



U.S. DEPARTMENT OF  
**ENERGY**

OFFICE OF  
**ENVIRONMENTAL  
MANAGEMENT**

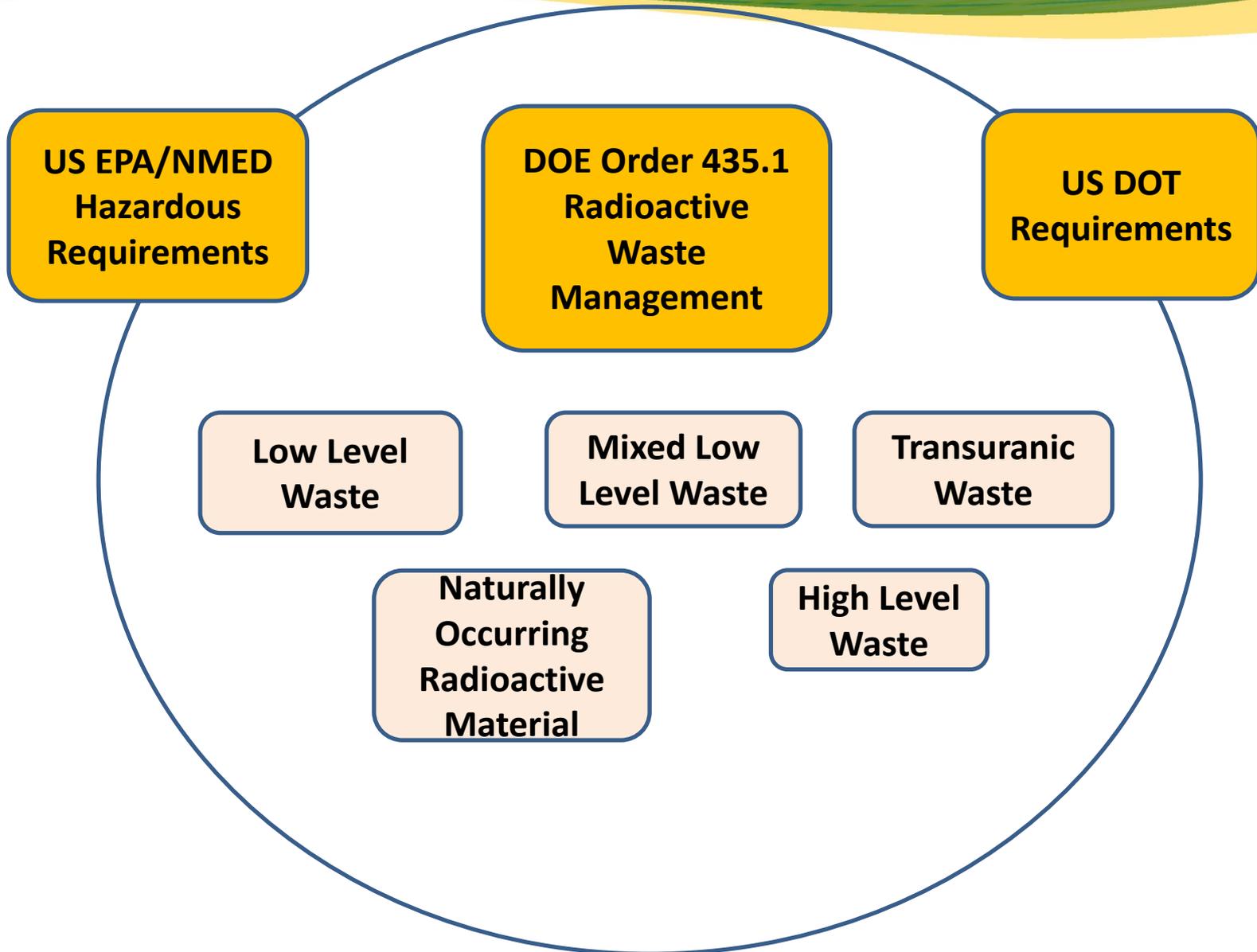
# Radioactive Waste

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**Environmental Management Los Alamos Field Office**

- Radioactive Waste Requirements**
- Waste Types and Classes**
- Legacy Waste Disposition at LANL**

# Waste Management



# Types of Waste

- ❑ **Radioactive Waste** – Any garbage, refuse, sludge, and other discarded material, including solid, liquid, semisolid, or contained gaseous material that must be managed for its radioactive content.  
[Adapted from: 40 CFR Part 240]

## Low-level Waste –

Radioactive waste that is not high-level radioactive waste, spent nuclear fuel, transuranic waste, byproduct material (as defined in section 11e.(2) of the *Atomic Energy Act of 1954*, as amended), or naturally occurring radioactive material.

[Adapted from: *Nuclear Waste Policy Act of 1982*, as amended]



**Mixed Waste** – Waste that contains both source, special nuclear, or by-product material subject to the *Atomic Energy Act of 1954*, as amended, and a hazardous component subject to the *Resource Conservation and Recovery Act*. [Adapted from: *Federal Facility Compliance Act of 1992*]



Loading MLLW containers for off-site transport

**TRU waste** – waste containing more than 100 nano-curies (3,700 becquerels) of alpha-emitting transuranic isotopes per gram of waste, with half-lives greater than 20 years

- Remote Handled
- Contact Handled



Loading Payload of Drums into TRUPACT-II

[Source: DOE Manual 435.1, *Radioactive Waste Management Manual*, Attachment 1, July 9, 1999

- **Waste Acceptance Criteria (WAC).** Waste acceptance criteria are the technical and administrative requirements that a waste must meet in order for it to be accepted at a storage, treatment, or disposal facility. [Adapted from: DOE 5820.2A]
- **Waste Acceptance Requirements.** Waste acceptance requirements are waste acceptance criteria, and all other requirements that a facility receiving radioactive waste for storage, treatment, or disposal must meet to receive waste (e.g., waste acceptance program requirements, receiving facility operations manual). [Adapted from: DOE O 5820.2A]
- **Waste Characterization.** The identification of waste composition and properties, by review of acceptable knowledge (which includes process knowledge), or by nondestructive examination, nondestructive assay, or sampling and analysis, to comply with applicable storage, treatment, handling, transportation, and disposal requirements. [Adapted from: DOE Glossary (“Characterization” definition) and Federal Register, Vol. 62, No. 224]

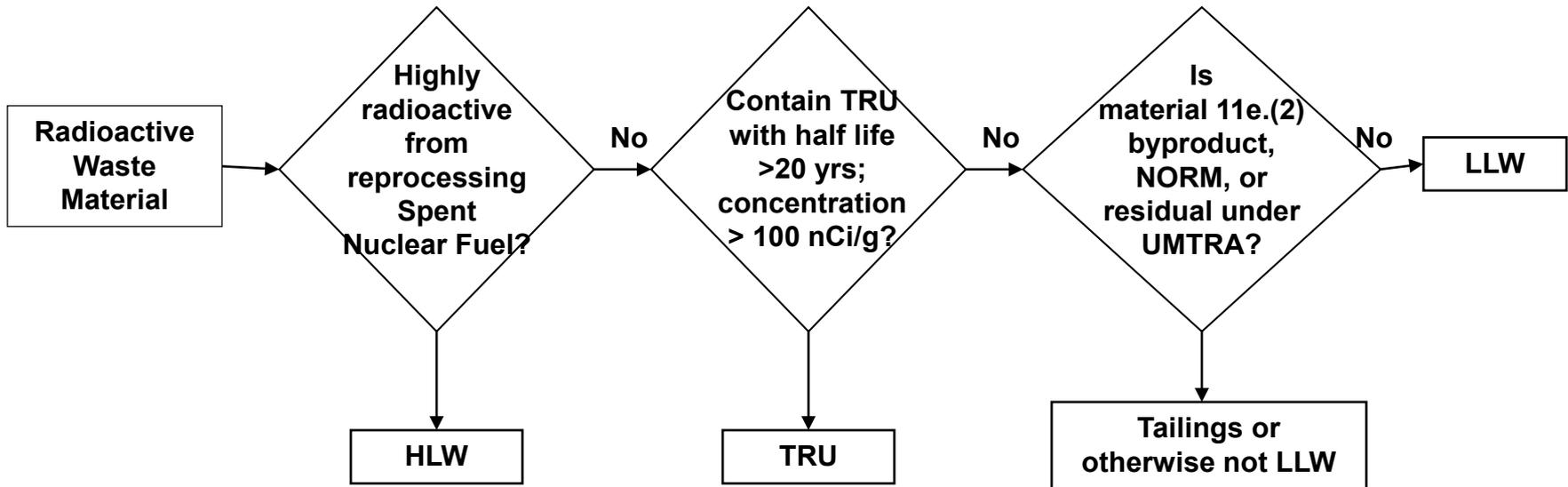
## July 1, 1999 is the “Key Date”

- WIPP opened in March 1999.
- On July 1, 1999, EM-1 designated by memo:
  - Waste generated before July 1999 is “Legacy Waste”
  - Waste generated after July 1999 is “Newly Generated”

# Legacy vs NewGen

- Legacy Waste
  - Generated/packaged during cold war era
  - Repackaging/processing necessary for most containers.
  - WIPP requirements not defined at time of generation.
  - Managed as TRU, but a portion is LLW
- New Generated Waste
  - Generated/Packaged after July 1999
  - Packaged to be WIPP compliant
  - Knowledge of generation process more reliable
  - Most container can be characterized directly for WIPP Shipment
  - Nearly all TRU

# Waste Classification Process



**Exceeds Class C (GTCC)** Waste that exceeds NRC requirements for LLW disposal – must be evaluated on a case by case basis

**GTCC is NOT LLW**

**Class C** Meets NRC Requirements, Enhanced Stability, and Enhanced Intruder Isolation

**<5% of LLW = C**

**Class B** Meets NRC Requirements and has enhanced Stability

**<5% of LLW = B**

**Class A** Meets NRC Requirements for LLW Disposal

**90%+ of LLW = A**

# Legacy Waste Overview

Waste Type	Location		Target Processing Path		
	Above Ground	Below Ground	231/412 Line	375 Line	Certifiable As Is
Cemented	1700	400	10%	60%	30%
Absorbed	900	40	30%	40%	30%
Debris	1750	3580	25%	50%	25%
OSRP	17				100%
Soil	18	61			100%
Other 1	4	675	~30%	~10%	
Other 2	1000	50	~50%	~10%	~20%
<b>Total</b>	<b>10000</b>	<b>5000</b>	<b>10%</b>	<b>30%</b>	<b>20%</b>

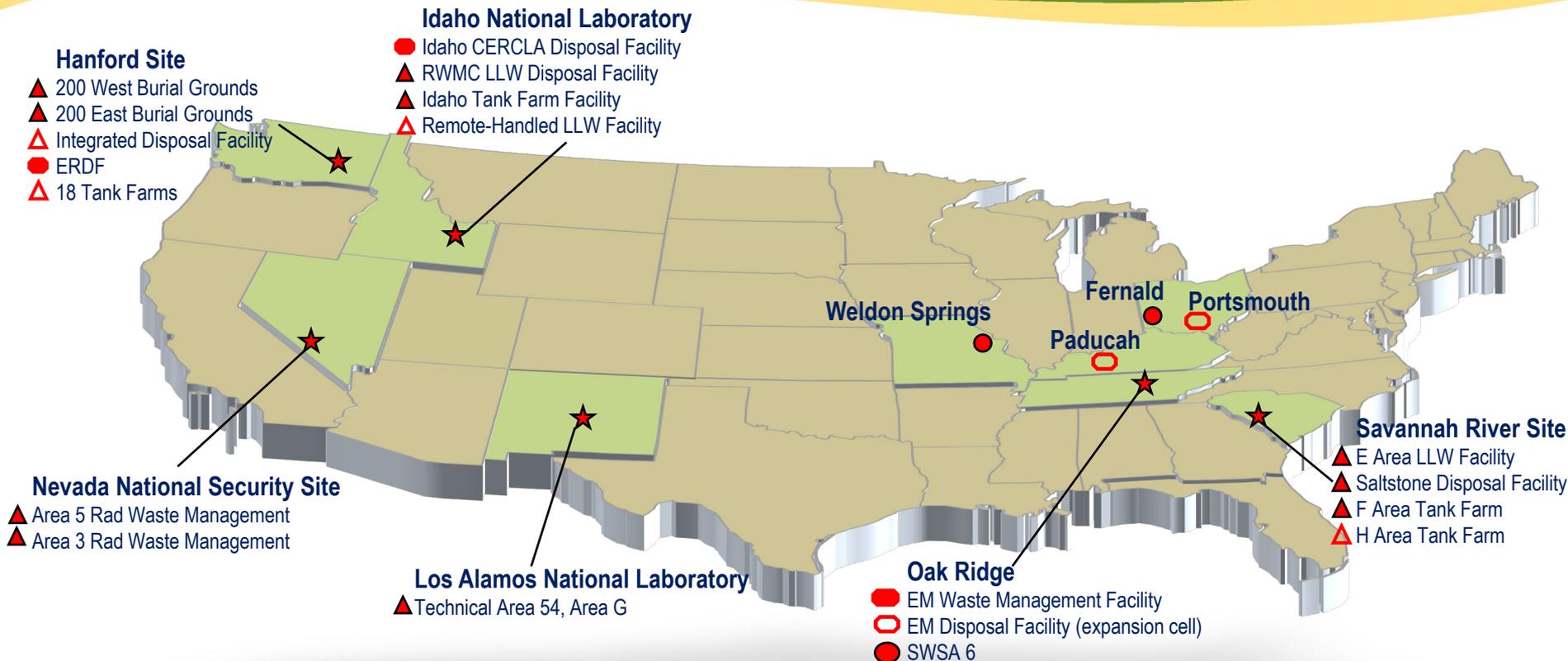


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# Backup Slides

- ❑ **Naturally Occurring Radioactive Material (NORM) -**  
Naturally occurring materials not regulated under the *Atomic Energy Act of 1954*, as amended whose composition, radionuclide concentrations, availability, or proximity to man have been increased by or as a result of human practices. NORM does not include the natural radioactivity of rocks or soils, or background radiation.  
[Adapted from: January 1997 Draft Part N, Regulation and Licensing of Naturally Occurring Radioactive Material, Conference of Radiation Control Program Directors, Inc.]
- ❑ **Highly radioactive waste –** material resulting from the reprocessing of spent nuclear fuel, including liquid waste produced directly in reprocessing and any solid materials derived from such liquid waste that contains fission products in sufficient concentrations; and other highly radioactive material that is determined, consistent with existing law, to require permanent isolation



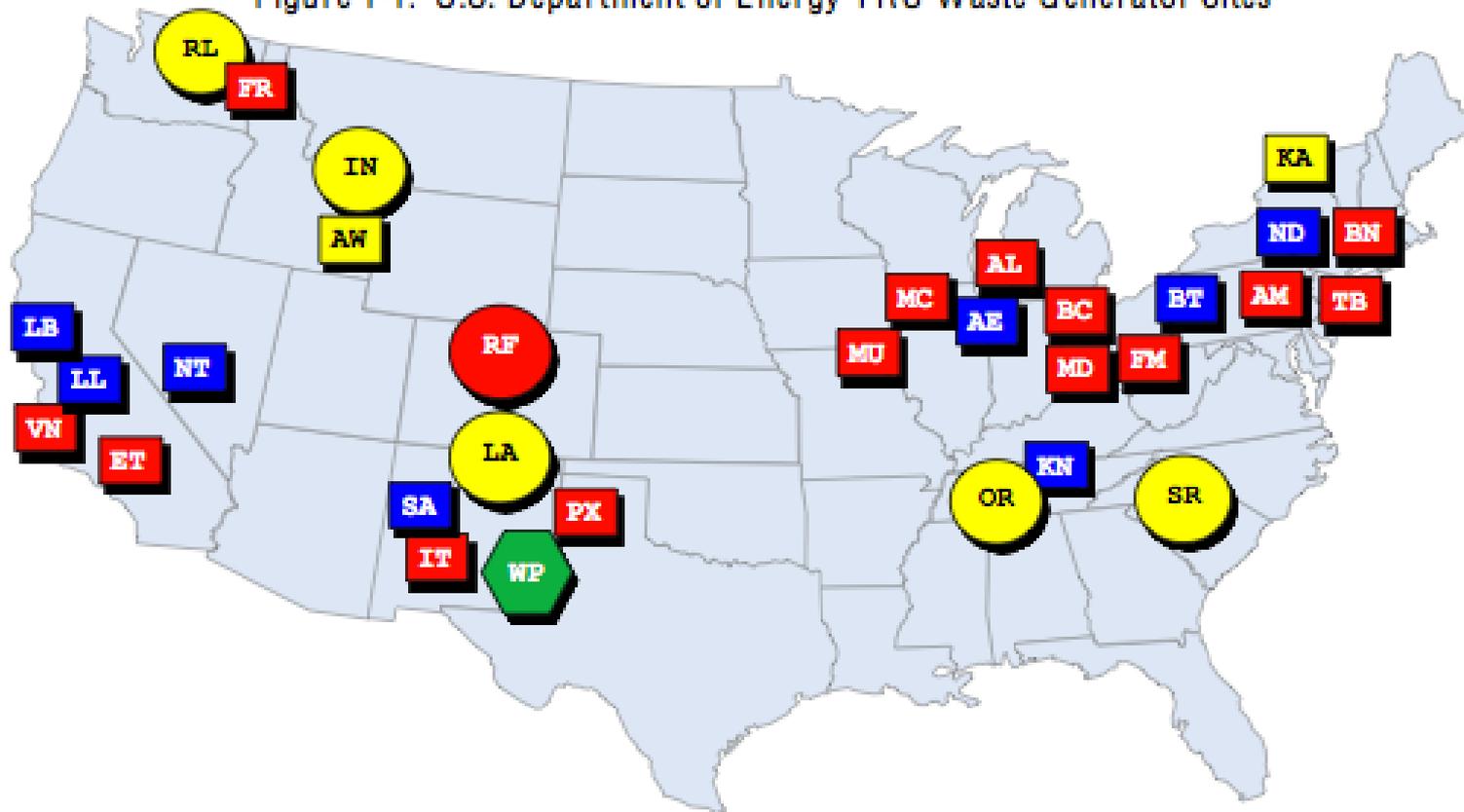
## Disposal Facilities

- Existing CERCLA Disposal Facility
- Future CERCLA Disposal Facility
- ▲ LLW Operations Disposal Facility
- ▲ Future LLW Disposal Facility
- Closed Disposal Facility

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# TRU Waste Generator Sites

Figure 1-1. U.S. Department of Energy TRU Waste Generator Sites



Source - Annual TRU Waste Inventory Report -2013, DOE/TRU-133425

- **Storage.** The holding of radioactive waste for a temporary period, at the end of which the waste is treated, disposed of, or stored elsewhere. [Adapted from: 40 CFR Part 260]
- **Treatment.** Any method, technique, or process designed to change the physical or chemical character of waste to render it: less hazardous; safer to transport, store, or dispose of; or reduce its volume. [Source: DOE 5820.2A]

- **Types of Treatment**
  - Incineration
  - Macro encapsulation
  - Compaction
  - Vitrification
  - Solidification
  - pH control (corrosive)
- Changes as part of the process that results in a waste form is not considered treatment

# LLW RWMB: Required Controls

- **Disposal facilities**
  - Waste acceptance requirements similar to those for storage and treatment facilities
  - Require all key documents leading to and including a disposal authorization statement
    - **Performance Assessment**
    - **Composite Analysis**
    - **Preliminary Closure Plan**
    - **Monitoring Plan**
    - **Maintenance Plan**
    - **Change Control Process Procedure**
    - **Waste Acceptance Criteria**
  - Controls as specified in a safety analysis