

Policy P-8

Implementation Policy for Radium Effluent Limits in WYPDES Permits

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WYPDES Program Manager



WYPDES Permitting Program Supervisor



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Based on a review of the EPA documents, current Nuclear Regulatory Commission standards, radium 226 and 228 literature, analytical results from historic and current oil and gas facilities and recent sample results of samples collected from 10 active oil and gas facilities at the outfall, ½ mile from the outfall and one mile from the outfall, the NPDES program will use the following implementation strategy for radium to ensure protection of Wyoming surface water quality standards Chapter 1, Section 22. ¹

¹As with all SOPs, this policy may be revised as new information becomes available.

Radium Effluent Limit Implementation Approach

Wyoming Surface Water Quality Standards

Class 2A, 2B and 2AB waters:	Ra 226 + 228 = 5 pCi/L
Class 2C, 3 and 4 waters:	Ra 226 = 60 pCi/L
PQL:	Ra 226 = 0.2 pCi/L

Radium effluent limits shall be incorporated into WYPDES Permits as described below.

Scenario 1 ▶ Discharges less than 1 (one) mile from a Class 2A or 2AB or direct discharges to Class 2A or 2AB surface waters.

- Effluent limits will be based on the water quality standard of 5 pCi/L for Radium (Ra) 226 + 228. The limit for Ra 226 + 228 will be established using standard wasteload allocation (WLA) procedures and application of the antidegradation policy.

Scenario 2 ▶ Discharges to a Class 2B, 2C, 3 or 4 surface water where the outfall is between 1 mile and 2 miles from a Class 2A or 2AB surface water.

- The default effluent limit for Ra 226 will be 3 pCi/L.
- If the representative sample is less than 2 pCi/L then Ra 226 will be considered a pollutant of non-concern and no effluent limits for Ra 226 will be incorporated into the permit.

Scenario 3 ▶ Discharges to a Class 2B, 2C, 3 or 4 surface water where the outfall is greater than two miles but less than 10 miles from a Class 2A or 2AB surface water.

- The default effluent limit for Ra 226 will be 5 pCi/L.
- If the representative sample is ≤ 2 pCi/L then Ra 226 will be considered a pollutant of non-concern and no effluent limits for Ra 226 will be incorporated into the permit.

Scenario 4 ▶ Discharges to a Class 2B, 2C, 3 or 4 surface water where the outfall is greater than or equal to 10 miles from a Class 2A or 2AB surface water.

- The default effluent limit for Ra 226 will be 60 pCi/L.
- If the representative sample is ≤ 12 pCi/L then Ra 226 will be considered a pollutant of non-concern and no effluent limits for Ra 226 will be incorporated into the permit.

Scenario 5 ▶ Discharges to off-channel or other isolated Class 4 waters.

- Effluent limits for Ra 226 will be 60 pCi/L.
- If the representative sample is ≤ 12 pCi/L then Ra 226 will be considered a pollutant of non-concern and no effluent limits for Ra 226 will be incorporated into the permit.

Calculated Limits ▶ Applicable to Scenarios 2 through 5.

- Permit writers should consult with the Permits Program Supervisor for guidance on proper calculation of effluent limits other than default limits.
- Calculated limits other than the default limits shall, at a minimum, consider the following:
 1. Ra 226 concentration of the produced water.
 2. Discharge rate of the outfall in cubic feet per second.
 3. Dilution, if any, in the immediate surface water.
 4. Fate of Ra 226 in the surface water of the immediate receiving stream based on a 53% reduction in the first mile and a 30% reduction for every mile thereafter up to the confluence with the Class 2A or 2B surface water.
 5. 7Q10 of the Class 2A or 2AB surface water that would be receiving the discharge water.
 6. The ambient radium 226 concentration in the Class 2A or 2AB surface water that would be receiving the discharge water.
 7. Dilution, if any, of the produced water entering the Class 2A or 2AB surface water.

March 2004
Radium Study
Analytical Results and Evaluation

* Results in pCi/L	Outfall	1/2 Mile from Outfall	%Reduction	1/2 Mile from Outfall	%Reduction	1 Mile from Outfall	%Reduction	1 Mile from Outfall	Outfall	1 Mile from Outfall
Wellstar 001	58.9	5.8	0.90	5.8	0.90	2.9	0.50	58.9	2.9	0.95
WY0000289 Ranch Oil	38.6	27.7	0.28	27.7	0.28	26.8	0.03	38.6	26.8	0.31
WY0000264 Calwest 001	23.6	22.5	0.05	22.5	0.05	19.6	0.13	23.6	19.6	0.17
WY0000744 Natural Gas Processing	21.4	21.3	0.00	21.3	0.00	23	-0.08	21.4	23	-0.07
WY0036943 Trend Exploration	18.5	1.3	0.93	1.3	0.93	0.2	0.85	18.5	0.2	0.99
WY0027081 Lee Washburn	17.7	18.5	-0.05	No data	-0.05	No data				
WY0003051 Townsend	10.9	3.8	0.65	3.8	0.65	0.2	0.95	10.9	0.2	0.98
WY0037095 Devon	6.5	3.7	0.43	3.7	0.43	3.7	0.00	6.5	3.7	0.43
WY0040849 Devon	1.6	0.7	0.56	0.7	0.56	1.2	-0.71	1.6	1.2	0.25
WY0038822 Conoco-Phillips 003	1.4	0.3	0.79	0.3	0.79	0.3	0.00	1.4	0.3	0.79
Average % Reduction		n=8	0.46			n=6	0.18		n = 7	0.532057

Radium 226
Estimated Degradation
in the Water Column

	10	8.5	8	7.5	7	6.5	6	5.5	5	4.5	4	3.5	3	2.5	2	1.5	1	0.5	0		
Miles	60	23.406	19.427	16.1244	13.3832	11.1081	9.21972	7.65237	6.35146	5.21172	4.37552	3.63168	3.0143	2.50187	2.07655	1.72354	1.43054	1.18734	0.9855	17% per half mile	
pCi/L	60	28.2	19.74	13.818	9.8726	6.77082	4.73957	3.3177	2.32239	1.62567										30% per mile	
	53% Mile 1																				
	30% Each Additional Mile																				
	Default Limits																				
	0-1 Mile	WLA																			
	1-2 Miles	3																			
	2-10 Mile	5																			