Long-term Recovery from a Radiological Dispersal Device (RDD)
Waste Management Challenges

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Overview of Presentation

RDD Waste Management Challenges

Estimating RDD Waste Volumes

Liberty RadEx Scenario and Waste Volumes
RDD Waste Management Challenges

Wide-scale radiological incidents present significant and unique circumstances for waste management

- Significant waste volumes
- Time and public pressures for action (days vs. years)
- Logistical and resource limitations (e.g., sampling)
- Coordination of multiple agencies/activities

EPA is the lead Federal agency for long-term recovery and cleanup (Emergency Support Function #10)

- How will we address events of this nature?
- Agency is studying disposal issues for chem, bio, rad
Estimating RDD Waste Volumes

EPA is developing a method to generate first-order estimates of potential RDD waste volumes

- Plume maps generated by DOE (IMAAC)
- Census tract data from FEMA HAZUS program
  - Building types and numbers
  - Used for insurance purposes
- Databases of typical building construction materials
- Estimates of deposition/penetration
- Estimates of green space/roads between buildings
- Paper presented at WM10 (based on TOPOFF4)
- Method applied to Liberty RadEx, SOE/PLE 3-10
Liberty RadEx

- April 26-30, 2010
- Downtown Philadelphia, PA
- Sponsored and designed by EPA
- Co-sponsors: City of Philadelphia-OEM & PADEP
- Scenario focus: post-emergency phase response to a radiological dispersal device (RDD) detonation
Exercise Scope

- 900+ participants: planners, players, controllers, & evaluators
- Post-emergency phase: 30-90 days past detonation
- Multiple, varied venue sites- Navy yard, subway, office building, water plant, etc.
Main Exercise Goals

- Test/assess ESF-10 response (local, state, & federal management of assessment, mitigation, cleanup of contamination in urban environment)
- Test/assess Nuclear/Radiological Incident Annex of National Response Framework in post-emergency phase
- Exercise the lead-agency, coordinating agency, and support agency roles and interface with ESF-3 (public works), ESF-8 (public health), and ESF-15 (external affairs)
DHS National Planning Scenario 11

- Center City Philadelphia – Federal Building
- 3000 lbs ammonium nitrate mixed with diesel fuel and 2300 curies of cesium-137
- Winds carry radiation contamination NNE through Philadelphia
- Deposition nearly 50 miles out and into north central New Jersey

Exercise began 30-45 days after blast

- Already excavating/demolishing 100s tons/day
- How will cleanup decisions affect waste volumes?
Interagency waste team tasked with developing a waste management plan for the incident

- EPA (HQ, Regions 2 and 3)
- NRC
- USACE
- State of Pennsylvania

Team worked through issues related to

- Staging (several sites identified w/help of citizens)
- Characterization (including identifying special waste)
- Management (logistics – treat, package, transport)
- Disposal (all potential options considered)
Dark Gray: >1000uCi/m²
Medium Gray: >100uCi/m²
Light Gray: >10uCi/m²
Liberty RadEx Deposition Zones

Medium Gray Zone  > 100 uCi/m²

Dark Gray Zone    > 1000 uCi/m²

Total Affected Area  ~ 1 square mile

Estimated Waste Generation  500,000 tons
  • 25,000 trucks
  • Assumes 10% of buildings, all roofs, 6” soil, 1” pavement, all floors removed/demolished
  • Does not address water, trees, blast zone debris
Relocation Zone: Cleanup or Abandon

Based upon Protective Action Guides (PAGs)

- Zone 2 – First year relocation at 2 rem (Federal)
- Zone 3 – Second year relocation at 0.5 rem (State)

Impacted population ~ 61,000

Affected area 5.5 miles long x 1 mile wide (300-600 city blocks)

~1,400,000 tons of waste (70,000 trucks)
  - ~11 billion gallons of liquid waste
50 Year PAG
50-Year PAG Zone

Based on projected 5 rem over 50 years

Impacted population ~ 148,000

Affected area ~ 9 miles long x ~ 2 miles wide

Likely minimum cleanup zone

~4,000,000 tons of waste (200,000 trucks)
For an area at ~5 times background radiation, cleanup to typical Superfund standards results in

- Impacted population ~ 1,000,000
- Affected area ~ 50 miles long x ~ 10 miles wide
  - ~ 300 square miles total
- ~ 40,000,000 tons of waste
  - 2,000,000 tri-axle dump trucks
  - Assuming 1 cubic yard ~ 1 ton, estimated volume is in excess of 1 billion cubic feet
Thoughts on the Exercise

Diligent effort produced a draft plan addressing important aspects
- Policy and logistical issues much broader than can be addressed in a short-term exercise
- Extensive planning allowed the team to focus on the endpoint rather than basic information gathering

State officials forthright about action to be taken
- Would this be true in all states?
- Political support may be critical

Identified gaps in guidance for decision-making