Metropolitan Washington
Council of Governments

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Radiological Dispersal Device (RDD) Response Guidelines SOG 1

Approved by the COG Fire Chiefs Committee

Metropolitan Washington

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A product of the COG Hazardous Materials Subcommittee

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A. SCOPE:

1. This document is to be used in conjunction with local response policies to provide first responding company officers, hazardous materials teams and incident commanders with the basic guidance for operating during the initial stage of a radiological dispersal device event.

B. OVERVIEW:

1. This Standard Operating Guideline seeks to establish a model procedure that provides safe, efficient and effective response for first arriving emergency service personnel when addressing potential radiological events. This model provides a framework for building a regional protocol tailored to the National Capitol Region (NCR). It was developed so that a first responder will have knowledge of the broader process in which they may be requested or required to assist.

2. The following document outlines response parameters and gives consistent dose limits for emergency response personnel in a response to a radiological incident within the NCR.

3. A major radiological incident, whether intentional or not, will require a multi-jurisdictional response. Establishment of this guideline, in advance of such an incident, will allow jurisdictions to operate with consistent guidance.

C. GENERAL:

1. This document is to be used as a guideline for emergency responders operating in the initial stage of a radiological event. During the initial stage of the incident, emergency responders will be tasked with multiple activities such as:
    a. Confirming a radiological release
    b. The rescue of live victims
    c. Establishing control lines and determining protective actions
    d. Characterizing the scene
2. Always assume radiological materials are present at an explosive event until proven otherwise through the deployment of radiation detection equipment. Wear full personal protective equipment and SCBA until such materials have been ruled out. Wearing SCBA will prevent the inhalation of airborne radioactive material.

3. NCR Emergency response personnel will utilize the roentgen (R) as the standard unit to measure radiological exposure. All agencies responding to assist in the incident will be expected to comply with this standard.

4. The NCR's fire departments and hazardous materials teams consider:

1 Roentgen (R) = 1 Radiation Absorbed Dose (RAD) = 1 Radiation Equivalent Man (REM)

5. Radiation exposure rates will be measured in microroentgen per hour (µR/hr), milliroentgen per hour (mR/hr), or roentgen per hour (R/hr).

1,000 microroentgen (µR) = **1** milliroentgen (mR)
1,000 milli-roentgen (mR) = **1** Roentgen (R)
thus,
1,000,000 µR = **1** Roentgen (R)

6. Naturally occurring background radiation exposure rates in the NCR vary in ranges between 5 µR/hr to 20 µR/hr.

5 -- 20 µR/hr = **0.005 -- 0.02** mR/hr

D. RADIATION PROTECTION CONTROLS – ALARA PRINCIPLE (AS LOW AS REASONABLY ACHIEVABLE):

1. During all incidents where suspected radiological materials are present, responders shall use the ALARA principle in order to limit responder's exposure to radiation.

2. The basic principles of ALARA are:

   a. Maximize the distance between responders and radiological material
   b. Minimize responder exposure time
   c. Maximize shielding between responders and radiological material

3. In order to ensure that responders receive the lowest possible dose of radiation at an incident, responders shall adhere to the following practices:

   a. Limit the number of responders operating in the area to those absolutely necessary to efficiently complete a task. Unnecessary personnel should remain out of the hot zone. However, as many personnel as required to quickly rescue viable victims should be utilized during the initial phase of the incident.

b. Ensure that the tasks to be completed are worth the anticipated radiation exposure. Personnel should evaluate the risk of expected exposure versus the expected benefit of completing the task.
c. Rotate personnel in and out of the hot zone as necessary to ensure that no single responder receives a higher dose than absolutely necessary.
d. Always ensure personnel are wearing adequate personal protective equipment, including respiratory protection.
e. Maintain as much distance as possible between the responders and radioactive material.
f. Use natural shielding whenever possible.

E. DOSE LIMITS

1. The following chart summarizes the recommended maximum dose limits for emergency personnel during response to a radiological incident:

Guideline	Activity	Condition
5 rem	All activities	All reasonably achievable actions have been taken to minimize dose
10 rem	Protecting critical infrastructure necessary for public welfare	Exceeding 5 rem unavoidable and all appropriate actions taken to reduce dose
25 rem	Lifesaving or protection of large populations	Exceeding 5 rem unavoidable and all appropriate actions taken to reduce dose.
>25 rem	Lifesaving or protection of large populations	Exceeding 5 rem unavoidable and all appropriate actions taken to reduce dose, and only for voluntarily responders fully aware of the risks involved.

2. The 25 rem lifesaving emergency worker guideline provides assurance that exposures will not result in detrimental acute health effects. However, it could increase the risk of chronic effects, such as the risk of cancer. Response actions that could cause exposures in excess of 25 rem should only be voluntarily undertaken with an understanding of the potential acute effects of radiation to the exposed responder and only when the benefits of the action clearly exceed the associated risks.

3. For potential doses > 5 rem, medical monitoring programs should be implemented.

F. INCIDENT STAY TIMETABLE

1. During emergency response, the following general guidance regarding stay time in contaminated areas should be followed:

TOTAL GAMMA RADIATION DOSE

DOSE RATE	100 mR	1 R	5 R	10 R	25 R	50 R	100 R	500 R
1 mR/hr	4.2 days	5.9 weeks	29.8 weeks	59.6 weeks	2.9 years	5.7 years	11.4 years	57.1 years
2 mR/hr	2.1 days	3 weeks	14.9 weeks	29.8 weeks	1.4 years	2.9 years	5.7 years	28.5 years
5 mR/hr	20 hrs	8.3 days	6 weeks	2.8 months	6.9 months	1.1 years	2.3 years	11.4 years
10 mR/hr	10 hrs	4.2 days	3 weeks	6 weeks	3.5 months	6.9 months	1.1 years	5.7 years
25 mR/hr	4 hrs	40 hrs	8.3 days	16.6 days	6 weeks	11.9 weeks	6.9 months	2.3 years
50 mR/hr	2 hrs	20 hrs	4.2 days	8.3 days	20.8 days	6 weeks	11.9 weeks	1.1 years
100 mR/hr	1 hr	10 hrs	50 hrs	4.2 days	10.4 days	20.8 days	6 weeks	6.9 months
200 mR/hr	30 mins	5 hrs	25 hrs	50 hrs	5.2 days	10.4 days	20.8 days	14.9 weeks
500 mR/hr	12 mins	2 hrs	10 hrs	20 hrs	50 hrs	100 hrs	8.3 days	6 weeks
1 R/hr	6 mins	1 hr	5 hrs	10 hrs	25 hrs	50 hrs	100 hrs	20.8 days
2 R/hr	3 mins	30 mins	2.5 hrs	5 hrs	12.5 hrs	25 hrs	50 hrs	10.4 days
5 R/hr	72 secs	12 mins	1 hr	2 hrs	5 hrs	10 hrs	20 hrs	100 hrs
10 R/hr	36 secs	6 mins	30 mins	1 hr	2.5 hrs	5 hrs	10 hrs	50 hrs
25 R/hr	14.4 secs	2.4 mins	12 mins	24 mins	1 hr	2 hrs	4 hrs	20 hrs
50 R/hr	7.2 secs	1.2 mins	6 mins	12 mins	30 mins	1 hr	2 hrs	10 hrs
100 R/hr	3.6 secs	36 secs	3 mins	6 mins	15 mins	30 mins	1 hr	5 hrs
200 R/hr	1.8 secs	18 secs	90 secs	3 mins	7.5 mins	15 mins	30 mins	150 mins

G. INCIDENT RESPONSE

1. Mandatory Notifications
   a. Local and State Law Enforcement
   b. Federal Bureau of Investigation WMD Coordinator
   c. Joint All Hazards Operations Center (JAHOC)
   d. Local and State Emergency Management Agencies / Emergency Operations Centers
   e. Local hospitals that should expect to receive casualties
   f. Department of Energy Radiological Assistance Program
   g. Environmental Protection Agency

2. Personal Protective Equipment

a. Fire Department personnel should utilize structural firefighting gear and self-contained breathing apparatus until it can be confirmed that it is safe to utilize other personal protective equipment.
b. Other emergency response personnel should utilize, at a minimum and to the extent available, air purifying respirators. If other personal protective equipment, such as Level C ensembles, should be utilized.

3. Initial Actions
   a. Incorporate local EOD assets to determine if multiple devices are present at or near the incident scene.
   b. Every effort should be made to approach the incident from uphill and upwind. Additionally, begin approach 330 feet from incident or at the edge of debris field.
   c. Initial Hot Zone (Initial Isolation Distance) should be 800 feet in all directions, until radiological measurements can define the actual Hot Zone. As radiological measurements become available, the Hot Zone perimeter should be re-established at contamination levels that exceed 10mR/hr.
   d. Initial Shelter-in-Place Zone (Protective Action Distance) should be 1,600 feet in all directions until radiological measurements are available. When the direction of the contamination is confirmed by radiological measurements, extend the Shelter-in-Place Zone out to 1.2 miles in the direction of the contamination to protect the public from low-level contamination and external radiation from radiological material on the ground. Public messaging during this initial response is critical to reinforce the Shelter-in-Place effort.

COLD ZONE	WARM ZONE	HOT ZONE	DANGEROUS RADIATION ZONE	ABSOLUTE TURN BACK
Up to 2 x Background	2 x Background to 10 mR/hr	10 mR/hr to 10 R/hr	> 10 R/hr	200 R/hr

   e. If victims are present or the likelihood is great, fire department personnel can begin life-saving actions. If initial fire department personnel are NOT equipped with radiological dosimeters, they may conduct lifesaving operations for a maximum of 15 minutes. If initial fire department personnel ARE equipped with radiological dosimeters, they may conduct life-saving operations in accordance with the maximum dose limits outlined in Section E.
   f. Remove all victims as quickly as possible from the explosion site and/or radiological source(s).

g. Initiate START Triage according to local SOP and determine the appropriate decontamination, treatment and transportation decisions according to the following:
    1. BLACK: Do not move due to evidence preservation
    2. RED: Treat and Transport without delay, notifying the receiving facility of the potential for receiving contaminated victims
    3. YELLOW: Decontaminate, Treat and Transport
    4. GREEN: Decontaminate, Delay Treatment and Transport until sufficient resources available

h. The removal of radioactive contamination should never take precedence over the treatment and transport of victims with potentially life-threatening conditions.

i. Decontamination procedures shall be determined by the IC. Whenever possible, dry decontamination should be strongly considered in an effort to reduce the amount of contaminated waste.

j. When resources allow, control zones should be identified based on radiological measurements. In general, measurements of twice background should be considered evidence of contamination.

4. Dosimetry
    a. All personnel making entry into an area in which a radiation field is suspected or known shall utilize a dosimeter. It is acceptable for only one member of each team to wear a dosimeter, if the team is to work together in the same area.
    b. Alarming Personal Radiation Detectors (PRDs) with dose capabilities are acceptable during the initial response to an incident.
    c. Dosimeters should be worn on the outside of PPE, above the waist and below the neck, in order to allow the user to read the dosimeter while in the hot zone.
    d. Dosimeters should be monitored closely to ensure personnel do not exceed their recommended dose allowance.
    e. If possible, dosimeters should be zeroed prior to entry.

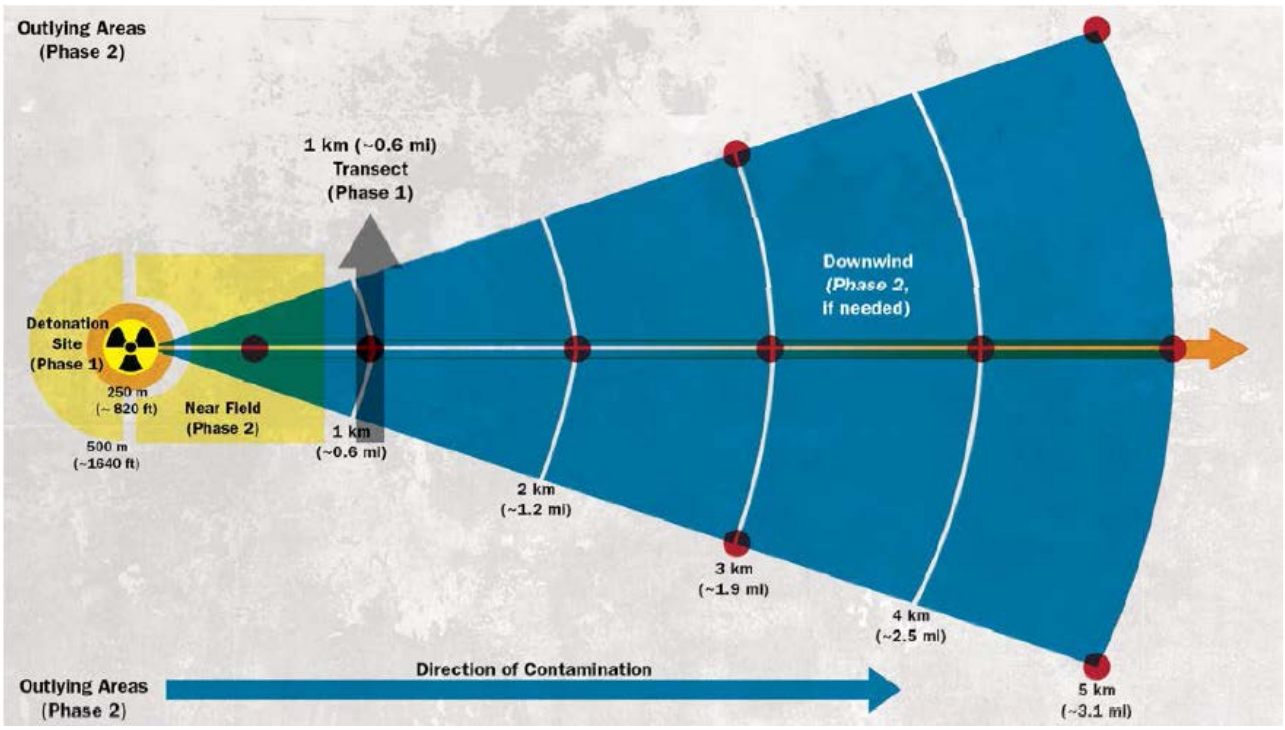
5. Radiological Detection and Measurement
    a. Personnel responding to an explosion or a suspected radiological incident should deploy all available radiological detection equipment. As soon as possible, equipment capable of detecting the presence of gamma radiation, measuring exposure dose rates, and measuring total dose should be utilized.
    b. After an initial indication that radiation is present at an incident, emergency responders shall take at least two measurements, in at least

two locations (minimum of fifty feet apart at a height of 3 feet above the ground), with at least two separate radiation detection instruments. Dose rates or count rates of greater than three times the normal background level are significant and indicative of the presence of radioactive materials.

c. If it is determined that radiation is present, incident command efforts should be initiated as soon as possible, utilizing hazardous materials teams and additional specialty radiological response assets, to characterize and understand the qualitative extent of radiological contamination. This information is critical in order to make health and safety decisions that protect response personnel and the public from high exposure levels and to limit the spread of contamination. **(Collecting radiological data is secondary to lifesaving rescue operations and should not delay or interfere with the emergency response being conducted at the incident scene.)**

d. The Incident Commander should collect radiological measurement data by assigning strike teams to take measurements in two phases, outlined in priority order:
    1. Phase 1: Detonation Site – Transect at 0.5 miles downwind, based on the direction of likely contamination spread near the point of detonation.
    2. Phase 2: Nearfield – 10 Point Monitoring Plan: Areas farther downwind if presence of contamination is detected at 0.5 miles Transect.

e. Personnel should record all survey measurements in RadResponder as each measurement is collected. It is important to record, at a minimum, the location of measurement, instrument type, and units of measurement. This will assist the IC, with the assistance of radiological subject matter experts, in mapping the initial Hot Zone and the protective action zones. This is critical to assist the EOC to quickly visualize boundaries for protective action areas for public messaging and responder safety.



Phase 1: Strike Team 1 Decision Points

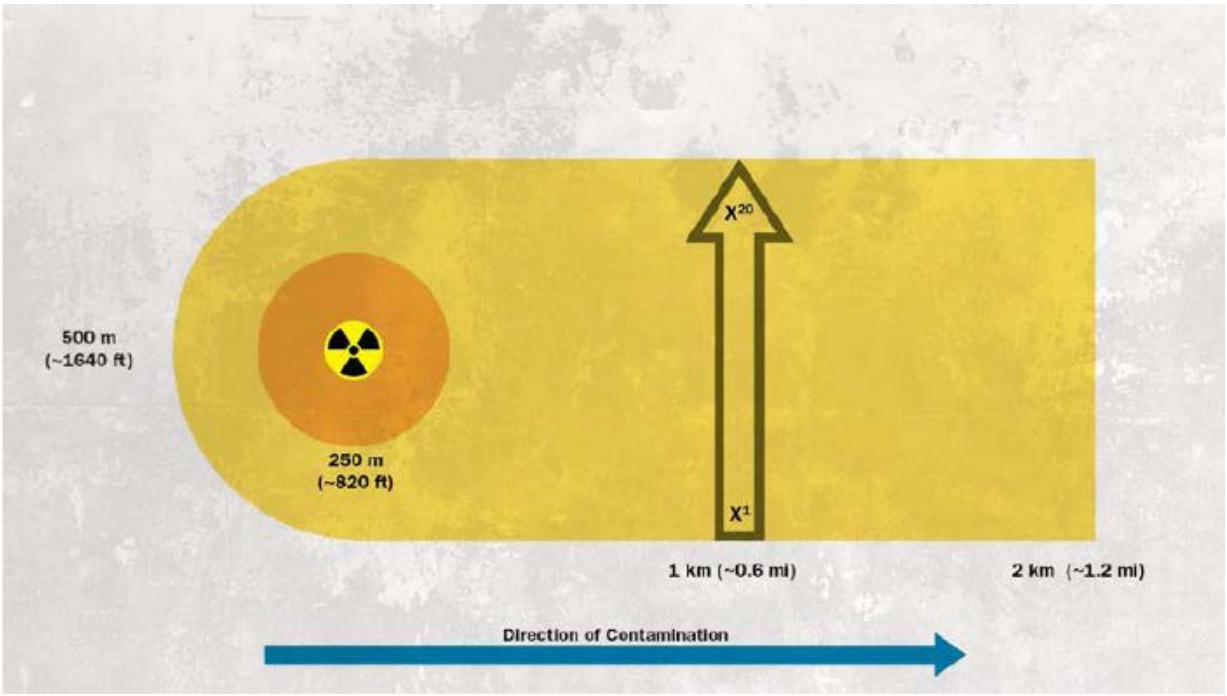
Decision Point	Outcomes
Determine areas that are Dangerous Radiation Zones (10 R/hr)	• If 10 R/hr is measured, personnel should stop, mark this point and move to a safe area (near background radiation levels) • Marking and moving away from Dangerous Radiation Zones will ensure responder safety and maintain ALARA
Discernable direction from detonation site with highest radiological contamination indicates the direction and magnitude of radiological contamination	• Preliminary indication of an aerosol or fragmentation dispersal • Determine which direction is downwind and where the 0.5 mile Transect will be conducted.
Determine if alpha radiation contamination is present	• If no alpha contamination is found, cease monitoring for alpha contamination. • If alpha contamination is found, begin to define the boundary of the Hot Zone based on a 6,000 dpm/cm^2 at 0.25 inch above the ground with an alpha probe that includes predetermined conversion factors from counts per minute (cpm) to dmp/cm^2. • If beta contamination is found, but no alpha contamination is found, continue to enforce the 10mR/hr Hot Zone.

1. Strike Team 1
    a. It is unnecessary for responders taking measurements to enter the detonation point (65 feet around the center of the soot spot or markings caused by explosion) to collect data. The measurement and mapping of the detonation site excludes this 65-foot circle as a law enforcement-controlled crime scene.
    b. Strike Team 1 should take several measurements approaching the detonation site starting at 330 feet out until they are 65 feet away from the detonation point or 10 R/hr, whichever comes first. Strike Team 1 should then repeat the measurements from four or more different directions/approaches that span the 360 degrees around the detonation site (where possible based on site-specific conditions). In a dense urban environment only four directions of approach may be possible (for example, approaches from north, south, east and west). All measurements should be taken at 3 feet above the ground.
    c. If Strike Team 1 measures radiation at or above 10 R/hr, they should stop, mark this point and move to a low background area. Areas bounded by 10 R/hr will be designated the Dangerous Radiation Zones.
    d. Strike Team 1 should continue measuring outwards from 330 feet in multiple directions if no discernable directional pattern is found.
    e. Strike Team 1 should take measurements using alpha and beta contamination probes at 0.25 inch above the ground to help characterize the radioactive material and determine what Hot Zone boundaries should be established past the initial boundary.

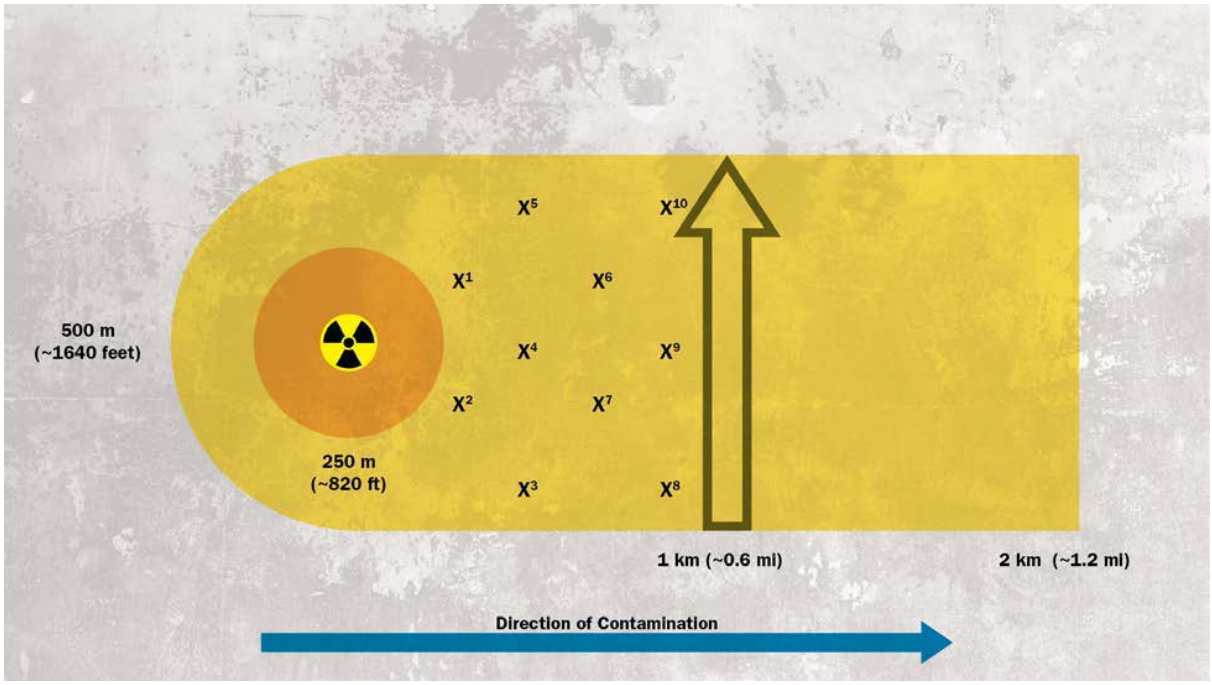
Phase 1: Strike Team 2 Decision Points

Decision Point	Outcomes
Assess the extent of the contamination downwind	• If radiation measurements at the 0.5 mile Transect are at background levels, the either the device did not result in a significant amount of smoke/aerosol dispersion, or the identified direction of contamination spread is incorrect. • If radiation measurements at the 0.5 mile Transect are elevated, it indicates that radiological material was dispersed downwind and Phase 2 measurements further downwind are required.
Determine if alpha radiation contamination is present	• If no alpha contamination is found, cease monitoring for alpha contamination. • If alpha contamination is found, begin to define the boundary of the Hot Zone based on a 6,000 dpm/cm^2 at 0.25 inch above the ground with an alpha probe that includes predetermined conversion factors from counts per minute (cpm) to dmp/cm^2. • If beta contamination is found, but no alpha contamination is found, continue to enforce the 10mR/hr Hot Zone.

2. Strike Team 2
    a. Strike Team 2 should walk along the 0.5 miles Transect and take measurements using low-range exposure rate meters at 3 feet above the ground in the center of intersections and the halfway point between intersections. If no intersections exist, personnel should aim to take measurements approximately every 150 feet, which should result in about 20 measurements.
    b. Strike Team 2 should also take measurements with beta contamination probes at 0.5 inch above the ground and with alpha contamination probes at 0.25 inch above the ground.

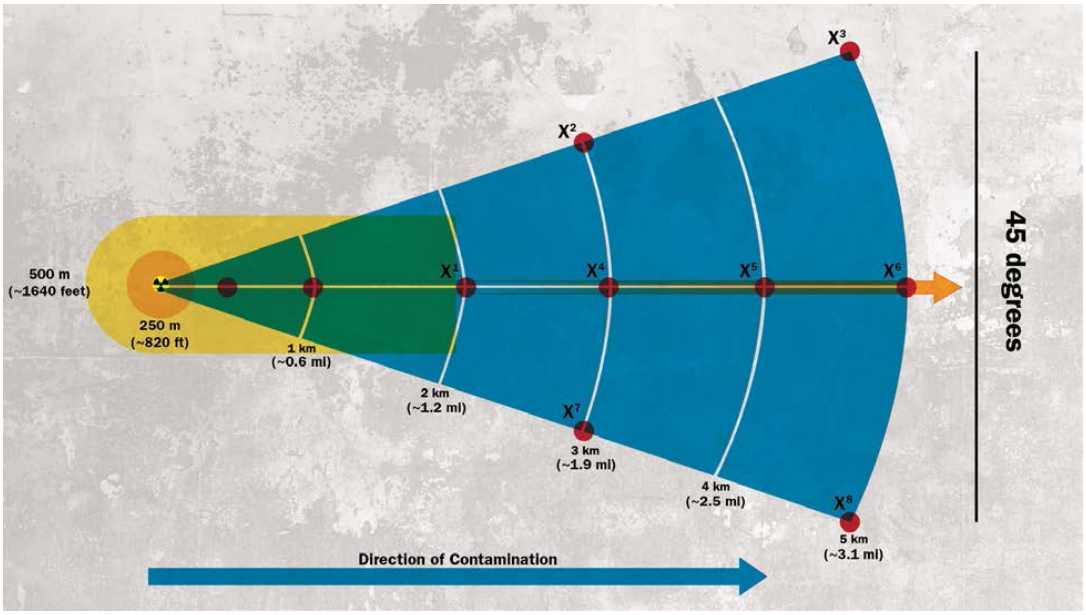


3. Strike Team 3
    a. Strike Team 3 surveys the area between the detonation area and approximately 0.5 miles in the direction of contamination.
    b. Strike Team 3 should collect measurements parallel to the wind direction to identify the edges of the plume where the exposure rate is greater than 10 mR/hr and to establish the general contour of the footprint.



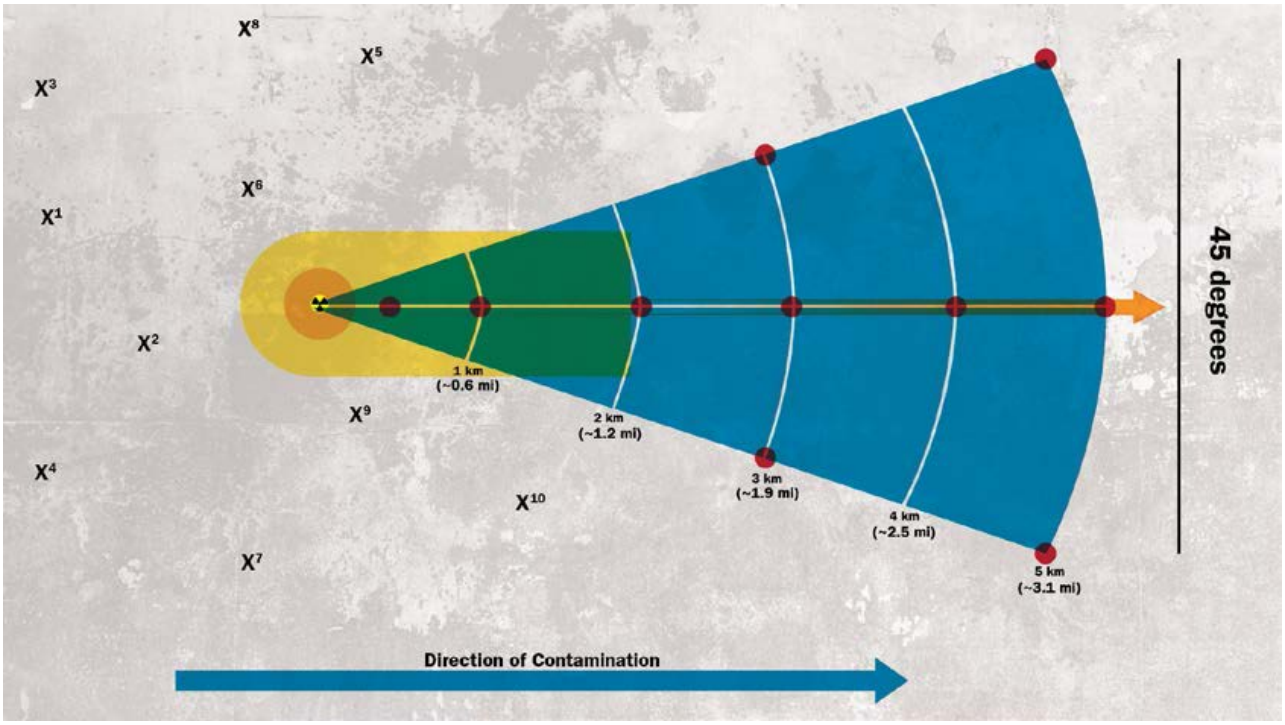
    c. If radiological contamination is detected at the 0.5 miles Transect, first responders should initiate the 10-Point Monitoring Plan based on the direction of contamination as confirmed while collecting radiological measurements at the Transect. The Transect and Near Field surveys will provide measurements for two of the 10 points, thus only eight additional points are needed.
4. IC should contact personnel who have radiation detectors at fixed locations, such as at firehouses, police stations and hospitals. This will facilitate rapid data collection and avoid the need to send an additional Strike Team. Request that measurements are taken outdoors at 3 feet above the ground. Measurements close to the recommended points on the grid are

sufficient. If fixed collection points are not available, deploy personnel to collect measurements along the recommended grid.



5. Outlying Areas
    a. The objective of measuring the outlying areas, which are the areas outside any of the survey areas, is to confirm that radiation is not present in these areas. These outlying measurements of background (no contamination) will be important to map and critical when messaging hazard areas to the public.
    b. IC should assign a team to coordinate the collection of radiation measurements from fixed and portable locations throughout the region. Agency representatives should contact personnel at locations with existing detection capabilities such as firehouses, police stations, universities, hospitals, and other local, state and federal partner agencies. Request that measurements be taken outdoors at 3 feet above the ground. Data collected from these locations should include the radiation measurement and the instrument that was used, the exact location, and the individual responsible for taking the measurement, for input into RadResponder and in case additional information is required.

c. If there are no available locations that have radiation detection equipment available, a team of two properly trained and equipped responders (and more teams if resources permit) should drive around the jurisdiction and surrounding areas and confirm background radiation measurements.



H. RESPONDER DOCUMENTATION

1. In all suspected radiation incidents, response personnel's exposure to radiation must be documented. It is recommended that the Hazardous Materials Team track and document personnel exposure information. Dosimetry information can be entered into an ICS 214 (Activity Log) for tracking during an incident and should be included in ICS 221 (Demobilization Check-Out) for personnel as their activities at an incident conclude.
2. In order to ensure that response personnel doses are recorded, the following specific practices shall be used (Responders working as a team and sharing dosimeters shall report the same readings and indicate that the measurements are estimated as a result of shared dosimetry):
    a. Dose provided by dosimetry.
    b. Isotopes encountered.
    c. Potential for internal contamination.
    d. Time period over which the dose was received.

ATTACHMENT A

Summary of Missions and Tactics

MISSION	TACTIC	ACTIVITIES	
		FIELD RESPONSE	EOC/ COMMAND CENTER
RECOGNIZE that radiation is present at scene of explosion. (0-5 minutes)	**1. Initial Response & On-scene Recognition**	First responders are equipped with radiation detection equipment that is in continuous use when responding to an explosion.	
	2. Confirm the Presence of Radiation	After an initial indication that radiation is present, first responders take at least two readings, in at least two locations, with at least two separate radiation detection instruments to confirm that elevated radiation levels above background are present at the explosion scene.	
INFORM responders and the public of the initial default Hot Zone and Shelter-in-Place Zone and notify local, state and federal authorities to request assistance. (5-10 minutes)	**3. Give Report from the Scene**	The Incident Commander or designated official on scene notifies command center(s), including the EOC (if already activated), that the explosion was from an RDD and also informs emergency personnel arriving on scene that radiation is present.	
	4. Issue Protective Actions to the Public		Emergency management issues pre-approved public messaging with immediate shelter-in-place instructions.
	5. Notify Partners and Request Assistance		Emergency management notifies local, state and federal partners that an RDD has detonated and requests assistance.

MISSION	TACTIC	ACTIVITIES	
		FIELD RESPONSE	EOC/ COMMAND CENTER
INITIATE a multiagency response, with agencies conducting lifesaving rescue operations and securing and managing the scene, without waiting for radiation monitoring to begin. (5-40 minutes)	**6. Initiate Lifesaving Rescue Operations**	First responders initiate lifesaving rescue operations, including search and rescue, fire suppression, and medical triage and treatment. These operations are **not** delayed because of the presence of radiation.	Emergency management issues Public Message #2.
	7. Secure and Manage the Scene	Law enforcement clears the scene of all hazards, including secondary devices, then establishes initial public safety boundaries around the scene, designates the area immediately surrounding the detonation point (~20 m (~65 ft) in extent) a crime scene, and initiates initial coordination with the FBI and other investigative agencies. These activities happen concurrently with the lifesaving rescue operations described in Tactic 6.	
MEASURE & MAP radiation levels at the detonation site, in the near field, and downwind to initially characterize and visualize the extent of the radiological contamination. (15-90 minutes)	**8. Measure and Map Radiation Levels**	The Incident Commander assembles three strike teams, in two sequential phases, to conduct an initial characterization of radiological contamination, locate non-uniform high radiation areas, and provide survey data for mapping.	The EOC consolidates and maps field data that visualizes the extent of contamination to support analyst decision making on hazard boundaries and refining protective actions based on actual radiological measurements.

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MISSION	TACTIC	ACTIVITIES	
		FIELD RESPONSE	EOC/ COMMAND CENTER
EVACUATE & MONITOR populations from impacted areas and begin to identify locations to open community reception centers (CRCs) for screening and population monitoring. (>70 minutes)	**9. Commence Phased Evacuations**	First responders establish evacuation routes based on radiological measurements taken in the field that avoid evacuating populations through heavily contaminated areas.	Emergency management organizes a press conference with updates on the response, evacuation and self-decontamination instructions (Public Message #3).
	10. Monitor and Decontaminate	First responders perform quick screening and decontamination of individuals at exits from the Hot Zone, to the extent practical, without unduly slowing down the evacuation.	Emergency management begins to identify possible locations to open CRCs.