using devices that draw air through filter material. Sample collection personnel should not use cologne, perfume, insect repellent, medical creams, or strong soaps while taking an air sample. These fragrances mimic volatile organic compounds that can be absorbed on the filter and skew analytical results. Smoke products can also interfere with air sample collection; therefore, avoid cigarette, vehicle exhaust, and campfire smoke. Shipboard sample collection operations must consider the products (for example, fuels, solvents, and gases) that are present and can cause false readings. Another method for collecting air samples is with devices such as automatic air samplers. Employ device for three to four minutes, when possible. Upon completion of sample collection, place the tube in a sealable bag and seal the bag with pressure-sensitive tape. Place the bag into a second bag, and use any type of tape to secure it. Decontaminate each layer of packaging with a 5 percent chlorine solution. Whatever is used (for example, sodium hypochlorite or calcium hypochlorite) the strength should be measured to create 5 percent chlorine solution. (See ATP 3-11.32/MCRP 10-10E.8/NTTP 3-11.37/AFTTP 3-2.46 or *Naval Ships' Technical Manual, Chapter 470 – Shipboard BW/CW Defense and Countermeasures* for directions on how to mix a 5 percent chlorine solution.) When possible, record the ambient temperature, barometric pressure, wind direction, and wind velocity when air sample collection is begun and when the sample collection ends.
Legend: BW biological warfare CW chemical warfare	

WATER SAMPLE COLLECTION

F-33. The collection of water (see table F-8) involves the collection of a sufficient number of samples to properly analyze the source with regard to contaminants. Water samples may be collected by CBRN R&S elements if suspected source of information on CBRN contamination. Water samples are collected by PVNTMED personnel/bioenvironmental engineers for identification or verification of biological contamination. At least four samples should be taken-three samples of the suspected contamination and one control sample-from a nearby, uncontaminated area for reference.

Table F-8. General procedures for water samples

<table>
<tr><td>When to sample</td><td> Water from a facility should be sampled when intelligence or local reports suggest that possible production or storage occurs at the facility or an incident has occurred there. Intelligence assets will provide information on the presence of indicators that may show the need for sample collection (such as higher than normal amounts of security, increased flow of smoke from a facility chimney, or water from water discharge pipes). Collect water samples from allegedly contaminated areas just after the start of a rainstorm when runoff is beginning. Natural surface drainage will concentrate any remnants of toxic compounds in depressions, streams, or ditches. Because of their large surface area and the potential for collecting runoff from an incident area, ponds, streams, reservoirs, or puddles in the immediate area of a suspected incident are potential sources of useful samples. </td></tr>
<tr><td>Where to sample</td><td> Water discharge pipes from suspected facilities should be sampled directly. Drainage areas are ideal sample collection areas since contamination and dilution from other sources is minimized. Samples should be collected as close to the potential contamination area as possible since mixing may not have occurred. Multiple samples should be taken, one from the water surface and several from different depths. At a minimum, samples should be collected from the water surface and at the bottom of the water column in slow moving areas. Preferably, the R&S element should sample various parts of a stream to capture different water velocities, water body depth, and other variables. Avoid extremely turbulent and rapidly moving areas as this may affect contaminant concentration and detection. If an oil stain-like fan, globules of organic materials, or an unnatural-looking powder is visible on surface water, take surface samples. Most chemicals of interest are denser than water and usually sink to lower levels. However, high water temperatures promote decomposition and may cause the upper layers of water to harbor contaminants (blister agent [mustard] may float on the surface of water due to surface tension, even though it is heavier than water). The R&S element may also collect samples from stagnant pools of water if the pools of water are part of chemical waste areas (a landfill, a chemical disposal area). Chemicals may percolate into stagnant pools or dumps close to the area. </td></tr>
<tr><td>How to sample</td><td> If deemed safe enough to collect samples, then use one of the following methods to collect samples: The samples can be taken with a 50- to 100-milliliter pipette (or syringe) from the source surface. Use one pipette per sample, transfer the contents into a separate clean sample bottle (retaining any material suspended in the water), and close the bottle (airtight). A sample size of at least 50 milliliters is needed.
If the sample container is not preserved, collect the sample by immersing a capped container or a container with a stopper to the desired depth, removing the cap or stopper, letting the container fill, and then recapping the container.
An alternate method for deep-water sample collection is to use a plastic, pump-operated siphon to pump water from a specific depth. Besides water samples, surface scum and bottom sediment can also be sampled and forwarded for analysis. If there is a belief that the adversary has used chemical agents during an incident, use a chemical-agent water test kit for sample collection. This kit will provide gross-level detection of chemical agents but is not an alternative to collecting samples for laboratory analysis. If the collector believes that radiological particles are present, he should use RADIAC equipment to confirm contamination. </td></tr>
<tr><td colspan="2">Legend:
R&S reconnaissance and surveillance
RADIAC radiation, detection, indication, and computation</td></tr>
</table>

F-34. When uncapping the bottle or container, hold the bottle or container near the bottom and the cap near the top edge. Do not allow anything to touch the inside of the cap. Do not set the cap down. Do not rinse the bottle or cap. If the bottle becomes contaminated (for example, if the threads are touched or hit on the stream bottom), discard it.

- **Step 1.** Hold the bottle near its base and plunge it below the water surface with the opening pointing downward. Collect the sample from the desired depth. See figure F-2.
- **Step 2.** Turn the bottle underwater into the current, and ensure that is it turned away. In slow moving streams, push the bottle underneath the surface, and ensure that it is pointed away and in an upstream direction.
- **Step 3.** Remove the bottle from the water when it is filled to the shoulder. Two-thirds of the way full is also acceptable.

Note. Do not discard the sample if the sample collection container contains a preservative. If a preservative is present, the sampler must choose a sample collection method that conserves the preservative. If the water level in the bottle is over full (there is no air pocket), quickly flick the bottle until the sample level falls enough to create headspace. If more than a few seconds pass, cap and shake the bottle before flicking.

- **Step 4.** Recap the bottle carefully without touching the sample inside.

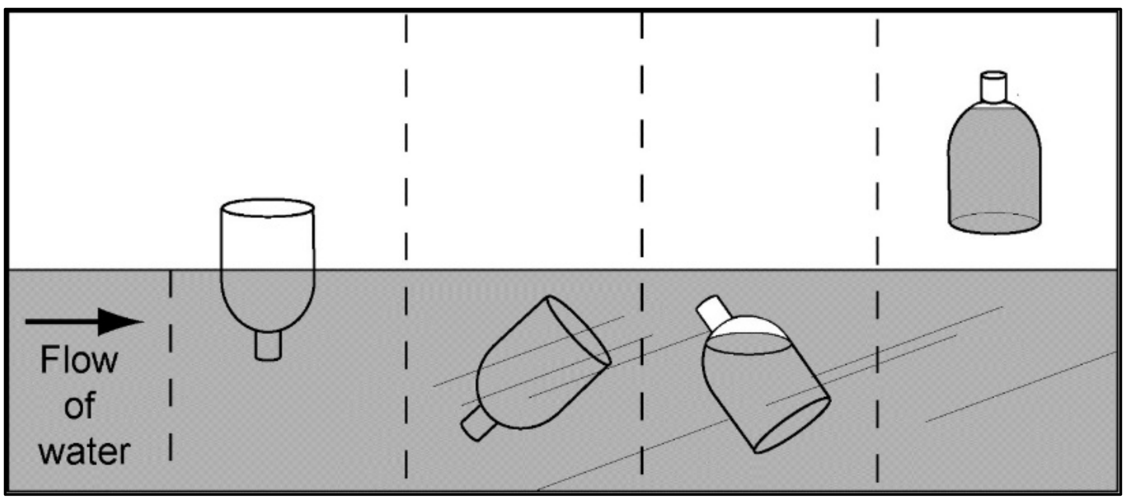


Figure F-2. Water collection technique

SOIL SAMPLE COLLECTION

F-35. Soil is a good medium to sample (see table F-9) for toxic organic compounds. Soil may contain large amounts of compounds of interest. For best results, it is essential that the collector from the R&S element sample at the precise area of compound deposition. Soil is a good medium to collect radiological particles (dust or pellets). It is essential that the sample collector monitor the sample before collecting it to ensure that the sample is contaminated with low enough levels of radiation to be safe for transport and will not exceed the OEG.

Table F-9. General procedures for soil samples

When to sample	The R&S element should sample as soon as possible after the alleged chemical or biological incident.
Where to sample	Contamination may be recognized by discoloration or apparent deposition of material on the soil's surface. If discoloration or deposition of material is evident, use a garden trowel or wooden tongue depressor to scrape up the soil. Collect only discolored soil or deposited materials, if possible. Multiple samples should be taken at different depths. Collect radiological agent samples from any place where RADIAC equipment indicates contamination (hot). If radiological deposits or material are evident, use a garden trowel or the scoop provided in the soil sample collection kit to scrape up the soil. Collect only contaminated (hot) soil, if possible.
How to sample	The R&S element may take soil samples using a knife, spoon, spatula, or similar item by scraping into a collection container the top 2 to 5 centimeters of soil from areas that appear to be contaminated. If the R&S element samples chunks or clods of earth, select those that are no larger than 10 x 5 x 1 centimeters. Collect a control sample from a sample control point of the same soil type or texture from a nearby, uncontaminated area. Normally 500 meters from actual sample point. Use a glass bottle, container, or nonstick container as a container when available. Plastic bags may also be used. When using glass bottles, containers, or nonstick plastic containers, seal the cap with pressure-sensitive tape and mark for identification. Place the soil sample in one bag, purge excess air, and seal by folding over open end two to three times and wrapping with any tape when using plastic bags. Insert the first bag into a second bag, seal, tape, and mark for identification. If possible, place samples in a shielded container.
	Ensure that each layer of packaging is decontaminated using a 5 percent chlorine solution. Whatever is used (for example, sodium hypochlorite or calcium hypochlorite), the strength should be measured to create a 5 percent chlorine solution. See ATP 3-11.32/MCRP 10-10E.8/NTTP 3-11.37/AFTTP 3-2.46. Place the soil sample in one bag, purge excess air, and seal by folding over open end two to three times and wrapping with any tape when using plastic bags. Insert the first bag into a second bag, seal, tape, and mark for identification. If possible, place samples in a shielded container.
Legend: R&S reconnaissance and surveillance RADIAC radiation, detection, indication, and computation	

VEGETATION SAMPLE COLLECTION

F-36. Although not categorized as media, vegetation provides an excellent means for collecting CBRN samples. Collect samples of vegetation that are not consistent with healthy plants or plant material that is in the process of natural decay. See table F-10, page F-18.

Table F-10. General procedures for vegetation samples

When to sample	The R&S element should sample as soon as possible after the alleged chemical, biological, or radiological incident.
Where to sample	When the center of the incident in an area has been determined, collect a control sample of similar material from and unaffected area at a sample control point normally 500 meters away (upwind) from the sample collection area. The control should be taken before entering the contaminated area. Collect the sample from the center of the contaminated area, and at several 100-meter increments downwind of the area. If the R&S element can discern a contamination pattern in the area, this should be reported.
How to sample	Select leaves that have wilted or appear to have been chemically burned. Collect vegetation that has liquid or solid substances deposited on its surfaces. This may appear as a shiny or moist area. Collect vegetation at several places within the suspected contaminated area. Horizontal surfaces are the preferred sample collection areas. Use a cutting tool or any sharp object and cut several contaminated leaves or a handful of grass when possible. Collect enough vegetation to fill a one-gallon zipper lock storage bag. Do not crush the sample. Triple-bag the sample. Place the vegetation sample into a zipper lock bag. Purge excess air out of the bag and seal. Fold opened end of the bag two to three times and wrap with tape. Mark the bag for identification. Take a control sample of similar material from an unaffected area. Seal, tape, and mark the control sample. Ensure that each layer of packaging is decontaminated using a 5 percent chlorine solution.
Legend: R&S reconnaissance and surveillance	

SURFACE SAMPLE COLLECTION

F-37. Surface sample collection technique is the process of wiping surfaces with approved material that will capture the suspected contamination. The surface technique of sample collection varies with the agent and purpose of the sample. It is recommended that the analytical laboratory processing the samples be consulted when selecting a sample procedure for a specific chemical or contaminant to ensure the lab's ability to analyze off the matrix selected (for example, thermal desorption), as well as the availability of appropriate analytical instrumentation. Surface sample collection techniques also involve properly using the appropriate wiping materials of a particular surface such as a filter or cloth, which is then submitted to a laboratory for analysis. Typical materials used in surface sample collection include—

- **Glass fiber filters.** Glass fiber filters are recommended for chemicals that are analyzed by using gas chromatography or high-performance liquid chromatography. Also used for radiological wipes (for carbon-14 and tritium) being analyzed with a liquid scintillation counter.
- **Cloth sample collection smears (4.5 centimeters).** Cloth sample collection smears (4.5 centimeters) are used for surface wipe sample collection for radiological material.
- **Paper filters.** Paper filters are generally used for collection of metals. Mixed cellulose ester filter discs or smear tabs or their equivalent, are most often recommended.
- **Polyvinyl chloride filters.** Polyvinyl chloride is available for substances unstable on paper-type filters.
- **Gauze squares.** Gauze squares may be used for organic substances. More durable than filter media, especially when wiping rough surfaces.
- **Charcoal-impregnated pads.** Charcoal-impregnated pads may be used for collection of volatile solvents from surfaces. Work by trapping solvent on activated charcoal.
- **Swabs.** Swabs are ideal for areas that are obviously contaminated and are easier to package for transport as well as process in most laboratories when compared to wipes and filters. Swabs should consist of natural fibers for suspect chemical or radiological materials and preferably consist of sterile synthetic fibers for biological materials.

GENERAL PROCEDURES FOR WIPING

F-38. Two techniques are commonly used for wiping-S-pattern and decreasing concentric squares. For each technique, firm pressure should be applied when wiping.

- **S-pattern.** Place filter flat at one end of the sample and wipe in an S-pattern over the entire surface. Without allowing the filter to come in contact with any other surface, fold the filter in half with the exposed side in. If possible, for chemical/radiological sample collection use the same filter to rewipe the area at 90° from the first wipe, again using the S-pattern, and then fold it inward again (see figure F-3). Place the filter in a sample vial or container, cap, and place identifying data on the container. Place the same identifying data on the area sketch and sample collection form. Include notes with the sketch and sample collection form giving any further description of the sample, for example, tabletop or baseboard.

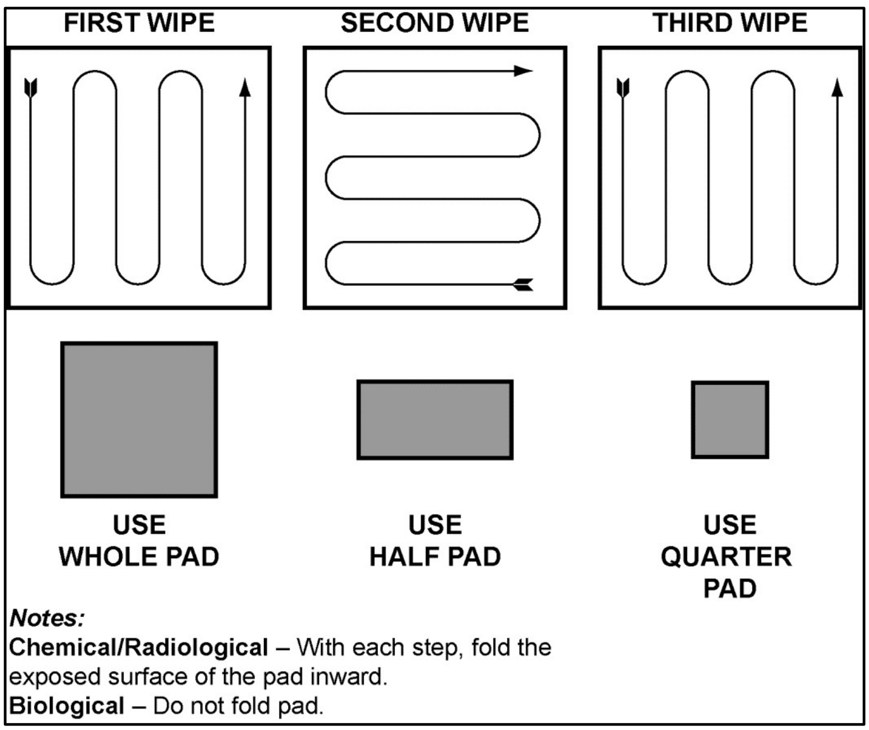


Figure F-3. S-pattern surface technique

- **Decreasing concentric squares.** Start at the outside edge and progress toward the center of the surface area by wiping in concentric squares of decreasing size. Without allowing the filter to come in contact with any other surface, fold the filter with the exposed side inward. If possible, for chemical/radiological sample collection use the same filter to repeat sample collection of the same area, and then fold it inward again (see figure F-4, page F-20). Place the filter in a sample vial or container, cap and place identifying data on the container. Place the same identifying data on the area sketch and sample collection form. Include notes with the sketch and sample collection form giving any further description of the sample, for example, tabletop or baseboard.

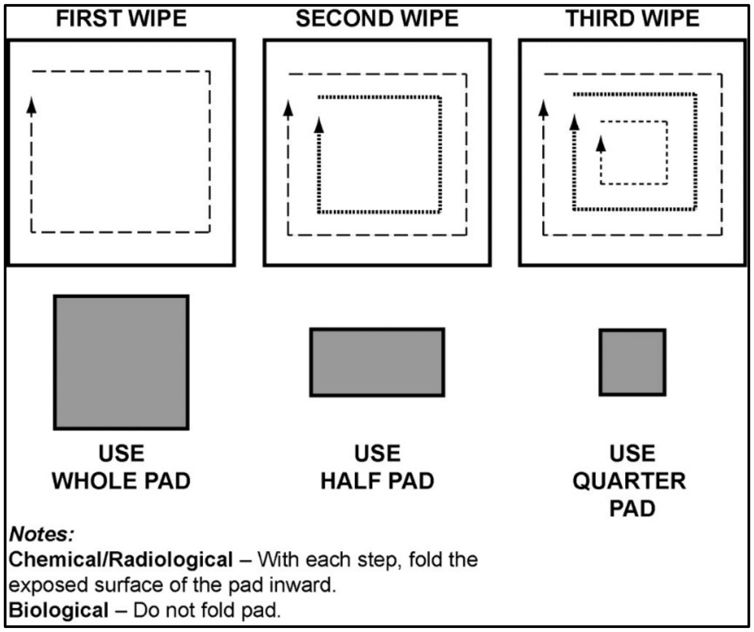


Figure F-4. Decreasing concentric squares surface technique

GENERAL SAMPLE SUBMISSION PROCEDURES

F-39. Samples submitted for analysis must be properly packaged, labeled, and shipped so that they arrive in an analytically acceptable condition. Chain of custody must be documented tracking accountability of the sample from sample collector through each change of hands. The samples should be maintained at 1°C to 4°C. Priority of cooling goes to biological samples and any sort of vegetation. Prechilled refrigeration packs and dry ice wrapped in paper may be used to keep samples cool. Where dry ice is used, ensure a sufficient opening is created in order to let gas escape and not cause pressure. Exercise caution when using dry ice in an enclosed environment (such as aircraft, confined space), as carbon dioxide (CO_2) displaces the oxygen. Carbon dioxide, solid, or dry ice is part of the hazardous cargo manifest, Class 9, UN1845, when the applicable regulations apply to this item.

F-40. The general sample submission procedure are as follows:

- Obtain information for the analytical laboratory about adding solvent to the container containing the swipe sample. Samples for some substances should have solvent added to the vial or other container as soon as the swipe sample is placed inside the container.
- Submit the samples to the analytical laboratory with appropriate documentation, which includes a chain-of-custody form (DD Form 3108). (Sample shipment procedures are not covered under this reference document.)
- Follow 42 CFR and 49 CFR, AFMAN 24-604/TM 38-250/NAVSUP PUB 505/DLAI 4145.3, and IATA regulations when packaging for all intra- and inter-theater.
- Submit control standards and samples (for example, field blanks, background samples, spike samples, split samples, duplicates, laboratory blanks) as required by the sample collection plan or analytical laboratory's protocol.

SECTION IV – CHEMICAL SAMPLE COLLECTION

F-41. Table F-11 provides additional guidance for determining the size or amount of the recommended sample for chemical agents. Background samples should be about the same size as contaminated sample taken from an incident area.

Table F-11. Recommended sample collection sizes

Chemical samples		
Sample Matrix	***Sample Quantity***	***Remarks***
Soil	10 by 5 by 1 centimeters ½ soda can (3.5 in^2 x ½ in depth from contaminated soil)	A larger area is more useful than a greater depth. Chunks/clods of soil should be no larger than 2 in W x 4 in L x ½ in D.
Solid, bulk chemical	4 mL	Fill 4 mL vial.
Organic liquid (non-CWA)	4 mL	None.
Organic liquid-neat (CWA, precursor, or super toxic)	4 mL	None.
Organic liquid-dilute (CWA, precursors, or super toxic)	50 mL	Depth depends on source and agent surface tension.
Water	100 mL (maximum)	Depth depends on the water source and the agent surface tension.
Vegetation	Equivalent to 3 leaves or 3 handfuls of grass	The size depends on the amount of contamination. The best samples are found closest to the release point. Pack as much material into sample container as possible.
Swab/Wipe	2x swab/wipe	None.
Legend: CWA chemical warfare agent D depth in inch L length mL milliliter W width		

SOLID CHEMICAL SAMPLE

F-42. The steps in table F-12 provide example procedures the sample collection R&S element might use for collecting a solid chemical sample.

Table F-12. Solid chemical sample

Steps	***Process***
1	The assistant sampler removes all identified sample collection tools from kit and lays them out on clean ground tarp. The sampler determines which tool he will use and tells assistant sampler.
2	(Optional) The assistant sampler hands the sampler the small tarp (for chemical analysis), which the sampler places near where the samples will be obtained.
3	(If analytic equipment utilized.) The assistant sampler hands the sampler the chemical analysis equipment and pH paper/meter, which the sampler places on the small tarp and ensures are ready for analysis.
4	The assistant sampler hands sample collection spoon or sample collection scoop and scoop handle or scalpel to assistant sampler.
Note. Use the sample collection scoop for sample collection of fine particulates. Use the spoon for sample collection of coarse particulates. Use the scalpel for scrapping wood, paint, or crusted/coated material.	
5	The assistant sampler opens protective packing and allows the sampler to remove the identified tool.
6	The sampler inserts the sample collection scoop into the scoop handle.
Note. If using the sample collection spoon or scalpel, skip to step 7.	
7	The assistant sampler removes sample container assembly from the kit; opens the outer container and removes sample container.

Table F-12. Solid chemical sample (continued)

Steps	Process
8	The assistant sampler opens sample container packaging, removes identification labels and affixes one label to the sample container. If a three-person team, the recorder affixes the label to the sample container.
9	The assistant sampler verifies sample container number matches sample number on outer container; affixes sample number label to sample log notebook; records information in sample log notebook. If using a three-person team, the recorder completes this step.
10	The assistant sampler opens sample container and hands it to the sampler.
11	The sampler scrapes or scoops the solid material/soil into the sample container until the container is at least two-thirds full while assistant sampler takes a picture of the sample collection. (If conducting analysis on site, sampler will collect a small amount of material and deposit the sampled material onto appropriate analysis equipment.) When possible, sample containers should be completely filled, leaving no head space to minimize possible volatilization.
12	(If analytic equipment utilized.) The sampler scrapes or scoops the solid material for transfer onto appropriate analysis equipment.
13	The sampler places cap on sample container and screws tight. While the sampler holds the container and verifies that the cap is secure, the assistant sampler takes a picture.
14	The assistant sampler removes bleach pack wipe from kit and hands to sampler.
15	The sampler decontaminates his hands and the outside of the sample container with the bleach pack wipe. Allow the bleach to dry off the container. (If multiple layers of gloves are worn, the sampler may remove outer gloves.)
16	The assistant sampler removes self-sealing laboratory film from kit, cuts an adequate section length, and hands to sampler.
17	The sampler places self-sealing laboratory film around the sample container closure to seal cap to container.
18	The sampler places sealed container into outer container held by the assistant sampler. Sampler announces “Sample XXX (sample sequence number) taken.”
19	(If analytic equipment utilized.) The sampler uses the decontamination wipe to decontaminate the chemical analysis equipment, as necessary, and prepares the equipment for the next sample.
20	The assistant sampler places cap on outer container and screws tight; places tamper seal tape across cap with the ends contacting the sides of the outer container (forming a seal that will be broken if the cap is removed).
21	The assistant sampler places the outer sample vial or container, containing the sample, into a secondary containment bag (for example, Poly-bag or anti-static bag); decontaminates with 5 percent chlorine solution; seals the bag.
22	The assistant sampler places sample and secondary containment bag into a tertiary containment bag, so there is three layers of containment; decontaminates with 5 percent chlorine solution; seals the bag. Assistant sampler announces “Sample XXX (sample sequence number) complete.”
23	The sample collection team members dispose of used sample collection equipment and remove nitrile gloves.

LIQUID CHEMICAL SAMPLE

F-43. The steps in table F-13 provide example procedures the sample collection R&S element might take for collecting a liquid chemical sample.

Table F-13. Solid liquid sample

Steps	Process
1	The assistant sampler removes all identified sample collection tools from kit and lays them out on clean ground tarp designated as clean work area.
2	(Optional.) The assistant sampler hands the sampler the small tarp (for chemical analysis), which the sampler places near where the samples will be obtained.
3	(If analytic equipment utilized.) The assistant sampler hands the sampler the chemical analysis equipment and pH paper/meter, which the sampler places on the small tarp and ensures are ready for analysis.
4	The assistant sampler opens protective packing and allows the sampler to remove the syringe.
5	The sampler removes syringe from packing and collects liquid sample from just below the surface.
6	The assistant sampler opens sample container assembly from kit, removes sample container and sample labels.

Table F-13. Solid chemical sample (continued)

Steps	***Process***
7	The assistant sampler opens sample container packaging, removes identification labels and affixes one label to the sample container. If a three-person team, the recorder affixes the label to the sample container.
8	The assistant sampler verifies sample container number matches sample number on outer container, affixes sample number label to sample log notebook; records information in sample log notebook. If using a three-person team, the recorder completes this step.
9	The assistant sampler opens sample container and hands it to the sampler.
10	The sampler expresses collected liquid into sample container and discards syringe in dirty area. When possible, sample containers should be completely filled, leaving no head space to minimize possible volatilization. The assistant sampler (recorder if a three-person team) takes pictures of the collection.
11	(If analytic equipment utilized.) Sampler expresses drops of collected liquid onto appropriate analysis equipment and begins analysis process. The sampler expresses 1-2 drops of collected liquid onto the pH paper/meter and reads results to the recorder.
Note. Do not completely empty the syringe, leave at least 5 milliliters of liquid in the 60-mL syringe, if using a smaller syringe scale accordingly; otherwise, some of the liquid may be aerosolized, creating a contamination hazard. When placing the syringe into the decontamination bucket, draw a small amount of decontamination solution into the syringe in order to neutralize any agent remaining inside the syringe	
12	The assistant sampler places cap on sample container, screws tight.
13	The assistant sampler opens a bleach pack wipe and hands wipe to the sampler.
14	The sampler decontaminates his hands and the outside of the sample container with the bleach pack wipe. Allow the bleach to dry off the container.
15	The assistant sampler opens self-sealing laboratory and cuts an adequate section length and hands it to the sampler.
16	The sampler places self-sealing laboratory film around the sample container closure to seal the cap to container.
17	The sampler places sealed container into secondary container held by the assistant sampler, ensuring that he does not touch the outer container.
18	(If analytic equipment utilized.) The sampler uses the decontamination wipe to decontaminate the chemical analysis equipment, as necessary, and prepares the equipment for the next sample.
19	The assistant sampler places cap on the secondary container and screws tight, places tamper seal tape across the cap with the ends contacting the sides of the outer container (forming a seal that will be broken if the cap is removed).
20	The assistant sampler places the outer sample vial or container, containing the sample, into a secondary containment bag (for example, Poly-bag or antistatic bag); decontaminates with 5 percent chlorine solution; seals the bag.
21	Place sample and secondary containment bag into a tertiary containment bag, so there is three layers of containment; decontaminates with 5 percent chlorine solution; seals the bag. Assistant sampler announces “Sample XXX (sample sequence number) complete.”
22	The sample collection team members dispose of used sample collection equipment; remove nitrile gloves.
Note. Chemicals that are contained in a glovebox should be sampled, analyzed, and packaged (inner package) inside that glovebox. This is due to the potential for violent reactions of the chemicals with oxygen or other chemicals in the air. All materials required for sampling and analysis should be passed into the glovebox through existing pass-through/airlocks, and any equipment that is pulled out of the glovebox (such as chemical analysis equipment or pH meters) should be decontaminated both before they leave the glovebox (before they are placed in the pass-through/airlock) and after they are removed from the pass-through/airlock.	

LIQUID CHEMICAL SAMPLE USING TUBING

F-44. The steps in table F-14, page F-24, provides example procedures the sample collection R&S element might take for collecting a liquid chemical sample using tubing.

Table F-14. Liquid chemical sample using tubing

Steps	*Process*
1	The assistant sampler removes all identified sample collection tools from kit and lays them out on clean ground tarp.
2	(Optional) The assistant sampler hands the sampler the small tarp (for chemical analysis), which the sampler places near where the samples will be obtained.
3	(If analytic equipment utilized.) The assistant sampler hands the sampler the chemical analysis equipment and pH paper/meter, which the sampler places on the small tarp and ensures are ready for analysis.
4	The sampler determines the length of tubing necessary to extract the sample.
5	The assistant sampler opens tubing package; pulls out one end of tubing and removes end cap.
6	The assistant sampler partially opens blunt tip needle package at the attachment end, removes blunt tip needle, and inserts needle into tubing for at least one-half inch.
7	The assistant sampler pulls tubing out of package to the desired length for sample collection. Using the scissors cuts the tubing at the desired length, allowing excess tubing to fall to the ground. Tubing may be set on clean ground tarp.
8	The assistant sampler opens the tubing weight packages and slides tubing weights onto far end of the tubing, ensuring that at least one inch of tubing extends past the last tubing weight.
Note. The number of tubing weights on sample end of the tubing is determined by length of tubing. One to three weights can be used.	
9	The assistant sampler opens syringe package, removes syringe from package, and attaches syringe to blunt tip needle.
10	The assistant sampler hands syringe and tubing to sampler.
11	The sampler carefully lowers the weighted end of the tubing into the object to be sampled until it is below the liquid level while maintaining at least 4 inches of tubing above the object being sampled. The assistant sampler (recorder if a three-person team) takes pictures of the collection.
12	The sampler carefully draws back on the syringe plunger until the syringe fills with liquid ensuring to not fully retract the plunger while the assistant sampler (or recorder) takes pictures of the collection.
13	The assistant sampler removes sample container assembly from kit; opens outer container and removes sample container.
14	The assistant sampler opens sample container packaging, removes identification labels and affixes one label to the sample container. If a three-person team, the recorder affixes the label to the sample container.
15	The assistant sampler verifies sample container number matches sample number on outer container, affixes sample number label to sample log notebook; records information in sample log notebook. If using a three-person team, the recorder completes this step.
16	The assistant sampler opens sample container.
17	The sampler unlocks the needle from the syringe and discards, prior to receiving sample container from assistant sampler.
18	The sampler slowly expresses collected liquid against the inside of the sample container to minimize aerosol creation. Also, when possible, sample containers should be completely filled, leaving no head space to minimize possible volatilization.
19	(If analytic equipment utilized.) The sampler expresses drops of collected liquid onto appropriate analysis equipment and begins analysis process.
Note. Do not completely empty the syringe, leave at least 5 milliliters of liquid in the 60 milliliter syringe, if using a smaller syringe scale accordingly; otherwise, some of the liquid may be aerosolized, creating a contamination hazard.	
20	The assistant sampler places cap on sample container, screws tight, and verifies that the cap is secure.
21	The assistant sampler removes bleach pack wipe from kit and hands to the sampler.
22	The sampler opens bleach pack wipe decontaminates his hands and the outside of the sample container.

Table F-14. Liquid chemical sample using tubing (continued)

Steps	Process
23	The assistant sampler removes self-sealing laboratory film; cuts an adequate section length and hands to sampler.
24	The sampler places self-sealing laboratory film around the sample container closure to seal cap to container.
25	The sampler places sealed container into secondary container held open by the assistant sampler. Sampler announces “Sample XXX (sample sequence number) taken.”
26	(If analytic equipment utilized.) The sampler uses the decontamination wipe to decontaminate the chemical analysis equipment, as necessary, and prepares the equipment for the next sample.
27	The assistant sampler places cap on the secondary container and screws tight, places tamper seal tape across cap with the ends contacting the sides of the secondary container (forming a seal that will be broken if the cap is removed).
28	The assistant sampler places the outer sample vial or container, containing the sample, into a secondary containment bag (for example, Poly-bag or anti-static bag); decontaminates with 5 percent chlorine solution; seals the bag.
29	The assistant sampler places sample and secondary containment bag into a tertiary containment bag, so there is three layers of containment; decontaminates with 5 percent chlorine solution; seals the bag. Assistant sampler announces “Sample XXX (sample sequence number) complete.”
30	The sample collection team members dispose of used sample collection equipment and remove nitrile gloves.

CHEMICAL WIPE SAMPLE

F-45. Figure F-3, page F-19, and figure F-4, page F-20, depict the two techniques used for wipe samples, the decreasing concentric squares and the S-pattern technique. The steps in table F-15 provides example procedures the sample collection R&S element might take for collecting a chemical wipe sample.

Table F-15. Chemical wipe sample

Steps	Process
1	The assistant sampler removes identified sample collection tools from kit and lays them out on ground tarp.
2	The assistant sampler opens protective packing and allows the sampler to remove the designated tool from the package using the handle ends.
3	The assistant sampler opens the alcohol wipe or dry (natural fiber) wipe and holds it for the sampler.
4	The sampler removes the alcohol or dry wipe from its packaging, using the biting end of the hemostat (or extension tool).
5	The sampler wipes the surface of the object to be sampled, do not exceed 1-square foot. If more surface area is to be sampled, use additional alcohol wipes. The assistant sampler (the recorder if a three-person team) takes pictures of the collection.
6	The assistant sampler opens sample container assembly and removes sample container.
7	The assistant sampler verifies sample container number matches sample number on outer container, affixes sample number label to sample log notebook; records information in sample log notebook. If using a three-person team, the recorder completes this step.
8	The assistant sampler verifies sample container number matches sample number on outer container; affixes sample number label to sample log notebook. If a three-person team the recorder completes this step.
9	The assistant sampler opens sample container and hands it to the sampler.
10	The sampler places used alcohol wipe or dry wipe into the sample container.
11	The assistant sampler places cap on sample container and screws tight while the sampler holds the container and verify that the cap is secure.
12	The assistant sampler removes bleach pack wipe from kit and gives to sampler. The sampler decontaminates his hands and the outside of the sample container with the bleach pack wipe. Allow the bleach to dry off the container.

Table F-15. Chemical wipe sample (continued)

Steps	*Process*
13	The assistant sampler removes laboratory film; cuts an adequate section length, and hands to sampler.
14	The sampler places self-sealing laboratory film around the sample container cap to seal cap to container.
15	The sampler places sealed container into outer container held by the assistant sampler. Sampler announces "Sample XXX (sample sequence number) taken."
16	The assistant sampler places cap on outer container and screws tight, places tamper seal tape across cap with the ends contacting the sides of the secondary container (forming a seal that will be broken if the cap is removed), and places outer container into sample transport bag.
17	The assistant sampler places the outer sample vial or container, containing the sample, into a secondary containment bag (for example, Poly-bag, or antistatic bag); decontaminates with 5 percent chlorine solution and seals the bag.
18	The assistant sampler places sample and secondary containment bag into a tertiary containment bag, so there is three layers of containment; decontaminates with 5 percent chlorine solution; seals the bag. Assistant sampler announces "Sample XXX (sample sequence number) complete."
19	The sample collection team members dispose of used sample collection equipment; remove nitrile gloves.

SECTION V – BIOLOGICAL SAMPLE COLLECTION

F-46. Table F-16 provides additional guidance for determining the size or amount of the recommended sample for biological agents. Background samples should be about the same size as contaminated sample taken from an incident area.

Table F-16. Recommended sample collection sizes

Biological samples		
Sample Matrix	***Sample Quantity***	***Remarks***
Soil	10 x 5 x 1 centimeter ½ soda can (3.5 in^2 x ½ in depth from contaminated soil)	A larger area is more useful than a greater depth. Chunks/clods of soil should be no larger than 2 in W x 4 in L x ½ in D
Liquid	5-10 mL	None.
Vegetation	Grass and/or leaves to fill a one gallon plastic bag	Size depends on amount of contamination. The best samples are found closest to the release point. Pack as much material into sample container as possible
Swab/wipe	2x swab/wipes	None.
Legend: D depth in inch L length mL milliliter W width		

SOLID BIOLOGICAL SAMPLE

F-47. The steps in table F-17 provide example procedures the sample collection R&S element might take for collecting a dry biological sample.

Table F-17. Solid biological sample

Steps	Process
1	The assistant sampler removes all identified sample collection tools from kit and lays them out on clean ground tarp.
2	The assistant sampler opens protective packing and allows the sampler to remove the required tool.
3	The assistant sampler removes labels; affixes one label to the sample bag.
4	The assistant sampler verifies that the sample numbers match; affixes the other sample number label to sample log notebook. The recorder completes this step in a three-person team.
5	The assistant sampler opens inner sample vial assembly or sample jar bag and hands it to sampler.
6	The sampler carefully collects the sample so that the sample collection end of the tool touches nothing but the sample, and transfers it to the inner sample vial assembly or sample jar while the assistant sampler (or recorder if a three-person team) takes a picture of the sample collection.
7	The assistant sampler screws the cap on the inner sample vial or sample jar.
8	The assistant sampler removes a bleach pack wipe and hands to the sampler.
9	The sampler decontaminates his hands and the inner sample vial using the bleach pack wipe.
10	The assistant sampler removes laboratory film, and cuts an adequate section length, and gives it to the sampler.
11	The sampler uses the self-sealing laboratory film to seal the cap to the vial or jar.
12	The sampler places the inner sample vial assembly or jar in an outer sample vial or container held open by the assistant sampler. Sampler announces “Sample XXX (sample sequence number) take.”
13	The assistant sampler places the lid onto the outer sample vial or container and places tamper seal tape over the lid or cap of the outer container.
14	The assistant sampler places the outer sample vial or container, containing the sample, into a secondary containment bag (for example, poly-bag, or antistatic bag), and decontaminates with 5 percent chlorine solution. The assistant sampler then seals the bag.
15	The assistant sampler places sample and secondary containment bag into a tertiary containment bag, so there are three layers of containment; decontaminates with 5 percent chlorine solution and seals the bag. The assistant sampler announces, “Sample XXX (sample sequence number) complete.”
16	The sample collection team members dispose of used sample collection equipment; remove nitrile gloves.

LIQUID BIOLOGICAL SAMPLE

F-48. The steps in table F-18 provide example procedures the sample collection R&S element might take for collecting a liquid biological sample.

Table F-18. Liquid biological sample

Steps	Process
1	The assistant sampler removes all identified sample collection tools from kit and lays them out on clean ground tarp.
2	The assistant sampler opens the protective packaging of the sterile disposable pipette (handle end).
3	The sampler removes the pipette (by the handle) from the packaging, being careful not to touch the sample collection end of the pipette.
4	The assistant sampler opens the sterile inner sample vial assembly bag and lays it out on the tarp.
5	The assistant sampler removes identification labels and affixes one label to the sample transport container. If a three-person team, the recorder affixes the label to the sample transport container.
6	The assistant sampler verifies sample container number matches sample number on outer container, affixes sample number label to sample log notebook; records information in sample log notebook. If using a three-person team, the recorder completes this step.
7	The assistant sampler opens the inner sample vial assembly and hands it to the sampler.
8	The sampler carefully collects the sample so that the sample collection end of the pipette touches nothing but the sample. Gently squeezing the bulb on the pipette, inserting the tip into the liquid and slowly releasing the bulb to avoid the creation of aerosols during sample collection. The assistant sampler (or recorder if a 3-person team) takes pictures of the collection.

Table F-18. Liquid biological sample (continued)

Steps	*Process*
9	The sampler transfers the sample to the inner sample vial assembly.
10	The assistant sampler screws the cap on the inner sample vial assembly.
11	The assistant sampler removes a bleach pack wipe and hands to the sampler.
12	The sampler decontaminates his hands and the inner sample vial assembly using the bleach pack wipe.
13	The assistant sampler removes laboratory film; cuts an adequate length and gives it to the sampler.
14	The sampler uses the laboratory film to seal the cap to the vial.
15	The assistant sampler holds the outer sample vial for the sampler.
16	The sampler places the inner sample vial assembly in the outer sample vial. Sampler announces "Sample XXX (sample sequence number) taken."
17	The assistant sampler places tamper seal tape over the cap of the outer sample vial.
18	The assistant sampler places the outer sample vial or container, containing the sample, into a secondary containment bag (for example poly-bag or antistatic bag) and decontaminates with 5 percent chlorine solution. The assistant sampler then seals the bag.
19	The assistant sampler places the sample and secondary containment bag into a tertiary containment bag, so there is three layers of containment, decontaminates with 5 percent chlorine solution; and seals the bag. The assistant sampler announces, "Sample XXX (sample sequence number) complete."
20	The sample collection team members dispose of used sample collection equipment; remove nitrile gloves.

DRY BIOLOGICAL SWAB SAMPLE

F-49. The steps in table F-19 provide example procedures the sample collection R&S element might take for collecting a dry biological swab sample.

Table F-19. Dry biological swab sample

Steps	*Process*
1	The assistant sampler removes all identified sample collection tools from kit and lays them out on clean ground tarp.
2	The assistant sampler opens the sterile swab from the handle end and offers swab to sampler.
3	The sampler pulls the swab from the packaging by the nonsample collection end of the swab.
4	The assistant sampler opens sterile inner sample vial assembly bag and lays out on tarp.
5	The assistant sampler opens sample container packaging, removes identification labels and affixes one label to the sample container. If a three-person team, the recorder affixes the label to the sample container.
6	The assistant sampler verifies sample container number matches sample number on outer container, affixes sample number label to sample log notebook; records information in sample log notebook. If using a three-person team, the recorder completes this step.
7	The sampler collects the sample by rubbing the swab against the selected surface. The swab should be gently rotated during sample collection. The sampler places the used swab in the inner sample vial assembly (held by the assistant sampler) and using the neck of the vial as a fulcrum, bends the handle of the swab to break the swab end into the vial. The wooden handle is discarded. If a three-person team, the recorder takes a picture of the collection.
Note. Repeat procedure as needed; if swabs are used on the same sample collection area then multiple swabs can be placed in a single inner sample vial assembly.	
8	The assistant sampler opens inner sample vial assembly and hands it to the sampler.
9	The assistant sampler screws the cap on the inner sample vial assembly.
10	The assistant sampler removes a bleach pack wipe and hands to the sampler.
11	The sampler decontaminates his hands and the inner sample vial assembly using the bleach pack wipe.

Table F-19. Dry biological swab sample (continued)

Steps	Process
12	The assistant sampler removes laboratory film; cuts an adequate section length, and gives it to the sampler.
13	The sampler uses the laboratory film to seal the cap to the vial.
14	The assistant sampler holds the outer sample vial for sampler.
15	The sampler places the inner sample vial assembly in the outer sample vial. The sampler announces, "Sample XXX (sample sequence number) taken."
16	The assistant sampler places the lid onto the outer sample vial and places tamper seal tape over the lid of the outer sample vial.
17	The assistant sampler places the outer sample vial or container, containing the sample, into a secondary containment bag (for example, poly-bag or antistatic bag), decontaminates with 5 percent chlorine solution and seals the bag.
18	The assistant sampler places the sample and secondary containment bag into a tertiary containment bag, so there is three layers of containment, decontaminates with 5 percent chlorine solution and seals the bag. The assistant sampler announces, "Sample XXX (sample sequence number) complete."
19	The sampler collection team members dispose of used sample collection equipment and remove nitrile gloves.

WET BIOLOGICAL SWAB SAMPLE

F-50. The steps in table F-20 provide example procedures the sample collection R&S element might take for collecting a wet biological swab sample.

Table F-20. Wet biological swab sample

Steps	Process
1	The assistant sampler removes all identified sample collection tools from kit and lays them out on clean ground tarp.
2	The assistant sampler opens the sterile swab from the handle end and offers swab to sampler.
3	The sampler pulls the swab from the packaging by the nonsample collection end of the swab.
4	The assistant sampler opens the sterile buffer or sterile water and hands to the sampler.
5	The sampler moistens the sterile swab with the sterile buffer or water (ensure that when the swab is moistened that it is not dripping. Press swab against the wall of the vial to remove excess fluid).
6	The assistant sampler opens sterile inner sample vial assembly bag and lays it out on tarp.
7	The assistant sampler removes identification labels and affixes one label to the sample container. If a three-person team, the recorder affixes the label to the sample container.
8	The assistant sampler verifies sample container number matches sample number on outer container, affixes sample number label to sample log notebook; records information in sample log notebook. If using a three-person team, the recorder completes this step.
9	The sampler collects the sample by rubbing the swab against the selected surface. The swab should be gently rotated during sample collection. The sampler places the used swab in the inner sample vial (held by the assistant sampler) and using the neck of the vial as a fulcrum, bends the handle of the swab to break the swab end into the vial. The wooden handle is discarded. If a three-person team, the recorder takes pictures of the collection.
10	The assistant sampler opens inner sample vial assembly and hands it to the sampler.
Note. Repeat procedure as needed; if swabs are used on the same sample collection area then multiple swabs can be placed in a single inner sample vial.	
11	The assistant sampler screws the cap on the inner sample vial.
12	The assistant sampler removes bleach pack wipe and gives it to the sampler.
13	The sampler decontaminates the inner sample vial assembly by wiping it with the bleach pack wipe. Allow the bleach to dry off the container.
14	The assistant sampler removes laboratory film; cuts an adequate length and gives it to the sampler.
15	The sampler uses the laboratory film to seal the cap to the vial.
16	The sampler places the inner sample vial assembly in an outer sample vial held by the assistant sampler. Sampler announces, "Sample XXX (sample sequence number) taken."
17	The assistant sampler places the lid onto the outer sample vial and places tamper seal tape over the lid of the outer sample vial.

Table F-20. Wet biological swab sample (continued)

Steps	Process
18	The assistant sampler places the outer sample vial or container, containing the sample, into a secondary containment bag (for example Poly-bag or antistatic bag), decontaminates with 5 percent chlorine solution, and seals the bag.
19	The assistant sampler places sample and secondary containment bag into a tertiary containment bag so there is three layers of containment, decontaminates with 5 percent chlorine solution and seals the bag. The assistant sampler announces, "Sample XXX (sample sequence number) complete."
20	The sample collection team members dispose of used sample collection equipment; remove nitrile gloves.

DRY BIOLOGICAL WIPE (STERILE GAUZE SPONGE) SAMPLE

F-51. The steps in table F-21 provide example procedures the sample collection R&S element might take for collecting dry biological wipe [sponge] sample.

Table F-21. Dry biological wipe sample

Steps	Process
1	The assistant sampler removes identified sample collection tools from kit and lays them out on ground tarp.
2	The assistant sampler opens the sterile tweezers, forceps, or hemostat package and offers it to the sampler.
3	The sampler pulls the sterile tweezers, forceps, or hemostat from the packaging by grasping it on the handle side (this will be the nongauze holding side).
4	The assistant sampler opens the sterile gauze sponge package and offers sterile gauze sponge to sampler.
5	The sampler pulls the sterile gauze sponge from the packaging by grasping it on one side (this will be the nonsample collection side) using the sterile tweezers, forceps, or hemostat.
6	The assistant sampler opens sterile sample vial assembly bag and lays out on tarp.
7	The assistant sampler opens sample container packaging, removes identification labels and affixes one label to the sample container. If a three-person team, the recorder affixes the label to the sample container.
8	The assistant sampler verifies sample container number matches sample number on outer container, affixes sample number label to sample log notebook; records information in sample log notebook. If using a three-person team, the recorder completes this step.
9	The sampler holds sterile gauze sponge with sample collection side up.
10	The sampler collects the sample by rubbing the sterile gauze sponge against the selected surface while grasping the sponge in the center with the tweezers, forceps, or hemostat. The assistant sampler, or recorder in a three-person team, takes pictures of the collection.
11	The assistant sampler opens inner sample vial and hands it to the sampler.
12	The sampler, using sterile nitrile gloves, folds the gauze sponge in half (with the sample collection side to the inside of the fold); carefully rolls the folded sponge into a tube; slides rolled up gauze into the inner sample vial. When possible, the sample container should be big enough so that the gauze can be inserted using tweezers instead of gloved hands. The assistant sampler, or recorder in a three-person team, takes pictures of this process.
13	The assistant sampler screws the cap on the inner sample vial.
14	The assistant sampler removes a bleach pack wipe and hands to the sampler.
15	The sampler decontaminates his hands and the inner sample vial using the bleach pack wipe.
16	The assistant sampler removes laboratory film, cuts an adequate length, and gives it to the sampler.
17	The sampler uses the laboratory film to seal the cap to the vial.
18	The sampler places the inner sample vial assembly in an outer sample vial held open by the assistant sampler. Sampler announces "Sample XXX (sample sequence number) taken."
19	The assistant sampler places the cap on the outer sample vial and places tamper seal tape over the cap.
20	The assistant sampler places the outer sample vial or container, containing the sample, into a containment bag, so there is three layers of containment; decontaminates with 5 percent chlorine solution, and seals the bag. Assistant sampler announces "Sample XXX (sample sequence number) complete."
21	The sample collection team members dispose of used sample collection equipment; remove nitrile gloves.

WET BIOLOGICAL WIPE (STERILE GAUZE SPONGE) SAMPLE

F-52. The steps in table F-22 provide example procedures the sample collection R&S element might take for collecting a wet biological wipe (sterile gauze sponge) sample.

Table F-22. Wet biological wipe (sterile gauze sponge) sample

Steps	*Process*
1	The assistant sampler removes all identified sample collection tools from kit and lays them out on clean ground tarp.
2	The assistant sampler opens the sterile tweezers, forceps, or hemostat package and offers it to the sampler.
3	The sampler pulls the sterile tweezers, forceps, or hemostat from the packaging by grasping it on the handle side (this will be the nongauze holding side).
4	The assistant sampler opens the sterile gauze sponge package and offers sterile gauze sponge to sampler.
5	The sampler pulls the sterile gauze sponge from the packaging by grasping it using the sterile tweezers, forceps, or hemostat.
6	The assistant sampler opens sterile the sample vial assembly bag and lays out on tarp.
7	The assistant sampler opens sample container packaging, removes identification labels and affixes one label to the sample container. If a three-person team, the recorder affixes the label to the sample container.
8	The assistant sampler verifies sample container number matches sample number on outer container, affixes sample number label to sample log notebook; records information in sample log notebook. If using a three-person team, the recorder completes this step.
9	The assistant sampler opens sterile sample collection pipette package and removes pipette from bulb end, opens buffer or sterile water vial, draws up one milliliter of buffer or sterile water, replaces cap on sterile water vial, and discards sterile water vial.
10	The sampler holds sterile gauze sponge with sample collection side up.
11	The assistant sampler squeezes contents of pipette onto sterile gauze sponge, wetting it, and discards pipette.
12	The sampler collects the sample by rubbing the sterile gauze sponge against the selected surface while grasping the sponge in the center. The assistant sampler, or recorder in a 3-person team, takes pictures of the collection.
13	The assistant sampler opens inner sample vial and hands it to the sampler.
14	The sampler, using sterile nitrile gloves, folds the gauze sponge in half (with the sample collection side to the inside of the fold); carefully rolls the folded sponge into a tube; slides rolled up gauze into the inner sample vial. When possible the sample container should be big enough so that the gauze can be inserted using tweezers instead of gloved hands.
15	The assistant sampler screws the cap on the inner sample vial.
16	The assistant sampler removes a bleach pack wipe and hands to the sampler.
17	The sampler decontaminates his hands and the inner sample vial using the bleach pack wipe.
18	The assistant sampler removes laboratory film; cuts an adequate length and gives it to the sampler.
19	The sampler uses the laboratory film to seal the cap to the vial.
20	The assistant sampler holds outer sample vial for sampler.
21	The sampler places the inner sample vial assembly in the outer sample vial. Sampler announces “Sample XXX (sample sequence number) taken.”
22	The assistant sampler places cap on outer sample vial and screws tight; places tamper seal tape over the cap of the outer sample vial.
23	The assistant sampler places the outer sample vial or container, containing the sample, into a secondary containment bag (such as Poly-bag or antistatic bag), decontaminates with 5 percent chlorine solution, and seals the bag.
24	The assistant sampler places sample and secondary containment bag into a tertiary containment bag, so there is three layers of containment; decontaminates with 5 percent chlorine solution and seals the bag. The assistant sampler announces “Sample XXX (sample sequence number) complete.”
25	The sample collection team members dispose of used sample collection equipment; remove nitrile gloves.

SECTION VI – RADIOACTIVE CONTAMINATION SAMPLE COLLECTION

F-53. Radiological sample collection operations are important to determine if and where an enemy uses a radiological agent. The collection of samples and background information must be as detailed and comprehensive as possible. Each sample must be processed and analyzed to provide refined data for further analysis. Sample processing includes the collection, packaging, storing, transporting, transferring, and tracking of the sample. The following are included in the sample process:

- An enemy may scatter radiological agents as radionuclide dust or as pellets of radioactive materials. Radioactive dust will cover vegetation, soil, and water surfaces. Radioactive pellets will not cover vegetation surfaces like a dust, but will remain on the surface of the soil. Also, pellets will sink to the bottom of bodies of water. The R&S element can take samples of vegetation, soil, or water to collect the pellets or dust.
- Ensure that personnel involved in the operation have dosimetry devices and are dressed in the appropriate level of PPE according to Occupational Safety and Health Administration regulations.
- The R&S element conducts a ground radiological search to locate the contamination. If the purpose of the sample mission is only to collect radioactive samples, not survey, terminate the search after the radioactive area is found. The safety of the R&S element is a constant concern for the commander. The contaminated area may emit high dose rates of radiation; therefore, the R&S element monitors the radiation throughout the radiological sample collection mission and does not exceed the commander's OEG turn-back dose and turn-back dose rate.
- The R&S element collects radiological contaminated environmental samples. It chooses the sample media based on the measurements the collector makes with RADIAC equipment. Ground contamination may vary significantly from place to place. Local dose rate averages are helpful in choosing a representative sample collection area. Conduct soil sample collection after the release has ended. Be aware of the commander's turn-back dose and turn-back dose rate guidance and of the hazards that may be encountered.

Note. The radiological sample collection described in this section is provided as a guide. Technical units may use more detailed procedures found in references, such as AEP-66.

F-54. Monitoring for removable radioactive contamination should be conducted using conventional large-area wiping for qualitative analyses using a filter paper or equivalent over 100 square centimeters of the surface. Large-area sample collection is performed by wiping cheesecloth, muslin, or an oil-impregnated dust cloth over the surface. If tritium contamination is likely, collection should be done using wet glass fiber filters meant to be analyzed with a liquid scintillation counter. Under certain conditions, radioactive (tritium) contamination may penetrate the contaminated surface and then return to the surface over an extended period of time. The following are procedures for surface sample collection for radioactive contamination:

- Ensure that the collected samples are representative of the entire surface, with special attention paid to likely points for collection of contamination.
- Sample the following points of contamination:
  - Leakage points.
  - Rough surface areas.
  - Infrequently cleaned areas.
  - Work areas.
  - High-traffic areas.

F-55. Table F-23 provides additional guidance for determining the size or amount of the recommended sample for radiological materials. Background samples should be about the same size as contaminated sample taken from an incident area.

Table F-23. Recommended sample collection sizes

Radiological samples		
Sample Matrix	***Sample Quantity***	***Remarks***
Solid, bulk chemical	4 mL	Fill 4 mL vial
Organic liquid (non-CWA)	4 mL	
Swab/wipe	2x swab/wipe	
Water	1 to 4 liters	This sample is obtained from surface or water discharges.
	1 to 4 liters	This sample is obtained from drinking water.
Soil	2 kilograms (about 1 meter x 1 meter x 8 centimeter)	This is the gamma spectrometry plus the gross alpha or beta.
	100 grams	This is the gross alpha or beta.
Legend: CWA depth mL milliliter		

Note. Special consideration is given to protection against both the radiological and chemical hazards that might be present. This is especially relevant if the sampled chemicals are (or are suspected to be) fluorine-based, such as uranium hexafluoride and material dissolved in hydrofluoric acid, as most conventional PPE, especially over-garments and filters, do not provide adequate protection.

CRITICALITY/EXCURSION RISK

CAUTION

CBRN R&S sampling teams must consider the possible presence of fissile material when receiving a positive reading of radioactivity. CBRN R&S elements must understand the unique risks of criticality, when interacting with fissile materials. See Section VII for more information on fissile material.

Some fissile materials have dangerous chemical properties. Sampling should only be done by CBRN R&S teams who have received special training for these materials.

F-56. Any time radioactive material is handled, the sampling team must consider the likelihood that the system from which the sample is taken or the sample itself may contain fissile material and therefore result in an unregulated excursion. If the potential for an excursion of the system containing fissile material is suspected, the sampling team will not approach the system until—

- Criticality mitigation procedures have been identified by subject matter experts (SMEs) such as nuclear disablement teams or Department of Energy.
- Identified procedures have been implemented.
- Mitigation procedures have had the desired risk mitigation effects.

IONIZING RADIATION EXPOSURE CONCERNS.

F-57. Exposure to high levels of ionizing radiation (alpha, beta, gamma, x-ray) can result in injury, illness, or death. When radioactive material is handled, care must be taken to ensure that individuals do not exceed prescribed radiation dose limits, OEG. See TM 3-11.91/MCRP 10-10E.4/NTRP 3-11.32/AFTTP 3-2.55, and DA PAM 385-24.

F-58. In addition to adhering to guidance and regulations, all operations involving radioactive material will follow the principle of ALARA. Following this principle, the sample team will develop a plan that allows for as little exposure to radiation as possible. This plan will include radiation reduction measures that incorporate the three methods of dose reduction: time, distance, and shielding.

- **Time.** The time a person is exposed to elevated levels of radiation will be kept as short as possible. This can be accomplished through detailed rehearsals, the use of multiple people staged to follow another in order to accomplish a task, or other methods as approved by leadership.
- **Distance.** Radiation levels are reduced by the square of the distance; in other words, doubling the distance from radioactive source will reduce the radiation levels by a factor of 4. Keeping this in mind, personnel will actively ensure that they remain outside of any elevated radiation fields until it is necessary to enter them, and will maintain a maximum distance from radioactive sources when in their radiation fields.
- **Shielding.** Shielding radiation reduces radiation exposure by physically blocking the radiation from reaching personnel or equipment. The type and quantity of shielding varies by radiation type (alpha/beta/gamma/x-ray), intensity, and energy. Shielding, such as buildings and earthen mounds, should be utilized to reduce exposure. Actively employing shielding for personnel using items such as lead blankets should not be employed unless radiation safety experts are consulted, as the resulting radioactive interactions can cause more damage to tissue than the original radiation the user was attempting to shield.

PACKAGING OF RADIOACTIVE SAMPLES

CAUTION

Water and packed earth (sandbags) will never be used to shield uranium or plutonium due to the interaction of neutrons with water. If shielding uranium or plutonium, the shielding must be no closer than one meter from the sample container.

F-59. Once a sample is obtained, the radioactivity of that sample becomes a critical concern. Prolonged exposure to even relatively low levels of radiation (for example 100 milliroentgen per hour in air at contact with the outer sample container), as could occur when the sample is handled, stored, or prepared for transport, can cause health concerns that can be avoided.

F-60. The primary container for radiological samples should mitigate any chemical risk the sample may pose (for example, be resistant to hydrofluoric acid); the secondary or even tertiary container (as necessary) must ensure that the residual radioactivity is reduced to a manageable level. This outside packaging can be purpose-built lead containers (a pig), appropriate Type-B containers, or a container that is constructed on-site that meets the criteria for shielding. Whatever type of shielded container is used, the type of radiation that is posing the threat must be considered; shielding for gamma radiation, such as lead, has little to no effect on neutron radiation.

F-61. If an appropriately shielded container is not available, the sample will be stored in a manner and location that reduces or eliminates radiological exposure from the sample. This storage means or location will follow the Time, Distance, and Shielding concepts listed above. For example, radioactive samples can be stored in a separate room away from personnel, surrounded by lead bricks of sufficient quantity, or well away from personnel.

F-62. Common materials that can be used for shielding gamma/x-ray include lead, steel, aluminum, packed earth and water (properly packaged samples that emit alpha and beta radiation alone are not a threat). In general, high-Z materials (materials with a large quantities of protons in their nucleus, such as lead (82 protons) are good for shielding gamma/x-ray radiation.

F-63. Thickness of the shielding material is critical and varies by the type of shielding material being used. The below tables outline how much shielding is required for varying gamma radiation dose rates and differing radioactive isotopes. The next section contains instructions for using tables F-24 and F-25, with an example of calculating how much shielding is required following immediately thereafter.

CALCULATING REQUIRED SHIELDING THICKNESS

F-64. To determine the required shielding thickness for specific radioactive isotopes the following steps are followed:

- **Step 1.** Determine the radioactive isotope that is to be shielded from table F-24. If the isotope is unknown or is not listed in the table, use Cobalt-60.
- **Step 2.** Determine what type of shielding material will be used from table F-24. Note that water and packed earth will never be used to shield uranium or plutonium.

Table F-24. Radioactive isotope shielding values

	Radioactive Isotope					
Type of shielding	Co-60	Cs-137	Ir-192	U-238	U-235	Pu-239
Lead	4.5	2.2	1.1	3	0.2	0.6
Steel	9	6.6	5.4	7.3	2.8	3.5
Aluminum	26	22	20	22	15	14
Packed earth (sandbags)	28	24	21.1	0	0	0
Water	65	55	50	0	0	0

- **Step 3.** Record the value at the intersection of the radioactive isotope and the type of shielding.
- **Step 4.** Determine the dose rate of the sample at 1 meter from the sample.
- **Step 5.** Determine what the target dose rate is, after shielding. This target dose rate should take OEG and exposure time into account.
- **Step 6.** Record the value at the intersection of target dose rate and sample dose rate @ 1 meter from table F-25.

Table F-25. Target dose rate to sample dose rate

	Target Dose Rate					
Sample dose rate @ 1 meter	***1 R/hr***	***500 mR/hr***	***100 mR/hr***	***50 mR/hr***	***10 mR/hr***	***2 mR/hr***
1000 R/hr	3.00	3.30	4.00	4.3	5.00	5.70
500 R/hr	2.70	3.00	3.70	4.00	4.70	5.40
100 R/hr	2.00	2.3	3.00	3.30	4.00	4.70
50 R/hr	1.70	2.00	2.70	3.00	3.70	4.40
10 R/hr	1.00	1.30	2.00	2.30	3.00	3.70
1 R/hr		0.30	1.00	1.30	2.00	2.70
500 mR/hr			0.70	1.00	1.70	2.40
100 mR/hr				0.30	1.00	1.70
50 mR/hr					0.70	1.40
10 mR/hr						0.70

Legend:
R roentgens
hr hour
mR milliroentgens

- **Step 7.** Multiply the value from step 3 with the value from step 6. This is the thickness of the required shielding in centimeters.
- **Step 8.** After constructing the shielding around the radioactive sample, measure the residual radiation (outside of the shielding) to confirm the desired dose rate was reached.

Example

Staff Sergeant Jones is tasked with packaging Cesium-137. She determines that the dose rate of the sample, taken one meter from the sample, is 10 roentgens/hour. The shielding material Staff Sergeant Jones will be using is sandbags. She will be storing the sample for four hours, and does not want to receive more than a 400 milliroentgen dose. Using the steps provided she determines a minimum of 48 centimeters of sandbags are required for shielding.

Radioactive isotope: Cs-137
Shielding: packed earth (sandbags)
Value from table F-24: **24**
Dose rate at one meter from sample: 10 roentgens/hour
Target dose rate: 100 milliroentgen/hour
Value from table F-25: **2.00**

Calculated thickness of sandbags: **24 x 2.00 = 48** centimeters of sandbags (minimum)
After stacking sandbags around the cesium source to a thickness of 48 centimeters, Staff Sergeant Jones measures the resulting dose rate (outside of the sandbag shielding) to ensure that the desired dose rate has been reached.

LIQUID RADIOACTIVE MATERIAL SAMPLE

F-65. The steps in table F-26 provide an example procedures for collecting a liquid radiological sample.

Table F-26. Liquid radioactive material sample

Steps	*Process*
1	The assistant sampler removes the identified sample collection tools from kit and lays them out on ground tarp designated as clean work area.
2	The assistant sampler hands the sampler the small tarp for chemical analysis, which the sampler places near where the samples will be obtained.
3	The assistant sampler hands the sampler the chemical analysis equipment and pH paper/meter, which the sampler places on the small tarp and ensures are ready for analysis.
4	The assistant sampler opens laboratory film; cuts an adequate section length, and places on ground tarp.
5	The assistant sampler opens sample container packaging, removes identification labels and affixes one label to the sample container. If a three-person team, the recorder affixes the label to the sample container.
6	The assistant sampler verifies sample container number matches sample number on outer container, affixes sample number label to sample log notebook; records information in sample log notebook. If using a three-person team, the recorder completes this step.
7	The assistant sampler (or recorder if a 3-person team) takes pictures of the sampling setup.
8	The assistant sampler opens syringe package exposing the back end and presents to the sampler.
9	The sampler removes syringe from packing and collects liquid sample from just below the surface.
10	The assistant sampler opens inner sample container and hands to sampler.
11	The sampler expresses collected liquid into inner sample container and discards syringe in dirty area. When possible, sample containers should be completely filled, leaving no head space to minimize possible volatilization.
12	(If analytic equipment utilized.) The sampler expresses drops of collected liquid onto appropriate analysis equipment and begins analysis process. The sampler expresses 1-2 drops of collected liquid onto the pH paper/meter and reads results to the recorder.
Note. Do not completely empty the syringe; leave at least 5 milliliters of liquid in the syringe. Otherwise, some of the liquid may be aerosolized, creating a contamination hazard.	

Table F-26. Liquid radioactive material sample (continued)

Steps	*Process*
13	The assistant sampler places cap on sample container, screws tight, and verifies that the cap is secure while the sampler holds the container.
14	The assistant sampler opens a decontamination wipe and hands wipe to the sampler.
15	The sampler decontaminates his hands and the sample container with the decontamination wipe.
16	The assistant sampler retrieves laboratory film from tarp and hands an adequate section length to sampler.
17	The sampler places laboratory film around the sample container closure to seal the cap to container.
18	The assistant sampler retrieves the outer container, opens it, and holds it open to the sampler.
19	The sampler places sealed container into outer container held by the assistant sampler, ensuring that he does not touch the outer container. Sampler announces "Sample XXX (sample sequence number) taken."
20	The assistant sampler places cap on outer container and screws tight, places tamper seal tape across the cap with the ends contacting the sides of the outer container (forming a seal that will be broken if the cap is removed) and places outer container into secondary containment bag and seals the bag. Sample and secondary containment bag placed into a tertiary containment bag; resulting in three layers of containment. Assistant sampler announces "Sample XXX (sample sequence number) complete."
21	The sampler uses the decontamination wipe to decontaminate the chemical analysis equipment, as necessary, and prepares the equipment for the next sample.
22	The sample collection team members dispose of used sample collection equipment and removes nitrile gloves.
23	The outer sample package will be wipe tested before it passes through the decontamination line. If contamination is detected, the outer package will either be decontaminated or placed in another outer package, which will then be wipe tested. This process will continue until no contamination is detected.
Note. Moisture can block alpha contamination–the outer sample bag must be dry when conducting this procedure.	
Note. Chemicals that are contained in a glovebox should be sampled, analyzed, and packaged (inner package) inside that glovebox. This is due to the potential for violent reactions of the chemicals with oxygen or other chemicals in the air. All materials required for sampling and analysis should be passed into the glovebox through existing pass-through/airlocks, and any equipment that is pulled out of the glovebox (such as chemical analysis equipment or pH meters) should be decontaminated both before they leave the glovebox (before they are placed in the pass-through/airlock) and after they are removed from the pass-through/airlock.	

LIQUID RADIOACTIVE MATERIAL SAMPLING USING TUBING

F-66. The steps in table F-27 provide example procedures for collecting a liquid radioactive material using tubing. Radioactive materials may have dangerous chemical properties requiring analysis.

Table F-27. Liquid radioactive material sampling using tubing

Steps	*Process*
1	The assistant sampler removes the identified sample collection tools from kit and lays them out on ground tarp designated as clean work area.
2	The assistant sampler hands the sampler the small tarp for chemical analysis, which the sampler places near where the samples will be obtained.
3	The assistant sampler hands the sampler the chemical analysis equipment and pH paper/meter, which the sampler places on the small tarp and ensures are ready for analysis.
4	The sampler determines the length of tubing necessary to extract the sample.
5	The assistant sampler opens tubing package; pulls out one end of tubing and removes end cap.
6	The assistant sampler partially opens blunt tip needle package at the attachment end, removes blunt tip needle, and inserts needle into tubing for at least one-half inch.
7	The assistant sampler pulls tubing out of package to the desired length for sample collection. Using the scissors cuts the tubing at the desired length, allowing excess tubing to fall to the ground. Tubing may be set on clean ground tarp.
8	The assistant sampler opens the tubing weight packages and slides tubing weights onto far end of the tubing, ensuring that at least one inch of tubing extends past the last tubing weight.
Note. The number of tubing weights on sample end of tubing is determined by length of tubing. 1–3 weights can be used.	
9	The assistant sampler opens syringe package, removes syringe from package, and attaches syringe to blunt tip needle.
10	The assistant sampler hands syringe and tubing to sampler.

Table F-27. Liquid radioactive material sampling using tubing (continued)

Steps	Process
11	The assistant sampler opens laboratory film; cuts an adequate section length, and places on ground tarp.
12	The assistant sampler opens sample container from kit, removes sample container and sample labels, and places them on the ground tarp.
13	The assistant sampler opens sample container packaging, removes identification labels and affixes one label to the sample container. If a three-person team, the recorder affixes the label to the sample container.
14	The assistant sampler verifies sample container number matches sample number on outer container, affixes sample number label to sample log notebook; records information in sample log notebook. If using a three-person team, the recorder completes this step.
15	The assistant sampler (or recorder if a 3-person team) takes pictures of the sampling setup.
16	The sampler carefully lowers the weighted end of the tubing into the object to be sampled until it is below the liquid level while maintaining at least 4 inches of tubing above the object being sampled.
17	The sampler carefully draws back on the syringe plunger until the syringe fills with liquid.
18	The sampler unlocks the needle from the syringe and discards, once the sample is taken.
19	The assistant sampler opens inner sample container and hands to sampler.
20	The sampler expresses collected liquid into inner sample container and discards syringe in dirty area. When possible, sample containers should be completely filled, leaving no head space to minimize possible volatilization.
21	(If analytic equipment utilized.) The sampler expresses drops of collected liquid onto appropriate analysis equipment and begins analysis process. The sampler expresses 1-2 drops of collected liquid onto the pH paper/meter and reads results to the recorder.
Note. Do not completely empty the syringe; leave at least 5 milliliters of liquid in the syringe. Otherwise, some of the liquid may be aerosolized, creating a contamination hazard.	
22	The assistant sampler places cap on sample container, screws tight, and verifies that the cap is secure while the sampler holds the container.
23	The assistant sampler opens a decontamination wipe and hands wipe to the sampler.
24	The sampler decontaminates his hands and the inner sample container with the decontamination wipe.
25	The assistant sampler retrieves laboratory film from tarp and hands an adequate section length to sampler.
26	The sampler places laboratory film around the inner sample container closure to seal the cap to container.
27	The assistant sampler retrieves the outer container, opens it, and holds it open to the sampler.
28	The sampler places sealed container into outer container held by the assistant sampler, ensuring that he does not touch the outer container. Sampler announces “Sample XXX (sample sequence number) taken.”
29	The assistant sampler places cap on outer container and screws tight, places tamper seal tape across the cap with the ends contacting the sides of the outer container (forming a seal that will be broken if the cap is removed) and places into secondary containment bag and seals the bag. Sample and secondary containment bag placed into a tertiary containment bag; resulting in three layers of containment. Assistant sampler announces “Sample XXX (sample sequence number) complete.”
30	The sampler uses the decontamination wipe to decontaminate the chemical analysis equipment, as necessary, and prepares the equipment for the next sample.
31	The sample collection team members dispose of used sample collection equipment and removes nitrile gloves.
32	The outer sample package will be wipe tested before it passes through the decontamination line. If contamination is detected, the outer package will either be decontaminated or placed in another outer package, which will then be wipe tested. This process will continue until no contamination is detected.
Note. Moisture can block alpha contamination–the outer sample bag must be dry when conducting this procedure.	

POWDERED RADIOACTIVE MATERIAL SAMPLE

F-67. The steps in table F-28 provide example procedures for collecting powdered radioactive material sample collection. While powdered material is, by definition, a solid, it is being treated differently from bulk solids due to the special considerations, such as chemical reactivity, changing of geometry within a sample package, powdered material entails.

Note. Special consideration must be given to PPE requirements. This is especially relevant if the sampled chemicals are (or are suspected to be) fluorine-based, such as uranium hexafluoride and material dissolved in hydrofluoric acid. Most conventional PPE, especially overgarments and filters, do not provide adequate protection.

Table F-28. Powdered radioactive material sample

Steps	***Process***
1	The assistant sampler removes all identified sample collection tools from kit and lays them out on clean ground tarp.
2	The assistant sampler opens protective packing and allows the sampler to remove the required tool.
3	The assistant sampler opens sterile inner sample vial assembly bag or sample jar bag and lays out on tarp.
4	The assistant sampler removes identification labels and affixes one label to the sample bag.
5	The assistant sampler (or recorder if using a three-person team) verifies that sample numbers match and affixes the other sample number label to sample log notebook.
6	The assistant sampler (or recorder if using a three-person team) takes pictures of the sampling setup.
7	The assistant sampler opens inner sample container and hands to sampler.
8	The sampler carefully collects the sample so that the sample collection end of the tool touches nothing but the sample, and transfers it to the inner sample container.
9	(If analytic equipment is utilized.) The sampler places a small amount of the collected material onto the chemical analysis equipment and begins analysis process. The sampler reads the results of the chemical analysis equipment to the recorder.
10	The sampler holds the inner sample container, when finished collecting the sample, while the assistant sampler puts on the cap.
11	The assistant sampler screws the cap on the inner sample container while the sampler holds the vial.
12	The assistant sampler removes decontamination wipe and gives it to the sampler.
13	The sampler decontaminates his hands and the inner sample container with the decontamination wipe.
14	The assistant sampler removes laboratory film from package; cuts enough to wrap once around the sample container top and gives it to the sampler.
15	The sampler uses the laboratory film to seal the cap to the inner sample container.
16	The assistant sampler holds outer sample container.
17	The sampler places the inner sample vial assembly into the outer sample container. Sampler announces “Sample XXX (sample sequence number) taken.”
18	The assistant sampler places the cap on the outer sample container, and places tamper seal tape over the outer sample vial or container cap (forming a seal that will be broken if the cap is removed) and places into secondary containment bag and seals the bag. Sample and secondary containment bag placed into a tertiary containment bag; resulting in three layers of containment. Assistant sampler announces “Sample XXX (sample sequence number) complete.”
19	The sample collection team members dispose of used sample collection equipment; remove nitrile gloves.
20	The outer sample package will be wipe tested before it passes through the decontamination line. If contamination is detected, the outer package will either be decontaminated or placed in another outer package, which will then be wipe tested. This process will continue until no contamination is detected.
Note. Moisture can block alpha contamination–the outer sample bag must be dry when conducting this procedure.	

SOLID RADIOACTIVE MATERIAL SAMPLE

F-68. This section addresses bulk solid radiological material, as opposed to powdered radiological material. By definition, they are both solids; however, special considerations and sampling techniques exist for the sampling and packaging of each, and thus they are treated separately. Sampling of solid radiological material is based off of the grab technique, which is the basic and preferred collection technique in sample collection operations. Grab sample collection is defined as a single sample that is removed at a single point in time from one area. Additionally, the probability that such samples will be required as evidence in legal proceedings substantiates this approach as the preferred technique. The steps in table F-29, page F-40, provide example procedures for solid radiological material sample collection.

Table F-29. Solid radioactive material sample

Steps	*Process*
1	The assistant sampler removes all identified sample collection tools from kit and lays them out on clean ground tarp.
2	The assistant sampler opens sterile inner sample container assembly and lays out on tarp.
3	The assistant sampler removes identification labels and affixes one label to the secondary sample bag, and hands the other label to the recorder.
4	The assistant sampler (or recorder if using a 3-person team) verifies all sample numbers match; affixes the other sample number label to sample log notebook.
5	The assistant sampler (or recorder if using a three-person team) takes pictures of the sampling setup.
6	The assistant sampler opens inner sample container assembly and hands it to the sampler.
7	The sampler carefully collects the sample so that the sample does not touch any other items and transfers it to the inner sample container assembly.
8	The sampler holds the inner sample container, when finished collecting the sample, while the assistant sampler puts on the cap.
9	The assistant sampler screws the cap on the inner sample container assembly while the sampler holds the assembly.
10	The assistant sampler removes decontamination wipe and gives it to the sampler.
11	The sampler decontaminates his hands and the inner sample vial with the decontamination wipe.
12	The assistant sampler removes laboratory film from package; cuts enough to wrap once around the sample assembly top and gives it to the sampler.
13	The sampler uses the laboratory film to seal the cap to inner sample container assembly.
14	The assistant sampler holds outer sample container.
15	The sampler places the inner sample container assembly into the outer sample container. Sampler announces “Sample XXX (sample sequence number) taken.”
16	The assistant sampler places the cap on the outer sample container, and places tamper seal tape over the outer sample container cap (forming a seal that will be broken if the cap is removed) and places into secondary containment bag and seals the bag. Sample and secondary containment bag placed into a tertiary containment bag; resulting in three layers of containment. Assistant sampler announces “Sample XXX (sample sequence number) complete.”
17	The sample collection team members dispose of used sample collection equipment; remove nitrile gloves.
18	The outer sample package will be wipe tested before it passes through the decontamination line. If contamination is detected, the outer package will either be decontaminated or placed in another outer package, which will then be wipe tested. This process will continue until no contamination is detected.
Note. Moisture can block alpha contamination–the outer sample bag must be dry when conducting this procedure.	

RADIOACTIVE SAMPLE LABELING

F-69. In addition to the sample label, the outermost package/container will be labeled with the level of radioactivity, with the reading taken at 1 meter from the sample. For intra-theater shipping during combat conditions, this can be any firmly affixed label with the following information clearly visible from one meter from the outermost packaging.

F-70. This label must be clearly visible to anyone approaching the sample. Therefore, if shielding material is placed around the sample, this label must be both on the outermost sample container and on the outside of the shielding. For example, if a radioactive sample is surrounded by sandbags for shielding, the radioactivity label must be on the outermost sample container and on the outside layer of the sandbags where it can be seen by anyone approaching the sample. Figure F-5 is an example of an intra-theater radioactivity label.

Radioactive Material

Sample Radioactivity (at one meter): 12.56 (units) µSv

Date of Reading: 251345ZDEC20

SAMPLE

Figure F-5. Example intratheater radioactivity label

SECTION VII – FISSILE MATERIAL SAMPLING

F-71. If there is suspected system containing fissile material on site, the CBRN R&S team will not approach the system until—

- A criticality risk assessment has been conducted and approved with criticality mitigation procedures identified by SMEs. DD Form 2977 (*Deliberate Risk Assessment Worksheet*) may be used. See table F-30, page F-42, for example tasks that should be considered.
- Identified procedures have been implemented.
- Mitigation procedures have had the desired risk mitigation effects.

CAUTION

CBRN R&S elements must understand the unique risks of criticality, when interacting with fissile materials. A system becomes critical when a chain of fission events is self-sustaining. An excursion is when a system becomes unintentionally critical, and may happen as a result of changes in quantity, geometry, concentration, or surroundings. This may happen when fissile materials are consolidated in a close area, the flow of liquid containing fissile materials, the removal of neutron absorbers, or by placing a neutron moderator or reflector (including a human body) near a system already close to criticality.

If a possibility for nuclear excursion exists, CBRN R&S units should not attempt to handle, package, or transport the materials without first consulting technical experts, such as nuclear disablement teams, United States Army Nuclear and Countering Weapons of Mass Destruction Agency, Defense Threat Reduction Agency, or Department of Energy. Indicators of a potential for excursion include the presence of plutonium or enrichment of uranium above natural levels (greater than 1 percent U-235).

Scenario

A U.S. Army nuclear disablement team is tasked to exploit a spent nuclear fuel reprocessing site in order to determine the method, quality, and quantity of extracted plutonium-239 and uranium 235/238. The process being exploited relies on dilution for criticality control, and the process has been running without supervision for seven days (due to the evacuation of personnel by the adversarial host nation). See table F-30.

Table F-30. Example criticality risk assessment

Task: Collect CBRN Samples (Fissile Material)				
Subtask	***Response***	***Initial Risk***	***Mitigation/ Control***	***Residual Risk***
Is a physical sample of the material required? Can the material be passively analyzed in situ (for example through gamma spectroscopy), without having to approach the system? What is the benefit of analyzing a sample versus the risk involved in obtaining it (cost/benefit analysis)?	Yes, a physical sample is required due to limitations of nuclear disablement team analysis; passive analysis will not provide appropriate level of fidelity	Extremely High	Perform all criticality prevention methods to prevent an excursion	High
Can the sample be obtained remotely (without approaching the sample), as may be possible with open-top containers?	No	High	Not Applicable	High
If a sampling team must be in direct contact with the system in order to obtain the required physical sample, can it be determined if an excursion is likely? This will be determined through a deliberate process that will be outlined specifically by SMEs for each system.	Yes	Extremely High	Perform all criticality prevention methods to prevent an excursion	High
Are there SMEs that can be consulted (such as, Department of Energy)?	Yes	High	Constant communication with Department of Energy criticality control specialists	Medium
Can changing the geometry of the system change the risk of excursion? If so, will the risk increase or decrease?	Yes, but with unknown results	High	Unable to determine results of geometry change with on-hand equipment; team will not intentionally change geometry	Medium
Can monitors that may provide warning of a pending excursion or that identify that an excursion has occurred (such as gas/vapor/neutron radiation/gamma radiation/temperature monitors) be emplaced? These monitors can include but are not limited to continuous air monitors (such as JCAD) and remote temperature gauges.	Pending excursion–yes, but cannot determine how close the team is to excursion; Excursion occurred; Yes	Extremely high	Employ and monitor all excursion detection monitors	High
If a sample can be obtained, does the sample itself have criticality concerns? If so, how are these going to be mitigated? Is special packaging, criticality-safe storage, or other special accommodations required?	No	Medium	Small sample size, samples kept at least 3 feet apart at all times	Low
How can risk to the remaining team members be minimized? Can this sample be taken when no one else is in the facility?	Yes	High	Minimal quantity of personnel within danger area if an excursion occurs	Low to remaining team members; high to sample team

Table F-30. Example criticality risk assessment (continued)

Task: Collect CBRN Samples (Fissile Material)				
Subtask	***Response***	***Initial Risk***	***Mitigation/ Control***	***Residual Risk***
If an excursion occurs, how will this affect the exploitation of the rest of the facility? Will contamination and/or activation products prevent further exploitation?	Contamination of local area with highly radioactive material will prevent future exploitation	High	Excursion could contaminate room where sample is taken	Medium
Are reacting to an excursion/criticality drills known to the team and rehearsed?	Yes	High	Practiced and rehearsed	Medium
Is the team and higher-level medical personnel prepared to handle casualties from an excursion and/or the resulting contamination/activation?	Yes	High	Local medical care (field hospital) aware and prepared for radiation poisoning/sickness; decontamination assets trained, set up and ready for expedient decontamination	Medium
Legend: CBRN chemical, biological, radiological, and nuclear JCAD joint chemical agent detector SME subject matter expert				

F-72. The same considerations for ionizing radiation exposure and calculations for required shielding as other radioactive materials should be applied for fissile materials. See paragraph F-64 for more information.

LIQUID FISSILE MATERIAL SAMPLE

F-73. The steps in table F-31 provide example procedures for liquid fissile material sample collection.

Table F-31. Liquid fissile material sample

Steps	***Process***
1	The assistant sampler removes the identified sample collection tools from kit and lays them out on ground tarp designated as clean work area.
2	The assistant sampler hands the sampler the small tarp (for chemical analysis), which the sampler places near where the samples will be obtained.
3	The assistant sampler hands the sampler the chemical analysis equipment and pH paper/meter, which the sampler places on the small tarp and ensures are ready for analysis.
4	The assistant sampler opens laboratory film; cuts an adequate section length, and places on ground tarp.
5	The assistant sampler opens sample container packing; removes identification labels; hands one label to recorder and affixes the other label to the sample container.
6	The assistant sampler (or recorder if a three-person team) verifies sample container number matches sample number on outer container; affixes sample number label to sample log notebook; records information in sample log notebook.
7	The assistant sampler (or recorder for a 3-person team) takes pictures of the sampling setup.
8	The assistant sampler opens syringe package exposing the back end and presents to the sampler.
9	The sampler removes syringe from packing and collects liquid sample from just below the surface.
10	The assistant sampler opens sample container and hands to sampler.
11	The sampler expresses collected liquid into sample container and discards syringe in dirty area. When possible, sample containers should be completely filled, leaving no head space to minimize possible volatilization.

Table F-31. Liquid fissile material sample (continued)

Steps	Process
12	(If analytic equipment utilized.) The sampler expresses drops of collected liquid onto appropriate analysis equipment and begins analysis process. The sampler expresses 1-2 drops of collected liquid onto the pH paper/meter and reads results to the recorder.
Note. Do not completely empty the syringe; leave at least 5 milliliters of liquid in the syringe. Otherwise, some of the liquid may be aerosolized, creating a contamination hazard.	
13	The assistant sampler places cap on sample container, screws tight, and verifies that the cap is secure while the sampler holds the container.
14	The assistant sampler opens a decontamination wipe and hands wipe to the sampler.
15	The sampler decontaminates his hands and the sample container with the decontamination wipe.
16	The assistant sampler retrieves laboratory film from tarp and hands an adequate section length to sampler.
17	The sampler places laboratory film around the sample container closure to seal the cap to container.
18	The assistant sampler retrieves the outer container, opens it, and holds it open to the sampler.
19	The sampler places sealed container into outer container held by the assistant sampler, ensuring that he does not touch the outer container. Sampler announces “Sample XXX (sample sequence number) Taken.”
20	The assistant sampler places cap on outer container and screws tight, places tamper seal tape across the cap with the ends contacting the sides of the outer container (forming a seal that will be broken if the cap is removed) and places into secondary containment bag and seals the bag. Sample and secondary containment bag placed into a tertiary containment bag; resulting in three layers of containment. Assistant sampler announces “Sample XXX (sample sequence number) complete.”
21	The sampler uses the decontamination wipe to decontaminate the chemical analysis equipment, as necessary, and prepares the equipment for the next sample.
22	The sample collection team members dispose of used sample collection equipment and removes nitrile gloves.
23	The outer sample package will be wipe tested before it passes through the decontamination line. If contamination is detected, the outer package will either be decontaminated or placed in another outer package, which will then be wipe tested. This process will continue until no contamination is detected.
Note. Moisture can block alpha contamination—the outer sample bag must be dry when conducting this procedure.	

LIQUID FISSILE MATERIAL SAMPLING USING TUBING

F-74. The steps in table F-32, page F-44, provide example procedures for collecting a liquid fissile material using tubing.

Table F-32. Liquid fissile material sampling using tubing

Steps	Process
1	The assistant sampler removes the identified sample collection tools from kit and lays them out on ground tarp designated as clean work area.
2	The assistant sampler hands the sampler the small tarp (for chemical analysis), which the sampler places near where the samples will be obtained.
3	The assistant sampler hands the sampler the chemical analysis equipment and pH paper/meter, which the sampler places on the small tarp and ensures are ready for analysis.
4	The sampler determines the length of tubing necessary to extract the sample.
5	The assistant sampler opens tubing package; pulls out one end of tubing and removes end cap.
6	The assistant sampler partially opens blunt tip needle package at the attachment end, removes blunt tip needle, and inserts needle into tubing for at least one-half inch.
7	The assistant sampler pulls tubing out of package to the desired length for sample collection. Using the scissors cuts the tubing at the desired length, allowing excess tubing to fall to the ground. Tubing may be set on clean ground tarp.
8	The assistant sampler opens the tubing weight packages and slides tubing weights onto far end of the tubing, ensuring that at least one inch of tubing extends past the last tubing weight.
Note. The number of tubing weights on sample end of the tubing is determined by length of tubing. One to three weights can be used.	

Table F-32. Liquid fissile material sampling using tubing (continued)

Steps	Process
9	The assistant sampler opens syringe package, removes syringe from package, and attaches syringe to blunt tip needle.
10	The assistant sampler hands syringe and tubing to sampler.
11	The assistant sampler opens laboratory film; cuts an adequate section length, and places on ground tarp.
12	The assistant sampler opens sample container from kit, removes sample container and sample labels, and places them on the ground tarp.
13	The assistant sampler opens sample container packing; removes identification labels; and affixes the other label to the sample container.
14	The assistant sampler (or recorder if a 3-person team) verifies sample container number matches sample number on outer container; affixes sample number label to sample log notebook; records information in sample log notebook.
15	The assistant sampler (or recorder if a 3-person team) takes pictures of the sampling setup.
16	The sampler carefully lowers the weighted end of the tubing into the object to be sampled until it is below the liquid level while maintaining at least 4 inches of tubing above the object being sampled.
17	The sampler carefully draws back on the syringe plunger until the syringe fills with liquid.
18	The sampler unlocks the needle from the syringe and discards, once the sample is taken.
19	The assistant sampler opens inner sample container and hands to sampler. The assistant sampler keeps the sample container cap.
20	The sampler expresses collected liquid into inner sample container and discards syringe in dirty area. When possible, sample containers should be completely filled, leaving no head space to minimize possible volatilization.
21	(If analytic equipment utilized.) The sampler expresses drops of collected liquid onto appropriate analysis equipment and begins analysis process. The sampler expresses 1-2 drops of collected liquid onto the pH paper/meter and reads results to the recorder.
Note. Do not completely empty the syringe; leave at least 5 milliliters of liquid in the syringe. Otherwise, some of the liquid may be aerosolized, creating a contamination hazard.	
22	The assistant sampler places cap on sample container, screws tight, and verifies that the cap is secure while the sampler holds the container.
23	The assistant sampler opens a decontamination wipe and hands wipe to the sampler.
24	The sampler decontaminates his hands and the inner sample container with the decontamination wipe.
25	The assistant sampler retrieves laboratory film from tarp and hands an adequate section length to sampler.
26	The sampler places laboratory film around the inner sample container closure to seal the cap to container.
27	The assistant sampler retrieves the outer container, opens it, and holds it open to the sampler.
28	The sampler places sealed container into outer container held by the assistant sampler, ensuring that he does not touch the outer container. Sampler announces "Sample XXX (sample sequence number) taken."
29	The assistant sampler places cap on outer container and screws tight, places tamper seal tape across the cap with the ends contacting the sides of the outer container (forming a seal that will be broken if the cap is removed) and places into secondary containment bag and seals the bag. Sample and secondary containment bag placed into a tertiary containment bag; resulting in three layers of containment. Assistant sampler announces "Sample XXX (sample sequence number) complete."
30	The sampler uses the decontamination wipe to decontaminate the chemical analysis equipment, as necessary, and prepares the equipment for the next sample.
31	The sample collection team members dispose of used sample collection equipment and removes nitrile gloves.
32	The outer sample package will be wipe tested before it passes through the decontamination line. If contamination is detected, the outer package will either be decontaminated or placed in another outer package, which will then be wipe tested. This process will continue until no contamination is detected.
Note. Moisture can block alpha contamination–the outer sample bag must be dry when conducting this procedure.	

POWDERED FISSILE MATERIAL SAMPLE

F-75. The steps in table F-33 provide example procedures for collecting powdered radioactive material sample collection. While powdered material is, by definition, a solid, it is being treated differently from bulk solids due to the special considerations, such as chemical reactivity, changing of geometry within a sample package, powdered material entails.

Note. Special consideration must be given to PPE requirements. This is especially relevant if the sampled chemicals are (or are suspected to be) fluorine-based, such as uranium hexafluoride and material dissolved in hydrofluoric acid. Most conventional PPE, especially over-garments and filters, do not provide adequate protection.

Table F-33. Powdered fissile material sample

Steps	*Process*
1	The assistant sampler removes all identified sample collection tools from kit and lays them out on clean ground tarp.
2	The assistant sampler opens protective packing and allows the sampler to remove the required tool.
3	The assistant sampler opens sterile inner sample vial assembly bag or sample jar bag and lays out on tarp.
4	The assistant sampler removes identification labels and affixes one label to the sample bag.
5	The assistant sampler (or recorder if using a three-person team) verifies that sample numbers match and affixes the other sample number label to sample log notebook.
6	The assistant sampler (or recorder if using a 3-person team) takes pictures of the sampling setup.
7	The assistant sampler opens inner sample container and hands to sampler.
8	The sampler carefully collects the sample so that the sample collection end of the tool touches nothing but the sample, and transfers it to the inner sample container.
9	(If analytic equipment utilized.) The sampler places a small amount of the collected material onto the chemical analysis equipment and begins analysis process. The sampler reads the results of the chemical analysis equipment to the recorder.
10	The sampler holds the inner sample container, when finished collecting the sample, while the assistant sampler puts on the cap.
11	The assistant sampler screws the cap on the inner sample container while the sampler holds the vial.
12	The assistant sampler removes decontamination wipe and gives it to the sampler.
13	The sampler decontaminates his hands and the inner sample container with the decontamination wipe.
14	The assistant sampler removes laboratory film from package; cuts enough to wrap once around the sample container top and gives it to the sampler.
15	The sampler uses the laboratory film to seal the cap to the inner sample container.
16	The assistant sampler holds outer sample container.
17	The sampler places the inner sample vial assembly into the outer sample container. Sampler announces "Sample XXX (sample sequence number) taken."
18	The assistant sampler places the cap on the outer sample container, and places tamper seal tape over the outer sample vial or container cap (forming a seal that will be broken if the cap is removed) and places into secondary containment bag and seals the bag. Sample and secondary containment bag placed into a tertiary containment bag; resulting in three layers of containment. Assistant sampler announces "Sample XXX (sample sequence number) complete."
19	The sample collection team members dispose of used sample collection equipment; remove nitrile gloves.
20	The outer sample package will be wipe tested before it passes through the decontamination line. If contamination is detected, the outer package will either be decontaminated or placed in another outer package, which will then be wipe tested. This process will continue until no contamination is detected.
Note. Moisture can block alpha contamination–the outer sample bag must be dry when conducting this procedure.	

Solid Fissile Material Sample

F-76. This section addresses bulk solid fissile material, as opposed to powdered fissile material. By definition, they are both solids; however, special considerations and sampling techniques exist for the sampling and packaging of each, and thus they are treated separately. Sampling of solid fissile material, such as fissile material pucks, weapon pits, or criticality testing special nuclear material hemispheres, is based off of the grab technique, which is the basic and preferred collection technique in sample collection operations. Grab sample collection is defined as a single sample that is removed at a single point in time from one area. Additionally, the probability that such samples will be required as evidence in legal proceedings substantiates this approach as the preferred technique. The steps in table F-34 provide example procedures for solid fissile material sample collection.

Table F-34. Solid fissile material sample

Steps	*Process*
1	The assistant sampler removes all identified sample collection tools from kit and lays them out on clean ground tarp.
2	The assistant sampler opens sterile inner sample container assembly and lays out on tarp.
3	The assistant sampler removes identification labels and affixes one label to the secondary sample bag, and hands the other label to the recorder.
4	The assistant sampler (or recorder if using a three-person team) verifies all sample numbers match; affixes the other sample number label to sample log notebook.
5	The assistant sampler (or recorder if using a 3-person team) takes pictures of the sampling setup.
6	The assistant sampler opens inner sample container assembly and hands it to the sampler.
7	The sampler carefully collects the sample so that the sample does not touch any other items and transfers it to the inner sample container assembly.
8	The sampler holds the inner sample container, when finished collecting the sample, while the assistant sampler puts on the cap.
9	The assistant sampler screws the cap on the inner sample container assembly while the sampler holds the assembly.
10	The assistant sampler removes decontamination wipe and gives it to the sampler.
11	The sampler decontaminates his hands and the inner sample vial with the decontamination wipe.
12	The assistant sampler removes laboratory film from package; cuts enough to wrap once around the sample assembly top and gives it to the sampler.
13	The sampler uses the laboratory film to seal the cap to inner sample container assembly.
14	The assistant sampler holds outer sample container.
15	The sampler places the inner sample container assembly into the outer sample container. Sampler announces "Sample XXX (sample sequence number) taken."
16	The assistant sampler places the cap on the outer sample container, and places tamper seal tape over the outer sample container cap (forming a seal that will be broken if the cap is removed) and places into secondary containment bag and seals the bag. Sample and secondary containment bag placed into a tertiary containment bag; resulting in three layers of containment. Assistant sampler announces "Sample XXX (sample sequence number) complete."
17	The sample collection team members dispose of used sample collection equipment; remove nitrile gloves.
18	The outer sample package will be wipe tested before it passes through the decontamination line. If contamination is detected, the outer package will either be decontaminated or placed in another outer package, which will then be wipe tested. This process will continue until no contamination is detected.
Note. Moisture can block alpha contamination–the outer sample bag must be dry when conducting this procedure	

SECTION VIII – PACKAGING AND LABELING SAMPLES

F-77. Packaging and labeling samples is as critical as the actual collection of the sample. All samples must be packaged in three layers of containment to meet air transport regulations (primary container, secondary container, and outer packaging). Package the primary container in absorbent material within a secondary container, which is carried within an outer packaging or double-wrap or double-bag the primary container for less hazardous samples. The label will be affixed to the sample container and will also be affixed to the outermost package/container.

F-78. To prevent confusion, a sample identification number is assigned to the sample. The identification number format should be established in theater sample management plans or SOPs and contain—

- **Date acquired.** This six-digit numerical code represents the year, month, and day that the collector took the sample.
- **Sample sequence number.** The collector assigns this 3-digit numerical code. It begins anew each collection day.
- **Sample collection unit identification or sampler identity code.** This two to three digit code represents the sample collection element or abbreviation of the sampler's first and last name. (See the examples below.)

Example 1	
011110-001-WFG1AA-JD	
011110	Day, month, year that the collector took the sample.
001	Sample sequence number (001 is first sample collected of the day).
WFG1AA	Sample collection unit identification code.
JD	Initials of sampler's first and last name (Joe Doe took the sample).

Example 2	
WLS181118-002	
WLS	Samplers initials.
181118	Day, month, year that the collector took the sample.
002	Sample sequence number (002 is the second sample collected of the day).

F-79. There are several physical and chemical characteristics that must be considered when selecting a suitable container for shipping and sample collection. Important characteristics include the container material, size, shape, and sealing method. Generally, a container should be made of material that is chemically nonreactive with the sample and it should maintain physical integrity during normal handling and shipment. The container must have sufficient volume to contain enough samples for all analyses required of the sample and for several repeat analyses. It should have an opening that allows for easy filling and emptying of the container and that minimizes external contamination of the container. All containers should be new and unused. Containers should be able to be written on or able to have marking tags or labels affixed to them.

F-80. Depending on the sample media and the sample collection technique, the container selection must protect the sample and avoid further contamination. Container considerations are—

- **Collection bags.** A leakproof, clear, plastic collection bag can be used as the initial container for samples, such as protective masks and filter canisters, individual antidote and decontamination kits, ammunition fragments, and other items that are too large to place in a sample container. It can also be used to package containers, which ensures a vapor barrier in case the container is broken in transit. It acts as an initial or secondary vapor barrier that prevents air from leaking in and toxic material from leaking out. The following are the recommended steps for using leakproof, clear, plastic collection bags:
  - **Step 1.** Verify that the item has a command designated sample number if the sample or sample container is being packaged.
  - **Step 2.** Carefully place the sample in a bottom corner of the bag.
  - **Step 3.** Ensure that each layer of packaging is decontaminated using five percent chlorine solution
  - **Step 4.** Purge air out of the bag and seal it.
- **Containers and tubes.** Glass, spun Teflon®, or polypropylene sample containers and tubes can be used for collection; however, do not store biological samples in polypropylene containers because proteins and deoxyribonucleic acid (DNA) may adhere to them. Use glass containers to hold small environmental samples. Use sterile polypropylene tubes to hold biological samples if no other alternative is available (such as glass). Use glass containers instead of plastic because toxic agents may leach chemicals from plastics into a sample, introducing contamination and complicating analysis efforts.
- **Shipping containers.** Place samples in commercial, biohazard shipping containers for shipping.
- **Commercial air shipment containers**. When the samples must be transported on commercial aircraft, IATA-approved sample transport containers must be used for shipment and delivery to the designated location.

F-81. Samples submitted for analysis must be properly packaged, decontaminated, labeled, and shipped so that they arrive in an analytically acceptable condition. The samples should be maintained at 1°C to 4°C. Ideally, samples should arrive at the laboratory within six hours of collection. The samples should be delivered to the NATO, theater designated laboratory, or CONUS laboratory within 24 to 48 hours. If the biological samples cannot be delivered to NATO, theater designated laboratory, or CONUS within 48 hours, the supporting laboratories should subculture the samples and send the subculture to the CONUS laboratory.

F-82. Standard polyethylene or metal ice chests are the most easily procured items that can be used to ship chemical-biological samples. Even though an ice chest provides good insulation for samples and the coolant, place extra insulation and cushioning around the metal cans inside the ice chest. Plastic bubble wrap or foam rubber can be used with good results.

F-83. For double-bagging or double-wrapping, the plastic bags or plastic container containing the sample should be placed into a second bag. Excess air should be removed from the bag. The sample bags should be carried within an outer container packed with absorbent material.

F-84. Any breakable containers should be placed in more rigid containers to protect them from puncture or breakage. Commercially manufactured packs, specifically designed for the transport of dangerous pathogens and approved by the IATA, are widely available. The following should be considered when transporting materials:

- Material is placed in a securely closed, watertight container, which is then enclosed in a second, durable, watertight container. Several primary containers may be enclosed in a single secondary container, if the total volume of the primary containers enclosed does not exceed 50 milliliters.
- Packaging of material in volumes of 50 milliliters or more will comply with specified requirements based on the type of sample collected.

F-85. Supporting documents must accompany the sample with clear labeling on the outside of the package. When samples are sent to a laboratory for theater validation or definitive identification, they must be properly packed and shipped to maintain security and chain-of-custody requirements. Evidence should be tagged at the scene as it is collected or at the place where it is received by attaching a locally-produced adhesive label or its equivalent. If evidence is placed in a heat sealed bag, the tag on the bag may replace the adhesive label. Tagging, often referred to as a shoe tag may be used when labels disrupt the original state of evidence. In the absence of tags or labels, ensure that supporting documentation, at a minimum, contains the information shown in figure F-6, page F-52. To prevent confusion, the sampler uses the sample identification number when referring to the sample or to information concerning its acquisition.

F-86. The following are steps for preparing a sample for shipment:

- **Step 1.** Obtain the primary container that contains the sample.
- **Step 2.** Mark the primary container with the sample identification number using an adhesive label or by marking the container.
- **Step 3.** Seal the primary container first with laboratory film, decontaminate, and then seal with tamper-resistant tape. If applicable, apply two strips of tape across the top of the container in an X-pattern ensuring that the tape reaches down both sides of the container. Ensure that the tape covers a portion of the label on the container, but does not cover the sample identification number.
- **Step 4.** Place the container inside a plastic bag or International Air Transport Association container containing absorbent material. Decontaminate the container. If using a plastic bag, remove excess air, twist the neck of the bag until it forms a tight coil with the bag snug around the container, and seal it with a strip bag tie.
- **Step 5.** Place an adhesive label containing the sample identification number on the International Air Transport Association container or plastic bag.
- **Step 6.** Place the tube inside a second bag or an International Air Transport Association container. Decontaminate the second bag. If using a plastic bag, remove the excess air, twist the neck of the second bag until it forms a tight coil, and seal it with a strip bag tie.
- **Step 7.** Place an adhesive label containing the sample identification number on the outer packaging.
- **Step 8.** Place the package inside the sample transfer case.

- **Step 9.** Complete the chain-of-custody document. Ensure that the operator handling the sample signs the initial signature block immediately.

Note. After steps 3, 4, and 6, spray and wipe the package with a 5 percent hypochlorite solution.

SECTION IX – SAMPLE TRANSFER EXECUTION

F-87. In preparing for the execution of a sample evacuation, the commander prioritizes the samples that should be evacuated with the help of the command surgeon and CBRN officer and staff. The commander considers the following when determining the priority of samples:

- What is the time sensitivity for a specific sample evacuation package?
- Where the sample was collected (the proximity of transportation or courier assets for sample transport)?
- What is the role of the sample in the overall process of the operation (is it being used to support detect to treat or verification of agent or release decisions)?
- How many resources (consumables) are needed to support analysis and testing?

F-88. The personnel packaging, transporting, and storing samples must ensure the integrity of the sample from the time it is first taken until it is delivered to the supporting laboratory. The temperature at which the sample is stored and transported is crucial to its viability. Samples should be transported and stored at 1°C to 4°C. The sample courier should be able to periodically check the temperature within the sample transfer case to ensure continued sample viability.

F-89. Designated samples are evacuated to laboratories for theater validation identification. Laboratories will prioritize sample analyses based on critical background information (for example, time sensitivity and role of the sample). The laboratory commander will determine the number and types of samples to be analyzed.

F-90. Sample evacuation execution relies on an effective means to evacuate the sample. Specialized assets may be available; however, if specialized assets are not available, additional courier personnel can be trained to perform escort responsibilities.

F-91. Sample evacuation packages from CBRN elements may require field confirmatory or theater validation identification support. The applicable Service component prepares the sample, and an escort element transports the sample. The supporting medical and/or environmental laboratory destination for theater validation testing could be a ship-based laboratory, United States Air Force laboratory, or United States Army medical laboratory.

THEATER SAMPLE MANAGEMENT PROCESS

F-92. The geographic combatant commander identifies a theater sample manager to manage the movement of samples within theater and to definitive laboratories outside the theater based on feedback from the geographic combatant commander command surgeon, CBRN staff, and supporting laboratories. The decision to return a sample to a CONUS definitive laboratory for further analysis is made by the field confirmatory/theater validation laboratory, geographic combatant commander surgeon, theater commander, and/or CONUS higher commands.

F-93. Before a CBRN sample is evacuated to a specific laboratory there are detailed requirements that must be met. As discussed in chapter 1, the need to evacuate samples to fulfill the commander's information and PIRs will drive the sample management process. Proper identification of CBRN hazards affect decisions such as the administration of effective prophylaxis, troop movements, individual and collective protective postures, and selection of proper decontamination methods. These decisions are critical to the success of operations in a CBRN environment. Issues to be considered prior to the movement of CBRN samples include the following:

- Coordinate actions with the theater surgeon or medical officer.
- Ensure that proper chain-of-custody procedures are being followed.
- Prioritize the transport and analysis of samples.

- Provide appropriately trained personnel or forces to escort samples to the transfer point or laboratory.
- Coordinate with the appropriate command and staff transportation authorities to help so that the transport and transfer of a sample is uninterrupted across international borders or to another government agency. The intent is unimpeded and controlled sample flow.
- Evacuate background samples to a laboratory for analysis.
- Maintain sample tracking and visibility.

CHAIN OF CUSTODY AND SUPPORTING DOCUMENTATION

F-94. A strict chain of custody needs to be initiated and maintained for every sample collected. When filled out properly, the chain of custody provides uninterrupted chronological documentation of the collection, custody, control, transfer, analysis, and disposition of a sample. It provides a documented record of information pertaining to a specific sample during transport from the point of collection, to the receiving medical laboratory, to the final disposition of the sample. Individuals receiving a sample from another individual or courier must sign the document transferring custody of the sample and then annotate in writing what happened to the sample while in their custody. This includes the custody transfer that occurs when supervision of the sample changes, such as the operator changes shifts. The document will provide answers to the following questions about the sample:

- When was it collected?
- Who has maintained custody of it?
- What has been done with it at each change of custody?
- What was collected?
- How much was collected?
- How was it packaged?

F-95. The documents that support the evacuated sample are integral components of the evacuation package and must accompany the sample. There is only one complete sample evacuation package for each sample. DD Form 3108 captures important information regarding the conditions during the sample collection and provides chain-of-custody tracking. Each completed sample evacuation package is comprised of the—

- Sealed and packaged sample container.
- Sealed document mailer.
- Chain-of-custody form (the completed chain-of-custody form is hand-carried by the sample courier). See figure F-6, page F-52, for a sample chain-of-custody DD Form 3108.

CBRN Sample Documentation and Chain of Custody

For use of this form, see ATP 3-11.37/MCRP 10-10E.7/NTTP 3-11.29/AFTTP 3-2.44; the proponent agency is TRADOC.

1. DTG SAMPLE(S) COLLECTED *(DDTTTTZMMMYY)*:	2. LOCATION SAMPLE(S) COLLECTED:
280659LJUN17	11 3 NV 58708 16191

3. REASON FOR COLLECTION *(routine surveillance, suspected/known hazard, OPORD, WARNORD)*:
Suspected lab

4. ENVIRONMENTAL CONDITIONS AT COLLECTION *(terrain, wind, weather-rain, temperature, humidity)*:
Dry, wind speed 8 mph, temp 71 degrees

5. OTHER INFORMATION:
Report received from locals of suspicious activities, upper respiratory distress.

6a. TEAM LEADER *(Name, Rank, and E-Mail)*:	6b. REPORT UNIT ADDRESS *(Unit, Address, Phone Number)*:
SSG Michelle Mather michelle.p.mathers.mil@mail.mil	TASK FORCE 3-6 Camp Smith (573)123-4567

7. SAMPLE IDENTIFICATION:

ITEM #	SAMPLE NO./UPC	QTY	TIME	DESCRIPTION OF ARTICLES *(Include state of matter, instrument readings, color, pH, etc.)*
1	PRV 280617-001	1	0659	Background sample
2	PRV 280617-002	2	0732	CD-R
3	PRV 280617-003	1	0745	Liquid sample, positive for G series on JCAD and M8. Sample taken from bench-scale chemical process reactor vessel inside frame hood along west wall.
				-----Nothing Follows----- PRV

SHIPMENT TRANSFERS

I certify by my signature that I have received the materials listed on this form and am aware of the applicable safety and security requirements.

8. ITEM NO(s).	9. DTG TRANSFER *(DDTTTTZMMMYY)*	10. RELEASED BY	11. RECEIVED BY	12. PURPOSE OF CHANGE OF CUSTODY and RECEIVING ACTIVITY/ LABORATORY
1-3	280820LJUN17	SAMPLER SIGNATURE Phillips Vega NAME, GRADE, OR TITLE Vega, Phillips R. SGT	SIGNATURE Michelle Mathers NAME, GRADE, OR TITLE Mathers, Michelle P. SSG	Transfer from sampler to team leader.

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Figure F-6. Sample chain-of-custody DD Form 3108

2	280835LJUN17	SIGNATURE Michelle Mathers NAME, GRADE, OR TITLE Mathers, Michelle P. SSG	SIGNATURE Leslie Baker NAME, GRADE, OR TITLE Baker, Leslie A. CPT	Transfer media to G-2
1,3	281312LJUN17	SIGNATURE Michelle Mathers NAME, GRADE, OR TITLE Mathers, Michelle P. SSG	SIGNATURE Bob Mulliken NAME, GRADE, OR TITLE Mulliken, Robert GS12	Transfer to CARA
		SIGNATURE NAME, GRADE, OR TITLE	SIGNATURE NAME, GRADE, OR TITLE	
		SIGNATURE NAME, GRADE, OR TITLE	SIGNATURE NAME, GRADE, OR TITLE	
		SIGNATURE NAME, GRADE, OR TITLE	SIGNATURE NAME, GRADE, OR TITLE	
		SIGNATURE NAME, GRADE, OR TITLE	SIGNATURE NAME, GRADE, OR TITLE	
		SIGNATURE NAME, GRADE, OR TITLE	SIGNATURE NAME, GRADE, OR TITLE	
		SIGNATURE NAME, GRADE, OR TITLE	SIGNATURE NAME, GRADE, OR TITLE	
		SIGNATURE NAME, GRADE, OR TITLE	SIGNATURE NAME, GRADE, OR TITLE	

FINAL DISPOSAL ACTION

RELEASE TO OWNER OR OTHER *(Name/Unit)* ______________________

DESTROY ______________________

OTHER *(Specify)* ______________________

FINAL DISPOSAL AUTHORITY

ITEM(S) ______________________ ON THIS DOCUMENT, COLLECTED BY

______________________ ______________________

(Name) *(Organization)*

(IS) (ARE) NO LONGER REQUIRED AS EVIDENCE AND MAY BE DISPOSED OF AS INDICATED ABOVE. *(If article(s) must be retained, do not sign, but explain in separate correspondence.)*

(Typed/Printed Name, Grade, Title) *(Signature)* *(Date in format YYYYMMDD)*

WITNESS TO DESTRUCTION OF EVIDENCE

THE ARTICLE(S) LISTED AT ITEM NUMBER(S) ______________________ (WAS)/(WERE) DESTROYED BY THE EVIDENCE CUSTODIAN, IN MY PRESENCE, ON THE DATE INDICATED ABOVE.

(Typed/Printed Name, Grade, Title) *(Signature)* *(Date in format YYYYMMDD)*

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Figure F-6. Sample chain-of-custody DD Form 3108 (continued)

INSTRUCTIONS

ITEM 1 - DTG SAMPLE(S) COLLECTED: Date time group sample collected, in the format of 2-digit day, 4-digit time, time zone designation, 3-letter month, 2-digit year, (DDTTTTZMMM YY), for example 141700LJUN19.

ITEM 2 - LOCATION SAMPLE(S) COLLECTED: Provide grid coordinate or specific information for location where sample collected.

ITEM 3 - REASON FOR COLLECTION: Provide reason for collection such as routine surveillance, potential hazard, known hazard, confirmation of attack. Include operations order or warning order number, if applicable.

ITEM 4 - ENVIRONMENTAL CONDITIONS AT COLLECTION: Provide information of environmental conditions at collection such as: indoors, terrain (flat, hills, mountains, desert, jungle, forest, urban, grassy, sparse trees/shrubs, other), wind direction and speed, and weather (rain, temperature, humidity).

ITEM 5 - OTHER INFORMATION: Describe any other information. Characteristics noted by initial observers or sampling team such as odor, color, size, shape, texture, or weight. Information on surface where collection occurred such as countertop, glassware, soil, or filter. Method of collection used such as swab, swipe, or tubing. Include maps, sketches, photos, and any additional supporting diagrams as needed.

ITEM 6a - TEAM LEADER: Include the name, rank, and email, of the individual (shipper, team leader, or sampler) who packaged the sample. This may be the sampling element leader or a command representative who will be an enduring point of contact to reach for information regarding the sample and who will be used to report final results.

ITEM 6b - REPORT UNIT ADDRESS: The unit, unit address and phone number (DSN or commercial) for the person listed in 6a or where to report final results.

ITEM 7 - SAMPLE IDENTIFICATION: If more than one sample is taken, each sample will be listed as a separate item number. Additional text for description of articles may be continued onto the next line, within same column. Additional space for listing sample items may be continued onto a new DD Form 3108. Following the last item listed, type or write the words "Nothing else follows" along with the initials of the person filling out form.

- **ITEM NO.:** Item number is the sequential listing of samples collected.
- **SAMPLE NO./UPC:** Sample identification number or universal product code (UPC) number designated to the sample.
- **QTY**: Estimated quantity associated with the sample, if liquid the volume (mL), if sample is solid it may be volume or weight, or number of items
- **TIME:** The time the sample was collected.
- **DESCRIPTION OF ARTICLES:** The description of articles if not described by other categories. This may include meter readings, color, matrix (liquid, vapor, powder, solid), or other examples include swab samples, computer drives, cell phone, petri dish, sample collection vial, and any special handling instructions (for example, maintain temperature of specified range). Specify any other information such as soil, water or food sample.

ITEM 8 - ITEM NO(s).: Item number column refers to the specific sample item numbers from block 7 to track transfers of chain of custody. It may include multiple numbers.

ITEM 9 - DTG TRANSFER: Date time group transfer of sample(s) occurred.

ITEM 10 - RELEASED BY: includes the Name, Grade or Title and signature of the individual transferring sample into another individual's custody. The first entry is designated for the individual who collected the sample (SAMPLER).

ITEM 11 - RECEIVED BY: includes the Name, Grade or Title and signature of the individual receiving the sample and assuming responsibility for custody.

ITEM 12 - PURPOSE OF CHANGE OF CUSTODY AND REIVING ACTIVITY/LABORATORY: Reason for the change of custody such as technical escort or receiving laboratory.

FINAL DISPOSITION AUTHORITY, FINAL DISPOSAL AUTHORITY, WITNESS TO DESTRUCTION OF EVIDENCE are to be used at the discretion of the sample custodian to document any final actions taken with samples collected.

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SAMPLE

Figure F-6. Sample chain-of-custody DD Form 3108 (continued)

F-96. A complete history of the circumstances surrounding the acquisition of each sample must be documented and provided to the analyzing agency. These documents should also accompany shipments to the confirmatory laboratory. Critical information includes the—

- **Date and location.** Provide the dated time group sample collected and the grid coordinate where sample collected.
- **Reason for collection.** Provide reason for collection such as routine surveillance, potential hazard, known hazard, confirmation of attack. State the estimated length of time after the alleged incident to when sample was taken.
- **Environmental conditions.** Describe the terrain and meteorological conditions at the time of sample collection and at the time of the alleged incident.
- **Other information.** Describe any other information such as—
  - **Circumstances of the acquisition.** Describe how the sample was obtained and indicate the source of the sample.
  - **Physical description.** Describe the physical state (solid, liquid, powder, viscosity), color, approximate size, weight or volume, identity (military nomenclature, dirt, leaves), and dose rate (if radiologically contaminated).
  - **Circumstances of the agent deposition.** Describe the type of delivery system; how the system or weapon functioned; how the agent acted on release; sounds heard during dissemination; a description of craters or shrapnel found associated with the burst; and colors of smoke, flames, or mist that may be associated with the incident.
  - **Agent effects on vegetation.** Describe the general area (jungle, mountain, and grassland) and changes in the vegetation after agent deposition (that is, color change, wilting, drying, and dead) in the main incident and fringe areas.
  - **Agent effects on humans.** Describe how the agent affected personnel in the main incident area versus the fringe areas; the duration of agent effects; peculiar odors that may have been noticed in the area before, during, and after the incident; measures taken that alleviated or worsened the effects; and the approximate number of fatalities and survivors (include age and gender).
  - **Agent effects on animals.** Describe the types of animals that were and were not affected by the incident and a description of how they were affected.

SPECIAL TRANSPORTATION REQUIREMENTS

F-97. Transporting of radioactive material requires the consideration of radiological, chemical, and tactical factors. These factors to be considered include (but are not limited to) the following:

- Does the sample (or do the samples) have to be transported, or can they be secured on-site?
- Are there SMEs outside of the team that can be consulted (such as Department of Energy)?
- Can appropriate radiation monitors be emplaced?
- Can appropriate chemical monitors be emplaced?
- What is the expected dose the transportation team is expected to receive? This expected dose must be calculated for all mission phases, including loading, transport, and unloading of the material.
- If the sample packaging is damaged during transport, will the resulting chemical interactions be a risk to the transportation team or any other people in the area? If so, can the samples be segregated onto different vehicles, based on potential chemical reactions?
- Does the transportation team have the appropriate PPE?
- Has special packaging and shielding been employed during sampling?
- If so, are these containers safe from all directions (top, sides, and bottom) or only from one direction, thus requiring transportation arrangements that maintain appropriate geometries?
- What effect would rough handling have on the samples?
- Can it/they withstand driving over rough terrain, enemy contact, and so forth, without posing a radiation exposure concern?
- How can risk to the transportation team be minimized?

- If an incident that results in radiological contamination occurs, how will this affect the routes, airfields, etc. being used?
- For example, could radiological contamination close vital MSRs, contaminate an airfield, or inhibit maneuver forces? This assessment must include staging areas, routes, and temporary rest areas.
- What is the consequences if the transport vehicle falls into enemy hands? For example, if highly radioactive samples are transported on the same vehicle, would the capture of this vehicle by enemy forces enable the enemy to quickly produce a radiation dispersal device? Can, or should, the load be divided into multiple convoys or lifts?
- Is it possible for the transportation team, which are unlikely to be radiation SMEs, to deliver the samples without SME support?
- In other words, can the transportation team safely load, transport, and unload the samples without requiring additional skillsets?
- Are reacting to radiological incident procedures known and rehearsed by the transport team?
- Is the transportation team and higher-level medical personnel prepared to handle casualties from radiological exposure?
- Are there intermediate / temporary storage facilities where the samples will be housed? If so, does the storage facility have expertise on the storage/handling of radiological material, including the ability to calculate expected accumulated dose and keep that dose ALARA and to assess the effects of any chemical reactions that could occur?

SAMPLE ESCORT TEAMS

F-98. A sample escort team is comprised of a minimum of 2 personnel to maintain proper chain of custody, one of whom will be designated the team leader. At a minimum, one team member must be certified in the following:

- Certified in AMMO-62, *Technical Transportation of Hazardous Materials,* is required if samples contain hazardous materials (for example, CBRN agents, precursors, or contaminated materials).
- Certified in AMMO-67, *Hazardous Materials Familiarization and Safety in Transportation,* is required if samples contain munitions or explosives.

F-99. The sample escort team is responsible for recognizing, detecting, responding to, and mitigating any leaks or other hazards discovered during transit. The team must be prepared to conduct emergency procedures to prevent loss, theft, or capture of materials during transit.

F-100. All samples will be accompanied by the appropriate paperwork, including a *Shippers Declaration for Dangerous Good*s and chain of custody (DD Form 3108). The aircraft loadmaster may request a copy of the HAZMAT training certification.

MONITORING EQUIPMENT, PERSONAL PROTECTIVE EQUIPMENT, AND DECONTAMINATION

F-101. Monitoring equipment that is capable of detecting the transported material will be carried and used by the sample escort team. Each member of the sample team, to include security personnel, will carry adequate PPE.

F-102. For samples for which conventional PPE (for example, Joint Service Lightweight Integrated Suit Technology and M50 protective mask) provides adequate protection, each supplying unit will supply their own members with PPE. If specialized PPE (non- Joint Service Lightweight Integrated Suit Technology and M50 protective mask) is required to protect personnel, it will be provided by the unit who collected the sample.

F-103. Decontamination assets (equipment, chemicals, and so forth) that can mitigate spills and other potential hazards of the escorted substance will be on-hand with the escort team during transport.

SECURITY REQUIREMENTS

F-104. Surety material is a full-strength or diluted chemical agent of a quantity or concentration that exceeds limits established by the Army. If surety material is transported by ground, a minimum of three vehicles - one sweep, one cargo, and one guard are used. Nonsurety material security requirements are determined by the commander.

F-105. If surety material is transported by air, a minimum of four armed personnel will be employed. Nonsurety material security requirements are determined by the commander.

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Appendix G
Threat Indicators

This appendix provides doctrinal guidance on recognition, of potential threat indicators related to CBRN agent production, weapon systems, and delivery systems. The materials in this annex are drawn from the United States Army Chemical, Biological, Radiological, and Nuclear School, Dugway Proving Grounds, and the ODIN.

OVERVIEW

G-1. CBRN R&S elements can support confirmation of CBRN related PIR without a CBRN-specific detection or sampling operation. Personnel proficient in both the tactical reconnaissance and CBRN detection disciplines, observing an assigned NAI, can use a series of observed events to support confirmation/denial of a PIR in conjunction with the joint ISR enterprise.

G-2. Observation of the pattern of life of enemy forces on an assigned NAI provides additional nuance and detail to support analysis beyond observation for only brief periods of time.

ENVIRONMENTAL CBRN INDICATORS

G-3. The following are environmental indicators of CBRN activities or hazard:

- Dead animals, animals exhibiting unusual symptoms.
- Discarded CBRN protective equipment.
- Personnel suddenly exhibiting runny nose, salivation, miosis (pinpointed pupils), difficulty breathing, vomiting, convulsion, blistering, hoarseness, or a hacking cough.
- Dead personnel without conventional wounding (bullet, blast, fragmentation, incendiary).

ENEMY ACTIVITY INDICATORS

G-4. The following enemy activities are potential indicators of a CBRN attack:

- Increase in CBRN protection.
- Vacating areas templated for enemy CBRN strike.
- Increased meteorological surveys in conjunction with enemy fires observers or reconnaissance.
- Movement of additional support personnel for CBRN weapon systems. Observation of personnel, including ranks, unit insignia on uniforms or vehicles, and the specific equipment of observed enemy forces will support analysis to answer multiple PIRs, including those related to enemy CBRN capability, activities, or intent.

CHEMICAL AGENT PRODUCTION OR HANDLING INDICATORS

G-5. The following items and systems are potential indicators of chemical agent production or handling:

- **Chemical process stations**. Chemical process stations are systems made by the arrangement of industrial or improvised chemical production devices to produce a desired chemical product. Chemical processes include synthesis, distillation, reflux, separation, extraction, and filtration.
- **Chemical production equipment.** Chemical production equipment may be industrial or improvised. Chemical production equipment includes heating mantles, cooling baths, grinders, centrifuges, glassware (flasks, funnels, cylinders, beakers), and accessories such as measuring devices, industrial vacuums, and modular piping and clamp arrays to facilitate use of glassware. Production equipment may range from process-specific industrial scale facilities to improvised,

clandestine facilities made of repurposed kitchen and food storage items. Figures G-1, G-2, and G-3 provide examples of chemical production equipment.

- **Chemical precursors.**

G-6. A significant amount of safety equipment such as fume hoods, ventilation, and filtration, vapor/gas sealed entrances, gloveboxes, and so forth is an indicator of potential CBRN production or handling.

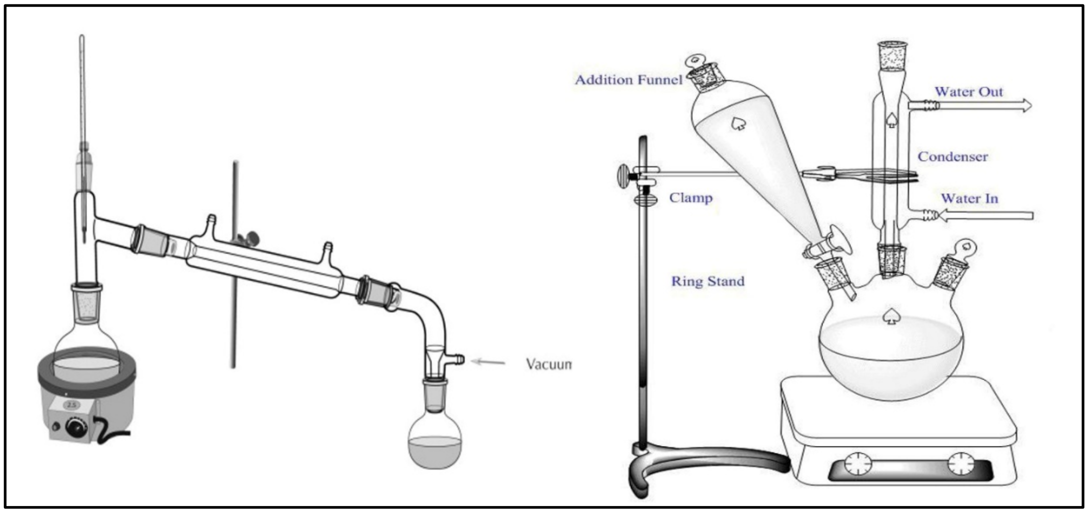

Figure G-1. Example of a laboratory distillation station

Figure G-2. Example of chemical filling equipment

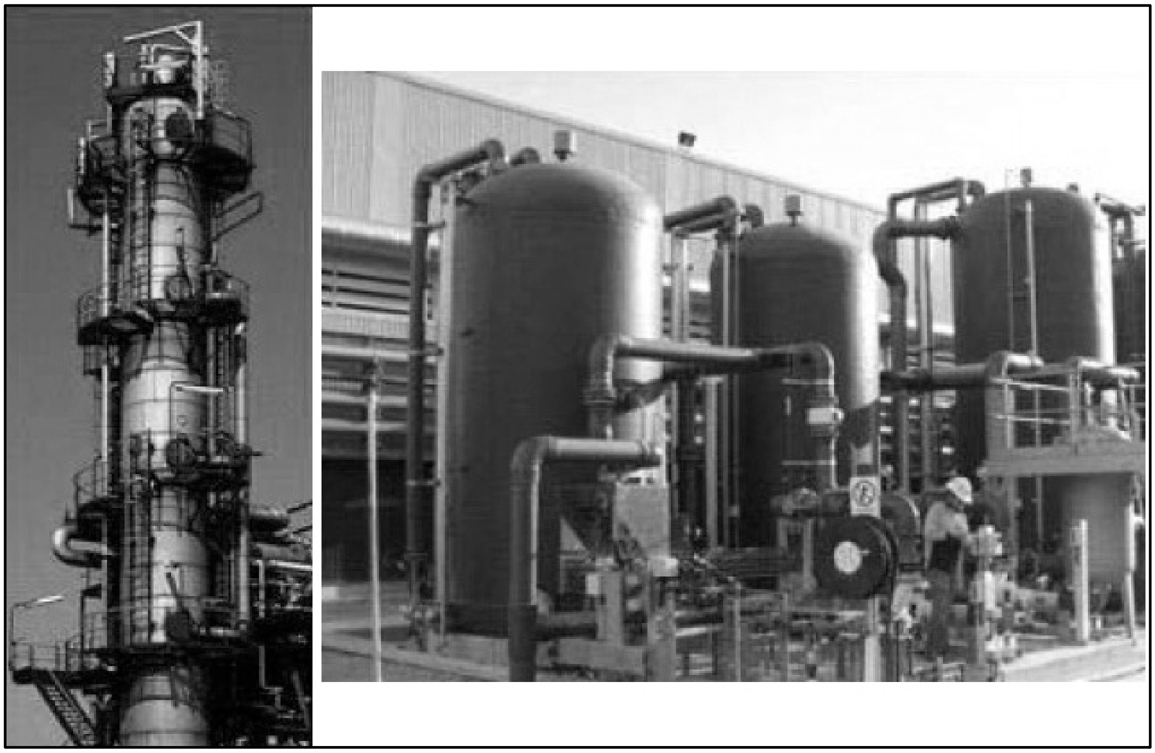

Figure G-3. Example chemical storage tanks and distillation tower

BILOGICAL AGENT PRODUCTION OR HANDLING INDICATORS

G-7. The following items and systems are potential indicators of biological agent production or handling: biological process stations, biological production equipment, and biological media, cultures and packaging.

G-8. Biological process stations are made by the arrangement of industrial, laboratory, or improvised systems to allow the growth, harvesting, and final processing of a selected bacteria or virus. Biological process used in the production of biological warfare agent include incubation, fermentation, harvesting/drying, filtration, milling, and areosolization.

G-9. Biological production equipment may be industrial or improvised. Biological production equipment includes agar or growth medias, petri dishes, fermenters, bioreactors, incubators, grinders, filters, glassware (flasks, funnels, cylinders, beakers), and accessories such as measuring devices, industrial vacuums, and modular piping and clamp arrays to facilitate use of glassware. Like chemical agent processes, biological production equipment may range from process-specific industrial scale facilities to improvised, clandestine facilities made of repurposed kitchen and food storage items. Figures G-4, G-5, and G-6, pages G-4 and G-5, provide examples of equipment for biological production.

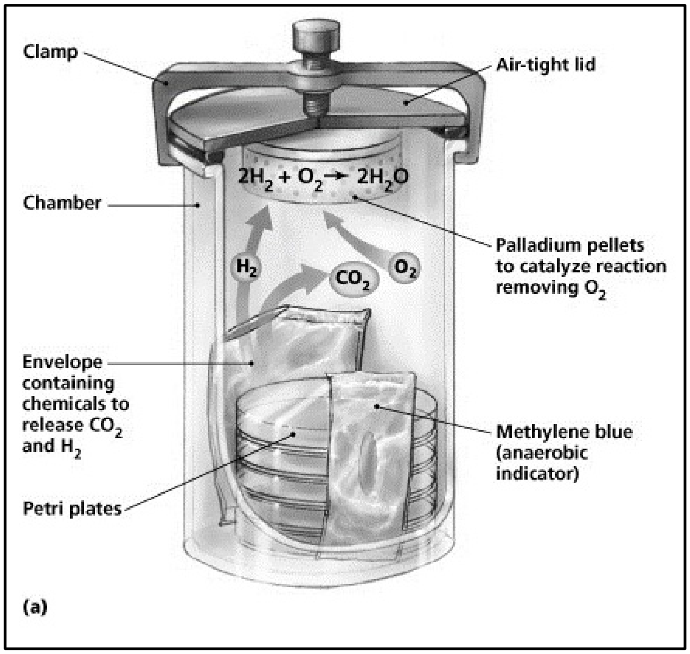

Figure G-4. Example of an anaerobic growth station

Figure G-5. Example of an aerobic growth station (with stirring tray and temperature control)

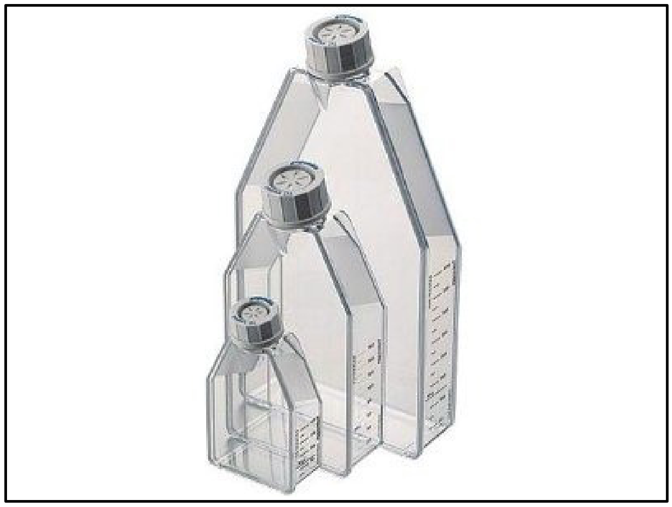

Figure G-6. Example of T-flasks used for viral production

WEAPON AND DELIVERY SYSTEMS

G-10. CBRN munitions may be marked with a combination of red, yellow, green, white, black bands, and stripes. They may contain nerve, blister, choking, blood, vomiting or riot control agents, and they may differ very little in appearance from conventional munitions. Common attributes of CBRN munitions include fill ports or plugs, and bursting charges to disperse CBRN agent. When tactically feasible, suspected CBRN munitions be examined and photographed to enable technical and weapons intelligence teams to provide more thorough analysis. See figure G-7 and figure G-8, page G-6, for examples of chemical munitions.

G-11. Identification of the specific weapons systems ranging from ballistic missiles or long-range artillery to tactical mortar systems are equipped with CBRN weapons will often require the collaboration of multiple intelligence collection efforts. CBRN R&S elements operating in assigned NAIs must be familiar with relevant threat weapon systems, including artillery, multiple-launch rocket system, and missile platforms and the enemy's supporting C2 and joint ISR activities, capabilities, and systems.

Figure G-7. Chemical munitions

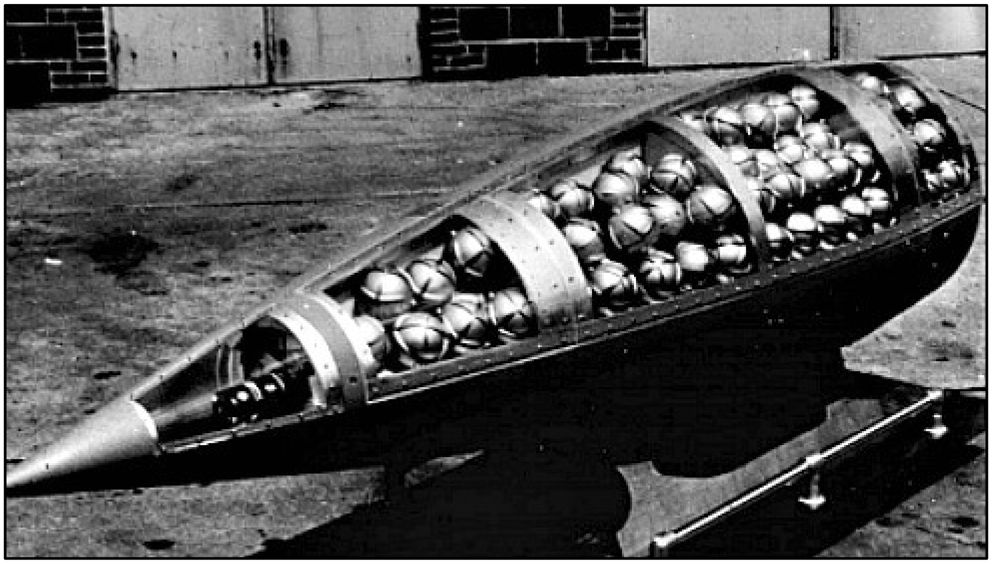

Figure G-8. Cutaway showing submunitions for agent dispersal

Glossary

The glossary lists acronyms and terms with Army or joint definitions. Where Army and joint definitions differ, (Army) precedes the definition. Terms for which ATP 3-11.37/MCRP 10-10E.7/NTTP 3-11.29/AFTTP 3-2.44 is the proponent are marked with an asterisk (*).

SECTION I – ACRONYMS AND ABBREVIATIONS

ADP	Army doctrine publication
AFMAN	Air Force manual
AFTTP	Air Force tactics, techniques, and procedures
ALARA	as low as reasonably achievable
AO	area of operations
AOR	area of responsibility
APOD	aerial port of debarkation
APOE	aerial port of embarkation
AR	Army regulation
ASCOPE	areas, structures, capabilities, organization, people, and events
ATP	Army techniques publication; Allied tactical publication
attn	attention
BEB	brigade engineer battalion
C	Celsius
C2	command and control
CARA	chemical, biological, radiological, nuclear, and explosives analytical and remediation activity
CBRN	chemical, biological, radiological, and nuclear
CBRNE	chemical, biological, radiological, nuclear, and explosives
CBRNWRS	CBRN Warning and Reporting System
CCIR	commander's critical information requirement
CCMD	combatant command
CFR	Code of Federal Regulation
CM	chemical
CO_2	carbon dioxide
CO	company
COMM	commercial
CONUS	continental United States
COP	common operational picture
CRT	chemical, biological, radiological, nuclear, and explosives response team
CWMD	countering weapons of mass destruction

DA	Department of the Army
DCS	Department of Chief of Staff
DD	Department of Defense form
DOD	Department of Defense
DODD	Department of Defense directive
DODI	Department of Defense instruction
DOEHRS	Defense Occupational and Environmental Health Readiness System
DNA	deoxyribonucleic acid
DSN	Defense switching network
EEI	essential elements of information
EEFI	essential element of friendly information
EOD	explosive ordnance disposal
FED STD	federal standard
FL	Florida
FLOT	forward line of troops
FM	field manual
G-1	assistant chief of staff, personnel
G-2	assistant chief of staff, intelligence
G-3	assistant chief of staff, operations
G-9	assistant chief of staff, civil affairs operations
GTA	graphic training aid
HAZMAT	hazardous material
HPT	high-payoff target
HRC	hazard response company
IATA	International Air Transportation Association
IED	improvised explosive device
IFAS	Initial Field Account Survey
IPB	intelligence preparation of the battlefield
IPE	individual protective equipment
ISR	intelligence, surveillance, and reconnaissance
J-2	intelligence directorate of a joint staff
J-3	operations directorate of a joint staff
J-9	civil-military operations/interagency cooperation directorate of a joint staff; civil-military operations directorate/interagency operations directorate of a joint staff; civil-military operations directorate of a joint staff
JFC	joint force commander
JIPOE	joint intelligence preparation of the operational environment
JOA	joint operations area
JP	joint publication
JRSOI	joint reception, staging, onward movement, and integration
JTF	joint task force
LP	listening post

LSCO	large-scale combat operations
LTIOV	latest time information is of value
MAGTF	Marine air-ground task force
MARSOFEOD	Marine Forces Special Operations Command Explosive Ordnance Disposal
MASINT	measurement and signature intelligence
MCPP	Marine Corps Planning Process
MCRP	Marine Corps reference publication
MDMP	military decision-making process
METT-T	mission, enemy, terrain and weather, troops and support available-time available
METT-TC	mission, enemy, terrain and weather, troops and support available, time available, civil considerations [mission variables] (Army)
MIL-STD	military standard
MO	Missouri
MSCoE	Maneuver Support Center of Excellence
MSR	main supply route
MCO	Marine Corps order
MTTP	multi-Service tactics, techniques, and procedures
NAI	named area of interest
NATO	North Atlantic Treaty Organization
NFPA	National Fire Protection Association
NTRP	Navy tactical reference publication
NTSM	Navy ships' technical manual
NTTP	Navy tactics, techniques, and procedures
OAKOC	observation and fields of fire, avenues of approach, key terrain, obstacles, and cover and concealment (military aspects of terrain)
OBJ	objective
ODIN	OE Data Integration Network
OE	operational environment
OEG	operational exposure guidance
OP	observation post
OPORD	operation order
PACE	primary, alternate, contingency, and emergency
PIR	priority intelligence requirement
PPE	personal protective equipment
PVNTMED	preventive medicine
R&S	reconnaissance and surveillance
RADIAC	radiation detection, indication, and computation
RHO	reconnaissance handover
RTE	route
S-1	battalion or brigade personnnel staff officer
S-2	battalion or brigade intelligience staff officer

S-3	battalion or brigade operations staff officer
S-9	battalion or brigade civil affairs operations staff officer
SALUTE	size, activity, location, unit, time, and equipment
SME	subject matter expert
SOP	stardard operating procedure
SOSRA	suppress, obscure, secure, reduce, assault
SPOD	seaport of debarkation
STANAG	Standardization Agreement
TIM	toxic industrial material
TLP	troop leading procedures
TM	technical manual
TRADOC	United States Army Training and Doctrine Command
UAS	unmanned aerial system
UGF	underground facilities
U.S.	United States
USA	United States Army
USAF	United States Air Force
USMC	United States Marine Corps
USN	United States Navy
UXO	unexploded explosive ordnance
VA	Virginia
WARNORD	warning order
WMD	weapons of mass destruction

SECTION II – TERMS

***chemical, biological, radiological, and nuclear (CBRN)**

Chemical, biological, radiological, and nuclear (CBRN) sample management is the process whereby CBRN samples are collected, packaged, transported, stored, transferred, analyzed, reported, safeguarded, tracked, and disposed.

***definitive identification**

The employment of multiple state-of-the-art, independent, established protocols and technologies by scientific experts in a nationally recognized laboratory to determine the unambiguous identity of a chemical, biological, radiological, and/or nuclear hazard with the highest level of confidence and the degree of certainty necessary to support strategic-level decisions.

***field confirmatory identification**

The employment of technologies with increased specificity and sensitivity by technical forces in a field environment to identify chemical, biological, radiological, and/or nuclear hazards with a moderate level of confidence and the degree of certainty necessary to support follow-on tactical and operational decisions.

***presumptive identification**

The employment of technologies with limited specificity and sensitivity by forces in a field environment to detect the presence of chemical, biological, radiological, and/or nuclear hazards with a low, but sufficient level of confidence to support immediate tactical decisions.

***theater validation identification**

The employment of multiple independent, established protocols and technologies by scientific experts in the controlled environment of a fixed or mobile/transportable laboratory to characterize a chemical, biological, radiological, and/or nuclear hazard with a high level of confidence and the degree of certainty necessary to support operational to strategic-level decisions.

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Entries are by paragraph number.

ATP 3-11.37
31 March 2021

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