

Radium Removal and Disposal in Wisconsin

Norman Hahn, Jr., P.E.

Bureau of Drinking Water and
Groundwater

Wisconsin DNR

Wisconsin Radionuclide Exceedances

- Municipal Systems
 - 26 with combined radium
 - 5 with gross alpha only
 - 2 with uranium
- OTM Systems
 - 8 with combined radium
 - 2 with gross alpha only

Reduction Methods in WI

- Replacement/blending with surface water
- Replacement/blending with low radium content groundwater
- Approved/existing radium treatment
 - cation exchange softening
 - lime softening
 - HMO filtration
- Anion exchange for uranium removal (2)

Reduction Methods in WI (Continued)

- Piloted Treatment
 - Dow Company RSC (Layne-Northwest)
 - WRT Z-88 selective resin
 - HMO filtration
 - Well geophysical investigation & selective packer installation
 - Electrodialysis Reversal (EDR) (1 system)
 - Reverse osmosis (1 system)

WI Rad Disposal Issues

- WI DNR & WI DHFS Rad Section have been working on this issue since the 1980's
- POTW Ra sludge landfill criteria codified in NR 204 (Also used for lime sludge)
- WI DNR radionuclide waste disposal guidance updated in 3/04
- DHFS license required for operation of a facility creating a LL radioactive waste

WI DNR Rad Waste Disposal Guidance

- Ra already received at the POTW unless removed by a Ra selective resin
- Compliance w/10CFR20 Unity Equation for discharges of WW to a sanitary sewer
$$\text{Ra}_{226}/600 + \text{Ra}_{228}/600 + \text{U}/3000 \leq 1$$
- Compliance w/10CFR20 Unity Equation for discharges of WW to surface water
$$\text{Ra}_{226}/60 + \text{Ra}_{228}/60 + \text{U}/300 \leq 1$$

WI DNR Rad Waste Disposal Guidance (Continued)

- Spent WTP media must be examined for rad content prior to disposal
- Case-by-case DNR review and approval of NORM waste to an engineered WI landfill
- DHFS consulted before DNR approves rad waste disposal w/rads of 50 to 2,000 pCi/g
- Waste $> 2,000$ pCi/g to a LLRW disposal site

WI DNR Rad Waste Disposal Guidance (Continued)

- 2002 biosolids disposal in WI (by number of facilities)
 - 94% landspread
 - 3% fertilizer production (example: Milorganite)
 - 2.5% landfill
 - 0.5% incinerate

WI DNR Rad Waste Disposal Guidance (Continued)

- POTW landspreading
 - Ra226 the controlling factor (1/2 life & Rn)
 - Max 2 pCi/g (dry weight) in top 12”
 - Soil pH ≥ 6
 - Minimum organic matter content required
 - Stop at calculated load of 1,640 microC per acre
 - Can sample to extend site life if soils favorable

WI Rad Waste Disposal Guidance (Continued)

- Deep well injection not allowed in WI
- Disposal to a private septic system approved on a case-by-case basis
- Private septic system sludge rad content currently not regulated
- Some investigation of gamma radiation and radon gas in WTPs/operators not present during regen & backwash/proper ventilation