What Types and Quantities of Waste Would be Generated from an RDD?

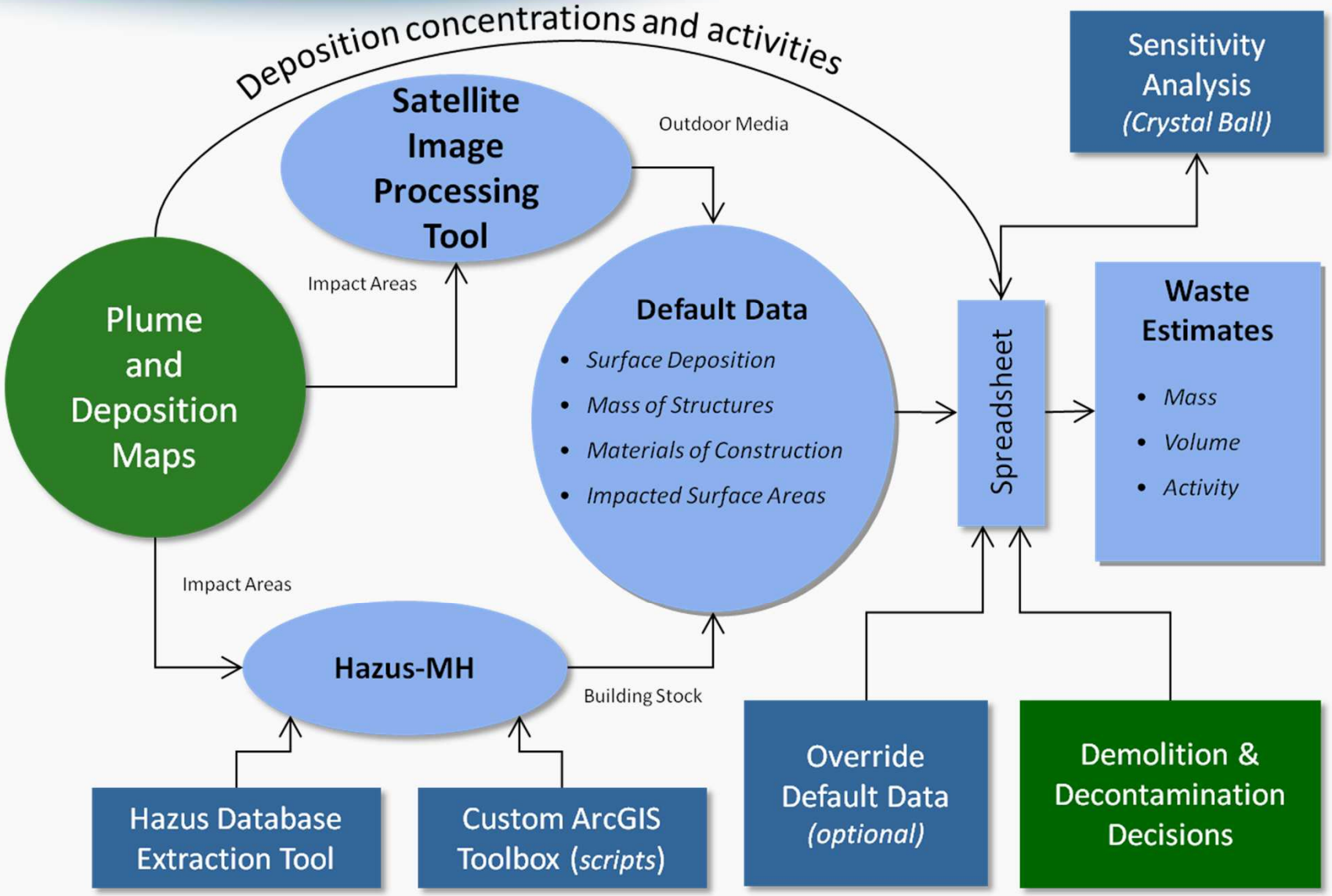
Paul Lemieux
US EPA
National Homeland Security Research Center

Tools that Were Used

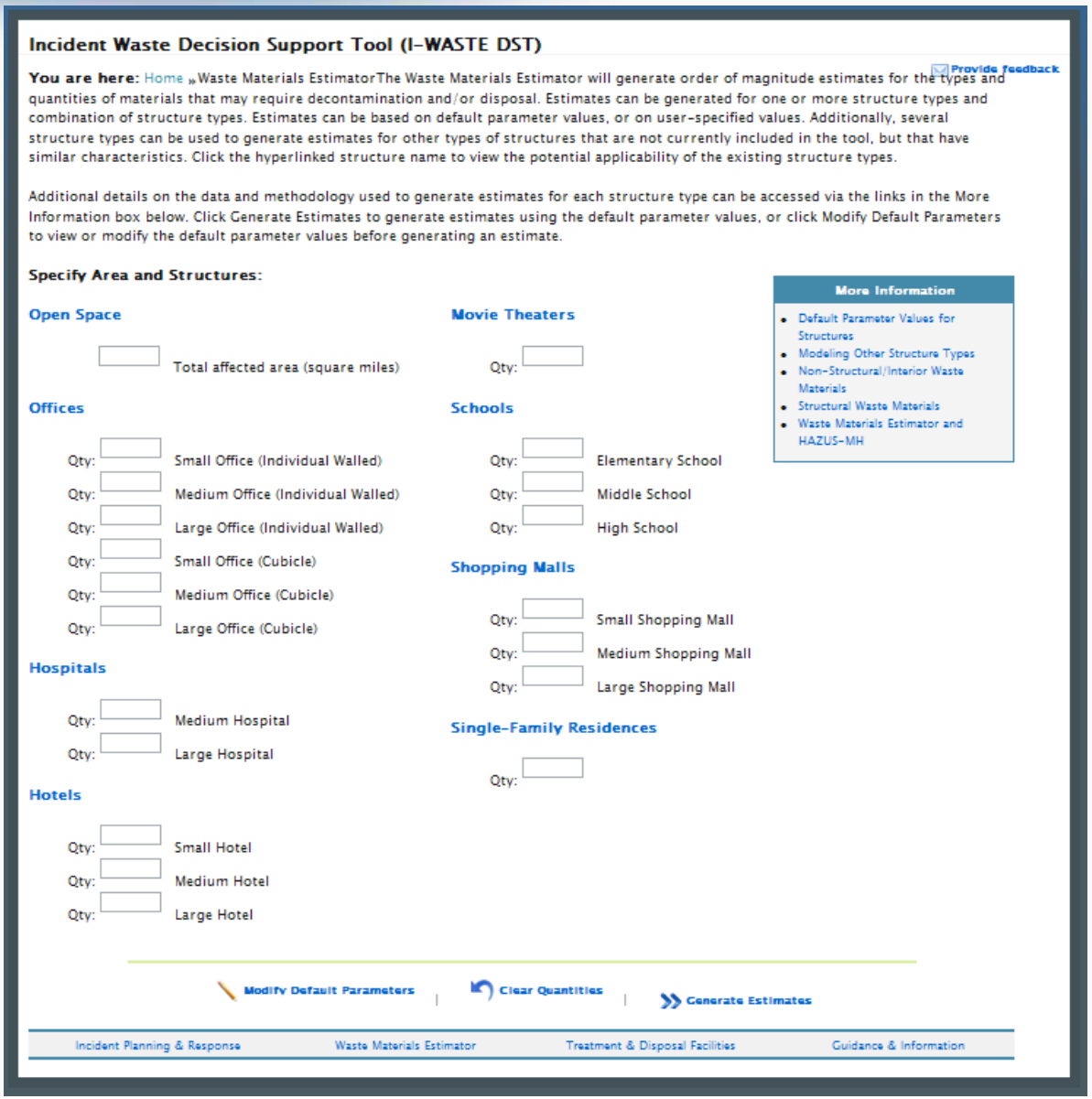
- Scenario from DHS Wide Area Recovery and Resiliency Program (WARRP)
- RDD Waste Estimation Support Tool (WEST)
  - Building Stock and Outdoor Areas
  - Decon and Demolition Waste
- I-WASTE Tool
  - Building Contents
- Bio-response Operational Testing and Evaluation (BOTE) Personnel Decontamination Waste Generation Data

Denver RDD WARRP Scenario

Waste Estimation Support Tool (WEST)



I-WASTE Tool



Incident Waste Decision Support Tool (I-WASTE DST)

Provide Feedback

You are here: Home »Waste Materials EstimatorThe Waste Materials Estimator will generate order of magnitude estimates for the types and quantities of materials that may require decontamination and/or disposal. Estimates can be generated for one or more structure types and combination of structure types. Estimates can be based on default parameter values, or on user-specified values. Additionally, several structure types can be used to generate estimates for other types of structures that are not currently included in the tool, but that have similar characteristics. Click the hyperlinked structure name to view the potential applicability of the existing structure types.

Additional details on the data and methodology used to generate estimates for each structure type can be accessed via the links in the More Information box below. Click Generate Estimates to generate estimates using the default parameter values, or click Modify Default Parameters to view or modify the default parameter values before generating an estimate.

Specify Area and Structures:

More Information

- Default Parameter Values for Structures
- Modeling Other Structure Types
- Non-Structural/Interior Waste Materials
- Structural Waste Materials
- Waste Materials Estimator and HAZUS-MH

Open Space

Total affected area (square miles)

Offices

Qty: Small Office (Individual Walled)
Qty: Medium Office (Individual Walled)
Qty: Large Office (Individual Walled)
Qty: Small Office (Cubicle)
Qty: Medium Office (Cubicle)
Qty: Large Office (Cubicle)

Hospitals

Qty: Medium Hospital
Qty: Large Hospital

Hotels

Qty: Small Hotel
Qty: Medium Hotel
Qty: Large Hotel

Movie Theaters

Qty:

Schools

Qty: Elementary School
Qty: Middle School
Qty: High School

Shopping Malls

Qty: Small Shopping Mall
Qty: Medium Shopping Mall
Qty: Large Shopping Mall

Single-Family Residences

Qty:

Modify Default Parameters | Clear Quantities | Generate Estimates

Incident Planning & Response | Waste Materials Estimator | Treatment & Disposal Facilities | Guidance & Information

Methodology for Waste Estimation

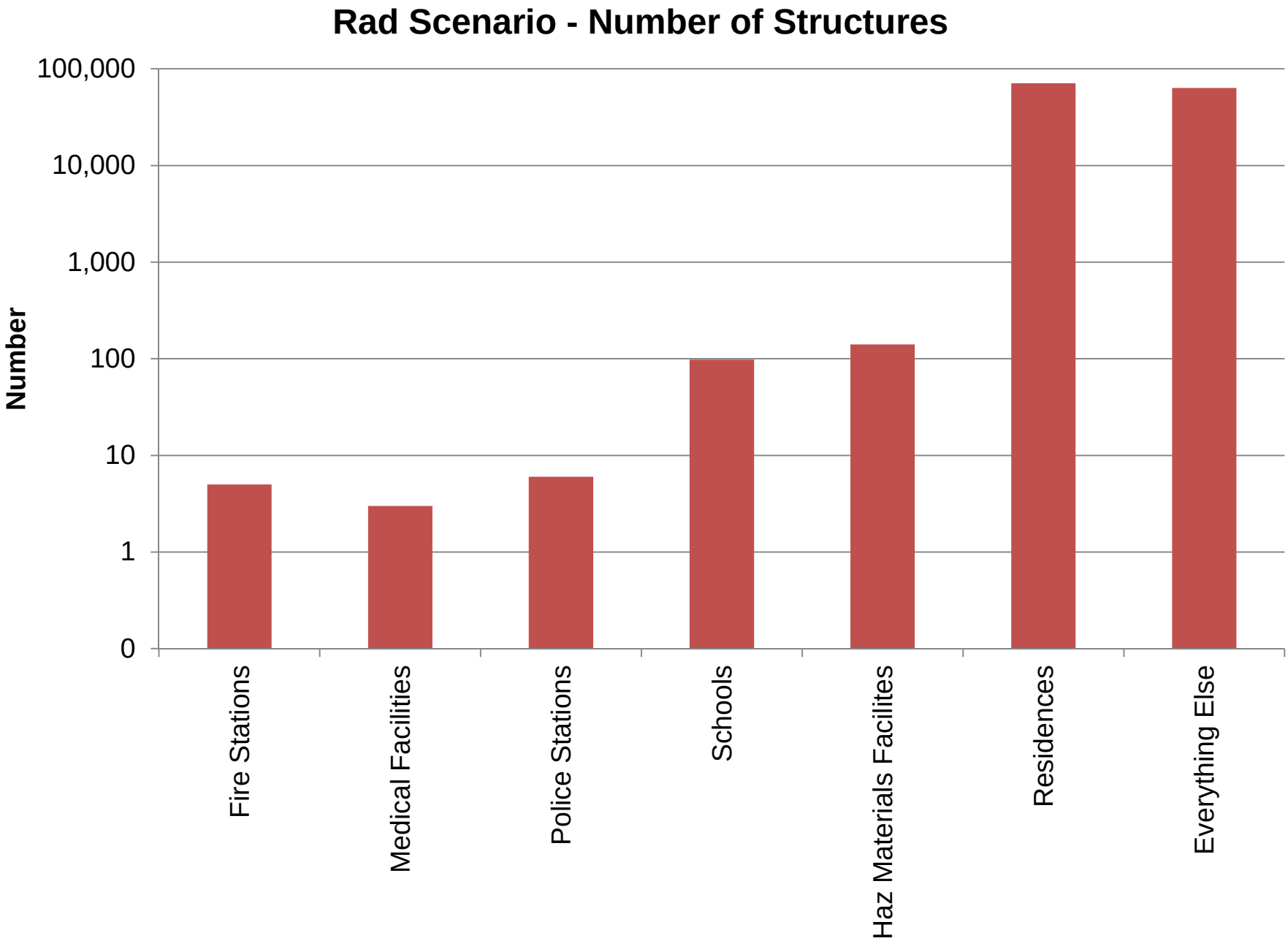
- Used Plume Shapefiles from WARRP Planning Team
- Used RDD WEST GIS tools to develop inventory of building stock and infrastructure in affected area
- Used RDD WEST spreadsheet to estimate waste quantity and activity using assumed decontamination and demolition parameters
- Used I-WASTE Tool's Back of the Envelope Estimator (BOEE) to estimate building contents
  - Mapped HAZUS building types to I-WASTE BOEE building types
  - Used DRAFT data from BOTE to estimate quantity of personnel decon waste (liquid and solid) from sampling and decontamination
  - Identified building contents that would likely enter waste stream

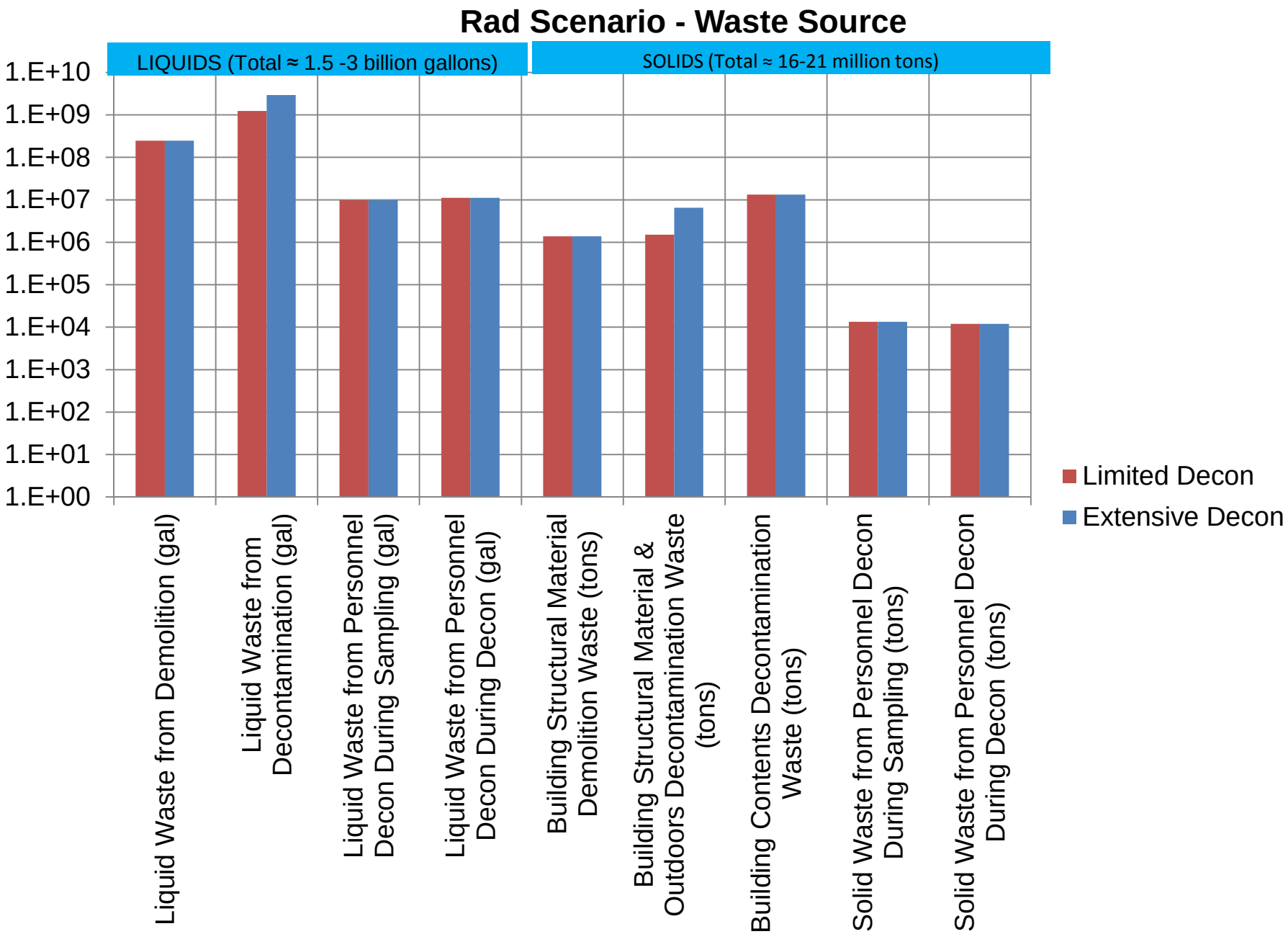
Methodology for Waste Estimation

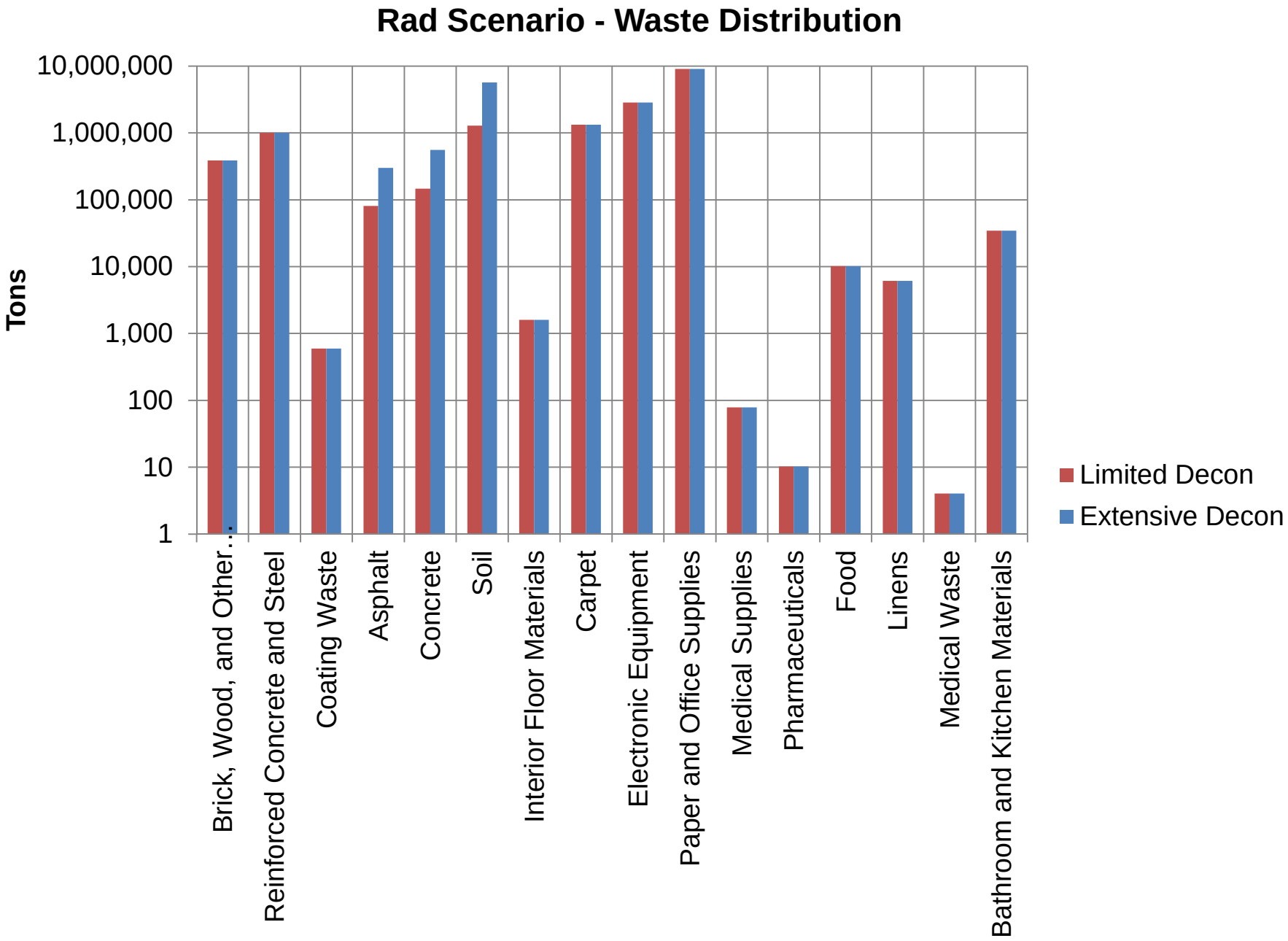
- Counted schools, hospitals as per HAZUS output, assumed all small wood buildings and mobile homes are residences, assumed all the rest of the general building stock was offices (99%), hotels (1%); assumed small (50%), medium (30%), large (20%)

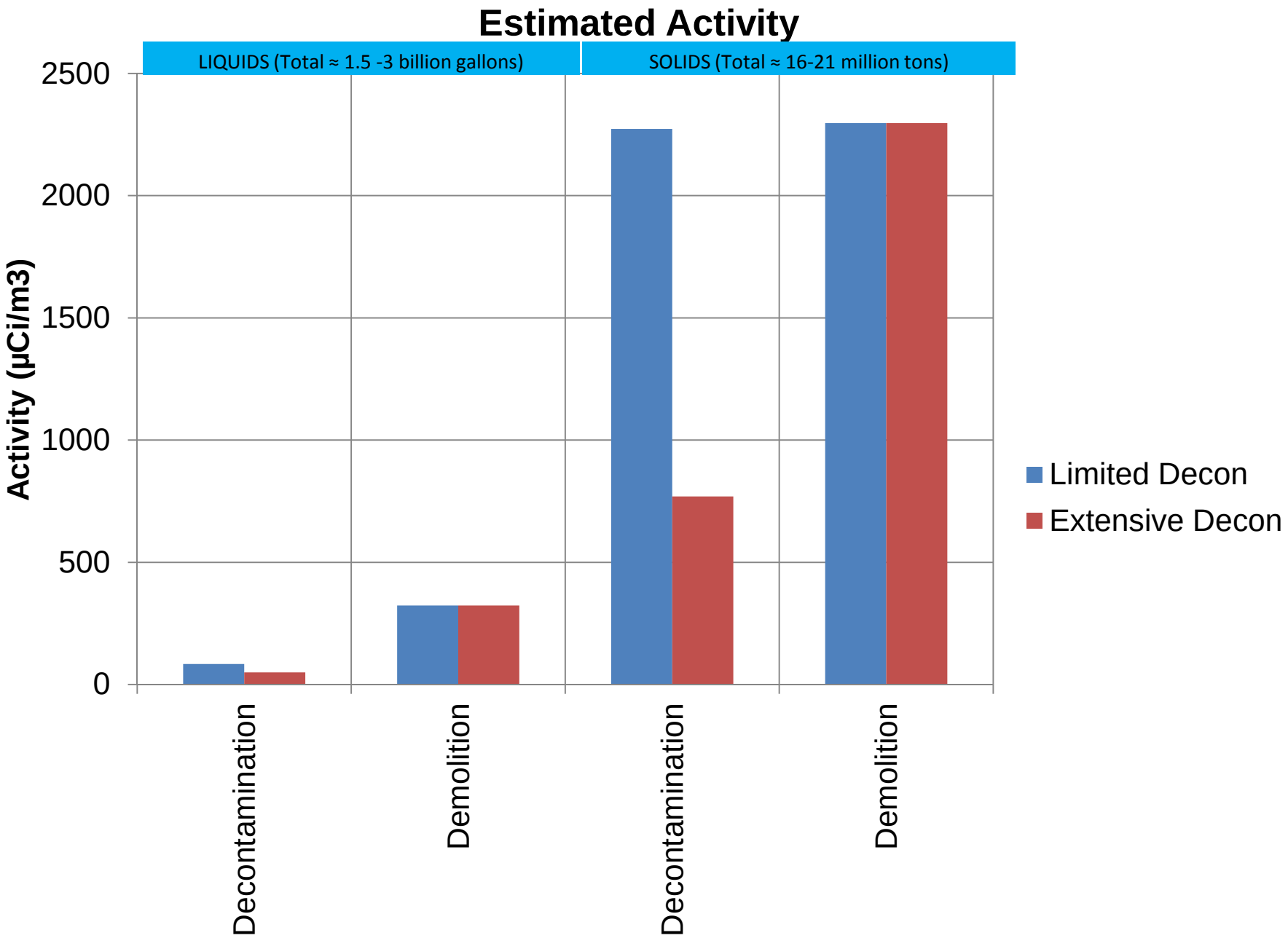
Waste Estimate Assumptions

- Assumed 2 different decon scenarios
  - Extensive decontamination (significant amount of demolition, lots of washing, interior decon)
  - Limited decontamination (less demolition, less washing, interior decon)
- Used personnel decontamination waste generation rates from BOTE volumetric decon data for both sampling and decon


Rad Scenario - Number of Structures
Number
100,000
10,000
1,000
100
10
1
0
Fire Stations
Medical Facilities
Police Stations
Schools
Haz Materials Facilites
Residences
Everything Else


Rad Scenario - Waste Source
LIQUIDS (Total ≈ 1.5 -3 billion gallons)
SOLIDS (Total ≈ 16-21 million tons)
1.E+10
1.E+09
1.E+08
1.E+07
1.E+06
1.E+05
1.E+04
1.E+03
1.E+02
1.E+01
1.E+00
Liquid Waste from Demolition (gal)
Liquid Waste from Decontamination (gal)
Liquid Waste from Personnel Decon During Sampling (gal)
Liquid Waste from Personnel Decon During Decon (gal)
Building Structural Material Demolition Waste (tons)
Building Structural Material & Outdoors Decontamination Waste (tons)
Building Contents Decontamination Waste (tons)
Solid Waste from Personnel Decon During Sampling (tons)
Solid Waste from Personnel Decon During Decon (tons)
Limited Decon
Extensive Decon


Rad Scenario - Waste Distribution
Tons
10,000,000
1,000,000
100,000
10,000
1,000
100
10
1
Brick, Wood, and Other…
Reinforced Concrete and Steel
Coating Waste
Asphalt
Concrete
Soil
Interior Floor Materials
Carpet
Electronic Equipment
Paper and Office Supplies
Medical Supplies
Pharmaceuticals
Food
Linens
Medical Waste
Bathroom and Kitchen Materials
Limited Decon
Extensive Decon


Estimated Activity
LIQUIDS (Total ≈ 1.5 -3 billion gallons)
SOLIDS (Total ≈ 16-21 million tons)
Activity (µCi/m3)
2500
2000
1500
1000
500
0
Decontamination
Demolition
Decontamination
Demolition
Limited Decon
Extensive Decon

Rad Scenario Waste Observations

- 3 billion gallons of water for decon is 4% of Denver's annual water usage
- Most solid waste generated from a few streams
  - Soil, concrete, ceiling tile, carpet, electronics, furniture, paper
- Not a huge overall difference between "limited" and "extensive" decon scenarios, mainly due to amount of contaminated soil

Disclaimer

- Reference herein to any specific commercial products, process, or service by trade name, trademark, manufacturer, or otherwise, does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States Government. The views and opinions of authors expressed herein do not necessarily state or reflect those of the United States Government, and shall not be used for advertising or product endorsement purposes.