SAND2007-4294P

Response Options Following an Urban Nuclear Attack

presented to the
Health Physics Society
Annual Meeting

Portland, Oregon

July 10, 2007

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Response to an Urban Nuclear Detonation

Tasks that should be addressed include:

- **Situation assessment to understand detonation characteristics and infrastructure status**
- **Estimation of hazard zones that limit operations**
- **Identification of areas where life saving opportunities are greatest**
- **Pragmatic steps to limit spread of contamination**
- **Communication to public regarding appropriate actions (including shelter-evacuate decisions**
- **Control of contaminated areas**

Early, informed action by responders and the public can significantly reduce casualties associated with a nuclear event.

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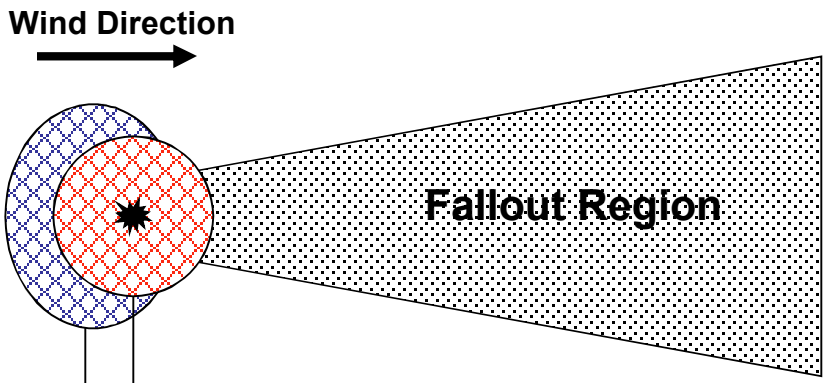
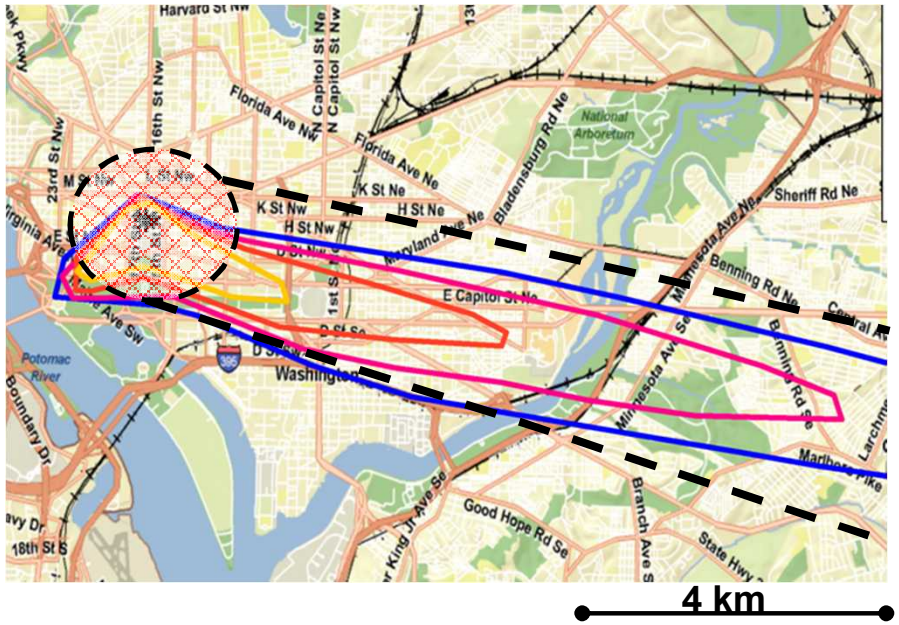
The "Keyhole" Response Planning Concept





Contours: 1000, 500, 250, 100 rem/hr at t = 36 minutes

- **Keepout Zone (~1 to 1.5 km radius)**
  - Underground infrastructures may provide safer access
- **"On-site" Response Zone**
  - Low radiation hazards
  - High probability of ambulatory survivors

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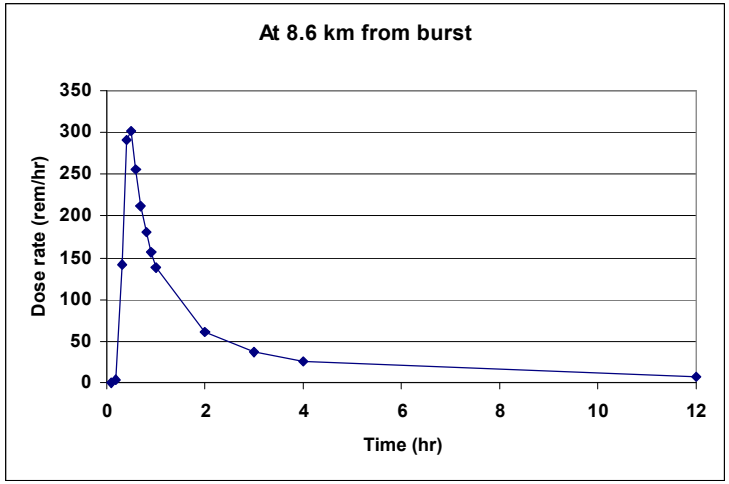
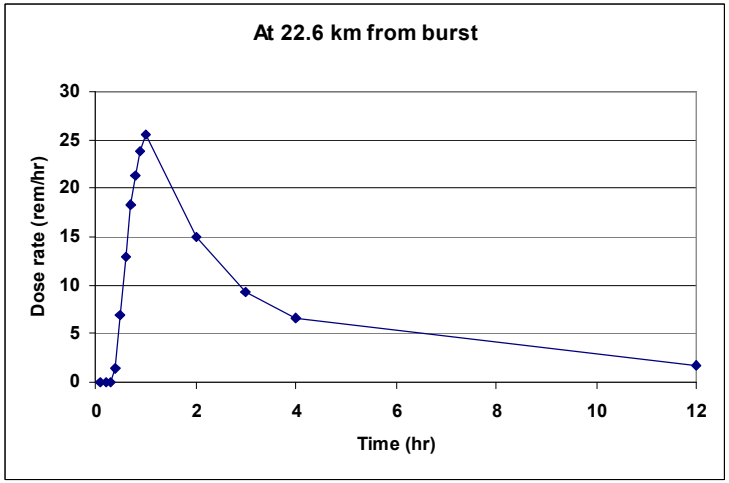
Downwind fallout arrives rapidly.





At 8.6 km downwind, a peak dose rate of 300 rem/hr occurs at 36 minutes.

At 22.6 km downwind, a peak dose rate of 25 rem/hr occurs at 1 hour.

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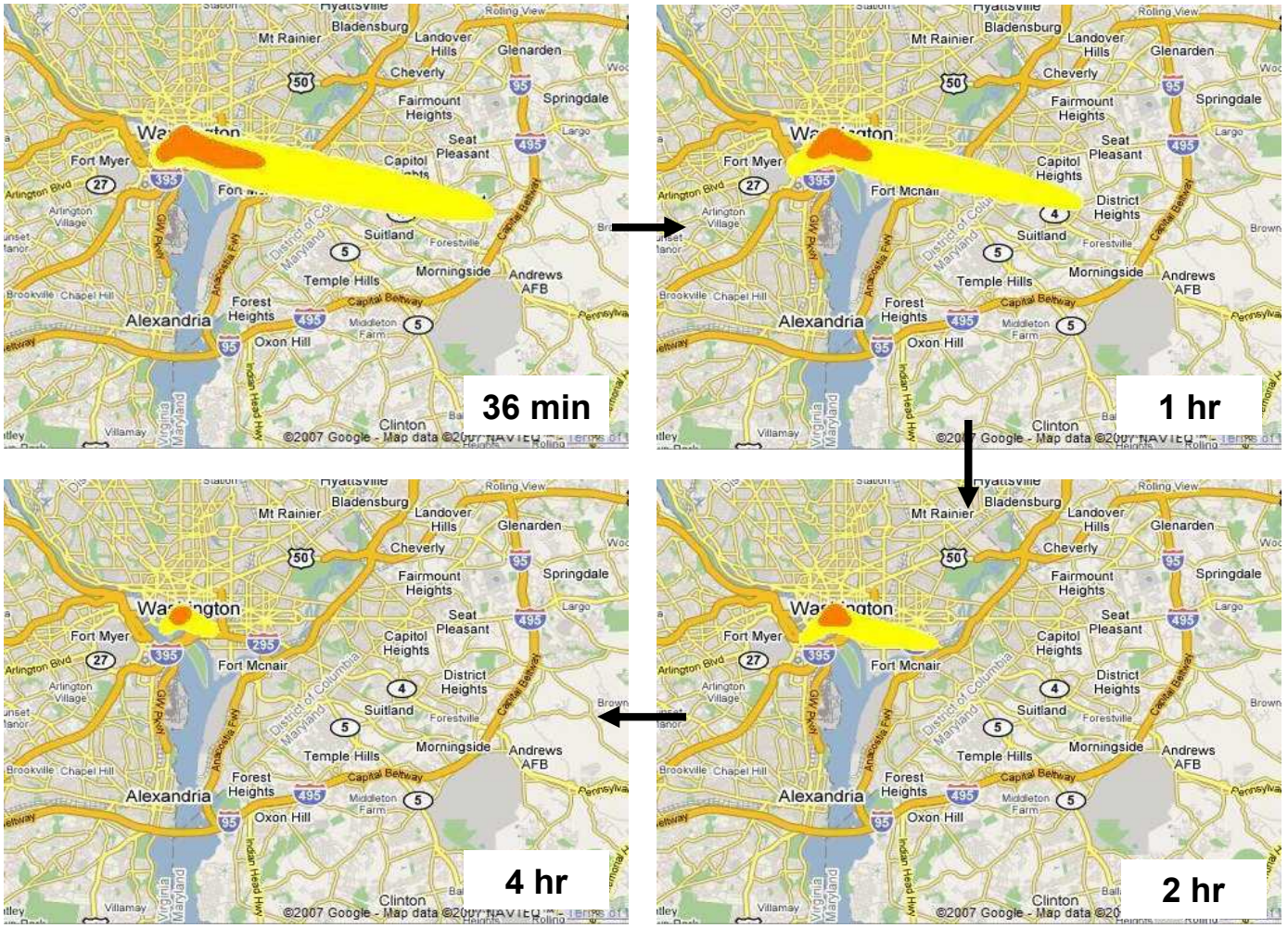
…but peak dose rates decay rapidly as well.



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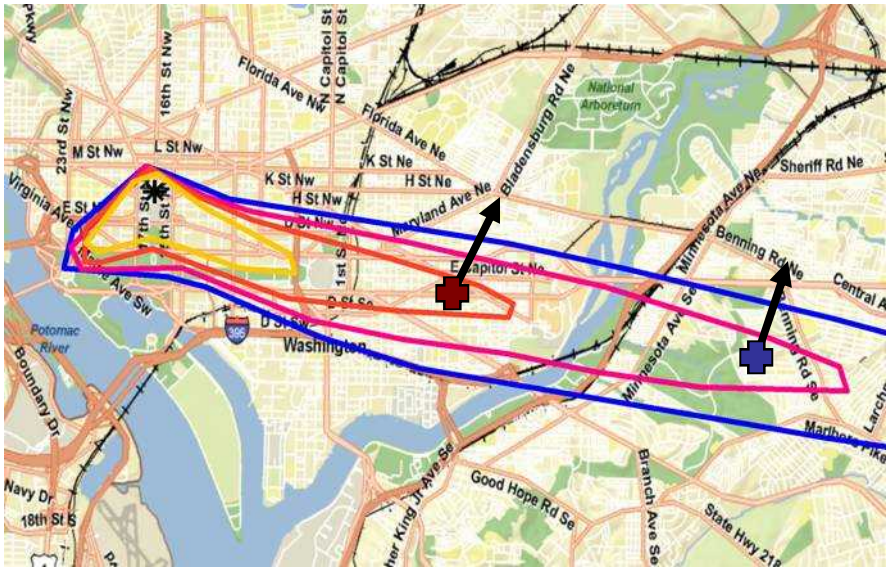
24 Hour Dose for Various Evacuation Strategies



Peak Rate:
600 rem/hr

300 rem/hr

Baseline Shelter (Transmission Factor = 0.15)

	24 Hour Total Dose (in rem)	
	✚	✚
Shelter in Place	**123**	**75**
Evacuate (walking)		
Initial (36 min)	**56**	**41**
At 4 hours	**85**	**54**

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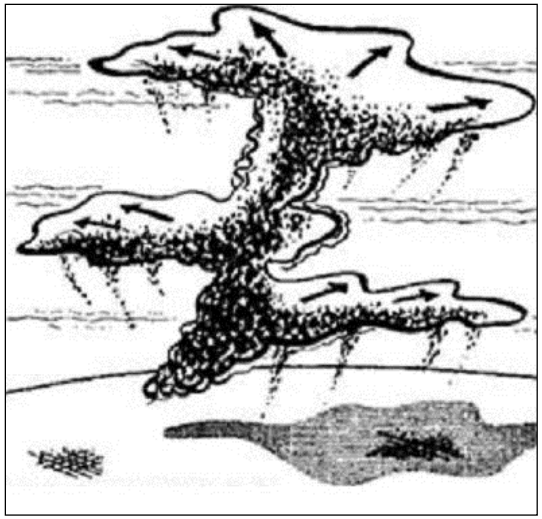
Wind shear can complicate evacuation planning.

- The most intense fallout is created by visible dust or particulate (some as large as fine sand) deposited close to the detonation point.
- The primary fallout direction is determined by high altitude (6-8 km) winds.
- Lower altitude winds primarily impact fallout intensity close to the detonation point.
- Directional wind shear with altitude can cause significant spreading of close-in fallout contours.



Multi-lobed cloud caused by complex wind shear profile.

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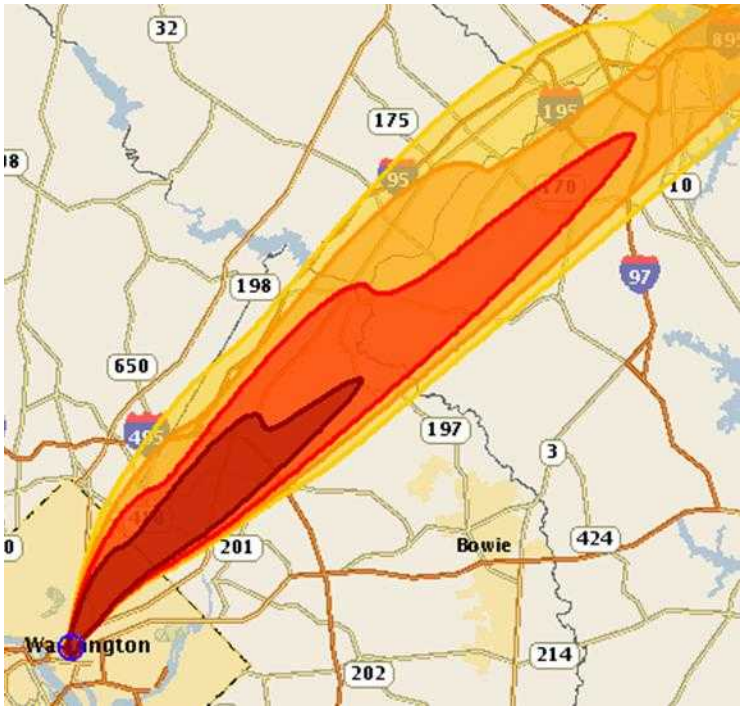
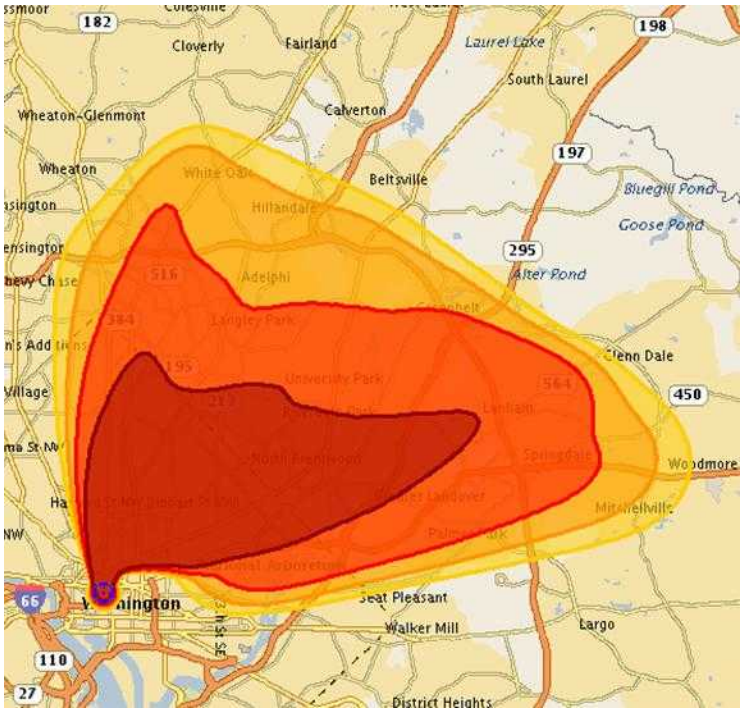
Impact of Meteorological Variations



Meteorology #1



Meteorology #2

Uncertainties in meteorological predictions make early evacuation instructions difficult.

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Observations

- **The response environment following a nuclear event is complex.**
  - Radiation hazards are a key factor in response decisions
  - The shelter-evacuate decision requires balancing of competing factors
  - Other responder decisions also need to be grounded in science-based protocols, including:
    - Situational assessment approaches for hazard mapping and infrastructure survey
    - Contamination avoidance and decontamination
    - Need for population control measures
- **More detailed assessment and development of training and exercise guidance is underway.**

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