CHAPTER 8
QUALITY STANDARDS FOR WYOMING GROUNDWATERS

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Section 1. Authority.

These regulations are promulgated pursuant to Sections 35-11-101 through 1104 of the Wyoming Statutes, specifically Section 35-11-302, and no person shall cause, threaten or allow violation of any water quality standard or provision contained herein.

Section 2. Definitions.

The following definitions supplement those definitions contained in Section 35-11-103 of the Wyoming Environmental Quality Act.

(a) "Aquifer" means a zone, stratum or group of strata that can store and transmit water in sufficient quantities for a specific use.

(b) "Background" means the constituents or parameters and the concentrations or measurements ~~which~~ that describe water quality and water quality variability prior to a subsurface discharge.

(c) "Below-Surface Receiver (Receiver)" means any zone, interval, formation or unit in the subsurface ~~which~~ that can accept water or fluid from other sources.

(d) "Domestic Water" means a water ~~which~~ that is suitable for uses, including but not limited to, drinking, gardening and other household uses, municipal uses and farmstead uses, including water used in the washing or hydro-cooling of farm products destined for human consumption on the farm, for sale on the fresh food market or for delivery to a processing plant for canning, freezing or other type of preparation prior to marketing. Classification of Domestic water does not mean that it meets the national drinking water standards.

(e) "Fluid" means any material ~~which~~ that flows or moves whether semisolid liquid, sludge, gas or any other form or state.

(f) "Groundwater" means subsurface water that fills available openings in rock or soil materials such that they may be considered water saturated under hydrostatic pressure.

(g) "Groundwaters of the State" are all bodies of underground water ~~which~~ that are wholly or partially within the boundaries of the State; Groundwaters of the State is synonymous with Groundwaters of Wyoming.

(h) "Hazardous Material (Substance)" means any matter of any description including petroleum related products and radioactive material (substance) ~~which~~ that, when discharged into any waters of the State presents an imminent and substantial hazard to public health or welfare and shall include all materials (substances) so designated by the U.S. Environmental Protection Agency in the Federal Register for March 13, 1978 (Part III), Water Programs, Hazardous Substances.

(i) "Milliequivalents Per Liter," ~~,~~ abbreviated meq/L, used to report the Residual Sodium Carbonate concentration in water used for irrigation, is defined as 0.001 of the equivalent weight of the ion per liter volume.

(j) "Milligrams Per Liter," ~~,~~ abbreviated mg/L, means milligrams of solute per liter of solution -- equivalent to parts per million assuming unit density of water.

(k) "Parameter" means one of a set of physical or chemical properties whose measured values determine the characteristics of a fluid.

(l) "pH" is a term to express the intensity of the acid or basic condition. A pH value of 7.0 at 25 degrees Celsius (C) is neutral, with pH's of less than 7.0 progressively more acid and pH's of greater than 7.0 progressively more basic.

(m) "Picocuries Per Liter," ~~,~~ abbreviated pCi/L, is a measure of radioactivity of waters or fluids. A picocurie is equal to 10-12 curie; a curie is defined as 3.7 x 1010 disintegrations per second.

(n) "Residual Sodium Carbonate", abbreviated RSC, is defined as twice the concentration of carbonate or bicarbonate a water would contain after subtracting an amount equivalent to the calcium plus the magnesium, and is a measure of potential hazard ~~which~~ that exists when waters high in carbonate and bicarbonate and relatively low in calcium and magnesium are used for irrigation.

(o) "Sodium Adsorption Ratio", abbreviated SAR, of a water is defined by the U.S. Department of Agriculture Laboratory (1954) as: where ion concentrations are expressed in ~~milliequivalents per liter~~ meq/L. The SAR predicts reasonably well the degree to which irrigation water tends to enter into cation-exchange reactions in soil.

(p) "Standard Unit", abbreviated s.u., is the unit of measurement used to describe the numerical pH of a solution, fluid or pollutant.

(q) "Subsurface Discharge" means a discharge to a below-surface receiver.

(r) "Total Dissolved Solids," ~~,~~ abbreviated TDS, is the sum of the dissolved mineral constituents in water, expressed as mg/L.

(s) "Toxic Materials (Substances)" are those materials (substances) or combinations of materials (substances), including disease-causing agents, ~~which~~ that, after discharge and upon exposure, ingestion, inhalation or assimilation into any environmentally significant organism, either directly from the environment or indirectly by ingestion through food chains, may cause death, disease, behavioral abnormalities, cancer, genetic malfunctions, physiological malfunctions (including malfunctions in reproduction of offspring) or physical deformations in such organisms or their offspring; and includes all materials (substances) so designated as toxic by the U.S. Environmental Protection Agency in the Federal Register for December 24, 1975 (Part IV), Water Programs, National Interim Primary Drinking Water Regulations.

(t) "Underground Water" means subsurface water~~, which~~ that is any body of water under the surface of the earth, including water in the vadose zone and groundwater.

(u) "Vadose Zone" means the unsaturated zone in the earth, between the land surface and the top of the first saturated aquifer ~~which~~ that is not a perched water aquifer. The vadose zone characteristically contains liquid water under less than atmospheric pressure, and water vapor and air or other gases at atmospheric pressure. Perched water bodies exist within the vadose zone.

(v) "Virtually Free" means a concentration less than the concentration ~~which~~ that is the lower limit of detection.

Section 3. Underground Water Protected.

(a) All waters, including Groundwaters of the State, within the boundaries of the State of Wyoming are the property of the State; and control of the beneficial use of waters of the State resides with the Wyoming State Engineer.

(b) Nothing herein contained shall be construed so as to interfere with the right of any person to use water from any underground water source for any purpose identified in W.S. 35-11-102 and 35-11-103(c)(i); or to limit or interfere with the jurisdiction, duties or authorities of other Wyoming State agencies or officials.

(c) Protection shall be afforded all underground water bodies (including water in the vadose zone). Water being used for a purpose identified in W.S. 35-11-102 and 103(c)(i) shall be protected for its intended use and uses for which it is suitable. Water not being put to use shall be protected for all uses for which it is suitable.

Section 4. Quality Standards Prescribed; Groundwaters of the State Classified.

(a) Standards are prescribed to protect the natural quality of underground water:

(i) Receiving pollution or wastes directly from a subsurface discharge or by migrating water or fluid of a discharge;

(ii) Invaded by underground water of inferior quality as a result of well or exploration hole drilling or completion practices;

(iii) From pollution ~~which~~ that may result from above-ground facilities capable of causing or contributing to pollution;

(iv) From pollution ~~which~~ that may result from surface mining operations.

(b) Groundwaters of the State are classified in order to apply standards to protect water quality. Groundwaters of the State are classified by use, and by ambient water quality.

(c) Waters ~~which~~ that are known sources of supply and appropriated for uses identified in W.S. 35-11-102 and 103(c)(i) are classified herein as: Domestic water; Water for fish and aquatic life; Water for agriculture; Water for livestock; and, Water for industry. A discharge or activity that impacts an underground source of water for existing uses identified in W.S. 35-11-102 and 103(c)(i) shall not make the affected water unsuitable for its intended use or uses, at any place or places of withdrawal or natural flow to the surface.

(d) Unappropriated waters are classified by ambient water quality.

(i) Class I Groundwater of the State - This water is suitable for domestic use. The ambient quality of underground water of this suitability does not have a concentration in excess of any of the standards for Class I Groundwater of the State (see Table I, page 9).

(ii) Class II Groundwater of the State - This water is suitable for agricultural use where soil conditions and other factors are adequate. The ambient quality of underground water of this suitability does not have a concentration in excess of any of the standards for Class II Groundwater of the State (see Table I, page 9).

(iii) Class III Groundwater of the State - This water is suitable for livestock. The ambient quality of underground water of this suitability does not have a concentration in excess of any of the standards for Class III Groundwater of the State (see Table I, page 9).

(iv) Class Special (A) Groundwater of the State -This water is suitable for fish and aquatic life. The ambient quality of underground water of this suitability does not have a concentration in excess of any of the standards for Class Special (A) Groundwater of the State (see Table I, page 10).

(v) Underground water of Class I, II, III or Special (A)

(A) ~~s~~Shall not contain biological, hazardous, toxic or potentially toxic materials or substances in concentrations or amounts ~~which~~ that exceed maximum allowable concentrations based upon information of the EPA in the Federal Register for December 24, 1975 (Part IV), Water Programs, National Interim Primary Drinking Water Regulations; and in the Federal Register for March 13, 1978 (Part II), Water Programs, Hazardous Substances. In addition, underground water of Class I, II, III or Special (A) shall not contain any biological, hazardous, toxic or potentially toxic materials or substances in concentrations or amounts ~~which~~ that, based upon the latest available scientific information and as determined by the Administrator, will impair this water for its use suitability or ~~which~~ that may contribute to a condition in contravention of groundwater quality standards or to any toxic or hazardous effect on natural biota.

(vi) A discharge into an aquifer containing Class I, II, III or Special (A)

(A) Groundwater of the State shall not result in variations in the range of any parameter, or concentrations of constituents in excess of the standards of these regulations at any place or places of withdrawal or natural flow to the surface. A discharge ~~which~~ that results in concentrations in excess of standards shall be permitted if post-discharge water quality can be returned to a quality of use equal to, or better than, and consistent with the uses for which the water was suitable prior to the operation.

(vii) Class IV Groundwater of the State - This water is suitable for industry. The quality requirements for industrial water supplies range widely and almost every industrial application has its own standards.

(A) Class IV (A) Groundwater of the State has a total dissolved solids concentration not in excess of 10,000 mg/L.

(B) Class IV (B) Groundwater of the State has a total dissolved solids concentration in excess of 10,000 mg/L.

(C) A discharge into an aquifer containing Class IV (A) or IV (B) Groundwater of the State shall not result in the water being unfit for its intended use.

(D) A discharge into an aquifer with Class IV (A) or IV (B) Groundwater of the State shall not result in oil and grease concentrations in excess of 10 mg/L or a lesser amount if a concentration in excess of the lesser amount is determined to be toxic; or oil and grease in excess of background concentrations of the underground water, whichever is greater, at any place or places of withdrawal or natural flow to the surface.

(E) A discharge into an aquifer with Class IV (A) or IV (B) Groundwater of the State shall not result in radioactivity concentrations or amounts ~~which~~ that exceed the standards for Class I through III and Special (A) Groundwaters of the State; or in

concentrations or amounts ~~which~~ that exceed background concentrations of the underground water, whichever is greater, at any place or places of withdrawal or natural flow to the surface.

(F) A discharge into an aquifer with Class IV (A) or IV (B) Groundwater of the State shall not result in biological, hazardous, toxic or potentially toxic materials or substances including pesticides, insecticides or herbicides in concentrations or amounts ~~which~~ that exceed maximum allowable concentrations, based upon information of the EPA in the Federal Register for December 24, 1975 (Part IV), Water Programs, National Interim Primary Drinking Water Regulations, and in the Federal Register for March 13, 1978 (Part II), Water Programs, Hazardous Substances; or ~~which~~ that exceed background concentrations of the underground water, whichever is greater, at any place or places of withdrawal or natural flow to the surface.

In addition, a discharge shall not result in any biological, hazardous, toxic or potentially toxic materials or substances, in concentrations or amounts ~~which~~ that, based on the latest available scientific information and as determined by the Administrator, will impair the quality of ambient Groundwaters of the State of this ~~C~~class; or ~~which~~ that may contribute to a condition in contravention of groundwater quality standards or cause, allow or permit any deleterious effect on natural biota.

(viii) Groundwater of the State found closely associated with commercial deposits of hydrocarbons and/or other minerals, or ~~which~~ that is considered a geothermal resource, is Class V (Hydrocarbon Commercial), Class V (Mineral Commercial) or Class V (Geothermal) Groundwater of the State.

(A) A discharge into a Class V (Hydrocarbon Commercial) Groundwater of the State shall be for the purpose of the production of oil and gas and shall not result in the degradation or pollution or waste of other water resources.

(B) A discharge into a Class V (Mineral Commercial) Groundwater of the State shall be for the purpose of mineral production and shall not result in the degradation or pollution of the associated or other groundwater and, at a minimum, be returned to a condition and quality consistent with the pre-discharge use suitability of the water.

(C) A discharge into a Class V (Geothermal) Groundwater of the State shall be for the purpose of the production of geothermal resources and shall not result in the degradation or pollution or waste of other water resources.

(ix) Class VI Groundwater of the State may be unusable or unsuitable for use:

(A) Due to excessive concentration of total dissolved solids or specific constituents; or

(B) Is so contaminated that it would be economically or technologically impractical to make the water useable; or

(C) Is located in such a way, including depth below the surface, so as to make use economically and technologically impractical.

Section 5. Classification for Groundwater of the State Affected by a Discharge; Classification by Aquifer and Area.

(a) Classification of Groundwaters of the State shall be based on the water quality standards of this chapter; excepting, a Class I Groundwater of the State shall be classified by ambient water quality and the technical practicability and economic reasonableness of treating ambient water quality to meet use suitability standards.

(b) Underground water quality shall be classified for an aquifer ~~which~~ that is or may be affected by a subsurface discharge or other activity identified in Section 4.a. of these regulations.

(c) Classification shall be made:

(i) Whenever there is pollution or the threat of pollution to a ~~g~~Groundwater of the State; or

(ii) The physical, chemical, radiological or biological properties of any ~~g~~Groundwater of the State are or may be altered by man's action.

(d) Classification shall be for a water in a specified locally defined area by named and described aquifer or receiver. Any aquifer or receiver in its regional setting may have one or more classifications by defined area or areas.

(i) The name shall be a recognized geologic name whenever possible;

(ii) The description shall include a lithologic description.

(e) The lateral and vertical limits of an aquifer or receiver, for purposes of classification, shall be based on existing water use, ambient water quality and geologic and hydrologic characteristics of the aquifer or of the receiver.

(f) An underground water may be reclassified if new or additional data warrant reclassification

TABLE I

	UNDERGROUND WATER CLASS		
	I	II	III
Use Suitability Constituent or Parameter	Domestic* Concentration**	Agriculture Concent.**	Livestock Concent.**
Aluminum (Al)	---	5.0	5.0
Ammonia (NH_3-N)	0.5[7]	---	---
Arsenic (A~~S~~s)	0.05	0.1	0.2
Barium (Ba)	2.0	---	---
Beryllium (Be)	---	0.1	---
Boron (B)	0.75	0.75	5.0
Cadmium (Cd)	0.005	0.01	0.05
Chloride (Cl)	250.0	100.0	2000.0
Chromium (Cr)	0.10	0.1	0.05
Cobalt (Co)	---	0.05	1.0
Copper (Cu)	1.0	0.2	0.5
Cyanide (CN)	0.2	---	---
Fluoride (F)	4.0	---	---
Hydrogen Sulfide(H_2S)	0.05	---	---
Iron (Fe)	0.3	5.0	---
Lead (Pb)	0.015	5.0	0.1
Lithium (Li)	---	2.5	---
Manganese (Mn)	0.05	0.2	---
Mercury (Hg)	0.002	---	0.00005
Nickel (Ni)	---	0.2	---
Nitrate (NO_3-N)	10.0	---	---
Nitrite (NO_2-N)	1.0	---	10.0
(NO_3+NO_2)-N	---	---	100.0
Oil & Grease	Virtually Free	10.0	10.0
Phenol	0.001	---	---
Selenium (Se)	0.05	0.02	0.05
Silver (Ag)	0.10	---	---
Sulfate (SO_4)	250.0	200.0	3000.0
Total Dissolved Solids (TDS)	500.0	2000.0	5000.0
Vanadium (V)	---	0.1	0.1
Zinc (Zn)	5.0	2.0	25.0
pH	6.5-8.5	4.5-9.0s.u.	6.5-8.5s.u
SAR	---	8.0	---
RSC	---	1.25 meq/L	---
Combined Total Radium 226 and Radium 228[8]	5pCi/L	5pCi/L	5pCi/L
Total Strontium 90	8pCi/L	8pCi/L	8pCi/L

Gross alpha particle radioactivity (including Radium 226 but excluding Radon and Uranium[8]	15pCi/L	15pCi/L	15pCi/L

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297 * This list does not include all constituents in the national drinking water standards.

298 ** mg/L, unless ~~other wise~~ otherwise indicated

299

300 **TABLE I**

	UNDERGROUND WATER CLASS
Use Suitability Constituent or Parameter	Special (A) Fish/Aquatic Life Concentration*
Aluminum (Al)	0.1
Ammonia (NH_3)	~~0.021~~ 0.02[1]
Arsenic (As)	0.05
Barium (Ba)	5.0
Beryllium (Be)	0.011-1.3[3]
Boron (B)	---
Cadmium (Cd)	0.0004-0.015[3]
Chloride (Cl)	---
Chromium (Cr)	0.05
Cobalt (Co)	---
Copper (Cu)	0.01-0.04[3]
Cyanide (CN)	0.005
Fluoride (F)	---
Hydrogen Sulfide (H_2S)	~~0.0022~~ 0.002[2]
Iron (Fe)	0.5
Lead (Pb)	0.004-0.15[3]
Lithium (Li)	---
Manganese (Mn)	1.0
Mercury (Hg)	0.00005
Nickel (Ni)	0.05-0.4[3]
Nitrate (NO_3-N)	---
Nitrite (NO_2-N)	---
(NO_3+NO_2-N	---
Oil & Grease	Virtually ~~f~~Free
Phenol	0.001
Selenium (Se)	0.05
Silver (Ag)	0.0001-0.00025[3]
Sulfate (SO_4)	---
Total Dissolved Solids(TDS)	500.0[4]-1000.0[5]-2000.0[6]

Uranium (U)	0.03-1.4[3]
Vanadium (V)	---
Zinc (Zn)	0.05-0.6[3]
pH	6.5~~s.u.~~-9.0 s.u.
Combined Total Radium 226 and Radium 228[8]	5 pCi/L
Total Strontium 90	8 pCi/L
Gross alpha particle radioactivity (including Radium 226 but excluding Radon and Uranium[8]	15pCi/L

*mg/L, unless ~~other wise~~ otherwise indicated

TABLE I

Explanation for Superscripts Used in Table I

[1]Unionized ammonia: When ammonia dissolves in water, some of the ~~ammoniareacts~~ ammonia reacts with water to form ammonium ions. A chemical equilibrium is established ~~whichcontains~~ that contains unionized ammonia (NH_3), ionized ammonia (NH_4~~+~~$^+$) and hydroxide ions (OH^-).The toxicity of aqueous solutions of ammonia is attributed to NH_3; therefore, the standard is for unionized ammonia. ~~(~~[Note: 0.02 mg/L NH_3 is equivalent to 0.016 NH_3 as (N~~.~~)]

[2]Undissociated ~~H2S~~ H_2S: The toxicity of sulfides derives primarily from ~~H2S~~ H_2S, rather than from the dissociated hydrosulfide (HS^-) or sulfide (S^{2-}) ions; therefore, the standard is for the toxic undissociated H_2S.

[3]Dependent on hardness: The toxicity of metals in natural waters varies with the hardness of the water; generally, the limiting concentration is higher in hard water than in soft water.

[4]Egg hatching

[5]Fish rearing

[6]Fish and aquatic life

[7]Total ammonia nitrogen

[8]Requirements and procedures for the measurement and analysis of gross alpha particle activity, Radium 226 and Radium 228 shall be the same as requirements and procedures of the U.S. Environmental Protection Agency, National Interim Primary Drinking Water Regulations, EPA-570/9-76-003, effective June 24, 1977.

Section 6. Standards for the Underground Management of Hazardous or Toxic Wastes.

The underground management of wastes includes the temporary storage and the ultimate disposal of all hazardous or toxic wastes in below-surface receivers. The following standards apply to any underground storage or disposal of hazardous or toxic wastes.

(a) The below-surface receiver:

(i) Is an extensive sedimentary rock stratum or strata free of complex faulting and folding and distant from any underground water recharge area;

(ii) Is adequately separated from aquifers both above and below;

(iii) Has normal or low formation pressure and is capable of accepting the discharge without necessitating excessive discharge or injection pressure;

(iv) Has slow movement of ambient formation fluid under the natural horizontal gradient and is not in an area of underground water discharge for the receiver;

(v) Is located areally and stratigraphically so that an escape of waste to useable water resources would not be anticipated due to:

(A) Seismic risk;

(B) Abandoned holes; or

(C) Mineral exploration or other drilling, or mineral development.

(b) The underground water in the receiver;

(i) Is not an economically available source of water or is unusable;

(ii) Is confined by strata overlying and underlying the receiver; and

(iii) Is classified as ~~c~~Class VI groundwater by this chapter.

(c) The discharge or waste:

(i) Will not create or result in a hazard to health or impair existing rights, and is not prohibited from subsurface disposal by Federal or State law or regulation;

(ii) Will not degrade or decrease the availability of mineral resources, including oil and gas;

(iii) Is compatible with the receiver and ambient water; and

(iv) Can be controlled at all times.

Section 7. Testing Procedures.

(a) For determination of the parameters involved in the standards, analysis will be in accord with test procedures as defined pursuant to: Title 40, Code of Federal Regulations, Part 136, or any modifications thereto. For test procedures not listed in the Code of Federal Regulations, test procedures outlined in EPA Methods for Chemical Analysis of Water and Wastes (March, 1979); or Standard Methods for the Examination of Water and Wastewaters (1975); or, A.S.T.M. Standards, Part 31 (1979), Water shall be used.

(b) The analytical technique for total uranium (as U) shall be the fluorometric method as referenced in Methods for Determination of Radioactive Substances in Water and Fluvial Sediments, Techniques of Water - Resource Investigations of the U.S. Geological Survey, Book 5, Chapter A-5 (1977).

(c) Where standard methods of testing have not been established, the suitability of testing procedures shall be determined by the Department.

Section 8. Limit of Detection.

Where the standard is below the lower limit of detection given in EPA Methods for Chemical Analysis of Water and Wastes (March, 1979), or Standard Methods for the Examination of Water and Wastewaters (1975), or, A.S.T.M. Standards, Part 31 (1979), Water, the standard shall be the lower limit of detection, unless otherwise provided by the Environmental Quality Council.