



OREGON REFUSE & RECYCLING ASSOCIATION

February 7, 2022

To: Oregon Department of Energy (ODOE) **sent via email to:**
Maxwell Woods, Assistant Director, Nuclear Safety and Emergency Preparedness Division
maxwell.woods@energy.oregon.gov

Re: Radioactive Waste Materials Rulemaking

Dear Mr. Woods:

Thank you for the opportunity to participate and comment on the Radioactive Waste Materials Rules under development by the Oregon Department of Energy. The rulemaking, resulting from Senate Bill 246, passed in the 2021 Legislative Session, is to update the administrative rules for the enforcement of laws and rules governing the transport and disposal of radioactive materials and waste in Oregon. These are issues of critical importance to the Oregon Refuse and Recycling Association (ORRA) and our members.

Founded in 1965 to advance the efficiencies of collecting and processing recyclables and solid waste, Oregon Refuse and Recycling Association (ORRA) is the statewide trade association representing solid waste management companies across Oregon. ORRA members collect, transport, and process most of Oregon's residential and commercial refuse and recyclables, as well as operate material recovery facilities and many of Oregon's municipal solid waste transfer stations, landfills, and compost facilities.

To contribute to the development of this highly complex and technical update to the administrative rules, ORRA secured the expertise of Andy Lombardo, who is participating on the Radioactive Waste Materials Rulemaking Advisory Committee representing ORRA and our members.

Mr. Lombardo has over 35 years of experience in radiation protection/health physics and the management of radioactive material sites including radiological engineering, hazardous and radiological waste characterization, project management, decontamination and decommissioning, and environmental remediation. He currently serves as the Senior Vice President and Manager of Nuclear Services for Perma-Fix. Mr. Lombardo is an industry expert in radioactive material assessment and the characterization and management of naturally occurring radioactive material (NORM) and technologically enhanced NORM (TENORM).

I have included preliminary comments from Mr. Lombardo for your consideration as the administrative rules continue to take shape.

ORRA looks forward to continuing to work with ODOE and the Radioactive Waste Materials Rulemaking Advisory Committee to develop these important administrative rules. Please do not hesitate to contact me if you have questions at andrea@orra.net or 503-507-8275.

Sincerely,



Andrea J. Fogue

Governmental Affairs Director

c: Christopher Clark, Oregon Department of Energy
Andy Lombardo, Perma-Fix Environmental Services, Inc.
Jim Denson, Waste Management
ORRA Steering Committee

VIA ELECTRONIC MAIL

February 7, 2022

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RE: Comments on Proposed Rule Change Oregon Admin Rules 345-050

ORS 469.525 (1977) prohibits radioactive waste disposal facilities in Oregon. Because virtually everything contains some radioactivity, the Energy Facility Siting Council promulgated OAR 345-050 to define exempt wastes:

- Exempt quantities
- Exempt concentrations
- “Pathway Exemption” for Naturally Occurring Radioactive Material (NORM) and Technologically Enhanced NORM (TENORM)

I have no comments on Exempt quantities or concentrations. I have over 15 years of experience in the management and disposal of NORM and TENORM waste in multiple states. NORM and TENORM are regulated by the States and not by the Nuclear Regulatory Commission (NRC). Federal and State regulations revised after 1994 have all been risk based.

Clarity in the definition of NORM and TENORM is needed. Industrial NORM and TENORM originate primarily from the uranium (U-238 parent) and the thorium (Th-232 parent) natural decay series found within all soil and rock. These series occur naturally and are the most prevalent of the three natural decay series (the third being the actinium series, U-235 parent). Surface soil typically contains approximately 1 to 2 pico-Curies per gram (pCi/g), a measure of radioactivity concentration, of both the uranium and of the thorium series with all of the series members at approximately equal activity concentration (i.e., secular equilibrium). The thorium series includes: Th-232 (parent), Radium-228 (Ra-228), Actinium-228 (Ac-228), Th-228, Ra-224, Radon-220 (Rn-220), Polonium-216 (Po-216), Lead-212 (Pb-212), Bismuth-212 (Bi-212), Po-212, Thallium-208 (Tl-208), and Pb-208. Pb-208 is stable (does not decay). For the 11-member Th-232 decay chain, 6 alpha particles and 4 beta particles are eventually emitted every time the Th-232 parent decays.

Likewise, the uranium series includes the following radionuclides in order of decay: U-238 (parent), Th-234, Protactinium 234 (Pr-234), U-234, Th-230, Ra-226, Rn-222, Po-218, Pb-214, Bi-214, Po-214, Pb-210, Bi-210, Po-210 and Pb-206 (stable). Of the other 14, unstable members, 8 decay by alpha emission and 6 by beta emission.

The less prevalent actinium natural decay series contains U-235 as the parent at approximately 1/22nd of the activity concentration of U-238 and U-234 (members of the U-238 decay series). The actinium decay series contains 12 unstable members terminated by stable Pb-207.

Potassium 40 (K-40) also occurs naturally, decays by beta particle emission and is routinely identified in soil (typical range of 1 to 20 pCi/g). Many of the naturally occurring, beta-emitting radionuclides also emit gamma rays when they decay. Whereas alpha and beta particles do not travel very far from the source, gamma rays do travel and are easy to detect outside of containers or through various thicknesses of material.

The current pathway exemption framework includes:

- 1) the Gamma Pathway based on 500 mrem and a conservatively derived dose rate limit,
- 2) the Water Pathway based on 25 mrem and leachability of the waste and
- 3) the Radon Pathway based on a concentration of 3 pCi/Liter in air inside a home.

The current pathway exemptions for NORM and TENORM are risk informed but only within each of the 3 exemptions and not consistent. Should the Department decide to recommend a reduction in the current public dose limit of 500 mrem/year Total Effective Dose Equivalent (TEDE); I recommend one exemption based on the current public dose limit of 100 mrem/year total effective dose equivalent (TEDE) from all applicable pathways under the following inputs.

The assumptions used to evaluate the risk for each of the 3 pathways are not the same. The revised rule should include an exemption for NORM and/or TENORM waste streams greater than the Exempt quantities and/or concentrations where the resulting exposure to a member of the public is less than 100 mrem/year, for the next 1,000 years, all applicable pathways summed. The same reasonable assumptions and input parameters regarding the physical placement of the waste within the landfill should be used in the evaluation of all applicable pathways. A default assessment based on the minimum municipal landfill design can be used to establish a working model and default concentrations of NORM radionuclides (listed above).

Use of a standard risk based model addresses the following concerns of the rule making committee:

- Is the Pathway Exemption framework still necessary and protective?

- Are there pathways missing? (e.g., plant uptake, livestock)
- Is the 7-day deadline for disposing waste appropriate?
- Is the 500 millirem gamma dose rule appropriate?
- Should any protection be assumed when disposed normally in an existing landfill?
- Is the evaluated period of waste generation appropriate?
- Is accumulation of NORM in landfills adequately accounted for?
- How to account for waste disposed under a previously-approved pathway exemption?
- Should there be any new exemptions for certain waste forms/types?
- Are out-of-equilibrium wastes appropriately analyzed in the current rule?
- Are there circumstances when waste blending may be allowed?

In addition, another scenario, such as land spreading, can be modeled and concentrations of key NORM radionuclides can be determined for land spreading versus concentrations for landfill disposal.

Sincerely,

Andrew J. Lombardo, CHP
Perma-Fix Environmental Services
Executive Vice President