U.S. Department
of Transportation
**Pipeline and
Hazardous Materials Safety
Administration**

400 Seventh Street, S.W.
Washington, D.C. 20590

JUN 26 2006

Mr. Charles T. Simmons
Thompson & Simmons, PLLC
1225 Nineteenth St., NW, Suite 300
Washington, DC 20036

Ref. No.: 06-0003

Dear Mr. Simmons:

This is in response to your December 28, 2005 letter regarding the transportation of radionuclide-bearing drinking water treatment wastes under the Hazardous Materials Regulations (HMR; 49 CFR Parts 171-180). Specifically you ask several questions related to the meaning of the phrase "natural materials" in § 173.401(b)(4). Your questions are paraphrased and answered as follows:

Q1. Does the exception for "natural materials" in § 173.401(b)(4) include naturally occurring zeolite water treatment medium that have absorbed naturally occurring radionuclides from public drinking water supplies and are intended to be managed as waste?

A1. The answer is no. The term "natural materials" in § 173.401(b)(4) means materials and radionuclides existing in nature, not those produced by humans. Radionuclides addressed by § 173.401(b)(4) do not include those contained in filters used in removal of radionuclides from drinking water, produced in nuclear reactors, or by other technological means. In the scenario described in your letter, the naturally occurring radionuclides in public drinking water supplies are absorbed onto zeolite medium through a water treatment process. Therefore, these radionuclides, while naturally occurring in the pre-treatment drinking water, are not naturally occurring in the zeolite medium since they are transferred from another medium (i.e., the water). If the zeolite medium contains naturally occurring radionuclides prior to its use as a filtering medium, the exception in § 173.401(b)(4) is applicable. However, after the drinking water is processed through the zeolite medium and additional radionuclides are absorbed, § 173.401(b)(4) does not apply.

Q2. Do the radionuclide activity concentration values for exempt material in § 173.436 apply to parent nuclides when footnote b is referenced?

A2. The answer is yes. Daughter products listed in association with a specific parent radionuclide in Footnote (b) in § 173.436 are accounted for when determining the exempt value for the parent in the Table in § 173.436.

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173.401(b)(4)
173.436

Q3. Does the radium-228 activity concentration for exempt material account for progeny, including thorium-228 and its decay products?

A3. Thorium-228 is not included as a daughter product of radium-228. Based on Footnote (b) in § 173.436, only actinium-228 is accounted for in the activity concentration exemption value for radium-228.

Q4. May a person who offers for transportation a radium specific drinking water treatment media rely on the § 173.436 activity concentration value for radium-228 based on the parent nuclide only?

A4. The entry for radium-228 in Footnote (b) in § 173.436 specifies the presence of actinium-228 in secular equilibrium with radium-228. Other subsequent daughter products (e.g., thorium-228), if present in the material, must be accounted for separately when determining the effective activity concentration exemption value for the material utilizing the formula in § 173.433(d)(6).

I hope this information is helpful. If you have further questions, please do not hesitate to contact this office.

Sincerely,

Hattie L. Mitchell
Chief, Regulatory Review and Reinvention
Office of Hazardous Materials Standards

Pollack
§173.401(b)(4)
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December 28, 2005

Via E-Mail and U.S. Mail
Mr. Edward Mazzullo
Director of Hazmat Standards
USDOT/PHMSA, Suite 8422
Office of Hazardous Materials Safety
400 7th Street, S.W.
Washington, D.C. 20590-3012

RE: Request for Regulatory Interpretation

Dear Mr. Mazzullo:

This is a request for interpretation of U.S. Department of Transportation ("DOT") regulations pursuant to 49 C.F.R. 107.14(b) made on behalf of Water Remediation Technology, Inc. ("WRT").[1] WRT manufactures, installs and maintains patent-pending processes using its proprietary, industrial mineral-based media for removing radionuclides from drinking water supplies.

This request generally relates to DOT regulations implementing the IAEA TS-R-1 regulations governing the safe transportation of radioactive materials, and specifically pertains to the 49 C.F.R. 173.401(b)(4) exemption from the scope of regulation for "natural materials and ores" as it applies to radionuclide-bearing drinking water treatment residues.

As discussed below, U.S. Environmental Protection Agency ("EPA") regulations require municipal drinking water providers nationwide to remove radionuclides to meet very low federal standards by 2007. Unlike conventional technologies that discharge radionuclides to the environment, WRT's unique technology captures and contains radionuclides using ion selective media, which must, when saturated, be transported for waste management or disposal. Because the spent media will contain radionuclides, it is important that drinking water providers understand how DOT's 173.401(b)(4) exemption applies to the spent treatment media. Having to transport spent treatment media as Class 7 (radioactive) hazardous material could be a disincentive to complete radionuclide removal and isolation, as offered by WRT's technology.

[1] For further information, please see: http://www.wrtnet.com.

We welcome the opportunity to clarify any of the information presented in this request by meeting with DOT staff, if necessary. Please do not hesitate to contact the undersigned if DOT has any questions or requires further information regarding this request.

I. Background Information

The primordial radionuclides are ubiquitous in the natural environment and natural background radioactivity has been shown to be highly variable worldwide, depending on local geological influences (Reference: EPA NORM Report 1991; Myrick, T.E., B.A. Berven, and F.F. Haywood, ``Determination of Concentrations of Selected Radionuclides in Surface Soil in the U.S.," Health Physics, Vol. 45, No. 3, pp. 631-642, 1983; UNSCEAR 1998). Human interactions with the natural environment can alter the radionuclide content of natural materials, or cause the removal of radionuclides from one environmental medium and subsequent transfer to another.

Chemical and/or physical processing of materials obtained from the earth is often required to purify such materials to render them fit for a particular purpose. For example, municipal drinking water supplied from deep wells must meet federally imposed maximum contaminant levels for radium (5 pCi/l) and uranium (30 μg/l) to be lawfully distributed.[2] EPA's regulations come into effect in 2007 and municipalities are currently struggling with how to meet them.

These criteria can be met by chemically or physically removing radionuclides from water supplies. Conventional technologies may remove radionuclides from drinking water, only to transport them to another environmental medium. Hydrous manganese oxide ("HMO") and reverse osmosis processes, for example, result in the discharge of concentrated radionuclides to surface water or the sewer.

WRT manufactures, installs and maintains an alternative technology for radionuclide removal through contact with a radionuclide-specific absorbent zeolite medium that selectively absorbs radium. Zeolites are naturally occurring hydrated aluminosilicates of the alkaline and alkaline-earth metals.[3]

The WRT technology employs an upflow movement of water through the treatment vessel, which fluidizes the bed of media and results in absorbed radionuclides being evenly distributed throughout the zeolite media.

Radionuclides are transferred from drinking water to the treatment media, and the media is not regenerated by stripping off the radioactive material and discharging these radioactive residuals to the environment (e.g., to the sewer). The spent media must be

[2] See: 67 Fed. Reg. 76708, December 7, 2000.
[3] United States Geological Survey, "Zeolites"(1995).

transported for waste management or disposal, and the activity concentration of the media may range from 1 to 10 or more Bq/g. It is therefore critical that persons who offer these materials for transportation understand how the current exemption language of §173.401(b)(4) applies to this material.

II. The Regulations

DOT's regulations harmonizing 49 C.F.R. 173 with the International Atomic Energy Agency's ("IAEA's) TS-R-1 Regulations for the Safe Transport of Radioactive Material, effective October 1, 2004, contain the following provision:

> **§173.401 Scope**
>
> (b) This subpart does not apply to:
>
> (4) natural material and ores containing naturally occurring radionuclides which are not intended to be processed for use of these radionuclides, provided the activity concentration does not exceed 10 times the values specified in §173.436.

The table at §173.436 shows a variety of parameters for different radionuclides, and includes the following information for the naturally occurring radionuclides Ra-226 and Ra-228:

Symbol of Radionuclide	Element and Atomic Number	Activity concentration for exempt material (Bq/g)	Activity concentration for exempt material (Ci/g)	Activity limit for exempt consignment (Bq)	Activity limit for exempt consignment (Ci)
Ra-226(b)	.....	1.0×10^{1}	2.7×10^{-10}	1.0×10^{4}	2.7×10^{-7}
Ra-228(b)	.....	1.0×10^{1}	2.7×10^{-10}	1.0×10^{5}	2.7×10^{-6}

Footnote b to the table at §173.436 states "Parent nuclides and their progeny included in secular equilibrium are listed in the following:" and identifies the following decay chains for Ra-226 and Ra-228:

Ra-226 Rn-222; Po-218; Pb-214; Bi-214; Po-214; Pb-210; Bi-210; Po-210

Ra-228 Ac-228

III. Request for Clarification

A. Scope of "natural materials."

We are seeking clarification of the phrase "**natural materials**" in the first clause of §173.401(b)(4) as it applies to natural materials that are used to absorb natural radionuclides from drinking water.

An important distinction separating "natural" from "artificial" is that the radionuclides in deep aquifers are all naturally occurring and not man-made – e.g., created in a particle accelerator or nuclear reactor. In the case of WRT's technology for radium removal from drinking water, a non-radioactive zeolite – a type of natural clay – is used to absorb the radionuclides from drinking water in a manner that evenly distributes the radionuclides throughout the zeolite media. In the drinking water treatment context, the quality of "naturalness" called for in the regulation should be liberally construed to include materials onto which naturally occurring radionuclides are absorbed from drinking water sources.

Moreover, the radium that is removed from drinking water is not intended to be "used" for any particular purpose. Rather, radium must be removed from drinking water pursuant to a federal mandate and is intended to be disposed of at an approved disposal facility.

To conclude otherwise may require public water providers to transport water treatment media exceeding 1 Bq/g as Class 7 (radioactive) hazardous material.

Consequently, we request DOT clarify that the exemption for "natural materials" in §173.401(b)(4) encompasses naturally occurring zeolite water treatment media that have absorbed naturally occurring radionuclides from public drinking water supplies and are intended to be managed as waste.

B. The 10x exemption of §173.436

The third clause of §173.401(b)(4) elevates the activity content threshold of regulation to ten times the §173.436 values. We request the following clarifications from DOT regarding the applicability of the activity concentration values in §173.436 to natural drinking water treatment media containing uranium and/or radium, as follows.

1. Based on materials published by the IAEA, we believe that the radionuclide values in §173.436 apply to parent nuclides where progeny are present.[4] For example, the footnote b citations in §173.436 to radionuclides, including Ra-226 and Ra-228, are intended to convey the message that the activities of decay progeny are taken into account in the §173.436 table values.

Please confirm that the radionuclide activity concentration for exempt material values in §173.436 that reference footnote b apply to parent nuclides.

2. With regard to Ra-228, the 49 C.F.R. §173.436 activity concentration for exempt material is 10 Bq/g and that under §173.401(b)(4), natural materials and ores containing Ra-228 would have an exempt activity concentration of 10 x 10 Bq/g, or 100 Bq/g Ra-228. The §173.436 table listing for Ra-228 references footnote b, which identifies only the Ac-228 decay isotope, unlike Ra-226 which identifies the full complement of its decay progeny, including the relatively longer half-life Pb-210, in footnote b. Our request for clarification is based on the following considerations as they would apply in a transportation scenario involving spent drinking water media used to remove radium:

- Whether only listing Ac-228 in the footnote b decay series for Ra-228 is a result of technical modeling done by IAEA and takes the full complement of Ra-228 decay progeny into account; or

- Whether the regulations are intended to restrict computing Ra-228 activity concentration to the activity concentrations of the Ra-228 and Ac-228 isotopes. [This interpretation could mean that materials having an exempt activity concentration of Ra-228 could ultimately become non-exempt over time, as Th-228 ingrowth occurs, because Th-228 has a much lower exempt activity concentration than Ra-228 (i.e., 10 Bq/g versus 100 Bq/g for natural materials or ores satisfying the §173.401(b)(4) exemption).]

Therefore, we request the following:

- ***Please clarify whether the Ra-228 activity concentration for exempt material accounts for progeny, including Th-228 and its decay products; and***

- ***Whether a person transporting a radium-specific drinking water treatment media may rely on the §173.436 exemption value for Ra-228 based on the parent nuclide alone.***

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[4] See: Report from the Special Working Group on Exemption (Backelandt, et al., 1996), ""Where daughter products are involved, these values refer to the activity of the parent nuclide."

IV. Conclusions

The requested clarifications will greatly assist WRT and municipal drinking water providers charged with radium removal from the nation's water supply in meeting EPA's requirements and maintaining compliance with DOT's regulations. Please do not hesitate to contact the undersigned if you have any questions or require further information.

Sincerely,

Charles T. Simmons

Cc: Fred Ferate, Health Physicist
Office of Hazardous Materials Technology DHM - 23
WRT