Access the recorded webinar here:
https://register.gotowebinar.com/recording/5565721654755685634?assets=true

Access speaker bios here:
https://asprtracie.s3.amazonaws.com/documents/healthcare-challenges-after-radiological-incidents-speaker-bios.pdf

Access Q&A here:
https://asprtracie.s3.amazonaws.com/documents/aspr-tracie-healthcare-challenges-after-rad-incident-webinar-qa.pdf

TRACIE
HEALTHCARE EMERGENCY PREPAREDNESS INFORMATION GATEWAY

Healthcare Challenges after Radiological Incidents

July 11, 2018

ASPR
ASSISTANT SECRETARY FOR PREPAREDNESS AND RESPONSE

ASPR TRACIE: Three Domains

- Self-service collection of audience-tailored materials
- Subject-specific, SME-reviewed "Topic Collections"
- Unpublished and SME peer-reviewed materials highlighting real-life tools and experiences

- Personalized support and responses to requests for information and technical assistance
- Accessible by toll-free number (1844-5-TRACIE), email (askasprtracie@hhs.gov), or web form (ASPRtracie.hhs.gov)

- Area for password-protected discussion among vetted users in near real-time
- Ability to support chats and the peer-to-peer exchange of user-developed templates, plans, and other materials

ASPRtracie.hhs.gov

1-844-5-TRACIE

askasprtracie@hhs.gov

ASPR
ASSISTANT SECRETARY FOR PREPAREDNESS AND RESPONSE

TRACIE
HEALTHCARE EMERGENCY PREPAREDNESS INFORMATION GATEWAY

TRACIE

HEALTHCARE EMERGENCY PREPAREDNESS INFORMATION GATEWAY

Craig DeAtley

Director, Institute for Public Health Emergency Readiness, MedStar Washington Hospital Center

ASPR

ASSISTANT SECRETARY FOR PREPAREDNESS AND RESPONSE

Webinar Objectives

- Discuss the science and modeling of a nuclear detonation
- Discuss assessment and care of the radiation-injured patient
- Describe exposure versus contamination and assessment
- Discuss healthcare impact and triage of fallout casualties (EAST)
- Learn about the response role of the Radiation Injury Treatment Network (RITN)

Setting the Stage

- Recent ASPR TRACIE presentations have discussed preparing for emerging and old standby infectious diseases, pediatric disasters, and no-notice large scale incidents
- Focus for today's webinar:
  - Community and nation-wide response to the first 72 hours after a RAD/IND incident
  - Problems and priorities that community responders will have to address after a radiologic incident
- The presenters on today's webinar are subject matter experts that will be speaking on six key "need to know about" topics related to radiological and nuclear health and medical response
- This webinar is an introduction to a complex subject and we will cover a lot of ground rapidly—please be sure to check out the resources promoted during the webinar for additional information

Note: In order for this PDF to meet Section 508 Compliance Standards, ASPR TRACIE removed the animation from this portion of the presentation. Please contact us for the fully (non-compliant) animated version that illustrates the damage zones, fallout, staging areas, and contamination over time associated with a radiological incident.

TRACIE

HEALTHCARE EMERGENCY PREPAREDNESS INFORMATION GATEWAY

Brooke Buddemeier, MS, CHP

Principal Investigator in the Global Security Directorate of Lawrence Livermore National Laboratory (LLNL)

ASPR

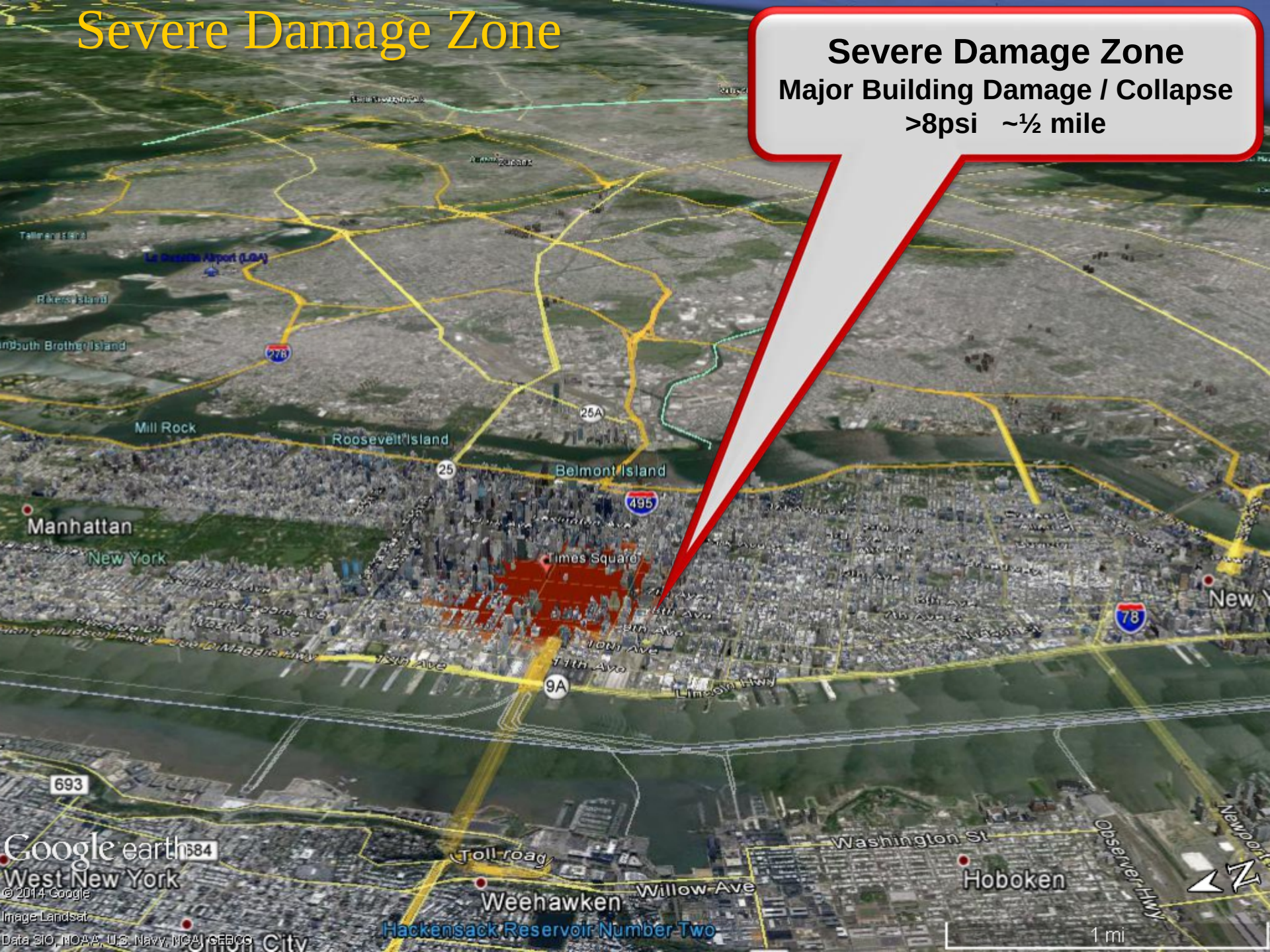
ASSISTANT SECRETARY FOR PREPAREDNESS AND RESPONSE

NYC Example: Times Square 10kT

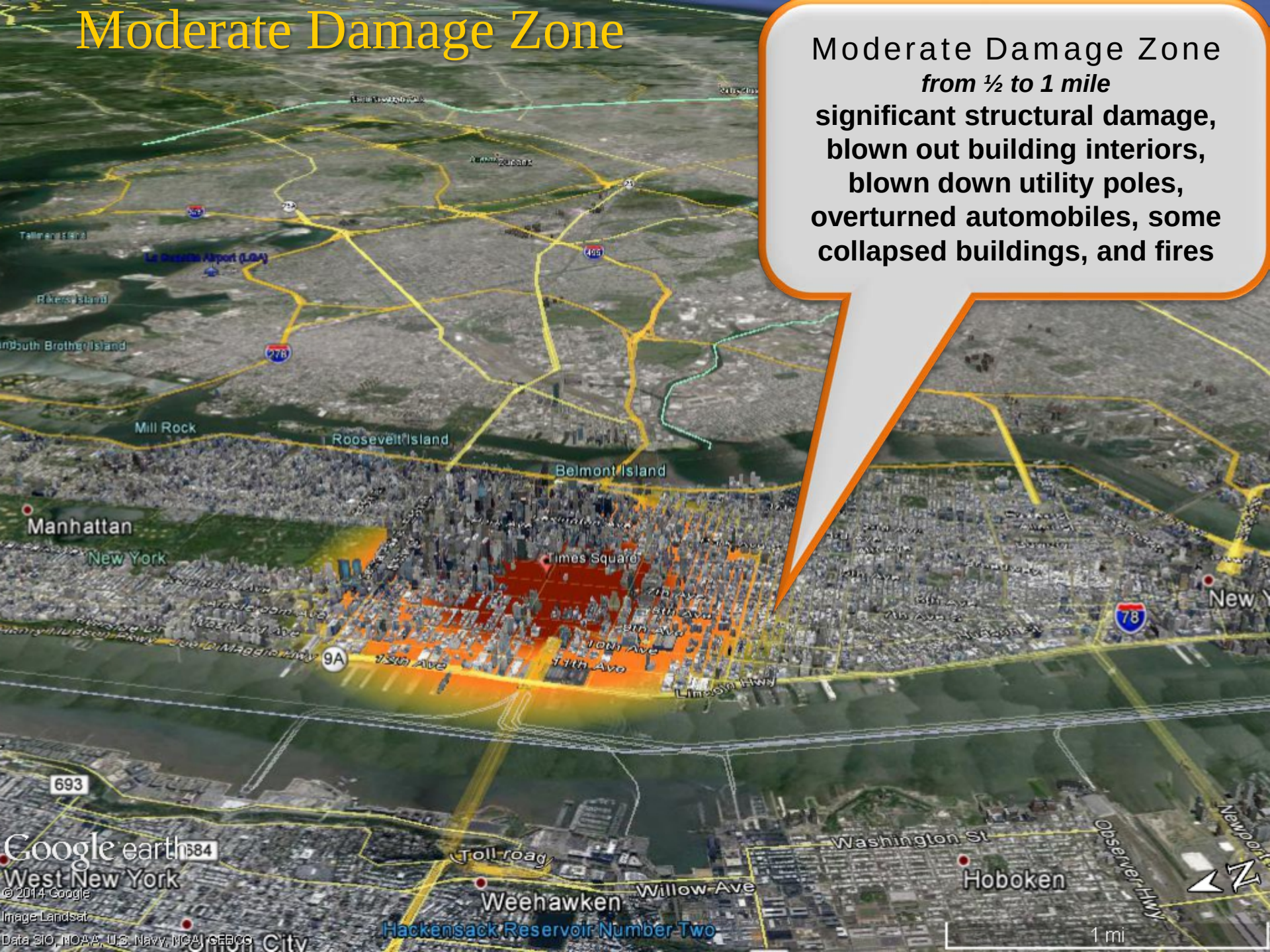
The Light of a Thousand Suns

- Scenario Presumptions:
  - 10kT Yield (equivalent to 5,000 Oklahoma City Truck Bombs)
  - Ground Level Detonation at Times Square
  - New York City Workday
  - Weather profile from August 14th 2009

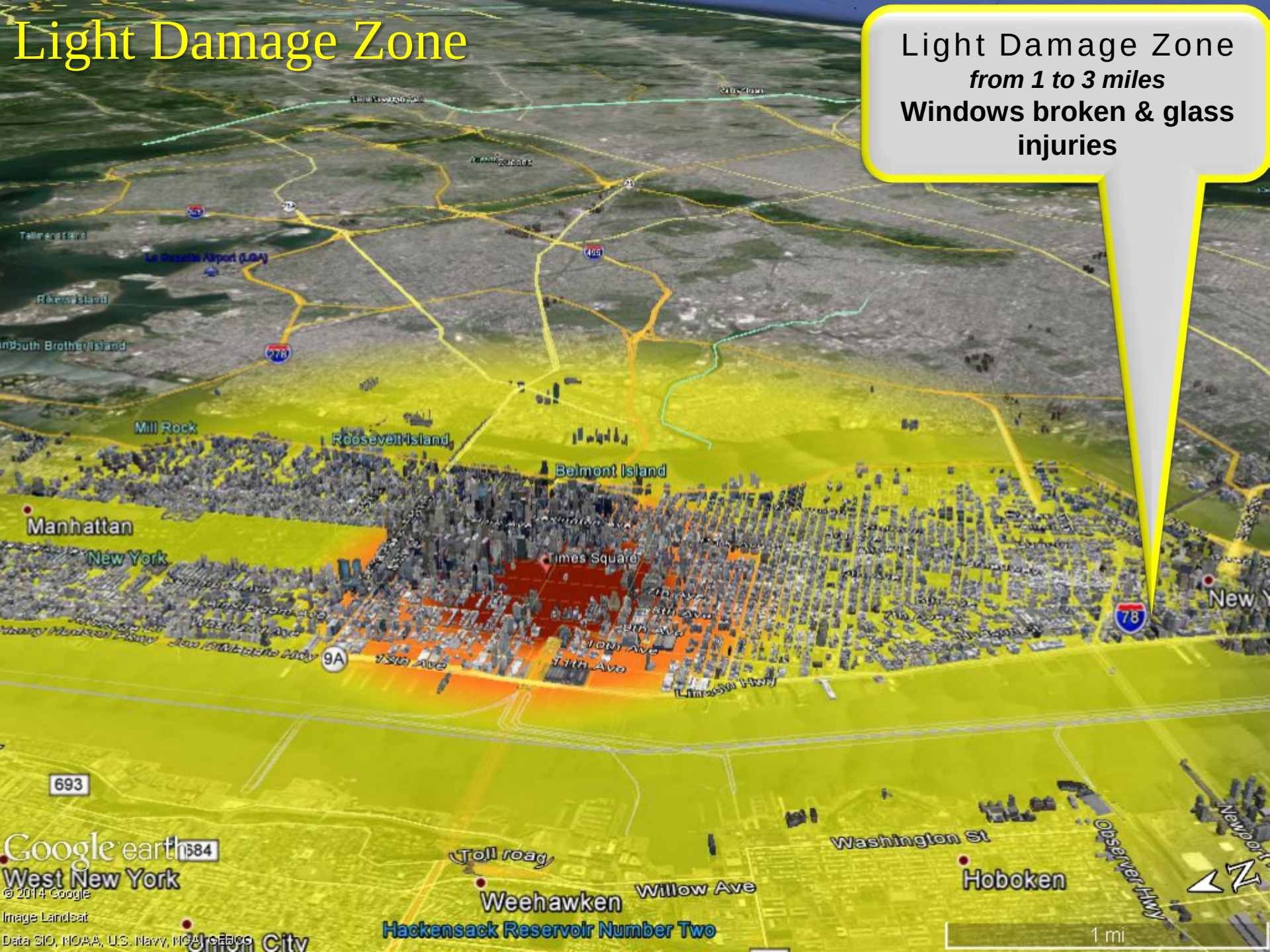
Severe Damage Zone



Moderate Damage Zone

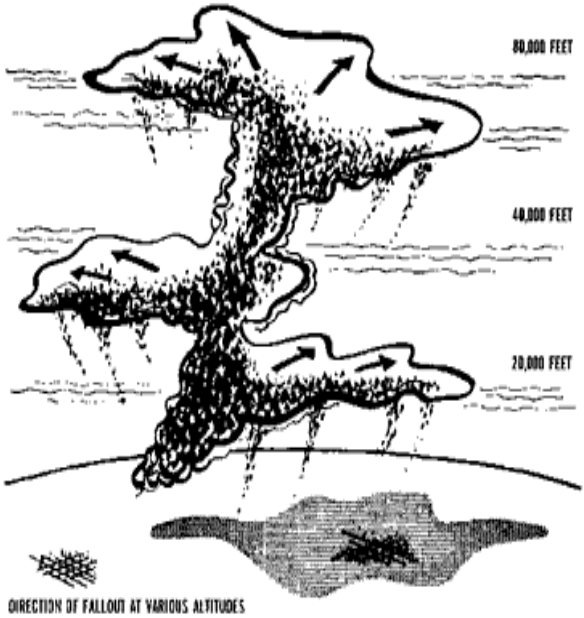


Light Damage Zone

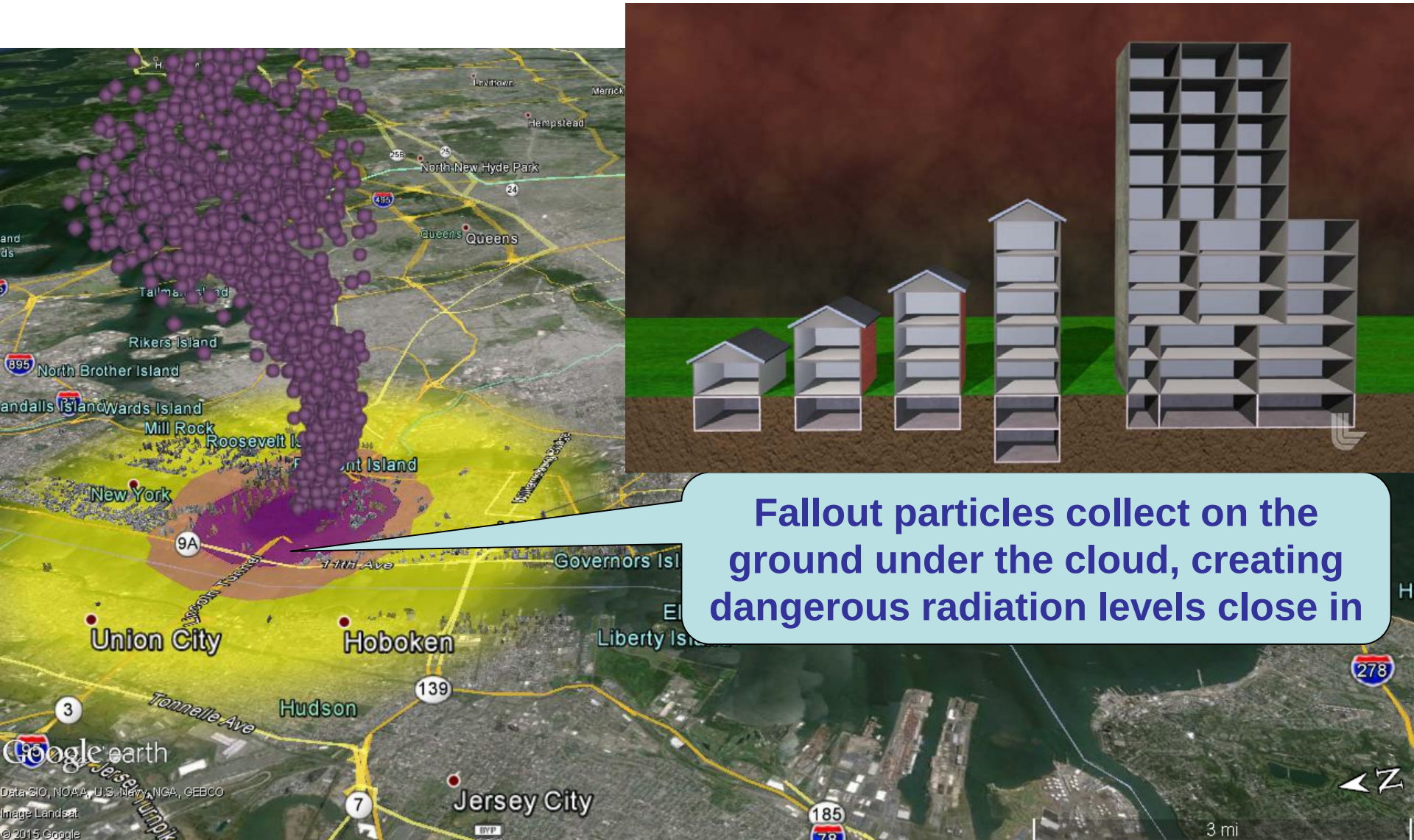


FALLOUT

- If the detonation occurs close to the ground, radioactive fallout can be created
- The **Fireball rises** at speeds greater than 100 mph, drawing **thousands of tons of dust and debris** upward that mix with the fission products.
- The fallout cloud rises several miles into the atmosphere before the particles fall back to earth **contaminating surfaces**
- Dangerous levels of fallout creates visible dust and debris. These particles give off **penetrating radiation** that can injure people (even in cars or inadequate shelter)

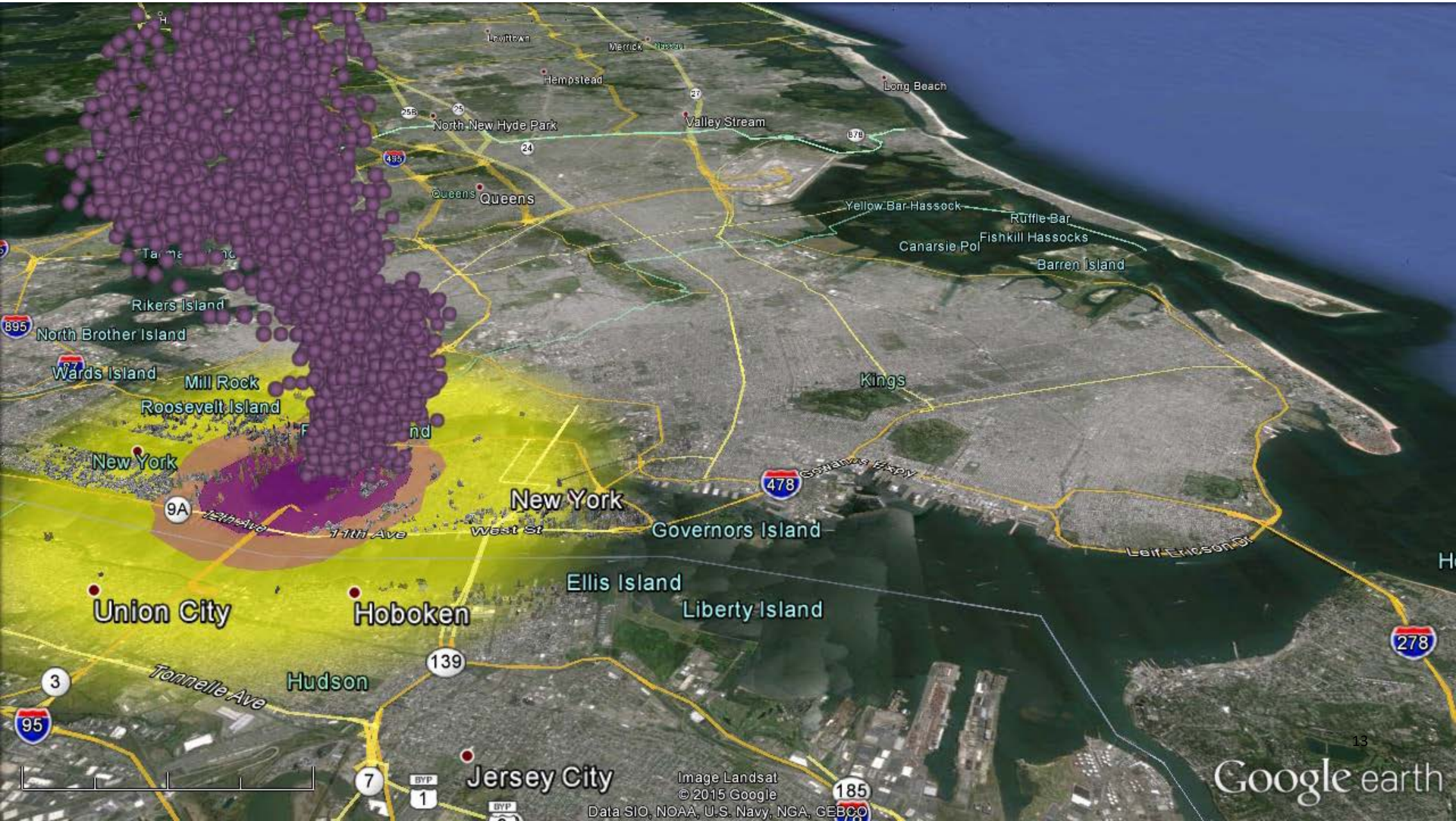


Fallout Creates Ground Level Radiation



Fallout particles collect on the ground under the cloud, creating dangerous radiation levels close in

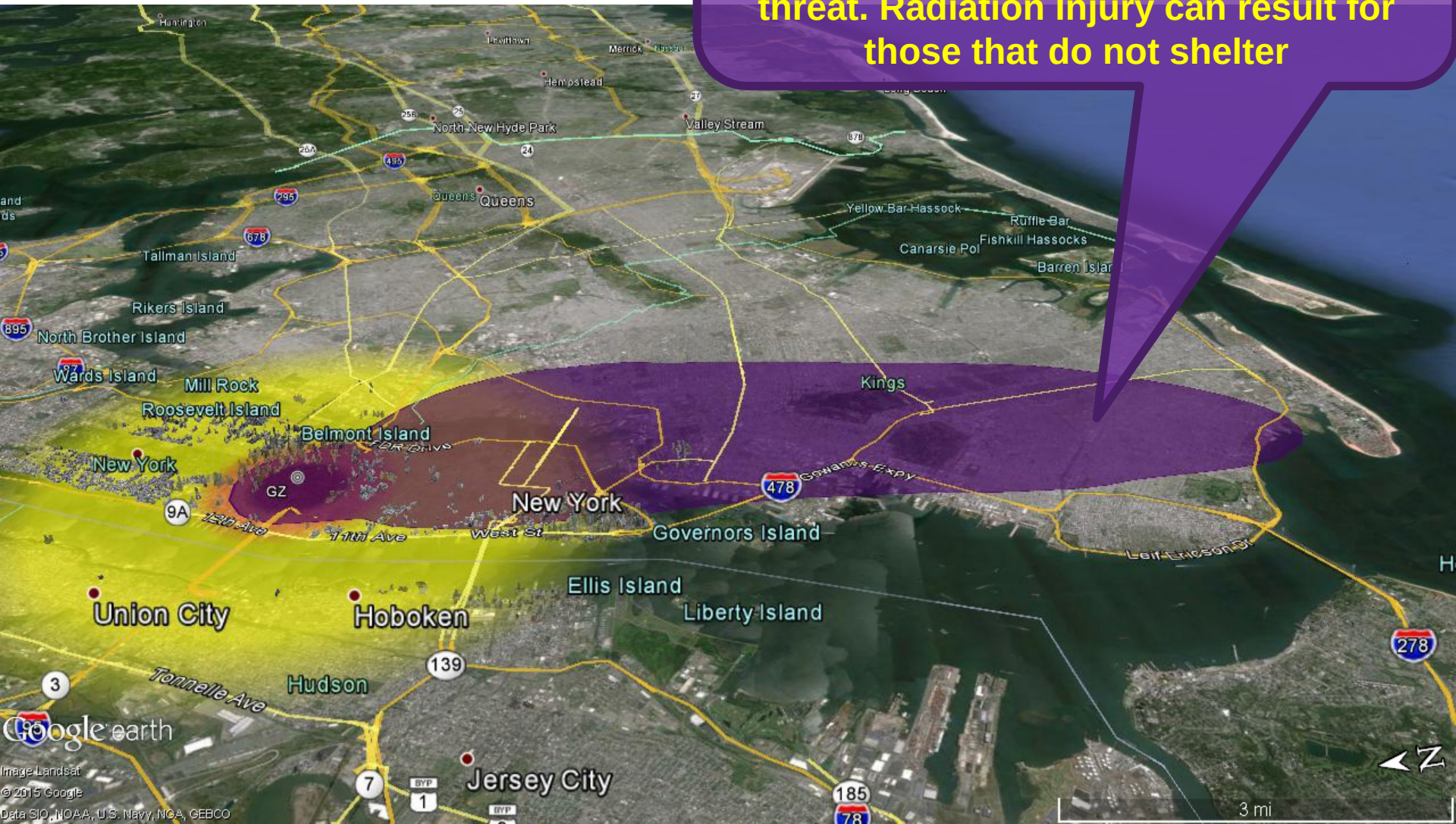
First 2 hours of Fallout



Fallout Extent at 2 Hours

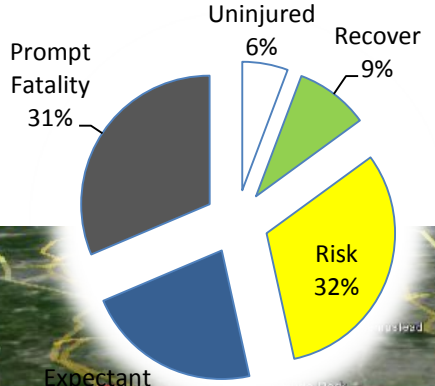
Dangerous Fallout Zone >10 R/h

Radiation represents a direct health threat. Radiation Injury can result for those that do not shelter

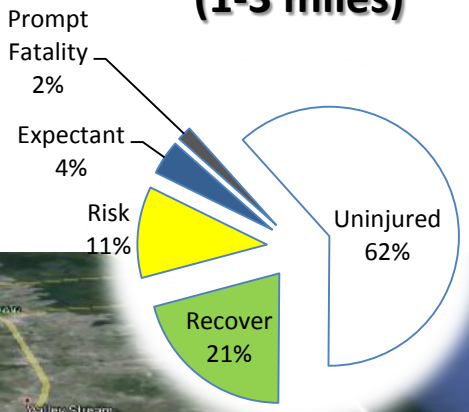


Severe Damage Zone (0-0.5 mile)

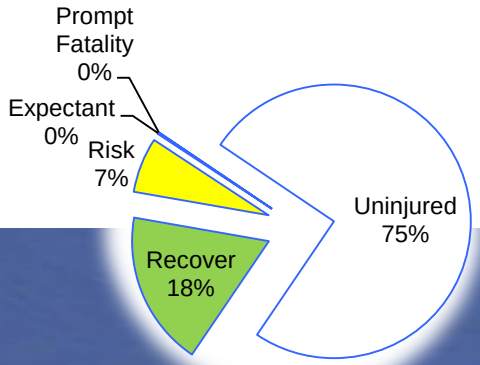
Moderate Damage Zone (0.5 - 1 mile)



Light Damage Zone (1-3 miles)



Dangerous Fallout Zone (Outside LDZ)



Total Population
740,000

Total Population
1,347,000

Total Population
1,427,000

MDZ: ~**250,000** "at risk" injuries

LDZ: ~**150,000** "at risk" injuries

DFZ: ~**100,000** "at risk" injuries

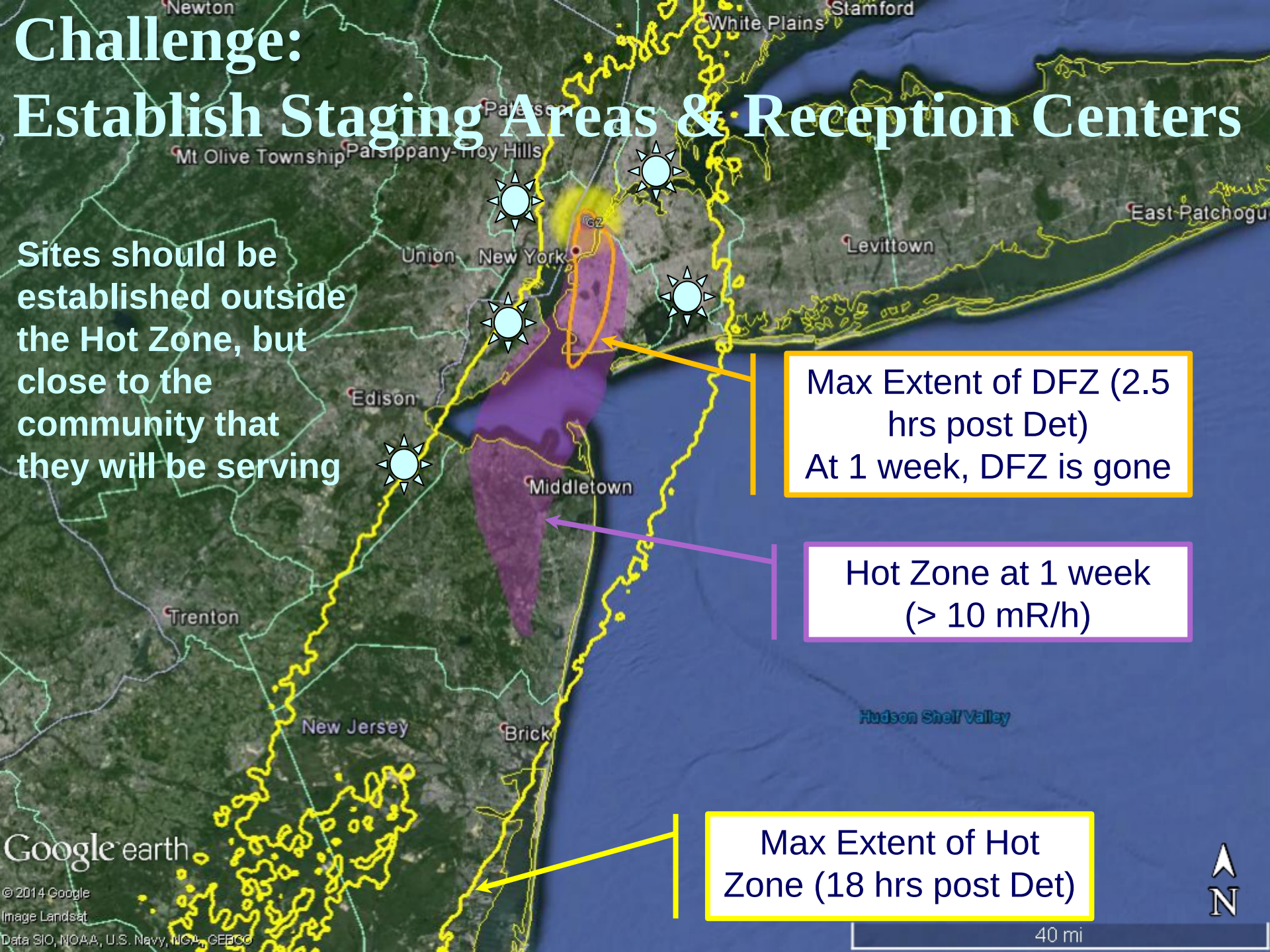
Injury Summary (NYC Scenario)

- Over 1 million injuries*
  - ~ 400,000 in Recover (low exposure) category
  - ~ 500,000 in **Risk** (significant exposure or injury) category
- At **Risk** radiation injuries may not be readily apparent
- Acute Radiation Syndrome often progresses over weeks, allowing extended opportunity for medical intervention
- With medical care, more than 100,000 potential **Risk** fatalities can be avoided.

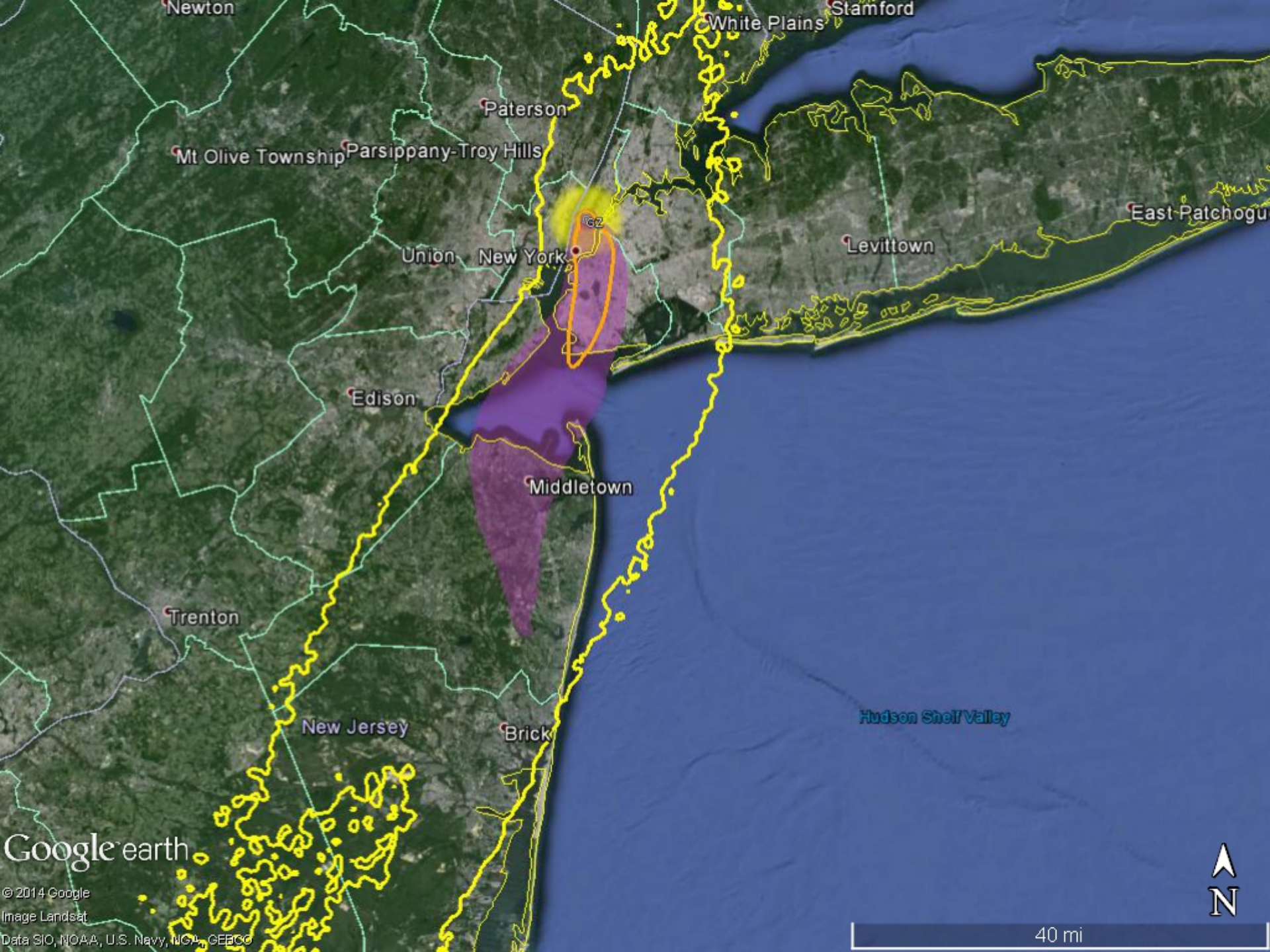
* Presumes prompt effects & 2 hours of outdoor fallout exposure

Challenge: Rapidly Changing Environment

Challenge: Establish Staging Areas & Reception Centers

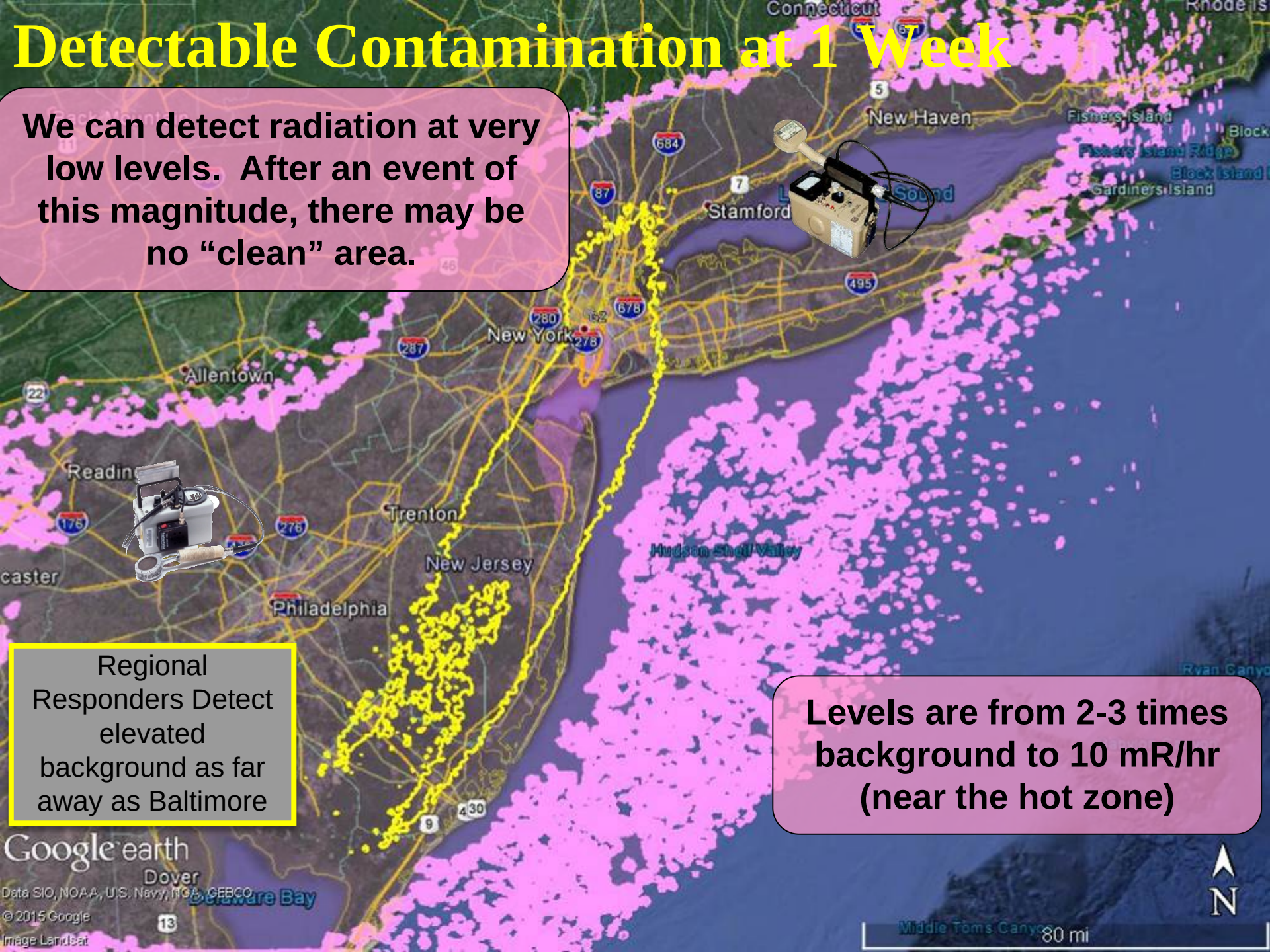


Sites should be established outside the Hot Zone, but close to the community that they will be serving


Newton
White Plains
Stamford
Paterson
Mt Olive Township
Parsippany-Troy Hills
GZ
Union
New York
Levittown
East Patchogu
Edison
Middletown
Trenton
New Jersey
Brick
Hudson Shelf Valley
Google earth
© 2014 Google
Image Landsat
Data SIO, NOAA, U.S. Navy, NGA, GEBCO
N
40 mi

Detectable Contamination at 1 Week

We can detect radiation at very low levels. After an event of this magnitude, there may be no "clean" area.

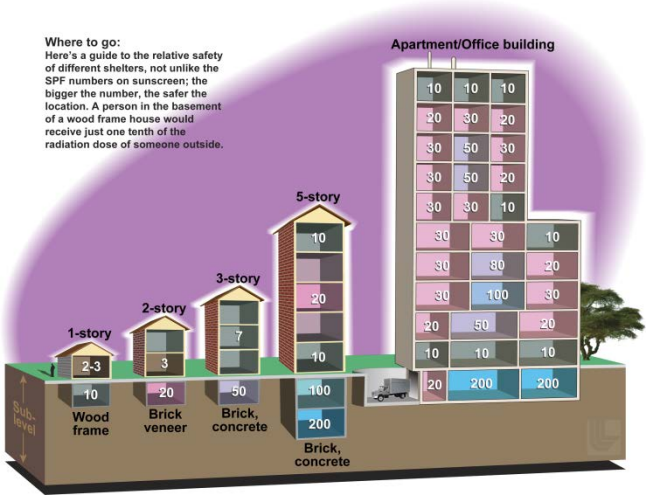


Regional Responders Detect elevated background as far away as Baltimore

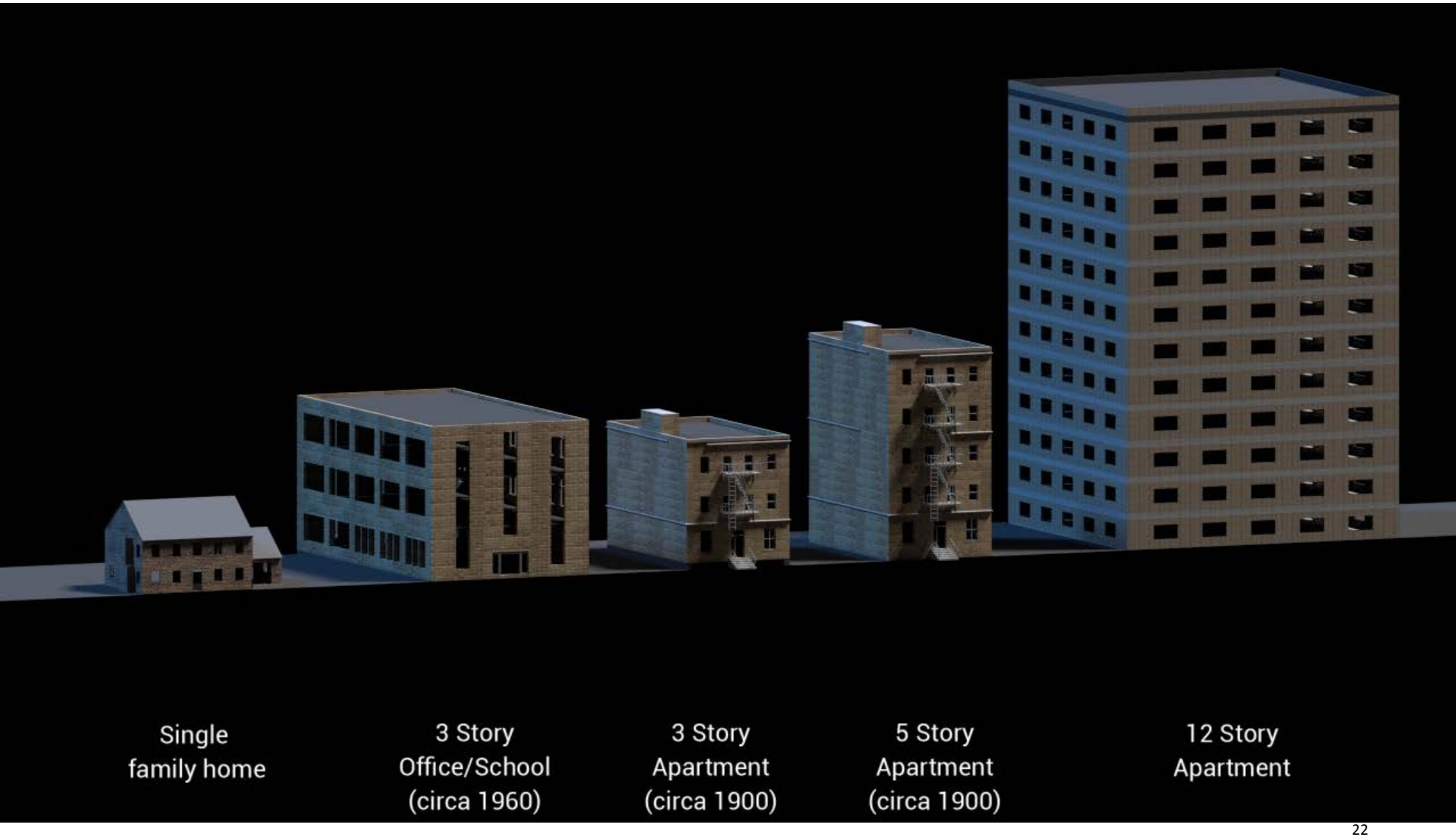
Levels are from 2-3 times background to 10 mR/hr (near the hot zone)

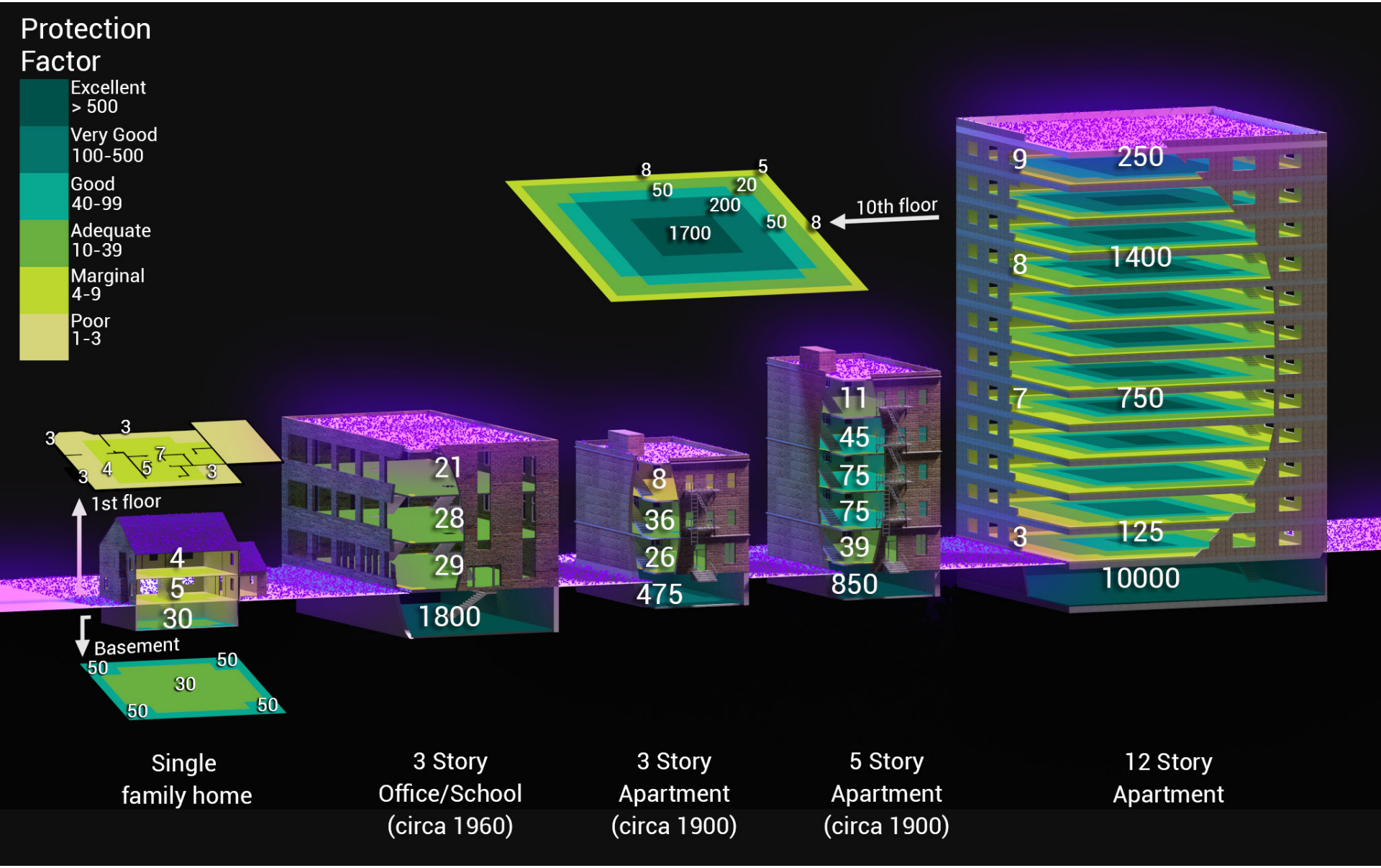
Key Fallout Considerations

- ***Fallout Decays Rapidly*** (releasing more than half of its energy in the first hour)
- Primary hazard from fallout is exposure to penetrating radiation from the fallout particles
- Dangerous levels of fallout is readily visible as it falls
- Fallout is not a significant inhalation hazard
- The radiation penetrates through windows and walls, but exposure decreases with distance and intervening materials.

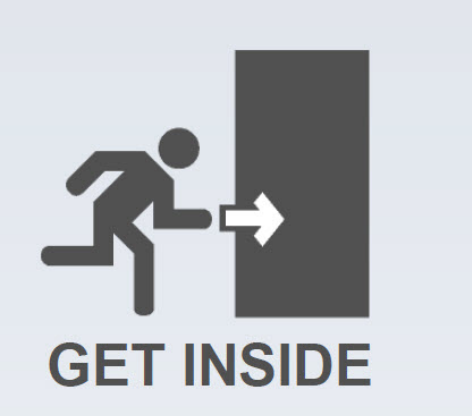


Fallout Location



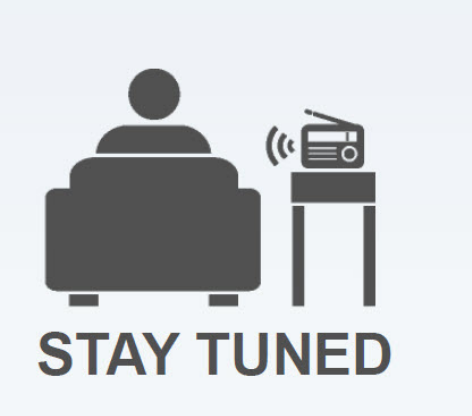

Protection Factor
Excellent > 500
Very Good 100-500
Good 40-99
Adequate 10-39
Marginal 4-9
Poor 1-3
8
5
50
20
200
50
8
1700
10th floor
9
250
8
1400
7
750
3
125
10000
3
3
3
4
5
7
3
1st floor
4
5
30
Basement
50
50
30
50
50
21
28
29
1800
8
36
26
475
11
45
75
75
39
850
Single family home
3 Story Office/School (circa 1960)
3 Story Apartment (circa 1900)
5 Story Apartment (circa 1900)
12 Story Apartment

GET INSIDE. STAY INSIDE. STAY TUNED



Go to the basement or the middle of a building.

Plan on 12 – 24 hours unless provided updated guidance.



AM/FM Radio is best, Cellular and Internet if available.

Saving Lives after a Nuclear Detonation

- **Fallout Exposure is Preventable**
  - Adequate (protection factors of 10 or higher) shelters are easy to find in the urban environment.
  - For this NYC scenario, ***a million people can avoid significant exposure through early, adequate shelter***.

- **Response Actions Can Save Hundreds of Thousands**
  - Shelter to prevent fallout exposures
  - Response planning to manage those injured by the prompt effects or who didn't get into adequate shelters.
  - There is time to provide critical care before radiation illness manifests

The numbers can seem over whelming…

But the vast majority of people and responders in the NYC area survive…

Having a plan and knowing what to do can save a lot of lives

Lawrence Livermore
National Laboratory

TRACIE

HEALTHCARE EMERGENCY PREPAREDNESS INFORMATION GATEWAY

Norman Coleman, MD

NIH, National Cancer Institute, Associate Director, Radiation Research Program, and Senior Medical Advisor, ASPR

ASPR

ASSISTANT SECRETARY FOR PREPAREDNESS AND RESPONSE

Clinical Management: Outline & Key Points

1. Radiation injury is a multiorgan disease where the effects (syndromes) depend on dose
2. Triage is based on what responders already know – trauma and burn; radiation effects next
3. Medical management has much in common with cancer care
4. Laboratory tests help the clinician make the decisions
5. Management algorithms and information available on REMM website
6. A scarce resources setting will exist- preparedness and planning will impact the success and fairness

Radiation Injury – Spectrum and Course

Acute Radiation Syndrome (ARS) and Delayed Effect of Acute Radiation Exposure (DEARE)

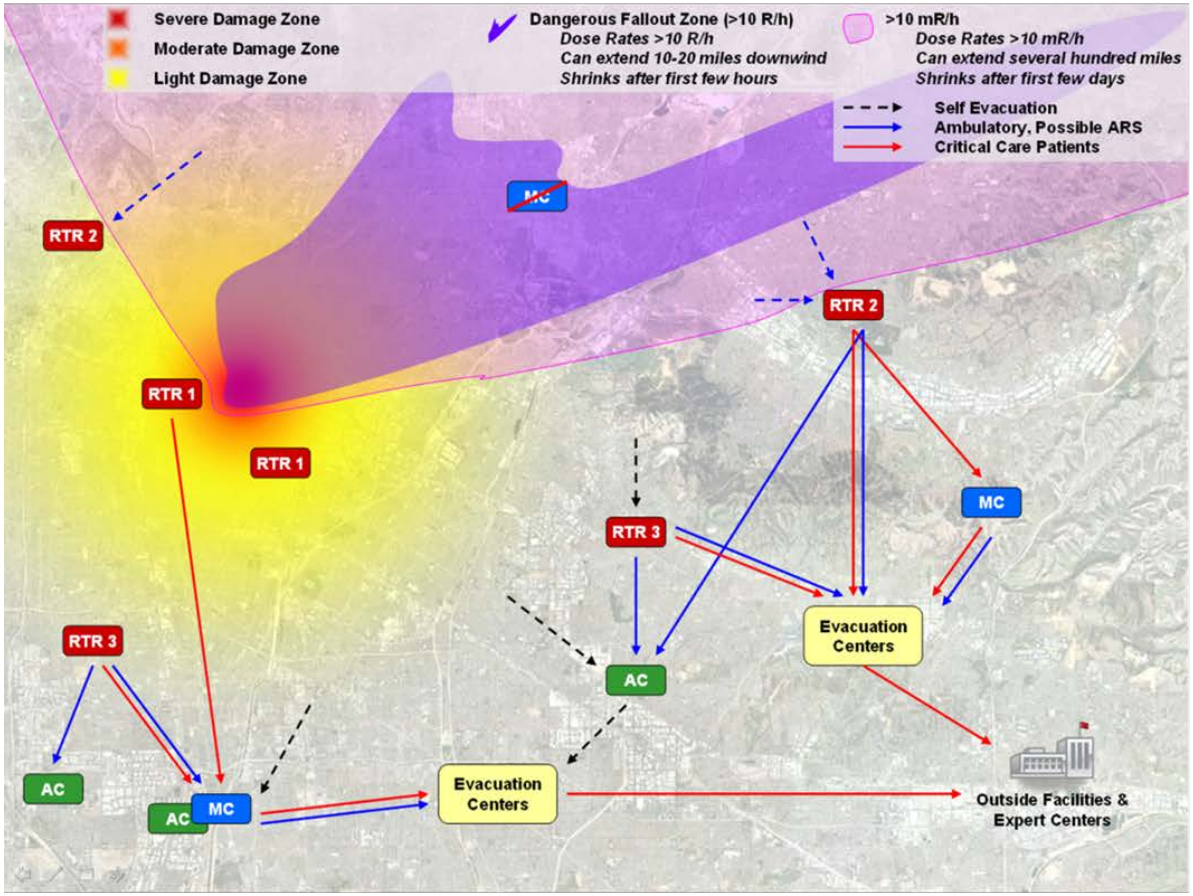
- Continuum of injuries- Multi-organ injury
- Time to clinical manifestation depends on organ system and dose
- *Phases: Prodrome →Latent→ Manifest*

Organ syndromes

• Hematological (>2 *Gy)	few days to 2 months
• Gastrointestinal (>6 Gy)	few days to a week
• CNS/Cardiovascular (>10 Gy)	immediate
• Cutaneous (>6 Gy)	few days to weeks
• Combined injury	immediate

New data suggest endothelial cell injury and inflammation are key part of the mechanism

RTR- System for Operational Management: **R**adiation **TR**iage, **TR**eatment, and **TR**ansport.



Radiation Triage, Treatment, & Transport Sites (RTR1, RTR2, RTR3)

↓

Assembly Centers (AC)

↓

Medical Centers (MC)

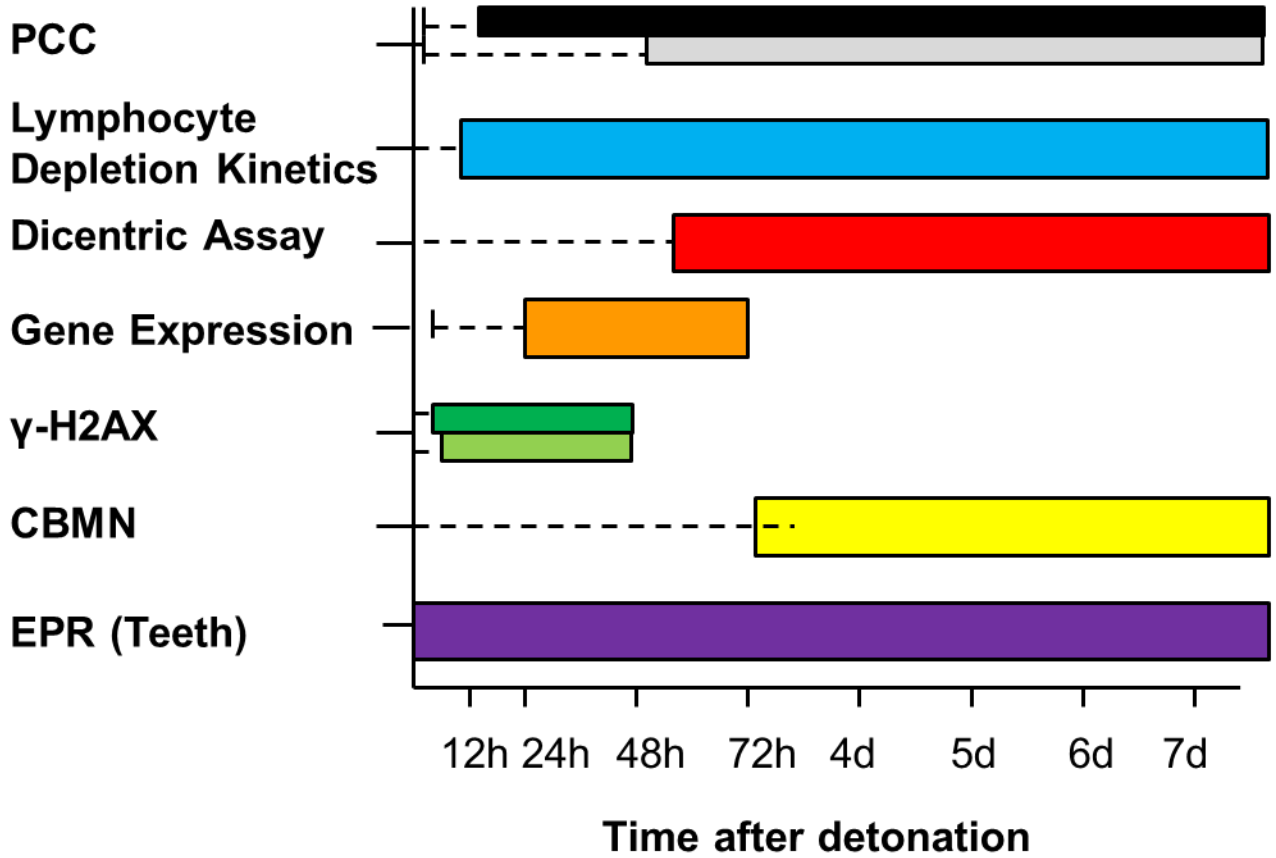
↓

Evacuation Centers

ASPR ASSISTANT SECRETARY FOR PREPAREDNESS AND RESPONSE

TRACIE HEALTHCARE EMERGENCY PREPAREDNESS INFORMATION GATEWAY

Biodosimetry: Biomarkers of Radiation Injury



- - Time for sample preparation and analysis

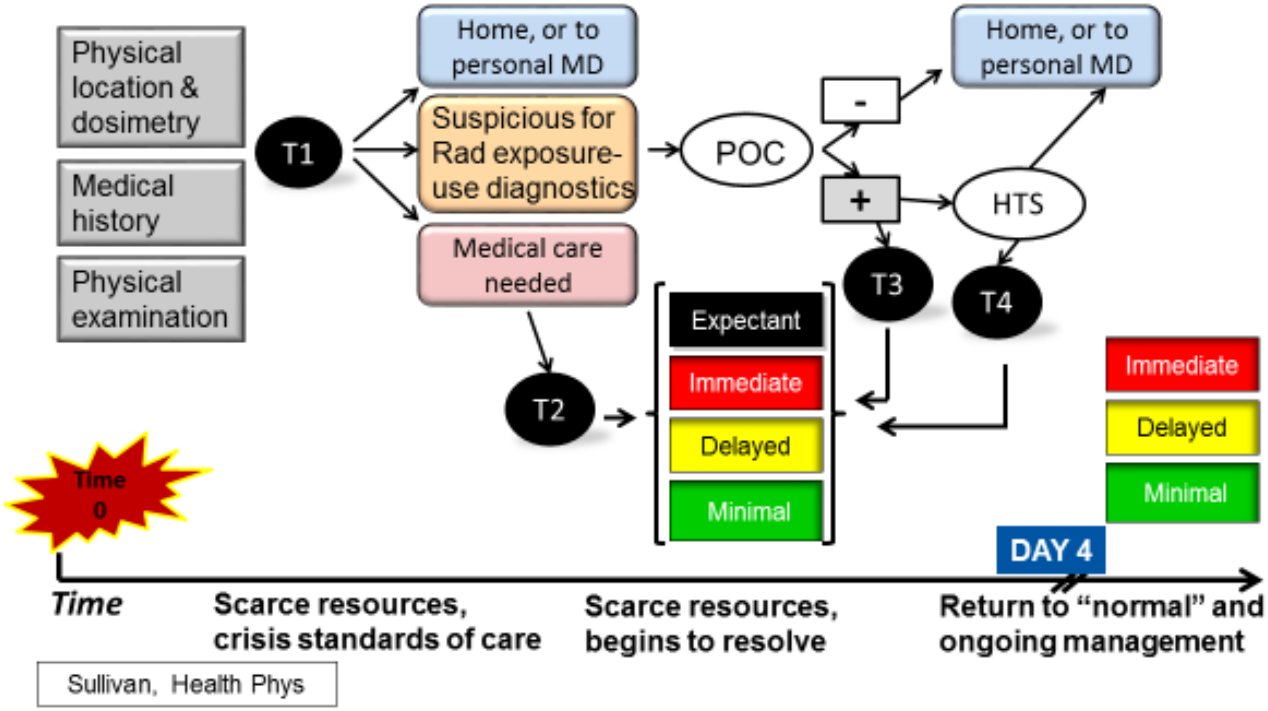
Health Phys. 2013 Dec;105(6):540-54.

ASPR ASSISTANT SECRETARY FOR PREPAREDNESS AND RESPONSE

TRACIE HEALTHCARE EMERGENCY PREPAREDNESS INFORMATION GATEWAY

Sorting and Triage: *Stepwise* & Conservative with Re-Triage as Situation Evolves

Incorporation of medical triage model with coordinated biodosimetry model



Health Phys. 2013 Dec;105(6):540-54.

Scarce Resources Triage - Radiation

On line tool available

Triage category affected by radiation dose and resource availability

RADIATION ONLY

Radiation Dose* (Gy)	Normal	Good	Fair	Poor
<10* Likely fatal (in higher range)	Expectant[3] / Immediate[2]	Expectant[3]	Expectant[3]	Expectant[3]
6 - 10* Severe	Immediate[2]	Immediate[2]	Delayed[2]	Expectant[3]
<2 - 6* Moderate	Immediate[1]	Immediate[1]	Immediate[1]	Immediate[1]
<0.5 - <2* Minimal	Minimal B[3]	Minimal B[3]	Minimal B[3]	Minimal B[3]
<0.5* Minimal	Minimal A[3]	Minimal A[3]	Minimal A[3]	Minimal A[3]
Resource availability:	Normal	Good	Fair	Poor
Standard of care**:	Conventional	Contingency	Crisis	Crisis

ASPR TRACIE

ASSISTANT SECRETARY FOR PREPAREDNESS AND RESPONSE

HEALTHCARE EMERGENCY PREPAREDNESS INFORMATION GATEWAY

Radiation Emergency Medical Management (REMM)

U.S. Department of Health & Human Services

REMM RADIATION EMERGENCY MEDICAL MANAGEMENT

Guidance on Diagnosis and Treatment for Healthcare Providers

- Understand Radiation
- Plan Ahead
- Practice Teamwork
- Work Safely

Interactive Clinical Tools | Diagnosis & Treatment | Reference & Data | Overview | Get REMM App | Search...

What Kind of Emergency?

- Nuclear Detonation: Weapons, Improvised Nuclear Devices
- Radiological Dispersal Devices, Dirty Bombs
- Nuclear Power Plant/ Reactor Incidents
- Radiological Exposure Devices
- Transportation Incidents

Patient Management

- Choose Appropriate Algorithm
- Contamination
- Exposure (Acute Radiation Syndrome)
- Exposure + Contamination
- Triage Guidelines
- Hospital Orders Template

Initial Incident Activities

- Discovering an Incident
- Describing an Incident
- On-site Activities
- Triage Guidelines
- Transport Victims
- Hospital Activities

http://www.remm.nlm.gov

Management Modifiers

- Radiation + Trauma
- Burn Triage and Treatment
- Mass Casualty
- Psychological Issues
- At-risk / Special Needs Populations

Practical Guidance

- Use of Blood Products
- Population Monitoring
- Decontamination Procedures
- Follow-up Instructions
- Management of the Deceased
- Develop a Response Plan

More...

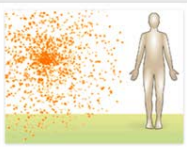
Other Audiences

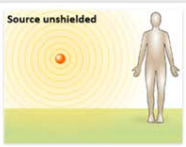
- First Responders
- Mental Health Professionals
- Hospital Staff
- Public Information Officers
- Radiation Safety Officers
- Planners
- Trainers: Practices & Drills

More...

REMM Multimedia Library

Dirty Bomb


Contamination



Exposure

Radiation Incidents | Radiation Basics | Exposure (ARS) | Contamination | Radiation Safety | Triage & Transport | All Videos

Judy Bader, MD

REMM

John Koerner

ASPR- CBRNE

www.remm.nlm.gov

ASPR ASSISTANT SECRETARY FOR PREPAREDNESS AND RESPONSE

TRACIE HEALTHCARE EMERGENCY PREPAREDNESS INFORMATION GATEWAY

Please Note: A lot has been done with more to do for planning & response at national scale

Nuclear Incident Medical Enterprise (NIME)

	Decision making & Communication	Organizing response	Triage	Medical management	Medical care
Response tools & capabilities	Decision-makers guide Communication guidance	Playbooks RTR- triage system Victim tracking	Integrated Clinical Diagnostics System Population monitoring	Medical Countermeasures (MCM) SNS, VMI & UMI	NDMS VA system RITN & Cancer Centers
Planning & response resources	REMM- Radiation Emergency Medical Management GeoHEALTH (MedMap)- Planning and situational awareness CONOPS Concept of Operations				
Underlying public health & medical concepts	SME support & availability Risk Communication	Medical-decision management model PAGs	Scarce resources triage Biodosimetry-POC & HTS	Radiation medicine MCM Requirements	Product Development BARDA, NIAID, DoD, Industry
Scenario & impact (physical & medical)	NUCLEAR SCENARIO and national & international impact Scenario Modeling BARDA-ADS, DHS, DTRA, AHRQ	Planning Guidance for Response to a Nuclear Detonation		Interagency Collaboration White House (OSTP)	
Coordination	Non-federal partners: State, Local, Tribal, Territorial partners	PHEMCE ASPR, WG's CDC		International partners, GHSI	
Science base	Radiation sciences: NIAID-CMCRs; NCI,NIH; AFRRI; NLM, RABRAT (multiagency) ←→ Academia				

Health Physics 2015 Feb;108(2):149-60.

ASPR ASSISTANT SECRETARY FOR PREPAREDNESS AND RESPONSE

TRACIE HEALTHCARE EMERGENCY PREPAREDNESS INFORMATION GATEWAY

Clinical Management - Key Points

1. **Radiation injury depends on dose-** syndromes: blood, GI, skin, lung, scarring
   - Long term- tissue fibrosis, increased risk of cancer
2. **Medical management**- build from cancer care: most of what you need to know is on **REMM** (www.nlm.nih.gov)

TRACIE

HEALTHCARE EMERGENCY PREPAREDNESS INFORMATION GATEWAY

Robert L. Jones, PhD

Chief, Inorganic and Radiation Analytical Toxicology Branch, National Center for Environmental Health, Centers for Disease Control and Prevention (CDC)

ASPR

ASSISTANT SECRETARY FOR PREPAREDNESS AND RESPONSE

Biodosimetry versus Bioassay

Radiation "Exposure" NO contamination on clothes or body (e.g. X-ray, gamma rays)	External Radionuclide Contamination ON clothes or body (e.g. radioactive particles)	Internal Radionuclide Contamination INSIDE the body (e.g. radioactive particles)
Biodosimetry Lymphocyte depletion Chromosome analysis	Radiation meter Radiation portal	Bioassay

Biodosimetry versus Bioassay

Type of Incident	Exposure (Biodosimetry)	Contamination (Bioassay)
Improvised Nuclear Device (IND)	**Effective** (shine)	**Effective** (fallout)
Nuclear Power Plant (NPP)	Limited	**Effective** (fallout)
Radiation Dispersal Device (RDD)	Limited	**Effective**
Radiation Exposure Device (RED)	**Effective**	Not useful

Biodosimetry determines a “past” radiation dose from an “exposure” incident.

Bioassay determines “past, current and future” radiation doses from a “contamination” incident.

Bioassay Testing

- **Capability**: Rapid **screening**, **identification** and **quantitative** assessment of **internal** incorporation of radionuclides to quantify contamination so one can calculate radiation dose
- **Capacity**: ID and Quantify hundreds of samples per day
- Limited surge testing capacity after a nuclear incident (e.g., IND)
- Bioassays not readily available or a priority in the immediate resource-limited environment
- Determine priority in conjunction with local, state, and federal epidemiology subject matter experts

CDG = Clinical Decision Guide (NCRP Report 161)
NCRP = National Council on Radiation Protection & Measurements

Bioassay Summary

- Radiation Laboratory Methods (bioassay): rapidly identify and directly quantify specific radionuclides in people potentially contaminated in a radiological or nuclear incident
- Provides information for population monitoring by determining the level of internal contamination/exposure
- Coordinate with local, state, and federal epidemiology subject matter experts
- In many cases it provides test results for people who think that they may be contaminated but are not truly contaminated thereby relieving the stress on the public health system and health care system

References

- Radionuclides of concern can be found at:
  - www.pub.iaea.org/MTCD/publications/PDF/Pub1309_web.pdf
  - www.energy.gov/sites/prod/files/edg/media/RDDRPTF14MAYa.pdf
- The CDC "Grand Rounds" presentation and slides can be found at: www.cdc.gov/grand-rounds/pp/2010/20100318-radiological-disaster.html
- CDC Radiation Emergencies: emergency.cdc.gov/radiation
- HHS REMM Web site: www.remm.nlm.gov

Disclaimer

- The findings and conclusions in this presentation have not been formally disseminated by the Centers for Disease Control and Prevention and should not be construed to represent any agency determination or policy.
- Use of trade names is for identification only and does not imply endorsement by the Centers for Disease Control and Prevention, the Public Health Service, or the U.S. Department of Health and Human Services.

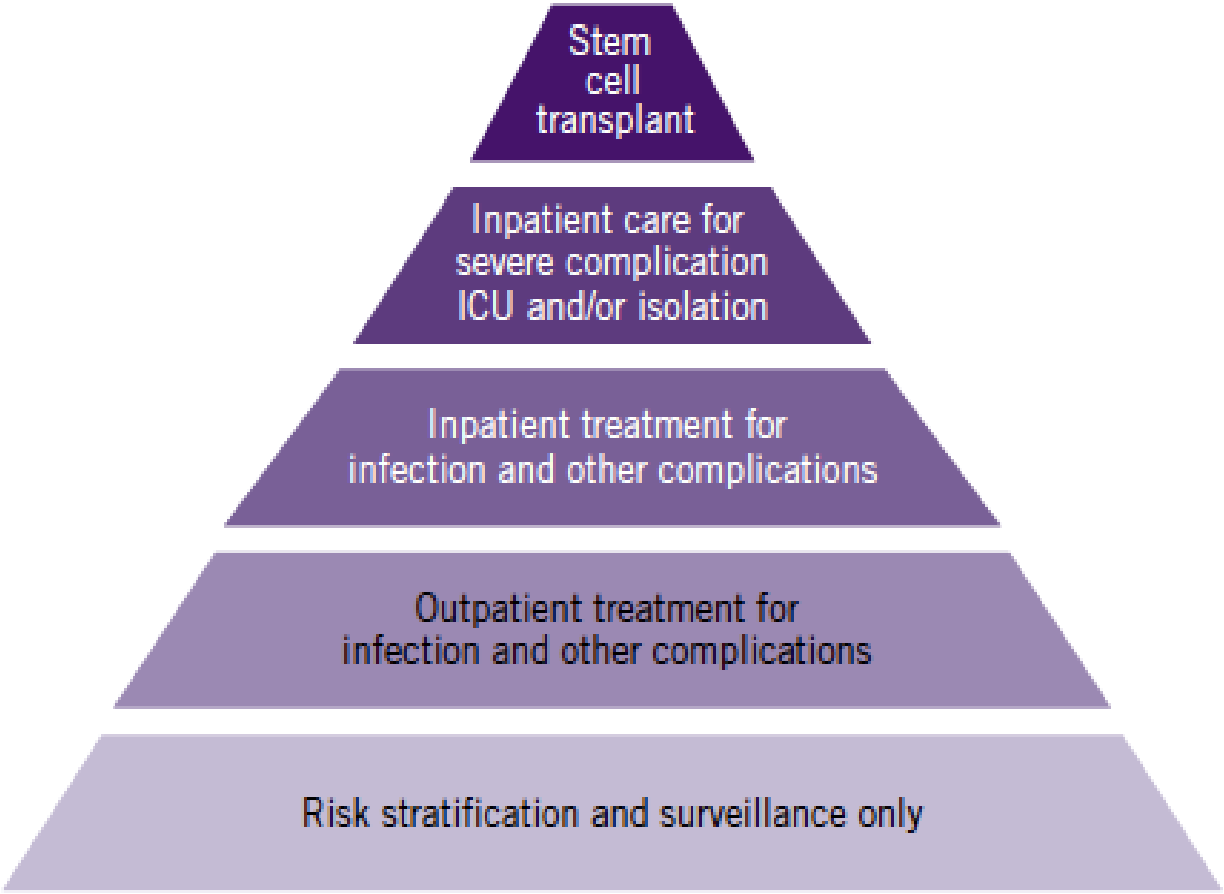
TRACIE

HEALTHCARE EMERGENCY PREPAREDNESS INFORMATION GATEWAY

John Hick, MD
Hennepin County Medical Center & ASPR

ASPR
ASSISTANT SECRETARY FOR PREPAREDNESS AND RESPONSE

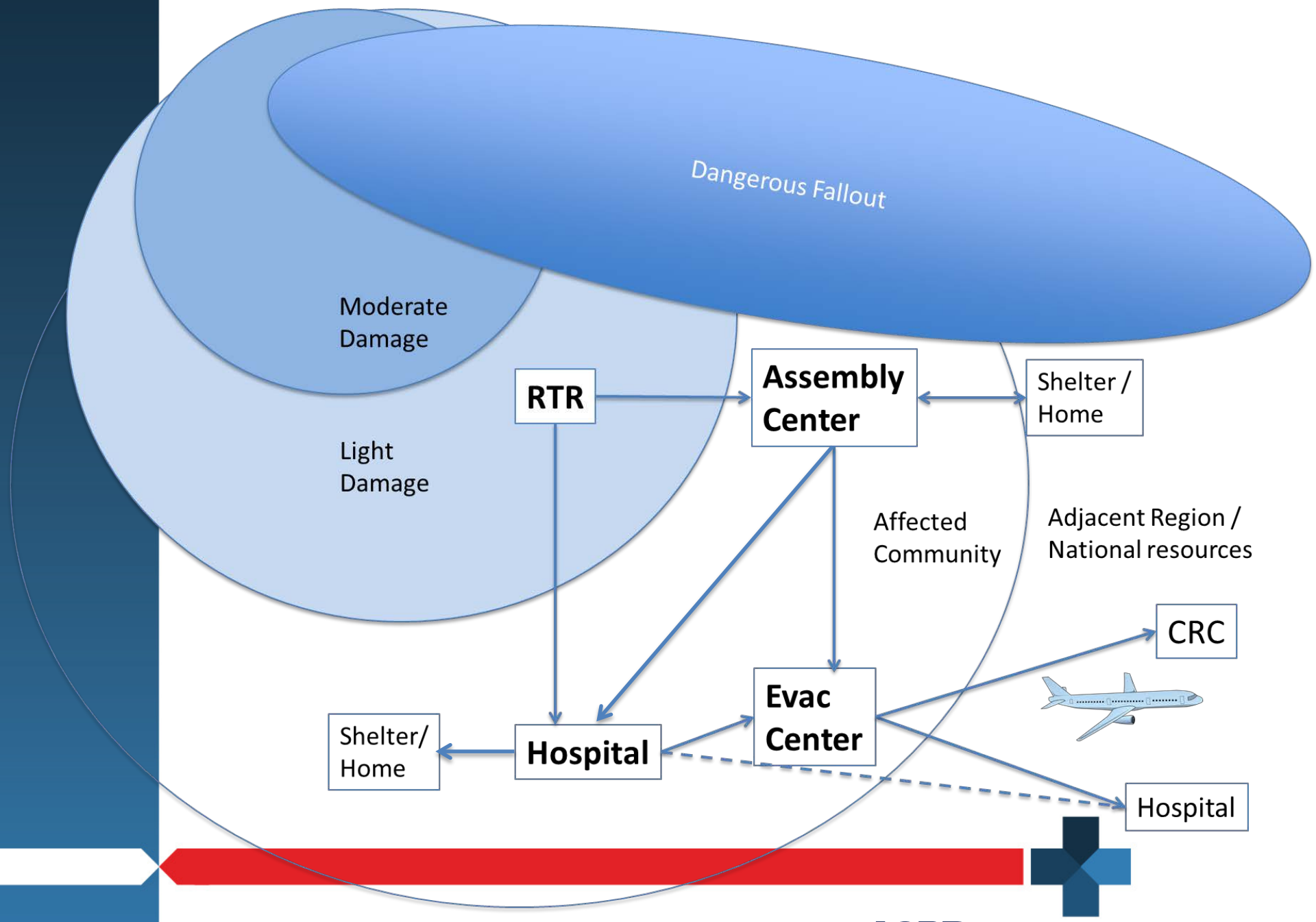
Acute Radiation Syndrome



Radiation Injury Only

Radiation Dose (Gy)	Normal	Good	Fair	Poor
> 10 Likely fatal (in higher range)	Expectant / Immediate	Expectant	Expectant	Expectant
6 - 10 Severe	Immediate	Immediate	Delayed	Expectant
> 2 - 6 Moderate	Immediate	Immediate	Immediate	Immediate
< 2 Minimal	Minimal	Minimal	Minimal	Minimal
Standard of care:	Conventional	Contingency	Crisis	Crisis

Coleman CN, Weinstock DM et al. *Disaster Med Health Prep* 2011


Dangerous Fallout
Moderate Damage
Light Damage
RTR
Assembly Center
Shelter / Home
Affected Community
Adjacent Region / National resources
CRC
Evac Center
Shelter/ Home
Hospital
Hospital

Assembly Centers vs. Community Reception Centers

	Assembly Center (AC)	Community Reception Center (CRC)
Location	Close to detonation	Far from detonation
Resources in community	Scarce	Adequate
Goal	Rapid assessment for total body radiation exposure	Detailed assessment for external and internal residual radiation
Resources required	Minimal	Extensive
Decontamination	Gross / Containment	Technical
Registration / interview	Minimal	Detailed
Other functions on site?	Likely – some medical care, cytokine administration, possible shelter / support operations	Unlikely

Assembly Center – 24-48 Hours After Detonation

- Planned and spontaneous
- Thousands of people / site
- Decontamination / containment
- Screening / Triage
  - Countermeasures
  - Evacuation
- Family reunification
- Sheltering and food
- Medical countermeasures?
- Medical care?

EAST Project

- CDC, HHS, FEMA, private partners
- Exposure and Symptom Triage
- Implemented at Assembly Center or wherever sorting function can be performed
- Selected key variables from common radiation triage methods
- Assume serial ALC will *not* be available
- To be used in scarce resource areas only

Goals

- Sort to high, medium, low priority for
  - Cytokine administration
  - Evacuation to areas with adequate resources
- Highest priority are *moderate* – 2-6 Gy exposure range
- Next priority are >6 Gy – based on likely degree of benefit : resource utilization
- Adjust for underlying illness / vulnerability

Tool

- ALC
- Vomiting time
- Vomiting # / day
- IMAAC map
- Location – other map
- Diarrhea
- Headache
- Fever
- Skin burns

Nuclear Detonation Survivor Prioritization for Evacuation / Bone Marrow Cytokines

Clothing/contamination control performed

↓

Acute medical/trauma complaints? (1) → Yes → Refer to medical care area/facility

↓ No

Were located in/transit through damage or fallout zone? → No → Send to support services

↓ Yes

Assess symptoms/data – major predictors listed first (e.g. ALC is best predictor, skin changes unlikely) - base cytokine and evacuation priority on column with ***majority or strongest predictive variables*** (2)

ARS Severity Prediction	Severe ARS Predicted (>6 Gy)	Moderate ARS Predicted	Mild ARS Predicted (<2 Gy)
ALC/lymphocyte single value estimate (3)	<500 at 48h	500-1500 at 48h	>1500 at 48h
Vomiting onset (4)	Rapid (within 1h) after exposure	Intermediate (1-4h)	Delayed > 4h
Vomiting (per day) (5)	>6 or worsening with time	Moderate 3-6	1-2 or resolved
IMAAC /official 12-24h estimated dose map (6)	>6 Gy (modify to 2-6 Gy if good shelter for 24h)	2-6 Gy (modify to < 2 Gy if good shelter for 24h)	<2 Gy
Location in damage or fallout zone (non-IMAAC map) first 12-24h	In damage or fallout zone with minimal / no sheltering	In damage/fallout zone with good sheltering (e.g. concrete)	Not in damage/fallout zone according to map
Diarrhea (stools / day)	Severe (>6)	Mild / moderate (<6)	None
Headache (7)	Severe, interferes with activities	Mild/moderate	None/minimal
Fever (unexplained)	High/sustained	Low (< 101F) or resolved	None
Skin (beta) burns (8)	Burns / blisters > 3% BSA	Burns/blisters < 3% BSA	None
Match dominant signs/symptoms in column above to suggested triage category in same column below			
GCSF/myeloid cytokine **priority** (9)	**2** – Possible benefit	**1** – Most benefit	**3** – Unlikely benefit
Evacuation **group** (10)	**2** – Second evacuated	**1** – First evacuated	**3** - Third evacuated

Complicating Medical Conditions / Vulnerability (see note 10)

Adjust evacuation priority to a *higher* color (e.g. yellow up to red) if patient has a condition for which local care is not available and that could deteriorate within 48h putting the patient at risk including but not limited to:

- Diabetes
- Dialysis / End Stage Renal Disease
- CHF (Congestive Heart Failure)
- Pregnancy
- Immunosuppression (e.g. AIDS, taking steroids/transplant meds, recent chemo)
- Severe Respiratory Disease (e.g. Asthma, COPD with disability, requiring oxygen, or daily symptoms)
- Vulnerable / at risk in current environment (e.g. pediatric, disability)

↓

Myeloid cytokine (GCSF/other) administration (record dose/time) according to priority/availability (11)

↓

Support – referral to resources for evacuation and basic needs coordination (12)

End notes – turn over

Limitations, etc.

- Not validated
- Not binary – more of a risk matrix than a decision tool
- Limited predictive value compared to serial ALC
- But…
  - Better than ad hoc decisions
  - Provides planning and implementation structure
  - Provides a level of fairness and consistency

Key Points

- Hundreds of thousands of lives at risk from fallout radiation can be saved
- Planning for assembly centers is critical to prioritize those exposed and identify other needs
- Coordinated, large scale evacuation of priority groups will be the key to saving the most lives possible

TRACIE

HEALTHCARE EMERGENCY PREPAREDNESS INFORMATION GATEWAY

Cullen Case, Jr.

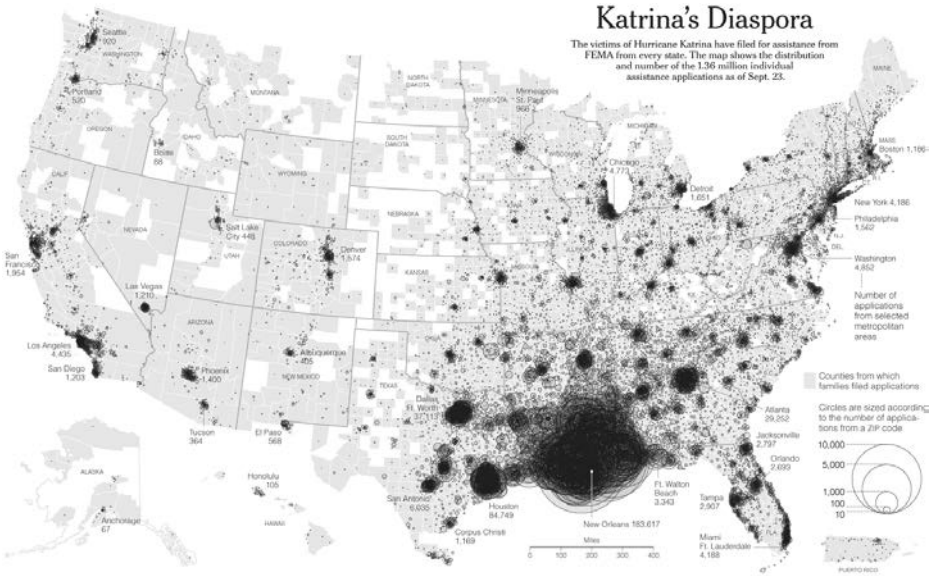
Program Manager, Radiation Injury Treatment Network

ASPR

ASSISTANT SECRETARY FOR PREPAREDNESS AND RESPONSE

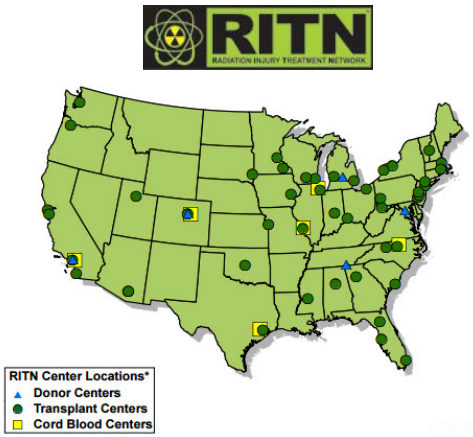
RITN
RADIATION INJURY TREATMENT NETWORK

Radiological disaster preparedness a tale of two cities……



What is RITN & Why Cancer Centers?

- 80 Cancer centers, blood donor centers and cord blood banks preparing to care for patients with ARS
- Bone marrow is a the most sensitive organ in the body to ionizing radiation
- Doses >2 Gy** of ionizing radiation can cause Acute Radiation Syndrome (ARS)
- ARS mimics what BMT/hematology/oncology staff see daily while treating patients with blood cancers
- Through cancer treatment process patients are irradiated or given chemotherapy to destroy their immune system (marrow)
- Failure to restore would result in **death**



Full list of centers is on www.RITN.net/about

ARS Casualties from 10kT IND

Radiation Dose (Gy)	Care Requirement	Casualty Estimate
Mild (0.75-1.5)	Self Recover and Monitoring	91,000
Moderate (1.5-5.3)	Outpatient Monitoring And Specialized Supportive Care	51,000
Severe (5.3-8.3)	Specialized Supportive Care and Possible Transplant	12,000
Expectant (>8.3)	Comfort Car	47,000
Combined Injury and Radiation (>1.5)	Stabilization and monitoring, pending resource availability	44,000

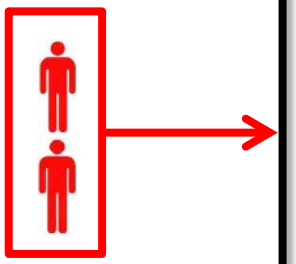
Estimate of 63,000 casualties for RITN

Table adapted from: Knebel AR, Coleman CN, Cliffer KD; et al. Allocation of scarce resources after a nuclear detonation: setting the context. Disaster Med Public Health Prep. 2011;5 (Suppl 1):S20-S31

RITN Patient Profile

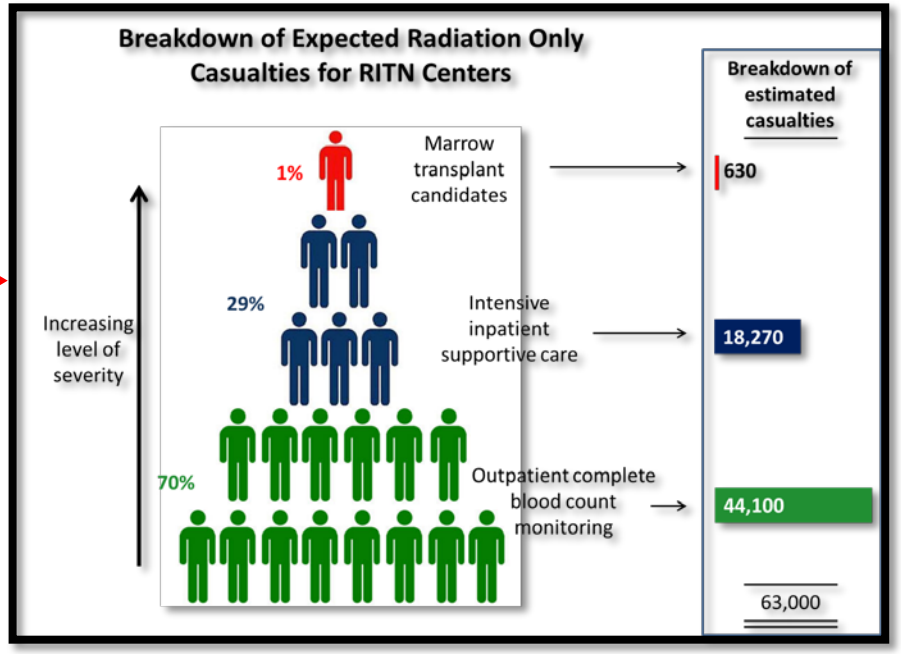
Total IND Casualties

90% will have **trauma or combined injuries** and receive treatment elsewhere



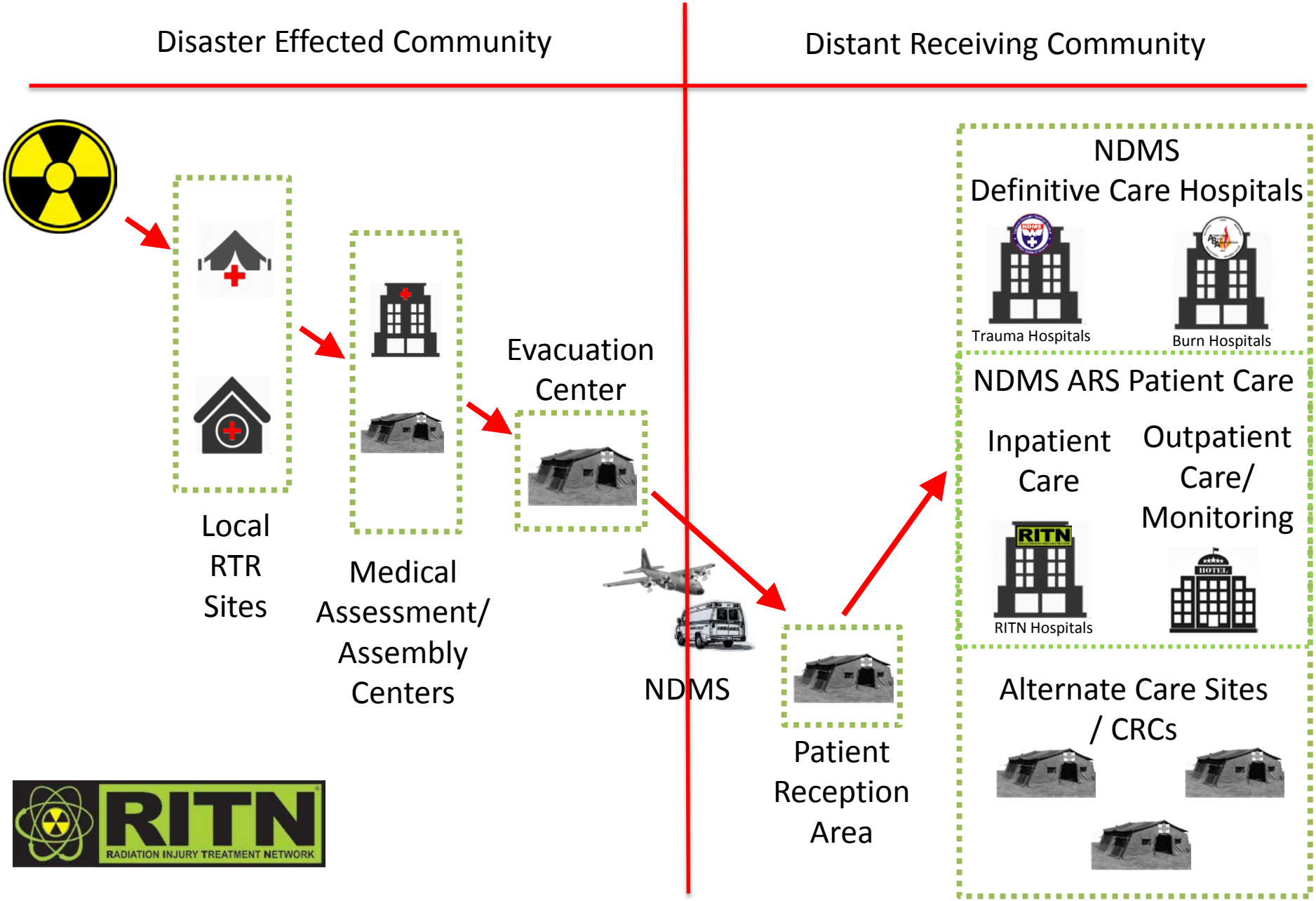
10% will have **radiation only (ARS)** injuries and be sent to RITN centers for definitive medical care

Expected Patient Care Requirements for RITN Patients



Casualty Estimates adapted from: Knebel AR, Coleman CN, Cliffer KD; et al. Allocation of scarce resources after a nuclear detonation: setting the context. Disaster Med Public Health Prep. 2011;5 (Suppl 1):S20-S31

RITN ConOps: Patient Movement



RITN
RADIATION INJURY TREATMENT NETWORK

RITN Preparedness Efforts…. Exercises, Training and More….

Since 2006

650+ exercises

***All exercise materials available on RITN.net/exercises

15,000+ medical staff trained

***Free web-based courses available on RITN.net

16,900+ G-CSF doses on-hand inventory

***Fluctuates throughout year, is sum of inventory at each RITN hospital

2,400 Adult & 1,600 ped ARS beds w/in 72 hrs *** as of May2016

RITN
RADIATION INJURY TREATMENT NETWORK

80 cancer centers, blood donor centers, cord blood banks

Treatment Guidelines on RITN.net/treatment

RITN
RADIATION INJURY TREATMENT NETWORK

Acute Radiation Syndrome Treatment Guidelines

March 2016

Please forward comments or suggestions to RITN@nmdp.org

Contents

- Principles of ARS management at RITN centers
- Altered standards after a nuclear detonation
- Acute Radiation Syndrome
- Casualty triage after a nuclear detonation
- ARS management
- Stem cell support: when to HLA type casualties
- Additional Resources

Decision to perform HLA typing

Factors favoring HLA typing*

- Estimated whole body dose > 3 Gy
- Neutrophil count < 100/µl by day 6 (see slide 26)
- Rapid drop of platelets (see slide 27)
- Expected to survive other injuries

Expedited HLA typing will be available using buccal swab, with high resolution DNA typing of HLA-A, -B, -C, -DRB1, and -DQB1

*Guidance for obtaining HLA-typing can be obtained by contacting the NMDP or the closest RITN center:
- NMDP HLA-typing guidance: 1 (800) MARROW2 or (612) 627-5800
- For an updated map and list of RITN centers: http://www.ritn.net/About/
- *RITN Participating Centers General Contact Directory*: http://www.ritn.net/Contact/

Decision to recruit a donor for evaluation

Factors favoring recruitment of a donor

- Bone marrow is aplastic at 2 sites >14 days after exposure
- Neutrophil count < 100/µl after 5 days of myeloid cytokine therapy
- Expected to survive other injuries
- Suitable donor is available:
  - 8/8 match (HLA-A, B-C, DRB1) using bone marrow or PBSCs
  - Alternatives, if a matched donor is unavailable:
    - At least 4/6 matched umbilical cord blood of adequate cell number
    - Haploidentical donor
    - Mismatched, related or unrelated donor with T-cell depletion

Referral Guidelines: www.RITN.net/treatment

Guidelines for Identifying Radiation Injury and Considering Transfer to a Specialized Facility

Purpose: to provide hospitals with a concise guide for identifying casualties in the aftermath of a radiation incident who may have received a clinically significant dose of radiation.

Regional RITN hospital contact information for specialized consultation:

Hospital Name:

Department:

Phone: E-mail:

Overview: Ionizing radiation affects the hematopoietic system even at very low doses; hematology and oncology medical staff treat these effects daily. Irradiated patients may develop severe organ dysfunction over time and require intense and specialized management.

For extensive information on the acute radiation syndrome (hematologic, gastrointestinal, cutaneous, central nervous system), types of radiation incidents, and radiation decontamination, see: www.remm.nlm.gov (Radiation Emergency Medical Management (REMM) website)

CONSULTATION/REFERRAL CRITERIA: Any patient suspected of having a radiation injury can be discussed with your local RITN center. The ability to accept referrals will depend on the size of the incident and the capacity of regional RITN center(s).

a. **Criteria for considering RITN center consultation/referral include:**
   i. Absolute neutrophil count less than 1,000/µL
   ii. Absolute lymphocyte count less than 1,000/µL
   iii. Severe nausea, vomiting and/or anorexia
   iv. A localized cutaneous radiation injury that requires extensive management
   v. Suspected or known internal contamination (e.g. involving a wound, the lung or GI tract)
   vi. Current facility not equipped to provide irradiated, leukoreduced blood products

b. **Manage comorbidities and possible seqelae of irradiation:**
   i. See www.ritn.net/Treatment/ for acute radiation syndrome treatment guidelines:
      1. Transfuse only irradiated and leukocyte-depleted blood products

ASPR ASSISTANT SECRETARY FOR PREPAREDNESS AND RESPONSE

TRACIE HEALTHCARE EMERGENCY PREPAREDNESS INFORMATION GATEWAY

Adult & Ped Medical Orders – on REMM.NLM.gov & RITN.net/treatment

U.S. Department of Health & Human Services
REMM RADIATION EMERGENCY MEDICAL MANAGEMENT

RITN RADIATION INJURY TREATMENT NETWORK

Prototype for Adult Medical Orders
During a Radiation Incident
Version: April 17, 2017

Cautions
- Authored by REMM and RITN physicians, this set of orders is a prototype only.
- **Orders must be customized for each patient and incident.**
- Specific drugs are suggested for function only. Patients may not need any/every category of drug listed.
- No HHS, CDC, FDA, or other US government entity endorsement of specific drugs or drug doses is intended or implied by inclusion in this order set.
- Consult the notes at the end of this document for additional, key information.

Internal contamination (decorporation treatments)
- This **Adult Orders Prototype** lists only FDA-approved medications as radioisotope countermeasures.
- Some, but not all of these drugs are currently in the Strategic National Stockpile.
- Prescribers should consult the FDA drug label for complete prescribing information.
- Decorporation drugs should be used in children with great caution.
- The online version of REMM has additional recommendations about additional countermeasure drugs that may be considered.
- This prototype does **not** address threshold levels of internal contamination that would trigger initiation, continuation, or discontinuation of decorporation treatment. See REMM Countermeasures Caution and Comment, which discusses this issue

---

Drug dosages
- All adult drug doses in this prototype are based on a 70 kg adult with normal renal and hepatic function.
- Appropriate dose adjustments should be made based on age, weight, drug-drug interactions, nutritional status, renal, and hepatic function.

- After a mass casualty incident, practitioners may encounter counterfeit drugs. This

Prototype for Pediatric Medical Orders
During a Radiation Incident
Version: April 17, 2017

Cautions
- Authored by REMM and RITN physicians, this set of orders is a prototype only.
- **Orders must be customized for each patient and incident.**
- Specific drugs are suggested for function only. Patients may not need any/every category of drug listed.
- No HHS, CDC, FDA, or other US government entity endorsement of specific drugs or drug doses is intended or implied by inclusion in this order set.
- Consult the notes at the end of this document for additional, key information.

Internal contamination (decorporation treatments)
- This **Pediatric Orders Prototype** lists only FDA-approved medications as radioisotope countermeasures.
- Some, but not all of these drugs are currently in the Strategic National Stockpile.
- Prescribers should consult the FDA drug label for complete prescribing information.
- Decorporation drugs should be used in children with great caution.
- The online version of REMM has additional recommendations about additional countermeasure drugs that may be considered.
- This prototype does **not** address threshold levels of internal contamination that would trigger initiation, continuation, or discontinuation of decorporation treatment. See REMM Countermeasures Caution and Comment, which discusses this issue.

ASPR ASSISTANT SECRETARY FOR PREPAREDNESS AND RESPONSE
TRACIE HEALTHCARE EMERGENCY PREPAREDNESS INFORMATION GATEWAY

Training: Medical Grand Rounds on RITN.net/training

RITN
RADIATION INJURY TREATMENT NETWORK

Medical Grandrounds: Medical Response to Radiation Exposure: the Role of Hematologists

Rev. March 2016

Agenda

- Radiation Injury Treatment Network
- Radiological Event Scenarios
- Radiation Biology
- Dosimetry
- Acute Radiation Syndrome
- Mitigation and Treatment
- Available resources

Key Points

- RITN is focused on the care of ARS patients in cities distant from the disaster
- RITN = Hematology/Oncology/Bone Marrow Transplant medical professionals
- RITN receives ARS patients through NDMS
- Many resources on RITN.net
- Questions: RITN@nmdp.org

TRACIE

HEALTHCARE EMERGENCY PREPAREDNESS INFORMATION GATEWAY

Rich Kozub

Special Operations, Middlesex County Public Health Preparedness Division (NJ)

ASPR

ASSISTANT SECRETARY FOR PREPAREDNESS AND RESPONSE

Radiation and Public Health

- Public Health has a clear role in the response to a radiation/nuclear incident
- Actions are Local / Region based
  - Public Messaging
    - Risk Communications
  - Population screening
  - Dose Assessment
  - Exposure Registry
  - Counter measure distribution

Radiation and Public Health

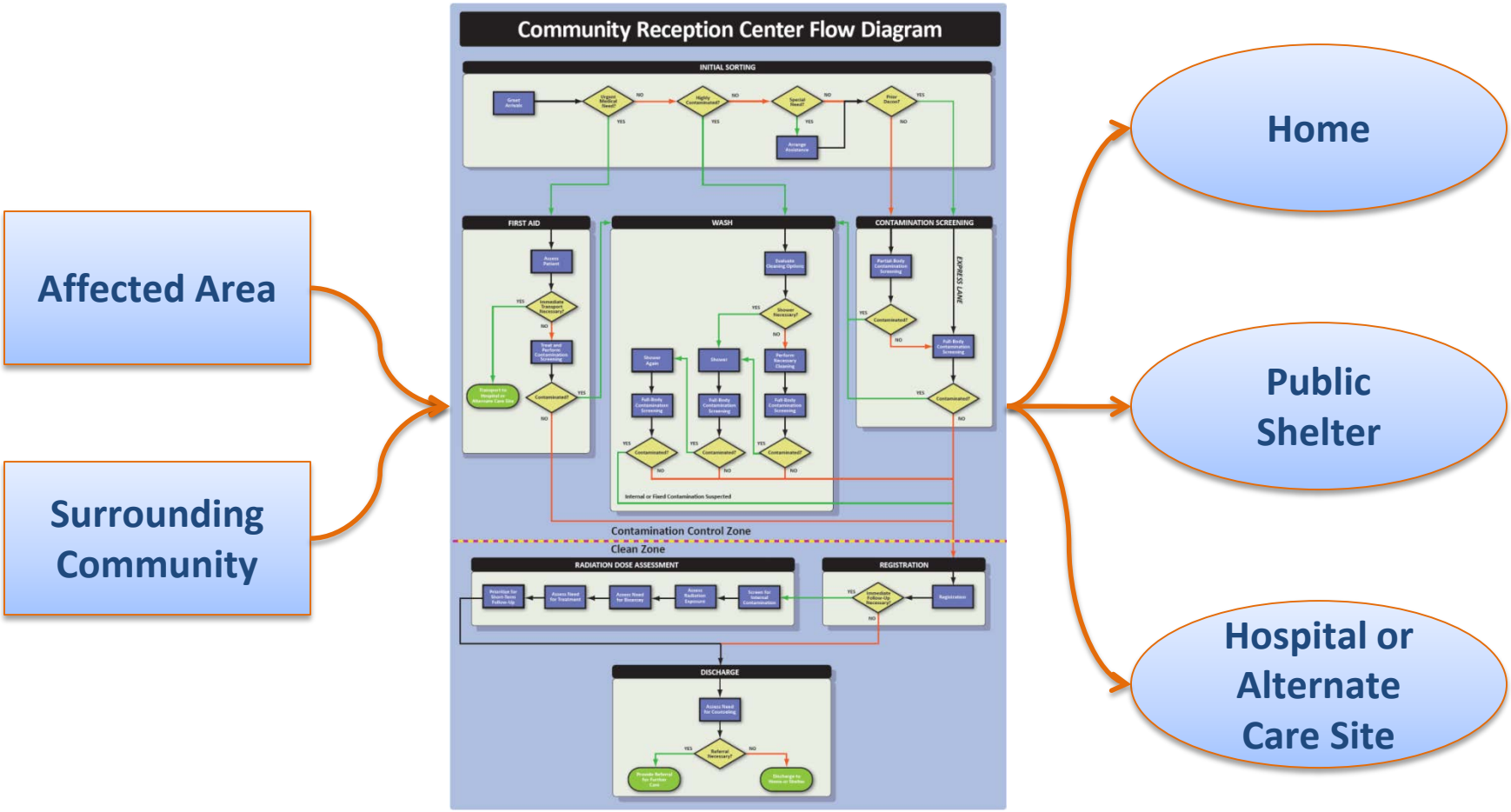
- Public Messaging
  - Must be rapid and consistent
  - ***Get Inside, Stay Inside, Stay Tuned***
  - Self Decontamination procedures
  - How, when and where to be screened
- Population Monitoring
  - **All** affected individuals
  - Responders, Hospital Emergency Dept.
  - Evacuated Population, Shelters
  - Transport Screening of patients
  - Persons with Disabilities
  - Pets, Concerned individuals

Community Reception Centers

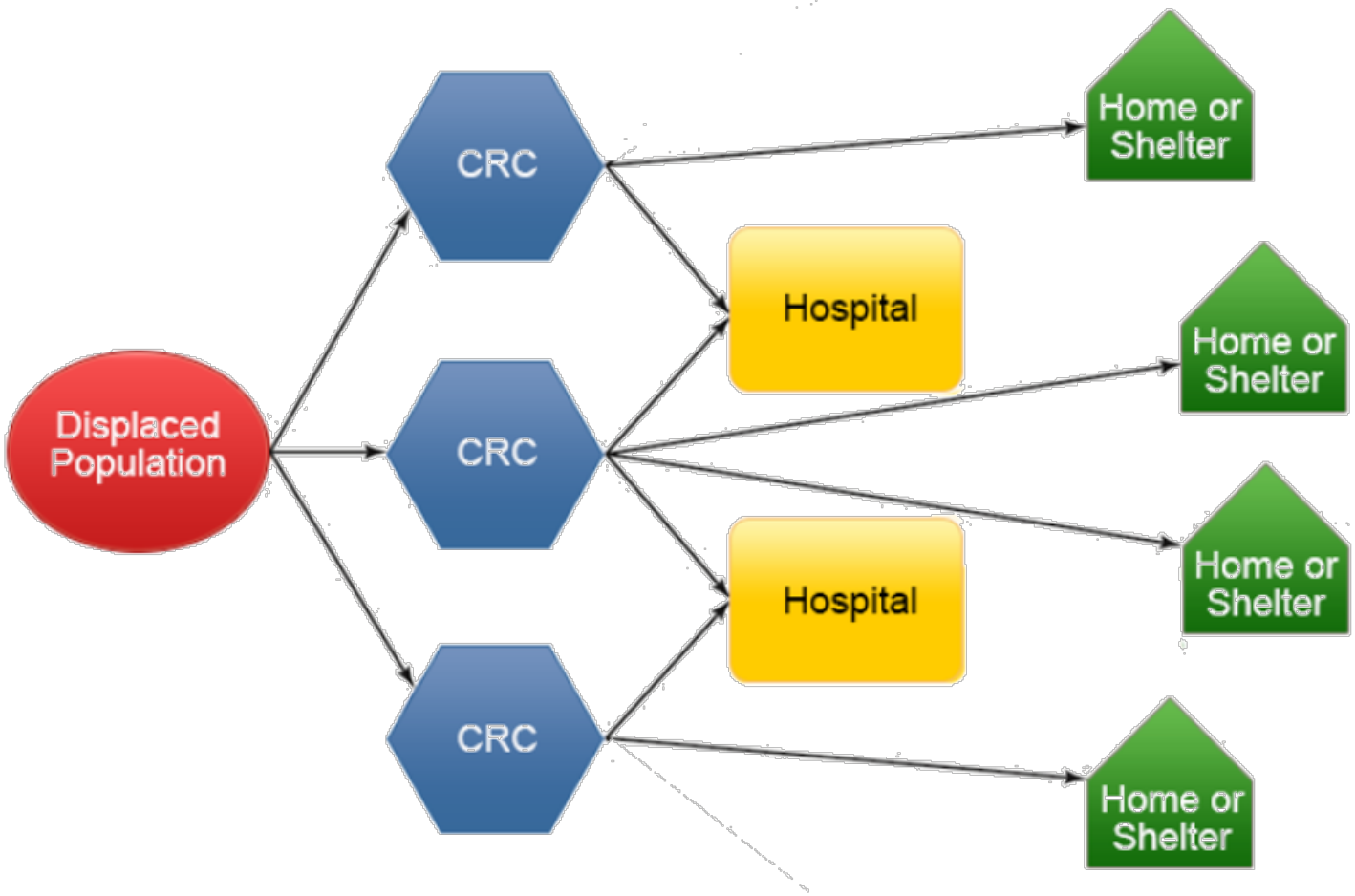
- Initial Sort of who needs to go and how fast
  - Field Triage – Assembly Area – CRC
- Development of an exposure registry for long term evaluations
- Distribution of medical counter measures
- Dose Assessment sample collection for initial lab evaluation
- Act as a Bridge between the incident and definitive care

Community Reception Center

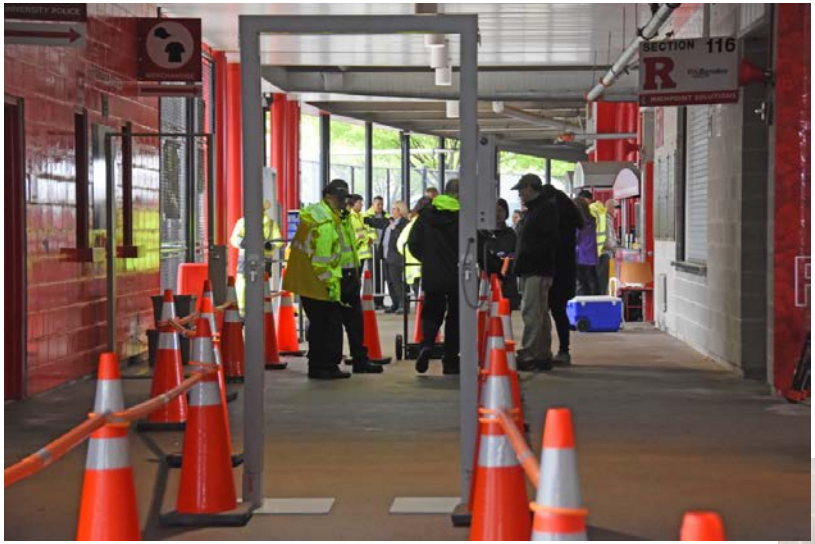
Origin → **CRC** → **Endpoint**

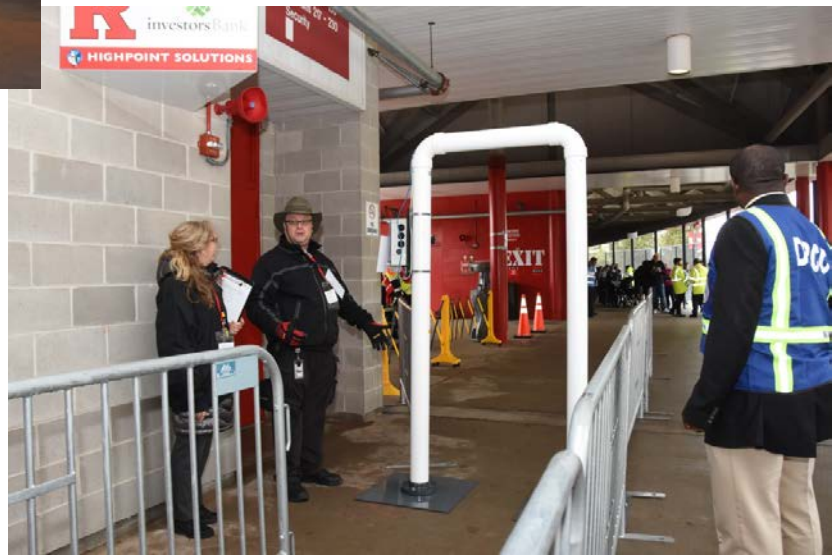


Community Reception Centers



Gotham Shield 2017





Key Points

- Public Health has a clear role in the response and recovery
- Preplanning is essential for
  - Messaging: first 24 hours, self decon
  - Screening: resources, training, locations
  - Hospital, Shelter and transport screening
  - Screening at Receiving Communities
- All ESF-8 partners need to participate in order to address the healthcare needs

Question & Answer

Contact Us

asprtracie.hhs.gov

1-844-5-TRACIE

askasprtracie@hhs.gov

ASPR
ASSISTANT SECRETARY FOR PREPAREDNESS AND RESPONSE

TRACIE
HEALTHCARE EMERGENCY PREPAREDNESS INFORMATION GATEWAY