

# Inorganic Chemistry Branch - Current Methods and Reporting Limits (PQLs)

North Carolina Division of Water Resources, Water Sciences Section - Chemistry Laboratory

*Methods and PQL's Effective as of August 25, 2016*

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Parameter	EPA <sup>1</sup> Methods	APHA <sup>2</sup> Methods	Other Methods <sup>3</sup>	Practical Quantitation Limit (PQL) <sup>4</sup>
<b>Microbiology:</b>				
Alkalinity to pH 8.3		SM 2320 B-1997		1 mg/L
Alkalinity to pH 4.5		SM 2320 B-1997		1 mg/L
BOD <sub>5</sub> (5-Day)		SM 5210 B-2001		2.0 mg/L
CBOD <sub>5</sub> (5-Day)		SM 5210 B-2001		2.0 mg/L
Coliform, MF Fecal		SM 9222 D-1997		1 colony/100 mL
Coliform, MF Total		SM 9222 B-1997		1 colony/100 mL
Conductivity @ 25°C (Specific Conductance)		SM 2510 B-1997		14.9 µmhos/cm
TOC/DOC (Organic Carbon)		SM 5310 B-2000		2 mg/L
Turbidity	EPA 180.1 Rev. 2.0 (1993)	SM 2130 B-2001		1 NTU

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<b>Metals (Total and Dissolved):</b>				
<b>Hardness by Titration</b>	EPA 200.7 Rev. 4.4 (1994)	SM 2430 C-1997		<b>1.00 mg/L</b>
<b>Aluminum (Al)</b>	EPA 200.7 Rev. 4.4 (1994)			<b>50 µg/L</b>
<b>Antimony (Sb)</b>	EPA 200.8 Rev. 5.4 (1994)			<b>10 µg/L</b>
<b>Arsenic (As)</b>	EPA 200.8 Rev. 5.4 (1994) EPA 200.9 Rev. 2.2 (1994)\$			<b>2 µg/L</b>
<b>Barium (Ba)</b>	EPA 200.7 Rev. 4.4 (1994)			<b>10 µg/L</b>
<b>Beryllium (Be)</b>	EPA 200.7 Rev. 4.4 (1994)			<b>5 µg/L</b>
<b>Boron (B)</b>	EPA 200.7 Rev. 4.4 (1994)			<b>50 µg/L</b>
<b>Cadmium (Cd)</b>	EPA 200.8 Rev. 5.4 (1994) EPA 200.9 Rev. 2.2 (1994)\$			<b>0.50 µg/L</b>
<b>Calcium (Ca)</b>	EPA 200.7 Rev. 4.4 (1994)			<b>0.10 mg/L</b>
<b>Chromium (Cr), Total</b>	EPA 200.8 Rev. 5.4 (1994) EPA 200.7 Rev. 4.4 (1994)\$			<b>5.0 µg/L</b>
<b>Cobalt (Co)</b>	EPA 200.7 Rev. 4.4 (1994)			<b>50 µg/L</b>
<b>Copper (Cu)</b>	EPA 200.8 Rev. 5.4 (1994) EPA 200.9 Rev. 2.2 (1994)\$			<b>2.0 µg/L</b>

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Iron (Fe)	EPA 200.7 Rev. 4.4 (1994)			50 µg/L
Lead (Pb)	EPA 200.8 Rev. 5.4 (1994) EPA 200.9 Rev. 2.2 (1994)\$			2.0 µg/L
Lithium (Li)	EPA 200.7 Rev. 4.4 (1994)			25 µg/L
Magnesium (Mg)	EPA 200.7 Rev. 4.4 (1994)			0.10 mg/L
Manganese (Mn)	EPA 200.8 Rev. 5.4 (1994)\$ EPA 200.7 Rev. 4.4 (1994)			10 µg/L
Mercury (Hg)	EPA 245.1 Rev. 3.0 (1994)			0.2 µg/L
Mercury - trace level	EPA 1631 E			1.00 ng/L
Molybdenum (Mo)	EPA 200.8 Rev. 5.4 (1994)			10 µg/L
Nickel (Ni)	EPA 200.8 Rev. 5.4 (1994) EPA 200.9 Rev. 2.2 (1994)\$			2.0 µg/L
Potassium (K)	EPA 200.7 Rev. 4.4 (1994)			0.10 mg/L
Selenium (Se)	EPA 200.8 Rev. 5.4 (1994) EPA 200.9 Rev. 2.2 (1994)\$			1.0 µg/L
Silver (Ag)	EPA 200.8 Rev. 5.4 (1994)			1.0 µg/L
Sodium (Na)	EPA 200.7 Rev. 4.4 (1994)			0.10 mg/L

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Parameter	EPA <sup>1</sup> Methods	APHA <sup>2</sup> Methods	Other Methods <sup>3</sup>	Practical Quantitation Limit (PQL) <sup>4</sup>
Strontium (Sr)	EPA 200.8 Rev. 5.4 (1994)			10 µg/L
Thallium (Tl)	EPA 200.8 Rev. 5.4 (1994)			2.0 µg/L
Tin (Sn)	EPA 200.8 Rev. 5.4 (1994)			10 µg/L
Titanium (Ti)	EPA 200.7 Rev. 4.4 (1994)			10 µg/L
Vanadium (V)	EPA 200.7 Rev. 4.4 (1994)			10 µg/L
Zinc (Zn)	EPA 200.8 Rev. 5.4 (1994) EPA 200.7 Rev. 4.4 (1994)\$			10 µg/L
<b>Nutrients:</b>				
NH3 as N	EPA 350.1 Rev. 2.0 (1993)		QUIK CHEM 10-107-06-1-J\$	0.02 mg/L
NO2 + NO3 as N	EPA 353.2 Rev. 2.0 (1993)		QUIK CHEM 10-107-04-1-C\$	0.02 mg/L
NO2 as N	EPA 353.2 Rev. 2.0 (1993)		QUIK CHEM 10-107-04-1-C\$	0.01 mg/L
P, Total as P	EPA 365.1 Rev. 2.0 (1993)		QUIK CHEM 10-115-01-1-EF\$	0.02 mg/L
PO4 as P	EPA 365.1 Rev. 2.0 (1993)		QUIK CHEM 10-115-01-1-A\$	0.02 mg/L
TKN as N	EPA 351.2 Rev. 2.0 (1993)		QUIK CHEM 10-107-06-2-H\$	0.20 mg/L
<b>Note: Methods and PQL's for Nutrients parameters are applicable for regular samples and dissolved (filtered) samples.</b>				

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<b>Wet Chemistry:</b>				
<b>Bromide</b>	EPA 300.0 Rev. 2.1 (1993)			<b>0.4 mg/L</b>
<b>Chloride</b>	EPA 300.0 Rev. 2.1 (1993)			<b>1.0 mg/L</b>
<b>Chlorophyll <i>a</i> (uncorrected)</b>	EPA 445.0 (modified option)			<b>1 µg/L</b>
<b>COD</b>		SM 5220 D-2000		<b>20 mg/L</b>
<b>Color: Platinum Cobalt (true)</b>		SM 2120 B-2001	NCASI 1999, 71.01	<b>5 color units</b>
<b>Color: ADMI</b>		SM 2120 E-1993		<b>10 color units</b>
<b>Cyanide, Total</b>	EPA 335.4 Rev. 1.0 (1993)\$	SM 4500-CN	QUIK CHEM 10-204-00-1-X	<b>0.01 mg/L</b>
<b>Fluoride</b>	EPA 300.0 Rev. 2.1 (1993)			<b>0.4 mg/L</b>
<b>Formaldehyde</b>			ASTM D60303-98	<b>0.5 mg/L</b>
<b>HEM (Oil and Grease)</b>	EPA 1664 B			<b>10 mg/L</b>
<b>HEM (Oil and Grease) - solid samples</b>			SW-846 9071 B	<b>1000 mg/Kg</b>
<b>Hexavalent Chromium</b>		SM3500-Cr B-2009		<b>5 µg/L</b>
<b>MBAS (surfactants)</b>		SM 5540 C-2000		<b>0.1 mg/L</b>

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pH		SM 4500-H+ B-2000		0.01 units from 4.01-9.18 s.u.
Phenols	EPA 420.4 Rev. 1.0 (1993)		QUIK CHEM 10-210-00-1-A\$	10 µg/L
Residue, Total Dissolved		SM 2540 C-1997		12 mg/L
Residue, Total		SM 2540 E-1997		12 mg/L
Residue, Total - Fixed	EPA 160.4			12 mg/L
Residue, Total - Volatile	EPA 160.4			12 mg/L
Residue, Suspended - Total		SM 2540 D-1997		6.2 mg/L
Residue, Suspended Fixed		SM 2540 E-1997		6.2 mg/L
Residue, Suspended Volatile		SM 2540 E-1997		6.2 mg/L
Tannin & Lignin		SM 5550 B-1998		0.2 mg/L
Silica		SM 4500-SiO2 C-1997	QUIK CHEM 10-114-27-1-A\$	2 mg/L
Sulfate	EPA 300.0 Rev. 2.1 (1993)			2.0 mg/L
Sulfide		SM 4500-S2 D-2000		0.1 mg/L

**\*On-line version available at the following web page:**

<http://deq.nc.gov/about/divisions/water-resources/water-resources-data/water-sciences-home-page/microbiology-inorganics-branch/methods-pqls-qa>

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**Practical Quantitation Limit (PQL):** Each chemical parameter has a PQL, which is defined as "the lowest concentration that can be reliably achieved within specified limits of precision & accuracy during routine laboratory operating conditions." PQLs serve as the reporting limit for a parameter and are subjectively set at a multiple of a parameter's Method Detection Limit (MDL) - generally 3 to 5 times the MDL. For some parameters, the PQL is defined by a reporting limit or minimum limit (ML) specified by the analytical method; sample volume and buret graduations; and/or minimum measurement values that are method-defined. MDL studies are conducted annually (at a minimum); a PQL may be updated based on MDL results or change in analytical method.

### Footnotes:

<sup>1</sup>**EPA:** *Methods for Chemical Analysis of Water and Wastes*, USEPA Office of Research and Development, Cincinnati, OH; EPA 600/4-79-020.

<sup>2</sup>**SM:** *Standard Methods for the Examination of Water and Wastewater*, American Public Health Association, Washington, DC (revision date specified).

<sup>3</sup>**SW-846:** *Test Methods for Evaluating Solid Wastes, Physical/Chemical Methods*; 3rd edition (9/86), USEPA Office of Solid Waste and emergency Response, Washington, D.C.

<sup>3</sup>**HACH** refers to Hach Chemical Company, PO Box 389, Loveland, CO 80537.

<sup>3</sup>**QUIK CHEM** refers to HACH Company/Lachat Instruments, Loveland, CO 80539 (Milwaukee, WI).

\* - under evaluation

\$ - secondary method reference