National Primary Drinking Water Regulations



# Radionuclides Rule

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#### The Rule Outline

u Rule Background
u Health Effects
u Sources of Radionuclides
u Monitoring Requirements
u Treatment Technology

# Why was the Radionuclides Rule developed?

u To prevent the increased risk of cancer from exposure of radionuclides found in drinking water.

#### Just what are Radionuclides?

■ A radionuclide is an atom with an unstable

nucleus.



#### Just what are Radionuclides? (contd.)

u The radionuclide undergoes radioactive decay.

u Types of radioactive decay include: uAlpha particles uBeta particles uPhotons (Gamma Rays and X-rays)

## How can Radionuclides affect me?

u Health Effects- Radionuclides are known carcinogens.

- u Target bone, reproductive organs, thyroid, liver.
- uChildren are particularly sensitive.

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u Uranium is a nephrotoxic metal u Target kidneys .

#### Where do Radionuclides come from?

u The Radionuclides chemicals enter drinking water through two ways:

Lerosion or chemical weathering of naturally occurring mineral deposits.
 Lerosion or chemical weathering of naturally occurring mineral deposits.

# Monitoring Requirements for the Revised Rule

u Who does the rule apply to? uCommunity Water Systems uGround Water or Surface Water

u All results must be submitted to a <u>certified</u> <u>laboratory</u>.

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#### u Maximum Contaminant Levels

Regulated Contaminants			
Regulated Radionuclide	MCL	MCLG	
Beta/photon emitters*	4 mrem/yr	0	
Gross alpha particle	15 pCi/L	0	
Combined radium- 226/228	5 pCi/L	0	
Uranium	30 µg/L	0	
*A total of 168 individual beta particle and photon emitters may be used to calculate compliance with the MCL.			

Monitoring Requirements (contd.) u Samples must be taken from EACH sampling point (SP) in your system.

uSame SPs on your schematics as Nitrates, SOCs, VOCs, IOCs.

u Quarterly monitoring - sample for 4 consecutive quarters.

u Can waive final 2 quarterly sample collection requirements if results are below detection levels.

Composite samples are allowed.
 Use Running Annual Average (RAA) to calculate compliance.

u Initial sample must include

uGross Alpha uRadium-228

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	Sample Results	Action
Radium-226	Total Gross Alpha < 5 pCi/L	Radium-226 = 0.5*Gross Alpha (pCi/L)
	Total Gross Alpha > 5 pCi/L	Sample for Radium-226
Uranium	Total Gross Alpha < 15 pCi/L*	Uranium not required.
	Total Gross Alpha > 15 pCi/L	Sample for Uranium.
	* If Total Gross Alpha used for Uranium, convert to ug/L.	

u Detection Limits: uGross alpha = 3 pCi/L uRa-226 + Ra-228 = 1 pCi/L uUranium = 1 µg/L

## New Monitoring Schedules

Based on the RAA for quarterly schedules or based on individual sample results for reduced schedules:

u < DLaevery 9 yrsu > DL, but < ½ MCLaevery 6 yrsu > ½ MCL, but < MCLaevery 3 yrsu > MCLaquarterly

Cannot monitor on the 9-yr. schedule if use substitution

# Substitution Example

Lab results (RAA):

- Gross alpha = 2.4 pCi/L (< DL)
- Ra-226 = Not tested
- Ra-228 = Non-detect
- Uranium = Not tested

Use gross alpha substitution method for determining Ra-226 and Uranium monitoring schedules.

#### Substitution Example (cont.)

u Gross alpha detection limit = 3 pCi/L. uUse ½ the detection limit as the substitution number.

Ra-226 = 1.5 pCi/L

U = 1.5 pCi/L \* (1.49  $\mu$ g/pCi) = 2.2  $\mu$ g/L

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## Substitution Example (cont.)

Contaminant	Result	Test Schedule
Gross alpha	2.4 pCi/L	9 years
Ra226+Ra228	1.5 pCi/L+0= 1.5 pCi/L	6 years
Uranium	2.2 µg/L	6 years

#### **MCL Violations**

u A system is in violation if:

uAny RAA is in violation of an MCL.

Any sample result will cause the RAA to exceed the MCL at any entry point to the distribution systems (EPTDS) (i.e.- the analytical result is greater than 4 times the MCL).

#### **MCL Violations**

u Now monitor on quarterly basis until problem resolved.

Post Tier 2 Public Notice:
 uHand or direct delivery
 uMail as a separate notice or with the bill
 u30-day timeframe for completion

#### **Treatment Technologies**

For those who exceeded the MCL: uPreliminary considerations u Treatment selection **u**Best Available Technology (BAT) uSmall Systems Compliance Technology (SSCT)

# What should I consider first?

u Consolidation or restructuring u Blending:

Configure all entry points (EPS) into 1 centralized location

uTreat small portion of flow and blend

- u Well abandonment and new source construction
- Optimization/Modification of existing treatment

## **Treatment Selection**

- u Consider operator skill required
- u Identify all contaminants of concern
- u Carefully evaluate source water
- u Identify waste streams and disposal issues
- Le Evaluate how existing treatment units can be used
- u Conduct pilot study
- u Costs

# Best Available Technology

Contaminant	BAT
Radium-226 + 228	Ion exchange, RO, lime softening
Uranium	Ion exchange, RO, lime softening, coagulation/filtration
Gross alpha (less radon and Uranium)	RO
Beta particle/Photon emitters	Ion exchange, RO

# Small System Compliance Technology

u lon Exchange (IE) u Point of Use (POU) IE u Reverse Osmosis (RO) u Lime Softening u Green Sand Filtration

# SSCT (cont.)

Coprecipitation with barium sulfate
 Electrodialysis/electrodialysis reversal

- u Pre-formed hydrous manganese oxide filtration
- u Activate alumina (AA)
- u Enhanced coagulation/filtration

# Summary

u Background:

uWhy the rule was developed uWhat are Radionuclides

u Health Effects:

uHow Radionuclides could affect the body

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u Treatment Technologies:

u Treatment Selection- things to consider for best fit.

uBAT

uSSCT



u Sources of Radionuclides:

uNaturally vs. Man-made.

u Monitoring Requirements:

uMCL's, DL's, who should sample, where to sample, helpful hints

uNew monitoring schedule

uMCL violations

## Things to remember

- Contact the Radionuclides Rule Manager immediately if you have the MCL exceedance.
- Do not collect repeat samples because of the MCL exceedance.

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- Collect sample at the approved sampling point (not at the source).
- Send data to: <u>r8dwu@epa.gov</u>
   Subject Line = PWS No. and "RADS"



u Region 8 website: <u>http://epa.gov/region8-waterops</u>

Let EPA Office of Ground Water and Drinking Water website: <u>http://epa.gov/ground-water-and-</u> <u>drinking-water</u>

Radionuclides in Drinking Water – reference pages:

http://epa.gov/dwreginfo/radionuclides-rule



#### u Please call or e-mail if you have any questions.

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