

# Authorized Limits: Current Status and Path Forward

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# What are Authorized Limits?

“DOE establishes authorized limits as a way to set protection limits from exposure to radiation as a result of plant processes”

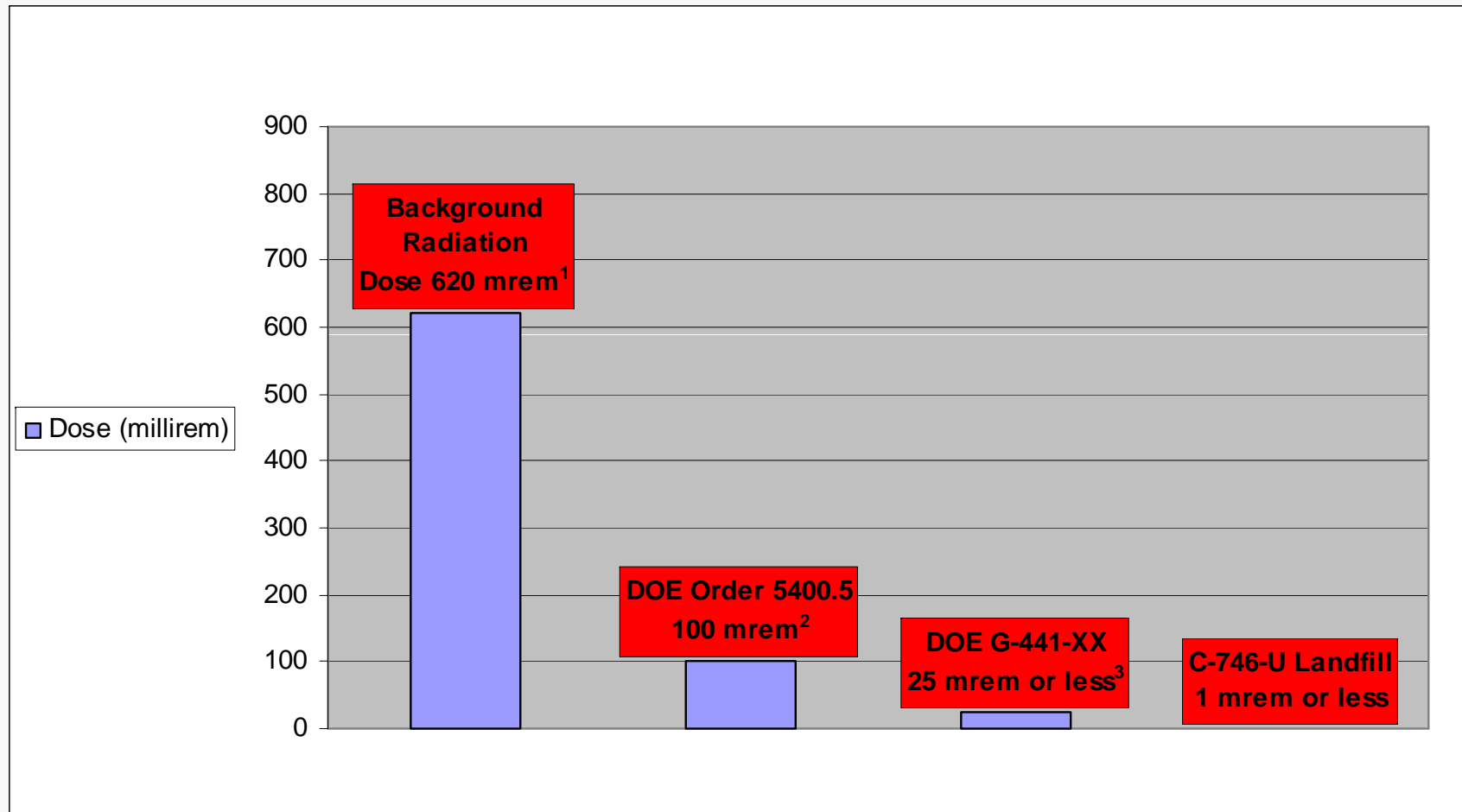
DOE develops authorized limits in these situations:

- Property is being released to the public
- Material is being disposed of

# What are Authorized Limits?

- **Authorized limits** is a level of residual radioactive material that shall not be exceeded if the remedial action is to be considered completed **and** the property is to be released without restrictions on use due to residual radioactive material.
- The basic public dose limits for exposure to residual radioactive material, *in addition to natural occurring "background" exposures*, are 100 mrem per year

# Authorized Limits Compared to Regulatory Guidelines and Background Exposure Rates



1. Background form natural sources
2. Limit for all sources and pathways
3. Release of real property

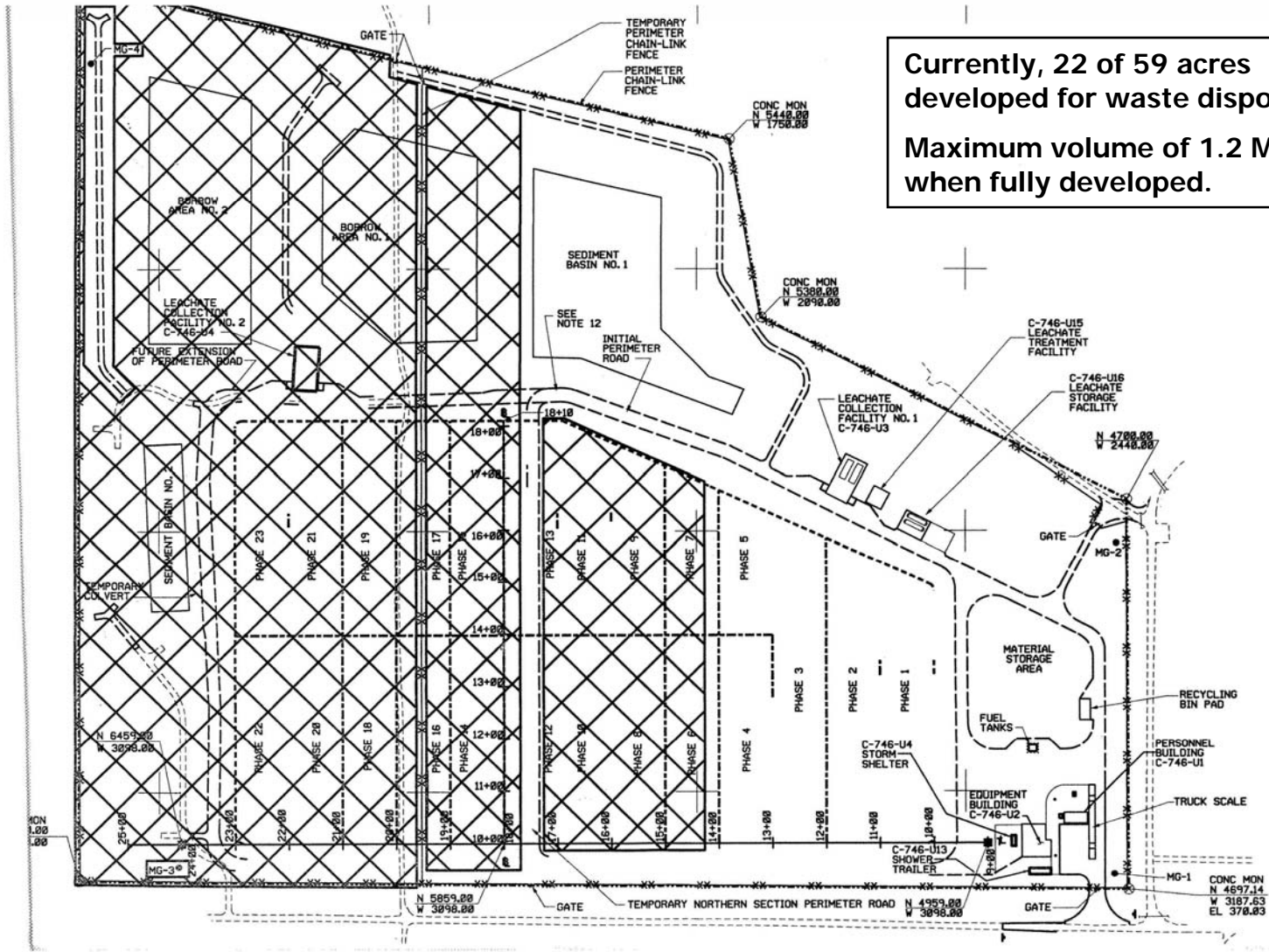
# What are Natural Background Exposures?

Radiation Category	Annual Radiation Dose (NCRP 160)
Background	311 mrem
Medical	300 mrem
Consumer Products	1.3 mrem
Industrial Products, Security, Educational and research	0.3 mrem
Occupational	0.5 mrem
Total Annual dose from natural background radiation (rounded)	620 mrem

# Why are Authorized Limits being Discussed?

- Educate the CAB as to why we are revising the Authorized Limits and the path forward for developing the new limits for C-746-U Landfill.
- DOE is going to be changing the expiring authorized limits for the C-746-U landfill.
- Discuss the reason for developing Authorized Limits for the wildlife areas and the path forward for developing the new limits.

# C-746-U Landfill



Currently, 22 of 59 acres developed for waste disposal.  
 Maximum volume of 1.2 M yd<sup>3</sup> when fully developed.

# Current Authorized Limits

- C-746-U Authorized Limits were approved by DOE ORO on February 6, 2003
  - Applied to disposal of solid waste (i.e., non-hazardous soil and debris wastes generated from construction, maintenance, environmental restoration, and D&D activities in PGDP C-746-U landfill).
  - Authorized Limits projected disposal volume estimates for 7 years' operation
  - Disposal Volume Estimates:
    - 11,795 M<sup>3</sup> first year
    - 5000 M<sup>3</sup> annually for years 2-7

# Dose Assessment – Basis for AL

- DOE evaluated public and occupational dose by 2 computer models: RESRAD & TSD-DOSE
- Kentucky confirmed dose calculations using RESRAD

Note : RESRAD is recognized and used nationally (by EPA and NRC and other government agencies) and internationally.

# Results of Dose Assessment

- Occupational dose projected by TSD-DOSE
  - Total annual maximum projected TEDE was 4.04 mrem/year
  - Workers are monitored
  - Workers are legally allowed 5000 mrem/yr
  - No detectable exposure to workers has been observed from PGDP activities
  
- Dose **projected** by RESRAD
  - Occupational (Maximum) – 0.02 mrem/year
  - Resident (Maximum) – 0.06 mrem/year
  - Subsistence Farmer (Maximum dose) – 88.7 mrem/year

# Maximum Projected Dose

- Maximum projected dose is to a farmer residing on top of the landfill, growing crops and raising livestock for consumption.
- In this case, the maximum projected annual dose is 88.7 mrem if all controls fail. This is less than the annual public dose limit of 100 mrem/year accepted by the DOE.
- This is really a worst-case scenario that is very unlikely.

# Review of Authorized Limits

- The DOE evaluated the current Authorized Limits and tracking system in October, 2008.
- Conclusion of Authorized Limits evaluation
  - PPPO checks the activity by radionuclide being disposed and compares it against annual caps and the overall AL limits.
  - PPPO receives and analyzes weekly and monthly waste stream disposal reports from Energy Solutions, the C-746-U landfill operator and PRS partner.
  - On-going authorized limits disposal waste streams are well tracked.

# Why New ALs for C-746-U?

- Existing Authorized Limits need to be closed and new Authorized Limits need to be developed, approved, and implemented.
  - Current Authorized Limits based on PGDP work activities projected in 2002.
  - ARRA has expedited D&D Work at PGDP.
  - The clean-up has been accelerated throughout the site.
  - With landfill expansion, new Authorized Limits needed to ensure appropriate disposal.

# Why ALs for Wildlife Areas?

- Provide a set of limits that will be used for review of survey data for areas like the soil piles.
- Better understanding of sites in the West Kentucky Wildlife Management Area that might have residual contamination.
  - Does residual contamination need to be cleaned up to protect Workers? Residents? Recreational Users?

# New Authorized Limit Evaluation

- ORISE has been awarded the contract to perform new Authorized Limits evaluation for PGDP wildlife areas and the C-746-U landfill.
- ORISE is a nationally recognized expert in radiation protection.
- ORISE will use the latest versions of RESRAD or RESRAD OFFSITE and TSD-Dose to model exposure pathways.

# Review and Approval

- As with the current Authorized Limits, DOE will work with the USEPA and the Commonwealth of Kentucky when developing the new Authorized Limits.
- Because the limit used to derive the Authorized Limits will be at 1 mrem per year, approval will be by the PPPO Manager in consultation with the Chief Health, Safety and Security Officer at DOE-HQ.

# Schedule

Milestone Task Summary	Estimated Delivery Dates (Landfill)	Estimated Delivery Dates (Wildlife)
ORISE submits technical and cost proposal to DOE-Paducah	12/4/09	12/4/09
Contract Award and Receipt of Funding	1/19/10	1/19/10
Kick off - Biweekly conference calls with DOE and ORISE staff	2/1/10	2/1/10
Deliver draft Analytical Plan to DOE	3/3/10	4/14/10
Presentation of Analytical Plan to DOE and DOE-invited regulators (Lexington, KY) (Note: exact dates, times, and invitees to be determined by DOE Paducah.)	March 11-12, 2010	Week of 4/19/2010
Begin writing Draft D0	2/2/10	2/2/10
Provide D0 to DOE for review and comment	4/21/10	6/16/10
Receive comments on D0 from DOE	5/12/10	7/7/10
Begin writing Draft D1	5/12/10	7/7/10
Deliver Draft D1 to DOE for review and comment	6/9/10	8/4/10
Receive comments from DOE on D1	6/23/10	8/18/10
Begin writing Final Report (D2)	6/23/10	8/18/10
Deliver Final Report (D2) to DOE for Submittal (Note: Limited to primarily main text; not all relevant appendices)	7/16/10	9/15/10
Final Report (D2) Submitted by DOE-Paducah to DOE-HQ (Note: Some appendices that use the ALs will be completed after the Final Report is delivered). ORISE presentation of final report to DOE - location and date to be determine by DOE.	Week of 7/19/2010	Week of 9/20/2010
DOE-HQ anticipated approval of Authorized Limits	8/18/10	10/22/10
Deliver D1 of report appendices to DOE for review and comment	9/15/10	11/24/10
Receive comments from DOE on D1 Appendices	9/22/10	12/1/10
Submission of Final (D2) Appendices to DOE	9/29/10	12/8/10

- Backup Slides

# Authorized Limits

- General Information:
  - Regulatory authority for Authorized Limits is promulgated in DOE O 5400.5 IV.4
  - Authorized Limits apply to radioactive material on or within material, equipment, and property which is approved for release by PPPO.
  - Authorized Limits must be approved by a Secretarial Officer in consultation with the Chief Health, Safety and Security Officer if exposure is  $>1$  mrem, but  $\leq 100$  mrem per year.
  - Authorized Limits must be approved by a PPPO Manager in consultation with the Chief Health, Safety and Security Officer if exposure is  $\leq 1$  mrem per year.

# Agencies Reviewing AL

- Agencies that reviewed the current Authorized Limits when they were proposed:
  - USEPA
  - Commonwealth of Kentucky (KYEPA)
  - DOE HSS

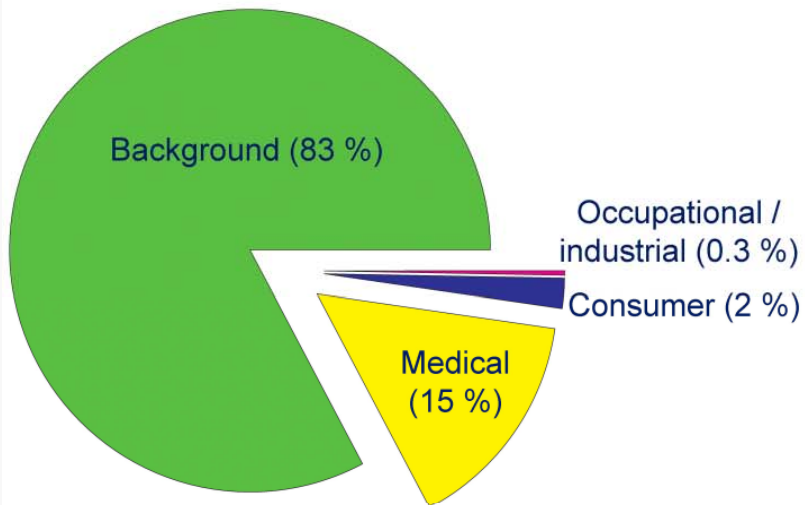
# Guidance and Reference Documents

- Guidance Documents for developing Authorized Limits:
  - DOE Order 5400.5, *Radiation Protection of the Public and the Environment*
  - DOE Standard 5506-99, *Guide to Good Practice for Establishing Authorized Limits for the Release of Waste Containing Residual Radioactivity*

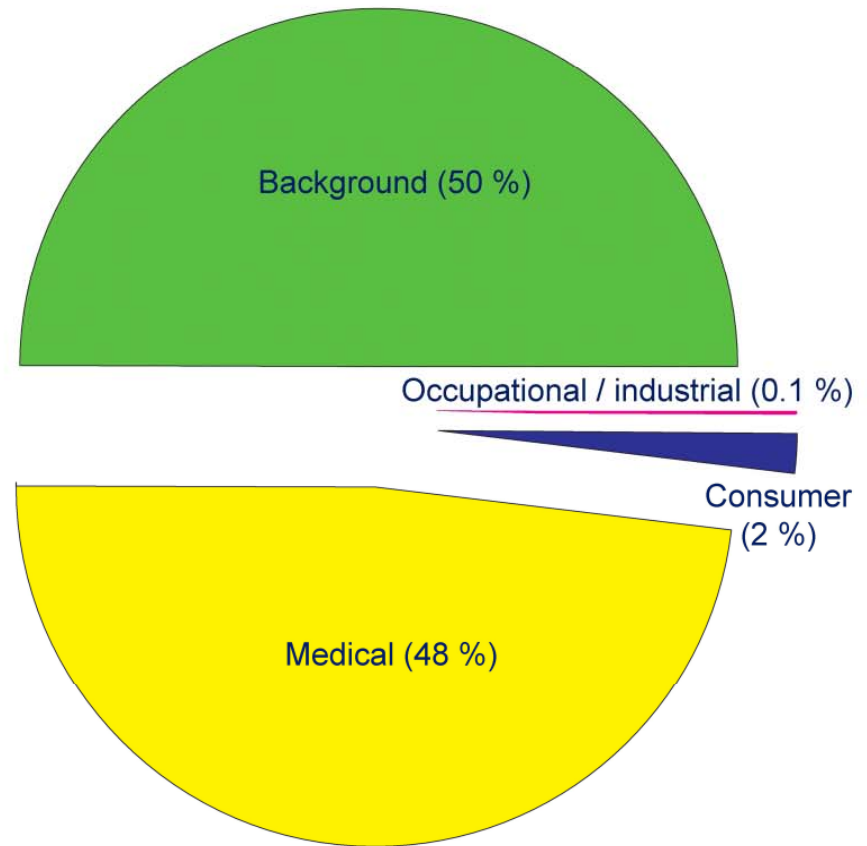
# C- 746- U Landfill Characteristics

- Total landfill permitted area  $\approx$  59 acres
- 22 of the 59 acres are currently designated to be developed for waste disposal
- Potential disposal capacity  $\approx$  1,200,000 M<sup>3</sup>
- Construction of the facility and emplacement of wastes is proceeding from the southern end toward the northern end of the landfill

### Early 1980s



### 2006



# Guidance Used To Evaluate Waste Streams

- Release decision-making process is guided by:
  - Multi-Agency Radiation Surveys and Site Investigation Manual (MARSSIM)
  - Multi-Agency Survey and Assessment of Materials and Equipment Manual (MARSAME)

Note: Jointly prepared and endorsed by DOE, EPA, & NRC. These documents provide guidance on how to demonstrate that activities at a site are in compliance with applicable release criteria.

# Major Exposure Pathway per RESRAD

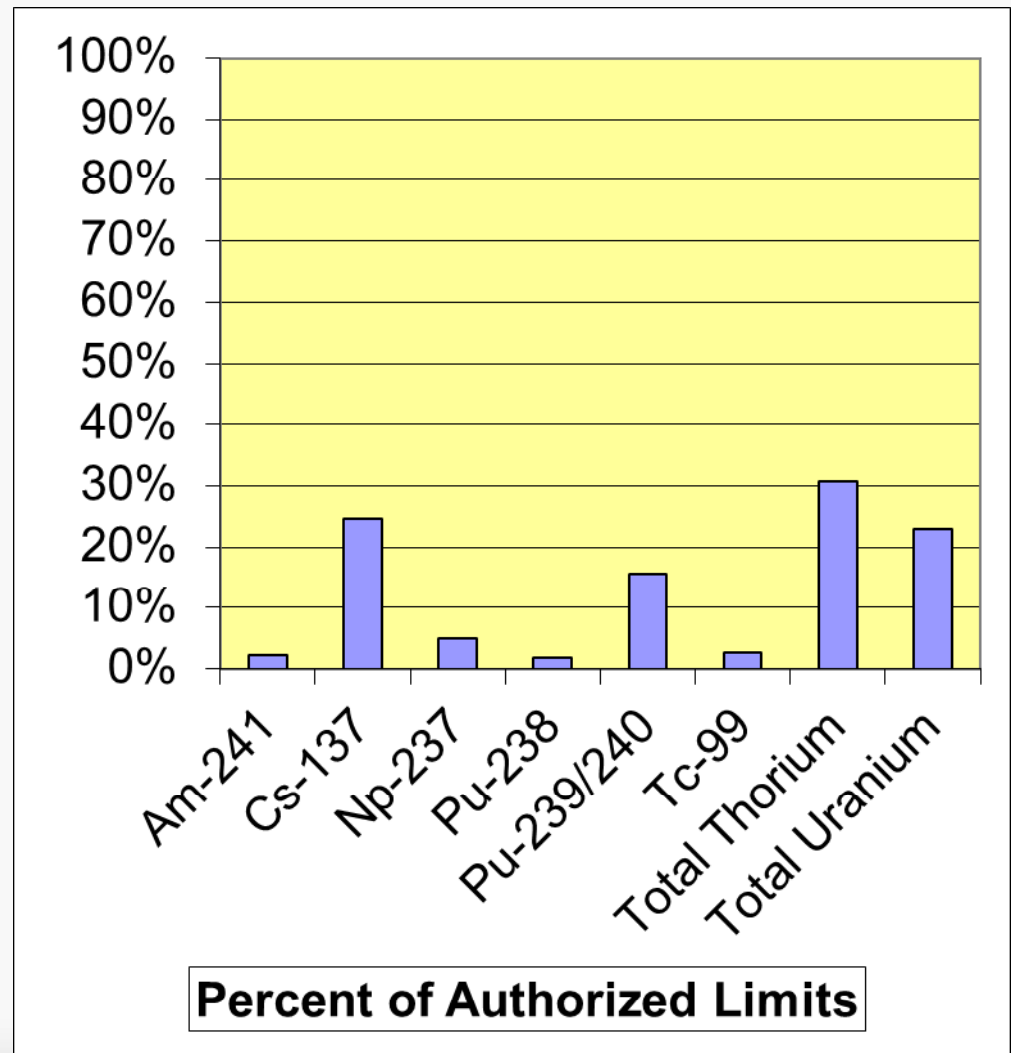
- Drinking water ingestion is the limiting exposure pathway per RESRAD (subsistence farmer)
  - This condition is estimated to occur ~9 years post-closure (based on no leachate treatment).
  - This scenario is considered implausible due to deed restrictions.

# Allowed Total Activity in the Landfill under current AL

Isotope	Activity (Ci)
Total U	8.777
Tc-99	29.256
Thorium	0.877
Np-237	0.175
Pu-238	0.175
Pu-239/240	0.175
Am-241	0.175
Cs-138	0.175

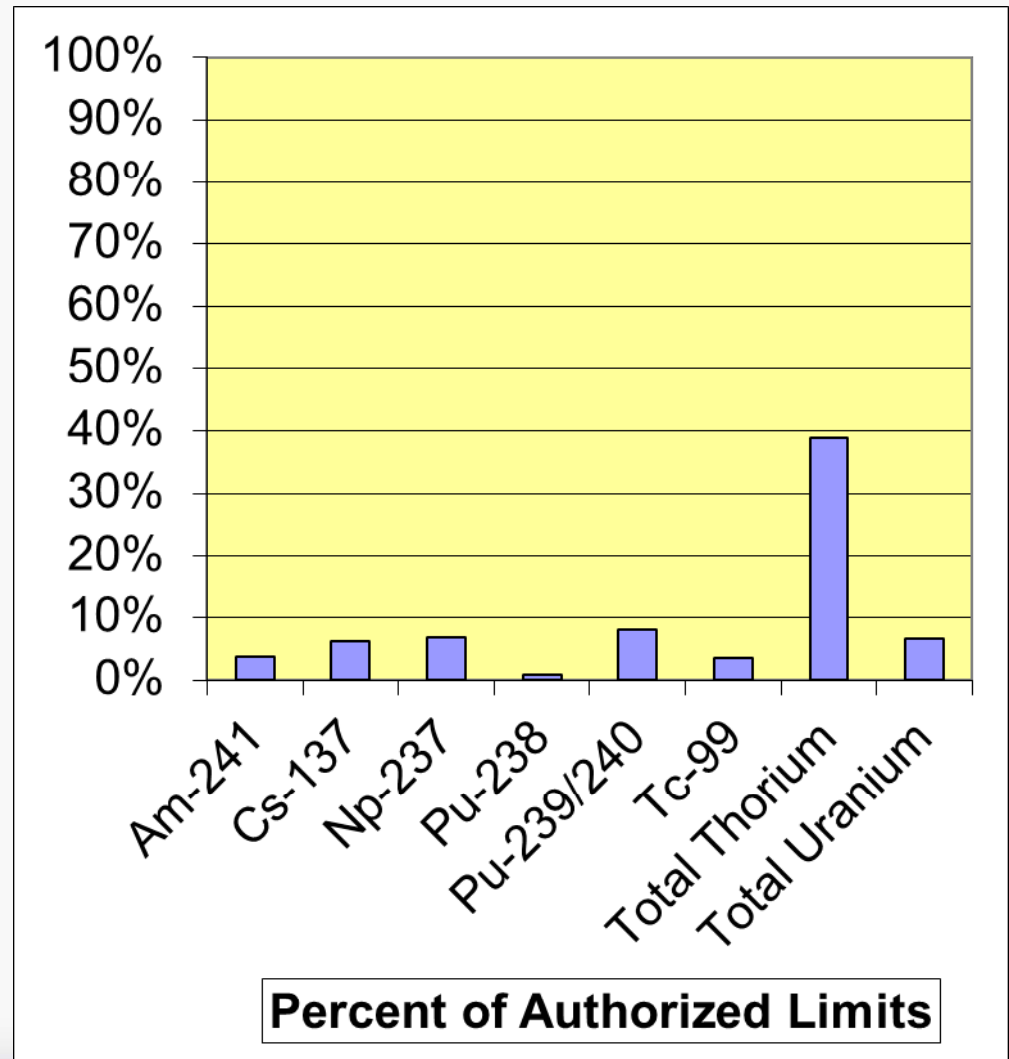
# 7<sup>th</sup> Year Usage of Authorized Limits

Isotope	% of AL
Am-241	2.18%
Cs-137	24.56%
Np-237	4.95%
Pu-238	1.76%
Pu-239/240	15.61%
Tc-99	2.62%
Total Thorium	30.74%
Total Uranium	23.08%



# Total Inventory Thru 7<sup>th</sup> Year

Isotope	% of AL
Am-241	3.64%
Cs-137	6.17%
Np-237	6.90%
Pu-238	0.90%
Pu-239/240	8.07%
Tc-99	3.50%
Total Thorium	38.86%
Total Uranium	6.56%



# Benefits of New Authorized Limits

- Cleanup costs and occupational radiation exposure will be less.
- Less material will be shipped to Nevada for burial saving disposal cost and transportation cost.
- Will not significantly increase exposure to general public around landfill.