

## Analytical Parameters for Colorado Oil and Gas Commission

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Parameters	Approx RL	Possible Methods (others may be appropriate, and lab may use different methods for some parameters than those listed)	COGCC Recommended Parameters	COGA Recommended Parameters	EDF- Shell Recommended Parameters	Boulder County	New York State Department of Health Recommended Water Well Testing (draft Environmental Assessment)	Marcellus Shale Coalition
						compliance with COGCC parameters		
<b>Microorganisms</b>								
Total Coliforms (including fecal coliform and E. coli)	P/A, MPN	SM 9225 or SM 9221B	Included, but not specified			Included, but not specified		Included, but not specified
Turbidity	0.10 NTU	EPA 180.1						Included, but not specified
Iron Bacteria		Field Test Kits	Included, but not specified					
<b>Inorganic Chemicals (for metals, both total and dissolved)</b>								
Antimony	1 ug/l	EPA 200.8						
Arsenic	0.5 ug/l	EPA 200.8	0.39 mg/kg <sup>2</sup>		0.01 mg/l	Included, but not specified		Included, but not specified
Barium	0.5 ug/l	EPA 200.8	15000 mg/kg <sup>2</sup>			Included, but not specified	Included, but not specified	Included, but not specified
Beryllium	0.5 ug/l	EPA 200.8						
Cadmium	0.2 ug/l	EPA 200.8	70 mg/kg					
Chromium (total)	0.5 ug/l	EPA 200.8	(III) 120,000 mg/kg			Included, but not specified		Included, but not specified
Hexavalent Chromium	0.01 mg/l	EPA 218.6 or SM 4500CR-D	23 mg/kg					
Copper	0.5 ug/l	EPA 200.8	3100 mg/kg			Included, but not specified		
Fluoride	0.1 mg/l	SM 4500F-C	Included, but not specified			Included, but not specified		
Lead	0.2 ug/l	EPA 200.8	400 mg/kg			Included, but not specified		Included, but not specified
Mercury (inorganic)	0.2 ug/l	EPA 245.1	23 mg/kg					
Nitrate (measured as Nitrogen)	0.05 mg/l	EPA 300.0A, 353.2	Included, but not specified			Included, but not specified		Included, but not specified
Nitrite (measured as Nitrogen)	0.05 mg/l	EPA 300.0A, 353.2	Included, but not specified			Included, but not specified		
Total Nitrate/Nitrite (as Nitrogen)	0.05 mg/l	EPA 300.0A, 353.2		0.1 mg/l	.1 mg/l			
Selenium	0.5 ug/l	EPA 200.8	390 mg/kg	Included, but not specified	0.01 mg/l	Included, but not specified		Included, but not specified
Thallium	0.1 ug/l	EPA 200.8						
Aluminum	1 ug/l	EPA 200.7 or 200.8						
Chloride	1.0 mg/l	EPA 300.0A	<1.25x background <sup>3</sup> (in water)	1 mg/l	1 mg/l	Included, but not specified	Included, but not specified	Included, but not specified
Iron	0.05 mg/l	EPA 200.7 or 200.8	Included, but not specified	Included, but not specified	0.05 mg/l	Included, but not specified	Included, but not specified	Included, but not specified
Manganese	0.010 mg/l	EPA 200.7 or 200.8	Included, but not specified	Included, but not specified	0.015 mg/l	Included, but not specified	Included, but not specified	Included, but not specified
pH	0.01 units	EPA 150.1 or SM 4500H	Included, but not specified	Included, but not specified	1 (pH unit)	Included, but not specified	Included, but not specified	Included, but not specified
ORP (oxidation-reduction potential)		Field test						
Silver	0.2 ug/l	EPA 200.8	390 mg/kg					
Sulfate	1.0 mg/l	EPA 300.0A	<1.25x background <sup>3</sup> (in water)	1 mg/l	1 mg/l	Included, but not specified		Included, but not specified
Total Dissolved Solids	5 mg/l	SM 2540C		10 mg/l	10 mg/l	Included, but not specified	Included, but not specified	Included, but not specified
Zinc	0.25 ug/l	EPA 200.8	23000 mg/kg					

Nickel	0.05 ug/l	EPA 200.8	1600 mg/kg					
Sodium	0.5 mg/l	EPA 200.7 or 200.8	Included, but not specified	Included, but not specified	1 mg/l	Included, but not specified	Included, but not specified	Included, but not specified
Boron	0.5 ug/l	EPA 200.7 or 200.8	2 mg/l <sup>3</sup>	Included, but not specified	0.05 mg/l	Included, but not specified		
Vanadium	1.4 ug/l	EPA 200.8						
Alkalinity	1.0 mg/l	2320B	Included, but not specified - bicarb & CaCO3	bicarb & CaCO3 - 10 mg/l	10 mg/l	Included, but not specified		Included, but not specified
Ammonia	0.1 mg/l	4500-NH <sub>3</sub> C						
Uranium (total)	0.5 ug/l	EPA 200.8						
Dissolved oxygen	0.2 mg/l	4500-O G						
<b>Organic Chemicals, VOC's (Volatile Organic Compounds)</b>								
Benzene	1.0 ug/l	EPA 524.2	0.17 mg/kg <sup>2</sup> (in soil), 5 µg/l <sup>3</sup> (in water)	.001 mg/l	0.001 mg/l	Included, but not specified	Included, but not specified	Included, but not specified
Ethylbenzene	1.0 ug/l	EPA 524.2	100 mg/kg <sup>2</sup> (in soil), 700 µg/l <sup>3</sup> (in water)	.001 mg/l	0.001 mg/l	Included, but not specified	Included, but not specified	Included, but not specified
Styrene	1.0 ug/l	EPA 524.2						
Toluene	1.0 ug/l	EPA 524.2	85 mg/kg <sup>2</sup> (in soil), 560 to 1000 µg/l <sup>3</sup> (in water)	0.001 mg/l	0.001 mg/l	Included, but not specified	Included, but not specified	Included, but not specified
Xylenes (total)	2.0 ug/l	EPA 524.2	175 mg/kg <sup>2</sup> (in soil), 1400 to 10000 µg/l <sup>3</sup> (in water)	.003 mg/l	0.003 mg/l	Included, but not specified	Included, but not specified	Included, but not specified
Methyl-tert-butyl-ether (MTBE)	10 ug/l	EPA 524.2						
Chloroform	1.0 ug/l	EPA 524.2						
Bromoform	1.0 ug/l	EPA 524.2						
Bromodichloromethane	1.0 ug/l	EPA 524.2						
Dibromochloromethane	1.0 ug/l	EPA 524.2						
Bromobenzene	1.0 ug/l	EPA 524.2						
1,2,4-Trimethylbenzene	1.0 ug/l	EPA 524.2						
n-Propylbenzene	1.0 ug/l	EPA 524.2						
n-Butylbenzene	1.0 ug/l	EPA 524.2						
Naphthalene	1.0 ug/l	EPA 524.2	23 mg/kg <sup>2</sup>					
1,3,5-Trimethylbenzene	1.0 ug/l	EPA 524.2						
p-Isopropyltoluene	1.0 ug/l	EPA 524.2						
Isopropylbenzene	1.0 ug/l	EPA 524.2						
Tert-butylbenzene	1.0 ug/l	EPA 524.2						
Sec-butylbenzene	1.0 ug/l	EPA 524.2						
Total Organic Carbon (TOC)	1.0 mg/l	5310B				Included, but not specified		
Methane, ethane, and ethene	1 mg/l	RSK-175 or equivalent	Included, but not specified	Methane - 0.026 mg/l; ethane - 0.026 mg/l	C1 - C6 : 0.026 mg/l each	Included, but not specified	Included, but not specified	Included, but not specified
Methane			methane > 1.0 mg/l) in a water well, do gas compositional and stable isotope analysis (carbon and hydrogen – 12C, 13C, 1H and 2H)	if methane > 1mg/l -- analyze for fixed gases (0.026 each detection) and stable isotope concentration of carbon and hydrogen in methane	methane, ethane, propane: 0.026 mg/l; cariable for 12C, 13C, 1H, 2H	methane > 2mg/l gas compositional analysis and stable isotope analysis of the methane (carbon and deuterium). Further testing may be required.		
<b>Radionuclides</b>								
gross alpha and beta	2 pCi/l	EPA 900.0 or SW-846 9310					Included, but not specified	
<b>OTHER</b>								
Total sulfide	2 mg/l	4500-S2- D or 376.2				Included, but not specified		
GRO and DRO/RRO	0.5 mg/l	EPA 8015B or equivalent						
Propane			Included, but not specified	0.026 mg/l				Included, but not specified

Bromide			Included, but not specified	1 mg/l	1 mg/l			
Phosphorus			Included, but not specified	0.1 mg/l	0.1 mg/l			
calcium			Included, but not specified	1 mg/l	1 mg/l	Included, but not specified		Included, but not specified
magnesium			Included, but not specified	1 mg/l	1 mg/l	Included, but not specified		
strontium			Included, but not specified	.05 mg/l	0.050 mg/l	Included, but not specified		Included, but not specified
sulfate-reducing bacteria			Included, but not specified					
slime			Included, but not specified					
total petroleum hydrocarbons (TPH)			500 mg/kg			Included, but not specified		
field observations: odor, water color, sediment, bubbles, effervescence			Included, but not specified	Included, but not specified				
specific conductance			< 4 mmhos/cm or 2x background	10 umhos/cm	10 umhos/cm		Included, but not specified	Included, but not specified
potassium					1 mg/l	Included, but not specified		Included, but not specified
oil & grease								
total suspended solids			<1.25x background^3					
total hardness								
surfactants								
Acenaphthene			1000 mg/kg^2					
Anthracene			1000 mg/kg^2					
Benzo(A)anthracene			.22 mg/kg^2					
Benzo(B)fluoranthene			.22 mg/kg^2					
Benzo(K)fluoranthene			2.2 mg/kg^2					
Benzo(A)Pyrene			.022 mg/kg^2					
Chrysene			22 mg/kg^2					
Dibenzo(A,H)anthracene			.022 mg/kg^2					
Fluoranthene			1000 mg/kg^2					
Indeno(1,2,3,C,D)pyrene			.22 mg/kg^2					
Pyrene			1000 mg/kg^2					
Water level						Included, but not specified	Included, but not specified	
Stable Isotopes of Water (O-18 and Deuterium), C-13 and S-34						Included, but not specified		
For Method 524.2 or equivalent, include tentatively-identified compounds								
For all organic methods (except TOC) include chromatograms in the data package								