

**Iowa Department of Natural Resources  
Environmental Protection Commission**

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ITEM

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DECISION

TOPIC

**Notice of Intended Action – Chapter 61 Water Quality Standards-  
Chloride, Sulfate and Total Dissolved Solids**

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**Background**

In 2004, the DNR moved forward with a proposed chloride standard. Concerns were raised that the proposed chloride standard was not scientifically defensible for use in Iowa. The result was that a chloride standard was not approved and an interim strategy using Total Dissolved Solids as an indicator regarding water quality was put in place while the Department worked through the issues surrounding the chloride standard.

Recently the research and analysis related to toxicity of total dissolved solids, chloride and sulfate has been completed by the Department in conjunction with the Environmental Protection Agency. The purpose was to update and develop criteria for these parameters to better protect aquatic life based on new scientific information.

The DNR worked with the U.S. Environmental Protection Agency to ensure that the research compiled met certain scientific standards. Gaps were identified in the research and resulted in new toxicity tests being performed in 2008 and 2009.

With the availability of new research and toxicity data, the information is now available to propose numeric criteria for chloride and sulfate to better protect river, stream and lake aquatic life uses and remove the current interim approach for total dissolved solids criteria.

***Proposed chloride criteria***

To calculate the applicable acute and chronic criteria for chloride, use the equations below. Statewide default values for hardness and sulfate will be used unless site specific data is available.

***Acute Chloride Criteria Equation***

$$287.8(\text{Hardness})^{0.205797}(\text{Sulfate})^{-0.07452} = \text{Acute Criteria Value (mg/L)}$$

***Chronic Chloride Criteria Equation***

$$177.87(\text{Hardness})^{0.205797}(\text{Sulfate})^{-0.07452} = \text{Chronic Criteria Value (mg/L)}$$

***Proposed Sulfate Criteria***

Chloride Hardness mg/L as CaCO <sub>3</sub>	Cl <sup>-</sup> < 5 mg/L	5 ≤ Cl <sup>-</sup> < 25	25 ≤ Cl <sup>-</sup> ≤ 500
H < 100 mg/L	<b>500</b>	<b>500</b>	500
100 ≤ H ≤ 500	<b>500</b>	<b>[-57.478 + 5.79 (hardness) + 54.163 (chloride)] * 0.65</b>	[1276.7 + 5.508 (hardness) - 1.457 (chloride)] * 0.65
H > 500	500	2,000	2,000

***Statewide Background Values***

The following statewide background values were determined by analyzing DNR ambient water monitoring data from 2000 to 2007:

Hardness: 200 mg/L as CaCO<sub>3</sub>

Sulfate: 63 mg/L

Chloride: 34 mg/L

***Total Dissolved Solids***

The current interim approach for total dissolved solids levels through Whole Effluent Toxicity Testing will be replaced by the proposed numerical criteria for chloride and sulfate.

This revision is based on scientific review that demonstrates individual ions cause toxicity to aquatic life. This review revealed that in Iowa, chloride and sulfate are the specific ions of concern. As a result, ion criteria for chloride and sulfate are better indicators than integrative parameters such as TDS, conductivity and salinity for water quality protection.

Charles C. Corell, Chief  
Water Quality Bureau  
Environmental Services Division

April 27, 2009

## ENVIRONMENTAL PROTECTION COMMISSION [567]

### Notice of Intended Action

Pursuant to the authority of Iowa Code sections 455B.105 and 455B.173, the Environmental Protection Commission gives Notice of Intended Action to amend Chapter 61, "Water Quality Standards," Iowa Administrative Code.

The proposed amendments will:

- Establish numerical water quality criteria for chloride for the protection of aquatic life uses.
- Establish numerical water quality criteria for sulfate for the protection of aquatic life uses.
- Remove TDS criteria and implementation approach

Iowa Code (Sections 455B.171 – 455B.183) establishes requirements for the protection and management of surface water quality. The Environmental Protection Commission, through the assistance of the department, promulgates administrative regulations on water quality. Iowa's Water Quality Standards (WQS) are written into regulation at 567 IAC Chapter 61 – Water Quality Standards.

In 2004, the DNR moved forward with a proposed chloride standard. Concerns were raised that the proposed chloride standard was not scientifically defensible for use in Iowa. The result was that a chloride standard was not approved and an interim strategy using Total Dissolved Solids as an indicator regarding water quality was put in place while the Department worked through the issues surrounding the chloride standard.

Recently the research and analysis related to toxicity of total dissolved solids, chloride and sulfate has been completed by the Department in conjunction with the Environmental Protection Agency. The purpose was to update and develop criteria for these parameters to better protect aquatic life based on new scientific information.

The DNR worked with the U.S. Environmental Protection Agency to ensure that the research compiled met certain scientific standards. Gaps were identified in the research and resulted in new toxicity tests being performed in 2008 and 2009.

With the availability of new research and toxicity data, the information is now available to propose numeric criteria for chloride and sulfate to better protect river, stream and lake aquatic life uses and remove the current interim approach for total dissolved solids criteria.

Additional information on Iowa's Water Quality Standards and the Department's rules can be found on the Department's Web site at <http://www.iowadnr.com/water/standards/index.html>.

Any person may submit written suggestions or comments on the proposed amendments through August 14, 2009. Such written material should be submitted to Adam Schnieders, Iowa Department of Natural Resources, Wallace State Office Building, 502 East 9<sup>th</sup> Street, Des Moines, Iowa 50319-0034, fax (515)281-8895 or by E-mail to [adam.schnieders@dnr.iowa.gov](mailto:adam.schnieders@dnr.iowa.gov). Persons who have questions may contact Adam Schnieders at (515)281-7409.

Persons are invited to present oral or written comments at public hearings which will be held:

July 7, 2009	11 a.m.	Orange City Public Library 112 Albany Avenue SE Orange City, IA
July 7, 2009	6 p.m.	Spencer Public Library 21 E. 3 <sup>rd</sup> St. Spencer, IA
July 9, 2009	1 p.m.	Wallace State Office Building

		Fifth Floor Conference Rooms 502 East 9 <sup>th</sup> Street Des Moines, Iowa
July 13, 2009	11 a.m.	Dubuque Public Library 360 W. 11th Street Dubuque, Iowa
July 13, 2009	6 p.m.	Iowa City Public Library 123 S. Linn Street Iowa City, Iowa
July 15, 2009	10 a.m.	Atlantic Public Library 507 Poplar Street Atlantic, Iowa
July 16, 2009	11 a.m.	Clear Lake Public Library 200 N. 4th Street Clear Lake, Iowa

These amendments may have an impact upon small businesses.

These amendments are intended to implement Iowa Code chapter 455B, division III, part 1.

The following amendments are proposed.

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ITEM 1. Amend chloride portion of subrule 61.3(3), Table 1, Criteria for Chemical Constituents, as follows:

**TABLE 1: Criteria for Chemical Constituents**

Parameter		Use Designations						C	HH
		B(CW1)	B(CW2)	B(WW-1)	B(WW-2)	B(WW-3)	B(LW)		
Chloride	<u>Chronic</u>	<u>389<sup>(m)*</sup></u>	<u>389<sup>(m)*</sup></u>	<u>389<sup>(m)*</sup></u>	<u>389<sup>(m)*</sup></u>	<u>389<sup>(m)*</sup></u>	<u>389<sup>(m)*</sup></u>	--	--
	<u>Acute</u>	<u>629<sup>(m)*</sup></u>	<u>629<sup>(m)*</sup></u>	<u>629<sup>(m)*</sup></u>	<u>629<sup>(m)*</sup></u>	<u>629<sup>(m)*</sup></u>	<u>629<sup>(m)*</sup></u>	--	--
	MCL	--	--	--	--	--	--	250*	--
Cadmium	Chronic	1	--	<u>0.45 0.27<sup>(h)</sup></u>	<u>0.45 0.27<sup>(h)</sup></u>	<u>0.45 0.27<sup>(h)</sup></u>	1	--	--
	Acute	4	--	<u>4.32 2.13<sup>(h)</sup></u>	<u>4.32 2.13<sup>(h)</sup></u>	<u>4.32 2.13<sup>(h)</sup></u>	4	--	--
	Human Health + -- Fish	--	--	--	--	--	--	--	168 <sup>(e)</sup>
	MCL	--	--	--	--	--	--	5	--
Copper	Chronic	20	--	<u>16.9 9.3<sup>(i)</sup></u>	<u>16.9 9.3<sup>(i)</sup></u>	<u>16.9 9.3<sup>(i)</sup></u>	10	--	--
	Acute	30	--	<u>26.9 14<sup>(i)</sup></u>	<u>26.9 14<sup>(i)</sup></u>	<u>26.9 14<sup>(i)</sup></u>	20	--	--
	Human Health + -- Fish	--	--	--	--	--	--	--	1000 <sup>(e)</sup>
	Human Health + -- F & W	--	--	--	--	--	--	--	1300 <sup>(f)</sup>
Lead	Chronic	3	--	<u>7.7 3.2<sup>(j)</sup></u>	<u>7.7 3.2<sup>(j)</sup></u>	<u>7.7 3.2<sup>(j)</sup></u>	3	--	--
	Acute	80	--	<u>197 81.7<sup>(j)</sup></u>	<u>197 81.7<sup>(j)</sup></u>	<u>197 81.7<sup>(j)</sup></u>	80	--	--
	MCL	--	--	--	--	--	--	50	--
Nickel	Chronic	350	--	<u>93 52<sup>(k)</sup></u>	<u>93 52<sup>(k)</sup></u>	<u>93 52<sup>(k)</sup></u>	150	--	--
	Acute	3250	--	<u>843 470<sup>(k)</sup></u>	<u>843 470<sup>(k)</sup></u>	<u>843 470<sup>(k)</sup></u>	1400	--	--
	Human Health + -- Fish	--	--	--	--	--	--	--	4600 4584 <sup>(e)</sup>
	Human Health + -- F & W	--	--	--	--	--	--	--	610 <sup>(f)</sup>
Zinc	Chronic	200	--	<u>215 120<sup>(l)</sup></u>	<u>215 120<sup>(l)</sup></u>	<u>215 120<sup>(l)</sup></u>	100	--	--
	Acute	220	--	<u>215 120<sup>(l)</sup></u>	<u>215 120<sup>(l)</sup></u>	<u>215 120<sup>(l)</sup></u>	110	--	--
	Human Health + -- Fish	--	--	--	--	--	--	--	26* 5000 <sup>(e)</sup>
	Human Health + -- F & W	--	--	--	--	--	--	--	7.4* 9100 <sup>(f)</sup>

\* units expressed as milligrams/liter

h) Class B(WW-1), B(WW-2), & B(WW-3) criteria listed in main table based on a hardness of ~~400~~ **200** mg/l (as CaCO<sub>3</sub> (mg/l)). Numerical criteria (µg/l) for cadmium is a function of hardness (as CaCO<sub>3</sub> (mg/l)) using the equation for each use according to the following table:

	B(WW-1)	B(WW-2)	B(WW-3)
Acute	$e^{[1.0166\text{Ln(Hardness)} - 3.924]}$	$e^{[1.0166\text{Ln(Hardness)} - 3.924]}$	$e^{[1.0166\text{Ln(Hardness)} - 3.924]}$
Chronic	$e^{[0.7409\text{Ln(Hardness)} - 4.719]}$	$e^{[0.7409\text{Ln(Hardness)} - 4.719]}$	$e^{[0.7409\text{Ln(Hardness)} - 4.719]}$

(i) Class B(WW-1), B(WW-2), & B(WW-3) criteria listed in main table based on a hardness of ~~400~~ **200** mg/l (as CaCO<sub>3</sub> (mg/l)). Numerical criteria (µg/l) for copper is a function of hardness (CaCO<sub>3</sub> (mg/l)) using the equation for each use according to the following table:

	B(WW-1)	B(WW-2)	B(WW-3)
Acute	$e^{[0.9422\text{Ln(Hardness)} - 1.700]}$	$e^{[0.9422\text{Ln(Hardness)} - 1.700]}$	$e^{[0.9422\text{Ln(Hardness)} - 1.700]}$
Chronic	$e^{[0.8545\text{Ln(Hardness)} - 1.702]}$	$e^{[0.8545\text{Ln(Hardness)} - 1.702]}$	$e^{[0.8545\text{Ln(Hardness)} - 1.702]}$

(j) Class B(WW-1), B(WW-2), & B(WW-3) criteria listed in main table based on a hardness of ~~400~~ **200** mg/l (as CaCO<sub>3</sub> (mg/l)). Numerical criteria (µg/l) for lead is a function of hardness (CaCO<sub>3</sub> (mg/l)) using the equation for each use according to the following table:

	B(WW-1)	B(WW-2)	B(WW-3)
Acute	$e^{[1.2731\text{Ln(Hardness)} - 1.46]}$	$e^{[1.2731\text{Ln(Hardness)} - 1.46]}$	$e^{[1.2731\text{Ln(Hardness)} - 1.46]}$
Chronic	$e^{[1.2731\text{Ln(Hardness)} - 4.705]}$	$e^{[1.2731\text{Ln(Hardness)} - 4.705]}$	$e^{[1.2731\text{Ln(Hardness)} - 4.705]}$

(k) Class B(WW-1), B(WW-2), & B(WW-3) criteria listed in main table based on a hardness of ~~400~~ **200** mg/l (as CaCO<sub>3</sub> (mg/l)). Numerical criteria (µg/l) for nickel is a function of hardness (CaCO<sub>3</sub> (mg/l)) using the equation for each use according to the following table:

	B(WW-1)	B(WW-2)	B(WW-3)
Acute	$e^{[0.846\text{Ln(Hardness)} + 2.255]}$	$e^{[0.846\text{Ln(Hardness)} + 2.255]}$	$e^{[0.846\text{Ln(Hardness)} + 2.255]}$
Chronic	$e^{[0.846\text{Ln(Hardness)} + 0.0584]}$	$e^{[0.846\text{Ln(Hardness)} + 0.0584]}$	$e^{[0.846\text{Ln(Hardness)} + 0.0584]}$

(l) Class B(WW-1), B(WW-2), & B(WW-3) criteria listed in main table based on a hardness of ~~400~~ **200** mg/l (as CaCO<sub>3</sub> (mg/l)). Numerical criteria (µg/l) for zinc is a function of hardness (CaCO<sub>3</sub> (mg/l)) using the equation for each use according to the following table:

	B(WW-1)	B(WW-2)	B(WW-3)
Acute	$e^{[0.8473\text{Ln(Hardness)} + 0.884]}$	$e^{[0.8473\text{Ln(Hardness)} + 0.884]}$	$e^{[0.8473\text{Ln(Hardness)} + 0.884]}$
Chronic	$e^{[0.8473\text{Ln(Hardness)} + 0.884]}$	$e^{[0.8473\text{Ln(Hardness)} + 0.884]}$	$e^{[0.8473\text{Ln(Hardness)} + 0.884]}$

**(m) Acute and chronic criteria listed in main table are based on a hardness of 200 mg/l (as CaCO<sub>3</sub> (mg/l)) and sulfate concentration of 63 mg/l. Numerical criteria (µg/l) for chloride is a function of hardness (CaCO<sub>3</sub> (mg/l)) and sulfate (mg/l) using the equation for each use according to the following table:**

	<b><u>B(CW1), B(CW2), B(WW-1), B(WW-2), B(WW-3), B(LW)</u></b>
<b><u>Acute</u></b>	<b><u><math>287.8(\text{Hardness})^{0.205797}(\text{Sulfate})^{-0.07452}</math></u></b>
<b><u>Chronic</u></b>	<b><u><math>177.87(\text{Hardness})^{0.205797}(\text{Sulfate})^{-0.07452}</math></u></b>

ITEM 2. Add the following new Table 4, Criteria for Sulfate, to subrule 61.3(3) as follows:

**TABLE 4: Aquatic Life Criteria for Sulfate for Class B waters**

*(all values expressed in milligrams per liter)*

Chloride Hardness mg/L as CaCO <sub>3</sub>	Cl <sup>-</sup> < 5 mg/L	5 ≤ Cl <sup>-</sup> < 25	25 ≤ Cl <sup>-</sup> ≤ 500
H < 100 mg/L	500	500	500
100 ≤ H ≤ 500	500	$[-57.478 + 5.79$ (hardness) + 54.163 (chloride)] * 0.65	$[1276.7 + 5.508$ (hardness) - 1.457 (chloride)] * 0.65
H > 500	500	2,000	2,000

ITEM 3. Rescind subrule 61.3(2)g as follows:

~~g. Acceptable levels of total dissolved solids (TDS) and constituent cations and anions will be established on a site-specific basis. The implementation approach for establishing the site-specific levels may be found in the “Supporting Document for Iowa Water Quality Management Plans,” Chapter IV, July 1976, as revised on June 16, 2004.~~

ITEM 4. Amend “Supporting Document for Iowa Water Quality Management Plans,” Chapter IV, July 1976, (insert new effective date)” to reflect the removal of the TDS site-specific approach and revision of the sulfate ion guideline value.

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Date

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Richard Leopold, Director