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FRMAC Operations Manual

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FEDERAL RADIOLOGICAL
MONITORING AND ASSESSMENT CENTER

FRMAC Operations Manual

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FRMAC OPERATIONS MANUAL
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PREFACE

In Homeland Security Presidential Directive-5 (HSPD-5), the President directed the development of a plan to align federal coordination structures, capabilities, and resources into a unified approach for domestic incident management. **The National Response Framework (NRF) is this plan and serves as the guide as to how the nation conducts all-hazards responses.** It is built on the template of the National Incident Management System (NIMS), which provides a consistent doctrinal framework for incident management at all jurisdictional levels, regardless of the cause, size, or complexity of the incident. The activation of the NRF and its coordinating structures and protocols provides a mechanism for the coordination and implementation of a wide variety of incident management and emergency assistance activities. Included in these activities are federal support to state, tribal, and local authorities; interaction with nongovernmental, private donor, and private-sector organizations; and the coordinated, direct exercise of federal authorities, when appropriate. The Nuclear/Radiological Incident Annex (NRIA) to the NRF addresses the response of federal agencies to incidents involving nuclear or radioactive materials.

In the event of a potential or existing major radiological incident, the U.S. Department of Energy, National Nuclear Security Administration Nevada Site Office (NNSA/NSO) is responsible for establishing and initially managing the Federal Radiological Monitoring and Assessment Center (FRMAC) during the initial phases. The FRMAC provides coordinated federal assistance to the state, tribal, and local authorities responsible for public areas affected by the incident and to the Coordinating Agency responsible for regulation and/or operation of the facility or site.

This manual was written for those personnel who will be called upon to provide technical data, input, and decisions. Overall, this manual provides general guidance and some specific diagrams and forms. However, it is understood that site- and event-specific operational decisions and procedure parameters will need to be established and documented at the time of an emergency event. This manual is intended to provide enough guidance for stand-alone use without limiting FRMAC's ability to integrate the work with other partners or stakeholders. Note that some of the titles of management positions within the FRMAC have been changed in order to comply with the structure of the Incident Command System (ICS) under NIMS.

This manual supersedes *FRMAC Operations Manual*, DOE/NV/11718--080 REV. 2, dated December 2005.

The NNSA/NSO has the overall responsibility for maintaining the master copy of all FRMAC manuals. Please provide comments on this manual to:

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1.0 INTRODUCTION

1.1 Purpose

In the event of a major radiological incident, the Federal Radiological Monitoring and Assessment Center (FRMAC) will coordinate the federal agencies that have various statutory responsibilities. The FRMAC is responsible for coordinating all environmental radiological monitoring, sampling, and assessment activities for the response.

This manual describes the FRMAC's response activities in a radiological incident.[1] It also outlines how FRMAC fits in the National Incident Management System (NIMS) under the National Response Framework (NRF) and describes the federal assets and subsequent operational activities which provide federal radiological monitoring and assessment of the affected areas. In the event of a potential or existing major radiological incident, the U.S. Department of Energy (DOE), National Nuclear Security Administration Nevada Site Office (NNSA/NSO) is responsible for establishing and managing the FRMAC during the initial phases.

1.2 History and Evolution of FRMAC

1.2.1 The Federal Radiological Emergency Response Plan (FRERP)

Following the Three Mile Island accident in March 1979, the President and Congress mandated federal agencies to develop a plan to deal with such an event. The resulting plan was the FRERP which was to be used in any kind of large, radiological incident. The plan recognized that if such an incident occurred and impacted the public, the state(s) would need federal assistance to characterize and assess the radiological conditions. The FRERP established the FRMAC to fulfill this function. Because of its history and capabilities in radiological monitoring and assessment, the DOE was assigned the responsibility to establish and initially manage the FRMAC. The FRERP also assigned long-term management responsibility of the FRMAC to the U.S. Environmental Protection Agency (EPA)[2] following the emergency phase of the incident. The FRMAC is composed federal agencies with various statutory responsibilities that work as a single federal entity to assist state, tribal, and local responders.

1.2.2 Homeland Security Act of 2002

The *Homeland Security Act of 2002* was passed after the terrorist attacks of September 11, 2001. The act established the U.S. Department of Homeland Security (DHS) and assigned it the responsibility to prevent terrorist attacks within the United States; reduce the vulnerability of the United States to terrorism, natural disasters, and other emergencies; and minimize the damage and assist in the

[1] The term "radiological incident" is used throughout this report. It is applicable to an accident, an incident, a potential accident, or a potential, perceived, or deliberate act to spread radioactivity in the environment. This includes incidents when a domestic nuclear explosion (DNE) occurs or an improvised nuclear device (IND) is used. Also see Table 1 on page 7 of this manual and the Nuclear/Radiological Incident Annex (June 2008) to the National Response Framework (January 2008).

[2] The agency responsible for leading the FRMAC is not necessarily responsible for the cleanup. Under the Nuclear/Radiological Incident Annex, various agencies/entities may be responsible for cleanup.

recovery from terrorist attacks, natural disasters, and other emergencies. The act also designated DHS as "a focal point regarding natural and manmade crises and emergency planning."

1.2.3 National Response Plan (NRP)

The NRP was developed in 2003 to implement the domestic incident management authorities, roles, and responsibilities of DHS as defined in Homeland Security Presidential Directive-5 (HSPD-5), "Management of Domestic Incidents" and the *Robert T. Stafford Disaster Relief and Emergency Act* (Stafford Act). It established a comprehensive, all-hazards approach to domestic incident management across a spectrum of activities including prevention, preparedness, response, and recovery.

1.2.4 National Response Framework (NRF)

In January 2008, the NRP was revised and reissued as the NRF. It is applicable to domestic incident management in the context of terror attacks, major disasters, and other emergencies. The NRF applied to all federal departments and agencies that may be requested to provide assistance or conduct operations in actual or potential incidents requiring a coordinated federal response and provides a framework for such a response by federal, state, tribal, local, private sector, and nongovernmental agencies. The NRF and its associated Incident Annexes are available online at http://www.fema.gov/emergency/nrf/ along with other reference material.

1.2.5 Nuclear/Radiological Incident Annex (NRIA)

The nation's current nuclear/radiological emergency response plan is the Nuclear/Radiological Incident Annex (June 2008) to the NRF. The NRIA provides an organized and integrated approach for federal agencies to adopt to respond to accidents and incidents involving nuclear or radioactive materials. DHS is responsible for overall coordination of all actual and potential incidents, including terrorist incidents involving nuclear materials.[3] A fuller discussion of DHS, DOE, and other individual agencies' responsibilities for different scenarios may be found in Section 2 of this document.

NOTE: An outline of significant events in the history of FRMAC and a list of major FRMAC exercises is presented in the format of a timeline in Appendix L.

1.3 Coordinating Agencies and Cooperating Agencies

The NRIA still supports the definition of Coordinating Agencies and Cooperating Agencies. DHS, as the overall incident manager for domestic incidents, is supported by Coordinating Agencies and Cooperating Agencies. Coordinating Agencies have specific nuclear/radiological technical expertise and assets for responding to the unique characteristics of these types of incidents and facilitate the nuclear/radiological aspects of the response in support of DHS. For any given incident, the

[3] *Nuclear/Radiological Incident Annex (June 2008) of the National Response Framework (January 2008).*

Coordinating Agency is the federal agency that owns, has custody of, authorizes, regulates, or is otherwise designated responsibility for the nuclear/radioactive material, facility, or activity involved in the incident. See Appendix A for detailed explanation. The Coordinating Agency is represented in the Joint Field Office (JFO) Coordination Group and the National Operations Center (NOC).

Coordinating Agencies are also responsible for leading the federal response to nuclear/radiological incidents of lesser severity.

Cooperating Agencies provide technical and resource support, as requested by the Coordinating Agency or DHS. Depending upon the circumstances of the event, agencies may be designated as either Coordinating Agencies or Cooperating Agencies (refer to Section 2.2 for a more detailed discussion of the responsibilities of various Coordinating Agencies according to type of incident.)

Because the assignment of specific responsibilities for protecting the public varies from state to state and tribal, county, and city interests are involved as well, this manual employs the term *local authorities* to generically address the local group in the public sector that has radiological protection responsibilities for the public.

1.3.1 National Incident Management System (NIMS)

The structure for NRF coordination is based on the NIMS construct: Incident Command System (ICS)/Unified Command (UC) on-scene supported by an Area Command (if needed), multi-agency coordination centers, and multi-agency coordination entities.

When a FRMAC is established, it operates under the parameters of the ICS. Position titles within the FRMAC organization have been changed to reflect the ICS terminology and to facilitate working in an ICS/UC structure (Appendix K).

1.4 Radiological Response in Perspective

State, tribal, county, and/or city governments have the primary responsibility for determining and implementing measures to protect health, safety, property, and the environment in all areas. The owner or operator of a nuclear facility has the primary responsibility for actions within the boundaries of that facility; for providing notification and advice to state, tribal, and local officials; and for minimizing the radiological hazard to the public. For incidents involving fixed facilities, the owner/operator may also have responsibilities for response and recovery activities outside the facility boundary under applicable legal obligations (e.g., contractual, licensee, Comprehensive Environmental Response, Compensation, and Liability Act).

When a radiological emergency occurs, the highest priority is protecting the public. All federal response activities are focused on assisting the governing agencies in accomplishing this. Whether real or perceived, public health concerns will remain the paramount priority during the entire response activity. Response activities will begin with computer predictions that form the basis for decisions affecting protection of the public. These predictions will also drive the radiological monitoring response activities. Once the data have been collected and assessed at the FRMAC, the predictions will be refined to assist the governing agencies in taking actions to prevent or minimize hazards to the public.

For emergencies involving an area under federal control, the responsibility for response actions belongs to the federal government while public protection in areas outside of federal control is the responsibility of the state, tribal, and/or local governments. For all other emergencies, the state, tribal, and/or local government has the responsibility for taking all emergency actions.

1.5 Federal Radiological Monitoring and Assessment Center (FRMAC) Mission

As defined in the NRF's NRIA, FRMAC is the multi-federal agency radiological initial/emergency response organization created for responding to radiological or nuclear emergencies impacting the United States. The number of required FRMAC personnel is closely correlated with the number of field monitoring teams because the basic functions of the FRMAC depend on the number of monitoring teams collecting field monitoring data and radiological samples.

A FRMAC is established in response to a request from a Coordinating Agency, state, tribal, or local government when there is a suspected release of radioactive materials or when a radiological incident is anticipated, suspected, or has occurred. The FRMAC becomes a coalition of all federal off-site radiological monitoring and assessment efforts to assist the Coordinating Agency, state, tribal, and local authorities. State, tribal, and local authorities are invited and encouraged to co-locate and prioritize radiological monitoring and assessment efforts in the FRMAC.

Support provided by the FRMAC includes:

- Coordinating federal radiological monitoring and assessment activities.
- Maintaining technical liaison with state, tribal, and local agencies with radiological monitoring and assessment responsibilities.
- Maintaining a common set of all off-site radiological monitoring data in an accountable, secure, and retrievable form, and ensuring the technical integrity of the FRMAC data.
- Providing radiological monitoring data and interpretations, including exposure rate contours, dose predictions, and any other requested radiological assessments, to the Coordinating Agency, the Advisory Team for Environment, Food and Health (Advisory Team) and to the state, tribal, and local governments.
- Providing, in cooperation with other federal agencies, the personnel and equipment needed to perform radiological monitoring and assessment activities.
- Requesting supplemental assistance and technical support from other federal agencies as needed.
- Arranging consultation and support services through appropriate federal agencies to all other entities (e.g., private contractors) with radiological monitoring functions and capabilities.
- Coordinating with simultaneous non-radiological response efforts (e.g., for health and safety purposes).

Potential radiological emergencies that fall within the scope of a FRMAC activation vary widely in terms of the area affected, the nature of the contamination, and the scope of the government's response. Detonation of a nuclear device, accidental release of radiation from a nuclear power plant, and a terrorist threat are just a few of the many possible scenarios that the FRMAC must be prepared to address. Regardless, supporting the state, tribal, and local organizations in the protection of the public remains the primary goal of the federal response.

2.0 ROLES AND RESPONSIBILITIES

The management responsibilities for a federal radiological emergency response may be divided among several agencies and organizations. The overall responsibility for coordinating the response is scenario dependent. These responsibilities are discussed below.

2.1 U.S. Department of Homeland Security (DHS)

DHS coordinates the overall federal response to radiological incidents in accordance with Homeland Security Presidential Directive-5 (HSPD-5) and the National Response Framework (NRF) and its Nuclear/Radiological Incident Annex (NRIA). A detailed description of the organizational framework that DHS utilizes to respond to both terrorist and non-terrorist incidents can be found in the NRF. The NRF applies to all federal departments and agencies that may be requested to provide assistance or conduct operations in actual or potential incidents requiring a coordinated federal response. The NRF provides a framework for a coordinated response by an appropriate combination of federal, state, tribal, local, private sector, and nongovernmental entities.

Following a terrorist attack, major disaster, or other emergency, the DHS Secretary may designate a federal officer to serve as the Principal Federal Official (PFO) to represent the DHS Secretary at the incident and oversee and coordinate federal activities relevant to the incident. The PFO will ensure overall coordination of federal domestic incident management activities and resource allocation on scene, ensuring a seamless integration of federal incident management activities in support of state, tribal, and local requirements. The PFO provides a primary point of contact and situational awareness locally for the Secretary of Homeland Security. The Secretary is not restricted to DHS officials when selecting a PFO.

The PFO does not direct or replace the Incident Command (IC) structure established at the incident, nor does the PFO have directive authority of federal, state, tribal, and local government officials. The PFO also provides a channel for media and public communications and an interface with appropriate jurisdictional officials pertaining to the incident.

For incidents not led by DHS, other federal agency response plans provide the primary federal response protocols.

2.1.1 U.S. Department of Homeland Security/Emergency Preparedness and Response/ Federal Emergency Management Agency (DHS/EPR/FEMA)

For Stafford Act or federal-to-federal support incidents, DHS/EPR/FEMA coordinates the provision of federal resources and assistance to affected state, tribal, and local governments as part of the Joint Field Office (JFO) Operations Section or other appropriate location established by DHS/EPR/FEMA. The general responsibilities of DHS/EPR/FEMA are to:

- Maintain the operation of the Regional Response Coordination Center (RRCC).
- Promote coordination among federal agencies with the state, tribal, and local authorities concerning interactions on non-radiological issues.
- Serve as the coordinator for information related to the federal non-radiological response.

- Provide medical advice on handling radiologically contaminated populations, utilizing the Radiation Emergency Assistance Center/Training Site (REAC/TS) resources at the FRMAC. This should be done in coordination with the U.S. Department of Health and Human Services (HHS).

2.2 Coordinating Agencies

The Coordinating Agency is the federal agency that owns, has custody of, authorizes, regulates, or is otherwise deemed responsible for the radiological facility or activity involved in the incident. Table 1 identifies the Coordinating Agency for a variety of radiological incidents. When DHS leads an incident, the Coordinating Agency supports DHS in some of these activities. When DHS is not leading an incident, the Coordinating Agency has the lead. For example, the U.S. Nuclear Regulatory Commission (NRC) is the Coordinating Agency for incidents involving nuclear facilities licensed by the NRC; the U.S. Department of Energy (DOE) is the Coordinating Agency for incidents involving transportation of radioactive materials shipped by or for DOE.

The Coordinating Agency will:

- Coordinate the overall activities (both on-site and off-site) of all federal agencies during all phases of a nuclear/radiological response.
- Oversee on-site response and support operator activities.
- Assist state, tribal, and local authorities in determining appropriate measures to protect life, property, and the environment.
- Coordinate and provide all federal Protective Action Recommendations (PARs) to the state, tribal, and local authorities.
- Ensure that federal agencies assist state, tribal, and local authorities in implementing protective actions, if requested.
- Serve as the principal federal source of information for on-site conditions; coordinate all public information on federal response activities; and provide information to Congress, the White House, and the Department of State (when foreign countries are affected).
- Establish on-scene response centers.
    - The Joint Field Office (JFO) is the coordination center for overall federal, state, tribal, and local response.
    - The Joint Information Center (JIC) coordinates information to the public and media.

2.2.1 U.S. Department of Energy (DOE)

The NRF assigns DOE the responsibility for establishing and initially managing the FRMAC. Under the NRF, when a FRMAC is activated, DOE's responsibilities are to:

- Provide technical support to the Coordinating Agency, state, tribal, and local authorities by establishing the FRMAC and coordinating the off-site federal radiological monitoring, assessment, and evaluation of data.

Table 1. Coordinating Agencies for Nuclear/Radiological Incidents

NOTE: When exercising domestic incident management responsibilities, the Secretary of Homeland Security is supported by other coordinating agencies and cooperating agencies. For incidents wherein the Secretary is not fulfilling domestic incident management responsibilities, the Coordinating Agency will be the responsible agency for domestic incident management as defined by their authorities.

Nuclear/Radiological Facilities or Materials Involved in Incident	Coordinating Agency
Nuclear facilities:	
(1) Owned or operated by DoD or DOE	(1) DoD or DOE
(2) Licensed by NRC or Agreement State	(2) NRC
(3) Not licensed, owned, or operated by a Federal agency or an Agreement State, or currently or formerly licensed facilities for which the owner/operator is not financially viable or is otherwise unable to respond	(3) EPA
Radioactive materials being transported:	
(1) Materials shipped by or for DoD or DOE[1]	(1) DoD or DOE
(2) Shipment of NRC or Agreement State-licensed materials	(2) NRC
(3) Shipment of materials in certain areas of the coastal zone that are not licensed or owned by a Federal agency or Agreement State (see DHS/USCG list of responsibilities for further explanation of "certain areas")	(3) DHS/USCG[2]
(4) All others	(4) EPA
Radioactive materials in space vehicles impacting within the United States:	
(1) Managed by NASA or DoD	(1) NASA or DoD
(2) Not managed by DoD or NASA and impacting certain areas of the coastal zone	(2) DHS/USCG
(3) All others	(3) EPA
Foreign, unknown, or unlicensed material:[3]	
(1) Incidents involving inadvertent import of radioactive materials	(1) DHS/CBP[4]
(2) Incidents involving foreign or unknown sources of radioactive material in certain areas of the coastal zone	(2) DHS/USCG
(3) All others	(3) EPA
Nuclear weapons	DoD or DOE (based on custody at time of incident)
All deliberate attacks involving nuclear/radiological facilities or materials, including RDDs (Radiological Dispersal Devices) or INDs (Improvised Nuclear Device)[5,6]	DHS

[1] The Coordinating Agency is either DoD or DOE, depending on which of these agencies has custody of the material at the time of the incident.

[2] United States Coast Guard (USCG)

[3] The DHS Domestic Nuclear Detection Office (DNDO) coordinates the adjudication of unresolved radiation detection alarms.

[4] Customs and Border Patrol (CBP)

[5] For deliberate attacks, DHS assumes its domestic incident management responsibilities under HSPD-5, paragraph 4, and is also the Coordinating Agency for implementing the activities in this annex with respect to deliberate attacks.

[6] For deliberate attacks, the U.S. Department of Justice assumes those law enforcement coordination activities under HSPD-5, paragraph 8.

- Provide various operational and planning assets including radiation detection and measurement equipment, data management support, communications support, aerial monitoring capability, medical advice, and plume modeling, as appropriate.
- Provide off-site support to the EPA when it acquires management of the FRMAC following the initial phase of the emergency.

2.2.1.1 Association between DOE and NNSA

The DOE's, National Nuclear Security Administration (NNSA) is a semi-autonomous organized agency of DOE.

The NNSA's mission is:

- To enhance U.S. national security through the military application of nuclear energy.
- To maintain and enhance the safety, reliability, and performance of the United States nuclear weapons stockpile, including the ability to design, produce, and test, in order to meet national security requirements.
- To provide the U.S. Navy with safe, militarily effective nuclear propulsion plants and to ensure the safe and reliable operation of those plants.
- To promote international nuclear safety and nonproliferation.
- To reduce global danger from weapons of mass destruction.
- To support United States leadership in science and technology.

DOE Headquarters (DOE/HQ) has assigned the responsibility for FRMAC to the NNSA/Nevada Site Office (NSO) in Las Vegas, Nevada. This office provides day-to-day management; development of FRMAC plans, procedures, training, exercise development (e.g., Empire 09) and exercise coordination; and oversight of FRMAC working groups. This office also has the capability to respond to any radiological emergency.

2.2.1.2 Naval Nuclear Propulsion Program

Executive Order 12344, 47 FR. 4979 (1982) established the Naval Nuclear Propulsion Program (NNPP) as an integrated program under the Department of Energy and Department of the Navy. The NNPP has responsibility for the safety of naval nuclear reactors and associated propulsion plants and for the control of radiation and radioactivity associated with NNPP activities. As such, the NNPP is responsible for planning for and responding to radiological emergencies involving U.S. nuclear-powered warships and associated radioactivity. Consistent with the National Response Framework, the NNPP is the Coordinating Agency for emergencies involving U.S. nuclear-powered warships and associated radioactivity and, as such, would coordinate the Federal response to NNPP emergencies.

The NNPP maintains the capability to respond to an emergency involving a U.S. nuclear-powered warship or associated radioactive material anywhere in the world.

The NNPP does not have specific responsibility for responding to a nuclear or radiological emergency not involving U.S. nuclear-powered warships or associated radioactive material.

However, the NNPP could supplement the primary response by other Federal agencies. Support from the NNPP may include conduct of radiological surveys in the field, use of field radiochemistry equipment to analyze environmental samples, and assessment of the radiological impact to human health by NNPP health physicists.

Following an emergency not involving NNPP propulsion plants or radioactive material, the NNPP would identify and mobilize available resources to support the response when requested. These response assets would assist local authorities and the Incident Commander, consistent with the National Response Framework. Following the establishment of the Federal Radiological Monitoring and Assessment Center (FRMAC), NNPP assets would be incorporated into FRMAC as one discrete unit, with the NNPP team leader reporting to FRMAC leadership. NNPP monitoring would be coordinated through and report results of surveys to FRMAC. Support from the NNPP may be requested using contact information maintained by the Department of Energy Emergency Operations Center.

2.2.2 U.S. Environmental Protection Agency (EPA)

The NRF assigns EPA the responsibility for managing the FRMAC during site clean-up (NRF Emergency Support Function [ESF] #14), once the transition criteria (discussed in more detail in Section 5 of this document) are met. Throughout a response, EPA provides response support through the FRMAC and for other activities (i.e., under ESF #10, EPA has additional responsibilities beyond characterization and assessment). Site characterization and monitoring will be supported by EPA's On-Scene Coordinators, their contractors, and the Special Teams, which includes the Radiological Emergency Response Team (RERT).

The EPA's Senior Representative (SR)[4] in the FRMAC is typically one of the RERT commanders. The EPA SR is to advise the DOE FRMAC Director during the emergency and intermediate phases of the response on issues specific to long-term monitoring and recovery that might commence during earlier phases. At an appropriate time during an intermediate phase, the EPA SR, EPA Incident Command (IC), or Unified Command (UC) will begin a dialogue culminating in a transfer of FRMAC management from DOE to EPA.

After the conditions for transfer of management, as cited in the NRF and discussed in Section 5.0 of this document, are met and a formal document is signed, the EPA will assume the federal agency responsibility for coordinating the intermediate- and long-term off-site radiological monitoring, sampling, and assessment activities. When this occurs, DOE and other federal agencies will continue to commit the equipment, personnel, and funds for the duration of the federal response effort as mutually agreed upon. Concurrence from other federal, state, tribal, and local entities may be necessary. (Refer to Appendix J for a copy of the Transfer Guidance Document.)

After transfer, the EPA SR will work with whatever cleanup group (Site Restoration Working Group, Decontamination Committee, etc.) is in charge of the overall cleanup. The FRMAC will continue to provide monitoring data for cleanup and reassessment of the problem areas.

[4] Under the NRF, agencies with a major role in a response may be asked to provide a Senior Representative (SR) to the JFO Unified Coordination Group. The EPA SR to the FRMAC is a different position than an EPA SR to the JFO Unified Coordination Group.

In time, the EPA-led FRMAC will scale down into a smaller EPA and EPA-contractor entity. This may include relocating out of the original FRMAC location and establishing whatever near-site facility is necessary to accomplish the monitoring mission.

2.2.3 U.S. Department of Defense (DoD)

When requested and approved by the Secretary of Defense, DoD provides Defense Support of Civil Authorities (DSCA) during domestic nuclear and radiological consequence management incidents and is a cooperating or support agency for the NRIA of the NRF. DoD will execute domestic DSCA through the U.S. Northern Command (USNORTHCOM) or U.S. Pacific Command (USPACOM) (for Hawaii and the Pacific territories). Typically, this occurs when the relevant civil authorities have requested DoD assistance because response operation requirements for federal, state, tribal, and local entities have been expended, or will exceed their capabilities. Support can be provided to deter, prevent, protect, respond, and/or recover from a potential or actual incident. As directed by the Commander of USNORTHCOM, a Joint Task Force Commander exercises control over DoD forces.

For a small-scale DoD response, the Commander of USNORTHCOM will deploy a Defense Coordinating Officer (DCO), who will be the single DoD point of contact to coordinate military support in the JFO. If designated as a Joint Force Commander, the DCO can provide command and control for the entire radiological or nuclear consequence management effort so long as the response force does not exceed the DCO's command and control capability. However, if a larger structure is needed, a DCO will still deploy to serve as DoD's single point of contact in the JFO for validation of requests for assistance. For a larger DoD response, the Commander of USNORTHCOM can use a Joint Task Force to manage supporting military activities.

DoD can quickly respond to incidents through Immediate Response Authority. Immediate Response Authority is any form of requested immediate action taken by a local DoD military commander to assist civil authorities or the public to save lives, prevent human suffering, or mitigate great property damage under imminently serious conditions. When such conditions exist and time does not permit approval from higher headquarters, local military commanders and responsible officials from the DoD components and agencies are authorized to take necessary action to respond to requests of civil authorities to save lives, mitigate property damage, and prevent human suffering.

DoD units possess varying levels of radiological and nuclear consequence management capabilities; however, response times and resources vary. Additionally, some capabilities may be committed to potential or current military operations worldwide. Based upon adjusted priorities, the Secretary of Defense could redirect these units to perform radiological and nuclear consequence management operations. The required time to disengage and redeploy the units and the impact of this on ongoing military operations, are key planning considerations.

2.2.3.1 Chemical, Biological, Radiological, Nuclear, and High-Yield Explosives (CBRNE) Consequence Management Response Force (CCMRF)

The CCMRF is a DoD capability that provides the sustained military response to a CBRNE event. While the exact composition of the CCMRF, in terms of required capabilities, is classified, the CCMRF capability areas can be broadly grouped into functional areas including marking hazardous

areas, extraction (including search and rescue), decontamination, reconnaissance (survey and monitoring), medical treatment, logistics (including transportation), communications, and aviation. CCMRF elements are deployed in force packages within which capabilities are grouped in order of expected need. DoD CBRNE consequence management operations will be integrated into the response via the unified coordination group's coordination/planning efforts. The unified coordination group's membership includes the Joint Task Force Commander (and/or the DCO), who represents DoD, and the senior DOE official, who represents the FRMAC.

2.2.3.2 National Guard Bureau (NGB)

National Guard soldiers and airmen routinely support emergency response under the authority of the governor of the state to which they belong. Governors also routinely share National Guard and other resources between states during emergencies using the Emergency Management Assistance Compact (EMAC) process. When the FRMAC is activated for a large-scale radiological emergency, National Guard troops will likely be deployed in and around the incident area under the direction of the governor(s) of the state(s) in which the emergency occurs. By the time the FRMAC arrives on scene and is operational, National Guard troops will likely have valuable radiological, casualty, and operational information about the hazard relevant to FRMAC operations. The FRMAC personnel and the National Guard troops should mutually investigate what data are available and integrate that data into the FRMAC. Coordination for collection and integration of this information into FRMAC operations may speed and improve the support FRMAC is able to provide the Incident Commander. The National Guard Bureau (NGB) Joint Operations Command Center (JOCC) serves as the focal point for NGB domestic operations by assembling and managing the NGB's Common Operational Picture (COP) for internal and external use and by acting as the NGB's primary communications and coordination node for requests for assistance, resources, policy, and information from the states and territories and federal authorities relative to Guard matters.

2.2.4 Nuclear Regulatory Commission (NRC)

The NRC is the Coordinating Agency for incidents at or caused by a facility or an activity that is licensed by the NRC or an Agreement State. These facilities include commercial nuclear power plants, fuel cycle facilities, radiopharmaceutical manufacturers, and research reactors. The NRC performs an independent assessment of the incident and potential off-site consequences and, as appropriate, provides recommendations concerning any protective measures. The NRC closely coordinates its actions with state, tribal, and local government officials during an incident by providing advice, guidance, and support as needed.

NRC may assist during other incidents by providing technical assistance to include source term estimation, plume dispersion, and dose assessment calculations. They may also integrate into the FRMAC and provide radiological monitoring and assessment activities.

2.2.5 National Aeronautics and Space Administration (NASA)

NASA is the Coordinating Agency for the federal response to incidents involving the release of nuclear/radioactive materials from NASA space vehicles or joint space vehicles with significant NASA involvement. It collaborates with DOE when preparing for the launch of spacecraft involving

significant quantities of DOE-owned nuclear material by providing additional specialized radiological monitoring equipment and radiological accident response personnel that fold into the FRMAC Operations. These limited quantity assets may be utilized in response to non-launch radiological incidents.

2.2.6 Federal Bureau of Investigation (FBI)

The FBI manages, leads, and coordinates all law enforcement and investigative activities with regard to the response to terrorist acts or threats, including tactical operations, crime scene investigation, crisis negotiation, and intelligence gathering and dissemination.

If any agency or government entity becomes aware of an overt threat or act involving nuclear/radiological material/device or indications the event is not inadvertent or otherwise accidental, the U.S. Department of Justice (DOJ) should be notified through the Federal Bureau of Investigation (FBI). The Attorney General has the lead responsibility for criminal investigations of terrorist acts or terrorist threats by individuals or groups inside the United States, or directed at United States citizens or institutions abroad, where such acts are within the federal criminal jurisdiction of the United States. Generally acting through the FBI, the Attorney General, in cooperation with other federal departments and agencies engaged in activities to protect our national security, shall also coordinate the activities of the other members of the law enforcement community to detect, prevent, preempt, and disrupt terrorist attacks against the United States. For investigations pertaining to nuclear/radiological incidents, the Coordinating Agencies and Cooperating Agencies perform the functions delineated in this annex and provide technical support and assistance to the FBI in the performance of its law enforcement and criminal investigative mission. Further details regarding the FBI response are outlined in the Terrorism Incident Law Enforcement and Investigation Annex to the NRF. In situations resulting from a deliberate act, NRIA response actions will be coordinated with the NRF and the Terrorism Incident Law Enforcement and Investigation Annex and the Catastrophic Incident Annex, as appropriate.

2.3 State, Tribal, and Local Authorities

State, tribal, and local authorities are responsible for the health and welfare of the general public during an emergency. They will assess the situation and issue instructions for necessary protective actions. The state, tribal, or local authority receives federal Protective Action Recommendations (PARs) from the Coordinating Agency and the Remote Advisory Team, which serve as the federal channel for such recommendations.

2.4 Other Federal Agencies

All other federal agencies, not previously identified as having a management and/or support role, will respond in accordance with the NRF, and other interagency agreements subordinate to the NRF, at the request of the DHS, Coordinating Agency, DOE, or the affected state, tribal, or local governments or in accordance with established statutory responsibilities.

2.5 Public Information Coordination

Public information coordination is most effective when the owner/operator, federal, state, tribal, local, and other relevant information sources participate jointly. The primary location for linking these sources is the Joint Information Center (JIC).

Prior to the establishment of federal operations at the JIC, it may be necessary to release federal information regarding public health and safety. In these instances, federal agencies will coordinate with the Coordinating Agency and the state, tribal, and local governments in advance or as soon as possible after the information has been released.

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3.0 RESPONSE ACTIONS

3.1 Description of the Emergency

When formally notified of a radiological emergency and a FRMAC is requested, DOE will obtain a detailed description of the emergency. To ensure a timely and appropriate response, the following information will be requested by DOE from the requesting agency:

- The nature and condition of the emergency (e.g., is a release imminent, in process, or has it terminated).
- The type of facility or radiological material involved in the emergency (a power reactor, nuclear material, etc.).
- The location of the emergency and the nearest major city or town.
- An estimate of the source term and isotope(s) involved and the chemical and physical form, if known.
- An estimate of other information concerning chemical, biological and other hazards, if known.
- The name and telephone number of a technical person from the reporting organization who is knowledgeable about the radiological situation.
- The extent of knowledge about the release and distribution.
- Public protective actions initiated.
- The meteorological conditions at the time of the emergency.
- Points of contact for liaisons to the FRMAC (name/phone number/e-mail) for follow-up support.
- An identified Public Information Officer (PIO) (name/phone number/e-mail) due to the potential public interest.

3.2 Call-Up Procedures/Authorities

At the request of the U.S. Department of Homeland Security/Emergency Preparedness Program/Federal Emergency Management Agency (DHS/EPR/FEMA), the Coordinating Agency and/or state, tribal, or local authorities, DHS will activate and deploy the off-site federal radiological monitoring assistance assets. The DOE assets supporting the FRMAC are the Radiological Assistance Program (RAP), the Consequence Management Home Team (CMHT) (Appendix H), the Consequence Management Response Team (CMRT) Phases I, II, and Augmentation, the National Atmospheric Release Advisory Center (NARAC) (Appendix B) located at Lawrence Livermore Nation Laboratory (LLNL), the Aerial Measuring System (AMS) (Appendix C), and the REAC/TS teams (see Figure 1).

3.3 Phased-Response Approach

To aid in ensuring a timely response to state, tribal, or local governments and Coordinating Agency requests for FRMAC services, DOE/NNSA has developed a phased response approach for deploying monitoring, sampling, analysis, and assessment resources. The consequence management response teams are deployed by the NNSA Nuclear Incident Team (NIT) located at DOE Headquarters. Resource deployment is divided into three phases with each phase incorporating both management

and operational capabilities. The organizational structure is comparable in each phase of the response; this is in order to facilitate the integration of other federal, state, tribal, and local government resources in to the FRMAC.

Throughout this document, the terms CMRT Phase I, CMRT Phase II, and Augmentation are used. The terms CMRT I and II refer exclusively to NNSA/NSO resources and support of Augmentation is provided by other DOE assets. Augmentation is not exclusively a NNSA resource. It also includes other federal agencies that are signatories to the National Response Framework (NRF) and states that are of a state compact.

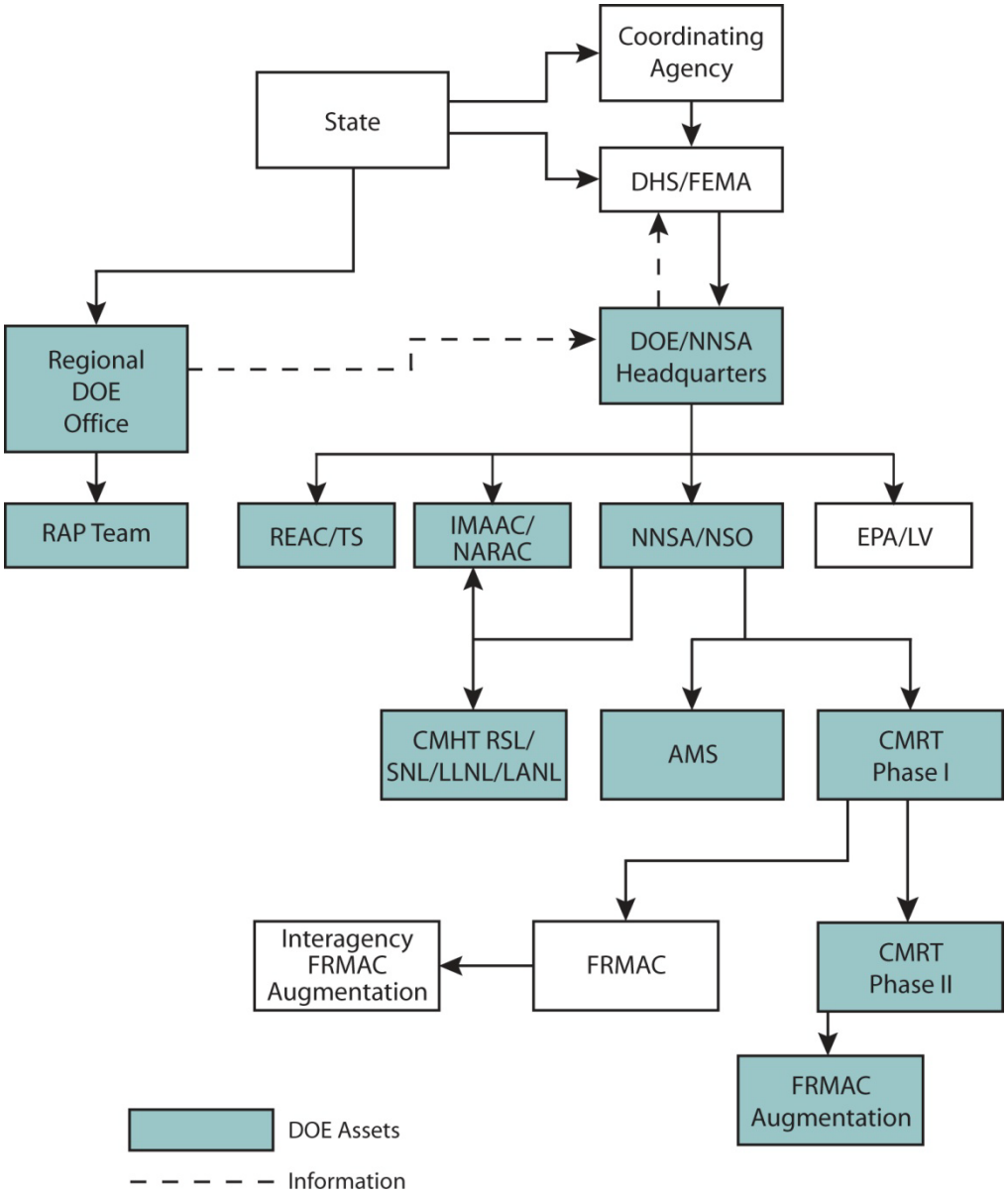

FIGURE 1. ***ALERT, ACTIVATION, AND DEPLOYMENT***

Consequence management products provided by the NARAC are model based and therefore predictive. Confidence in that prediction increases as the products incorporate field measurement data. The first products available are likely to be based on an unknown or estimated airborne release source term and characteristics, and unlikely to be based on field measurements. These products are purely predictive. As measurements become available, the model-generated products will be updated and refined using field and aerial survey measurement data. As a result, refined products are considered predictive but do utilize field data. Eventually, the number of field measurements taken will be sufficient to produce a largely data-driven FRMAC product that can be considered a much more refined estimate of the contamination footprint.

3.4 FRMAC Activation Stages

When DOE/NNSA receives a request to deploy a FRMAC response, the Manager of NNSA/NSO, with the concurrence of DOE/NNSA/HQ, designates a FRMAC Director, initiates a FRMAC deployment, and stands up the CMHT. The DOE/NNSA will begin deploying the CMRT and notifying the other federal agencies that may be called upon to assist. DOE will also notify the Environment Protection Agency (EPA) (for activated billet), the Nuclear Regulatory Commission (NRC), and the Advisory Team whenever CMRT is deployed and the FRMAC is activated. The CMRT uses a phased approach to deploy personnel and resources into the field in a timely fashion.

While CMRT Phase I is undergoing load-out and is in transit, analysis and interpretation of the initial source term and early data, along with predictive map products, can be provided by the CMHT. The CMHT is operational and ready to assist within two hours of notification. The CMRT Phase I, which consists of technical and management personnel, is ready to deploy within four hours of notification and can be operational and gathering data within three hours of establishing a base of operations. The CMRT Phase I includes all technical aspects of a FRMAC response and initially acts as the command and control element of the FRMAC. The FRMAC Director and the EPA/Radiological Emergency Response Team (RERT) Commander from Las Vegas, Nevada will accompany this team.

The CMRT Phase II follows the Phase I resources within 12 hours of activation and provides a more robust response team by providing additional personnel and equipment. The CMRT assets, along with the interagency resources, respond to a FRMAC within 24–36 hours after the initial request for assistance. If requested, NNSA can call upon trained professionals from other DOE facilities and National Laboratories, and additional personnel and equipment will be deployed to augment and assist FRMAC operations. As each team arrives in the field, they will be in constant contact with the CMHT to ensure a prudent and reasonable follow-on response effort. Other federal agencies that contribute to the FRMAC response will coordinate with the FRMAC Manager upon their arrival at the incident site or with the FRMAC Director if that position is at the Unified Command (see Figure 2).

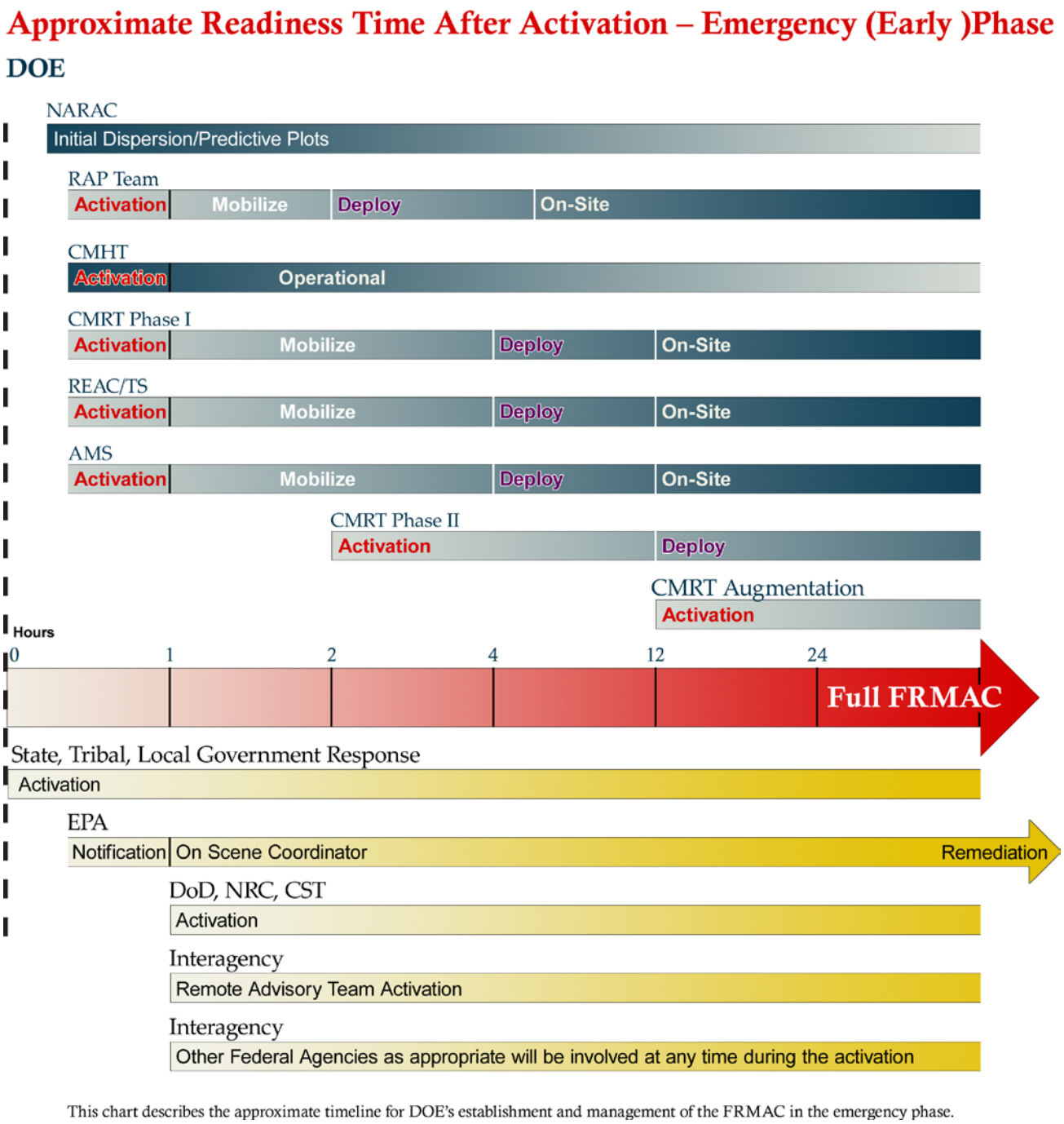

FIGURE 2. ACTIVATION SEQUENCE FOR VARIOUS DOE-RELATED ASSETS ONCE AUTHORIZED

3.5 Primary DOE Assets Accessible to FRMAC

The FRMAC provides radiological monitoring and assessment during the initial phase of a response and into the intermediate phase of a monitoring response by using EPA and other DOE assets. The FRMAC is an interagency organization with representatives from various federal, state, tribal, and local government radiological response organizations. It has the assets and the capabilities to provide additional logistical and communications support for the interagency organizations responding within the FRMAC only. For logistical requirements see Appendix G.

The DOE and EPA provide significant radiation monitoring, analysis, and assessment equipment as well as highly skilled professionals. In addition, the CMRT element brings essential communications, logistics, photo/video, computer network, and mechanical/electrical support. Both institutional and mobile laboratories are available from DOE, EPA, and other federal agencies. The federal agencies that comprise FRMAC may provide equipment and/or personnel to state, tribal, county, or local EOCs to augment liaison processes with the FRMAC, as requested. The following DOE assets will be activated and deployed, depending upon the real or potential impact of the emergency.

3.5.1 Consequence Management Home Team (CMHT)

The primary function of the CMHT is to be the virtual extension of the FRMAC. It operates in preparation for the arrival of the CMRT and in coordination with the deployed FRMAC assets. The CMHT is activated by contacting the NIT located at DOE Headquarters. Once DOE has made the determination that CMHT assistance is required, the NIT initiates the activation call-out. All positions of the CMHT are on-call 24/7/365 and can respond within one hour during normal business hours and two hours after close of business. The same *data* products and *technical* assistance are available from the CMHT as from a FRMAC with the exception of field monitoring capabilities. Interpretations of measurements and predictions in terms of the published guidelines are available, plus calculations, such as Derived Response Levels, worker turn-back limit and stay times. Recommendations for protective actions must be made by the Coordinating Agency and the Remote Advisory Team. However, the interpretations and calculations by FRMAC/CMHT are in harmony with their advice, because FRMAC/CMHT is tightly tied to the Remote Advisory Team. The CMHT maintains reachback capabilities to agencies with expertise that cover a variety of disciplines to assist with local concerns or needs.

The CMHT may also be activated to support other non-FRMAC events such as Accident Response Group (ARG) or Radiological Assistance Program (RAP) deployments.

A more detailed explanation of the CMHT is provided in Appendix H.

3.5.2 Atmospheric Dispersion Modeling

NARAC is the primary atmospheric plume and deposition modeling service and tool utilized by DOE in support of the FRMAC and is located at Lawrence Livermore National Laboratory (LLNL) in Livermore, California. The national center is staffed on weekdays. During off hours, on-call staff

is available on a one-hour recall. The DOE NARAC Program can be activated through the RAP team, DOE/HQ, or through NARAC at LLNL's 24/7/365 phone number 925.424.6465.

NARAC is a resource center for planning, real-time assessment, and detailed analysis of atmospheric releases involving nuclear, radiological, chemical, or biological material. To model atmospheric incidents, NARAC ingests over a million real-time meteorological observations each day from around the world. The center can quickly project the downwind consequences of releases from a few days in the past to a few days in the future. For future predictions, NARAC receives National Oceanic and Atmospheric Administration (NOAA) and U.S. Navy weather forecast products, and can also run a high-resolution regional weather forecast model over the area of interest.

Its primary products are calculated contour plots overlaid on a map of the emergency area. The minimum information needed to make a calculation is the time and location of the event. From this information NARAC can display the general downwind area of concern. If an estimate of the amount and type of material released (source term) is available, specific consequences can be estimated.

NARAC is also the DHS Interagency Modeling and Atmospheric Assessment Center (IMAAC) the functions of which are described in Section 4.6.1 of this manual.

Other supplementary modeling tools include DOE HotSpot, a PC-based plume modeling and Health Physics software tool that can produce simple, rapid, initial plume model predictions on a desktop or laptop PC, and the Sandia Hazard Assessment Response Capability (SHARC). A more detailed discussion of all these capabilities can be found in Appendix B. More information on NARAC can be found at https://narac.llnl.gov.

3.5.3 Radiological Assistance Program (RAP) Response[5]

RAP is DOE/NNSA's first responding resource in assessing an emergency situation and advising decision makers on what further steps could be taken to evaluate and minimize the hazards of a nuclear/radiological emergency. RAP is also capable of providing assistance for all types of nuclear/radiological incidents, but its support may be limited to advice given over the telephone or extend to sending skilled personnel and equipment to the incident scene to help evaluate, assess, advise, isotopically identify, search for, and assist in the mitigation of actual or perceived radiological hazards and risks to workers, the public, and the environment.

DOE/NNSA implements RAP on a regional basis. Nine geographical regions have been established (see Figure 3) to provide radiological assistance, upon request, on a 24-hour basis. Requests for DOE/NNSA radiological assistance should be directed to the appropriate DOE Region or to DOE/HQ. DOE/HQ emergency response telephone number is 202.586.8100.

Each region has a minimum of three RAP teams. A full RAP team has eight members, including a Federal Team Leader. The number of RAP personnel deployed will be tailored to meet the needs of the particular incident and may be as few as two people. Multiple RAP teams may also be deployed if warranted by the situation. The RAP team can be expected to be on-scene within six hours of being alerted.

[5] *For additional information refer to the Radiological Assistance Program Field Operational Guide.*

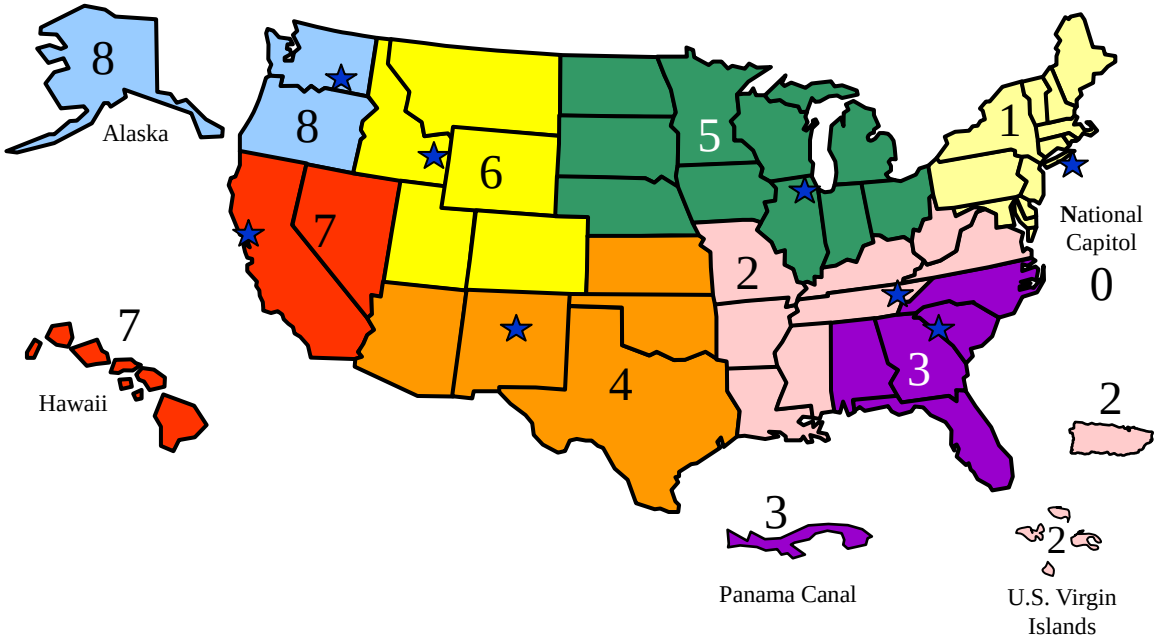

FIGURE 3. MAP OF DOE RAP REGIONS THAT PROVIDE RESOURCES THAT AUGMENT A FRMAC OPERATION

Region	Contact for Questions	24-Hour Telephone for Assistance
0	Regional Response Coordinator, Remote Sensing Laboratory – Andrews P.O. Box 380, M/S RSL-AO, Suitland, MD 20752	202.586.8100
1	Regional Response Coordinator, Brookhaven Site Office 53 Bell Ave., Long Island, NY 11973	631.344.2200
2	Regional Response Coordinator, Oak Ridge Office P.O. Box 2001, Oak Ridge, TN 37831	865.576.1005
3	Regional Response Coordinator, Savannah River Site Office P.O. Box A, Aiken, SC 29802	803.725.3333
4	Regional Response Coordinator, NNSA Service Center P.O. Box 5400, Albuquerque, NM 87115	505.845.4667
5	Regional Response Coordinator, Chicago Office 9800 S. Cass Ave., Argonne, IL 60439	630.252.4800
6	Regional Response Coordinator, Idaho Operations Office 850 Energy Drive, Idaho Falls, ID 83402	208.526.1515
7	Regional Response Coordinator, Livermore Site Office P.O. Box 808, L-293 Livermore, CA 94551	925.422.8951
8	Regional Response Coordinator, Richland Operations Office P.O. Box 550, Richland, WA 99354	509.373.3800

RAP has expertise in search and identification of radioactive materials, radiological monitoring and sampling, radiological assessment, area monitoring, air sampling, and exposure and contamination control. RAP teams are equipped with specialized man-portable and mobile search equipment, gamma spectroscopy systems, radiation detection and contamination monitoring instruments, air sampling equipment, environmental sampling kits, communications equipment, personal protective equipment (PPE), and other equipment necessary to conduct their mission.

3.5.4 Consequence Management Response Teams (CMRT)—Overall Concept

The CMRT deploys in three phases—Phase I, Phase II, and Augmentation. Each phased-response element deploys with a standard equipment package and qualified and trained personnel to support the technical needs during each phase of the response. During an incident, the Consequence Management Home Team is stood up at the various laboratories to provide both technical and logistical assistance (see CMHT CONOPS, NA-40 Policy Note #15).

3.5.5 CMRT Phase I Response

CMRT Phase I is a small response group both in terms of personnel and equipment. It is prepared to deploy from Las Vegas within 4 hours following notification. The size of the team (25 members) and the relatively small load of equipment (3,500 pounds) give it the flexibility to meet a short deployment time line.

This phase serves as a quick response element to augment RAP in U.S. responses and will be handled on a case-by-case basis for foreign deployments. It also provides the core Command and Control for FRMAC contributions from other federal agencies. The team incorporates all the disciplines necessary to support operations but only on a limited scale. These disciplines include radiation monitoring, sampling, analysis, assessment, health and safety, and support and logistics functions. It is designed for quick response and rapid radiological data collection and assessment in order to provide early health effects information and timely characterization of the radiological situation to the officials responsible for making and implementing protective actions for the public. In addition, CMRT I has the capability to provide escort services for emergency workers entering potentially contaminated areas for lifesaving and/or forensic operations.

3.5.6 CMRT Phase II Response

The CMRT II is designed to complete the CMRT staffing for a full 24-hour operation. Upon field integration of CMRT I and CMRT II, the integrated group provides additional radiological monitoring and assessment capability; allows for 24-hour emergency response activities; establishes the data, voice, and fax links with NNSA/NSO and DOE/NNSA/HQ; and establishes GIS support to the state, tribal, or local government and Coordinating Agency. CMRT I and II are comprised of assets from NNSA/NSO. Both provide the DOE with the consequence management capability to rapidly respond to any radiological emergency. For deployments to remote areas, DOE has the resources and capability to establish forward field technical centers in tents equipped with portable generator alternating current power, air conditioning/heating, satellite communications, radio communications, tables, chairs, and other support equipment. As with CMRT I, a specific emergency may require a tailored response. Figure 4 shows the organizational structure of a CMRT I with the integration of a CMRT II. Note that the configuration of CMRT I and CMRT II never changes but

CMRT Augmentation does. There is only one exception to this rule and that is when there is a pre-deployment for a NASA space launch.

3.5.7 CMRT Augmentation Response

During a CMRT Augmentation response to an incident, protective actions focus on accurately defining areas where contamination levels of air, water, crops, forage, and livestock may lead to concentrations in excess of nationally accepted guidelines (U.S. Food and Drug Administration [FDA] Derived Intervention Levels).

The technical response during the CMRT Augmentation period focuses on extensive sampling, sample processing, and analysis. Further collection, assessment, compilation, and archiving of data in order to characterize the radiological conditions are specified by the NRIA to the NRF. The response is prepared to support 24-hour-a-day operations for several weeks as determined by the severity of the emergency.

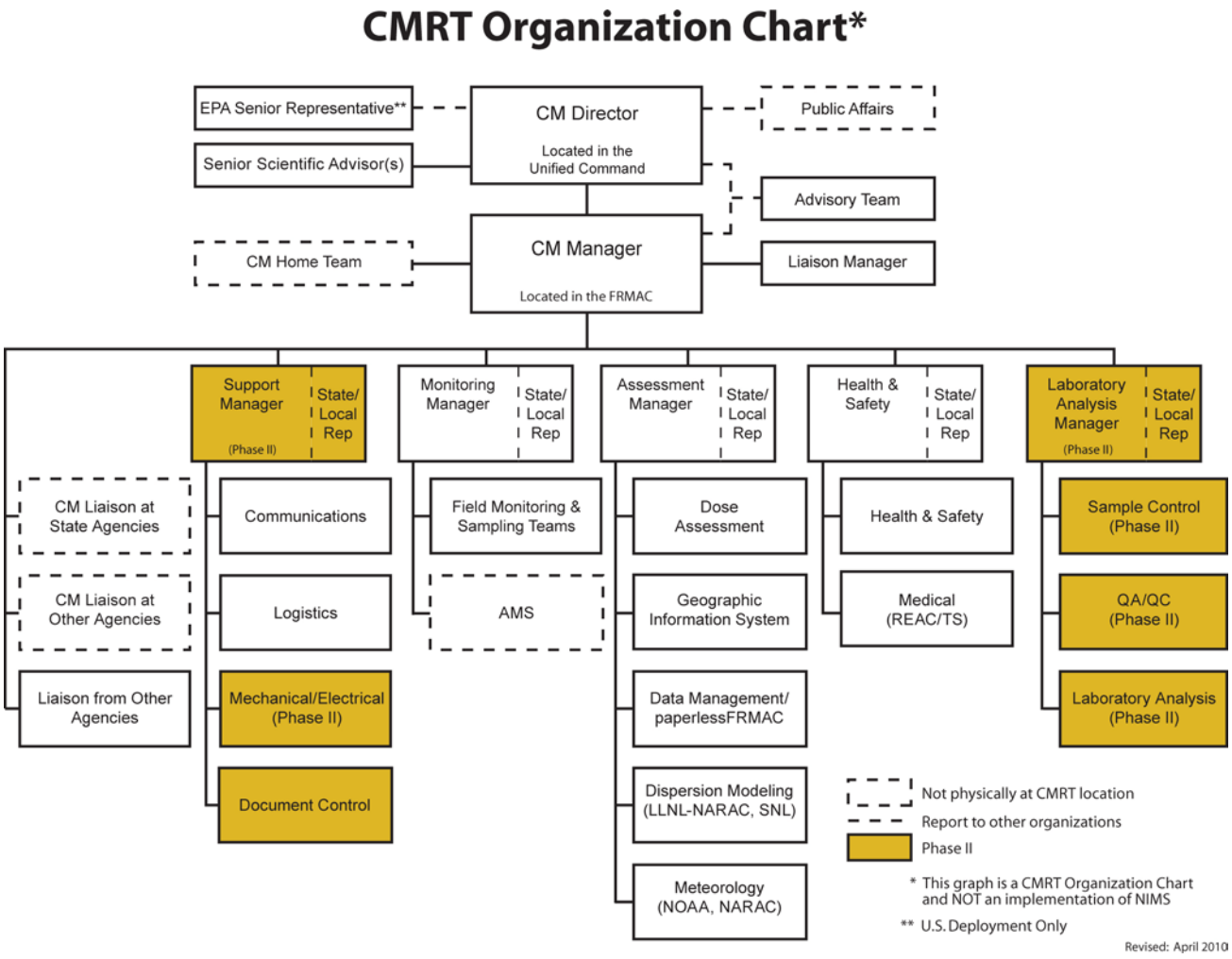

FIGURE 4. INTEGRATION OF CMRT I AND CMRT II

3.5.8 Aerial Measuring System (AMS)

The AMS helicopter and fixed-wing aircraft (Figure 5) are equipped to measure radioactive material deposited on the ground. The aircraft, permanently based at Nellis Air Force Base (AFB) in Las Vegas, Nevada, and at Andrews AFB near Washington, D.C., are key components in a response to an emergency involving dispersal of radioactive material over a large area.

FIGURE 5. AMS PLATFORMS

The DOE/NNSA AMS Program has an extensive collection of background radiological surveys of nuclear facilities in the United States. These survey results can be used as a baseline for evaluating releases of radioactivity from an accident or incident at one of the sites. A more detailed discussion of the AMS capabilities is given in Appendix C. The AMS fixed-wing response can occur in the same time frame as the CMRT I deployment.

3.5.9 Radiation Emergency Assistance Center/Training Site (REAC/TS)

The REAC/TS and World Health Organization Collaborating Center, located in Oak Ridge, Tennessee, provide 24/7 radiation emergency medical support to the FRMAC and NNSA's Accident Response Group (ARG). Upon direction from NNSA/HQ, REAC/TS can provide deployable emergency medical and health physics support teams nationally or internationally for dose assessments, diagnosis, treatment, advice, recommendations, and consultation for all types of radiological injuries/illnesses in response to a radiological or nuclear incident. REAC/TS can provide emergency medical response to the FRMAC and DOE assets personnel for injuries/illnesses from other hazards that might complicate a radiological or nuclear incident such as biological, chemical, thermal, or other physical events. REAC/TS can provide education/training related to radiation emergency medical response prior to, or at, radiological or nuclear incidents. The REAC/TS training can be tailored to the needs of NNSA personnel as well as to civilian response and health care personnel in a community or region affected by a radiological or nuclear event. REAC/TS stocks and manages specific radiological countermeasures such as Zn-DTPA (Zinc trisodium diethylenetriaminepentacetate) and Ca-DTPA (Calcium triosodium diethylenetriaminepentacetate) and Prussian Blue (ferric hexacyanoferrate[II]) (FDA, New Drug

Application) that might be required for treatment of internal contamination with various actinides (and Cs-137). Use of countermeasures should be coordinated with HHS. For more information contact REAC/TS: **Emergency Number: 865.576.1005 (ask for REAC/TS)**

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4.0 RESPONSE ORGANIZATION

4.1 Emergency Response Operations Structure

FRMAC operations, by definition, support the state, tribal, and local governments and the Coordinating Agency. The Advisory Team (see Section 4.6.5) and other federal responders along with state, tribal, and local government representatives may choose to co-locate in the FRMAC facility and carry out their own responsibilities related to the emergency (early) response. It is expected that co-located responders will coordinate their activities with the FRMAC; however, FRMAC operations will not interfere with any obligation of other federal, state, tribal, and local government organizations to the emergency response. It is expected that the FRMAC structure will merge into the planning section of the Incident Command Structure (ICS) organization.

FRMAC is traditionally an "off-site" monitoring entity. However, in the case of terrorist activity or a transportation incident, the definition of the "site" might be vague. In such incidents, FRMAC will work with first responders (federal, state, tribal, and local) to negotiate a time when FRMAC will direct all monitoring activities, including the "on-site" area. This would typically occur once the FBI no longer controls the site as a crime scene, or after first responders have removed victims. This negotiation might be as simple as the Incident Commander releasing the site to FRMAC monitoring direction.

4.2 National Incident Management System (NIMS)

The following is an executive summary of the ICS implementation plan that will be used as a guide to incorporate the FRMAC into an ICS organization. This integration of FRMAC into ICS will ensure FRMAC's ability to coordinate and manage radiological monitoring during an incident as depicted in Figure 6. Figure 7 depicts the integration of FRMAC supporting several Incident Commands. An incident in the United States will always be managed using the principles of ICS. The Advance Party Meeting (APM) Checklist (See Appendix I) is a useful tool to begin this coordination and will provide the FRMAC Director with the means to most effectively incorporate the FRMAC into the response structure. One important doctrine of this plan is that the FRMAC will remain intact as an organizational unit to ensure that monitoring priorities are accomplished; however, the FRMAC incorporation into the ICS will remain flexible and will be tailored to suit the specific incident.

In the event a FRMAC is established, two assumptions can be made:

- The incident will be a multi-agency/multi-jurisdictional response; therefore, the ICS Command function will be managed by a UC.
- The radiation aspect of the incident will only be one component of the overall response.

As a Coordinating or Cooperating Agency, DOE expects to be part of IC/UC. DOE will be a member of UC based on:

- How the response operations impact DOE's Area of Responsibility.
- The fact that DOE is charged with commanding, coordinating, and managing a major aspect of the incident response (FRMAC).

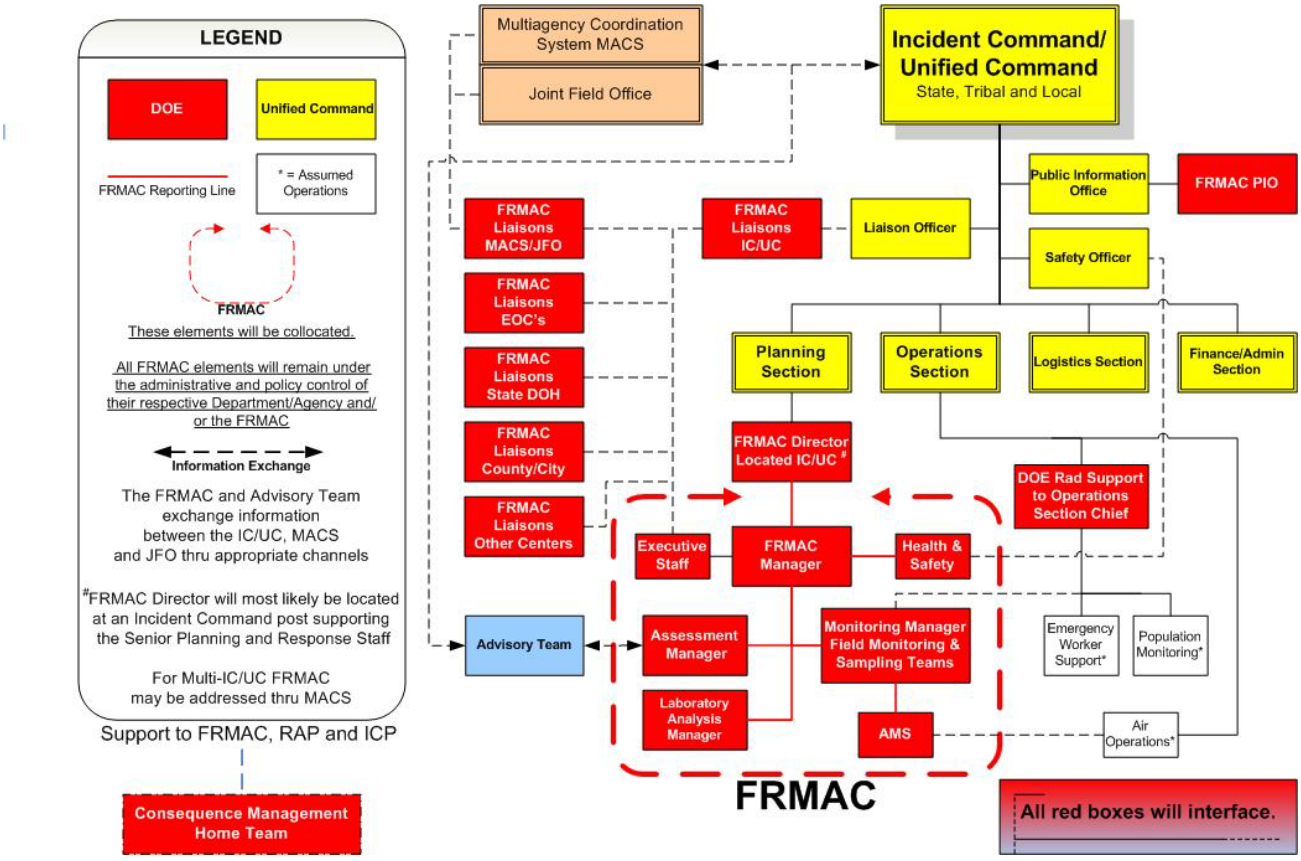

FIGURE 6. FRMAC NIMS IMPLEMENTATION PLAN FOR SINGLE EVENT

The primary purpose of the FRMAC is to provide the Incident Command (IC) structure with a common operating picture of the radiation conditions for planning incident response activities. For this reason DOE has chosen to establish the FRMAC as a single, clearly identifiable federal field structure serving in the Planning Section of ICS. This makes its function, location, and identity immediately obvious to all emergency responders. Field structures within the NRF are designed to implement specific lanes of responsibility and provide compact coordination of independent but functionally analogous components. Examples of federal field structures include the JIC and Joint Operations Center (JOC). As such, this organizational placement is consistent with proven and accepted ICS principles. Although the FRMAC will be incorporated into the Planning Section, some components have strong links to certain ICS components. For example, Monitoring and AMS have strong links to the Operations Section. Most notably, the FRMAC Director may serve as a Deputy Planning Section Chief (DPSC) overseeing all of the FRMAC mission areas. Although the FRMAC may be physically separated from the Planning Section, the DPSC for FRMAC will be located at the Unified Command Post with the Planning Section Chief.

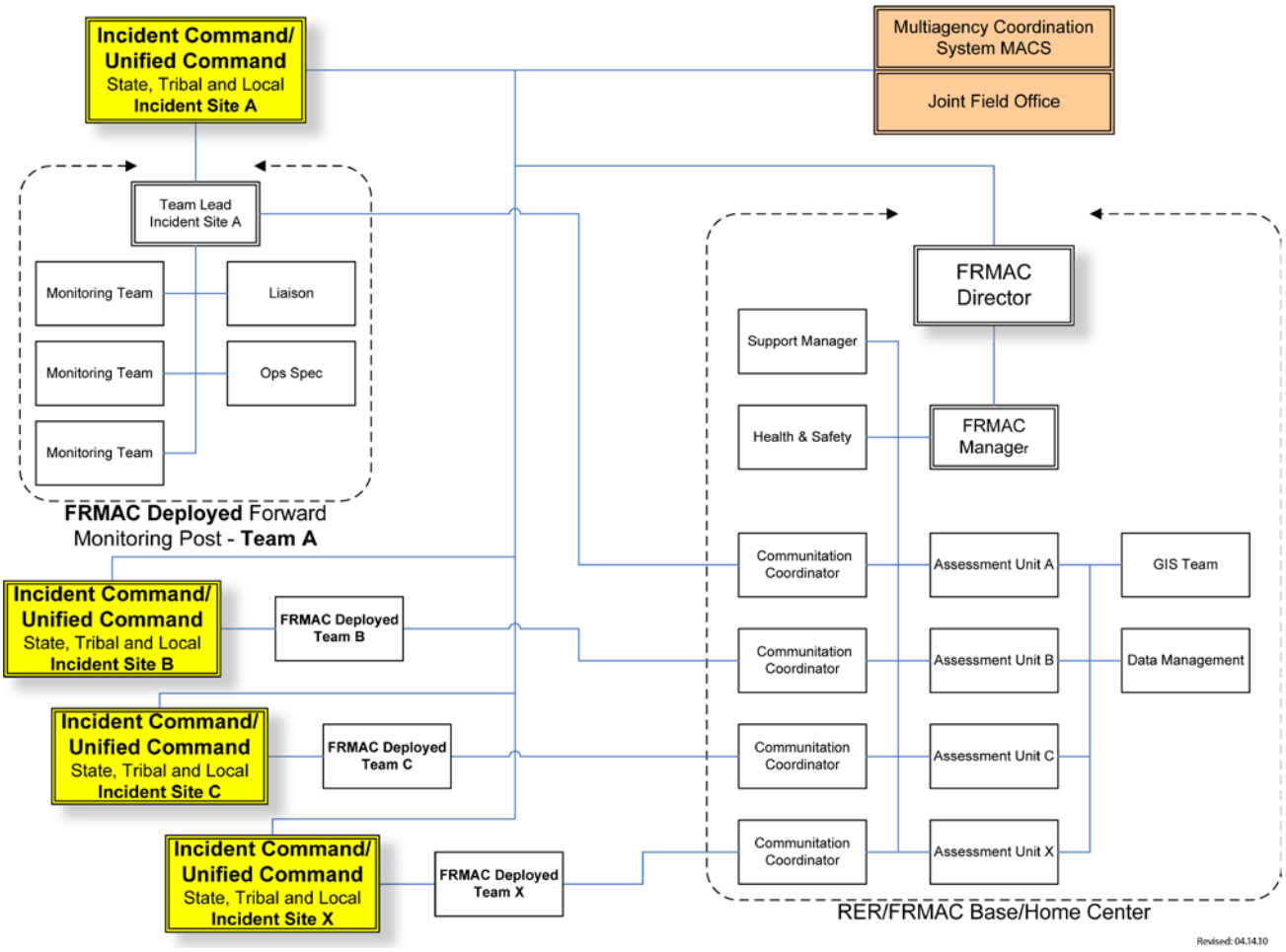

FIGURE 7. FRMAC CONFIGURATION FOR MULTIPLE INCIDENT COMMANDS

Critical FRMAC personnel (e.g., DPSC) will participate in all appropriate planning meetings under the NIMS planning cycle. The DPSC for FRMAC is the primary link between a Command and FRMAC, and will serve as the principal point-of-contact for tasking FRMAC. The DPSC for FRMAC will be supported by the FRMAC Manager, who will be physically located with the FRMAC. The FRMAC Manager will govern activities internal to the FRMAC. In particular, they have the responsibility to ensure that the FRMAC is integrated with the other components of the IMT, specifically in the Planning Section; ensure that the Monitoring Plan is consistent with the Incident Action Plan priorities; and monitor the various FRMAC functions to ensure they are providing timely and accurate information to the Situation, Resources, Documentation, Environmental, and Demobilization Units.

When a FRMAC is requested in support of a response, it is recommended that the UC designate a Deputy Operations Section Chief (DOSC) for Radiological Response. This position ensures that all field-level radiological activities (emergency worker support, radiological monitoring, population monitoring, etc.) are coordinated and supported. The DOSC could be responsible for the deployment of FRMAC monitoring teams, although the monitoring teams will be tasked directly by the FRMAC Monitoring Manager. The person filling the role of the DOSC for Radiological Response should be from the agency with the greatest scope of radiological responsibility.

The FRMAC Monitoring Manager will work closely with the DOSC for Radiological Response (if established), DPSC for FRMAC, and the FRMAC Manager to ensure that FRMAC radiological field activities are coordinated with the overall incident response to ensure safety and security of personnel. This position will also coordinate the planned movement of AMS aircraft with the Air Operations Branch Director to ensure that AMS operations are conducted with full knowledge of other air assignments. The FRMAC Monitoring Manager will be physically located with the FRMAC.

4.3 FRMAC Organization

The FRMAC Organization Chart (Figure 8) shows the basic and most common operational configuration during a major radiological emergency. However, this chart may be scaled for smaller radiological deployments. A description of key FRMAC positions and functions is given in Appendix K.

Figure 8 also shows participation by the Coordinating Agency and the state, tribal, and local governments that are the customers of the FRMAC. They play a major role in setting overall FRMAC priorities and activities. Their representatives are the link to the FRMAC Manager and staff. They are responsible for delivering requests from their organizations to the Director and staff for FRMAC radiological products and services. Technical representatives from these organizations are located at key positions in the FRMAC to help implement their organizations' requirements and priorities. Liaisons representing other agencies are always requested to participate at the FRMAC management location.

4.4 Field Operation

Requests for information are received at the FRMAC from the Coordinating Agency, liaisons at other agencies, and the state, tribal, and local governments, and from other federal agencies through the Coordinating Agency. These requests will be prioritized and transmitted to the appropriate FRMAC supervisor. Field monitoring teams or others will collect the requested data. The data will be reviewed by the appropriate staff, and the results will be evaluated, processed, and reported in the desired format. The data are provided, as soon as possible, simultaneously to the Coordinating Agency and state, tribal and local government representatives.

The FRMAC coordinates off-site federal monitoring efforts and provides the following information without request and as needed:

- Plume and deposition predictions, as appropriate.
- Air and ground concentrations.
- Deposition patterns of isotopic concentrations, exposure rates, and dose projection
- Isotopic concentrations in environmental media.
- Assurance of data quality.
- Results of radiological data collection, analysis, and evaluation.

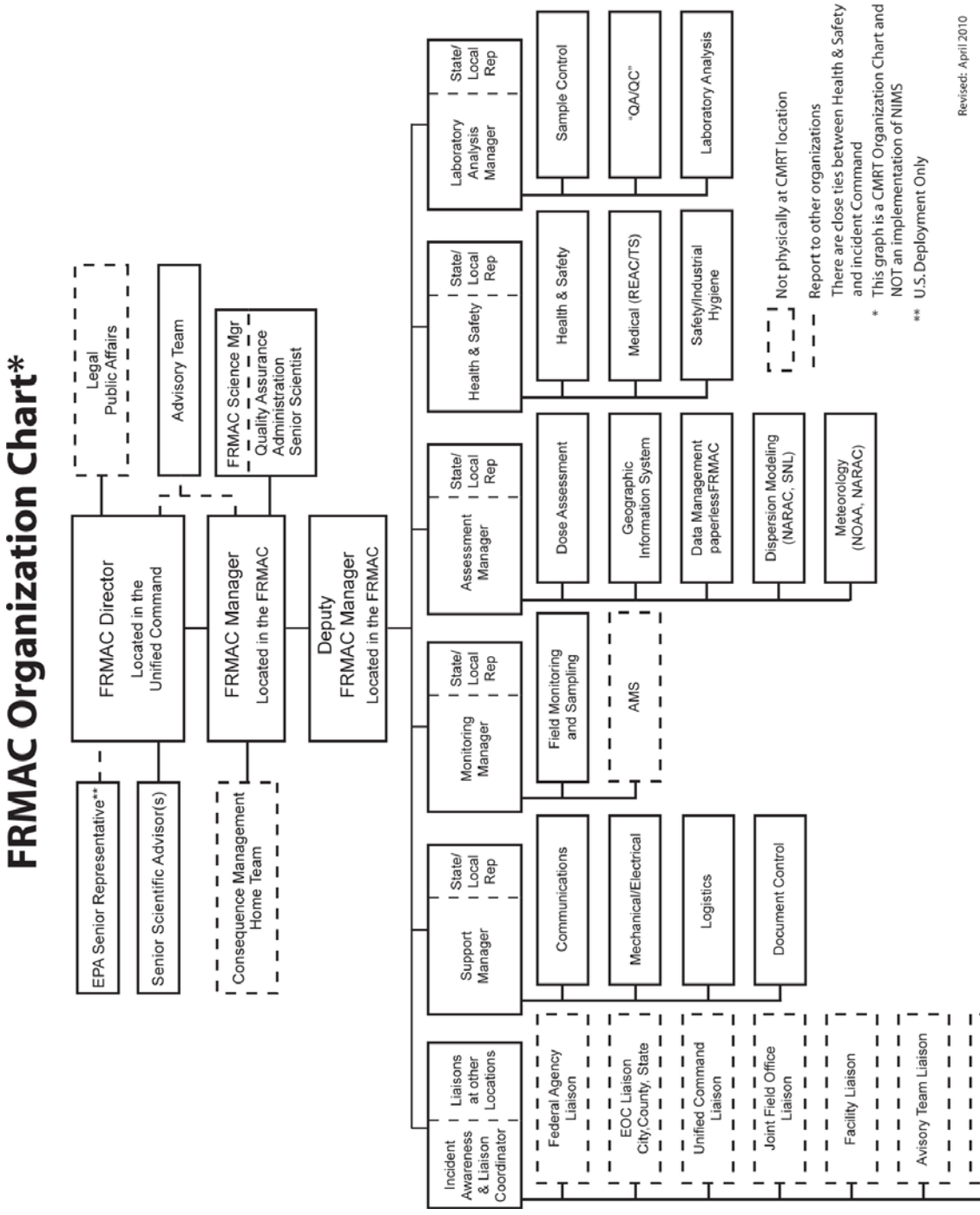

FIGURE 8. FRMAC ORGANIZATIONAL CHART

- Evaluations, assessments, and interpretation of radiological data, as applicable.
- Technical assistance to the Coordinating Agency; the Advisory Team; and state, tribal, and local government decision-making officials, as requested.
- Meteorological reports and weather forecasts.

The eFRMAC database (RAMS) also contains the documentation to provide assurance of data quality and provides retrievable data of radiological contamination (see Appendix E).

When the emergency phase is concluded, the source of radioactivity is determined to be stable, the environment has been evaluated, and the participating federal agencies have agreed to continue providing appropriate resources, DOE/NNSA will transfer the FRMAC management to the EPA at a mutually agreeable time as referenced in the EPA Transfer Guidance Document. Details on the transfer process are discussed in Appendix J of this manual.

4.5 Setting FRMAC Priorities

FRMAC reports monitoring data and assessments to the Coordinating Agency, the Advisory Team, and the state, tribal, and local governments. In turn, the Coordinating Agency and state, tribal, and local governments use this information to determine if new or additional protective actions are necessary. The highest priority for FRMAC activities is protecting public health and safety. Therefore, setting priorities for radiological monitoring and assessment activities will be dictated by the needs of the Coordinating Agency and state, tribal, and local governments. There will be times, particularly in the early stages of a response, when the need for information and assistance may exceed FRMAC's resources. Priorities must then be established. The process for setting FRMAC priorities when priorities exceed resources is described throughout Section 4.

4.5.1 FRMAC Action Requests

As the need for FRMAC services arise, the Coordinating Agency and the state and/or tribal and local representatives to the FRMAC submit their requests to the FRMAC using the FRMAC Action Request Form (Figure 9) or through the ICS Incident Action Plan (IAP). Examples of requests might include monitoring data from a specific location or projected dose estimates of the inside and outside areas of a specific building for one year. As requests are received, the FRMAC Director; the FRMAC Manager; the Coordinating Agency; and state, tribal, and local government representatives review the new requests, the status of previous requests, and the status of current activities to determine and establish the new priorities for all requests. Additionally, FRMAC liaisons located within the FRMAC and established at other locations submit their requests to the FRMAC using the Action Request Form.

FRMAC Action Requests are entered, tracked, and maintained in the Radiological and Assessment Monitoring System (RAMS) Database. The system allows users to enter, retrieve, and view the status of Action Requests as hard copy reports. FRMAC Action Requests may also be used within FRMAC to document requested changes or actions from FRMAC staff, including inter-agency liaisons, especially those actions that require approval or authorization and need to be distributed to multiple working groups within FRMAC and/or to FRMAC liaisons.

FRMAC Action Request

Reference No. _____

Reported By:

Organization _____

Name _____

Priority _____

1. Emergency
2. Urgent
3. Routine

Authorization _____

Nature of Request (usually handwritten)

DO NOT WRITE BELOW THIS LINE – FOR FRMAC USE ONLY

FRMAC Response Action Groups(s)

Organization _____

Name _____

Priority _____

1. Emergency
2. Urgent
3. Routine

Authorization _____

REPLY/RESOLUTION

Distribution

For Tracking Use Only

Received By _____

Date/Time _____

FIGURE 9. FRMAC ACTION REQUEST

4.5.2 Setting Overall Priorities

Relevant FRMAC personnel (e.g., DPSC) will participate in all appropriate planning meetings under the NIMS planning cycle. As the need arises, the FRMAC Director will call meetings to review current and future priorities. The overall priorities will be determined by UC including the FRMAC Director, FRMAC Manager, Coordinating Agency representative(s), and state, tribal, and local government representative(s). This group will consider the overall FRMAC activities and responsibilities as well as the immediate needs of the Coordinating Agency and the state, tribal, and local governments to protect the public. The group will also decide, on a continuing basis, the overall priorities of the activities. However, implementing and managing FRMAC resources will be determined by the Senior Energy Official (SEO) and FRMAC Director/Manager. The group may, as needed, obtain input from the Senior Scientific Advisor (SSA), the Assessment Manager, the Monitoring and Sampling Manager, the Laboratory Analysis Manager, or others collocated with the FRMAC including the Advisory Team. This group will meet if the requests exceed FRMAC resources. Otherwise, the FRMAC Manager and the Operations staff will handle the requests.

It is understood that the FRMAC has overall responsibility for monitoring and assessing the off-site radiological situation without being specifically requested by the Coordinating Agency or the state, tribal, or local governments.

4.5.3 Implementation Plan for Priorities

Once overall FRMAC priorities have been established, the FRMAC Manager will meet with appropriate division managers to draft the details for implementing priorities and determining impacts on current FRMAC operations. The primary division managers will be the Assessment Manager, the Monitoring and Sampling Manager, the Laboratory Analysis Manager, the Health and Safety Manager, Liaisons, and all DOE and interagency Support Managers. If the impact on the FRMAC is large, the SSA may also be involved. If priorities involve support functions or the health and safety of FRMAC personnel, respective division managers would also be involved. This implementation plan would also contain a time line.

4.5.4 Technical Data Flow and Priorities

The FRMAC's highest priority is to provide monitoring data and assessment results to the Coordinating Agency and state, tribal, and local government authorities. In the event that a release of radioactivity impacts a large area, the monitoring process will require a significant amount of time to acquire the data. Additional time will also be needed to assess the extent and magnitude of the impact. The goal is to replace the early model-based data used to project initial protective actions with actual monitoring results. A complete discussion of the type of dose assessment products that will become available to decision makers, the time line of when these products will be available, and the data management quality assurance/quality control (QA/QC) process may be found in the FRMAC Assessment Manual.

- Initial monitoring will focus on protecting the public and determining the magnitude, direction, and extent of released radioactivity. Aerial surveys, which will be augmented by ground monitoring, will be utilized for these purposes. These first results are then used to direct a more detailed monitoring effort with inhabited areas receiving first priority unless otherwise directed by the Coordinating Agency and state, tribal, and local governments.

Finally, the monitoring will be continued until all of the surrounding contaminated area is evaluated and impacts assessed.

Figure 10 details the internal information flow of all FRMAC radiological data. Provisions will be made in the information flow to promptly report any radiological monitoring results that represent an immediate threat to public health. All raw data coming into the FRMAC from teams not using the eFRMAC telemetry system, such as state teams, will be entered into the eFRMAC data management system either electronically, if possible or by hand. Information received via the eFRMAC telemetry system enters into the system directly. The eFRMAC data management system is called the Radiological Assessment Monitoring System (RAMS). RAMS allows users within the FRMAC to review and process the data electronically. Finished products are distributed through the CMweb. For more information on eFRMAC, CMweb, and RAMS (see Appendix E).

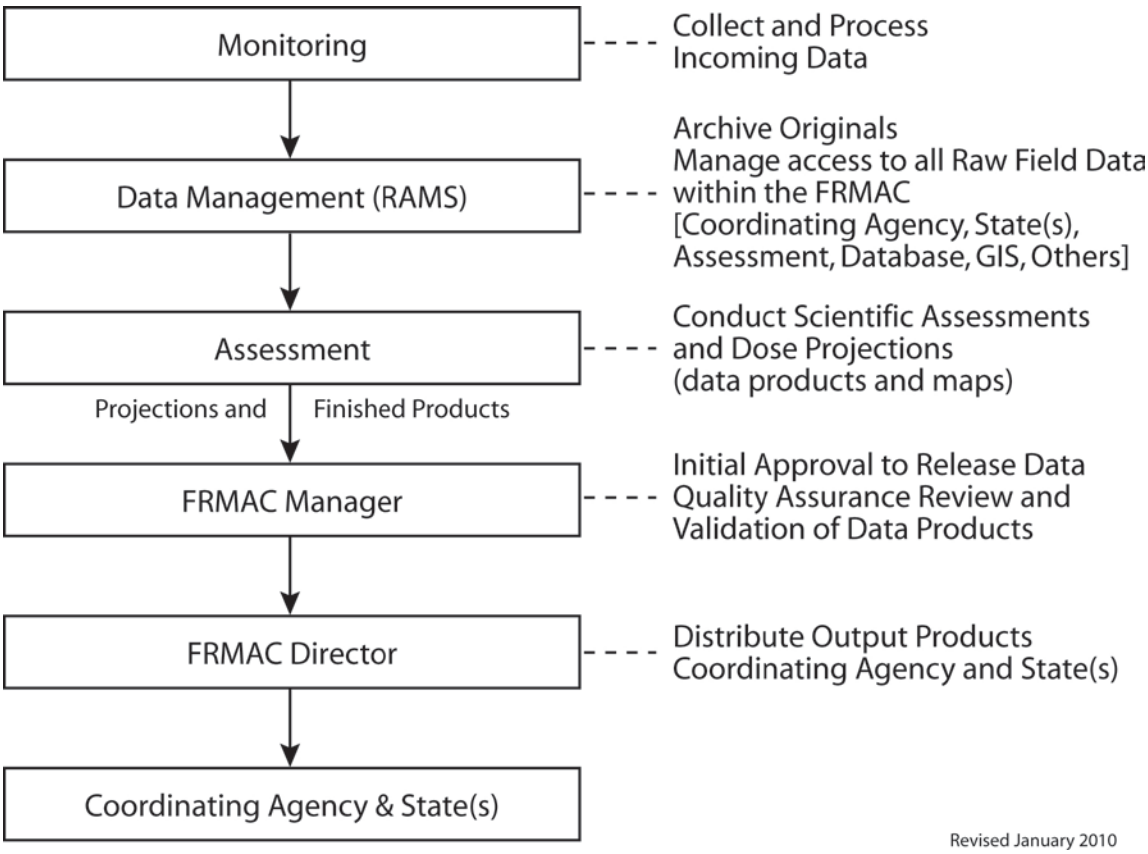

FIGURE* 10. *FRMAC RADIOLOGICAL DATA INFORMATION FLOW

Processed, evaluated, and summarized data from the Assessment Group are approved by the FRMAC Director for external distribution. These evaluated technical data are distributed formally to the appropriate Coordinating Agency unit within the ICS—typically the Planning Section and also to state, tribal, local authorities, and interested participants within the FRMAC facility. Internal use finished products are distributed through the CMweb, unless otherwise requested by the Coordinating Agency. In some circumstances, the Coordinating Agency may ask to review FRMAC assessments prior to distribution to the state, tribal or local governments. This review by the Coordinating Agency will ensure that the assessments performed by the Coordinating Agency and FRMAC are consistent and assumptions used for the specific source term and release are accurate.

4.6 Interfacing Organizations

4.6.1 U.S. Department of Homeland Security (DHS)

The National Response Framework (NRF) established the National Operations Center (NOC) at DHS headquarters to integrate and provide overall steady-state threat monitoring and situational awareness for domestic incident management on a 24/7 basis. DHS and other federal agencies listed in the NRF provide representatives at the NOC watch.

The Interagency Modeling and Atmospheric Assessment Center (IMAAC) is operated by NARAC and is responsible for the production, coordination, and dissemination of the federal consequence predictions for an airborne hazardous material release. Through a partnership of the DHS, DOE, DoD, Commerce (through the National Oceanic and Atmospheric Administration [NOAA]), EPA, NASA, and the NRC, the IMAAC provides the single federal atmospheric prediction of hazardous material concentration to all levels of the Incident Command (IC). The IMAAC is an off-site resource that supports the incident response remotely.

DHS, Coordinating Agencies, and the authorized IMAAC requestors (as designated in the IMAAC Standard Operating Procedures) may request IMAAC activation directly from the IMAAC or from the NOC Watch at 202.282.8101. The NOC Watch ensures that federal agencies are notified when the IMAAC has been activated for the purpose of generating the single, interagency-coordinated federal prediction of atmospheric dispersions and their consequences.

When DHS coordinates the overall federal response, the IMAAC generates the single, interagency-coordinated federal prediction of atmospheric dispersions and their consequences. The IMAAC predictions are used for risk management decisions, public information, and operational response. The IMAAC may also generate predictions for other incidents requiring federal coordination. Plume models are initially generated using default assumptions and then are refined over time as actual data from on-scene responders become available.

4.6.2 Coordinating Agency

The FRMAC Director will initiate discussions with the Coordinating Agency staff as soon as technical assistance is requested. These discussions will address the conditions and status of the emergency and possible off-site consequences. Once the FRMAC is established, the Coordinating Agency will provide appropriate status updates to the FRMAC through a Coordinating Agency

representative located at the FRMAC. The representative will be the primary channel for transmitting the Coordinating Agency's off-site radiological monitoring and assessment requirements to the FRMAC and the distribution of the FRMAC's assessed data to the Coordinating Agency.

4.6.3 State, Tribal, and Local Agencies

To facilitate the requests from the state, tribal, or local governments to the FRMAC and the flow of assessed data from the FRMAC back to the state, tribal, or local governments, liaison personnel representing these groups are exchanged. In addition, state, tribal, and local government advisors are invited to incorporate into the FRMAC Director's senior staff as well as the Monitoring, Assessment, Health and Safety, Laboratory Analysis, and Support groups. Because of their local and professional knowledge, advisors provide valuable assistance in the efficient and optimal operation of the FRMAC in meeting the requirements of the state, tribal, and local governments. (The Laboratory Analysis Function is described in Appendix F.)

4.6.4 U.S. Environmental Protection Agency (EPA)

The EPA will be notified if a FRMAC has been requested to respond to a radiological emergency. The EPA provides a senior representative to the FRMAC to ensure that data collected and recorded in the data center provide the necessary information for long-term re-entry and recovery considerations and can be used as a basis for developing a long-term monitoring plan. During the emergency (early phase) of a radiological incident, EPA provides several resources to the FRMAC as follows:

- Airborne Spectral Photometric Environmental Collection Technology (ASPECT) – an airborne platform with an emergency response sensor package. It provides first responders – emergency workers on scene – with information on possible radiological and chemical releases.
- RadNet, formerly Environmental Radiation Ambient Monitoring System (ERAMS) – a national network of monitoring stations that regularly collect air, precipitation, drinking water, and milk samples for analysis of radioactivity. The RadNet network has been used to track environmental releases resulting from nuclear emergencies and to provide baseline data during routine conditions. Data generated from RadNet's predecessor, ERAMS, provides the information base for making decisions necessary to ensure the protection of public health.
- Mobile Environmental Radiation Laboratory (MERL) – a team of experienced specialists that utilizes emergency response radiation detection/monitoring instruments, isotope identifiers, and specialized equipment including large trucks, vehicles, and support equipment especially developed for MERL.

Once the emergency is stabilized and at an agreeable time, the EPA Senior Representative in the FRMAC will assume management of the FRMAC from DOE/NNSA and will ensure provisions are made for continuing to incorporate external data sets into the FRMAC database, such as data from the RadNet and ASPECT systems and for transferring DOE FRMAC data into the EPA Scribe database. See Section 5 for additional information on the transfer of FRMAC management from DOE to EPA.

4.6.5 Advisory Team for Environment, Food, and Health (Advisory Team)

The Advisory Team for Environment, Food, and Health (Advisory Team) develops coordinated advice and recommendations on environmental, food, health, and animal health matters for the IC/UC, DHS, the JFO Unified Coordination Group, the Coordinating Agency, and state, tribal, and local governments. The team includes representatives from EPA, the U.S. Department of Agriculture (USDA), the FDA, the Centers for Disease Control and Prevention (CDC), and other federal agencies, as warranted by the incident. The Advisory Team uses information provided by the IMAAC, FRMAC, and other relevant sources to develop advice on issues related to:

- Environmental assessments (field monitoring) required for developing recommendations.
- Protective Action Guides (PAGs) and their applications.
- PARs using data and assessment from the FRMAC.
- Protective actions to prevent or minimize contamination of milk, food, and water and to prevent or minimize exposure through ingestion.
- Recommendations for minimizing losses of agricultural resources from radiation effects.
- Availability of food, animal feed, and water supply inspection programs to ensure wholesomeness.
- Recommendations for recovery, return, and cleanup issues.
- Relocation, reentry, and other radiation protection measures prior to recovery.
- The disposal of contaminated livestock.
- Health and safety advice/information for the public and for workers.
- Estimate effects of radioactive releases on human health and environment.
- Other matters as requested by the IC or Coordinating Agency.

The Advisory Team for Environment, Food, and Health (Advisory Team) can be notified as follows:

- DHS, Coordinating Agencies, and state, tribal, local governments may request support from the Advisory Team by contacting the CDC Director's Emergency Operations Center at 770.488.7100.
- DOE will request activation of the Advisory Team whenever the FRMAC is activated.

A "remote" Advisory Team will be operational via a phone bridge within two hours of initial notification. The Advisory Team will establish contact with the CMHT to obtain information about the incident along with data products being generated. The CMHT will be invited to join the Advisory Team phone bridge, and the Advisory Team will participate on the CMHT phone bridge.

If deployed, the Advisory Team is expected to incorporate into the Planning Section to provide technical expertise to the IC/UC and the Coordinating Agency. The Advisory Team may also provide liaisons to and/or coordinate with the JFO and state, tribal, and local government EOCs as needed. Therefore, the Advisory Team may be in several locations at any one time, including being co-located with the FRMAC. It has no independent authority and will not release information or make recommendations to the public unless authorized to do so by the Coordinating Agency.

4.6.6 Other Agencies

As needed and as requested by the Coordinating Agency, other signatory agencies to the NRF are provided space and support to integrate their activities into the FRMAC operations. Many agencies provide key professionals in technical areas of importance to the FRMAC. Included are specialists in food crops, milk production, water supplies, and critical industries. As full participants in the FRMAC, these agencies become part of the radiological monitoring and assessment technical teams to ensure that their areas of concern are addressed. These federal agencies may include the EPA, NRC, DoD, USDA, HHS, NOAA, and others as needed. The responsible facility operator may also be represented at the FRMAC to provide updates on facility status.

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5.0 TRANSFER OF FRMAC MANAGEMENT FROM DOE/NNSA TO EPA

5.1 Introduction

The NRF states that DOE/NNSA will transfer responsibility for managing the FRMAC to EPA at a mutually agreeable time after consulting with the Coordinating Agency, the IC, and state, tribal, and local governments. This section discusses the processes and conditions by which this transfer will take place. Appendix J contains a copy of the EPA transfer guidance document and provides additional details.

5.2 Transfer Requirements

The DOE/NNSA FRMAC Director will work closely with the EPA Senior Representative to facilitate a smooth transfer of the federal radiological monitoring and assessment coordination responsibility to EPA at a mutually agreeable time and after consultation with their respective headquarters offices, the Coordinating Agency, the IC, and the state, tribal, and local governments. Although it is difficult to specify in advance when the transfer of this coordination responsibility would occur, certain conditions are intended to be met prior to this transfer. These conditions include:

- The immediate emergency condition is stabilized.
- Off-site release of radioactive material has ceased, and there is little or no potential for further unintentional off-site releases.
- The off-site radiological conditions have been evaluated, and the immediate consequences have been assessed.
- An initial long-range monitoring plan has been developed in conjunction with the affected state, tribal, and local governments and appropriate federal agencies.
- The EPA has received adequate assurances from the other federal agencies that they are committing the required resources, personnel, and funds for the duration of the federal response.
- After these conditions are met and a formal document is signed, the EPA will assume the federal agency responsibility for coordinating the intermediate and long-term off-site radiological monitoring, sampling, and assessment activities. When this occurs, DOE and other federal agencies will continue to commit the equipment, personnel, and funds for the duration of the federal response effort as necessary.[6]

After transfer, the EPA FRMAC Director will work with whatever cleanup group (Site Restoration Working Group, Decontamination Committee, IC/UC, Technical and Stakeholder Working Groups, etc.) is in charge of the overall cleanup. The FRMAC will continue to provide monitoring data for cleanups as well as re-assessing problem areas.

In time, the EPA-led FRMAC will scale down into a smaller EPA and EPA-contractor entity. This will include relocating out of the original FRMAC location and establishing whatever near-site facility is necessary to accomplish the radiological monitoring mission.

[6] *Nuclear / Radiological Incident Annex June 2008, National Response Framework January 2008*

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APPENDIX A
RESPONSIBILITIES OF COORDINATING AND COOPERATING AGENCIES

The following descriptions are summaries of the response missions and capabilities and resources of the signatory agencies. A full discussion can be found in the *Nuclear/Radiological Incident Annex (June 2008)* to the *National Response Framework (January 2008).*

Agency	Description
U.S. Department of Defense (DoD)	As indicated in the body of this manual, DoD is the Coordinating Agency for federal actions related to radiological incidents involving: nuclear weapons in DoD custody; DoD facilities, including U.S. nuclear-powered ships; or material otherwise under DoD jurisdiction (e.g., transportation of material shipped by or for DoD). Under the Comprehensive Environment Response Compensation and Liability Act (CERCLA), Executive Order 12580, and the National Contingency Plan (NCP), DoD is responsible for hazardous substance responses to releases on or from DoD facilities or vessels under the jurisdiction, custody, or control of DoD, including transportation-related incidents. For responses under these circumstances, DoD provides a Federal On-Scene Commander responsible for taking all CERCLA response actions, which includes on-site and off-site response actions (40 CFR 300.120(c) and 40 CFR 300.175(b)(4)). For incidents where the incident is on, or where the sole source of the nuclear/radiological release is from, any facility or vessel under DoD jurisdiction, custody, or control, DoD is responsible for: • Mitigating the consequences of an incident. • Providing notification and appropriate protective action recommendations to state, tribal, and/or local government officials. • Minimizing the radiological hazard to the public. For radiological incidents involving a nuclear weapon, special nuclear material, and/or classified components that are in DoD custody, DoD may establish a National Defense Area (NDA). DoD will coordinate with state and local officials to ensure appropriate public health and safety actions are taken outside the NDA. DoD will lead the overall response to safeguard national security information and/or restricted data or equipment and material. DoD may also include lands normally not under DoD control as part of the established NDA for the duration of the incident. DoD coordinates the federal response for incidents involving the release of nuclear/radioactive materials from DoD space vehicles or joint space vehicles with significant DoD involvement. A joint venture is an activity in which the U.S. government has provided extensive design/financial input; has provided and maintains ownership of instruments, spacecraft, or the launch vehicle; or is intimately involved in mission operations. A joint venture with a foreign nation is not created by simply selling or supplying material to a foreign country for use in its spacecraft. In the event that DHS assumes overall management of the federal response under HSPD-5 to an accidental or inadvertent incident involving DoD facilities or materials, DoD will support DHS under the NRF and the National Incident Management System (NIMS), including acting as the Coordinating Agency for this annex. DoD will manage the response within the boundaries of the DoD facility or NDA.

U.S. Department of Energy (DOE)	As indicated in the body of this manual, DOE is the coordinating agency for the federal response to a nuclear/radiological release at a DOE facility or involving DOE materials (e.g., during the use, storage, and shipment of a variety of radioactive materials; the shipment of spent reactor fuel; the production, assembly, and shipment of nuclear weapons and special nuclear materials; the production and shipment of radioactive sources for space ventures; and the storage and shipment of radioactive and mixed waste). Under CERCLA, Executive Order 12580, and the National Contingency Plan (NCP), DOE is responsible for hazardous substance responses to releases on or from DOE facilities or vessels under the jurisdiction, custody, or control of DOE, including transportation-related incidents. For responses under these circumstances, DOE provides a Federal OSC responsible for taking all CERCLA response actions, which includes on-site and off-site response actions (40 CFR 300.120(c) and 40 CFR 300.175(b)(5)). For incidents at nuclear/radiological facilities that it owns or operates, or incidents involving transportation of DOE nuclear/radiological materials, DOE is responsible for: • Mitigating the consequences of an incident. • Providing notification and appropriate protective action recommendations to state, tribal, and/or local government officials. • Minimizing the radiological hazard to the public. For radiological incidents involving a nuclear weapon, special nuclear material, and/or classified components that are in DOE custody, DOE may establish a National Security Area (NSA). DOE will coordinate with state and local officials to ensure that appropriate public health and safety actions are taken outside the NSA. DOE will lead the overall response to safeguard national security information and/or restricted data, or equipment and material. DOE may also include lands normally not under DOE control as part of the established NSA for the duration of the incident. DOE Accident Response Group (ARG) teams will deploy to mitigate the consequences of a nuclear weapon accident in conjunction with specialized assets from DoD, regardless of whether DOE or DoD has custody of the weapon or special nuclear material. In the event that DHS assumes overall management of the Federal response under HSPD-5 to an accidental or inadvertent incident involving DOE facilities or materials, DOE will support DHS under the NRF and NIMS, including acting as the Coordinating Agency for this annex. DOE will manage the response within the boundaries of the DOE facility or NSA.
U.S. Department of Homeland Security (DHS)	The DHS Secretary is the principal federal official for domestic incident management. Domestic incident management includes preventing, preparing for, responding to, and recovering from terrorist attacks (except for those law enforcement coordination activities assigned to the Attorney General and generally delegated to the Director of the FBI), major disasters, or other emergencies. For deliberate attacks, DHS assumes its domestic incident management responsibilities under HSPD-5, paragraph 4, and is also the Coordinating Agency for implementing the activities in this annex with respect to deliberate attacks. Under the Homeland Security Act, DHS has control of the Nuclear Incident Response Team (NIRT). DHS/Customs and Border Patrol (CBP) coordinates the federal response for incidents involving the inadvertent import of radioactive material. For incidents at the border, DHS/CBP maintains radiation detection equipment and nonintrusive inspection technology at ports of entry and Border Patrol checkpoints to detect the presence of radiological substances transported by persons, cargo, mail, or conveyance arriving from foreign countries.

DHS/U.S. Coast Guard (USCG)	As indicated in the body of this manual, DHS/USCG is the Coordinating Agency for the federal response to incidents involving the release of nuclear/radioactive materials that occur in certain areas of the coastal zone, including: • Release from transportation incidents involving the release of nuclear/radioactive materials that are not licensed or owned by a federal agency or Agreement State. • Incidents involving space vehicles not managed by DoD or NASA that impact certain areas of the coastal zone. • Incidents involving foreign or unknown sources of radioactive material. "Certain areas" of the coastal zone, for the purposes of this document, means the following areas of the coastal zone ("coastal zone" as defined by the NCP): • Vessels, as defined in 33 CFR 160. • Areas seaward of the shoreline to the outer edge of the Economic Exclusion Zone. • Within the boundaries of the following waterfront facilities subject to the jurisdiction of DHS/USCG: those regulated by 33 CFR 126 (Dangerous cargo handling), 127 (LPG/LNG), 128 (Passenger terminals), 140 (Outer continental shelf activities), 154–156 (Waterfront portions of oil and hazmat bulk transfer facilities – delineated as per the NCP), 105 (Maritime security – facilities). For incidents that have cross-boundary impacts, there will be only one On-Scene Commander (OSC) during the course of a response incident, and the agencies involved should reference the NCP [40 CFR 300.140(b)] to determine which agency will assume the lead. DHS/USCG will give prime consideration to the area vulnerable to the greatest threat in determining whether to transition to another Coordinating Agency. DHS/USCG coordinates the agency response for these incidents during the prevention and emergency response phase and transfers responsibility for later response phases to the appropriate agency.
Environmental Protection Agency (EPA)	As indicated in the body of this manual, EPA is the Coordinating Agency for the federal environmental response to incidents that occur at facilities not licensed, owned, or operated by a federal agency or an Agreement State, or currently or formerly licensed facilities for which the owner/operator is not financially viable or is otherwise unable to respond. EPA is also the Coordinating Agency for the federal environmental response to incidents involving the release of nuclear/radioactive materials that occur in the inland zone and in areas of the coastal zone not addressed by DHS/USCG, including: • Transportation incidents involving the release of nuclear/radioactive materials that are not licensed or owned by a federal agency or Agreement State. • Incidents involving space vehicles not managed by DoD or NASA or addressed by DHS/USCG. • Incidents involving foreign, unknown, or unlicensed radiological sources that have actual, potential, or perceived radiological consequences in the United States or its territories, possessions, or territorial waters, and that are not addressed by DHS/CBP or DHS/USCG. When acting as the Coordinating Agency, EPA coordinates the federal environmental response. For a DHS-led federal response, EPA will generally provide response coordination support to DHS through this annex and ESF #10 – Oil and Hazardous Materials Response. For an EPA-led federal response, EPA will generally respond under the NCP (which is an operational supplement to the NRF). For some incidents, EPA may also rely upon its Public Health Service Act authorities.

National Aeronautics and Space Administration (NASA)	As indicated in the body of this manual, NASA is the Coordinating Agency for the federal response to incidents involving the release of nuclear/radioactive materials from NASA space vehicles or joint space vehicles with significant NASA involvement. For radiological incidents involving nuclear material in NASA custody, NASA may establish a National Security Area (NSA), and will coordinate with state and local officials to ensure appropriate public health and safety actions are taken outside the NSA. In the event that DHS assumes overall management of the federal response under HSPD-5 to an accidental or inadvertent incident involving NASA space vehicles, NASA will support DHS under the NRF and NIMS, including acting as the Coordinating Agency for this annex. NASA will manage the response within the boundaries of the NSA.
Nuclear Regulatory Commission (NRC)	As indicated in the body of this manual, the NRC is the Coordinating Agency for incidents at or caused by a facility or an activity that is licensed by the NRC or an Agreement State. These facilities include, but are not limited to, commercial nuclear power plants, fuel cycle facilities, DOE-owned gaseous diffusion facilities operating under NRC regulatory oversight, independent spent fuel storage installations, radiopharmaceutical manufacturers, and research reactors. The NRC licensee primarily is responsible for taking action to mitigate the consequences of an incident and providing appropriate protective action recommendations to state, local, and/or tribal government officials. The NRC: • Performs an independent assessment of the incident and potential off-site consequences and, as appropriate, provides recommendations concerning any protective measures. • Performs oversight of the licensee, to include monitoring, evaluation of protective action recommendations, advice, assistance, and, as appropriate, direction. • Dispatches, if appropriate, an NRC site team of technical experts to the licensee's facility. Under certain extraordinary situations involving public health/safety or national defense/security, the NRC may order the transfer of special nuclear materials and/or the operation of certain facilities regulated by the NRC. The NRC closely coordinates its actions with state and local government officials during an incident by providing advice, guidance, and support as needed. In the event that DHS assumes overall management of the federal response under HSPD-5 to an accidental or inadvertent incident involving an NRC-regulated facility, the NRC will support DHS under the NRF and NIMS, including acting as the Coordinating Agency for this annex.

APPENDIX B
ATMOSPHERIC DISPERSION MODELING

B.1 National Atmospheric Release Advisory Center (NARAC)

The following two standard emergency (early) phase map products are produced by the National Atmospheric Release Advisory Center (NARAC) at Lawrence Livermore National Laboratory (LLNL) for radiological incidents:

- **Four-day Total Effective Dose Equivalent (TEDE) plotted in roentgen equivalent man (rem).** TEDE includes doses from inhalation and cloud shine from cloud passage, four days of ground shine, plus four days of inhalation of resuspended material. Contour areas on maps are given for the U.S. Environmental Protection Agency (EPA) Protective Action Guide (PAG) dose levels.
- **Total deposition plotted in microCuries per square meter.** Total deposition is the amount of material deposited on the ground from both wet processes (precipitation scavenging) and dry processes (gravitational and deposition).

Standard Intermediate and Late phase products include:

- The first-year dose includes the TEDE from one year of ground shine plus the Committed Effective Dose Equivalent (CEDE) from inhalation of resuspended material over one year.
- Ground contamination levels of concern from the food ingestion pathways based on U.S. Food and Drug Administration (FDA) Derived Intervention Levels for specific nuclides.
- Total Deposition.

Each of these products represents effects from the sum of all nuclides released as well as their daughter products. In addition to standard products, organizations can request other products such as air concentration, dose rate, components of the TEDE, or deposition for specific times, nuclides, contour values, or sources (see Figure B-1).

NARAC mapped products aid in:

- Assessing the downwind areas of airborne and ground contamination and corresponding dose.
- Guiding the deployment of field teams to monitor and sample the affected area.
- Planning for aircraft (Aerial Measuring System) surveys.
- Developing protective action decisions.

NARAC products may be requested and received electronically through the password-controlled CMweb site (described in Appendix E) by authorized users. These tools allow multiple organizations to simultaneously view results. Alternatively, products can be e-mailed or faxed to specific users. NARAC contours are routinely delivered electronically to the Federal Radiological Monitoring and Assessment Center (FRMAC) Geographic Information System (GIS) for inclusion as a layer on large-scale mapped products.

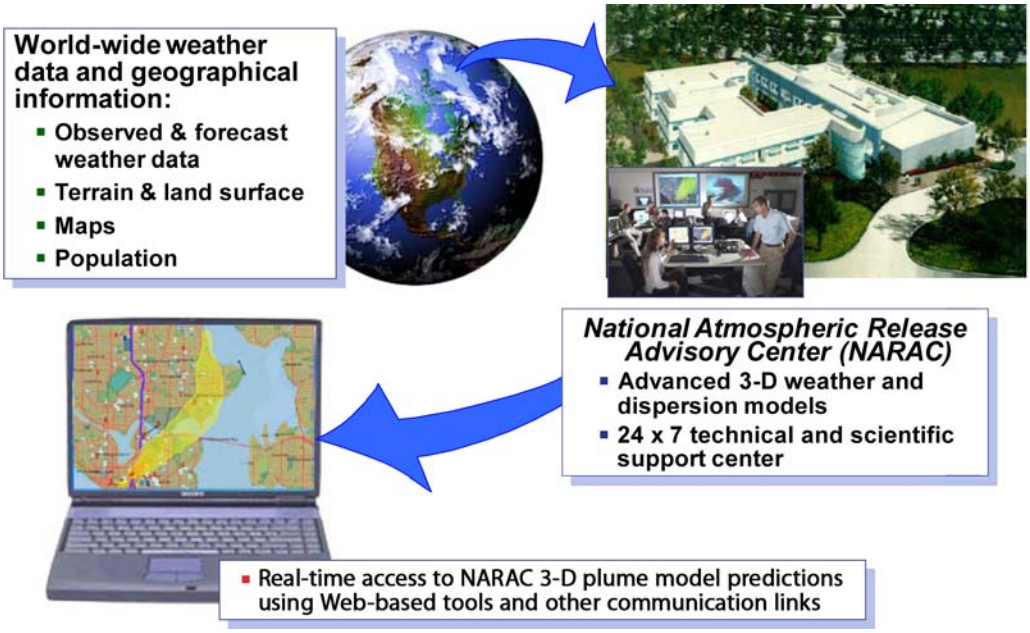


FIGURE B-1. NARAC MODELING SERVICES AND TOOLS

For users with direct electronic connections, initial default NARAC products can be automatically received typically 5–10 minutes after the completed request is received. After initial plots are distributed, NARAC meteorologists will modify the source characteristics to match the set of ground and/or aerial survey measurements collected at and distributed from the FRMAC. It typically takes 30–90 minutes for NARAC to prepare inputs, run models, quality assure calculations, and deliver refined plots based on more detailed information or measurement data. For further information see https://narac.llnl.gov.

NARAC and Sandia National Laboratories' (SNL) High Consequence Assessment and Technology Department have each developed unique and complementary consequence assessment tools that have recently been integrated into a unified tool set.

B.2 Sandia Hazard Assessment Response Capability (SHARC)

SHARC has been developed by Sandia National Laboratories as a modeling and simulation software tool to be used during radiological emergencies. This modeling software called SHARC is capable of simulating the conventional explosive dispersal of radiological material as well as the fallout from a nuclear explosion. It is compatible with NARAC, but is adapted to be useful on a field-deployed computer, in particular for use by DOE members of the Joint Technical Operations Teams.

Conventional explosive dispersal of radiological material can be simulated in either an unmitigated mode, mitigated mode, or simultaneously in both modes. Nuclear dispersal of radioactive material can be simulated to occur a few days in the past to a few days in the future. These dispersal simulations can be created simultaneously. This capability allows for the simulation of a range of

possible yields and effects. This feature can be used to help bound the effect that could result from the detonation of a nuclear device.

SHARC has the capability of simulating the prompt effects of both conventional and nuclear detonations. Conventional effects simulated include overpressure versus range, radius of various injuries (e.g., eardrum rupture) on people, and safe distance from the blast. Nuclear effects simulated include light and heavy damage to various types of structures, deaths, major and minor injury due to the prompt radiation, thermal radiation, and overpressure. Human effects calculations take into account the population distribution among structure types and the protection afforded by the structure.

SHARC also contains a fully-integrated GIS viewer and consequence report generator. These capabilities allow SHARC to display contours of dispersed radiation, and other effects, on top of maps that display location features (roads, cities, hospitals, etc.) of interest, and then consequences of the simulation. SHARC is a stand-alone, self-contained software, capable of simulating a dispersal of radioactive material, producing maps of effect, and generating a report on those effects without the need for support software or a connection to the Internet.

SHARC provides a puff-Gaussian Monte Carlo atmospheric dispersion modeling software that can be operated on a laptop computer. Typical simulation times take five minutes from entry of inputs to report production. The software is intentionally designed to operate as stand-alone software on a laptop or desktop computer while still providing rapid dispersion models that account for meteorological conditions. SHARC's stand-alone capability is comparable to that of NARAC's LODI code, although it lacks the complex meteorological inputs of that model. Future versions of SHARC will provide the option to run the LODI code from the SHARC interface.

SHARC performs intricate atmospheric dispersion calculations that can account for the impacts to the plume caused by atmospheric dynamics. Due to the stand-alone design of SHARC, Internet communications and the higher performance computers needed for the more detailed LLNL NARAC model calculations are not required. SHARC is designed to fill the gap between the LLNL HotSpot and NARAC models by providing more sophistication than HotSpot provides, while still remaining as stand-alone software capable of running on a laptop or desktop computer. Work is underway to make NARAC and SHARC cross-compatible so that one or both software codes can be used depending on the nature of the emergency. SHARC is also integrated with the SNL-developed Turbo FRMAC software. The Turbo FRMAC software is designed to assist in the assessment portion of an event to allow emergency planners to make determinations on the radiological deposition and dose to individuals at given locations. This direct integration with the Turbo FRMAC health physics engine ensures that all calculated consequences in SHARC are based on official federal guidance approved by the FRMAC.

B.3 HotSpot Plume Model and Health Physics Codes for PC

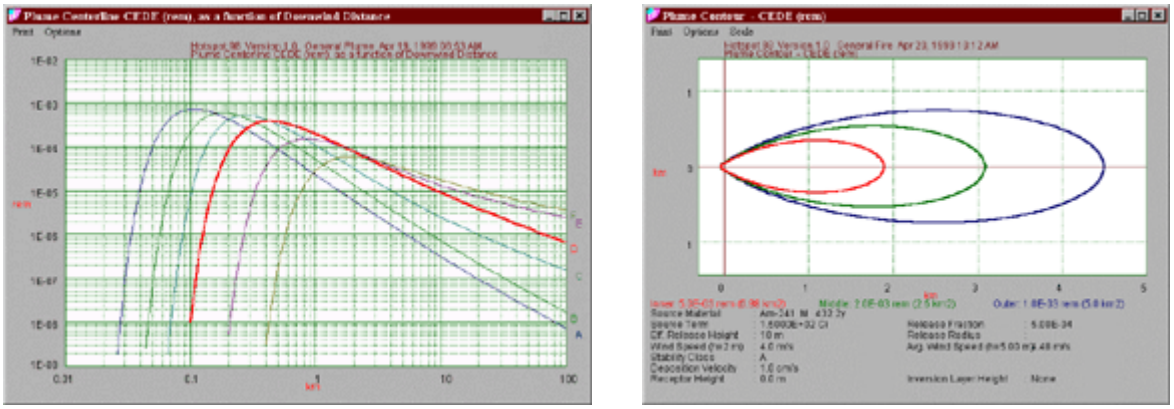
HotSpot is a PC-based plume modeling and Health Physics software tool that can produce simple, rapid, initial plume model predictions on a desktop or laptop PC. The HotSpot software is maintained by DOE by LLNL/NARAC.

The HotSpot Health Physics codes were created to provide emergency response personnel and emergency planners with a fast, field-portable set of software tools for evaluating incidents involving radioactive material. The software is also used for safety-analysis of facilities handling nuclear material. HotSpot provides a fast and usually conservative means for estimating the radiation effects associated with the short-term (less than 24 hours) atmospheric release of radioactive materials. The HotSpot codes have been developed for the Windows 95/98/00/NT/XP operating systems. Users requiring more sophisticated modeling capabilities (complex terrain, multi-location real-time wind field data, etc.) are directed to other Department of Energy's NARAC capabilities and computer codes.

The radionuclide library in HotSpot incorporates Federal Guidance Reports 11, 12, and 13 (FGR-11, FGR-12, FGR-13) Dose Conversion Factors (DCFs) for inhalation, submersion, and ground shine. FGR-12 DCF values are used for submersion and ground shine. In addition to the inhalation 50-year CEDE DCFs, acute (1, 4, 30 days) DCFs are available for estimating deterministic effects. This acute mode can be used for estimating the immediate radiological impact associated with high acute radiation doses (applicable target organs are the lung, small intestine wall, and red bone marrow).

Tables and graphical output (see examples in Figure B-2) can be directed to the computer screen, printer, or a disk file. The graphical output consists of dose and ground contamination as a function of plume centerline downwind distance, and radiation dose and ground contamination contours. Users have the option of displaying scenario text on the plots. Radiation dose and ground contamination contours can also be saved as mapping files for display on geographical maps.

Additional information, and a downloadable version of the HotSpot software, can be obtained from https://www-gs.llnl.gov/hotspot.



Downwind Plume Centerline Plot (Stability A-F) **Plume Contour Plot**

FIGURE B-2. EXAMPLE OUTPUT FROM THE HOTSPOT PLUME MODEL

APPENDIX C
AERIAL MEASURING SYSTEM (AMS)

C.1 Introduction

The Aerial Measuring System (AMS) is a key element of the U.S. Department of Energy, National Nuclear Security Administration Nevada Site Office (NNSA/NSO) response to a large radiological incident. Large areas can be surveyed quickly to assist the Coordinating Agency and the state(s), tribal, or local governments in determining the impact of the emergency. The AMS assets, which are operated and maintained by the NNSA/NSO Remote Sensing Laboratory (RSL), are located at Nellis Air Force Base (AFB) in Las Vegas, Nevada, and at Andrews AFB near Washington, D.C. The Region 3 RAP team has additional aerial on-call response assets.

C.2 Activation

Before deployment of AMS assets, authorization for their release must be approved by U.S. Department of Energy Headquarters (DOE/NNSA/HQ). This authorization is initiated by a request for assistance from the Coordinating Agency, the state(s), tribal, or local governments through the Department of Homeland Security (DHS), or from other DOE Emergency Response Groups to the DOE/HQ Emergency Operations Center. Until the Federal Radiological Monitoring and Assessment Center (FRMAC) arrives on scene, the Radiological Assistance Program (RAP) Team Leader at the scene, in coordination with the Consequence Management Home Team (CMHT), will contact and coordinate the AMS flights with the Coordinating Agency, state(s), tribal, and local authorities at the scene.

C.3 Capabilities

AMS-equipped, fixed-wing aircraft are instrument rated and capable of all-weather operation. Fixed-wing aircraft operate at altitudes as low as 152 meters (500 feet) above ground level and as high as the aircraft's operational ceiling, which is approximately 16,700 meters (35,000 feet) mean sea level. Dependent upon flight conditions, the fixed-wing aircraft's optimum flying time is 5 hours.

Standard instrumentation includes:

- Three sodium iodide detectors (one 2″ × 4″× 16″; one 2″× 4″× 4″; and one 1″× 1″ × 1″)
- Survey meters for crew dose monitoring and contamination surveys
- Recording equipment
- Radar altitude
- An Autonomous Global Positioning System (GPS) unit
- Direct readout hardware
- Data analysis equipment
- Data telemetry equipment

The data are stored on hard disk for detailed analysis upon landing. The AMS mission scientist can provide initial analysis of the data to the monitoring manager and assessment scientists if telemetry of the data has not been successful during the mission. Currently, telemetry is not transmitted from the helicopter due to the volume of data. The data are transmitted to the FRMAC after the mission is complete. A mission scientist and data analyst on board the helicopter prepare the data for the FRMAC.

AMS-equipped helicopters operate only under Federal Aviation Administration (FAA) visual flight rules and will not be deployed during poor weather conditions. Helicopters operate at altitudes as low as 15 meters (50 feet) above ground level, but their actual operational altitudes will be dictated by flight safety concerns and the radionuclides of concern and their deposited concentrations. Dependent upon flight conditions, the helicopter's optimum flying time is 2–3 hours. Standard instrumentation includes twelve 2″ × 4″ × 16″ sodium iodide thallium-activated (NaI[*Tl*]) detectors, data formatting and recording equipment, radar altitude and differential GPS position tracking equipment, direct readout hardware, and data analysis equipment. The data are partially analyzed on board and are stored on hard disk for detailed analysis upon landing.

C.4 Missions

An initial AMS flight can be made by one fixed-wing aircraft to rapidly, but coarsely, map the residual fallout pattern and intensity of contaminated debris or material that may have been deposited after passage of the radioactive air mass or cloud. The AMS-equipped aircraft will fly a serpentine pattern (Figure C-1) of flight lines that will include survey lines upwind and around the release point and the entire downwind-contaminated footprint, if possible. During the flight, cursory radiological data such as peak exposure rates will be sent by satellite telemetry to the AMS data receiving station for processing, review, and submittal to the CMweb. The initial ground deposition survey flight will normally be limited to daylight hours. However, nighttime flights will be considered on a case-by-case basis. Mission deliverables are:

- Color-coded plot map of inferred exposure rate (exposure rate footprint) along serpentine flight path
- Meteorological conditions measured at multiple altitudes over the release area

The initial AMS radiological data results and the meteorology data are submitted to NARAC for refinement of their emergency phase map products. These detailed surveys are likely to provide important assessment information through all phases of the response.

After the initial broad survey, detailed radiological surveys will be performed to measure and map the extent of the residual fallout deposition, determine the average surface area exposure rate, and identify the specific radionuclides responsible for the contamination and their relative intensities. These detailed surveys are likely to provide important assessment information through all phases of the response.

Normally, to perform an aerial radiological survey of an area, the AMS-equipped aircraft must fly a series of parallel flight lines at as low an altitude and ground speed as can be safely achieved (Figure C-2).

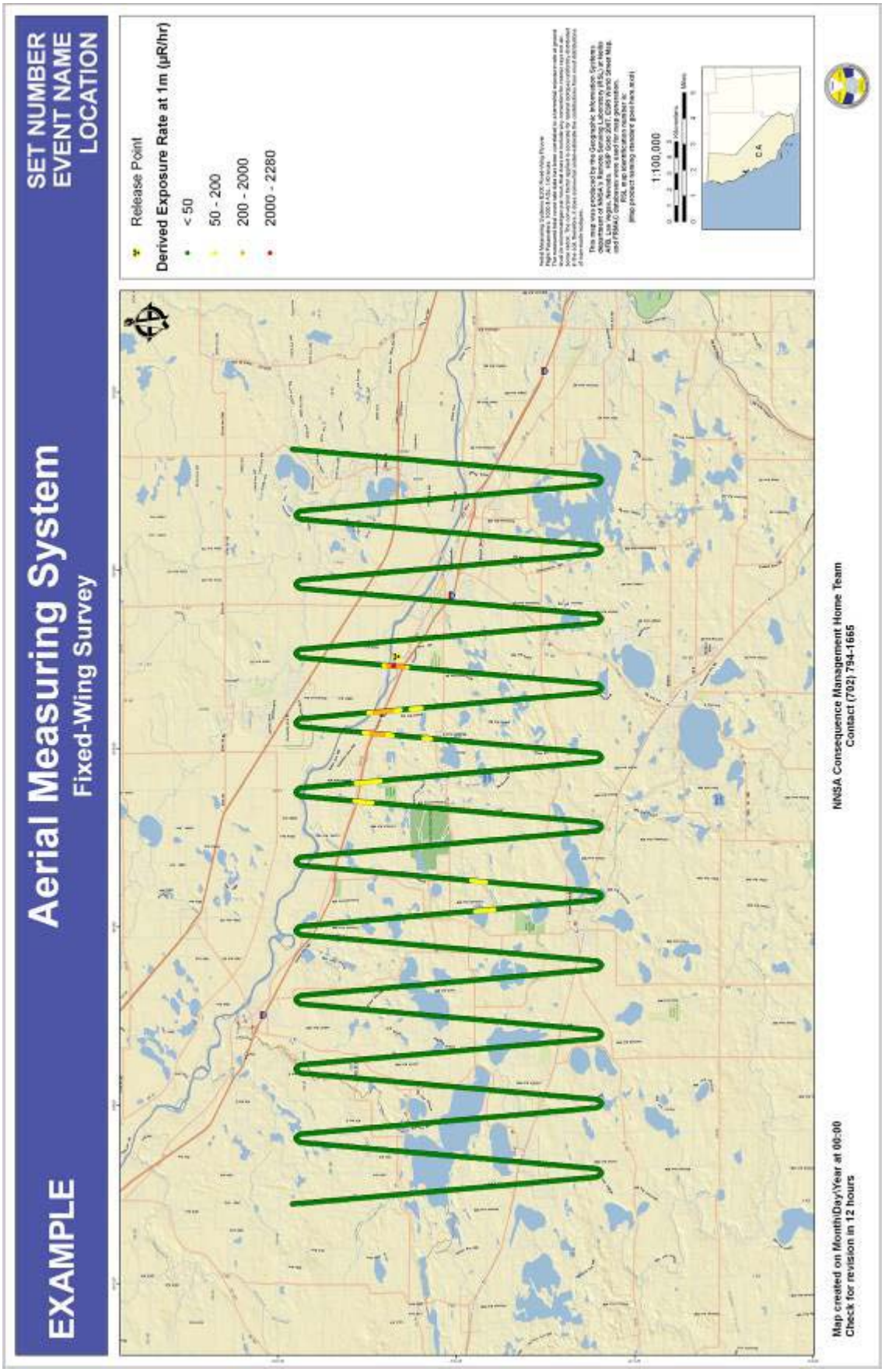


FIGURE C-1. SERPENTINE FLIGHT PATTERNS (EXPOSURE RATES)

AMS fixed wing serpentine flight. Colors of data points indicate the magnitude of the exposure rate at ground level.

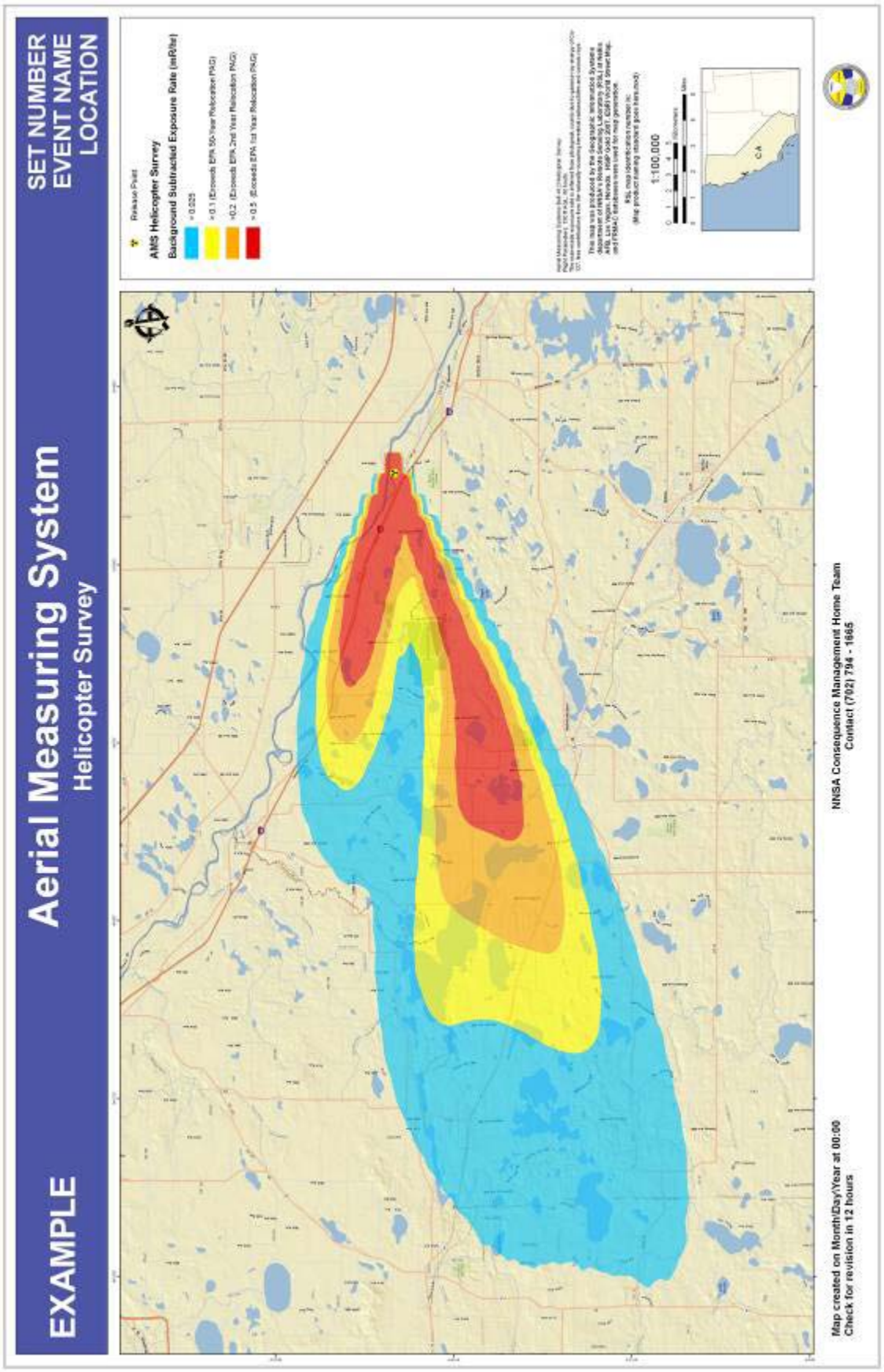


FIGURE C-2. AMS HELICOPTER SURVEY

AMS helicopter map. The contours indicate the ground level exposure rates.

For the fixed-wing system, the nominal survey altitude is 305 meters (1,000 feet) above ground level with a flight line spacing of approximately 500 meters (1,600 feet) at a ground speed of 72 meters per second (140 knots). For the helicopter system, the nominal survey altitude is 46 meters (150 feet) above ground level with a flight line spacing of 92 meters (300 feet) at a ground speed of 36 meters per second (70 knots). The preferred aerial platform for performing a detailed aerial survey is the helicopter because of its larger-volume NaI[*T*l] detector array, lower flying altitude, and greater spatial resolution.

A map produced from helicopter data provides much more detailed information for decision makers. The higher sensitivity and line spacing used for radiological mapping surveys allows the data to be contoured in the units (counts, exposure rate, man-made) necessary for comparison to long-term guidance levels. An example is provided in Figure C-2.

Flying at an altitude of 46 meters (150 feet) will provide a ground-monitoring window (field of view) of approximately 92 meters (300 feet) in width. In this manner, the helicopter can map the ground deposition at a rate of about 10 square kilometers per hour (4 square miles per hour). The radiological survey flights are normally limited to daylight hours. However, nighttime flights will be considered on a case-by-case basis (see Figure C-3).

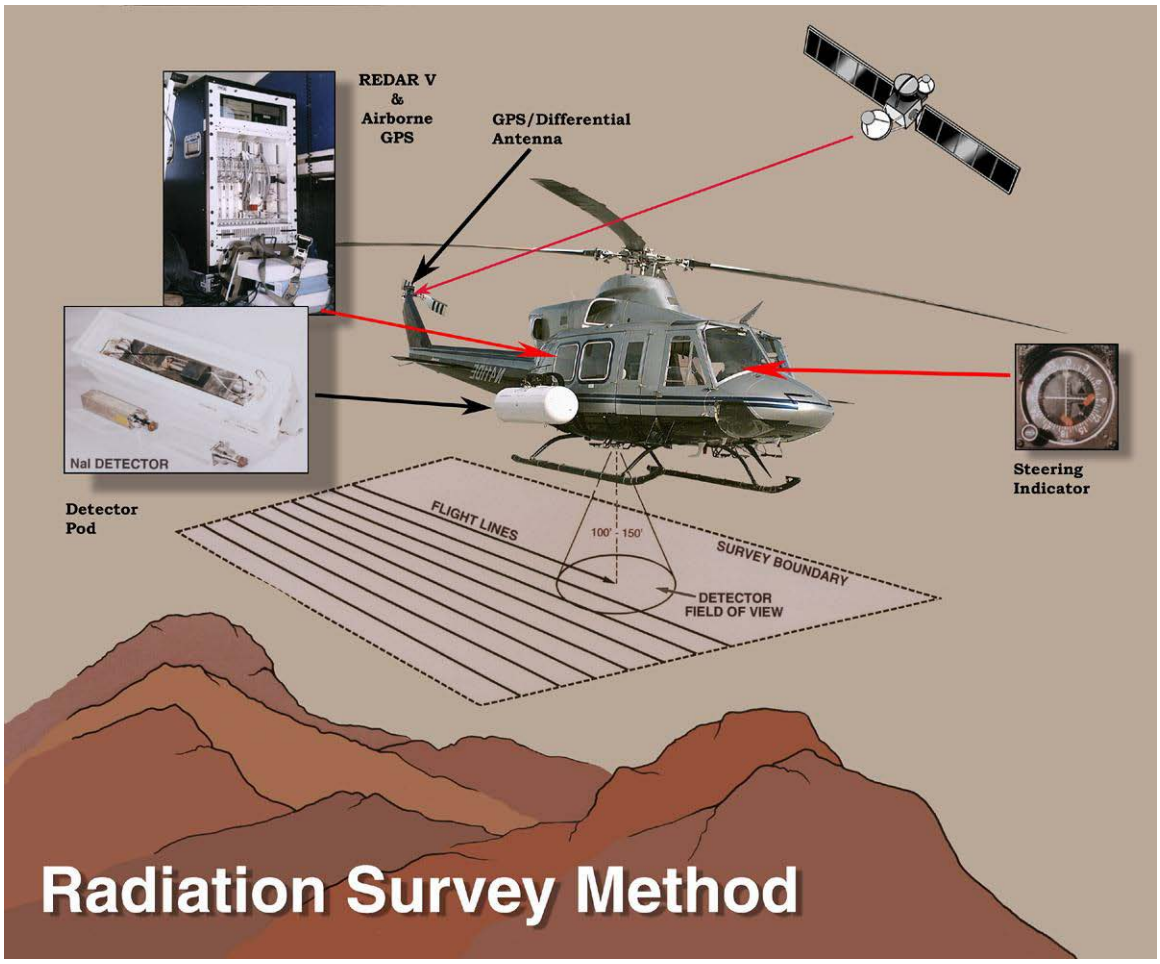


FIGURE C-3. TYPICAL AERIAL RADIOLOGICAL SURVEY SETUP

After each survey flight, detailed data analysis is performed with the computer analysis equipment on site. The data processing time required to complete each set of flight data is approximately 1–3 hours. Completed survey deliverables are:

- Contour map of inferred exposure rate at one meter above ground level
- Contour map(s) of specific isotope surface area activity
- Identification and magnitude of dominant isotopes (gamma energy spectra)

C.5 Aerial Radiological Survey Sensitivities

The minimum detectable activity limits of the AMS aerial platforms for a typical radiological survey are shown in Table C-1. Sensitivity values are given for typical isotopes in units of microcuries per square meter ($\mu Ci/m^2$), assumed to be surface deposition with no mixture in the soil. Detection sensitivities will vary, depending upon altitudes flown, line spacing, deposition variability, and analysis processing.

Table C-1. AMS Minimum Detectable Activities

Radionuclide	Photopeak Energy (kiloelectron Volts [keV])	Surface Area Deposition[a] ($\mu Ci/m^2$)	
		Fixed-Wing Aircraft[b]	Helicopter[c]
Americium-241 (^{241}Am)	60 keV	430	0.2
Cesium-137 (^{137}Cs)	662 keV	2.0	0.05
Cobalt-60 (^{60}Co)	1,173–1,333 keV	0.3	0.02
Iodine-131 (^{131}I)	365 keV	4.0	0.06

[a] Minimum detectable activity (MDA) value is the three-sigma value due to the counting statistics in the spectral energy window of the photo peak of interest.

[b.] Fixed-wing systems are equipped with one 2-inch by 4-inch by 16-inches NaI(*Tl*) log flown at an altitude of 305 meters (1,000 feet) above ground level, a flight line spacing of 305 meters (1,000 feet), and an average ground speed of 72 meters per second (140 knots). Flying at higher altitudes (e.g., 1,500 feet) will reduce detectability by a factor of 3 or more.

[c.] Helicopter systems are equipped with eight to twelve 2-inch by 4-inch by 16-inch NaI(*Tl*) logs flown at an altitude of 46 meters (150 feet) above ground level, a flight line spacing of 76 meters (250 feet), and an average ground speed of 36 meters per second (70 knots). Processing the data using a 9-second averaging routine can enhance the detectability up to a factor of 3. MDA cited are for eight-log detector array.

C.6 Response Times

One fixed-wing aircraft[7] and one helicopter[8] are stationed at both RSL-Nellis in Las Vegas, Nevada, and RSL-Andrews near Washington, D.C. Flight times from both locations for both types of aircraft are shown in Figure C-4 and Figure C-5.

[7] Twin-engine fixed-wing aircraft are used by the AMS for initial ground deposition and wind sounding measurements.

[8] Twin-engine helicopters are used by the AMS for low-altitude radiation survey detection and monitoring.

For fixed-wing flight times, the concentric circles depict 480 kilometers (300 miles), representing one hour of aircraft flight time. Refueling stops of approximately one-hour duration will generally occur at three-hour intervals.

For helicopter flight times, the concentric circles show 460 kilometers (290 miles), representing 2.25 hours of flight time. Refueling stops of up to one-hour duration will occur at each circle, so the time expended is 3.25 hours for each circle. Maximum daily flight time will not exceed 10 hours for a two-pilot crew. Specific flight routes and times for both types of aircraft will be determined by the pilot-in-command after analysis of weather, aircraft loading, and other pertinent mission information.

C.7 Fixed Base of Operations

The fixed-wing aircraft and helicopter require the use of a fixed base of operations (FBO) facility to conduct aerial survey missions. In most responses, a commercial or military airport will be used for deployment. The FBO facilities will be chosen by the AMS flight crew based on their relative distance from the incident area and the availability of commercial electrical power, aviation fuel, and commercial telephone and Internet services.

For many scenarios, the AMS aircraft will not be located near the FRMAC facility. The mission scientist and Pilot-in-command will receive directions from the FRMAC monitoring manager through commercial telephone, satellite phone systems, or from the CMHT. Most of the AMS data products will be submitted to the FRMAC via the CMHT after they have been transmitted via the aircraft telemetry systems or after post-flight data processing and Internet transmittal from the FBO.

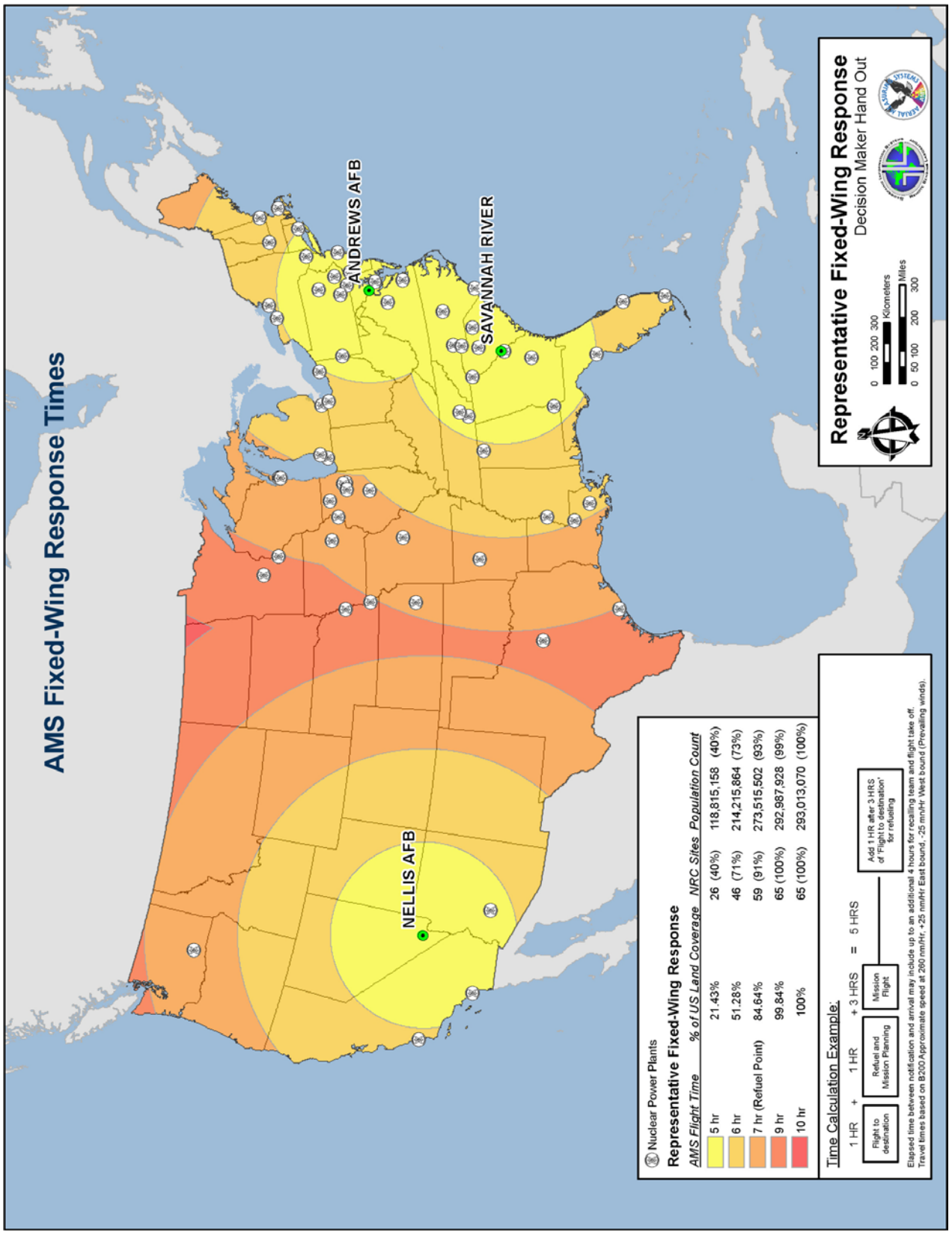


FIGURE C-4. RESPONSE FLIGHT TIMES FOR THE FIXED-WING AIRCRAFT STATIONED AT NELLIS AFB AND ANDREWS AFB.

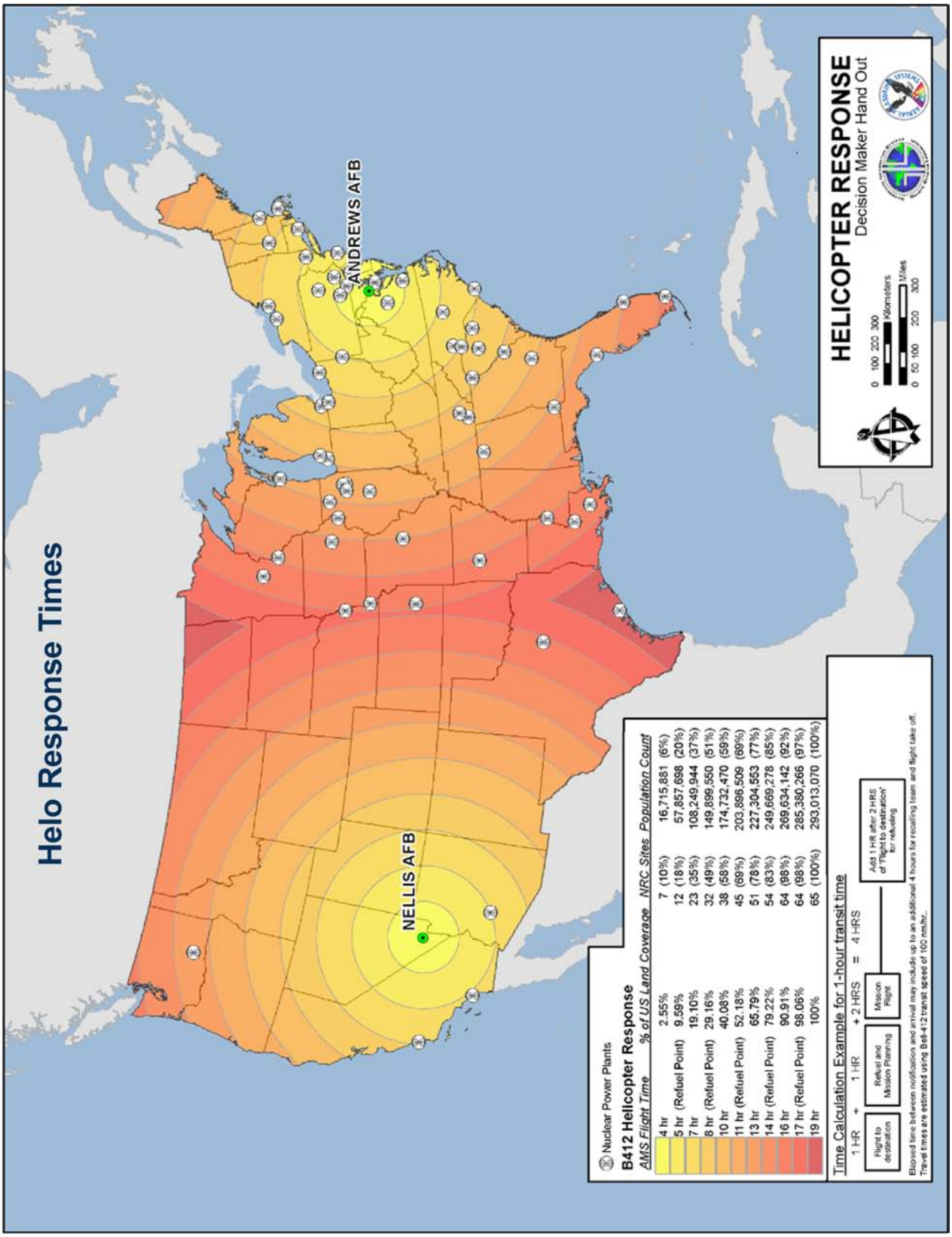


FIGURE C-5. RESPONSE FLIGHT TIMES FOR THE HELICOPTERS STATIONED AT NELLIS AFB AND ANDREWS AFB

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APPENDIX D
FEDERAL RADIOLOGICAL MONITORING AND ASSESSMENT CENTER (FRMAC) DATA PRODUCTS

FRMAC's Data Products are the culmination of FRMAC's contribution to the emergency response. The primary purpose of the FRMAC is to create the Common Operating Picture of the radiological scenario following a major radiological incident. However, the most important aspect of this picture is the interpretation of measurements and models in terms of published federal guidelines. Therefore, FRMAC Data Products fall into three broad classes:

1. Information ready for decision-making.
2. Radiological common operating picture.
3. Data for the technical community.

Most of the FRMAC Data Products are graphics. Most are created to serve a technical audience (Standard Products), while other are designed for briefing a non-technical audience (Briefing Products). The Standard Products are the most well known and have been long established. The Briefing Products are relatively new. In fact, those unique to a nuclear detonation are still in development as of this writing. Examples of both the Standard Products and Briefing Products are provided at the conclusion of this appendix.

Individual components of the FRMAC Data Products depend on the type of radiological incident. A default set of FRMAC Data Products has been defined which covers all events except a nuclear detonation. A special set has been defined to specifically address a nuclear detonation. The default Standard Products are described in some detail below. Such detail is unnecessary for the Briefing Products because they are both self explanatory and very closely tied to their Standard Product counterparts. The default Standard Products and Briefing Products for a nuclear detonation are also outlined below.

FRMAC Data Products are distributed to all users via CMweb. This is an Internet website dedicated to distribution of FRMAC Data Products and other FRMAC-related information. CMweb makes it possible for users to immediately access and download FRMAC Data Products once they are approved. However, access is limited to those who have been identified as qualified recipients. Access to CMweb is described in detail in Appendix E, eFRMAC.

Some of the FRMAC Data Products are unique to FRMAC because they describe radiological monitoring data. However, most of them can also be produced by model predictions made by the National Atmospheric Release Advisory Center (NARAC)/Interagency Modeling and Assessment Center (IMAAC). Often in the early stages of a response to a radiological event, essentially the same modeling products will be published by both FRMAC and NARAC/IMAAC.

D.1 PAG Zone Maps – Information Ready for Decision Making

The key FRMAC Data Products are called Protective Action Guideline (PAG) Zone Maps. These PAG Zone Maps present information ready for decision makers to use to interpret measurements and models in terms of published federal PAGs. These are not protective action recommendations, but the technical basis for actions such as evacuation/sheltering, relocation, and various agricultural controls. These maps delineate the best current estimate of where particular PAGs are exceeded. These maps are produced in two formats. The most familiar is the Standard Products format which is crafted to serve the subject matter experts supporting decision makers. These maps contain technical details important to the proper interpretation and application of the maps. A newer format is the Briefing Products format. This is targeted to briefing key leaders and decision makers who may be non-technical.

A suite of PAG Zone Maps are routinely produced. These maps will be produced even if there is no specific request by the state, tribal, local, or Coordinating Agency. The first set, or first few sets, of these maps will be models predicting the areas in which various protective actions may be warranted. These will be produced by NARAC/IMAAC and Sandia National Laboratories (SNL) in certain cases. As more technical details are learned about the radioactive release, the models will be rerun to improve the reliability of the predictions, and then revised PAG Zone Maps will be issued to reflect these quality improvements. As measurements become available, the models will be periodically adjusted to match the measurements, the PAG Zone Maps will again be reissued to reflect increasing reliability. Eventually, the maps will be based purely upon measurements and offer the greatest level of detail and accuracy. Many re-releases and all maps constructed from measurements will be produced by FRMAC. Therefore, users should expect to see the suite of PAG Zone Maps released repeatedly by either NARAC and/or FRMAC, each release reflecting improved quality.

The basic suite of PAG Zone maps include:

- Evacuation and Sheltering PAG Zone Map
- Relocation PAG Zone Map
- Ingestion PAG Zone Map

A separate, specialized suite is generated for a nuclear explosion.

D.1.1 Evacuation and Sheltering PAG Zone Map (EPA/DHS Early Phase PAG)

The Evacuation and Sheltering PAG Zone Map depicts the area that exceeds (or is predicted to exceed) either the U.S. Environmental Protection Agency (EPA) or U.S. Department of Homeland Security (DHS) Early Phase PAGs. These zones are *not* evacuation or sheltering areas. The areas depicted merely exceed the dose guidelines and additional considerations are necessary to formulate protective action recommendations. The PAGs for evacuation and sheltering are based on the dose that can be avoided by prompt protective action. The early phase PAG is not a dose threshold, but rather a range of dose to provide latitude for dealing with special cases. This PAG Zone Map depicts both the upper and lower value of this range. The dose displayed is that accrued in four days commencing at the time the map is produced. The dose considers both external exposure to radiation, plus the dose from radioactivity taken into the body (primarily inhalation). It is important

to understand that the evacuation/sheltering area shown may change in size or shape as time progresses. An example Evacuation and Sheltering PAG Zone Map is shown in Figure D-1 at the end of Appendix D.

D.1.2 Relocation PAG Zone Map – (EPA/DHS Intermediate Phase PAG)

The Relocation PAG Zone Map depicts the area that exceeds (or is predicted to exceed) either the EPA or DHS Intermediate Phase PAGs. Relocation is not evacuation. Whereas prompt action is required for evacuation and sheltering, less urgency is involved in relocation because the dose considered is long term (annual) rather than short term (4 day). The areas depicted exceed the intermediate phase dose guidelines, but are not themselves the areas to be relocated, because other considerations may enter into the decision. The PAGs for relocation are based on the dose that can be avoided by prohibiting residence in the affected area for protracted periods (possibly years). The calculated dose shown does not consider the benefit derived from any dose reduction measures. The intermediate PAG is a set of thresholds for dose during the first year, second year, and subsequent years. The Relocation PAG Zone Map displays a contour for each. It is important to understand that the relocation area shown may be larger or smaller than the area evacuated and/or sheltered $T_{1/2}$ related. An example Relocation PAG Zone Map is shown in Figure D-2 at the end of Appendix D.

D.1.3 Ingestion PAG Zone Map – (FDA Food PAG)

The Ingestion PAG Zone Map depicts the area in which agricultural products used in food may exceed the U.S. Food and Drug Administration (FDA) PAG for food and warrants detailed investigation. This PAG Zone Map does not delineate where food may or may not be acceptable, unless explicitly stated as doing so. The areas depicted on this map suggest where extensive, time-consuming radiological monitoring and sampling with laboratory analysis will be required to determine acceptability of agricultural products. These areas may also be candidates for numerous mitigation measures. Initially, this PAG Zone Map projects where various agricultural products may exceed the FDA guidelines based on radioactive deposition in the area. A contour will be shown on this PAG Zone Map for each agricultural product considered. Once many agricultural product samples have been analyzed, this map will reflect the results of those laboratory analyses, instead of predictions from local deposition. Only at that point may this map be used to suggest where particular agricultural products may or may not be acceptable. An example Ingestion PAG Zone Map is shown in Figure D-3 at the end of Appendix D.

D.2 Common Operating Picture Maps

FRMAC develops and maintains a common operating picture of the radiological environment, which provides the technical basis for many aspects of the Incident Action Plan and other interventions. This requires operationally oriented information depicting expected working environments, plus information depicting the progress and quality of the measurement campaign. Therefore, two groups of products are added to the PAG Zone Maps to create this common operating picture of the radiological environment. The first group includes maps of current exposure rate (or dose rate if more appropriate) and deposition. The second group includes the Radiological Monitoring and Sampling Status Maps. This is not a fixed set of maps like the PAG Zone Maps; instead these are tailored to the situation and needs of users on scene. They are usually the highly detailed, “E” sized

GIS maps produced by FRMAC, even though some may display NARAC model results. Because these are "living" products that change minute-by-minute, it is always important to assure the most current versions are being used.

D.2.1 Current Exposure/Dose Rate and Deposition Maps

Maps of deposition and exposure/dose rate are important to planners for defining team assignments. They are also important to safety officers to anticipate hazards and plan controls. Generally, a map of exposure rate will suffice. If inhalation is anticipated to be an important dose pathway, then dose rate based on measured or estimated air concentration will be added. A map of deposition may also be produced to help plan measurements and sampling. A Briefing Product addressing emergency worker protection will be prepared, if required. An example of the Ground Exposure Dose Rate Map is shown in Figure D-4 at the end of the appendix.

D.2.2 Radiological Monitoring and Sampling Status Maps

Perhaps the most beneficial map(s) for conveying current status are the Radiological Monitoring and Sampling Status Maps. The Radiological Monitoring and Sampling Status Maps not only convey the progress of the measurement campaign but also a sense of the quality of the various maps being produced by FRMAC. The Radiological Monitoring and Sampling Status Maps are created at least once per operational period. These maps summarize the location and type of all radiological monitoring and sampling data that have been collected up to the current time. The maps do not reflect the level of radiation, concentration, or dose. Because they are issued frequently, they intuitively convey progress, and because they continually grow in density and diversity of measurements, they compellingly convey the reliability of the other maps being issued by FRMAC. For example, initial PAG Zone Maps are based primarily on modeling, so the corresponding Radiological Monitoring and Sampling Status Map would display little or no data. However, as time progresses more measurements are displayed, which reflects the increasing dependence on measurements versus model predictions. The first few maps may roll up all measurements and sampling into one or two maps. These may use complex map icons to convey acquisition of multiple measurement types at a single location. Later, separate maps may be used for each kind of measurement or sample simply because there is too much data to be conveyed on a single map. An example of the Monitoring Status Map is shown in Figure D-5 at the end of the appendix.

D.3 Standard Products vs. Briefing Products

The PAG Zone Maps are made available in two forms: (1) Standard Products and (2) Briefing Products. Standard Products are the most common and long familiar map products produced by NARAC and FRMAC. Standard Products target the technical community serving decision makers and key leaders. These products include technical details that are often important to analysts. Moreover, the Standard Products produced by FRMAC are large "D" and "E" size wall charts that utilize detailed base maps and can present large amounts of data and contours. The examples of PAG Zone Maps discussed above are Standard Products.

Briefing Products are a new additional line of products that supplement the Standard Products. These products are crafted to brief key leaders and decision makers who are not technical. As such, the

Briefing Products use no regulatory or technical jargon, eliminate non-essential details, enumerate key points and are laid out for projection (PowerPoint). Because some users may not have the advice of subject matter experts at hand, some key points outline actions stopping just short of making recommendations. FRMAC cannot and does not make recommendations. Instead, the Briefing Products offer paraphrases and quotes from the federal guidelines. Each Briefing Product is comprised of a graphic for projection, a slide of key points for projection, and a page of explanatory and background information to serve as speaker notes. There is a Briefing Product for each of the PAG Zone Maps.

Separate product suites are defined for a nuclear detonation versus the default set for all other situations. The product suites for both the default case and nuclear detonation are specified below for both the Standard Products and Briefing Products.

Default Standard Product Suite (target technical audience).

For examples see Figures D-6 – D-20.

- **Predicted Evacuation and Sheltering Areas (Plume Phase).** Shows upper and lower levels of the Early Phase PAG for evacuation and shelter, including plume immersion and inhalation dose, as well as ground-shine and resuspension due to deposition of radioactivity.
- **Predicted Evacuation and Sheltering Areas (Post-Plume Phase).** Shows upper and lower levels of the Early Phase PAG for evacuation and shelter, but includes only ground-shine and resuspension due to deposition of radioactivity.
- **Predicted Relocation Areas.** Shows areas exceeding the Intermediate Phase PAG for relocation.
- **Areas of Concern for Agricultural Products.** Shows areas where FDA Food PAGs may be exceeded and warrant further investigation.
- **Worker Protection Areas.** Shows areas where various levels of risk (radiation dose rate) warrant commensurate control measures to protect emergency responders.
- **Agriculture Embargo.** Area placed under embargo by decision makers.
- **Monitoring Status.** Frequently updated map showing locations of all alpha, beta, and gamma measurements but not values. Intended to communicate up-to-date progress of radiological monitoring effort.
- **Monitoring Results.** Shows values for all alpha, beta and gamma measurements. Used for construction of other maps, may be separated into separate maps of 1) external exposure rate, 2) total dose rate, 3) gross alpha deposition or 4) gross beta deposition.
- **Aerial Measuring System (Fixed-Wing).** Shows measured exposure rate along flight path of AMS fixed-wing aircraft.
- **Aerial Measuring System (Helicopter).** Detailed contour maps of exposure rate or radionuclide concentration as measured by low flying helicopter.

Default Briefing Product Suite (target non-technical audience)

- **Predicted Evacuation and Sheltering Areas Based on EPA/DHS Guides (Plume Phase).** Shows upper and lower levels of the Early Phase PAG for evacuation and shelter, including plume immersion and inhalation dose, as well as ground-shine and resuspension due to deposition of radioactivity.
- **Predicted Evacuation and Sheltering Areas Based on EPA/DHS Guides (Post-Plume Phase)**. Shows upper and lower levels of the Early Phase PAG for evacuation and shelter, but includes only ground-shine and resuspension due to deposition of radioactivity.
- **Predicted Relocation Areas Based on EPA/DHS Guides**. Shows areas exceeding the Intermediate Phase PAG for relocation.
- **Areas of Concern for Agricultural Products Based on FDA Guides.** Shows areas where FDA Food PAGs may be exceeded and warrant further investigation.
- **Worker Protection Areas Based on Exposure Rate.** Shows areas where various levels of risk (radiation dose rate) warrant commensurate control measures to protect emergency responders.
- **Default Evacuation or Sheltering Area Based on CRCPD Guide (RDD case only).** Unique to a radiological dispersal device for which nothing is known except that radioactive material is involved.

Nuclear Detonation Standard Product Suite

- **Prompt Nuclear Detonation Population Effects: (Overpressure, Thermal, and Radiation).** Estimates of the percentage of the population that will experience fatal and non-fatal injuries or deleterious health effects from the immediate blast overpressure, thermal, and radiation.
- **Prompt Thermal Effects on Personnel: (Radial Extent of Thermal Effects).** Shows regions where some portion of an individual's exposed skin is expected to receive the indicated type of skin burn.
- **Prompt Nuclear Detonation Heavy Structure Effects: (Concrete/Brick-Type Structures).** Specifies the percentages of buildings that suffer given levels of damage due to the overpressure effects on heavily constructed buildings.
- **Prompt Nuclear Detonation Light Structure Effects: (Residential-Type Structures).** Specifies the percentages of buildings that suffer given levels of damage due to the overpressure effects on lightly constructed buildings.
- **Nuclear Detonation Early Population Effects: (1-Day Groundshine Dose).** Fatalities and illness/injuries due to exposure to radioactive fallout for just 24 hours, although effects on health, may not be manifest for days to weeks.
- **Nuclear Detonation Groundshine Dose: (Groundshine Dose 0–96Hrs).** Identifies areas that could exceed DHS/EPA Early Phase PAG over a 4-day exposure period begins at detonation time.
- **Nuclear Detonation Early Phase PAGs (Avoidable Dose): (Evacuation/Sheltering based on Avoidable Groundshine 6–102Hrs).** Identifies areas that could exceed DHS/EPA Early Phase PAG over a 4-day exposure period but beginning six hours after detonation time.
- **Emergency Workers Dose Rate (Far Field): (Groundshine Dose Rate at Release Time + 6 Hrs).** Shows areas where various levels of risk (radiation dose rate) warrant commensurate control measures to protect emergency responders.

- **Nuclear Detonation Intermediate Phase PAGs: (Relocation based on Avoidable Groundshine Dose).** Shows areas exceeding the Intermediate Phase PAG for relocation with exposure commencing with fallout arrival.
- **Nuclear Detonation Intermediate Phase Dose: (Based on Avoidable Groundshine Dose 6Hr–50Yr).** Shows areas exceeding the Intermediate Phase long term objectives the second and 50 years.

Nuclear Detonation Briefing Product Suite

The template for the nuclear detonation Briefing Products is not yet final as of this writing.

- **Predicted Dangerous Fallout Zone (DF) for Date/Time.** This presents the last of the four zones (DF) cited in the OSTP "Planning Guidance for Response to a Nuclear Detonation." It is all new. This product couples with the new "Hot Zone" product to take the place of the former Worker Protection product. The Dangerous Fallout Zone is presented in six time steps.
- **Predicted Hot Zone for Date/Time.** This is a new product to define the expected high-radiation hazard zone (>10 mR/h). It combines with the Dangerous Fallout Zone to be the basis planning emergency worker protection. It is also presented in six time steps.
- **Predicted Damage Response Zones.** These are three of the zones (NG, MD & LD) cited in the Office of Science and Technology Policy (OSTP) "Planning Guidance for Response to a Nuclear Detonation." This takes the place of two of the Standard Products that describe overpressure effects on buildings.
- **Predicted Area for Potential Fallout Casualties at Date/Time.** This is a fresh presentation of the 1-Day Ground-shine Dose which emphasizes where intervention can be of greatest benefit.
- **Predicted Prompt Effects of Nuclear Detonation on Population.** This is a fresh presentation of the standard Prompt Effects on Population.
- **Predicted EPA/DHS Sheltering/Evacuation Areas at Date/Time.** This is the familiar Evacuation/Sheltering RDD Briefing Product but with information to place it in proper perspective relative to the graver issues nearer to the GZ. It emphasizes shelter and urgency by presenting six time steps.
- **Predicted EPA/DHS Relocation Areas.** This is basically unchanged from the RDD version. It starts dose accumulation one day after the plot is executed to suggest the benefit achieved at completion of relocation.
- **Predicted Areas of Concern for Agricultural Products.** This is basically unchanged from the RDD version. It presents the agricultural impact four days after detonation, at which point in time deposition of fallout in North America will probably be complete.

D.4 Data for the Technical Community

The traditional clientele of the FRMAC are the federal, state, tribal, and local subject matter experts working the technical aspects of a radiological accident or incident. FRMAC caters to their needs for modeling, measurements, calculations, information management, and data presentation. Therefore, FRMAC offers a number of products in addition to those described above.

D.4.1 Modeling

NARAC provides FRMAC with atmospheric transport and diffusion modeling of dose, deposition, and instantaneous concentration. This dovetails the modeling done through the IMAAC because they are one and the same at the operational level. The SNL/New Mexico Consequence Predictions group provides FRMAC with modeling of explosive effects and dispersal. These predictions will always be fitted to field measurement data as they become available. While initially the models may be used to predict consequences, the models may also be used later to interpolate and extrapolate a rich set of measurements. These models can be customized as requested. FRMAC can also reach into other DOE laboratories for special modeling, such as Argonne National Laboratory for dose pathway modeling (RESRAD) or Oak Ridge National Laboratory for biokinetic dosimetry modeling. A more complete description of the NARAC capabilities can be found in Appendix B, "Atmospheric Dispersion Modeling."

D.4.2 Aerial Measurements

Aerial measurements are performed in two phases. First, a quick overview of the entire area is performed by the DOE/NNSA Aerial Measuring System (AMS) "On Call" fixed-wing airplane. This is often the first measurement to portray the full scope of the incident by defining the spatial extent and abundance of radioactivity involved, plus identifying the major gamma emitting radionuclides. However, the spatial resolution, sensitivity, and isotopic selectivity of this initial mission is quite limited. Therefore, later missions will involve more detailed surveys conducted by low flying helicopters. Sensitivities are such that small changes in background can be detected and selectivity is sufficient to create maps of each prominent gamma emitting radionuclide. Each aerial mission is expected to take from two to three hours, with the results available one to three hours after a mission is completed. A more complete description can be found in Appendix C, "Aerial Measuring System."

D.4.3 Calculations

Almost invisible to casual observers are FRMAC's health physics calculations. The most important of these are computations of various Derived Response Levels (DRLs) that are critical to the interpretation of measurements. FRMAC will also provide certain dose conversion factors necessary for prudent emergency worker protection. All of this is built upon construction of the radionuclide mix and estimation of resuspension factors by FRMAC. The primary tools for these calculations are the FRMAC Assessment Manual and Turbo FRMAC. Turbo FRMAC is a software tool that computes DRLs, dose conversion factors and sample doses for any mix, time period, or set of dosimetry assumptions. Turbo FRMAC is developed and maintained by the SNL/New Mexico Consequence Predictions group.

D.4.4 Geographic Information System (GIS)

The GIS is a computerized database management system that provides for the capture, storage, retrieval, analysis, and display of spatial (defined by location) data. By having layers of information displayed on a computer screen and/or map, a person can see the relationship of one piece of information to another. The GIS database also allows for attributes of a given piece of data to be

easily referenced. For example, a specific school can be located on a map and applicable information about that school can be extracted using the database. The GIS can also calculate areas of interest. For example, a land-use data layer can be overlaid onto a radiation plot to calculate the area of a given type of land use that lies within a certain radiation zone.

Layers of information within the GIS may include: (1) geographic base data, (2) administrative data, (3) emergency response data, (4) land cover/land use, (5) critical industries, (6) radiation data, (7) dispersion model output, and (8) image data. These GIS layers may include locations of evacuation routes, police and fire stations, hospitals and clinics, operations centers, shelters, and institutions (schools, prisons, and nursing homes). Radiation data could include baseline background levels, environmental thermoluminescent dosimeter locations, continuous location of survey teams, AMS data, isotopic concentration contours by dominant isotope, and location of measurements and samples by type, exposure rate contours, integrated one-year dose projection contours.

D.4.5 Data Management and Quality Assurance

FRMAC performs an enormous number of measurements and analyses, all of which must be compiled in a readily accessible, easily manipulated way that assures integrity and accountability.

D.4.5.1 Database and Data Archive

The eFRMAC enterprise moves data faster, farther, and better through telemetry, automation, and networking. The heart of eFRMAC is the Radiological Assessment and Monitoring System (RAMS) database software. The RAMS database not only compiles and reports FRMAC data, but plots data, performs some quality assurance (QA) checks, and interfaces with Turbo FRMAC to calculate doses and DRLs. eFRMAC is also integral to handling samples and analyses. Users can easily perform customized queries the results of which can be displayed as hardcopy reports or Excel spreadsheets. RAMS also directly exports to and imports from EPA's SCRIBE database. eFRMAC is described in Appendix E, "eFRMAC."

D.4.5.2 Quality Assurance

FRMAC not only conducts extensive conventional radiological monitoring and sampling, but adds value to those measurements by performing numerous checks on quality to assure construction of a valid, internally consistent data set. Initially, data quality standards are relaxed to maximize prompt access to all data. However, as time progresses attention to quality issues escalates. Except for the earliest measurements, all ground-based radiation data (exposure rates, sampling results, and isotopic concentrations of deposited activity, etc.) are first screened for completeness and obvious discrepancies by the FRMAC Monitoring Manager. Then the data are reviewed again by FRMAC Assessment for consistency by conducting peer comparisons (nearest neighbors, model trends, and ratios of collocated measurements). Laboratory data are treated by the same process to assure validity. Analysis results received from laboratories are first screened by FRMAC Laboratory staff by reviewing their QA/QC data, and then Assessment reviews them for consistency with related peer measurements. Similarly, other quantities such as the radionuclide mix and resuspension factor are validated by analysis of multiple data sources with special attention to spatial variations and temporal changes.

Data integrity is vital. Therefore, three types of safeguards are employed. The first safeguard is construction and protection of the data archive by the Data Center, which captures all of the radiological data acquired by or furnished to the FRMAC. Every data point acquired by FRMAC is traceable to an individual instrument, survey team, calibration, and procedure. The Data Center also maintains event logs, rosters, and other administrative records of the event. Most of FRMAC's data are now electronic. Therefore, the second safeguard is to secure all electronic data (RAMS). Access to the RAMS database and privileges within the system are controlled, plus certain critical transactions are tracked. But most importantly the RAMS database is maintained on mirrored servers in real time, with one server in the field and the other server at RSL in Las Vegas. The last safeguard is a chain-of-custody, which is utilized for all samples starting at the field team and maintained through the analysis laboratory.

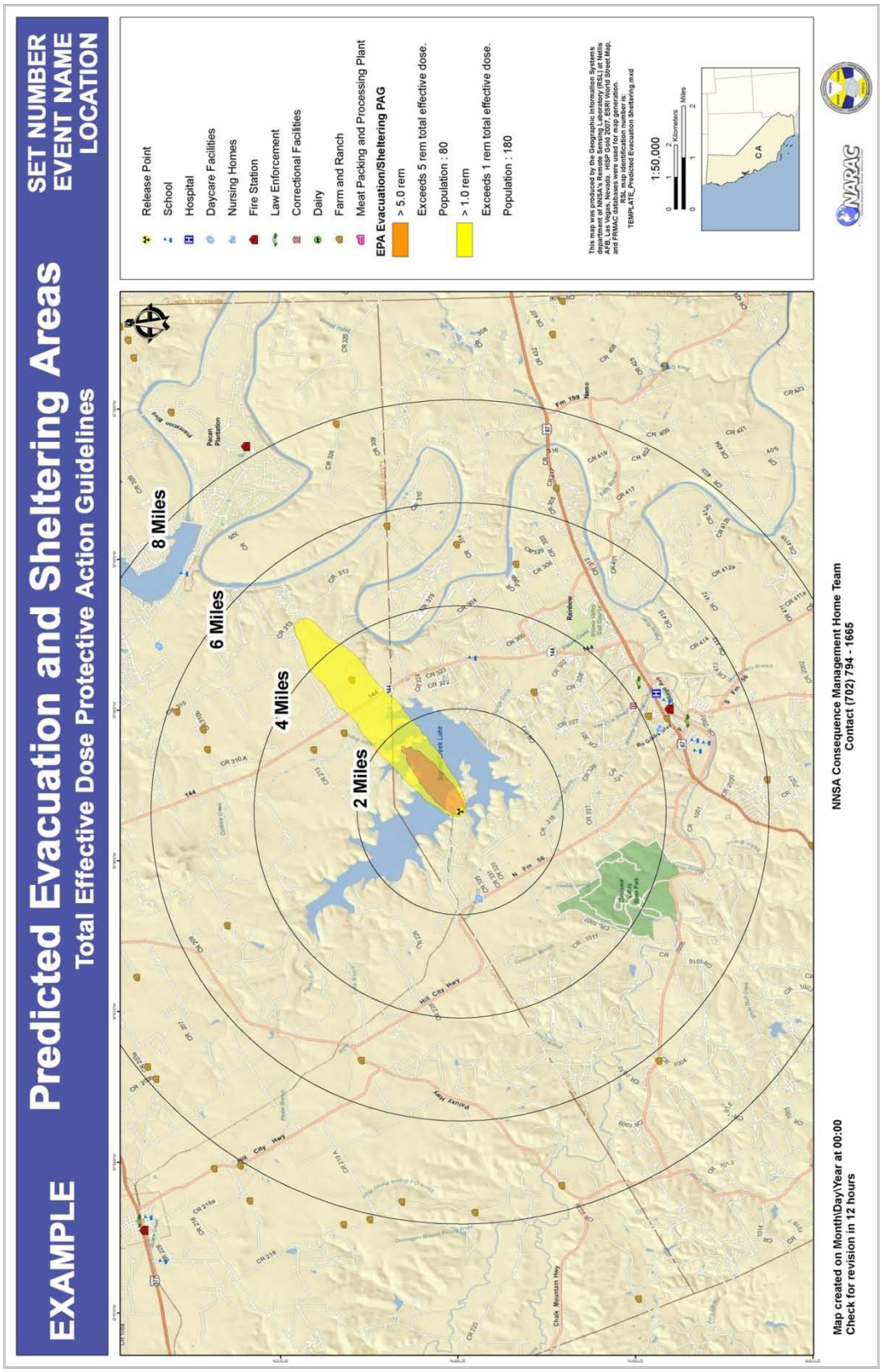


FIGURE D-1. EXAMPLE EVACUATION AND SHELTERING PAG ZONE MAP

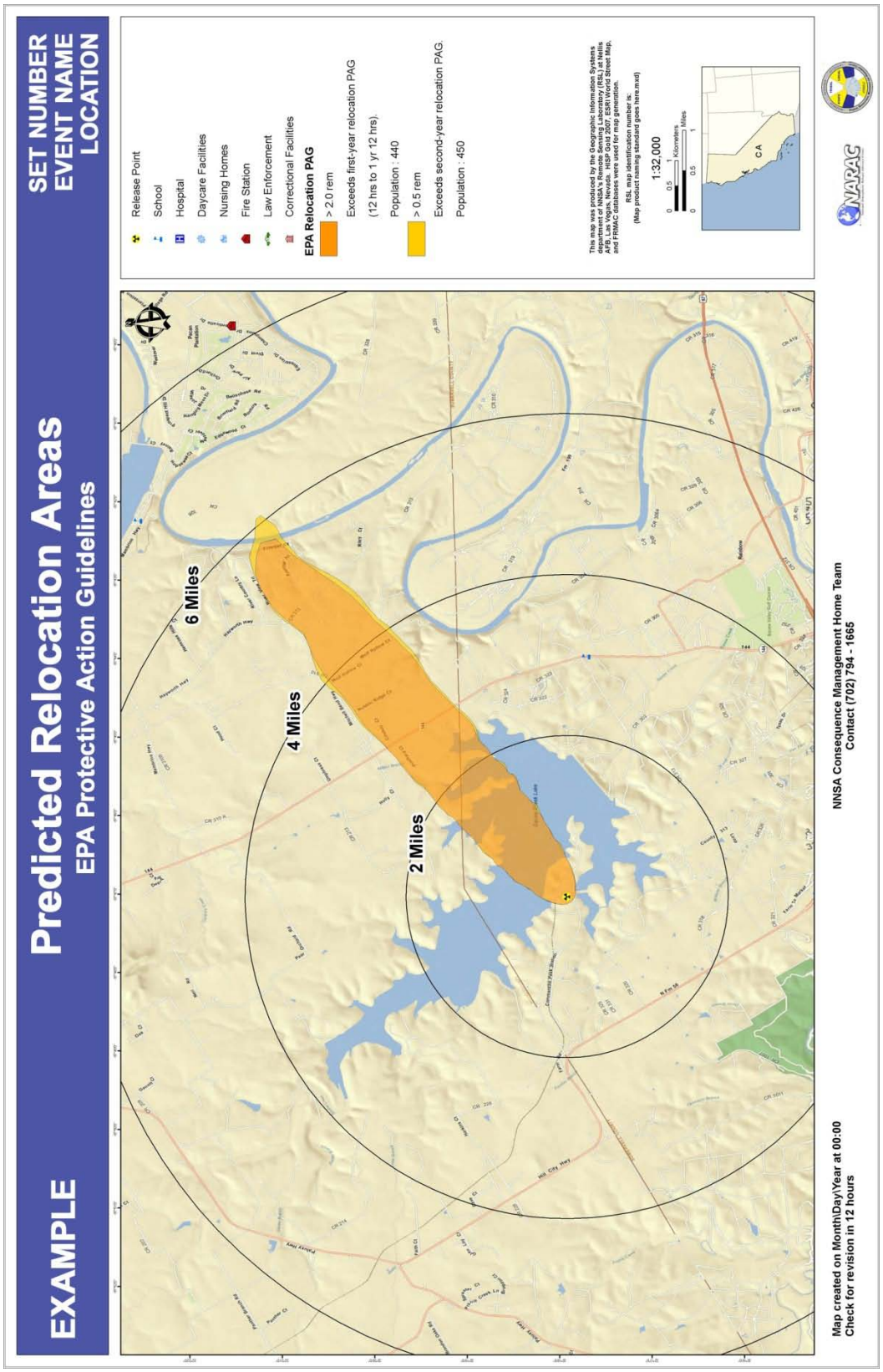


FIGURE D-2. EXAMPLE RELOCATION PAG ZONE MAP

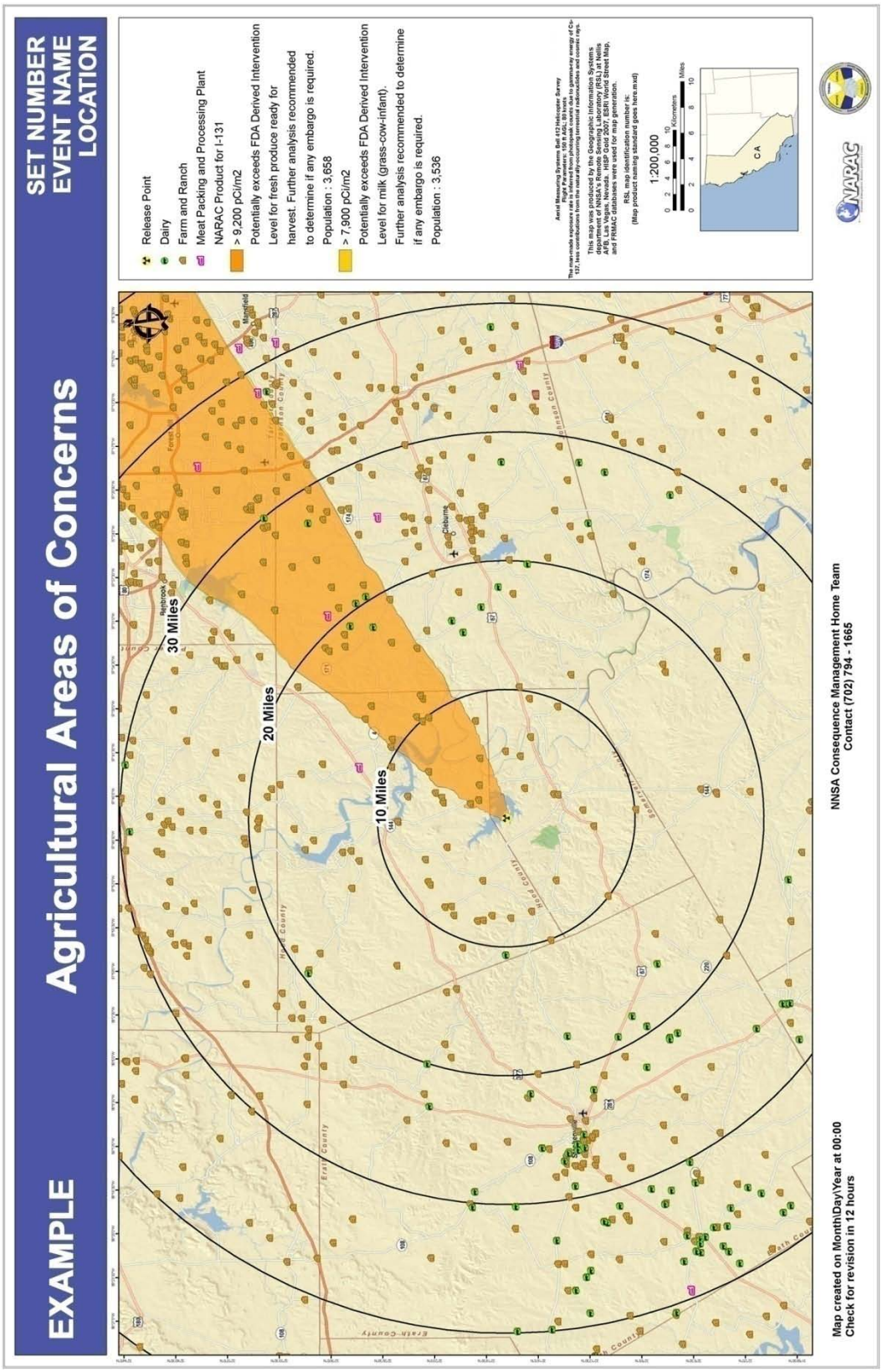


FIGURE D-3. EXAMPLE INGESTION PAG ZONE MAP

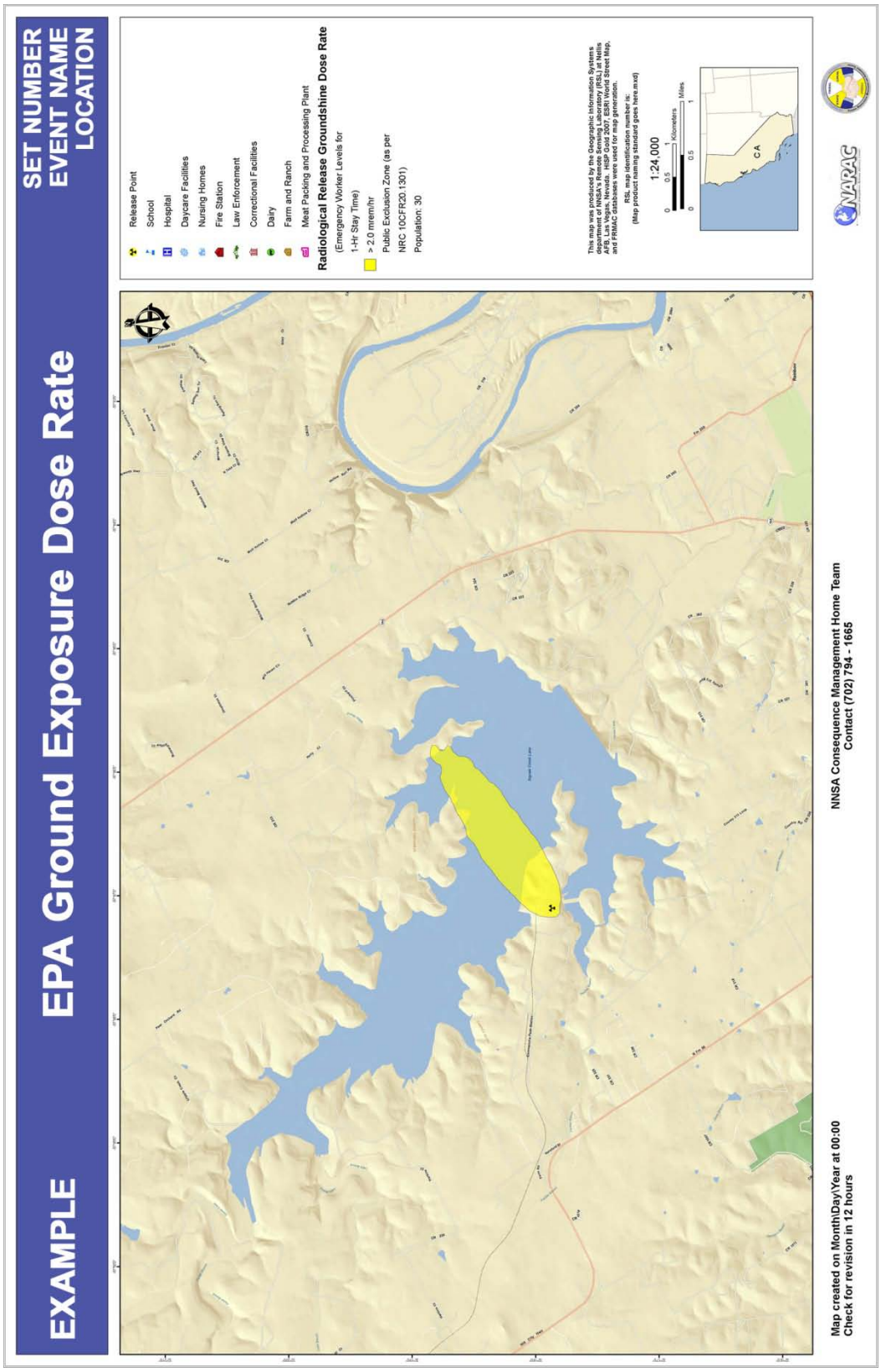


FIGURE D-4. EXAMPLE GROUND EXPOSURE DOSE RATE

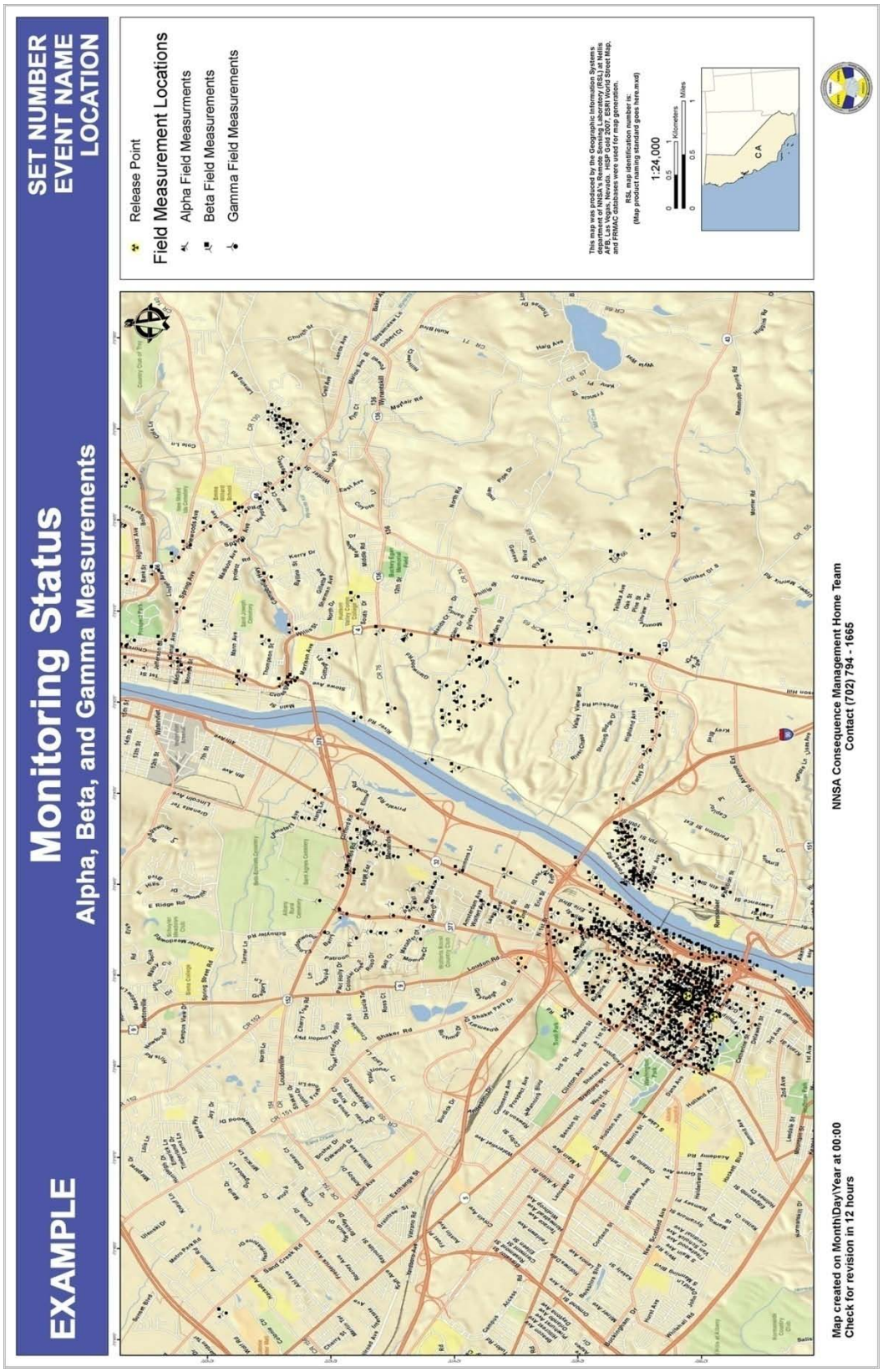


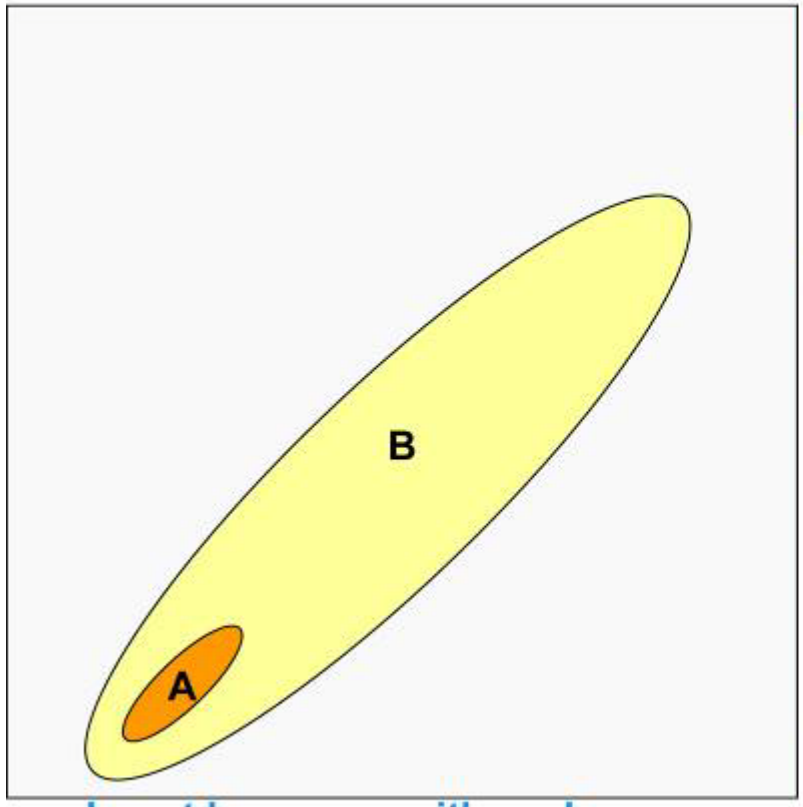
FIGURE D-5. EXAMPLE MONITORING STATUS

Classification

Product Set #: [Exercise/Real Event]
[Location City, State]
[Event Type] at [Date, Time]

Predicted Evacuation and Sheltering Areas Based on EPA/DHS Guides

Applicable within first hours/days while radioactive cloud is present



Insert base map with scale

A Evacuation of entire population warranted, unless additional unusually hazardous circumstances exist (exceeds 5 rem). Estimated population: [insert pop count]

B Evacuation or sheltering normally initiated (1 to 5 rem). Estimated population: [insert pop count]

Notes:

- Radiation dose predicted for maximally exposed individuals, and includes some or all the dose delivered during plume passage
- Protective actions are only based on dose that can be avoided, prediction does not include dose received before [insert time and date]
- Promptness of evacuation and/or sheltering reduces radiation dose and cancer risk
- Sheltering-in-place can be more protective than evacuation radioactive cloud is present.
- Radiation dose predicted for maximally exposed individuals and includes both dose from contaminated air, plus dose from ground contamination over four days.

- Areas shown are [insert proper text, e.g., "model predictions based on estimate source term but no measurements"]
- Plume Phase- Radioactive cloud may be still present or imminent
- Four days exposure to both airborne and ground contamination

Briefing Product for Public Officials
Current: [insert time and date]
Check for updates

Technical Details: FRMAC Home Team 702 -794-1665
Advice & Recommendations: A -Team 770-488-7100

Classification

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FIGURE D-6. MODELED EVACUATION AND SHELTERING AREAS (PLUME PHASE) BRIEFING PRODUCT GRAPHIC

Classification

Product Set #: [Exercise/Real Event]
[Location City, State]
[Event Type] at [Date, Time]

Predicted Evacuation and Sheltering Areas Based on EPA/DHS Guides

Applicable within first hours/days while radioactive cloud is present

Key Points

- Protective actions are based on dose that can be avoided .
- Areas shown do not include dose received before [insert time and date] .
- Greatest hazard is due to exposure to the radioactive cloud. Evacuation before radioactive cloud is present is best, but avoid evacuation in the radioactive cloud.
- Radioactive cloud is expected to clear the contoured areas by [insert date/time,].
- Sheltering-in-place may be preferable to evacuation in some situations,
  - If radioactive cloud is present or its arrival is imminent,
  - For certain populations needing special consideration (hospitals/nursing homes, prisoners, elderly….),
  - Other hazards are present which complicate or impede evacuation (severe weather, competing disasters…).
- Sheltering followed by a delayed evacuation may be best, if radioactive decay is very rapid and shelter provides adequate shielding.
- Predicted dose is accumulated over 4 days ([insert date/times, e.g. 16 Oct 2008 12:30 PDT to 20 Oct 2008 12:30 PDT]).
- Predicted dose assumes individuals are unsheltered and unprotected.
- Use the "Radioactive Cloud has Passed" map after radioactive cloud passes.

Briefing Product for Public Officials
Current: [insert time and date]
Check for updates

Technical Details: FRMAC Home Team 702-794-1665
Advice & Recommendations: A-Team 770-488-7100

Classification

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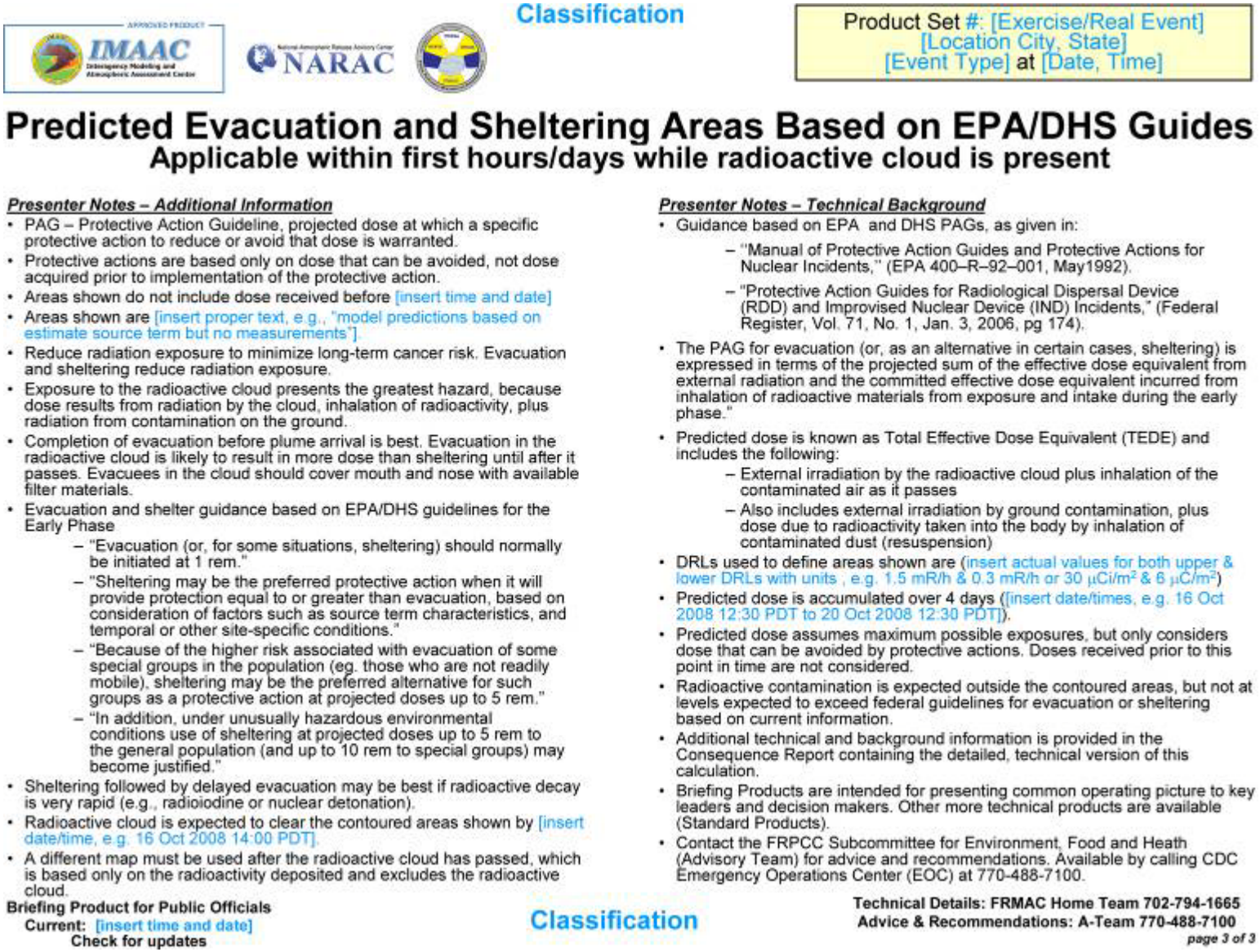
FIGURE D-7. MODELED EVACUATION AND SHELTERING AREAS (PLUME PHASE) BRIEFING PRODUCT KEY POINTS



Classification

Product Set #: [Exercise/Real Event]
[Location City, State]
[Event Type] at [Date, Time]

Predicted Evacuation and Sheltering Areas Based on EPA/DHS Guides

Applicable within first hours/days while radioactive cloud is present

Presenter Notes – Additional Information

- PAG – Protective Action Guideline, projected dose at which a specific protective action to reduce or avoid that dose is warranted.
- Protective actions are based only on dose that can be avoided, not dose acquired prior to implementation of the protective action.
- Areas shown do not include dose received before [insert time and date]
- Areas shown are [insert proper text, e.g., "model predictions based on estimate source term but no measurements"].
- Reduce radiation exposure to minimize long-term cancer risk. Evacuation and sheltering reduce radiation exposure.
- Exposure to the radioactive cloud presents the greatest hazard, because dose results from radiation by the cloud, inhalation of radioactivity, plus radiation from contamination on the ground.
- Completion of evacuation before plume arrival is best. Evacuation in the radioactive cloud is likely to result in more dose than sheltering until after it passes. Evacuees in the cloud should cover mouth and nose with available filter materials.
- Evacuation and shelter guidance based on EPA/DHS guidelines for the Early Phase
  - "Evacuation (or, for some situations, sheltering) should normally be initiated at 1 rem."
  - "Sheltering may be the preferred protective action when it will provide protection equal to or greater than evacuation, based on consideration of factors such as source term characteristics, and temporal or other site-specific conditions."
  - "Because of the higher risk associated with evacuation of some special groups in the population (eg. those who are not readily mobile), sheltering may be the preferred alternative for such groups as a protective action at projected doses up to 5 rem."
  - "In addition, under unusually hazardous environmental conditions use of sheltering at projected doses up to 5 rem to the general population (and up to 10 rem to special groups) may become justified."
- Sheltering followed by delayed evacuation may be best if radioactive decay is very rapid (e.g., radioiodine or nuclear detonation).
- Radioactive cloud is expected to clear the contoured areas shown by [insert date/time, e.g. 16 Oct 2008 14:00 PDT].
- A different map must be used after the radioactive cloud has passed, which is based only on the radioactivity deposited and excludes the radioactive cloud.

Presenter Notes – Technical Background

- Guidance based on EPA and DHS PAGs, as given in:
  - "Manual of Protective Action Guides and Protective Actions for Nuclear Incidents," (EPA 400–R–92–001, May1992).
  - "Protective Action Guides for Radiological Dispersal Device (RDD) and Improvised Nuclear Device (IND) Incidents," (Federal Register, Vol. 71, No. 1, Jan. 3, 2006, pg 174).
- The PAG for evacuation (or, as an alternative in certain cases, sheltering) is expressed in terms of the projected sum of the effective dose equivalent from external radiation and the committed effective dose equivalent incurred from inhalation of radioactive materials from exposure and intake during the early phase."
- Predicted dose is known as Total Effective Dose Equivalent (TEDE) and includes the following:
  - External irradiation by the radioactive cloud plus inhalation of the contaminated air as it passes
  - Also includes external irradiation by ground contamination, plus dose due to radioactivity taken into the body by inhalation of contaminated dust (resuspension)
- DRLs used to define areas shown are (insert actual values for both upper & lower DRLs with units , e.g. 1.5 mR/h & 0.3 mR/h or 30 μCi/m² & 6 μC/m²)
- Predicted dose is accumulated over 4 days ([insert date/times, e.g. 16 Oct 2008 12:30 PDT to 20 Oct 2008 12:30 PDT]).
- Predicted dose assumes maximum possible exposures, but only considers dose that can be avoided by protective actions. Doses received prior to this point in time are not considered.
- Radioactive contamination is expected outside the contoured areas, but not at levels expected to exceed federal guidelines for evacuation or sheltering based on current information.
- Additional technical and background information is provided in the Consequence Report containing the detailed, technical version of this calculation.
- Briefing Products are intended for presenting common operating picture to key leaders and decision makers. Other more technical products are available (Standard Products).
- Contact the FRPCC Subcommittee for Environment, Food and Heath (Advisory Team) for advice and recommendations. Available by calling CDC Emergency Operations Center (EOC) at 770-488-7100.

Briefing Product for Public Officials
Current: [insert time and date]
Check for updates

Classification

Technical Details: FRMAC Home Team 702-794-1665
Advice & Recommendations: A-Team 770-488-7100

page 3 of 3

FIGURE D-8. MODELED EVACUATION AND SHELTERING AREAS (PLUME PHASE) BRIEFING PRODUCT SPEAKER NOTES

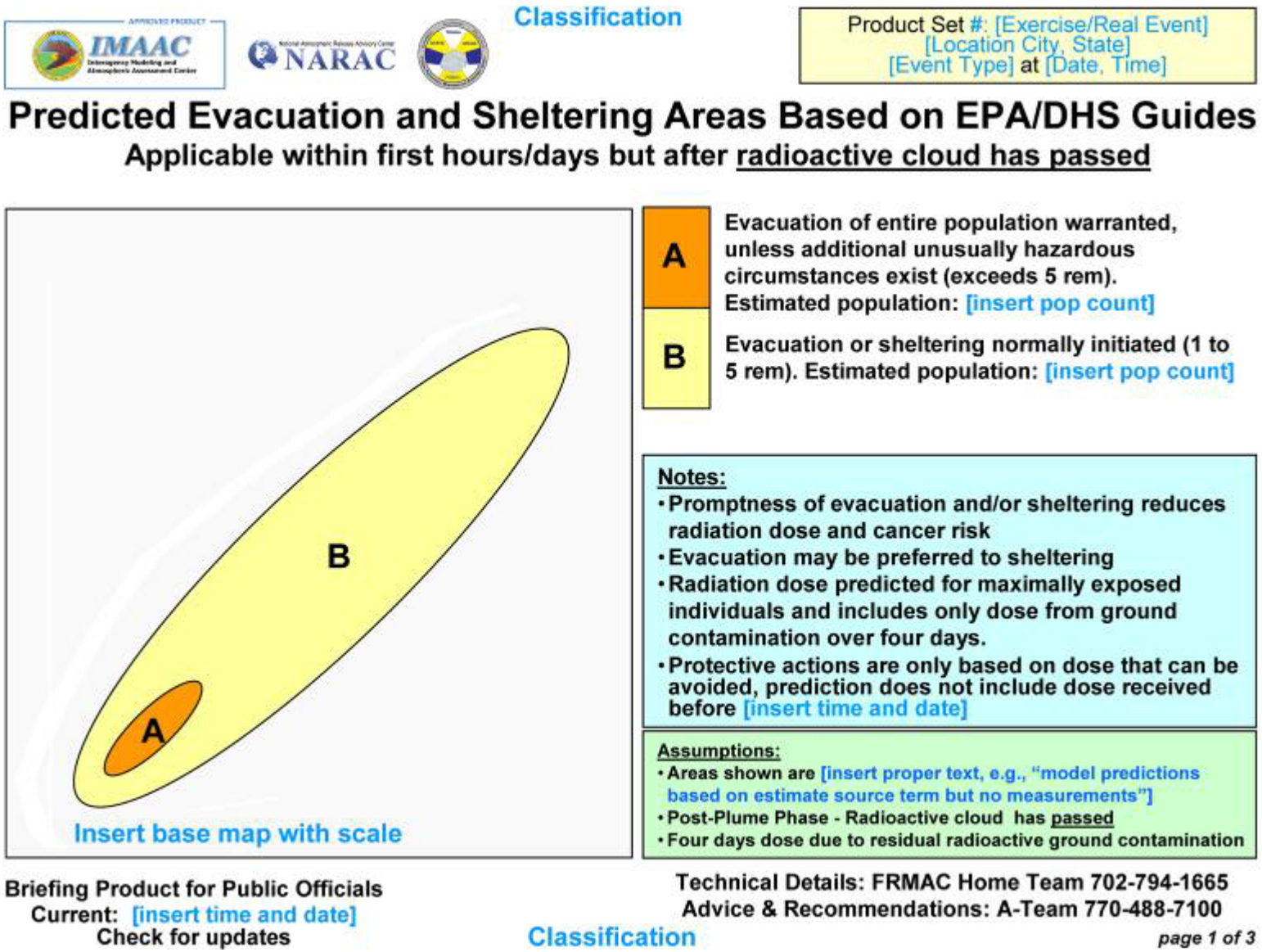


FIGURE D-9. MODELED EVACUATION AND SHELTERING AREAS (POST-PLUME PHASE) BRIEFING PRODUCT GRAPHIC

Classification

Product Set #: [Exercise/Real Event]
[Location City, State]
[Event Type] at [Date, Time]

Predicted Evacuation and Sheltering Areas Based on EPA/DHS Guides

Applicable within first hours/days but after radioactive cloud has passed

Key Points

- Protective actions are based on dose that can be avoided.
- Areas shown do not include dose received before [insert time and date].
- Evacuation or sheltering minimizes long-term cancer risk.
- Sheltering-in-place may be preferable to evacuation in some situations
  - For certain populations needing special consideration (hospitals/nursing homes, prisoners, elderly…).
  - Other hazards which complicate or impede evacuation (severe weather, competing disasters…).
- Sheltering followed by delayed evacuation may be best if radioactive decay is very rapid.
- Radioactive cloud has cleared the area, leaving only radioactive ground contamination.
- Predicted dose is accumulated over 4 days ([insert date/times, e.g. 16 Oct 2008 12:30 PDT to 20 Oct 2008 12:30 PDT]).
- Predicted dose assumes individuals are unsheltered and unprotected.

Briefing Product for Public Officials
Current: [insert time and date]
Check for updates

Technical Details: FRMAC Home Team 702-794-1665
Advice & Recommendations: A-Team 770-488-7100

Classification

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FIGURE D-10. MODELED EVACUATION AND SHELTERING AREAS (POST-PLUME PHASE) BRIEFING PRODUCT KEY POINTS

Classification

Product Set #: [Exercise/Real Event]
[Location City, State]
[Event Type] at [Date, Time]

Predicted Evacuation and Sheltering Areas Based on EPA/DHS Guides

Applicable within first hours/days but after radioactive cloud has passed

Presenter Notes – Additional Information

- PAG – Protective Action Guideline, projected dose at which a specific protective action to reduce or avoid that dose is warranted.
- Protective actions are based only on dose that can be avoided, not dose acquired prior to implementation of the protective action.
- Areas shown do not include dose received before [insert time and date]
- Areas shown are [insert proper text, e.g., "model predictions based on estimate source term but no measurements"].
- Reduce radiation exposure to minimize long-term cancer risk. Evacuation and sheltering reduce radiation exposure.
- Shelter and evacuation guidance based on EPA/DHS guidelines for the Early Phase
  - "Evacuation (or, for some situations, sheltering) should normally be initiated at 1 rem."
  - "Sheltering may be the preferred protective action when it will provide protection equal to or greater than evacuation, based on consideration of factors such as source term characteristics, and temporal or other site-specific conditions."
  - "Because of the higher risk associated with evacuation of some special groups in the population (eg. those who are not readily mobile), sheltering may be the preferred alternative for such groups as a protective action at projected doses up to 5 rem."
  - "In addition, under unusually hazardous environmental conditions use of sheltering at projected doses up to 5 rem to the general population (and up to 10 rem to special groups) may become justified."
- Sheltering followed by delayed evacuation may be best if radioactive decay is very rapid (e.g., radioiodine or nuclear detonation).
- Initial radioactive cloud has cleared the area, leaving only radioactive ground contamination.
- Protective actions may be initiated over larger areas and at lower contamination/dose levels if advantageous, for example, in order to account for uncertainties in the predicted dose and mapped areas, and/or to use boundaries, such as roads, that are convenient.

Presenter Notes – Technical Background

- Guidance based on EPA and DHS PAGs, as given in:
  - "Manual of Protective Action Guides and Protective Actions for Nuclear Incidents," (EPA 400–R–92–001, May1992).
  - "Protective Action Guides for Radiological Dispersal Device (RDD) and Improvised Nuclear Device (IND) Incidents," (Federal Register, Vol. 71, No. 1, Jan. 3, 2006, pg 174).
- "The PAG for evacuation (or, as an alternative in certain cases, sheltering) is expressed in terms of the projected sum of the effective dose equivalent from external radiation and the committed effective dose equivalent incurred from inhalation of radioactive materials from exposure and intake during the early phase." Note that in this case however, committed inhalation dose from plume passage is not included in the predicted doses since the plume has already passed out of these areas.
- Predicted dose is known as Total Effective Dose Equivalent (TEDE), which in this case is only due to external irradiation by ground contamination, plus dose due to radioactivity taken into the body by inhalation of contaminated dust (resuspension).
- DRLs used to define areas shown are (insert actual values for both upper & lower DRLs with units , e.g. 1.5 mR/h & 0.3 mR/h or 30 $\mu C/m^2$ & 6 $\mu C/m^2$)
- Predicted dose is accumulated over 4 days ([insert date/times, e.g. 16 Oct 2008 14:00 PDT to 20 Oct 2008 14:00 PDT])
- Predicted dose assumes maximum possible exposures, but only considers dose that can be avoided by protective actions. Doses received prior to this point in time are not considered.
- Radioactive contamination is expected outside the contoured areas, but not at levels expected to exceed federal guidelines for evacuation or sheltering based on current information.
- Additional technical and background information is provided in the Consequence Report containing the detailed, technical version of this calculation.
- Briefing Products are intended for presenting common operating picture to key leaders and decision makers. Other more technical products are available (Standard Products).
- Contact the FRPCC Subcommittee for Environment, Food and Heath (Advisory Team) for advice and recommendations. Available by calling CDC Emergency Operations Center (EOC) at 770-488-7100.

Briefing Product for Public Officials
Current: [insert time and date]
Check for updates

Technical Details: FRMAC Home Team 702-794-1665
Advice & Recommendations: A-Team 770-488-7100

Classification

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FIGURE D-11. MODELED EVACUATION AND SHELTERING AREAS (POST-PLUME PHASE) BRIEFING PRODUCT SPEAKER NOTES

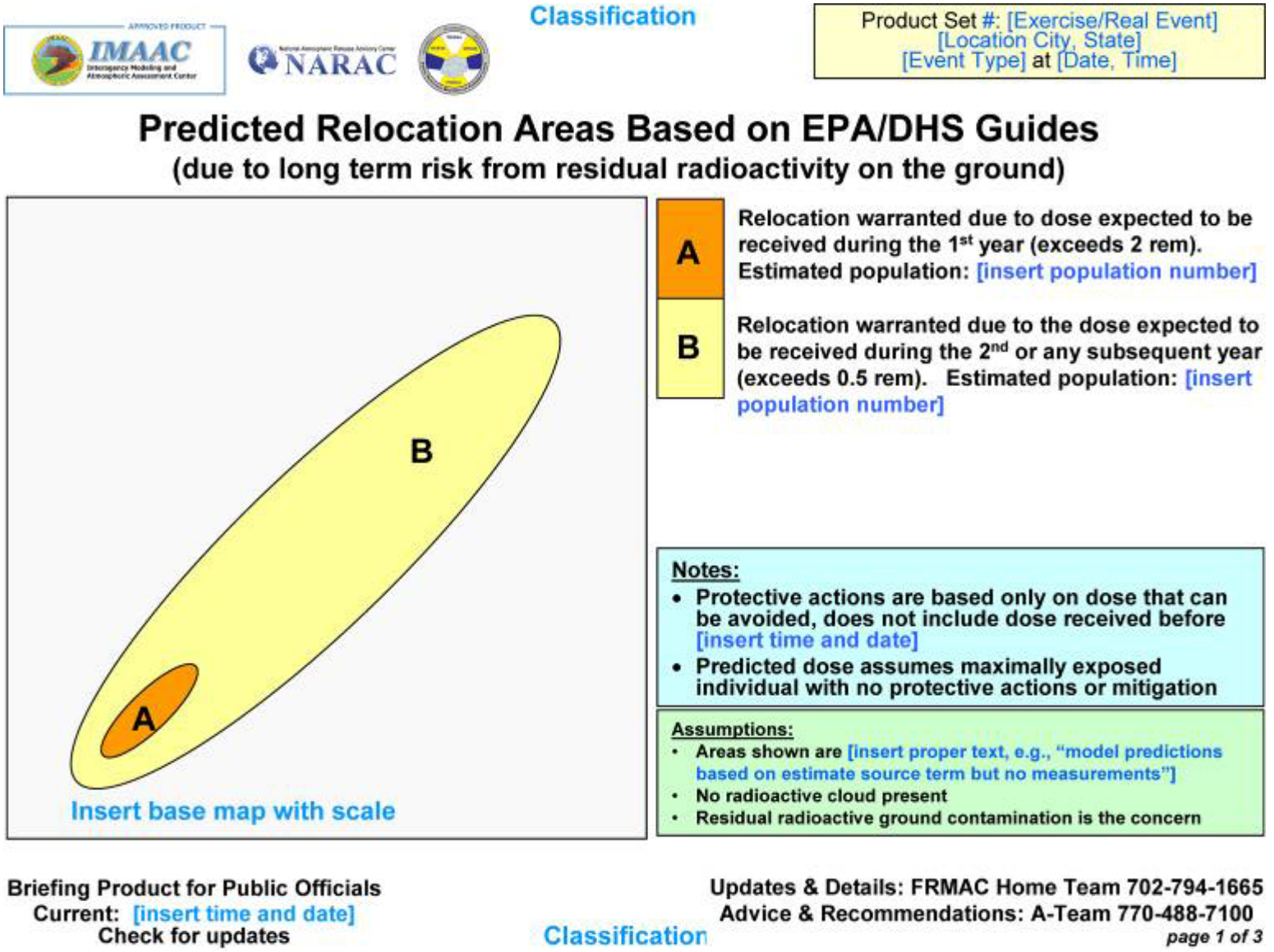


FIGURE D-12. RELOCATION AREAS BRIEFING PRODUCT GRAPHIC

Classification

Product Set #: [Exercise/Real Event]
[Location City, State]
[Event Type] at [Date, Time]

Predicted Relocation Areas Based on EPA/DHS Guides

(due to long term risk from residual radioactivity on the ground)

Key Points

- Areas shown are [insert proper text, e.g., "model predictions based on estimate source term but no measurements"].
- Relocation is not urgent. PAG based on long term exposure and cancer risk.
- Protective actions are based only on dose that can be avoided.
- Areas shown do not include dose received before [insert time and date].
- Some groups not previously evacuated may require relocation.
- Re-entry into relocated areas permitted with appropriate controls.
- Separate guidelines:
  - Dose during first year,
  - Dose during any subsequent year.
- Assumes maximally exposed individual, no protective actions considered.
- Only ground contamination contributes to dose.
- Dose rate tends to naturally diminish with time.
- Dose reduction measures can be considered, contact Advisory Team.

Briefing Product for Public Officials
Current: [insert time and date]
Check for updates

Classification

Updates & Details: FRMAC Home Team 702-794-1665
Advice & Recommendations: A-Team 770-488-7100
page 2 of 3

FIGURE D-13. RELOCATION AREAS BRIEFING PRODUCT KEY POINTS

Classification

Product Set #: [Exercise/Real Event]
[Location City, State]
[Event Type] at [Date, Time]

Predicted Relocation Areas Based on EPA/DHS Guides

(due to long term risk from residual radioactivity on the ground)

Presenter Notes – Additional Information

- PAG – Protective Action Guideline, projected dose at which a specific protective action to reduce or avoid that dose is warranted.
- Relocation PAG applies only to dose that can be avoided.
- Areas shown do not include dose received before [insert time and date]
- Areas shown are [insert proper text, e.g., "model predictions based on estimate source term but no measurements"].
- Following early phase it may be necessary to temporarily relocate the public from areas until decontamination has taken place.
- Contrary to the situation during the early phase, when decisions usually must be made and implemented quickly, many decisions and actions during the intermediate phase can be delayed until adequate resources are in place.
- PAGs should be considered as guidance only. During an incident, due to unanticipated local conditions and constraints, professional judgment will be required. Situations can be envisaged in which relocation of the public, based on the recommended PAGs, would be impracticable. Conversely, under some conditions relocation may be quite practicable at doses below the PAGs.
- Some groups not previously evacuated may require relocation.
- Informed judgment must be exercised to assure priority of protection for individuals in areas having the highest exposure rates.
- Contamination below PAG levels may extend beyond the restricted zone. Monitoring and simple dose reduction efforts are recommended in this area to reduce doses to the extent practical.
- Re-entry into relocated areas permitted with appropriate controls.

Presenter Notes – Technical Background

- Guidance based on EPA and DHS PAGs, as given in:
  - "Manual of Protective Action Guides and Protective Actions for Nuclear Incidents," (EPA 400–R–92–001, May1992).
  - "Protective Action Guides for Radiological Dispersal Device (RDD) and Improvised Nuclear Device (IND) Incidents," (Federal Register, Vol. 71, No. 1, Jan. 3, 2006, pg 174).
- Dose considered is the projected Total Effective Dose Equivalent (TEDE) includes external irradiation and inhalation of re-suspended material, accounting for weathering of material and radioactive decay. Only ground contamination contributes to the dose. There is no plume contribution.
- Two separate dose criteria are used: 1) Dose during first year (2 rem), 2) Dose during second or any subsequent year (0.5 rem)
- DRLs used to define areas shown are (insert actual values for both 1str & 2nd year DRLs with units , e.g. 1.5 mR/h & 0.3 mR/h or 30 $\mu Ci/m^2$ & 6 $\mu C/m^2$)
- Projected dose assumes individuals are unsheltered and unprotected, and no mitigation or remediation actions are taken (maximally exposed individual). Dose accumulated over a period of one year.
- Dose reduction factors associated with simple, rapid decontamination techniques are not included in calculating projected dose for decisions on relocation, as prescribed by EPA PAGs.
- Some special cases (e.g., beta only RDD) may also require consideration of beta radiation from surface contamination and direct ingestion of contaminated soil.
- Dose reducing actions may reduce the size of the relocation area and the size of the affected population.
- Dose rate tends to naturally diminish with time due to radioactive decay and weathering of contamination into the soil.
- Radioactive contamination is expected outside the contoured areas, but not at levels expected to exceed federal guidelines for relocation based on current information.
- Briefing Products are intended for presenting common operating picture to key leaders and decision makers. Other more technical products are available (Standard Products).
- Contact the FRPCC Subcommittee for Environment, Food and Health (Advisory Team) for advice and recommendations. Available by calling CDC Emergency Operations Center (EOC) at 770-488-7100.

Briefing Product for Public Officials
Current: [insert time and date]
Check for updates

Classification

Updates & Details: FRMAC Home Team 702-794-1665
Advice & Recommendations: A-Team 770-488-7100

page 3 of 3

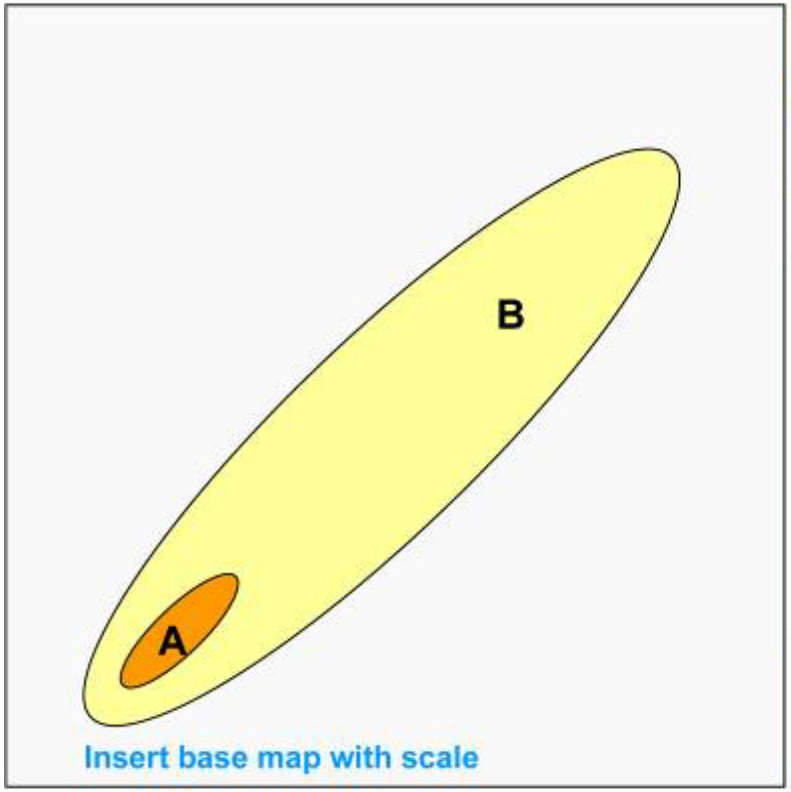
FIGURE D-14. RELOCATION AREAS BRIEFING PRODUCT SPEAKER NOTES

Classification

Product Set #: [Exercise/Real Event]
[Location City, State]
[Event Type] at [Date, Time]

Areas of Concern for Agricultural Products Based on FDA Guides

Areas where crops and milk may exceed FDA's default food safety guidelines



A Milk from cows pastured in this area may exceed FDA's default food safety guidelines (exceeds XXX pCi/m^2 of radionuclide).

B Produce ready for harvest in this area may exceed FDA's default food safety guidelines (exceeds XXX pCi/m2 of radionuclide).

Notes:

- Prediction based on ground deposition of radioactive material. Food not yet analyzed.
- Simple precautionary actions warranted to avoid or reduce potential contamination of food/feed
- Temporary embargo of foods from this area may be warranted pending food analysis
- FDA DILs are very conservative and generic. New DILs may be developed when more information becomes available.
- Extensive sampling and analysis are yet required.

Assumptions:

- Areas shown are [insert proper text, e.g., "model predictions based on estimate source term but no measurements. No food sampling yet available."]
- Dose due to residual contamination on food crops.

Technical Details: FRMAC Home Team 702-794-1665
Advice & Recommendations: A-Team 770-488-7100

Briefing Product for Public Officials
Current: [insert time and date]
Check for updates

Classification

page 1 of 3

FIGURE D-15. INGESTION BRIEFING PRODUCT GRAPHIC

FIGURE D-16. INGESTION BRIEFING PRODUCT KEY POINTS

Classification

Product Set #: [Exercise/Real Event]
[Location City, State]
[Event Type] at [Date, Time]

Areas of Concern for Agricultural Products Based on FDA Guides

Areas where crops and milk may exceed FDA's default food safety guidelines

Presenter Notes – Additional Information

- This is a preliminary assessment or prediction based on radioactivity levels in the environment, not concentration of radioactivity in foods. FDA food safety guidance is based on concentration in foods as prepared for consumption.
- This preliminary assessment pertains only to food products that are ready for immediate consumption, not foods to be harvested at a future date nor to foods grown underground or indoors.
- No food sampling has taken place. Confidence and accuracy will be improved once results of food sampling are obtained.
- "Protective actions can be taken before the release or arrival of contamination if there is advance knowledge that radionuclides may accidentally contaminate the environment."
- "Protective actions which can be taken within the area likely to be affected and prior to confirmation of contamination consist of:
  - simple precautionary actions to avoid or reduce the potential for contamination of food and animal feeds, and
  - temporary embargoes to prevent the introduction into commerce of food which is likely to be contaminated."
- "Protective actions which should be implemented when the contamination in food equals or exceeds the DILs consist of:
  - temporary embargoes to prevent the contaminated food from being introduced into commerce,
  - normal food production and processing actions that reduce the amount of contamination in or on food to below the DILs."
- "Normal food production and processing procedures that could reduce the amount of radioactive contamination in or on the food could be simple, (such as holding to allow for radioactive decay, or removal of surface contamination by brushing, washing, or peeling)…"
- Food products that are not yet ready for harvest should be analyzed at a later time before consumption to determine if they are suitable for consumption.
- Pre-packaged food and beverages in these areas are not affected.
- This map is valid for this growing season at most.

Presenter Notes – Technical Background

- Guidance based on EPA and DHS PAGs, as given in:
  - "Guidance on Accidental Radioactive Contamination of Human Food and Animal Feeds: Recommendations for State and Local Agencies," (Federal Register, Vol. 71, No. 1, Jan. 3, 2006, pg 174).
  - "Manual of Protective Action Guides and Protective Actions for Nuclear Incidents," (To be published Federal Register, 2009).
- Preliminary assessment based on FDA's food safety guidelines, termed Derived Intervention Levels (DILs). These food guidelines have been extrapolated to obtain limits for deposition of radioactivity in the environment, which can be easily predicted and quickly measured.
- Later assessments will be based on application of FDA DILS to analyses of radioactivity in foods, not the amount of radioactivity deposited in the environment.
- FDA DILs limit the radiation dose due to consumption of contaminated food to 0.5 rem for the body or 5 rem to any one organ. They are computed for the most sensitive age group.
- Drinking water is protected by separate EPA drinking water DRLs, which limit the radiation dose due to consumption of contaminated water to the same levels.
- Computations of DRLs in terms of FDA DILs and area concentration are based on only on radioactivity deposited on the plant exterior surfaces. Uptake of radioactivity into the plant from the soil is a slow process which is not included.
- Radioactive contamination is expected outside the contoured areas, but not at levels expected to exceed federal guidelines based on current information.
- Briefing Products are intended for presenting common operating picture to key leaders and decision makers. Other more technical products are available (Standard Products).
- Contact the FRPCC Subcommittee for Environment, Food and Heath (Advisory Team) for advice and recommendations. Available by calling CDC Emergency Operations Center (EOC) at 770-488-7100.

Briefing Product for Public Officials
Current: [insert time and date]
Check for updates

Technical Details: FRMAC Home Team 702-794-1665
Advice & Recommendations: A-Team 770-488-7100

Classification

page 3 of 3

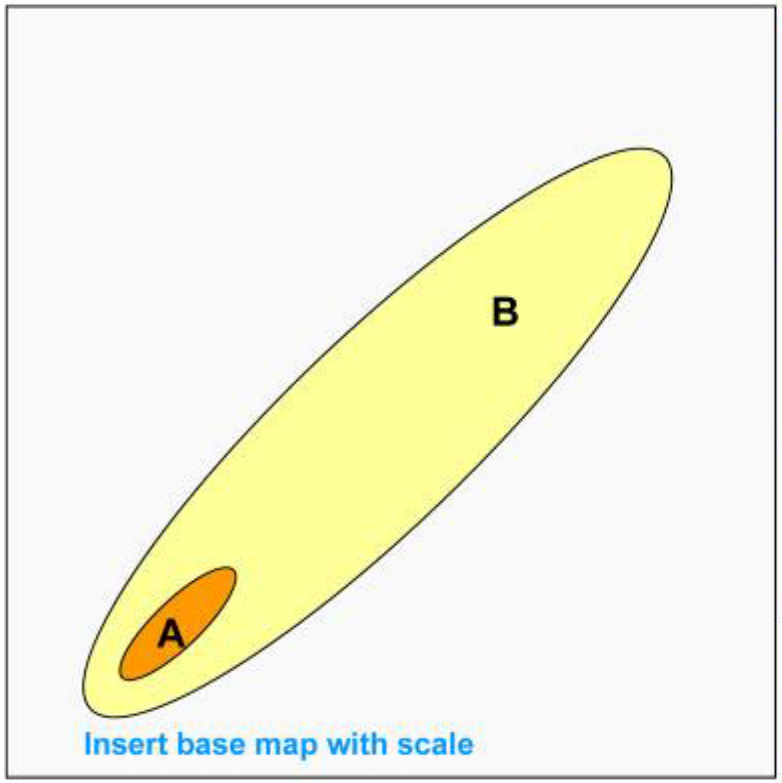
FIGURE D-17. INGESTION BRIEFING PRODUCT SPEAKER NOTES

Classification

Product Set #: [Exercise/Real Event]
[Location City, State]
[Event Type] at [Date, Time]

Predicted Relocation Areas Based on EPA/DHS Guides

(due to long term risk from residual radioactivity on the ground)



A Relocation warranted due to dose expected to be received during the 1st year (exceeds 2 rem). Estimated population: [insert population number]

B Relocation warranted due to the dose expected to be received during the 2nd or any subsequent year (exceeds 0.5 rem). Estimated population: [insert population number]

Notes:

- Protective actions are based only on dose that can be avoided, does not include dose received before [insert time and date]
- Predicted dose assumes maximally exposed individual with no protective actions or mitigation

Assumptions:

- Areas shown are [insert proper text, e.g., "model predictions based on estimate source term but no measurements"]
- No radioactive cloud present
- Residual radioactive ground contamination is the concern

Briefing Product for Public Officials
Current: [insert time and date]
Check for updates

Classification

Updates & Details: FRMAC Home Team 702-794-1665
Advice & Recommendations: A-Team 770-488-7100

page 1 of 3

FIGURE D-18. WORKER PROTECTION BRIEFING PRODUCT GRAPHIC

Classification

Product Set #: [Exercise/Real Event]
[Location City, State]
[Event Type] at [Date, Time]

Predicted Relocation Areas Based on EPA/DHS Guides

(due to long term risk from residual radioactivity on the ground)

Key Points

- Areas shown are [insert proper text, e.g., "model predictions based on estimate source term but no measurements"].
- Relocation is not urgent. PAG based on long term exposure and cancer risk.
- Protective actions are based only on dose that can be avoided.
- Areas shown do not include dose received before [insert time and date].
- Some groups not previously evacuated may require relocation.
- Re-entry into relocated areas permitted with appropriate controls.
- Separate guidelines:
  - Dose during first year,
  - Dose during any subsequent year.
- Assumes maximally exposed individual, no protective actions considered.
- Only ground contamination contributes to dose.
- Dose rate tends to naturally diminish with time.
- Dose reduction measures can be considered, contact Advisory Team.

Briefing Product for Public Officials
Current: [insert time and date]
Check for updates

Classification

Updates & Details: FRMAC Home Team 702-794-1665
Advice & Recommendations: A-Team 770-488-7100
page 2 of 3

FIGURE D-19. WORKER PROTECTION BRIEFING PRODUCT KEY POINTS

Classification

Product Set #: [Exercise/Real Event]
[Location City, State]
[Event Type] at [Date, Time]

Predicted Relocation Areas Based on EPA/DHS Guides

(due to long term risk from residual radioactivity on the ground)

Presenter Notes – Additional Information

- PAG – Protective Action Guideline, projected dose at which a specific protective action to reduce or avoid that dose is warranted.
- Relocation PAG applies only to dose that can be avoided.
- Areas shown do not include dose received before [insert time and date]
- Areas shown are [insert proper text, e.g., "model predictions based on estimate source term but no measurements"].
- Following early phase it may be necessary to temporarily relocate the public from areas until decontamination has taken place.
- Contrary to the situation during the early phase, when decisions usually must be made and implemented quickly, many decisions and actions during the intermediate phase can be delayed until adequate resources are in place.
- PAGs should be considered as guidance only. During an incident, due to unanticipated local conditions and constraints, professional judgment will be required. Situations can be envisaged in which relocation of the public, based on the recommended PAGs, would be impracticable. Conversely, under some conditions relocation may be quite practicable at doses below the PAGs.
- Some groups not previously evacuated may require relocation.
- Informed judgment must be exercised to assure priority of protection for individuals in areas having the highest exposure rates.
- Contamination below PAG levels may extend beyond the restricted zone. Monitoring and simple dose reduction efforts are recommended in this area to reduce doses to the extent practical.
- Re-entry into relocated areas permitted with appropriate controls.

Presenter Notes – Technical Background

- Guidance based on EPA and DHS PAGs, as given in:
  - "Manual of Protective Action Guides and Protective Actions for Nuclear Incidents," (EPA 400–R–92–001, May1992).
  - "Protective Action Guides for Radiological Dispersal Device (RDD) and Improvised Nuclear Device (IND) Incidents," (Federal Register, Vol. 71, No. 1, Jan. 3, 2006, pg 174).
- Dose considered is the projected Total Effective Dose Equivalent (TEDE) includes external irradiation and inhalation of re-suspended material, accounting for weathering of material and radioactive decay. Only ground contamination contributes to the dose. There is no plume contribution.
- Two separate dose criteria are used: 1) Dose during first year (2 rem), 2) Dose during second or any subsequent year (0.5 rem)
- DRLs used to define areas shown are (insert actual values for both 1str & 2nd year DRLs with units , e.g. 1.5 mR/h & 0.3 mR/h or 30 $\mu C/m^2$ & 6 $\mu C/m^2$)
- Projected dose assumes individuals are unsheltered and unprotected, and no mitigation or remediation actions are taken (maximally exposed individual). Dose accumulated over a period of one year.
- Dose reduction factors associated with simple, rapid decontamination techniques are not included in calculating projected dose for decisions on relocation, as prescribed by EPA PAGs.
- Some special cases (e.g., beta only RDD) may also require consideration of beta radiation from surface contamination and direct ingestion of contaminated soil.
- Dose reducing actions may reduce the size of the relocation area and the size of the affected population.
- Dose rate tends to naturally diminish with time due to radioactive decay and weathering of contamination into the soil.
- Radioactive contamination is expected outside the contoured areas, but not at levels expected to exceed federal guidelines for relocation based on current information.
- Briefing Products are intended for presenting common operating picture to key leaders and decision makers. Other more technical products are available (Standard Products).
- Contact the FRPCC Subcommittee for Environment, Food and Heath (Advisory Team) for advice and recommendations. Available by calling CDC Emergency Operations Center (EOC) at 770-488-7100.

Briefing Product for Public Officials
Current: [insert time and date]
Check for updates

Classification

Updates & Details: FRMAC Home Team 702-794-1665
Advice & Recommendations: A-Team 770-488-7100

FIGURE D-20. WORKER PROTECTION BRIEFING PRODUCT SPEAKER NOTES

APPENDIX E
eFRMAC

The eFRMAC enterprise is a broad initiative to move data faster, farther, and better through telemetry, automation, and networking. Appreciable time was required for field measurements to find their way onto maps and into models using a paper-based process. Therefore, the eFRMAC enterprise was conceived to eliminate paper handling and avoid data re-entry as much as possible throughout the process of monitoring, assessment, and data product distribution. In eFRMAC data are moved, managed, and manipulated electronically all the way from the instrument in the field to the final map product on the decision maker's desk. Measurements can now be viewed on a map and used for computations within seconds of acquisition. Special access is provided for direct upload of early data acquired by first responders.

eFRMAC results in other advantages besides improved speed. First, potential errors are greatly reduced because data are never repeatedly transcribed. In fact, efforts are underway to entirely eliminate manual data entry for the primary core of instruments. Second, FRMAC now becomes operational upon notification. eFRMAC, which is available 24/7, permits a Home Team to carry the full workload while FRMAC's field teams are in transit. Upon arrival on scene, eFRMAC immediately delivers all the data and all the products developed by the Home Team to the team in the field. Third, added productivity is realized because the Home Team now augments the FRMAC field team throughout the course of the event, providing assistance with assessment of data and creation of FRMAC products. Finally, it is anticipated that the use of eFRMAC will permit FRMAC resources to be stretched farther to cover multiple venues and forward staging areas.

E.1 Accessing eFRMAC

eFRMAC presents itself to users via two Internet websites. Users generally need only access one of the two sites depending upon their role in the event.

The first website is the FRMAC Portal, which is restricted to the FRMAC staff for data input, analysis, and product development. Think of it as the entry to the FRMAC Factory Floor. The second website is CMweb, where completed and approved FRMAC Products are made available to the entire emergency response community. Think of it as the FRMAC Factory Store (Figure E-1). Both websites are capable of hosting information up to and including Official Use Only.

New Accounts and Access Privileges:

User accounts can be created and access privileges granted almost immediately upon demand during an emergency. However, account requests are preferred prior to any actual event or exercise.

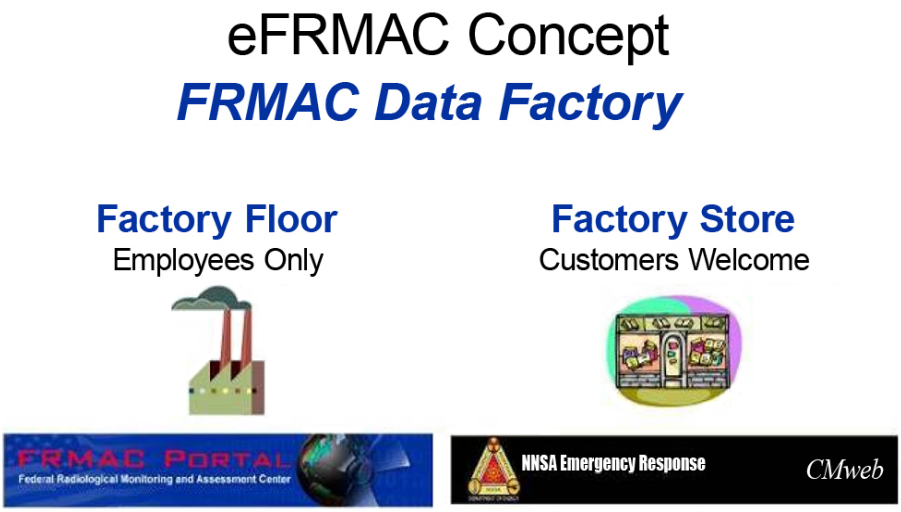


FIGURE E-1. eFRMAC CONCEPT

During day-to-day operations, contact Colleen O'Laughlin at U.S. Department of Energy, National Nuclear Security Administration Nevada Site Office (NNSA/NSO). The system administrator will create the account immediately upon approval by Colleen O'Laughlin.

Colleen O'Laughlin
FRMAC Program Manager
NNSA Nevada Site Office
232 Energy Way
N. Las Vegas, NV 89030
olaughlin@nv.doe.gov
Office: 702.295.0648
Cell: 702.630.0203

During events (actual or exercise) contact the Consequence Management Home Team or National Atmospheric Release Advisory Center (NARAC) to initiate new accounts and privileges on the FRMAC Portal or CMweb, respectively. The system administrator will create the account immediately upon U.S. Department of Energy (DOE) approval.

FRMAC Portal
Consequence Management
Home Team
cmht@nnsa.doe.gov
Phone: 702.794.1665

CMweb
NARAC
https://cmweb.llnl.gov
an application form will be found on the website
Phone: 925.422.7627

E.1.1 CMweb – FRMAC Data Product Distribution Website

CMweb is the new FRMAC data distribution and information-sharing website. It replaces FRMACweb. The intent of CMweb is to provide simplified access to the National Atmospheric Release Advisory Center (NARAC) / Interagency Modeling and Atmospheric Assessment Center (IMAAC) and FRMAC products. CMweb also hosts FRMAC working group documents and documents for other DOE Consequence Management assets.

Prior to implementation of CMweb, users needed three separate logins to access NARAC/IMAAC and FRMAC products. Now CMweb unifies access to all three sites with a single login. That is, the username/password is the same for all three sites. Existing NARACweb or IMAAC accounts already have an associated CMweb account. The username/password is the same for all. All previous FRMACweb users have been moved to CMweb. New accounts can be requested as described above. A user can navigate from one area to another area. However, users can only reach the body of information for which they are authorized.

Logging into CMweb

CMweb can be reached from any computer with Internet access, using either of these CMweb links: https://cmweb.llnl.gov or cmweb.llnl.gov.

Both of these links take the user to the CMweb home page, which is accessible to all. At the home pager there is a set of asset-specific links and a login dialog box. Each asset-specific link leads to a public website featuring information about that asset. For example, the FRMAC link leads to links for the FRMAC Program's home page, the FRMAC manuals, and the FRMAC calendar. Asset-specific links are also provided for NARAC, Aerial Measuring System, Radiological Assistance Program, and Radiation Emergency Assistance Center/Training Site. There is also a link to the FRMAC Portal entitled "eFRMAC." This link goes from CMweb directly to the FRMAC Portal for login to RAMS.

The CMweb login dialog box is also on the CMweb home page, at the right side of the screen. Enter "Username" and "Password" here. New user accounts can be requested by selecting the "Request Account" link in the CMweb login dialog box. The "Request Account" link will open a form, which solicits the information required to open an account. The system administrator will activate the account upon approval by DOE.

Once logged into CMweb, the user is presented with an individualized screen. NARAC and IMAAC users will immediately see a strong resemblance between the CMweb screen and the NARAC and IMAAC screens because they share the same server infrastructure at Lawrence Livermore National Laboratory (LLNL). If access has recently been granted to a folder or book of information on CMweb, an e-mail notification will be sent and an announcement will be posted here with a link to the folder or book. The CMweb directory may also be browsed by selecting the "CM Events" link. However, a user may only view those folders and books to which access has been granted.

The CM Events directory is organized by year and includes folders for the Archived Events, Consequence Management, Current Year Events, and FRMAC.

The CMweb has a directory structure, similar to most computer systems—UNIX, Linux, or Windows. The highest level of CMweb is the CMweb directory. Under the CMweb directory there are two types of folders: Events and Assets. Each year has its own events folder; for example, Events 200X, with X being last digit of the year. There are individual folders for assets such as FRMAC, CM, and RAP. Each of these folders is under the control of either the administrators for that asset (DOE – CMweb group), or the entire group (RAP). Each year's folder; e.g., Events 200X, contains relevant events or exercise folders (an example would be Diablo Bravo or Point Beach IPX). Instructions for creating an Event or Exercise folder are given below. The title of the folder should be the Event or Exercise Name.

E.1.2 FRMAC Portal – Gateway to RAMS Database

The FRMAC Portal is the gateway for FRMAC staff to access a variety of data management utilities hosted at the Remote Sensing Laboratory (RSL) at Nellis Air Force Base. The most important is the Radiological Assessment and Monitoring System (RAMS), which is the database in which all FRMAC data are accumulated, displayed, manipulated, and dispensed. The FRMAC Portal also provides access to other utilities such as the Radioanalytical Organization Database for Emergency Operations (RODEO) and the real-time data acquisition and dissemination tracking system (RDADTS).

Services hosted on the FRMAC Portal are available 24/7. This provides access to the RAMS database from the outset of any incident. Because the FRMAC Portal is accessible via the Internet, the RAMS database is accessible to the Consequence Management Home Team (CMHT) distributed at NARAC, Sandia and Los Alamos, as well as RSL–Nellis. Therefore, the CMHT can begin working an incident immediately upon notification and provide FRMAC support, while the FRMAC Field Team is en route to the incident site. Once FRMAC has been established in the field, the RAMS database in the field establishes continuous synchronization with the RAMS database on the FRMAC Portal. This way the FRMAC Field Team and the CMHT work as one. The FRMAC Portal also provides a means for FRMAC Liaisons to initiate and track Action Items and participate in work product approval, regardless of location.

Access to the FRMAC Portal, particularly RAMS, is strictly limited to FRMAC staff in order to assure that all FRMAC data and data products have been reviewed for quality and approved by stakeholders for release.

Logging into the FRMAC Portal – Accessing RAMS

Outside the FRMAC

One may access RAMS from outside the FRMAC in two ways, either directly via its URL or via a link on CMweb.

1. FRMAC Portal URL — https://frmac.oem.doe.gov
2. CMweb link — enter cmweb.llnl.gov or https://cmweb.llnl.gov
   Go to the **eFRMAC** link

Both methods resolve to the same VPN login page. This login results in a secure connection to the RSL–Nellis servers. After logging in, select the "FRMAC Portal" link. A menu of utilities will be presented. Choose RAMS to be taken to the RAMS Welcome Page.

Inside the FRMAC

One may also access RAMS from *inside* the FRMAC via the deployed FRMAC servers using https://frmac.oem.doe.gov. In this case the user must log into RAMS using the same username and password used for the accessing the FRMAC Portal.

RAMS Desktop Screen

The RAMS Desktop Screen is immediately presented upon entering RAMS. This is the default starting page for the RAMS system. It is capped with a menu bar and includes a series of links used for common activities. The menu choices and links displayed depend on the role that the user is assigned. No user has all options.

Desktop Features:

- Event – Selector box to choose event of interest to user
- Quick Start Links – Instant jump to most frequently used features
- Featured Work Product – Graphic posted for all to see on entry
- Event Snapshot – Statistics about data in database
- Event Phone Numbers – Key phone numbers identified in event's phone list
- Event website Links – Key websites identified in event's phone list
- Tickler Bar – Scrolling notice to the user currently logged in highlighting outstanding obligations (Work Product approval or Action Items)
- News Bar – Scrolling notice to all users for general announcements

E.2 Early Data Entry on RAMS

Often the most important measurements are the initial measurements recorded by first responders. These can be vital to realistic modeling and prudent planning of the radiological monitoring campaign. Therefore, eFRMAC offers an "Early Data Entry" utility. The CMHT will provide the FRMAC Portal accounts to first responders wishing to submit their measurements. Data submitted using the Early Data Entry feature become immediately available to Assessment for consideration.

The RAMS's Early Data Entry feature was designed to easily assimilate the measurements taken by the first responders. The goal is to quickly identify every organization that has measurements or data of any kind, then enable that organization to enter their data into RAMS. It is understood that the first responders themselves may not do the data entry. In that case, either FRMAC liaisons or the CMHT will have to do the data entry. Designated members of first responding organizations will be given RAMS accounts. A first responder account has a simplified menu structure so that Early Data Entry is prominent.

Uploading data via Early Data Entry – *Bulk Upload*

Access Early Data Entry either via the Quick Link on the welcoming Desktop or via "Early Responder Upload Utility" under the "Upload/Download" menu tab.

The Bulk Upload option allows the user to upload measurements to RAMS as either an Excel spreadsheet (xls) or comma delimited text file (csv). This is the easiest mechanism for data entry for more than about five measurements. Click on "To bulk upload multiple measurements from a file, click here."

For RAMS to recognize the data fields properly, it is important to use the headings as provided in the sample files. Three sample files are provided:

1. Excel (Minimum Columns) – Columns with headings for minimum information
2. Excel (All Columns) – Recommended Template. Solicits all desired information (Figure E-2)
3. CSV (Minimum Columns) – Comma delimited file with headings for minimum information

Event	Measurement Date	Surface Type	Measurement Type	Raw Value	Measurement Unit	Latitude	Longitude	Description	Street Address	City	State	Zip Code
Diablo Bravo	01/01/2008	Asphalt	Alpha	900	cpm	0	0	Sample Field Measurement 1	123 Sample St.	Hometown	DC	12345
Diablo Bravo	01/01/2008	Dirt	Beta	230	cpm	0	0	Sample Field Measurement 2	123 Sample St.	Hometown	DC	12345
Diablo Bravo	01/01/2008	Grass	Gamma	500	cpm	0	0	Sample Field Measurement 3	123 Sample St.	Hometown	DC	12345

FIGURE E-2. ***EXCEL "ALL COLUMNS" FILE WITH EXAMPLE DATA***

To use these templates simply:

- Copy a template file to your computer. Then open it (usually with Excel).
- Delete the sample data and insert your own data. The format for Lat/Lon is decimal degrees (nnn.nnnnn) with a minus sign (-) for West Longitude or South Latitude.
- Save the file to your computer with a name of your choice.
- Use Browse to designate your file to RAMS, press Upload.

Uploading data via Early Data Entry – *On-Line Data Entry*

Access Early Data Entry either via the Quick Link on the welcoming Desktop or via "Early Responder Upload Utility" under the "Upload/Download" menu tab.

The data entry form in the RAMS Early Data Entry Utility is the easiest method to add just a few data points. One simply completes the on-line form for each measurement. Only the fields with asterisks are required. Click on "To upload a single measurement, click here."

E.3 Technical Description of eFRMAC

eFRMAC is not software. It is an enterprise comprised of multiple hardware and software components. Development was first conceptualized in the fall of 2006 as just replacement database software.

Quickly, it was realized that several separate but related hardware and software projects could be aligned into a single effort to develop a truly paperless FRMAC; that is, a FRMAC in which paper form-based data management would be replaced by telemetry, automation, and networking. The NNSA Office of Emergency Response (NA-42) formed and led a collaboration of the RSL, Chainbridge Technologies, LLNL (NARAC), and Sandia National Laboratories. Their goal for fiscal year (FY) 2007 was to field a fully operational eFRMAC enterprise for field monitoring data at the Top Off 4 Exercise. eFRMAC exceeded expectations and work continues to expand it.

Key features of eFRMAC currently include:

- Multipath telemetry of measurements from DOE field teams
- 24/7 accessibility via the Internet
- Expedited data entry for first responder data
- Support for distance collaborations
- Data delivery to NARAC
- Data exchange with the EPA's SCRIBE database
- Integration with Turbo FRMAC
- Automated quality assurance (QA) and workflow aids
- Integration with FRMAC's enterprise Geographic Information System (GIS) mapping capability
- Database mirrored on synchronized servers

The schema for eFRMAC presents the relationships between its hardware components (Figure E-3). Essentially, eFRMAC is a database mirrored on synchronized servers. One suite of servers is at a fixed Home Team location (RSL) and one suite deployed to the FRMAC location. Both are tied together via a satellite link. Telemetry directly feeds measurements by field teams into the database. Exposure on the Internet enables access from outside the RSL-based CMHT and FRMAC, plus facilitates data exchanges with other systems.

The eFRMAC enterprise comprises four major components:

1. Database – RAMS
2. Telemetry – Data Tablets and MultiPath Communications Devices (MPCDs)
3. Satellite Communications – Emergency Communications Network (ECN)
4. Internet Gateways – CMweb, FRMAC Portal, plus links to other systems

Each of the four components is described below.

E.3.1 Radiological Assessment and Monitoring System (RAMS)

The RAMS database is designed to manage all information related to field teams and monitoring instruments, as well as all field measurements and field samples with their analysis results. It is also designed to facilitate certain aspects of QA and FRMAC workflow. Most of the features of eFRMAC are derived from RAMS alone. These include:

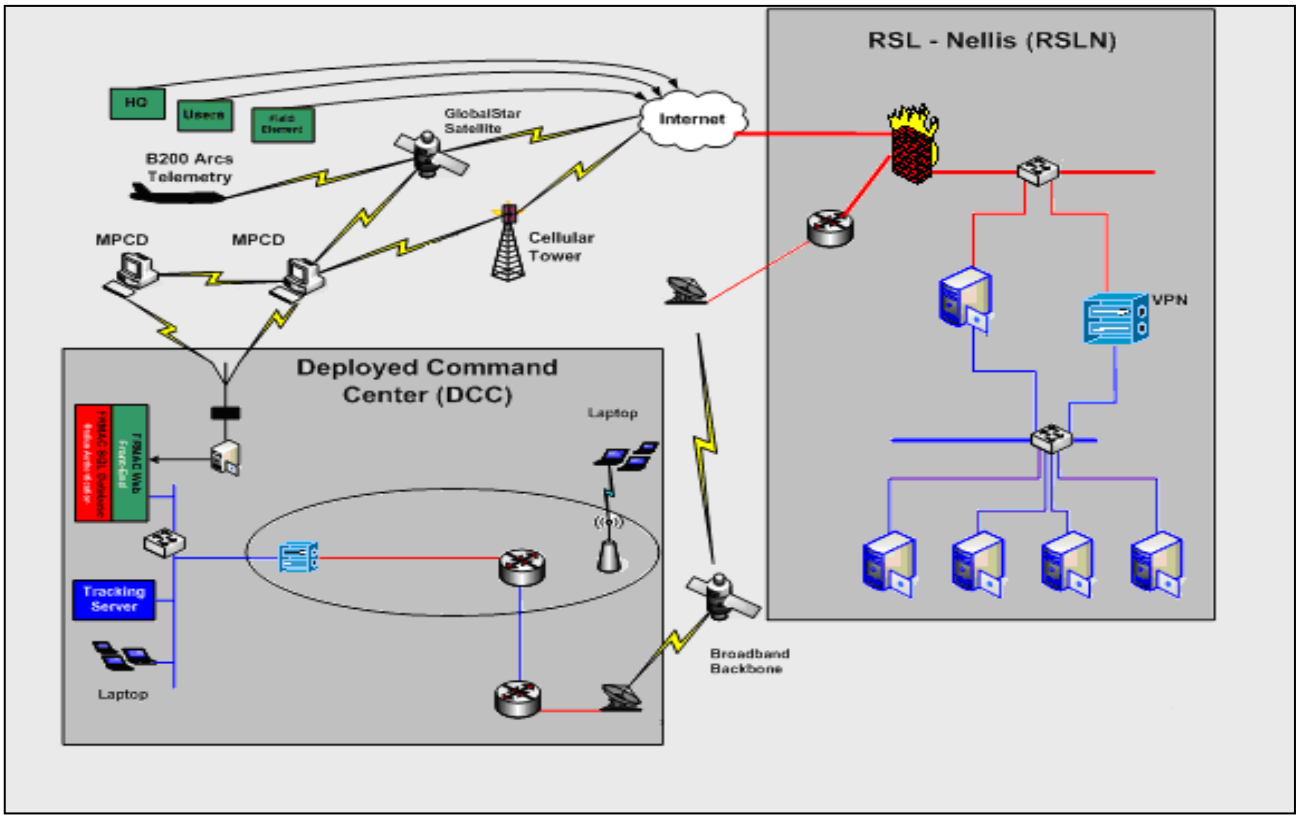


FIGURE E-3. eFRMAC SCHEMA

- *Server Synchronization* – Both the central database software and the software for data manipulation were expressly designed for server replication. That is, the central database automatically and continuously replicates itself so that there are two identical, mirror image copies of the central database, one in the field and the other at RSL. This accomplishes two goals. First, it permits fully independent operation of RAMS at two locations using their own copies of the central database. It also provides a level of data redundancy in addition to the use of a redundant array of inexpensive disks (RAID) technology on the respective servers.
- *Early Data Entry* – As described in Appendix E.2 "Early Data Entry on RAMS," a key feature is that RAMS is made available to first responders so that early measurements can be easily and directly uploaded into RAMS. This feature is available 24/7 via the FRMAC Portal.
- *Automated QA Aids* – These features support the two independent quality reviews of the data that are performed on data before they are used for interpretations and FRMAC data products. For example, RAMS automatically plots any data returned by a database query. The data points are typically color-coded by comparison to Derived Response Levels (DRLs). Another feature performs automatic bounds checking on data as entered and sets flags to alert reviewers. Yet another feature automatically creates sets of data that are nearby in time and space for consideration as peers. It also computes various ratios and statistics to facilitate the peer comparison.
- *Integration with FRMAC's Enterprise GIS* – RAMS and FRMAC's Geographic Information System (GIS) capability have been linked in two important ways. First, any data on RAMS is visible to GIS along with all of its attributes. Similarly, any GIS layers in enterprise GIS (base maps, NARAC plots, etc.) can be viewed in RAMS as part of the automatic data plotting.

- *NARAC Export* – This convenient feature allows data identified as important for normalization of NARAC's modeling to be automatically sent to NARAC for their consideration.
- *Turbo FRMAC Integration* – To both speed health physics calculations using Turbo FRMAC and to avoid data transcription errors, an interface is designed into RAMS to interchange data directly with Turbo FRMAC. This includes uploading DRLs and conversion factors into RAMS from Turbo FRMAC, plus downloading sample analysis results from RAMS to Turbo FRMAC.
- *Workflow Management Aids* – Two FRMAC workflow management functions are automated in RAMS. Firstly, Action Items cannot only be created and tracked through RAMS, but responses with data products can be distributed to requestors. Also, approval of FRMAC work products is managed through RAMS. Because RAMS can be accessed via the Internet, work products can be reviewed and approved, plus Action Items can be accessed from outside the FRMAC.
- *Data Exchange with EPA's SCRIBE* – EPA and NNSA worked together to develop an XML-based data transfer protocol to assure that data could be conveniently exchanged between their respective agency databases.

E.3.2 Data Tablets and Telemetry – Data Tablets and MPCDs

Telemetry of radiological monitoring data from teams in the field directly into the RAMS database is one of the most unique aspects of eFRMAC. Instead of completing paper forms, a user completes an electronic form on a touch-screen tablet computer. Instead of attempting to accurately call in measurements by radio, measurements are directly inserted into RAMS without transcription or potential error. Instead of waiting for completed forms to be delivered to the FRMAC, information on the electronic forms is instantly available to RAMS users without potential loss of information.

The front end of the 2-way telemetry system is comprised of the Data Tablet and the MPCD (Figures E-4 – E-7). The Data Tablet is the user's interface with eFRMAC. It communicates via wireless Ethernet (802.11) to the MPCD, which then provides the long distance telemetry links back to RAMS. The Data Tablet is small and light enough to be easily hand carried and used anywhere in the general vicinity of the MPCD. The much larger MPCD is mounted on the user's vehicle.

The Data Tablet is a ruggedized, touch-screen tablet computer equipped with a Global Positioning System (GPS), Bluetooth, and wireless Ethernet (802.11). An application, Digital Field Monitoring Software, has been written that presents screens to the user that functionally resemble conventional paper forms for recording field monitoring information. The user can complete the form by touching options in pull down lists or by writing on the touch-screen with a stylus. The GPS location and time of the measurement are automatically added to the entry. Information, such as instrument choices, team members, and the like, is downloaded from RAMS and presented to Data Tablet users in pull down lists. The Data Tablet communicates via wireless Ethernet to the MPCD. If this wireless link is broken, data are buffered in the Data Tablet and in the MPCD until the link is restored. A future goal is to have Bluetooth enabled radiation monitoring instruments communicate directly with the Data Tablet.

FIGURE E-4. DATA TABLET WITH MPCD EXTERIOR MODULE INSTALLED ON VAN

FIGURE E-5. DATA TABLET SCREEN

FIGURE E-6. MPCD (INTERIOR MODULE)

FIGURE E-7. MPCD (EXTERIOR MODULE)

The MPCD is a vehicle-mounted device that provides a long distance communication pathway for Data Tablets to RAMS. The MPCD transmits loss-free data from the Data Tablets by satellite, cellular, and mesh networking technologies. It does so automatically with no user intervention. That is, if the MPCD is either sufficiently close to the FRMAC or if a series of MPCDs can form a relay chain to the FRMAC, then the MPCD communicates directly to a data gateway at the FRMAC via the IP mesh network (Internet protocol peer-to-peer network). If the MPCDs are too scattered to use the IP mesh network, then the MPCD will attempt to use commercial cellular data services (both AT&T and Verizon networks are supported) to reach the data gateway at RSL in Las Vegas, Nevada. If cellular service is not available, then the MPCD will establish the link to the RSL data gateway via satellite using GlobalStar. If no link can be made, data are simply buffered until the link can be completed. The data gateways serve as the mediator with the RAMS database. The MPCD also contains a GPS unit. These data are used by the MPCD to continuously report the current position of the field team vehicle. The positions of all MPCD-equipped vehicles can be displayed in real time at the FRMAC.

E.3.3 ECN Satellite Backbone

The FRMAC, especially eFRMAC, is vitally dependent on communications. This vital link is provided via satellite using DOE's Emergency Communications Network (ECN). A mobile satellite terminal provides the FRMAC with telephone service, Internet access, and a private network dedicated to eFRMAC. Telephone service presently consists of 16 full-featured telephones (Figures E-8 and E-9). Internet service is available to all FRMAC staff (federal, state, tribal, or local) and can be accessed via wired or wireless connections. The private network provides the link between the Las Vegas-based and deployed FRMAC RAMS servers. It is this link that maintains the continuous synchronization of data on the two servers. Data coming into the RSL data gateway from the MPCDs via GlobalStar satellite or cell phone are placed on the RSL-based RAMS server. Those data are then automatically replicated on the server deployed with the FRMAC in the field via the private network on the ECN satellite. Similarly, all data acquired in the FRMAC and placed on its RAMS server are replicated via the ECN satellite link on the RSL-based RAMS server. That way both the CMHT and FRMAC are looking at the same data at all times. In the event that the link is lost, server transactions are simply buffered until the link is restored and then the servers are brought up-to-date.

Replicated but independent, RAMS servers permit the CMHT to be actively involved in acquiring data, conducting assessments, and producing FRMAC data products, while the FRMAC team is traveling to the incident scene. Once the FRMAC is set up, the servers synchronize and the FRMAC has all the data and products produced up to that point. The CMHT remains activated after FRMAC becomes operational. It continues to support the FRMAC by taking on tasks as assigned by the FRMAC, for example, production of Radiological Monitoring and Sampling Status Maps.

FIGURE E-8. SWE-DISH SATELLITE TERMINAL

FIGURE E-9. SATELLITE AND TELEPHONE CONTROL CONSOLE

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APPENDIX F
LABORATORY ANALYSIS

When the Federal Radiological Monitoring and Assessment Center (FRMAC) responds to a radiological event, there is an urgent need to obtain radiological/radiochemical data from a variety of media. These data are obtained from a combination of both field and laboratory analytical results. The data are critical for protective action decisions that will be made. There are many situations in which the field instruments are not able to effectively measure or identify the specific radionuclides that may be present at an event. Sample results from a variety of media are vital to helping decision makers fully understand the type and extent of contamination that is present.

When the FRMAC responds to a radiological accident, monitoring, sampling, and radioanalytical support will be provided from a number of different sources. The responders providing this support have varying levels of training and experience in disciplines such as monitoring, sampling, and radioanalytical equipment and procedures. It is important that an acceptable and established set of standard operating procedures (SOPs) be followed by all personnel having responsibilities for processing samples and analytical data during the emergency. It is to be understood that site- and event-specific operational decisions and procedure parameters need to be established and documented at the time of an emergency event. It is also understood that FRMAC sample tracking and analysis may operate in an integrated and coordinated environment with other agencies and jurisdictions which include state and local agencies.

The Nuclear/Radiological Incident Annex (NRIA) assigns responsibility to the U.S. Department of Energy (DOE) specifically for on-scene analytical capability supporting assessment and indicates that this should be done in cooperation with other federal agencies.

The U.S. Environmental Protection Agency (EPA) shares responsibility with the DOE for the analysis of radiological samples collected during an incident. To this end, they are actively establishing an Environmental Laboratory Response Network (ELRN) with fixed laboratories throughout the country. This network is primarily comprised of EPA and state laboratories.

The FRMAC Laboratory Analysis team is prepared to accept and arrange for the analysis of a wide variety of samples at both on-site and off-site laboratories. Some of these samples will require rapid turnaround times in which the end user is willing to accept higher detection levels and analysis results errors as well as acceptance of a lower rigor level of Quality Assurance (QA) and Quality Control (QC). As the event progresses, requirements will transition from the need for rapid turnaround results to obtaining rigorous and detailed results where lower detection levels, detailed sample QA/QC, and formal chain-of-custody will be vital to ensure legally defensible laboratory results. Documentation of the transfer of custody of a sample(s) is important. There must be sufficient evidence to demonstrate that the integrity of the sample is not compromised from the time it is collected to the time it is analyzed. Any radiological emergency that requires a FRMAC response has a substantial probability of leading to criminal and/or civil litigation. As such, the maintenance of associated records will be crucial. FRMAC will be responsible for records retention

until control of the event is assumed by the Coordinating Agency. At this time, the Coordinating Agency will assume responsibility for the records.

F.1 Emergency Phase

During the emergency phase of the incident, the Data Quality Objectives (DQO) requirements for analytical data needed to support assessment are very minimal at first but increase over time. The sample chain-of-custody formality may also be lower in this early phase but to the extent possible sample chain-of-custody will be maintained. Data Quality Objectives (DQO) are adjusted to be commensurate with the urgency of the decision at hand and the risk of potential consequences from an incorrect decision. During this phase, the role of field measurements and mobile laboratory assets will begin to decline as increasing rigor on sample DQOs and lower urgency for immediate results may allow/require analysis at fixed laboratories. The relative role of field measurements, mobile laboratories and fixed laboratories will depend on the radionuclides of concern for the specific incident or emergency.

F.2 Intermediate Phase

The intermediate phase will require a greater degree of data quality as longer-term exposure risks are evaluated, as well as the use of a formal sample chain-of-custody processes to ensure the data remains legally defensible. These more rigorous DQOs may require the use of fixed laboratories, with greater capacity and enhanced capabilities. The role of on-site analytical capability may also decline depending on its capacity and ability to adapt to these more rigorous DQOs.

Laboratories that have an extended ability to conduct analysis for virtually any radionuclide occurring in a wide variety of media (soil, water, and vegetation) and have a thorough quality assurance program should be used as soon as possible. These laboratories are typically audited and accredited by several organizations (DOE's Laboratory Accreditation Program and Consolidated Audit Program, National Voluntary Laboratory Accreditation Program, and National Environmental Laboratory Accreditation Program) and participate in multiple radiological performance testing programs. Some of these laboratories have existing contracts with DOE field offices that provide for 24-hour turn-around time.

The Laboratory Analysis team will apply a Graded Approach to the level of rigor for each sample depending upon the ultimate needs of the end user of the data. There are several factors which impact the Laboratory Analysis team's decisions such as using an on-site verses off-site laboratory, which off-site laboratories to use, as well as the urgency of the data:

1. Knowledge of the Materials Released
2. Timing of the Event
3. Activity Levels of Samples
4. Intended Use of Data
5. Ability to Detect Key Radionuclides using Field Instruments

Once the decision to perform sampling activities is made, the next step is to consider the type of analysis and determine the data needs for these analyses. It is advisable to select a radiochemical laboratory as early in the radiological monitoring and sampling process as is practical.

Data deliverables are dependent on the phase of the response and the DQO needed for the data. Verification and validation can be a long process and some analytical data may not have completed verification until sometime after the results are returned to the FRMAC.

F.2.1 Knowledge of Materials Released

The number of laboratory samples needed, as well as the urgency of obtaining these samples early in the event, depends on several factors. One of these factors is the amount of knowledge that exists regarding the material that was released.

In situations where there is process knowledge related to the released material, such as a weapons accident or a transportation accident, the need for laboratory analysis is minimal, and only a few samples will likely be analyzed until much later in the event because the distribution of radionuclides is likely well known. Laboratory samples will be used to confirm what was released and to what degree and will likely be used in food characterization and ultimate release of areas for reoccupation. In this case, the urgency of the sample results are lower during the emergency phases of the events, but the overall formality of QA/QC and chain-of-custody becomes very important as the data will become part of the official information used to determine actions for the contaminated site. Documentation of the transfer of custody of a sample(s) is important. There must be sufficient evidence to demonstrate that the integrity of the sample is not compromised from the time it is collected to the time it is analyzed.

In contrast, if there is little or no knowledge of the released material early in a response event, such as in the case of a Radiological Dispersal Device (RDD) or “Dirty Bomb”, the urgency of obtaining initial sample analysis is imperative. Until a reasonable cross-section of laboratory analyses have been performed, one cannot be sure that the correct radionuclide mixture is being used for dose assessment and Protective Action Guide (PAG) decisions. In this case, very rapid sample results are vital. In this case, on-site laboratories are used, if possible, to achieve the fastest turnaround times. Also, in this phase of the response less emphasis is placed on formal QA/QC such as duplicates, splits, blanks, and spike samples. In the early phases of the event generally the internal QA/QC of the laboratory is sufficient. Later in the process, samples requiring more detailed QA/QC analysis would be distributed to the laboratories. The process would then transition to a recovery mode in which the laboratory analysis process begins to be conducted the same way as when a known radionuclide mixture has been released.

F.2.2 Timing of the Event

During the emergency phase of a response:

- If the released material is known, there is less urgency to obtain laboratory analysis results because the laboratory results are simply to confirm that the information about the mixture is correct. In this situation, the use of off-site laboratories is adequate.

- If the released material is not known, the urgency of obtaining laboratory analysis results is drastically elevated. The initial samples become vital information in defining the released radionuclide mixture. Appropriate PAG and Derived Response Limits (DRL) guidance cannot be developed until that data becomes available. This is the situation, one would want to use the on-site laboratories if possible to achieve the most rapid turnaround times for results.

During the intermediate and recovery phases of a response:

The initial actions have been completed and the released material will be known. Sample results will now be used to: fully characterize the plume and plume boundaries; determine contamination levels of food and water supplies; and support ultimate release of the uncontaminated areas. The formality of the QA/QC processes as well as the chain-of-custody processes become required. This data will ultimately become part of the legally defensible site characterization and as such require a very high level of formal rigor. At this point in the response the use of on-site laboratories would likely have transitioned to the use of off-site laboratories.

F.2.3 Activity Levels of Samples

One factor that can significantly impact the choice of laboratory to analyze a particular sample is the overall radioactivity of the sample. In certain situations the samples collected may be highly radioactive. Most laboratories are not prepared to handle high activity samples and will not be willing to accept such samples due to the possibility of license violations.

In this situation the options become more limited. The DOE Fly-Away Laboratory will be a more likely option due to its ability to accept higher activity samples. An additional resource would be the DOE National Laboratories who have significant radiochemistry capability and can accept significantly higher activity samples and perform the analyses that are needed.

F.2.4 Intended Use of Data

When the decision is made to send out a sample for analysis the Laboratory Analysis team considers the intended use of the data.

Samples sent out early in the event in an attempt to gain initial characterization of the plume content require very rapid turnaround times and, as such, the end users are willing to accept results with higher detection levels and a lower rigor level of QA/QC and less formality in chain-of-custody processes.

As the event progresses, the sample results become final characterization data for the recovery phase of the event or used to characterize contamination levels of food supplies. At this point, the end user requires lower detection levels and a high rigor level of QA/QC and more formal chain-of-custody. This data will be important information in determining the ultimate disposition and recovery of the contaminated area. The decisions made using these data have significant impact on people’s homes and personal property as well as the economic well-being of a region’s farming or business interests. The implications of these data results are significant and as such the overall quality of the data must be high rigor.

F.2.5 Ability to Detect Key Radionuclides using Field Instruments

Another key factor impacting the number of laboratory samples is whether or not the radionuclides in the mixture (or at least some key radionuclides) are readily detected by field instruments:

- In the situation where some of the key radionuclides are readily detectable using field instruments, the number of laboratory samples will be significantly reduced. In this situation laboratory samples may be required to supplement the field measurements to verify the overall mixture or to verify how the mixture is changing either spatially or temporally. Once the dynamics of the mixture is confirmed from the laboratory analysis, the vast majority of the data used to characterize the plume will result from measurements taken by field instruments.
- In the situation where none of the key radionuclides are readily detectable using field instruments, the number of laboratory samples will be significantly increased. In this situation all of the data used to characterize the plume will be generated from either fixed or mobile laboratories. This situation will result in many hundreds to many thousands of samples being collected and analyzed.

F.3 Sample Types

The FRMAC Laboratory Analysis team will be called upon to analyze many different sample media during a response. Laboratory Analysis personnel work closely with the Assessment Scientists to determine their laboratory data needs and with the Radiological Monitoring and Sampling specialists to determine appropriate sample sizes and proper sample containers to achieve the required detection levels. Examples of the types of sample matrices that might be expected include:

- Filters – Air filters collected near the event scene dictate respiratory protection requirements for responders and provide a measure of airborne concentrations to which the public may be exposed. These filters could be analyzed by non-destructive techniques such as gamma spectroscopy or gross alpha/beta or could potentially be analyzed using destructive techniques such as radiochemistry methods to identify a specific nuclide and its concentration.
- Soil – Soil samples might be collected near the event site or at the boundaries of the anticipated plume. These samples would be used to determine the exact mixture of nuclides that was released from an event to help validate model assumptions. These samples could also be used to help verify the boundary of specific plume contamination levels. Soil samples might also be used to determine if a particular area of farm land could be used to grow certain crops after contamination, or to determine if a particular area of a city can be reoccupied or if the population needs to be relocated. These samples could be analyzed by non-destructive techniques such as gamma spectroscopy or potentially analyzed using destructive radiochemistry methods to identify a specific nuclide and its concentration.
- Water – Water samples could be collected to determine the contamination levels in lakes, streams, rivers, wells, and public drinking water supplies to determine the safety of any of these bodies of water for future use. These samples could be analyzed by non-destructive techniques such as gamma spectroscopy or potentially analyzed using destructive techniques such as radiochemistry methods to identify a specific nuclide and its concentration.
- Forage – Vegetation or food stuff samples could be collected to determine the contamination levels to help determine if the material is acceptable for direct human consumption or for use as livestock feed. These samples could be analyzed by non-destructive techniques such as

gamma spectroscopy or potentially analyzed using destructive techniques such as radiochemistry methods to identify a specific nuclide and its concentration.

- Swipes – Swipe samples could be collected to determine the contamination levels on surfaces where removing actual material is not practical such as buildings, sidewalks, streets, and similar types of fixed surfaces. These results will be used to determine the ability to reoccupy certain sections of a city. Filters could also be analyzed by non-destructive techniques such as gamma spectroscopy or gross alpha/beta or potentially analyzed using destructive techniques such as radiochemistry methods to identify a specific nuclide and its concentration.

F.4 Laboratory Resources

DOE is currently exploring a number of different processes to identify what laboratory capabilities exist around the country. Both EPA and the Centers for Disease Control and Prevention (CDC) are developing databases of laboratory capabilities. DOE is evaluating the EPA- and CDC-developed databases to determine if they meet the needs of FRMAC.

F.4.1 DOE National Laboratory Analysis Capability

The DOE National Laboratories have a wide breadth of capability to perform radiochemistry analysis on samples that might result from a FRMAC-type response. The DOE National Laboratories bring their unique abilities to the area of higher-activity samples and some of the more unusual specialized analyses. The capabilities of the DOE National Laboratories are outlined in the RODEO database.

F.4.2 DOE Fly-Away Laboratory Capability

DOE has prototyped a new fly-away laboratory capability to support FRMAC on-site laboratory needs. This capability will become a fully-functioning resource by 2011. The equipment will be positioned with the CMRT II team deployment location. Personnel to operate the fly-away laboratory will be drawn initially from RSL and augmented with personnel from the interagency community and the DOE National Laboratories. This fly-away laboratory will have the ability to perform gamma spectroscopy, liquid scintillation, and gross alpha/beta analyses on-site. It will also have the ability to perform limited sample handling in terms of repackaging samples, creating duplicates, splits, blanks, and spiked samples. This laboratory will also have the capability to perform work in a portable glove box enclosure to allow handling of higher hazard samples such as high activity samples and transuranic samples. The fly-away laboratory will complement the EPA mobile laboratory capability as it can be fielded sooner and is able to accommodate more highly radioactive samples than is possible in the EPA laboratories.

F.4.3 EPA Deployable Mobile Laboratory Capability

For emergency response, EPA has two mobile laboratories (one in Montgomery, Alabama, and the one in Las Vegas, Nevada), which can deploy to the incident scene. These laboratoreis only accept samples with relatively low levels of radioactive contamination. EPA's objective is to maintain these laboratories' ability to analyze environmental samples to detection levels in the environmental

background ranges. This resource is important in assisting in the overall characterization especially in determining the non-contaminated regions and plume boundary regions.

F.4.4 Additional Mobile Laboratory Capabilities

The Air Force Radiation Assistance Team (AFRAT) also has considerable mobile laboratory capability, which can be deployed to support an event.

Civil Support Teams (National Guard) located throughout the U.S. have a limited number of trained responders with analysis equipment who will likely respond to a radiological incident.

F.4.5 Fixed Laboratory Capabilities

Some of the states, primarily those with nuclear generating stations, maintain laboratories that are willing to participate with FRMAC.

In addition, there are numerous commercial laboratories that perform radiochemistry analysis. The key during an emergency is being able to determine which laboratory is available and able to perform the required analysis for samples of certain media and to ensure that the laboratory is able to accept the radioactivity level contained in the sample. As the response evolves FRMAC will transition to using more commercial laboratories capabilities to accommodate the large number of samples and the strict data quality requirements.

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APPENDIX G
LOGISTICAL REQUIREMENTS

G.1 Overview

Under most conditions, the Federal Radiological Monitoring and Assessment Center (FRMAC) has the resources to be able to function self-sufficiently at the incident site, once given a facility not being used for evacuation purposes, without additional logistical support from the state. FRMAC's resources help to ensure that operations minimally impact state and local economies. However, if conditions are extremely severe, either in terms of weather or location (e.g., Point Barrow, Alaska, in January) the FRMAC is not prepared to sustain itself without support from other federal agencies. The selection of a FRMAC site will include consideration of housing, airport facilities, and vehicle availability. All of these factors may be affected by the magnitude of the emergency, evacuation status, presence of an airborne radioactive plume, and other factors that will only be known at the time of the emergency. In addition, interaction with state and local monitoring activities and the location of emergency operations facilities will be considered. Conditions at the time will dictate FRMAC site selection.

G.2 State Assistance

The most important contribution that state officials can bring to a FRMAC response is its people and their local knowledge. Trained state and local personnel are an essential resource in ensuring the FRMAC priorities for monitoring and assessing the radiological hazard are established in accordance with *state requirements and needs*.

State officials working within the FRMAC act as the primary point of contact between the Governor and other high-ranking state officials. State and federal health physicists will work together to determine the extent and level of contamination in terms of radiation dosage to the population and the environment.

State personnel should plan on participating in shifts and supporting the FRMAC 24-hours per day, seven days a week, until the initial phase is over and the environmental impact has been evaluated. The number of state and/or local personnel required to support a FRMAC is a function of what the state can adequately afford. Optimally, a minimum of *seven state or local personnel* would be needed. During the day shift, they would include the senior state official working with the FRMAC Director, a monitoring liaison, radiation assessment liaison, and a field team coordinator. The evening shift would optimally require a senior state official, a monitoring liaison, and a radiation assessment liaison. State functional participation within the FRMAC would also benefit greatly by having personnel involved in Health and Safety as well as other critical positions within the FRMAC, including administrative support.

In addition, and if available, FRMAC could utilize as many state radiological field monitoring teams as possible. These key state monitors would team with federal, National Laboratory, and contractor monitors to provide radiological monitoring and sampling throughout the region. Their knowledge

and experience in the area would be invaluable to the overall credibility of the environmental data and radiation analysis performed at the FRMAC.

G.3 Law Enforcement

In addition to the personnel requested above, another asset that state and local officials could provide is security. The FRMAC will require a security perimeter that must be maintained by law enforcement officials who have the jurisdiction to control crowds and traffic at various locations. FRMAC will require 24-hour law enforcement services to the extent that state and local agencies can provide them.

In the event that local law enforcement cannot be obtained and controlled by state resources, it may be necessary to employ federal security, including the use of military personnel, federal agents, or off-duty local law enforcement. State planners can assist by coordinating in advance with local law enforcement agencies for this purpose.

G.4 Site Specifications

Whenever possible, a FRMAC will be located within 16 to 24 kilometers (10 to 15 miles) of the emergency scene to effectively carry out its mission. Because of the expected use of the U.S. Department of Energy's (DOE) Aerial Measuring System (AMS) assets, the FRMAC location should be convenient to an airport or a helicopter pad to facilitate rapid turnaround. Specific site specifications are situation dependent and will vary in accordance with the level of the response. Following is a description of the site requirements that may *typically* be required for each of the phased response elements. It is important to keep in mind, however, that these requirements are incident dependent.

G.5 CMRT Phase I

The Consequence Management Response Team (CMRT) Phase I Team is a small (25 person), rapidly-deployable team focused on obtaining and assessing gross field monitoring measurements. It is staffed for limited 24-hour operations and is a stand-alone response. The equipment load provides communications, data telemetry, and radiological detection capabilities for up to five field teams and computers and administrative support for a small operations base to manage those teams until additional resources arrive. The load, which consists of approximately 3,500 pounds (240 cubic feet) and personnel roster, is designed to be deployed via a single aircraft from the Remote Sensing Laboratory (RSL) on Nellis Air Force Base in Las Vegas, Nevada. Once notified by DOE's, National Nuclear Security Administration (NNSA) NA-42 in Washington, D.C, the team can be prepared to deploy within four hours (dependent on aircraft availability) The operating footprint of CMRT Phase I is approximately 2,000 square feet; however, if additional resources such as CMRT Phase II or other federal agencies are deployed, it would be beneficial to select a site as stipulated in paragraph G.7.

G.6 CMRT Phase II

Should the radiological incident escalate to a level requiring a CMRT Phase II deployment, an additional 38 personnel with an equipment load of roughly 25,000 pounds (1,750 cubic feet) will be deployed. This response is dispatched within 12 hours from Las Vegas after notification (dependent on aircraft availability). This team provides augmentation and relief for the initial CMRT Phase I Team; the team is staffed for 24-hour operations and can operate as a stand-alone response for weeks. The Support Section of the CMRT will work through the Support Section of the established Command Structure to acquire the supplies necessary for long-term operations.

G.7 FRMAC

When other federal agencies integrate into the response, in addition to state and local agencies, the response is designated a FRMAC and an indoor workspace of 10,000 to 20,000 square feet is required. Space must be available for administrative functions and for specialized equipment, such as a Geographic Information System (GIS), communications, photography, and still video. A large, fenced staging area is needed for shipping and storage of supplies, tents, large trucks and analysis vans, and the setup of outdoor communications equipment. Adequate electrical service must also be available; however, DOE has the capability to provide sufficient electrical service, if required.

The availability and suitability of the following facilities and resources will be considered in the selection of a FRMAC site:

- Site access – airport and/or major highways to accommodate large trucks and vans
- Communications – clear of interference, appropriate terrain for a satellite antenna, telephone trunk lines
- Housing – hotels or military quarters
- Vehicle rental, including several types of large trucks and vans
- Medical facilities – hospital or dispensary
- Food services – round-the-clock catered service
- Materials and services – office supplies, minor repairs, and security

G.8 Site Selection

A final FRMAC operating site will not be selected until an incident occurs. This is due to the fact that the FRMAC may be responding in the aftermath of an earthquake, hurricane, flood, or possible terrorist activity. A significant radiation release may preclude access to pre-selected FRMAC sites due to possible contamination; therefore, any pre-selection of FRMAC sites is limited to simply identifying one or two potential locations for each major, fixed nuclear facility. Members of the Consequence Management Home Team (CMHT) or CMRT I, in consultation with the Coordinating Agency, state, and local authorities, will make the final selection of a FRMAC site based on the current emergency conditions. Potential FRMAC locations include armories, schools, and hangars. FRMAC Site requirements are shown in Figure G-1.

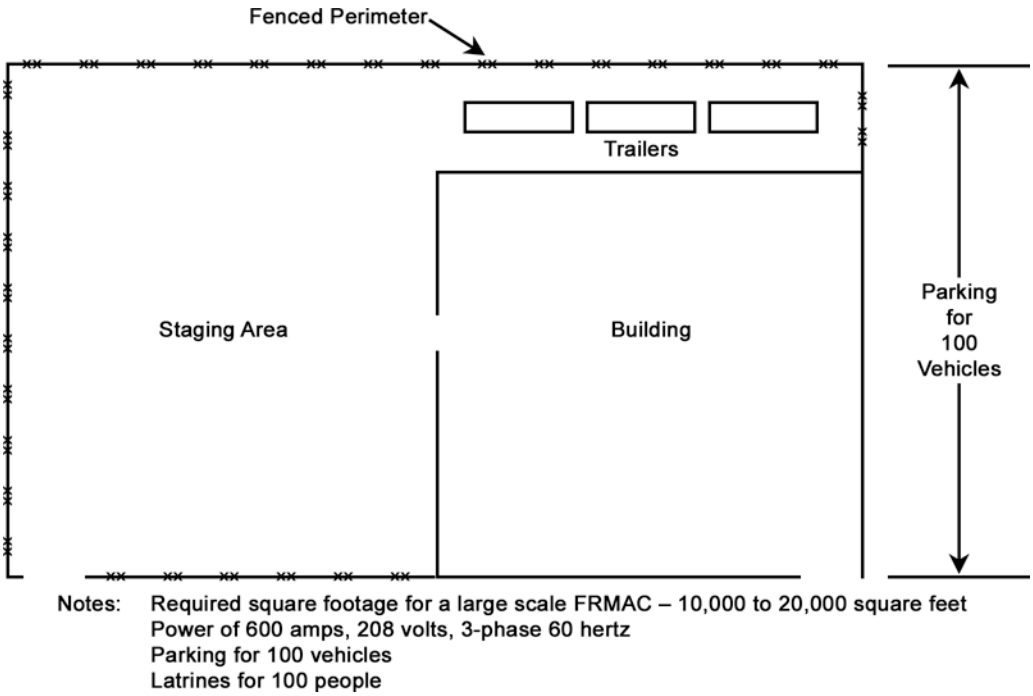

FIGURE* G-1. *EXAMPLE OF A POTENTIAL FRMAC SITE

G.9 Logistics

With a large number (in excess of 250) of state, specialized federal, contractor, and National Laboratory personnel working in the FRMAC 24-hours per day, it will be necessary to accommodate the staff with transportation, food, and lodging. State officials can greatly assist federal planners in this area. When CM assets are requested to be deployed, a Consequence Management Logistical Requirements form (Figure G-2, at the end of this appendix) would be completed by NNSA/NSO and faxed to the appropriate state or local agency. The information on this form would advise the state or local agency what type of logistical assistance is being requested for a CMRT I, CMRT II, or FRMAC.

State officials can assist in meeting the demand for transportation. These needs can be met using school buses, rental cars, or other forms of mass transportation. School buses can be of great benefit during shift changes since it is likely schools will not be in session while the incident is ongoing. State officials may also be able to obtain a number of trucks, vans, and sedans from their available state inventory to assist in transporting FRMAC participants and equipment. If possible, and if liability issues can be resolved, it would be of great benefit to allow FRMAC staff to use state vehicles if rental vehicles are unavailable.

Field radiological monitoring and sampling teams comprised of both state and federal teams will be among the highest priorities for trucks and vehicles. Vans and trucks will be required for a variety of sampling and data collection.

Hotel rooms will also be at a premium since non-critical members of the media and others may seize a large number of limited hotel rooms in an area. Securing essential facilities for critical support staff is a highly recommended action.

Some state planners have suggested that agreements be set in place between car rental companies and hotels. These agreements may help to ensure the availability of rental cars and hotel rooms when they are in short supply.

G.10 Aircraft Support

The deployment of multiple large cargo aircraft to the affected region will require state officials to assist in the identification of one or more nearby airports. It can be expected that the federal government would deploy a number of military aircraft (C-5 or C-17). Personnel and off-loading equipment would be required to assist with unloading the aircraft. The equipment would be moved to the facility designated for the FRMAC after it is unloaded or, if a facility has not yet been identified, to a holding area.

In addition, fixed-wing aircraft and helicopters will be brought in to support the ongoing mission of the FRMAC. It is necessary to ensure that the proper type and amount of fuel is available to support all aircraft. This would include general aviation fuel as well as jet fuel.

G.11 Laboratory and Medical Supplies

Local laboratories, either nearby or at the scene, can provide radiation contamination results to state and federal decision-making officials quickly; however, FRMAC will also need access to local suppliers of liquid nitrogen, distilled water, and other laboratory-related supplies. Federal laboratory capabilities include analysis of food and agriculture samples by the U.S. Food and Drug Administration (FDA) and bioassays performed by the Centers for Disease Control and Prevention (CDC).

FRMAC deploys with licensed physicians from the DOE's Radiation Emergency Assistance Center/Training Site (REAC/TS) who specialize in radiological contamination and have limited medical supplies. In the case of deployment to a remote location where nearby medical facilities are unavailable, FRMAC may also deploy with paramedics. The Strategic National Stockpile (SNS), managed by the U.S. Department of Health and Human Services (HHS)/CDC, has countermeasures available for a radiological event that include chelating agents (Ca-DTPA, Zn-DTPA, and Prussian blue), cytokines (Neupogen), Potassium Iodide, pain medications (morphine and oxycodone), nausea medications (Kytril, phenergan), and burn creams (silvadene). In addition, the SNS has fluid replacement products, gauze dressings, and laceration repair supplies for burn and blast victims. HHS and REAC/TS should coordinate use of radiological countermeasures.

A very large volume of environmental field samples will be collected for analysis. While a very small sampling of data can and will be processed in the field for quick results, the vast majority of the samples will be analyzed at designated certified laboratories throughout the country. The state can help by pre-planning and working with overnight delivery services to ensure that the flow of data are not interrupted and given the highest priority.

G.12 Other Assets

Heavy equipment such as flatbed trucks and forklifts will also be required at the arrival airfield for offloading the equipment that arrives with the teams. Additionally, adequate forklifts (20K) at the

FRMAC site will be required to offload. In the case of the CMRT II load, a K-Loader will be required to offload the aircraft. A K-Loader is a large conveyance on a scissor lift truck that is capable of sliding the large pallets and equipment off the plane and lowering them to ground level where a forklift then can be used to move the pallets. K-Loaders are typically used by military organizations or companies that transport large amounts of cargo.

Other useful information that state and local officials can provide to the FRMAC includes GIS data from local utilities as to the location of utility poles (telephone and power), manhole covers for sewers, other access areas, and known Global Positioning System (GPS) location points throughout the region. In addition, latitude and longitude reference points, using GPS systems, will identify all field data collected.

Portal monitors will also be of great value in a large, potentially contaminated region. In the case of a large incident, it is expected that a large volume of people would request to be examined. The use of portal monitors is more efficient for scanning a large number of people for radiation contamination than handheld instruments.

The FRMAC will also bring a large amount of radiation detection to the scene. State and local field monitoring teams may wish to coordinate the calibration and operation of their equipment and instruments against FRMAC standards. State and local equipment would then be added to the overall inventory of equipment available for use by field monitoring teams.

G.13 CM Logistics Requirements Form

The following checklist can be used by state officials to assist in the site selection process and arrival of the CMRT. Officials working with the CMHT and CMRT personnel can use this form to select equipment and begin the process of moving it into place or to assist the CMHT/CMRT personnel in securing the necessary vendors to procure the equipment.

National Nuclear Security Administration / Remote Sensing Laboratory
Consequence Management Logistics Requirements Form

Upon activation of CM assets, this form can be used to help meet the logistical requirements of the deployment.

General Information

Name of Response Asset: **CMRT Phase I**

The logistical considerations behind a NNSA CM response are considerable. For a Phase I deployment, ~3,400 lbs. of equipment is moved in addition to the personnel required for the response. The CM phases will bring their own scientific and communications equipment to fulfill the mission, but other logistical needs must be met in order for the mission to be a success. This form outlines the personnel, equipment, and method of transportation that will be used to respond to a given location, as well as the logistical needs required to facilitate the response. Local authorities need not provide all of the following items, but should be able to supply information to the CMHT to ensure the necessary items are in place once the CM deployable teams arrive. Sections are denoted where local procurement would be most beneficial.

This phase consists of 25 personnel. It is assumed that all accommodations, meals, and rental cars will be arranged through the CMHT and all information regarding local accommodations and rental agencies should be directed to the Home Team Contact during initial activation.

Transportation

Deployment mode of transportation (**CMRT Phase I will arrive via**):

- ☐ Commercial Air (for passengers)
- ☐ Charter Air (for passengers/equipment)
- ☐ Military Air (for passengers/equipment)
- ☐ Ground (for equipment)

Whatever mode of transportation is made available that will ensure the most rapid departure will be utilized.

Additional information:

Special airstrip requirements:

Military Airlift:

90 ft. X 5000 ft. (C-5 or C-17)

90 ft. X 4000 ft. (C-130)

147 ft. X 5000 ft. (KC-135*)

Commercial / Charter Airlift:

100 ft. X 7400 ft. (747-200F)

100 ft. X 6000 ft. (727-XXX)

*** A shoulder of 10-50 ft. is required on either side of the runway for this type aircraft.**

If deployed via airlift, equipment will require ground transportation from its point of debarkation to the response site. This equipment should be arranged for through local channels and be on hand when the Phase I Team arrives at the airfield.

Number of flatbeds/box truck required: **One 10 ft. (or larger) box truck**

Weight of incoming load: **~3,400 lbs. loaded on either**:

- One 463L (88" X 108") military pallet
- Six 40" X 48" mini-pallets (floor-loaded)
- Free-loaded on aircraft (belly-loaded)

It is assumed that if ground transportation is utilized, no assistance from local authorities will be required to relocate to the response site.

FIGURE G-2. CONSEQUENCE MANAGEMENT LOGISTICS REQUIREMENTS FORM

Load/Equipment Handling

Material handling equipment required: This equipment should be arranged for through local channels and be on hand when the Phase I Team arrives at the airfield.

- ☐ **One 10K forklift for on/off-loading of pallet (if cargo is palletized)**
- ☐ **One K-Loader* (if pallet is transported via military air)**

***A K-Loader is a large military-style vehicle used to off-load palletized equipment from military aircraft.**

Operations Center Communication Requirements

Communications requirements: The facility selected should have at a minimum the following

a. Number of phone lines: **2**
b. Number of high speed data lines: **1**

The CMRT deploys with telephone equipment and portable radios.

Operations Center Space Requirements

Required warehouse storage space (square footage and height): **200 sq. ft. up to 60" high**

Footprint of equipment while in use (square footage needed): **2,000 sq. ft. (minimum)**

Required office space: **2,000 sq. ft.**

Operations Center Power/Electrical Requirements

Number of electrical outlets (if needed):
Three 20 amp AC outlets (minimum). This converts to 3,000 watts.

Additional requirements:

a. **Parking for up to 20 vehicles**
b. **Latrines for up to 40 people**

Miscellaneous Requirements

Where practicable, provide the following information to the CM Home Team, as well as have ready to provide to arriving team.

a. **Local medical facilities and/or hospitals**
b. **Vendors for liquid nitrogen and fuels**
c. **Personnel for facility security**

Contact Information

Deployed Point of Contact: (Deployed POC may be en-route to the response site during the first six hours following activation and therefore may not be immediately available. Direct all contact to the Home Team if POC is unreachable during that time.)

a. **Name:**
b. **Cell Phone Number:**
c. **Pager:**
d. **Fax**

Additional Information

Non-Deployed (Home Team) Point of Contact:

a. **Name:**
b. **Phone Number:**
c. **Fax:**

Figure *G-2. Consequence Management Logistics Requirements Form (continued)*

Additional Information - (other needs as discussed situation dependant)

Page 3 of 6
Date last revised: Oct 2008

FIGURE G-2. Consequence Management Logistics Requirements Form (continued)

National Nuclear Security Administration / Remote Sensing Laboratory
Consequence Management Logistics Requirements Form

Upon activation of CM assets, this form can be used to help meet the logistical requirements of the deployment.

General Information

Name of Response Asset: **CMRT Phase II**

The logistical considerations behind a NNSA CM response are considerable. For a Phase II deployment, ~25,000 lbs. of equipment is moved in addition to the personnel required for the response. The CM phases will bring their own scientific and communications equipment to fulfill the mission, but other logistical needs must be met in order for the mission to be a success. This form outlines the personnel, equipment, and method of transportation that will be used to respond to a given location, as well as the logistical needs required to facilitate the response. Local authorities need not provide all of the following items, but should be able to supply information to the CMHT to ensure the necessary items are in place once the CM deployable teams arrive. Sections are denoted where local procurement would be most beneficial.

This phase consists of 38 personnel. It is assumed that all accommodations, meals, and rental cars will be arranged through the CMHT and all information regarding local accommodations and rental agencies should be directed to the Home Team Contact during initial activation.

Transportation

Deployment mode of transportation (**CMRT Phase II will arrive via**):

- ☐ Commercial Air (for passengers)
- ☐ Charter Air (for passengers/equipment)
- ☐ Military Air (for passengers/equipment)
- ☐ Ground (for equipment)

Whatever mode of transportation is made available that will ensure the most rapid departure will be utilized.

Additional information:

Special airstrip requirements:

Military Airlift:
90 ft. X 5000 ft. (C-5 or C-17)
90 ft. X 4000 ft. (C-130)
147 ft. X 5000 ft. (KC-135*)

Commercial / Charter Airlift:
100 ft. X 7400 ft. (747-200F)
100 ft. X 6000 ft. (727-XXX)

*** A shoulder of 10-50 ft. is required on either side of the runway for this type aircraft.**

If deployed via airlift, equipment will require ground transportation from its point of debarkation to the response site. Transportation for this equipment should be arranged through local channels and be made available when the Phase II Team arrives at the airfield.

Number of flatbeds required: **Two 53' open-sided flatbed trucks**

Weight of incoming load: **~25,000 lbs. loaded on six 463L (88" X 108") military pallets**

It is assumed that if ground transportation is utilized, no assistance from local authorities will be required to relocate to the response site.

FIGURE G-2. Consequence Management Logistics Requirements Form (continued)

Load/Equipment Handling

Material handling equipment required: This equipment should be arranged for through local channels and be on hand when the Phase II Team arrives at the airfield.

- ☐ **One 20K forklift (with a 36" load center) for on/off-loading of pallets**
- ☐ **One K-Loader* (if pallet is transported via air)**

*** A K-Loader is a large military-style vehicle used to off-load palletized equipment from military aircraft.**

Operations Center Communication Requirements

Communications requirements: The facility selected should, at a minimum, contain the following:

a. Number of phone lines: **10**
b. Number of high speed data lines: **2**

The CMRT deploys with telephones, portable radios, and a satellite capability.

Space Requirements

Required warehouse storage space (square footage and height): **1,000 sq. ft. up to 96" high**

Footprint of equipment while in use (square footage needed): **5,500 sq. ft.**

Required office space:

a. FRMAC **5,000 sq. ft. minimum (10,000 recommended)**
b. Forward staging areas **5,000 sq. ft. minimum (if necessary)**

Power/Electrical Requirements

Number of electrical outlets (if needed): **(12) 20 amp AC outlets (recommended). This converts to 12,000 watts.**

Generators deployed with the team would be utilized to supplement power requirements.

Fuel required for deployed generators (**CMRT Home Team will obtain a fuel source, but may require local assistance**).

a. Amount: **40 gallons**
b. Type: **20 gallons each of diesel and unleaded per 24-hour shift**

Additional requirements:

a. **Parking for 30 vehicles**
b. **Latrines for 75 people**

Miscellaneous Requirements

Where practicable, provide the following information to the CM Home Team, as well as have ready to provide to arriving team.

a. **Local medical facilities and/or hospitals**
b. **Vendors for liquid nitrogen and fuels**
c. **Personnel for facility security**

Contact Information

Deployed Point of Contact:

a. **Name:**
b. **Cell Phone Number:**
c. **Pager:**
d. **Fax:**

Non-Deployed (Home Team) Point of Contact:

a. **Name:**
b. **Phone Number:**
c. **Fax:**

FIGURE G-2. ***Consequence Management Logistics Requirements Form (continued)***

Additional Information – (other needs as discussed situation dependant)

Considerations for a full FRMAC:

1. **Parking for 100 vehicles**
2. **Latrines for 100 people**
3. **Personnel for facility security**

FIGURE *G-2. Consequence Management Logistics Requirements Form (concluded)*

APPENDIX H
CONSEQUENCE MANAGEMENT HOME TEAM (CMHT)

H.1 Introduction

The Consequence Management Home Team (CMHT) plays an essential role in the Federal Radiological Monitoring and Assessment Center (FRMAC). It is anticipated that the role of CMHT in the FRMAC will continue to expand with the continuing process improvement efforts that include improved automation of telecommunications capabilities, the necessity to decrease the size of the deployed footprint, and the support of additional non-consequence management assets.

H.2 Mission Statement

The CMHT mission is to assist federal, state, tribal, and local decision makers in collecting and interpreting data in order to provide for public safety and minimize the social and economic impacts of a nuclear/radiological event. The primary role of the CMHT is to support the FRMAC event response while the CMRT I is en route to the event scene, to provide support to Radiological Assistance Program (RAP) or the Accident Response Group (ARG) teams. CMHT support includes collecting and analyzing data, evaluating hazards, providing event information and data products to protective action decision makers. The Remote Sensing Laboratory (RSL) serves as the headquarters for CMHT. The CMHT establishes a bridge line for decision makers, scientists, state authorities, and other assets to discuss the situation and any available data before CMRT I has set up the FRMAC, or in the event a FRMAC is not requested. The CMHT will continue to support the event for as long as necessary.

H.3 Sequence of Events

The CMHT is activated when a requestor (state, local, tribal, or agency official) contacts the DOE National Incident Team (NIT) who in turn notifies the Nevada Test Site Emergency Operations Center (NTS EOC). The NTS EOC notifies the RSL duty manager that an event has occurred which requires Consequence Management support. The duty manager starts the Dialogics call to the members of the CMHT who are on-call; this consists of two Home Team Bridge Line Coordinators (BLC), two assessment scientists, one Geographic Information Systems (GIS) scientist, and one Paperless FRMAC Administrator. At least four members of the National Atmospheric Release Advisory Center (NARAC) are also part of the CMHT; however they are not included in the Dialogics call-out procedure. The BLC will notify NARAC when the bridge line becomes active and invite them to the conference. The bridge line is activated by the BLC from the RSL. Both BLC's must report to the CMHT room within one hour if on-site already, two hours if off-site. An established call-out list will be used to contact all interested parties such as all involved states, the Environmental Protection Agency (EPA), the Advisory Team, the RAP Senior Energy Official, and other emergency assets as required. It should also be noted that during the time the BLC's are in transit the DOE federal official assigned to the CMHT will return the call to the requestor to advise

them how they will be contacted regarding the CMHT and an approximate time when the CMHT will be stood up. When the DOE federal official arrives at the CMHT room he/she will follow up with more information. Once functioning, the bridge line serves as the main communications vehicle for participants until it is no longer necessary and is stood down.

H.4 Roles and Responsibilities

Duty Manager

- Activated by the NTS EOC
- Part of the RSL Response Support Team (RST) and is responsible for notifying the Home Team Bridge Line Coordinator at the start of an event
- Serves as operations manager for CMHT staff
- Communicates with both BLCs to ensure all information is being shared
- Ensures coordination between technical, logistical, and aerial asset personnel

Home Team Bridge Line Coordinator

- Activated via Dialogics
- Responsible for ensuring that the bridge line is up and running within one hour of notification during normal business hours, and within two hours of notification during non-business hours
- Notifies all involved states, counties, the Advisory Team, NARAC, EPA, and RAP teams that the bridge line has been activated
- Ensures the bridge line is monitored at all times and that all pertinent information is being logged in (such as who is on line, phone numbers, agencies, etc.)
- Facilitates bridge line interactions (e.g. establishing “meeting” times or directing people to the appropriate line in the case of multiple event sites)
- Maintains event information in the RAMS database and provides access to authorized authorities
- Facilitates access to CMweb and transfers approved products to CMweb from RAMS
- Ensures all data received by the CMHT are entered into the database
- Maintains communication with CMHT GIS specialist to ensure all data products are uploaded RAMS/CMweb
- Works with Documentation Specialists to ensure field activities and CMHT activities are coordinated
- Keeps bridge line open until directed by FRMAC director (or designated personnel such as FRMAC Lead) that the bridge line can stand down
- Operates 12 hour shifts/24 hours per day to accommodate the event until stood down
- Archives data in CMweb, as appropriate

Home Team GIS Scientist

- Activated via Dialogics
- Retrieves data from the database

- Interacts with Assessment Scientist on technical details of map product requests
- Creates map products
- Responsible for uploading all pertinent data into CMweb site
- Archives data products once superseded

Assessment Scientist

- Activated via Dialogics
- Filled by scientists from SNL, LANL, and LLNL
- Available to participate in a bridge line conference call within one hour of notification during normal business hours and within two hours of notification during non-business hours
- Interacts with the appropriate laboratory POC, NNSA/NSO CM POC, NARAC, the RSL Duty Manager, the BLC, the CMHT GIS Scientist, state, local, tribal authorities, ARG POC and RAP teams.
- Works with field team supervisors to obtain the necessary event information (e.g., radionuclide identity and activity, dispersal agent, location) to perform assessment analysis
- Works with NARAC/IMAAC to refine the data products
- Performs calculations based on FRMAC Assessment Manual methods to assess the potential impacts of the radiological release
- May brief products to requestor or other participants of the bridge line
- Approves NARAC/IMAAC data products for technical soundness and forwards to Federal Lead for final approval to release
- Works with GIS Scientist to produce map products
- Validates event settings in RAMS
- Explains approved and distributed products to the participants on the bridge line
- Runs 12 hour shifts/24 hours per day to accommodate the event until stood down

Stand-by Assessment Scientist[9]

- Utilized during a deployment of a full FRMAC
- Requested by CMHT duty manager prior to the departure of Phase II (scientist position comes out of Phase II billet)
- Assists in the assessment activities of the CMHT as listed above

[9] This position is not an official duty position. It is filled on a case by case basis depending on the event and availability of scientists.

Data Management Technician[10]

- Requested by CMHT duty manager as needed
- Enters data into RAMS database
- Performs QA/QC on data collected in RAMS
- Serves as back-up to Home Team BLC

NARAC Personnel

- Activated by ERO
- Notified of bridge line activities by BLC
- Generates general plume predictions within minutes of a release based on meteorological data
- Refines models based on data from assessment scientists regarding source term and initial monitoring work from first responders
- Transitions to integrate with personnel on site once FRMAC established (if FRMAC activated)
- Interfaces with participants on the bridge line
- Provides access to the CMweb and works through any technical CMweb issues

eFRMAC Administrator

- Activated by Dialogics
- Assists with any concerns or issues with the RAMS database

H.5 Scenarios

The CMHT has the capability to respond to several types of radiological emergency situations and can tailor itself to meet the needs of the event. Listed below are the standard variations that have been identified as a potential response situation.

1. Single event with full FRMAC deployment
   - This is the standard deployment scenario and thus is adequately covered by the above concept of operations.
2. Multiple Events or Locations
   - RSL will assign an event or location to different laboratories based on need, availability of positions, and/or proximity of the laboratory to the event.
   - Additional bridge lines will be opened as needed
   - If available more CMHT staff will be requested
3. Radiological Assistance Program (RAP)-federal response
   - Minimal CMHT support – BLC and assessment scientist

[10] This position is not an on-call position and may be filled as needed.

- Mapping and modeling capabilities may be provided depending on need

4. State Response
   - Minimal CMHT support – BLC and assessment scientist
   - Mapping and modeling capabilities may be provided depending on need

H.6 Situational Awareness

Assessment scientists in the home team are functional managers of the event for the Consequence Management Home Team. With this responsibility the assessment scientist must then:

1. Provide periodic Situational Reports to the FRMAC Director
2. Participate in NIT conference calls to provide technical information
3. Keep the CMHT Federal Lead informed of the current status of the event

H.7. Transition to CMRT I

In the event the CMRT deploys, there will come a point where the CMHT assessment scientist will not be the only FRMAC assessment scientist available to the local decision makers. In this case, a smooth transition of roles and responsibilities must be made. The FRMAC Director also may choose to not shut down the CMHT for a period of time so the duties of the assessment scientists in the field must be shared with those on the bridge line. The assessment scientist in the field will be the lead in this case. Duties should be split as follows:

Field Assessment Scientist

1. Interacts with the state, local, tribal decision makers for priorities and requests
2. Interacts with monitoring manager
3. Provides guidance on data products
4. Assists GIS in creating standard and non-standard map products

Consequence Management Home Team Assessment Scientist

1. QA/QC of data products
2. Interacts with NARAC for model evolutions
3. Provides Situational Reports for activities on the bridge line
4. Assists GIS in creating standard map products

These duties are not all inclusive. The nature of emergency response does not allow for a complete definitive list. Furthermore, these duties are not concrete. If either scientist finds him/her self in a position where assistance is needed from the other, they may ask for that assistance. The intent of the duty list is to provide a foundation to build responsibilities.

H.8 Standing Down the Home Team

The decision to stand down the Consequence Management Home Team can be made by the FRMAC Director, the FRMAC Deputy Director, or the Home Team Federal Lead.

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APPENDIX I
ADVANCE PARTY MEETING (APM) CHECKLIST

I.1 Introduction

One of the first actions that the Federal Radiological Monitoring and Assessment Center (FRMAC) Consequence Management Home Team (CMHT) is to prepare an Advance Party Meeting (APM) Checklist (see Figure I-1). The APM was originally created with the intention that a physical meeting would take place with federal, state, tribal, or local authorities once the FRMAC was established. It has been determined, however, that this meeting may be limited or impractical due to situational constraints. ***It is still strongly recommended that whenever possible an initial face-to-face meeting be conducted.***

The primary purpose of the U.S. Department of Energy's (DOE) phased response is to provide initial technical capability and to prepare for the arrival of additional FRMAC resources in order to ensure an effective and timely FRMAC operation in support of the Coordinating Agency, state, tribal, and local governments. The APM Checklist is a tool to brief FRMAC personnel arriving at the scene of an incident regarding what has occurred, who to contact, and the priorities of state, tribal, and local authorities.

The CMHT will work with the state, tribal, and local authorities via the CM Home Team Bridge Line Coordinator (BLC) to record situational information required on the form. This will be provided to the FRMAC personnel once on scene to direct establishment of a location for the FRMAC, initiate radiological monitoring activities, participate in future briefings, etc. The APM Checklist will also be made available to the Advisory Team.

Advance Party Meeting Checklist

Event Status and Action Worksheet

[Event Name]

[Location]

[Date]

Concurrence with APM Checklist Decisions

Title	Signature	Date
DHS Representative		
Coordinating Agency Representative		
FRMAC Director		
State Representative		
Local Representative		

[Pick the date]

FIGURE I-1. ADVANCE PARTY MEETING CHECKLIST

Contact Information

Incident Commander/Unified Command		
Position	**Name**	**Location During Operations Phone Number**
Incident Commander		
Lead State Official		
DHS Representative		
FEMA Representative		
Coordination Agency Representative		

[Pick the date]

Version 1 2

FIGURE I-1. ADVANCE PARTY MEETING CHECKLIST (continued)

Contact Information

Command Staff		
Position	**Name**	**Location During Operations Phone Number**
Incident Commander		
Planning Chief		
Operations Chief		
Finance Administrator		
Public Information Officer		
Safety Officer		
Liaison Officer		
Technical Specialist		

[Pick the date]

FIGURE I-1. ADVANCE PARTY MEETING CHECKLIST (continued)

Contact Information

FRMAC Staff		
Position	**Name**	**Location During Operations Phone Number**
FRMAC Director		
FRMAC Manager		
FRMAC Monitoring Manager		
FRMAC Assessment Manager		
FRMAC Health and Safety Manager		
FRMAC Lab Manager/ Sample Control		

Other Federal Agencies		
Position	**Name**	**Location During Operations Phone Number**
EPA Regional Representative		
Advisory Team Leader		
NRC Representative		
DOE Senior Energy Official		
Department of Defense Representative		

[Pick the date]

FIGURE I-1. ADVANCE PARTY MEETING CHECKLIST (continued)

Contact Information

State/Local Liaisons		
Organization	**Contact Name**	**Location During Operations Phone Number**

FRMAC Liaisons		
Organization	**Contact Name**	**Location During Operations Phone Number**

[Pick the date]

FIGURE I-1. ADVANCE PARTY MEETING CHECKLIST (continued)

Contact Information

Unit Leaders			
Unit	**Check if Unit Req'd**	**Unit Leader Name**	**Phone Number**
Environmental (FRMAC Monitoring and Sampling)	☐		
Planning (FRMAC Assessment)	☐		
Health and Safety	☐		
Other	☐		
Other	☐		
Other	☐		
Other	☐		

[Pick the date]

FIGURE I-1. ADVANCE PARTY MEETING CHECKLIST (continued)

Logistics

Event Locations		
Location of Interest	**Contact Name**	**Address and Phone Number**
FRMAC		
EOC 1		
EOC 2		
EOC 3		

Support Items		
Item	**Contact Name**	**Address and Phone Number**
Air Freight Delivery		
Radio Frequencies		
Liquid Nitrogen		
Plotter		

[Pick the date]

FIGURE I-1. ADVANCE PARTY MEETING CHECKLIST (continued)

Situational Briefing Information

Describe the Event			
Has a release or loss occurred?	**Yes**	**No**	**Unknown**
Start Time (approximate)	**Date:**	**Time:**	
Stop Time (approximate)	**Date:**	**Time:**	**Has not stopped**
Multiple Releases?	**Yes**	**No**	**If so, how many?**
Further Details and Current Actions Taken			

Source Term
List involved isotopes and abundances if known:
What is the chemical form (powder, liquid, explosive dispersal, etc.)?

FIGURE I-1. ADVANCE PARTY MEETING CHECKLIST (continued)

Situational Briefing Information

Data Products
Models – Have any models been created and if so, where are they being stored and how can they be accessed?
Sample Data – Has there been any field sampling/monitoring data collected? How can the FRMAC obtain this data?
What Derived Response Levels and assumptions will be used to implement Protective Action Guides (PAGs)? What is the status of the protective actions taken for the public?

[Pick the date]

FIGURE I-1. ADVANCE PARTY MEETING CHECKLIST (continued)

Incident Action Plan Objectives

Objective	Resource Requirements	Products Needed	Date/Time Needed
Evacuation/Shelter in Place			
Worker Dose Projection			
Road Closure/Re-Open			
Hotline Support			

FIGURE I-1. ADVANCE PARTY MEETING CHECKLIST (continued)

DOE/NV/25946--980

Incident Action Plan Objectives

Objective	Resource Requirements	Products Needed	Date/Time Needed
Population Monitoring Support			
Monitoring Support			
Health Physics Support			
AMS Flyover Support			

FIGURE I-1. ADVANCE PARTY MEETING CHECKLIST (continued)

Incident Action Plan Objectives

Objective	Resource Requirements	Products Needed	Date/Time Needed

FIGURE I-1. ADVANCE PARTY MEETING CHECKLIST (concluded)

DOE/NV/25946--980

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APPENDIX J
TRANSFER GUIDANCE DOCUMENT

Guidance Document for the
Transfer of Operational Control of the
Federal Radiological Monitoring and Assessment Center
(FRMAC)
from the U.S. Department of Energy to the
U.S. Environmental Protection Agency

September 28, 2009
Version 2

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I. Background

As part of the Federal response to radiological emergencies under the National Response Framework's (NRF) Nuclear/Radiological Incident Annex (NRIA), the Federal Radiological Monitoring and Assessment Center (FRMAC) is an interagency asset that is available on request to respond to nuclear/radiological incidents. The U.S. Department of Energy (DOE) coordinates FRMAC activities for the initial response phase, then transitions FRMAC coordination responsibility to the U.S. Environmental Protection Agency (EPA). The concept of transferring coordination responsibility of FRMAC from DOE to EPA dates to the original Federal Radiological Emergency Response Plan (FRERP 1984) and artifacts of that time remain in the current NRIA document[1].

DOE is responsible for overseeing the operation of the FRMAC during the initial response phase, while EPA's Office of Radiation and Indoor Air (ORIA) and other EPA organizations provide personnel and support to the FRMAC. A FRMAC typically includes representatives from the Department of Commerce, the Department of Homeland Security (DHS) National Communications System, the U.S. Army Corps of Engineers (USACE), and other Federal departments and agencies (D/As) as needed, as well as incorporating State and local monitoring and assessment activities.

According to the NRIA, the DOE FRMAC Director and the FRMAC's Senior EPA Representative, with the requisite concurrences from their respective headquarters, will hold negotiations on terms of a transfer and agree on a time to transition the coordination responsibility to EPA. It is important to note that the resultant transfer agreement document is a "field transfer" conducted in the field. The DOE FRMAC Director and Senior EPA representative should have the authority or permission to sign as the official representative of their department or agency. State and local agencies giving concurrence should also be senior enough to represent their groups. Concurrences are noted by name only for transfer documentation. This transfer will most likely occur during the recovery phase of the response, but, depending on the situation, could be in the latter stages of the response phase. EPA would then be responsible for the transition into long-term monitoring and assessment. The responsible officials will also seek concurrence form the DHS, the Unified Coordination Group, and State, local, and tribal governments regarding the transfer.

Tests of FRMAC transfers from DOE to EPA have occurred in numerous exercises, notably *FRMAC '93* (1993, Omaha, Nebraska) and *Southern Crossing* (2006, Dothan, Alabama).

II. Purpose

The purpose of this guidance is to provide the framework for transfer of responsibility for operation and management of the FRMAC from DOE to EPA. This document addresses the items identified in the NRF/NRIA as prerequisites for transferring this operational control and is intended to facilitate the transfer of FRMAC coordination responsibility.

[1] The use of the word "site" dates from the original FRERP when the plan addressed nuclear power plants with fixed site boundaries, DOE national laboratories with fixed site boundaries, and National Security Areas or National Defense Areas with controlled site boundaries. In a terrorist-initiated event, the term "site" is questioned: the entire affected area could be construed as the site; however, some consider the "site" as the area under law enforcement control (i.e., the crime scene). For the purposes of a transfer, the use of the word "site" needs to be agreed upon.

A transfer most likely will occur in the recovery phase of a response, when immediate emergency operations have largely been completed. However, each radiological incident is unique and the DOE FRMAC Director and the FRMAC's Senior EPA representative, in cooperation with the Coordinating Agency (CA) and affected State(s), will use their experience and judgment to determine when it is beneficial and appropriate to initiate a transfer of control and direction of the FRMAC from DOE to EPA. For the purpose of gaining insight into the needs of EPA and other partners for a transfer, DOE may start a transition discussion at any time, recognizing that all specific conditions may not be met. This document adds details to the items identified in the NRF/NRIA as prerequisites for transferring operational control and is intended to facilitate the transfer of FRMAC operational responsibility.

III. Applicability

This guidance applies to all nuclear and radiological incidents where a FRMAC has been established and there is a recognized need for intermediate and/or long-term environmental monitoring. It is anticipated that FRMAC deployments will result in an ultimate transfer of responsibility to EPA. Possible exceptions to a transfer may be found, such as if a FRMAC was established for a threat that did not actually materialize, or if a FRMAC was established, but the consequences of an incident were short-term and remediated in a rapid manner.

It should be recognized that FRMAC support in the response and recovery phases is limited to environmental radiological monitoring, sampling, and assessment activities. The FRMAC's mission does not include monitoring of the general public, although some partner agencies of the FRMAC may perform this mission. The FRMAC mission also does not include on-site (i.e., within a facility boundary), controlled, or secured area cleanup; however, the FRMAC may provide limited support to these activities when there is an urgent need and other resources are insufficient or not available.

FRMAC transfer as specified in the NRIA is not intended for operational control for cleanup and recovery, but could provide support for those operations. Cleanup and recovery are activities under the purview of the CA, independent of the FRMAC role.

Termination of FRMAC operations will occur when the following determinations are made, as stated in NRF/NRIA (Recovery, page NUC24):

> *Radiological monitoring and assessment activities are normally terminated when the coordinating agency, in consultation with all participating Federal agencies, and State, tribal, and local governments, determines that:*
>
> - *There is no longer a threat to public health and safety of the environment;*
> - *State, tribal, and local resources are adequate for the situation; and*
> - *There is mutual agreement among the agencies involved to terminate monitoring and assessment.*

IV. Transfer Requirements

The DOE FRMAC Director will work closely with the FRMAC's Senior EPA representative to facilitate a smooth transition of the Federal radiological monitoring and assessment coordination responsibility to EPA at a mutually agreeable time and after consultation with DHS, the Unified Coordination Group, and State, tribal, and local governments. These consultations and confirmations are important because in many situations, a State or the CA may have the ultimate authority for emergency management and may have issued the request for Federal assistance that led to the establishment of the FRMAC. DOE and EPA Headquarters will have a voice in the decision, since they will be responsible for the outcome of the response, including funding considerations, and must respond to public authorities.

Although it is difficult to specify in advance when the transfer of this coordination responsibility would occur, certain conditions must be met prior to this transfer. DOE may request that EPA consider the transfer when DOE believes it practical and appropriate to do so and EPA will consider this request. The transfer will be based upon the five criteria established under the NRF/NRIA:

1. The immediate emergency condition is stabilized.
2. Offsite releases of radioactive material have ceased, and there is little or no potential for further unintentional off-site releases.
3. The offsite radiological conditions are evaluated and the immediate consequences are assessed.
4. An initial long-range monitoring plan has been developed in conjunction with the affected State, tribal, and local governments, and appropriate Federal agencies.
5. EPA has received adequate assurances from the other Federal agencies that they are committing the required resources, personnel, and funds for the duration of the Federal response.

DOE may order that a committee or working group be formed during the response phase to address the practical matter of gathering the information necessary to allow for a transfer. Although DOE may select other entities to participate in the discussion, at a minimum, it should include EPA and the affected States(s).

Once DOE and EPA have set up an agreement for the appropriate time of transfer, DHS, the Unified Coordination Group, and the State(s), tribe(s), and local governments will be brought in to consult on the organization of the post-emergency FRMAC. At this time, the State(s) and other entities will have the opportunity to suggest modifications to the structure of the plan.

V. Conditions for Transfer

The following lists potentially applicable situational conditions that could meet each of the five criteria for transfer. The list is not inclusive and does not represent absolute requirements, but indicates the type and range of conditions and requirements necessary for a transfer to take place.

A. Criterion 1: The immediate emergency condition is stabilized.

- If applicable, recoverable remains of a radiological dispersion device or improvised nuclear device have been secured. Intelligence indicates that no additional devices are likely to be detonated in the general area.
- Reactor (if involved) is in a safe shutdown mode, and no further significant releases into the environment are anticipated. Damaged fuel is in a configuration so it will not degrade further; remaining fuel is in stable mode.
- Resuspension of long-lived radionuclides is not predicted to result in significant exposure or contamination of previously unaffected areas.
- All evacuation, sheltering, and initial protective actions have been accomplished.
- The DOE may measure or propose bounding resuspension factors for long-lived radionuclides to verify absence of further significant inhalation dose.
- Airborne concentrations due to resuspension indicate no further emergency-phase protective actions are necessary to comply with EPA Protective Action Guidelines (PAGs).

B. Criterion 2: Offsite releases of radioactive material have ceased, and there is little or no potential for further unintentional off-site releases.

- All airborne and/or waterborne releases have ceased, or at most, are anticipated to be of only minor consequence.
- At most, only minor releases of short-lived radionuclides are expected.
- Contamination in onsite and National Security or National Defense Areas pose no or minor potential for releases to off-site areas.

C. Criterion 3: The offsite radiological conditions are evaluated and the immediate consequences are assessed.

- Along with detailed data from the affected area, EPA needs assurance that there are no major unidentified or unevaluated contaminated areas. It is expected that, at a minimum, a comparison will be available of aerial data with ground survey data and environmental sample analyses, including those from outside the release footprint in areas presumed to have been unaffected. EPA may be able to provide available RadNet data to support this task.
- Prior to the transfer, available data should be sufficient to characterize small operable units (e.g., bounded neighborhoods or districts with a clear picture of the contamination conditions for each neighborhood). The data provided should be readily understood, since they will likely be used for public dissemination by both agencies.
- Deposition profiles completed out to all levels comparable to background.
- Radiological analyses completed on all applicable consumable products.
- Decontamination and/or stabilization have been completed for contaminated areas or areas where resuspension remains a concern and where egress is required.

- Infrastructure in place to support remaining population and response personnel.
- A National Security Area or National Defense Area, if previously declared, is no longer in effect or is secured and controlled.

D. Criterion 4: An initial long-range monitoring plan has been developed in conjunction with the affected State, tribal, and local governments, and appropriate Federal agencies.

- A separate plan should have been developed within the Incident Command structure to support decontamination and restoration activities (a so-called "Site Restoration Plan" or "Recovery Plan"). To support that plan, a long-term monitoring program, which includes important pathways, needs to be identified, at least in an initial draft. The program should also:

  i. identify the resources required to execute the plan by agency;
  ii. define continuing monitoring requirements,
  iii. propose monitoring locations and frequencies; and
  iv. identify the laboratory resources that will be able to provide the required analyses. For an interim period, to be negotiated, DOE may continue to allow samples to be sent to its contract laboratories. DOE may also transfer its interest in private agreements with other Federal and State laboratories for their continued use by EPA. EPA will provide a termination point for the DOE contracting of private labs and ensure that EPA contracted services provide continuity.

E. Criterion 5: EPA has received adequate assurances from the other Federal agencies that they are committing the required resources, personnel, and funds for the duration of the Federal response.

- An agreement to support the long-term activities is developed that includes all participating Federal departments and agencies and the resources necessary for continuation of monitoring efforts.
- EPA will provide DOE and other Federal agencies in the FRMAC a reasonable expectation of the services and staff skills it will continue to need and the timeframe required, and identify how the salaries/contract fees for those groups will be paid. DOE and other departments and agencies have a reasonable expectation that their emergency response assets will be released to prepare for a new emergency. EPA recognizes this and will release those assets at a mutually agreeable time.
- Specific examples of EPA's needs for a post-emergency FRMAC include:
  - Radiation monitoring equipment to stay as long as required and be released at a mutually agreeable time.
  - DOE "FRMAC (CM) Home Team" and assessment scientist support to augment EPA until it can replace these roles on its own. This support does not necessarily need to be at the incident site and can occur from

DOE's Remote Sensing Laboratory in Las Vegas or other locations, as negotiated.

- A FRMAC Senior DOE representative to function in an advisory role to the EPA FRMAC Lead. This person is also necessary to serve as the DOE Contract Officer Representative (COR) while DOE FRMAC contractors remain in an on-site or near site assistance role to EPA.
- DOE's AMS support on an as-needed basis for radiation recharacterization as clean up proceeds. EPA will provide DOE with an expected timeframe for this standby support and negotiate a schedule for surveys.
- On-site training on equipment, systems, and data systems.
- Environmental and Radiation Health and Safety support.
- Logistical support for the FRMAC, possibly for the long-term. This may include experts who will assist in deploying equipment and in setting up a "new" FRMAC location for the long-term use of EPA.
- Data management support, especially those individuals necessary for the smooth integration of DOE FRMAC data into the EPA Scribe database.
- Personnel dosimetry and bioassay.
- Laboratory capacity, which will become a large issue in the long-term.
- Mobile whole-body counting capabilities.
- Advice on sampling and public consumption of agricultural products.

VI. Possible Timeframes for Transfer

The following table provides estimates for the lengths of time involved for some anticipated scenarios, measured from the initiation of the FRMAC (with the exception of Criterion 5). It should be recognized that these are only estimates and can vary widely depending on a number of variables.

FRMAC Response	Transfer Anticipated	Anticipated Time to Achieve					Significant Resources Required from Federal D/As in EPA-led FRMAC
		Time from FRMAC Initiation[1]				Time from Transfer Until Release[2]	
		Criterion 1	Criterion 2	Criterion 3	Criterion 4	Criterion 5	
Wide Scale Contaminating Event – Foreign Source							
Unlikely	No	N/A	N/A	N/A	N/A	N/A	N/A
Nuclear Power Plant or Spent Fuel Accident							
Yes	Yes	2 months	2 months	4 months	6 months	6 months	Yes
RDD – Long Lived Radionuclide							
Yes	Yes	1 month	1 month	6 weeks	4 months	6 months	Yes
Failed Improvised Nuclear Device							
Yes	Yes	6 weeks	6 weeks	8 weeks	4 months	6 months	Yes
Improvised Nuclear Device							
Yes	Yes	1 year	1 year	1 year	18 months	8 months	Yes
Localized Event – Short Lived Nuclides							
Yes	No	N/A	N/A	N/A	N/A	N/A	N/A

[1] This is the time required to develop a robust plan, a draft or interim plan could be developed in less time.

[2] **DOE and other federal agencies agree in principle to support an EPA-lead FRMAC at transfer with may negotiated services and equipment. The time shown in the column represents the period of time EPA EPA need these DOE and other federal agency resources until they can be replaced.**

Cited and Uncited References

1. Department of Homeland Security, National Response Framework, Publication P-682, January 2008.

2. Department of Homeland Security, National Response Framework, Publication P-682, Nuclear/Radiological Incident Annex, NUC-1, June 2008.

3. EPA Radiological Emergency Response Plan, EPA-402-R-00-003, January, 2000.

4. Federal Radiological Emergency Response Plan (FRERP), 49 FR 35896, September 12, 1984.

5. Federal Radiological Emergency Response Plan (FRERP), 50 FR 46542, November 8, 1985.

6. Federal Radiological Emergency Response Plan (FRERP), 9230.1-PL. April, 1999.

7. FRMAC Assessment Manual, Pre-Assessed Default Scenarios, The Federal Manual for Assessing Environmental Data During a Radiological Emergency, SAND 2003-1073P, September 2007.

8. Federal Radiological Monitoring and Assessment Center, Operations Manual - Emergency Phase, USDOE, April 2000.

9. Assignment of Emergency Preparedness Responsibilities, Executive Order 12656 (1988).

10. The National Oil and Hazardous Substances Pollution Contingency Plan, dated October 17, 1994 (40 CFR Part 300).

11. The Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (SUPERFUND), 42 USC 9601 et seq. (P.L. 96-510, December 11, 1980), as amended by the Superfund Amendments and Reauthorization Act of 1986 (PL 99-499) (1986).

12. National Incident Coordination Team, Operational Guidelines, U.S. Environmental Protection Agency, October 1988.

APPENDIX A

Post-Emergency FRMAC Facility Considerations

When preparing to transfer control of the FRMAC from DOE to EPA, the condition of the current facility being used by FRMAC will need to be evaluated, and a new facility may be deemed necessary prior to the transfer taking place. To avoid the disruptions and expenses involved in moving FRMAC operations to a different long-term facility, DOE should consider the long-term requirements in its initial selection of a FRMAC facility. Facility types may include, but are not limited to, a warehouse, a vacated department store, or a strip mall. The facility should have large power capacities, a large amount of office space, and the capability to have an onsite lab.

The required criteria in choosing a facility include the following:

- 40,000+ ft^2
- Large power capabilities (400kW minimum)
- Loading docks able to handle semi-trailers
- Fork lift, pallet jacks, extra pallets
- Sample Receipt, Handling, and Management Area (with Hotline Potential)
- Supply Storage Area
- Archival Sample Storage Area
- Mailing/Shipping Center
- Internet (at least T2) with wireless network and telephone capability
- Badging Area
- Equipment Training Area
- Meeting/Briefing Room
- Calibration/Instrument Maintenance/Instrument Storage Area
- Food Services Area
- Decontamination/Shower/Restroom Area (may be separated)
- Temporary Radwaste/Other Waste Storage Area
- Break Room
- Area for processing personal protective equipment and air masks
- Secured by guard (FPS or contracted)/gated/fenced
- Assigned GSA vehicles: 2 pickups, 20 mini-vans, 20 SUV's, 1 box-style delivery truck, 1 lift-gate pickup truck
- Ability to add an on-facility radiation laboratory (if needed)
- Large parking area (~10,000 sq. ft.)
- Nearby lodging
- Reasonably close to an airport
- A separate Forward Staging Area

The above list is not comprehensive, but is intended to demonstrate the type of requirements and equipment that may be necessary for long-term FRMAC operation.

In addition to a primary FRMAC facility, there should also be an acceptable Forward Staging Area. The Forward Staging Area has several requirements, including the following:

- 6,000–10,000 ft^2
- Shower facility
- Sample control area
- Appropriate climate control
- Parking lot
- Decontamination "hotline"
- Provisions for vehicle decontamination
- Access for larger vehicles
- Field teams' equipment and supplies
- First aid
- Vehicle fuel

Possible considerations:

- Heliport
- Multiple forward staging areas, because of the size of area to be served or geographical barriers

EPA may require a support/transition manager to facilitate all the above needs and to coordinate with the General Services Administration (GSA) for a suitable facility to fulfill long-term monitoring needs. This coordination with GSA may be necessary early in a response, while FRMAC leadership is still with DOE, in order to have a facility available when needed.

If a proper facility cannot be acquired, other options, such as leasing office trailers and using trade schools, can be considered. If no facility is available and the need for a facility could extend over a protracted time, GSA could be requested to arrange for a structure to be constructed.

FRMAC will need a support/transition manager to facilitate all the above needs.

APPENDIX B

Suggested Agreement Format

Federal Radiological Monitoring and Assessment Center (FRMAC)

**Agreement to Transfer Operational Control of FRMAC
from the U.S. Department of Energy
to the U.S. Environmental Protection Agency**

Name of Response

It is be the responsibility of the DOE FRMAC Director and the FRMAC's Senior EPA representative to ensure that the following conditions have been satisfied and the appropriate concurrences obtained prior to effecting transfer of operational control of the FRMAC from DOE to EPA.

By our signatures below, we certify that the following CONDITIONS have been met:

1. The immediate emergency condition requiring a FRMAC response has stabilized.

2. Off-site release of radioactive material has ceased, and there is little or no potential for further unintentional off-site releases.

3. The off-site radiological conditions have been evaluated and the immediate consequences have been assessed.

4. An initial long-range monitoring plan has been developed in conjunction with the affected State, tribal, and local governments and appropriate Federal agencies.

5. The EPA has received adequate assurances from the other Federal agencies that they are committing the required resources, personnel, and funds for the duration of the Federal response.

Sub Conditions

Attach the results of all negotiations and agreements on data transfer, assets required for a longer term, and contract payment.

The effective date and time of FRMAC Transfer is_____

CONCURRENCES

		(Name)	(Date/Time)
HQ DOE	Concurrence from	_____	_____
HQ EPA	Concurrence from	_____	_____
DHS PO	Concurrence from	_____	_____
UCG Leader	Concurrence from	_____	_____
CA	Concurrence from	_____	_____
State	Concurrence from	_____	_____
State	Concurrence from	_____	_____

Signed:

DOE FRMAC Director	_____	_____
FRMAC's EPA Senior Representative	_____	_____

APPENDIX K
FRMAC POSITION DESCRIPTIONS/TRAINING REQUIREMENTS AND OTHER SUPPORT

The following descriptions provide guidance of general duties in the Federal Radiological Monitoring and Assessment Center (FRMAC) under U.S. Department of Energy (DOE) leadership. While the post-emergency FRMAC may retain similar titles, the demands, and thus the requirements, for these positions may change. Each FRMAC position-holder will meet all applicable National Incident Management System (NIMS) training requirements. During an emergency, they will coordinate with their appropriate partners under the NIMS Incident Command System (ICS) (e.g., the FRMAC Health and Safety Manager will coordinate closely with the ICS Safety Officer).

Disclaimer

Although the training requirements stated in each position description in this Appendix are standard DOE requirements, the FRMAC will work with all agencies that want to integrate their radiological technically trained personnel with the FRMAC.

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FRMAC DIRECTOR

POSITION SUMMARY

The Consequence Management (CM)/FRMAC Director has the overall responsibility for the management and deployment of the deployed Consequence Management Response Team (CMRT)/FRMAC; execution of the mission; health and safety of FRMAC personnel; protection of classified information, government property, and critical assets; and ensuring compliance with all applicable DOE orders, Occupational Safety and Health Administration (OSHA) standards, Department of Transportation (DOT) standards, and federal statutes.

The FRMAC Director is a senior DOE official appointed by the Manager of the U.S. Department of Energy, National Nuclear Security Administration Nevada Site Office (NNSA/NSO) with concurrence from the U.S. Department of Energy, National Nuclear Security Administration Headquarters (NNSA/HQ) to manage the response. The FRMAC Director is responsible for the overall execution of the response and ensures that FRMAC activities reflect the prioritized requirements of the state and the Coordinating Agency and meet the statutory requirements of participating federal agencies.

DUTIES AND RESPONSIBILITIES

- Maintain knowledge of and familiarity with:
  - Homeland Security Presidential Directive (HSPD)-5
  - The National Response Framework (NRF) and the Nuclear/Radiological Incident Annex (NRIA)
  - NNSA/DOE Consequence Management Official's (CMO's) Handbook
  - FRMAC Operations Manual
  - NNSA/NSO Alert and Activation Procedures
  - Remote Sensing Laboratory (RSL) Alert, Activation, and Deployment Procedures
  - 10 CFR 835 (Occupational Radiation Protection)
  - 10 CFR 20 (Standards for Protection Against Radiation)
  - Applicable Standard Operating Procedures
- Maintain detailed knowledge and familiarity with all applicable DOE and federal statutes, orders, rules, and regulations relating to radiological emergency response activation, deployment, and operational activities
- Maintain knowledge and thorough understanding of FRMAC and CMRT Phase I, Phase II, and Augmentation missions, capabilities, objectives, and expected products
- Overall responsibility for the health and safety of the FRMAC personnel
- Overall responsibility for the management and execution of the all FRMAC activation, deployment, operational, and deactivation activities
- Overall responsibility for ensuring compliance with all applicable DOE orders, OSHA standards, and federal statutes

FRMAC DIRECTOR

- Identify the FRMAC management team
- Determine the composition and skill mix of the CMRT Phase I, Phase II, and Augmentation deployments
- Exercise management and coordination control of the FRMAC
- Overall responsibility for ensuring a working relationship and communications with the Coordinating Agency, effected state, and local officials
- Ensure that the FRMAC activities and data products reflect the ongoing priority needs of the Coordinating Agency and state
- Ensure that the FRMAC activities and data products meet the statutory responsibilities of participating federal agencies
- Ensure that FRMAC raw data and approved assessed data products are distributed as expeditiously as possible and in accordance with FRMAC procedures and agreements
- Overall responsibility for ensuring that all FRMAC assessed data products, which are officially released outside of the FRMAC, are of known and defensible quality
- Overall responsibility for ensuring that all necessary physical accommodations are provided for FRMAC personnel
- Overall responsibility for ensuring strict document control, confidentiality, and archiving of all FRMAC personnel medical records, radiation exposures/doses, industrial hygiene and/or occupational health-related incidents, and/or other health issues
- Overall responsibility for all federal government equipment located at the FRMAC, FRMAC data and data products, radioactive sources, classified information, and critical assets
- Overall responsibility for ensuring that all handling, packaging, storing, and shipping of hazardous materials, radioactive substances, and mixed waste are in compliance with all applicable DOE orders, OSHA and DOT standards, and federal regulations
- Overall responsibility for ensuring that all required DOE and federal government documentation are complete, accurate, timely, and properly archived for historical and legal purposes
- Ensure the development of timely and appropriate Situational Reports.
- In concert with the Coordinating Agency and the state, determine the extent, composition, capability, and timeline for additional consequence management assets
- In accordance with the NRF and the NRIA, and in conjunction with the U.S. Environmental Protection Agency (EPA) Senior Representative, the Coordinating Agency, and the state, develops a formal transition plan for transitioning the management and coordination of the FRMAC from DOE to EPA. In conjunction with the EPA Senior Representative, ensure a smooth, seamless transition of the FRMAC management for DOE to EPA
- In concert with the Coordinating Agency and the state, determine all required operations, activities, and documentation required to bring the deployment to completion

May 2008

FRMAC DIRECTOR

- Overall responsibility for the safe return of the FRMAC personnel, federal government equipment, and critical assets
- Overall responsibility for ensuring all handling, packaging, storing, and shipping of hazardous materials, radioactive substances, and mixed waste are in compliance with all applicable DOE orders, OSHA and DOT standards, and federal regulations
- Overall responsibility for ensuring strict document control, confidentiality, and archiving of all FRMAC personnel medical records, radiation exposures/doses, industrial hygiene and/or occupational health related incidents, and/or other health issues
- Overall responsibility for the proper disposition of all classified documentation
- Document the chronology of significant events, meetings, and activities
- Document FRMAC activities, accomplishments, lessons learned, and any other significant occurrences
- Ensure the development of a comprehensive and timely final report of the FRMAC activities
- Provide closeout documentation as required
- Responsible for the disposition of all self-generated notes, logs, and mission-related documentation

ORGANIZATION AND COMMUNICATIONS

- RECEIVES DIRECTION FROM:
  - Unified Command or Lead Coordinating Agency On-Scene Commander
- WORKS WITH:
  - Unified Command
- PROVIDES DIRECTION TO:
  - FRMAC Managers

QUALIFICATIONS

- Senior NNSA/NSO official
- Demonstrated ability to manage emergency response personnel in very stressful, urgent situations
- Demonstrated detailed knowledge and familiarity with all applicable DOE and federal statutes, orders, rules, and regulations relating to FRMAC and radiological emergency response activation, deployment, and operational activities
- Experience and thorough understanding of CMRT Phase I and II, and Augmentation and FRMAC missions, resources, capabilities, objectives, operations, and expected data products

FRMAC DIRECTOR

- Successful completion of:
  - EOTA CMP-101DW – Operations Overview for CM
  - Exercise Participation
  - ICS-100 – Introduction to ICS
  - ICS-200 – ICS for Single Resources and Initial Action
  - ICS-300 – Intermediate
  - ICS-400 – Advanced
  - IS-700 – NIMS
  - IS-800.b – National Response Framework (NRF), An Introduction
  - Liaison Refresher
- Authorized for deployment

PHYSICAL DEMANDS AND REQUIREMENTS

- Possibly, only austere living conditions will be available
- Work can require long hours and stressful, urgent situations
- Exposure to extreme temperature and weather conditions can be encountered

May 2008

FRMAC SENIOR SCIENTIFIC ADVISOR

POSITION SUMMARY

The FRMAC Senior Scientific Advisor (SSA) is a recognized national expert in radiation health effects, the impact of radiation on the environment, and the transport of radioactive materials in the biosphere. The SSA is the senior technical advisor to the FRMAC Director and will provide him/her with assessments of the off-site radiological situation, a technical overview of FRMAC activities, and advice and assistance in determining the best technical and scientific basis for operational activities to meet overall FRMAC objectives. The SSA provides technical advice to the Coordinating Agency, state, and local officials as requested. In addition, the SSA functions as the FRMAC technical spokesperson at briefings for the Coordinating Agency, state and local officials, news media, and/or the public.

DUTIES AND RESPONSIBILITIES

- Maintain expert knowledge and experience with respect to radiological dose assessment, radiation-related health effects and environmental impact, transport of radioactive materials in the biosphere, federal Protective Action Guides (PAGs), mitigation processes, and consequence management activities
- Maintain familiarity and working knowledge of current International Atomic Energy Agency radiological emergency intervention levels
- Maintain in-depth knowledge and experience with all of the current FRMAC manuals, including the FRMAC Assessment Manual, the FRMAC Health and Safety Manual, and the FRMAC Operations Manual
- Maintain familiarity with the National Response Framework (NRF) and the Nuclear/Radiological Incident Annex (NRIA)
- Function as the senior on-scene technical advisor to the FRMAC Director
- Provide technical overview and assessments of the FRMAC operations and activities
- Provide the FRMAC Director with interpretations of the scientific and technical information, technical options, estimates of risks and benefits, and recommended courses of action
- Provide advice with respect to technical activities to meet the overall FRMAC objectives that reflect the Coordinating Agency's and state's prioritized requirements
- As requested, provide advice and interpretations of the scientific and technical information, technical options, and estimates of risks and benefits to the Coordinating Agency and/or state and local officials
- Function as the FRMAC technical spokesperson at briefings for the Coordinating Agency, state and local officials, news media, and/or the public
- Serve as the FRMAC scientific contact with other federal and state agencies
- Assist the FRMAC Director in ensuring smooth, seamless transition of the FRMAC management from DOE to EPA. This includes developing plans and procedures for transferring the SSA's logs, records, and documentation to EPA

FRMAC SENIOR SCIENTIFIC ADVISOR

ORGANIZATION AND COMMUNICATIONS

- RECEIVES DIRECTION FROM:
  - FRMAC Director
- WORKS WITH:
  - FRMAC Assessment Manager
  - FRMAC Monitoring Manager
  - FRMAC Public Information Officer (PIO)
- PROVIDES DIRECTION TO:
  - N/A

QUALIFICATIONS

- Recognized national expert in radiation health effects, the impact of radiation on the environment, and the transport of radioactive materials in the biosphere
- Demonstrated an expert knowledge and experience in radiological dose assessment, radiation-related health effects and environmental impact, protective action guides (PAGs), mitigation processes, and consequence management activities
- Successful completion of:
  - AS-100 – Introduction to Assessment Science
  - AS-200 – FRMAC Overview
  - CM Drill
  - EOTA CMP-101DW – Operations Overview for CM
  - EOTA CMP-110DW – Assessment Manual Training
  - EOTA CMP-123DW – GIS Overview
  - ICS-100 – Introduction to ICS
  - ICS-200 – ICS for Single Resources and Initial Action Incidents
  - ICS-300 – Intermediate
  - ICS-400 – Advanced
  - IS-800.b – National Response Framework (NRF), An Introduction
  - Liaison Initial
  - Liaison Refresher
  - Rad Worker II
  - Technical Training for CM Managers
- Authorized for deployment

May 2008

FRMAC SENIOR SCIENTIFIC ADVISOR

PHYSICAL DEMANDS AND REQUIREMENTS

- Possibly, only austere living conditions will be available
- Work can require long hours and stressful, urgent situations
- Exposure to extreme temperature and weather conditions can be encountered

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FRMAC PUBLIC INFORMATION OFFICER

POSITION SUMMARY

The FRMAC Public Information Officer (PIO) is appointed by the FRMAC Director in consultation with the Director, Office of Public Affairs, NNSA/NSO. The PIO is an expert on public affairs and is responsible for advising the FRMAC Director on all activities associated with the news media and dissemination to the public of information related to FRMAC activities. The PIO will interface with the Joint Information Center (JIC); interact with the Coordinating Agency, state, and local PIOs; develop public information materials relating to FRMAC activities; assist in the development of briefing materials; develop FRMAC Fact Sheets; and coordinate requested tours of the FRMAC facility.

DUTIES AND RESPONSIBILITIES

- Maintain detailed knowledge, expertise, and proficiency with all phases of public affairs as it relates to FRMAC and DOE emergency response programs
- Maintain detailed knowledge and familiarity with all applicable DOE orders, rules, and regulations relating to public information activities and the dissemination of information to the public and the media
- Maintain in-depth expertise in NNSA/NSO Public Affairs activities
- Maintain knowledge and experience of news media processes and activities
- Maintain highly developed writing skills
- Maintain knowledge and thorough understanding of the DOE CMRT and FRMAC missions, capabilities, and objectives
- Advice and support the FRMAC Director in all public information, news media, and briefing issues
- Assist in the development of public information briefings and briefing materials to be presented by the FRMAC Director at news briefings and public meetings
- Function as the liaison between the FRMAC and the JIC
- Interface with the Coordinating Agency, state, and local PIOs
- Coordinate public affairs information with DOE/NNSA/HQ and NNSA/NSO
- Develop public information materials as required
- Coordinate tours of the FRMAC facility for the news media and/or public officials
- Develop FRMAC Fact Sheets, in coordination with the JIC, to address FRMAC activities and accomplishments
- At the beginning of each shift provide FRMAC Field Monitoring Teams with a briefing regarding how the team should address inquiries from the public and/or the media and copies of FRMAC Fact Sheets to provide contact information for appropriate individuals that the public or news media can contact for further information
- Document all public affairs-related news briefings, public meetings, major decisions, and communications

FRMAC PUBLIC INFORMATION OFFICER

- Provide, operate, and maintain public affairs audio/visual equipment
- Assist the FRMAC Director in ensuring a smooth, seamless transition of the FRMAC management from DOE to EPA. This includes developing plans and procedures to transfer Public Affairs logs, records, and documentation to EPA

ORGANIZATION AND COMMUNICATIONS

- RECEIVES DIRECTION FROM:
  - FRMAC Director
- WORKS WITH:
  - Director, Public Affairs and Information Division, NNSA/NSO
- PROVIDES DIRECTION TO:
  - FRMAC Documents Control Specialist

QUALIFICATIONS

- Recognized Public Affairs expert
- Demonstrated ability to communicate orally and in writing
- Thorough knowledge and experience of news media processes and activities
- Demonstrated expertise in developing emergency response-related briefing materials for presentation to the news media and/or the public
- Successful completion of:
  - EOTA CMP-101DW – Operations Overview for CM
  - Exercise Participation
  - ICS-100 – Introduction to ICS
  - ICS-200 – ICS for Single Resources and Initial Action
  - ICS-300 – Intermediate
  - ICS-400 – Advanced
  - IS-700 – NIMS
  - IS-800.b – National Response Framework (NRF), An Introduction
  - Liaison Refresher
- Authorized for deployment

PHYSICAL DEMANDS AND REQUIREMENTS

- Possibly, only austere living conditions will be available
- Work can require long hours and stressful, urgent situations
- Exposure to extreme temperature and weather conditions can be encountered

May 2008

EPA SENIOR REPRESENTATIVE

POSITION SUMMARY

The U.S. Environmental Protection Agency (EPA) Senior Representative to the FRMAC, collocated at the FRMAC, is NOT a FRMAC position under the direction of the FRMAC Director. This job description addresses the EPA Senior Representative to the FRMAC from the perspective of the FRMAC during the emergency phase while the FRMAC is under the management of DOE.

Following the stabilization of the emergency and during the intermediate phase of a CONUS deployed FRMAC, the management responsibilities for the FRMAC will transition from DOE to EPA. This transition will occur at a mutually agreeable time with the DOE and EPA and in coordination with the Coordinating Agency and the affected state. The EPA will assume the federal responsibility for coordinating the intermediate and long-term, off-site radiological monitoring, sampling, and dose assessment activities, and the EPA Senior Representative will transition to become the FRMAC Director.

While the FRMAC is under the management of the DOE, the EPA Senior Representative in the FRMAC provides guidance to the FRMAC Director concerning the long-term monitoring implications of the EPA PAGs. In addition, the EPA Senior Representative works closely with the FRMAC Director and is cognizant of all major decisions and activities executed by the FRMAC. In this way, the EPA Senior Representative to the FRMAC possesses the background information and experience in the evolution of the FRMAC necessary for a smooth transition in assuming the role of FRMAC Director.

DUTIES AND RESPONSIBILITIES

Pre-activation Duties and Responsibilities

- Maintain detailed knowledge and familiarity with all applicable EPA, DOE, federal statutes, orders, rules, and regulations relating to the National Response Framework (NRF) and the Nuclear/Radiological Annex (NRIA), FRMAC, and radiological emergency response activation, deployment, and operational activities
- Maintain knowledge and thorough understanding of FRMAC mission, capabilities, and objectives
- Maintain knowledge and understanding of various FRMAC positions, duties, responsibilities, and desired qualifications
- Maintain working knowledge and expertise with EPA's (PAGs)

EPA SENIOR REPRESENTATIVE

Activation Duties and Responsibilities

- Provide guidance to the DOE/NNSA FRMAC Director concerning the monitoring implications of the EPA PAGs
- Work closely with the FRMAC Director and remain cognizant of the evolution of the FRMAC: what directives have been provided to the FRMAC, what agreements have been made with the Coordinating Agency and the states, and familiarity with all major decisions and activities executed by the FRMAC
- Ensure that the data collected by the FRMAC contains the necessary information required by EPA to support the development of the Long-Term Monitoring Plan and conduct long-term monitoring, reentry, and recovery operations
- Assist in the development of the FRMAC Long-Term Monitoring Plan
- Ensure the development of appropriate documentation to support the transition of the FRMAC management from DOE to EPA
- In accordance with the NRIA of the NRF, negotiate with the DOE FRMAC Director, the Coordinating Agency, and the states to develop a formal transition plan
- In conjunction with the DOE FRMAC Director, ensure a smooth, seamless transition of the FRMAC management from DOE to EPA

Close-Out Duties and Responsibilities

N/A – The deactivation of the FRMAC under EPA management and coordination is outside the purview of this document.

ORGANIZATION AND COMMUNICATIONS

- RECEIVES DIRECTION FROM:
  - EPA/HQ, Office of Radiation and Indoor Air
  - Coordinating Agency On-Scene Commander
  - Senior Officials from affected states
- PROVIDES DIRECTION TO:
  - N/A

May 2008

EPA SENIOR REPRESENTATIVE

QUALIFICATIONS

- Demonstrated ability to manage emergency response personnel in very stressful, urgent situations
- Demonstrated detailed knowledge and familiarity with all applicable EPA and federal statutes, orders, rules, and regulations relating to FRMAC and radiological emergency response activation, deployment, and operational activities
- Experience and thorough understanding of FRMAC Phase I, II, and III missions, resources, capabilities, objectives, operations, and expected data products
- Knowledge and understanding of FRMAC Operations
- Successful completion of:
  - ICS 100 – Introduction to ICS
  - ICS 200 – ICS for Single Resources and Initial Action
  - ICS 300 – Intermediate
  - ICS 400 – Advanced
  - IS-700 – NIMS
  - IS-800.b – National Response Framework (NRF), An Introduction
- Authorized for deployment

PHYSICAL DEMANDS AND REQUIREMENTS

- Possibly, only austere living conditions will be available
- Work can require long hours and stressful, urgent situations
- Exposure to extreme temperature and weather conditions can be encountered

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FRMAC LIAISON

POSITION SUMMARY

The FRMAC Liaisons coordinate requests, information, and data products between the FRMAC and their point-of-contact at the deployed location. These deployed locations may be associated with the Coordinating Official's (CO's) Joint Operations Center (JOC); states, counties, and/or cities Emergency Operations Centers (EOCs); the Federal Emergency Management Agency's (FEMAs)Disaster Field Office (DFO); the facility's Emergency Operations Facility (EOF); or various other federal, state, tribal, and local government locations. The FRMAC Liaisons ensure timely transmittal of event-related information and data products to and from the Coordinating Official, state, and participating federal agencies. The Liaisons facilitate the resolution of problems, conflicts, and unmet needs.

DUTIES AND RESPONSIBILITIES

- Maintain knowledge of and familiarity with FRMAC documentation and applicable federal regulations
- Maintain knowledge and thorough understanding of the DOE CMRT and FRMAC missions, capabilities, and objectives
- Maintain familiarity and working knowledge of current federal radiological emergency response Protective Action Guides (PAGs). This includes PAGs for evacuation, relocation, and ingestion
- Maintain detailed knowledge, understanding, and experience with FRMAC data products
- Provide direct communication between the deployed location and the FRMAC Director.
- Ensure the timely distribution to the point-of-contact of event-related information and FRMAC data products received from the FRMAC Director
- Provide interpretations/explanations of FRMAC data products to the point-of-contact and others as appropriate
- Perform data entry and data management of all field monitoring and derived radioanalytical data, source-term information, on-site radiological situation information, and other incident-related information required by the Database Management System
- Assist in ensuring and maintaining the technical integrity of all FRMAC data and data products
- Assist in the date and time stamping, cataloging, and archiving of all original FRMAC documents relating to the response, data, data products, any parameters affecting the quality or integrity of the data or data products, and any other related data forms and/or information
- Produce pre-defined reports as requested
- Interact with Geographic Information System (GIS) to transfer the desired data sets from the Data Center to GIS

FRMAC LIAISON

ORGANIZATION AND COMMUNICATIONS

- RECEIVES DIRECTION FROM:
  - FRMAC Director
- WORKS WITH:
  - FRMAC Assessment Manager
  - FRMAC Laboratory Analysis Manager
  - FRMAC Monitoring Manager
- PROVIDES DIRECTION TO:
  - FRMAC Documentation Specialist

QUALIFICATIONS

- Demonstrated in-depth knowledge and experience in the application and use of the *FRMAC Assessment Manual*
- Demonstrated expert knowledge and experience in radiological dose assessment, radiation-related health effects and environmental impact, PAGs, mitigation processes, and consequence management activities
- Working knowledge and experience with PAGs and IAEA intervention levels
- Successful completion of:
  - ICS-100 – Introduction to ICS
  - ICS-200 – ICS for Single Resources and Initial Action
  - ICS-300 – Intermediate
  - ICS-400 – Advanced
  - IS-700 – NIMS
  - IS-800.b – National Response Framework (NRF), An Introduction
  - Liaison Initial
  - Liaison Refresher
- Authorized for deployment

PHYSICAL DEMANDS AND REQUIREMENTS

- Possibly, only austere living conditions will be available
- Work can require long hours and stressful, urgent situations
- Exposure to extreme temperature and weather conditions can be encountered

May 2008

FRMAC MANAGER

POSITION SUMMARY

The FRMAC Manager has the overall responsibility for the management of the FRMAC in the field when the FRMAC Director is involved in Unified Command. This includes execution of the mission; health and safety of FRMAC personnel; protection of classified information, government property, and critical assets; and ensuring compliance with all applicable DOE orders, Occupational Safety and Health Administration (OSHA) standards, Department of Transportation (DOT) standards, and federal statutes.

DUTIES AND RESPONSIBILITIES

- Maintain knowledge of and familiarity with:
  - Homeland Security Presidential Directive-5 (HSPD-5)
  - The National Response Framework (NRF) and the Nuclear/Radiological Incident Annex NRIA
  - NNSA/DOE CMO's Handbook
  - FRMAC Operations Manual
  - NNSA/NSO Alert and Activation Procedures
  - Remote Sensing Laboratory (RSL) Alert, Activation, and Deployment Procedures
  - 10 CFR 835 (Occupational Radiation Protection)
  - 10 CFR 20 (Standards for Protection Against Radiation)
  - Applicable Standard Operating Procedures
- Maintain detailed knowledge and familiarity with all applicable DOE and federal statutes, orders, rules, and regulations relating to radiological emergency response activation, deployment, and operational activities
- Maintain knowledge and thorough understanding of FRMAC and Consequence Management Response Team (CMRT) Phase I, Phase II, and Augmentation missions, capabilities, objectives, and expected products
- Overall responsibility for the health and safety of the FRMAC personnel
- Overall responsibility for ensuring compliance with all applicable DOE orders, OSHA standards, and federal statutes
- Exercise management and coordination control of the FRMAC
- Ensure that the FRMAC activities and data products reflect the ongoing priority needs of the Coordinating Agency and state

FRMAC MANAGER

- Ensure that the FRMAC activities and data products meet the statutory responsibilities of participating federal agencies
- Ensure that FRMAC raw data and approved assessed data products are distributed as expeditiously as possible and in accordance with FRMAC procedures and agreements
- Overall responsibility for ensuring that all FRMAC assessed data products, which are officially released outside of the FRMAC, are of known and defensible quality
- Overall responsibility for ensuring that all necessary physical accommodations are provided for FRMAC personnel
- Overall responsibility for ensuring strict document control, confidentiality, and archiving of all FRMAC personnel medical records, radiation exposures/doses, industrial hygiene and/or occupational health-related incidents, and/or other health issues
- Overall responsibility for all federal government equipment located at the FRMAC, FRMAC data and data products, radioactive sources, classified information, and critical assets
- Overall responsibility for ensuring that all handling, packaging, storing, and shipping of hazardous materials, radioactive substances, and mixed waste are in compliance with all applicable DOE orders, OSHA and DOT standards, and federal regulations
- Overall responsibility for ensuring that all required DOE and federal government documentation are complete, accurate, timely, and properly archived for historical and legal purposes
- Ensure the development of timely and appropriate Situational Reports
- Overall responsibility for the proper disposition of all classified documentation
- Document the chronology of significant events, meetings, and activities
- Document FRMAC activities, accomplishments, lessons learned, and any other significant occurrences.
- Ensure the development of a comprehensive and timely final report of the FRMAC activities
- Responsible for the disposition of all self-generated notes, logs, and mission-related documentation

FRMAC MANAGER

ORGANIZATION AND COMMUNICATIONS

- RECEIVES DIRECTION FROM:
  - FRMAC Director
- WORKS WITH:
  - N/A
- PROVIDES DIRECTION TO:
  - FRMAC Managers

QUALIFICATIONS

- Demonstrated ability to manage emergency response personnel in very stressful, urgent situations
- Demonstrated detailed knowledge and familiarity with all applicable DOE and federal statutes, orders, rules, and regulations relating to FRMAC and radiological emergency response activation, deployment, and operational activities
- Experience and thorough understanding of CM Phase I and II, and Augmentation and FRMAC missions, resources, capabilities, objectives, operations, and expected data products
- Successful completion of:
  - EOTA CMP-101DW – Operations Overview for CM
  - Exercise Participation
  - ICS-100 – Introduction to ICS
  - ICS-200 – ICS for Single Resources and Initial Action
  - ICS-300 – Intermediate
  - ICS-400 – Advanced
  - IS-700 – NIMS
  - IS-800.b – National Response Framework (NRF), An Introduction
  - Liaison Refresher
- Authorized for deployment

PHYSICAL DEMANDS AND REQUIREMENTS

- Possibly, only austere living conditions will be available
- Work can require long hours and stressful, urgent situations
- Exposure to extreme temperature and weather conditions can be encountered

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FEDERAL TEAM LEADER – CMHT

POSITION SUMMARY

The Federal Team Leader-CMHT has the overall responsibility for the management of the Consequence Management Home Team (CMHT) when the FRMAC Director is deployed. This includes execution of the mission; health and safety of FRMAC personnel; protection of classified information, government property, and critical assets; and ensuring compliance with all applicable DOE orders, OSHA standards, DOT standards, and federal statutes.

DUTIES AND RESPONSIBILITIES

- Maintain knowledge of and familiarity with:
  - HSPD-5
  - The NRF and the NRIA
  - NNSA/DOE CMO's Handbook
  - FRMAC Operations Manual
  - NNSA/NSO Alert and Activation Procedures
  - RSL Alert, Activation, and Deployment Procedures
  - 10 CFR 835 (Occupational Radiation Protection)
  - 10 CFR 20 (Standards for Protection Against Radiation)
  - Applicable Standard Operating Procedures
- Maintain detailed knowledge and familiarity with all applicable DOE and federal statutes, orders, rules, and regulations relating to radiological emergency response activation, deployment, and operational activities
- Maintain knowledge and thorough understanding of FRMAC and CMRT Phase I, Phase II, and Augmentation missions, capabilities, objectives, and expected products
- Overall responsibility for the health and safety of the CMHT personnel
- Overall responsibility for ensuring CMHT compliance with all applicable DOE orders, OSHA standards, and federal statutes
- Overall responsibility for CMHT support of the Event response while CMRT I is en route to the Event scene and to provide early data assessment resources. The CMHT also provides logistical support to the CMRT resources in transit to the Event scene
- Exercise management and coordination control of the CMHT, and support deployed FRMAC Director and deployed CMRT
- Ensure that the CMHT activities and data products reflect the ongoing priority needs of the Coordinating Agency, and responding federal, state, tribal, and local government agencies

FEDERAL TEAM LEADER – CMHT

- Ensure that the CMHT activities and data products meet the statutory responsibilities of participating federal agencies
- Ensure that FRMAC raw data and approved assessed data products are distributed as expeditiously as possible and in accordance with FRMAC procedures and agreements
- Overall responsibility for CMHT distribution of data products to the Nuclear Incident Team (NIT) and Radiological Assistance Program (RAP) team(s) that have been deployed to support the response until the CMRT assets are established at the Event scene
- Overall responsibility for CMHT provision of status information to the CMRT I assets when those assets arrive at the Event scene
- Overall responsibility for all federal government equipment located in the CMHT, FRMAC data and data products, radioactive sources, classified information, classification of information, and critical assets
- Ensure the development of timely and appropriate NIT Situational Reports
- Overall responsibility for the proper disposition of all classified documentation in the CMHT
- Document the chronology of significant events, meetings, and activities
- Document CMHT activities, accomplishments, lessons learned, and any other significant occurrences
- Ensure the development of a comprehensive and timely final report of the CMHT activities
- Responsible for the disposition of all self-generated notes, logs, and mission-related documentation

ORGANIZATION AND COMMUNICATIONS

- RECEIVES DIRECTION FROM:
  - FRMAC Director
- WORKS WITH:
  - NIT, FRMAC Manager, and RSL Response Manager
- PROVIDES DIRECTION TO:
  - Consequence Management Home Team (CMHT)

QUALIFICATIONS

- Demonstrated ability to manage emergency response personnel in very stressful, urgent situations
- Demonstrated detailed knowledge and familiarity with all applicable DOE and federal statutes, orders, rules, and regulations relating to FRMAC and radiological emergency response activation, deployment, and operational activities

March 2009

FEDERAL TEAM LEADER – CMHT

- Experience and thorough understanding of CMRT Phase I and II, and Augmentation and FRMAC missions, resources, capabilities, objectives, operations, and expected data products
- Successful completion of:
  - EOTA CMP-101DW – Operations Overview for CM
  - Exercise Participation
  - ICS-100 – Introduction to ICS
  - ICS-200 – ICS for Single Resources and Initial Action
  - IS-700 – NIMS
  - IS-800.b – National Response Framework (NRF), An Introduction
  - Liaison Refresher
- Authorized for deployment

PHYSICAL DEMANDS AND REQUIREMENTS;

- Work can require long hours and stressful, urgent situations

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FRMAC SUPPORT MANAGER

POSITION SUMMARY

The FRMAC Support Manager manages logistical operations for the FRMAC response and is responsible for maintaining the operational flow of activities. In addition, the Support Manager oversees the activities of the communications and mechanical/electrical support personnel to ensure that operational capability is maintained.

DUTIES AND RESPONSIBILITIES

- Maintain a general working knowledge and understanding of FRMAC missions, capabilities, objectives, and procedures
- Responsible for establishing and maintaining the operational capability of the FRMAC facility
- Ensure the availability of adequate communications and rental vehicles
- Ensure that equipment, materials, supplies, and services, as required by the operation, are provided
- Ensure that transportation for personnel and equipment is provided
- Responsible for all DOE sensitive assets
- Responsible for all classified communications and documentation
- Responsible for ensuring that all support documentation required by DOE or National Security Technologies, LLC (NSTec), is complete, accurate, and timely
- Responsible for providing a summary of all support-related activities to the periodic Situation Reports
- Responsible for preparing for the arrival of additional or replacement personnel or equipment
- Ensure the availability of mechanical/electrical support, when appropriate
- Ensure the availability of all operational and logistical support required to deactivate the FRMAC activities and redeploy

FRMAC SUPPORT MANAGER

ORGANIZATION AND COMMUNICATIONS

- RECEIVES DIRECTION FROM:
  - FRMAC Manager
- WORKS WITH:
  - FRMAC Operations Support Specialist
- PROVIDES DIRECTION TO:
  - FRMAC Communications Specialists
  - FRMAC Electrical/Mechanical Specialists

QUALIFICATIONS

- Demonstrated ability to function in a support management role in very stressful, urgent situations
- Successful completion of:
  - CM Drill
  - EOTA CMP-101DW – Operations Overview for CM
  - GERT
  - ICS-100 – Introduction to ICS
  - ICS-200 – ICS for Single Resources and Initial Action
  - ICS-300 – Intermediate
  - ICS-400 – Advanced
  - IS-700 – NIMS
  - IS-800.b – National Response Framework (NRF), An Introduction
  - Technical Training for CM Managers
- Authorized for deployment

PHYSICAL DEMANDS AND REQUIREMENTS

- Possibly, only austere living conditions will be available
- Work can require long hours and stressful, urgent situations
- Exposure to extreme temperature and weather conditions can be encountered

May 2008

FRMAC COMMUNICATIONS SPECIALIST

POSITION SUMMARY

The FRMAC Communications Specialist establishes and maintains all communications capabilities including repeaters, encoded radios and radio nets, satellite communications systems, telephone systems, secure communications, facsimile machines, common carrier systems (microwave and multiplexers), and local area networks for field operations.

DUTIES AND RESPONSIBILITIES

- Maintain a general working knowledge and understanding of FRMAC missions, capabilities, objectives, and procedures
- Maintain expertise on all communications assets including encoded radios, repeaters, telephones, satellite communications system, common carrier system, and secure communications equipment
- Responsible for assuring that all communications assets and capabilities are established, supported, and maintained in an operational capacity, this includes encoded radios, repeaters, telephones, satellite communications system, common carrier system (microwave and multiplexers), secure communications equipment, facsimile machines, and local area networks
- Establish and/or assist in establishing and maintaining secure voice, fax, and data communications
- Adhere to all applicable DOE, National Telecommunications and Information Administration (NTIA), OSHA, and NSTec communications orders, rules, and regulations
- Function as the secure communications custodian
- Provide or assist in radio frequency coordination
- Assist in video distribution and teleconference service activities

ORGANIZATION AND COMMUNICATIONS

- RECEIVES DIRECTION FROM:
  - FRMAC Operations Support Specialist
- WORKS WITH:
  - N/A
- PROVIDES DIRECTION TO:
  - N/A

FRMAC COMMUNICATIONS SPECIALIST

QUALIFICATIONS

- Cryptographic Clearance
- Demonstrated expertise on all communications assets including encoded radios, repeaters, telephones, deployed satellite communications system, common carrier, and secure communications equipment
- Detailed knowledge and experience with all applicable DOE, NTIA, OSHA, and NSTec communications orders, rules, and regulations
- Familiarity with safety issues such as Fall Protection, Electrical Safety, Confined Space, and Lock Out/Tag Out
- Successful completion of:
  - CM Drill
  - EOTA CMP-101DW – Operations Overview for CM
  - ICS-100 – Introduction to ICS
  - ICS-200 – ICS for Single Resources and Initial Action
  - IS-700 – NIMS
  - Rad Worker II
- Authorized for deployment

PHYSICAL DEMANDS AND REQUIREMENTS

- Possibly, only austere living conditions will be available
- Work can require long hours and stressful, urgent situations
- Exposure to extreme temperature and weather conditions can be encountered

FRMAC OPERATIONS SUPPORT SPECIALIST

POSITION SUMMARY

The FRMAC Operations Support Specialist carries out initial logistical operations for the FRMAC response and is also responsible for maintaining the operational flow of activities required to support the deployment including requisitioning and coordinating ongoing logistical requirements (lodging, rations, transportation, fuel, material purchases, etc.). In addition to overseeing the logistical requirements described previously, the Operations Support Specialist also oversees the activities of the communications and mechanical/ electrical support personnel to ensure that operational capability is maintained.

DUTIES AND RESPONSIBILITIES

- Maintain a general working knowledge and understanding of FRMAC missions, capabilities, objectives, and procedures
- Responsible for establishing and maintaining the operational capability of the FRMAC facility
- Ensure the availability of adequate communications and rental vehicles
- Obtain equipment, materials, supplies, and services, as required by the operation
- Obtain transportation for personnel and equipment
- Responsible for all DOE sensitive assets
- Responsible for all classified communications and documentation
- Responsible for ensuring that all support documentation required by DOE or NSTec is complete, accurate, and timely
- Responsible for providing a summary of all support-related activities to the periodic Situation Reports
- Responsible for preparing for the arrival of additional or replacement personnel or equipment
- Ensure the availability of mechanical/electrical support, when appropriate
- Ensure the availability of all operational and logistical support required to deactivate the FRMAC activities and redeploy

FRMAC OPERATIONS SUPPORT SPECIALIST

ORGANIZATION AND COMMUNICATIONS

- RECEIVES DIRECTION FROM:
  - FRMAC Manager
- WORKS WITH:
  - FRMAC Support Manager
- PROVIDES DIRECTION TO:
  - FRMAC Communications Specialists
  - FRMAC Electrical/Mechanical Specialists

QUALIFICATIONS

- Demonstrated ability to function in a "Support Manager" role in very stressful, urgent situations
- Successful completion of:
  - Authorized Derivative Classifier Training
  - CM Drill
  - Communication Equipment for Users
  - Emergency Response Security Training
  - EOTA CMP-101DW – Operations Overview for CM
  - Hazardous Materials Drivers Training
  - Hazardous Material General Awareness Transportation Training
  - ICS-100 – Introduction to ICS
  - ICS-200 – ICS for Single Resources and Initial Action
  - IS-700 – NIMS
  - Rad Worker II
  - Sealed Radioactive Source Control
- Authorized for deployment

PHYSICAL DEMANDS AND REQUIREMENTS

- Possibly, only austere living conditions will be available
- Work can require long hours and stressful, urgent situations
- Exposure to extreme temperature and weather conditions can be encountered

May 2008

FRMAC ELECTRICAL/MECHANICAL SPECIALIST

POSITION SUMMARY

The FRMAC Electrical/Mechanical Specialist provides mechanical, electrical, and engineering support to the FRMAC. Required support includes establishing the operating facility, which may require setting up large tents and ensuring satisfactory electrical power, heating, and air conditioning services are available to sustain operations. Electrical/ Mechanical Specialists also provide electrical generators and power sources for equipment and mobile laboratories, electrical/mechanical repair and field fabrication support, and forklifts and other loading/unloading equipment.

DUTIES AND RESPONSIBILITIES

- Maintain a general working knowledge and understanding of FRMAC missions, capabilities, objectives, and procedures
- Maintain working knowledge of general mechanical/electrical operations as they apply to the FRMAC
- Maintain certification to operate forklifts, loading/unloading equipment, and other related heavy equipment
- Provide mechanical, electrical, and engineering support to establish operations as needed
- Assist in the assembly/disassembly of all on-scene required tents to support the CMRT/FRMAC. These tents may be used for the operations facility, sample control facility, monitoring team dispatch facility, equipment storage, etc.
- Assist in ensuring satisfactory electrical power is available to sustain operations including the mobile laboratories collocated with the deployed organization
- Operate and maintain on-scene electrical generators (3 kW–90 kW) and power sources for equipment
- Perform mechanical/electrical repair and field fabrication support as required
- Operate forklifts, loading/unloading equipment, and other heavy equipment as required
- Provide and maintain required heating and air conditioning
- Obtain equipment, materials, supplies, and services as required by the operations
- Prepare and load equipment for transportation
- Obtain and/or provide transportation for personnel and equipment
- Provide mechanical/electrical support for the termination and redeployment of operations
- Prepare for shipping and containerize, as needed, all mechanical/electrical support equipment

FRMAC ELECTRICAL/MECHANICAL SPECIALIST

ORGANIZATION AND COMMUNICATIONS

- RECEIVES DIRECTION FROM:
  - FRMAC Operations Support Specialist
- WORKS WITH:
  - N/A
- PROVIDES DIRECTION TO:
  - N/A

QUALIFICATIONS

- Certified to operate forklifts, loading/unloading equipment, and other related heavy equipment
- Detailed knowledge and familiarity with all applicable DOE, OSHA, DOT, and NSTec rules, regulations, and orders
- Successful completion of:
  - EOTA CMP-101DW – Operations Overview for CM
  - Federal Motor Carrier Safety Requirements
  - Hazardous Material General Awareness Transportation Training
  - ICS-100 – Introduction to ICS
  - ICS-200 – ICS for Single Resources and Initial Action
  - IS-700 – NIMS
  - Rad Worker II
  - Sealed Radioactive Source Control
- Authorized for deployment

PHYSICAL DEMANDS AND REQUIREMENTS

- Possibly, only austere living conditions will be available
- Work can require long hours and stressful, urgent situations
- Exposure to extreme temperature and weather conditions can be encountered

FRMAC MONITORING MANAGER

POSITION SUMMARY

The FRMAC Monitoring Manager coordinates and directs activities relating to aerial radiological monitoring, field monitoring, and sampling. The Monitoring Manager is responsible for the safety of all FRMAC personnel and maintains all radiation exposures to
As Low As Reasonably Achievable (ALARA). In coordination with the FRMAC Assessment Manager and the FRMAC Laboratory Analysis Manager, the Monitoring Manager evaluates the requirements for field monitoring, environmental sampling, and radioanalytical data and develops priorities, strategies, and plans to acquire the data. The Monitoring Manager is responsible for identifying equipment, personnel, and resource requirements and coordinating their availability.

DUTIES AND RESPONSIBILITIES

- Maintain a general working knowledge and understanding of FRMAC missions, capabilities, objectives, and procedures
- Maintain detailed knowledge and expertise with a broad spectrum of radiological field monitoring and health physics instrumentation including Field Instruments for the Detection of Low Energy Radiation (FIDLERs) and in situ high-resolution gamma spectrometry systems
- Maintain detailed knowledge, expertise, and proficiency with all phases of radiological monitoring, environmental sampling, and radioanalytical methodologies as identified in the *FRMAC Monitoring and Analysis Manual*, Volume 1 – Radiation Monitoring and Sampling and Volume 2 – Sample Preparation and Analysis
- Maintain knowledge and experience with radiological contamination control and decontamination procedures
- In concert with the FRMAC Health and Safety Manager, ensure that the principle of ALARA is practiced during all possible radiation exposure activities
- Develop a Radiological Monitoring and Sampling Plan based upon the Incident Action Plan developed by the state, tribal, local, and other participating agencies
- Maintain flexibility and adjust monitoring activities to reflect changing FRMAC priorities, requirements, and data quality objectives
- Identify and develop plans to integrate available field monitoring personnel from the Coordinating Agency, state, tribal, local, and/or other emergency response organizations into FRMAC monitoring activities
- Ensure adequate maps are available for the Field Team Specialists
- Identify how Field Monitoring Specialists can pass through roadblocks into evacuated areas to perform monitoring duties
- Identify local emergency response personnel who are familiar with the area and who are available to drive the monitoring vehicles

FRMAC MONITORING MANAGER

- Provide trained and knowledgeable personnel to operate the contamination control station/hotline
- In consultation with the FRMAC Assessment Manager and/or the FRMAC Senior Scientific Advisor, evaluate the requirements and data quality objectives for field radiation monitoring and sampling and develop priorities, strategies, and plans to acquire the radiological monitoring and sampling derived data
- In concert with the FRMAC Health and Safety Manager, ensure the Field Team Specialists receive a Mission and Safety Briefing prior to each field operation. These briefings will address operational objectives, possible radiation exposures and related turn back values and dose commitment levels, required personal dosimetry (direct reading and non-direct reading), radiation exposure reporting and documentation requirements, meteorological hazards, general safety issues, and any other hazards that may exist.
- In concert with the Public Information Officer (PIO) and as part of the Field Team Specialists' Mission and Safety Briefing, ensure the Field Team Specialists receive:
- A briefing at the beginning of each shift to explain the emergency response and consequence management information that has been disseminated to the public and how the teams should address inquiries from the public and/or the media
- Current FRMAC Fact Sheets suitable for the FRMAC monitoring teams to give to the inquiring public and/or media. In addition to information relating to the FRMAC activities, the Fact Sheets will contain names and telephone numbers of appropriate individuals that the public or news media can contact for information such as the JIC Chief, FRMAC PIO, and other appropriate individuals.
- Ensure that all field monitoring data are of known quality and meet FRMAC requirements and data quality objectives
- Ensure chain-of-custody procedures for all collected samples and documentation are maintained
- Provide radiological field monitoring training, as requested, to local responders
- Ensure accurate and complete documentation of all field monitoring, sample collection, sample analyses, and health physics activities are maintained
- Ensure effective and appropriate command and control of the FRMAC field monitoring teams
- Provide support as required for health physics monitoring and contamination control activities
- Archive all FRMAC monitoring, sampling, health physics, chain-of-custody, and quality control/assurance forms, per instruction

ORGANIZATION AND COMMUNICATIONS

- RECEIVES DIRECTION FROM:
  - FRMAC Director

May 2008

FRMAC MONITORING MANAGER

- WORKS WITH:
  - FRMAC Assessment Manager
  - FRMAC Health and Safety Manager
  - FRMAC Laboratory Analysis Manager
- PROVIDES DIRECTION TO:
  - Field Team Specialists

QUALIFICATIONS

- DOE Rad Worker II certified
- Full Face Respirator certified
- Current and detailed knowledge and expertise with a broad spectrum of radioanalytical procedures, instrumentation, and methodologies
- Successful completion of:
  - CM Drill
  - EOTA CMP-101DW – Operations Overview for CM
  - Hazardous Waste Site General Worker for Supervisors
  - Hazardous Waste Site General Worker, Initial
  - Hazardous Waste Site General Worker, Refresher
  - ICS-100 – Introduction to ICS
  - ICS-200 – ICS for Single Resources and Initial Action
  - ICS-300 – Intermediate
  - IS-700 – NIMS
  - IS-800.b – National Response Framework (NRF), An Introduction
  - Monitoring Division Manager Training, Introduction
  - Monitoring Division Manager Training, Advanced
  - Rad Worker II
  - Respirator Training for Supervisors
  - Sample Control Training, Introduction
- Authorized for deployment

PHYSICAL DEMANDS AND REQUIREMENTS

- Possibly, only austere living conditions will be available
- Work can require long hours and stressful, urgent situations
- Exposure to extreme temperature and weather conditions can be encountered

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FRMAC IN SITU SCIENTIST

POSITION SUMMARY

The FRMAC In Situ Scientist is the senior technician who collects spectral information of radiological deposition. The person in this position will also assist with field monitoring duties.

DUTIES AND RESPONSIBILITIES

- Maintain a general working knowledge and understanding of FRMAC missions, capabilities, objectives, and procedures
- Maintain detailed knowledge and familiarity with the FRMAC *Monitoring Manual*, *Volumes 1 and 2*
- Maintain knowledge and familiarity with the FRMAC *Health and Safety Manual*
- Maintain detailed knowledge and expertise with a broad spectrum of radiological field monitoring and health physics instrumentation including Field Instruments for the Detection of Low Energy Radiation (FIDLERs), Violinists, and in situ high-resolution gamma spectroscopy
- Maintain detailed knowledge, expertise, and proficiency with all phases of Aerial Measuring System (AMS) radiological monitoring techniques and methodologies including activities and the comparability of data associated with:
  - Aerial radiation surveys and radioactive source searches
  - Real-time radiological aerial atmospheric tracking and sampling
  - Ground-based vehicle (Kiwi) radiation surveys and radioactive source search capabilities
  - In situ gamma spectroscopy
- Acquire in situ gamma spectral data as required
- Perform in situ gamma spectral data reduction to provide the desired data interpretations that are consistent with the required data quality objectives
- Responsible for the quality control procedures and related documentation on all in situ gamma spectroscopy systems and other radiological monitoring instruments in use
- Maintain accurate and complete documentation of all field monitoring, sample collection, and health physics activities
- Maintain strict chain-of-custody for all gamma spectral data, collected samples, and in situ gamma spectroscopy related documentation
- Responsible for adherence to all health physics monitoring and contamination control activities as applicable to the in situ gamma spectroscopy missions
- Cognizant of contamination control procedures during all monitoring and sample collection and handling activities associated with the in situ gamma spectroscopy missions

FRMAC IN SITU SCIENTIST

ORGANIZATION AND COMMUNICATIONS

- RECEIVES DIRECTION FROM:
  - FRMAC Monitoring Manager
- WORKS WITH:
  - FRMAC Field Monitoring Specialists
- PROVIDES DIRECTION TO:
  - N/A

QUALIFICATIONS

- Radiation Worker trained
- Full Face air-purifying respirator certified
- Certified in the use of personnel protective equipment to include Level B protective clothing
- Successful completion of:
  - CM Drill
  - EOTA CMP-101DW – Operations Overview for CM
  - Field Monitoring Team Training, Introduction
  - Hazardous Waste Site General Worker, Initial
  - Hazardous Waste Site General Worker, Refresher
  - ICS-100 – Introduction to ICS
  - ICS-200 – ICS for Single Resources and Initial Action
  - In Situ Training
  - IS-700 – NIMS
  - Rad Worker II
  - Sealed Radioactive Source Control
- Authorized for deployment

PHYSICAL DEMANDS AND REQUIREMENTS

- Possibly, only austere living conditions will be available
- Work can require long hours and stressful, urgent situations
- Exposure to extreme temperature and weather conditions can be encountered

May 2008

FRMAC FIELD MONITORING SPECIALIST

POSITION SUMMARY

The Federal Radiological Monitoring and Assessment Center (FRMAC) Field Monitoring Specialist executes radiological field radiation monitoring and sampling duties according to established and documented FRMAC methodologies in a safe, consistent, efficient, and timely manner. The Field Monitoring Specialist may also escort first responders into potentially contaminated areas for lifesaving and/or forensic operations. In addition, the Field Monitoring Specialist may be requested to provide training to local responders in field monitoring, sampling, and/or contamination control procedures.

DUTIES AND RESPONSIBILITIES

- Maintain a general working knowledge and understanding of FRMAC missions, capabilities, objectives, and procedures
- Maintain detailed knowledge, expertise, and proficiency with all phases of radiological monitoring techniques and environmental sampling methodologies as identified in the FRMAC *Monitoring Manual*, Volume 2 – *Radiation Monitoring and Sampling*
- Maintain knowledge and familiarity with the FRMAC *Health and Safety Manual*
- Maintain detailed knowledge and expertise with a broad spectrum of radiological field monitoring and health physics instrumentation including Field Instruments for the Detection of Low Energy Radiation (FIDLERs), Violinists, and in situ high-resolution gamma spectroscopy
- Ensure that the principle of As Low As Reasonably Achievable (ALARA) is practiced during all possible radiation exposures
- Perform radiological field monitoring and environmental sampling duties
- Escort emergency workers into potentially contaminated areas for lifesaving and/or forensic operations
- Perform quality control procedures and complete related documentation on all radiological monitoring instruments in use
- Provide training to local responders in field monitoring, sampling, and/or contamination control procedures as requested
- Maintain accurate and complete documentation of all field monitoring, sample collection, and health physics activities
- Maintain strict chain-of-custody for all collected samples and documentation
- Perform health physics monitoring and contamination control activities as requested
- Remain cognizant of contamination control procedures during all monitoring and sample collection and handling activities
- Ensure that all field instruments and equipment that affect the quality of the data are within calibration specifications and in proper working order

FRMAC FIELD MONITORING SPECIALIST

ORGANIZATION AND COMMUNICATIONS

- RECEIVES DIRECTION FROM:
  - FRMAC Monitoring Manager
- WORKS WITH:
  - FRMAC In Situ Scientists
- PROVIDES DIRECTION TO:
  - N/A

QUALIFICATIONS

- Radiation Worker II certified
- Full Face Air-Purifying Respirator certified
- Knowledge and familiarity with contamination control and decontamination practices and procedures
- Successful completion of:
  - CM Drill
  - EOTA CMP-101DW – Operations Overview for CM
  - Field Monitoring Team Training, Introduction
  - Field Monitoring Team Training, Advanced
  - Hazardous Waste Site General Worker, Initial
  - Hazardous Waste Site General Worker, Refresher
  - ICS-100 – Introduction to ICS
  - ICS-200 – ICS for Single Resources and Initial Action
  - IS-700 – NIMS
  - Rad Worker II
  - Respirator Training for Non-Supervisors
  - Sealed Radioactive Source Control
- Authorized for deployment

PHYSICAL DEMANDS AND REQUIREMENTS

- Possibly, only austere living conditions will be available
- Work can require long hours and stressful, urgent situations
- Exposure to extreme temperature and weather conditions can be encountered

May 2008

FRMAC DOCUMENTATION SPECIALIST

POSITION SUMMARY

The FRMAC Documentation Specialist will document and track the status of all FRMAC requests, priorities, and activities for FRMAC support. In addition, the Documentation Specialist is responsible for ensuring that all FRMAC documented activities including correspondence, Situation Reports, action requests, lessons learned, and other pertinent information is archived in an accountable, secure, and retrievable form. The Documentation Specialist will also assist with the badging of personnel entering the FRMAC.

DUTIES AND RESPONSIBILITIES

- Maintain a general working knowledge and understanding of FRMAC missions, capabilities, objectives, and procedures
- Maintain in-depth knowledge, experience, and expertise with the Radiological Assessment and Measurement System (RAMS)
- Maintain understanding and familiarity with the FRMAC data flow
- Document and track the status of all FRMAC requests (including those for support resources and data products), priorities, and activities
- Maintain status board of all requests, actions, and priorities
- Responsible for ensuring that all FRMAC documented activities, correspondence, situation reports, action requests, lessons learned, and other pertinent information are archived in an accountable, secure, and retrievable form
- Assist with badging of FRMAC members as required
- Coordinate with EPA to ensure that transfer of FRMAC is performed seamlessly with respect to documentation

ORGANIZATION AND COMMUNICATIONS

- RECEIVES DIRECTION FROM:
  - FRMAC Manager
  - FRMAC Monitoring Manager
- WORKS WITH:
  - FRMAC Database Specialists
- PROVIDES DIRECTION TO:
  - N/A

FRMAC DOCUMENTATION SPECIALIST

QUALIFICATIONS

- Successful completion of:
  - CM Drill
  - Data Control Training
  - Documentation Training
  - EOTA CMP-101DW – Operations Overview for CM
  - GERT
  - ICS-100 – Introduction to ICS
  - ICS-200 – ICS for Single Resources and Initial Action
  - IS-700 – NIMS
- Authorized for deployment

PHYSICAL DEMANDS AND REQUIREMENTS

- Possibly, only austere living conditions will be available
- Work can require long hours and stressful, urgent situations
- Exposure to extreme temperature and weather conditions can be encountered

FRMAC ASSESSMENT MANAGER

POSITION SUMMARY

The FRMAC Assessment Manager coordinates the activities of all assessment-related personnel: Assessment Scientists, GIS Specialists, and Database Specialists. The FRMAC Assessment Manager will define needs, priorities, and decision level for radiological monitoring and sampling and will work with the FRMAC Monitoring Manager and FRMAC Laboratory Analysis Manager to gather the appropriate data.

DUTIES AND RESPONSIBILITIES

- Function as an expert with respect to radiological dose assessment, radiation-related health effects and environmental impact, PAGs, mitigation processes, and consequence management activities
- Ensure the development, technical integrity, and scientific defensibility of all CM summarized and assessed data products
- Provide interpretations of the National Atmospheric Release Advisory Center (NARAC) predictions
- Based upon available information, provide radiological dose commitment estimates as a function of time and distance from the incident site
- Provide preliminary impact evaluation and dose assessment for specific situations, specific areas, and specific population groups
- Prepare and provide interpretations, assessments, and overviews of the impact of radiological dose as it pertains to health effects for the public and impacts on the environment
- Provide technical predictions relating to modifications of environmental radiation fields and dose projections caused by weathering, resuspension, structural shielding, and decontamination activities
- Interpret dose assessments based on actual and/or model predictions in relation to the appropriate federal PAGs or the International Atomic Energy Agency's (IAEA's) intervention levels
- Provide technical expertise, planning, and resource information for the mitigation and recovery process
- Provide dose mitigation options with predictions of effectiveness to minimize dose
- Responsible for the completion of data summarization and dose assessment-related duties, activities, and documentation required to bring the deployment to closure and to redeploy
- Prepare data summarization, dose assessment, and environmental impact documents as required
- Maintain strict document control, confidentiality, and archiving of all FRMAC personnel medical records, radiation exposures/doses, industrial hygiene and/or occupational health-related incidents, and/or other health issues

FRMAC ASSESSMENT MANAGER

ORGANIZATION AND COMMUNICATIONS

- RECEIVES DIRECTION FROM:
  - FRMAC Director
- WORKS WITH:
  - FRMAC Monitoring Manager
  - FRMAC Laboratory Analysis Manager
- PROVIDES DIRECTION TO:
  - Assessment Scientists
  - GIS Specialists
  - Database Specialists

QUALIFICATIONS

- Demonstrated in-depth knowledge and experience in the application and use of the *FRMAC Assessment Manual*
- Demonstrated expert knowledge and experience in radiological dose assessment, radiation-related health effects and environmental impact, PAGs, mitigation processes, and consequence management activities
- Working knowledge and experience with PAGs and IAEA intervention levels
- Successful completion of:
  - AS-100 – Introduction to Assessment Science
  - AS-200 – FRMAC Overview
  - CM Drill
  - EOTA CMP-101DW – Operations Overview for CM
  - EOTA CMP-104DW – Health and Safety Orientation
  - EOTA CMP-110DW – Assessment Manual
  - EOTA CMP-123DW – GIS Overview
  - GERT
  - ICS-100 – Introduction to ICS
  - ICS-200 – ICS for Single Resources and Initial Action
  - ICS-300 – Intermediate
  - IS-700 – NIMS
  - IS-800.b – National Response Framework (NRF), An Introduction
- Authorized for deployment

May 2008

FRMAC ASSESSMENT MANAGER

PHYSICAL DEMANDS AND REQUIREMENTS

- Possibly, only austere living conditions will be available
- Work can require long hours and stressful, urgent situations
- Exposure to extreme temperature and weather conditions can be encountered

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FRMAC ASSESSMENT SCIENTIST

POSITION SUMMARY

The FRMAC Assessment Scientist will support state, tribal, and local authorities with radiological dose assessment and how they relate to EPA Protective Action Guides (PAGs) and the U.S. Food and Drug Administration (FDA) intervention levels. The Assessment Scientist develops summarized and assessed data products, which include data to support the protective action decision-making process, dose projections, contamination contours, and contours related to PAGs. The FRMAC Assessment Scientist will also address quality assurance (QA) issues for emergency phase data and provide oversight and direction to the Geographic Information System (GIS) Specialists. The Assessment Scientist serves as a radiation protection advisor for issues such as personnel protection, exposure and contamination control, and remediation techniques.

DUTIES AND RESPONSIBILITIES

- Maintain a general working knowledge and understanding of FRMAC missions, capabilities, objectives, and procedures
- Maintain knowledge, experience, and familiarity relating to the understanding and interpretation of National Atmospheric Release Advisory Center (NARAC), Sandia National Laboratories' modeling tools, and Aerial Measuring System (AMS) data products, capabilities, and limitations
- Maintain familiarity with other dispersion models that are commonly in use, such as RASCAL, HOTSPOT, and MIDAS
- Function as an expert with respect to radiological dose assessment, radiation-related health effects and environmental impact, PAGs, mitigation processes, and consequence management activities
- Function as an expert with respect to the application and use of the *FRMAC Assessment Manual*
- Ensure the development, technical integrity, and scientific defensibility of all CM summarized and assessed data products
- Interface with NARAC in the exchange of information and data to develop the "best" iterative predictions of deposition and dose commitments to individuals in the off-site areas
- Provide interpretations of the NARAC predictions
- Based upon available information, provide radiological dose commitment estimates as a function of time and distance from the incident site
- Provide preliminary impact evaluation and dose assessment for specific situations, specific areas, and specific population groups
- Prepare and provide interpretations, assessments, and overviews of the impact of radiological dose as it pertains to health effects for the public and impacts on the environment
- Provide technical predictions relating to modifications of radiation fields and dose projections caused by weathering, resuspension, structural shielding, and decontamination activities
- Interpret dose assessments based on actual and/or model predictions in relation to the appropriate EPA PAGs or the FDA's intervention levels

FRMAC ASSESSMENT SCIENTIST

- Provide technical expertise, planning, and resource information for the mitigation and recovery process
- Provide dose mitigation options with predictions of effectiveness to minimize dose.
- Responsible for the completion of data summarization and dose assessment-related duties, activities, and documentation required to bring the deployment to closure and to redeploy
- Prepare data summarization, dose assessment, and environmental impact documents, as required
- Maintain strict document control, confidentiality, and archiving of all FRMAC personnel medical records, radiation exposures/doses, industrial hygiene and/or occupational health-related incidents, and/or other health issues

ORGANIZATION AND COMMUNICATIONS

- RECEIVES DIRECTION FROM:
  - FRMAC Assessment Manager
  - FRMAC Director
- WORKS WITH:
  - CMHT Assessment Scientist
- PROVIDES DIRECTION TO:
  - GIS Specialists
  - Database Specialists

QUALIFICATIONS

- Demonstrated in-depth knowledge and experience in the application and use of the *FRMAC Assessment Manual*
- Demonstrated expert knowledge and experience in radiological dose assessment, radiation-related health effects and environmental impact, PAGs, mitigation processes, and consequence management activities
- Working knowledge and experience with EPA PAGs and FDA intervention levels
- Successful completion of:
  - AS-100 – Introduction to Assessment Science
  - AS 200 – FRMAC Overview
  - CM Drill
  - EOTA CMP-101DW – Operations Overview for CM
  - EOTA CMP-104DW – Health and Safety Orientation
  - EOTA CMP-110DW – Assessment Manual

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  - EOTA CMP-123DW – GIS Overview
  - GERT
  - ICS-100 – Introduction to ICS
  - ICS-200 – ICS for Single Resources and Initial Action
  - IS-700 – NIMS
- Authorized for deployment

PHYSICAL DEMANDS AND REQUIREMENTS

- Possibly, only austere living conditions will be available
- Work can require long hours and stressful, urgent situations
- Exposure to extreme temperature and weather conditions can be encountered

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FRMAC GIS SPECIALIST

POSITION SUMMARY

The FRMAC Geographic Information System (GIS) Specialist works with the Assessment Scientist to generate map data products for use by the on-scene decision-makers at the site. The GIS Specialist also downloads updated data from the National Atmospheric Release Advisory Center (NARAC), Aerial Measuring System (AMS) B-200 flight data, and data from field monitoring teams that illustrate the various locations where sampling activities have taken place.

DUTIES AND RESPONSIBILITIES

- Maintain a general working knowledge and understanding of FRMAC missions, capabilities, objectives, and procedures
- Maintain knowledge and experience of NARAC and AMS data types
- Maintain in-depth knowledge, experience, and familiarity with the GIS hardware and software
- Maintain proficiency in creating various emergency response GIS data products
- Set up and operate the emergency response GIS equipment
- Produce GIS data products as requested
- Import NARAC model prediction information and produce data products as required
- Provide GIS data products to the NNSA/NSO, NNSA/HQ, Emergency Operations Support Center at the RSL, and other Emergency Communication Networks (ECN) Centers via the ECN
- Archive GIS data products

ORGANIZATION AND COMMUNICATIONS

- RECEIVES DIRECTION FROM:
  - FRMAC Assessment Manager
  - FRMAC Director
- WORKS WITH:
  - CMHT
- PROVIDES DIRECTION TO:
  - N/A

FRMAC GIS SPECIALIST

QUALIFICATIONS

- Knowledge and experience in emergency response GIS activities and methodologies
- Successful completion of:
  - CM Drill
  - Emergency Response GIS
  - EOTA CMP-101DW – Operations Overview for CM
  - GERT
  - ICS-100 – Introduction to ICS
  - ICS-200 – ICS for Single Resources and Initial Action
  - IS-700 – NIMS
- Authorized for deployment

PHYSICAL DEMANDS AND REQUIREMENTS

- Possibly, only austere living conditions will be available
- Work can require long hours and stressful, urgent situations
- Exposure to extreme temperature and weather conditions can be encountered

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eFRMAC FIELD TEAM ADMINISTRATOR

POSITION SUMMARY

The eFRMAC Field Team Administrator is an expert on the software and databases involved in the paperless FRMAC process. This includes Radiological Assessment and Monitoring System (RAMS), FRMAC Web, the Digital Field Monitoring tablets, and the Hermes black box. General responsibilities include configuring the software and databases to properly run in certain environments, troubleshooting any software or database issues that arise, and maintaining the software and databases to adapt to any changes in hardware, software, or procedures.

DUTIES AND RESPONSIBILITIES

- Maintain currency and expertise on all applicable DOE orders, OSHA standards, other federal regulations, and FRMAC documents
- Maintain a general working knowledge and understanding of CM missions, capabilities, objectives, and procedures
- Maintain familiarity with RSL Alert, Activation, and Deployment policies, procedures, and activities
- Maintain Deployment Authorization Program qualification (immunizations, medical clearance, passport, and training).
- Maintain a general working knowledge and understanding of the paperless FRMAC process of data transfer
- Set up, configure, or troubleshoot RAMS database and website
- Maintain familiarity with RAMS website for data viewing and entry
- Maintain familiarity with the FRMAC Web website
- Maintain familiarity with communications between the FRMAC Web, RAMS, the Cisco VPN, and the RADIUS Server
- Set up, configure, or troubleshoot Digital Field Monitoring tablets
- Set up, configure, or troubleshoot Hermes black box
- Set up, configure, or troubleshoot the Tracking Server
- Set up, configure, or troubleshoot web services
- Assist Digital Field Monitoring tablet users
- Assist technical/non-technical personnel with FRMAC Web or RAM
- Responsible for the completion and documentation of all duties and activities required to bring the deployment to closure and to redeploy
- Responsible for the disposition of all self-generated notes, logs, and mission-related documentation as instructed
- Document lessons learned

eFRMAC FIELD TEAM ADMINISTRATOR

ORGANIZATION AND COMMUNICATIONS

- RECEIVES DIRECTION FROM:
  - FRMAC Director/Deputy
  - Home Team Administrator
- WORKS WITH:
  - eFRMAC Hardware Specialist
  - Home Team Administrator
- PROVIDES DIRECTION TO:
  - Field Monitoring Specialists
  - Home Team Administrator

QUALIFICATIONS

- Knowledge of SQL Server databases, including creation, attaching/detaching, backups/restores, triggers and stored procedures (both T-SQL and CLR), and peer-to-peer transactional replication
- Knowledge of Windows Server 2007 (or latest Server version), including IIS (setting up and configuring web services and websites) and Windows services
- Knowledge of Windows XP (or latest operating system), including wireless network configuration, remote desktop, installation of software, configuration of XML files, adding and viewing certificates, using the command prompt (ping, telnet, netstat), editing the hosts file
- Knowledge and experience in C#, including ADO.Net and ASP.Net
- Ability to set up and configure the Tracking Server website, the Tracking Server Writer service, and the RADIUS Server
- Decent data entry skills

eFRMAC FIELD TEAM ADMINISTRATOR

- Successful completion of all training identified in Asset Readiness and Management System (ARMS)
  - CM Drill
  - EOTA CMP-101DW – Operations Overview for CM
  - EOTA CMP-123DW – GIS Overview
  - FRMAC Web Configuration and Operations
  - GERT
  - Internet Information Server (IIS) Configuration (+Certificates)
  - MPCD Configuration and Operations
  - RAMS Website
  - SQL Server Replication
  - Tablet PC Configuration and Operations
  - Tracking Server Configurations and Operations
- Authorized for deployment

PHYSICAL DEMANDS AND REQUIREMENTS

- Possibly only austere living conditions will be available
- Be able to climb and work at heights
- Work can require long hours and stressful, urgent situations
- Exposure to extreme temperature and weather conditions can be encountered
- May be required to lift up to 50 pounds

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eFRMAC HARDWARE SPECIALIST

POSITION SUMMARY

The eFRMAC Hardware Specialist is an expert on TCP/IP networking, satellite, and the MultiPath Communications Device (MPCD). They support the eFRMAC system that includes but is not limited to end user PC setup, IP Phones, Cat 5/6 cabling, networking, wireless networking, servers, video teleconferencing, and satellite communications. Additionally, the Hardware Specialist supports field monitoring teams with MPCD set up, configuration, and troubleshooting.

DUTIES AND RESPONSIBILITIES

- Maintain currency and expertise on all applicable DOE orders, OSHA standards, other federal regulations, and FRMAC documents
- Maintain a general working knowledge and understanding of CM missions, capabilities, objectives, and procedures
- Maintain familiarity with RSL Alert, Activation, and Deployment policies, procedures, and activities
- Maintain Deployment Authorization Program qualification (immunizations, medical clearance, passport, and training)
- Understand, maintain, and troubleshoot the “SWE Dish” satellite communications system, to include updating, configuring, and troubleshooting in the field independently
- Set up, maintain, and troubleshoot TCP/IP addressing schemes within the eFRMAC independently
- Set up, maintain, and troubleshoot the Cisco equipment: VPN, firewall, router, and switches (knowledge of Cisco command line and Cisco networking principles required)
- Set up, maintain, and troubleshoot IP phones
- Set up, maintain, and troubleshoot CAT 5/6 to industry standards
- Set up, maintain, and troubleshoot wireless networking to include frequency allocation, encryption standards, antenna configuration, and IP addressing
- Set up, maintain, and troubleshoot the MPCD for field team use.
- Set up, maintain, and troubleshoot mesh networking to include the mounting and manufacturing of required cabling in the field
- Maintain a general working knowledge and understanding of the eFRMAC process of data transfer
- Responsible for the completion and documentation of all duties and activities required to bring the deployment to closure and to redeploy
- Responsible for the disposition of all self-generated notes, logs, and mission-related documentation as instructed
- Document lessons learned

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eFRMAC HARDWARE SPECIALIST

ORGANIZATION AND COMMUNICATIONS

- RECEIVES DIRECTION FROM:
  - FRMAC Assessment Manager
  - FRMAC Director/Deputy
- WORKS WITH:
  - eFRMAC Home/Field Team Administrator
- PROVIDES DIRECTION TO:
  - Field Monitoring Teams via MPCD Units

QUALIFICATIONS

- Understand the components of Ku band satellite systems and be able to speak with third-party vendors if necessary about airtime, bandwidth, and latency issues
- Understanding of Wireless Networking encryption standards
- Knowledge of Cisco command line
- Understanding of TCP/IP networking standards
- Understanding of Cat 5/6 cabling standards, limitations, and terminations
- Understanding of PF Topology and data flow
- Understanding of server configuration and standards
- Understanding of Cisco equipment: switches, routers, and VPN configuration
- Have a working knowledge of the SQL Server
- Understand the MPCD including but not limited to:
  - Cingular network configuration
  - Globalstar configuration
  - 802.11 configuration
  - Novaroam Mesh networking configuration
  - GPS configuration
  - Tablet Configuration

eFRMAC HARDWARE SPECIALIST

- Understanding of basic radio frequency (RF) communications systems and troubleshooting steps
- Understanding of RF communication cabling standards and competency with manufacturing of necessary RF cabling
- Understanding and in-depth knowledge of Windows XP OS and its subsets (Tablet PC edition, Embedded)
- Understand and demonstrate the ability to troubleshoot and repair/replace MPCD computer hardware components (BIOS, memory, processor, etc.)
- Successful completion of :
  - MPCD Configuration and Operation
  - Tablet PC Configuration and Operation
  - SWE-Dish Configuration
  - Network Setup and Troubleshooting
  - Server Configuration and Operation Support
  - Authorized for deployment

PHYSICAL DEMANDS AND REQUIREMENTS

- Possibly only austere living conditions will be available
- Be able to climb and work at heights
- Work can require long hours and stressful, urgent situations
- Exposure to extreme temperature and weather conditions can be encountered
- May be required to lift up to 50 pounds

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FRMAC HEALTH AND SAFETY MANAGER

POSITION SUMMARY

The FRMAC Health and Safety Manager provides advice to the FRMAC Director in all health and safety-related areas including the applicability of various health physics standards, allowable exposure and dose commitment levels, and requirements for exceeding these levels. The Health and Safety Manager completes the Health and Safety Plan and updates it on a daily basis. The Health and Safety Manager ensures that all field team personnel receive safety briefings and appropriate personal protective (PPE) equipment before being sent to the field environment. The Health and Safety Manager integrates with the ICS Health and Safety Officer.

DUTIES AND RESPONSIBILITIES

- Maintain a general working knowledge and understanding of FRMAC missions, capabilities, objectives, and procedures
- Maintain familiarity and working knowledge of current federal radiological emergency response Protective Action Guides (PAGs). This includes guidance for emergency workers and general public PAGs for evacuation, relocation, and ingestion.
- Provide responder health and safety advice to the FRMAC Director
- In concert with the Assessment Manager and the Monitoring Manager, develop radiation exposure turn back values and dose commitment levels for FRMAC personnel based on mission requirements, ALARA, and applicable federal regulations
- In concert with the Monitoring Manager, ensure that the Field Monitoring Specialists have appropriate personal dosimetry, instructions on use, and understand exposure reporting and documentation requirements
- Document all FRMAC personnel radiation exposures and provide document control for all direct reading and non-direct reading dosimetry records
- In concert with the Monitoring Manager, ensure Field Monitoring Specialists receive Mission and Safety Briefings prior to each field operation. These briefings will address operational objectives, possible radiation exposures and related turn back values and dose commitment levels, required personal dosimetry (direct reading and non-direct reading), radiation exposure reporting and documentation requirements, meteorological hazards, general safety issues, and any other hazards that may exist.
- Conduct periodic walk-through of the FRMAC facility looking for radiological, contamination control, industrial hygiene, and occupational safety issues
- Ensure all handling, packaging, storing, and shipping of hazardous materials, radioactive substances, and mixed waste are in compliance with all applicable DOE orders, OSHA and DOT standards, and federal regulations
- Provide a summary of Health and Safety activities and issues for inclusion in the periodic FRMAC Situational Reports.

FRMAC HEALTH AND SAFETY MANAGER

- Assist the FRMAC Director in ensuring a smooth and seamless transition of appropriate Health and Safety records and activities to EPA when the FRMAC management transitions from DOE to EPA
- Maintain strict document control, confidentiality, and archiving of all FRMAC personnel medical records, radiation exposures/doses, industrial hygiene and/or occupational health- related incidents, and/or other health issues

ORGANIZATION AND COMMUNICATIONS

- RECEIVES DIRECTION FROM:
  - FRMAC Director
- WORKS WITH:
  - FRMAC Assessment Manager
  - FRMAC Monitoring Manager
  - FRMAC Laboratory Analysis Manager
  - ICS Health and Safety Officer
- PROVIDES DIRECTION TO:
  - Health and Safety Professionals
  - Monitoring Specialists performing contamination control and hotline activities

QUALIFICATIONS

- Recognized expert in the field of health physics, good knowledge and experience in the areas of industrial hygiene and occupational safety
- Detailed knowledge and experience with all applicable DOE orders, OSHA and DOT standards, and other federal regulations
- Detailed knowledge and experience with all aspects of FRMAC Health and Safety activities and the *FRMAC Health and Safety Manual*

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FRMAC HEALTH AND SAFETY MANAGER

- Successful completion of:
  - CM Drill
  - EOTA CMP-101DW – Operations Overview for CM
  - Hazardous Waste Site General Worker for Supervisor
  - Hazardous Waste Site General Worker, Initial
  - Hazardous Waste Site General Worker, Refresher
  - Health and Safety Orientation Course
  - ICS-100 – Introduction to ICS
  - ICS-200 – ICS for Single Resources and Initial Action
  - ICS-300 – Intermediate
  - ICS-400 – Advanced
  - IS-700 – NIMS
  - IS-800.b – National Response Framework (NRF), An Introduction
  - Rad Worker II
  - Respirator Training for Supervisors
  - WMD Response Training
- Familiarity with safety issues such as Fall Protection, Electrical Safety, Confined Space, and Lock Out/Tag Out
- Authorized for deployment

PHYSICAL DEMANDS AND REQUIREMENTS

- Possibly, only austere living conditions will be available
- Work can require long hours and stressful, urgent situations
- Exposure to extreme temperature and weather conditions can be encountered

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FRMAC FIELD TEAM SUPERVISOR

POSITION SUMMARY

The FRMAC Field Team Supervisor is responsible for the command and control of the field teams. The Field Team Supervisor organizes the field teams, integrates the various field monitoring skill mixes, assigns tasks, and continuously evaluates field monitoring resources and requests for field monitoring assets and priorities. The Field Team Supervisor uses the available resources as efficiently as possible, always with consideration for safety and the concept of maintaining members of the field teams' exposure to radiation As Low As Reasonably Achievable (ALARA).

DUTIES AND RESPONSIBILITIES

- Maintain a general working knowledge and understanding of FRMAC missions, capabilities, objectives, and procedures
- Maintain detailed knowledge, expertise, and proficiency with all phases of radiological monitoring techniques and radiation sampling methodologies as identified in the FRMAC *Monitoring Manual*, Volume 2 – *Radiation Monitoring and Sampling*
- Maintain knowledge and familiarity with the FRMAC *Health and Safety Manual*
- Maintain detailed knowledge and expertise with a broad spectrum of radiological field monitoring and health physics instrumentation including Field Instruments for the Detection of Low Energy Radiation (FIDLERs), Violinists, and in situ high-resolution gamma spectroscopy
- Ensure that the principle of ALARA is practiced during all possible radiation exposures.
- Organize the field monitoring assets into effective field teams allowing for various skill mix and Level 1, 2, or 3 of monitoring capability
- Ensure that all Field Monitoring Specialists have the appropriate PPE, certifications, and instruments and equipment for the monitoring duties assigned
- Ensure that all field instruments and equipment that affect the quality of the data are within calibration specifications and in proper working order
- Ensure that all quality control procedures are adhered to and that all related documentation is completed on all radiological monitoring instruments in use
- Responsible for accurate and complete documentation of all field monitoring, sample collection, and health physics activities
- Responsible for ensuring that strict chain-of-custody for all collected samples and documentation is maintained
- Coordinate health physics monitoring and contamination control activities as requested

FRMAC FIELD TEAM SUPERVISOR

ORGANIZATION AND COMMUNICATIONS

- RECEIVES DIRECTION FROM:
  - FRMAC Monitoring Manager
- WORKS WITH:
  - FRMAC Health and Safety Manager
- PROVIDES DIRECTION TO:
  - In Situ Scientists
  - Field Monitoring Specialists

QUALIFICATIONS

- Radiation Worker trained
- Full Face Air-Purifying Respirator certified
- Knowledge and familiarity with contamination control and decontamination practices and procedures
- Successful completion of:
  - CM Drill
  - EOTA CMP-101DW – Operations Overview for CM
  - Field Monitoring Team Training, Introduction
  - Field Monitoring Team Training, Advanced
  - Hazardous Waste Site General Worker, Initial
  - Hazardous Waste Site General Worker, Refresher
  - ICS-100 – Introduction to ICS
  - ICS-200 – ICS for Single Resources and Initial Action
  - IS-700 – NIMS
  - Rad Worker II
  - Respirator Training for Supervisors
  - Sealed Radioactive Source Control
- Authorized for deployment

PHYSICAL DEMANDS AND REQUIREMENTS

- Possibly, only austere living conditions will be available
- Work can require long hours and stressful, urgent situations
- Exposure to extreme temperature and weather conditions can be encountered

May 2008

FRMAC LABORATORY ANALYSIS MANAGER

POSITION SUMMARY

The FRMAC Laboratory Analysis Manager coordinates and directs all laboratory analytical activities and maintains close coordination with mobile and fixed laboratories providing the analytical support to FRMAC. The Laboratory Analysis Manager, in coordination with the FRMAC Assessment Manager, defines data quality objectives (DQOs), analytical methods, minimum detection limits, and prioritizes sample analyses. The Laboratory Analysis Manager acts as the point-of-contact for queries regarding the status of any sample. The Laboratory Analysis Manager ensures that the data are reviewed for accuracy and quality.

DUTIES AND RESPONSIBILITIES

- Maintain expert working knowledge and experience in radiochemical analytical methods, laboratory operations, laboratory QA/QC, and radiochemistry
- Maintain knowledge and familiarity with the *FRMAC Laboratory Analysis Manual*.
- Maintain a general working knowledge and understanding of CM missions, capabilities, objectives, and procedures
- Integrate with hotline operations to assure that samples are surveyed for contamination and transferred to sample receipt personnel efficiently
- Communicate analytical capability and capacity to the FRMAC Monitoring Manager and the FRMAC Assessment Manager
- Evaluate the analytical capabilities of laboratories. Be able to identify what analyses can be performed by identified laboratories
- Ensure that the laboratories receiving the samples can reach the detection limits required for assessment decisions. Ensure that the quantity of sample collected is adequate to meet detection limit requirements in a reasonable count time
- Monitor sample numbers and analysis types to maximize production and minimize turnaround time commensurate with DQOs. Track the sample load to each laboratory
- Coordinate sample identification, tracking and laboratory use with other state or local agencies involved in the event
- Communicate expected turnaround time for results from laboratories and communicate analytical priorities to the laboratories based on assessment requirements
- Direct samples to the appropriate laboratory
- Identify and/or request a sample storage area sufficient to handle all samples collected. This will include samples returned after mobile laboratory analysis
- Coordinate shipment of sample for off-site analysis. If qualified, ship samples as needed
- Review data for accuracy and reasonableness and resolve data quality issues

FRMAC LABORATORY ANALYSIS MANAGER

ORGANIZATION AND COMMUNICATIONS

- RECEIVES DIRECTION FROM:
  - FRMAC Director
- WORKS WITH:
  - FRMAC Monitoring Manager
  - FRMAC Assessment Manager
  - FRMAC Health and Safety Manager
- PROVIDES DIRECTION TO:
  - Sample Control Technicians
  - Analytical Chemists

QUALIFICATIONS

- Demonstrated knowledge and experience in laboratory and radiochemistry
- Working knowledge and experience with DQOs, analytical methods, minimum detectable activity (MDA) calculations, and quality assurance procedures
- Successful completion of:
  - ICS-100 – Introduction to ICS
  - ICS-200 – ICS for Single Resources and Initial Action
  - ICS 300 – Intermediate
  - IS-700 – NIMS
  - IS-800.b – National Response Framework (NRF), An Introduction
  - Sample Control Training, Introduction
  - Sample Control Training, Advanced
- Authorized for deployment

PHYSICAL DEMANDS AND REQUIREMENTS

- Work can require long hours and stressful, urgent situations
- Exposure to extreme temperature and weather conditions can be encountered

May 2008

FRMAC SAMPLE CONTROL SPECIALIST

POSITION SUMMARY

The FRMAC Sample Control Specialist is responsible for receiving, inspecting, and logging samples that have been collected and screened by hotline personnel. These samples will be prepared for analysis by the on-site mobile laboratories and for shipment to off-site fixed laboratories. Sample operations may involve repackaging, splitting, and combining samples. Contamination control procedures will be followed.

DUTIES AND RESPONSIBILITIES

- Maintain a general working knowledge and understanding of FRMAC missions, capabilities, objectives, and procedures
- Maintain detailed knowledge, expertise, and proficiency with the FRMAC *Laboratory Analysis Manual*
- Receive samples that have been screened for contamination by hotline personnel
- Review, validate, and sign chain-of-custody documentation
- Inspect sample
- Log samples into sample tracking system
- Record sample tracking information
- Prepare samples for shipment and include shipping documentation
- Remain cognizant of contamination control procedures during all sample control and handling activities

ORGANIZATION AND COMMUNICATIONS

- RECEIVES DIRECTION FROM:
  - FRMAC Laboratory Analysis Manager
- WORKS WITH:
  - FRMAC Field Monitoring Specialists
- PROVIDES DIRECTION TO:
  - N/A

FRMAC SAMPLE CONTROL SPECIALIST

QUALIFICATIONS

- Radiation Worker trained
- Successful completion of:
  - Analysis Leadership Training
  - CM Drill
  - EOTA CMP-101DW – Operations Overview for CM
  - Health and Safety Orientation Course
  - ICS-100 – Introduction to ICS
  - ICS-200 – ICS for Single Resources and Initial Action
  - IS-700 – NIMS
  - Laboratory Instrument Management System (LIMS) System Admin, Initial
  - Monitoring Division Manager Training, Introduction
  - Rad Worker II
  - Sample Control Training, Introduction
  - Sample Control Training, Advanced
- Authorized for deployment

PHYSICAL DEMANDS AND REQUIREMENTS

- Possibly, only austere living conditions will be available
- Work can require long hours and stressful, urgent situations
- Exposure to extreme temperature and weather conditions can be encountered

May 2008

FRMAC CMHT GIS SPECIALIST

POSITION SUMMARY

The Consequence Management Home Team Geographic Information System (CMHT GIS) Specialist works with the CMHT Manager and CMHT Assessment Scientists to generate map data products for use by decision-makers. The CMHT GIS Specialist initially supports Home Team operations and then transfer to a support role once CMRT I & II arrive at the incident scene.

DUTIES AND RESPONSIBILITIES

- Maintain a general working knowledge and understanding of FRMAC missions, capabilities, objectives, and procedures
- Maintain knowledge and experience of NARAC and Aerial Measuring System (AMS) data types
- Maintain in-depth knowledge, experience, and familiarity with the GIS hardware and software
- Maintain proficiency in creating various emergency response GIS data products
- Set up and operate the emergency response GIS equipment
- Produce GIS data products as requested
- Import NARAC model prediction information and produce data products as required
- Provide GIS data products to the NNSA/NSO, NNSA/HQ, Emergency Operations Support Center at the RSL, and other ECN Centers via the ECN
- Archive GIS data products
- Maintain proficiency in and access to CMweb and its file structures as well as the RAMS database

ORGANIZATION AND COMMUNICATIONS

- RECEIVES DIRECTION FROM:
  - CMHT Assessment Scientists
  - CMHT Manager
  - FRMAC Assessment Manager
- WORKS WITH:
  - CMHT
  - Deployment Assessment and GIS staff
- PROVIDES DIRECTION TO:
  - N/A

FRMAC CMHT GIS SPECIALIST

QUALIFICATIONS

- Knowledge and experience in emergency response GIS activities and methodologies
- Successful completion of:
  - AS-200 – FRMAC Overview
  - CM Skills
  - Emergency Response GIS
  - EOTA CMP-101DW – Operations Overview for CM
  - GERT
  - ICS-100 – Introduction to ICS
  - IS-700 – NIMS

PHYSICAL DEMANDS AND REQUIREMENTS

- Work can require long hours and stressful, urgent situations

October 2008

FRMAC CMHT BRIDGE LINE COORDINATOR

POSITION SUMMARY

The Consequence Management Home Team (CMHT) Bridge Line Coordinator works with the CMHT Manager to coordinate Home Team operations with CMHT Assessment Scientists, NARAC, RAP, interagency participants, and state, tribal, and/or, local agencies. The CMHT Bridge Line Coordinator establishes a schedule for conference calls to exchange information and data.

DUTIES AND RESPONSIBILITIES

- Maintain a general working knowledge and understanding of FRMAC missions, capabilities, objectives, and procedures
- Maintain knowledge and experience of CMHT operations
- Maintain in-depth knowledge, experience, and familiarity with the CMweb, RAMS database, and Bridgeline operations
- Set up and operate the CMHT equipment
- Enter data into RAMS as needed
- Ensure sitreps and other status requests are completed
- Maintain log of traffic and activity on Bridgeline

ORGANIZATION AND COMMUNICATIONS

- RECEIVES DIRECTION FROM:
  - CMHT Assessment Scientists
  - CMHT Manager
  - FRMAC Assessment Manager
- WORKS WITH:
  - CMHT
  - Deployment Assessment and GIS staff
- PROVIDES DIRECTION TO:
  - N/A

FRMAC CMHT BRIDGE LINE COORDINATOR

QUALIFICATIONS

- Knowledge and experience in CMHT emergency response activities
- Successful completion of:
  - FRMAC Health and Safety Course
  - Overview of FRMAC Operations Course
  - CMHT Bridge Line Coordinator Training
  - NARAC 101
- Modified Radiological Worker Course

PHYSICAL DEMANDS AND REQUIREMENTS

- Work can require long hours and stressful, urgent situations

FRMAC CMHT ASSESSMENT SCIENTIST

POSITION SUMMARY

The Consequence Management Home Team (CMHT) Assessment Scientist supports CMHT operations with radiological dose assessment and how they relate to EPA Protective Action Guide (PAGs) and the US Food and Drug Administration (FDA) intervention levels. The CMHT Assessment Scientist, along with the CMHT Geographic Information System (GIS) specialists and NARAC Contact, work to develop assessed data products, which include data to support the protective action decision-making process, dose projections, contamination contours, and contours related to PAGs. The CMHT Assessment Scientist will also address quality assurance (QA) issues for emergency phase data and provide oversight and direction to the GIS Specialists. The Assessment Scientist serves as a radiation protection advisor for issues such as personnel protection, exposure and contamination control, and remediation techniques for state/local decision-makers on the Bridgeline.

DUTIES AND RESPONSIBILITIES

- Maintain a general working knowledge and understanding of FRMAC missions, capabilities, objectives, and procedures
- Maintain knowledge and experience of CMHT operations
- Maintain knowledge, experience, and familiarity relating to the understanding and interpretation of NARAC, Sandia National Laboratories' modeling tools, and AMS data products, capabilities, and limitations
- Maintain familiarity with other dispersion models that are commonly in use, such as RASCAL, HOTSPOT, and MIDAS
- Function as an expert with respect to radiological dose assessment, radiation-related health effects and environmental impact, PAGs, mitigation processes, and consequence management activities
- Function as an expert with respect to the application and use of the FRMAC Assessment Manual
- Ensure the development, technical integrity, and scientific defensibility of all CM summarized and assessed data products
- Interface with NARAC in the exchange of information and data to develop the "best" iterative predictions of deposition and dose commitments to individuals in the off-site areas
- Provide interpretations of the NARAC predictions
- Based upon available information, provide radiological dose commitment estimates as a function of time and distance from the incident site
- Provide preliminary impact evaluation and dose assessment for specific situations, areas, and population groups

FRMAC CMHT ASSESSMENT SCIENTIST

- Prepare and provide interpretations, assessments, and overviews of the impact of radiological dose as it pertains to health effects for the public and impacts on the environment
- Provide technical predictions relating to modifications of radiation fields and dose projections caused by weathering, resuspension, structural shielding, and decontamination activities
- Interpret dose assessments based on actual and/or model predictions in relation to the appropriate EPA PAGs or the FDA's intervention levels
- Provide technical expertise, planning, and resource information for the mitigation and recovery process
- Provide dose mitigation options with predictions of effectiveness to minimize dose
- Responsible for the completion of data summarization and dose assessment-related duties, activities, and documentation required to bring the deployment to closure and to redeploy
- Prepare data summarization, dose assessment, and environmental impact documents as required
- Enter data into RAMS as needed
- Complete sitreps and other status requests as requested

ORGANIZATION AND COMMUNICATIONS

- RECEIVES DIRECTION FROM:
  - CMHT Manager
  - FRMAC Assessment Manager
- WORKS WITH:
  - CMHT
  - Deployment Assessment and GIS staff
- PROVIDES DIRECTION TO:
  - Home Team Bridge Line Coordinators
  - GIS Specialists

FRMAC CMHT ASSESSMENT SCIENTIST

QUALIFICATIONS

- Demonstrated in-depth knowledge and experience in the application and use of the FRMAC Assessment Manual
- Demonstrated expert knowledge and experience in radiological dose assessment, radiation-related health effects and environmental impact, PAGs, mitigation processes, and consequence management activities
- Working knowledge and experience with EPA PAGs and FDA intervention levels
- Successful completion of:
  - AS-100 – Introduction to Assessment Science
  - AS-200 – FRMAC Overview
  - CM Skills
  - EOTA CMP-101DW – Operations Overview for CM
  - EOTA CMP-104DW – Health and Safety Orientation
  - EOTA CMP-110DW – Assessment Manual
  - EOTA CMP-123DW – GIS Overview
  - GERT
  - ICS-100 – Introduction to ICS
  - IS-700 – NIMS

PHYSICAL DEMANDS AND REQUIREMENTS

- Work can require long hours and stressful, urgent situations

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FRMAC CMHT DATA ENTRY SPECIALIST

POSITION SUMMARY:

The CMHT Data Entry Specialist will document and track the status of all FRMAC requests, priorities, and activities for FRMAC support submitted to the CMHT. In addition, the CMHT Data Entry Specialist is responsible for ensuring that all FRMAC documented activities submitted to the CMHT including scientific data, correspondence, Situation Reports, action requests, lessons learned, and other pertinent information is inputted and archived appropriately.

DUTIES AND RESPONSIBILITIES:

- Maintain a general working knowledge and understanding of FRMAC missions, capabilities, objectives, and procedures.
- Maintain in-depth knowledge, experience, and expertise with the RAMS database.
- Maintain understanding and familiarity with the FRMAC data flow.
- Maintain and understanding of the CMweb and RAMS systems
- Document and track the status of all FRMAC requests (including those for support resources and data products), priorities, and activities.
- Responsible for ensuring that all FRMAC documented activities, scientific data, correspondence, Situation Reports, action requests, lessons learned, and other pertinent information are processed appropriately.
- Maintain understanding familiarity with radiation instruments and detection basics.
- Input raw data from agencies outside the FRMAC and perform preliminary data verification and validation.
- Support Lab Analysis group in data entry and storage of sample documents returned to the FRMAC for storage.
- Support and backup to Home Team Administrator as needed. See Home Team Administrator Position Description.

ORGANIZATION AND COMMUNICATIONS:

- RECEIVES DIRECTION FROM:
  - CMHT Manager
  - Federal Home Team Leader
- WORKS WITH:
  - Home Team Administrators
  - CMHT Assessment Scientist
  - AMS Home Team Scientists
  - Outside Agency Representatives
- PROVIDES DIRECTION TO:
  - N/A

October 2008

FRMAC CMHT DATA ENTRY SPECIALIST

QUALIFICATIONS:

- Successful completion of:
  - CM Drill
  - Data Control Training
  - Home Team Administrator Training
  - Documentation Training
  - EOTA CMP-101DW: Operations Overview for CM
  - Radworker II
  - ICS-100 – Introduction to ICS
  - ICS-200 – ICS for Single Resources and Initial Action
  - IS-700 – NIMS

PHYSICAL DEMANDS AND REQUIREMENTS:

- Work can require long hours and stressful, urgent situations

Advisory Team

Although the Advisory Team is not part of the FRMAC, it may be co-located with the FRMAC. The Advisory Team for Environment, Food, and Health is composed of representatives from the U.S. Environmental Protection Agency, U.S. Department of Agriculture, U.S. Food and Drug Administration and the Centers for Disease Control and Prevention. It provides direct support to the Coordinating Agency in evaluating and recommending protective actions. The Home Teams and the FRMAC will share technical information with the Advisory Team.

Population Monitoring Liaison Team

Depending on the circumstances, the Centers for Disease Control and Prevention may deploy a Population Monitoring Liaison Team to provide recommendations to the cooperating agency and state, tribal, and local governments. The Population Monitoring Liaison Team is not part of the FRMAC but may co-locate with the FRMAC and will obtain technical information from the Home Teams and the FRMAC.

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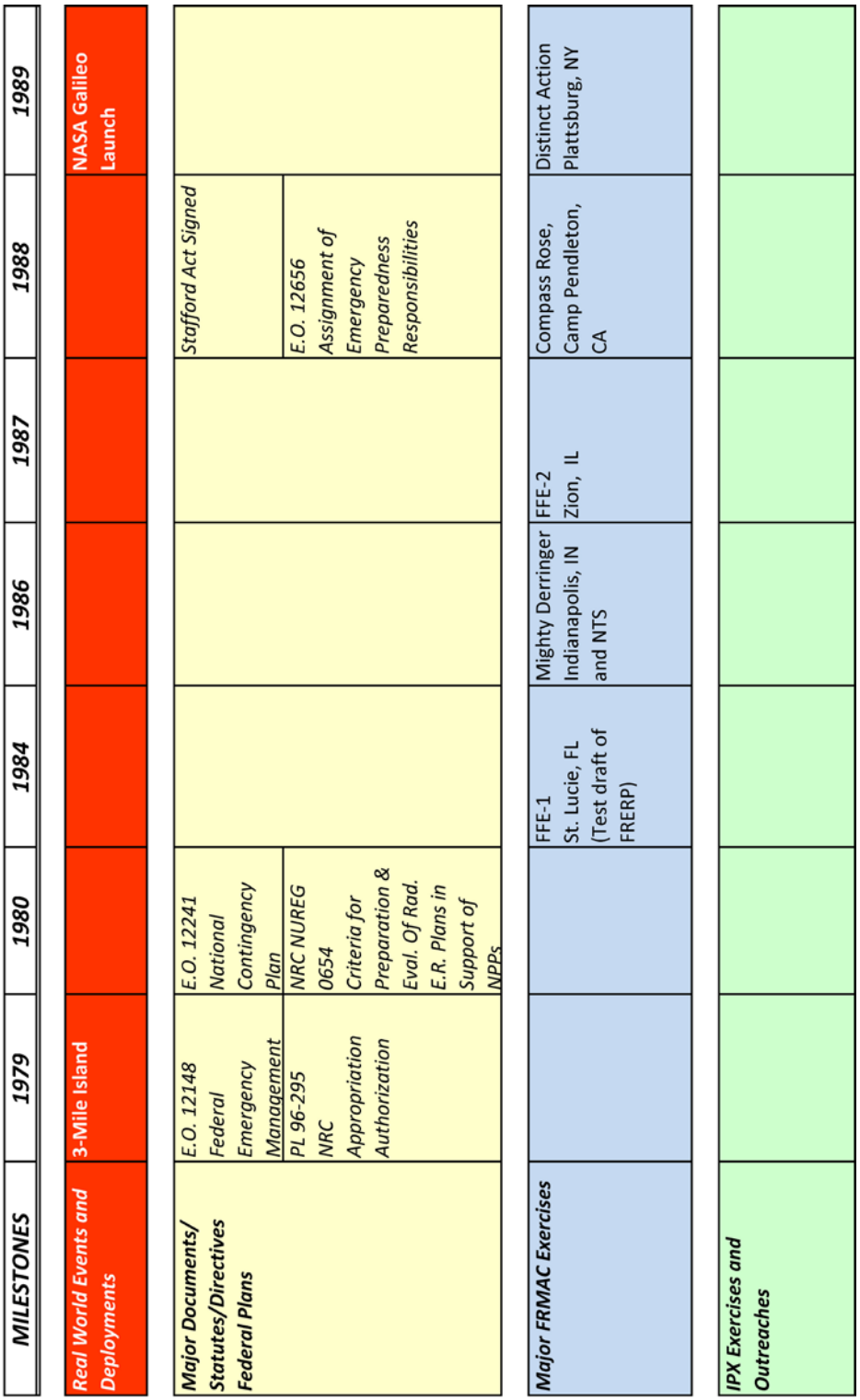
APPENDIX L
FRMAC HISTORY AND TIMELINE OF EVENTS



MILESTONES	1990	1992	1993	1994	1995	1996	1997	1998	1999
Real World Events and Deployments	NASA Ulyssess Launch						NASA Cassini Launch		
Major Documents/ Statutes/Directives Federal Plans	*Nuclear Weapon Accident Response Procedures (NARP Manual)*	*EPA-400 (Manual of PAGS & Protective Actions for Nuclear Incidents)*		*Stafford Act Amendment*	*DOE Order*	*FRERP Signed*		*FDA Human Food & Animal Feed PAGS*	
Major FRMAC Exercises	Digit Prime Senecca, NY	PU Valley NTS	FRMAC 93 Ft. Calhoun, NE	Handshake I NTS	Display Select Yorktown, VA	Handshake II SRS, SC	Surry Newport News, VA	Ventex 98 NTS	Vigilant Lion Annville, PA
			Fremont DOE/Hanford	Diver Mist Lakenheath, UK		Dial Flinty Minot AFB, ND	Bold Endeavor San Antonio, TX		Songs San Diego, CA
			Diagram Jump Bangor, WA			Digit Pace I, Albuquerque, NM	Digit Pace II, Albuquerque, NM		
IPX Exercises and Outreaches			Diablo Canyon IPX San Luis Obispo, CA			Mirrored Image CPX Atlanta, GA	HB Robinson CPX, Hartsville, SC	Prairie Island IPX Minn, MN	Palo Verde IPX Phoenix, AZ Indian Point TTX NYC, NY
						Arkansas Nuclear One IPX	Kewaunee IPX Green Bay, WI	Peach Bottom IPX Lancaster, PA	Vermont Yankee IPX Brattleboro, VT
						Duane Arnold IPX Cedar Rapids, IA	Callaway IPX Jefferson City, MO	Hatch IPX Baxley, GA	Comanche Peak IPX & Outreach Glen Rose, TX
						Point Beach IPX	Robinson IPX Columbia, SC	Salem IPX Wilmington, DE	Sequoyah IPX Chattanooga, TN
								Palo Verde IPX Phoenix, AZ	Browns Ferry Athens, AL
								River Bend IPX Baton Rouge, LA	Limerick IPX Philadelphia
									Grand Gulf IPX Vicksburg, MS
									McGuire IPX Charlotte, NC
									Pilgrim IPX Plymouth, MA

MILESTONES	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Real World Events and Deployments	Cerro Grande Fire, LANL XXVI Summer Olympics, Sydney, Aus	World Trade Center 9/11	XIX Winter Olymics, Salt Lake City, UT	NASA Mars Experimental Rover			NASA Pluto Launch			
Major Documents/ Statutes/Directives Federal Plans			*Homeland Security Act*	*Initial NRP & Nuc/Rad Incident Annex* *DHS Created* *HSPD-5*	*EPA's OEM Established* *NIMS Final* *EPA's OEM Established*			*DOE Order 153.1 Dept. Rad ER Assets* *Revision of EPA PAGs Manual in progress. SNL provided updated to derived values tables and other methods, formulae, and assumptions.* *CDC Population Monitoring Guidelines*	*National Response Frameswork (Replaces NRP)* *Revised Nuc/Rad Annex*	
Major FRMAC Exercises	Dingo Dawn Seattle, WA		Diligent Warrior 02, Camp Guernsey, WY Joint Venture 02, Aiken, SC	TOPOFF II Seattle, WA	Diligent Warrior 04, Great Falls, MO Operation Synergy, Los Alamitos, CA	Dingo King Kings Bay, GA Pinnacle 05 Washington D.C. Diamond Dragon, Las Vegas, NV	Southern Crossing Dothan, AL CAPEX 06 Cheyenne, WY Vigilant Shield Davis Montham AFB, Tucson,AZ	TOPOFF 4 Portland, OR NNX-3 07 Albuquerque, NM & Las Vegas, NV ARG/CM TTX Las Vegas, NV Ardent Sentry, Indianapolis, IN	Diablo Bravo Portland, OR	Empire 09 Albany, NY NUWAIX 09 F.E.Warren AFB, WY
IPX Exercises and Outreaches	EPA Regional Training Workshop Topeka, Seabrook IPX Portsmouth, NH Robinson IPX Florence, SC Palisades IPX South Haven, MI	Clinton IPX Clinton, IL Santa Barbara CA, No-Notice Drill	FRMAC Technical Outreach, Augusta, GA Duane Arnold IPX, Cedar Rapids, IA Arkansas Nuclear One, Russellville, AR Crystal River IPX Florida Oconee IPX Greenville, SC Wolf Creek IPX, Burlington, KS	Monticello IPX Minneapolis, MN Watts Bar IPX Spring City, TN Surry IPX Newport News, VA Duane Arnold IPX Cedar Rapids, IA Ft. Calhoun IPX Omaha, NB Kewaunee IPX Green Bay, WI Millstone IPX New London, CT Oyster Creek IPX Toms River, NJ Salem IPX Wilmington, DE	Waterford IPX New Orleans, LA South Texas Project IPX, Bay City, TX Millstone IPX Waterford, CT Monticello IPX Minneapolis, MN Susquehanna IPX Berwick, PA Watts Bar IPX Spring City, TX	Palo Verde iPX Phoenix, AZ Ginna IPX Rochester, NY Vermont Yankee Brattleboro, VT Grand Gulf IPX Vicksburg, MS Palo Verde REP-05 Phoenix, AZ Vogtle IPX Augusta, GA Grand Gulf IPX Vicksburg, MS Hanford IPX Richland, WA Plant Farley IPX Dothan AL	Palo Verde Phoenix, AZ Braidwood IPX Joliet, IL Oconee IPX Clemson, SC Beaver Valley IPX McCandless, PA Fermi II IPX Toledo, OH Seabrook IPX Portsmouth, NH EPA Table Top	Wolf Creek IPX Burlington, KS McGuire IPX Charlotte, NC FRMAC Tech Outreach Kettle Point, RI Capitol Bridge EPA TTX, Washington, DC Hanford 07 Richland, WA Harris IPX Raleigh, NC	Point Beach IPX Manitowoc, WI Duane Arnold IPX, Cedar Rapids, IA Sequoyah IPX Chattanooga, TN Columbia IPX Richland, WA Catawba IPX Rock Hill, SC North Anna IPX Richmond, VA Arkansas One IPX Russelville, AR ORNL TTX Oak Ridge, TN St. Lucie IPX Ft. Pierce, FL RAP 3 Prarie Island Minneapolis, MN	Calloway IPX Jefferson City, MO Calvert Cliffs IPX Annapolis, MD Monticello IPX Monticello MN Pt.Beach IPX Manitowoc, WI NNX 1-09 Riverside, CA ComanchePeak Glen Rose,TX Turkey Point IPX Miami, FL

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APPENDIX M
GLOSSARY

Accident	A deviation from the normal operations or activities associated with a hazard, which has the potential to result in an emergency.
Activate	In accordance with the Nuclear/Radiological Incident Annex, federal agencies, responding to an accident or incident involving nuclear or radioactive materials, will activate their primary emergency response recall process, check the capability status of all required assets, and then pack, load, and transport all required assets to the incident site.
Aerial Measuring System	An airborne system used to detect, locate, and measure low levels of airborne radiation. In addition to multi-spectral sensing capabilities and instrumentation for determining geodetic positions, the system can acquire aerial photography.
Airborne Radioactive Material	Radioactive material dispersed in air. Airborne radioactive material may include colloidal suspensions, windblown dust, fumes, mists, vapors, gases, or any other airborne media.
Agency	A division of government with a specific function offering a particular kind of assistance.
ALARA	(As Low As Reasonably Achievable): A basic concept of radiation protection which specifies that exposure to ionizing radiation and releases of radioactive materials should be managed to reduce collective doses as far below regulatory limits as is reasonably achievable considering economic, technological, and societal factors, among others. Reducing exposure at a site to ALARA strikes a balance between what is possible through additional planning and management, remediation, and the use of additional resources to achieve a lower collective dose level. A determination of ALARA is a site-specific analysis that is open to interpretation, because it depends on approaches or circumstances that may differ between regulatory agencies. An ALARA recommendation should not be interpreted as a set limit or level.
Alert	Notification of program personnel that mobilization and/or deployment are being considered. Key personnel will report to their designated work location. Other personnel will remain available for mobilization, activation, and deployment.
Area Command	*NRF Definition:* An organization established to oversee the management of multiple incidents that are each being handled by a separate Incident Command System organization or to oversee the management of a very large or evolving incident that has multiple incident management teams engaged. An agency administrator/ executive or other public official with jurisdictional responsibility for the incident usually makes the decision to establish an Area Command. An Area Command is activated only if necessary, depending on the complexity of the incident and incident management span-of-control considerations.

Assessment	Evaluation and interpretation of information to develop a basis for making decisions; for example, an evaluation of radiometric data that may include dose estimates and recommendations for protective actions to minimize harmful effects from radiation.
Background Radiation	Radiation from cosmic sources, naturally occurring radioactive material, including radon (except as a decay product of source or special nuclear material), and global fallout as it exists in the environment from the testing of nuclear explosive devices or from nuclear accidents like Chernobyl, which contribute to background radiation and are not under the control of the cognizant organization. Background radiation does not include radiation from source, byproduct, or special nuclear materials regulated by the cognizant federal or state agency. Different definitions may exist for this term. The definition provided in regulations or regulatory program being used for a site release should always be used if it differs from the definition provided here.
Call-out	An emergency or exercise is declared. Upon declaring an emergency, the appropriate federal agency will supply personnel and assets to respond to the emergency. These requests for personnel and assets are commonly referred to as "call-outs."
Casualty	Any person who is declared dead or is missing, ill, or injured.
Characterize	***MARSSIM Definition:*** To describe the characteristics of something, such as a waste or a waste site. For example, characterizing a waste from mining or processing a naturally occurring radioactive material typically includes finding the following types of information: ▪ chemical and radionuclide content ▪ level of radiation ▪ physical description (is it liquid or solid, in big chunks or a fine powder, etc.) ▪ amount ▪ pH (is it an acid or a base)
Characterization survey	A type of survey that includes facility or site sampling, monitoring, and analysis activities to determine the extent and nature of contamination. Characterization surveys provide the basis for acquiring necessary technical information to develop, analyze, and select appropriate cleanup techniques.
Consequence (focus on effects)	Measures to protect public health and safety, restore essential government services, and provide emergency relief to governments, businesses, and individuals affected by the consequences of an emergency, incident, or terrorist act.
Contamination	A condition that exists when an unwanted material has spread to previously unaffected areas at levels that may be harmful to public health and the environment or interfere with various measurements. ***MARSSIM Definition:*** The deposition of unwanted radioactive material on the surfaces of structures, areas, objects, or people. It may also be airborne, external, or internal (inside components or people).

Contractor	A non-federal party to a federal agency contract, engaging in activities or operations involving hazards, which could potentially affect the health and safety of employees, the public, or the quality of the environment.
Coordinating Agency (formerly Lead Federal Agency)	The federal agency that owns, authorizes, regulates, or is otherwise responsible for managing deployment of personnel and response to an emergency with the authority to take whatever action is necessary to stabilize the situation. ***MARSSIM Definition:*** The agency responsible for the radiological facility or activity involved in the incident. Coordinating Agencies have primary responsibilities for federal activities related to the nuclear/radiological aspects of the incident.
Cooperating Federal Agency	The federal agency providing technical and resource support to the Department of Homeland Security and the Coordinating Federal Agencies. Cooperating Federal Agencies include Department of Agriculture, Department of Commerce, Department of Defense, Department of Energy, Department of Health and Human Services, Department of Homeland Security, Department of Housing and Urban Development, Department of the Interior, Department of Justice, Department of Labor, Department of State, Department of Transportation, Department of Veterans Affairs, Environmental Protection Agency, General Services Administration, Nuclear Regulatory Commission, and the American Red Cross. ***MARSSIM Definition:*** Agencies that provide support to the Coordinating Agency during the federal response to a radiological emergency.
Corrective Actions	Those measures taken to terminate or mitigate the consequence of an emergency at or near the source of the emergency. *NRF Definition:* Implementing procedures that are based on lessons learned from actual incidents or from training and exercises.
Deactivation	When the mission or exercise has been resolved, the federal agency personnel and assets will be released to return to their home bases. Release will be authorized by the on-scene Senior Federal Official and any responding agency or organization.
Decontamination	The process of making any person, object, or area safe by absorbing, destroying, neutralizing, or removing contaminated or hazardous materials. ***MARSSIM Definition:*** The reduction or removal of contaminated radioactive material from a structure, object, or person.
Deploy	The act of physically relocating assets, personnel, and equipment to the site of an emergency or incident.
Deployment	Movement of federal assets and capabilities (e.g., personnel and equipment) from their home bases to the area-of-operations.
Deposition	The accumulation of (radioactive) material on unprotected surfaces of plants, structures, soil, or the bottom of ponds, streams, etc., from airborne release(s).

Dirty Bomb

MARSSIM Definition: Commonly refers to a device that spreads radioactive material by exploding a conventional (non-nuclear) explosive, such as dynamite. Because they do not involve the sophisticated technology required to create a nuclear explosion, dirty bombs are much simpler to make than a true nuclear bomb.

Dose

The amount of energy deposited in body tissue due to radiation exposure. Various technical terms, such as dose equivalent, effective dose equivalent, and collective dose, are used to evaluate the amount of radiation an exposed person receives. These terms are used to describe the differing interactions of radiation with tissue as well as to assist in the management of personnel exposure to radiation.

MARSSIM Definition:

Denotes the quantity of radiation or energy absorbed. Dose may refer to:

- absorbed dose, the amount of energy deposited per unit mass
- equivalent dose, the absorbed dose adjusted for the relative biological effect of the type of radiation being measured
- committed dose, a dose that accounts for continuing exposures over long periods of time (such as 30, 50, or 70 years)

Dosimeter

An instrument for measuring the accumulated or total dose from exposure to ionizing radiation.

Drill

A supervised, hands-on instruction period intended to test, develop, and/or maintain a specific emergency-response capability that is not graded or evaluated. A drill is a component of training.

eFRMAC

The overall data management enterprise used by CM/FRMAC to handle all data is eFRMAC. The eFRMAC enterprise is primarily designed to move data faster, farther and with less potential chance of error. It provides linkage between monitoring teams, FRMAC, FRMAC Forward Staging Areas and the Home Team. Many field teams are equipped with telemetry enabled interments (Data Tablets & MPCDs), which submit data directly into the system from anywhere in North America. This linkage also enables the Home Team to be distributed among various locations (Sandia, NARAC and RSL). Because eFRMAC is available 24/7, the Home Team can collect and assess data from the moment CM/FRMAC is notified even while the deployment is in progress. Once CM/FRMAC arrives on scene a second eFRMAC server is setup in the field to provide redundancy. eFRMAC is interfaced with Turbo FRMAC, EPA Scribe and NASA ECAMs with more interconnections planned.

Emergency

As defined by the Stafford Act, an emergency is “any occasion or instance for which, in the determination of the President, federal assistance is needed to supplement state and local efforts and capabilities to save lives and to protect property and public health and safety, or to lessen or avert the threat of a catastrophe in any part of the United States.”

Emergency Operations Center (EOC)	The center from which emergency response personnel and teams receive field instructions and directions during emergency situations. Emergency Operations Centers are usually staffed and operated by state, tribal, and local government personnel. *NRF Definition:* The physical location at which the coordination of information and resources to support incident management (on-scene operations) activities normally takes place. An EOC may be a temporary facility or may be located in a more central or permanently established facility, perhaps at a higher level of organization within a jurisdiction. EOCs may be organized by major functional disciplines (e.g., fire, law enforcement, and medical services), by jurisdiction (e.g., Federal, State, regional, tribal, city, county), or some combination thereof.
Emergency Operations Facility (EOF)	A licensee-controlled and operated support center for management of emergency response, coordination of radiological and environmental assessments, development of recommended public protective actions, and coordination of emergency response with federal, state, tribal, or local areas.
Emergency Planning Zone (EPZ)	A geographic area surrounding a specific facility for which special planning and preparedness efforts are carried out to ensure that prompt and effective protective actions can be taken to reduce or minimize the impact to on-site personnel, public health and safety, and the environment.
Emergency Preparedness	The training of personnel, acquisition and maintenance of resources, and exercising of the plans, procedures, personnel, and resources essential for emergency response.
Emergency Response	The implementation of planning and preparedness during an emergency, involving the effective decisions, actions, and application of resources that must be accomplished to mitigate consequences and recover from an emergency.
Evacuation	The process of removing people from a hazardous area to a safe area. As used here, evacuation refers to removal of a population for a short period (not more than a few days), and relocation refers to removal for longer periods.
Evaluate	To determine the significance, worth, or condition of usually by careful appraisal and study.
Event	A planned, non-emergency activity.
Exercise	A planned and scheduled comprehensive performance test that evaluates the integrated capability and most aspects of the emergency management program, associated with a particular facility, operation, or asset.
Exposure	The level of radiation flux to which a material or living tissue is exposed. The actual dose of radiation resulting from the exposure depends upon a number of factors. ***MARSSIM Definition:*** A term relating to the amount of ionizing radiation that strikes a living or inanimate material. (This is a general definition. In health physics, exposure is specifically defined as a measure of ionization in air caused by x-ray or gamma radiation only.)

Fallout, nuclear	***MARSSIM Definition:*** The slow descent of minute particles of radioactive debris in the atmosphere following a nuclear explosion.
Federal (organizations)	Agencies, departments, or other entities of the federal government.
Federal Radiological Monitoring and Assessment Center (FRMAC)	A center in the vicinity of a radiological incident that coordinates the federal radiological monitoring and assessment response to an incident that threatens the health or well-being of affected populations. The center, which operates at off-site locations in the affected state, tribal, or local area(s), does not generally need to be located near the emergency operations centers (EOC), as long as operations involving the Coordinating Agency, FRMAC, and local entities can be coordinated. The Coordinating Agency has overall responsibility for coordination and/or operation of the incident.
Field Exercise (FX)	***MARSSIM Definition:*** Also known as "full scale exercise"; an emergency response training exercise that tests a major portion of the functions in an emergency plan and/or operating procedures. Field exercises incorporate a high degree of realism and an extensive involvement of resources and personnel.
First Responder	Local and non-governmental police, fire, and emergency personnel who in the early stages of an incident are responsible for the protection and preservation of life, property, evidence, and the environment. First responders may include personnel from federal, state, tribal, local governments, or nongovernmental organizations.
Geographical Information System (GIS)	***MARSSIM Definition:*** A system for linking information to a particular geographical location. GISs are generally capable of producing maps that show the location of the information. For example, a GIS containing TENORM information might contain the name and number of acres at a TENORM site as well as information about its longitude and latitude. A map printed from this system would show locations and sizes of TENORM sites on a map of the United States.
Guidance	***MARSSIM Definition:*** Specific, suggested procedures and best practices that are similar to regulations but not legally enforceable.
Hazard	Something that is potentially dangerous or harmful, often the root cause of an unwanted outcome.
Hazardous Materials	Any solid, liquid, or gaseous material that is toxic, flammable, corrosive, an oxidizing agent, explosive, poisonous, etiological, radioactive, nuclear, unduly magnetic, a chemical agent, biological research material, compressed gases, or any other material that, because of its quantity, properties, or packaging, may endanger human life or property.
Health Physics	***MARSSIM Definition:*** Scientific field that focuses on radiation protection of humans and the environment. Health Physics uses physics, biology, chemistry, statistics, and electronic instrumentation to help protect individuals from any damaging effects of radiation.
High Explosive (HE)	An explosive that can be made to detonate (rather than burn). The detonation speed (i.e., the rate of advance of the reaction zone into the unreacted high explosive) is faster than the velocity of sound in the explosive.

Hot spot	The region in a contaminated area, where the level of radioactive contamination is considerably greater than that in nearby neighboring regions.
IMAAC	Interagency Modeling and Atmospheric Assessment Center. Under the National Response Framework, IMAAC provides a single point for the coordination and dissemination of Federal dispersion modeling and hazard prediction products that represent the Federal position during an actual or potential incident. The IMAAC provides plume modeling analyses of the impacts of hazardous atmospheric releases to aid in protecting the public and the environment. Eight federal agency partners support the IMAAC, led by the Department of Homeland Security. The Department of Energy's National Atmospheric Release Advisory Center (NARAC) at Lawrence Livermore National Laboratory serves as the operations hub of the IMAAC.
Impacted Area	Any area that is not classified as non-impacted. Areas with a reasonable possibility of containing residual radioactivity in excess of natural background or fallout levels.
Improvised Nuclear Device (IND)	A device that has, appears to have, or is claimed to have the capability to produce a nuclear explosion. NOTE: The Department of Defense uses the term "Sophisticated Improvised Explosive Device (SIED)" to refer to an IND of comparatively advanced design.
Incident	*NRF Definition:* An occurrence or event, natural or manmade, that requires a response to protect life or property. Incidents can, for example, include major disasters, emergencies, terrorist attacks, terrorist threats, civil unrest, wildland and urban fires, floods, hazardous materials spills, nuclear accidents, aircraft accidents, earthquakes, hurricanes, tornadoes, tropical storms, tsunamis, war-related disasters, public health and medical emergencies, and other occurrences requiring an emergency response.
Incident Command System (ICS):	A standardized on-scene emergency management construct specifically designed to provide for the adoption of an integrated organizational structure that reflects the complexity and demands of single or multiple incidents, without being hindered by jurisdictional boundaries. ICS is the combination of facilities, equipment, personnel, procedures, and communications operating within a common organizational structure, designed to aid in the management of resources during incidents. It is used for all kinds of emergencies and is applicable to small as well as large and complex incidents. ICS is used by various jurisdictions and functional agencies, both public and private, to organize field-level incident management operations.
Joint Field Office (JFO)	A temporary federal facility established locally to provide a central point for federal, state, tribal, or local executives with responsibility for incident oversight, direction, and/or assistance to effectively coordinate protection, prevention, preparedness, response, and recovery actions. The JFO will combine the traditional functions of the Joint Operations Center (JOC), the Federal Emergency Management Agency (FEMA) Disaster Field Office (DFO), and the Joint Information Center (JIC) within a single federal facility.

Joint Information Center (JIC)	The JIC serves as a focal point for the coordination and dissemination of information to the public and media concerning incident prevention, preparedness, response, recovery, and mitigation. *NRF Definition:* An interagency entity established to coordinate and disseminate information for the public and media concerning an incident. JICs may be established locally, regionally, or nationally depending on the size and magnitude of the incident.
Judgment measurement	Measurements performed at locations selected using professional judgment based on unusual appearance, location relative to known contaminated areas, high potential for residual radioactivity, general supplemental information, etc. Judgment measurements are not included in the statistical evaluation of the survey unit data because they violate the assumption of randomly selected, independent measurements. Instead, judgment measurements are individually compared to the $DCGL_W$.
Local Government	Any county, municipality, city, town, township, local public authority, school district, special district, intrastate district, council of governments (regardless of whether the council of governments is incorporated as a nonprofit corporation under state law), regional or interstate government entity, or agency or instrumentality of a local government; an Indian tribe or authorized tribal, organization, or in Alaska a Native village or Alaska Regional Native Corporation; a rural community, unincorporated town or village, or any other public entity.
Logistics	Providing resources and other services to support the incident.
Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM)	A cooperative effort among the Environmental Protection Agency (EPA), Nuclear Regulatory Commission, Department of Energy, and Department of Defense; MARSSIM describes appropriate methods to design surveys to assess radioactive contamination at sites.
Minimum detectable concentration (MDC)	The MDC is the activity level that a specific instrument and technique can be expected to detect 95% of the time. When stating the detection capability of an instrument, this value should be used. The MDC is the detection limit, L_D, multiplied by an appropriate conversion factor to give units of activity.
Mission	Any deployment or use of the federal radiological emergency response assets, or components thereof, except for specifically identified exercises and/or drills/training activities.
Mitigation	The activities designed to reduce or eliminate risks to persons or property or to lessen the actual or potential effects or consequences of an incident. Mitigation measures may be implemented prior to, during, or after an incident.
Mobilization	The process and procedures used by all organizations—federal, state, tribal, or local—for activating, assembling, and transporting all resources that have been requested to respond to or support an incident.

Monitoring	Continuing collection of data to assess information, determine adequacy of radiation protection practices, and to identify potentially significant changes in conditions or radiation protection. ***MARSSIM Definition:*** The use of sampling and detection equipment to determine the levels of radiation or other toxic materials in land, air, or water.
Memorandum of Understanding (MOU)	***MARSSIM Definition:*** An agreement between two (or more) parties, such as two federal agencies, that describes how responsibilities will be shared for a particular situation. For example, EPA has an MOU with DOE to share information related to treatment of mixed waste.
NARAC	National Atmospheric Release Advisory Center: A resource center for preparedness, real-time predictions, and detailed analysis of atmospheric releases involving nuclear, radiological, chemical, or biological material. See https://narac.llnl.gov for more information.
National Defense Area (NDA)	An area established on non-federal lands located within the U.S., its possessions, or its territories for safeguarding classified defense information, or protection of Department of Defense (DoD) equipment and/or materials. Establishment of a NDA temporarily places such non-federal lands under the effective control of the DoD and results only from an emergency event. The senior DoD representative at the scene shall define the boundary, mark it with a physical barrier, and post warning signs. The landowner's consent and cooperation shall be obtained, whenever possible; however, military necessity shall dictate the final location, shape, and size of the NDA.
National Incident	Any event requiring federal assistance.
National Incident Management System (NIMS)	A system mandated by Homeland Security Presidential Directive-5 (HSPD-5) that provides a consistent nationwide approach for federal, state, tribal, or local governments; the private sector; and nongovernmental organizations to work effectively and efficiently together to prepare for, respond to, and recover from domestic incidents, regardless of cause, size, or complexity. To provide for interoperability and compatibility among federal, state, tribal, or local capabilities, the NIMS includes a core set of concepts, principles, and terminology. *NRF Definition:* System that provides a proactive approach guiding government agencies at all levels, the private sector, and nongovernmental organizations to work seamlessly to prepare for, prevent, respond to, recover from, and mitigate the effects of incidents, regardless of cause, size, location, or complexity, in order to reduce the loss of life or property and harm to the environment.
National Response Framework (NRF)	The NRF is a guide to how the nation conducts all-hazards response. It is built upon scalable and adaptable coordinating structures to align key roles and responsibilities across the nation, linking all levels of government, nongovernmental organizations, and the private sector. It is intended to capture specific authorities and best practices for managing incidents that range from the serious but purely local, to large-scale terrorist attacks or catastrophic natural disasters. This document supersedes the corresponding sections of the National Response Plan (2004, with 2006 revisions).

National Security Area (NSA)	An area established on non-federal lands located within the U.S., its possessions, or territories for safeguarding classified and/or restricted data information or equipment and material belonging to the Department of Energy (DOE) or the National Aeronautics and Space Administration (NASA). Establishment of a NSA temporarily places such non-federal lands under the effective control of the DOE or NASA and results only from an emergency event. The senior DOE or NASA representative, having custody of the material at the scene shall define the boundary, mark it with a physical barrier, and post warning signs. The landowner's consent and cooperation shall be obtained, whenever possible; however, operational necessity shall dictate the final location, shape, and size of the NSA.
Naturally occurring radionuclides	Radionuclides and their associated progeny produced during the formation of the earth or by interactions of terrestrial matter with cosmic rays.
Nongovernmental Organization (NGO)	A nonprofit entity that is based on interests of its members, individuals, or institutions and that is not created by a government, but may work cooperatively with government.
Non-impacted area	Areas where there is no reasonable possibility (extremely low probability) of residual radioactivity. Non-impacted areas are typically located off-site and may be used as background reference areas.
Nuclear Detonation	A nuclear explosion resulting from fission or fusion reactions in nuclear materials, such as from a nuclear weapon.
Nuclear Material	Special Nuclear Material (SNM), byproduct material, and source material as defined by the Atomic Energy Act of 1954, as amended; also, any other material used in the production, testing, utilization, or assembly of nuclear weapons or components of nuclear weapons, that is determined by DOE O 471.1 to be a nuclear material.
Nuclear Radiation	Particulate and electromagnetic radiation emitted from the atomic nuclei in various nuclear processes. The important nuclear radiation for weapons are alpha and beta particles, gamma-rays, and neutrons.
Nuclear/Radiological Incident Annex (to the National Response Framework)	The Nuclear/Radiological Incident Annex to the National Response Framework provides an organized and integrated capability for a timely, coordinated response by federal agencies to terrorist incidents involving nuclear or radioactive materials and accidents or incidents involving such material that may or may not rise to a higher level.
Nuclear Weapon	A complete assembly (e.g., implosion type, gun type) in its intended ultimate configuration that, upon completion of the prescribed arming, fusing, and firing sequence, is capable of producing the intended nuclear reaction and release of energy.
Off-site	The area outside the boundary of a site or facility, but within the affected area.
Off-site Federal Support	The federal role assisting during mitigation of off-site consequences during an emergency and protection of public health and safety, including assistance identifying and implementing measures to protect public health.

On-site

Area within the boundary of a site or facility established by the owner or operator, a transporter or the Coordinating Agency of the affected facility for administrative control during an emergency. Specifically, the on-site area includes everything within the boundary of a nuclear power plant, a DoD installation, a DOE facility, a National Defense Area, or a National Security Area. It also includes the controlled area surrounding a radioactive spill in a transportation incident. In the event of a terrorist event, "on-site" would be defined as the area where the Incident Commander defined a perimeter to identify the crime scene or area where dangers may still exist. Once the initial criminal and forensic investigation is completed, the "on-site" boundary would be lifted and the state, tribal, or local authorities would assume control.

On-site Federal Support

Assistance by a federal agency that owns, authorizes, regulates, or is otherwise responsible for the radiological facility, material being transported, etc. (e.g., the Coordinating Agency). Federal support is in response to state, tribal, or local assistance efforts and supports the owner or operator's efforts to manage and thereby prevent or minimize off-site consequences during an incident.

Pathways

MARSSIM Definition: The way in which people are exposed to radiation or other contaminants. The three basic pathways are inhalation (contaminants are taken into the lungs), ingestion (contaminants are swallowed), and direct (external) exposure (contaminants cause damage from outside the body).

Phases

Emergency (Early) Phase: Period at the beginning of a nuclear/radiological incident when immediate decisions for effective use of protective actions are required. These decisions must be based primarily on predictions of radiological conditions in the environment. This phase may last from hours to days. This document focuses on the Emergency (Early) Phase of a response immediately following an event. For the purpose of this document the Emergency (Early) Phase in general ends dependent on the incident type, status of release, and completed public protection actions. The intermediate Phase will begin only after:

A. The release is controlled, stopped and stabilized

B. Assurance that the event will not reoccur

C. Protective action for public safety has been completed

- If there is a shelter in place requirement, it has been terminated. Evacuation if necessary is complete

Recovery Phase: Once immediate lifesaving activities are complete, the focus shifts to assisting individuals, households, critical infrastructure, and businesses in meeting basic needs and returning to self-sufficiency. Even as the immediate imperatives for response to an incident are being addressed, the need to begin recovery operations emerges. The emphasis upon response will gradually give way to recovery operations. Within recovery, actions are taken to help individuals, communities, and the nation return to normal. Depending on the complexity of this phase, recovery and cleanup efforts involve significant contributions from all sectors of our society.

A. Short-term recovery is immediate and overlaps with response. It includes actions such as providing essential public health and safety

services, restoring interrupted utility and other essential services, reestablishing transportation routes, and providing food and shelter for those displaced by the incident. Although called "short term," some of these activities may last for weeks.

B. Long-term recovery, which is outside the scope of the framework, may involve some of the same actions but may continue for a number of months or years, depending on the severity and extent of the damage sustained. For example, long-term recovery may include the complete redevelopment of damaged areas.

Plume

MARSSIM Definition: Material spreading from a particular source and traveling through environmental media, such as air or ground water. For example, a plume could describe the dispersal of particles, gases, vapors, and aerosols in the atmosphere, or the movement of contamination through an aquifer (dilution, mixing, adsorption onto soil, etc.).

Precision

A measure of mutual agreement among individual measurements of the same property, usually under prescribed similar conditions, expressed generally in terms of the standard deviation.

Preparedness

The range of deliberate, critical tasks and activities necessary to build, sustain, and improve the operational capability to prevent, protect against, respond to, and recover from domestic incidents. Preparedness is a continuous process.

NRF Definition: Actions that involve a combination of planning, resources, training, exercising, and organizing to build, sustain, and improve operational capabilities. Preparedness is the process of identifying the personnel, training, and equipment needed for a wide range of potential incidents, and developing jurisdiction-specific plans for delivering capabilities when needed for an incident.

Prevention

Actions to avoid an incident or to intervene to stop an incident from occurring. Prevention involves actions to protect lives and property. It involves applying intelligence and other information to a range of activities that may include such countermeasures as deterrence operations; heightened inspections; improved surveillance and security operations; investigations to determine the full nature and source of the threat; public health and agricultural surveillance and testing processes; immunizations, isolation, or quarantine; and, as appropriate, specific law enforcement operations aimed at deterring, preempting, interdicting, or disrupting illegal activity and apprehending potential perpetrators and bringing them to justice.

Professional judgment

An expression of opinion, based on technical knowledge and professional experience, assumptions, algorithms, and definitions, as stated by an expert in response to technical problems.

Protective Action Guide (PAG)	The projected dose to an individual from an unplanned release of radioactive material at which a specific protective action to reduce or avoid that dose is recommended. ***MARSSIM Definition:*** A protective action guide tells state and local authorities at what projected dose they should take action to protect people from exposure to unplanned releases of radioactive material into the environment.
Public Information Officer (PIO)	Representative from a federal agency who works in cooperation with other federal, state, tribal, or local agencies, to coordinate public releases of information during an event. *NRF Definition:* A member of the Command Staff responsible for interfacing with the public and media and/or with other agencies with incident-related information requirements.
Qualified data	Any data that have been modified or adjusted as part of statistical or mathematical evaluation, data validation, or data verification operations.
Radiation	***MARSSIM Definition:*** Energy given off as either particles or rays from the unstable nucleus of an atom.
Radiological Control Area (RCA)	The control area encompassing all known, or suspected, radiological contamination at an incident site.
Radiological Dispersal Device (RDD) or Dirty Bomb	A device that has, appears to have, or is claimed to have the capability to produce radioactive contamination over an area without a nuclear explosion.
Radiological Emergency	A radiological incident that poses an actual, potential, or perceived hazard to the public health or safety, and/or loss of, or damage to, property.
Radiation Emergency Assistance Center/ Training Site (REAC/TS)	An NNSA multi-purpose medical/training facility with 24/7 national/ international deployable radiological emergency response teams, which is located at Oak Ridge, Tennessee, and is capable of providing medical/health physics care and consultation for all types of radiological injuries (www.orau.gov/reacts).
Radiological Assistance Program (RAP) Team	A DOE/NNSA team dispatched to the site of a nuclear/radiological incident by the responding DOE Region.
Radiation Protection Guide (RPG)	***MARSSIM Definition:*** Radiation dose that should not be exceeded without careful consideration for doing so; every effort should be made to encourage the maintenance of radiation doses as far below this guide as practicable.
Radiation Contamination	***MARSSIM Definition:*** A deposit of radioactive material in any place where it may harm persons, equipment, or the environment.
Radiological Emergency	A radiological incident that poses an actual, potential, or perceived hazard to the public health or safety, and/or loss of, or damage to, property.

Recovery	The term "recovery," as used in this manual encompasses any action dedicated to the continued protection of the public and resumption of normal activities in the affected area. NIMS Definition: The development, coordination, and execution of service- and site-restoration plans; the reconstitution of government operations and services; individual, private sector, nongovernmental, and public assistance programs to provide housing and to promote restoration; long-term care and treatment of affected persons; additional measures for social, political, environmental, and economic restoration; evaluation of the incident to identify lessons learned; post-incident reporting; and development of initiatives to mitigate the effects of future incidents.
Reference area	Geographical area from which representative reference measurements are performed for comparison with measurements performed in specific survey units at the remediation site. A radiological reference area (background area) is defined as an area that has similar physical, chemical, radiological, and biological characteristics as the site area being remediated, but which has not been contaminated by site activities. The distribution and concentration of background radiation in the reference area should be the same as that which would be expected on the site if that site had never been contaminated. More than one reference area may be necessary for valid comparisons if a site exhibits considerable physical, chemical, radiological, or biological variability.
Release criterion	A regulatory limit expressed in terms of dose or risk.
Relocation	The removal or continued exclusion of people (households) from contaminated areas to avoid chronic radiation exposure.
Removable activity	Surface activity that is readily removable by wiping the surface with moderate pressure and can be assessed with standard radiation detectors. It is usually expressed in units of dpm/100 cm^2
Residual radioactivity	Radioactivity in structures, materials, soils, groundwater, and other media at a site resulting from activities under the cognizant organization's control. This includes radioactivity from all sources used by the cognizant organization, but excludes background radioactivity as specified by the applicable regulation or standard. It also includes radioactive materials remaining at the site as a result of routine or accidental releases of radioactive material at the site and previous burials at the site, even if those burials were made in accordance with the provisions of 10 CFR Part 20.
Resources	Personnel and major items of equipment, supplies, and facilities available or potentially available for assignment to incident operations and for which status is maintained.

Response	Activities that address the short-term, direct effects of an incident. Response includes immediate actions to save lives, protect property, and meet basic human needs. Response also includes the execution of emergency operations plans and of mitigation activities designed to limit the loss of life, personal injury, property damage, and other unfavorable outcomes. NIMS Definition: Activities that address the short-term, direct effects of an incident. Response includes immediate actions to save lives, protect property, and meet basic human needs. Response also includes the execution of emergency operations plans and of mitigation activities designed to limit the loss of life, personal injury, property damage, and other unfavorable outcomes. As indicated by the situation, response activities include applying intelligence and other information to lessen the effects or consequences of an incident; increased security operations; continuing investigations into nature and source of the threat; ongoing public health and agricultural surveillance and testing processes; immunizations, isolation, or quarantine; and specific law enforcement operations aimed at preempting, interdicting, or disrupting illegal activity, and apprehending actual perpetrators and bringing them to justice.
Risk	***MARSSIM Definition:*** The probability of injury, disease, or death under specific circumstances. Risk can be expressed as a value that ranges from zero (no injury or harm will occur) to one hundred percent (harm or injury will definitely occur). Risk-based standards limit the risk that releasing a contaminant to the environment may pose rather than limiting the quantity that may be released absolute risk, the excess risk attributed to irradiation and usually expressed as the numeric difference between irradiated and non-irradiated populations (e.g., 1 case of cancer per million people irradiated annually for each rad). Absolute risk may be given on an annual basis or lifetime basis, relative risk, the ratio between the number of cancer cases in the irradiated population to the number of cases expected in the unexposed population. A relative risk of 1.1 indicates a 10 percent increase in cancer due to radiation, compared to the “normal” incidence.
Risk Assessment	***MARSSIM Definition:*** An evaluation of the risk to human health or the environment by hazards. Risk assessments may look at either existing hazards or potential hazards. The assessment may be quantitative or qualitative.
Roentgen Equivalent Man (rem)	***MARSSIM Definition:*** A unit of equivalent dose. Rem relates the absorbed dose in human tissue to the effective biological damage of the radiation. Not all radiation has the same biological effect, even for the same amount of absorbed dose.
Sample	***MARSSIM Definition:*** A part or selection from a medium located in a survey unit or reference area that represents the quality or quantity of a given parameter or nature of the whole area or unit; a portion serving as a specimen. (As used in statistics) A set of individual samples or measurements drawn from a population whose properties are studied to gain information about the entire population.
Scoping survey	A type of survey that is conducted to identify (1) radionuclide contaminants, (2) relative radionuclide ratios, and (3) general levels and extent of contamination.

Sheltering	The use of a structure for radiation protection from an airborne plume and/or deposited radioactive materials. Effectiveness diminishes with time due to infiltration.
State (organization)	The state government agency or office having the principal or lead role in emergency planning and preparedness. There may be more than one state involved, resulting in separate application of evaluation criteria for the affected states. To the extent possible, however, one state should be designated as the lead.
Statutory Authority	***MARSSIM Definition:*** Responsibility and authority assigned by law to a state; a federal agency, department, bureau, etc.; or other governmental organization.
Survey unit	A geographical area consisting of structures or land areas of specified size and shape at a remediated site for which a separate decision will be made whether the unit attains the site-specific reference-based cleanup standard for the designated pollution parameter. Survey units are generally formed by grouping contiguous site areas with a similar use history and the same classification of contamination potential. Survey units are established to facilitate the survey process and the statistical analysis of survey data.
Tabletop Exercise (TTX)	***MARSSIM Definition:*** An informal gathering of government officials and emergency response personnel to discuss an emergency response operation based upon an emergency plan and its standard operating procedures. The purpose of the TTX is to have participants practice problem solving and resolve questions of coordination and assignment of responsibilities in a non-threatening format, under minimum stress. TTXs can be use in preparation for a field exercise.
Terrorism	Under the Homeland Security Act of 2002, terrorism is defined as activity that involves an act dangerous to human life or potentially destructive of critical infrastructure or key resources and is a violation of the criminal laws of the United States or of any state or other subdivision of the United States in which it occurs and is intended to intimidate or coerce the civilian population or influence a government or affect the conduct of a government by mass destruction, assassination, or kidnapping. See Section 2 (15), Homeland Security Act of 2002. Pub. L. 107-296, 116 Stat. 2135 (2003).
Tribal	Any Indian tribe, band, nation, or other organized group or community, including any Alaskan Native Village as defined in or established pursuant to the Alaskan Native Claims Settlement Act (85 stat. 688) [43 U.S.C.A. and 1601 et seq.], that is recognized as eligible for the special programs and services provided by the United States to Indians because of their status as Indians.
Turbo FRMAC	The Turbo FRMAC software is designed to assist in the Assessment portion of an event to allow Emergency Planners to make determinations on the radiological deposition and dose to individuals at given locations.
Unified Command	A Unified Command is established when incidents under an Area Command are multi-jurisdictional. See Area Command.

Unity rule (mixture rule)	A rule applied when more than one radionuclide is present at a concentration that is distinguishable from background and where a single concentration comparison does not apply. In this case, the mixture of radionuclides is compared against default concentrations by applying the unity rule. This is accomplished by determining (1) the ratio between the concentration of each radionuclide in the mixture, and (2) the concentration for that radionuclide in an appropriate listing of default values. The sum of the ratios for all radionuclides in the mixture should not exceed 1.
Volunteer	Any individual accepted to perform services by an agency that has authority to accept volunteer services when the individual performs services without promise, expectation, or receipt of compensation for services performed.
Weapon of Mass Destruction (WMD)	As defined in Title 18, U.S.C., Section 2332a, which reads (1) any explosive, incendiary, or poison gas, bomb, grenade, rocket having a propellant charge of more than four ounces, missiles having an explosive or incendiary charge of more than one quarter ounce, mine or similar device; (2) any weapon that is designed or intended to cause death or serious bodily injury through the release, dissemination, or impact of toxic or poisonous chemicals or their precursors; (3) any weapon involving a disease organism; or (4) any weapon that is designed to release radiation or radioactivity at a level dangerous to human life.

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APPENDIX N
FRMAC MANUALS AND LOGS

The Federal Radiological Monitoring and Assessment Center (FRMAC) manuals have been extensively peer reviewed. As the manuals are used, FRMAC expects to receive many comments and suggestions related to their content and application. These comments and suggestions will be evaluated by the appropriate FRMAC Working Group and they will be incorporated into future revisions as suitable. Comments, suggestions, and/or requests for manuals should be addressed to:

U.S. Department of Energy
National Nuclear Security Administration
Nevada Site Office
Attn: FRMAC Program Manager
P.O. Box 98518
Las Vegas, NV 89193-8518

Information contained in other FRMAC manuals (cited below) may be valuable for reference purposes during an emergency. These manuals are available to the public on the U.S. Department of Energy, National Nuclear Security Administration Nevada Site Office (NNSA/NSO) website: http://www.nv.doe.gov.

FRMAC Assessment Manual, Vol. 1* SAND2003-1071P (April 2003) and *FRMAC Assessment Manual, Vol. 2,* SAND2010-2575P (February 2010*)

Provides information in methods and pre-assessed default scenarios as well as useful tables, charts, worksheets, and a glossary relevant to the work of the Assessment group.

***Radiological Emergency Response Health and Safety Manual,* DOE/NV/11718--440 (May 2001)**

The *Radiological Emergency Response Health and Safety Manual* provides for radiation safety, industrial hygiene, occupational safety, and emergency medical care. The manual includes information on Radiation Exposure Guidelines, personnel dosimetry, contamination control (including limits on contamination for release of equipment to uncontrolled areas), radioactive and hazardous waste packaging, and personal protective equipment.

FRMAC Monitoring Manual, Volumes 1 Monitoring Group Operations (December 2005) and Monitoring Manual, Volume 2 (old Volume 1, September 2002), Radiation Monitoring and Sampling (December 2005)

FRMAC Monitoring Manual, Volume 2, "Radiation Monitoring and Sampling," describes the procedures employed by FRMAC field teams in performing radiological monitoring and sampling activities and provides guidance for radiochemical analysis of samples collected during a radiological emergency.

FRMAC Laboratory Analysis (December 2005)

The *FRMAC Laboratory Analysis Manual* provides guidance for radiochemical analysis of samples collected during a radiological emergency to provide scientifically defensible data of acceptable quality.

APPENDIX O
ACRONYMS AND ABBREVIATIONS

AFB.....Air Force Base
AFRAT.....Air Force Radiation Assistance Team
ALARA.....As Low As Reasonably Achievable
AMS.....Aerial Measuring System
APM.....Advance Party Meeting
ARG.....Accident Response Group
CBP.....Customs and Border Patrol
CBRNE.....Chemical, Biological, Radiological, Nuclear, and High-Yield Explosives
CCMRF.....CBRNE Consequence Management Response Force
CDC..... Centers for Disease Control and Prevention
CFR.....Code of Federal Regulations
CEDE.....Committed Effective Dose Equivalent
CERCLA.....Comprehensive Environmental Response Compensation and Liability Act
CM.....Consequence Management
CMHT.....Consequence Management Home Team
CMRT.....Consequence Management Response Team
COP.....Common Operational Picture
DCF.....Dose Conversion Factor
$DCGL_w$.....derived concentration guideline level nonparametric statistical test
DCO.....Defense Coordinating Officer
DFO.....Disaster Field Office
DHS.....U.S. Department of Homeland Security
DNDO.....Domestic Nuclear Detection Office
DoD.....U.S. Department of Defense
DOE.....U.S. Department of Energy
DOE/HQ.....DOE Headquarters
DOJ.....U.S. Department of Justice
DOSC.....Deputy Operations Section Chief

DPSC.....Deputy Planning Section Chief
DQO.....Data Quality Objective
DRL.....Derived Response Level
DSCA.....Defense Support of Civil Authorities
ECN.....Emergency Communications Network
EMAC.....Emergency Management Assistance Compact
EMP .....Electromagnetic Pulse
EOC.....Emergency Operations Center
EPA .....U.S. Environmental Protection Agency
EPR .....Emergency Preparedness and Response
ERDS .....Emergency Response Database System
ESAW.....Event Status and Action Worksheet
ESF.....Emergency Support Function
FAA.....Federal Aviation Administration
FBI .....Federal Bureau of Investigation
FBO.....fixed base of operations
FDA.....U.S. Food and Drug Administration
FEMA .....Federal Emergency Management Agency
FGR.....Federal Guidance Report
FIDLER.....Field Instruments for the Detection of Low Energy Radiation
FRERP .....Federal Radiological Emergency Response Plan
FRMAC.....Federal Radiological Monitoring and Assessment Center
FRPCC .....Federal Radiological Preparedness Coordinating Committee
FY .....fiscal year
GIS .....Geographic Information System
GPS .....Global Positioning System
GSA.....General Services Administration
HHS.....U.S. Department of Health and Human Services
HPGe.....high-purity Germanium
HSPD .....Homeland Security Presidential Directive
IAEA .....International Atomic Energy Agency
IAP .....Incident Action Plan
IATA.....International Air Transport Association
IC.....Incident Command

ICS .....Incident Command System
IMAAC .....Interagency Modeling and Atmospheric Assessment Center
IMT .....Incident Management Team
IND .....Improvised Nuclear Device
JFO.....Joint Field Office
JIC.....Joint Information Center
JOC. .....Joint Operations Center
JOCC.....Joint Operations Command Center
keV.....kiloelectron volts
km .....kilometer
LIMS .....Laboratory Instrument Management System
LLNL .....Lawrence Livermore National Laboratory
$\mu Ci/m^2$ .....microcurie per square meter
µR/hr .....microroentgen per hour
MDA .....Minimum Detectable Activity
MARSSIM .....Multi-Agency Radiation Survey and Site Investigation Manual
MPCD .....MultiPath Communications Devices
mR.....milliroentgen (unit of exposure to x- or gamma-radiation)
MRE.....meals ready to eat
mrem .....millirem (a unit of radiation dose)
NARAC.....National Atmospheric Release Advisory Center
NASA.....National Aeronautics and Space Administration
NCP.....National Contingency Plan
NGB .....National Guard Bureau
NIMS.....National Incident Management System
NIT.....Nuclear Incident Team
NNPP .....Naval Nuclear Propulsion Program
NNSA/HQ.....National Nuclear Security Administration Headquarters
NNSA/NSO.....National Nuclear Security Administration Nevada Site Office
NOAA.....National Oceanic and Atmospheric Administration
NOC .....National Operations Center
NRC .....U.S. Nuclear Regulatory Commission
NRF.....National Response Framework
NRP.....National Response Plan

NRIA.....Nuclear/Radiological Incident Annex
NSA.....National Security Area
NSTec.....National Security Technologies, LLC
NTIA.....National Telecommunications and Information Administration
OSC.....On-Scene Coordinator
OSHA.....Occupational Safety and Health Administration
OSTP.....Office of Science and Technology Policy
PAG.....Protective Action Guide
PAR.....Protective Action Recommendation
PFO.....Principal Federal Official
PIO.....Public Information Officer
PPE.....Personal Protective Equipment
QA.....quality assurance
QC.....quality control
RAMS.....Radiological Assessment and Monitoring System
RAP.....Radiological Assistance Program
RDADTS.....real-time data acquisition and dissemination tracking system
RDD.....Radiological Dispersal Device
REAC/TS.....Radiation Emergency Assistance Center/Training Site
rem.....roentgen equivalent man (a unit of radiation dose)
RERT.....Radiological Emergency Response Team (EPA)
R/N.....radiological or nuclear
RODEO.....Radioanalytical Organization Database for Emergency Operations
RRCC.....Regional Response Coordination Center
RSL.....Remote Sensing Laboratory
SEO.....Senior Energy Official
SHARC.....Sandia Hazard Assessment Response Capability
sitreps.....situation reports
SNL.....Sandia National Laboratories
SNS.....Strategic National Stockpile
SO.....Senior Official
SR.....Senior Representative
SSA.....Senior Scientific Advisor
TEDE.....Total Effective Dose Equivalent

UC.....Unified Command
USCG.....United States Coast Guard
USDA.....U.S. Department of Agriculture
USNORTHCOM.....U.S. Northern Command
USPACOM.....U.S. Pacific Command

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APPENDIX P
KEY REFERENCE DOCUMENTS

Primary Federal Plan

The National Response Framework (NRF), U.S. Department of Homeland Security, January 2008.

Supporting Federal Statutes, Orders, Regulations, and Plans

Atomic Energy Act of 1954, amended, Public Law 83-703.

Homeland Security Presidential Directive-5 (HSPD-5), February 28, 2003.

Robert T. Stafford Disaster Relief and Emergency Assistance Act, Public Law 93-288, as amended by Public Law 106-390, October 20, 2000.

Nuclear/Radiological Incident Annex to the NRF, U.S. Department of Homeland Security June 2008.

Title 10 CFR 835, "Occupational Radiation Protection," December 14, 1993, Revised January 1, 2009.

Title 29 CFR 1910, "Occupational Safety and Health Standards," Subpart 1910.120, "Hazardous Waste Operations and Emergency Response." Revised July 1, 2009.

Title 44 CFR, "Emergency Management and Assistance," October 1, 1992, Revised October 1, 2008.

Title 44 CFR 351, "Radiological Emergency Planning and Preparedness," October 1, 1992, Revised October 1, 2008.

Executive Orders

Executive Order 13286, February 28, 2003 (Amendment of Executive Orders, and other actions, in connection with the transfer of certain functions to the Secretary of Homeland Security). Amends, among others, EO 12919, June 3, 1994; EO 12656, November 18, 1988; EO 12148, July 20, 1979.

Executive Order 12656, "Assignment of Emergency Preparedness Responsibilities," November 18, 1988.

Executive Order 12241, "National Contingency Plan," September 29, 1980.

Executive Order 12196, "Operational Safety and Health Programs for Federal Employers," February 26, 1980.

Executive Order 12148, "Federal Emergency Management," July 20, 1979.

DOE Orders

DOE Order 151.1C, “Comprehensive Emergency Management System,” November 2, 2005.

DOE Order 450.1A, “Environmental Protection Program,” June 4,2008.

DOE Order 5400.5, “Radiation Protection of the Public and the Environment,” February 8, 1990, and Change 1, June 5, 1990, and Change 2, January 7, 1993.

DOE Order 153.1, “Departmental Radiological Emergency Response Assets” June 27, 2007.

Other Federal Agency Documents

Assistant to the Secretary of Defense. *Nuclear Weapon Accident Response Procedures (NARP) Manual,* DoD 5100.52-M, September 1990; Defense Nuclear Agency, Alexandria, VA.

McKenna, T., et al. *RTM-96 Response Technical Manual,* NUREG/BR-0150, Vol. 1, Rev. 4, March 1966; Nuclear Regulatory Commission, Division of Operational Assessment, Office for Analysis and Evaluation of Operational Data.

U.S. Department of Health and Human Services/U.S. Food and Drug Administration. *Accidental Radioactive Contamination of Human Food and Animal Feeds,* August 13, 1998. Electronic version available at: www.fda.gov/cdrh/dmqrp/84.html. Accessed: December 29, 2008.

U.S. Environmental Protection Agency. *EPA Manual of Protective Action Guides and Protective Actions for Nuclear Incidents,* May 1992. Electronic version available at: www.epa.gov/radiation/rert/pags.html. Accessed: December 29, 2008.


RESPONSE
TRIBAL
RECOVERY
READINESS
STATE
LOCAL
FRMAC
FEDERAL RADIOLOGICAL MONITORING AND ASSESSMENT CENTER