



Decontamination strategies adopted by the USEPA in the clean-up of radiologically contaminated sites

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Outline

- EPA Superfund Program
- Case-Studies of Cleanup Sites
- Decontamination Technologies
- Large-scale Cleanup Preparedness Activities
- Chernobyl Short Videos
- Decontamination Research and Development

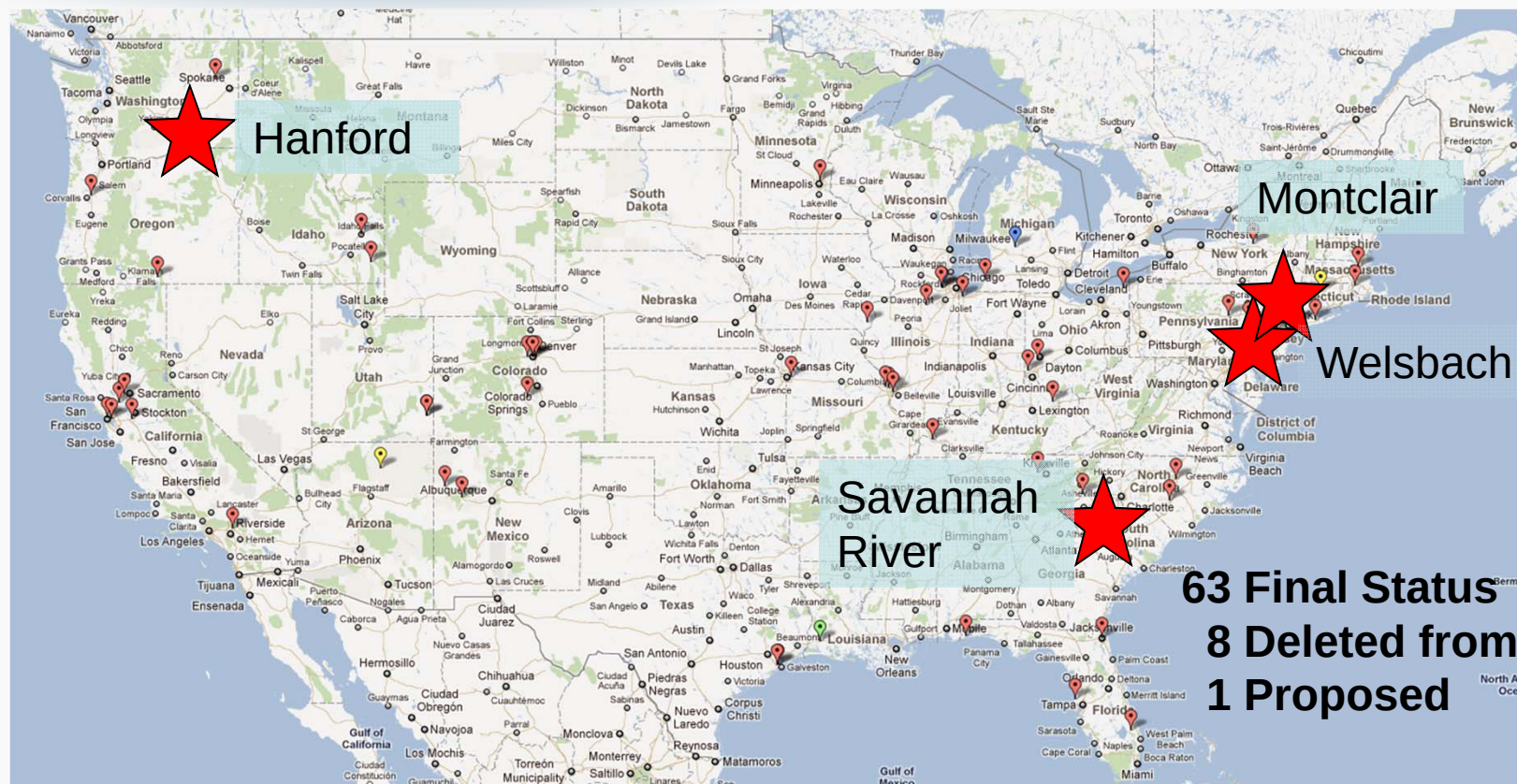


EPA Addresses Site Cleanup Under Several Laws and Programs

- Comprehensive Environmental Response, Compensation & Liability Act, CERCLA or “Superfund”
- National Contingency Plan (NCP) is regulation for CERCLA

National Priorities List (NPL) designates which sites need further attention for long-term cleanup

72 EPA Superfund Radiation NPL Sites



**63 Final Status
8 Deleted from NPL
1 Proposed**



Case studies included in this presentation

<http://www.epa.gov/superfund/sites/cursites/>

Media Contamination



Media	Uranium	Radium	Thorium	Plutonium	Strontium	Tritium	Cesium	Americium	Cobalt	Technetium	Radon	Other Radionuclides*
	Number of NPL Sites											
Soil	47	50	37	11	10	13	9	8	8	6		62
Sediment	13	15	12	2	2	1	4	3	3	2		8
Sludge	4	2	3	2	4	2	3	2	3	1		7
Tailings	7	8	5									
Solid Waste/ Debris	12	12	10	4	2	2	3	1	2	1		9
Groundwater	39	37	23	8	14	16	6	5	4	9	5	25
Surface Water	24	15	16	8	7	10	8	2	5	4	1	6
Leachate/Liquid Waste	2	1	2	2	1					3		3
Air						1					28	

<http://www.epa.gov/radiation/docs/cleanup/media.pdf>

Various Cleanup Levels



Site specific cleanup levels based on future land-use assumptions

Site	Scenario								
	Resident	Rancher	Farmer	Park/Open Space User	Commercial/Industrial	Fish & Wildlife Service	Ecotourist	Homesteader	Subsurface
Brookhaven	✓				✓				
Enewetak	✓		✓						✓
Fernald			✓	✓					
Ft. Dix	✓				✓				
Hanford	✓		✓		✓				
Johnston Atoll	✓					✓	✓	✓	
Linde Site					✓				
Nevada	✓	✓	✓		✓				
Oak Ridge					✓				
Savannah River					✓				
Rocky Flats	✓			✓	✓	✓			
Weldon Spring	✓		✓	✓		✓			

<http://www.itrcweb.org/Documents/RAD-2.pdf>

Decision Criteria

1. Overall protection of human health and the environment
2. Compliance with relevant requirements
3. Long-term effectiveness and performance
4. Reduction of toxicity, mobility, or volume through treatment
5. Short-term effectiveness
6. Implementability
7. Cost
8. State acceptance
9. Community acceptance

Different Cleanup Challenges?



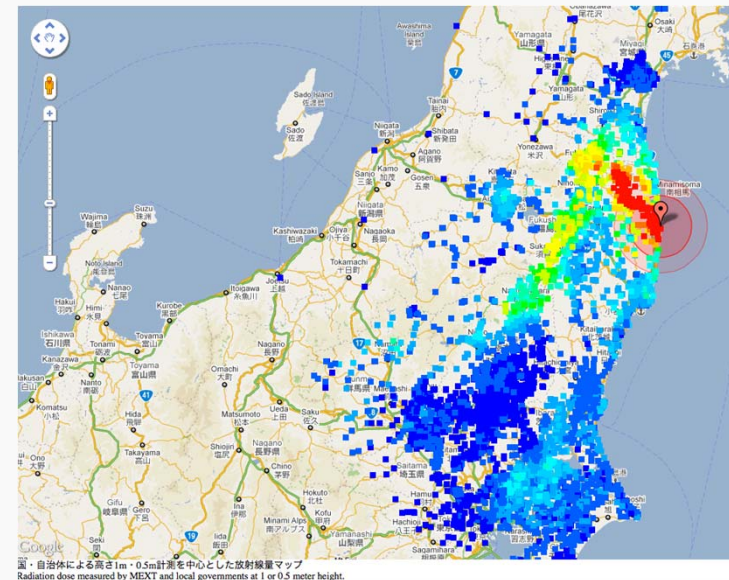
EPA Superfund Sites

- Contamination extends deep into the soil and underlying groundwater
- Residential cleanup generally for Radium, Thorium, and Radon.



Japan Situation

- Widespread surface contamination
- Cesium-134 & -137
- Other fission products (Sr-90)?



Similar Cleanup Challenges?



- Selecting Decontamination Technologies
- Controlling spread of contamination
- Speed of implementation and cost
- Re-contaminating “cleaned” areas
- Determining appropriate exit strategy
 - When to terminate sampling/monitoring
- Large surfaces/media to survey/decon
- Health and Safety (i.e., dose limits)
- Many others...





Welsbach Superfund Site

- Covers two densely populated cities; Gloucester City and Camden
- Gloucester City population¹ 11,456 (5,000 people per square mile)
- Camden population¹ - 77,344 (8,700 people per square mile)

— Welsbach Site Study Areas

1- population data from 2010 U.S. Census



Background: 2002 Aerial



Legend

- Areas of Elevated Thorium Chain Count Rates
- Field Investigative Results
- Remediation Completed



1980 Flyover with EPA
Field Investigative Results
and 2009 ASPECT GEM
Flyover.



Montclair/West Orange Radium Sites



5/13/97

THE MONTCLAIR TIMES



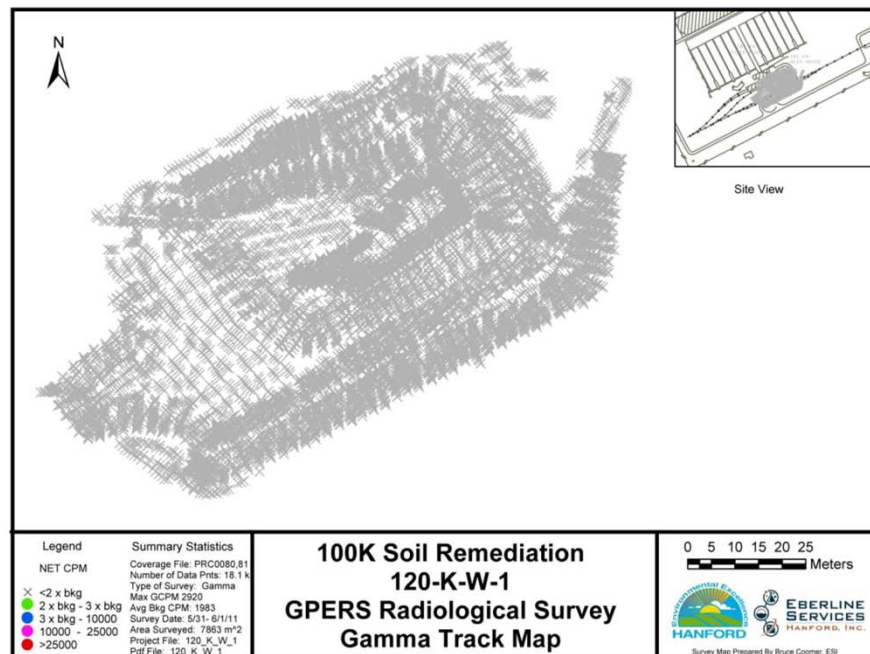
Vacuum Guzzler Truck

Restoration





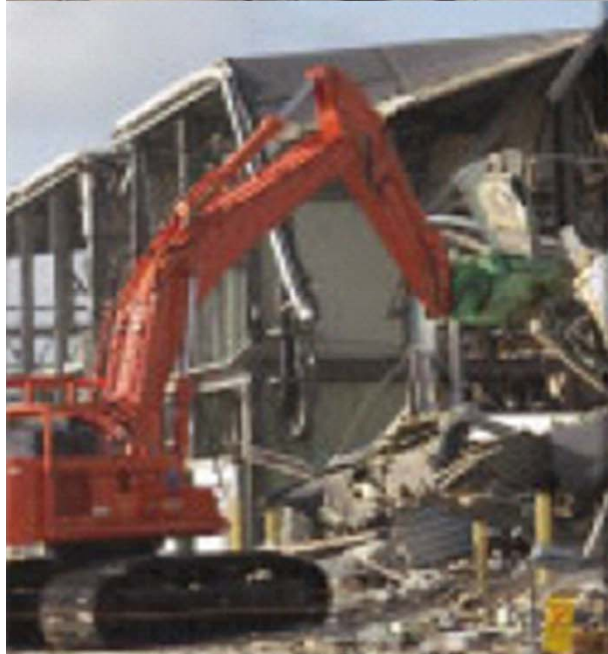
Hanford Site







Savannah River

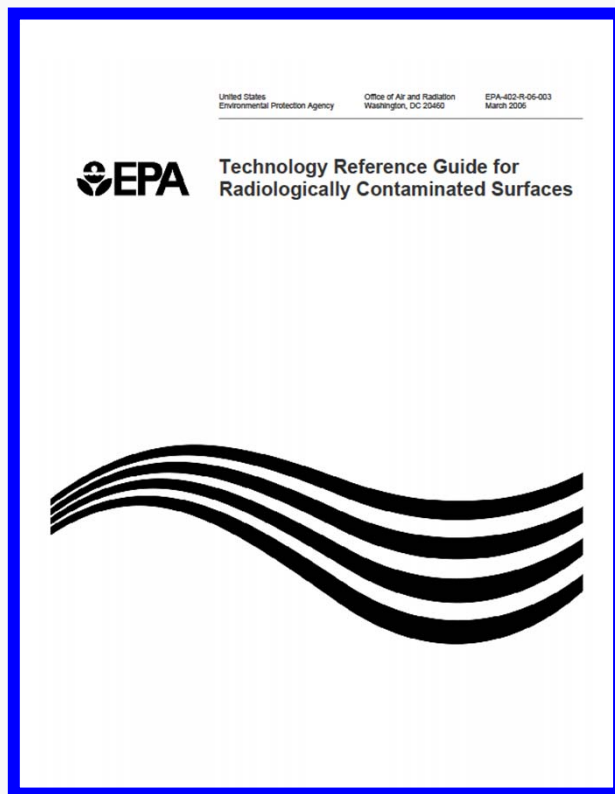


Summary Decontamination Documents



Surfaces

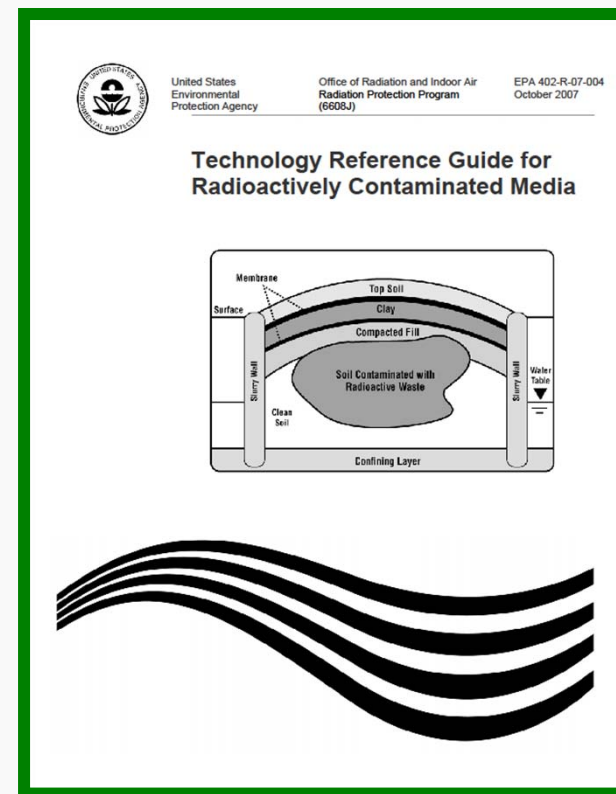
20+ technologies



<http://www.epa.gov/radiation/docs/cleanup/402-r-06-003.pdf>

Media

20+ technologies



<http://www.epa.gov/radiation/docs/cleanup/media.pdf>

Disposal of Large Volumes of Waste

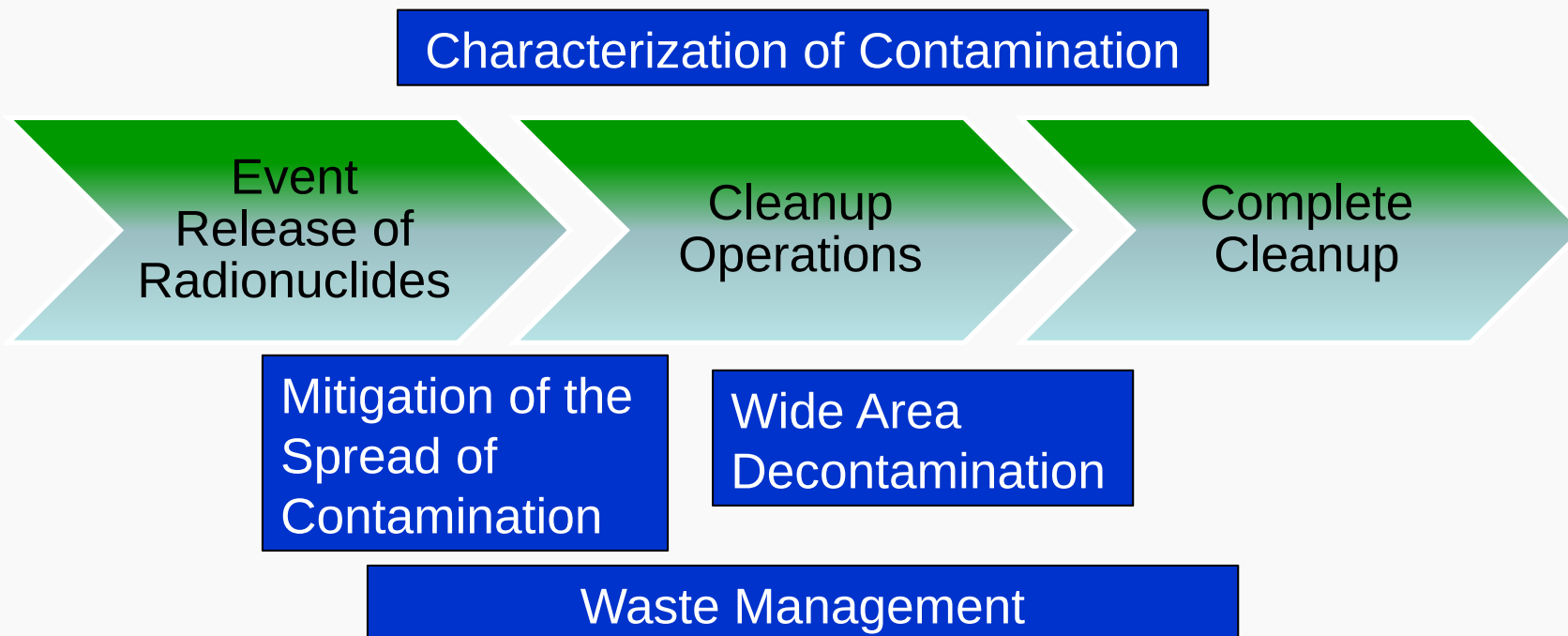


- Natural basin or valleys
- Specially dug trenches
- Mined out quarries or open pit mines
- Underground Mines
- Large mounds





EPA Research and Development Program Areas



R&D Characterization of Contamination



- Rapid sampling and analysis methods
- Sample collection procedures
- A guide for development of a sample collection plan
- Evaluation of systems for on-line detection of alpha, beta, and gamma emitters in drinking water

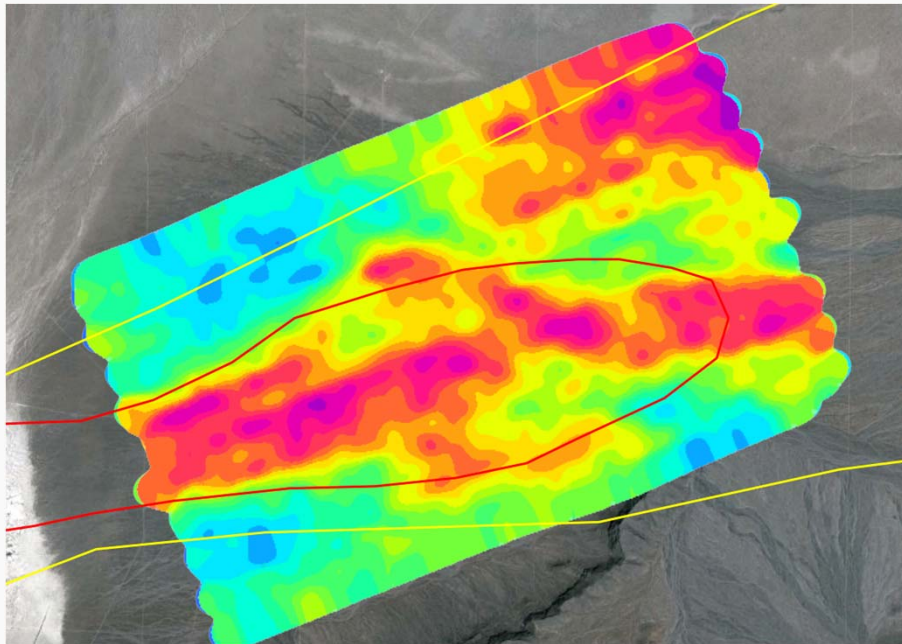


<http://www.epa.gov/nhsrsc/sam.html>

Advanced Processing Algorithms (distributed contamination)



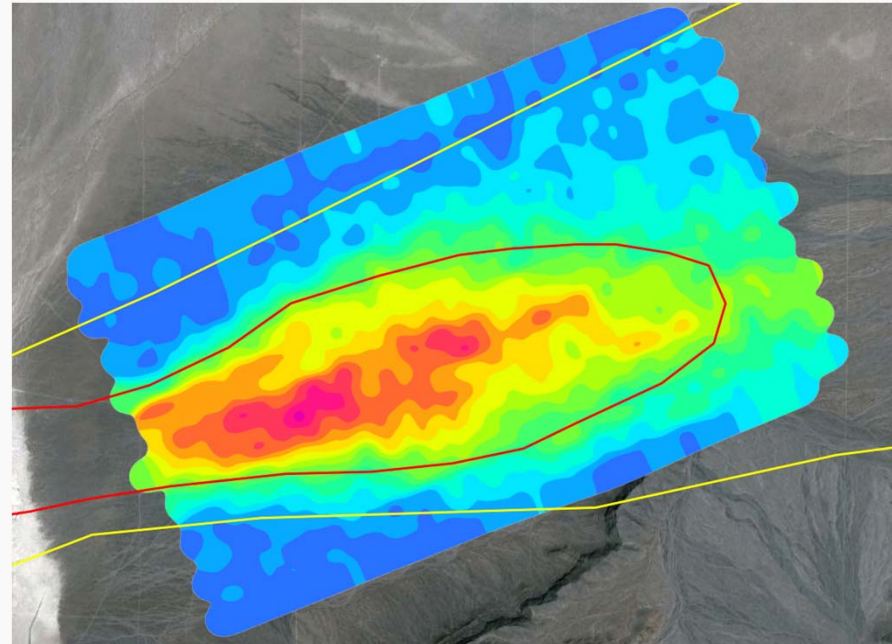
Cs-137 ROI



Total counts in ROI for specific
isotopes

Product produced **quickly**

NASVD : Cs-137 contour



Noise Adjusted Singular Value
Decomposition

Post processing requires
subject matter expertise

www.epaosc.net/aspectgem

R&D Mitigation of Contamination



- Evaluation of technologies for gross decontamination (fire hosing, pressure washing)
- Development of test procedures for sequestration coatings
- Evaluation of the fate and transport of radionuclides in drinking water infrastructure
- Development of a wash-aid for mitigation of cesium contamination



<http://www.epa.gov/nhsrcl>

R&D Wide Area Decontamination



- Evaluation of methods for decontamination of drinking water infrastructure
- Evaluation of self help methods (laundering, use of cleaners on hard surfaces) for removal of radionuclides
- Evaluation (bench to full scale) of physical and chemical decontamination technologies (e.g. strippable coatings, gels, foams) for removal of radionuclides

Material	%R – ^{137}Cs (Simple Green)	%R - ^{137}Cs (water)
Vinyl flooring	96.7%	96.0%
Granite	31.4%	7.7%
Poly coated wood	67.2%	68.1%
Painted wallboard	9.5%	7.3%



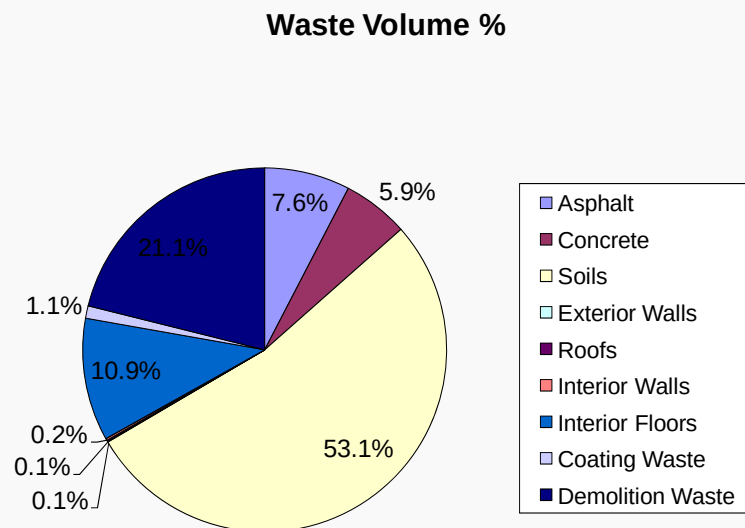
<http://www.epa.gov/nhsrcl>

U.S. Environmental Protection Agency

R&D Waste Management



- Development of a first-order waste estimation methodology and accompanying tool
- Development of a waste minimization method for cesium-contaminated biomass
- Development of waste segregation methodologies for waste minimization
- Scoping study on waste water systems



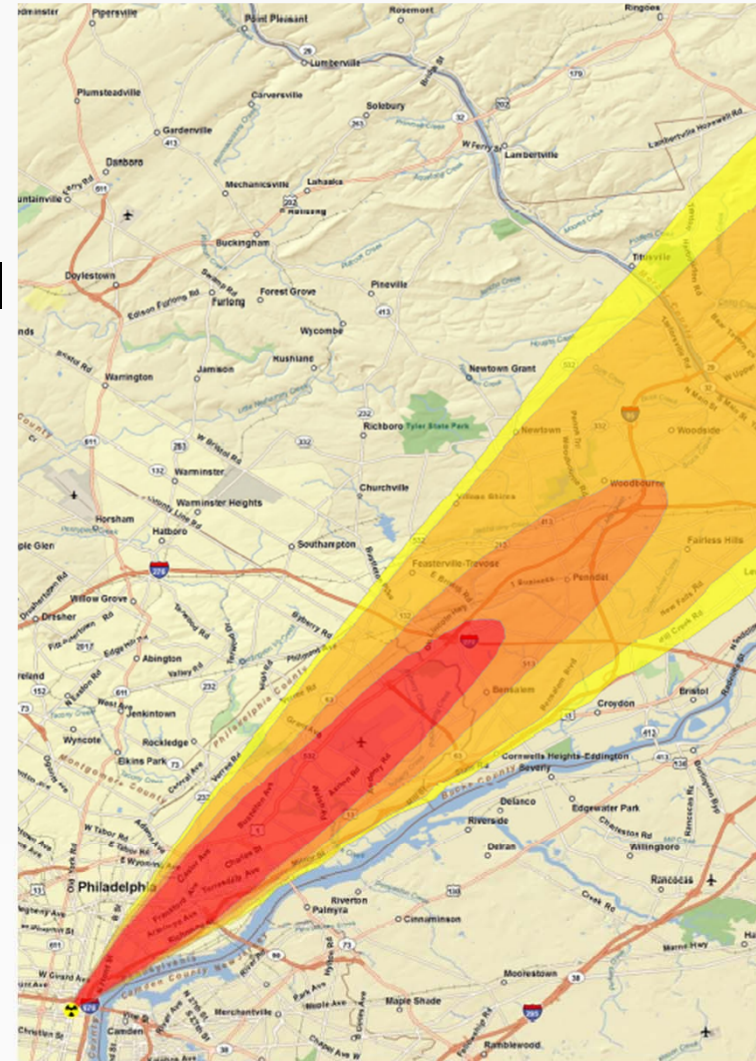
<http://www.epa.gov/nhsr/>



Liberty RadEx Exercise



- April 2010
- Cs-137 Dispersal Device Attack
- 1st EPA - sponsored national level exercise
 - 1,000 participants
 - 35 Federal Agencies
 - 9 community groups
 - 14 business
 - 2 universities
 - 6 foreign countries
- 1st to focus on late-phase
<http://www.epa.gov/libertyradex/>



Short videos on Chernobyl accident & EPA preparations



Managing the Food Supply (50 second clip)



11 Short videos

1. Lesson Learned
2. Radiation and Radioactivity
3. Types of Radiation Incidents
4. The Initial Response
5. Self Protection
6. Reducing Risks
7. Managing Food Supply
8. Coping with Health Concerns
9. Communication / Trust
10. US Government Preparation
11. Educational Resources

More Information



- Guidance documents are on Superfund Radiation Webpage:
 - <http://www.epa.gov/superfund/health/contaminants/radiation/index.htm>
- EPA/ITRC training on EPA Superfund radiation approach
 - http://www.clu-in.org/conf/itrc/radscleanup_060507/
- Guidance documents for overall cleanup level issues are on Superfund Remedy Decisions Webpage:
 - <http://www.epa.gov/superfund/policy/remedy/sfremedy/index.htm>

Theory of “Recovery”



$$E = mc^5$$

E =

efficiency

m =

massive amounts of

c =

coordination

communication

collaboration

cooperation

cash

Questions?



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