Oregon Radioactive Waste Disposal

Regulations, Enforcement, and Prevention

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WHAT WE'LL COVER

- Review of the radioactive waste disposal event discovered in 2019 and the Corrective Action process that followed
- Review of Oregon statutes and rules governing radioactive waste disposal
- Discussion of enforcement and prevention challenges and approach
- Legislative needs (public hearing topic)

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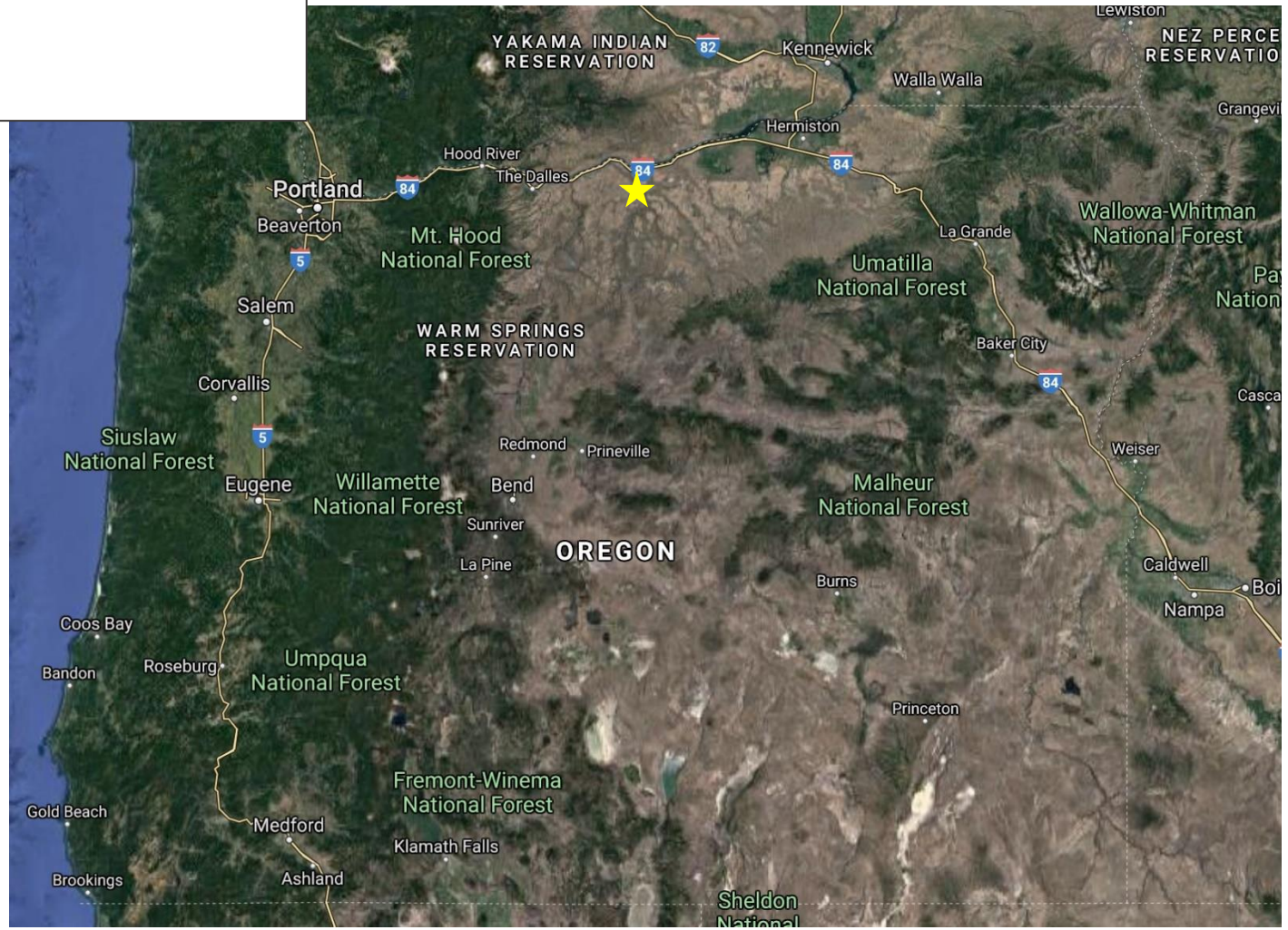
Oregon landfill took 2M pounds of radioactive fracking waste

Authorities say a chemical waste landfill in Oregon near the Columbia River has been accepting hundreds of tons of radioactive fracking waste from North Dakota in violation of Oregon regulations

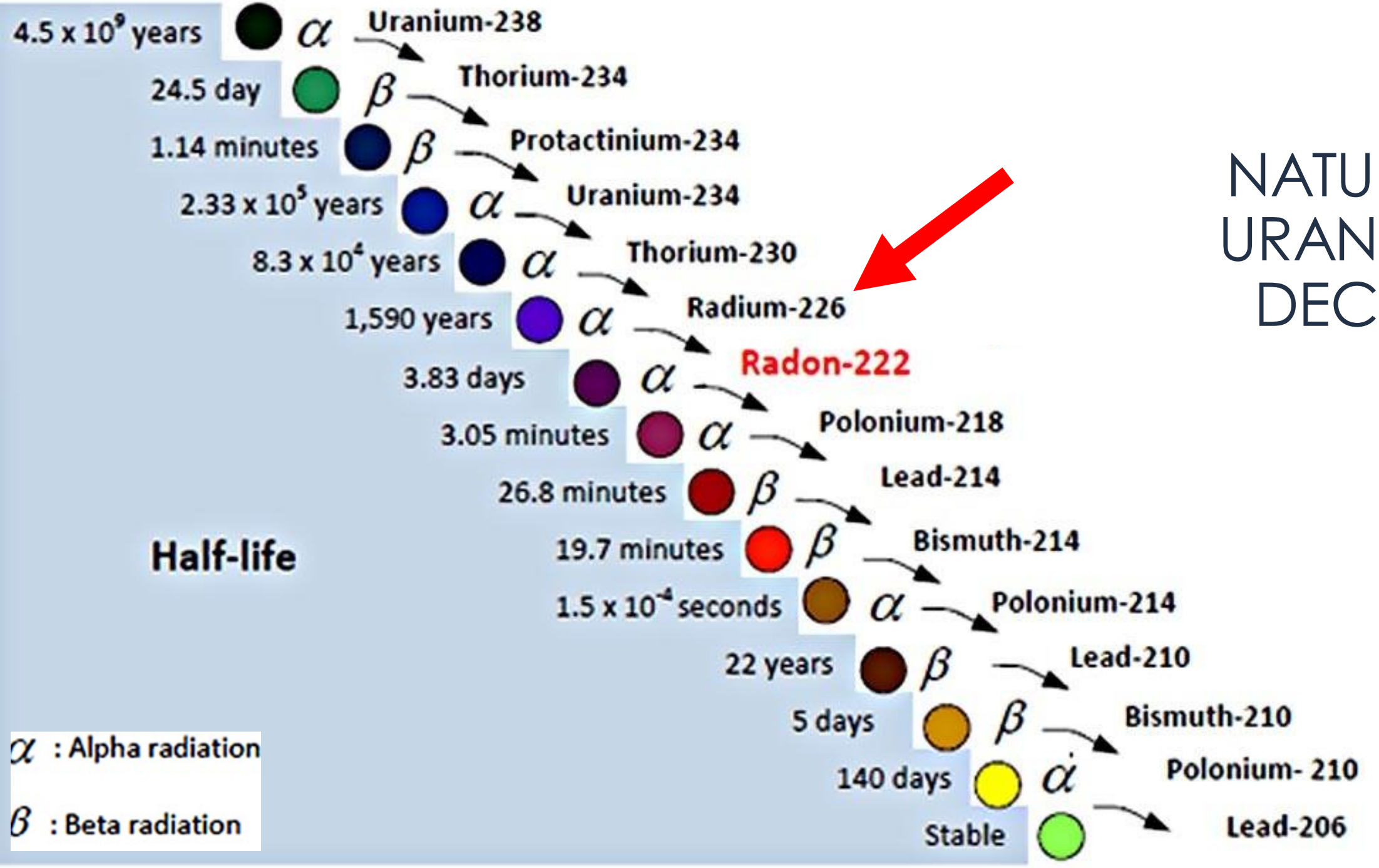
By **The Associated Press**

February 14, 2020, 9:33 AM • 3 min read



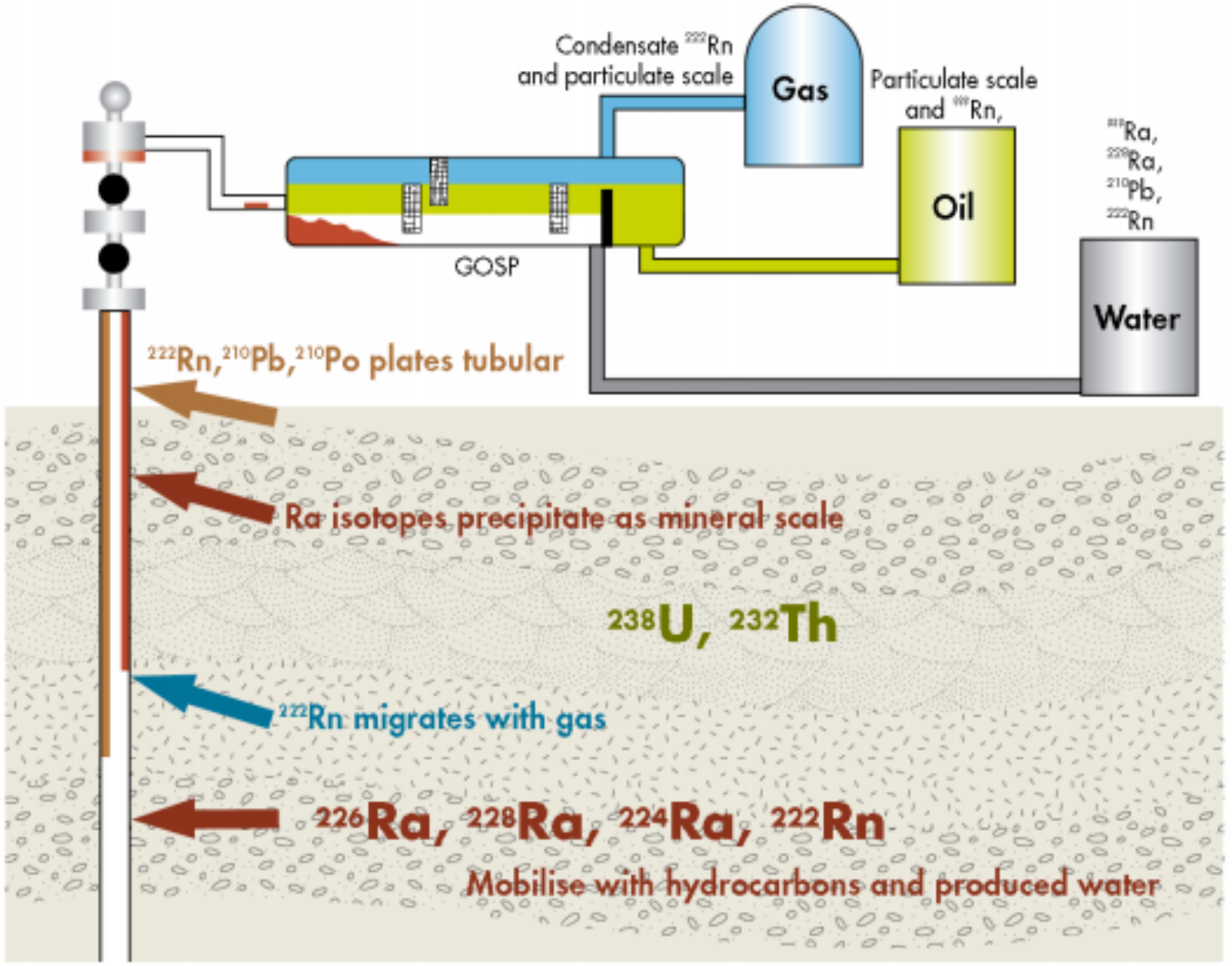

~80% of waste
was filter socks
from fracking
water recycling

NATURAL URANIUM DECAY



WHAT IS TENORM?

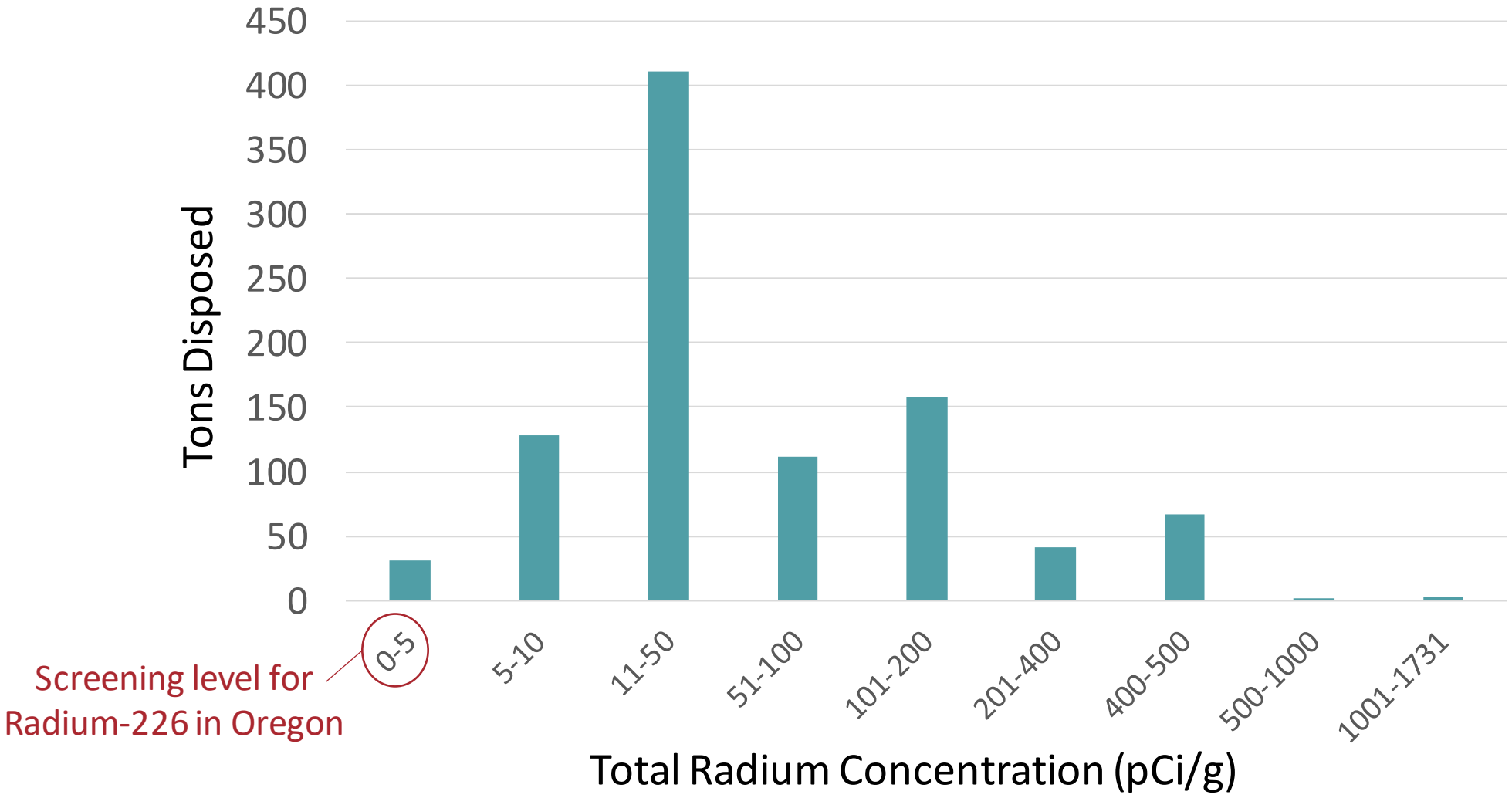
(Technologically-Enhanced Naturally Occurring Radioactive Material)



Origins of TENORM and Where It May Accumulate

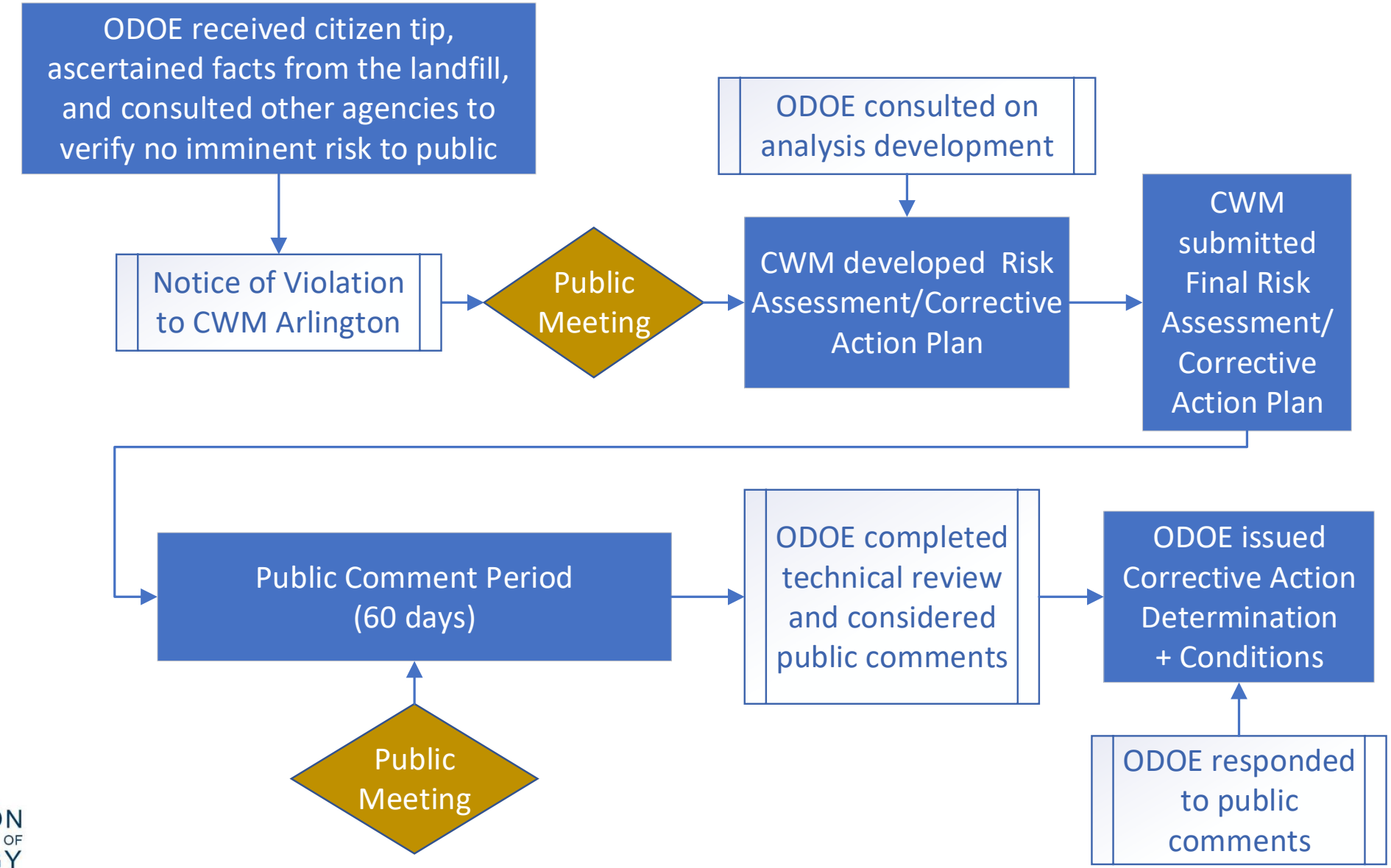
Source: International Assoc. of Oil & Gas Producers, Report No. 412 (2008)

TONS OF WASTE* DISPOSED BY CONCENTRATION



Radioactivity in this chart based on North Dakota tracking information and does not represent total volume of waste.

CORRECTIVE ACTION PUBLIC PROCESS



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ALTERNATIVES EVALUATED

Alternative 1 - In Place Closure

- Landfill would continue piling new fill in the landfill
- Final burial depth = 100 feet average (18 feet to shallowest load)
- Landfill cap/liner + dry climate prevents migration into environment
- Groundwater monitoring until 30 years post-closure (~100 years from today)

Alternative 2 – Exhume and Redispose Out of State

- Excavate and relocate 680,000 yd^3 of hazardous, non-radioactive waste to access 3,244 yd^3 of mixed TENORM
- Dispose out of state (assumed Idaho) via 322 truck shipments

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NCP Selection Criteria - RI/FS 40 CFR Part 300	
1	Overall protection of human health and the environment
2	Compliance with ARARs
3	Long-term effectiveness and permanence
4	Reduction of toxicity, mobility, or volume through treatment
5	Short-term effectiveness
6	Implementability
7	Cost
8	State acceptance
9	Community acceptance

Threshold Criteria
Primary Balancing Criteria
Modifying Criteria

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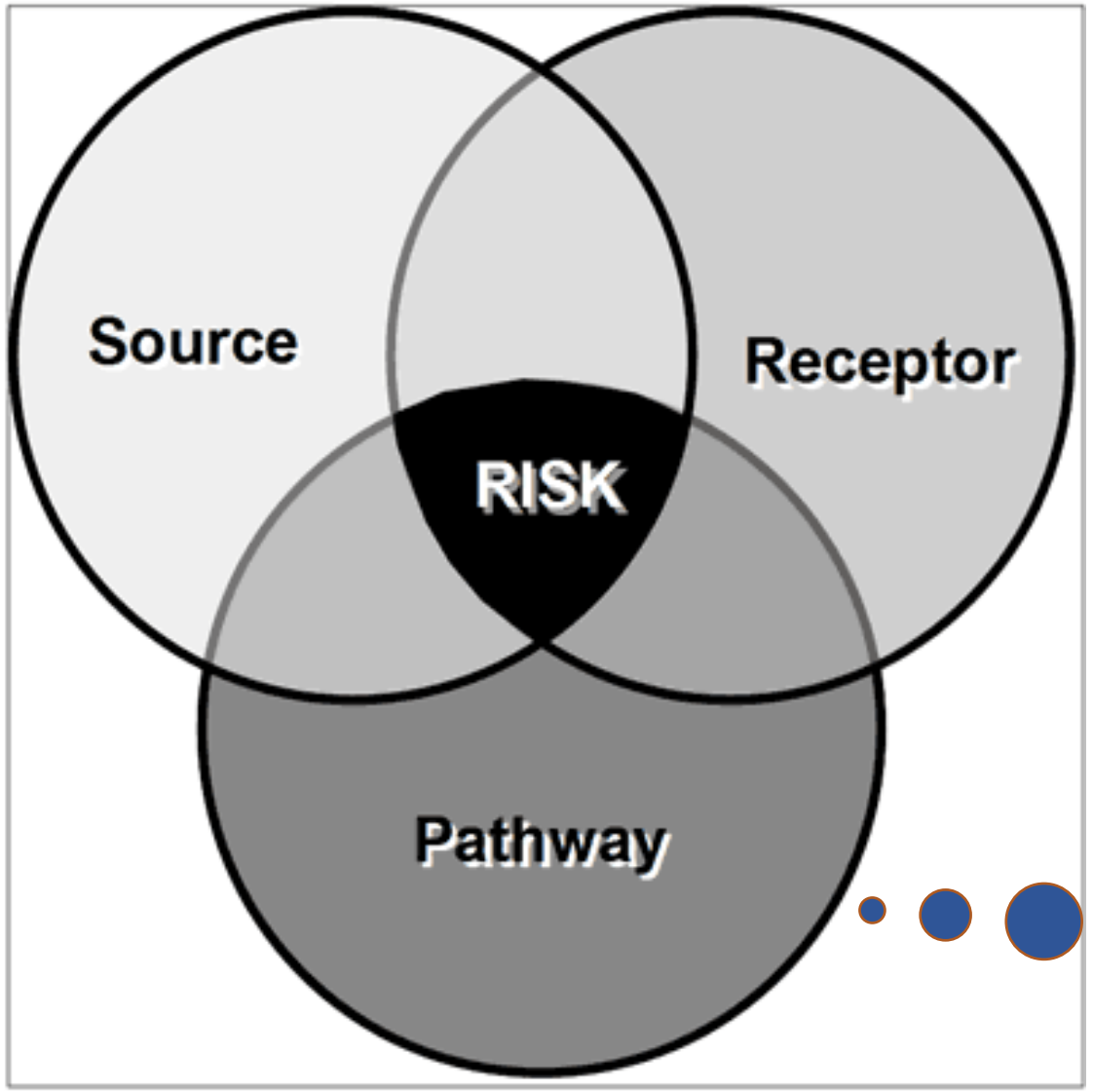
Radionuclides



People
(present or future person)

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

ALTERNATIVE 1
SAFE UNDER WORST CASE ASSUMPTIONS

- Assumed a future resident lives on landfill cap and drills a water well despite land use controls.
- Water assumed to be potable and in sufficient quantity for consumption contrary to real conditions.
- TENORM assumed to be the maximum sampled concentration for all wastes instead of a weighted average.
- TENORM assumed to be concentrated in one location instead of spread throughout landfill.
- Assumed cap and liner degrade faster than designed.

Result:
Risk to future resident =
up to 1:1 million

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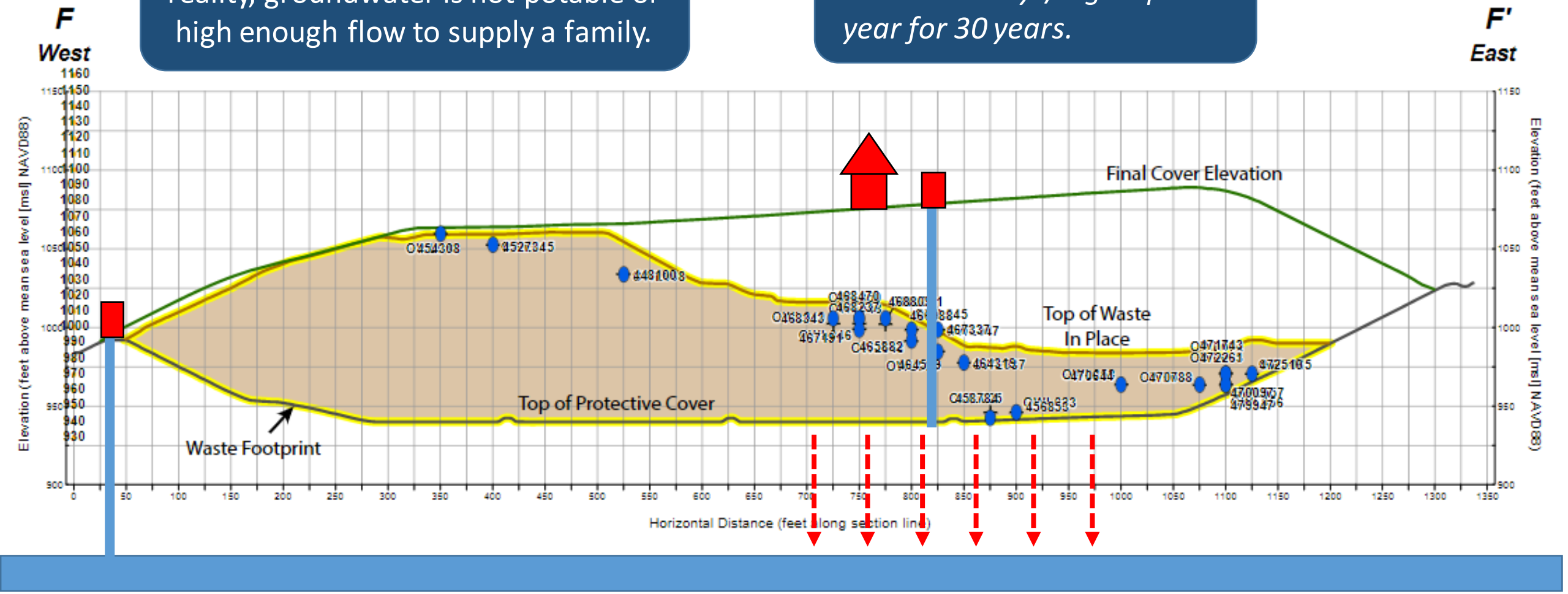
Well assumed at landfill edge. In reality, groundwater is not potable or high enough flow to supply a family.

Person assumed to reside in house 350 days/nights per year for 30 years.



Assuming early liner/cap failure, TENORM reaches groundwater at 100x lower than drinking water standard and is immediately diluted.

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ALTERNATIVE 2
EXCAVATION AND RE-DISPOSAL OUT OF STATE

- Excavate 680,000 yd^3 of material to access 3,244 yd^3 of waste.
- Estimated 322 truckloads of mixed waste sent to Idaho for re-disposal.
- Estimated to take **10 years** to complete.
- **Potential risk** to workers and public via radiation exposure, disturbance of hazardous chemicals, physical injuries, potential vehicle accidents.
- Estimated cost = **$210 million**.

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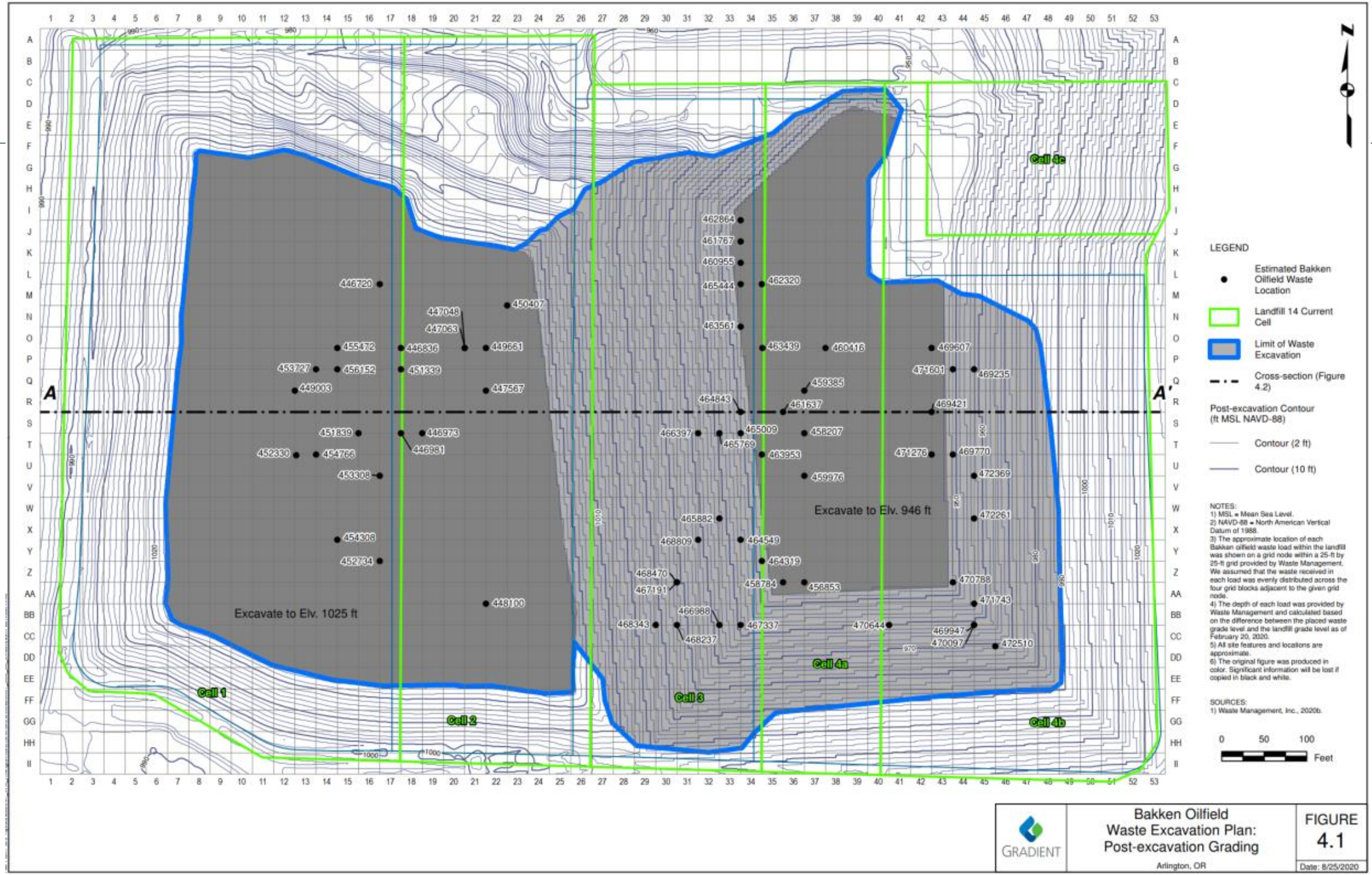
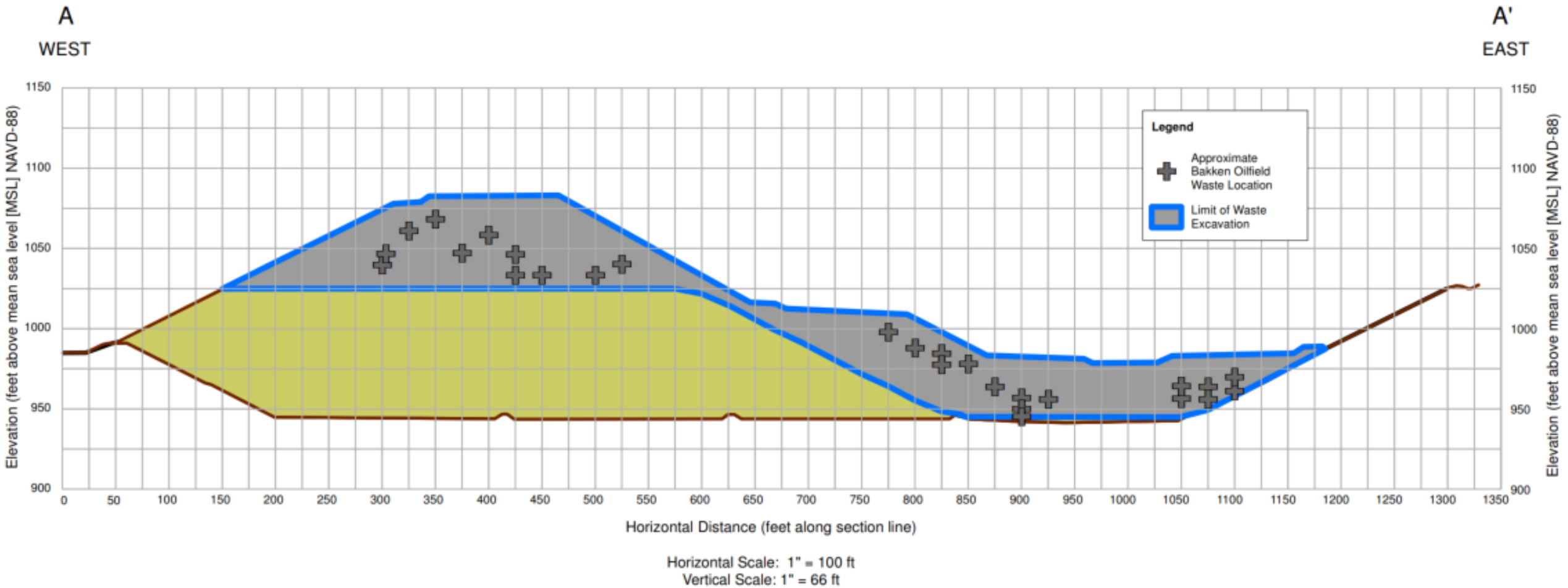

A
A'
Excavate to Elv. 1025 ft
Excavate to Elv. 946 ft
Cell 1
Cell 2
Cell 3
Cell 4a
Cell 4b
Cell 4c
446720
450407
447048
447063
455472
446836
449661
453727
456152
451339
449003
447567
451839
446973
446981
452330
454766
459308
454308
452734
448100
462864
461767
460955
465444
462320
463561
463439
460416
469607
471601
469235
459385
464843
461637
469421
466397
465009
458207
465769
463953
471276
469770
459876
472369
465882
472261
468809
464549
464819
468470
467191
458784
456853
470788
471743
466988
468343
468237
467337
470644
469947
470097
472510
LEGEND
Estimated Bakken Oilfield Waste Location
Landfill 14 Current Cell
Limit of Waste Excavation
Cross-section (Figure 4.2)
Post-excavation Contour (ft MSL NAVD-88)
Contour (2 ft)
Contour (10 ft)
NOTES:
1) MSL = Mean Sea Level.
2) NAVD-88 = North American Vertical Datum of 1988.
3) The approximate location of each Bakken oilfield waste load within the landfill was shown on a grid node within a 25-ft by 25-ft grid provided by Waste Management. We assumed that the waste received in each load was evenly distributed across the four grid blocks adjacent to the given grid node.
4) The depth of each load was provided by Waste Management and calculated based on the difference between the placed waste grade level and the landfill grade level as of February 20, 2020.
5) All site features and locations are approximate.
6) The original figure was produced in color. Significant information will be lost if copied in black and white.
SOURCES:
1) Waste Management, Inc., 2020b.
0
50
100
Feet
GRADIENT
Bakken Oilfield
Waste Excavation Plan:
Post-excavation Grading
Arlington, OR
FIGURE
4.1
Date: 8/25/2020



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OTHER EXCAVATION HAZARDS

- Reactivity – mixture of unknown chemicals could generate toxic gases, heat, fire, or explosion
- Dispersion, spills, or other mobilization of hazardous wastes
- Acute chemical exposure risks
- Chronic exposure toxic effects or cancer to organs as a result of exposure
- Physical risks from worker injury, equipment accidents, traffic accidents
- Greenhouse gas contributions

ODOE DETERMINATION

- ODOE concurred that leaving the waste in place is the path of least harm
- ODOE required regular monitoring of groundwater and landfill leachate
- ODOE required installation of an automated radiation monitor to screen all trucks entering the landfill
- WM instituted a waste profile verification process including laboratory analysis for radioactivity

Drive-Thru Radiation Detecting Portal Monitor

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Oregon's Regulatory System for Radioactive Waste Disposal

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RADIOACTIVE WASTE DISPOSAL PROHIBITED

- ORS 469.525 (1977) prohibited radioactive waste disposal facilities:

  "Notwithstanding any other provision of this chapter, no waste disposal facility for any radioactive waste shall be established, operated or licensed within this state. . ."

- Because virtually everything contains some radioactivity, the Energy Facility Siting Council promulgated OAR 345-050 to define exempt wastes.
  - Exempt quantities
  - Exempt concentrations
  - Naturally Occurring Radioactive Material (NORM)

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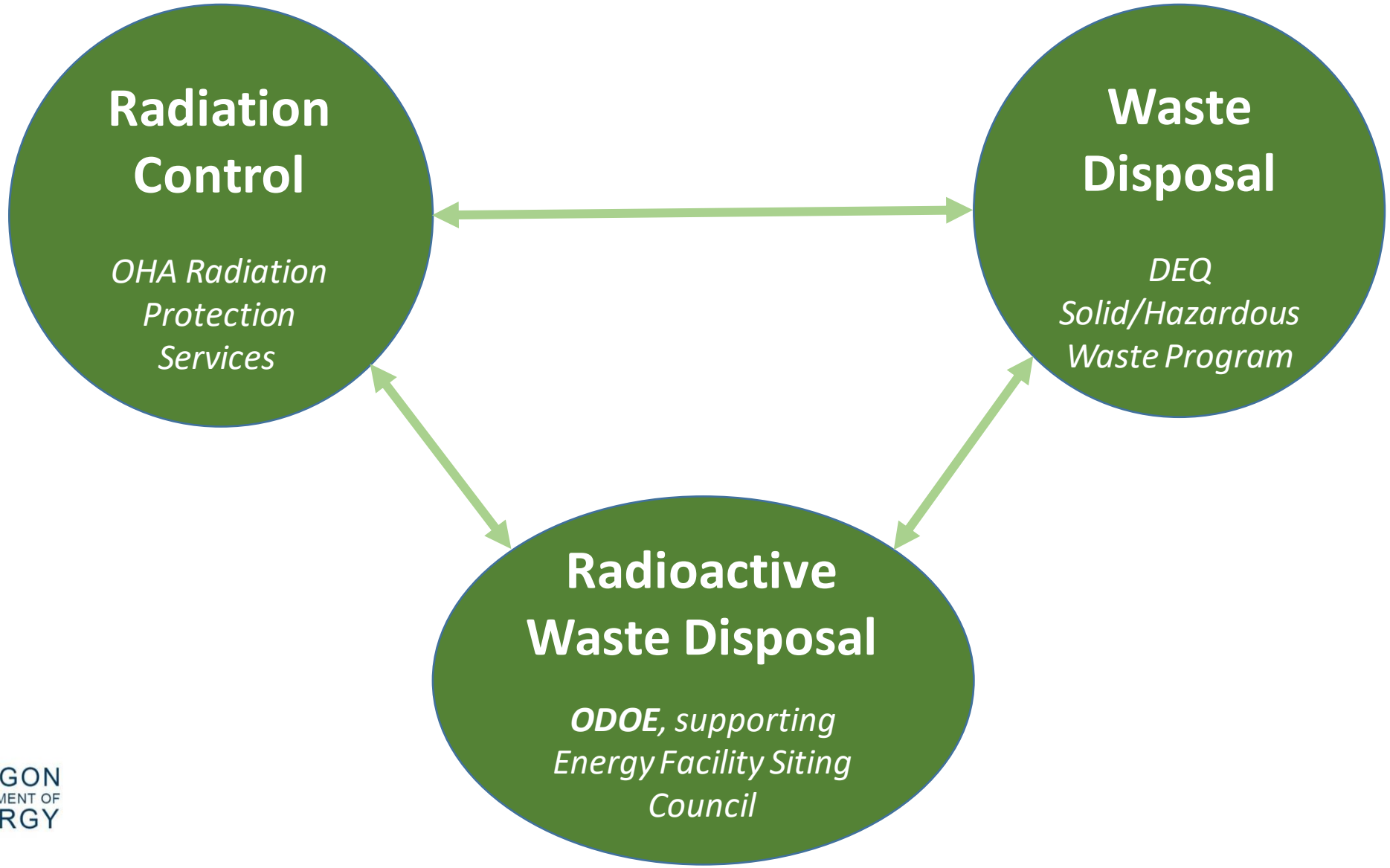
STATE AGENCY JURISDICTION



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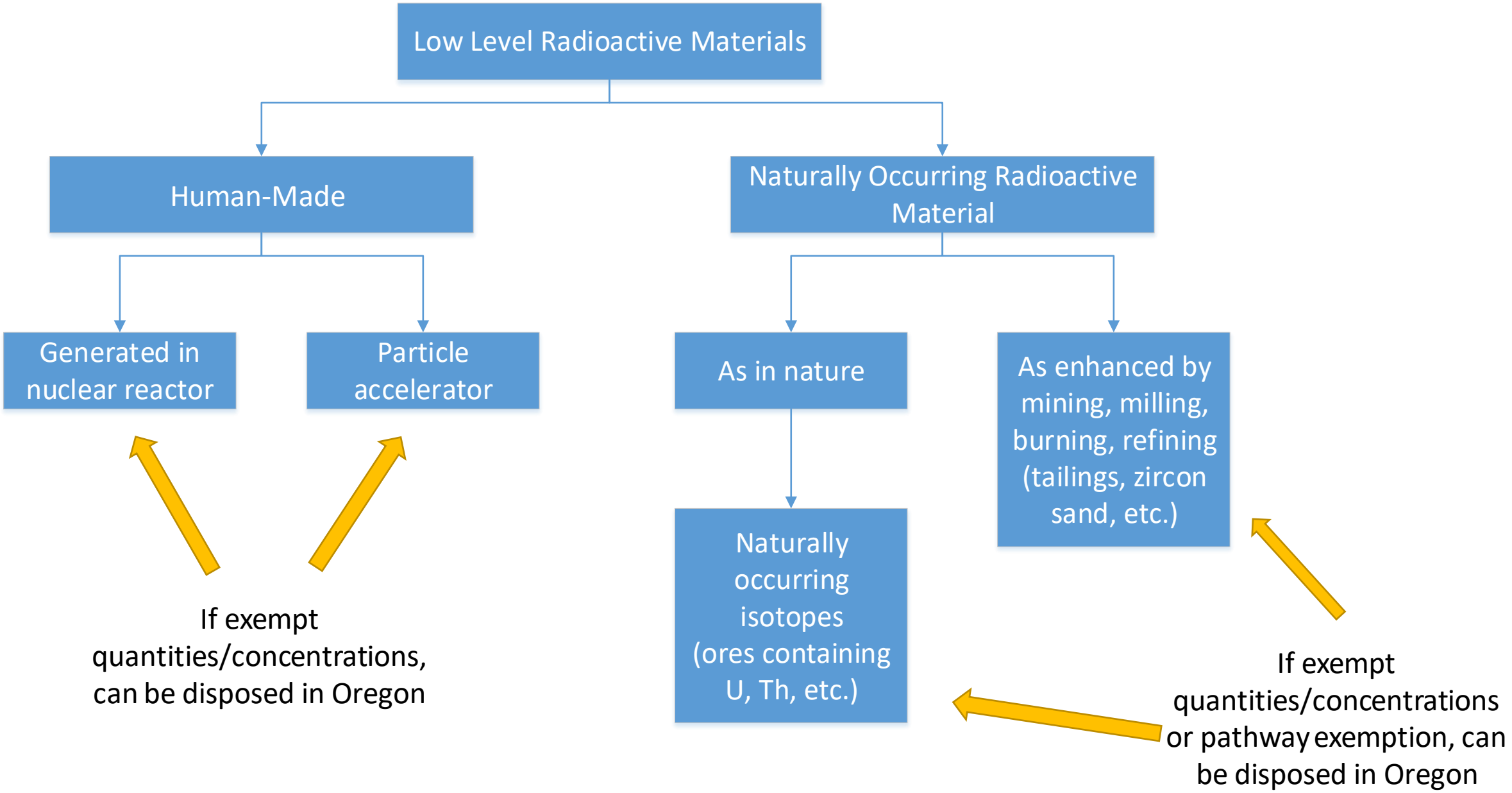
Low Level Radioactive Materials
Human-Made
Naturally Occurring Radioactive Material
Generated in nuclear reactor
Particle accelerator
As in nature
As enhanced by mining, milling, burning, refining (tailings, zircon sand, etc.)
Naturally occurring isotopes (ores containing U, Th, etc.)
If exempt quantities/concentrations, can be disposed in Oregon
If exempt quantities/concentrations or pathway exemption, can be disposed in Oregon

LOW LEVEL RADIOACTIVE WASTE DISPOSAL

Oregon is part of the **Northwest Interstate Compact** for low-level waste disposal (including Alaska, Hawaii, Idaho, Montana, Oregon, Utah, and Washington).

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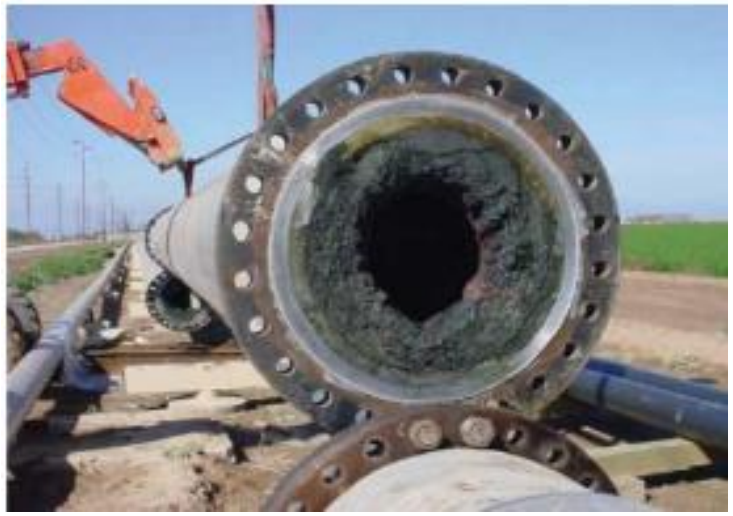
NATURALLY OCCURRING RADIOACTIVE MATERIAL



HOW IS EXEMPT NORM DEFINED NOW?

"Exempt" means the NORM does not qualify as "radioactive waste" in Oregon and may be disposed anywhere (i.e., landfill not assumed).

1. Quantity/Concentration thresholds for Uranium, Thorium, and Radium are low and generally consistent with many other states. Established in rule.

2. Pathway Exemption (if thresholds are exceeded):

   a) External gamma dose of 500 millirem/year based on direct measurement + model

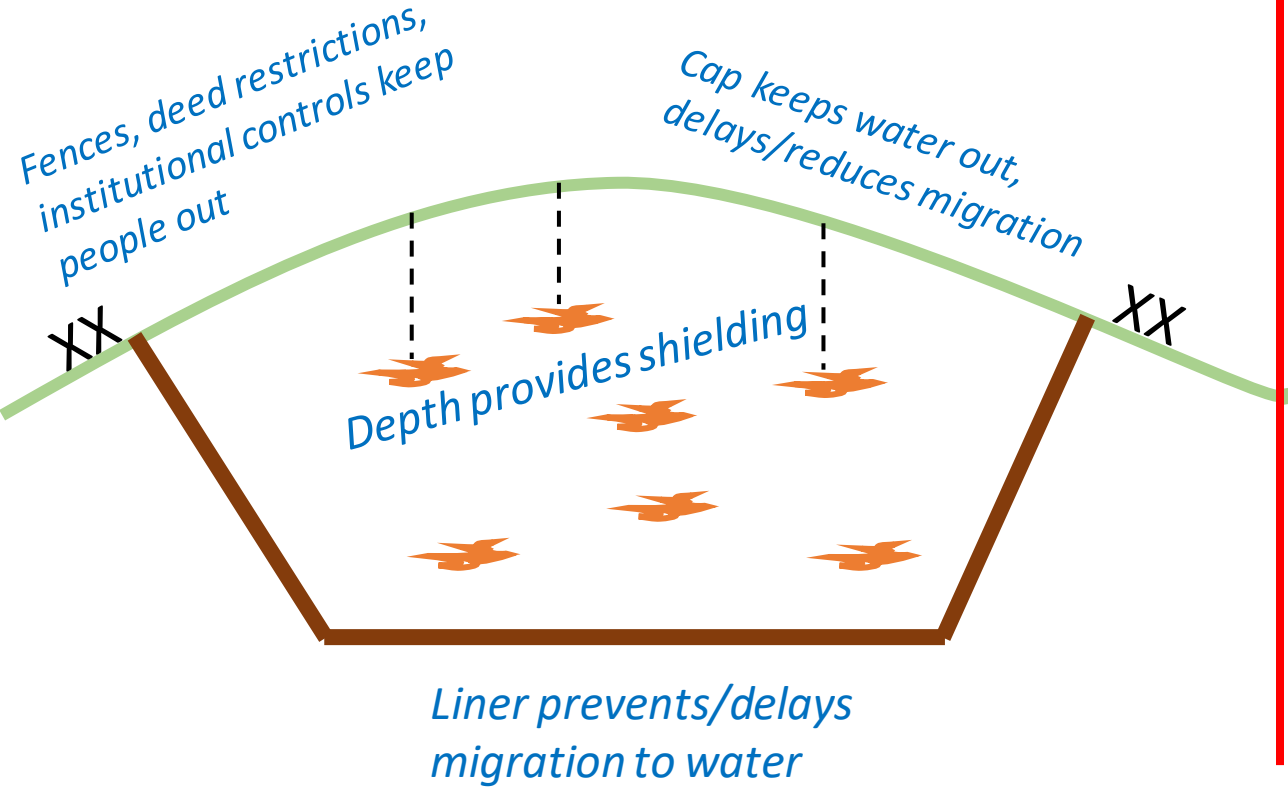
   b) Testing of actual waste required to ensure it will not **leach to water and air** above specified concentrations in Table 3 of the rule (also based on 500 millirem/year).

   c) Radon-specific value must be met (based on 3 pCi/L) as supported by measurements and a model assuming a house built on the waste.

OREGON'S RULES ARE FUNDAMENTALLY DIFFERENT

Some other states allow disposal in permitted facilities with safety features

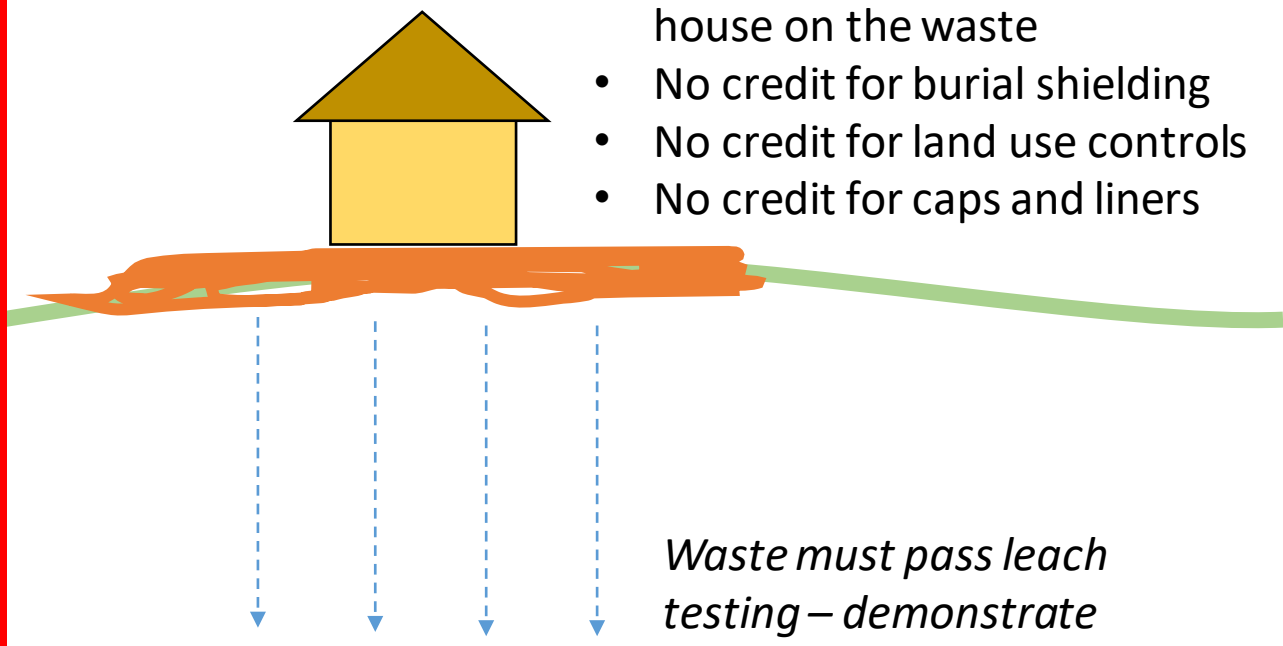
(supported by predictive environmental model)



ORS 469.525: Radioactive waste disposal facilities prohibited

("Radioactive waste" is defined by its risk properties)

- Assume a person builds a house on the waste
- No credit for burial shielding
- No credit for land use controls
- No credit for caps and liners



Waste must pass leach testing – demonstrate inherently low migration

Strengthening Enforcement and Prevention

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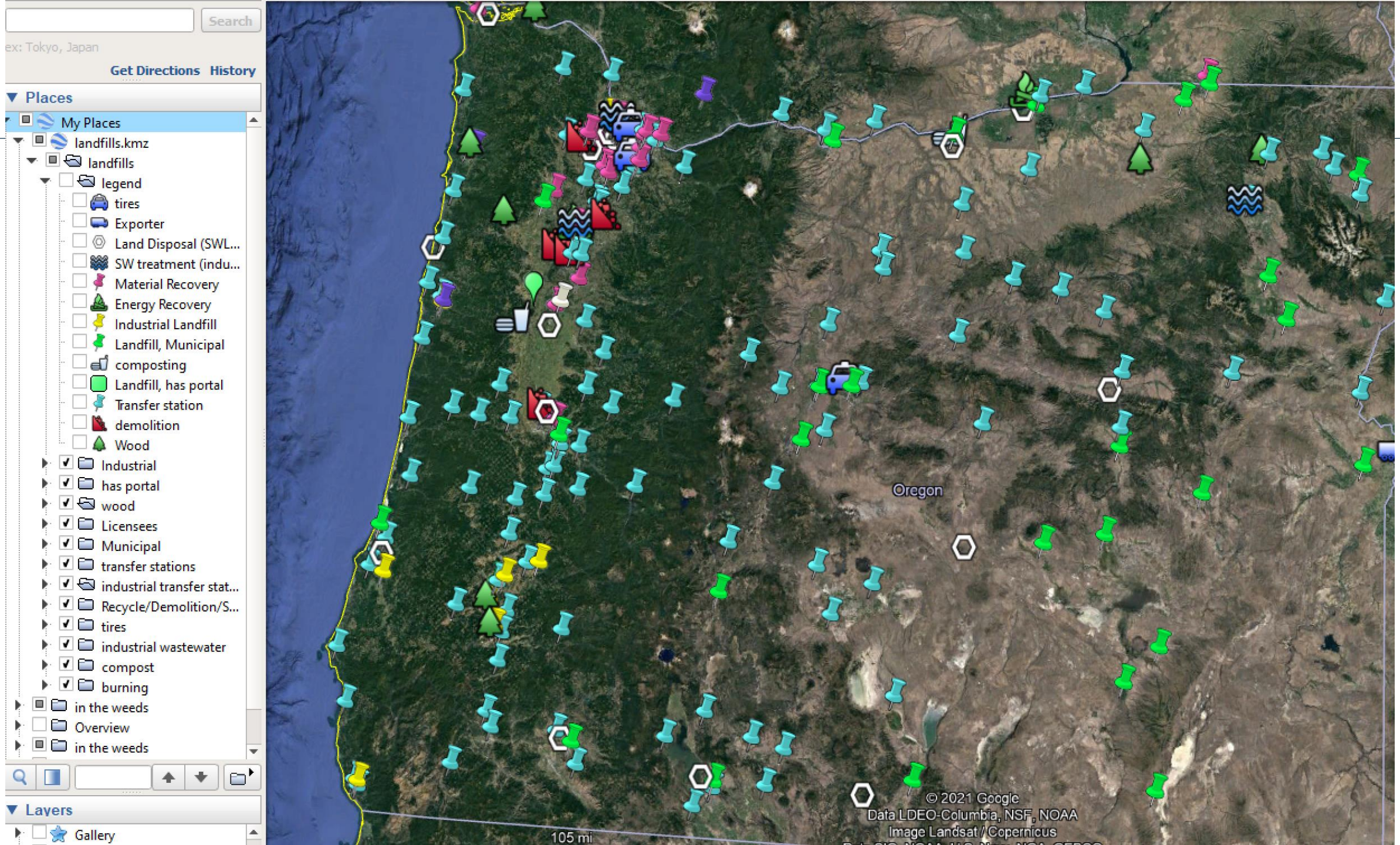
STRENGTHENING ENFORCEMENT AND PREVENTION

- Thinking beyond standard-keeping: “neighborhood beat” model of prevention
- Improving education and outreach
- Need information to build a system map, prioritize potential vulnerabilities
- Need clarity on ODOE authority to require compliance or preventative measures
- Need strengthened investigative powers to pursue potential violations

Drive-Thru Radiation Detecting Portal Monitor


Search
ex: Tokyo, Japan
Get Directions History
Places
My Places
landfills.kmz
landfills
legend
tires
Exporter
Land Disposal (SWL...
SW treatment (indu...
Material Recovery
Energy Recovery
Industrial Landfill
Landfill, Municipal
composting
Landfill, has portal
Transfer station
demolition
Wood
Industrial
has portal
wood
Licensees
Municipal
transfer stations
industrial transfer stat...
Recycle/Demolition/S...
tires
industrial wastewater
compost
burning
in the weeds
Overview
in the weeds
Layers
Gallery
Oregon
© 2021 Google
Data LDEO-Columbia, NSF, NOAA
Image Landsat / Copernicus
105 mi

RECENT ODOE ACTIONS

- Revised OAR 345 Division 29 rules governing enforcement and civil penalty
  - Significantly strengthens penalty deterrence for severe violations
  - Incentivizes corrective action
  - Establishes more opportunities for information gathering and analysis
  - Lays groundwork for holding more entities responsible (*needs legislation to activate*)
- Annual notice to landfills regarding Oregon radioactive waste regulations
- Working with Oregon Health Authority to add conditions to existing radioactive material handling licenses regarding waste verification and disposal.
- Actively reviewing Waste Management Inc. waste profiles for compliance

Oregon Radioactive Waste Disposal

SB 246 Public Hearing

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April 26, 2021

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PURPOSE OF PROPOSED BILL SB 246

- Expand who may be held responsible for illegal radioactive waste disposal, to include not only a disposer, but anyone who arranges for or transports such waste for disposal.
- Enable the Energy Facility Siting Council, with support from ODOE, to update and clarify the definition of radioactive waste subject to the disposal ban (OAR 345 Division 50).
- Expand and clarify ODOE enforcement and prevention authority for radioactive waste disposal.
- Add authority to recoup costs to the agency when a violation occurs.

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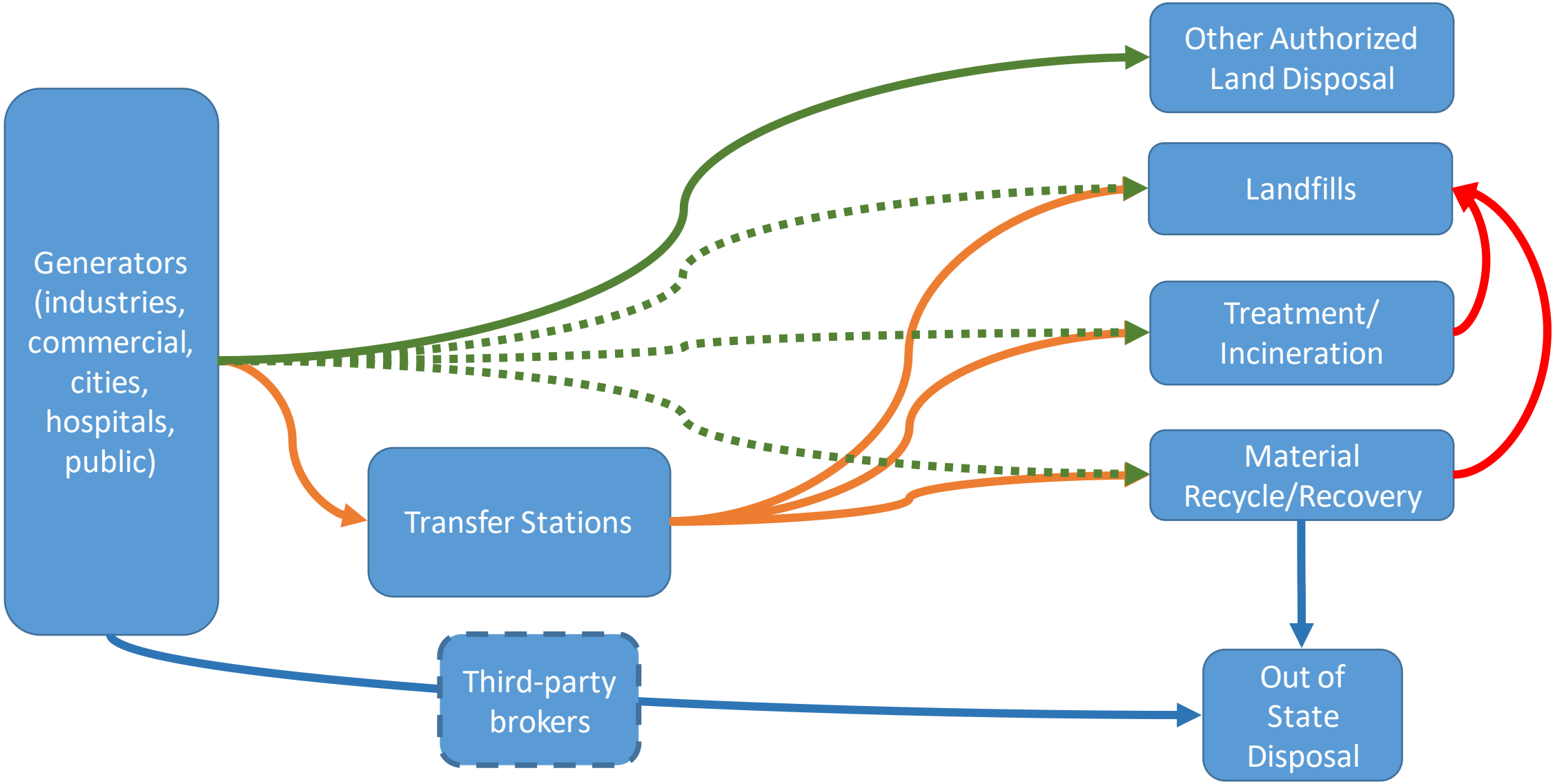
ENFORCING WASTE DISPOSAL AS A SYSTEM



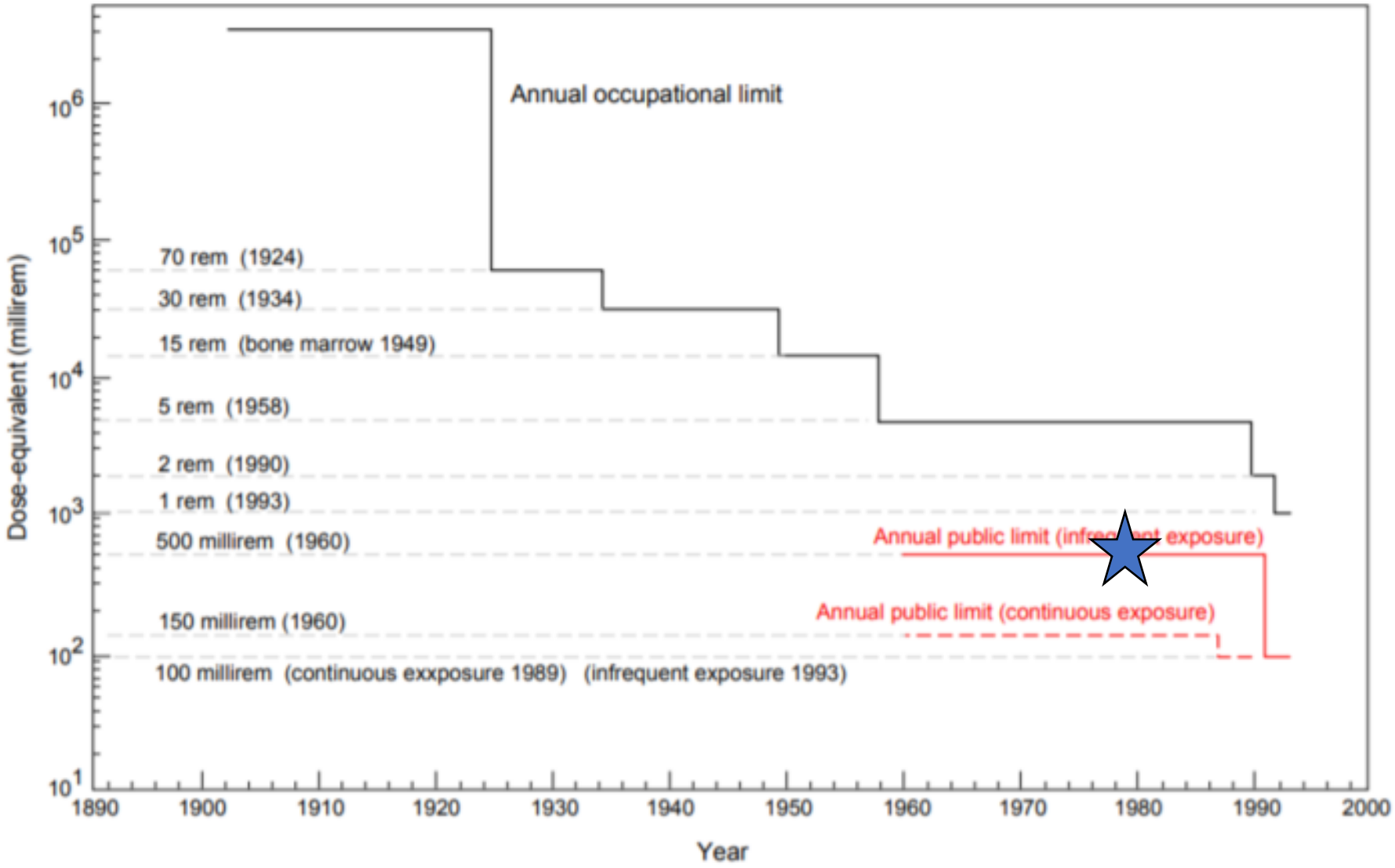
UNIQUE SITUATION: ADMINISTRATIVE RULE CITED IN STATUTE

(23)(a) "Radioactive waste" means all material which is discarded, unwanted or has no present lawful economic use, and contains mined or refined naturally occurring isotopes, accelerator produced isotopes and by-product material, source material or special nuclear material as those terms are defined in ORS 453.605. **The term does not include those radioactive materials identified in OAR 345-50-020, 345-50-025 and 345-50-035, adopted by the council on December 12, 1978, and revised periodically for the purpose of adding additional isotopes which are not referred to in OAR 345-50 as presenting no significant danger to the public health and safety**.

(b) Notwithstanding paragraph (a) of this subsection, "radioactive waste" does not include uranium mine overburden or uranium mill tailings, mill wastes or mill by-product materials as those terms are defined in Title 42, United States Code, section 2014, on June 25, 1979.

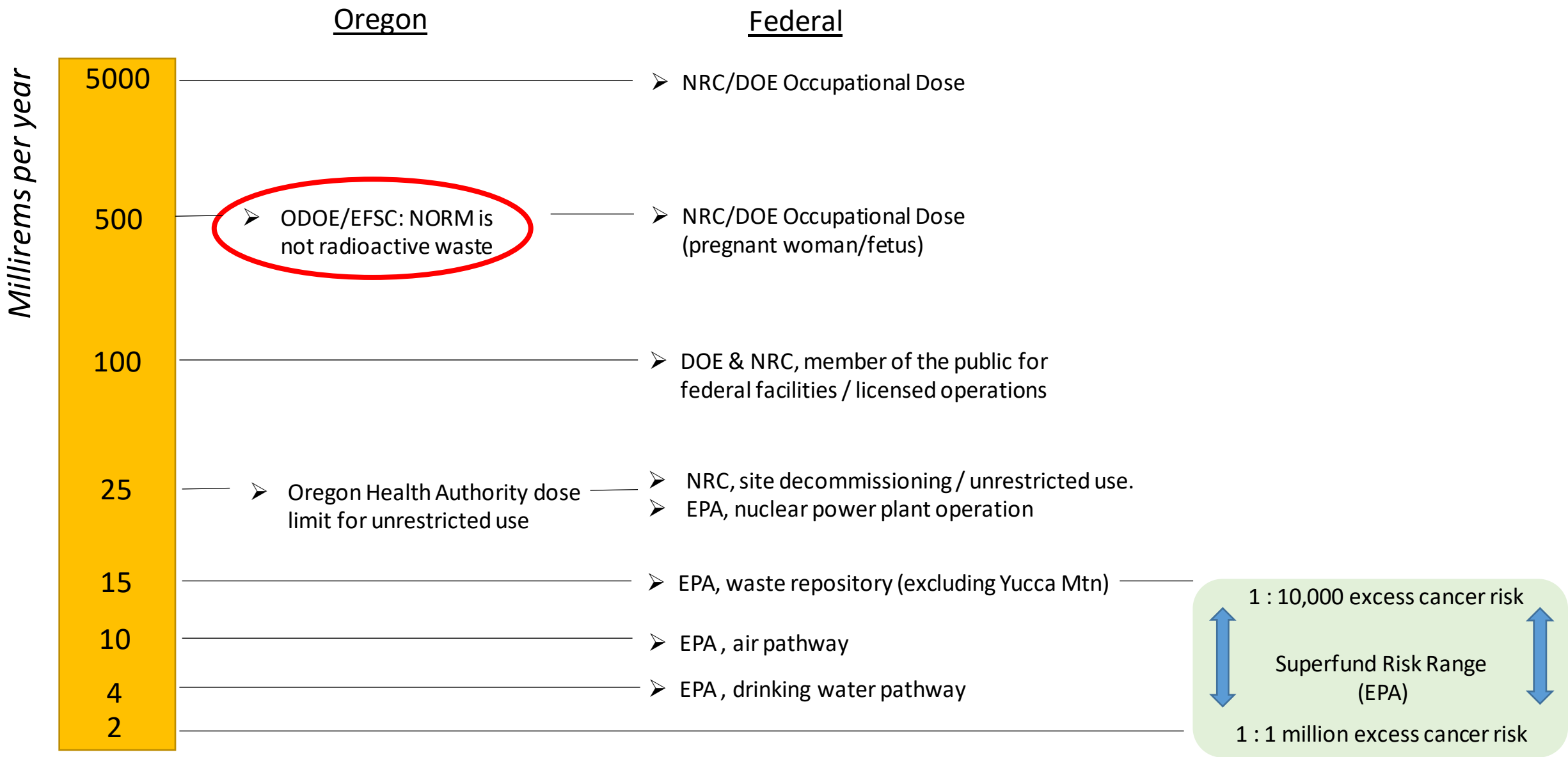
Restriction in statute allows only very limited updates to the rules defining what is **not** radioactive waste.

SAFE DOSE BASIS HAS CHANGED



Source: "A Brief History of Radiation Protection Standards". Los Alamos Science Number 23, 1995

NEED FOR IN-STATE AND FEDERAL CONSISTENCY



High Country News

States lack rules for radioactive drilling waste disposal

New report calls for stronger regulation to protect human health and water quality.

Jodi Peterson | Nov. 23, 2015 |

U.S. News & World Report

Regulators Prep for North Dakota Nuclear Waste Disposal

By Associated Press, Wire Service Content Aug. 17, 2020, at 1:01 a.m.

RADWASTE

FEBRUARY 23, 2018

Colorado Bill Would Require Rules for TENORM Disposal

BY CHRIS SCHNEIDMILLER

courier journal

Kentucky to look at new fracking rules

LEXOLOGY

Pennsylvania and Ohio regulatory efforts regarding NORM/TENORM in oil and gas production wastes

King & Spalding LLP

BILLINGS GAZETTE

Montana's first rules limiting radioactive waste from oilfields set to take effect

Phoebe Tollefson May 28, 2020

Questions?

www.oregon.gov/energy | christy.splitt@oregon.gov

Alpha radiation emitting from natural U-238