



# The Evolution of FRMAC: Focusing on the Future

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FRMAC Program Manager  
National Nuclear Security Administration  
(NNSA)

2010 National REP Conference  
Chicago, Illinois





# 25 Years of Partnership

## Offsite Radiological Emergency Preparedness

- Three Mile Island Nuclear Power Plant in March 1979
  - President and Congress directed the impacted federal agencies to develop a plan to provide for an integrated federal response to radiological emergencies
- 1980 Federal guidelines compel establishing the FRERP –and ultimately the Federal Radiological Monitoring and Assessment Center (FRMAC)
- FFE-1: 1984 First FRMAC Exercise at St. Lucie NPP, Marks the beginning of Radiological Emergency Preparedness Partnership



# 25 Years of Partnership

## Offsite Radiological Emergency Preparedness

- FRMAC focus expands from its roots with nuclear power plant incidents to include:
  - Accidents involving major radiological sources on spacecraft
  - Detonation of a Radiological Dispersal Device (RDD)
  - Detonation of an Improvised Nuclear Device (IND)



# 25 Years of Partnership

## Offsite Radiological Emergency Preparedness

- Rapid response always a driving factor
- Reach back to Home Teams for early modeling and assessment support:
  - NARAC – dispersion modeling
  - CMHT – data assessment
  - REAC/TS – medical assessment
- Phased response teams to place monitoring assistance on the ground as soon as needed



# 25 Years of Partnership

## Offsite Radiological Emergency Preparedness

- FRMAC Response Team; improving assistance through exercising with State and local agencies – Don Van Etten, RSL Nevada
- Advancing Dispersion Modeling for early protective actions – John Nasstrom, NARAC
- Assessing Avoidable Doses – Tom Laiche, SNL



# Evolution of Consequence Management Response Teams

Presented By  
Don Van Etten  
FRMAC Programs  
Remote Sensing Laboratory (RSL), Nevada  
National Security Technologies (NSTec)





# Deployment (early 1990s)

## ➤ An Advance Party

- 4-10 hours after event
- Planning, preparation

## ➤ FRMAC Arrives

- 24-36 hours after event
- All Federal Assets
- 100 plus responders
- Event driven and directed



## ➤ Exercise Lessons Learned

- Need faster response time to establish an operating FRMAC



# Deployment (circa 1999)

- A DOE Phased Approach (CMRT I)
  - A small Response Team with the Advance Party
    - 15 persons for planning and set-up
  - Field Team Assets to begin collecting data
    - To integrate with responders on scene
  - Equipment, command and control to begin coordination of all Federal Assets as they arrive
    - Equipment is rapidly deployable and can even be carried commercial air as check baggage
  - Four hours 'Wheels Up' from Las Vegas, NV



# Deployment (circa 1999)

- A Phased Approach (CMRT II)
  - 45 additional responders
  - Integrating with other State / Federal Assets on scene
  - 12 hours 'Wheels Up' from Las Vegas, NV
  - Enough people & equipment to operate multiple shifts
- FRMAC Operational at 24 hours
  - With the inclusion of other Federal Assets
  - Better coordination of oncoming assets



# Deployment (circa 2005)

- CMRT I evolves to better support the event
  - Personnel component doubles to support multiple shifts
  - Implementation of NIMS and the Incident Command System
- CMHT is born to better support planning and preparation
- Augmentation is born
  - A pool of trained responders from DOE and other federal agencies to be deployed based on the severity of the event



# CM Home Team

*Mission:* Support incident while CMRT is en route

Ongoing reachback support to DOE as well as federal, state, local and tribal requests

*Activation:* Immediate (during duty hours)

2 hours (off duty)

- Duty Manager
- Home Team Support Specialists (Bridge Line Coordinators)
- GIS Scientist
- Assessment Scientist
  - Position filled by scientists from the National Labs
  - RSL scientist to assist in-house
- Data Management Technician
- NARAC Support Personnel
- paperlessFRMAC Administrator





# CMHT Capabilities

- Assessment
  - Data assessment and map products
  - Assessment Scientists provide support to State personnel via Bridgeline
- AMS Reachback
  - Mission support and data analysis
- CMweb
  - Provides access to maps and other data products
- RAMS database
  - Allows responders to report field data related to radiation in real time to CMHT
  - Houses all data generated by or received by FRMAC
- Bridge line
  - Monitored conference lines available 24/7 during an event
  - Provides state and local responders with access to assessment scientists and agencies such as EPA, NRC, CDC for guidance



# AMS On-Call Response

*Goal:* Get data from large area quickly  
*Method:* Fly high and fast

## Beech King Air B-200

- Twin-engine turbo prop
- IFR (all weather) rated
- 260 knots (300 mph)
- Range 1,130 nm (1,300 sm)
- Max Endurance 5 hrs (without refueling)
- Avg. post-flight data processing time: 1 hour
- Data Products: Breadcrumb overlay plot
- Real-time data telemetry

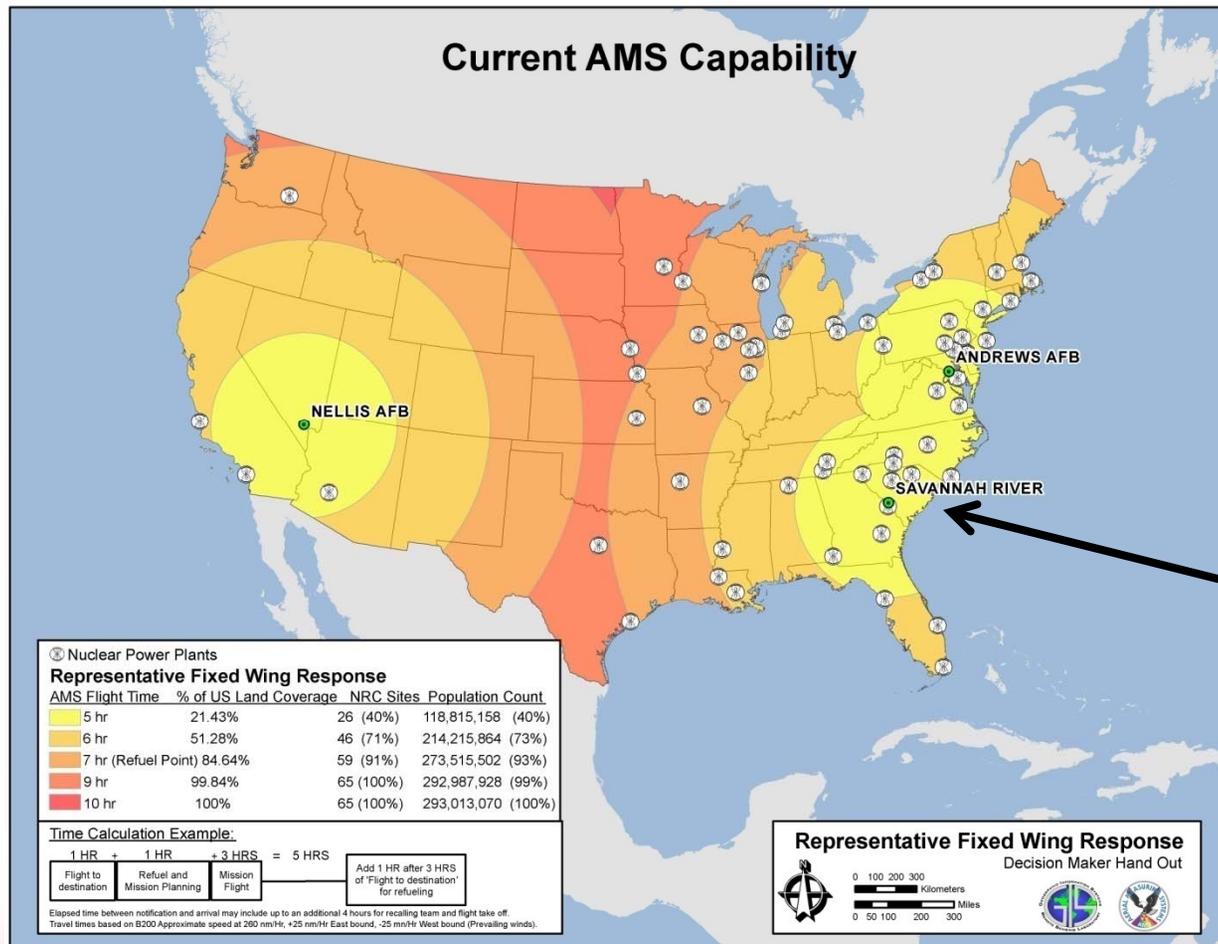
Two, 4-person on-call response teams  
(RSL-Nellis and RSL-Andrews)

- 24 / 7 duty
- 2-hour recall, 4-hours wheels up





# Fixed-Wing Response Range



**New**



# CM Response Team I (CMRT I)

*Mission:* Initial field element of FRMAC  
*Activation:* 4 hours following notification

- Trained responders - 25
- Equipment – 3,500 pounds
- Operations – 24 hours (for limited time)



- Initial capabilities
  - Assessment
  - Geographical Information Systems
  - Health & Safety
  - Monitoring & Sampling
    - Five field teams
  - Logistics



# CM Response Team II (CMRT II)

*Mission:* Complete CMRT staffing for full 24-hour operations

*Activation:* 12 hours following notification

- Additional responders – 38
  - 24-hour/day operation for several weeks
  - Augmented monitoring, sampling and assessment
- Additional equipment – 25,000 lbs.
  - 20 field teams
- Laboratory Analysis
  - Sample receipt
  - Prepare samples for transport to labs
- Training for additional responders





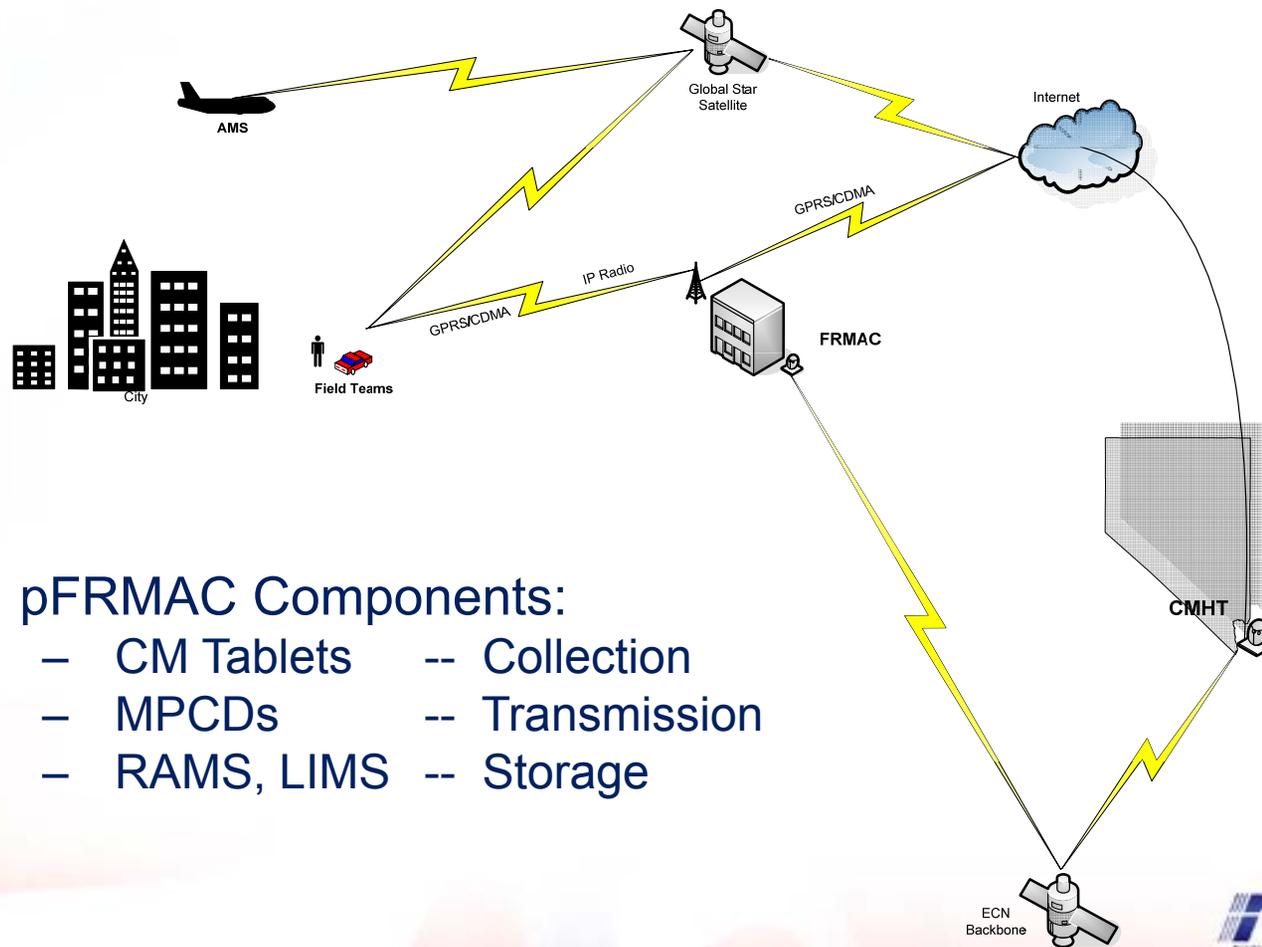
# FRMAC Data Collection and Products

- FRMAC monitoring and sampling data captured via pFRMAC tablet system
  - RAP early data collection and satellite transmission to CMHT/CMRT
  - DOE provided software to allow other response agencies data collection and transmissions via Internet
- Data managed via RAMS database
  - Servers satellite linked between CMHT and CMRT
- Outputs directly to NARAC, EPA, and FRMAC GIS to generate products
- Supports goal of delivering products to decision makers faster



# Paperless FRMAC

Provides timely and defensible data for analysis and archival



- pFRMAC Components:
- CM Tablets -- Collection
  - MPCDs -- Transmission
  - RAMS, LIMS -- Storage



# Further Refinement of Phased Approach

- Optimize response for wide range of incidents
- Support geographically distributed incidents (e.g., IND)
  - Forward field teams
  - More home team support (numbers of people and skill sets)
  - Core FRMAC in central, yet safe, location
- Formalize augmentation and reach out to additional organizations (NRC, CST, “some reference to locals trained to support NPP accidents”)



# FRMAC Augmentation

- DOE Augments CMRT I & II and is staffed through the national laboratories and the RAP regions
- Augmentation from other Federal Agencies
- Supports larger and extended operations and allows for people to be rotated out
- Regionally deployed to the affected area



# AMS Radiological Mapping Overview

*Goal:* Get more detailed data

*Method:* Fly low and slow

## Bell-412

- Twin-Pac turboshaft engine
- IFR (all weather) rated
- 120 knots (140 mph)
- Range 360 nm (410 m)
- Max Endurance 3 hrs (without refueling)



## Eight person crew:

- Flight Crew
  - Pilot (2)
  - Electronics Tech (1)
- Ground Crew
  - Mission Scientist
  - Data Scientist
  - Data Technician
  - Electronics Tech (1)
  - Helicopter Mechanic



# FRMAC and NARAC Advances in Data/Model Products and Web Access

Presented By  
John Nasstrom, PhD  
National Atmospheric Release Advisory Center  
Lawrence Livermore National Laboratory



This work performed under the auspices of the U.S. Department of Energy by Lawrence Livermore National Laboratory under Contract DE-AC52-07NA27344.





# Outline of this presentation

- paperlessFRMAC advances in processing of measurement data to update NARAC model predictions
- Briefing versions of data/model products
- *CMweb*: Unified distribution of FRMAC and NARAC model and data products



# Modeling and Monitoring in a Coupled, Cyclical Process

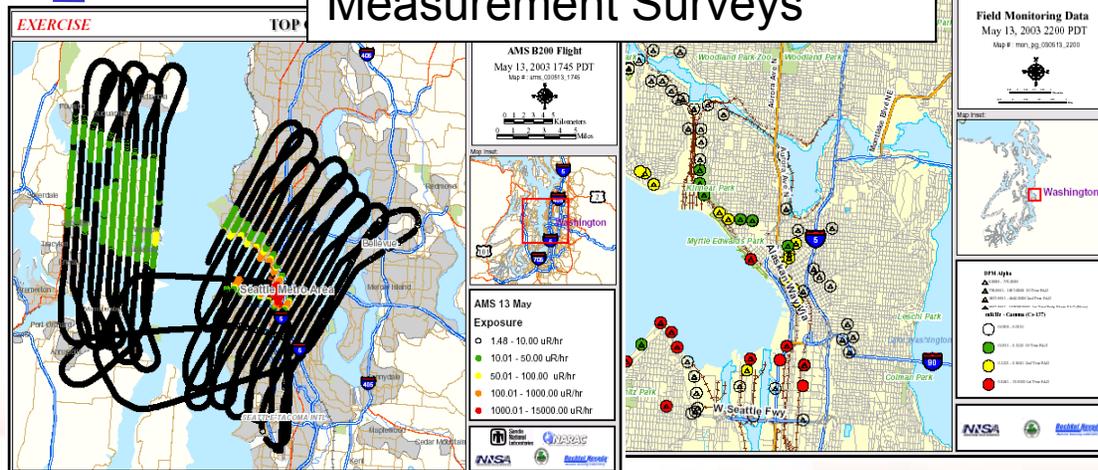
NARAC Plume Model Predictions



Model predictions guide measurement surveys

Measurements refine model predictions

FRMAC/ AMS Measurement Surveys





# Field Measurement Processing and Analysis Capabilities Reduce the Delivery Time for Data-Model Products of Projected Dose

Electronic transfer of measurement data from Paperless FRMAC RAMS Database to NARAC (XML, Excel/CSV formats)

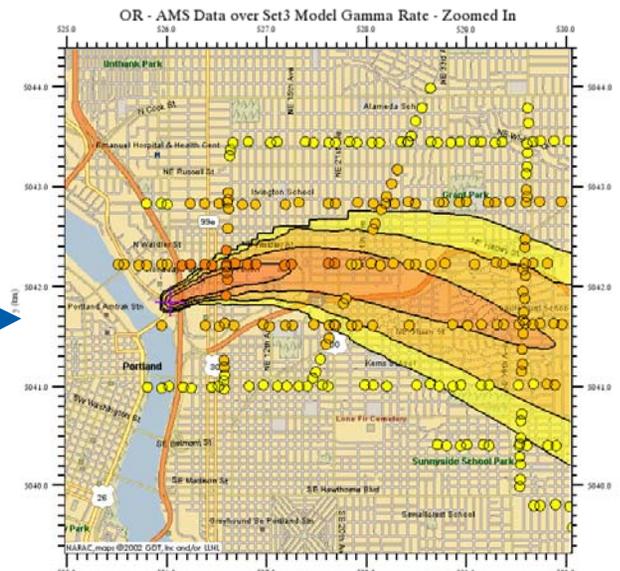
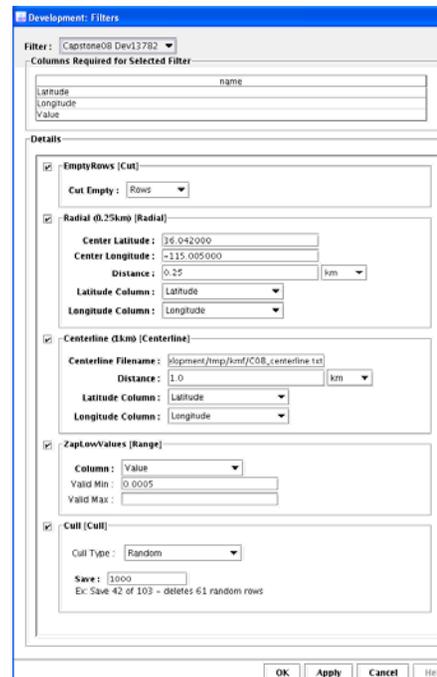
## NARAC Analysis Software

- Measurement data filtering, selection and outlier elimination
- Graphical/statistical analysis of measurement-prediction agreement
- Determination of improved model inputs

Refined Model Predictions using measurement data

```

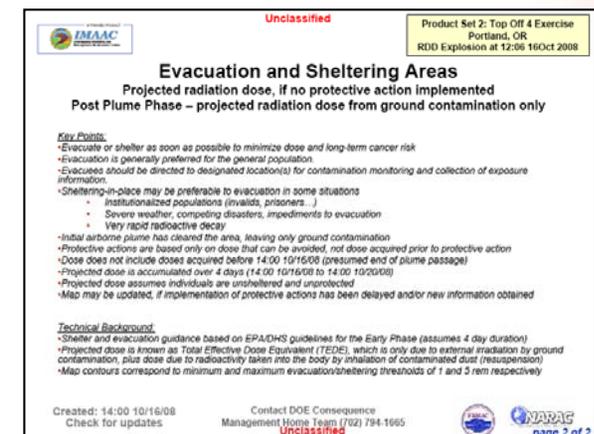
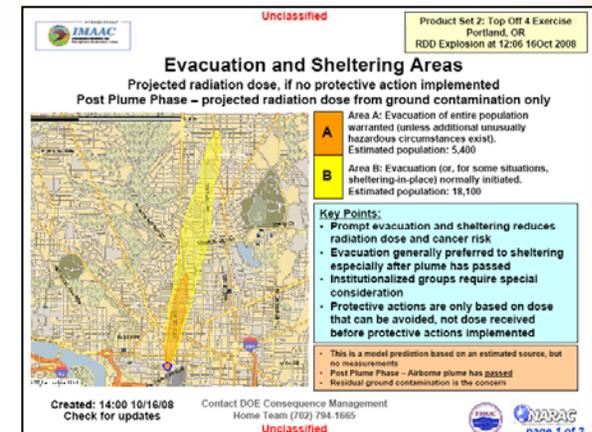
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# Briefing Products Have Been Developed to Help Communicate Actionable Information to Decision Makers for Radiological Incidents

- The Homeland Security Council requested that IMAAC and FRMAC produce hazard area maps and explanations so that State and local officials can be briefed effectively
- Characteristics of briefing products:
  - Explain possible actions, like sheltering and evacuation, that need to be considered and why
  - Communicate protective action guides in plain, non-technical language
- Products intended to help subject matter experts brief decision-making officials
- DOE and DHS supported the project
- Harvey Clark (DOE/RSL) and Kevin Foster (LLNL) led the effort
- Software automatically produces PowerPoint versions of briefing products



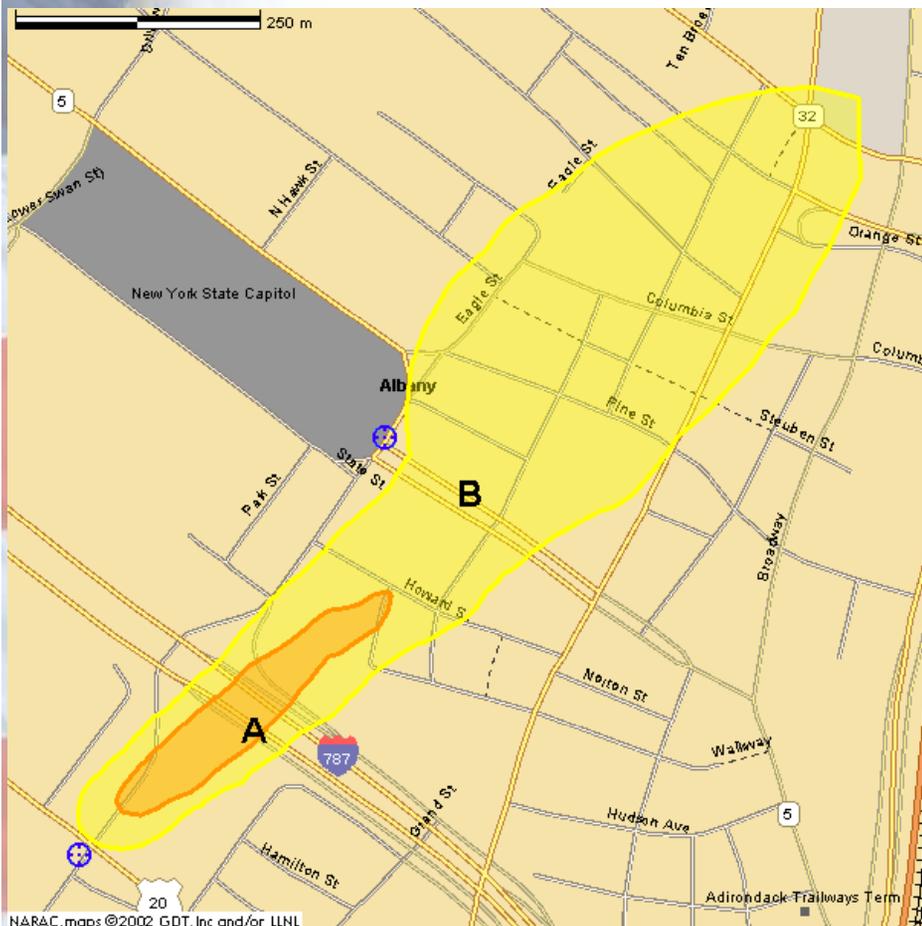


# Predicted Evacuation and Sheltering Areas Based on EPA/DHS Guides

Applicable within first hours/days while radioactive cloud is present

## Example Briefing Product

Automated Report: Exercise  
Albany, NY  
RDD Explosion at 09 Sep 2009 18:00 UTC



A

Evacuation of entire population warranted, unless additional unusually hazardous circumstances exist (exceeds 5 rem). Estimated Population: 80

B

Evacuation or sheltering normally initiated (1 to 5 rem). Estimated Population: 250

### Notes:

- Promptness of evacuation and/or sheltering reduces radiation dose and cancer risk.
- Sheltering-in-place can be more protective than evacuation while 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.
- Protective actions are only based on dose that can be avoided. Prediction does not include dose received before 9 Sep 2009 19:00 UTC.

### Assumptions:

- Areas shown are model predictions based on an estimated source term but no measurements.
- Plume Phase - Radioactive cloud may still be present or imminent.
- Four days exposure to both airborne and ground contamination.



# Predicted Evacuation and Sheltering Areas Based on EPA/DHS Guides

Applicable within first hours/days while radioactive cloud is present

Key points communicate  
important considerations from  
protective actions

Automated Report: Testing  
Albany, NY  
RDD Explosion at 09 Sep 2009 18:00 UTC

## ***Key Points***

- Protective actions are based on dose that can be avoided.
- Areas shown do not include dose received before 9 Sep 2009 19:00 UTC.
- 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 9 Sep 2009 20:45 UTC.
- 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 delayed evacuation may be best if radioactive decay is very rapid.
- Predicted dose is accumulated over 4 days (9 Sep 2009 19:00 UTC to 13 Sep 2009 19:00 UTC).
- Predicted dose assumes individuals are unsheltered and unprotected.
- Use the "Radioactive Cloud has Passed" map after radioactive cloud passes.





# Access to Model/Data Products from FRMAC, NARAC/IMAAC and CMHT Has Been Unified under *CMweb*

<https://cmweb.llnl.gov>

- Links to public information and documents on FRMAC and other DOE Emergency Response assets
- Login to secure, password-controlled site for restricted information, including exercise and response data products from FRMAC, NARAC and IMAAC
- Same user name and password for CMweb, NARAC Web and IMAAC Web



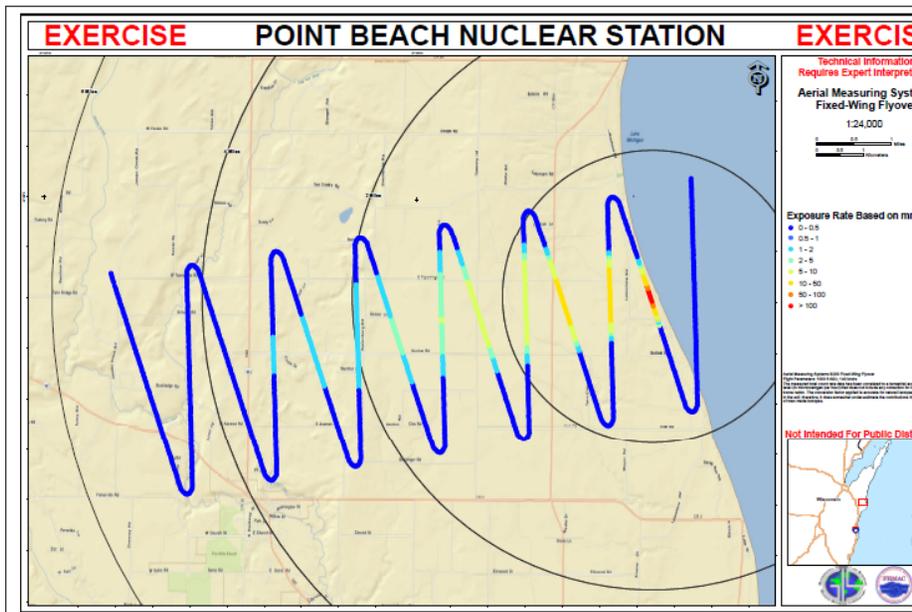
The screenshot shows the CMweb website interface. At the top left is the CMweb logo, which includes a radiation warning symbol and the text "CMweb". Below the logo is a navigation menu with the following items: FRMAC (highlighted in red), Home, Documents and Manuals, and Calendar. To the right of the menu is a list of emergency response assets: pFRMAC, ARAC, AMS, ARG, RAP, NEST, and REAC/TS. The main content area contains a welcome message from the DOE National Nuclear Security Administration (NNSA) Office of Emergency Response (NA-42) and a description of the site's purpose. On the right side of the main content area is a login box with fields for User ID and Password, a Sign In button, and links for "Forgot password?" and "Request Account". At the bottom of the page, the identifier "LLNL-WEB-410860" is displayed.



# FRMAC/AMS Measurement Surveys and NARAC Model Predictions are Available on a Single CMweb Site

FRMAC and AMS Measurement Survey Maps

NARAC Model Predictions

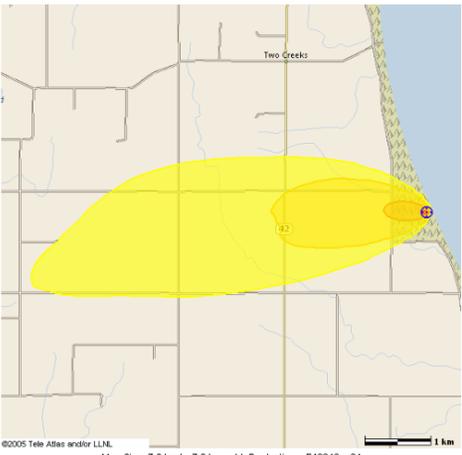




**For Exercise Use Only**

**Emergency Workers Dose Rate (Far Field)**  
(Groundshine Dose Rate at Release Time + 12 Hrs)

Initial NARAC Projection  
NARAC Report - Assessment



Acute (Short-Term) Effects			
	Description	(mrem/hr) Extent Area	Population
	Limit for all occupational exposures exceeded by exposure for 5 hours or less.	>1,000 0.06km 0.004km <sup>2</sup>	0
	Limit for all occupational exposures exceeded by exposure for 50 hours or less.	>100 0.7km 0.2km <sup>2</sup>	0
	NCRP radiological control boundary.	>10 2.4km 2.0km <sup>2</sup>	0
	NRC public exclusion zone.	>2 6.1km 9.9km <sup>2</sup>	50

**Note:** Areas and counts in the table are cumulative. Population Source = LandScanUSA10.

Effects or contamination at December 10, 2008 06:00 UTC at or near ground level.  
**Release Location:** 44.280800 N, 87.536100 W  
**Release Material:** I-132 + daughters + I-134 + CS-136 + I-135 + CS-135 + I-129 + I-133 + RB-88 + RB-87 + I-131  
**Generated On:** October 01, 2008 20:55 UTC  
**Model:** ADAPT/LODI  
**Comments:**  
 Release starting at 12/09/2008 18:00:00 UTC for 1 hr  
 canned met at 12/09/2008 18:00:00 UTC; 12/09/2008 18:45:00 UTC; 12/09/2008 19:00:00 UTC  
 Groundshine dose only. Assumes use of respiratory protection.

©2005 Tele Atlas and/or LLNL. Map Size: 7.0 km by 7.0 km. Id: Production.rcE16616.rcC1

NARAC Operations: ( onDuty Assessor ); narac@lnl.gov; 925-424-6405  
 Requested by: (Assessment Scientist; CMHT; 702-794-1665 (Call for Further Explanation); cmh@nrcsa.doe.gov)  
 Approved by: (NARAC Operations; NARAC; 925-424-6405)

For Exercise Use Only



# CMweb Home Page Provides Links to Take You Quickly to FRMAC, AMS and NARAC Products

Links to Meeting Notes, Documents, in addition to Event and Exercise Folders.

**CMweb** No Msgs | Signed in as pobanz2-usa-ca | Your Account | Sign out

Home CM Events View Members Bookmarks Help Manage

**Operations**

[Events](#) - There are currently no events being supported.

[Exercises](#) -

[NTNF November Exercise](#)

**NLE2010 Planning** - Planning has begun for the National Level Exercise to be held in May of 2010. Please do not use the NARAC system to generate runs for NLE2010. If you need access to run information, please contact NLE2010 planners Harvey Clark ([ClarkHW@nv.doe.gov](mailto:ClarkHW@nv.doe.gov)) or Brenda Pobanz ([pobanz2@lnl.gov](mailto:pobanz2@lnl.gov)).

**Federal Radiological Monitoring and Assessment Center (FRMAC)**  
Please call Keith Frandsen 702-295-8634 ([frandska@nv.doe.gov](mailto:frandska@nv.doe.gov)), with questions related to the FRMAC.

[FRMAC Working Groups](#)

[FRMAC Documentation](#)

**Aerial Measuring System (AMS)**  
Please call Karen McCall 702-295-8089 with questions related to AMS.

**Radiological Assistance Team (RAP)**

**Accident Response Group (ARG)**

**Emergency Support**  
DOE Watch Office 202-586-8100  
For consequence modeling support contact NARAC/IMAAC at (925) 424-6465.  
[Additional Information](#)

**Notices** (View all)

<a href="#">NNPP User Group access granted (boo...</a>	Nov 10, 2009 13:54:49
<a href="#">Reminder - NARAC NNPP User Group Web Meeting/Conference Call toda...</a>	<a href="#">more</a>
<a href="#">Dose Rate at 96 hours access grante...</a>	Nov 6, 2009 06:02:34
<a href="#">NTNF November Exercise - Updated NARAC calculation</a>	<a href="#">more</a>
<a href="#">Dose Rate at 72 hours access grante...</a>	Nov 5, 2009 07:49:17
<a href="#">NTNF November Exercise - Updated NARAC calculation</a>	<a href="#">more</a>
<a href="#">Dose Rate at 48 hours access grante...</a>	Nov 4, 2009 06:31:51
<a href="#">NTNF November Exercise - Updated NARAC calculation</a>	<a href="#">more</a>
<a href="#">Dose Rate at 24 hours access grante...</a>	Nov 3, 2009 06:10:58
<a href="#">NTNF November Exercise - NARAC Set 3</a>	<a href="#">more</a>

*Time in UTC*

**Guides and Information**

[CM Web User's Guide](#)  
Draft version

[FAQ](#)  
Answers to common questions.

[NARAC-IMAAC Plot Guide](#)

[Quick Guide to Web 2.3](#)

Notifications that new products or information are available

Guides and reference material

Access to all information is controlled, so though all users may see these links, only those with need to know will have access to their information



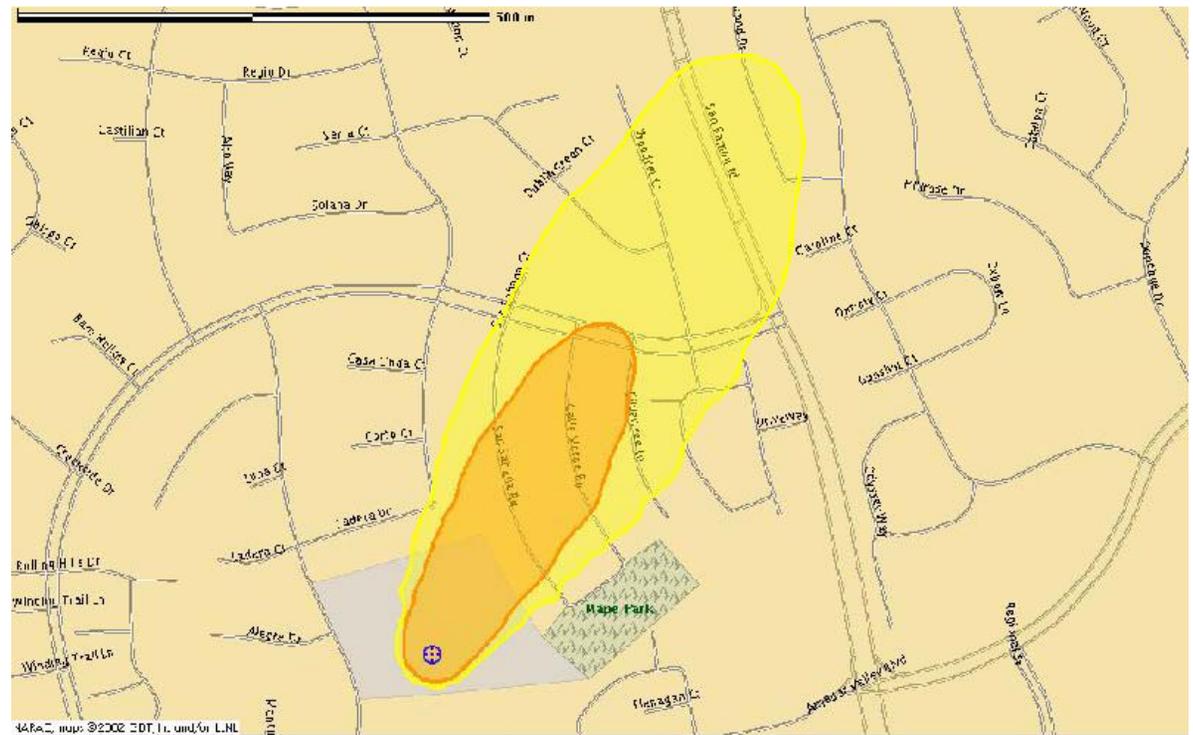
# Standard IMAAC/NARAC Technical Products

- Standard products designed for use by staff having technical background
- Assumes familiarity with dose-response relationships, health effects and dispersion modeling concepts as applied to emergency response
- Assumes previous training in application and interpretation of products



**Not For Public Dissemination**  
**Radiological Release Early Phase PAGs (TED)**  
**(Evacuation/Sheltering based on Avoidable TED)**  
**12-108 Hrs)**

RDD EP test  
 Automated Report -  
 Testing



Actions and Long-Term Effects				
Description	Level (rem)	Extent	Area	Population
Exceeds upper limit early phase PAG for evacuation/sheltering.	>5	403m	44,471m <sup>2</sup>	80
Exceeds lower limit early phase PAG for evacuation/sheltering.	>1	731m	142,571m <sup>2</sup>	250

**Note:** Areas and counts in the table are cumulative. Population Source = LandScanUSA10 LandScan2005.

Effects or contamination from September 10, 2009 06:00 UTC to September 14, 2009 06:00 UTC at or near ground level.





# For Each Exercise or Event There Will Be a Folder Under “CMweb Events”



# CMweb

No Msgs | Signed in as pobanz2-usa-ca | [Your Account](#) | [Sign out](#)

- [Home](#)
- [CM Events](#)
- [View](#)
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- [Help](#)
- [Manage](#)

## FRMAC and Briefing Products

[USA](#) > [CMweb](#) > [Events 2010](#) >

[March Capstone](#) > [FRMAC and Briefing P...](#)

### Description:

**Created:** March 8, 2010 19:45:31 UTC  
**Creator:** pobanz2-usa-ca

- [Overview](#)
- [Files \(5\)](#)
- [Links \(0\)](#)
- [Messages \(0\)](#)
- [Manage](#)
- [Share](#)
- [Delete](#)
- [Move](#)
- [Help](#)

Files (more)	Sort: Name	Date
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<a href="#">Sampling Status</a> 060204_1530_SamplingStatus1.pdf		3/08
<a href="#">Monitoring Status</a> 060902_FieldMonitoringSt.pdf		3/08
<a href="#">Worker Protection Briefing Product</a> Set3_Workder_Protection.pdf		3/08
<a href="#">Evacuation and Sheltering Briefing Product</a> Set3_Evacuation_PAG.pdf		3/08

This folder will contain the most recent Version of each FRMAC product and each Briefing Product



## ***Additional Information***

**John Nasstrom and Brenda Pobanz**

Lawrence Livermore National Laboratory  
P. O. Box 808, Livermore, CA 94551



This work performed under the auspices of the U.S. Department of Energy by Lawrence Livermore National Laboratory under Contract DE-AC52-07NA27344.





# The Future of FRMAC Assessment

Presented By  
Thomas Laiche, CHP  
Nuclear Incident Response Programs  
Sandia National Laboratories



Sandia is a multiprogram laboratory operated by Sandia Corporation, a Lockheed Martin Company, for the United States Department of Energy's National Nuclear Security Administration under contract DE-AC04-94AL85000.





# The Future of FRMAC Assessment

## ➤ Assessment Division



- Highly trained Health Physics professionals
- Analyzes radiological conditions
- Interprets data
- Performs complex radiation protection calculations
- Acts as a Liaison to internal and external entities
- Essential part of Response and Home Teams



# The Future of FRMAC Assessment



## ➤ Assessment Division – The Past

- Started with a handful of Health Physics professionals
- Training was via a Mentoring/Protégé process
- Started with a very Limited number of Resources
- Made Simplifying Assumptions in Assessment Methods to enable Hand Calculations



# The Future of FRMAC Assessment

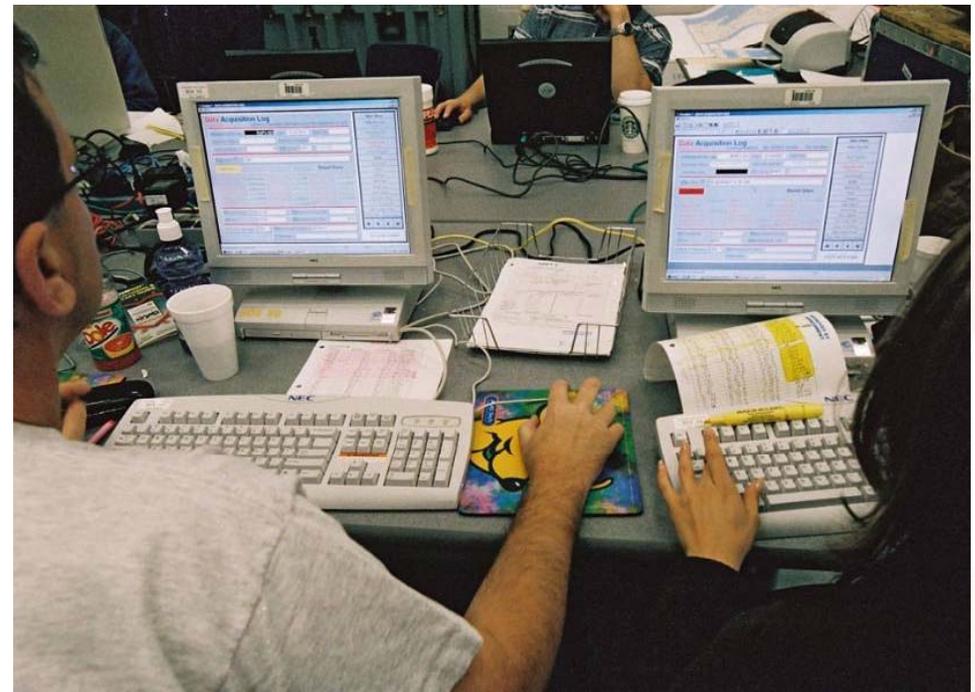


**Assessment Interacts With  
Every FRMAC Element!**



# The Future of FRMAC Assessment

- Improvements and Advancements to Assessment
  - Training
  - Staffing/Assignments
  - Responsibilities
  - Method Improvements
  - Calculation Tools
  - Availability





# The Future of FRMAC Assessment

## ➤ Training, Training, Training

- Assessment has a very structured set of initial and retraining requirements
  - Initial training on calculation tools (4 days)
  - Initial training on roles & responsibilities followed by a “Capstone” drill (3 days)
  - Continuing training via online problems and presentations (~1/qtr)
  - 3 year requalification required



# The Future of FRMAC Assessment

## ➤ Staffing & Assignments

- Core group of qualified Assessment Scientists from all the national labs available for Response and Home Teams
- Developing an Augmentation phase of trained Assessment Scientists to support long-term response
- Developing training for the Assessment Manager position
- Assignment of duties clarified and follow the ICS principles as described in the following slide

<b>Assessment Interactions</b>	<b>Primary Responsibilities</b>	<b>Secondary Responsibilities</b>	<b>Calculations Performed</b>
<b>A-Team /Federal Assets</b>	Providing PAG information, Dose Models, "Advanced" Parameters, Time Phases ( $t_1$ ), etc.	Integrate Federal assets into assessment response	
<b>Health and Safety</b>	Assisting with determining Dose Limits, Respirator Use, Shift Times	Re-entry Plans	Worker Protection (Turn back/Stay time)
<b>Monitoring and Sampling</b>	Assisting with development of Sampling Plans	Data Review	Resuspension
<b>Laboratory Analysis</b>	Providing Analysis Parameters such as analysis type,	Analysis Requests	MDAs, Resuspension
<b>GIS/NARAC</b>	Providing data for appropriate map and briefing products	Data Products, CM Web	
<b>RAMS/pFRMAC</b>	Reviewing data and assuring correct data is input	Data Approval, Action Item Tracking, CM Web	
<b>Home Team</b>	Requesting assistance with radiological issues, data interpretation, etc.	Calculations	Any DRLs, Worker Protection (Turn back/Stay time), Resuspension, MDAs
<b>State/Local/Tribal</b>	Integrating State/Local/Tribal Assessment assets into response	Calculations	Any DRLs, Worker Protection (Turn back/Stay time), Resuspension, MDAs



# The Future of FRMAC Assessment

## ➤ Method Improvements

### Old Method

$$DRL_{EPg} = P_{EP} \times \frac{\sum_i^n (C_{gi} \times ECF_{gi})}{\sum_i^n (C_{gi} \times DCF_{EPgi})}$$

### New Method

$$XR\_DRL_{t_n} = PAG * \frac{\sum_i \left\{ (Dp_i * e^{-\lambda_i t_n} * WF_{t_n}) * \left[ \frac{ExDC * GRF}{XDCF} \right] \right\}}{MTDP\_Dp}$$





# The Future of FRMAC Assessment

## ➤ Calculation Tools

The screenshot shows a software interface with a sidebar on the left and a main panel on the right. The sidebar is titled "Results" and contains a tree view with "Deposition DRLs" selected. The main panel is titled "Deposition DRLs" and contains a "Filter Options" section with three dropdown menus: "Age Group" set to "Adult", "Organ" set to "Whole Body", and "Commitment Period" set to "50 to 70 Year". Below the filters are "Expand All" and "Collapse All" buttons. At the bottom, a table displays the results for a radionuclide.

Radionuclide	Early Phase
$^{90}\text{Sr}$	6.76E3



# The Future of FRMAC Assessment

- How to Reach Assessment
  - FRMAC Assessment is available via Home Team, 24/7. (Initial response within 1 hour during normal work hours and 2 hours during off hours)
  - Initial calculations can be ready within minutes of response

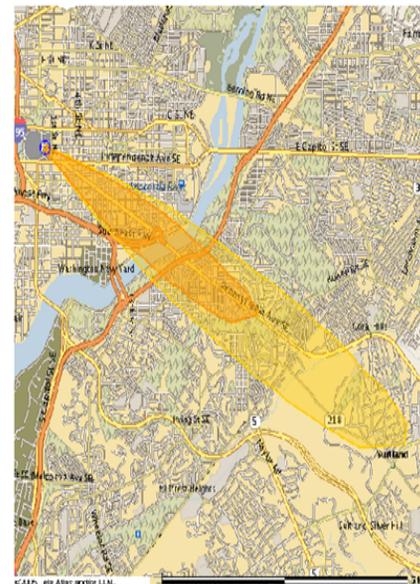


Unclassified

Product Set 2: Exercise  
Washington, D.C.  
RDD Explosion at 12:05 2/25/08

## Relocation Areas

Areas subject to relocation of population during 1<sup>st</sup> and 2<sup>nd</sup> years.  
Projected radiation dose from ground contamination only.



- D** Area D: Relocation warranted during first year  
Estimated population: 5,400
- C** Area C: Relocation warranted during first two (or more) years. Estimated population: 18,100

**Key Points:**

- Protective actions are only based on dose that can be avoided, not dose received before protective actions are implemented.
- Projected dose assumes no protective action or mitigation.

- This is a model prediction based on numerous measurements
- Airborne plume has passed, and ground contamination is the concern

Created: 14:00 2/25/08  
Check for updates

Contact DOE Consequence Management  
Home Team (702) 794-1665

Unclassified





# QUESTIONS