



Central Florida Disaster Medical Coalition Radiation Surge Annex

Approved by the CFDMC Board
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1. Introduction

1.1 Purpose

The Radiation Surge Annex provides guidance to support a coordinated healthcare response to a radiation emergency in which the number and severity of exposed or possibly exposed patients challenges the capability of healthcare coalition member facilities within Central Florida. The annex is designed to improve the capacity and capabilities to manage exposed or potentially exposed patients during a radiation emergency. The annex will outline specific incident response, treatment, and response protocols necessary to properly plan for, manage, and care for patients during a radiological emergency.

1.2 Scope

This plan, as well as all plans facilitated by the Central Florida Disaster Medical Coalition (CFDMC), is based on an annual timeframe and will be reviewed and updated annually by the CFDMC. Lessons learned as they emerge from After Action Report/ Improvement Plans following real events or planned training/exercises will be incorporated into the plan.

The healthcare delivery system within RDSTF Region 5 is a network of facilities and persons who carry out the tasks of ensuring that healthcare services are available and providing healthcare services to the public. This includes CFDMC, hospitals and health systems, emergency management, public health, EMS providers, long-term care providers, behavioral and mental health providers, specialty service providers (dialysis, pediatrics, urgent care, district Medical Examiners, funeral directors, etc.), support service providers (laboratories, pharmacies, blood banks, poison control, etc.), primary care providers, community health providers, and other healthcare and response stakeholders. All stakeholders have opportunities for input into this and all CFDMC plans.

This annex does not replace other county or local emergency operations plans or procedures, but rather builds upon the existing plans.

For Definition of Terms, see 3.2.

1.3 Overview/Background of HCC

Central Florida Disaster Medical Coalition's mission is to develop and promote healthcare emergency preparedness and response capabilities in the RDSTF Region 5 (nine counties in East Central Florida, Brevard, Indian River, Lake, Martin, Orange, Osceola, Seminole, St. Lucie, and Volusia Counties). The CFDMC facilitates healthcare organizations and other partners in working together collaboratively to build, strengthen, and sustain a healthcare preparedness and response system within Central Florida and to assist Emergency Management and Emergency Support Function 8 (ESF-8 / Health and Medical) with the National Preparedness

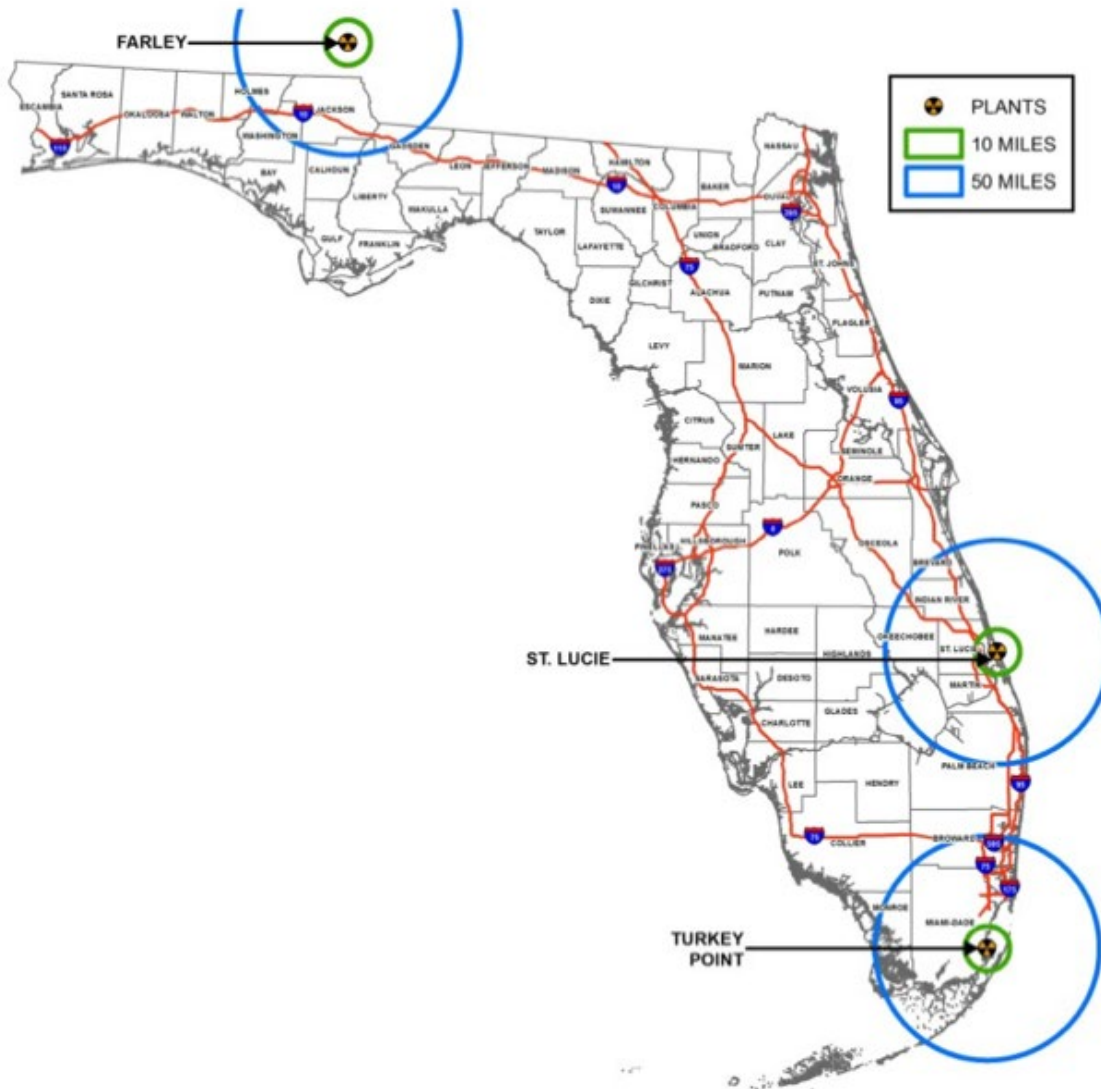
Goal identified five mission areas: Prevention, Protection, Mitigation, Response, and Recovery as related to healthcare disaster operations.

Central Florida is uniquely vulnerable to large scale disasters due to its population and critical infrastructure. The 2021 US Census data shows more than 4.5 million people reside in the nine counties that comprise RDSTF Region 5. Winter residents and tourists dramatically increase this population and the region's growth rate is significantly higher than the U.S. and Florida rate. The region has large at-risk populations, including the elderly and pediatrics. Six of the nine counties have a relatively high score in the Social Vulnerability Index (SVI); two have a relatively moderate score, and only one has a relatively low score. All counties within the region are at higher risk than more than 90% of the nation's counties.

The Region has a robust healthcare system, including a Level I trauma center and a Level 1 pediatric trauma center in the metro Orlando area, six Level 2 trauma centers across the region, three children's hospitals and a total of 74 acute care hospitals and free-standing emergency departments. The Level I trauma center is also a Radiation Injury Treatment Network (RITN) facility.

There is one nuclear power plant within Region 5, located in St. Lucie County. In addition, there are numerous medical facilities across the region, in particular cancer treatment centers, which have radiation sources, with concerns regarding movement of these sources. There are also periodic NASA and private industry launches of space vehicles carrying radioactive materials.

See maps below:



1.4 Assumptions

Radiological/nuclear emergencies can range from a minor emergency with no incident site effects to a major emergency that may result in an incident site release of radioactive materials. This may include terrorism acts associated with nuclear power plants, nuclear weapons detonations, radiological dispersal devices (RDD), radiation exposure devices (RED), various radiological accidents including those associated with transportation of radioactive materials, and incidents associated with industries using radioactive materials including hospitals, commercial food irradiators, and similar operations.

List of Potential Types of Radiological/Nuclear Emergencies:

- Nuclear Detonation
 - accidental
 - deliberate (terrorism; Improvised Nuclear Device-IND or a nuclear weapon detonation)
- Nuclear Reactor - Radiological Material Dispersal
 - accident such as a transportation mishap
 - radioactive material - release/dispersal (non-explosive)
- Radiological Dispersal Device (RDD) “dirty bomb” (terrorism)
- Transportation of Radioactive Material
 - accident (road/rail/air incident)
 - sabotage (terrorism)
- Hospital/Cancer Therapy center/Medical Diagnostic Facility
 - Gamma Knife source stolen/lost
 - brachytherapy source stolen/lost
 - nuclear medicine materials stolen/lost
 - blood product irradiators at hospitals
- Laboratory (The amount of material required to produce a criticality accident would be found only at a fuel fabrication facility or one of the DOE national laboratories.)
 - research incident/release
 - referral lab for analysis of incident
 - criticality incident
- Food/Material Irradiation Facility
 - source stolen and dispersed
 - exploded on-site
- Nuclear Fuel Reprocessing Facility (There are no civilian reprocessing facilities in the United States. There are fuel fabrication facilities which manufacture fuel and fuel rods. The closest facility is in Columbia, SC.)
 - stolen reactor fuel
 - explosion (terrorism)
 - explosion (criticality incident)
- Industrial Radiography Sources
 - stolen
 - lost
- Launch of Space Vehicle
 - explosion at launch
 - reentry accident
- Military Use of Radioactive Materials
 - accidents
 - stolen

The overall objective of radiological/nuclear emergency response planning and preparedness is to minimize radiation exposure from a spectrum of emergencies that could produce incident site radiation doses in excess of protective action guides established by the Environmental

Protection Agency. Minimizing radiation exposure will reduce the consequences of an emergency to people in the area. After a radiation incident, hospitals would likely fill with trauma patients. Later, others would arrive with acute radiation syndrome, which can take days to manifest and affects multiple organ systems.

No specific emergency sequence can be isolated as the model for which to plan because each emergency could have different consequences, both in nature and degree. As an alternative to defining a specific emergency, this annex identifies various parameters for planning, which are based upon knowledge of the possible consequences, timing, and release characteristics of a spectrum of emergencies.

- Radiation incidents may be accidental in nature (e.g., industrial or transportation accident) or purposeful, require prolonged response and extensive resource management challenges.
- Substantial differences in response protocols and priorities exist between power plant / industrial, terrorist (e.g., RDD/dirty bomb) and nuclear detonation. The plan should emphasize the scenario(s) most relevant to the community.
- Local command may consider activating the Regional Trauma Coordination Center to assist with load management.
- Patients will arrive first from trauma, then from radiation exposure.
- The Coalition annex does not replace the need for protocols at each hospital and EMS agency
- Different agencies may have authority over management of power plant, transportation, and terrorist incidents, including the authority to implement shelter-in-place and evacuation orders.
- The roles and responsibilities of agencies and organizations will change depending on the severity and scale of the incident and the respective level of activation by impacted jurisdictions and should be outlined ahead of an incident.
- Federal, state, and local emergency resources will all be needed during a large-scale event.
- Contamination assessments, proper PPE utilization, and decontamination efforts will be essential in protecting coalition partners, staff, and the public
- Staff at member facilities may be impacted by exposure, fear of exposure, or family obligations (e.g., child/family care if schools are closed, acute care facilities are affected).
- Fear from the incident will cause a worried well surge to the emergency departments and pharmacies. Limited understanding of radiation and contamination with radioactive material will contribute to public anxiety and will require multi-modal solutions. Local officials will have the lead for public information and state and federal officials can add information or take over if the local jurisdiction is overwhelmed and ask that they take the lead.
- Public safety (e.g., police, fire, EMS) and other first responder personnel are considered a high-risk population; the implementation of protocols for monitoring control zones and effective contamination control measures will be essential for workforce protection.

- Federal resources (e.g., ambulance contracts, National Disaster Medical System [NDMS] teams) cannot be relied upon to mobilize and deploy for the first 72 hours.
- Management of contaminated waste from decontamination efforts should be managed in consultation with SMEs, EPA, and local water authorities.

Each facility or healthcare organization should understand expectations specific to their role in a radiation emergency, including:

- Implementation of surge protocol specific to a radiation emergency will occur quickly—staff must be prepared to pivot operational procedures immediately.
- Initial trauma care should precede radiation injury management and assessment of contamination with radioactive materials (i.e., radiation detection survey and decontamination).
- Radiation contamination assessments will require rapid protocol and education implementation. Staff will need to evaluate real versus possible exposure, internal versus external contamination, and assess overall exposure levels for at-risk patients based on serial absolute lymphocyte counts measurements.
- Specialized expertise (such as clinical advisors, the poison centers, the RITN centers and the radiation control program) will be needed to manage the complexities of a major radiation emergency (e.g., dose estimation, exposure type, treatment plans, site evaluations, decontamination protocol).
- Contaminated injury care and decontamination may require rapid expert consultation.
- Community screening sites will be required to screen to differentiate exposed from unexposed patients. Local jurisdictions will work with public health to plan for and exercise Community Reception Centers to mitigate overloading of hospitals and healthcare with ambulatory potentially exposed persons.
- Depending on the scale of the radiation emergency, it may be necessary to establish alternate care sites, especially for radiological exposure requiring higher levels of care.
- Emergency departments, outpatient care centers, and alternate care sites, must be prepared to rapidly screen large groups of potentially exposed and contaminated individuals, triage, and transport as needed.
- Allocation of limited/scarce resources, and their distribution, should be based on agreed upon prioritization systems / methods.
- Large-scale radiation emergencies may require the recruitment of volunteers (e.g., Medical Reserve Corp), retirees, and trainees to support and relieve screeners and healthcare workers. The Florida National Guard has a detachment that deals with radiation emergencies. The local County can request that they be activated.
- Some individual healthcare facilities may require large-scale fatality management support.
- Community-based interventions will require significant public health effort if an evacuation or shelter in place order is necessary. Critical infrastructures will be impacted (e.g., food distribution, isolation assistance, surveillance activities).

- Health concerns, prolonged response requirements, difficult work environments, and stress may present behavioral health challenges among staff of coalition members and the general public.
- Rural areas may be severely impacted by citizens fleeing an affected area and seeking care.

A radiation emergency, either accidental or related to terrorism, would invoke an almost immediate federal government response due to the significant national and international ramifications of such an incident. The state and local authorities would initially guide response that may be quickly overwhelmed by the enormity of the situation and would soon be augmented by federal resources as they become available.

Radioactive material dispersion, either accidental or secondary to terrorist activity, will involve a local response initially with state backup and eventual federal response, especially if terrorism related.

Hospitals and other organizations with radioactive materials will notify appropriate state and local authorities of accidents, loss, or theft of these materials.

2. Concept of Operations

2.1 Activation

Any radiation emergency will trigger activation of the local jurisdiction's radiation response plan and likely the state radiation response plan.

Local governments have the primary role in implementing protective actions to reduce risks to the general public from a radiological/nuclear emergency. The risk county(ies) are responsible for directing the initial response to a radiological/nuclear situation, including establishing an incident command structure responsible for identifying the incident severity level, identifying impact zones (see attached impact zones), and assessing infrastructure damage. The county will coordinate and direct such actions through their emergency management organization and other county emergency response agencies.

As the emergency situation progresses, the county emergency manager may recommend that the chair of the county commission declares a local state of emergency and makes a formal request for state assistance. The request is forwarded to the Governor's Office through the Division of Emergency Management or the State Emergency Response Team, depending on the State Emergency Operation Center's level of activation. In support of the State Emergency Response Team, the Division of Emergency Management drafts an Executive Order which recommends that the Governor declare a state of emergency, as warranted.

The Coalition staff activate whenever the state EOC is activated or for any event in the region that is larger than a single county to share situational awareness with member agencies that is not provided via other partners, such as regional status.

2.2 Notifications

When a radiation emergency happens, the incident site will notify the county warning points. If the event is within the scope and capability of the local jurisdiction, local response will handle the event. If the event exceeds scope and capability of the local jurisdiction, then the county warning point will notify the state warning point. Event information is communicated through WebEOC and EMResource. CFDMC also uses Everbridge to notify healthcare partners across the region.

Through the State Watch Office, the Florida Division of Emergency (DEM) is responsible for: receiving notification of an emergency from anywhere in the state; verifying information contained in the notification messages; and, alerting key state, local, and federal emergency response personnel. DEM is also responsible for assisting local governments in providing warnings and instructions to the general public. DEM may receive initial warning of an incident or classification from the Florida Fusion Center, the Federal Emergency Management Agency National Warning Center, county or municipal government, or the news media. If a determination that an incident or other emergency has occurred, or is imminent, the State Watch Office will notify the appropriate counties, key DEM personnel, Regional Domestic Security Task Force co-chairs, the Florida Department of Law Enforcement (FDLE), DOH Bureau of Radiation Control (BRC) and other state agencies. The Florida Department of Law Enforcement (FDLE) has the operational authority to coordinate and direct the law enforcement resources and other resources of any and all state, regional and local governmental agencies that the FDLE may designate to take the precautions needed to protect the State of Florida (F.S. 943.03101). The Federal Bureau of Investigation (FBI) has the ultimate responsibility and authority in response to actual or potential terrorist threats and incidents. The FDLE will always be in support of the FBI in this instance.

The Emergency Coordinating Officers will be responsible for alerting and activating necessary personnel within their respective emergency support functions.

2.3 Roles and Responsibilities

2.3.1 Agencies/Specialized Facilities

Region 5 hospitals are responsible for providing screening and detection, decontamination, and treatment in a radiation emergency. CFDMC will facilitate an assessment of hospital capabilities and identify and plan to close regional gaps during the May 2023 exercise. A regional crisis standards of care plan is in place to support hospital crisis standards of care

policies (see the regional Crisis Standard of Care Plan at: <https://www.centralfladisaster.org/resources>)

Orlando Regional Medical Center in Orlando is the designated RITN facility for Region 5.

EMS agencies within the region will follow the direction of the county EMS Medical Director in a radiation emergency. Local jurisdiction may activate the regional Trauma Coordination Center to assist in load balancing during a radiation event (see the regional Trauma Coordination Center plan at: <https://www.centralfladisaster.org/resources>)

2.3.2 Local Responsibility

Most local governments should be able to maintain control of a Minor Radiological Incident without significant state assistance except for subject matter expertise from the Department of Health, Bureau of Radiation Control. With a Moderate Radiological Incident classification, or higher, an Executive Order will be drafted and may be signed declaring a State of Emergency and designating a State Coordinating Officer. The county emergency operations center serves as the central clearinghouse for information collection and coordination of response and recovery resources within the county. During a major emergency in Florida, non-impacted counties may also be requested by the Division of Emergency Management to activate their emergency operations centers to provide emergency assistance. The role of state government at these emergency classes will be to:

Step 1: The local authorities will make a Protective Action Recommendation to the Risk counties and the State Coordinating Officer or designee at the Emergency Operation Facility (if operable), based on current conditions.

Step 2: The Risk counties and the State Coordinating Officer or designee at the Emergency Operation Facility (if operable), in consultation with the Department of Health, will assess the local authorities recommendation and formulate a joint Protective Action Decision.

Step 3: The Risk counties will make contact with their respective emergency operation centers for implementation and public notification concerning the Protective Action Recommendation(s). The State Emergency Operations Center will contact the Host counties and all other counties in the State.

2.3.3 State Responsibility

The organizational structure that the State of Florida will use in response to an all-hazards radiation emergency is described in Section IV (Concept of Operations) of the State Comprehensive Emergency Management Plan. The State Emergency Response Team will operate from the State Emergency Operations Center in Tallahassee led by the Governor's

appointed State Coordinating Officer, usually the Director of the Division of Emergency Management.

The Department of Health, Bureau of Radiation Control (BRC) is the primary radiological emergency agency for assessment of environment and health hazards during radiation emergencies, regardless of their severity. The agency is assigned this responsibility in Chapter 404, Florida Statutes. Among the services performed will be offsite monitoring, the collection and analysis of samples by the BRC field teams according to established operating procedures, evaluation of the extent of radiological contamination of the affected area, recommending protective actions for persons living inside the emergency operation zone (size of zone determined by the incident), and laboratory analysis of air, water and food samples from the ingestion pathway zone (size of zone determined by the incident, if any). Should the BRC need monitoring and laboratory assistance, the Resources Coordinator will request the Division of Emergency Management to obtain federal assistance through the Department of Energy, Savannah River Operations. Also, assistance may be requested from other states through the Southern Mutual Radiation Assistance Plan and other mutual assistance compacts.

2.3.4 Federal Assistance

Federal assistance provided to state and local governments in response to and recovery from a radiation emergency will follow guidelines as established in the Nuclear/Radiological Incident Annex to the National Response Framework (NRF).

In general, the response to a radiation emergency is the responsibility of:

- 1) the appropriate utility if the release is from a nuclear power plant and is confined within the site boundaries of the plant;
- 2) The owner (NRC or state licensee) of the radioactive material
- 3) local government; or,
- 4) the state if capability of the local government is overwhelmed and an emergency declaration has been signed by the Governor.

The exceptions are if there is contamination resulting from a space launch, a nuclear detonation has occurred, or the capabilities of the state and local government can no longer handle the incident. The federal government has the authority to declare an area (no matter where it is in the U.S.) a “national security area (DOE) or “national defense area (DOD).” Once this is done, they are responsible for the quarantine and security of the area.

In the event of terrorist use of a radiological/nuclear material, it becomes a federal response for the law enforcement part, headed by the Department of Justice, with the FBI in charge of the investigation.

The Nuclear/Radiological Incident Annex of the NRF defines the coordinating federal agency (CFA) for radiation emergency and events. No matter which federal agency is the CFA, the

Department of Energy (DOE) provides the Federal Radiological Monitoring and Assistance Center (FRMAC) and the Consequence Management Home Team. The FRMAC divides their response into phases: 1) consequence management home team; and 2) consequence management response team phase I, II, and III. Each phase brings more assets.

2.3.4 Central Florida Disaster Medical Coalition

The Coalition's response role is two-fold: providing situational awareness to members and resource coordination. The Coalition's role in information sharing is to monitor communications from local and State ESF8 and share information with member organizations that is not provided via other partners, such as regional status. During exercises and grey skies, the Coalition uses the Everbridge health alert network to share information with members. Essential Elements of Information (EIs) have been identified and EMResource is now available throughout the region to share these EIs with county emergency management, hospitals, EMS and other response partners such as law enforcement. EMResource is also used in bed reporting, resource allocations, and patient distribution. Additionally, Coalition staff are available to provide support for local EOC/ESF8 operations upon request. The Coalition will work with county EOCs to identify appropriate response roles for Coalition staff. Additionally, the Coalition can host conference calls or webinars for resource coordination with the members to discuss the issues and possible resolutions. The Coalition's role in resource coordination is to monitor local county requests for resources and coordinate with member agencies to try to fill those requests as outlined in Section 2.4.

2.4 Logistics

Logistics are the responsibility of the local jurisdiction. The Coalition will work with our community partners to meet the needs created by the event. Regional plans have been created for Alternate Care Sites, Family Assistance Centers, Burn Surge, Pediatric Surge, and Regional Trauma Coordination (see these plans at: <https://www.centralfladisaster.org/resources>)

The process for redistribution of coalition and regional available resources in the event of a medical surge event is outlined below:

1. If a Coalition member organization needs assistance during a disaster response (staff, equipment, supplies, or other resources), the member organization submits a request to the County Emergency Operations Center (EOC) as per county and State CEMP. It is the county's responsibility to try to fulfill the request if able and if not, it is referred to the state EOC.

2. If the County EOC is unable to fulfill the request, the County submits requests to the State EOC through WebEOC event management system. During activation the coalition monitors WebEOC for mission requests. The coalition searches for local resources within the region to meet the requests.
3. If a resource requested is readily available locally through the Coalition or other member organizations, the Coalition will notify the State ESF8 desk and the local requestor of the available local resources. If so directed by the State ESF8 desk, the Coalition will put the requesting organization in touch with the organization providing the resource to arrange transfer of the resource.
4. If there are competing needs for the same asset, the Coalition will notify the state EOC for orders and prioritizations. It is the Coalition's responsibility to offer assistance, the management of resources requests and allocations rests with local and state authorities. At no time would the Coalition redirect or change the deployment of assets. State, territorial, county, or local officials would be responsible for any such modification of destination or other deployment specifics.

If the state cannot provide the requested resources, it is then forwarded to the State EOC Logistics Section who will work with either private vendors or through the Emergency Management Assistance Compact (EMAC) to secure the resources. If the resources are identified from private sources, the vendor information is given to the county Emergency Operations Center.

2.4.1 Space

Logistics are the responsibility of the local jurisdiction, with support from the State and Federal agencies as needed.

2.4.2 Staff

Hospitals have trained personnel to screen, detect, decontaminate and treat individuals in a radiation emergency. However, most hospitals within the region are experiencing staffing shortages on a daily basis, and in a radiation event staffing would be a major issue. During the May 2023 exercise, the region will identify strategies to increase staffing levels in a radiation emergency.

CFDMC's regional medical assistance team (RMAT) members may be available to provide medical surge and incident management capability within the region and state. The Central Florida Disaster Medical Team (CFDMT), a group of volunteer responders whose purpose is to stabilize, treat, and transfer, as appropriate, patients during a disaster or during a community-sponsored event, such as air shows, marathons, and concerts. The CFDMT consists of trained/

credentialed command staff, physicians, physician assistants, nurses, emergency medical technicians, paramedics, and administrative and logistics personnel.

2.4.3 Supplies

Region 5 hospitals and other agencies have detection equipment for response to a radiation emergency.

The region has identified hospital minimum readiness standards by hospital size, and the Coalition provides funding to equip hospitals to these standards. The Coalition's equipment management policy outlines how equipment and supplies can be deployed during an emergency (see the equipment management policy at <https://www.centralfladisaster.org/resources>).

To meet the patient care demands in a radiation emergency, all stakeholders should focus on mitigating the supply chain hazards, threats, and vulnerabilities unique to their area while identifying key actions that will enhance resilience during incidents. Some impacts can be greatly reduced through integrated mitigation and planning. Working with providers in the community and distributors to forecast ordering for different scenarios, including emergencies, can help set use and delivery expectations and plans and highlight areas where back up options are required. The region has a supply chain integrity plan with numerous links for resource shortage strategies (see the plan at <https://www.centralfladisaster.org/resources>).

2.5 Operations- Medical

All hospitals within the region are able to screen, triage, assess contamination, decontaminate patients, treat and prepare to transport to a specialized facility as needed. During the May 2023 exercise, the region will assess capabilities and identify and plan for any regional gaps.

2.5.1 Triage and Screening

Hospitals within the region have protocols for triage and screening in a radiation emergency.

The ICAT ((Internal Contamination Assessment Tool) is a CDC program to help radiation professionals use radiation measuring instruments to assess acute intakes of radionuclides: <https://www.cdc.gov/nceh/radiation/emergencies/clinicians/evaluation/index.htm>

The purpose of this set of instructions is to enable a radiation professional to assess the activity of a known radionuclide taken in by an individual at a known time after intake and the consequent dose to that individual. These procedures apply under the following conditions:

- There is a single radionuclide that has been identified
- The duration of the intake was brief compared to the elapsed time since the intake
- The time when the intake occurred is known

The Exposure and Symptom Triage (EAST) tool can be used to assess radiation exposure following a nuclear detonation:

https://www.researchgate.net/publication/318793780_Proposed_Exposure_And_Symptom_Triage_EAST_Tool_to_Assess_Radiation_Exposure_After_a_Nuclear_Detonation#:~:text=A%20new%20resource%20was%20created%20in%202018%20-the,now%20or%20to%20care%20beyond%20the%20disaster%20scene.%22

The impacted jurisdiction may establish a Community Reception Center (CRC) to assess victims who are not injured and may be contaminated or worried. Following a mass casualty radiation emergency, public health professionals play a crucial role in assessing and monitoring people potentially exposed to radiation or contaminated with radioactive material. This process, called population monitoring, will be conducted in the CRCs. In addition, sheltering displaced populations after a radiation emergency requires unique planning considerations.

Poison Control Centers play a key role in screening/detection. Florida has three Poison Control Centers:

1-800-222-1222

Florida Poison Information Center - Tampa

Tampa General Hospital
PO Box 1289
Tampa, FL 33601-1289

Florida/USVI Poison Information Center - Jacksonville

UF Health Jacksonville Medical Center
University of Florida Health Science Center - Jacksonville
655 West 8th Street, Box C23
Jacksonville, Florida 32209

Florida Poison Information Center - Miami

Jackson Memorial Hospital
University of Miami Miller School of Medicine
Highland Professional Building, 1st Floor
1801 NW 9th Avenue, 1st Floor
Miami, FL 33136

A directory of regional radiation experts will be compiled during the May 2023 exercise. Additional triage and screening resources and information can be found in 3.2.

2.5.2 Patient Care/ Management

Any patient suspected of having a radiation injury can be discussed with the local Radiation Injury Treatment Network (RITN) center. The ability to accept referrals will depend on the size of the incident and the capacity of regional RITN center(s). Poison control centers can also assist and provide clinical support, particularly when the incident involves external or internal contamination with radioactive materials.

1. Criteria for considering RITN center consultation/referral include:
 - i. Absolute neutrophil count less than 1,000/ μ L
 - ii. Absolute lymphocyte count less than 1,000/ μ L
 - iii. Severe nausea, vomiting and/or anorexia
 - iv. A localized cutaneous radiation injury that requiring extensive management
 - v. Suspected or known internal contamination (*e.g.*, involving a wound, the lung or GI tract)
 - vi. Current facility not equipped to provide irradiated, leukoreduced blood products
2. Manage comorbidities and possible sequelae of irradiation:
 - i. See www.ritn.net/Treatment/ for acute radiation syndrome treatment guidelines:
 1. Transfuse only irradiated and leukocyte-depleted blood products
 2. Administer myeloid cytokines (*e.g.* G-CSF), if indicated.
 3. Provide infection prophylaxis and/or treatment, as indicated
 4. Maintain fluid, electrolyte and nutritional balance

The highest treatment priority is for people who have life- threatening injuries or who are in need of immediate medical care, which may or may not be related to the radiation incident (*e.g.*, heart attack or a pre-existing critical condition). As will be discussed later, effective public communication is a key component of the emergency response. In a mass casualty incident, uninjured people can be encouraged to go home, self-decontaminate, and then return for monitoring at designated locations according to a priority schedule. The CDC has posted [Information for Clinicians](#).

In a radiation emergency, the Region 5 Trauma Coordination Center can also be activated. The goal of the Region 5 Trauma Coordination Plan is to ensure load-balancing across healthcare facilities and systems so that the highest possible level of care can be provided to all

patients who need that care before transitioning hospitals toward crisis measures. The plan is based on the concepts outlined in the ASPR Medical Operations Coordination Cells (MOCCs) initiative (see the Region 5 Trauma Coordination Plan at <https://www.centralfladisaster.org/resources>).

2.5.3 Treatment

The [Radiation Injury Treatment Network](#)[®] (RITN) is a national network of medical centers with expertise in the management of bone marrow failure and works with partners from other medical specialties to assist with managing acute radiation syndrome (ARS) and its health-related consequences. The mission of the RITN is to maximize health-related outcomes among casualties with ARS following a mass casualty disaster involving radiological, nuclear, or chemical agents with marrow toxicity.

RITN has established Radiation Emergency Assistance Center/Training Site radiation injury medical care materials. Guidelines for identifying radiation injury and considering transfer to a Specialized Facility are provided by the Radiation Injury Treatment Network (RITN) for hospitals with a concise guide for identifying casualties in the aftermath of a radiation incident who may have received a clinically significant dose of radiation.

Florida has the following participating Radiation Injury Treatment Network (RITN) Centers:

Orlando Regional Medical Center Orlando: 321-841-5111

Johns Hopkins All Children's Hospital St. Petersburg: 727-898-7451 1-800-456-4543

H. Lee Moffitt Cancer Center & Research Institute, Tampa: (813) 745-8442, (813) 745-7208

University of Miami/Sylvester Cancer Center Miami (305) 243-9921

UF Health Shands Hospital Gainesville (352) 733-0971

REAC/TS HOTLINE:

REAC/TS 865-576-3131

865.576.1005 (after hours – ask for REAC/TS)

The Radiation Emergency Assistance Center/Training Site (REAC/TS) is a world-renowned, U.S. Department of Energy asset and a leader in emergency medical response to radiological/nuclear incidents. REAC/TS provides emergency response and subject matter expertise on the medical management of radiation incidents for the National Nuclear

Security Administration's (NNSA) Office of Counterterrorism and Counterproliferation. REAC/TS is located at the Oak Ridge Institute for Science and Education in Tennessee and is operated for DOE by [ORAU](#).

REAC/TS maintains a 24/7 national and international response capability and provides continuing medical education and outreach exercises. REAC/TS courses annually reach thousands of healthcare professionals, emergency responders and health physicists worldwide. Topics address the medical management of radiological/nuclear incidents, as well as decontamination techniques through instructional and hands-on education.

REAC/TS also operates a unique laboratory that helps DOE close a critical gap in our nation's ability to respond to a radiological or nuclear incident. The REAC/TS Cytogenetic Biodosimetry Laboratory utilizes the "gold standard" dicentric chromosome assay, a proven technique that can be used to help calculate the absorbed radiation dose in exposed individuals.

Additional resources and information on treatment can be found in 3.2.

2.5.4 Safety and Control Measures

After a Radiological event, the public should be instructed to go inside, stay inside and stay tuned. Until the level and extent of contamination can be determined, efforts should be made to avoid being outdoors in potentially contaminated areas. Considerations would have to be made regarding the time length of the sheltering, the means of notification to evacuate as well as regarding ending the evacuation and returning the evacuees to the area of the incident. The possible administration of the thyroid blocking agent potassium iodide, if the source includes radioactive iodine, to affected populations as well as other radiation countermeasures would also need to be considered.

The geographical area covered in the Ingestion Pathway Zone will vary depending on the type of the radiation emergency. The principal exposure source will be from the ingestion of contaminated water or foods. For planning purposes, the zone may have a radius up to 50 miles for a nuclear power plant incident or, depending on the construction and yield of the device, from a nuclear weapon detonation. However, for a radiological dispersal device (RDD) the zone may be much less than five miles depending on the activity of the radioactive material, the amount of explosive used, if any, and weather conditions.

The Department of Health Bureau of Radiation Control Emergency Operations Officer will be responsible for coordination and implementation of all field monitoring and sampling activities. Decisions as to where sampling will occur will be made jointly involving staff from the Department of Health, the Department of Agriculture and Consumer Services, and the Department of Environmental Protection.

In general, very few responders have experience working in major disasters that include highly radioactive areas. Effective emergency response actions within the damage zones can only be accomplished with appropriate planning, responder training, provision and use of appropriate PPE, and other mission-critical capabilities, including alarming and passive radiation dosimetry, air monitors, and substance-specific monitors.

1. **Alarming Personal Radiation Dosimeters** (i.e., active devices) for use by responders working in fallout zones. These devices actively monitor radiation levels and are set to notify workers (by alarm) of elevated radiation conditions, or when they are approaching dose limits.
2. **Personal Radiation Detectors** for use by responders working in fallout zones. These devices, commonly issued to law enforcement personnel for detection of illicit radioactive material, have very sensitive detectors and can actively monitor radiation levels and be set to notify workers (by alarm) of elevated radiation conditions, or when they are approaching dose limits.
3. **Passive Dosimeters (TLDs or OSLDs)** to monitor accumulated radiation exposure or dose. These passive dosimeters reliably measure the wearer's total external radiation dose, but do not generally display the dose level in real time.
4. **Dose Rate Survey Instruments** to detect the presence of an external radiation field and measure the dose and dose rate are generally available to meet the needs of the response community.
5. **Pancake Geiger Mueller (frisker) survey instruments to measure** surface contamination are generally available to meet the needs of the response community.
6. **Radionuclide Identifiers** to determine the identity of radioactive material. While much of the initial response to a radiation emergency can be managed without knowing the specific radioactive material(s) present, identification of the radioactive materials will allow better management of contaminated individuals and improve protective measures for the responders.
7. **Pedestrian portal monitors are portable monitors that can be set up in population monitoring facilities to screen individuals for radioactive contamination. Counties in the immediate vicinity of nuclear power plants and the BRC have these in inventory.**
8. **Continuous air monitors to measure the amount of radioactive material in the air may be operated at population monitoring facilities to ensure the public and staff are not exposed to unsafe levels of airborne radioactive material.**
9. **Oxygen Meters and Explosimeters** to measure oxygen levels and the potential for explosion are essential for entry into buildings, below-surface excavation, and near potential chemical spill sources such as tanks and flammable gas containers.

Decontamination of response team members and their clothing and protective equipment is essential to limit exposures to radiation that could be caused by settled radioactive dust and debris (fallout). Ideally, team members emerging from contaminated areas should undergo full decontamination consisting of removal and disposal or laundering of outer clothing, boots, boot covers, and gloves; removal and laundering or disposal of inner clothing; full shower with

hair shampooed; removal of respirator in the shower; and donning clean contaminant-free clothing upon completion of showering. At a minimum, they should be monitored for contamination and if contaminated and no shower is available, clothing should be removed in a manner that minimizes spread of any contamination and a shower should be sought as soon as feasible. Worn clothing and equipment should be sealed in double plastic bags and stored in a secured (from theft) and isolated area at least 20 feet away from personnel, other people, or animals, where the radioactive contamination will decay. At some future time, when monitoring equipment and decontamination stations are available, the used clothing and equipment may be evaluated and cleaned for re-use.

2.5.5 Fatality Management

The CFDMC Fatality Management Plan outlines the roles and responsibilities of partners within Region 5 in managing mass fatalities. This plan includes information on how CFDMC and member organizations manage a mass fatality event within the region. Mass fatality management involves emergency management organizations, public health agencies, medical examiners, funeral homes, hospitals, and other stakeholders, depending on the nature of the emergency (see the mass fatality plan at <https://www.centralfladisaster.org/resources>).

The Medical Examiner Offices within the region will need assistance if a radiological mass fatality situation occurs. They will follow guidelines in the regional plan and the State Mass Fatality Plan (MEC supported). The regional ME offices will request State assistance through the local ESF8 desk to deploy appropriate FEMORS team members/equipment and the National Guard CBRNE team. In most radiological related deaths, the state team will request federal teams (DMORTs).

See additional mass fatality resources in 3.2.

2.5.6 Transport

EMS assets are a critical component of the public health and medical response system. County Emergency Operations Centers (EOC) may request additional EMS resources during a disaster to supplement ground and air ambulances and EMS personnel in counties when their resources are overwhelmed by a major emergency or catastrophic disaster. The State EOC may request EMS resources to fulfill missions from other states under EMAC.

2.5.7 Surveillance, Tracking, and Situational Awareness

Environmental sampling within the Emergency Operations Zone and the Ingestion Pathway Zone, as appropriate, will be directed by staff at the FRMAC and/or the Unified Command to define the limits of the area of radiological deposition and levels of radioactive contamination in milk, foodstuffs, and water. Additional information about sampling procedures and priorities

are available in Department of Health, Bureau of Radiation Control, Standard Operating Procedures.

The objectives of the population monitoring process are the following:

- Identify individuals whose health is in immediate danger and who need immediate care, medical attention (whether radiation-related or not), or decontamination.
- Identify people who may need medical treatment for contamination or exposure, further evaluation, or short-term health monitoring.
- Recommend (and to the extent possible, facilitate) practical steps to minimize the risk of future health consequences (e.g., cancer).
- Register potentially affected populations for long-term health monitoring.

2.5.8 Rehabilitation and Outpatient Follow Up Services

Patient tracking remains a gap within Region 5, the state, and the nation, and is a high priority for the Coalition.

The AHCA E-PLUS System will be a useful tool in managing rehabilitation and outpatient follow-up services.

2.5.9 Deactivation and Recovery

After a radiological or nuclear event is over, it can be expected that many people will be affected in a variety of ways. Many may have lost friends or relatives, suffer from fatigue or have financial losses as a result of the interruption of businesses and employment. Governments or other authorities should ensure that these concerns can be addressed and support the rebuilding of society. If needed, organize training and education for personnel involved will be provided.

The Coalition will facilitate a regional after-action report and work with healthcare and emergency response partners to address improvement opportunities and test these improvements in future exercises.

2.6 Special Considerations

2.6.1 Behavioral Health

A radiation emergency may have severe emotional impact on survivors, their families, and responders and cause substantial destabilization of patients with existing behavioral health issues. The region has a disaster behavioral health plan which provides subject matter experts as liaison to local emergency operations and uses the Florida Crisis Response Team members to

provide individual and group crisis intervention (see the behavioral health plan at <https://www.centralfladisaster.org/resources>).

Prepared general statements have been developed by the Department of Health, Bureau of Radiation Control and others in advance of any incident to be available for quick access during an emergency. Information on radiation emergencies can also be found on the Centers for Disease Control and Prevention website (<http://www.emergency.cdc.gov/radiation/>).

Other public information resources include:

CDC: [Radiation Emergencies](#)

HHS: [Psychological First Aid in Radiation Disasters](#)

CDC: [Radiation Emergency Preparedness Tools: Psychological First Aid](#)

2.6.2 Pediatric and At-Risk Populations:

Public health authorities and emergency planners should identify and prioritize special populations in the community that have special needs after a radiation incident. These include the following:

- Children (note: Be cognizant of minor children without custodial adults present, e.g., school children. Families should remain together.)
- Pregnant women
- Nursing mothers
- Elderly people requiring assistance
- Immunocompromised individuals
- Disabled persons requiring the use of wheelchairs or other mobility aids
- Workers or Emergency responders
- Transient or migrant workers or Commuters
- Homeless people
- Institutionalized individuals who may or may not be able to evacuate or relocate
- Hospital patients
- Residents of nursing homes or other institutions
- Prison inmates, guards, and workers required to maintain, operate, or secure critical and
- essential infrastructure

The CFDMC Pediatric Surge Annex provides a functional annex for all stakeholders involved in an emergency response within RDSTF5 in order to protect children and to provide appropriate pediatric medical care during a disaster. Please refer to CFDMC Pediatric Annex at <https://www.centralfladisaster.org/resources>).

2.6.3 Communications

The Coalition has redundant communication capabilities with its members. During blue skies, the Coalition uses Constant Contact to share information on meetings, plans, trainings and exercises with its members. During exercises and events, the Coalition uses the SERVFL Everbridge network to share information. Both systems are drilled each quarter.

2.6.4 Jurisdictional- Specific Considerations

Florida's geography and climate conditions could vary significantly at the same location in just a matter of hours. Monitoring for changes in conditions must be done regularly.

3. Appendices

3.1 Training and Exercises

REMM provides virtual trainings – see link below:

[Training and Education for Responding to Radiation Emergencies - Radiation Emergency Medical Management \(hhs.gov\)](#)

CDC also offers basic trainings:

[CDC Radiation Emergencies | Training: Radiation Basics Made Simple](#)

Southern Regional disaster Response System (SRDRS) Healthcare and Public Health Planning for a Radiological/Nuclear Emergency Webinar Series in partnership with the American College of Medical Toxicology (ACMT), the Association of Healthcare Emergency Preparedness Professionals (AHEPP), Radiation Injury Treatment Network (RITN), Interstate Disaster Medical Collaborative (IDMC), and the Region 4 Poison Control Center Collaboration (R4PC3).

Access the recordings at <https://srdrs4.org/resources/education-training.html>.

The FDOH Bureau of Radiation Control offers a variety of radiation training courses, some of which are available for a limited time, and some of which are ongoing. A brief description is provided below, along with links for further information. All training is currently grant funded, and free of charge.

RADIATION RESPONSE VOLUNTEER CORPS (RRVC) (1 day course, in Florida)

The Bureau has taught a one-day class in multiple cities throughout Florida for several years. The training, which is funded by a grant from the CDC, is for professionals who volunteer to

assist with using a portal monitor to screen a population for contamination after a large-scale radiation emergency, such as a nuclear power plant accident or the detonation of a "dirty" bomb. To request a class, please contact the local Medical Reserve Corp coordinator in your region. The MRC coordinator will then contact the Bureau to coordinate a class date and location, which we will post on the RRVC page linked above, so students can register for the class.

FIRST RESPONSE TO RADIOLOGICAL ACCIDENTS AND WEAPONS OF MASS DESTRUCTION.

(1 day or 0.5 day courses, in Florida)

Three courses are available: Basic/Awareness (3.5 CE's), Intermediate/Operations (8.0 CE's), and Advanced/Technical (8 CE's) levels. All courses provide instruction in radiological fundamentals, detection instrumentation, package labeling and transportation placarding, scene and incident control, decontamination techniques, and an overview of Radiological Dispersal Devices (RDD) and Nuclear Weapons.

St. Lucie County does an annual exercise for the nuclear power plan. In odd numbered years, the county does a self-evaluation and on even numbered years FEMA evaluates the exercise.

The Coalition will conduct a radiological tabletop in May 2023 to review the annex and identify and plan to close regional gaps.

3.1 Legal Authorities

Federal

Radiological Hazard Specific Plan Authorities and References

- Federal Emergency Management Agency (FEMA) - Executive Order: 12148 outlines FEMA as lead agency for all in state, tribal and local emergency planning, preparedness, mitigation, and assistance function activities for all hazards. FEMA Executive Order 12148
- Nuclear Regulatory Commission (NRC) - NRC Authorization Acts for 1980 (Public Law 96- 295) and 1982-1983 (Public Law 97-415) links off-site emergency preparedness and facility licensing. The acts prohibit the NRC from issuing an operating license for a power plant until it determines that plans are in place, which provide for reasonable assurance to public health and safety.
- Radiological Emergency Preparedness (REP) Program Manual, December 2019 FEMA REP Manual
- Nuclear/Radiological Incident Annex (NRIA) provides hazard-specific supplemental information to the National Response Framework. The NRIA describes the process and structures that will be utilized by Federal departments and agencies for responding to threats or actual nuclear or radiological incidents; whether resulting from accidents, deliberate acts, or natural disasters. Nuclear/Radiological Incident Annex (NRIA), National Response Framework
- Executive Order of the President, Number 12241, delegated the Director, Federal Emergency Management Agency (FEMA) to provide a plan to protect health and safety in case of accidents

at nuclear power facilities. This plan will be called the National Contingency Plan. This plan establishes planning criteria, assistance priorities, off-site and funding responsibilities.

- NUREG-0654, FEMA-REP-1, Revision 1, Supplement 1, Criteria for Preparation and Evaluation of Radiological Emergency Response Plans and Preparedness in Support of Nuclear Power Plants. NUREG-0654, FEMA-REP-1, Revision 1, Supplement 1

State

- Florida State Statute Chapter 252, Emergency Management.
- Florida being a Home Ruled state grants counties the power to enable the county to conduct government, perform functions, and render services, and may exercise any power for county government purposes. Florida Statutes 166.021
- State of Florida Comprehensive Emergency Management Plan-Annex A, State of Florida Radiological Emergency Management Plan.
- Florida Radiological Protection Act (Florida State Statute Chapter 404, Radiation)
- Florida Governor's Executive Order 80-29 (Disaster Preparedness).
- Southern Mutual Radiation Assistance Plan (SMRAP), Southern States Emergency Response Council. (This agreement provides a mechanism within the southern region for mutual assistance in responding to radiation incidents upon request by any party (State) to this agreement.) Southern Mutual Radiation Assistance Plan (SMRAP)
- State of Florida Bureau of Radiation Control Department of Health - Radiological Emergencies, Standard Operating Procedures

3.2 Additional Resources/ References

Definition of Terms:

- CFDMC: Central Florida Disaster Medical Coalition is the healthcare coalition representing the nine counties in East Central Florida (Brevard, Indian River, Lake, Martin, Orange, Osceola, Seminole, St. Lucie and Martin)
- Community Reception Center (CRC): To assess victims who are not injured and may be contaminated or worried to mitigate overloading of hospitals and healthcare with ambulatory potentially exposed persons
- DEM: Florida Division of Emergency Management
- EMResource: a software used in Region 5 to track bed availability
- EMS: Emergency Medical Services
- ESF-8: Emergency Support Function 8 (Health and Medical)
- Everbridge: a software used as an emergency alert system
- FEMA: Federal Emergency Management Agency
- FDLE: Florida Department of Law Enforcement
- FDOH/BRC: Florida Department of Health, Bureau of Radiation Control
- FRMAC: Federal Radiological Monitoring and Assistance Center
- RED: Radiological exposure device
- RDD: Radiological disposal device

- REAC/TS: Radiation Emergency Assistance Center/Training Site is a world-renowned, U.S. Department of Energy asset
- RITN: Radiation Injury Treatment Network
- RDSTF Region 5: Regional Domestic Security Region 5
- SVI: Social Vulnerability Index
- WebEOC: A software used by emergency management

Impact Zones:

Dangerous Radiation Zone (DRZ): DRZs are defined as the areas in which emergency action is needed to assure that prompt and effective interventions can be taken to protect the public in the event of a radiation emergency. The DRZ is a flexible term that can be used to describe the operational zone that is developed around a radiation emergency of any type. In a particular emergency, protective actions might well be restricted to a small part of the emergency operation zone. Although the radius of the emergency operation zone implies a circular area, the actual shape would depend on the type of incident that occurred as well as local conditions such as topography, land use characteristics, access routes, jurisdictional boundaries, and meteorological conditions.

NCRP 165 and “Planning Guidance for Response to a Nuclear Detonation” introduce concepts including severe damage zone, moderate damage zone, light damage zone, and DRZ that should be used in developing operational protocols for responding to radiation emergencies in order to be consistent with federal partner use of terminology and operational zone criteria.

Plume Exposure Pathway: For nuclear detonation, the plume would extend a great distance depending on the yield of the weapon and the prevailing weather conditions. The plume in a radiological dispersal device would essentially be local to the site of the incident. However, if an explosive device is utilized for the dispersal of radioactive material, the plume may be somewhat more widespread depending on the characteristics of the explosive material, the amount and activity of radioactive material initially present, and the prevailing weather conditions.

The principal radiation exposure sources (other than the prompt radiation from the nuclear detonation) are direct external exposure to radiation emitted from radioactive material contained in the plume or that has deposited on the ground or surfaces or people (e.g., ground shine) as well as exposure from radioactive material that has entered the body (i.e., internal contamination) from the inhalation/ingestion or injection of the material into the body. Wounds can also serve as a portal of entry of radioactive material. Appropriate response actions will be determined by the ability to best reduce potential exposure under the specific conditions occurring during the radiation emergency.

Ingestion Pathway (Emergency Operation) Zone (IPZ): Pre-event planning includes an Ingestion Pathway Zone of 50 miles associated with a nuclear power plant accident. From a nuclear detonation, depending on the construction and yield of the device as well as weather patterns, the Ingestion Pathway Zone could extend for hundreds of miles from ground zero. Smaller distances

for the IPZ radius would be involved for radiological dispersal incidents depending on whether explosives were utilized.

The principal exposure source from this pathway would be from the ingestion of contaminated water or foods such as milk, fresh vegetables, or aquatic food stuffs. For this pathway, the planning effort involves the identification of potentially hazardous, radiologically contaminated food and water. Following identification, control measures will be used to minimize the danger to the public.

Ground Zero: This is the roughly circular region surrounding the location of a nuclear detonation or radiological dispersal device (RDD) detonation. The radius of radioactivity at ground zero will depend on the yield of the nuclear weapon used or the amount of explosive and amount and type of radioactive material used in the device, the presence of buildings or other obstructions, and quantity and type of radionuclide used in the RDD. The Handbook for Responding to a Radiological Dispersal Device provides valuable information for emergency responders in dealing with an RDD.

From a nuclear weapon detonation, the principal exposure sources will be the direct blast, primary and secondary thermal effects, direct gamma/neutron/visible photonic radiation, and the radioactive material contaminating material/structures as well as from fallout. Similarly, blast effects and radionuclides would be present after an explosive RDD incident.

Coalition Resources: <https://www.centralfladisaster.org/resources>

Local/Regional Resources:

St. Lucie: <https://www.stlucieco.gov/departments-and-services/public-safety/radiological-emergency-preparedness>

State Resources:

[Florida Department of Health Bureau of Preparedness and Response Integrated Preparedness Plan \(IPP\)](#)

[State of Florida Radiological/Nuclear Incident Emergency Response Plan](#)

[Federal FM CONOPS \(femors.org\)](#)

[FEMORS.qxd \(ufl.edu\)](#)

Federal Resources:

[Major Radiological or Nuclear Incidents: Potential Health and Medical Implications](#)

[Topic Collection: Radiological and Nuclear](#)

[Select CBRN Resources](#)

[American Academy of Pediatrics. \(2018\). Considerations Before, During, and After Radiological or Nuclear Emergencies.](#)

[American College of Radiology. \(n.d.\). Disaster Preparedness and Response.](#)

[American College of Radiology. \(2006\). Disaster Preparedness for Radiology Professionals.](#)

[Department of Homeland Security. \(2016\). Health and Safety Planning Guide for Protecting First Responders Following a Nuclear Detonation.](#)

[Department of Homeland Security. \(n.d.\). Radiological Emergency Preparedness Program \(REPP\).](#)

[Federal Emergency Management Agency. \(2021\). Radiological Emergency Preparedness \(REP\) National Public Information Map.](#)

[Institute for Disaster Mental Health at SUNY New Paltz Disaster Mental Health. \(n.d.\). Assisting People Exposed to Radiation.](#)

[Lawrence Livermore National Laboratory. \(2018\). Nuclear Detonation Fallout: Key Considerations for Internal Exposure and Population Monitoring.](#)

[National Council on Radiation Protection and Measurements. \(2011\). Responding to a Radiological or Nuclear Terrorism Incident: A Guide for Decision Makers.](#)

[Occupational Safety and Health Administration. \(n.d.\). Ionizing Radiation.](#)

[U.S. Department of Health and Human Services. \(n.d.\). Medical Planning and Response Manual for a Nuclear Detonation Incident: A Practical Response Guide.](#)

[Guidelines for Identifying Radiation Injury and Considering Transfer to a Specialized Facility](#)

[Radiation Injury Treatment Network](#)

[Bureau of Radiation Control](#)

[CDC Internal Contamination Assessment Tool](#)

[REMM](#)

[NCRP 161](#)

[NCRP 161-Pt Management](#)

[Radiation Emergencies](#)

[Psychological First Aid in Radiation Disasters](#)

[Radiation Emergency Preparedness Tools: Psychological First Aid](#)

[ASPR/TRACIE - Potential Health and Medical Implications](#)

[Planning Guidance for Response to Nuclear Detonation](#)

[Capstone Draft](#)

https://www.fema.gov/sites/default/files/documents/fema_nuc-detonation-planning-guide.pdf

<http://www.remm.nlm.gov>

<https://remm.hhs.gov/Countermeasures.pdf>

https://remm.hhs.gov/ars_timephases1.htm

https://remm.hhs.gov/ars_wbd.htm

[The REMM Team has created new versions of the Mobile REMM app \(both iOS and Android\) for this transition. These links can be found on these two REMM pages. Please update the version you have on your phone.](#)

<https://remm.hhs.gov/downloadmremm.htm>

<https://remm.hhs.gov/Aboutthissite.htm - download>

https://remm.hhs.gov/ars_wbd.htm

https://remm.hhs.gov/ars_timephases1.htm

[World Health Organization: National stockpiles for radiological and nuclear emergencies: policy advice \(who.int\)](#)

[www.afrrri.usuhs.mil/www/outreach/pdf/2edmmrhandbook.pdf.](http://www.afrrri.usuhs.mil/www/outreach/pdf/2edmmrhandbook.pdf)

<http://www.ornl.gov/reacts/care.htm>.

[Capstone Draft](#)

[Planning Guidance for Response to Nuclear Detonation](#)