Oregon Response to the Waste Management Area-C WIR Evaluation

The Oregon Department of Energy has developed an initial response to US DOE's proposed waste classification determination, published on October 4th.

Limited paper copies are available on the back table.

To read the letter online, visit:

https://tinyurl.com/wmacwir-or

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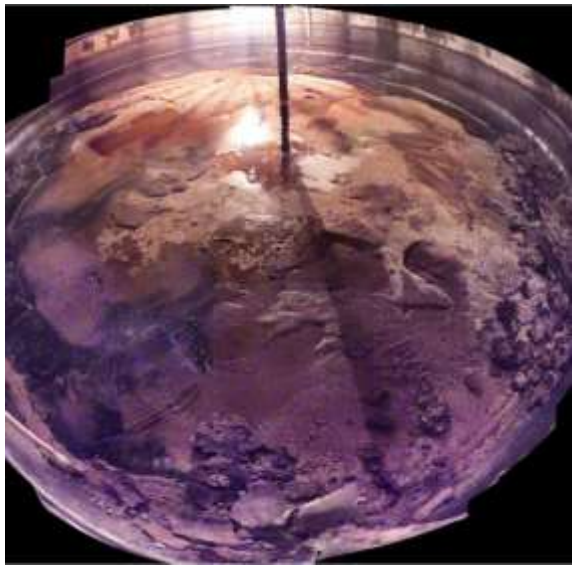
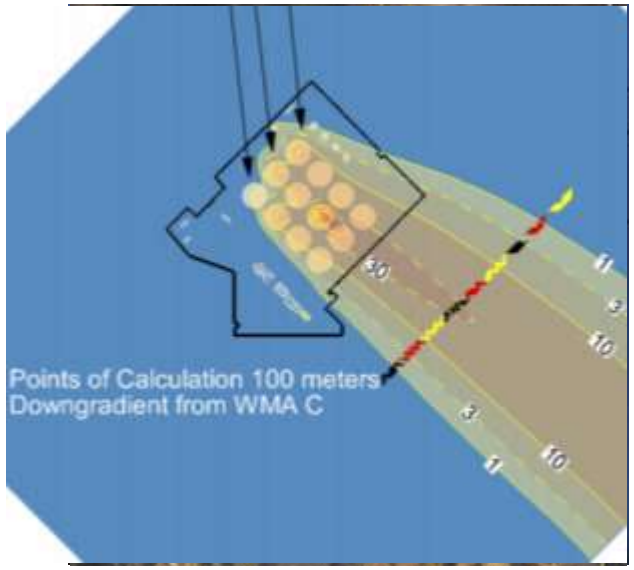
Hanford Radioactive Tank Wastes

Waste Management Area–C

Waste Incidental to Reprocessing





Oregon Public Meeting

Jeff Burright
October 16, 2018

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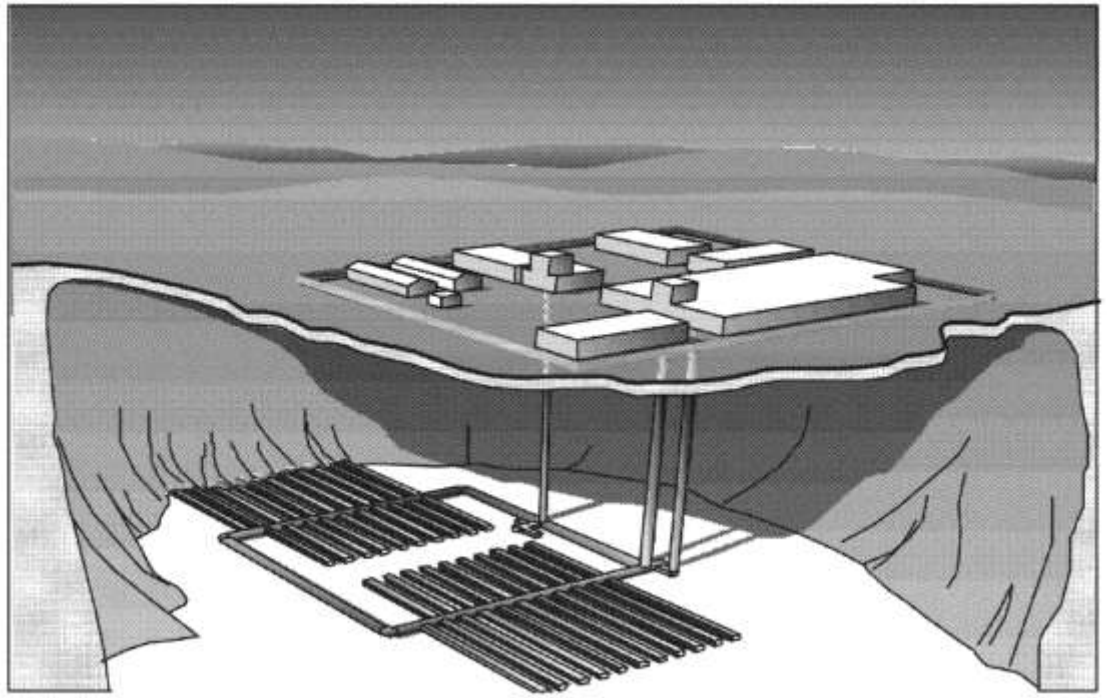
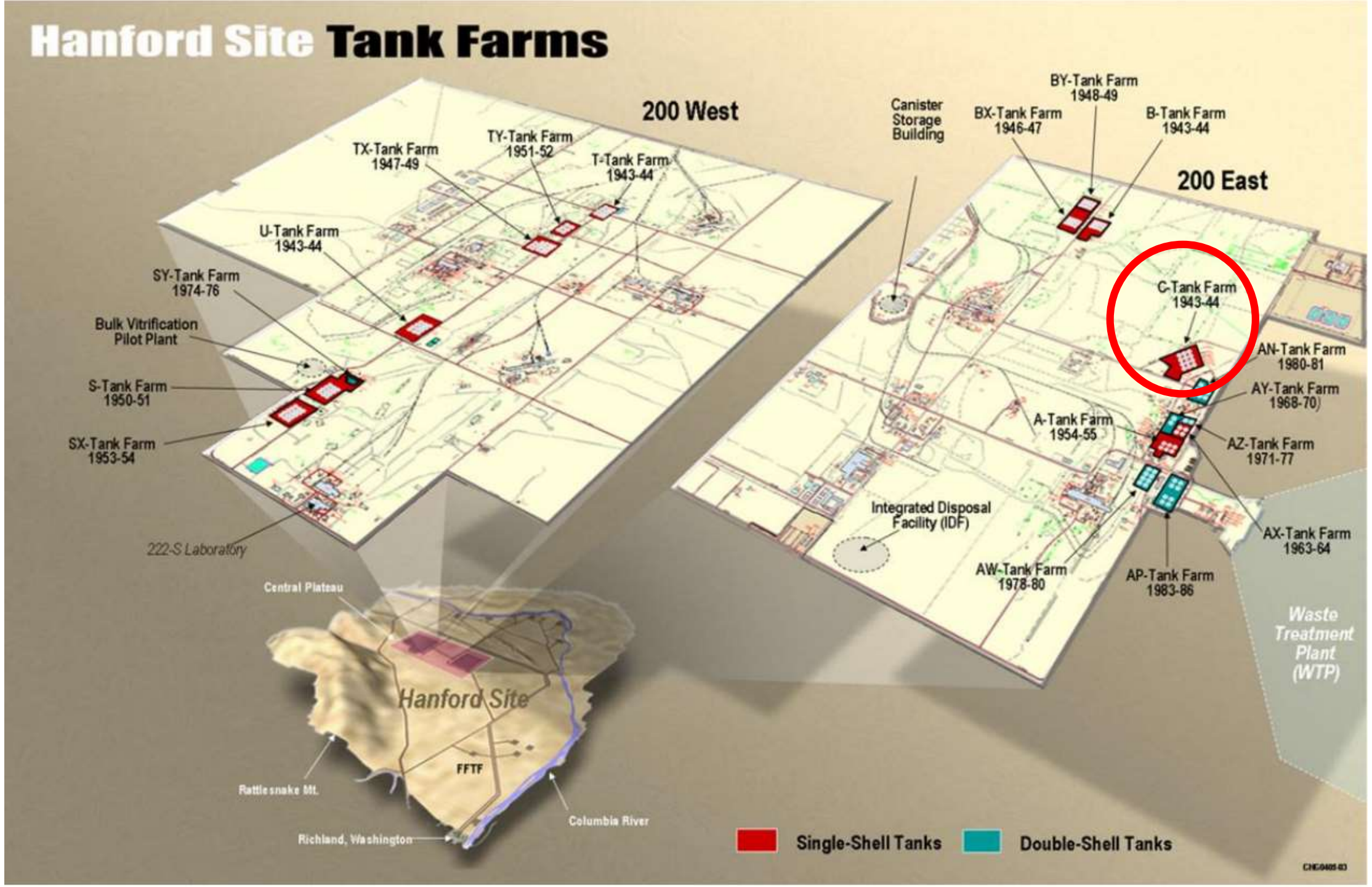
Decision: Can the waste left over in the C-Farm Tanks at Hanford be managed as "low-level waste"?



If it is high-level, it must be disposed in a Deep Geologic Repository for high-level radioactive waste, which does not yet exist in the United States.

If it is low-level, the tanks and residual waste heels can be closed in place forever at Hanford, assuming long-term safety can be "reasonably expected."


WASHINGTON
Washington
Seattle
Spokane
Hanford Site
Tri-Cities
Vancouver
Hanford Reach National Monument
CENTRAL PLATEAU
C Tank Farm
Tank Farms
Waste Treatment Plant
200 West Area
200 East Area
Hanford Reach National Monument
Mattawa
24-SW Rd
243
24
Road L SW
Saddle Mountain Lake
Columbia River
240
241
Hanford Rd
Savage Island
Basin City
Road 170
Mesa
17
Eltopia
395
Glade
FRANKLIN


Hanford Site Tank Farms
200 West
TX-Tank Farm
1947-49
TY-Tank Farm
1951-52
T-Tank Farm
1943-44
U-Tank Farm
1943-44
SY-Tank Farm
1974-76
Bulk Vitrification
Pilot Plant
S-Tank Farm
1950-51
SX-Tank Farm
1953-54
222-S Laboratory
Canister
Storage
Building
BX-Tank Farm
1946-47
BY-Tank Farm
1948-49
B-Tank Farm
1943-44
200 East
C-Tank Farm
1943-44
AN-Tank Farm
1980-81
AY-Tank Farm
1968-70
A-Tank Farm
1954-55
AZ-Tank Farm
1971-77
Integrated Disposal
Facility (IDF)
AX-Tank Farm
1963-64
AW-Tank Farm
1978-80
AP-Tank Farm
1983-86
Waste
Treatment
Plant
(WTP)
Central Plateau
Hanford Site
FFTF
Rattlesnake Mt.
Columbia River
Richland, Washington
Single-Shell Tanks
Double-Shell Tanks

Hanford’s Single-Shell Tanks

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4-Nov-44

Tank Pipelines and Diversion Boxes

High Level Radioactive Waste and Waste Incidental to Reprocessing (WIR)

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Definition of High Level Waste

Nuclear Waste Policy Act of 1982:

The term "high-level radioactive waste" means—

- (A) the highly radioactive material resulting from the reprocessing of spent nuclear fuel, including liquid waste produced directly in reprocessing and any solid material derived from such liquid waste that contains fission products in sufficient concentrations; and

- (B) other highly radioactive material that the (Nuclear Regulatory) Commission, consistent with existing law, determines by rule requires permanent isolation.

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From origin-based to risk-based

Is this high-level waste?

Retrieved sample from a WMA-C tank

Does it <u>result from</u> reprocessing spent nuclear fuel?

Yes

Then it is high-level waste.

Unless . . .

Can it meet criteria, developed by DOE and NRC, to demonstrate that it <u>would not pose an unacceptable risk</u> if managed as low-level or Transuranic waste?

No

Then it's still High-Level Waste.

Yes

Then it is **Waste Incidental to Reprocessing** and does not require deep geologic disposal.

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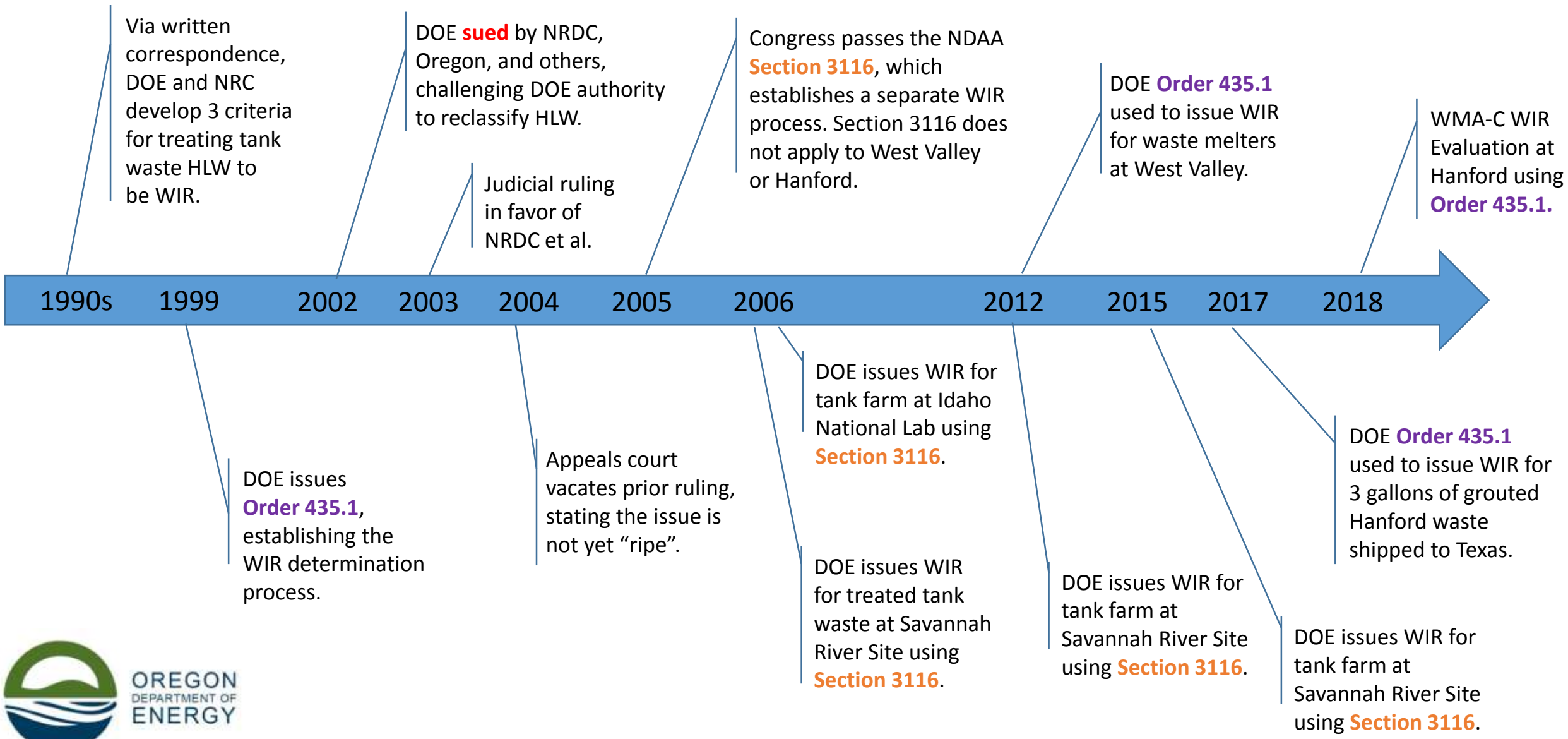
Timeline of the Waste Incidental to Reprocessing Determination Process



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Waste Incidental to Reprocessing (WIR) Criteria Application

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Waste Incidental to Reprocessing (WIR) Criteria

1. Have been processed, or will be processed, to remove key radionuclides to the maximum extent that is technically and economically practical; and
2. Will be managed to meet safety requirements comparable to the performance objectives set out in 10 CFR Part 61, Subpart C, Performance Objectives; and
3. Are to be managed, pursuant to DOE's authority . . . provided the waste will be incorporated in a solid physical form at a concentration that does not exceed the applicable concentration limits for Class C low-level waste as set out in 10 CFR 61.55 . . .

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Source: DOE M 435.1-1 – Chapter II, Section B (2)

#1: Removal of Key Radionuclides to the Maximum Extent Tech. & Econ. Practical

- Tank retrievals use several technologies
- Simple sluicing with supernatant
- More aggressive jet spraying (e.g. MARS)

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Tank Retrievals

- Other technologies (e.g. Foldtrak)

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Retrieval in C-Farm: 16 tanks in 19 years

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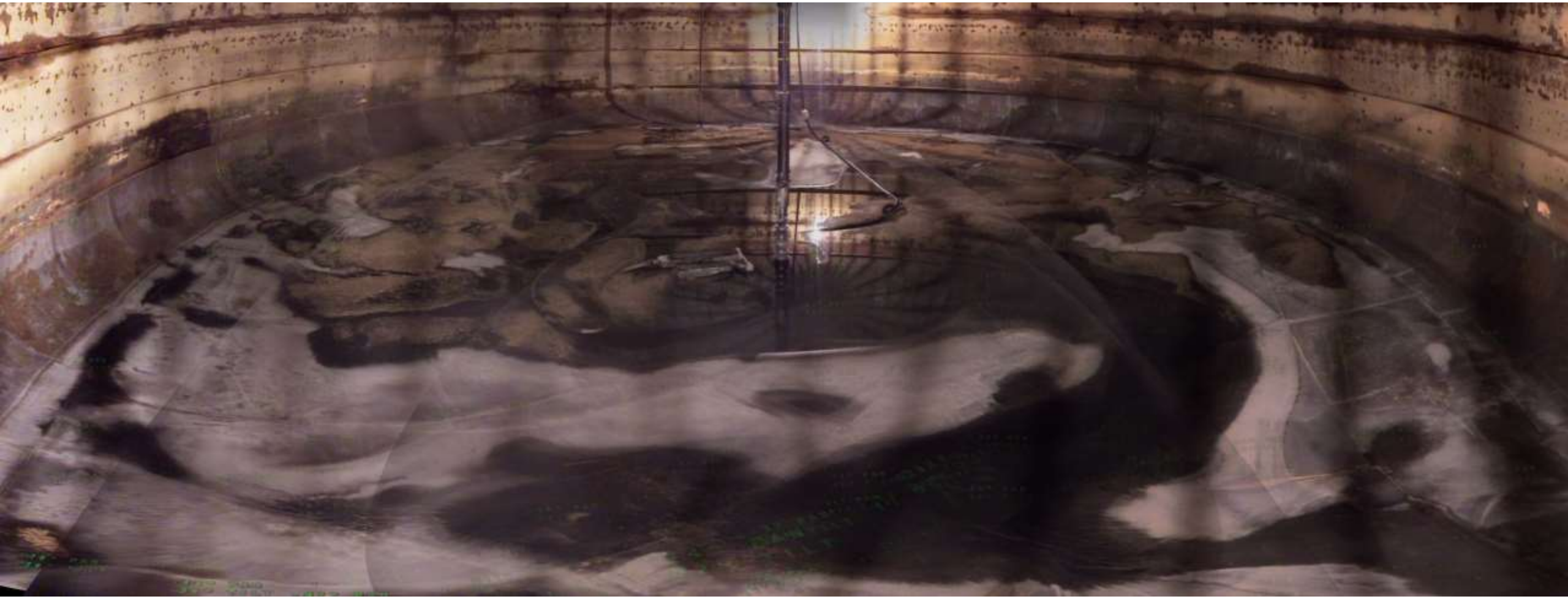
After tank waste retrieval



Tank C-110 – with the Foldtrak near the center

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Difficult waste retrieval

Tank C-102 – difficult sludge heel

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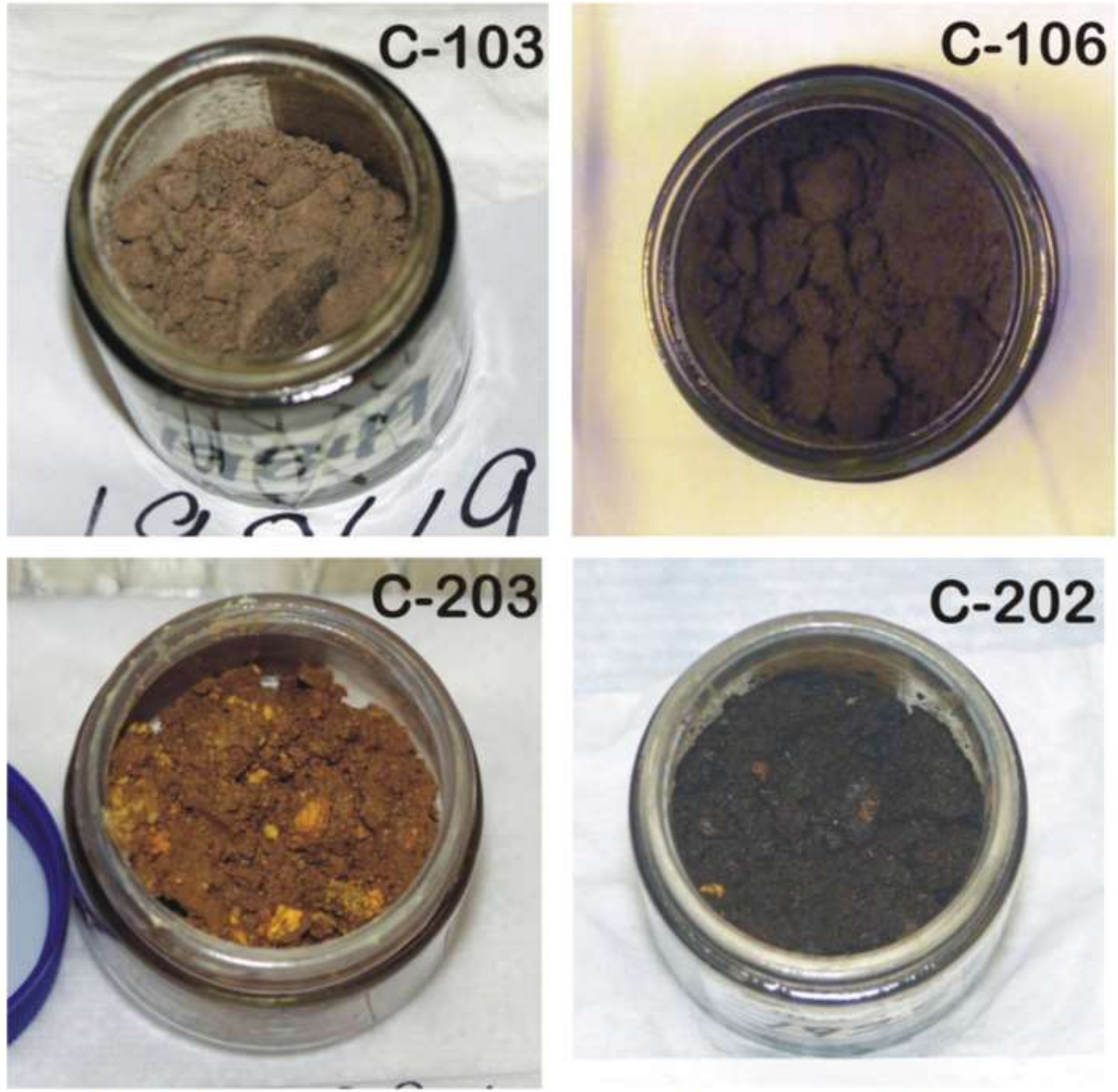
10:16PM
01May12
Pan:350
Tlt:095
C-109R3


10:39PM
25Jul12
Pan:216
Tlt:090
C-109R3


07:52PM
01May12
Pan:276
Tlt:102
C-109R3


10:39PM
25Jul12
Pan:130
Tlt:105
C-109R3

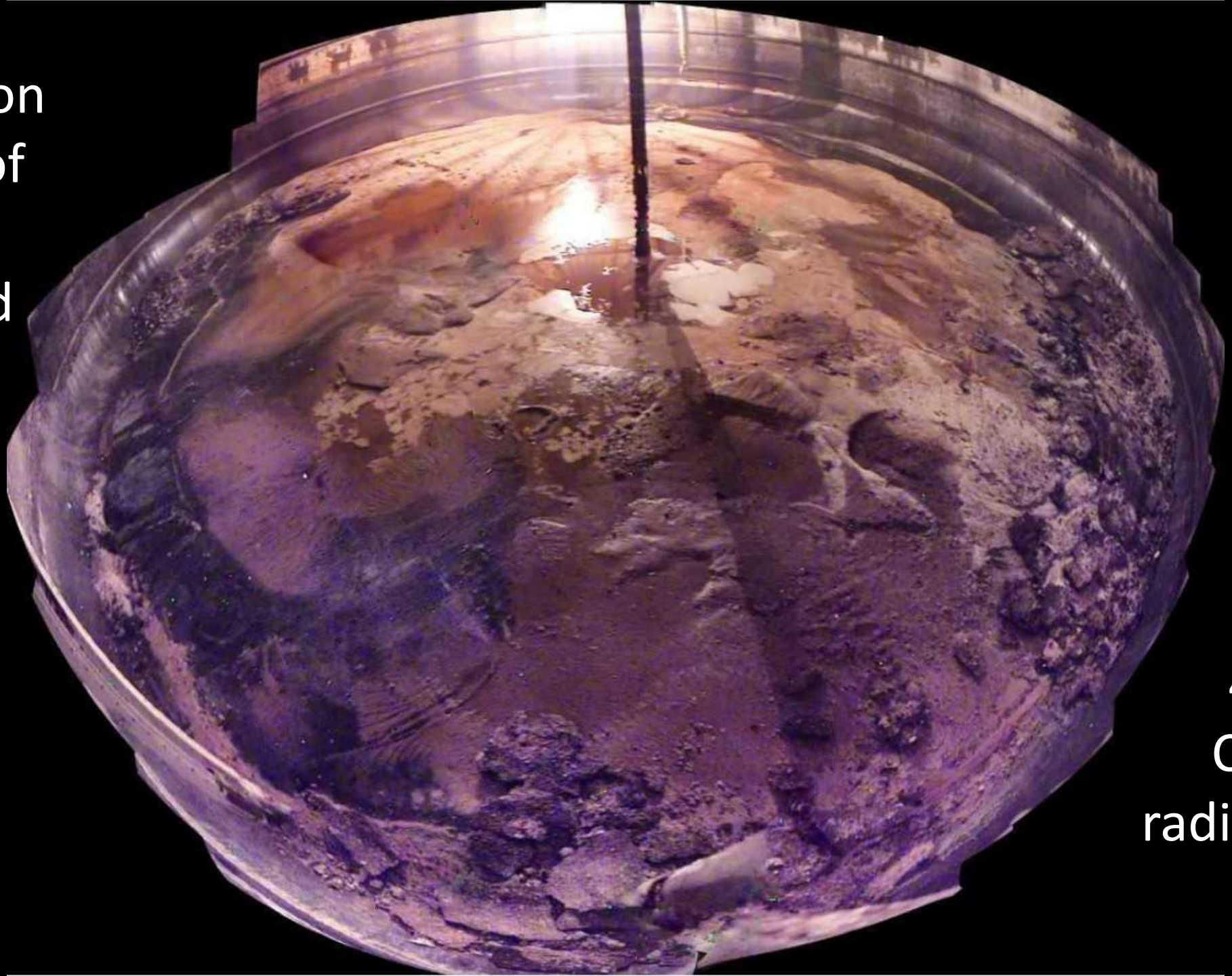
Figure 5-1. Photographs of As-Received, Post-Final Retrieval Residual Waste Samples from Tanks 241-C-103, 241-C-106, 241-C-202, and 241-C-203.



Source: "Hanford tank residual waste – Contaminant source terms and release models" (Deutsch et al. 2011).

1.7 million gallons of waste retrieved

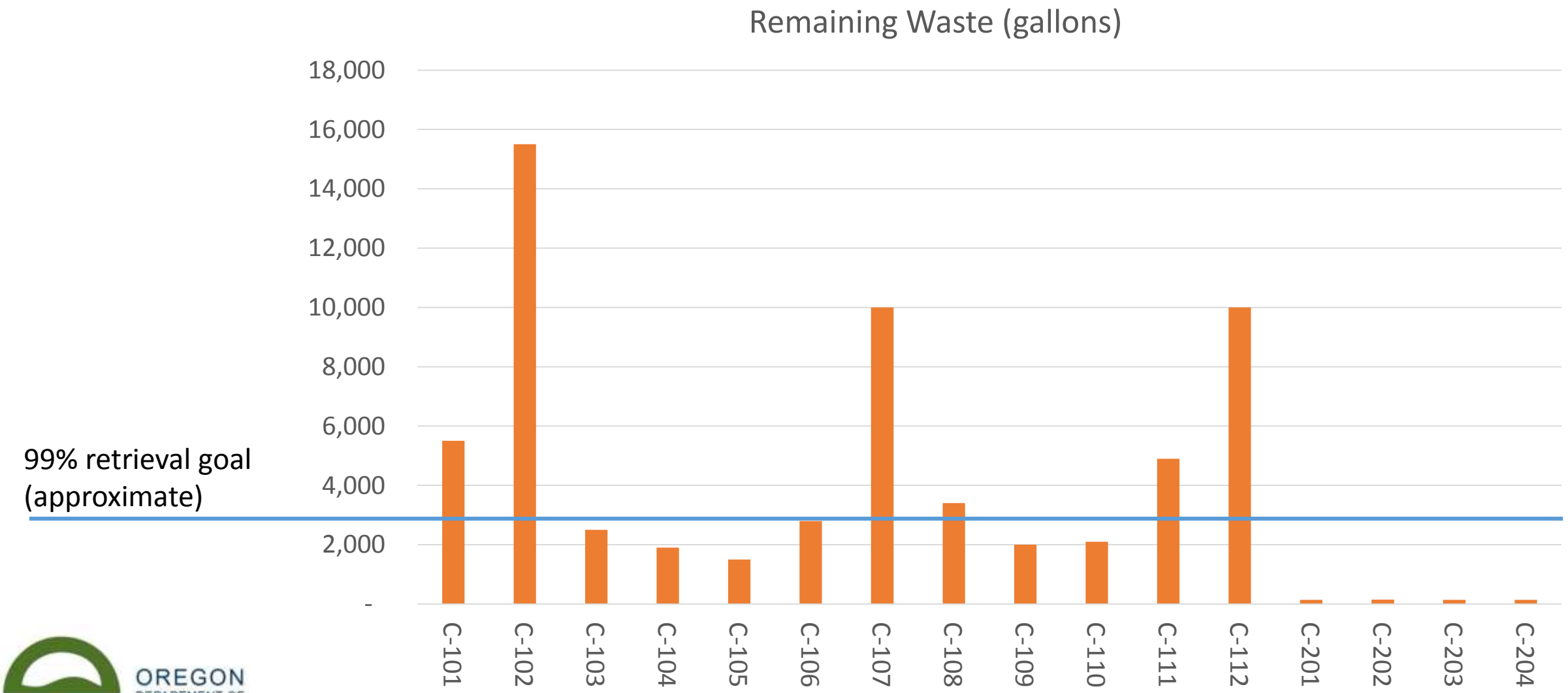
96% retrieval efficiency



67,000 gallons of waste remain

473,000 Curies of radioactivity remain

C-Farm Retrieval Efficiency



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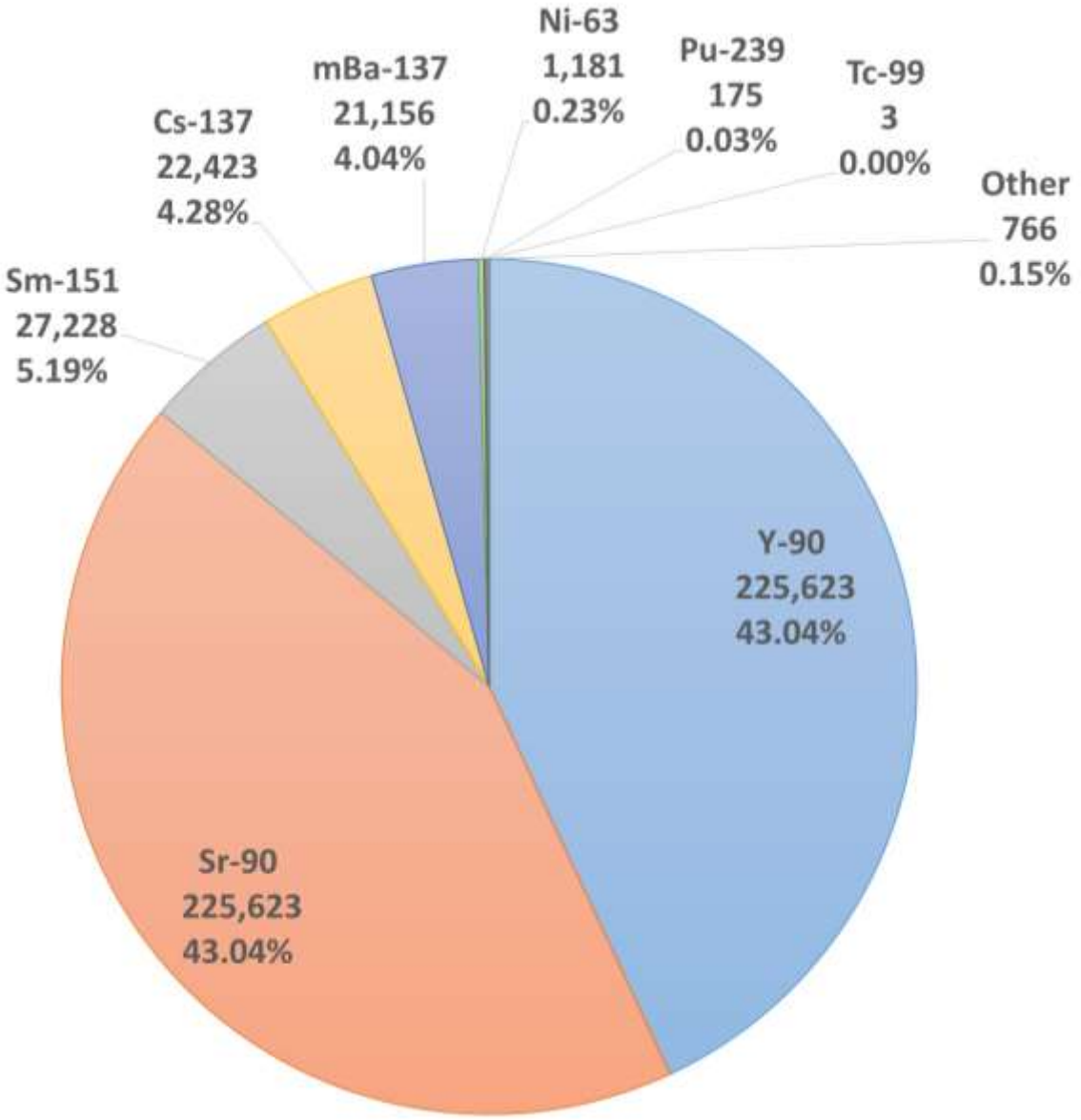
Residual Radionuclides in WMA-C Tanks



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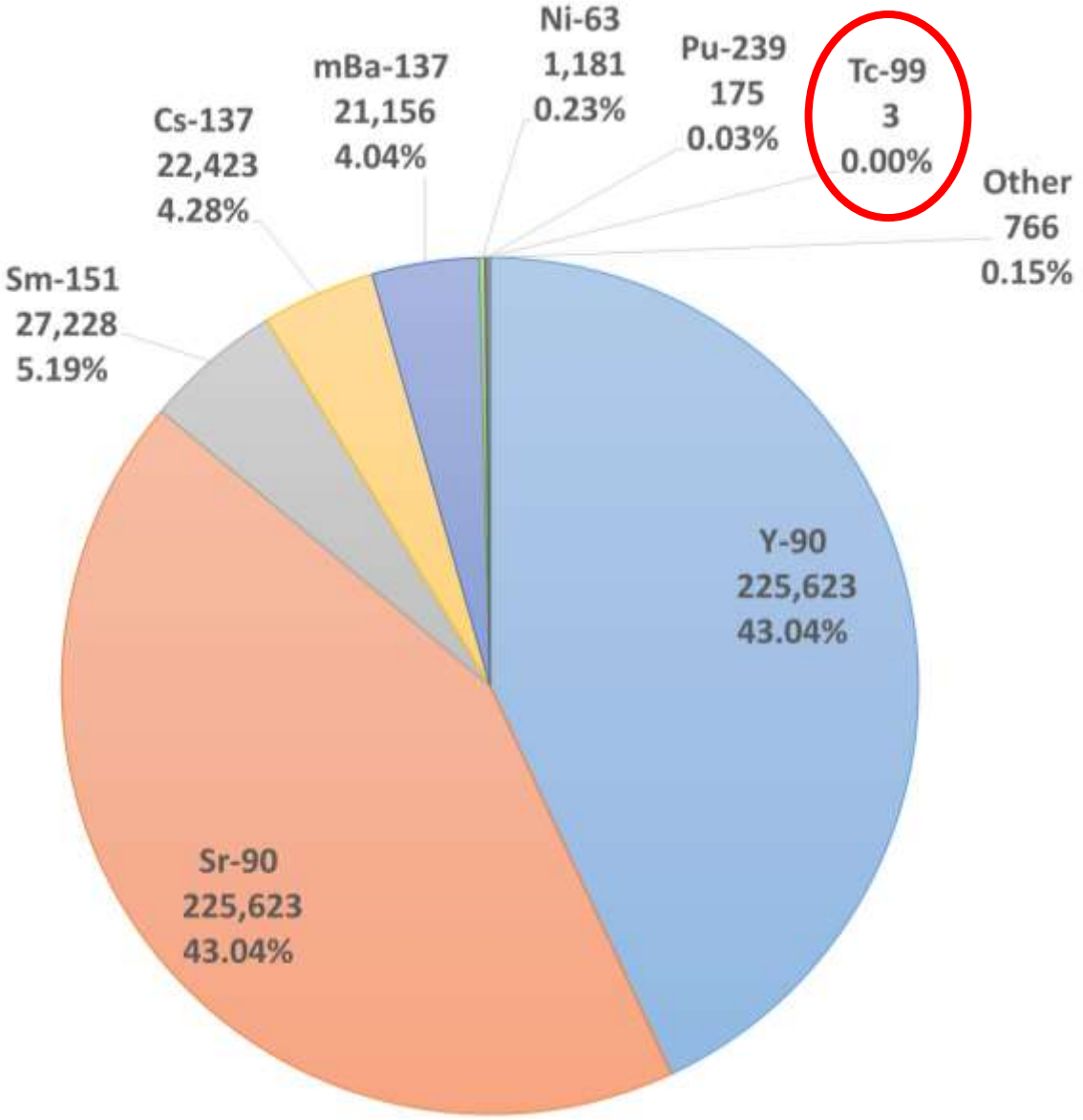
Curie values decayed as of 2015

Residual Radionuclides in WMA-C Tanks



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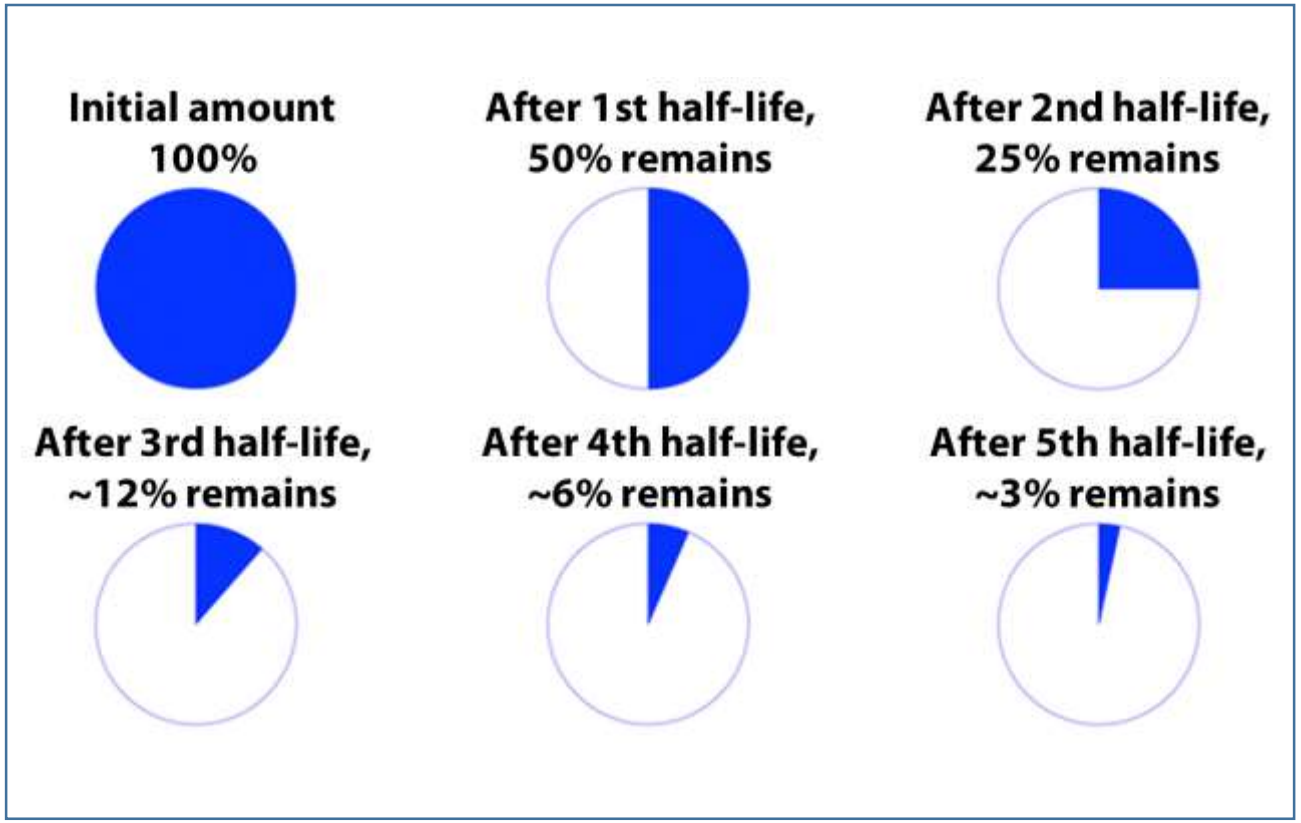
Curie values decayed as of 2015

Half Lives (in Years)

- Strontium-90 29
- Cesium-137 30
- Samarium-151 90
- Plutonium-239 24,100
- Technetium-99 211,000
- Iodine-129 15.7 million



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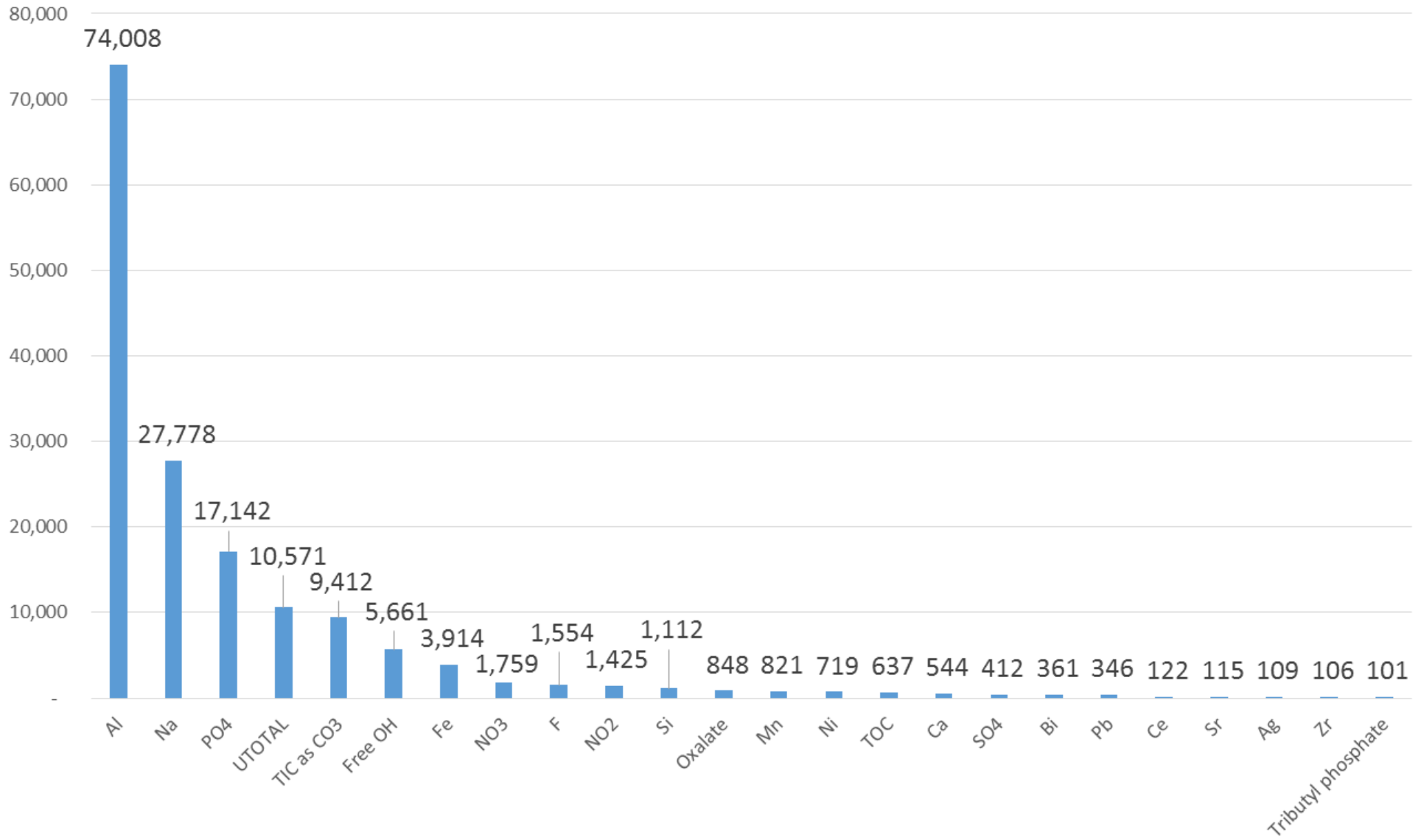
Residual Constituents by Mass (kg)



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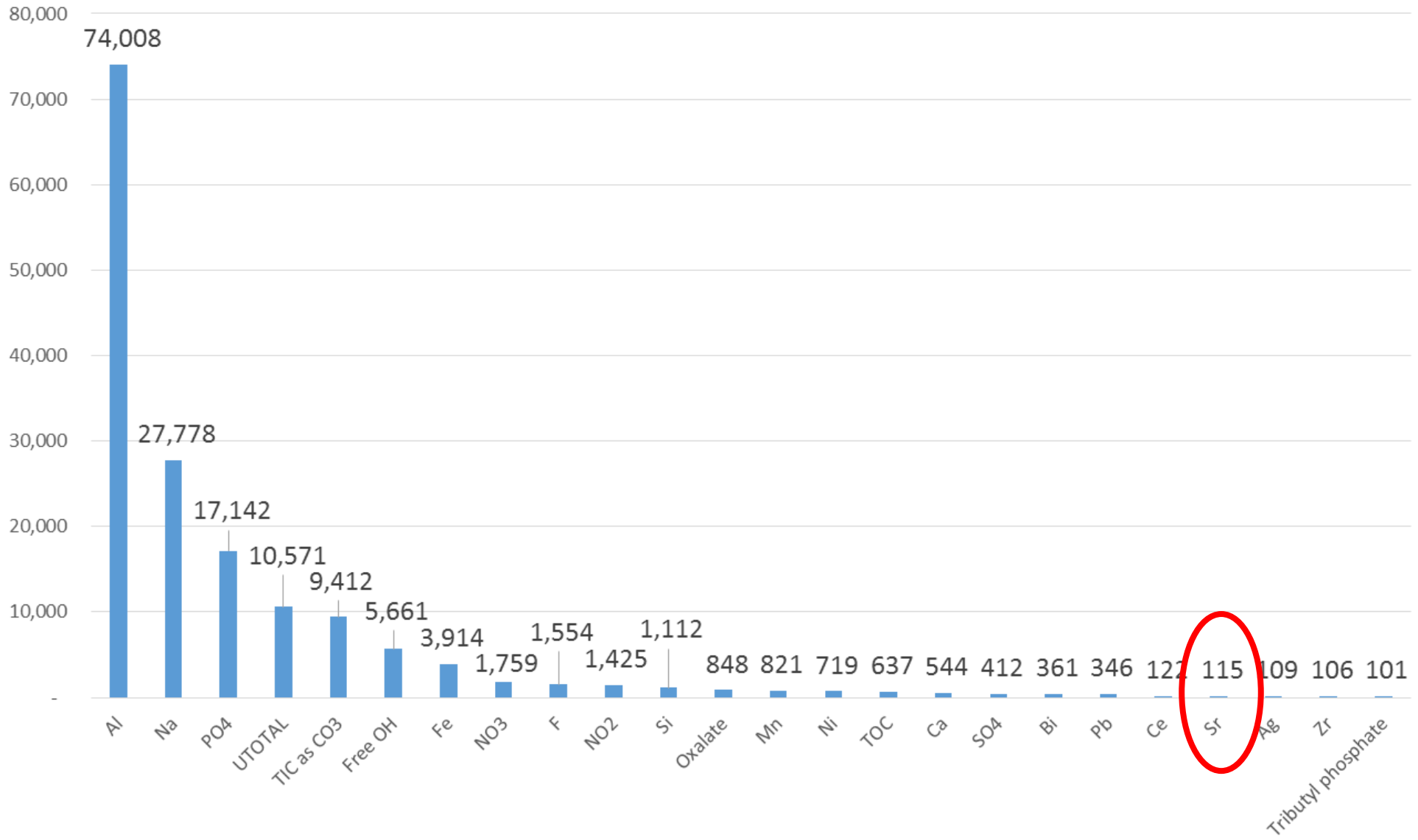
Residual Constituents by Mass (kg)



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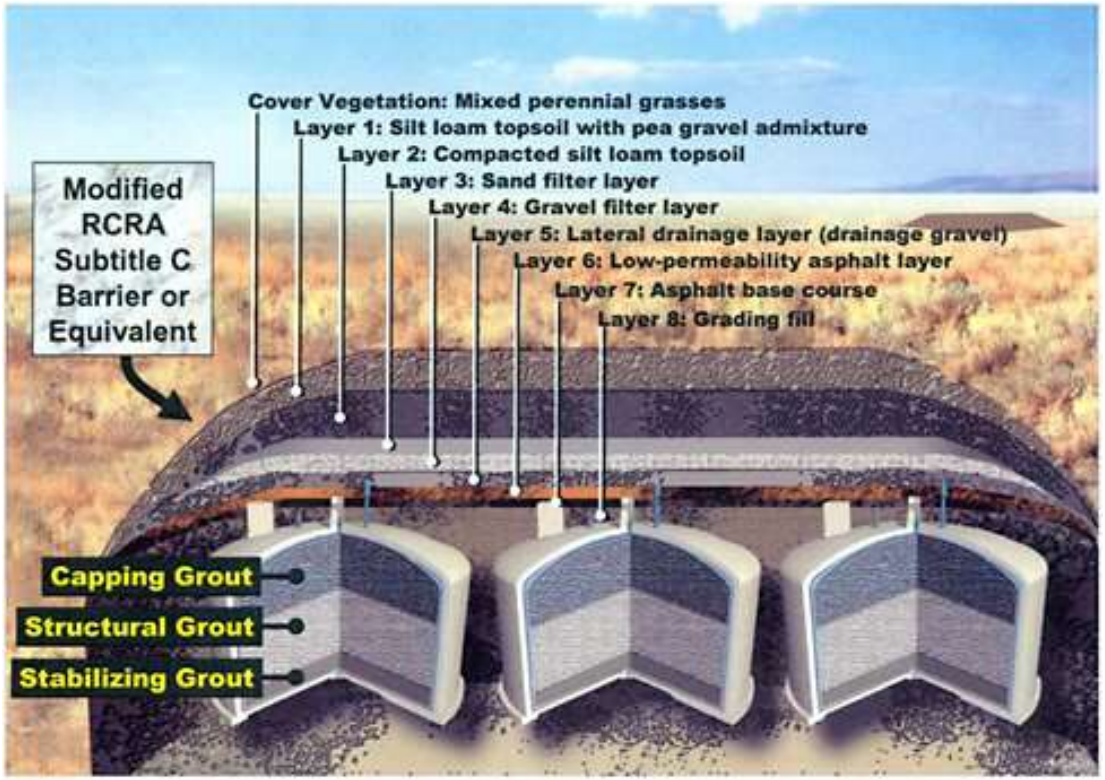
#2: Meet Performance Objectives Comparable to 10 CFR Part 61

Part 61 sets performance objectives for low-level radioactive waste disposal facilities (which the Hanford tanks would become if closed on site).

1. 25 millirems/year for any member of the public.
2. 500 millirems/year to an inadvertent intruder after active institutional controls are removed (assumed to occur after 100 years).
3. Various groundwater standards (4 mrem/yr beta; alpha; radium; uranium; others)
4. Protective assurance period for 1,000 – 10,000 years.



Conceptual tank closure design (still under development)

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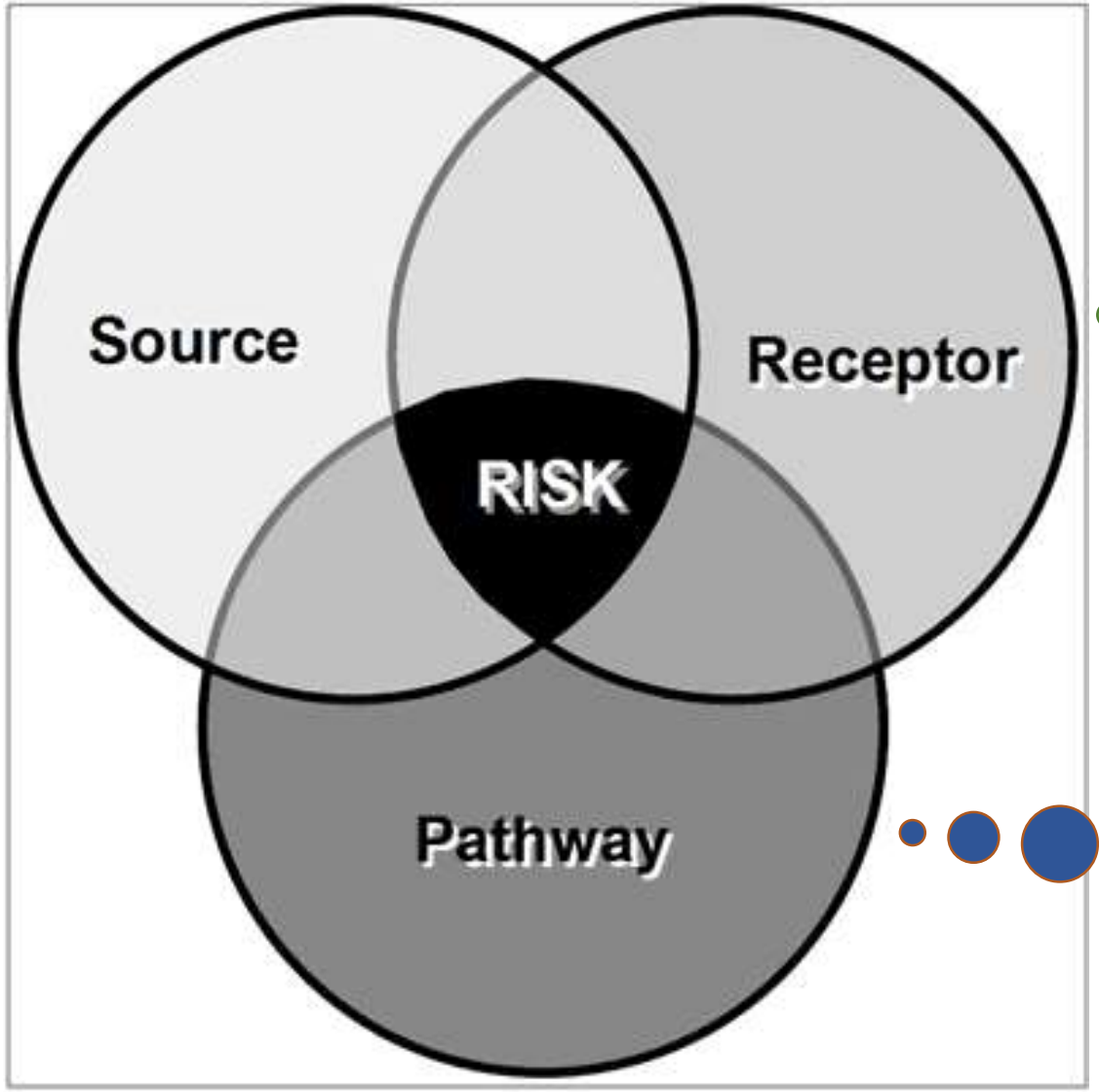
How is future risk determined?

Contaminants



People
("representative future person")

Water to drink, soil to inhale, food to eat, etc.

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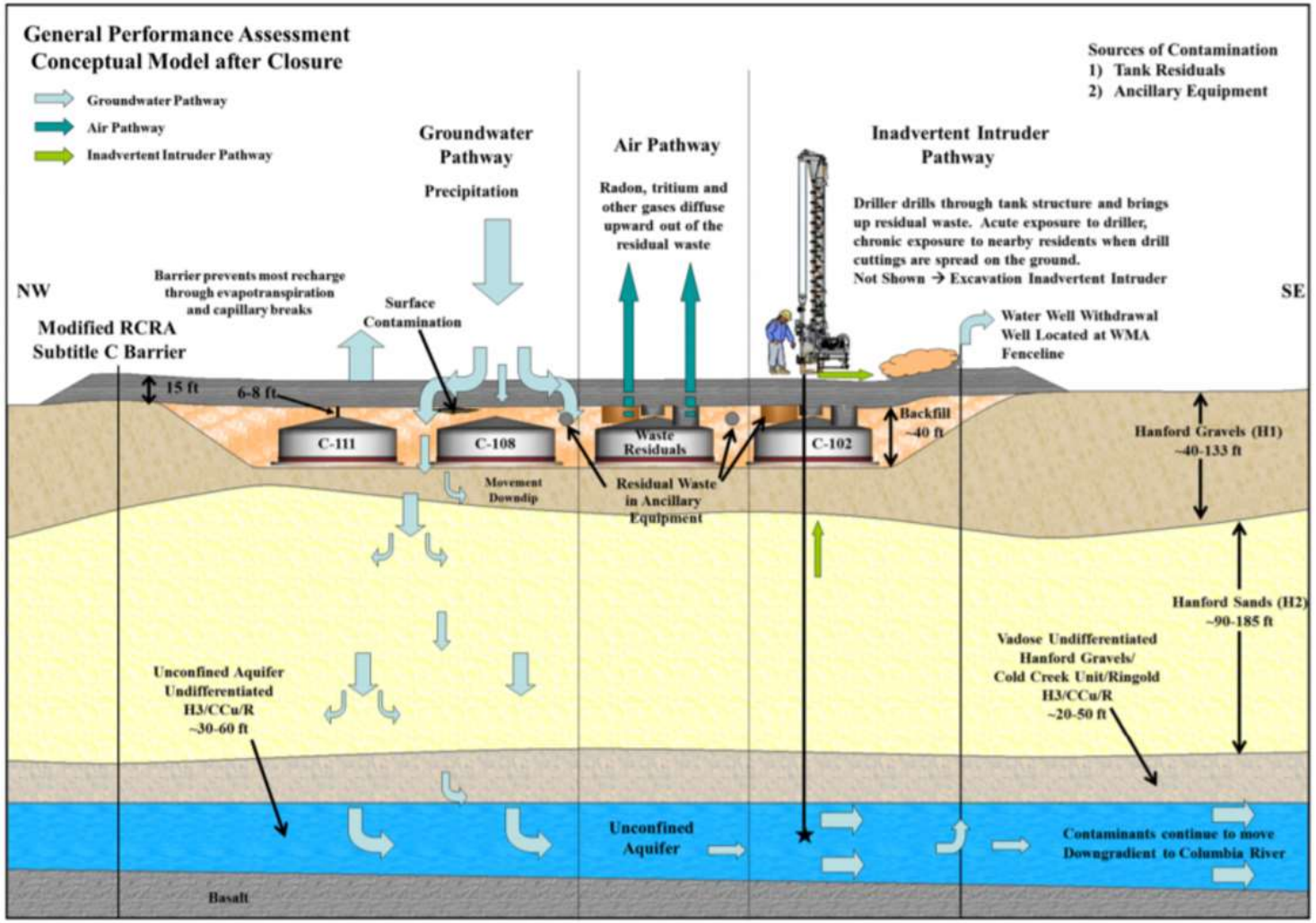
Future Exposure Scenarios in the C-Farm Performance Assessment

- Evaluates a future residential user, living 100 meters away, who grows crops, keeps livestock, and drinks groundwater.
- Evaluates an intruder after 100 years who lives onsite and drills a groundwater well through a buried pipeline.
- Model extends to 10,000 years.
- Assumes cap fails after 500 years.



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- C Tank Farm closure modeling shows maximum of 30 pCi/L in downgradient water wells, 1,500 years from now
  - Drinking water standard = 900 pCi/L
- Maximum dose to a future resident estimated at 0.1 millirem/year
  - DOE standard = 25 mrem/yr
  - Background radiation =
    - ~90 mrem/yr (Hanford area)
    - ~350 mrem/yr (US average)
- Oregon: Uncertainty in the modeling

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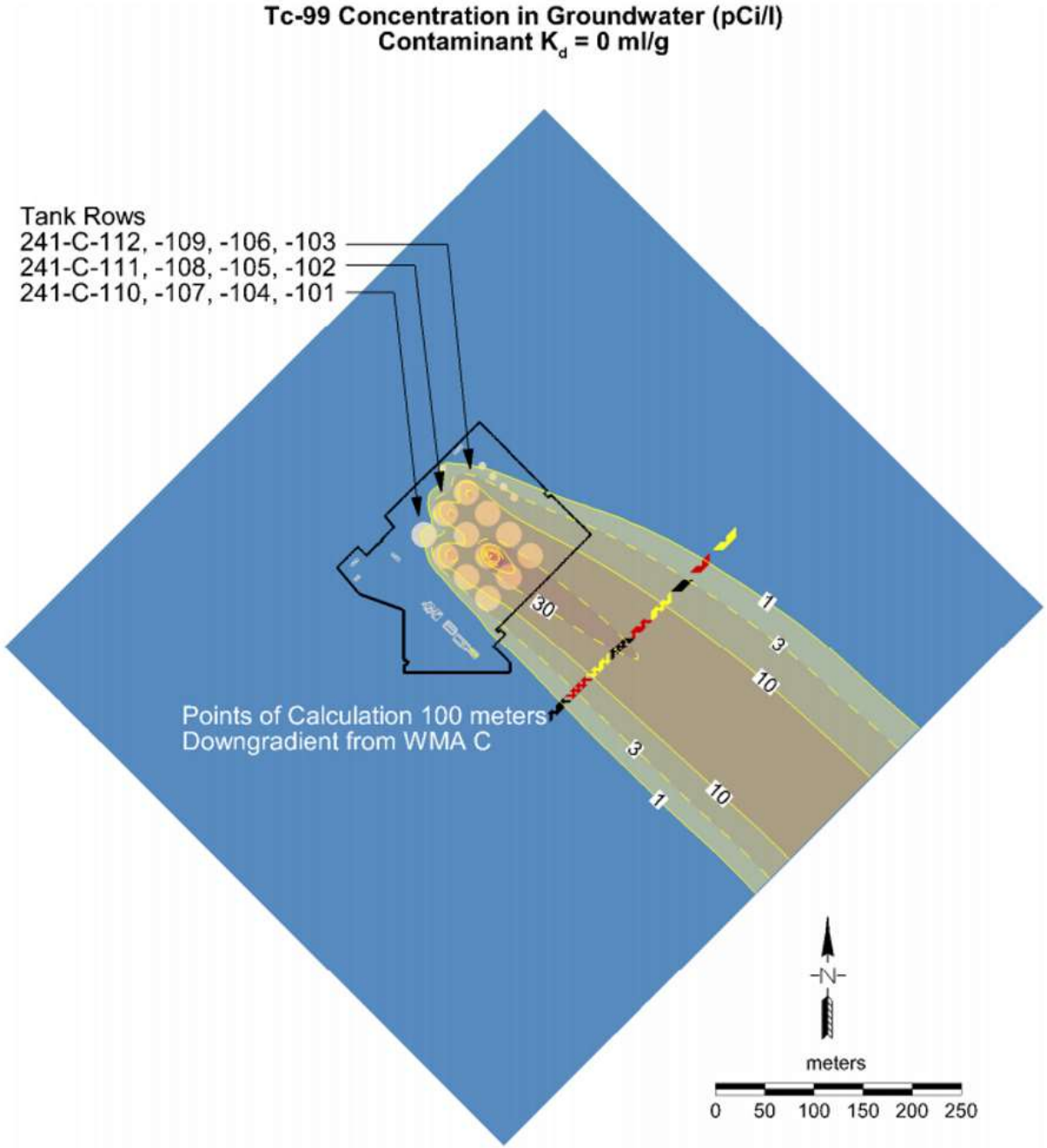
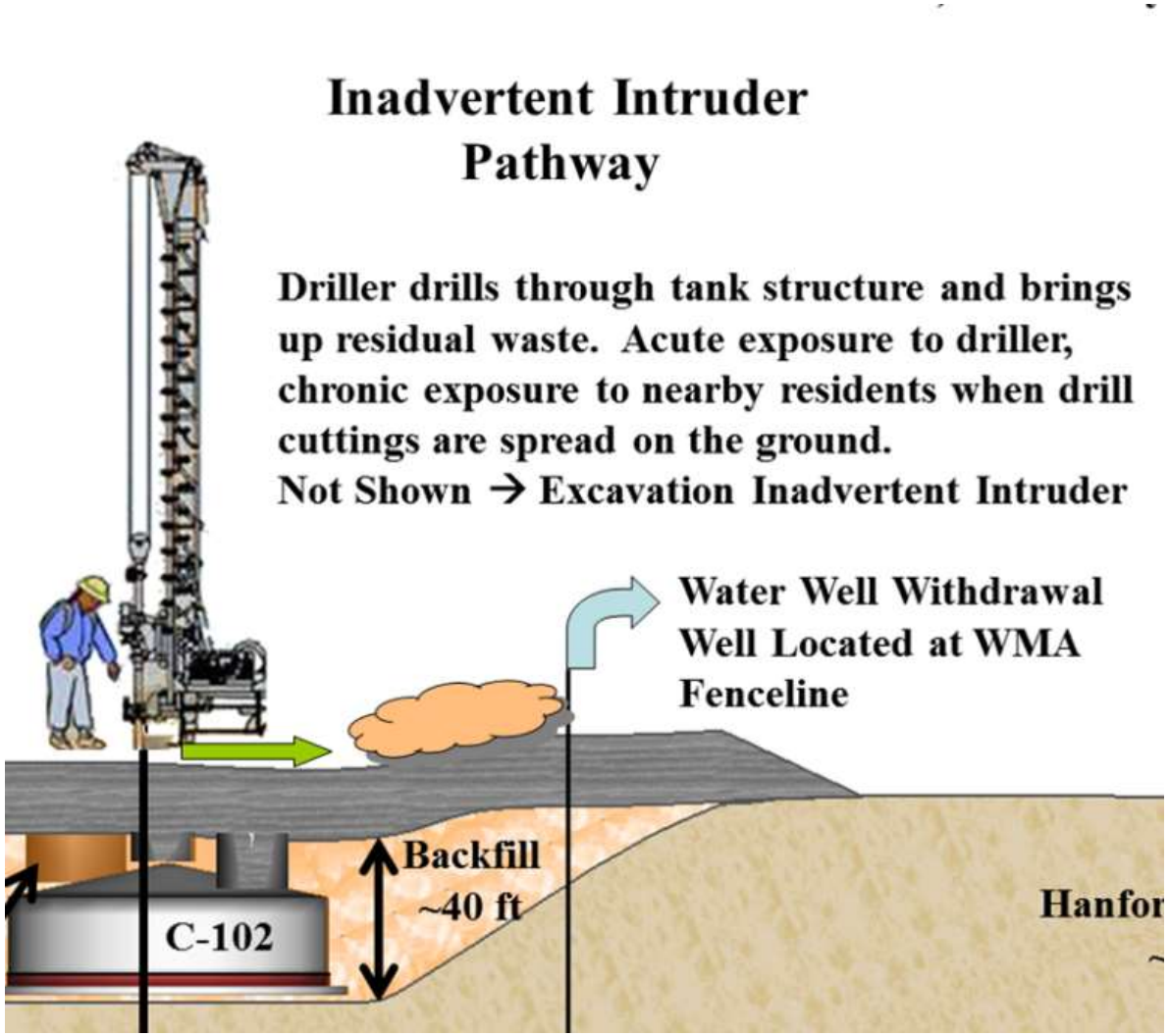
Figure 7-24. Extent of Technetium-99 Plume in Groundwater 1,570 Years after Closure at the Time of the Maximum Concentration at the Point of Compliance.



- Inadvertent Intruder modeling shows a maximum acute dose to a well driller = 36 millirem
  - Standard = 500 mrem
- Maximum chronic dose to an agricultural receptor spreading drill cuttings on crop land = 8.2 mrem/year
  - Standard = 100 mrem/year



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#3: Waste to be incorporated in a solid physical form & meet Class C LLW concentrations

- DOE applying NRC guidance to satisfy this criterion.
- What is the definition of “incorporated” vs. “encapsulated”?
- Do Class C concentrations have to be met everywhere, or just at times and places likely to be encountered by people in the future?

NUREG-1854

NRC Staff Guidance for Activities Related to U.S. Department of Energy Waste Determinations

Draft Final Report for Interim Use

U.S. Nuclear Regulatory Commission
Office of Federal and State Materials and Environmental Management Programs
Washington, DC 20555-0001

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Decision Scope:

Tanks vs. Soils

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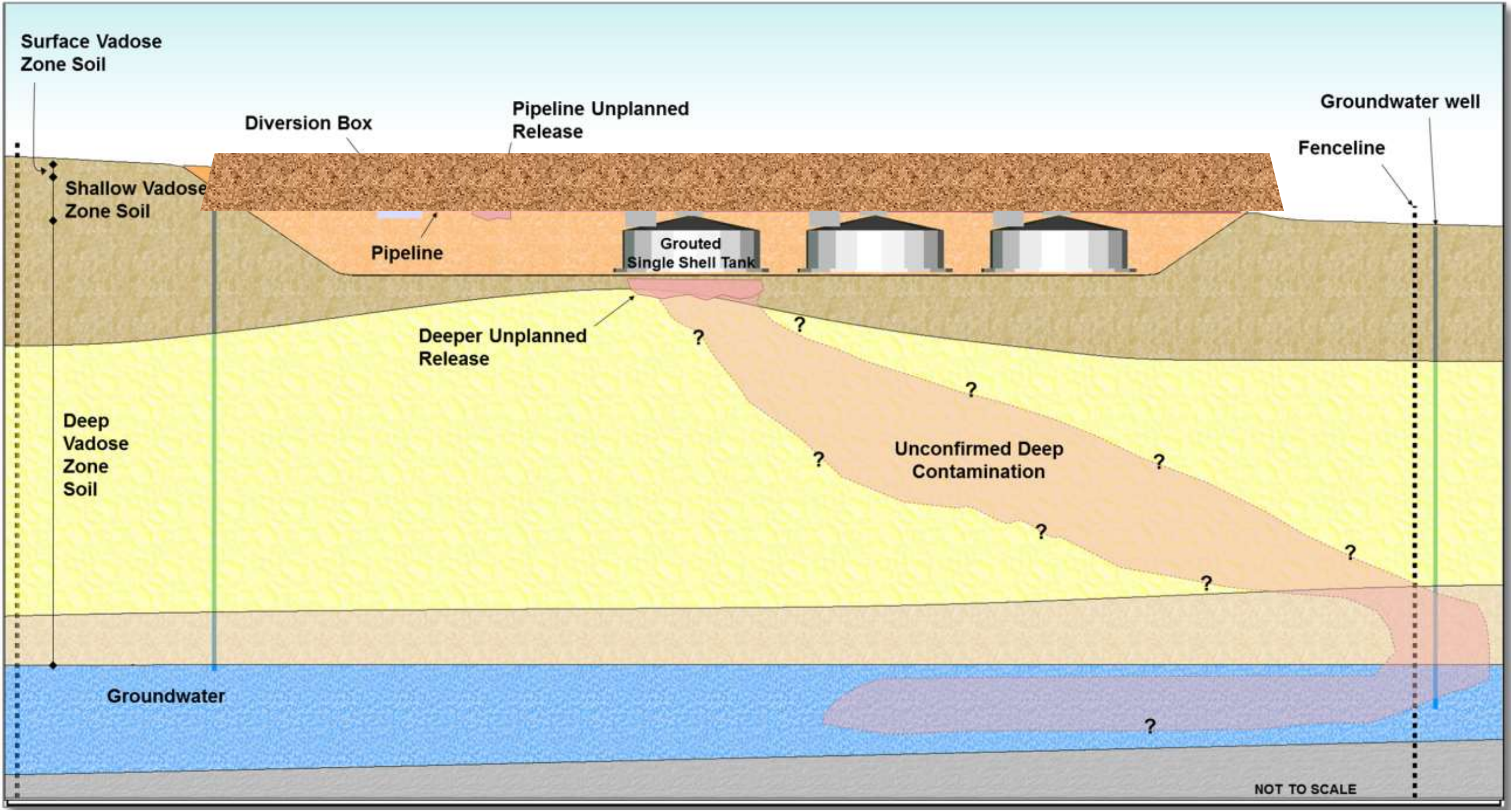
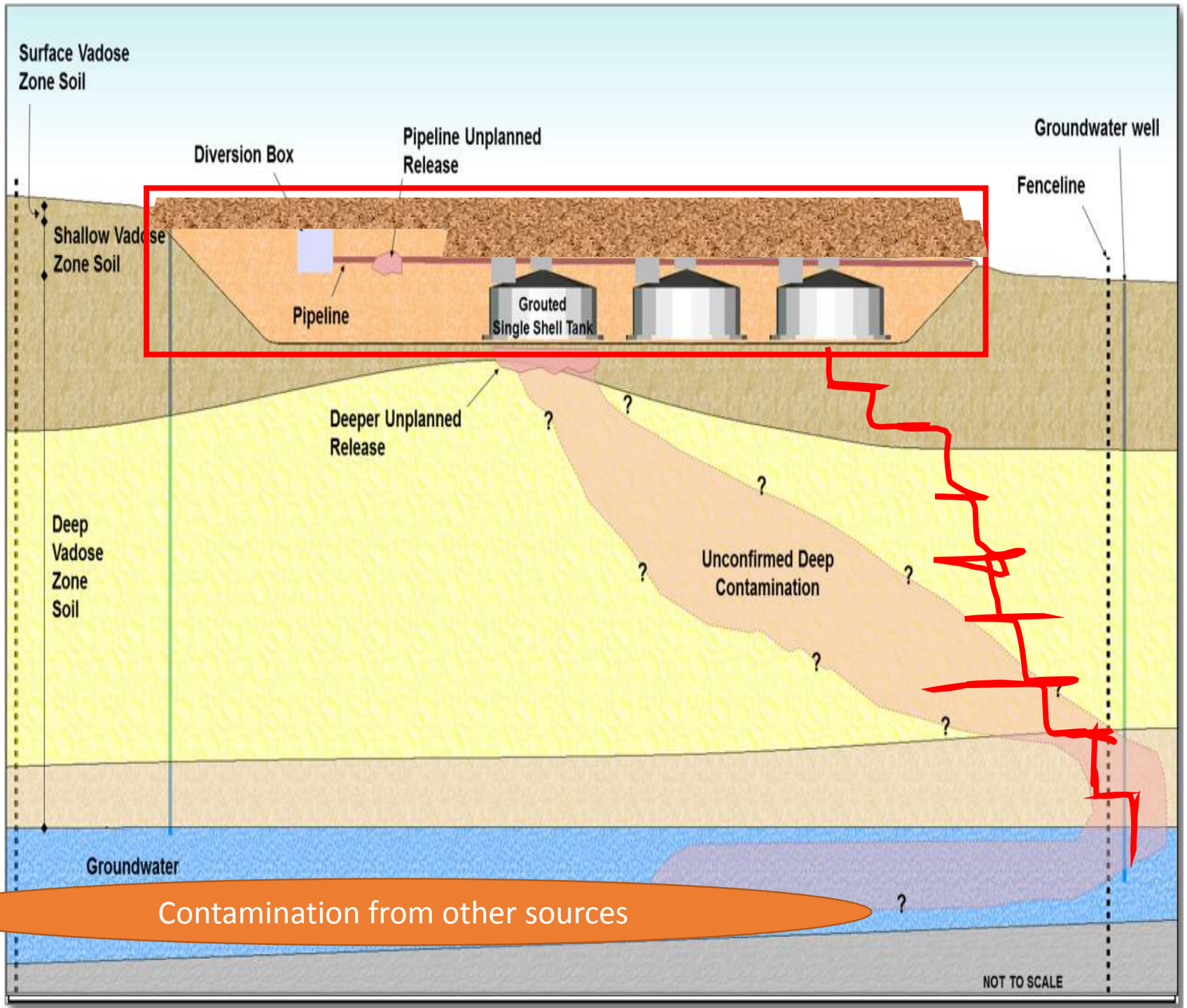

Surface Vadose Zone Soil
Diversion Box
Pipeline Unplanned Release
Groundwater well
Fenceline
Shallow Vadose Zone Soil
Pipeline
Grouted Single Shell Tank
Deeper Unplanned Release
Deep Vadose Zone Soil
Unconfirmed Deep Contamination
Groundwater
NOT TO SCALE



How do documents affect the ecosystem?

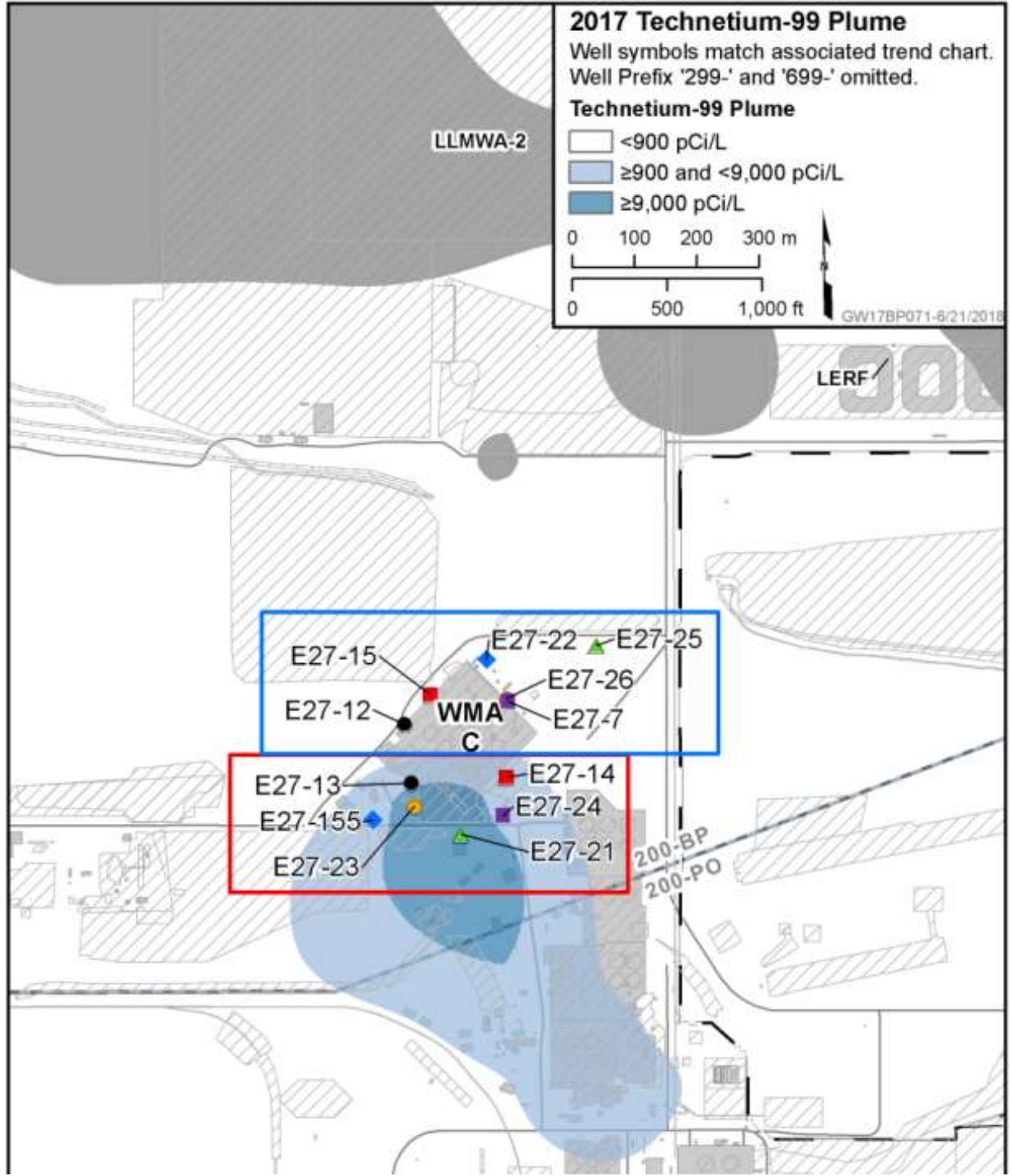
- Performance Assessment
- WIR Evaluation
- DOE Closure Plan
- RCRA Closure Plan

Soil remediation under RCRA and CERCLA

Groundwater remediation under CERCLA

Hanford TPA Appendix I Performance Assessment

Composite Analysis required for DOE Closure Plan



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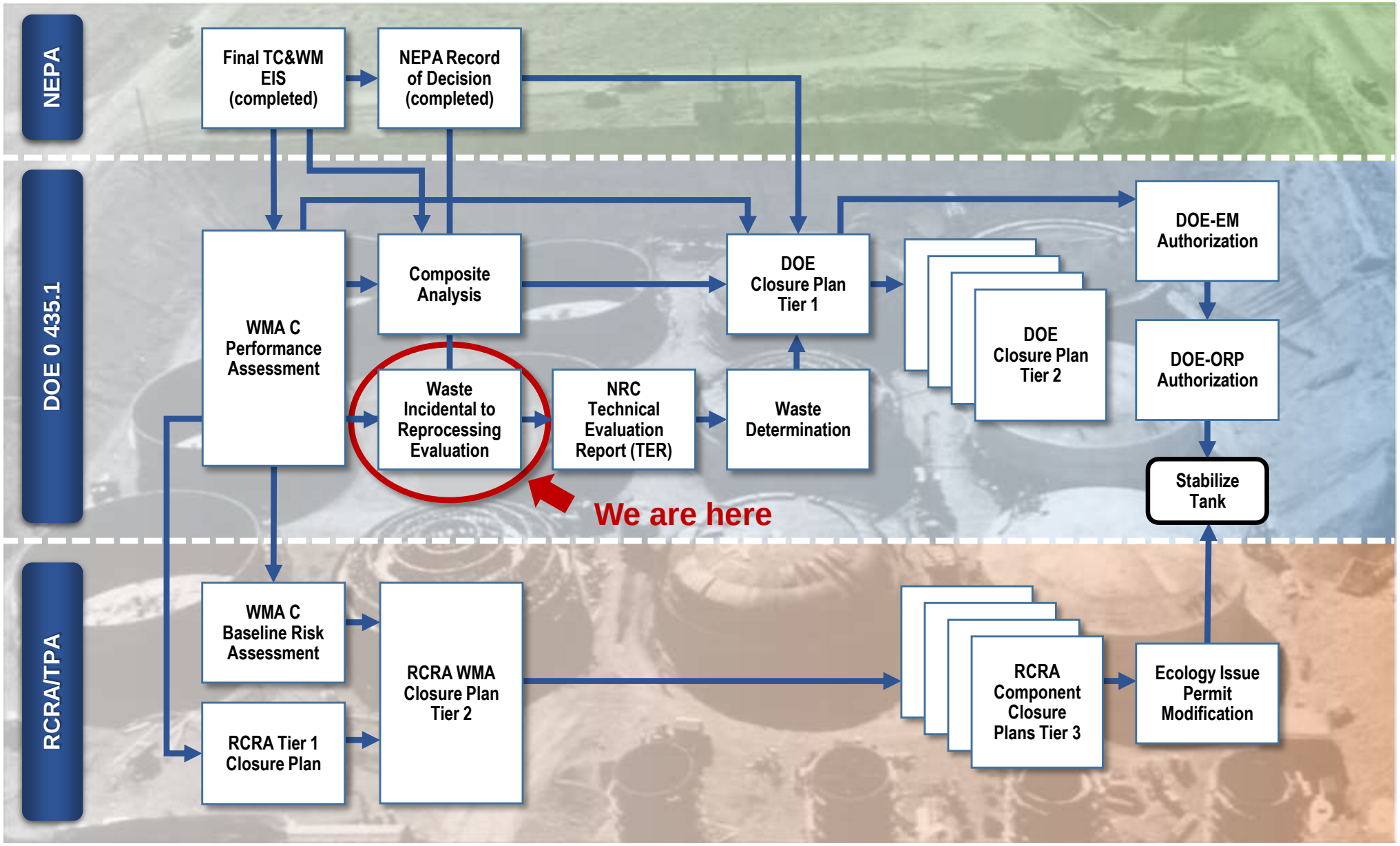
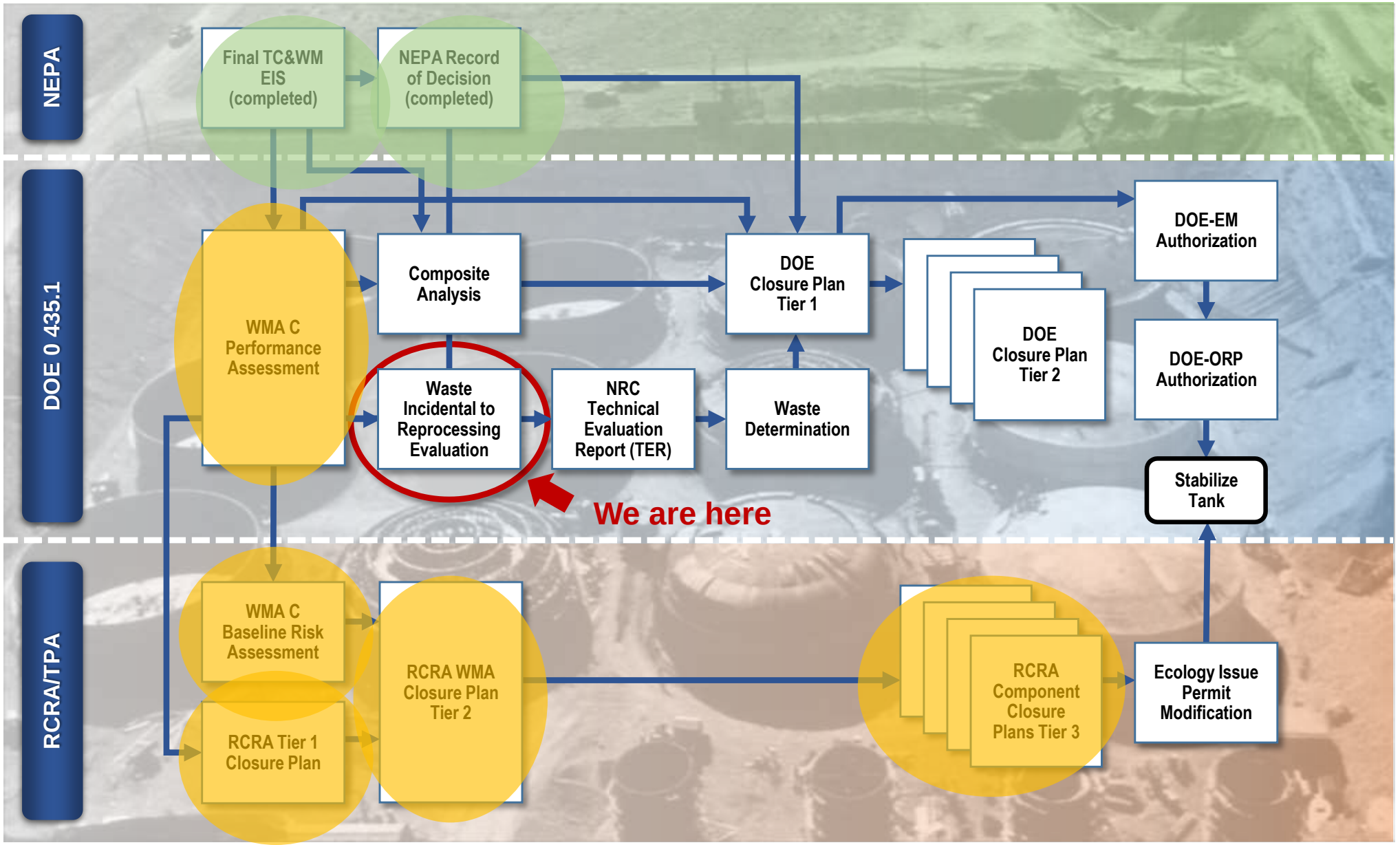
Regulatory Processes for Tank Closure



Regulatory Processes for Tank Closure



Complete

Under Review

Oregon's Recommendations for the WIR

1. Additional uncertainty analysis is needed for compound effects.
2. Include the full "decision package" in this WIR, including Composite Analysis and Performance Assessment Maintenance Plan.
3. Include Oregon and the public in developing the PA Maintenance Plan. (How will we know later if today's decision is wrong?)

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Oregon's Recommendations for the WIR

4. Oregon expects to see a WIR evaluation for past tank leaks to soil.
5. DOE should look for more powerful waste retrieval technologies before grouting the tanks.
6. Do not proceed with tank closure actions at least until the Waste Treatment Plant is operational.

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