

Evaluation of metals in surface water samples taken from Curran Coulee Creek

Concentrations of total (Table 1) and dissolved (Table 2) metals from surface water samples taken within the Curran Coulee Creek were compared to numeric surface water criteria for the protection of aquatic life and human health from exposure to toxic pollutants specified in ch. NR 105, Wis. Admin. Code. If ch. NR 105 specified criteria for both aquatic life and human health for a given metal, concentrations were compared against the most protective criteria.

Note: Aquatic life water quality criteria are hardness-dependent for some metals, and the location-specific criteria that are listed in Tables 1 and 2 reflect the hardness measured at that location.

The measured concentration of a metal was considered to pose a risk to human health or aquatic life if it was higher than the surface water criteria.

Measured concentrations of most metals were below the detection limit (indicated by *< value* in Tables 1 and 2). Where concentrations were high enough to be measured, they were below the water quality criteria and thus do not pose a health risk to humans or aquatic life.

Note: Although the analytical method's limit of detection for mercury (0.03 µg/L) was higher than the human health criterion for mercury (0.0015 µg /L), human health risks from mercury are not expected in this situation, as mercury was not detected in any sample and this spill event represents a short exposure window. Human health criteria are established to protect people from health risks after incidental ingestion of water and consumption of contaminated fish over many years.

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Table 1. Concentrations of total metals measured in samples from Curran Coulee Creek and the most protective applicable numeric surface water quality criteria specified in ch. NR 105, Wis. Admin. Code.

Analyte	Measured concentration (µg/L)			Most protective applicable criteria			
	Above spill	At spill	Below spill	Value (µg/L) Type			
Aluminum	258	4570	489	No applicable criteria			
Antimony	< 10	< 10	< 10	373 Human health, cold water, non-public water supply			
Arsenic	< 7	< 7	< 7	339.8 Aquatic life, cold water			
Beryllium	< 0.5	< 0.5	< 0.5	No applicable criteria			
Cadmium*	< 0.5	1.28	< 0.5	1.81	3.21	2.03	Aquatic life, cold water
Chromium (III)*^	< 2	10	< 2	961.36	1449.41	1043.74	Aquatic life, cold water
Chromium (VI)^				16.02			Aquatic life, cold water
Copper*	< 5	10.5	< 5	7.52	12.06	8.26	Aquatic life, cold water
Iron	2.21	26.4	2.81	No applicable criteria			
Lead*	< 3	32.6	< 3	50.92	82.64	56.1	Aquatic life, cold water
Mercury**	< 0.03	< 0.03	< 0.03	0.0015			Human health, cold water, non-public water supply
Nickel*	2.01	8.62	2.15	245.02	374.45	266.74	Aquatic life, cold water
Selenium	< 20	< 20	< 20	2600			Human health, cold water, non-public water supply
Silver	< 2	< 2	< 2	28000			Human health, cold water, non-public water supply
Zinc*	< 5	10.9	5.77	61.5	95.34	67.15	Aquatic life, cold water

* For these metals, aquatic life water quality criteria are hardness-dependent and criteria for each sample location is based on the hardness measured at that location (listed in table below).
 **Method limit of detection for mercury (0.03 µg/L) is higher than the human health criteria.
 ^ Samples were analyzed for total chromium, but criteria are for chromium (III) and chromium (VI). Sample results were compared to each criterion separately.

	Above spill	At spill	Below spill
<i>Calcium (mg/L)</i>	11.3	19.3	12.5
<i>Hardness (mg/L)</i>	46.4	76.6	51.3
<i>Magnesium (mg/L)</i>	4.41	6.91	4.9

Table 2. Concentrations of dissolved metals measured in samples from Curran Coulee Creek and the most protective applicable numeric surface water quality criteria specified in ch. NR 105, Wis. Admin. Code.

Analyte	Measured value (µg/L)			Most protective applicable criteria			
	Above spill	At spill	Below spill	Value (µg/L)		Type	
Aluminum	14	42	16.5	No applicable criteria			
Antimony	< 10	< 10	< 10	373		Human health, cold water, non-public water supply	
Arsenic	< 7	< 7	< 7	339.8		Aquatic life, cold water	
Beryllium	< 0.5	< 0.5	< 0.5	No applicable criteria			
Cadmium*	< 0.5	< 0.5	< 0.5	1.5	2.4	1.67	Aquatic life, cold water
Chromium (III)*^	< 2	< 2	< 2	299.49	417.45	322.43	Aquatic life, cold water
Chromium (VI)^				15.73		Aquatic life, cold water	
Copper*	< 5	< 5	< 5	7.1	10.41	7.73	Aquatic life, cold water
Iron	0.851	0.154	0.632	No applicable criteria			
Lead*	< 3	< 3	< 3	43.81	64.82	47.80	Aquatic life, cold water
Mercury**	< 0.03	< 0.03	< 0.03	0.0015		Human health, cold water, non-public water supply	
Nickel*	2.12	2.49	1.71	240.96	339.56	260.05	Aquatic life, cold water
Selenium	< 20	< 20	< 20	2600		Human health, cold water, non-public water supply	
Silver	< 2	< 2	< 2	28000		Human health, cold water, non-public water supply	
Zinc*	< 5	< 5	< 5	59.24	84.46	64.1	Aquatic life, cold water

* For these metals, aquatic life water quality criteria are hardness-dependent and criteria for each sample location is based on the hardness measured at that location (listed in table below).
 **Method limit of detection for mercury (0.03 µg/L) is higher than the human health criteria.
 ^ Samples were analyzed for total chromium, but criteria are for chromium (III) and chromium (VI). Sample results were compared to each criterion separately.

	Above spill	At spill	Below spill
Calcium (mg/L)	11.1	17	12.1
Hardness (mg/L)	45.6	68.4	49.9
Magnesium (mg/L)	4.36	6.29	4.77