Certification Page
Regular and Emergency Rules

1. General Information

a. Agency/Board Name *See attached list for references*
Department of Environmental Quality, Water Quality

b. Agency/Board Address	c. Agency/Board City	d. Agency/Board Zip Code
122 West 25th Street, Herschler Building 4	Cheyenne	WY 82002

e. Name of Contact Person	f. Contact Telephone Number
William Tillman	307-777-6941

g. Contact Email Address	h. Adoption Date:
william.tillman@wyo.gov	May 17, 2012

i. Program(s) *See attached list for references*

2. Rule Type and Information

a. These rules are: ☐ Emergency Rules *(After completing all of Section 2, proceed to Section 5 below)* ☒ Regular Rules

b. Choose all that apply: ☐ New Rules* ☒ Amended Rules ☐ Repealed Rules

* *"New" rules means the first set of regular rules to be promulgated by the Agency after the Legislature adopted a new statutory provision or significantly amended an existing statute.*

If "New," provide the Enrolled Act number and year enacted:

c. Provide the Chapter Number, and Short Title of Each Chapter being Created/Amended/Repealed *(if more than 5 chapters are being created/amended/repealed, please use the Additional Rule Information form and attach it to this certification)*

Chapter Number:	Short Title:
Chapter 11	Design and Construction Standards for Sewerage Systems
Chapter 3	Permit to Construct - cite changes only
Chapter 12	Design and Construction Standards - cite changes only
Chapter 16	Injection Wells - cite changes only
Chapter 20	Confined Swine Feeding Operations - cite changes only

d. ☒ The Statement of Reasons is attached to this certification.

e. If applicable, describe the emergency which requires promulgation of these rules without providing notice or an opportunity for a public hearing:

3. State Government Notice of Intended Rulemaking

a. Date on which the Notice of Intent containing all of the information required by W.S. 16-3-103(a) was filed with the Secretary of State: 12/9/11

b. Date on which the Notice of Intent and proposed rules in strike and underscore format were provided to the Legislative Service Office: 12/7/11

c. Date on which the Notice of Intent and proposed rules in strike and underscore format were provided to the Attorney General: 12/9/11

4. Public Notice of Intended Rulemaking

a. Notice was mailed 45 days in advance to all persons who made a timely request for advance notice. ☐ Yes ☐ No ■ N/A

b. A public hearing was held on the proposed rules. ■ Yes ☐ No

If "Yes:"	Date:	Time:	City:	Location:
	May 11, 2012	8:00	Sheridan, Wyoming	DEQ Field Office 2100 West 5th

5. Final Filing of Rules

a. Date on which the Certification Page with original signatures and final rules were sent to the Attorney General's Office for the Governor's signature:

b. Date on which final rules were sent to the Legislative Service Office:

c. Date on which a PDF of the final rules was electronically sent to the Secretary of State:

6. Agency/Board Certification

The undersigned certifies that the foregoing information is correct.

Signature of Authorized Individual	John V. Corra
Printed Name of Signatory	JOHN V. CORRA
Signatory Title	Director
Date of Signature	5/25/12

7. Governor's Certification

I have reviewed these rules and determined that they:

1. Are within the scope of the statutory authority delegated to the adopting agency;
2. Appear to be within the scope of the legislative purpose of the statutory authority; and, if emergency rules,
3. Are necessary and that I concur in the finding that they are an emergency.

Therefore, I approve the same.

Governor's Signature	
Date of Signature	

Distribution List:

Attorney General
1. Statement of Reasons;
2. Original Certification Page;
3. Summary of Comments (regular rules);
4. Hard copy of rules: clean and strike/underscore; and
5. Memo to Governor documenting emergency (emergency rules).

LSO
1. Statement of Reasons;
2. Copy of Certification Page;
3. Summary of Comments (regular rules);
4. Hard copy of rules: clean and strike/underscore;
5. Electronic copy of rules: clean and strike/underscore; and
6. Memo to Governor documenting emergency (emergency rules).

SOS
1. PDF of clean copy of rules; and
2. Hard copy of Certification Page as delivered by the AG.

Wyoming

Additional Rule Information

1. General Information

a. Agency/Board Name *See attached list for references* Department of Environmental Quality, Water Quality		
b. Agency/Board Address 122 West 25th Street, Herschler Building 4	c. Agency/Board City Cheyenne	d. Agency/Board Zip Code WY 82002
e. Name of Contact Person William Tillman	f. Contact Telephone Number 307-777-6941	
g. Contact Email Address william.tillman@wyo.gov		
h. Program(s) *See attached list for references*		

2. Rule Information, Cont.

a. Provide the Chapter Number and Short Title of Each Chapter being Created/Amended/Repealed

Chapter Number:	Short Title:
Chapter 21	Reuse of Treated Water - cite changes only
Chapter 23	Minimum Standards for Subdivision Applications
Chapter 25	Septic Tank and/or Soil Adsorption Systems
Chapter 26	Well Construction Standards

WATER QUALITY RULES AND REGULATIONS

Chapter 11

CHAPTER XI

DESIGN AND CONSTRUCTION STANDARDS FOR SEWERAGE SYSTEMS, TREATMENT WORKS, DISPOSAL SYSTEMS OR OTHER FACILITIES CAPABLE OF CAUSING OR CONTRIBUTING TO POLLUTION AND MOBILE HOME PARK AND CAMPGROUND SEWERAGE AND PUBLIC WATER SUPPLY DISTRIBUTION SYSTEMS

RULES AND REGULATIONS

WYOMING DEPARTMENT OF ENVIRONMENTAL QUALITY

WATER QUALITY DIVISION

I certify that the attached is a true and correct copy of Chapter XI of the rules of the Wyoming Department of Environmental Quality, Water Quality Division, adopted in accordance with W.S. 16-3-101 through 16-3-115. These rules are new rules of the Department of Environmental Quality, Water Quality Division, which were filed with the Secretary of State on [illegible] day of ________ 1984.

Prior to adoption, these rules were made available for public inspection beginning August 16, 1983, and were promulgated at a public hearing of the Wyoming Environmental Quality Council March 14, 1984. A notice of intended adoption was mailed to the Attorney General and the Legislative Service Office on August 16, 1983.

The rules have been approved by the Governor as indicated below. The attached rules are effective immediately upon filing with the Secretary of State.

Signed this ____ day of ________, 1984

Robert E. Sundin, Director
Department of Environmental Quality

STATE OF WYOMING
Office of the Secretary
FILED
THYRA THOMSON
Secretary of State

SS

Reviewed and Approved by the Governor

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PART A
INTRODUCTION AND GENERAL REQUIREMENTS

Section 1. Authority. These standards are promulgated pursuant to W. S. 35-11-101 through 3511-1207. Specifically, W. S. 35-11-302 requires the administrator to establish standards for the issuance of permits for construction, installation, or modification of any public water supply and sewerage system, treatment works, disposal system or other facility capable of causing or contributing to pollution.

Section 2. Purpose. The purpose of these standards is to:

(a) Ensure that the design and construction of sewerage systems, treatment works, disposal systems and other facilities capable of causing or contributing to pollution meet the purpose of the Environmental Quality Act.

(b) Prevent, reduce and eliminate pollution and enhance the waters of the State of Wyoming by ensuring design and construction of systems and facilities are capable of the required treatment and/or disposal and continued operation to protect the health, safety and welfare of the environment and its inhabitants.

These standards pertain only to permits required pursuant to Chapter III and IX, Wyoming Water Quality Rules and Regulations.

Section 3. Intent. The design and construction standards included in these regulations are directed toward conventional wastewater and waste systems. These standards impose limiting values of design for which a construction, installation or modification permit application and plans and specifications can be evaluated by the Division.

The terms “shall” and “must” are used when practice is sufficiently standardized to permit specific delineation of requirements or when safeguarding public health or protection of water quality justifies such definite action. Other terms, such as “should”, “recommend”, and “preferred” indicate desirable procedures or methods which allow deviations provided the purpose of these regulations can be accomplished.

The applicant shall use the date referenced copy of other standards referred to in these regulations. Where no date is listed for the referenced standards, the standards used shall be those in effect when these regulations become effective.

Section 4. Definitions. The following definitions supplement those contained in W. S. 35-11-103 of the Wyoming Environmental Quality Act.

(a) “Affected land” means the area of land from which overburden is removed, or upon which overburden, development waste rock or refuse is deposited, or both, access roads, haul roads, mineral stockpiles, mill tailings, impoundment basins, and all other lands whose natural state has been or will be disturbed as a result of the operations.

(b) “Campground” means a parcel or tract of land under the control of a person at which sites are offered for the use of the public or members of an organization either free of charge or for a fee, for the establishment of temporary living quarters for two or more recreational units.

(c) “Commercial/industrial waste and wastewater facilities” means any facility not defined as a municipal or single family residence facility.

(d) “Construction” shall encompass the materials used, installation procedures and tolerances, and testing and disinfection requirements.

(e) “Feedlot” means the concentrated confinement of animals or poultry in pens or houses for meat, milk, or egg production or the stabling of animals or poultry for a period of 45 days or more in a 12 month period when forage or crops are not grown in the area of confinement.

(f) “Hazardous substance” means any matter of any description including petroleum related products and radioactive material (substance) which, when discharged into any waters of the state, presents an imminent and substantial hazard to public health or welfare. This definition includes 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.

(g) “Land application/treatment” means the application of wastes or wastewater to the land at a predetermined rate for the purpose of disposal or treatment by any or all of the following processes: degradation, plant uptake, assimilation or accumulation in the soil profile from filtration.

(h) “Maximum daily demand” means the largest daily water use rate which would occur during the calendar year.

(i) “Maximum hourly or peak hourly demand” means the largest water use rate which would occur during any one hour during the year. The maximum hourly demand may or may not occur during the maximum daily demand period.

(j) “Mobile home park” means a parcel or tract of land under the control of a person upon which two (2) or more mobile homes are located on a continual or seasonal nonrecreational basis, regardless of whether a charge is made therefore.

(k) “Off-channel” means the interception of a drainage way which collects runoff only from disturbed areas.

(l) “On-channel” means the interception of a drainage way which collects runoff from both disturbed and undisturbed areas.

(m) “Permanent pool level” means the elevation in a sedimentation pond or sediment control structure below which the water will not be discharged by an outlet structure or by pumping.

(n) “Pond/lagoon” means a manmade or natural basin which is intended for containment, treatment or disposal of wastes or wastewater.

(o) “Rapid infiltration system” means a land treatment system in which treatment is accomplished by the movement of large quantities of wastewater through a coarse or highly permeable soil profile.

(p) “Recreational unit” means a tent or vehicular type structure, primarily designed as temporary living quarters for recreational, camping, or travel use, which either has its own motive power or is mounted on or drawn by a self-powered vehicle. A tent means a collapsible shelter of canvas or other fabric stretched and sustained by a rigid structure(s) and used for camping outdoors.

(q) “Seasonal high groundwater table” is the highest elevation reached by the groundwater during the wet season of the year (usually spring or early summer).

(r) “Sedimentation control facility” means a pond or structure designed to capture runoff from disturbed areas for the purpose of treating water for sediment and suspended solids removal.

(s) “Slow rate land application system” means an irrigation system in which wastewater treatment is achieved due to vegetative uptake and percolation of wastewater through the soil profile by low application rates.

(t) “Sludge” is the accumulation of solids settled from wastewater in a septic tank, aerobic unit, clarifier, or equivalent.

(u) “Soil” means all unconsolidated material overlaying bedrock.

(v) “Toxic characteristics (or wastes)” means those characteristics (or wastes) which are due to the presence of: substances or combinations of substances including disease causing agents which, after discharge and upon exposure, ingestions, 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) or physical deformation in such organisms or their offspring. This definition shall include all substances designated as toxic or hazardous 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; Federal Register for May 19, 1980, (Section 261), Hazardous Waste Management System: Identification and Listing of Hazardous Waste; and the Federal Register for July 16, 1982, Part V, National Oil and Hazardous Substances Contingency Plan.

Section 5. Facilities and Systems Not Specifically Covered by These Standards. This section is provided to encourage new technology and equipment and provide a process for evaluating and permitting designs which deviate from these regulations. The proposed construction of facilities and processes not in compliance with these regulations will be permitted provided that the facility, when constructed, can operate meeting the purpose of these regulations.

(a) Each application for a permit to construct a facility under this section shall be evaluated on a case-by-case basis using the best available technology. The following information should be included with the application:

(i) Data obtained from a full scale, comparable installation which demonstrates the acceptability of the design and/or,

(ii) Data obtained from a pilot plant operated under the design condition for a sufficient length of time to demonstrate the acceptability of the design and/or,

(iii) Data obtained from a theoretical evaluation of the design which demonstrates a reasonable probability of the facility meeting the design objectives; and

(iv) An evaluation of the flexibility of making corrective changes to the constructed facility in the event it does not function as planned.

(b) If an applicant wishes to construct a pilot plant to provide the data necessary to show the design will meet the purpose of the act, a permit to construct must be obtained.

Section 6. Engineering Design Report.

(a) Scope and purpose. An engineering design report which describes existing conditions, problems, and the proposed solution is required for each project.

(b) Sewerage systems. The engineering design report shall include:

(i) A description of the service area including scaled vicinity plan map(s) of the project with regard to adjacent and proposed development, elevations, and topographic features.

(ii) Current and projected average, maximum day and peak flows for the design of the project, per capita design flows, extraneous flows, and industrial and/or commercial waste flows.

(iii) Downstream impact on existing sewers, lift stations and treatment facilities. This information shall include existing population, waste loads, existing flows and capacity of downstream facilities.

(iv) A letter of acceptance from the municipality, sewer district, or owner of any affected downstream sewerage, treatment or disposal facilities.

(c) Treatment works and disposal systems. The engineering design report shall include:

(i) A description of the facility site and location, including scaled site plan and:

(A) Present and projected facility property.

(B)Flood protection indicating predicted elevation of 25- and 100- year flood stages.

(C) Present and proposed access.

(D) Distances from current habitation.

(E) Prevailing wind direction.

(F) Fencing and/or security.

(G) Topographic features and contours with indicated datum.

(H) Soil and subsurface geological characteristics. Location of soil borings, rock elevations and groundwater elevations shall be indicated. Provide a soils investigation report of the proposed site.

(ii) A detailed description of the service area for the project including scaled plan showing land use and boundaries.

(iii) A detailed description of the disposal technique for effluent and solids. For lagoons, indicate whether the discharge is continuous, seasonal, or nondischarging.

(iv) Effluent water quality considerations for design of the facility shall be described to include:

(A) Surface discharge. An application shall be submitted to the Water Quality Division for a National Pollution Discharge Elimination System Permit.

(B) Groundwater protection. Pursuant to Chapter VIII of the Water Quality rules.

(v) Design conditions shall be described to include:

(A) Proposed effluent standards.

(B) Design population.

(C) Existing and projected flows and flow variations.

(D) Shock loads, with cause and frequency.

(E) Existing and projected wastewater characteristics including BOD, suspended solids, and pH.

(F) Existing and projected flow, loads and characteristics of industrial wastes and toxic Materials.

(G)Existing or proposed quantity and frequency of septage discharges.

(H) Climate conditions at existing or proposed treatment facility site.

(I) Existing or proposed water supply.

(J) Theory of operation.

(K) Odor control features.

(L) Complete description of existing facilities.

(Vi) Specific requirements of any pertinent approved Water Quality Management Plan shall be included.

Section 7. Plans and Specifications Content.

(a) All plans for sewerage works shall have a suitable title showing the following:

(i) Name of owner and location of project.
(ii) North arrow and drawing scale.
(iii) Name and seal or signature of the engineer.

Datum used shall be indicated. Plans shall contain a site plan of the proposed project with topography and boundaries of the project.

(b) Sewers. Plans for interceptor sewers, outfall sewers, new collector systems, force mains, sewer extensions, or any combination shall include:

(i) A detailed plan view at a legible scale of each sewer line showing all existing and proposed streets, adjacent structures, physical features, existing and proposed locations of utilities and a North arrow. The location and size of all sewer lines, manholes, cleanouts, and other appurtenances shall be indicated. Pertinent elevations shall be indicated on all appurtenances.

(ii) Profiles of all sewer lines shall be shown on the same sheet as the plan view at legible horizontal and vertical scales, with a profile of existing and finished surfaces, elevations of the sewer inverts at all manholes, and the slope of the sewer inverts at all manholes, pipe size and material, and the slope of the sewer line. The location of all special features such as inverted siphons, concrete encasements, casing pipes, elevated sewers, etc., shall be shown.

(iii) Special detail drawings, scaled and dimensioned to show the following:

(A) Details of all sewer appurtenances such as manholes, cleanouts, inverted siphons, elevated sewers, encasements, casing pipes, force main thrust blocks, outfall structures, etc.

(B) The approximate bottom of the stream, the approximate elevation of the low and high-water levels, and other topographic features at all locations where the project is at streams or lakes.

(C) Cross section drawing of the sewer’s bedding.

(D) Additional features not otherwise covered by specifications.

(iv) Location of waterlines within 30 feet (9m) horizontally shall be shown on the plan. Water lines that intersect sewers shall be shown on the profile drawings. Public and/or private water wells within 30 feet (9m) of sewer lines shall be indicated on the plans.

(c) Pumping stations, treatment works and disposal systems. Plans shall be submitted showing the relation of the proposed project to the remainder of the system. Layouts and detail plans shall show the following:

(i) Site location and layout including topographic and physical features, proposed arrangement of pumping or treatment units, existing facilities, existing and proposed piping arrangements, access drive, power supply, fencing, embankments, outfall sewer, outfall structure, and receiving stream with direction of flow.

(ii) Schematic flow diagram(s) and hydraulic profile(s) for treatment works wastewater, sludge and effluent flows.

(iii) Plan and section view(s) of the wetwell and drywell of the pumping station with specific construction details, features and pertinent elevations.

(iv) Plan and section view(s) of each treatment facility process unit with specific construction details, features and pertinent elevations. Details of each unit should include, but are not limited to, inlet and outlet devices, baffles, valves, arrangement of automatic control devices, aeration equipment, motors, sludge scrapers, sludge disposal, electrical devices or other mechanical devices.

(d) Specifications. Technical specifications shall accompany the plans for new sewers, pump stations, treatment works, disposal systems, or additions/modifications to existing systems or facilities. Where plans are for extensions to sewer systems, the specifications may be omitted, provided it is stated that the work is to be constructed under specifications authorized by the Water Quality Division office. Specifications on file must conform to these regulations.

The specifications accompanying construction drawings shall include:

(i) Identification of construction materials.

(ii) The type, size, strength, operating characteristics, rating or requirements for all mechanical and electrical equipment, including machinery, valves, piping, electrical apparatus, wiring and meters; laboratory fixtures and equipment; operating tools; special appurtenances; and chemicals where applicable.

(iii) Construction and installation procedure for materials and equipment.

(iv) Requirements and tests of materials and equipment to meet design standards.

(v) Performance tests for operation of completed works and component units.

PART B

MUNICIPAL AND DOMESTIC SEWERAGE SYSTEMS, TREATMENT WORKS, AND DISPOSAL SYSTEMS

Section 8. General. This part contains the minimum standards for the design and construction of sewerage systems, treatment works, and disposal systems for domestic and municipal wastewater. Soil absorption and land application systems are contained in other parts. All facilities shall comply with the purpose of this chapter.

Section 9. Design of Sewers.

(a) Separate sewers. Separate sewers shall be provided for collection of stormwater and wastewater. Roof, areaway, drive or foundation drains shall not be connected to sanitary sewers.

(b) Pipe materials.

(i) Wastewater characteristics. Pipe materials shall resist acid and alkaline solutions, organic solvents, and other wastewater constituents and environmental conditions encountered.

(ii) Pipe loadings. Pipe materials shall be chosen and the pipeline shall be designed to withstand all trench and superimposed surface live loads with a minimum factor of safety. Rigid pipes shall have a minimum factor of safety of 1.5, and flexible pipes shall have a minimum factor of safety of 1.25.

(iii) Soil characteristics. Pipe materials shall be chosen to resist corrosion due to aggressive soil characteristics by the soil it contacts. Iron or steel pipe shall be protected from corrosion with polyethylene encasement or cathodic protection.

(iv) Joints. Pipe joints shall be flexible, durable and designed to minimize infiltration/exfiltration and exclude roots.

(v) Performance tests. Piping shall be subjected to leakage tests. Leakage tests shall be infiltration, exfiltration, or air tests.

(A) Infiltration. Maximum of 200 gallons per inch diameter per mile per day (1200 liters/cm/km/day) with a minimum of two feet (0.6 m) of head over the top of the pipe.

(B) Exfiltration. Maximum of 200 gallons per inch diameter per mile per day (1200 liters/cm/km/day) with a minimum of two feet (0.6 m) of head over the top of the pipe.

(C) Air. Air tests shall conform to ASTM C-828-80.

(D) Deflection. Maximum five percent deflection after flexible pipe is backfilled for 30 days. A mandrel of 95 percent of pipe diameter shall be used. No mechanical pulling of mandrel is permitted.

(vi) Approved pipe material specifications. Type of commercial pipe approved for gravity sanitary systems include:

(A) Extra strength and standard strength vitrified clay pipe: ASTM C700-78a.

(B) PVC sewer pipe and fittings: ASTM D3034-80, SDR35, ASTM F679-81,or ASTM F794-83.

(C) ABS composite sewer pipe: ASTM D2680-80.

(D) Reinforced plastic mortar pipe: ASTM D3262-81.

(E) Asbestos cement nonpressure sewer pipe: ASTM C428-80.

(F) Reinforced concrete sewer pipe: ASTM C76-82.

(G) Concrete Sewer Pipe: ASTM C-14.

(H) Ductile iron sewer pipe: ASTM A746-77.

Types of commercial pipe approved for pressure sanitary sewer systems include:

(I)PVC water pipe: ASTM D2241-80, or AWWA C900.

(J) Asbestos cement pressure pipe: AWWA C400-80.

(K) Ductile iron pipe: AWWA C151-81.

(L) Glass Fiber-Reinforced Thermo-setting-Resin Pressure Pipe: AWWA C950-81.

(c) Collection piping design, construction and testing. A sewage collection line is any conduit that carries wastewater that originates from two or more separate buildings or from a single building that generates more than 2,000 gpd (7.6 m^3/d) of average daily flow.

(i) Gravity system.

(A) Depth. Sewers shall be located to protect them from freezing and frost heave as prudently possible.

(B) Size. Sewers to be aligned straight shall be eight inch (20.3 cm) diameter or larger except six inch (15.2 cm) sewers may be used in cul-de-sacs, or other dead end locations where the sewer cannot be extended in the future. Eighteen-inch (45.7 cm) or larger sewers may be laid on curves. Lines shall be sized for 200 percent of maximum daily flow or more. In the absence of data deriving maximum daily flow, the chart on Figure 1-1 shall be used to deter mine maximum daily flow.

(C) Slope. Sewers shall be laid with uniform slope between manholes. Minimum slopes shall be:

Sewer Size Inch (cm)	Minimum Slope in Feet Per 100 Feet (m/100 m)
6 (15.2)	0.60
8 (20.3)	0.40
10 (25.4)	0.28
12 (30.5)	0.22
14 (35.6)	0.17
15 (38.1)	0.15
16 (40.6)	0.14
18 (45.7)	0.12
20 (50.8)	0.11
21 (53.3)	0.10
24 (61.0)	0.08
27 (68.6)	0.067
30 (76.2)	0.058
33 (83.8)	0.051
36 (91.4)	0.046

Maximum slopes without the use of concrete anchors shall be 20 percent. The following spacing of concrete anchors shall apply to slopes greater than 20 percent:

Slopes (percent)	Concrete Anchor
20-35	36 ft (11 m)
35-50	24 ft (7.3 m)
More than 50	16 ft (4.9 m)

(D) Velocity. Minimum velocities shall be 2 fps (0.6 mps) when flowing full. Velocities greater than 10 fps (3.0 mps) require special design considerations.

(E) Increasing size. All sewer pipe size changes shall be at manholes. Pipe size shall not be decreased in the direction of flow. The energy gradient line should be maintained when a smaller sewer joins a larger one.

(F) Excavation, bedding installation, backfill.

(I) Excavation. Trench width from the trench bottom to a point one foot above the top of the pipe shall be no less than the outside diameter of the pipe plus 8 inches (20.3 cm) but not more than 24 inches (61 cm) plus the pipe O.D. The trench bottom shall be excavated for the pipe bell. All rock shall be removed within six inches (15.2 cm) of pipe. The trench shall be dewatered for all work.

(II) Bedding. Bedding shall be designed in accordance with:

(1.) Rigid pipe. Types A, B, C (Water Pollution Control Federation Manual of Practice No. 9) or ASTM C12-81.

(2.) Flexible pipe. Types I, II, III, ASTM D2321-74.

(III) Backfill. Backfill shall be performed without disturbing pipe alignment. Backfill shall not contain debris, frozen material, unstable material, or large clods. Stones greater than three inches (7.6 cm) in diameter shall not be placed within two feet (0.6 m) of pipe. Compaction shall be to a density equal to or greater than the surrounding soil.

(ii) Force mains and pressure sewers.

(A) Depth. Force mains shall be located to protect them from freezing and frost heave.

(B) Size. Force mains shall be four inches (10 cm) diameter or greater. Pressure sewer collection system piping shall be one inch (2.4 cm) minimum.

(C) Velocity. Minimum velocity shall be 2.5 fps (0.76 mps).

(D) Air release. Air release facilities shall be provided at the high point in the piping whenever the pipe crown elevation falls below the pipe invert elevation. Access to air release manholes shall not be in traffic-ways.

(E) Cleanouts. Cleanouts shall be provided at 400 foot (122 m) maximum spacing in pressure piping four-inch diameter or less.

(F) Pressure sewer systems. Pressure sewer collection systems shall be preceded by grinder pumps or septic tanks.

(G) Pressure sewer collection system pumps. Pumps shall be provided with isolation and check valves. If a septic tank is not provided before the pump, a grinder pump shall be required. Pump holding sumps shall not be steel, iron, or coated metal. The sump chamber shall be 50 gallon (189 liters) volume, minimum.

(iii) Service connections. A service connection is any conduit that carries wastewater that is not defined as a sewage collection line. Service connections shall conform to the requirements for sewage collection lines (Section 9(c)(i) and (ii)) with the following modifications:

(A) Size: minimum size shall be four inches (10.2 cm).

(B) Slope: minimum slope shall be two feet/100 feet (2 m/100 m).

(C) Flow: flow shall be determined from a fixture unit count and the sewage size based on flowing full.

(D) Connections: all service connections to sewage collection lines shall be made with a wye or tee for new construction and a tapping saddle for connection to existing collection lines.

(d) Manholes and cleanouts.

(i) Location. Manholes shall be located at all changes in pipe size, vertical or horizontal alignment, pipe intersections, and the end of lines. Maximum spacing for various line sizes are as follows:

Line Size (In)	(cm)	Maximum M.H.	Spacing
15 or less	(38 or less)	400 ft	122 m
16 - 30	(40.6 - 76)	500 ft	152 m
31 or more	(76 or more)	600 ft	183 m

Terminal sewer cleanouts may be provided at the end of sewer lines if they are not more than 150 feet (45 m) from the nearest downstream manhole. The cleanout shall be constructed using 45 degree bends to the upturned pipe coming to the surface of the ground. The diameter of the cleanout shall be the same as the pipe size. Lampholes shall not be used.

(ii) Size. Minimum manhole interior size is four feet (1.2 m).

(iii) Drop manhole. Drop manholes must be constructed where the change in elevation between two lines is greater than 24 inches (0.6 m). Concrete encasement shall be provided around the drop pipe.

(iv) Invert. Manhole inverts shall be constructed to conform to the shape of the sewer. The bench shall drain to the invert. Connections to the manhole shall be watertight and allow differential settlement between the manhole and pipe. Minimum fillet height shall be one half of the pipe diameter.

(v) Cover. The manhole cover shall be suitable to withstand all loads, including impact loading without deformation, slip or rattle. The manhole cover shall be watertight in areas subject to flooding and a bolt-down type in areas subject to unauthorized dumping or vandals.

(vi) Steps. Access to manholes shall be with portable ladders, or with cast iron manhole steps spaced at 16 inches (40.6 cm) maximum.

(vii) Materials. Manholes shall be constructed watertight and durable using cast-in-place concrete, or precast concrete with gasketed joints. Where precast concrete bases are used, the first 12 inches (30 cm) of wall will be monolithically cast with the base.

(viii) Access. A 22 inch (56 cm) minimum diameter clear opening shall be provided on all manholes. All manholes shall be located to be accessible by motorized equipment for maintenance.

(e) Special structures.

(i) Inverted siphons. Inverted siphons shall have a minimum of two six-inch (15.2 cm) barrels. The inlet and outlet shall be arranged to cause only one pipe to be used during normal flows. The minimum velocity shall be 3 fps (1 mps) at average flow, and occur at least daily. The siphon shall be designed for flushing and maintenance.

(ii) Aerial crossings. Aerial crossings shall be designed to prevent freezing, leaking, settlement, lateral movement, and damage from expansion/contraction. It shall be located with proper vertical clearances for highway vehicles and the 100 year flood.

(iii) Stream crossings. Stream crossings shall be within 10° of the perpendicular direction of the stream. Pipe shall have a minimum cover of one foot in rock, and three feet under other surfaces. The crossing shall be made with an inverted siphon or without a grade change. Pipe materials shall be steel, cast iron, or ductile iron pipe.

(f) Potable water supply protection.

(i) Cross connections. There shall be no cross connections between sewer lines and potable water lines.

(ii) Horizontal and vertical separation from water mains. Minimum horizontal separation shall be ten feet (3 m) where the water main is less than 1.5 feet (0.46 m) above the elevation of the sewer. Minimum vertical separation shall be 1.5 feet (0.46 m) at crossing. Joints in sewers at crossing shall be located at least ten feet (3 m) from water mains. The upper line of a crossing shall be specially supported. Where vertical and/or horizontal clearances cannot be maintained, the sewer shall be placed in a separate conduit pipe.

Section 10. Pumping stations.

(a) Design conditions.

(i) Total dynamic head. The total dynamic head rating of pumping units shall be based on pipe friction, pressure losses from piping entrances, exits, appurtenances (bends, valves, etc.), and static head at the rated flow.

(ii) Grit. Where no grit removal is provided ahead of the pumping station, equipment and piping design shall minimize the deleterious effects of grit in the sewage.

(iii) Screening. Screens or comminutors shall be provided ahead of pumps where the average daily flow is in excess of 1.0 mgd (3,784 m^3/d) to prevent solids larger than 2 ½ inches (6.4 cm) from entering the pump.

(iv) Minimum pump opening. Except for grinder pumps, raw sewage pumps shall be capable of passing spheres of at least three inches (7.6 cm) in diameter. Pump suction and discharge piping in all sewage and sludge services shall be no smaller than four inches in diameter (10 cm).

(v) Pump cycle time. Intermittently operated pumps shall be designed to start no more often than once every ten minutes at the minimum operating interval.

(vi) Removal of equipment. Pumping stations shall be designed to permit removal of all items of equipment including pumps, valves, electrical and control equipment. Equipment located in wetwells shall be removable without entering the wetwell.

(vii) Surge control. Piping systems shall be designed to withstand the maximum possible surge (water hammer) from the pumping station, or adequate surge control provided to protect the piping. Pressure relief valves are not acceptable surge control.

(viii) Net positive suction head. Pumps shall be selected so that the net positive suction head required at maximum flow (NPSHR) is less than the NPSH available minus four feet (1.2 m) based on the hydraulic conditions and altitude of the pumping station.

(ix) Uplift. The pumping station chambers shall resist hydrostatic uplift pressures. Siting requirements.

(b) Siting requirements.

(i) Access. Pumping stations shall be located so that they are readily accessible to operating and maintenance personnel at all times of day or night, and under all weather conditions.

Pumping stations shall be located off of traffic ways.

(ii) Flood protection. Pumping stations shall be designed so there is no equipment or structural damage in the 100 year flood, and so the pumping station's operation is uninterrupted by the 25 year flood.

(iii) Security. The pumping station shall be designed to discourage unauthorized entry.

(c) Pumping station types.

(i) Dry wells.

(A) Access. Pumping station dry wells and equipment rooms shall be accessible for equipment inspection, operation and maintenance. Ladder and stair dimensions, locations of landings, and structural design shall comply with the Wyoming OHSA (1982). Equipment shall be removable from pumping stations without making structural changes to the station.

(B) Separation from wetwell. Dry wells and equipment rooms shall be completely separated from wetwells with no hatches, untrapped drains, or other connecting accessways.

(C) Dewatering. Dry pits and below-grade equipment rooms shall be provided with sump pumps sized to remove infiltration of water during normal seepage and leakage.

(ii) Wetwell design. Wetwells shall be designed to prevent vortexing and unstable pump operation. Pumps shall be located below the minimum water level, except suction lift pumps. Suction intakes shall be bell-mouthed. Provisions shall be made for isolating, bypassing and/or dewatering portions of the wetwell for maintenance. Hopper walls of wetwells shall be sloped at no less than 1.75 vertical to 1 horizontal.

(iii) Submersible pumping stations. Submersible pumping stations shall be designed specifically for totally submerged operation and so that pumps may be readily removed from the wetwell without dewatering the wetwell or disconnecting piping in the wetwell. Submersible pumps shall have an adequate means of indicating motor seal failure. Electrical equipment shall be suitable for Class 1, Division 1, Groups C and D hazardous environments, as defined in the National Electrical Code (1982).

(iv) Suction lift. Pumping stations utilizing suction lift pumps shall have adequate priming means to prime the pumps quickly and shall be designed for priming the pumps when the water level in the wetwell is one foot (0.3 m) below the lead pump starting elevation in the suction wetwell, and for maintaining prime when the wetwell level is one foot (0.3 m) below the lead pump stopping level. Valving shall not be located in the wetwell.

(v) Pneumatic ejectors. Pneumatic ejectors shall be limited to design flows equivalent to 25 residential connections. One standby compressor shall be provided.

(vi) Grinder pumps. Grinder pumps shall be limited to design flows equivalent to 25 residential connections.

(d) Piping and valves.

(i) Suction.

(A) Suction intake. Suctions shall be located so the pump is below the minimum water level. Suction intakes shall be bell-mouthed. Suction intakes shall be located against the far wall from the wetwell inlet.

(ii) Piping.

(A) Size. Sewage and sludge piping shall be no smaller than four inches (10.2 cm) diameter, except as required for metering, or where grinder pumps are provided.

(B) Velocity. Piping and pumping systems shall be designed to maintain a minimum velocity of 2.5 fps (0.76 mps), and a maximum velocity of 5 fps (1.52 mps) for suction piping.

(C) Design pressure. Piping shall be designed for the maximum operating pressure and for the maximum value of any surges (water hammer) which may occur, taking into account any surge protection provided.

(D) Restraints. Piping shall be blocked and otherwise restrained to prevent damaging movement under the maximum anticipated pressure (including test pressure).

(E) Cleanouts. Cleanouts shall be provided in pump suctions.

(iii) Valves. Valves shall not be located in wetwells.

(A) Shutoff. Except on submersible pumps and suction lift pumps, a shutoff valve shall be provided on the suction of all pumps. A shutoff valve shall be provided on the discharge of all pumps, regardless of type or service.

(B) Check. All pumps shall be provided with a check valve located between the pump and the discharge shutoff valve, except where arranged so that backflow is not possible under normal operating conditions.

(C) Air release. Air release valves shall be provided at the high points in piping whenever the pipe crown elevation falls below the pipe invert elevation. On sewage lines, air or air and vacuum release valves shall be specifically designed for sewage service.

(e) Reliability.

(i) Multiple units. Every pumping station shall have not less than two pumping units. The number of units and their size shall be sufficient to permit pumping the maximum design flow with the largest pumping unit out of service.

(ii) One of the following shall be provided:

(A) Alternative power source. Where the pumping station serves more than 50 residential units, alternative power shall be provided. Alternative power shall be permanently installed or portable engine generator sets, permanently installed or portable engine driven pumps or a separate, independent utility source provided. Where manual starting is required, sufficient storage shall be provided to allow notifying the operator and performing whatever tasks are necessary to get the pumping station in service. Where permanently installed engine driven equipment is provided, sufficient fuel shall be provided for at least eight hours operation under the maximum flow condition. Where more than one pumping station is affected by a power outage and portable equipment is planned for alternative power source, sufficient portable equipment shall be provided to provide alternative power to all pumping stations under maximum flow conditions.

(B) Generators. Generators shall be sized to permit starting the largest pump in the pumping station with all other pumps except one running. If the generator is not capable of starting all pumps simultaneous ly, suitable controls shall be provided to stagger the pump starts to remain within the capabilities of the equipment. Generators shall be diesel-fired, natural gas-fired or bottled gas-fired. The use of gasoline or digester gas-fired generators for permanently installed standby service is unacceptable. Gasoline-fired portable generators are accept able.

(C) Engine driving pumps. Engine driven pumps shall be sized for maximum design flow. Diesel, natural gas and bottled gas are acceptable fuels for portable engines only. Digester gas is unacceptable for standby fuel. Quick connecting couplings shall be provided for portable engine driven pumps.

(D) Storage. Wastewater storage may be provided in the form of underground storage or surface ponds or tanks in lieu of alternative power supplies. Storage shall be sized for the maximum anticipated power outage, but not less than 24 hours at average design flow. Storage shall be water tight and arranged to drain back to the pumping station wetwell.

(f) Electrical.

(i) Equipment location. All electrical equipment, including motors, motor starters and controls shall be located so as to be undamaged by the 100 year flood.

(ii) Controls. Controls shall include a separate start/stop device for each pump or for each pumping position in the control sequence. Controls shall be arranged so that the failure of any one control system component will affect only the operation of one pumping unit. Manual override shall be provided for normal pump operating control.

(iii) Code requirements. All electrical work shall comply with the National Electrical Code as adopted and amended by the Wyoming Department of Fire Prevention and Electrical Safety. Electrical equipment in enclosed wetwells which may be subject to explosive concentration of hazardous gases or flammable fluids, including all raw sewage wetwells, shall comply with the NEC requirements for Class 1, Division 1, Groups C and D areas.

(iv) Alarms. An alarm system shall be provided for each pumping station. As a minimum, alarms shall include high wetwell level and high water level in the dry well. For pumping stations having a capacity of 0.5 mgd (1890 m^3/d) or more, the alarm shall be telemetered to a facility that is manned 24 hours a day. For pumping stations having a capacity of 0.5 mgd (1890 m^3/d) or less, an audio and visual alarm shall be provided in a conspicuous location.

(g) Safety.

(i) Ventilation. All accessible pumping station areas shall be ventilated. Ventilation may be continuous or intermittent. If intermittent, ventilation in areas normally visited by operating personnel shall be started automatically at not greater than 30 minute intervals. permanently installed dry well ventilation shall provide at least six air changes per hour if continuous, and 12 air changes per hour if intermittent. Permanently installed wetwell ventilation shall provide 12 complete air changes per hour if continuous, and 30 complete air changes per hour if intermittent. Wetwell ventilation shall be positive pressure, forcing air into the wetwell rather than exhaustion from it. All ventilation equipment shall be of a non-sparking design. Intermittent ventilating equipment shall insure starting upon entry of operating personnel. Wetwells may be ventilated by gravity means if normal access by operating personnel is unnecessary. Wetwells that are accessed infrequently shall be designed to permit the use of portable blowers that will exhaust the space and continue to supply fresh air during access periods.

(ii) Hoists. Where required for removing equipment, hoists shall be rated for not less than 50 percent more than the weight of the heaviest single item to be lifted by the hoist.

(iii) Lighting. Lighting levels shall be sufficient to permit safe operation and maintenance of all equipment within the pumping station, but not less than 30 foot-candles. All areas shall be lit in such a manner that the failure of one lighting fixture or lamp will not cause the area to be completely dark.

(iv) Equipment guards. Provide shields to protect from rotating or moving machinery.

(v) Warning signs. Provide warning signs for nonpotable water, electrical hazards, chemical hazards, or other unsafe features. Warning signs shall be permanently attached to the structure or appropriate equipment.

(vi) Safety. Comply with the Wyoming Occupational Health and Safety Rules and Regulations.

Section 11. General Treatment Plant Considerations.

(a) Surface water protection. Discharges to surface waters shall meet or exceed quality limitations in the National Pollution Discharge Elimination System Permit. Plant configurations and piping shall be arranged to avoid the bypassing of process units that could result in inadequately treated sewage reaching the receiving surface water.

(b) Groundwater protection. Seepage and/or discharge to groundwater shall comply with Chapter VIII of the Water Quality Regulations. Plan configurations and piping shall be arranged to avoid the bypassing of process units that could result in inadequately treated sewage reaching the groundwater.

(c) Siting requirements.

(i) Isolation. Treatment facilities shall be located to minimize public and private nuisances and health hazards on inhabited areas or residential areas. Where treatment plant siting does potentially affect inhabited areas, appropriate measures to minimize nuisances or hazards shall be incorporated in the design.

(ii) Flood protection. All treatment process structures, mechanical equipment, and electrical equipment shall be protected from the 100 year flood. The treatment facilities shall remain fully operational and accessible during the 25 year flood.

(d) Hydraulic and treatment reliability.

(i) Alternative power source. All treatment plants shall have an alternative source of power to provide reliable pumping and disinfection of sewage if required. The alternative source of power shall be sized to provide the capability to pump design maximum day flow rates through the treatment process and to disinfect the sewage if necessary. Acceptable alternative power sources include:

(A) A diesel, natural gas, or propane fueled engine generator.

(B) A second independent electrical supply.

(C) Storage of sewage and subsequent treatment.

(ii) Bypass treatment units. Complete by-passing of treatment units is prohibited. Provide means to bypass any duplicate process unit or single unit where adequate downstream process capability is provided. Sewage shall be treated in parallel singular units and/or subsequent processes.

(iii) Multiple units. For average design flows greater than 100,000 gpd (378 m^3/d), more than one unit of each unit process shall be provided. For average design flows of less than 100,000 gpd (378 m^3/d), one unit of each unit process may be provided if electrical or mechanical equipment or diffusers can be removed while the unit is in operation, or if the unit can be compartmentalized to permit access. There shall be no provision to bypass the entire plant nor shall bypass provisions be made that will allow inadequately treated sewage to reach the ground or surface waters.

Where more than one parallel unit is provided, positive means of dividing the flow proportionally between units shall be included (such as splitter weirs or valves and meters).

(iv) Multiple equipment. Mechanical process equipment shall be provided in multiple units. All pumping functions shall include sufficient pumping capacity that the peak flow can be pumped with the largest single unit not in service. Blowers and mechanical aerators for process aeration shall include sufficient capacity that the maximum day design capacity can be delivered with the largest single unit not in service. Other equipment shall have standby units where their function is critical to the treatment process.

(e) Electrical.

(i) Equipment location. Service transformers and other critical electrical equipment shall be located above the 100 year flood and above grade. Transformers shall be located in a manner that they are remote from or protected by substantial barriers from traffic. Motor controls shall be located in superstructures and in rooms that do not contain sewage, chemical processes, or corrosive atmospheres.

(ii) Code requirements. All electrical work shall comply with the National Electrical Code as enacted and amended by the Wyoming Department of Fire Prevention and Electrical Safety. Areas in which the occurrence of explosive concentrations of hazardous gases or flammable fluids can occur Class 1, groups C and

D, Division 1 locations shall be designed for hazardous locations in accordance with the National Electrical Code.

(f) Structural.

(i) Construction materials. Construction materials shall be selected, apportioned, and/or protected to provide water tightness, corrosion protection, and resistance to weather variations.

(ii) Coatings. Coatings used to protect structures, equipment and piping shall be suitable for atmospheres containing hydrogen sulfide and volatile organics. Surfaces exposed in chemical areas shall be protected from chemical attack. Concrete surfaces in confined spaces containing sewage shall be protected. Paints containing lead or mercury shall not be used.

(iii) Geological conditions. Structural design shall consider the seismic zone, groundwater and soil support. Soils investigations shall be made, or adequate previous soils investigations shall be available to develop structural design.

(g) Safety. The Wyoming Occupational Health and Safety Rules and Regulations shall be complied with. The following items shall also be provided:

(i) Instruction manuals. Instruction manuals shall be provided for all mechanical and electrical equipment describing operation, maintenance, and safety.

(ii) Handrails. In addition to all Wyoming OSHA requirements, barriers around treatment basins shall be provided.

(iii) Warning Signs. Provide warning signs for nonpotable water, electrical hazards, chemical hazards, or other unsafe features. Warning signs shall be permanently attached to the structure or appropriate equipment.

(iv) Equipment guards. Provide shields to protect from rotating or moving machinery.

(v) Lighting. Provisions shall be made to light walkways, paths, and other accessways around basins, in buildings and on the site. All areas shall be lit in a manner that the failure of one lighting fixture will not cause an area to be dark, or the loss of power will not cause a room or enclosed area to be dark.

(vi) Climate conditions. Design of facilities such as exposed stairs, walkways, and sidewalks shall include nonskid surfaces.

(h) Instrumentation.

(i) Location. A flow measuring device shall be provided for the plant effluent unless it is a mechanical plant where an influent flow measuring device will be acceptable.

(ii) Type. For plants having an average design flow of 50,000 gpd (189 m^3/d) or more, the flow measuring device shall provide recording of instantaneous flow rate, enable calculation of average daily flow rate and have provisions for calibration and correction.

(iii) Controls. Automatic controls shall be designed to permit manual override.

(iv) Alarms. Conditions that may affect discharge quality or personnel or public safety shall be alarmed at an attended location.

(i) Sampling. Access shall be provided to sample untreated wastewater ahead of the treatment facilities prior to adding any process return flows, and sampling of the effluent after all treatment process units, but before discharge to the receiving stream. An automatic sampler that composites samples in proportion to the flow rate on the effluent shall be provided if required by the NPDES permit.

(j) Ventilation. All enclosed spaces shall be provided with forced ventilation, excepting pumping station wetwells, scum pits, anaerobic process units, and man-holes. In areas where there are open sewage channels, wet pits exposed to the room or process units without gas tight enclosures, ventilation shall be provided to maintain a higher pressure in the room than atmospheric and shall provide 12 air changes per hour. In equipment rooms, ventilation shall be provided to limit the temperature rise in the room to less than 15° F (8° C) above ambient, but not less than six air changes per hour. Rooms housing chlorine storage and/or feeders shall have provisions for exhausting the room contents in two minutes and continuous ventilation to provide 12 air changes per hour.

(k) Dewatering of treatment units. All treatment units, channels, housing screens, or other embedded equipment, and wetwells shall be provided with drains or sumps that facilitate draining the unit for access and maintenance. Drainage shall be to upstream process units. Basin slabs shall be designed to successfully resist the hydrostatic uplift pressure or relief valves shall be provided.

(l) Cold weather protection. All equipment including pumps, bar screens, grit washers, electrical equipment and other equipment not required to be in or on open basins (such as clarifier drives and surface aerators) shall be housed in heated, lighted, and ventilated structures. Structure entrances shall be above grade. Piping shall be buried below frost level, placed in heated structures, or provided with heat and insulated. Walkways shall be located away from areas of spray and/or ice buildup.

(m) Chemical storage. All chemical storage shall be housed or buried. Areas designated for storage of specific chemicals shall be separated from areas designated for other reactive chemicals. Liquid storage containers shall be isolated from other portions of the structure by a curb that will contain and/or drain ruptured tank contents. Concrete floors, walls and curbs in chemical storage and feed areas shall be coated to protect the concrete from aggressive chemicals. Floors in polymer feed and storage areas shall be provided with nonslip surfaces. Rooms for chlorine storage and feed equipment shall be gas tight and be provided with entry from outdoors. All toxic chemical storage areas shall be provided with lighting and ventilation that are switched from outside the room, and windows to permit viewing the room from outside.

(n) Design capacities.

(i) Flow. In the absence of flow measurement information, the design average daily flow shall be based on a per capita daily flow rate of 100 gallons (378 liters). Allowances shall be made for return flows from digesters, sludge thickeners and the like, and the infiltration and wet weather inflow into older sewer systems. Significant industrial waste flows shall be added to the per capita flow rate.

(ii) Organic loads. In the absence of wastewater strength data, domestic waste treatment design shall be based on a per capita daily BOD and suspended solids contribution of 0.22 lb (0.10 kg) and 0.25 lb (0.11 kg), respectively. The influence of sidestream return flows and significantly strong industrial wastes shall be considered and included in the design where applicable.

Section 12. Pretreatment.

(a) Flow equalization.

(i) Storage requirements. Where mechanical plants experience large diurnal variations in flow rate which will cause mechanical, hydraulic, or biological process upsets, flow equalization shall be provided.

(ii) Location. Pretreatment facilities, such as bar screens, comminutors and grit chambers, and where possible, primary clarifiers should be located ahead of the equalization basin.

(iii) Drainage and cleaning. Provisions shall be made to isolate, drain and clean the basin(s).

(iv) Aeration and mixing. Aeration shall be sufficient to maintain a minimum of 2.0 mg/L of dissolved oxygen in the basin at all times. Air supply rates shall be a minimum of 10 cfm/ 1,000 cubic feet (10 m^3/min/1000 m^3) of volume for primary treated wastewater and 20 cfm/1,000 cubic feet (20 m^3/min/1000 m^3) of volume for raw or screened waste water.

(v) Controls. Controls shall be provided to control the flow rate from the flow equalization basin. Flow measurement devices shall be provided.

(b) Screens.

(i) Location. Coarse screens shall be the first unit in the treatment process. Screens shall be housed. The housing shall be heated and ventilated. Access shall be separated from other enclosed spaces. Housing shall be designed for hazardous location (National Electrical Code, Class 1, Groups C and D, Division 1 locations).

(ii) Capacity. The screen capacity shall be capable of handling the maximum anticipated peak hourly flow including inflow and infiltration.

(iii) Types.

(A) Mechanically cleaned. Bar screens shall be mechanically cleaned if the removal of the daily accumulation of screenings results in surging of the flow. Manually cleaned screens shall be provided in parallel channels to permit removal of the mechanically cleaned screen from service. Bars shall be between 45° and 90° measured from the horizontal.

(B) Manually cleaned. Manually cleaned bar screens shall be used for bypass of a mechanically cleaned screen or for treatment installations having an average design capacity of less than 100,000 gpd (378 m^3/day). Bars shall be between 30° to 45° from the vertical.

(iv) Bar spacing. Clear spacing on mechanically cleaned bar screens shall range from ½ inch to 1 3/4 inches (1.27 cm to 4.45 cm). Manually cleaned screens shall have a range from one to 1 3/4 inches (2.54 cm to 4.45 cm) clear spacing. Coarse screens may have spacing greater than 1 3/4 inches (4.45 cm).

(v) Velocities. Maximum approach velocity at average flows for a mechanically cleaned screen shall be 3.0 fps (0.91 mps). Maximum velocity for a manually cleaned bar screen shall be 1.5 fps (0.46 mps). Minimum velocities shall be1.25 fps (0.38 mps).

(vi) Channel. Channels shall be designed to eliminate deposition and permit draining. The channel shall contain a rock trap ahead of mechanically cleaned screens. Multiple channels shall be designed to allow uniform and equal flow to the screens. Slide gates shall be provided to permit isolating sections of channel containing screens.

(vii) Controls. Cleaning operation shall be controlled by one or several of the following methods.

(A) Timers. A timer to start the cleaning operation, and a device to stop the cleaning operation after one cycle.

(B) Differential head. Cleaning device starts and stops on differential head across screen.

(C) High level switch. Cleaning device starts on high level and runs for predetermined length of time.

All screens shall have manual override capability. All controls shall be suitable for use in hazardous location (National Electrical Code, Class 1, Groups C and D, Division 1 locations).

(viii) Handling. Screenings receptacles shall be designed to contain a minimum of one day's screenings. Manually cleaned bar screens shall include an easily accessible and safe working platform. All handling areas should be well drained.

(ix) Disposal. Screenings shall be disposed of in a manner approved by the Department of Environmental Quality, Solid Waste Management section. Grinding of screenings and return to the wastewater flow is not accept able.

(c) Comminutors.

(i) Location. When used, comminutors shall be located downstream of a coarse screen. Where grit removal is provided, comminutors shall be located downstream.

(ii) Capacity. Comminution or screening capacity shall be adequate with the largest comminutor out of service.

(iii) Number of units. Wherever comminutors are used, a bypass, manually cleaned bar screen shall be in stalled.

(iv) Channel. Provide stop plates or similar devices to permit isolating a comminutor for maintenance. Provide drainage and washdown facilities. Where grit removal is not provided upstream, provide a gravel trap upstream of each comminutor.

(v) Bypass. An emergency bypass with a manually cleaned bar screen shall be provided. All flow exceeding the operating capacity of the comminutor(s) shall be automatically directed to the emergency bypass.

(vi) Controls. The comminutor shall run continuously. All electrical controls shall be NEC Class 1, Groups C and D, Division 1 rated.

(d) Grit removal and disposal.

(i) Where required. Grit removal shall be provided either by providing for its accumulation in other process units or by removal in a specially designed basin. Where accumulation is provided in other process units, duplicate units shall be provided to permit removal of grit.

(ii) Location. Grit removal shall be placed after bar screens or racks, but before comminutors and other treatment units. Where grit removal facilities can be located at grade, they shall be upstream of raw sewage pumping stations. Grit basins may be located outdoors with proper precautions against freezing, but all grit conveying, washing and handling facilities shall be located indoors.

(iii) Capacity. Grit removal devices shall be designed to effectively remove grit at the peak instantaneous flow rate. The grit handling capacity shall be a minimum of 15 cubic feet per million gallons (1.12 m^3/10,000 m^3).

(iv) Number of units. A minimum of one mechanically cleaned unit and a bypass pipe or channel shall be provided for plants serving separate sewers. Five hundred thousand gallons per day (500,000 gpd) (1891.5 m^3/d) plants or smaller may have a manually cleaned unit and bypass. Plants larger than 1.0 mgd (3784 m^3/d), shall have two mechanically cleaned units with capability to isolate each one.

(v) Type.

(A) Aerated.

(I) Air requirements. Air supply must be controllable and capable of varying from 10 to 40 cfm/1,000 cubic feet (10 to 40 m^3/m/1,000 m^3) of basin. Air diffusers shall be located above the tank bottom and positioned for adequate mixing.

(II) Equipment requirements. The tank shall be sized for a three minute retention time at peak flows. Grit shall be collected to a hopper for removal by 60 or greater sloped sides or mechanical equipment. The inlet and outlet shall be designed to avoid shortcircuiting. Air diffusers shall be removable without taking the basin out of service.

(B) Gravity chamber. Horizontal channel grit basins shall have an outlet control weir and specially shaped channel to maintain velocities from 0.8 to 1.3 fps (0.24 to 0.4 m/s) over the anticipated range of flows. Square basins shall be designed for an overflow rate of 30,000 gpd/sq ft (1220 m^3/m^2/d) at the peak instantaneous flow rate.

(vi) Method of grit removal. Grit removal facilities located in pits six feet (1.8 m) or deeper and for plants larger than 500,000 gpd (1891.5 m^3/d) shall be provided with mechanical equipment for moving grit to ground level.

Plants having an average design capacity less than 100,000 gpd (378 m^3/d) may be provided with manually cleaned grit basins.

(vii) Drains. Each unit in the grit facility shall be capable of being dewatered.

(viii) Grit disposal. Grit disposal methods shall be approved by the Department of Environmental Quality, Solid Waste Management Office.

Section 13. Primary Treatment.

(a) Sedimentation.

(i) Number of basins. For plants having an average design capacity greater than 100,000 gpd (378.4 m^3/d) and where primary settling is provided, multiple units capable of independent operation shall be provided.

(ii) Design parameters.

(A) Performance. Unless full-scale data is available, primary settling shall be assumed to remove one third of the influent BOD and 55 percent of the influent suspended solids. It is unacceptable to return waste activated sludge to the primary clarifier.

(B) Water depth. The minimum side water depth shall be seven feet (2.1 m).

(C) Surface overflow rates. Surface overflow rates shall not exceed 1,000 gpd/sq ft (41 m^3/m^2d) of surface area at the average design flow nor 1,500 gpd/sq ft (61 m^3/m^2d) of surface area at the maximum day flow rate. Maximum day flow is the highest flow over a 24 hour period that is projected to occur during the design year.

(D) Weir loading rates. Circular basins (or basins with center inlets) shall be provided with a full periphery weir. Rectangular basins shall be provided with end weirs that provide less than 80,000 gpd/ft (9,920 m^3/m d) weir hydraulic loading at peak instantaneous flow rates.

(iii) Clarifier inlet and outlet.

(A) General. Clarifier inlet structures shall be designed to achieve the following:

(I) Dissipate the inlet kinetic energy.

(II) Distribute the flow evenly into the tank.

(III) Prevent short circuiting.

Inlet channels or piping shall be designed for minimum velocities of one fps (0.3 mps). Where minimum velocities are less, mixing, flushing or other means of resuspending solids shall be provided.

Circular basins shall be provided with symmetrical baffling to distribute flow equally in all radial directions.

Rectangular basins shall be provided with inlet parts uniformly distributed along the entire end of the basin and shall be provided with baffles.

(B) Weirs. Weir plates shall be adjustable for leveling and sealed against the effluent channel.

(C) Baffles. Provide scum baffles at the water surface to intercept all floating materials and scum prior to the weir. Baffles should extend three inches (7.6 cm) above the weir plate elevation and eight inches (20.3 cm) below the water surface.

(D) Clarifier effluent channel.

(I) Size. The effluent channel shall be sized to prevent weir submergence at the peak hourly flow.

(E) Freeboard. The outer walls of sedimentation tanks shall extend at least six inches (0.15 m) above the surrounding ground and shall provide at least 12 inches (0.3 m) of freeboard to the water surface. Where basin walls do not extend four feet (1.2 m) above the surrounding ground, a fence or suitable barrier to prevent debris from entering the basin shall be provided.

(F) Basin equipment and access. Provide walkways and accessways to collector drive units, effluent launders and manual skimmer. Handrail shall be provided.

(b) Fine screens.

(i) Number of units. A minimum of two units shall be provided. Multiple units shall be capable of independent operation. With the largest unit out of service, the remaining units shall be capable of passing the peak flow rate.

(ii) Flow distribution. Positive means of flow distribution shall be provided ahead of the screens to ensure even loading and hydraulic flows.

(iii) Design parameters.

(A) Performance. In the absence of pilot plant data, the removal efficiency of fine screens shall be assumed to be zero percent removal of BOD5 and 15 percent removal of suspended solids.

(B) Preliminary treatment requirement. Prior to the fine screens, removal of large debris shall be provided by coarse screens. Comminution shall not be provided ahead of screens.

(iv) Screenings storage and disposal. Screens with openings of 0.10 inch (2.5 mm) or more shall be disposed of directly to landfill in accordance with the requirements of the Department of Environmental Quality, Solid Waste Management Office. Screens with openings less than 0.10 inch (2.5 mm) shall discharge the screenings (primary sludge) to sludge handling system for organic stabilization.

(v) Cleaning and maintenance. Provide facilities to permit regular cleaning of screens with a high pressure, hot water or steam system.

(vi) Controls. For rotating screens, each screen or series of screens shall be provided with an overflow. An alarm shall be provided when overflowing.

(c) Sludge handling.

(i) Sludge removal. Mechanical sludge collection equipment is required for all primary settling basins. The sludge collection rake arms or flights and the drive assembly shall be designed to withstand the maximum anticipated loads and move sludge to the hopper.

(ii) Scum removal. Provide scum collection and removal facilities for all primary settling basins. Scum shall be removed from the liquid process and not returned.

(iii) Sludge hopper. The minimum side slope of the hopper shall be 1.7 vertical to 1.0 horizontal. Hopper bottoms shall have a maximum dimension of two feet (0.61 m). The sludge removal pipe shall be flush with the hopper bottom, and have a minimum diameter of six inches (15.2 cm).

(iv) Scum box. The scum box shall be located outside and immediately adjacent to the scum collection point (beaching plate). The beaching plate shall be located on the opposite side of the basin from the prevailing wind. Provide for mixing the contents of the scum box, such as a mechanical mixer or air diffusion. Provide access and wash water for washing the scum box.

(v) Controls.

(A) Primary settling sludge facilities. Primary sludge and scum shall be removed using positive displacement pumps. Each basin shall have a separately activated and controlled pump. (The standby pumps may be shared by more than one basin.) Pumps shall be on timers and the pumps should be designed to initiate sludge removal two or more times per hour.

Include devices on the primary sludge piping for sampling the primary sludge flow.

(B) Primary screen sludge facilities. Where sludge pumping is provided, include a means to shut off the pump when insufficient material is being supplied to the pump suction. The controls for the pump shall be designed to match the pumping rate to quantity of sludge. Where conveyors are used, they shall run continuously and alarm when off.

Section 14. Activated Sludge.

(a) Pretreatment. Where primary clarification is not provided, screening of the raw sewage to remove debris larger than 3/4 inch (1.9 cm) shall be provided. The screened material shall not be returned to the plant process. Where primary clarifiers are not provided, cleanouts, grinders, or other similar provisions shall be made in the return sludge piping.

(b) Loading rates. Activated sludge systems shall be designed to accommodate peak day loadings at the design year. Permissible loadings are presented in the following table. Where raw sewage BOD5 is less than 200 mg/L, detention times may be reduced.

(i) Conventional, including complete mix, plug flow, step aeration

		Average Day
Detention (*) hrs,	Following primary clarifiers	6 minimum
	Without primary clarifiers	9 minimum
Organic Loading:	lb/1,000 cu ft/day ($kg/1000\ m^3d$)	35 maximum (560
MLSS, mg/L		1,000 - 3,000

(ii) Contact stabilization.

Detention (*) hrs,		
Contact Zone		0.5 - 3
Sludge Stabilization Zone		6 minimum
		Average Day
Organic Loading (**)	lb/1,000 cu ft/day ($kg/1000\ m^3d$)	50 (800)
MLSS, mg/L		
Contact Zone		1,000 - 3,000
Sludge Stabilization Zone		5,000 - 10,000

(iii) Extended aeration, including oxidation ditch.

Detention (*) hrs,	16 minimum
Organic Loading, lb/1,000 cu ft/day ($kg/1000\ m^3d$)	15 maximum (240)
MLSS, mg/L	1,000 - 3,000

(*) Based on average day raw sewage flow rate exclusive of recirculation flow.

(**) Based on contact zone and sludge stabilization zone combined.

(c) Number of basins. For all design average flows in excess of 0.1 mgd (378 m^3/d), two or more aeration basins shall be provided. For flows less than 0.1 mgd (378 m^3/d), one aeration basin may be provided if the aeration devices can be readily removed while the basin is in operation.

(d) Configuration. The basin configuration shall promote mixing, transfer of oxygen, and minimize stagnant zones.

(e) Freeboard. The walls of the aeration shall extend above the normal water surface to provide a minimum freeboard as follows:

	Minimum Freeboard (*) inches	cm
Diffused air	18	45.7
Surface aeration	48	121.9
Submerged turbine	18	45.7
Brush aeration, less than 10 feet from aeration device	48	121.9
Brush aeration, 10 feet or more from aeration device	18	45.7
Surface aeration, where aeration is 30 or more feet from basin wall	36	91.40

(*) Vertical walls. For sloped walls, the runup effect shall be considered.

(f) Inlet and outlet conditions. Inlets may be submerged and shall be baffled or directed away from the outlet to minimize shortcircuiting. Outlets shall be of the overflow type to discourage buildup of foam and floatables on the aeration basins. Pipe and channels shall provide a minimum velocity of 0.5 fps (0.15 m/s).

(g) Aeration requirements.

(i) Carbonaceous BOD? . When it can be shown that nitrification will not occur in the activated sludge process, the aeration devices may be sized to meet only the carbonaceous oxygen demand. The oxygen provided by the aeration device shall be selected to be adequate for the projected maximum day loading. In the absence of other data, an oxygen requirement of two times the average design day BOD? to the aeration basin shall be used.

(ii) Nitrification. Where nitrification is required to meet the effluent requirements or where the process cannot be operated to prevent nitrification, the aeration requirements will be selected to provide oxygen for both carbonaceous BOD? and nitrification on the projected maximum day loading. In the absence of other data, an oxygen requirement of two times the average design day BOD5 plus 7.5 times the average day ammonia nitrogen to the aeration basin shall be used.

(iii) Minimum dissolved oxygen. Oxygen supply shall be selected to transfer the design quantity during the maximum day loading while maintaining an aeration basin dissolved oxygen of 2.0 mg/L. The oxygen supply shall be designed for the specific site considering all factors that affect oxygen transfer efficiency.

(h) Mechanical aeration. Mechanical surface aerators shall be designed to maintain all organics in suspension, enhance the oxygen transfer capability of the unit, and minimize mist and spray that escape the basin. Drive units shall be protected from freezing mist and spray.

(i) Diffused aeration.

(i) Diffuser requirements. The number and location of diffusers shall be selected to distribute the design air quantity for efficient aeration and mixing. Diffusers in a basin shall be grouped on control valves to permit varying the air supply to different parts of the basin. Oxygen transfer efficiencies used for design purposes shall be conservatively selected, based on experimentally determined transfer rates of generically similar diffusers. The effect of transferring oxygen to wastewater, in lieu of water, and the effect of altitude shall be considered. The aeration basin mid-depth shall be used to determine the oxygen saturation concentration. Differential head loss to individual diffuser inlets shall not be more than 0.2 psi (14 gm/cm^2).

(ii) Blower requirements. Blowers shall be sized to provide the air requirements for the aeration basins and other plant uses of low pressure air. The inlet air to the blowers shall be filtered or otherwise conditioned to effectively remove dust and other particulate material. Removal of particulate material for fine bubble diffusers shall be designed for 95 percent of 0.3 micron. Filters designed for blowers shall be easily replaceable. Blower intakes shall be located to avoid clogging from drifting snow. Blowers shall be housed. The housing shall be ventilated to prevent more than a 15° F (8° C) temperature rise with all blowers operating, excepting the standby blower. The housing, blowers, and blower piping shall be arranged to permit removal of individual blowers while all other blowers are operating. Noise attenuating materials shall be used in the building interior. Blower systems shall be designed to permit varying the volume of air delivered. Blower motors shall be of a size to operate the blower throughout the range of ambient air temperatures experienced at the plant site.

(j) Sludge recirculation and waste.

(i) Rates. Sludge recirculation from the secondary settling basin to the aeration basin shall be variable within 25 to 100 percent of the average design flow. Sludge wasting from the activated sludge process may be from the mixed liquor or the return sludge. Sludge wasting shall be variable to enable wasting ½ of the total system solids in one day to zero wasting.

(k) Equipment requirements.

(i) Return sludge. Return sludge pumping shall be variable. The return sludge rate from each secondary settling unit and the rate to each aeration basin shall be controllable. Pumps shall be housed in heated, ventilated space. The pump floor shall be sloped and drained. Valves shall permit isolating each pump. Pumps and piping shall be arranged to allow ready removal of each pump. Check valves shall be provided where backflow through the pump could occur. Check valves shall be located in the horizontal.

Pump suction and discharge shall be three inches (7.6 cm) minimum. Sludge piping shall be four inches (10.2 cm) or larger. Cleanouts and couplings shall be provided in sludge piping to enable cleaning the pipe or to remove pumping equipment. All pipe high points shall be provided with air releases. All sludge piping shall be metallic material. Should air lift pumps be used, the units shall be designed with a minimum of 80 percent static submergence.

(ii) Waste sludge. If separate waste sludge pumps are provided, the rate shall be controlled by timers or variable speed devices. Pumping units shall be housed in heated, ventilated space, with sloped and drained floors. Pump suction and discharge piping shall be three inches (7.6 cm) minimum. Sludge piping shall be four inches (10.2 cm) or larger, except short, easily removable sections that may be required to maintain velocities above one fps (0.3 mps), or for use in conjunction with meters.

(l) Metering.

(i) Return sludge. For treatment plants having an average day design capacity greater than 100,000 gpd (378 m^3/d) the return sludge flow rate from each secondary settling unit and to each aeration basin shall be metered to indicate flow rate. Return sludge metering devices shall be suitable for liquids carrying grease and solids, and shall be accurate to within ±5 percent of the actual flow rate. Meters shall be readily field calibrated by plant personnel. Meters shall be arranged to avoid trapping air.

(ii) Waste sludge. For treatment plants having an average day design capacity greater than 100,000 gpd (378 m^3/d), waste sludge flows shall be metered to indicate and totalize. Waste sludge meters shall meet the requirements described for return sludge meters.

(iii) Air flow. Low pressure air used for basin aeration and other plant uses shall be metered. Separate meters shall be used to indicate the flow rate to each aeration basin and to the ancillary uses made of the low pressure air. Indicators shall be located near the device used to control the air flow rate. Pressure gages shall be provided immediately downstream from each blower and immediately upstream of each aeration basin.

(m) Controls. Facilities for control shall be provided for:

(i) Control of flow split between parallel process units.

(ii) Control of return sludge flow rate to each aeration basin.

(iii) Control of waste sludge quantity.

(iv) Control of air flow rate to each aeration basin.

(v) Control of air distribution to different zones in aeration basin.

(vi) Control of energy imparted with mechanical aeration.

Facilities for control shall include a meter or device to measure rate and a device to change the rate such as a valve or adjustable weir.

(n) Prefabricated treatment units. Prefabricated activated sludge units shall conform to the applicable requirements described.

(o) Ancillary facilities. Adequate nonpotable washdown water shall be provided around the aeration basins sludge pumping area and secondary settling basins. Sampling ports, pipes or other access shall be provided on aeration basin inlets, return sludge piping, waste sludge piping and secondary settling basins. Hoisting or other means of equipment removal shall be provided. All subgrade floors shall be drained.

Section 15. Attached Growth Systems.

(a) Pretreatment and primary treatment requirements. Attached growth systems shall be preceded by primary settling or fine screening. If fine screening is provided, the screen size shall have 0.06 inch (1.5 mm) or smaller openings.

(b) Trickling filters.

(i) Loading rates. Applied organic loading rates on trickling filters, where not used in series with activated sludge, shall be limited to:

	Applied Liquid Rate to Surface of Filter		BOD Loading*	
	(gpm/sf)	(1pm/m)	(lb/1000ft^3/d)	(kg/1000 m^3/d)
Rock Media	0.1	4.07	10	160
	0.2	8.15	12	192
	0.3	12.22	16	256
Plastic or Redwood Media			20	320

*For more than a one-stage trickling filter, the volume of all stages shall be used.

(ii) Recirculation. Recirculated flow to stationary media attached growth systems shall be provided. Recirculated flow shall be sufficient to provide the following minimum wetting rates:

Media	Minimum Wetting Rate	
	(gpm/sf)	(1pm/m^2)
Rock	0.1	4.07
Plastic or redwood	0.75	30.5

(iii) Media. Media may be rock or specially manufactured material made of redwood or plastic. Rocks shall be durable and free from thin, elongated, flat pieces and should have the following size distribution:

Passing 6-inch (15.2 cm) screen	100% by weight
Retained on 4-inch (10.2 cm) screen	95 - 100% by weight

Fabricated media shall be resistant to ultraviolet degradation, disintegration, erosion, aging, all common acids, alkalies, organic compounds, fungus and biological attack. Media shall be capable of supporting a man’s weight.

(iv) Flow distribution. Wastewater shall be applied to stationary media by a rotary distributor or a fixed nozzle distribution system that provides uniform distribution. Flow distribution between multiple units of stationary or rotating media systems shall be by weirs, meters and valves, or other positive flow split device.

(v) Depth of media. Rock trickling filters depth shall be between 5 to 10 feet (1.52 to 3.04 m), and manufactured media filter depth shall be between 10 to 30 feet (3.05 to 9.15 m).

(vi) Underdrain system. The underdrainage system shall cover the entire floor of the filter. Inlet openings into the underdrains shall have an unsubmerged gross combined area equal to at least 15 percent of the surface area of the filter. Underdrains shall have a minimum slope of one percent.

Effluent channels shall be designed to maintain minimum velocity of two feet per second (0.61 mps). Drains, channels and pipe shall be designed to have maximum depth flow of 50 percent.

(vii) Flushing. Provide valves and structurally capable walls to permit flooding rock media filters. Access shall be provided around the periphery of the underdrain system to allow flushing the underdrains.

(viii) Freeboard. The clearance between rotating distributor and the media shall be at least 18 inches (0.46 m). The surrounding wall shall extend 2.5 feet (0.76 m) above the distributor.

(ix) Ventilation. All trickling filters shall be provided with ventilation openings to the underdrain. Ventilation openings will be provided with dampers or other adjustable devices to permit adjusting the ventilation rate opening. Ventilation openings shall be a minimum of eight square feet (0.74 m^2) per 1,000 lb (454 kg) BOD? /day.

Forced ventilation providing 4,000 cfm (113 m^3/min) per 1,000 lb (454 kg) BOD /day shall be provided for covered filters.

(c) Rotating biological contactors (RBC).

(i) Loading rates. The organic loading rate on the first stage of an RBC shall be limited to 140 lb BOD? /1,000 cu ft (2240 kg/1,000 m^3) of media per day. The organic loading rate on all stages of an RBC shall be limited to 45 lb/1,000 cu ft (720 kg/1,000 m^3) of media for media having a specific surface area of 35 sq ft per cu ft (114.8 sq m/m^3). When more than ½ of the media has a specific surface area of 50 sq ft per cu ft (164 sq m/m^3), the organic loading may be increased to 50 lb/ 1,000 cu ft (800 kg/1,000 m^3).

(ii) Number of stages. Rotating biological contactors shall be designed with a minimum of three stages in series. Baffles shall be provided between stages.

(iii) Velocities. The rotational speed of the contactors shall be designed to maintain at least two mg/L of dissolved oxygen in each stage at designed loading rates. Drive units shall provide a rotational speed of one rpm or more.

(iv) Draining. Provide drains from each contactor basin.

(v) Media materials. Media materials shall be special manufactured material suitable and durable for the rotating biological contactor process. Media shall be resistant to disintegration, ultraviolet degradation, erosion, aging, all common acids, alkalies, organic com pounds, fungus, and biological attack. Media shafts shall be designed for unbalanced loads and cycle fatigue.

(vi) Housing. The housing for the RBC'S shall be designed with openings or access to allow removal and replacement of entire shafts.

Section 16. Combination systems. When more than one type of biological treatment process is used in series, the removal through each biological unit shall be calculated as if it were acting alone. No symbiotic effect will be included in the design calculation.

Pretreatment requirements for combinations of biological systems will be the same as for attached growth systems. Final settling and sludge handling will be the same as for activated sludge systems.

Section 17. Secondary settling.

(a) Secondary settling. Secondary settling is required after suspended growth and attached growth biological processes such as activated sludge, trickling filters and RBC's.

(b) Configuration. The largest dimension (either diameter or length) of a clarifier shall be 80 feet (24.4 m). Corner sweeps on circular equipment are not acceptable.

(c) Flow distribution. Positive flow splitting shall be provided ahead of multiple sedimentation basins to ensure proportional hydraulic flows and solid loadings to each basin. Flow splitting shall be achieved using positive means such as weirs or valves and meters.

(d) Clarifier inlet and outlet structures.

(i) Clarifier inlet structures shall be designed to dissipate the:

(A) Inlet kinetic energy.

(B) Distribute the flow evenly into the basin.

(C) Minimize hydraulic turbulence.

(D) Prevent short circuiting.

Inlet devices that promote flocculation are encouraged.

The inlet structure for rectangular tanks shall be the full width of the basin, for peripheral feed clarifiers it shall be the entire periphery, and for center feed basins it shall be at least 20 percent of the tank diameter. Baffled scum relief ports shall be provided between the inlet structure and the clarifier.

(ii) Inlet conveyance pipe or channels shall be designed to maintain a minimum velocity of 0.5 fps (0.15 mps) at the design flow. Where channels provide less velocity, provide mixing, flushing, or other means of resuspending solids.

(iii) Clarifier outlet systems shall be designed to minimize vertical velocities and reduce the effect of density currents at the effluent weir. Weir level shall be adjustable.

(e) Freeboard. The outer walls of settling tanks shall extend at least six inches (0.15 m) above the surrounding ground and provide at least 12 inches (0.3 m) of free board to the water surface. Where settling basin walls are less than four feet (1.22 m) above the surrounding ground, a fence or other debris barrier shall be provided on the wall.

(f) Design parameters.

(i) Surface overflow rates.

(A) Activated sludge. Settling basins following an activated sludge process shall be designed to both thicken the sludge and clarify the liquid flow entering the tanks. The overflow rate shall not exceed:

	Design Flow		Peak Hourly Flow	
	gpd/ft²	$m^3/m^2/d$	gpd/ft²	$m^3/m^2/d$
Activated Sludge	600	24.4	1,200	48.8
Separate Nitrification	400	16.3	800	32.5

(B) Attached growth biological reactors. Overflow rates for settling basins following attached growth processes shall not exceed:

	Design Flow		Peak Hourly Flow	
	gpd/ft²	$m^3/m^2/d$	gpd/ft²	$m^3/m^2/d$
Trickling Filters and RBC's	800	32.5	1,200	48.8

(ii) Solids loadings. Solids loadings for settling basins following an activated sludge process shall not exceed:

	Design Flow		Peak Hourly Flow	
	gpd/ft²	$m^3/m^2/d$	gpd/ft²	$m^3/m^2/d$
All Activated Sludge Processes	28	136.7	50	244.1
Separate Nitrification	25	122.1	40	195.3

(iii) Side water depth. Settling basins shall be deep enough to provide adequate distance between the sludge blanket and the effluent weirs to avoid disturbance of settled sludge.

The volume of the settling basin shall provide a minimum detention time of two hours at peak hourly flow rate. The peak hourly flow is the projected maximum flow over a one hour period during the design year. Peak hourly flow shall include all recycle flows entering clarifier.

(iv) Weir overflow rates and placement. Weir loading rates shall not exceed the following values:

	Design Flow		Peak Hourly Flow	
	gpd/ft²	m²/m²/d	gpd/ft²	m²/m²/d
Launder and weir at outer wall	12,000	149	20,000	248
Launder and weir at 3/4 point of radius or less	18,000	223	36,000	446

Where double weirs or serpentine type weirs are used, the weir length shall be computed as the length of the centerline of the launder.

(g) Baffles. Baffles shall be located at the water surface and in such a position as to intercept all floating materials (scum) prior to the weirs. Baffles shall extend three inches (7.6 cm) above the weir level and 12 inches (0.3 m) below the water surface. In circular basins, the baffle shall be a minimum of six inches (0.15 m) inside the weir plate. In rectangular basins, the baffle shall extend across the width of the basin and upstream of the effluent weirs.

(h) Basin and equipment access. Walkways and access ways shall be provided to drive units, effluent launders, and manual scum devices.

(i) Sludge removal. Sludge collection and withdrawal equipment shall provide complete and continuous removal of settled sludge. Rapid sludge removal pipes shall return sludge to a well at the surface that enables visual observation of flow. Mechanical rakes shall move sludge to a hopper at the floor. The tip speed for circular mechanisms shall not exceed 8 fpm (2.4 m/min) and straight line flight speed shall not exceed 1 fpm (0.3 m/min).

The return sludge removal pipes shall be at least four inches (10.2 cm) in diameter. The hydraulic differential between the clarifier water level and the return sludge level shall be sufficient to maintain a three fps (0.9 mps) velocity in each rapid return sludge withdrawal pipe. Each sludge withdrawal pipe shall be accessible for rodding or backflushing when the settling basin is in operation.

(ii) Scum removal. Provide effective baffling and scum collection and removal facilities for all secondary settling basins. Equipment shall include a mechanical, positive scum skimmer.

(iii) Sludge hopper. The minimum side slope of the hopper shall be 1.7 vertical to 1.0 horizontal. Hopper bottoms shall have a maximum dimension of two feet (0.61 m). The sludge removal pipe should be flush with hopper bottom, and have a minimum diameter of six inches (0.15 m).

(iv) Scum box. Locate scum box outside settling tank and adjacent to the scum collection point. Provide method for mixing contents of scum box, such as air jets or surface wetting using waste sludge. Provide access and washwater for washing the scum box. The scum box shall be located on the side of the tank opposite the prevailing wind direction.

Section 18. Lagoons.

(a) Design requirements.(ii) Wastewater loading rates.

(i) Location. Wastewater lagoons shall be located more than 500 feet (152 m) from existing habitations.

(A) Facultative. The primary cells of a facultative (non-aerated) pond system shall be limited to a maximum BOD application of 40 lb/acre/day (44.8 kg/ha/d) at average design loading conditions.

(B) Aerated. Aerated lagoons shall be designed for an organic loading of less than 10 lb BOD /day/1,000 cu ft (160 kg/1,000 m^3/d) for completely mixed systems, and less than two lb BOD5/day/1,000 cu ft (32 kg/1,000 m^3/d) for aerated non-completely mixed systems. Aeration equipment shall be sized to maintain a minimum dissolved oxygen of two mg/L. Completely mixed systems are mixed to provide 1/4 hp/1000 cu ft mechanical mixing or 10 cfm/1000 cu ft of air mixing.

(C) Nonsurface water discharging ponds. Nonsurface water discharging ponds shall be designed on the basis of a water balance that considers evaporation and seepage. Water balance calculations shall be submitted with the plans and specifications. The BOD5 loading for non discharging ponds shall not exceed 14 lb/acre/day (15.7 kg/ha/d) based on the average annual BOD5.

(iii) Detention. Facultative lagoons shall be designed for a minimum detention time of 180 days.

The detention time in aerated lagoons shall be at least one and one half days for completely mixed primary cells, and seven days for non-completely mixed primary cells. Secondary cells shall increase the overall detention time to 30 days.

(iv) Storage. Nonsurface water discharging lagoons shall be designed to provide sufficient storage to retain all wastewater and rainfall during the wettest year of record during a ten year period of record. Seepage shall be controlled to maintain a minimum water depth of two feet (0.6 m) in the primary cell during the driest occurring year of a ten year period.

(v) Inlet.

(A) Location. The inlet pipe to the primary cell of a facultative lagoon shall be at least 30 feet (9.2 m) from any bank. It shall terminate at a point away from the outlet by a distance of at least equal to or greater than 2/3 of the longest lagoon dimension. In aerated systems, the influent line shall be located in the mixing zone of the aeration equipment.

(C) Apron. Provide a concrete apron at the inlet pipe termination with minimum dimensions of four feet by four feet (1.2 m by 1.2 m).

(D) Influent manhole. An influent man-hole shall be provided prior to the lagoons. The influent pipe in the influent manhole shall be at least six inches (0.15 m) above the normal operating water level of the primary lagoons.

(E) Flow distribution. Flow distribution for multiple primary cells shall be provided to effectively split hydraulic and solids proportionately.

(vi) Inlet and outlet structures.

(A) Location. Inlet and outlet structures shall be easily accessible by plant operators and located to minimize short circuiting within the cell. A level control structure shall be provided at the outlet of each cell.

(B) Level control. Provide controls to permit varying water levels between two feet and six feet (0.6 m to 1.8 m). Provide baffling at the outlet to prevent scum overflow. Multiple draw offs in the final cell shall be provided. At least one shall be located at the two foot (0.6 m) level.

(vii) Interconnecting piping.

(A) Location. Piping between lagoon cells shall connect to the preceding cell outlet control structure and discharge into the subsequent cell. The pipe shall discharge at least ten feet (3.05 m) from the toe of the slope on the lagoon bottom and shall terminate on the concrete apron that is at least four feet by four feet (1.2 m by 1.2 m).

(B) Elevation. The piping shall discharge at the floor of the lagoon.

(C) Material. Interconnecting piping shall be any acceptable pipe designed to resist low pressures and adequately protected from corrosion.

(b) Number of lagoons cells. A lagoon system with a total area greater than one acre (0.4 ha) shall have at least three cells in series. Smaller systems and nondischarge pond systems shall have at least two cells. The maximum size cell shall be 20 acres (8 ha).

(c) Lagoon configuration.

(i) Shape. Rectangular cells shall have a maximum length to width ratio of 5:1. No sharp corners nor dead-end coves are permitted.

(ii) Water depth. Facultative ponds shall be designed to have water depths of not less than two feet, nor more than six feet (0.61 m to 1.8 m). Aerated lagoons shall be designed to have water depths of not less than four feet nor more than 15 feet (1.2 m to 4.6 m).

(iii) Removal of lagoon cells from operation. Bypass piping for primary lagoon cells and aerated lagoon cells shall be provided.

(iv) Lagoon freeboard. A minimum freeboard of two feet (0.6 m) shall be provided. Greater freeboard shall be provided for wave runup, where required.

(d) Construction requirements.

(i) Dike.

(A) Material. Dikes and embankments shall be of relatively impervious and stable material, and compacted to at least 95 percent of maximum density (ASTM D698-78). Embankment fill shall be free from organic material, rock larger than six inches (15.2 cm) and construction debris. The area where the embankment is to be constructed shall be stripped of vegetation and roots.

(B) Top width. Dikes and embankments shall be constructed with minimum top width of eight feet (2.4 m).

(C) Slopes. Interior slopes shall be from three to four horizontal to one vertical, and shall be stable under varying water level conditions. Interior slopes that are surfaced with concrete paving or riprap may be constructed at slopes of two or more horizontal to one vertical. Exterior slopes shall be three or more horizontal to one vertical and shall prevent the entrance of surface water to the lagoon.

(ii) Seeding. Exterior slopes and interior slopes that are not riprapped shall be seeded with dryland grasses, unless another equivalent method for soil erosion control is provided.

(iii) Erosion control. Interior embankments except cells smaller than one acre shall be protected from wave action with riprap, paving, or other erosion resistant material, unless it is demonstrated that the ponds are sheltered from wind or where wind velocity is low and erosion will not occur.

(e) Lagoon sealing.

(i) Lagoon sealing. The seepage through the pond bottom and side walls shall not cause a violation of the groundwater standards as described in Chapter VIII (Quality Standards for Wyoming Groundwaters) of the Wyoming Department of Environmental Quality, Water Quality Rules and Regulations. Liners shall be required if the wastewater characteristics or site conditions will not insure the protection of the groundwater for which it is classified.

If the applicant cannot document that the facility poses no threat to groundwater and elects not to perform a subsurface study in accordance with Chapter III, Section 15 (a) and (b), then the groundwater shall be protected from contamination by the wastewater with a liner equivalent to three feet (1 m) of soil having a permeability of 10-7cm/sec or less. When an applicant performs a subsurface study, the requirements for the liner shall be determined based on the results of the study and the groundwater protection required. In no instance shall the maximum seepage rate exceed 1/8 inch per day (3.2 mm/day) in the primary pond(s).

Following construction of the lagoons, but prior to startup, a testing program shall be conducted to demonstrate the effectiveness of the sealing program. Should the testing program show the lagoon seal to be less effective than the above requirements, the seal shall be modified and retested until it succeeds.

(ii) Synthetic liners.

(A) Material. Synthetic liners shall be essentially impervious. The minimum lining thickness shall be 30 mils. The liner material shall be resistant to organic materials typical of sewage. The liner shall be resistant to sunlight or shall be covered with 12 inches (30.5 cm) or more of soil at all locations including the lagoon bottom and side slopes.

(B) Liner stabilization. Where the seasonal high groundwater is above the bottom of the lagoon, the liner shall be stabilized to prevent it from rising.

(C) Appurtenances. A leak detection system and/or air release mechanism may be required.

(f) Aerated systems.

(i) Air requirements. Aerated ponds shall be designed to maintain 2 mg/L of dissolved oxygen or more throughout the pond contents.

(ii) Equipment requirements.

(A) Number. Surface aerators shall be provided at intervals of 200 feet (61 m) or less. The lagoon shall be protected from erosion from the aeration equipment. At least two surface aerators or brush aerators shall be provided. With the largest unit out, the remaining units shall be capable of transferring the average day oxygen demand. Each diffused aeration system shall be provided with at least two blowers. With the largest blower out of service, the remainder shall be capable of supplying the design air flow rate.

(B) Removal. All equipment shall be accessible and removable from the edge of the lagoons. Provisions for dewatering shall be made for removal or repair of diffusers.

Section 19. Tertiary treatment systems.

(a) Phosphorus removal.

(i) Equipment requirements.

(A) Flash mixing. Chemical addition points shall be at points of high turbulence, such as Parshall flumes, hydraulic jumps, or separate mixing basins.

(B) Flocculation. Inlet and outlet design shall prevent short circuiting and turbulent destruction of floc. Minimum detention time shall be 20 minutes at the average design flow rate.

The velocity of flocculated water to settling basins shall be 0.5 to 1.5 fps (0.15 to 0.46 mps). Changes in direction shall be with long radius elbows or curved channels.

(C) Chemical feed equipment. Storage shall be provided for at least 14 days of chemical supply. Liquid chemical storage tanks shall have a liquid level indicator, an overflow, and a receiving basin capable of holding 110 percent of the stored volume, or a drain capable of receiving accidental spills or overflows. Liquid chemical storage shall be provided with heat.

(b) Ammonia nitrogen reduction.

(i) Activated sludge. Ammonia nitrogen removal by activated sludge processes shall be designed with sludge retention time of at least 15 days and shall provide at least 16 hours of hydraulic detention time. Aeration requirements are described in Section 15.

(ii) Attached growth. Rock media trickling filters shall not be used for ammonia reduction. Fabricated media trickling filters used for ammonia shall be designed using a BOD loading of less than 14 lb/1000 cu ft (224 kg/1,000 m^3) of media. Rotating biological contactors used for ammonia reduction shall be designed with hydraulic loadings less than 1.0 gpd/sq ft (40.7 $L/m^2/d$) of media surface area. At least four stages shall be provided for ammonia nitrogen removal.

(iii) Lagoons. The design of facultative lagoons for ammonia removal shall provide a minimum detention of 180 days. Aerated lagoon systems may be designed for 160 days.

(c) Solids reduction.

(i) Filtration.

(A) Filtration rate. The maximum hydraulic loading for 24 inch (61 cm) or deeper media is 5 gpm/sq ft (292.5 $m^3/m^2/d$) of filter area. Filtration rates for shallower media shall be limited to 3gpm/sq ft (175 m^3/m^2d).

(B) Backwash requirements. Provide a minimum backwash rate of 20 gpm per square foot (1170 $m^3/m^2/d$) of filter bed for 24 inch (61 cm) or deeper media and 12 gpm/square foot (702 $m^3/m^2/d$) for shallower media; supply shall be filtered water. A rate of flow regulator on the main backwash line shall be provided. The total backwash water storage capacity shall be adequate for 20 minutes of continuous backwash.

Air scour or surface wash facilities are required. All surface wash devices shall be provided with a minimum flow rate of 0.5 gpm per sq ft (29.3 m^3/m^2d) water pressures of 50 psi (3.52 kg/cm^2) or greater and use filtered water.

(C) Backwash waste handling and treatment. Waste filter backwash shall be collected in a surge tank and recycled to the treatment plant at a rate not to exceed ten percent of the average plant design flow rate. Waste backwash water may be returned to any point upstream of the biological treatment units.

(D) Number of units. At least two units shall be provided. With one filter out of service, the remaining filters shall be capable of passing the maximum day design flow rate.

(E) Controls. Controls should be provided to remove a filter from service, backwash the filter, and return it to service. Where the control is automatic, there shall also be a means of manually overriding the operating equipment, including each valve essential to filter operation.

In addition, the following shall be provided:

(I) Sampling tap on filter influent and effluent.

(II) Indicating and recording loss of head gauge.

(III) Flow rate indicating and control.

(IV) Means for feeding polymer as a filter aid at a controlled rate to filter influent water when chemically coagulated effluent is being filtered.

(ii) Microscreens.

(A) Pilot testing. Pilot plant testing on the fluid to be screened or data from other similar applications to demonstrate the suitability of the proposed filter fabric, fabric life, proposed loading rates, and other design criteria shall be provided.

(B) Loading rates. Flow equalization facilities shall be included in the design to moderate influent quality and flow variations.

The screening rate shall be selected to be compatible with available pilot plant test results and selected screen aperture, but shall not exceed 1.5 gpm/sq ft (87.8 $m^3/m^2/d$) for lagoon effluent or 5 gpm/sq ft (292.5 $m^3/m^2/d$) for activated sludge or attached growth effluents based on the maximum hydraulic flow rate applied to the units. The screening rate shall not exceed 0.75 lb/sq ft/day (3.7 kg/ m^2/day). The effective screen area shall be considered the submerged screen surface area less the area of screen blocked by structural supports and fasteners.

(C) Backwash requirements. The backwash water shall be at least eight gpm/ linear foot (9 Lpm/m) of screen length at 60 psi (4.2 kg/cm?), obtained from microscreened effluent.

(D) Controls. Each microscreen unit shall be provided with automatic drum speed controls with provisions for manual override.

(d) Rapid infiltration.

(i) Wastewater preapplication requirements. Rapid infiltration shall be preceded by settling or fine screening having 0.6 inch (1.5 mm) or smaller openings.

(ii) Hydraulic loading rates.

(A) Permeability. Hydraulic capacity of the rapid infiltration site shall be based upon soil permeability, basin infiltration tests, or cylinder infiltrometer tests. Design loading rates based on these tests shall be as follows:

Field Measurement	Annual I

Basin infiltration test	10% of minimum measure rate
Cylinder infiltrometer	2% of minimum measured rate
Permeability	5% of conductivity of most restricting soil layer

(B) Precipitation. The total hydraulic load to the rapid infiltration basins includes precipitation. The one in ten year precipitation event should be used as the basis for design.

(C) Cold weather conditions. The design must recognize that drying rates, oxidation rates, nitrification and denitrification rates all decrease in cold weather. Cold weather loading rates shall be used to determined land requirements or cold weather storage shall be used. Provisions should be made to mow and disc basin surfaces in the fall to prevent ice from freezing the vegetation near the soil surface. Snow fences can be used to keep snow cover on the rapid infiltration basins to insulate the applied wastewater and soil.

(iii) Land requirements.

(A) Storage. A minimum of 14 days of storage shall be provided. Where applied sewage will be less than 4° C, 160 days of effluent storage shall be provided.

(B) Location. Rapid infiltration basins shall be located more than 500 feet (152 m) from existing habitation.

(iv) Basin size. Individual basin size shall not be greater than five acres (2.0 ha). Basin sizing should be based upon a maximum water depth of 12 inches (30.5 cm) in the rapid infiltration basins.

(v) Subsurface drainage. The capillary fringe above the groundwater mound shall not be closer than two feet (0.6 m) to the bottom of the infiltration basin. The distance to groundwater shall be at least five feet (1.5 m) below the soil surface within two days following wastewater application.

(vi) Groundwater monitoring. Refer to Chapter III, Section 15, of the regulations.

(e) Intermittent sand filters.

(i) Wastewater preapplications treatment requirements. Intermittent sand filters shall be preceded by settling or fine screens having 0.06 inch (1.5 mm) or smaller openings.

(ii) Hydraulic loading rates. The maximum application rates shall be limited to:

	Maximum Application Rate	
Source	gallons/acre/day	(m^3/ha/d)
Primary Effluent	130,000	(200)
Secondary Effluent	400,000	(611)
Lagoon Effluent	300,000	(458)

(iii) Media. The minimum sand depth shall be 24 inches (0.6 m). The sand must be free of cementing materials and clay or loam. The sand should have an effective size of not less than 0.2 mm and not greater than 0.5 mm, and a uniformity coefficient of less than 5.

Clean graded gravel shall be placed around the under drains and to a depth of at least 12 inches (0.3 m) over the top of the underdrains.

(iv) Underdrains. All intermittent sand filters shall be provided with underdrains. Underdrains shall be at least four inches (10.2 cm) in diameter. The under-drain pipe shall have a minimum slope of 5 feet per 1,000 feet (5 m/1,000 m).

The groundwater shall be at least two feet (0.6 m) below the bottom of the underdrain pipe.

(v) Number of units. Three or more filters shall be provided.

(vi) Dosing.

(A) In each dosage of an intermittent filter, the hydraulic capacity shall permit covering the bed to a depth of two inches (5 cm), within 20 minutes or less.

Section 20. Sludge Handling, Treatment and Disposal.

(a) Pumping.

(i) Design requirements. Sludge pumps shall be provided with a positive suction pressure at the pump impeller, rotor or plunger at dynamic conditions. Discharge pressure shall include static pressure difference and system friction losses based on the higher viscosity of the sludge than water.

(ii) Piping and valves.

(A) Minimum size. Sludge piping and valves shall at least four inches (10.2 cm) in diameter for pressure piping and six inches (15.2 cm) in diameter for gravity pipe. Pump suction and discharge shall not be less than three inches (6.6 cm) in diameter.

(B) Minimum velocity. For sludge pipes larger than four inches (10.2 cm) in diameter, the minimum velocity shall be one fps (0.3 m/sec).

(b) Thickening.

(i) Types.

(A) Gravity. Gravity thickening shall only be used for primary sludge, digested primary sludge, lime sludge, or combinations of lime sludge, trickling filter humus and primary sludge.

(B) Dissolved air flotation. Dissolved air flotation shall only be used for combination of primary and biological sludges, waste biological sludges, and aluminum and iron salt sludges.

(ii) Design parameters.

(A) Influent solids concentration. The design for influent solids concentrations to gravity or flotation thickeners shall be 5,000 mg/L or less, except tertiary lime sludge.

(B) Operating schedule. Sludge thickening facilities shall have the capacity to treat the maximum amount of solids produced. Where intermittent operation is provided, sludge holding tanks ahead of and after the thickening process shall be provided.

(C) Solids loading. Solids loadings (solids applied to the thickener) on thickening devices shall be limited to the following maximum values.

	Solids Loading			
	lb/sq ft/day		kg/m²/d	
Sludge Type	Gravity	Dissolved Air Flotation	Gravity	Dissolved Air Flotation
Primary	24	NA	117.2	
Digested primary	20	NA	97.6	
Waste activated, without polymer	NA	12		58.6
with polymer		48		234.3
Primary and trickling filter	15	--	73.2	
Anaerobically digested primary and activated	NA	NA		
Primary and lime	20	NA	97.6	
Tertiary lime	60	NA	292.9	
Alum	NA	12		58.6

*NA - Not allowed.

(D) Hydraulic loading. Gravity thickeners shall be designed for 400-800 gpd/ sq ft (16.3 $m^3/m^2/d$ to 32.5 $m^3/m^2/d$) of surface area.

(iii) Number of units. Unless sludge storage capacity for three days is provided, there shall be at least two units of equal capacity provided for sludge thickening.

(iv) Controls. Controls for gravity and flotation sludge thickening operations shall include provision for influent flow rate control. Centrifuge thickening shall include adjustable manual controls for differential scroll speed, pool depth, and influent flow rate. Where chemical conditioning is required, chemical dosage rate shall have adjustable manual controls.

(v) Side stream waste characteristics. The flow, organic load, and solids load in the thickener return flow to the plant shall be included in the plant design loadings.

(vi) Odor control. Provisions shall be made for the continuous chlorination of gravity thickener influent. Any thickening installation for anaerobically digested sludge shall make provisions for enclosing zones where the sludge or decant is exposed to atmosphere, exhausting the zone at an adequate rate to prevent escape of gas, and treating the exhaust air for removal of odor causing agents.

(c) Aerobic digestion.

(i) Solids retention time. Solids shall be retained in the aerobic digester for 30 days for primary sludge and 20 days for waste sludge from conventional activated sludge systems. Waste activated sludge from extended aeration systems shall be retained for a minimum of 10 days.

(ii) Mixing and aeration requirements. Aeration requirements shall include the oxygen requirements for BOD stabilization, nitrification of ammonia nitrogen in the sludge, and nitrification of organic nitrogen in raw sewage solids and biological solids. A minimum dissolved oxygen of 2 mg/l shall be maintained. Minimum aeration requirements shall be:

Sludge	CFM/1,000 lb solids/day	m^3/min/1,000 kg/d
Extended Aeration	300	18.7
Conventional Activated Sludge	800	50.0
Primary Sludge	2,100	131.0

The aerobic digester aeration shall be provided with nonclog diffused aeration. Mechanical surface aerators shall not be allowed. Aeration provisions shall be a minimum of 30 cfm/1,000 cu ft (30 m^3/min/1,000 m^3) of volume.

(iii) Number of digesters. Where aerobic digesters are used, two or more shall be provided for treatment plants having an average design capacity of 100,000 gpd or more. Multiple aerobic digesters shall be arranged to permit either parallel or series operation.

(iv) Supernatant removal and disposal. Supernatant shall be returned prior to the influent of the biological treatment process.

(d) Anaerobic digestion.

(i) Sludge characteristics. The minimum sludge concentration for feed to anaerobic digesters is four percent.

(ii) Number of digesters. Two or more digesters shall be provided for treatment plants having an average design capacity of 100,000 gpd (378.4 m^3/d) or more.

(iii) Design requirements.

(A) Temperature. Primary anaerobic digesters shall be heated to provide a minimum temperature of 95°F (35°C). Controls shall maintain the digester temperature within ±5°F (±2° C).

(B) Mixing equipment. Digester mixing shall, as a minimum, provide control of scum accumulation at the gas/liquid interface. Mixing that is designed for increasing the effectiveness of the digester and thereby reducing detention time shall mix the entire tank contents. Mixing devices and their application rate that will be considered to provide high rate digestion are:

Volume	Per 1,000 cf	Per 1,000 m^3
Slow speed turbine mixers	0.25 hp	6.7 kw
Draft tube mechanical mixers	0.40 hp	14.1 kw
External pumps and jet nozzles	500 gpm	66.7 m^3/m
Gas mixing applied at bottom of digester	10 cfm	10 m^3/m

Less mixing may be provided; however, longer solids retention times than described below shall be required.

(C) Solids retention time. The minimum solids retention time for heated, primary digesters are:

Unmixed	Completely mixed
30 days	10 days

Solids retention time shall be the same as liquid retention time in the primary digester where waste activated sludge is anaerobically digested.

(D) Volatile solids loading. As an alternative design basis to solids retention time, heated primary digesters may be designed for the following maximum volatile solids loading:

Unmixed
0.1 lb/ft^3/day (1.6 kg/m^3/d)

Completely mixed
0.3 lb ft^3/day (4.8 kg/m^3/d)

(iv) Sludge piping.

(A) Inlet. Except in completely mixed digesters, multiple inlets shall be provided. The piping shall provide the opportunity to heat undigested sludge prior to entering the digester.

(B) Sludge withdrawal. Except in completely mixed digesters, multiple withdrawal pipes shall be provided. One or more withdrawal pipes shall be from the digester floor.

(C) Supernatant withdrawal. The design basis for facilities using digesters for waste activated sludge shall assume no supernatant withdrawal. Piping for supernatant withdrawal may be provided. A minimum of three supernatant withdrawal levels shall be provided otherwise.

(v) Gas system. All portions of the gas system, including the space above the tank liquor, storage facilities, and piping shall be designed to be under greater than atmospheric pressure at all times.

(A) Piping. Gas piping shall be 2.5 inches (6.4 cm) diameter or greater. Piping from the digester shall be provided with a flame trap. Piping shall slope to condensate traps. Float controlled condensate traps are not permitted.

(B) Safety equipment. All necessary safety equipment shall be included. Pressure and vacuum relief valves, flame traps and other safety equipment shall be provided. Gas safety equipment and gas compressors shall be housed in a separate room with an exterior entrance.

(C) Metering. A gas meter with bypass shall be provided for measurement of total gas production.

(vi) Heating equipment. Sludge and digester contents shall be heated with an external heat exchanger. Where sludge is heated using digester gas, an auxiliary fuel supply shall be provided. Boilers using digester gas shall be designed to minimize corrosion and to facilitate burner replacement. All digester gas that is not beneficially used shall be incinerated in a waste gas burner.

(vii) Access. The roof of the digester and the top sidewall shall be provided with sealed access hatches.

(viii) Sampling. One and one-half inches (3.8 cm) or larger sampling ports shall be provided for inlet sludge, effluent sludge, supernatant and digester contents.

(ix) Supernatant disposal. Supernatant from secondary digesters or from subsequent thickening or dewatering facilities for digested sludge shall be treated independently or returned immediately preceding the biological process. Supernatant shall not be returned to the primary clarifier.

(e) Dewatering.

(i) Mechanical dewatering. Where provided, mechanical dewatering facilities shall include storage tanks for liquid sludge and shall provide for reliable use.

(ii) Drying beds.

(A) Gravity. Drying beds may be strictly evaporation or evaporation - percolation. Evaporation - percolation beds shall be provided with graded gravel and sand beds over perforated underdrain pipe. Evaporation beds shall be designed for the application of 1.5 feet (0.46 m) of sludge per year. Evaporation - percolation beds shall be designed for the application of four feet (1.2 m) of sludge per year. Storage of sludge in the beds or in separate basins shall provide 180 days of capacity. Percolate shall be returned to the plant ahead of the biological treatment process.

(B) Vacuum. The bed area for vacuum assisted open drying beds shall be based on the application of no more than 40 feet (12.2 m) of liquid per year. If the beds are housed, the bed area shall be based on the application of 80 feet (24.4 m) per year. Where beds are not housed, sludge storage shall be provided for 180 days of capacity. Polymer conditioning, chemical feed, chemical storage and facilities for mixing the polymer with the sludge shall be provided. Vacuum pumps, sump pumps, chemical feed equipment and motor control equipment shall be housed.

(iii) Filtrate disposal. Filtrate, centrate or underdrain liquid shall be returned to a point upstream of the biological treatment process. Centrate or filtrate shall not be returned upstream of the primary clarifier.

(f) Disposal.

(i) Degree of stabilization.

(A) Land application. Sludges shall be stabilized. Sludges that are to be used on public lands that are accessed by the public (parks, golf courses, cemeteries) or sludges that are to be made available to the public shall be composted or stabilized and stored for a period of at least one year. Sludges that are to be incorporated into the land shall be stabilized.

“Stabilized sludge” shall have reduced organic content and reduced pathogenic content. Stabilized sludge shall have less than

60 lb of BOD5 per 1,000 lb (60 kg/1,000 kg) of dry weight sludge solids.

(B) Landfill. Sludge processed for incorporation into a landfill shall be (1) a solid or semisolid material that will not release water upon standing, and (2) has been subjected to anaerobic or aerobic digestion, or chemically treated with lime to a pH of 12.0 or chemically treated with chlorine to a free chlorine residual. Waiver of this requirement must be obtained from the Solid Waste Management Section of the Department of Environmental Quality.

(ii) Storage. Sludge storage shall be provided in lined earthen lagoons or structural tanks. The lagoon lining shall be designed to protect the groundwater pursuant to the requirements of Chapter VIII of the Water Quality Divisions rules and regulations. Sludge storage volume shall be sufficiently large to provide for independent operation of the sludge dewatering or disposal facilities from preceding liquid or sludge processes.

Section 21. Disinfection.

(a) Chlorination/dechlorination.

(i) Chlorination. The disinfection capacity shall be sized to provide the coliform concentrations required by the discharge permit. Feeders shall be sized to provide the minimum dosage at the minimum flow rate and to the maximum dosage at the maximum flow rate.

(ii) Dechlorination. Dechlorination feeders shall be sized for the final effluent dechlorination dosage required by the discharge permit requirements.

(iii) Chlorination.

(A) Number of units. Feeders shall be able to supply, at all times, the necessary amounts of chemical at an accurate rate (±3%) throughout the range of feed. The number of units shall provide capacity for effluent disinfection with the largest unit out of service and a separate feeder or feeders for ancillary uses, such as prechlorination or intermediate process control chlorination. The number of feeders shall be selected to permit feeding chemicals over the range of required dosage while only varying a single feeder over a 10:1 range.

(B) Chemical storage. Chlorine shall be stored in a heated, ventilated space. Space shall provide at least 30 days of chemical supply, convenient and efficient handling, and dry conditions. Cylinders or other containers of chlorine gas should be isolated from operating areas and restrained in position to prevent upset.

(C) Piping. Piping systems carrying gaseous or liquid chlorine shall be schedule 80 black steel pipe with forged steel fittings. Bushings shall not be used. Vacuum piping for gaseous chlorine may be polyethylene tubing.

Gas piping between the chlorine pressure reducing valve of the chlorinator and the ejector shall be PVC or polyethylene. Piping for aqueous solutions of chlorine beyond the ejector shall be PVC, fiberglass, or steel pipe lined with PVC or saran.

(D) Maximum withdrawal. The maximum withdrawal rate of gaseous chlorine shall be limited to 40 lbs/day (18.1 kg/day) for 100 or 150 lb (45.4 or 68.0 kg) cylinders and 400 lbs/day (181 kg/day) for 2,000 lb (907 kg) cylinders, unless chlorine evaporators are used.

(iv) Dechlorination.

(A) Number of units. Dechlorination equipment shall be provided to permit feeding the design dosage with the largest unit out of service. Feeders shall be sized for a 10:1 feed range.

(B) Chemical storage. Chemical storage shall be in a heated, ventilated room, separate from chlorine cylinder storage. Provisions for heating the storage area or the S0 cylinders shall be provided. Where used, bin storage shall be provided with desiccated vents.

(C) Piping. Piping for liquid or gaseous S0 shall be schedule 80 black steel pipe with forged steel fittings. Bushings shall not be used. Piping for aqueous solutions of dechlorination chemicals shall be PVC, fiber glass, or steel pipe lined with PVC or saran. All valves for liquid and gaseous sulfur dioxide shall be as approved by the Chlorine Institute. Valves for aqueous solution of dechlorination chemicals shall be PVC or saran lined.

(D) Maximum withdrawal.

(I) The maximum withdrawal rate for sulfur dioxide from 2,000 lb (907 kg) cylinders shall be 200 lb (90.7 kg) per day, unless sulfur dioxide evaporators are used.

(v) Makeup water. Water used for dissolving dry chemicals, diluting liquid chemicals or operating chlorine or S0 injectors shall be chlorinated and strained for filtered (65 mesh) final effluent or potable water. Where potable water is used, backflow prevention shall be achieved by (a) a 6 inch (15.2 cm) air gap between the potable water supply pipe and the maximum water level of a receiving tank; or (b) an approved reduced pressure zone backflow preventer.

(vi) Mixing requirements. The feed point for chlorination or dechlorination chemical shall be at a location of high turbulence. At points of critical flow, specially designed static tube mixers or artificial mixing are required.

(vii) Contact basins.

(A) Detention time. The chlorine contact period shall provide a minimum of 15 minutes contact time at the peak hour design flow. The contact period shall be from the point of chemical injection into the flow to the outfall point or dechlorination feed point.

(B) Baffling. Baffling of the chlorine contact basin shall provide a length-to-width ratio of 5:1 or greater.

(viii) Controls. The minimum control for chlorination - dechlorination facilities shall include manual variation of feed rate and a portable chlorine residual monitor.

(b) Ozonation.

(i) Applied dosage rates. Ozonation system for disinfection shall provide a range of chemical feed as follows:

Secondary effluents	5-15 mg/L
Advanced treatment effluents	5-10 mg/L

(ii) Piping. Injection equipment and piping in contact with ozonated air and air water emulsions shall be of stainless steel, Teflon or other material resistant to ozone. Valves carrying ozonized air shall be made of metal coated with ozone-resistant materials.

(iii) Mixing requirements. Ozone shall be fed to a contact tank along the length of the tank. The ozone contact tank shall be at least 15 feet (4.6 m) deep and provided with vertical serpentine baffles. Fine bubble diffusers shall be used in areas where the flow is downward.

(iv) Detention time. The minimum contact time for ozone is 15 minutes at peak hourly flow. Ozone contact basins shall be covered and provided with means to collect and destroy unreacted ozone. The contact basin shall be designed to facilitate maintenance and cleaning without reducing the effectiveness of the ozonation process.

(c) Housing.

(i) Access. Where housing is specially designed for equipment, structures, rooms and areas containing chemical feed equipment used in disinfection, convenient access should be provided. Access to chemical feed rooms shall only be from the outside. Doors shall be provided with panic hardware, and open from the inside to the outside.

(ii) Heating and ventilation. Chemical feed rooms and chemical storage rooms shall be heated and ventilated. Ventilation shall exhaust continuously from near the floor to an outside area that will not contaminate an air inlet to any building. The exhaust shall be screened and turned downward. Continuous ventilation shall provide a complete air change six times per hour. Emergency exhaust ventilation shall provide a complete room air change 30 times per hour. The control for the emergency ventilation fan shall be on the outside of the room.

(iii) Visual inspection. A clear glass, gas-tight window shall be installed in an exterior door or interior wall of the disinfection chemical feed room.

(iv) Isolation. Chemical feed and storage rooms shall be gas-tight. Ventilation, plumbing and access shall be separated from other building parts. When ton cylinders are used for chlorine or sulfur dioxide storage, storage and feed rooms will be separate. Where powdered or granular chemicals are used, they will be stored in separate rooms from the feed room. Switches for fans and lights shall be outside the room at the entrance. Vents from feeders and storage shall discharge to the outside atmosphere above grade. Pipes and feed lines through interior walls shall be gas-tight.

(d) Safety.

(i) Leak detectors. A bottle of ammonium hydroxide shall be available for chlorine leak detection. For plants that store 1,000 lbs (454 kg) or more of chlorine, continuously monitoring leak detectors shall be provided that sound an alarm in the event of an escape of gas.

(ii) Repair kits. Repair kits approved by the Chlorine Institute shall be provided for plants using ton containers or tank cars.

(iii) Personnel equipment. Protective clothing, rubber gloves, and U.S. Bureau of Mines approved industrial canister gas masks shall be provided for each operator who will handle or prepare chemical solutions/mixtures. A respiratory protection program shall be available for all employees.

(iv) Emergency breathing apparatus. Industrial size canister gas masks of the type designed for chlorine gas and approved by U.S. Bureau of Mines shall be available at all installations where chlorine gas is handled. Pressure-demand, self-contained breathing apparatus shall be provided for repairing leaks to chlorine systems. A respiratory protection program shall be available for all employees.

(v) Instruction manuals. Instruction manuals for all elements of the disinfectant storage, preparation and application system shall be provided. These instruction manuals shall describe each component of the system, and provide a complete discussion of the operation and maintenance requirements.

Section 22. <u>Effluent Structures.</u>

(a) Location. The location of the effluent discharge shall be at least three miles from public water supply intakes.

(b) Protection from hazards. The outfall sewer shall be constructed and protected against the effects of floodwater, ice, debris, or other hazards as to insure its structural stability and freedom from stoppage. A manhole should be provided at the shore-end of all gravity sewers extending into the receiving waters.

Section 23. <u>Laboratory requirements.</u>

(a) Test procedures. Test procedures for analysis of monitoring samples shall conform to regulations published pursuant to Section 304(g) of the Federal Water Pollution Control Act (33 U.S.C. 466 et. seq.).

(b) Testing requirements. All treatment plants shall have capability to perform or contract for the self-monitoring analytical work required by discharge permits or ground water monitoring requirements. All plants shall in addition be capable of performing or contract out the analytical work required to assure good management and control of plant operation and performance. Plants operating under requirements of an industrial pretreatment program must have the capability of performing or must contract out the necessary testing to maintain the program as approved by the reviewing agency.

(c) Minimum requirements.

(i) Location and space. The laboratory shall be located away from vibrating machinery or equipment which might have adverse effects on the performance of laboratory instruments or the analyst and shall be designed to prevent adverse effects from vibration.

A minimum of 400 square feet (37.2 m^2) of floor space shall be provided for the laboratory where an analysis program for a fulltime laboratory chemist is proposed. If more than two persons will be working in the laboratory, 100 square feet (9.3 m^2) of additional space shall be provided for each additional person.

(ii) Materials.

(A) Walls. Provide a durable, impervious surface that is easily cleaned.

(B) Doors. Two exit doors or openings shall be located to permit a straight egress from the laboratory; one exit shall be directly to outside of the building. Panic hardware shall be used. Interior doors shall have glass windows.

(C) Cabinets and bench tops. Cabinet and storage space shall be provided for dust-free storage of instruments and glassware.

Bench top height shall be 36 inches (0.91 m). Tops should be field joined into a continuous surface with acid, alkali, and solvent-resistant cements.

(D) Hoods. Fume hoods shall be provided where reflux or heating of toxic or hazardous materials is required.

(I) Fume hoods.

(1.) Location. A hood shall not be situated near a doorway, unless a secondary means of egress is provided.

(2.) Fixtures. All switches, electrical outlets, and utility and baffle adjustment handles shall be located outside the hood. Light fixtures shall be explosion proof.

(3.) Exhaust. Twenty-four hour continuous exhaust capability shall be provided. Exhaust fans shall be explosion proof.

(v) Sinks. The laboratory shall have a minimum of two sinks per 400 ft (37.2 m) (not including cup sinks). Sinks shall be double-well with drainboards and shall be made of epoxy resin or plastic. All water fixtures shall be provided with reduced pressure zone backflow preventers. Traps constructed of glass, plastic, or lead and accessibility for cleaning shall be provided.

(vi) Ventilation and lighting. Laboratories shall be separately air conditioned, with external air supply for 100 percent makeup volume. Separate exhaust ventilation shall be provided. Ventilation outlet locations shall be remote from ventilation inlets.

Lighting shall provide 100 foot-candles at the bench top.

(vii) Gas and vacuum. If gas is required in the laboratory, natural gas shall be supplied. Digester gas shall not be used.

(viii) Water still. Distilled water shall conform to the Standard Methods for the Examination of Water and Wastewater, 15th Edition.

(ix) Emergency shower and eye wash. All laboratories shall be equipped with an emergency eye wash and shower.

(d) Portable testing equipment. Portable testing equipment shall be provided where necessary for operational control testing or industrial waste testing. Portable testing may be used for testing as necessary, provided the testing procedure meets the requirements of Section 304(g) of the Federal Water Pollution Control Act, if the results are to be used for permit reporting. Non-EPA certified procedures may be used for operational control or gross data generation.

Section 24. Operation and Maintenance Manuals.

(a) Where required. Plant operation and maintenance manuals are required for each new or modified treatment or pumping facility. The manuals shall provide the following information as a minimum:

(i) Introduction.

(ii) Description of facilities and unit processes through the plant from influent structures through effluent structures.

(iii) Plant control system.

(iv) Utilities and systems.

(v) Emergency operation and response.

(vi) Permit requirements and other regulatory requirements.

(vii) Staffing needs.

(viii) Index to manufacturer's manuals.

(b) When required. Draft operation and maintenance manuals shall be submitted to the Department of Environmental Quality at 50 percent completion of construction. Approval of the final operation and maintenance manuals is required prior to plant startup.

(c) Description and facilities. The description of facilities and unit processes shall include the size, capacity, model number (where applicable) and intended loading rate.

(i) Each unit. The manual shall describe each unit, including the function, the controls, the lubrication and maintenance schedule, as well as the following:

(A) Startup operations.
(B) Routine operations.
(C) Abnormal operations.
(D) Emergency or power outage operations.
(E) Bypass procedures.

(F) Safety.

(ii) Flow diagrams. The manual shall provide flow diagrams of the entire process, as well as individual unit processes. The flow diagrams shall show the flow options under the various operational conditions listed above.

(d) Operating parameters. The O&M manual shall provide the design criteria for each unit process. The data shall include the number, type, capacity, sizes, etc., and other information, as applicable.

(e) Troubleshooting guide. Each equipment maintenance manual shall include a section on troubleshooting. These manuals are to be indexed in the plant O&M manual. The troubleshooting guide shall include a telephone number for factory troubleshooting assistance.

(f) Emergency procedures. The plant O&M manual shall detail emergency operations procedures for possible foresee able emergencies, including power outage, equipment failure, development of unsafe conditions, oil and hazardous substances discharge into the plant, and other emergency conditions. The details shall include valve positions, flow control settings, and other information to insure continued operation of the facility at maximum possible efficiency.

The manual shall also detail emergency notification procedures to be followed to protect health and safety under various emergency conditions.

(g) Safety. The manual shall provide general information of safety in and around the plant and its components. Each unit process discussion shall include applicable safety procedures and precautions. For unit processes or operations having extreme hazards (i.e., chlorine, closed tanks, etc.) the discussion shall detail appropriate protection, rescue procedures, and necessary safety equipment.

(h) Compliance submittals. The O&M manual shall summarize the monitoring and the reporting requirements of the discharge permit. These requirements will be modified from time-to-time, and should, therefore, be placed in an appendix to the O&M manual.

(i) Maintenance manuals. Maintenance manuals shall be required for each piece of equipment. These manuals must meet the requirements of the engineer and contractor for installation and startup of equipment. The information included in the manufacturers' manuals shall not be included in the O&M manual.

(i) General content of manuals.

(A) Neatly typewritten table of contents for each volume, arranged in a systematic order.

(B) Product data.

(C) Drawings.

(D) Written text as required to supplement product data for the particular installation.

(E) Copy of each warranty, bond and service contract issued.

(ii) Manuals for equipment and systems.

(A) Description of unit and component parts.

(B) Operating procedures.

(C) Maintenance procedures and schedules.

(D) Service and lubrication schedule.

(E) Sequence of control operation.

(F) Parts list.

(G) Recommended spare parts.

PART C

COMMERCIAL/INDUSTRIAL WASTE AND WASTEWATER FACILITIES

Section 25. General. This part contains the minimum standards for the design and construction of commercial/ industrial wastewater facilities. The applicant shall demonstrate to the administrator that any discharge or seepage from the wastewater facility will not cause a violation of the surface and/ or groundwaters of the state in accordance with Chapter I, “Quality Standards for Wyoming Surface Waters” and Chapter VIII, “Quality Standards for Wyoming Groundwaters.” Due to the wide variety of wastes, wastewater and site conditions, the latest available scientific information shall be used to demonstrate that violations will not occur.

Section 26. Discharge to Public Sewerage System. The discharge of commercial/industrial wastewater to a public sewerage system shall be allowed provided a letter of verification from the public sewerage system manager is submitted to the Department of Environmental Quality stating that the municipal system is capable of handling the added organic and/or hydraulic loads. The applicant shall demonstrate (1) that the wastewater will not adversely impact the treatment works and/or discharge or (2) that pretreatment of the wastewater shall be provided to eliminate the adverse impacts. The design and construction of any pretreatment device shall reduce the pollutants to the limits imposed by the public sewerage system manager.

Section 27. Domestic Wastes from Commercial/Industrial Facilities. Commercial/industrial facilities which generate waste that is entirely domestic waste shall be designed in compliance with Part B of Chapter 11 or Chapter 25. When the commercial/industrial facility generates a combined domestic and commercial/industrial waste, the facility may be designed in compliance with Chapter 25 or Part B of this chapter provided the applicant can demonstrate that the commercial/ industrial waste will not interfere or adversely impact the treatment works or the discharge.

Section 28. Biological Treatment Ponds. This section includes the standards for ponds that accept commercial/ industrial waste and wastewater that is primarily organic and utilizes biological organisms for treatment and do not meet the requirements of Section 27. The presence of toxic wastes, hazardous substances, and/or petroleum products shall not interfere or adversely impact the treatment process or disposal system.

(a) Location.

(i) Extraneous surface water and groundwater shall be excluded from entering the wastewater pond or entering the wastewater flow into the pond.

(ii) Ponds shall not be located within the ordinary high water mark of perennial rivers, streams, or creeks; nor in the bottoms of rivers, streams, creeks, draws, coulees, or other natural drainages into which natural runoff may flow and/or enter.

(iii) Ponds shall be protected from structural damage during the 100-year flood event.

(b) Basis of design.

(i) Aerobic, facultative, and anaerobic ponds shall be designed based on the type, strength characteristics, and anticipated flow rates of the wastewater. Loading rates shall be determined on a case-by-case basis using the best available technology, reference, and/or pilot studies. The affect of any toxic wastes, hazardous substances, and/or petroleum products on the wastewater treatment works and disposal system shall be evaluated. All anaerobic ponds shall be followed by an aerobic process if the system discharges to surface waters of the state.

When seepage is considered part of the design, the potential effect of groundwater mounding on the seepage rate shall be evaluated.

(ii) In addition to the above, all nonsurface water discharging ponds shall be designed on the basis of a water balance that considers net evaporation and seepage. They shall be designed to provide sufficient storage for retention of all wastewater and rainfall during the wettest occurring year of a ten-year period. Seepage shall be controlled to maintain a minimum water depth of two feet in the primary cell during the driest occurring year of a ten-year period.

(c) Pond layout.

(i) Discharging treatment systems and ponds that require liners to protect groundwater shall consist of a minimum of two cells. The largest cell shall not contain more than 55 percent of the total waste volume at the design capacity.

(ii) Inlet structures shall be submerged and located to properly distribute the wastewater flow throughout the pond(s) and shall prevent short circuiting. Influent wastewater shall not erode or disturb the liner, seal, or dike. Submerged multiple inlets are recommended. The pipe shall discharge at least ten feet from the toe of the slope.

(iii) Outlet structures from discharging treatment systems shall be capable of multilevel drawoff and have an overflow device. Outlet structures shall prevent short circuiting, prevent floating debris from discharging, and keep outlet velocities at a minimum so as not to erode or disturb the receiving channel. Erosion control material shall be designed based on flow velocities and quantities. Ice formation shall neither stop the overflow nor damage the outlet structure.

(iv) All pipe protruding through a dike or embankment shall have adequate seepage controls. Capabilities shall exist to drain the ponds for maintenance purposes. By-pass piping for each individual pond cell shall be provided.

(v) A manhole or vented cleanout wye shall be installed prior to the entrance of the influent pipe into the primary pond(s) and shall be located as close to the dike as topography permits. The influent pipe invert should be at least six inches above the maximum operating level of the pond.

(vi) The maximum water depth shall be six feet in the primary cell(s) of non-aerated aerobic or facultative systems. The maximum water depth shall be 15 feet in aerated cells. The maximum water depth for subsequent cells or other types of ponds shall be determined on a case-by-case basis.

The minimum water depth shall be three feet in the primary cell(s) and two feet in subsequent cell(s). Cells designed for high-rate infiltration may be allowed to be dry periodically provided that the applicant can demonstrate that vegetation will be controlled and a regular maintenance program is provided.

(vii) Free board shall be provided to protect embankments and dikes from overtopping from wave action, and shall be a minimum of three feet above the high water level. For ponds less than two acres, two feet of freeboard may be acceptable.

(d) Pond construction.

(i) Soils used in constructing the pond bottom and dike cores (not including the liner) shall be relatively incompressible, have a low permeability, and be free from organic material or trash. The soil shall be compacted at a water content that will insure structural stability, minimize hydraulic seepage, and minimize settling. The soil shall provide an adequate foundation for the liner, if used.

(ii) On ponds that are not specified to receive an artificial liner, no rocks larger than six inches in length shall be permitted in any of the designated embankment.

On ponds that are specified to be lined with an artificial liner, rocks larger than six inches in length shall not be placed within five feet of the interior slope of any pond embankment. Material containing by volume less than 25 percent of rock larger than six inches and less than 12 inches in length may be placed in the remainder of the embankment.

(iii) Outer dike slopes shall not be steeper than one vertical to two horizontal. Flatter slopes may be required to maintain slope stability. Outer dike slopes shall prevent surface runoff from entering the ponds.

Inner dike slopes shall be sloped between one vertical to four horizontal and one vertical to three horizontal. Flatter inner slopes may be allowed where vegetation due to the shallower slopes will not interfere with treatment or the dike’s integrity. Interior slopes surfaced with concrete paving or riprap may be constructed at slopes of one vertical to two horizontal.

(iv) The minimum top dike width shall be eight feet to permit access of maintenance vehicles. Top dikes wider than eight feet shall be required when necessary to assure structural stability.

(v) The pond bottom shall be sufficiently flat to insure a minimum water depth as required in Section 28 (c)(vi).

(e) Dike protection.

(i) Interior embankments shall be protected from wave action with riprap, paving, or other erosion resistant material. The following conditions may be exempted from the riprap requirements:

(A) Ponds of one surface acre or less;

(B) Ponds with an artificial liner;

(C) Embankments cut into natural slopes when a soil liner is not provided; or

(D) Ponds which are sheltered from wind or where winds are slow enough that significant erosion will not occur.

(ii) Exterior of dikes, top of dikes, and all interior dike surfaces where riprap or a seal is not provided shall be covered with topsoil and seeded with suitable dryland grasses to prevent erosion. A uniform coarse graded gravel may be substituted for the vegetation requirement.

(f) Liners.

(i) Seepage limits. The seepage through the pond bottom and side walls shall not cause a violation of the groundwater standards as described in Chapter VIII (Quality Standards for Wyoming Groundwaters) of the Wyoming Department of Environmental Quality, Water Quality Rules and Regulations. Liners shall be required if the wastewater characteristics or site conditions will not insure the protection of the groundwater for which it is classified.

If the applicant cannot document that the facility poses no threat to groundwater and elects not to perform a subsurface study in accordance with Chapter III, Section 15(a) and (b), then the groundwater shall be protected from contamination by the wastewater with a liner equivalent to three feet of soil having a permeability of 10-7 cm/sec or less. When an applicant performs a subsurface study, the requirement for the liner shall be determined based on the results of the study and the groundwater protection required. In no instance shall the maximum seepage rate exceed 1/8 inch per day in the primary pond(s).

(ii) Soil and bentonite liners. The specifications for a soil or bentonite liner shall be based upon the results of a preliminary testing program and shall contain at a minimum the type of material, optimum and acceptable range in water content, acceptable range for compaction, and maximum allowable particle size.

Soil or bentonite liners used to protect groundwater quality shall meet the following criteria: Written certification that the soil liner was constructed in accordance with specifications shall be provided by a Wyoming registered professional engineer or an independent soils laboratory. Tests for water content and density shall be taken during application of each lift. Additionally, either permeability testing of undisturbed core samples from the in-place seal, or detailed tests such as particle size distribution and Atterburg limits confirming that the soil used in the liner construction was the same soil initially tested, shall be provided. In all cases, at least one test shall be provided per acre per lift, except for core sampling of the in-place liner, where one core of the completed liner shall be tested per acre.

(iii) Synthetic liners. The thickness requirements for synthetic liners shall be determined on a case-by-case basis but shall not be less than 30 mil. The type of liner shall be compatible with the wastewater characteristics. The synthetic liner shall have a permeability equivalent to that required in Section 28(f)(i).

Synthetic liners shall be anchored to prevent movement, slippage, and flotation. The synthetic liner shall be protect ed from degradation by ultraviolet light, ice damage and settling of underdrain trenches. An air venting system may be required beneath the synthetic liner to expel gases trapped during installation, produced by decomposing organic material, or produced by a fluctuating water table.

(iv) Uniformity. The pond bottom shall be smooth with a maximum tolerance of ± 6 inches.

(v) Prefilling. All ponds shall be prefilled to the two foot level to protect the liner, to prevent weed growth, to encourage rapid startup of the biological process and discourage odor, to reduce freeze up problems for late fall startups, to confirm the seal’s integrity and to maintain the water of the seal at or above optimum conditions. The raw wastewater shall not be used for prefilling purposes except for anaerobic ponds.

(vi) Exfiltration evaluation. All ponds designated with a maximum exfiltration rate shall be tested for exfiltration. A maximum exfiltration rate not in excess of the design rate shall be deemed acceptable. If the exfiltration rate is deemed excessive, the seal shall be repaired and the test procedure repeated. This procedure shall be repeated until the maximum exfiltration rate criteria is met. Results of all testing shall be submitted to DEQ.

(g) Miscellaneous. A permanent flow measuring device shall be installed at the outfall of discharging pond sites and shall measure the effluent under all climatic conditions. The accuracy of the flow measuring device must be within ten percent of the actual flow. Ponds with a maximum daily discharge of less than 50,000 gallons per day may be exempted from installing a permanent flow measuring device.

Section 29. Feedlots. This section includes the standards for wastewater retention systems for feedlot runoff. The basic concept of retention systems is to intercept and collect runoff and wastes from the animal feeding area until it can be disposed of via land application. Although retention systems are usually the most economical method of treatment, other systems will be evaluated on a case-by-case basis.

(a) Location.

(i) Groundwater shall be excluded from entering the wastewater pond or the wastewater flow into the pond.

(ii) Ponds shall not be located within the ordinary highwater mark of perennial rivers, streams, or creeks. Ponds not containing hazardous or toxic wastes may be located within the ordinary high water mark of intermit tent rivers, streams, creeks, draws, coulees, or other natural drainages provided a by-pass ditch is installed capable of passing the 24 hour - 100 year precipitation event.

(iii) The wastewater retention system shall be as near to the animal feeding operation as possible to keep construction to a minimum. The retention ponds shall be located outside the pen area for safety and maintenance purposes. Sufficient space must be left between streams or drainage areas to allow construction of the necessary collection ditches and retention ponds.

(b) Basis of design. All livestock confinement areas, alleyways, etc., shall be graded to prevent accumulation of surface waters and to drain all contaminated water to the retention system. Collection ditches shall be provided when necessary to intercept contaminated water. The wastewater retention system shall be designed to contain the 25 year, 24 hour precipitation event. Wastewater in the retention pond shall be removed and disposed of as soon as possible after a precipitation event. The applicant shall demonstrate that equipment is available for removing the wastewater.

(i) Diversion ditches. The animal feeding area shall be protected with diversion ditches that will direct uncontaminated runoff from areas above and adjacent to the site away from the ponds and shall be capable of diverting the 25-year, 24 hour precipitation event.

(ii) Collection ditches. Collection ditches shall be constructed around the feeding area to intercept the contaminated runoff and transport it to the settling and/or retention pond. The depth shall be adequate to handle the design flow and shall have a bottom slope sufficient to produce a velocity of not less than two feet per second. Side slopes shall not be steeper than eight horizontal to one vertical.

(iii) Settling pond. A settling pond ahead of the retention pond is recommended to accumulate the solids in the waste flow and to simplify their removal and final disposal. The surface area shall be sized to reduce the flow velocity below one foot per second to allow settling of solids. The pond shall be between three to six feet deep to allow sufficient capacity for holding the solids and yet allow easy removal of the solids. The outlet structure shall minimize the overflow of solids into the retention pond.

(iv) Retention pond. The retention pond shall be capable of containing all runoff from the feeding area for the design storm until the contaminated runoff can be disposed. If a settling pond is not provided before the retention pond, the design volume shall be increased by 10 percent to accommodate collection of solids.

(c) Retention pond layout.

(i) The shape and depth shall facilitate ease of cleaning and maintenance. A minimum freeboard of 1.5 feet shall be required above the high water level of the spillway.

(ii) Spillways shall be provided on all retention ponds to pass flows in excess of the 25 year, 24 hour precipitation event. The spillway shall be placed above the design high water level.

(d) Retention pond construction. The retention pond construction shall meet the following requirements:

(i) Soils used in constructing the pond bottom and dike cores (not including the liner) shall be relatively incompressible, have a low permeability, and be free from organic material or trash. The soil shall be compacted at a water content that will insure structural stability, minimize hydraulic seepage, and minimize settling. The soil shall provide an adequate foundation for the liner, if used.

(ii) On ponds that are not specified to receive an artificial liner, no rocks larger than six inches in length shall be permitted in any of the designated embankments.

On ponds that are specified to be lined with an artificial liner, rocks larger than six inches in length shall not be placed within five feet surface of the interior slope of any pond embankment. Material containing by volume less than 25 percent of rock larger than six inches and less than 12 inches in length may be placed in the remainder of the embankment.

(iii) Outer dike slopes shall not be steeper than one vertical to two horizontal. Flatter slopes may be required to maintain slope stability.

Inner dike slopes shall be sloped between one vertical to four horizontal and one vertical to three horizontal. Flatter inner slopes may be allowed where vegetation due to the shallower slopes will not interfere with treatment or the dike's integrity. Interior slopes surfaced with concrete paving or riprap may be constructed at slopes of one vertical to two horizontal.

(iv) The minimum top dike width shall be eight feet to permit access of maintenance vehicles. Top dikes wider than eight feet shall be required when necessary to assure structural stability.

(v) The pond bottom may be sloped to facilitate pumping but shall not exceed a 0.5 percent slope.

(e) Liners.

(i) Seepage limits. The seepage through the pond bottom and side walls shall not cause a violation of the groundwater standards as described in Chapter VIII (Quality Standards for Wyoming Groundwaters) of the Wyoming Department of Environmental Quality, Water Quality Rules and Regulations. Liners shall be required if the wastewater characteristics or site conditions will not insure the protection of the groundwater for which it is classified.

If the applicant cannot document that the facility poses no threat to groundwater and elects not to perform a subsurface study in accordance with Chapter III, Section 15(a) and (b), then the groundwater shall be protected from contamination by the wastewater with a liner equivalent to three feet of soil having a permeability of 10-7 cm/sec or less. When an applicant performs a subsurface study, the requirement for the liner shall be determined based on the results of the study and the groundwater protection required. In no instance shall the maximum seepage rate exceed 1/8 inch per day in the primary pond(s).

(ii) Soil and bentonite liners. The specifications for a soil or bentonite liner shall be based upon the results of a preliminary testing program and shall contain at a minimum the type of material, optimum and acceptable range in water content, acceptable range for compaction, and maximum allowable particle size.

Soil or bentonite liners used to protect groundwater quality shall meet the following criteria: Written certification that the soil liner was constructed in accordance with specifications shall be provided by a Wyoming registered professional engineer or an independent soils laboratory. Tests for water content and density shall be taken during application of each lift. Additionally, either permeability testing of undisturbed core samples from the in-place seal, or detailed tests such as particle size distribution and Atterburg limits confirming that the soil used in the liner construction was the same soil initially tested, shall be provided. In all cases, at least one test shall be provided per acre per lift, except for core sampling of the in-place liner, where one core of the completed liner shall be tested per acre.

(iii) Synthetic liners. The thickness requirements for synthetic liners shall be determined on a case-by-case basis but shall not be less than 30 mils. The type of liner shall be compatible with the wastewater characteristics. The synthetic liner shall have a permeability equivalent to that of Section 29(e)(i).

Synthetic liners shall be anchored to prevent movement, slippage, and flotation. The synthetic liner shall be protect ed from degradation by ultraviolet light, ice damage and settling of underdrain trenches. An air venting system may be required beneath the synthetic liner to expel gases trapped during installation, produced by decomposing organic material, or produced by a fluctuating water table.

(iv) Exfiltration evaluation. All ponds designated with a maximum exfiltration rate shall be tested for exfiltration. A maximum exfiltration rate not in excess of the design rate shall be deemed acceptable. If the exfiltration rate is deemed excessive, the seal shall be repaired, and the test procedure repeated. This procedure shall be repeated until the maximum exfiltration rate criteria is met. Results of all testing shall be submitted to the Department of Environmental Quality.

Section 30. Non-biological Treatment Ponds. This section includes the standards for non-biological treatment ponds or ponds that accept commercial/industrial waste or wastewater that is primarily non-biological in nature and does not utilize biological organisms for treatment. Radio logical affects considered by the Nuclear Regulatory Commission (NRC) from non-surface discharging treatment works within a NRC licensed permit boundary are exempt from this section.

(a) Location.

(i) Extraneous surface water and groundwater shall be excluded from entering the wastewater pond or entering the wastewater flow into the pond.

(ii) Ponds shall not be located within the ordinary high water mark of perennial rivers, streams, or creeks. Ponds not containing hazardous or toxic wastes may be located within the ordinary high water mark of intermit tent rivers, streams, creeks, draws, coulees, or other natural drainages provided a by-pass ditch is installed capable of passing the 24 hour - 100 year precipitation event. All other ponds shall be protected from structural damage during the 100-year flood event.

(b) Basis of design.

(i) Ponds shall be designed based on the type of wastewater, the wastewater strength characteristics, and the anticipated flow rates. Loading rates shall be determined on a case-by-case basis using the best available technology, reference, and/or pilot studies. The affect of any toxic wastes, hazardous substances, and/or petroleum products on the wastewater treatment process and disposal system shall be evaluated.

Where seepage is considered part of the design, the potential effect of groundwater mounding on the seepage rate must be evaluated.

(ii) In addition to the above, non-surface water discharging ponds shall be designed on the basis of a water balance that considers net evaporation and seepage. Non-discharging ponds shall be designed to provide sufficient storage to retain all wastewater and rainfall during the wettest occurring year of a ten year period.

(c) Pond layout.

(i) Discharging treatment systems and ponds that require liners to protect groundwater shall consist of a minimum of two cells. The largest cell shall not contain more than 55 percent of the total waste volume at the design capacity.

(ii) Inlet and intracell structures for discharging treatment systems shall prevent short circuiting, and shall not erode or disturb the liner, seal or dike.

(iii) Outlet structures from a discharging treatment system shall have an overflow device, prevent short circuiting, prevent floating debris from discharging, and keep outlet velocities to a minimum so as not to erode or disturb the receiving channel. Erosion control material shall be designed based on flow velocities and quantities. Ice formation shall neither stop the overflow nor damage the outlet structure.

(iv) All pipe protruding through a dike or embankment shall have adequate seepage controls. Capabilities shall exist to drain the ponds for maintenance purposes.

(v) A manhole or vented cleanout wye shall be installed prior to the entrance of the influent pipe into the primary pond(s) and shall be located as close to the dike as topography permits. The influent pipe invert should be at least six inches above the maximum operating level of the pond.

(vi) The maximum and minimum water depth shall be determined on a case-by-case basis. However, the design engineer must demonstrate that ponds with less than two feet water depth will not have vegetation problems.

(vii) Free board shall be provided to protect embankments and dikes from overtopping from wave action, and shall be a minimum of three feet above the high water level. For ponds less than two acres, two feet of freeboard may be acceptable.

(d) Pond construction.

(i) Soils used in constructing the pond bottom and dike cores (not including the liner) shall be relatively incompressible, have a low permeability, and be free from organic material or trash. The soil shall be compacted at a water content that will insure structural stability, minimize hydraulic seepage, and minimize settling. The soil shall provide an adequate foundation for the liner, if used.

(ii) On ponds that are not specified to receive an artificial liner, no rocks larger than six inches in length shall be permitted in any of the designated embankment.

On ponds that are specified to be lined with an artificial liner, rocks larger than six inches in length shall not be placed within five feet of the interior slope surface of any pond embankment. Material containing by volume less than 25 percent of rock larger than six inches and less than 12 inches in length may be placed in the remainder of the embankment.

(iii) Outer dike slopes shall not be steeper than one vertical to two horizontal. Flatter slopes may be required to maintain slope stability. Outer dike slopes shall prevent surface runoff from entering the ponds.

Inner dike slopes shall be sloped between one vertical to four horizontal and one vertical to three horizontal. Flatter inner slopes may be allowed where vegetation due to the shallower slopes will not interfere with treatment or the dike's integrity. Interior slopes surfaced with concrete paving or riprap may be constructed at slopes of one vertical to two horizontal.

(iv) The minimum top dike width shall be eight feet to permit access of maintenance vehicles. Top dikes wider than eight feet shall be required when necessary to assure structural stability.

(e) Dike protection.

(i) Interior embankments shall be protected from wave action with riprap, paving, or other erosion resistant material. The following conditions may be exempted from the riprap requirements:

(A) Ponds of one surface acre or less;

(B) Ponds with an artificial liner;

(C) Embankments cut into natural slopes where a soil liner is not provided; or

(D) Ponds which are sheltered from wind or where winds are slow enough that significant erosion will not occur.

(ii) Exterior of dikes, top of dikes, and all interior dike surfaces where riprap or a seal is not provided shall be covered with topsoil and seeded with suitable dryland grasses to prevent erosion. A uniform coarse graded gravel may be substituted for the vegetation requirement.

(f) Liners.

(i) Seepage limits. The seepage through the pond bottom and side walls shall not cause, a violation of the groundwater standards as described in Chapter VIII (Quality Standards for Wyoming Groundwaters) of the Wyoming Department of Environmental Quality, Water Quality Rules and Regulations. Liners shall be required if the wastewater characteristics or site conditions will not insure the protection of the groundwater for which it is classified.

If the applicant cannot document that the facility poses no threat to groundwater and elects not to perform a subsurface study in accordance with Chapter III, Section 15(a) and (b), then the groundwater shall be protected from contamination by the wastewater with a liner equivalent to three feet of soil having a permeability of 10-7 cm/sec or less. When an applicant performs a subsurface study, the requirement for the liner shall be determined based on the results of the study and the groundwater protection required. In no instance shall the maximum seepage rate exceed 1/8 inch per day in the primary pond(s).

(ii) Soil and bentonite liners. The specifications for a soil or bentonite liner shall be based upon the results of a preliminary testing program and shall contain at a minimum the type of material, optimum and acceptable range in water content, acceptable range for compaction, and maximum allowable particle size.

Soil or bentonite liners used to protect groundwater quality shall meet the following criteria. Written certification that the soil liner was constructed in accordance with specifications shall be provided by a Wyoming registered professional engineer or an independent soils laboratory. Tests for water content and density shall be taken during application of each lift. Additionally, either permeability testing of undisturbed core samples from the in-place seal, or detailed tests such as particle size distribution and Atterburg limits confirming that the soil used in the liner construction was the same soil initially tested, shall be provided. In all cases, at least one test shall be provided per acre per lift, except for core sampling of the in-place liner, where one core of the completed liner shall be tested per acre.

(iii) Synthetic liners. The thickness requirements for synthetic liners shall be determined on a case-by-case basis but shall not be less than 30 mils. The type of liner shall be compatible with the wastewater characteristics. The synthetic liner shall have a permeability equivalent to that of Section 30(f)(i).

Synthetic liners shall be anchored to prevent movement, slippage, and flotation. The synthetic liner shall be protect ed from degradation by ultraviolet light, ice damage and settling of underdrain trenches. An air venting system may be required beneath the synthetic liner to expel gases trapped during installation, produced by decomposing organic material, or produced by a fluctuating water table.

(iv) Prefilling. For soil or bentonite liners, a method of maintaining the seal at or above optimum moisture conditions is required.

(v) Exfiltration evaluation. All ponds designated with a maximum exfiltration rate shall be tested for exfiltration. A maximum exfiltration rate not in excess of the design rate shall be deemed acceptable. If the exfiltration rate is deemed excessive, the seal shall be repaired and the test procedure repeated. This procedure shall be repeated until the maximum exfiltration rate criteria is met. Results of all testing shall be submitted to the Department of Environmental Quality.

(g) Miscellaneous. A permanent flow measuring device shall be installed at the outfall of discharging pond sites and shall measure the effluent under all climatic conditions. The accuracy of the flow measuring device must be within ten percent of the actual flow. Ponds with a maximum daily discharge of less than 50,000 gallons per day may be exempted from installing a permanent flow measuring device.

Section 31. Sedimentation Control Facilities. This section includes the standards for sedimentation control facilities. Those sedimentation control facilities that are regulated under Water Quality Rules and Regulations, Chapter X, “Performance/Design Standards for Surface Coal Mining Runoff Control Facilities” are exempted from this section.

(a) Location. The sedimentation control facilities shall be as near to the affected lands as possible to keep construction and containment volumes to a minimum. Sedimentation control facilities shall be located off-channel when possible. Runoff from unaffected lands should be by-passed around the containment area. All affected lands must drain to a sedimentation control facility.

(b) Basis of design. Sedimentation control facilities shall control all runoff from areas which drain into the facility from a 10 - year 24 - hour precipitation event in addition to the estimated sediment storage volume for one year be always available. The pond shall be drained down to the permanent pool level as soon as the effluent meets the discharge parameters. The applicant shall demonstrate that equipment or outlet structures are available for draining the pond.

(c) Layout.

(i) Inlet ditches or structures shall not erode or disturb the pond bottom.

(ii) Outlet structures, if used, shall have an overflow device, prevent short-circuiting, prevent floating debris from discharging and shall not erode or disturb the dike. All pipe protruding through a dike shall have adequate seepage control. The point of discharge into a channel shall be protected against erosion and erosion control devices shall be designed based on flow velocities.

(iii) Spillways. Sedimentation control facilities that individually contain more than 2.0 acre-feet of runoff or that individually have more than 2.0 acres of surface area or that are located on-channel shall have a spillway to by-pass precipitation events in excess of the design event. Spillways shall safely pass the 25 year flood event except when the impoundment height is greater than twenty feet or capacity exceeds twenty acre-feet; in which case the spillway shall safely pass the 100-year flood event.

(iv) By-pass ditches. If by-pass ditches are provided to transport runoff from unaffected lands, they shall be designed to pass the runoff from a 25 year precipitation event.

(v) Freeboard. Freeboard shall be provided to protect embankments and dikes from overtopping from wave action and shall be a minimum of one foot above the high water level. For ponds less than two acres, one-half foot of freeboard may be acceptable.

(d) Construction.

(i) Soils used in constructing the pond bottom and dike cores shall be relatively incompressible, have a low permeability, and be free from organic material or trash. The soil shall be compacted at a water content that will insure structural stability, minimize hydraulic seepage, and minimize settling.

Rocks larger than six inches in length shall not be placed within five feet of the interior slope surface of any pond embankment. Material containing by volume less than 25 percent of rock larger than six inches and less than 12 inch in length dimension may be placed in the remainder of the embankment.

(ii) Outer dike slopes shall not be steeper than one vertical to two horizontal. Flatter slopes may be required to maintain slope stability. Inner dike slopes shall be sloped between one vertical to four horizontal and one vertical to three horizontal.

(iii) The minimum top dike width shall be sufficient to provide structural stability.

(iv) Riprap or other acceptable erosion control shall be installed on the inner dike slopes at all anticipated levels of water. Dikes cut into existing ground shall be exempted from riprap requirements. Ponds that have less than 2.0 acres of surface area shall also be exempted.

PART D Septic Tank And/Or Soil Absorption Systems
And Other Small Wastewater Systems
NOW
Chapter 25
(Pages 90-119)

PART E

WASTE AND WASTEWATER LAND APPLICATION FACILITIES

Section 48. General. This part contains the minimum standards for the design and construction of waste and wastewater land application facilities.

Section 49. Definitions Specific to Part E.

(a) “Direct consumption” or “direct food chain crops” means vegetable, grain or fruit crops grown for direct human consumption.

(b) “Indirect food chain crops” means forage or grain crops utilized by grazing animals and thereby one step removed from human consumption.

(c) “Land application/treatment” is the application of wastes or wastewater to the land at a predetermined rate for the purpose of renovation by any or all of the following processes: chemical and microbial degradation, plant uptake and assimilation, or soil adsorption and accumulation in the profile.

(d) “Overland flow land application system” is a system in which treatment is accomplished by the application of wastewater to a sloping, largely impermeable site. Treatment mechanisms include filtration, sedimentation, microbial oxidation, and crop uptake. Typical application rates range from 0.0392-0.3136 $yd^3/yd/hr$.

(e) “Primary treatment level” (as related to pathogenic organism reduction) is that level of fecal coliform reduction (a minimum of 25 percent reduction) achieveable by primary sedimentation in single cell discharging lagoons operated within the limits described in Part B, Section 13(c).

(f) “Rapid infiltration system” is a land application system in which treatment is accomplished by the percolation of large quantities of wastewater through a sufficient depth of coarse or highly permeable soil profile. Treatment is accomplished by filtration, microbial oxidation (which may include nitrification denitrification), and soil adsorption. Application rates for these systems generally exceed four inches per week, and may exceed 100 inches per week on soils capable of transmitting a range of .30 to 20 inches of water per hour through the most restrictive layer.

(g) "Slow rate land application system" is an irrigation system in which wastewater treatment is achieved chiefly by microbial oxidation (nitrification - denitrification), plant uptake of nutrients and adsorption on soil and organic matter. Application rates for systems in this category range from 0.5-4 inches per week on soils capable of transmitting 0.06-6.0 inches of water per hour through the most restric tive layer.

(h) "Sludge" means any mixture or suspension of liquid and solid wastes having a total suspended solids content greater than ten percent by weight.

(i) "Soil" is the collection of natural bodies occupying parts of the earth's surface that support plants and that have properties due to the integrated effect of climate and living matter acting upon parent material, as conditioned by relief, over periods of time.

Section 50. Site Requirements.

(a) The method for determining the size of a particular land site for accomplishing the treatment level necessary to comply with an NPDES permit or to maintain a groundwater aquifer within its present class shall be based on the number of acres (hectares) required to reduce the waste constituent identified as requiring the largest land area, based on soil assimilative capacity. The ratio used for this determination is expressed as:

Required Land Treatment Area = G/C

Where:

G = generation rate = the yearly amount of the controlling constitutent to be applied for land treatment. G is listed in kilograms per year (kg/yr) or pounds per year (lbs/yr).

C = plant-soil assimilative capacity = the yearly amount of the control ling constituent which can be assim ilated by plant uptake, soil ad sorption and accumulation, transfor mation or degradation, and allow survival and maintenance of indige nous or crop plant species. C is listed in kilograms per hectare per year (kg/ha/yr) or pounds per acre per year (lbs/ac/yr).

Wastewater constituents or categories of constituents from which the land-limiting factor will be selected are generally grouped as:

Organics	Nitrogen
Phosphorus	Heavy metals
Salts, acids and bases	Water
Oil and grease	

(b) Slope. Slow rate irrigation systems (generally less than 4.0 inches/wk application rate) will not be developed on slopes greater than 15 percent unless the site is terraced, gated pipe is placed on the contour, or vegetation, application rate and soil infiltration rate are such that runoff and erosion would not result.

Overland flow systems will not be developed on sites having less than two percent or greater than eight percent slope.

(c) Soil profile. The minimum depth of unsaturated soil strata on which a land treatment system may be developed is five feet for a slowrate system and ten feet for a rapid infiltration system, unless underdrains or pumped recovery wells are employed for lowering the water table. The applicant should refer to Part A, Section 5 for innovative technology permit requirements.

(d) Runoff and erosion. All land treatment sites will be protected from upslope runoff by diversion ditches capable of intercepting the overland flow from a 10 - year 24 - hour storm event, unless it is otherwise demonstrated that a storm of this size will not have an impact on the site. A runoff collection ditch is required at the base of overland flow slopes or on sloping irrigation sites where site conditions are such that overapplication of wastewater and/or seasonal precipitation events may threaten to pollute surface waters of the state. Provisions for storage, return and reapplication are required where a runoff collection ditch is re quired.

Section 51. Pretreatment Water Quality Requirement. Pretreatment of wastewater shall provide sufficient organic and inorganic solids reduction, maintaining the estimated infiltration rate of the soil surface.

Section 52. Disinfection and Pathogen Control. Waste water effluent containing pathogenic organisms to be sprayed on agricultural lands supporting indirect food chain crops must achieve fecal coliform limits of 1000 colonies/100 ml (30 day geometric mean) before spray irrigation.

Wastewater containing pathogenic organisms that is surface applied to agricultural lands supporting indirect food chain crops must achieve a fecal coliform reduction equivalent to the primary treatment level (see Section 2(e)).

Wastewater effluent containing pathogenic organisms that is to be used for surface or spray irrigation of direct human consumption crops or for irrigation of golf courses, highway rest areas and rights-of-way (R.O.W.s), parks, playgrounds or similar domestic, commercial and industrial zones must achieve fecal coliform limits of 200/100 ml by positive disinfection.

Section 53. Buffer Zone. A buffer strip of varying width is required around all land treatment sites located within one-fourth mile upwind of current residential, commercial or industrial development where wastewater containing pathogenic organisms or capable of producing odors is to be spray irrigated. A 100 foot buffer zone is required for the spray irrigation of secondary municipal effluent. A 150 foot buffer zone is required around sites sprayed with primary municipal effluent.

The minimum allowable buffer strip for spray irrigation of wastewaters not containing pathogenic organisms or odor-producing substances is 30 feet.

Section 54. Land Application of Municipal Sewage Sludge and Septic Tank Pumpings. Before municipal sewage sludge and septic tank pumpings can be applied to soils, minimum public health criteria must be met with respect to reduction of pathogenic organisms, limitation of PCBs, and limitation of cadmium and other heavy metals.

(a) Reduction of pathogens. Sludges applied to a land surface or soil incorporated must undergo a Process to Significantly Reduce Pathogens(PSRP) before application.

PSRPs may include, but not be limited to, any one of the following:

(i) Anaerobic digestion - with a solids retention time (SRT) of eight to ten days at 95° F (35°C).

(ii) Aerobic digestion - minimum volatile solids reduction of 40 percent by any combination of time and temperature in the digester resulting in 475 degree days stabilization. (A minimum digester liquid temperature is approximately 40°F (4.4°C) resulting in a maximum winter retention of 108 days).

(iii) Windrow Composting - maintenance of pile temperatures at 131°F (55°C) for two days or 140°F(60°C) for .5 days to achieve approximately a 15 log reduction of the f2 bacteriophage, as monitored at the coldest pile location.

(iv) Individual static or extended aerated pile composting - according to the design developed by researchers at Beltsville, Md. A standard for destruction of pathogens is the maintenance of pile temperatures at approximately 68°C (154°F) for 10 days followed by storage in a curing pile for 30 days.

(v) Lime stabilization - addition of sufficient quantities of lime to maintain the pH at 12 for two hours.

(vi) Chlorine oxidation - the required chlorine is dependent on the type of sludge and percent solids, as follows:

Type of Sludge	percent SS	Chlorine Requirement lb/1000 gal
Primary Sludge	4.0	17
Waste-activated sludge with prior primary treatment	0.7	7
no primary treatment	0.7	7
from contact stabilization	0.7	7
Sludge from low and high rate trickling filters	1.0	10
Digester supernatant	0.3	2-10
Septage	1.2	6

From: R.C. Neal of BIF
1 lb/1,000 gal = 0.12 kg/l

In addition, public access to the site must be restricted for 12 months and access by grazing animals restricted for one month. If crops for direct human consumption are grown within 18 months after the application, the sludge must not come into direct contact with the edible portion of the crop.

Septic tank pumpings that are to be land applied must undergo a PSRP unless public access to the site is restricted for 12 months and grazing animal access is restricted for one month.

Where sludge or septic tank pumpings do come into direct contact with the edible portion of a direct consumption crop, or where dried sludge (greater than 40 percent solids) is utilized on parks, golf courses, highway R.O.W.s, or made available to the general public, the sludge or septage must undergo a Process to Further Reduce Pathogens (PFRP).

Disclaimer: Sludge or septage that has been subjected to a PFRP is considered to have an insignificant pathogenic organism content; such sludge is not, however, considered to be 100 percent pathogen free.

PFRPs may include, but not be limited to, any one of the following:

(i) Composting - storage for three months following windrowing, pile composting, or any previously mentioned PSRP.

(ii) Heat drying - use of a flash or rotary kiln drier.

(iii) Pasteurization - at 158° F (70° C) for 30 minutes.

(iv) Lime conditioning - of stabilized sludge to pH of 10.2-11.

(v) Gamma ray irradiation - 400 krads or greater dosage with Ce-137 or Co-60 source for dried, composted sludge of approximately 80 percent solids.

(vi) Electron beam (beta irradiation) - 400 krads dosage for liquid digested sludge.

(b) PCBs (Polychlorinated Biphenyls). Sludges containing greater than 10 mg/kg of PCBs that are land applied where a crop is grown for animal feed or pasture must be soil incorporated unless the annual application is less than 0.4 lbs/acre.

(c) Cadmium and other heavy metals.

(i) Sludges containing a significant quantity (greater than 2 mg/kg) of cadmium may be applied to land where direct human consumption crops are grown if the background soil pH is 6.5 or greater and the sludge pH is 6.2 or greater.

(ii) The maximum annual cadmium application rate to land where any direct human consumption crops are grown must not exceed 0.5 kg/ha (0.44 lbs/acre).

(iii) In addition, maximum cumulative cadmium application to any given land site where direct food chain crops are grown or capable of being grown shall not exceed 5 kg/ha (4.4 lb/ ac) for a soil with cation exchange capacity less than 5 meq/100 g, 10 kg/ha (8.9 lbs/ac) for a soil with a cation exchange capacity of 5-15 meq/100 g and 20 kg/ha (17.8 lbs/ac) when the cation exchange capacity is greater than 15 meq/100 g. Maximum cumulative loadings of other metals based on soil cation exchange capacity are as follows:

Soil Cation Exchange Capacity
(meq/100 gms)

Metal	<5	5-10 lbs/acre	>15
Lead	500	1000	2000
Zinc	250	500	1000
Copper	125	250	500
Nickel	50	100	200

(iv) Where the background soil pH is less than 6.5 and is adjusted by amendment (e.g. limestone) above that level, the following requirements must be met:

(A) Only indirect food chain crops (animal feed) may be grown, or

(B) Soil pH must be maintained at 6.5 or greater when sludge is applied or when the direct consumption crop is planted.

(C) The metal application rates in Section 54 (c) (i)-(iii) apply.

(v) Where the background soil pH is less than 6.5 and no adjustment is planned, the following requirements must be met:

(A) Only indirect food chain crops (animal feed) may be grown.

(B) The annual cadmium application rate shall not exceed 0.5 kg/ha (0.44 lbs/acre)

(C) The maximum cumulative cadmium application shall not exceed 5 kg/ha (4.4 lbs/ac).

(D) Maximum cumulative applications of lead, zinc, copper and nickel shall not exceed 500, 250, 125 and 50 lbs/acre respectively, regardless of the cation exchange capacity of the soil.

(d) Site limitations.

(i) Sludge and septage must not be applied to sites with a slope greater than five percent whether or not it is soil incorporated, unless the site is protected by a runoff collection ditch, in which case the site slope must not exceed eight percent. Sludge or septage application to frozen or snow-covered ground will require the installation of a runoff collection ditch on slopes greater than three percent.

(ii) Sludge application sites must be located a minimum distance of 300 feet from the definable high water line of all surface water bodies unless the sludge is subsurface injected, in which case the above distance is reduced to 50 feet.

(iii) Sludge application sites must be located a minimum distance of 300 feet from any public water supply wells, whether surface applied or subsurface injected.

(iv) Sludge application sites must be located a minimum distance of 1500 feet from residential developments, unless the sludge is subsurface injected, in which case the above distance reduces to 300 feet.

(v) Sludge application sites must be located a minimum distance of 300 feet from nonresidential developments or public road R.O.W.s, unless the sludge is subsurface injected, in which case the above distance reduces to 50 feet.

Section 55. Irrigation Water Quality.

(a) The surface infiltration rate and hydraulic conductivity of the soil profile shall be approximated by the appropriate tests and used in determining an average annual application rate.

(b) Indigenous or crop plant species shall be capable of survival and maintenance under the conditions of increased soil moisture, salinity, and alkalinity, the classes of which will be determined by use of Figure 1, Tables 1-3 and a soil textural analysis. Waste and wastewater analyses required for this evaluation include electrical conductivity (EC in umhos/cm @ 25°C), sodium (Na^{+}), calcium ($Ca2^{+}$), magnesium ($Mg2^{+}$), bicarbonate (HCO^{3}), chloride (Cl^{-}), sulfate (SO_4^{2-}), Boron (B) and Selenium (Se), and calculation of the Sodium Adsorption Ratio (SAR) by use of the formula:

$$SAR = \sqrt{\frac{\dfrac{[Na^{+}]\ [Ca^{2+}]\ +}{[Mg^{2+}]}}{2}}$$

(c) Numerical water quality criteria for special situations.

(i) For continuous and unrestricted irrigation of direct consumption crops or of parks, playgrounds, highway rest areas and rights-of-way (R.O.W.s), or domestic, commer cial and industrial grounds with treated municipal wastewater effluent, the following quality criteria shall not be exceeded: (ii)For disposal of limited volumes of industrial wastewater and sludge of less than 10 percent solids, the following criteria shall not be exceeded:

pH	4.5 - 9.0 s.u.
BOD	10+.0 mg/l Daytime
BOD	30 mg/l Dusk-Dawn
TSS	5.0 mg/l Daytime
TSS	100 mg/l Dusk-Dawn
Fecal Coliforms	200/100 ml (positive disinfection)
TDS	480.0 mg/l
Electrical Condutivity, (EC)	750 micromhos/cm@25°C
Sodium Adsorption Ratio (SAR	10
Chlorides (Cl^-)	213 mg/l
Sulfates (SO_4^{2-})	192 mg/l
Bicarbonates (HO_3^-)	Not greater than 50 percent of the total anion concentration in meq/l
Aluminum (Al)	5.0 mg/l
Arsenic (As)	1.0 mg/l
Beryllium (Be)	0.1 mg/l
Boron (B)	0.6 mg/l
Cadmium (Cd)	0.01 mg/l
Cobalt (Co)	0.5 mg/l
Chromium (Cr)	0.1 mg/l
Copper (Cu)	0.2 mg/l
Iron (Fe)	5.0 mg/l
Lead (Pb)	5.0 mg/l
Lithium (Li)	0.1 mg/l
Manganese (Mn)	10.0 mg/l
Nickel (Ni)	0.2 mg/l
Selenium (Se)	0.1 mg/l
Vanadium (V)	0.1 mg/l
Zinc (Zn)	2.0 mg/l

(ii) For disposal of limited volumes of indus trial wastewater and sludge of less than 10 percent solids, the following critieria shall not be exceeded:

pH	4.5 - 9.0 s.u.
Electrical Conductivity (EC)	3,250 micromhos/cm @25°C
Total Dissolved Solids	2,100 mg/l
Sodium Adsorption Ratio (SAR)	26
Potassium	In combination with sodium, will not produce an SAR greater than 26
Chlorides (Cl-)	1,500 mg/l
Sulfates (SO42-)	960 mg/l
Bicarbonates (HCO3-)	Not greater than 50 percent of the total anion concentration, meq/l
Arsenic (as H3AsO4, Arsenious Acid)	0.1 mg/l
Boron (as H3BO3, Boric Acid)	2.0 mg/l
Chromium (Cr)	1.0 mg/l
Copper (Cu)	1.0 mg/l
Nickel (Ni)	0.2 mg/l
Selenium (Se)	0.2 mg/l
Zinc (Zn)	2.0 mg/l
Oil and grease	20,000 lbs/ac when soil incorporated (surface 6 inches) 2,000 lbs/ac when surface applied

(iii) All other continuous disposal land application systems will be approved on a sitespecific, case by case basis by use of the applicable standards and guidelines.

Section 56. Effluent Quality.

(a) Surface water protection. Discharge from a land treatment system to a surface water body will be regulated by the NPDES permit process.

(b) Groundwater protection. Percolation water from land treatment of waste or wastewater shall not degrade groundwater quality to the point at which it is no longer suitable for its current or potential use as described in Chapter VIII of the Wyoming Water Quality Regulations.

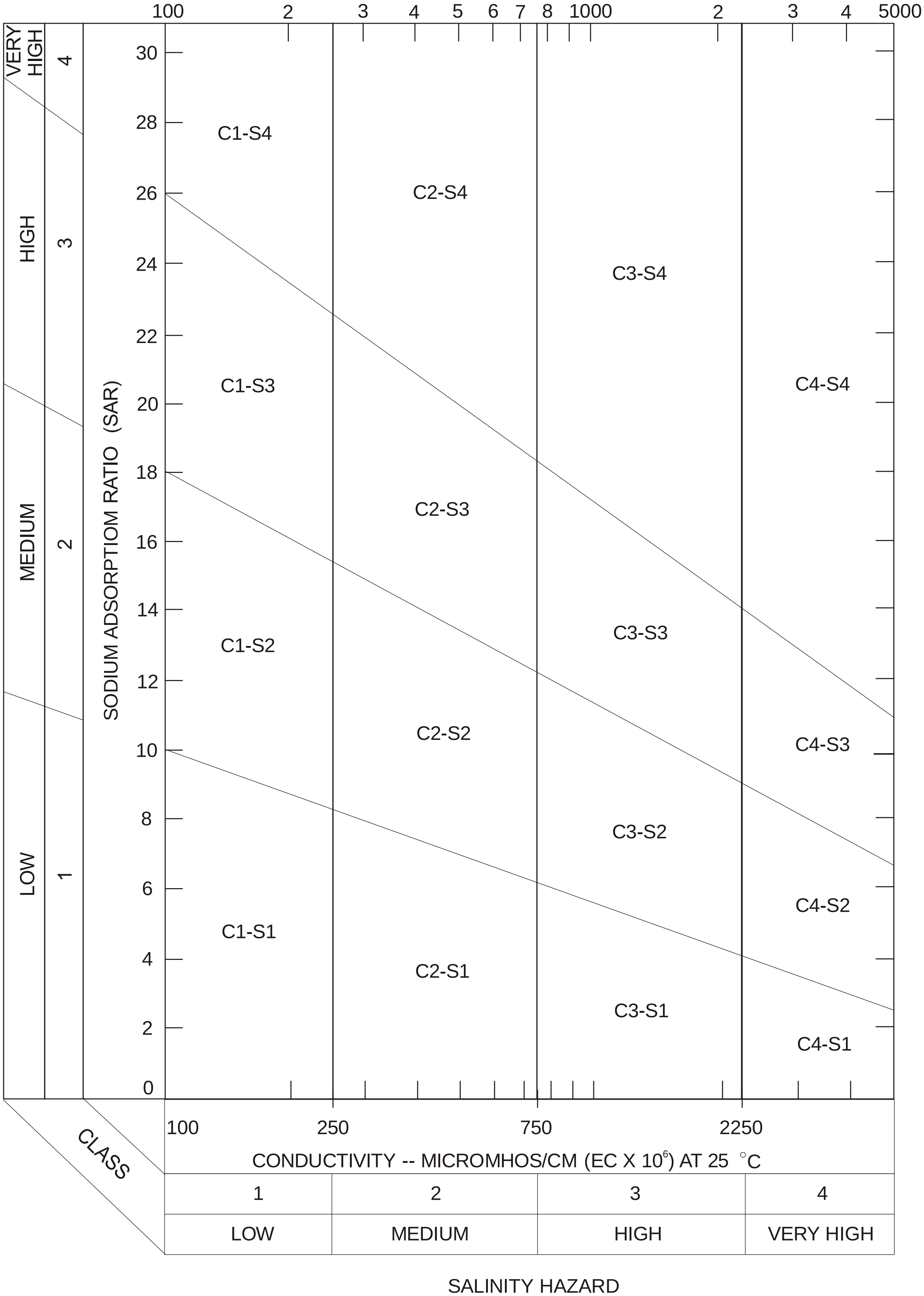

Figure I - Diagram for the classification of irrigation waters

IRRIGATION WATER QUALITY

Permissibility Classes for Salinity

Class C1, low salinity: --
Good water with little or no likelihood of salt accumulation under the leaching provided by average irrigation practices, except where sub-surface drainage is inadequate.

Class C2, medium salinity: --
Can be used if a moderate amount of leaching occurs. Plants with moderate salt tolerance can be grown in most cases without special practices for salinity control.

Class C3, high salinity: --
Cannot be used on soils with restricted drainage. With adequate drainage, considerable excess water must be applied to each irrigation; irrigations must be made more frequently, and plants with a good salt tolerance should be selected.

Class C4, very high salinity: --
Not usable under ordinary conditions. On very light and permeable soils with excellent drainage, water may be usable with a large amount of excess leaching water, frequent irrigations, and very salt-tolerant crops.

Permissibility Classes for Alkalinity

Class S1, low sodium: --
Good for almost all soils and all Wyoming crops.

Class S2, medium sodium: --
Can cause alkali problems on heavy clayey soils, with low leaching, unless gypsum (or equivalent soil amendments)are present or added to the soils.

Class S3, high sodium: --
May create harmful levels of exchangeable sodium in all soils and will require special management--good drainage, high leaching, and organic matter additions. Soils containing natural gypsum may not develop alkali troubles. Chemical amendments may be necessary, but are not feasible with waters of very high salinity.

Class S4, very high sodium: --
Generally unsuited for irrigation. Special conditions of low salinity water, favorable gypsum content of soils, tolerant crops, and special management may permit use of these waters.

These water classes are based on recommendations of the United States Regional Salinity Laboratory and numerous state agricultural experiment stations.

TABLE 1 - Boron Class Limits

Class	Limits -- parts per million			Description
	Sensitive crops	Semi-tolerant crops	Tolerant crops	
1	Below 0.33	Below 0.67	Below 1.00	Very low. No effect on crops.
2	0.33 to 0.67	0.67 to 1.33	1.00 to 2.00	Low. Very slight effect on crops.
3	0.67 to 1.00	1.33 to 2.00	2.00 to 3.00	Moderate. Significant yield depression.
4	1.00 to 1.25	2.00 to 2.50	3.00 to 3.75	High. Large yield depression anticipated.
5	Over 1.25	Over 2.50	Over 3.75	Very high. Non-usable.

TABLE II - Selenium Class Limits

Class	Limits -- parts per million	Description
1	0.00 to 0.10	Low. No plant toxicity anticipated.
2	0.11 to 0.20	Medium. Usable -- possible long-term accumulation under particular conditions and should be watched
3	0.21 to 0.50	High. Doubtful -- probably toxic accumulation in plants except under especially favorable conditions
4	Over 0.50	Very High. Non-usable under any conditions.

TABLE III. CHLORIDE AND SULFIDE LIMITS FOR THREE CLASSES OF IRRIGATION WATERS

Class		Chlorides		Sulfates	
		meq/l	mg/l	meq/l	mg/l
I-	Excellent to good; or suitable for most plants under most conditions	less than 2-5.5	71.1 - 195.5	4 - 10	192 - 480
II-	Good to injurious; harmful to some under certain conditions of soil, climate and practices	2 -16	71.1 - 568.0	4 - 20	192 - 960
III-	Injurious to unsatisfactory; unsuitable under most conditions	6 -16	213 - 568	12 - 20	576 - 960

PART F

MOBILE HOME PARK AND CAMPGROUND SEWERAGE AND PUBLIC WATER SUPPLY DISTRIBUTION SYSTEMS

Section 57. General. This part contains the minimum standards for the design and construction of mobile home park and/or campground wastewater facilities and public water supply systems.

Section 58. Sewage System Standards.

(a) If sewerage system services are to be provided by a second person, a letter of verification from the system manager stating that they are capable of handling added organic and/or hydraulic loads shall be provided by the owner/operator of the system.

(b) A mobile home park or campground sewerage system, treatment works and disposal system shall comply with Part A, B, C, and/or D of Chapter XI except as follows:

(i) Mobile home park sewerage systems, treatment works and disposal systems shall be designed on the basis of not less than 350 gallons per site per day. Camp ground sewerage systems, treatment works and disposal systems shall be designed on the basis of not less than 100 gallons per site per day for all sewered sites or 75 gallons per site per day for all unsewered sites.

(ii) Sanitary sewers shall not be smaller than six inches in diameter. They shall be installed at a slope equal to or greater than 0.6 feet per 100 feet.

(iii) Not more than two mobile homes or campground sites shall be served by a sanitary sewer service connection pipe of a least four inches in diameter, provided the main branch of the service pipe is served by a cleanout and provided it is not longer than 50 feet. It shall be installed at a minimum slope of 1/4 inch per foot. The riser portion of the service connection pipe shall be constructed of cast iron or schedule 40 plastic pipe. The riser shall be terminated at least four inches above finished grade and shall not be located closer than five feet from a potable water service riser. The service connection pipe shall connect to the sewerage system at a maximum 45 degree bend in the direction of sewage flow.

(iv) Not more than one mobile home shall be served by a sanitary sewer service riser pipe. The riser shall be located so as to minimize the length of pipe required to connect the mobile home drain. The riser pipe shall be capped or plugged when not in use.

(v) The connection of the mobile home drain to the riser pipe shall be sealed.

(vi) If sewer service is provided to sites in a campground, the sanitary sewer service connection pipe shall comply with subsections (iii) and (iv) above.

(vii) Service connection pipes for campgrounds shall be trapped below the frost line. Section 59. Potable Water Supply Standards.

(a) The potable water distribution system serving any building, mobile home lot, campground site or other appurte nance within a mobile home park or campground which is connected to a public water supply shall be considered an extension or modification of the public supply.

(b) If water is to be obtained from a public water supply, a letter of verification shall be provided from the public water supply system manager stating that the required flow can be supplied at a minimum pressure of 20 pounds per square inch under all conditions of flow throughout the proposed distribution system. A normal working pressure of 35 pounds per square inch shall be maintained in the distribution system.

(c) The public water supply serving mobile home sites, buildings and other facilities within a mobile home park shall be designed, constructed or installed and protected in accordance with Chapter XII of the Water Quality Rules and Regulations, except as follows:

(i) The water supply source shall be capable of supplying the peak water demand to a mobile home park distribution system according to the following table:

Homes	Gallons per Minute
25	65
50	105
75	145
100	180
150	235
200	285
each additional mobile home over 200	1 gpm

(ii) If fire protection is provided, the flow required shall be in addition to the requirements of subsection (i) above.

(iii) Each mobile home shall be provided with a potable water service connection pipe. It shall be 3/4 inch nominal pipe size or larger. The riser portion of the pipe shall be constructed of type K copper or steel pipe from a point below the frost line to the point of connection to the mobile home piping. The riser shall terminate at least four inches above finished grade and shall be protected from damage. The service connection pipe shall be provided with a curb stop below frost penetration. A stop and waste valve with a weep hole below grade shall not be used.

(iv) The distribution system shall be of sufficient size to supply the required volume of water at a minimum pressure of 20 pounds per square inch under all conditions of demand. A working pressure of 35 pounds per square inch shall be maintained under average day demand conditions. The distribution system mains shall not be smaller than 1 1/2 inches in diameter. If fire protection is provided, the distribution system shall meet the requirements of Chapter XII of the Water Quality Rules and Regulations.

(v) If the potable water is pumped to the distribution system from wells or storage facilities, the pumps shall be capable of meeting the maximum day demand with the largest pumping unit out of service.

(vi) Water storage facilities shall be provided when the potable water source cannot meet the peak demand.

(d) The public water supply serving campground sites, buildings and/or other facilities within a campground shall be designed, constructed and protected in accordance with Chapter XII of the Water Quality Rules and Regulations except as follows:

(i) The public water supply source shall be capable of supplying water to a campground distribution system at a rate of 0.5 gpm/site.

(ii) Below ground stop and waste valves with weep holes below ground shall not be permitted.

(iii) A minimum pressure of 20 pounds per square inch shall be maintained throughout the distribution system under all conditions of flow. A working pressure of 35 pounds per square inch shall be maintained under average day demand conditions.

(iv) The distribution piping shall not be smaller than one inch in diameter. Service pipes shall not be smaller than 1/2 inch in diameter.

Part G Well Construction

Now

Chapter 26

(pages 140 – 152)

WATER QUALITY RULES AND REGULATIONS

Chapter 11

CHAPTER XI

DESIGN AND CONSTRUCTION STANDARDS FOR SEWERAGE SYSTEMS, TREATMENT WORKS, DISPOSAL SYSTEMS OR OTHER FACILITIES CAPABLE OF CAUSING OR CONTRIBUTING TO POLLUTION AND MOBILE HOME PARK AND CAMPGROUND SEWERAGE AND PUBLIC WATER SUPPLY DISTRIBUTION SYSTEMS

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PART A
INTRODUCTION AND GENERAL REQUIREMENTS

Section 1. Authority. These standards are promulgated pursuant to W. S. 35-11-101 through 3511-1207. Specifically, W. S. 35-11-302 requires the administrator to establish standards for the issuance of permits for construction, installation, or modification of any public water supply and sewerage system, treatment works, disposal system or other facility capable of causing or contributing to pollution.

Section 2. Purpose. The purpose of these standards is to:

(a) Ensure that the design and construction of sewerage systems, treatment works, disposal systems and other facilities capable of causing or contributing to pollution meet the purpose of the Environmental Quality Act.

(b) Prevent, reduce and eliminate pollution and enhance the waters of the State of Wyoming by ensuring design and construction of systems and facilities are capable of the required treatment and/or disposal and continued operation to protect the health, safety and welfare of the environment and its inhabitants.

These standards pertain only to permits required pursuant to Chapter III and IX, Wyoming Water Quality Rules and Regulations.

Section 3. Intent. The design and construction standards included in these regulations are directed toward conventional wastewater and waste systems. These standards impose limiting values of design for which a construction, installation or modification permit application and plans and specifications can be evaluated by the Division.

The terms "shall" and "must" are used when practice is sufficiently standardized to permit specific delineation of requirements or when safeguarding public health or protection of water quality justifies such definite action. Other terms, such as "should", "recommend", and "preferred" indicate desirable procedures or methods which allow deviations provided the purpose of these regulations can be accomplished.

The applicant shall use the date referenced copy of other standards referred to in these regulations. Where no date is listed for the referenced standards, the standards used shall be those in effect when these regulations become effective.

Section 4. Definitions. The following definitions supplement those contained in W. S. 35-11-103 of the Wyoming Environmental Quality Act.

(a) "Affected land" means the area of land from which overburden is removed, or upon which overburden, development waste rock or refuse is deposited, or both, access roads, haul roads, mineral stockpiles, mill tailings, impoundment basins, and all other lands whose natural state has been or will be disturbed as a result of the operations.

(b) "Campground" means a parcel or tract of land under the control of a person at which sites are offered for the use of the public or members of an organization either free of charge or for a fee, for the establishment of temporary living quarters for two or more recreational units.

(c) "Commercial/industrial waste and wastewater facilities" means any facility not defined as a municipal or single family residence facility.

(d) "Construction" shall encompass the materials used, installation procedures and tolerances, and testing and disinfection requirements.

(e) "Feedlot" means the concentrated confinement of animals or poultry in pens or houses for meat, milk, or egg production or the stabling of animals or poultry for a period of 45 days or more in a 12 month period when forage or crops are not grown in the area of confinement.

(f) "Hazardous substance" means any matter of any description including petroleum related products and radioactive material (substance) which, when discharged into any waters of the state, presents an imminent and substantial hazard to public health or welfare. This definition includes 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.

(g) "Land application/treatment" means the application of wastes or wastewater to the land at a predetermined rate for the purpose of disposal or treatment by any or all of the following processes: degradation, plant uptake, assimilation or accumulation in the soil profile from filtration.

(h) "Maximum daily demand" means the largest daily water use rate which would occur during the calendar year.

(i) "Maximum hourly or peak hourly demand" means the largest water use rate which would occur during any one hour during the year. The maximum hourly demand may or may not occur during the maximum daily demand period.

(j) "Mobile home park" means a parcel or tract of land under the control of a person upon which two (2) or more mobile homes are located on a continual or seasonal nonrecreational basis, regardless of whether a charge is made therefore.

(k) "Off-channel" means the interception of a drainage way which collects runoff only from disturbed areas.

(l) "On-channel" means the interception of a drainage way which collects runoff from both disturbed and undisturbed areas.

(m) "Permanent pool level" means the elevation in a sedimentation pond or sediment control structure below which the water will not be discharged by an outlet structure or by pumping.

(n) "Pond/lagoon" means a manmade or natural basin which is intended for containment, treatment or disposal of wastes or wastewater.

(o) "Rapid infiltration system" means a land treatment system in which treatment is accomplished by the movement of large quantities of wastewater through a coarse or highly permeable soil profile.

(p) "Recreational unit" means a tent or vehicular type structure, primarily designed as temporary living quarters for recreational, camping, or travel use, which either has its own motive power or is mounted on or drawn by a self-powered vehicle. A tent means a collapsible shelter of canvas or other fabric stretched and sustained by a rigid structure(s) and used for camping outdoors.

(q) "Seasonal high groundwater table" is the highest elevation reached by the groundwater during the wet season of the year (usually spring or early summer).

(r) "Sedimentation control facility" means a pond or structure designed to capture runoff from disturbed areas for the purpose of treating water for sediment and suspended solids removal.

(s) "Slow rate land application system" means an irrigation system in which wastewater treatment is achieved due to vegetative uptake and percolation of wastewater through the soil profile by low application rates.

(t) "Sludge" is the accumulation of solids settled from wastewater in a septic tank, aerobic unit, clarifier, or equivalent.

(u) "Soil" means all unconsolidated material overlaying bedrock.

(v) "Toxic characteristics (or wastes)" means those characteristics (or wastes) which are due to the presence of: substances or combinations of substances including disease causing agents which, after discharge and upon exposure, ingestions, 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) or physical deformation in such organisms or their offspring. This definition shall include all substances designated as toxic or hazardous 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; Federal Register for May 19, 1980, (Section 261), Hazardous Waste Management System: Identification and Listing of Hazardous Waste; and the Federal Register for July 16, 1982, Part V, National Oil and Hazardous Substances Contingency Plan.

Section 5. Facilities and Systems Not Specifically Covered by These Standards. This section is provided to encourage new technology and equipment and provide a process for evaluating and permitting designs which deviate from these regulations. The proposed construction of facilities and processes not in compliance with these regulations will be permitted provided that the facility, when constructed, can operate meeting the purpose of these regulations.

(a) Each application for a permit to construct a facility under this section shall be evaluated on a case-by-case basis using the best available technology. The following information should be included with the application:

(i) Data obtained from a full scale, comparable installation which demonstrates the acceptability of the design and/or,

(ii) Data obtained from a pilot plant operated under the design condition for a sufficient length of time to demonstrate the acceptability of the design and/or,

(iii) Data obtained from a theoretical evaluation of the design which demonstrates a reasonable probability of the facility meeting the design objectives; and

(iv) An evaluation of the flexibility of making corrective changes to the constructed facility in the event it does not function as planned.

(b) If an applicant wishes to construct a pilot plant to provide the data necessary to show the design will meet the purpose of the act, a permit to construct must be obtained.

Section 6. Engineering Design Report.

(a) Scope and purpose. An engineering design report which describes existing conditions, problems, and the proposed solution is required for each project.

(b) Sewerage systems. The engineering design report shall include:

(i) A description of the service area including scaled vicinity plan map(s) of the project with regard to adjacent and proposed development, elevations, and topographic features.

(ii) Current and projected average, maximum day and peak flows for the design of the project, per capita design flows, extraneous flows, and industrial and/or commercial waste flows.

(iii) Downstream impact on existing sewers, lift stations and treatment facilities. This information shall include existing population, waste loads, existing flows and capacity of downstream facilities.

(iv) A letter of acceptance from the municipality, sewer district, or owner of any affected downstream sewerage, treatment or disposal facilities.

(c) Treatment works and disposal systems. The engineering design report shall include:

(i) A description of the facility site and location, including scaled site plan and:

(A) Present and projected facility property.

(B) Flood protection indicating predicted elevation of 25- and 100- year flood stages.

(C) Present and proposed access.

(D) Distances from current habitation.

(E) Prevailing wind direction.

(F) Fencing and/or security.

(G) Topographic features and contours with indicated datum.

(H) Soil and subsurface geological characteristics. Location of soil borings, rock elevations and groundwater elevations shall be indicated. Provide a soils investigation report of the proposed site.

(ii) A detailed description of the service area for the project including scaled plan showing land use and boundaries.

(iii) A detailed description of the disposal technique for effluent and solids. For lagoons, indicate whether the discharge is continuous, seasonal, or nondischarging.

(iv) Effluent water quality considerations for design of the facility shall be described to include:

(A) Surface discharge. An application shall be submitted to the Water Quality Division for a National Pollution Discharge Elimination System Permit.

(B) Groundwater protection. Pursuant to Chapter VIII of the Water Quality rules.

(v) Design conditions shall be described to include:

(A) Proposed effluent standards.

(B) Design population.

(C) Existing and projected flows and flow variations.

(D) Shock loads, with cause and frequency.

(E) Existing and projected wastewater characteristics including BOD, suspended solids, and pH.

(F) Existing and projected flow, loads and characteristics of industrial wastes and toxic Materials.

(G) Existing or proposed quantity and frequency of septage discharges.

(H) Climate conditions at existing or proposed treatment facility site.

(I) Existing or proposed water supply.

(J) Theory of operation.

(K) Odor control features.

(L) Complete description of existing facilities.

(vi) Specific requirements of any pertinent approved Water Quality Management Plan shall be included.

Section 7. <u>Plans and Specifications Content.</u>

(a) All plans for sewerage works shall have a suitable title showing the following:

(i) Name of owner and location of project.

(ii) North arrow and drawing scale.

(iii) Name and seal or signature of the engineer.

Datum used shall be indicated. Plans shall contain a site plan of the proposed project with topography and boundaries of the project.

(b) Sewers. Plans for interceptor sewers, outfall sewers, new collector systems, force mains, sewer extensions, or any combination shall include:

(i) A detailed plan view at a legible scale of each sewer line showing all existing and proposed streets, adjacent structures, physical features, existing and proposed locations of utilities and a North arrow. The location and size of all sewer lines, manholes, cleanouts, and other appurtenances shall be indicated. Pertinent elevations shall be indicated on all appurtenances.

(ii) Profiles of all sewer lines shall be shown on the same sheet as the plan view at legible horizontal and vertical scales, with a profile of existing and finished surfaces, elevations of the sewer inverts at all manholes, and the slope of the sewer inverts at all manholes, pipe size and material, and the slope of the sewer line. The location of all special features such as inverted siphons, concrete encasements, casing pipes, elevated sewers, etc., shall be shown.

(iii) Special detail drawings, scaled and dimensioned to show the following:

(A) Details of all sewer appurtenances such as manholes, cleanouts, inverted siphons, elevated sewers, encasements, casing pipes, force main thrust blocks, outfall structures, etc.

(B) The approximate bottom of the stream, the approximate elevation of the low and high-water levels, and other topographic features at all locations where the project is at streams or lakes.

(C) Cross section drawing of the sewer's bedding.

(D) Additional features not otherwise covered by specifications.

(iv) Location of waterlines within 30 feet (9m) horizontally shall be shown on the plan. Water lines that intersect sewers shall be shown on the profile drawings. Public and/or private water wells within 30 feet (9m) of sewer lines shall be indicated on the plans.

(c) Pumping stations, treatment works and disposal systems. Plans shall be submitted showing the relation of the proposed project to the remainder of the system. Layouts and detail plans shall show the following:

(i) Site location and layout including topographic and physical features, proposed arrangement of pumping or treatment units, existing facilities, existing and proposed piping arrangements, access drive, power supply, fencing, embankments, outfall sewer, outfall structure, and receiving stream with direction of flow.

(ii) Schematic flow diagram(s) and hydraulic profile(s) for treatment works wastewater, sludge and effluent flows.

(iii) Plan and section view(s) of the wetwell and drywell of the pumping station with specific construction details, features and pertinent elevations.

(iv) Plan and section view(s) of each treatment facility process unit with specific construction details, features and pertinent elevations. Details of each unit should include, but are not limited to, inlet and outlet devices, baffles, valves, arrangement of automatic control devices, aeration equipment, motors, sludge scrapers, sludge disposal, electrical devices or other mechanical devices.

(d) Specifications. Technical specifications shall accompany the plans for new sewers, pump stations, treatment works, disposal systems, or additions/modifications to existing systems or facilities.

Where plans are for extensions to sewer systems, the specifications may be omitted, provided it is stated that the work is to be constructed under specifications authorized by the Water Quality Division office. Specifications on file must conform to these regulations.

The specifications accompanying construction drawings shall include:

(i) Identification of construction materials.

(ii) The type, size, strength, operating characteristics, rating or requirements for all mechanical and electrical equipment, including machinery, valves, piping, electrical apparatus, wiring and meters; laboratory fixtures and equipment; operating tools; special appurtenances; and chemicals where applicable.

(iii) Construction and installation procedure for materials and equipment.

(iv) Requirements and tests of materials and equipment to meet design standards.

(v) Performance tests for operation of completed works and component units.

PART B

MUNICIPAL AND DOMESTIC SEWERAGE SYSTEMS, TREATMENT WORKS, AND DISPOSAL SYSTEMS

Section 8. General. This part contains the minimum standards for the design and construction of sewerage systems, treatment works, and disposal systems for domestic and municipal wastewater. Soil absorption and land application systems are contained in other parts. All facilities shall comply with the purpose of this chapter.

Section 9. Design of Sewers.

(a) Separate sewers. Separate sewers shall be provided for collection of stormwater and wastewater. Roof, areaway, drive or foundation drains shall not be connected to sanitary sewers.

(b) Pipe materials.

(i) Wastewater characteristics. Pipe materials shall resist acid and alkaline solutions, organic solvents, and other wastewater constituents and environmental conditions encountered.

(ii) Pipe loadings. Pipe materials shall be chosen and the pipeline shall be designed to withstand all trench and superimposed surface live loads with a minimum factor of safety. Rigid pipes shall have a minimum factor of safety of 1.5, and flexible pipes shall have a minimum factor of safety of 1.25.

(iii) Soil characteristics. Pipe materials shall be chosen to resist corrosion due to aggressive soil characteristics by the soil it contacts. Iron or steel pipe shall be protected from corrosion with polyethylene encasement or cathodic protection.

(iv) Joints. Pipe joints shall be flexible, durable and designed to minimize infiltration/exfiltration and exclude roots.

(v) Performance tests. Piping shall be subjected to leakage tests. Leakage tests shall be infiltration, exfiltration, or air tests.

(A) Infiltration. Maximum of 200 gallons per inch diameter per mile per day (1200 liters/cm/km/day) with a minimum of two feet (0.6 m) of head over the top of the pipe.

(B) Exfiltration. Maximum of 200 gallons per inch diameter per mile per day (1200 liters/cm/km/day) with a minimum of two feet (0.6 m) of head over the top of the pipe.

(C) Air. Air tests shall conform to ASTM C-828-80.

(D) Deflection. Maximum five percent deflection after flexible pipe is backfilled for 30 days. A mandrel of 95 percent of pipe diameter shall be used. No mechanical pulling of mandrel is permitted.

(vi) Approved pipe material specifications. Type of commercial pipe approved for gravity sanitary systems include:

(A) Extra strength and standard strength vitrified clay pipe: ASTM C700-78a.

(B) PVC sewer pipe and fittings: ASTM D3034-80, SDR35, ASTM F679-81, or ASTM F794-83.

(C) ABS composite sewer pipe: ASTM D2680-80.

(D) Reinforced plastic mortar pipe: ASTM D3262-81.

(E) Asbestos cement nonpressure sewer pipe: ASTM C428-80.

(F) Reinforced concrete sewer pipe: ASTM C76-82.

(G) Concrete Sewer Pipe: ASTM C-14.

(H) Ductile iron sewer pipe: ASTM A746-77.

Types of commercial pipe approved for pressure sanitary sewer systems include:

(I) PVC water pipe: ASTM D2241-80, or AWWA C900.

(J) Asbestos cement pressure pipe: AWWA C400-80.(K) Ductile iron pipe: AWWA C151-81.

(L) Glass Fiber-Reinforced Thermo-setting-Resin Pressure Pipe: AWWA C950-81.

(c) Collection piping design, construction and testing. A sewage collection line is any conduit that carries wastewater that originates from two or more separate buildings or from a single building that generates more than 2,000 gpd (7.6 m^3/d) of average daily flow.

(i) Gravity system.

(A) Depth. Sewers shall be located to protect them from freezing and frost heave as prudently possible.

(B) Size. Sewers to be aligned straight shall be eight inch (20.3 cm) diameter or larger except six inch (15.2 cm) sewers may be used in cul-de-sacs, or other dead end locations where the sewer cannot be extended in the future. Eighteen-inch (45.7 cm) or larger sewers may be laid on curves. Lines shall be sized for 200 percent of maximum daily flow or more. In the absence of data deriving maximum daily flow, the chart on Figure 1-1 shall be used to deter mine maximum daily flow.

(C) Slope. Sewers shall be laid with uniform slope between manholes. Minimum slopes shall be:

Sewer Size		Minimum Slope in feet per 100/feet
INCH	CM	m/100m
6	(15.2)	0.60
8	(20.3)	0.40
10	(25.4)	0.28
12	(30.5)	0.22
14	(35.6)	0.17
15	(38.1)	0.15
16	(40.6)	0.14
18	(45.7)	0.12
20	(50.8)	0.11
21	(53.3)	0.10
24	(61.0)	0.08
27	(68.6)	0.067
30	(76.2)	0.058
33	(83.8)	0.051
36	(91.4)	0.046

Maximum slopes without the use of concrete anchors shall be 20 percent. The following spacing of concrete anchors shall apply to slopes greater than 20 percent:

Slopes (percent)	**Concrete Anchor**
20-35	36 ft (11 m)
35-50	24 ft (7.3 m)
More than 50	16 ft (4.9 m)

(D) Velocity. Minimum velocities shall be 2 fps (0.6 mps) when flowing full. Velocities greater than 10 fps (3.0 mps) require special design considerations.

(E) Increasing size. All sewer pipe size changes shall be at manholes. Pipe size shall not be decreased in the direction of flow. The energy gradient line should be maintained when a smaller sewer joins a larger one.

(F) Excavation, bedding installation, backfill.

(I) Excavation. Trench width from the trench bottom to a point one foot above the top of the pipe shall be no less than the outside diameter of the pipe plus 8 inches (20.3 cm) but not more than 24 inches (61 cm) plus the pipe O.D. The trench bottom shall be excavated for the pipe bell. All rock shall be removed within six inches (15.2 cm) of pipe. The trench shall be dewatered for all work.

(II) Bedding. Bedding shall be designed in accordance with:

(1.) Rigid pipe. Types A, B, C (Water Pollution Control Federation Manual of Practice No. 9) or ASTM C12-81.

(2.) Flexible pipe. Types I, II, III, ASTM D2321-74.

(III) Backfill. Backfill shall be performed without disturbing pipe alignment. Backfill shall not contain debris, frozen material, unstable material, or large clods. Stones greater than three inches (7.6 cm) in diameter shall not be placed within two feet (0.6 m) of pipe. Compaction shall be to a density equal to or greater than the surrounding soil.

(ii) Force mains and pressure sewers.

(A) Depth. Force mains shall be located to protect them from freezing and frost heave.

(B) Size. Force mains shall be four inches (10 cm) diameter or greater. Pressure sewer collection system piping shall be one inch (2.4 cm) minimum.

(C) Velocity. Minimum velocity shall be 2.5 fps(0.76 mps).

(D) Air release. Air release facilities shall be provided at the high point in the piping whenever the pipe crown elevation falls below the pipe invert elevation. Access to air release manholes shall not be in traffic-ways.

(E) Cleanouts. Cleanouts shall be provided at 400 foot (122 m) maximum spacing in pressure piping four-inch diameter or less.

(F) Pressure sewer systems. Pressure sewer collection systems shall be preceded by grinder pumps or septic tanks.

(G) Pressure sewer collection system pumps. Pumps shall be provided with isolation and check valves. If a septic tank is not provided before the pump, a grinder pump shall be required. Pump holding sumps shall not be steel, iron, or coated metal. The sump chamber shall be 50 gallon (189 liters) volume, minimum.

(iii) Service connections. A service connection is any conduit that carries wastewater that is not defined as a sewage collection line. Service connections shall conform to the requirements for sewage collection lines (Section 9(c)(i) and (ii)) with the following modifications:

(A) Size: minimum size shall be four inches (10.2 cm).

(B) Slope: minimum slope shall be two feet/100 feet (2 m/100 m).

(C) Flow: flow shall be determined from a fixture unit count and the sewage size based on flowing full.

(D) Connections: all service connections to sewage collection lines shall be made with a wye or tee for new construction and a tapping saddle for connection to existing collection lines.

(d) Manholes and cleanouts.

(i) Location. Manholes shall be located at all changes in pipe size, vertical or horizontal alignment, pipe intersections, and the end of lines. Maximum spacing for various line sizes are as follows:

Line Size (In)	(cm)	Maximum M.H. Spacing			
15 or less	(38 or less)	400	ft	122	m
16 - 30	(40.6 - 76)	500	ft	152	m
31 or more	(76 or more)	600	ft	183	m

Terminal sewer cleanouts may be provided at the end of sewer lines if they are not more than 150 feet (45 m) from the nearest downstream manhole. The cleanout shall be constructed using 45 degree bends to the upturned pipe coming to the surface of the ground. The diameter of the cleanout shall be the same as the pipe size. Lampholes shall not be used.

(ii) Size. Minimum manhole interior size is four feet(1.2 m).

(iii) Drop manhole. Drop manholes must be constructed where the change in elevation between two lines is greater than 24 inches (0.6 m). Concrete encasement shall be provided around the drop pipe.

(iv) Invert. Manhole inverts shall be constructed to conform to the shape of the sewer. The bench shall drain to the invert. Connections to the manhole shall be watertight and allow differential settlement between the manhole and pipe. Minimum fillet height shall be one half of the pipe diameter.

(v) Cover. The manhole cover shall be suitable to withstand all loads, including impact loading without deformation, slip or rattle. The manhole cover shall be watertight in areas subject to flooding and a bolt-down type in areas subject to unauthorized dumping or vandals.

(vi) Steps. Access to manholes shall be with portable ladders, or with cast iron manhole steps spaced at 16 inches (40.6 cm) maximum.

(vii) Materials. Manholes shall be constructed watertight and durable using cast-in-place concrete, or precast concrete with gasketed joints. Where precast concrete bases are used, the first 12 inches (30 cm) of wall will be monolithically cast with the base.

(viii) Access. A 22 inch (56 cm) minimum diameter clear opening shall be provided on all manholes. All manholes shall be located to be accessible by motorized equipment for maintenance.

(e) Special structures.

(i) Inverted siphons. Inverted siphons shall have a minimum of two six-inch (15.2 cm) barrels. The inlet and outlet shall be arranged to cause only one pipe to be used during normal flows. T he minimum velocity shall be 3 fps (1 mps) at average flow, and occur at least daily. The siphon shall be designed for flushing and maintenance.

(ii) Aerial crossings. Aerial crossings shall be designed to prevent freezing, leaking, settlement, lateral movement, and damage from expansion/contraction. It shall be located with proper vertical clearances for highway vehicles and the 100 year flood.

(iii) Stream crossings. Stream crossings shall be within 10° of the perpendicular direction of the stream. Pipe shall have a minimum cover of one foot in rock, and three feet under other surfaces. The crossing shall be made with an inverted siphon or without a grade change. Pipe materials shall be steel, cast iron, or ductile iron pipe.

(f) Potable water supply protection.

(i) Cross connections. There shall be no cross connections between sewer lines and potable water lines.

(ii) Horizontal and vertical separation from water mains. Minimum horizontal separation shall be ten feet (3 m) where the water main is less than 1.5 feet (0.46 m) above the elevation of the sewer. Minimum vertical separation shall be 1.5 feet (0.46 m) at crossing. Joints in sewers at crossing shall be located at least ten feet (3 m) from water mains. The upper line of a crossing shall be specially supported. Where vertical and/or horizontal clearances cannot be maintained, the sewer shall be placed in a separate conduit pipe.

Section 10. Pumping stations.

(a) Design conditions.

(i) Total dynamic head. The total dynamic head rating of pumping units shall be based on pipe friction, pressure losses from piping entrances, exits, appurtenances (bends, valves, etc.), and static head at the rated flow.

(ii) Grit. Where no grit removal is provided ahead of the pumping station, equipment and piping design shall minimize the deleterious effects of grit in the sewage.

(iii) Screening. Screens or comminutors shall be provided ahead of pumps where the average daily flow is in excess of 1.0 mgd (3,784 m^3/d) to prevent solids larger than 2 ½ inches (6.4 cm) from entering the pump.

(iv) Minimum pump opening. Except for grinder pumps, raw sewage pumps shall be capable of passing spheres of at least three inches (7.6 cm) in diameter. Pump suction and discharge piping in all sewage and sludge services shall be no smaller than four inches in diameter (10 cm).

(v) Pump cycle time. Intermittently operated pumps shall be designed to start no more often than once every ten minutes at the minimum operating interval.

(vi) Removal of equipment. Pumping stations shall be designed to permit removal of all items of equipment including pumps, valves, electrical and control equipment. Equipment located in wetwells shall be removable without entering the wetwell.

(vii) Surge control. Piping systems shall be designed to withstand the maximum possible surge (water hammer) from the pumping station, or adequate surge control provided to protect the piping. Pressure relief valves are not acceptable surge control.

(viii) Net positive suction head. Pumps shall be selected so that the net positive suction head required at maximum flow (NPSHR) is less than the NPSH available minus four feet (1.2 m) based on the hydraulic conditions and altitude of the pumping station.

(ix) Uplift. The pumping station chambers shall resist hydrostatic uplift pressures. Siting requirements.

(b) Siting requirements.

(i) Access. Pumping stations shall be located so that they are readily accessible to operating and maintenance personnel at all times of day or night, and under all weather conditions. Pumping stations shall be located off of traffic ways.

(ii) Flood protection. Pumping stations shall be designed so there is no equipment or structural damage in the 100 year flood, and so the pumping station's operation is uninterrupted by the 25 year flood.

(iii) Security. The pumping station shall be designed to discourage unauthorized entry.

(c) Pumping station types.

(i) Dry wells.

(A) Access. Pumping station dry wells and equipment rooms shall be accessible for equipment inspection, operation and maintenance. Ladder and stair dimensions, locations of landings, and structural design shall comply with the Wyoming OHSA (1982). Equipment shall be removable from pumping stations without making structural changes to the station.

(B) Separation from wetwell. Dry wells and equipment rooms shall be completely separated from wetwells with no hatches, untrapped drains, or other connecting accessways.

(C) Dewatering. Dry pits and below-grade equipment rooms shall be provided with sump pumps sized to remove infiltration of water during normal seepage and leakage.

(ii) Wetwell design. Wetwells shall be designed to prevent vortexing and unstable pump operation. Pumps shall be located below the minimum water level, except suction lift pumps. Suction intakes shall be bell-mouthed. Provisions shall be made for isolating, bypassing and/or dewatering portions of the wetwell for maintenance. Hopper walls of wetwells shall be sloped at no less than 1.75 vertical to 1 horizontal.

(iii) Submersible pumping stations. Submersible pumping stations shall be designed specifically for totally submerged operation and so that pumps may be readily removed from the wetwell without dewatering the wetwell or disconnecting piping in the wetwell. Submersible pumps shall have an adequate means of indicating motor seal failure. Electrical equipment shall be suitable for Class 1, Division 1, Groups C and D hazardous environments, as defined in the National Electrical Code (1982).

(iv) Suction lift. Pumping stations utilizing suction lift pumps shall have adequate priming means to prime the pumps quickly and shall be designed for priming the pumps when the water level in the wetwell is one foot (0.3 m) below the lead pump starting elevation in the suction wetwell, and for maintaining prime when the wetwell level is one foot (0.3 m) below the lead pump stopping level. Valving shall not be located in the wetwell.

(v) Pneumatic ejectors. Pneumatic ejectors shall be limited to design flows equivalent to 25 residential connections. One standby compressor shall be provided.

(vi) Grinder pumps. Grinder pumps shall be limited to design flows equivalent to 25 residential connections.

(d) Piping and valves.

(i) Suction.

(A) Suction intake. Suctions shall be located so the pump is below the minimum water level. Suction intakes shall be bell-mouthed. Suction intakes shall be located against the far wall from the wetwell inlet.

(ii) Piping.

(A) Size. Sewage and sludge piping shall be no smaller than four inches (10.2 cm) diameter, except as required for metering, or where grinder pumps are provided.

(B) Velocity. Piping and pumping systems shall be designed to maintain a minimum velocity of 2.5 fps (0.76 mps), and a maximum velocity of 5 fps (1.52 mps) for suction piping.

(C) Design pressure. Piping shall be designed for the maximum operating pressure and for the maximum value of any surges (water hammer) which may occur, taking into account any surge protection provided.

(D) Restraints. Piping shall be blocked and otherwise restrained to prevent damaging movement under the maximum anticipated pressure (including test pressure).

(E) Cleanouts. Cleanouts shall be provided in pump suctions.

(iii) Valves. Valves shall not be located in wetwells.

(A) Shutoff. Except on submersible pumps and suction lift pumps, a shutoff valve shall be provided on the suction of all pumps. A shutoff valve shall be provided on the discharge of all pumps, regardless of type or service.

(B) Check. All pumps shall be provided with a check valve located between the pump and the discharge shutoff valve, except where arranged so that backflow is not possible under normal operating conditions.

(C) Air release. Air release valves shall be provided at the high points in piping whenever the pipe crown elevation falls below the pipe invert elevation. On sewage lines, air or air and vacuum release valves shall be specifically designed for sewage service.

(e) Reliability.

(i) Multiple units. Every pumping station shall have not less than two pumping units. The number of units and their size shall be sufficient to permit pumping the maximum design flow with the largest pumping unit out of service.

(ii) One of the following shall be provided:

(A) Alternative power source. Where the pumping station serves more than 50 residential units, alternative power shall be provided. Alternative power shall be permanently installed or portable engine generator sets, permanently installed or portable engine driven pumps or a separate, independent utility source provided. Where manual starting is required, sufficient storage shall be provided to allow notifying the operator and performing whatever tasks are necessary to get the pumping station in service. Where permanently installed engine driven equipment is provided, sufficient fuel shall be provided for at least eight hours operation under the maximum flow condition. Where more than one pumping station is affected by a power outage and portable equipment is planned for alternative power source, sufficient portable equipment shall be provided to provide alternative power to all pumping stations under maximum flow conditions.

(B) Generators. Generators shall be sized to permit starting the largest pump in the pumping station with all other pumps except one running. If the generator is not capable of starting all pumps simultaneously, suitable controls shall be provided to stagger the pump starts to remain within the capabilities of the equipment. Generators shall be diesel-fired, natural gas-fired or bottled gas-fired. The use of gasoline or digester gas-fired generators for permanently installed standby service is unacceptable. Gasoline-fired portable generators are acceptable.

(C) Engine driving pumps. Engine driven pumps shall be sized for maximum design flow. Diesel, natural gas and bottled gas are acceptable fuels for portable engines only. Digester gas is unacceptable for standby fuel. Quick connecting couplings shall be provided for portable engine driven pumps.

(D) Storage. Wastewater storage may be provided in the form of underground storage or surface ponds or tanks in lieu of alternative power supplies. Storage shall be sized for the maximum anticipated power outage, but not less than 24 hours at average design flow. Storage shall be water tight and arranged to drain back to the pumping station wetwell.

(f) Electrical.

(i) Equipment location. All electrical equipment, including motors, motor starters and controls shall be located so as to be undamaged by the 100 year flood.

(ii) Controls. Controls shall include a separate start/stop device for each pump or for each pumping position in the control sequence. Controls shall be arranged so that the failure of any one control system component will affect only the operation of one pumping unit. Manual override shall be provided for normal pump operating control.

(iii) Code requirements. All electrical work shall comply with the National Electrical Code as adopted and amended by the Wyoming Department of Fire Prevention and Electrical Safety. Electrical equipment in enclosed wetwells which may be subject to explosive concentration of hazardous gases or flammable fluids, including all raw sewage wetwells, shall comply with the NEC requirements for Class 1, Division 1, Groups C and D areas.

(iv) Alarms. An alarm system shall be provided for each pumping station. As a minimum, alarms shall include high wetwell level and high water level in the dry well. For pumping stations having a capacity of 0.5 mgd (1890 m^3/d) or more, the alarm shall be telemetered to a facility that is manned 24 hours a day. For pumping stations having a capacity of 0.5 mgd (1890 m^3/d) or less, an audio and visual alarm shall be provided in a conspicuous location.

(g) Safety.

(i) Ventilation. All accessible pumping station areas shall be ventilated. Ventilation may be continuous or intermittent. If intermittent, ventilation in areas normally visited by operating personnel shall be started automatically at not greater than 30 minute intervals. Permanently installed dry well ventilation shall provide at least six air changes per hour if continuous, and 12 air changes per hour if intermittent. Permanently installed wetwell ventilation shall provide 12 complete air changes per hour if continuous, and 30 complete air changes per hour if intermittent. Wetwell ventilation shall be positive pressure, forcing air into the wetwell rather than exhaustion from it. All ventilation equipment shall be of a non-sparking design. Intermittent ventilating equipment shall insure starting upon entry of operating personnel. Wetwells may be ventilated by gravity means if normal access by operating personnel is unnecessary. Wetwells that are accessed infrequently shall be designed to permit the use of portable blowers that will exhaust the space and continue to supply fresh air during access periods.

(ii) Hoists. Where required for removing equipment, hoists shall be rated for not less than 50 percent more than the weight of the heaviest single item to be lifted by the hoist.

(iii) Lighting. Lighting levels shall be sufficient to permit safe operation and maintenance of all equipment within the pumping station, but not less than 30 foot-candles. All areas shall be lit in such a manner that the failure of one lighting fixture or lamp will not cause the area to be completely dark.

(iv) Equipment guards. Provide shields to protect from rotating or moving machinery.

(v) Warning signs. Provide warning signs for nonpotable water, electrical hazards, chemical hazards, or other unsafe features. Warning signs shall be permanently attached to the structure or appropriate equipment.

(vi) Safety. Comply with the Wyoming Occupational Health and Safety Rules and Regulations.

Section 11. <u>General Treatment Plant Considerations.</u>

(a) Surface water protection. Discharges to surface waters shall meet or exceed quality limitations in the National Pollution Discharge Elimination System Permit. Plant configurations and piping shall be arranged to avoid the bypassing of process units that could result in inadequately treated sewage reaching the receiving surface water.

(b) Groundwater protection. Seepage and/or discharge to groundwater shall comply with Chapter VIII of the Water Quality Regulations. Plan configurations and piping shall be arranged to avoid the bypassing of process units that could result in inadequately treated sewage reaching the groundwater.

(c) Siting requirements.

(i) Isolation. Treatment facilities shall be located to minimize public and private nuisances and health hazards on inhabited areas or residential areas. Where treatment plant siting does potentially affect inhabited areas, appropriate measures to minimize nuisances or hazards shall be incorporated in the design.

(ii) Flood protection. All treatment process structures, mechanical equipment, and electrical equipment shall be protected from the 100 year flood. The treatment facilities shall remain fully operational and accessible during the 25 year flood.

(d) Hydraulic and treatment reliability.

(i) Alternative power source. All treatment plants shall have an alternative source of power to provide reliable pumping and disinfection of sewage if required. The alternative source of power shall be sized to provide the capability to pump design maximum day flow rates through the treatment process and to disinfect the sewage if necessary. Acceptable alternative power sources include:

(A) A diesel, natural gas, or propane fueled engine generator.

(B) A second independent electrical supply.

(C) Storage of sewage and subsequent treatment.

(ii) Bypass treatment units. Complete by-passing of treatment units is prohibited. Provide means to bypass any duplicate process unit or single unit where adequate downstream process capability is provided. Sewage shall be treated in parallel singular units and/or subsequent processes.

(iii) Multiple units. For average design flows greater than 100,000 gpd (378 m^3/d), more than one unit of each unit process shall be provided. For average design flows of less than 100,000 gpd (378 m^3/d), one unit of each unit process may be provided if electrical or mechanical equipment or diffusers can be removed while the unit is in operation, or if the unit can be compartmentalized to permit access. There shall be no provision to bypass the entire plant nor shall bypass provisions be made that will allow inadequately treated sewage to reach the ground or surface waters.

Where more than one parallel unit is provided, positive means of dividing the flow proportionally between units shall be included (such as splitter weirs or valves and meters).

(iv) Multiple equipment. Mechanical process equipment shall be provided in multiple units. All pumping functions shall include sufficient pumping capacity that the peak flow can be pumped with the largest single unit not in service. Blowers and mechanical aerators for process aeration shall include sufficient capacity that the maximum day design capacity can be delivered with the largest single unit not in service. Other equipment shall have standby units where their function is critical to the treatment process.

(e) Electrical.

(i) Equipment location. Service transformers and other critical electrical equipment shall be located above the 100 year flood and above grade. Transformers shall be located in a manner that they are remote from or protected by substantial barriers from traffic. Motor controls shall be located in superstructures and in rooms that do not contain sewage, chemical processes, or corrosive atmospheres.

(ii) Code requirements. All electrical work shall comply with the National Electrical Code as enacted and amended by the Wyoming Department of Fire Prevention and Electrical Safety. Areas in which the occurrence of explosive concentrations of hazardous gases or flammable fluids can occur Class 1, groups C and D, Division 1 locations shall be designed for hazardous locations in accordance with the National Electrical Code.

(f) Structural.

(i) Construction materials. Construction materials shall be selected, apportioned, and/or protected to provide water tightness, corrosion protection, and resistance to weather variations.

(ii) Coatings. Coatings used to protect structures, equipment and piping shall be suitable for atmospheres containing hydrogen sulfide and volatile organics. Surfaces exposed in chemical areas shall be protected from chemical attack. Concrete surfaces in confined spaces containing sewage shall be protected. Paints containing lead or mercury shall not be used.

(iii) Geological conditions. Structural design shall consider the seismic zone, ground-water and soil support. Soils investigations shall be made, or adequate previous soils investigations shall be available to develop structural design.

(g) Safety. The Wyoming Occupational Health and Safety Rules and Regulations shall be complied with. The following items shall also be provided:

(i) Instruction manuals. Instruction manuals shall be provided for all mechanical and electrical equipment describing operation, maintenance, and safety.

(ii) Handrails. In addition to all Wyoming OSHA requirements, barriers around treatment basins shall be provided.

(iii) Warning Signs. Provide warning signs for nonpotable water, electrical hazards, chemical hazards, or other unsafe features. Warning signs shall be permanently attached to the structure or appropriate equipment.

(iv) Equipment guards. Provide shields to protect from rotating or moving machinery.

(v) Lighting. Provisions shall be made to light walkways, paths, and other accessways around basins, in buildings and on the site. All areas shall be lit in a manner that the failure of one lighting fixture will not cause an area to be dark, or the loss of power will not cause a room or enclosed area to be dark.

(vi) Climate conditions. Design of facilities such as exposed stairs, walkways, and sidewalks shall include nonskid surfaces.

(h) Instrumentation.

(i) Location. A flow measuring device shall be provided for the plant effluent unless it is a mechanical plant where an influent flow measuring device will be acceptable.

(ii) Type. For plants having an average design flow of 50,000 gpd (189 m^3/d) or more, the flow measuring device shall provide recording of instantaneous flow rate, enable calculation of average daily flow rate and have provisions for calibration and correction.

(iii) Controls. Automatic controls shall be designed to permit manual override.

(iv) Alarms. Conditions that may affect discharge quality or personnel or public safety shall be alarmed at an attended location.

(i) Sampling. Access shall be provided to sample untreated wastewater ahead of the treatment facilities prior to adding any process return flows, and sampling of the effluent after all treatment process units, but before discharge to the receiving stream. An automatic sampler that composites samples in proportion to the flow rate on the effluent shall be provided if required by the NPDES permit.

(j) Ventilation. All enclosed spaces shall be provided with forced ventilation, excepting pumping station wetwells, scum pits, anaerobic process units, and man-holes. In areas where there are open sewage channels, wet pits exposed to the room or process units without gas tight enclosures, ventilation shall be provided to maintain a higher pressure in the room than atmospheric and shall provide 12 air changes per hour. In equipment rooms, ventilation shall be provided to limit the temperature rise in the room to less than 15° F (8° C) above ambient, but not less than six air changes per hour. Rooms housing chlorine storage and/or feeders shall have provisions for exhausting the room contents in two minutes and continuous ventilation to provide 12 air changes per hour.

(k) Dewatering of treatment units. All treatment units, channels, housing screens, or other embedded equipment, and wetwells shall be provided with drains or sumps that facilitate draining the unit for access and maintenance. Drainage shall be to upstream process units. Basin slabs shall be designed to successfully resist the hydrostatic uplift pressure or relief valves shall be provided.

(l) Cold weather protection. All equipment including pumps, bar screens, grit washers, electrical equipment and other equipment not required to be in or on open basins (such as clarifier drives and surface aerators) shall be housed in heated, lighted, and ventilated structures. Structure entrances shall be above grade. Piping shall be buried below frost level, placed in heated structures, or provided with heat and insulated. Walkways shall be located away from areas of spray and/or ice buildup.

(m) Chemical storage. All chemical storage shall be housed or buried. Areas designated for storage of specific chemicals shall be separated from areas designated for other reactive chemicals. Liquid storage containers shall be isolated from other portions of the structure by a curb that will contain and/or drain ruptured tank contents. Concrete floors, walls and curbs in chemical storage and feed areas shall be coated to protect the concrete from aggressive chemicals. Floors in polymer feed and storage areas shall be provided with nonslip surfaces. Rooms for chlorine storage and feed equipment shall be gas tight and be provided with entry from outdoors. All toxic chemical storage areas shall be provided with lighting and ventilation that are switched from outside the room, and windows to permit viewing the room from outside.

(n) Design capacities.

(i) Flow. In the absence of flow measurement information, the design average daily flow shall be based on a per capita daily flow rate of 100 gallons (378 liters). Allowances shall be made for return flows from digesters, sludge thickeners and the like, and the infiltration and wet weather inflow into older sewer systems. Significant industrial waste flows shall be added to the per capita flow rate.

(ii) Organic loads. In the absence of wastewater strength data, domestic waste treatment design shall be based on a per capita daily BOD and suspended solids contribution of 0.22 lb (0.10 kg) and 0.25 lb (0.11 kg), respectively. The influence of sidestream return flows and significantly strong industrial wastes shall be considered and included in the design where applicable.

Section 12. Pretreatment.

(a) Flow equalization.

(i) Storage requirements. Where mechanical plants experience large diurnal variations in flow rate which will cause mechanical, hydraulic, or biological process upsets, flow equalization shall be provided.

(ii) Location. Pretreatment facilities, such as bar screens, comminutors and grit chambers, and where possible, primary clarifiers should be located ahead of the equalization basin.

(iii) Drainage and cleaning. Provisions shall be made to isolate, drain and clean the basin(s).

(iv) Aeration and mixing. Aeration shall be sufficient to maintain a minimum of 2.0 mg/L of dissolved oxygen in the basin at all times. Air supply rates shall be a minimum of 10 cfm/ 1,000 cubic feet (10 m^3/min/1000 m^3) of volume for primary treated wastewater and 20 cfm/1,000 cubic feet (20 m^3/min/1000 m^3) of volume for raw or screened waste water.

(v) Controls. Controls shall be provided to control the flow rate from the flow equalization basin. Flow measurement devices shall be provided.

(b) Screens.

(i) Location. Coarse screens shall be the first unit in the treatment process. Screens shall be housed. The housing shall be heated and ventilated. Access shall be separated from other enclosed spaces. Housing shall be designed for hazardous location (National Electrical Code, Class 1, Groups C and D, Division 1 locations).

(ii) Capacity. The screen capacity shall be capable of handling the maximum anticipated peak hourly flow including inflow and infiltration.

(iii) Types.

(A) Mechanically cleaned. Bar screens shall be mechanically cleaned if the removal of the daily accumulation of screenings results in surging of the flow. Manually cleaned screens shall be provided in parallel channels to permit removal of the mechanically cleaned screen from service. Bars shall be between 45° and 90° measured from the horizontal.

(B) Manually cleaned. Manually cleaned bar screens shall be used for bypass of a mechanically cleaned screen or for treatment installations having an average design capacity of less than 100,000 gpd (378 m^3/day). Bars shall be between 30° to 45° from the vertical.

(iv) Bar spacing. Clear spacing on mechanically cleaned bar screens shall range from ½ inch to 1 3/4 inches (1.27 cm to 4.45 cm). Manually cleaned screens shall have a range from one to 1 3/4 inches (2.54 cm to 4.45 cm) clear spacing. Coarse screens may have spacing greater than 1 3/4 inches (4.45 cm).

(v) Velocities. Maximum approach velocity at average flows for a mechanically cleaned screen shall be 3.0 fps (0.91 mps). Maximum velocity for a manually cleaned bar screen shall be 1.5 fps (0.46 mps). Minimum velocities shall be1.25 fps (0.38 mps).

(vi) Channel. Channels shall be designed to eliminate deposition and permit draining. The channel shall contain a rock trap ahead of mechanically cleaned screens. Multiple channels shall be designed to allow uniform and equal flow to the screens. Slide gates shall be provided to permit isolating sections of channel containing screens.

(vii) Controls. Cleaning operation shall be controlled by one or several of the following methods.

(A) Timers. A timer to start the cleaning operation, and a device to stop the cleaning operation after one cycle.

(B) Differential head. Cleaning device starts and stops on differential head across screen.

(C) High level switch. Cleaning device starts on high level and runs for predetermined length of time.

All screens shall have manual override capability. All controls shall be suitable for use in hazardous location (National Electrical Code, Class 1, Groups C and D, Division 1 locations).

(viii) Handling. Screenings receptacles shall be designed to contain a minimum of one day's screenings. Manually cleaned bar screens shall include an easily accessible and safe working platform. All handling areas should be well drained.

(ix) Disposal. Screenings shall be disposed of in a manner approved by the Department of Environmental Quality, Solid Waste Management section. Grinding of screenings and return to the wastewater flow is not accept able.

(c) Comminutors.

(i) Location. When used, comminutors shall be located downstream of a coarse screen. Where grit removal is provided, comminutors shall be located downstream.

(ii) Capacity. Comminution or screening capacity shall be adequate with the largest comminutor out of service.

(iii) Number of units. Wherever comminutors are used, a bypass, manually cleaned bar screen shall be installed.

(iv) Channel. Provide stop plates or similar devices to permit isolating a comminutor for maintenance. Provide drainage and washdown facilities. Where grit removal is not provided upstream, provide a gravel trap upstream of each comminutor.

(v) Bypass. An emergency bypass with a manually cleaned bar screen shall be provided. All flow exceeding the operating capacity of the comminutor(s) shall be automatically directed to the emergency bypass.

(vi) Controls. The comminutor shall run continuously. All electrical controls shall be NEC Class 1, Groups C and D, Division 1 rated.

(d) Grit removal and disposal.

(i) Where required. Grit removal shall be provided either by providing for its accumulation in other process units or by removal in a specially designed basin. Where accumulation is provided in other process units, duplicate units shall be provided to permit removal of grit.

(ii) Location. Grit removal shall be placed after bar screens or racks, but before comminutors and other treatment units. Where grit removal facilities can be located at grade, they shall be upstream of raw sewage pumping stations. Grit basins may be located outdoors with proper precautions against freezing, but all grit conveying, washing and handling facilities shall be located indoors.

(iii) Capacity. Grit removal devices shall be designed to effectively remove grit at the peak instantaneous flow rate. The grit handling capacity shall be a minimum of 15 cubic feet per million gallons (1.12 m^3/10,000 m^3).

(iv) Number of units. A minimum of one mechanically cleaned unit and a bypass pipe or channel shall be provided for plants serving separate sewers. Five hundred thousand gallons per day (500,000gpd) (1891.5m^3/d) plants or smaller may have a manually cleaned unit and bypass. Plants larger than 1.0mgd (3784m^3/d), shall have two mechanically cleaned units with capability to isolate each one.

(v) Type.

(A) Aerated.

(I) Air requirements. Air supply must be controllable and capable of varying from 10 to 40 cfm/1,000 cubic feet (10 to 40 m^3/m/1,000 m^3) of basin. Air diffusers shall be located above the tank bottom and positioned for adequate mixing.

(II) Equipment requirements. The tank shall be sized for a three minute retention time at peak flows. Grit shall be collected to a hopper for removal by 60 or greater sloped sides or mechanical equipment. The inlet and outlet shall be designed to avoid shortcircuiting. Air diffusers shall be removable without taking the basin out of service.

(B) Gravity chamber. Horizontal channel grit basins shall have an outlet control weir and specially shaped channel to maintain velocities from 0.8 to 1.3 fps (0.24 to 0.4 m/s) over the anticipated range of flows. Square basins shall be designed for an overflow rate of 30,000 gpd/sq ft (1220 m^3/m2/d) at the peak instantaneous flow rate.

(vi) Method of grit removal. Grit removal facilities located in pits six feet (1.8 m) or deeper and for plants larger than 500,000 gpd (1891.5 m^3/d) shall be provided with mechanical equipment for moving grit to ground level.

Plants having an average design capacity less than 100,000 gpd (378 m^3/d) may be provided with manually cleaned grit basins.

(vii) Drains. Each unit in the grit facility shall be capable of being dewatered.

(viii) Grit disposal. Grit disposal methods shall be approved by the Department of Environmental Quality, Solid Waste Management Office.

Section 13. <u>Primary Treatment.</u>

(a) Sedimentation.

(i) Number of basins. For plants having an average design capacity greater than 100,000 gpd (378.4 m^3/d) and where primary settling is provided, multiple units capable of independent operation shall be provided.

(ii) Design parameters.

(A) Performance. Unless full-scale data is available, primary settling shall be assumed to remove one third of the influent BOD and 55 percent of the influent suspended solids. It is unacceptable to return waste activated sludge to the primary clarifier.

(B) Water depth. The minimum side water depth shall be seven feet (2.1 m).

(C) Surface overflow rates. Surface overflow rates shall not exceed 1,000 gpd/sq ft (41 m3/m²d) of surface area at the average design flow nor 1,500 gpd/sq ft (61 m^3/m²d) of surface area at the maximum day flow rate. Maximum day flow is the highest flow over a 24 hour period that is projected to occur during the design year.

(D) Weir loading rates. Circular basins (or basins with center inlets) shall be provided with a full periphery weir. Rectangular basins shall be provided with end weirs that provide less than 80,000 gpd/ft (9,920 m^3/m d) weir hydraulic loading at peak instantaneous flow rates.

(iii) Clarifier inlet and outlet.

(A) General. Clarifier inlet structures shall be designed to achieve the following:

(I) Dissipate the inlet kinetic energy.

(II) Distribute the flow evenly into the tank.

(III) Prevent short circuiting.

Inlet channels or piping shall be designed for minimum velocities of one fps (0.3 mps). Where minimum velocities are less, mixing, flushing or other means of resuspending solids shall be provided.

Circular basins shall be provided with symmetrical baffling to distribute flow equally in all radial directions.

Rectangular basins shall be provided with inlet parts uniformly distributed along the entire end of the basin and shall be provided with baffles.

(B) Weirs. Weir plates shall be adjustable for leveling and sealed against the effluent channel.

(C) Baffles. Provide scum baffles at the water surface to intercept all floating materials and scum prior to the weir. Baffles should extend three inches (7.6 cm) above the weir plate elevation and eight inches (20.3 cm) below the water surface.

(D) Clarifier effluent channel.

(I) Size. The effluent channel shall be sized to prevent weir submergence at the peak hourly flow.

(E) Freeboard. The outer walls of sedimentation tanks shall extend at least six inches (0.15m) above the surrounding ground and shall provide at least 12 inches (0.3 m) of freeboard to the water surface. Where basin walls do not extend four feet (1.2 m) above the surrounding ground, a fence or suitable barrier to prevent debris from entering the basin shall be provided.

(F) Basin equipment and access. Provide walkways and accessways to collector drive units, effluent launders and manual skimmer. Handrail shall be provided.

(b) Fine screens.

(i) Number of units. A minimum of two units shall be provided. Multiple units shall be capable of independent operation. With the largest unit out of service, the remaining units shall be capable of passing the peak flow rate.

(ii) Flow distribution. Positive means of flow distribution shall be provided ahead of the screens to ensure even loading and hydraulic flows.

(iii) Design parameters.

(A) Performance. In the absence of pilot plant data, the removal efficiency of fine screens shall be assumed to be zero percent removal of BOD5 and 15 percent removal of suspended solids.

(B) Preliminary treatment requirement. Prior to the fine screens, removal of large debris shall be provided by coarse screens. Comminution shall not be provided ahead of screens.

(iv) Screenings storage and disposal. Screens with openings of 0.10 inch (2.5 mm) or more shall be disposed of directly to landfill in accordance with the requirements of the Department of Environmental Quality, Solid Waste Management Office. Screens with openings less than 0.10 inch (2.5 mm) shall discharge the screenings (primary sludge) to sludge handling system for organic stabilization.

(v) Cleaning and maintenance. Provide facilities to permit regular cleaning of screens with a high pressure, hot water or steam system.

(vi) Controls. For rotating screens, each screen or series of screens shall be provided with an overflow. An alarm shall be provided when overflowing.

(c) Sludge handling.

(i) Sludge removal. Mechanical sludge collection equipment is required for all primary settling basins. The sludge collection rake arms or flights and the drive assembly shall be designed to withstand the maximum anticipated loads and move sludge to the hopper.

(ii) Scum removal. Provide scum collection and removal facilities for all primary settling basins. Scum shall be removed from the liquid process and not returned.

(iii) Sludge hopper. The minimum side slope of the hopper shall be 1.7 vertical to 1.0 horizontal. Hopper bottoms shall have a maximum dimension of two feet (0.61 m). The sludge removal pipe shall be flush with the hopper bottom, and have a minimum diameter of six inches (15.2 cm).

(iv) Scum box. The scum box shall be located outside and immediately adjacent to the scum collection point (beaching plate). The beaching plate shall be located on the opposite side of the basin from the prevailing wind. Provide for mixing the contents of the scum box, such as a mechanical mixer or air diffusion. Provide access and wash water for washing the scum box.

(v) Controls.

(A) Primary settling sludge facilities. Primary sludge and scum shall be removed using positive displacement pumps. Each basin shall have a separately activated and controlled pump. (The standby pumps may be shared by more than one basin.) Pumps shall be on timers and the pumps should be designed to initiate sludge removal two or more times per hour.

Include devices on the primary sludge piping for sampling the primary sludge flow.

(B) Primary screen sludge facilities. Where sludge pumping is provide d, include a means to shut off the pump when insufficient material is being supplied to the pump suction. The controls for the pump shall be designed to match the pumping rate to quantity of sludge. Where conveyors are used, they shall run continuously and alarm when off.

Section 14. Activated Sludge.

(a) Pretreatment. Where primary clarification is not provided, screening of the raw sewage to remove debris larger than 3/4 inch (1.9 cm) shall be provided. The screened material shall not be returned to the plant process. Where primary clarifiers are not provided, cleanouts, grinders, or other similar provisions shall be made in the return sludge piping.

(b) Loading rates. Activated sludge systems shall be designed to accommodate peak day loadings at the design year. Permissible loadings are presented in the following table. Where raw sewage BOD5 is less than 200 mg/L, detention times may be reduced.

(i) Conventional, including complete mix, plug flow, step aeration

Detention (*) hrs,		Average Day
	Following primary clarifiers	6 minimum
	Without primary clarifiers	9 minimum
Organic Loading:	lb/1,000 cu ft/day (kg/1000 m^3d)	35 maximum (560)
MLSS, mg/L		1,000 - 3,000

(ii) Contact stabilization.

Detention (*) hrs	
Contact Zone	0.5 - 3

Sludge Stabilization Zone		6 minimum
		Average Day
Organic Loading (**)	lb/1,000 cu ft/day	50
	(kg/1000 m^3d)	(800)

MLSS, mg/L

Contact Zone	1,000 - 3,000
Sludge Stabilization Zone	5,000 - 10,000

(iii) Extended aeration, including oxidation ditch.

Detention (*) hrs,		16 minimum
Organic Loading,	lb/1,000 cu ft/day	15 maximum
	(kg/1000 m^3d)	(240)
MLSS, mg/L		1,000 - 3,000

(*) Based on average day raw sewage flow rate exclusive of recirculation flow.

(**) Based on contact zone and sludge stabilization zone combined.

(c) Number of basins. For all design average flows in excess of 0.1 mgd (378 m^3/d), two or more aeration basins shall be provided. For flows less than 0.1 mgd (378 m^3/d), one aeration basin may be provided if the aeration devices can be readily removed while the basin is in operation.

(d) Configuration. The basin configuration shall promote mixing, transfer of oxygen, and minimize stagnant zones.

(e) Freeboard. The walls of the aeration shall extend above the normal water surface to provide a minimum freeboard as follows:

	Minimum Freeboard*	
	inches	cm
Diffused air	18	45.7
Surface aeration	48	121.9
Submerged turbine	18	45.7
Brush aeration - less than 10 feet from aeration device	48	121.9
Brush aeration - 10 feet or more from aeration device	18	45.7
Surface aeration	36	91.4

(*) Vertical walls. For sloped walls, the runup effect shall be considered.

(f) Inlet and outlet conditions. Inlets may be submerged and shall be baffled or directed away from the outlet to minimize shortcircuiting. Outlets shall be of the overflow type to discourage buildup of foam and floatables on the aeration basins. Pipe and channels shall provide a minimum velocity of 0.5 fps (0.15 m/s).

(g) Aeration requirements.

(i) Carbonaceous BOD. When it can be shown that nitrification will not occur in the activated sludge process, the aeration devices may be sized to meet only the carbonaceous oxygen demand. The oxygen provided by the aeration device shall be selected to be adequate for the projected maximum day loading. In the absence of other data, an oxygen requirement of two times the average design day BOD? to the aeration basin shall be used.

(ii) Nitrification. Where nitrification is required to meet the effluent requirements or where the process cannot be operated to prevent nitrification, the aeration requirements will be selected to provide oxygen for both carbonaceous BOD and nitrification on the projected maximum day loading. In the absence of other data, an oxygen requirement of two times the average design day BOD^5 plus 7.5 times the average day ammonia nitrogen to the aeration basin shall be used.

(iii) Minimum dissolved oxygen. Oxygen supply shall be selected to transfer the design quantity during the maximum day loading while maintaining an aeration basin dissolved oxygen of 2.0 mg/L. The oxygen supply shall be designed for the specific site considering all factors that affect oxygen transfer efficiency.

(h) Mechanical aeration. Mechanical surface aerators shall be designed to maintain all organics in suspension, enhance the oxygen transfer capability of the unit, and minimize mist and spray that escape the basin. Drive units shall be protected from freezing mist and spray.

(i) Diffused aeration.

(i) Diffuser requirements. The number and location of diffusers shall be selected to distribute the design air quantity for efficient aeration and mixing. Diffusers in a basin shall be grouped on control valves to permit varying the air supply to different parts of the basin. Oxygen transfer efficiencies used for design purposes shall be conservatively selected, based on experimentally determined transfer rates of generically similar diffusers. The effect of transferring oxygen to wastewater, in lieu of water, and the effect of altitude shall be considered. The aeration basin mid-depth shall be used to determine the oxygen saturation concentration. Differential head loss to individual diffuser inlets shall not be more than 0.2 psi (14 gm/cm^2).

(ii) Blower requirements. Blowers shall be sized to provide the air requirements for the aeration basins and other plant uses of low pressure air. The inlet air to the blowers shall be filtered or otherwise conditioned to effectively remove dust and other particulate material. Removal of particulate material for fine bubble diffusers shall be designed for 95 percent of 0.3 micron. Filters designed for blowers shall be easily replaceable. Blower intakes shall be located to avoid clogging from drifting snow. Blowers shall be housed. The housing shall be ventilated to prevent more than a 15° F (8° C) temperature rise with all blowers operating, excepting the standby blower. The housing, blowers, and blower piping shall be arranged to permit removal of individual blowers while all other blowers are operating. Noise attenuating materials shall be used in the building interior. Blower systems shall be designed to permit varying the volume of air delivered. Blower motors shall be of a size to operate the blower throughout the range of ambient air temperatures experienced at the plant site.

(j) Sludge recirculation and waste.

(i) Rates. Sludge recirculation from the secondary settling basin to the aeration basin shall be variable within 25 to 100 percent of the average design flow. Sludge wasting from the activated sludge process may be from the mixed liquor or the return sludge. Sludge wasting shall be variable to enable wasting ½ of the total system solids in one day to zero wasting.

(k) Equipment requirements.

(i) Return sludge. Return sludge pumping shall be variable. The return sludge rate from each secondary settling unit and the rate to each aeration basin shall be controllable. Pumps shall be housed in heated, ventilated space. The pump floor shall be sloped and drained. Valves shall permit isolating each pump. Pumps and piping shall be arranged to allow ready removal of each pump. Check valves shall be provided where backflow through the pump could occur. Check valves shall be located in the horizontal.

Pump suction and discharge shall be three inches (7.6 cm) minimum. Sludge piping shall be four inches (10.2 cm) or larger. Cleanouts and couplings shall be provided in sludge piping to enable cleaning the pipe or to remove pumping equipment. All pipe high points shall be provided with air releases. All sludge piping shall be metallic material. Should air lift pumps be used, the units shall be designed with a minimum of 80 percent static submergence.

(ii) Waste sludge. If separate waste sludge pumps are provided, the rate shall be controlled by timers or variable speed devices. Pumping units shall be housed in heated, ventilated space, with sloped and drained floors. Pump suction and discharge piping shall be three inches (7.6 cm) minimum. Sludge piping shall be four inches (10.2 cm) or larger, except short, easily removable sections that may be required to maintain velocities above one fps (0.3 mps), or for use in conjunction with meters.

(l) Metering.

(i) Return sludge. For treatment plants having an average day design capacity greater than 100,000 gpd (378 m^3/d) the return sludge flow rate from each secondary settling unit and to each aeration basin shall be metered to indicate flow rate. Return sludge metering devices shall be suitable for liquids carrying grease and solids, and shall be accurate to within ±5 percent of the actual flow rate. Meters shall be readily field calibrated by plant personnel. Meters shall be arranged to avoid trapping air.

(ii) Waste sludge. For treatment plants having an average day design capacity greater than 100,000 gpd (378 m^3/d), waste sludge flows shall be metered to indicate and totalize. Waste sludge meters shall meet the requirements described for return sludge meters.

(iii) Air flow. Low pressure air used for basin aeration and other plant uses shall be metered. Separate meters shall be used to indicate the flow rate to each aeration basin and to the ancillary uses made of the low pressure air. Indicators shall be located near the device used to control the air flow rate. Pressure gages shall be provided immediately downstream from each blower and immediately upstream of each aeration basin.

(m) Controls. Facilities for control shall be provided for:

(i) Control of flow split between parallel process units.

(ii) Control of return sludge flow rate to each aeration basin.

(iii) Control of waste sludge quantity.

(iv) Control of air flow rate to each aeration basin.

(v) Control of air distribution to different zones in aeration basin.

(vi) Control of energy imparted with mechanical aeration.

Facilities for control shall include a meter or device to measure rate and a device to change the rate such as a valve or adjustable weir.

(n) Prefabricated treatment units. Prefabricated activated sludge units shall conform to the applicable requirements described.

(o) Ancillary facilities. Adequate nonpotable washdown water shall be provided around the aeration basins sludge pumping area and secondary settling basins. Sampling ports, pipes or other access shall be provided on aeration basin inlets, return sludge piping, waste sludge piping and secondary settling basins. Hoisting or other means of equipment removal shall be provided. All subgrade floors shall be drained.

Section 15. Attached Growth Systems.

(a) Pretreatment and primary treatment requirements. Attached growth systems shall be preceded by primary settling or fine screening. If fine screening is provided, the screen size shall have 0.06 inch (1.5 mm) or smaller openings.

(b) Trickling filters.

(i) Loading rates. Applied organic loading rates on trickling filters, where not used in series with activated sludge, shall be limited to:

	Applied Liquid Rate to Surface of Filter		BOD Loading*	
	gpm/sf	1pm/m²	lb/1000ft³/d	kg/1000m/d³
Rock Media	0.1	4.07	10	160
	0.2	8.15	12	192
	0.3	12.22	16	256
Plastic or Redwood Media			20	320

*For more than a one-stage trickling filter, the volume of all stages shall be used

(ii) Recirculation. Recirculated flow to stationary media attached growth systems shall be provided. Recirculated flow shall be sufficient to provide the following minimum wetting rates:

Media	Minimum Wetting Rate	
	gpm/sf	1pm/m²
Rock	0.1	4.07
Plastic or redwood	0.75	30.5

(iii) Media. Media may be rock or specially manufactured material made of redwood or plastic. Rocks shall be durable and free from thin, elongated, flat pieces and should have the following size distribution:

Passing 6-inch (15.2 cm) screen	100% by weight
Retained on 4-inch (10.2 cm) screen	95-100% by weight

Fabricated media shall be resistant to ultraviolet degradation, disintegration, erosion, aging, all common acids, alkalies, organic compounds, fungus and biological attack. Media shall be capable of supporting a man's weight.

(iv) Flow distribution. Wastewater shall be applied to stationary media by a rotary distributor or a fixed nozzle distribution system that provides uniform distribution. Flow distribution between multiple units of stationary or rotating media systems shall be by weirs, meters and valves, or other positive flow split device.

(v) Depth of media. Rock trickling filters depth shall be between 5 to 10 feet (1.52 to 3.04 m), and manufactured media filter depth shall be between 10 to 30 feet (3.05 to 9.15 m).

(vi) Underdrain system. The underdrainage system shall cover the entire floor of the filter. Inlet openings into the underdrains shall have an unsubmerged gross combined area equal to at least 15 percent of the surface area of the filter. Underdrains shall have a minimum slope of one percent.

Effluent channels shall be designed to maintain minimum velocity of two feet per second (0.61 mps). Drains, channels and pipe shall be designed to have maximum depth flow of 50 percent.

(vii) Flushing. Provide valves and structurally capable walls to permit flooding rock media filters. Access shall be provided around the periphery of the underdrain system to allow flushing the underdrains.

(viii) Freeboard. The clearance between rotating distributor and the media shall be at least 18 inches (0.46 m). The surrounding wall shall extend 2.5 feet (0.76 m) above the distributor.

(ix) Ventilation. All trickling filters shall be provided with ventilation openings to the underdrain. Ventilation openings will be provided with dampers or other adjustable devices to permit adjusting the ventilation rate opening. Ventilation openings shall be a minimum of eight square feet (0.74 m^2) per 1,000 lb (454 kg) BOD /day.

Forced ventilation providing 4,000 cfm (113 m^3/min) per 1,000 lb (454 kg) BOD /day shall be provided for covered filters.

(c) Rotating biological contactors (RBC).

(i) Loading rates. The organic loading rate on the first stage of an RBC shall be limited to 140 lb BOD /1,000 cu ft (2240 kg/1,000 m^3) of media per day. The organic loading rate on all stages of an RBC shall be limited to 45 lb/1,000 cu ft (720 kg/1,000 m^3) of media for media having a specific surface area of 35 sq ft per cu ft (114.8 sq m/m^3). When more than ½ of the media has a specific surface area of 50 sq ft per cu ft (164 sq m/m3), the organic loading may be increased to 50 lb/ 1,000 cu ft (800 kg/1,000 m^3).

(ii) Number of stages. Rotating biological contactors shall be designed with a minimum of three stages in series. Baffles shall be provided between stages.

(iii) Velocities. The rotational speed of the contactors shall be designed to maintain at least two mg/L of dissolved oxygen in each stage at designed loading rates. Drive units shall provide a rotational speed of one rpm or more.

(iv) Draining. Provide drains from each contactor basin.

(v) Media materials. Media materials shall be special manufactured material suitable and durable for the rotating biological contactor process. Media shall be resistant to disintegration, ultraviolet degradation, erosion, aging, all common acids, alkalies, organic com pounds, fungus, and biological attack. Media shafts shall be designed for unbalanced loads and cycle fatigue.

(vi) Housing. The housing for the RBC'S shall be designed with openings or access to allow removal and replacement of entire shafts.

Section 16. <u>Combination systems.</u> When more than one type of biological treatment process is used in series, the removal through each biological unit shall be calculated as if it were acting alone. No symbiotic effect will be included in the design calculation.

Pretreatment requirements for combinations of biological systems will be the same as for attached growth systems. Final settling and sludge handling will be the same as for activated sludge systems.

Section 17. <u>Secondary settling.</u>

(a) Secondary settling. Secondary settling is required after suspended growth and attached growth biological processes such as activated sludge, trickling filters and RBC's.

(b) Configuration. The largest dimension (either diameter or length) of a clarifier shall be 80 feet (24.4 m). Corner sweeps on circular equipment are not acceptable.

(c) Flow distribution. Positive flow splitting shall be provided ahead of multiple sedimentation basins to ensure proportional hydraulic flows and solid loadings to each basin. Flow splitting shall be achieved using positive means such as weirs or valves and meters.

(d) Clarifier inlet and outlet structures.

(i) Clarifier inlet structures shall be designed to dissipate the:

(A) Inlet kinetic energy.

(B) Distribute the flow evenly into the basin.

(C) Minimize hydraulic turbulence.

(D) Prevent short circuiting.

Inlet devices that promote flocculation are encouraged.

The inlet structure for rectangular tanks shall be the full width of the basin, for peripheral feed clarifiers it shall be the entire periphery, and for center feed basins it shall be at least 20 percent of the tank diameter. Baffled scum relief ports shall be provided between the inlet structure and the clarifier.

(ii) Inlet conveyance pipe or channels shall be designed to maintain a minimum velocity of 0.5 fps (0.15 mps) at the design flow. Where channels provide less velocity, provide mixing, flushing, or other means of resuspending solids.

(iii) Clarifier outlet systems shall be designed to minimize vertical velocities and reduce the effect of density currents at the effluent weir. Weir level shall be adjustable.

(e) Freeboard. The outer walls of settling tanks shall extend at least six inches (0.15 m) above the surrounding ground and provide at least 12 inches (0.3 m) of free board to the water surface. Where settling basin walls are less than four feet (1.22 m) above the surrounding ground, a fence or other debris barrier shall be provided on the wall.

(f) Design parameters.

(i) Surface overflow rates.

(A) Activated sludge. Settling basins following an activated sludge process shall be designed to both thicken the sludge and clarify the liquid flow entering the tanks. The overflow rate shall not exceed:

$m^3/m^2/d$

	Design Flow		Peak Hourly Flow	
	gpd/ft²	$m^3/m^2/d$	gpd/ft²	$m^3/m^2/d$
Activated Sludge	600	24.4	1,200	48.8
Separate Nitrification	400	16.3	800	32.5

(B) Attached growth biological reactors. Overflow rates for settling basins following attached growth processes shall not exceed:

	Design Flow		Peak Hourly Flow	
	gpd/ft²	$m^3/m^2/d$	gpd/ft²	$m^3/m^2/d$
Trickling Filters and RBC's	800	32.5	1,200	48.8

(ii) Solids loadings. Solids loadings for settling basins following an activated sludge process shall not exceed:

	Design Flow		Peak Hourly Flow	
	lbs/day/ft²	kg/d m²	lbs/day/ft²	kg/d m²
All Activated Sludge Processes	28	136.7	50	244.1
Separate Nitrification	25	122.1	40	195.3

(iii) Side water depth. Settling basins shall be deep enough to provide adequate distance between the sludge blanket and the effluent weirs to avoid disturbance of settled sludge.

The volume of the settling basin shall provide a minimum detention time of two hours at peak hourly flow rate. The peak hourly flow is the projected maximum flow over a one hour period during the design year. Peak hourly flow shall include all recycle flows entering clarifier.

(iv) Weir overflow rates and placement. Weir loading rates shall not exceed the following values:

	Design Flow		Peak Hourly Flow	
	gpd/ft²	$m^3/m^2/d$	gpd/ft²	$m^3/m^2/d$
Launder and weir at outer wall	12,000	149	20,000	248
Launder and weir at 3/4 point of radius or less	18,000	223	36000	446

Where double weirs or serpentine type weirs are used, the weir length shall be computed as the length of the centerline of the launder.

(g) Baffles. Baffles shall be located at the water surface and in such a position as to intercept all floating materials (scum) prior to the weirs. Baffles shall extend three inches (7.6 cm) above the weir level and 12 inches (0.3 m) below the water surface. In circular basins, the baffle shall be a minimum of six inches (0.15 m) inside the weir plate. In rectangular basins, the baffle shall extend across the width of the basin and upstream of the effluent weirs.

(h) Basin and equipment access. Walkways and access ways shall be provided to drive units, effluent launders, and manual scum devices.

(i) Sludge removal. Sludge collection and withdrawal equipment shall provide complete and continuous removal of settled sludge. Rapid sludge removal pipes shall return sludge to a well at the surface that enables visual observation of flow. Mechanical rakes shall move sludge to a hopper at the floor. The tip speed for circular mechanisms shall not exceed 8 fpm (2.4 m/min) and straight line flight speed shall not exceed 1 fpm (0.3 m/min).

The return sludge removal pipes shall be at least four inches (10.2 cm) in diameter. The hydraulic differential between the clarifier water level and the return sludge level shall be sufficient to maintain a three fps (0.9 mps) velocity in each rapid return sludge withdrawal pipe. Each sludge withdrawal pipe shall be accessible for rodding or backflushing when the settling basin is in operation.

(ii) Scum removal. Provide effective baffling and scum collection and removal facilities for all secondary settling basins. Equipment shall include a mechanical, positive scum skimmer.

(iii) Sludge hopper. The minimum side slope of the hopper shall be 1.7 vertical to 1.0 horizontal. Hopper bottoms shall have a maximum dimension of two feet (0.61 m). The sludge removal pipe should be flush with hopper bottom, and have a minimum diameter of six inches (0.15 m).

(iv) Scum box. Locate scum box outside settling tank and adjacent to the scum collection point. Provide method for mixing contents of scum box, such as air jets or surface wetting using waste sludge. Provide access and washwater for washing the scum box. The scum box shall be located on the side of the tank opposite the prevailing wind direction.

Section 18. Lagoons.

(a) Design requirements.

(i) Location. Wastewater lagoons shall be located more than 500 feet (152 m) from existing habitations.

(ii) Wastewater loading rates.

(A) Facultative. The primary cells of a facultative (non-aerated) pond system shall be limited to a maximum BOD application of 40 lb/acre/day (44.8 kg/ha/d) at average design loading conditions.

(B) Aerated. Aerated lagoons shall be designed for an organic loading of less than 10 lb BOD /day/1,000 cu ft (160 kg/1,000 m^3/d) for completely mixed systems, and less than two lb BOD5/day/1,000 cu ft (32 kg/1,000 m^3/d) for aerated non-completely mixed systems. Aeration equipment shall be sized to maintain a minimum dissolved oxygen of two mg/L. Completely mixed systems are mixed to provide 1/4 hp/1000 cu ft mechanical mixing or 10 cfm/1000 cu ft of air mixing.

(C) Nonsurface water discharging ponds. Nonsurface water discharging ponds shall be designed on the basis of a water balance that considers evaporation and seepage. Water balance calculations shall be submitted with the plans and specifications. The BOD_5 loading for non discharging ponds shall not exceed 14 lb/acre/day (15.7 kg/ha/d) based on the average annual BOD_5.

(iii) Detention. Facultative lagoons shall be designed for a minimum detention time of 180 days.

The detention time in aerated lagoons shall be at least one and one half days for completely mixed primary cells, and seven days for non-completely mixed primary cells. Secondary cells shall increase the overall detention time to 30 days.

(iv) Storage. Nonsurface water discharging lagoons shall be designed to provide sufficient storage to retain all wastewater and rainfall during the wettest year of record during a ten year period of record. Seepage shall be controlled to maintain a minimum water depth of two feet (0.6 m) in the primary cell during the driest occurring year of a ten year period.

(v) Inlet.

(A) Location. The inlet pipe to the primary cell of a facultative lagoon shall be at least 30 feet (9.2 m) from any bank. It shall terminate at a point away from the outlet by a distance of at least equal to or greater than 2/3 of the longest lagoon dimension. In aerated systems, the influent line shall be located in the mixing zone of the aeration equipment.

(B) Elevation. The inlet line shall be located at the bottom of the lagoon.

(C) Apron. Provide a concrete apron at the inlet pipe termination with minimum dimensions of four feet by four feet (1.2 m by 1.2 m).

(D) Influent manhole. An influent man-hole shall be provided prior to the lagoons. The influent pipe in the influent manhole shall be at least six inches (0.15 m) above the normal operating water level of the primary lagoons.

(E) Flow distribution. Flow distribution for multiple primary cells shall be provided to effectively split hydraulic and solids proportionately.

(vi) Inlet and outlet structures.

(A) Location. Inlet and outlet structures shall be easily accessible by plant operators and located to minimize short circuiting within the cell. A level control structure shall be provided at the outlet of each cell.

(B) Level control. Provide controls to permit varying water levels between two feet and six feet (0.6 m to 1.8 m). Provide baffling at the outlet to prevent scum overflow. Multiple draw offs in the final cell shall be provided. At least one shall be located at the two foot (0.6 m) level.

(vii) Interconnecting piping.

(A) Location. Piping between lagoon cells shall connect to the preceding cell outlet control structure and discharge into the subsequent cell. The pipe shall discharge at least ten feet (3.05 m) from the toe of the slope on the lagoon bottom and shall terminate on the concrete apron that is at least four feet by four feet (1.2 m by 1.2 m).

(B) Elevation. The piping shall discharge at the floor of the lagoon.

(C) Material. Interconnecting piping shall be any acceptable pipe designed to resist low pressures and adequately protected from corrosion.

(b) Number of lagoons cells. A lagoon system with a total area greater than one acre (0.4 ha) shall have at least three cells in series. Smaller systems and nondischarge pond systems shall have at least two cells. The maximum size cell shall be 20 acres (8 ha).

(c) Lagoon configuration.

(i) Shape. Rectangular cells shall have a maximum length to width ratio of 5:1. No sharp corners nor dead-end coves are permitted.

(ii) Water depth. Facultative ponds shall be designed to have water depths of not less than two feet, nor more than six feet (0.61 m to 1.8 m). Aerated lagoons shall be designed to have water depths of not less than four feet nor more than 15 feet (1.2 m to 4.6 m).

(iii) Removal of lagoon cells from operation. Bypass piping for primary lagoon cells and aerated lagoon cells shall be provided.

(iv) Lagoon freeboard. A minimum freeboard of two feet (0.6 m) shall be provided. Greater freeboard shall be provided for wave runup, where required.

(d) Construction requirements.

(i) Dike.

(A) Material. Dikes and embankments shall be of relatively impervious and stable material, and compacted to at least 95 percent of maximum density (ASTM D698-78). Embankment fill shall be free from organic material, rock larger than six inches (15.2 cm) and construction debris. The area where the embankment is to be constructed shall be stripped of vegetation and roots.

(B) Top width. Dikes and embankments shall be constructed with minimum top width of eight feet (2.4 m).

(C) Slopes. Interior slopes shall be from three to four horizontal to one vertical, and shall be stable under varying water level conditions. Interior slopes that are surfaced with concrete paving or riprap may be constructed at slopes of two or more horizontal to one vertical. Exterior slopes shall be three or more horizontal to one vertical and shall prevent the entrance of surface water to the lagoon.

(ii) Seeding. Exterior slopes and interior slopes that are not riprapped shall be seeded with dryland grasses, unless another equivalent method for soil erosion control is provided.

(iii) Erosion control. Interior embankments except cells smaller than one acre shall be protected from wave action with riprap, paving, or other erosion resistant material, unless it is demonstrated that the ponds are sheltered from wind or where wind velocity is low and erosion will not occur.

(e) Lagoon sealing.

(i) Lagoon sealing. The seepage through the pond bottom and side walls shall not cause a violation of the groundwater standards as described in Chapter VIII (Quality Standards for Wyoming Groundwaters) of the Wyoming Department of Environmental Quality, Water Quality Rules and Regulations. Liners shall be required if the wastewater characteristics or site conditions will not insure the protection of the groundwater for which it is classified.

If the applicant cannot document that the facility poses no threat to groundwater and elects not to perform a subsurface study in accordance with Chapter III, Section 15 (a) and (b), then the groundwater shall be protected from contamination by the wastewater with a liner equivalent to three feet (1 m) of soil having a permeability of 10-7cm/sec or less. When an applicant performs a subsurface study, the requirements for the liner shall be determined based on the results of the study and the groundwater protection required. In no instance shall the maximum seepage rate exceed 1/8 inch per day (3.2 mm/day) in the primary pond(s).

Following construction of the lagoons, but prior to startup, a testing program shall be conducted to demonstrate the effectiveness of the sealing program. Should the testing program show the lagoon seal to be less effective than the above requirements, the seal shall be modified and retested until it succeeds.

(ii) Synthetic liners.

(A) Material. Synthetic liners shall be essentially impervious. The minimum lining thickness shall be 30 mils. The liner material shall be resistant to organic materials typical of sewage. The liner shall be resistant to sunlight or shall be covered with 12 inches (30.5 cm) or more of soil at all locations including the lagoon bottom and side slopes.

(B) Liner stabilization. Where the seasonal high groundwater is above the bottom of the lagoon, the liner shall be stabilized to prevent it from rising.

(C) Appurtenances. A leak detection system and/or air release mechanism may be required.

(f) Aerated systems.

(i) Air requirements. Aerated ponds shall be designed to maintain 2 mg/L of dissolved oxygen or more throughout the pond contents.

(ii) Equipment requirements.

(A) Number. Surface aerators shall be provided at intervals of 200 feet (61 m) or less. The lagoon shall be protected from erosion from the aeration equipment. At least two surface aerators or brush aerators shall be provided. With the largest unit out, the remaining units shall be capable of transferring the average day oxygen demand. Each diffused aeration system shall be provided with at least two blowers. With the largest blower out of service, the remainder shall be capable of supplying the design air flow rate.

(B) Removal. All equipment shall be accessible and removable from the edge of the lagoons. Provisions for dewatering shall be made for removal or repair of diffusers.

Section 19. Tertiary treatment systems.

(a) Phosphorus removal.

(i) Equipment requirements.

(A) Flashmixing.Chemicaladditionpointsshallbe at points of high turbulence, such as Parshall flumes, hydraulic jumps, or separate mixing basins.

(B) Flocculation. Inlet and outlet design shall preventshortcircuitingand turbulent destruction of floc. Minimum detention time shall be 20 minutes at the average design flow rate.

The velocity of flocculated water to settling basins shall be 0.5 to 1.5 fps (0.15 to 0.46 mps). Changes in direction shall be with long radius elbows or curved channels.

(C) Chemical feed equipment. Storage shall be provided for at least 14 days of chemical supply. Liquid chemical storage tanks shall have a liquid level indicator, an overflow, and a receiving basin capable of holding 110 percent of the stored volume, or a drain capable of receiving accidental spills or overflows. Liquid chemical storage shall be provided with heat.

(b) Ammonia nitrogen reduction.

(i) Activated sludge. Ammonia nitrogen removal by activated sludge processes shall be designed with sludge retention time of at least 15 days and shall provide at least 16 hours of hydraulic detention time. Aeration requirements are described in Section 15.

(ii) Attached growth. Rock media trickling filters shall not be used for ammonia reduction. Fabricated media trickling filters used for ammonia shall be designed using a BOD loading of less than 14 lb/1000 cu ft (224 kg/1,000 m3) of media. Rotating biological contactors used for ammonia reduction shall be designed with hydraulic loadings less than 1.0 gpd/sq ft (40.7 L/m²/d) of media surface area. At least four stages shall be provided for ammonia nitrogen removal.

(iii) Lagoons. The design of facultative lagoons for ammonia removal shall provide a minimum detention of 180 days. Aerated lagoon systems may be designed for 160 days.

(c) Solids reduction.

(i) Filtration.

(A) Filtration rate. The maximum hydraulic loading for 24 inch (61 cm) or deeper media is 5 gpm/sq ft (292.5 $m^3/m^2/d$) of filter area. Filtration rates for shallower media shall be limited to 3gpm/sq ft (175 m3/m²d).

(B) Backwash requirements. Provide a minimum backwash rate of 20 gpm per square foot (1170 $m^3/m^2/d$) of filter bed for 24 inch (61 cm) or deeper media and 12 gpm/square foot (702 $m^3/m^2/d$) for shallower media; supply shall be filtered water. A rate of flow regulator on the main backwash line shall be provided. The total backwash water storage capacity shall be adequate for 20 minutes of continuous backwash.

Air scour or surface wash facilities are required. All surface wash devices shall be provided with a minimum flow rate of 0.5 gpm per sq ft (29.3 m^3/m^2d) water pressures of 50 psi (3.52 kg/cm²) or greater and use filtered water.

(C) Backwash waste handling and treatment. Waste filter backwash shall be collected in a surge tank and recycled to the treatment plant at a rate not to exceed ten percent of the average plant design flow rate. Waste backwash water may be returned to any point upstream of the biological treatment units.

(D) Number of units. At least two units shall be provided. With one filter out of service, the remaining filters shall be capable of passing the maximum day design flow rate.

(E) Controls. Controlsshouldbeprovidedtoremove a filter from service, backwash the filter, and return it to service. Where the control is automatic, there shall also be a means of manually overriding the operating equipment, including each valve essential to filter operation.

In addition, the following shall be provided:

(I) Sampling tap on filter influent and effluent.

(II) Indicating and recording loss of head gauge.

(III) Flow rate indicating and control.

(IV) Means for feeding polymer as a filter aid at a controlled rate to filter influent water when chemically coagulated effluent is being filtered.

(ii) Microscreens.

(A) Pilot testing. Pilot plant testing on the fluid to be screened or data from other similar applications to demonstrate the suitability of the proposed filter fabric, fabric life, proposed loading rates, and other design criteria shall be provided

(B) Loading rates. Flow equalization facilities shall be included in the design to moderate influent quality and flow variations.

The screening rate shall be selected to be compatible with available pilot plant test results and selected screen aperture, but shall not exceed 1.5 gpm/sq ft (87.8 $m^3/m^2/d$) for lagoon effluent or 5 gpm/sq ft (292.5 $m^3/m^2/d$) for activated sludge or attached growth effluents based on the maximum hydraulic flow rate applied to the units. The screening rate shall not exceed 0.75 lb/sq ft/day (3.7 kg/ m^2/day). The effective screen area shall be considered the submerged screen surface area less the area of screen blocked by structural supports and fasteners.

(C) Backwash requirements. The backwash water shall be at least eight gpm/ linear foot (9 Lpm/m) of screen length at 60 psi (4.2 kg/cm), obtained from microscreened effluent.

(D) Controls. Each microscreen unit shall be provided with automatic drum speed controls with provisions for manual override.

(d) Rapid infiltration.

(i) Waste water preapplication requirements. Rapid infiltration shall be preceded by settling or fine screening having 0.6 inch (1.5 mm) or smaller openings.

(ii) Hydraulic loading rates.

(A) Permeability. Hydraulic capacity of the rapid infiltration site shall be based upon soil permeability, basin infiltration tests, or cylinder infiltrometer tests. Design loading rates based on these tests shall be as follows:

Field Measurement	Annual Loading Rate
Basin infiltration test	10% of minimum measure rate
Cylinder infiltrometer	2% of minimum measured rate
Permeability	5% of conductivity of most restricting soil layer

(B) Precipitation. The total hydraulic load to the rapid infiltration basins includes precipitation. The one in ten year precipitation event should be used as the basis for design.

(C) Cold weather conditions. The design must recognize that drying rates, oxidation rates, nitrification and denitrification rates all decrease in cold weather. Cold weather loading rates shall be used to determined land requirements or cold weather storage shall be used. Provisions should be made to mow and disc basin surfaces in the fall to prevent ice from freezing the vegetation near the soil surface. Snow fences can be used to keep snow cover on the rapid infiltration basins to insulate the applied wastewater and soil.

(iii) Land requirements.

(A) Storage. A minimum of 14 days of storage shall be provided. Where applied sewage will be less than 4° C, 160 days of effluent storage shall be provided.

(B) Location. Rapid infiltration basins shall be located more than 500 feet (152 m) from existing habitation.

(iv) Basic size. Individual basin size shall not be greater than five acres (2.0 ha). Basin sizing should be based upon a maximum water depth of 12 inches (30.5 cm) in the rapid infiltration basins.

(v) Subsurface drainage. The capillary fringe above the groundwater mound shall not be closer than two feet (0.6 m) to the bottom of the infiltration basin. The distance to groundwater shall be at least five feet (1.5 m) below the soil surface within two days following wastewater application.

(vi) Groundwater monitoring. Refer to Chapter III, Section 15 of the regulations.

(e) Intermittent sand filters.

(i) Wastewater preapplications treatment requirements. Intermittent sand filters shall be preceded by settling or fine screens having 0.06 inch (1.5 mm) or smaller openings.

(ii) Hydraulic loading rates. The maximum application rates shall be limited to:

Maximum Application Rate

Source	gallons/acre/day	(m^3/ha/d)
Primary Effluent	130,000	(200)
Secondary Effluent	400,000	(611)
Lagoon Effluent	300,000	(458)

(iii) Media. The minimum sand depth shall be 24 inches (0.6 m). The sand must be free of cementing materials and clay or loam. The sand should have an effective size of not less than 0.2 mm and not greater than 0.5 mm, and a uniformity coefficient of less than 5.

Clean graded gravel shall be placed around the under drains and to a depth of at least 12 inches (0.3 m) over the top of the underdrains.

(iv) Underdrains. All intermittent sand filters shall be provided with underdrains. Underdrains shall be at least four inches (10.2 cm) in diameter. The under-drain pipe shall have a minimum slope of 5 feet per 1,000 feet (5 m/1,000 m).

The groundwater shall be at least two feet (0.6 m) below the bottom of the underdrain pipe.

(v) Number of units. Three or more filters shall be provided.

(vi) Dosing.

(A) In each dosage of an intermittent filter, the hydraulic capacity shall permit covering the bed to a depth of two inches (5 cm), within 20 minutes or less.

Section 20. Sludge Handling, Treatment and Disposal.

(a) Pumping.

(i) Design requirements. Sludge pumps shall be provided with a positive suction pressure at the pump impeller, rotor or plunger at dynamic conditions. Discharge pressure shall include static pressure difference and system friction losses based on the higher viscosity of the sludge than water.

(ii) Piping and valves.

(A) Minimum size. Sludge piping and valves shall at least four inches (10.2 cm) in diameter for pressure piping and six inches (15.2 cm) in diameter for gravity pipe. Pump suction and discharge shall not be less than three inches (6.6 cm) in diameter.

(B) Minimum velocity. For sludge pipes larger than four inches (10.2 cm) in diameter, the minimum velocity shall be one fps (0.3 m/sec).

(b) Thickening.

(i) Types.

(A) Gravity. Gravity thickening shall only be used for primary sludge, digested primary sludge, lime sludge, or combinations of lime sludge, trickling filter humus and primary sludge.

(B) Dissolved air flotation. Dissolved air flotation shall only be used for combination of primary and biological sludges, waste biological sludges, and aluminum and iron salt sludges.

(ii) Design parameters.

(A) Influent solids concentration. The design for influent solids concentrations to gravity or flotation thickeners shall be 5,000 mg/L or less, except tertiary lime sludge.

(B) Operating schedule. Sludge thickening facilities shall have the capacity to treat the maximum amount of solids produced. Where intermittent operation is provided, sludge holding tanks ahead of and after the thickening process shall be provided.

(C) Solids loading. Solids loadings (solids applied to the thickener) on thickening devices shall be limited to the following maximum values.

Solids Loading

	lb/sq ft/day		$kg/m^2/d$	
Sludge Type	Gravity	Dissolved Air Flotation	Gravity	Dissolved Air Flotation
Primary	24	NA	117.2	
Digested primary	20	NA	97.6	
Waste activated,	NA	12		58.6
without polymer				
with polymer		48		234.3
Anaerobically				
digested primary and activated	NA	NA		
Primary and lime	20	NA	97.6	
Tertiary lime	60	NA	292.9	
Alum	NA	12		58.6

(D) Hydraulic loading. Gravity thickeners shall be designed for 400-800 gpd/ sq ft (16.3 $m^3/m^2/d$ to 32.5 $m^3/m^2/d$) of surface area.

(iii) Number of units. Unless sludge storage capacity for three days is provided, there shall be at least two units of equal capacity provided for sludge thickening.

(iv) Controls. Controls for gravity and flotation sludge thickening operations shall include provision for influent flow rate control. Centrifuge thickening shall include adjustable manual controls for differential scroll speed, pool depth, and influent flow rate. Where chemical conditioning is required, chemical dosage rate shall have adjustable manual controls.

(v) Side stream waste characteristics. The flow, organic load, and solids load in the thickener return flow to the plant shall be included in the plant design loadings.

(vi) Odor control. Provisions shall be made for the continuous chlorination of gravity thickener influent. Any thickening installation for anaerobically digested sludge shall make provisions for enclosing zones where the sludge or decant is exposed to atmosphere, exhausting the zone at an adequate rate to prevent escape of gas, and treating the exhaust air for removal of odor causing agents.

(c) Aerobic digestion.

(i) Solids retention time. Solids shall be retained in the aerobic digester for 30 days for primary sludge and 20 days for waste sludge from conventional activated sludge systems. Waste activated sludge from extended aeration systems shall be retained for a minimum of 10 days.

(ii) Mixing and aeration requirements. Aeration requirements shall include the oxygen requirements for BOD stabilization, nitrification of ammonia nitrogen in the sludge, and nitrification of organic nitrogen in raw sewage solids and biological solids. A minimum dissolved oxygen of 2 mg/l shall be maintained. Minimum aeration requirements shall be:

Sludge	**CFM/1,000 lb solids/day**	**m^3/min/1,000 kg/d**
Extended Aeration	300	18.7
Conventional Activated Sludge	800	50.0
Primary Sludge	2,100	131.0

The aerobic digester aeration shall be provided with nonclog diffused aeration. Mechanical surface aerators shall not be allowed. Aeration provisions shall be a minimum of 30 cfm/1,000 cu ft (30 m3/min/1,000 m3) of volume.

(iii) Number of digesters. Where aerobic digesters are used, two or more shall be provided for treatment plants having an average design capacity of 100,000 gpd or more. Multiple aerobic digesters shall be arranged to permit either parallel or series operation.

(iv) Supernatant removal and disposal. Supernatant shall be returned prior to the influent of the biological treatment process.

(d) Anaerobic digestion.

(i) Sludge.characteristics. The minimum sludge concentration for feed to anaerobic digesters is four percent.

(ii) Number of digesters. Two or more digesters shall be provided for treatment plants having an average design capacity of 100,000 gpd (378.4 m^3/d) or more.

(iii) Design requirements.

(A) Temperature. Primary anaerobic digesters shall be heated to provide a minimum temperature of 95°F (35°C). Controls shall maintain the digester temperature within ±5°F (±2° C).

(B) Mixing equipment. Digester mixing shall, as a minimum, provide control of scum accumulation at the gas/liquid interface. Mixing that is designed for increasing the effectiveness of the digester and thereby reducing detention time shall mix the entire tank contents. Mixing devices and their application rate that will be considered to provide high rate digestion are:

Volume	**Per 1,000 cf**	**Per 1,000 m^3**
Slow speed turbine mixers	0.25 hp	6.7 kw
Draft tube mechanical mixers	0.40 hp	14.1 kw
External pumps and jet nozzles	500 gpm	66.7 m^3/m
Gas mixing applied at bottom of digester	10 cfm	10 m^3/m

Less mixing may be provided; however, longer solids retention times than described below shall be required.

(C) Solids retention time. The minimum solids retention time for heated, primary digesters are:

Unmixed	Completely mixed
30 days	10 days

Solids retention time shall be the same as liquid retention time in the primary digester where waste activated sludge is anaerobically digested.

(D) Volatile solids loading. As an alternative design basis to solids retention time, heated primary digesters may be designed for the following maximum volatile solids loading:

Unmixed
0.1 lb/ft^3/day (1.6 kg/m^3/d)

Completely mixed
0.3 lb ft^3/day (4.8 kg/m^3/d)

(iv) Sludge piping.

(A) Inlet. Except in completely mixed digesters, multiple inlets shall be provided. The piping shall provide the opportunity to heat undigested sludge prior to entering the digester.

(B) Sludge withdrawal. Except in completely mixed digesters, multiple withdrawal pipes shall be provided. One or more withdrawal pipes shall be from the digester floor.

(C) Supernatant withdrawal. The design basis for facilities using digesters for waste activated sludge shall assume no supernatant withdrawal. Piping for supernatant withdrawal may be provided. A minimum of three supernatant withdrawal levels shall be provided otherwise.

(v) Gas system. All portions of the gas system, including the space above the tank liquor, storage facilities, and piping shall be designed to be under greater than atmospheric pressure at all times.

(A) Piping. Gas piping shall be 2.5 inches (6.4 cm) diameter or greater. Piping from the digester shall be provided with a flame trap. Piping shall slope to condensate traps. Float controlled condensate traps are not permitted.

(B) Safety equipment. All necessary safety equipment shall be included. Pressure and vacuum relief valves, flame traps and other safety equipment shall be provided. Gas safety equipment and gas compressors shall be housed in a separate room with an exterior entrance.

(C) Metering. A gas meter with bypass shall be provided for measurement of total gas production.

(vi) Heating equipment. Sludge and digester contents shall be heated with an external heat exchanger. Where sludge is heated using digester gas, an auxiliary fuel supply shall be provided. Boilers using digester gas shall be designed to minimize corrosion and to facilitate burner replacement. All digester gas that is not beneficially used shall be incinerated in a waste gas burner.

(vii) Access. The roof of the digester and the top sidewall shall be provided with sealed access hatches.

(viii) Sampling. One and one-half inches (3.8 cm) or larger sampling ports shall be provided for inlet sludge, effluent sludge, supernatant and digester contents.

(ix) Supernatant disposal. Supernatant from secondary digesters or from subsequent thickening or dewatering facilities for digested sludge shall be treated independently or returned immediately preceding the biological process. Supernatant shall not be returned to the primary clarifier.

(e) Dewatering.

(i) Mechanical dewatering. Where provided, mechanical dewatering facilities shall include storage tanks for liquid sludge and shall provide for reliable use.

(ii) Drying beds.

(A) Gravity. Drying beds may be strictly evaporation or evaporation - percolation. Evaporation - percolation beds shall be provided with graded gravel and sand beds over perforated underdrain pipe. Evaporation beds shall be designed for the application of 1.5 feet (0.46 m) of sludge per year. Evaporation - percolation beds shall be designed for the application of four feet (1.2 m) of sludge per year. Storage of sludge in the beds or in separate basins shall provide 180 days of capacity. Percolate shall be returned to the plant ahead of the biological treatment process.

(B) Vacuum. The bed area for vacuum assisted open drying beds shall be based on the application of no more than 40 feet (12.2 m) of liquid per year. If the beds are housed, the bed area shall be based on the application of 80 feet (24.4 m) per year. Where beds are not housed, sludge storage shall be provided for 180 days of capacity. Polymer conditioning, chemical feed, chemical storage and facilities for mixing the polymer with the sludge shall be provided. Vacuum pumps, sump pumps, chemical feed equipment and motor control equipment shall be housed.

(iii) Filtrate disposal. Filtrate, centrate or underdrain liquid shall be returned to a point upstream of the biological treatment process. Centrate or filtrate shall not be returned upstream of the primary clarifier.

(f) Disposal.

(i) Degree of stabilization.

(A) Land application. Sludges shall be stabilized. Sludges that are to be used on public lands that are accessed by the public (parks, golf courses, cemeteries) or sludges that are to be made available to the public shall be composted or stabilized and stored for a period of at least one year. Sludges that are to be incorporated into the land shall be stabilized.

"Stabilized sludge" shall have reduced organic content and reduced pathogenic content. Stabilized sludge shall have less than 60 lb of BOD5 per 1,000 lb (60 kg/1,000 kg) of dry weight sludge solids.

(B) Landfill. Sludge processed for incorporation into a landfill shall be (1) a solid or semisolid material that will not release water upon standing, and (2) has been subjected to anaerobic or aerobic digestion, or chemically treated with lime to a pH of 12.0 or chemically treated with chlorine to a free chlorine residual. Waiver of this requirement must be obtained from the Solid Waste Management Section of the Department of Environmental Quality.

(ii) Storage. Sludge storage shall be provided in lined earthen lagoons or structural tanks. The lagoon lining shall be designed to protect the groundwater pursuant to the requirements of Chapter VIII of the Water Quality Divisions rules and regulations. Sludge storage volume shall be sufficiently large to provide for independent operation of the sludge dewatering or disposal facilities from preceding liquid or sludge processes.

Section 21. Disinfection.

(a) Chlorination/dechlorination.

(i) Chlorination. The disinfection capacity shall be sized to provide the coliform concentrations required by the discharge permit. Feeders shall be sized to provide the minimum dosage at the minimum flow rate and to the maximum dosage at the maximum flow rate.

(ii) Dechlorination. Dechlorination feeders shall be sized for the final effluent dechlorination dosage required by the discharge permit requirements.

(iii) Chlorination.

(A) Number of units. Feeders shall be able to supply, at all times, the necessary amounts of chemical at an accurate rate (±3%) throughout the range of feed. The number of units shall provide capacity for effluent disinfection with the largest unit out of service and a separate feeder or feeders for ancillary uses, such as prechlorination or intermediate process control chlorination. The number of feeders shall be selected to permit feeding chemicals over the range of required dosage while only varying a single feeder over a 10:1 range.

(B) Chemical storage. Chlorine shall be stored in a heated, ventilated space. Space shall provide at least 30 days of chemical supply, convenient and efficient handling, and dry conditions. Cylinders or other containers of chlorine gas should be isolated from operating areas and restrained in position to prevent upset.

(C) Piping. Piping systems carrying gaseous or liquid chlorine shall be schedule 80 black steel pipe with forged steel fittings. Bushings shall not be used. Vacuum piping for gaseous chlorine may be polyethylene tubing.

Gas piping between the chlorine pressure reducing valve of the chlorinator and the ejector shall be PVC or polyethylene. Piping for aqueous solutions of chlorine beyond the ejector shall be PVC, fiberglass, or steel pipe lined with PVC or saran.

(D) Maximum withdrawal. The maximum withdrawal rate of gaseous chlorine shall be limited to 40 lbs/day (18.1 kg/day) for 100 or 150 lb (45.4 or 68.0 kg) cylinders and 400 lbs/day (181 kg/day) for 2,000 lb (907 kg) cylinders, unless chlorine evaporators are used.

(iv) Dechlorination.

(A) Number of units. Dechlorination equipment shall be provided to permit feeding the design dosage with the largest unit out of service. Feeders shall be sized for a 10:1 feed range.

(B) Chemical storage. Chemical storage shall be in a heated, ventilated room, separate from chlorine cylinder storage. Provisions for heating the storage area or the S0 cylinders shall be provided. Where used, bin storage shall be provided with desiccated vents.

(C) Piping. Piping for liquid or gaseous S0 shall be schedule 80 black steel pipe with forged steel fittings. Bushings shall not be used. Piping for aqueous solutions of dechlorination chemicals shall be PVC, fiber glass, or steel pipe lined with PVC or saran. All valves for liquid and gaseous sulfur dioxide shall be as approved by the Chlorine Institute. Valves for aqueous solution of dechlorination chemicals shall be PVC or saran lined.

(D) Maximum withdrawal.

(I) The maximum withdrawal rate for sulfur dioxide from 2,000 lb (907 kg) cylinders shall be 200 lb (90.7 kg) per day, unless sulfur dioxide evaporators are used.

(v) Makeup water. Water used for dissolving dry chemicals, diluting liquid chemicals or operating chlorine or S0 injectors shall be chlorinated and strained for filtered (65 mesh) final effluent or potable water. Where potable water is used, backflow prevention shall be achieved by (a) a 6 inch (15.2 cm) air gap between the potable water supply pipe and the maximum water level of a receiving tank; or (b) an approved reduced pressure zone backflow preventer.

(vi) Mixing requirements. The feed point for chlorination or dechlorination chemical shall be at a location of high turbulence. At points of critical flow, specially designed static tube mixers or artificial mixing are required.

(vii) Contact basins.

(A) Detention time. The chlorine contact period shall provide a minimum of 15 minutes contact time at the peak hour design flow. The contact period shall be from the point of chemical injection into the flow to the outfall point or dechlorination feed point.

(B) Baffling. Baffling of the chlorine contact basin shall provide a length-to-width ratio of 5:1 or greater.

(viii) Controls. The minimum control for chlorination - dechlorination facilities shall include manual variation of feed rate and a portable chlorine residual monitor.

(b) Ozonation.

(i) Applied dosage rates. Ozonation system for disinfection shall provide a range of chemical feed as follows:

Secondary effluents	5-15 mg/L
Advanced treatment effluents	5-10 mg/L

(ii) Piping. Injection equipment and piping in contact with ozonated air and air water emulsions shall be of stainless steel, Teflon or other material resistant to ozone. Valves carrying ozonized air shall be made of metal coated with ozone-resistant materials.

(iii) Mixing requirements. Ozone shall be fed to a contact tank along the length of the tank. The ozone contact tank shall be at least 15 feet (4.6 m) deep and provided with vertical serpentine baffles. Fine bubble diffusers shall be used in areas where the flow is downward.

(iv) Detention time. The minimum contact time for ozone is 15 minutes at peak hourly flow. Ozone contact basins shall be covered and provided with means to collect and destroy unreacted ozone. The contact basin shall be designed to facilitate maintenance and cleaning without reducing the effectiveness of the ozonation process.

(c) Housing.

(i) Access. Where housing is specially designed for equipment, structures, rooms and areas containing chemical feed equipment used in disinfection, convenient access should be provided. Access to chemical feed rooms shall only be from the outside. Doors shall be provided with panic hardware, and open from the inside to the outside.

(ii) Heating and ventilation. Chemical feed rooms and chemical storage rooms shall be heated and ventilated. Ventilation shall exhaust continuously from near the floor to an outside area that will not contaminate an air inlet to any building. The exhaust shall be screened and turned downward. Continuous ventilation shall provide a complete air change six times per hour. Emergency exhaust ventilation shall provide a complete room air change 30 times per hour. The control for the emergency ventilation fan shall be on the outside of the room.

(iii) Visual inspection. A clear glass, gas-tight window shall be installed in an exterior door or interior wall of the disinfection chemical feed room.

(iv) Isolation. Chemical feed and storage rooms shall be gas-tight. Ventilation, plumbing and access shall be separated from other building parts. When ton cylinders are used for chlorine or sulfur dioxide storage, storage and feed rooms will be separate. Where powdered or granular chemicals are used, they will be stored in separate rooms from the feed room. Switches for fans and lights shall be outside the room at the entrance. Vents from feeders and storage shall discharge to the outside atmosphere above grade. Pipes and feed lines through interior walls shall be gas-tight.

(d) Safety.

(i) Leak detectors. A bottle of ammonium hydroxide shall be available for chlorine leak detection. For plants that store 1,000 lbs (454 kg) or more of chlorine, continuously monitoring leak detectors shall be provided that sound an alarm in the event of an escape of gas.

(ii) Repair kits. Repair kits approved by the Chlorine Institute shall be provided for plants using ton containers or tank cars.

(iii) Personnel equipment. Protective clothing, rubber gloves, and U.S. Bureau of Mines approved industrial canister gas masks shall be provided for each operator who will handle or prepare chemical solutions/mixtures. A respiratory protection program shall be available for all employees.

(iv) Emergency breathing apparatus. Industrial size canister gas masks of the type designed for chlorine gas and approved by U.S. Bureau of Mines shall be available at all installations where chlorine gas is handled. Pressure-demand, self-contained breathing apparatus shall be provided for repairing leaks to chlorine systems. A respiratory protection program shall be available for all employees.

(v) Instruction manuals. Instruction manuals for all elements of the disinfectant storage, preparation and application system shall be provided. These instruction manuals shall describe each component of the system, and provide a complete discussion of the operation and maintenance requirements.

Section 22. Effluent Structures.

(a) Location. The location of the effluent discharge shall be at least three miles from public water supply intakes.

(b) Protection from hazards. The outfall sewer shall be constructed and protected against the effects of floodwater, ice, debris, or other hazards as to insure its structural stability and freedom from stoppage. A manhole should be provided at the shore- end of all gravity sewers extending into the receiving waters.

Section 23. Laboratory requirements.

(a) Test procedures. Test procedures for analysis of monitoring samples shall conform to regulations published pursuant to Section 304(g) of the Federal Water Pollution Control Act (33 U.S.C. 466 et. seq.).

(b) Testing requirements. All treatment plants shall have capability to perform or contract for the self-monitoring analytical work required by discharge permits or ground water monitoring requirements. All plants shall in addition be capable of performing or contract out the analytical work required to assure good management and control of plant operation and performance. Plants operating under requirements of an industrial pretreatment program must have the capability of performing or must contract out the necessary testing to maintain the program as approved by the reviewing agency.

(c) Minimum requirements.

(i) Location and space. The laboratory shall be located away from vibrating machinery or equipment which might have adverse effects on the performance of laboratory instruments or the analyst and shall be designed to prevent adverse effects from vibration.

A minimum of 400 square feet (37.2 m^2) of floor space shall be provided for the laboratory where an analysis program for a fulltime laboratory chemist is proposed. If more than two persons will be working in the laboratory, 100 square feet (9.3 m^2) of additional space shall be provided for each additional person.

(ii) Materials.

(A) Walls. Provide a durable, impervious surface that is easily cleaned.

(B) Doors. Two exit doors or openings shall be located to permit a straight egress from the laboratory; one exit shall be directly to outside of the building. Panic hardware shall be used. Interior doors shall have glass windows.

(C) Cabinets and bench tops. Cabinet and storage space shall be provided for dust-free storage of instruments and glassware.

Bench top height shall be 36 inches (0.91 m). Tops should be field joined into a continuous surface with acid, alkali, and solvent-resistant cements.

(D) Hoods. Fume hoods shall be provided where reflux or heating of toxic or hazardous materials is required.

(I) Fume hoods.

(1.) Location. A hood shall not be situated near a doorway, unless a secondary means of egress is provided.

(2.) Fixtures. All switches, electrical outlets, and utility and baffle adjustment handles shall be located outside the hood. Light fixtures shall be explosion proof.

(3.) Exhaust. Twenty-four hour continuous exhaust capability shall be provided. Exhaust fans shall be explosion proof.

(v) Sinks. The laboratory shall have a minimum of two sinks per 400 ft (37.2 m) (not including cup sinks). Sinks shall be double-well with drainboards and shall be made of epoxy resin or plastic. All water fixtures shall be provided with reduced pressure zone backflow preventers. Traps constructed of glass, plastic, or lead and accessibility for cleaning shall be provided.

(vi) Ventilation and lighting. Laboratories shall be separately air conditioned, with external air supply for 100 percent makeup volume. Separate exhaust ventilation shall be provided. Ventilation outlet locations shall be remote from ventilation inlets. Lighting shall provide 100 foot-candles at the bench top.

(vii) Gas and vacuum. If gas is required in the laboratory, natural gas shall be supplied. Digester gas shall not be used.

(viii) Water still. Distilled water shall conform to the Standard Methods for the Examination of Water and Wastewater, 15th Edition.

(ix) Emergency shower and eye wash. All laboratories shall be equipped with an emergency eye wash and shower.

(d) Portable testing equipment. Portable testing equipment shall be provided where necessary for operational control testing or industrial waste testing. Portable testing may be used for testing as necessary, provided the testing procedure meets the requirements of Section 304(g) of the Federal Water Pollution Control Act, if the results are to be used for permit reporting. Non-EPA certified procedures may be used for operational control or gross data generation.

Section 24. Operation and Maintenance Manuals.

(a) Where required. Plant operation and maintenance manuals are required for each new or modified treatment or pumping facility. The manuals shall provide the following information as a minimum:

(i) Introduction.

(ii) Description of facilities and unit processes through the plant from influent structures through effluent structures.

(iii) Plant control system.

(iv) Utilities and systems.

(v) Emergency operation and response.

(vi) Permit requirements and other regulatory requirements.

(vii) Staffing needs.

(viii) Index to manufacturer's manuals.

(b) When required. Draft operation and maintenance manuals shall be submitted to the Department of Environmental Quality at 50 percent completion of construction. Approval of the final operation and maintenance manuals is required prior to plant startup.

(c) Descriptionandfacilities. The description of facilities and unit processes shall include the size, capacity, model number (where applicable) and intended loading rate.

(i) Each unit. The manual shall describe each unit, including the function, the controls, the lubrication and maintenance schedule, as well as the following:

(A) Startup operations.

(B) Routine operations.

(C) Abnormal operations.

(D) Emergency or power outage operations.

(E) Bypass procedures.

(F) Safety.

(ii) Flow diagrams. The manual shall provide flow diagrams of the entire process, as well as individual unit processes. The flow diagrams shall show the flow options under the various operational conditions listed above.

(d) Operating parameters. The O&M manual shall provide the design criteria for each unit process. The data shall include the number, type, capacity, sizes, etc., and other information, as applicable.

(e) Troubleshooting guide. Each equipment maintenance manual shall include a section on troubleshooting. These manuals are to be indexed in the plant O&M manual. The troubleshooting guide shall include a telephone number for factory troubleshooting assistance.

(f) Emergency procedures. The plant O&M manual shall detail emergency operations procedures for possible foresee able emergencies, including power outage, equipment failure, development of unsafe conditions, oil and hazardous substances discharge into the plant, and other emergency conditions. The details shall include valve positions, flow control settings, and other information to insure continued operation of the facility at maximum possible efficiency.

The manual shall also detail emergency notification procedures to be followed to protect health and safety under various emergency conditions.

(g) Safety. The manual shall provide general information of safety in and around the plant and its components. Each unit process discussion shall include applicable safety procedures and precautions. For unit processes or operations having extreme hazards (i.e., chlorine, closed tanks, etc.) the discussion shall detail appropriate protection, rescue procedures, and necessary safety equipment.

(h) Compliance submittals. The O&M manual shall summarize the monitoring and the reporting requirements of the discharge permit. These requirements will be modified from time-to-time, and should, therefore, be placed in an appendix to the O&M manual.

(i) Maintenance manuals. Maintenance manuals shall be required for each piece of equipment. These manuals must meet the requirements of the engineer and contractor for installation and startup of equipment. The information included in the manufacturers' manuals shall not be included in the O&M manual.

(i) General content of manuals.

(A) Neatly typewritten table of contents for each volume, arranged in a systematic order.

(B) Product data.

(C) Drawings.

(D) Written text as required to supplement product data for the particular installation.

(E) Copy of each warranty, bond and service contract issued.

(ii) Manuals for equipment and systems.

(A) Description of unit and component parts.

(B) Operating procedures.

(C) Maintenance procedures and schedules.

(D) Service and lubrication schedule.

(E) Sequence of control operation.

(F) Parts list.

(G) Recommended spare parts.

PART C

COMMERCIAL/INDUSTRIAL WASTE AND WASTEWATER FACILITIES

Section 25. General. This part contains the minimum standards for the design and construction of commercial/ industrial wastewater facilities. The applicant shall demonstrate to the administrator that any discharge or seepage from the wastewater facility will not cause a violation of the surface and/ or groundwaters of the state in accordance with Chapter I, "Quality Standards for Wyoming Surface Waters" and Chapter VIII, "Quality Standards for Wyoming Groundwaters." Due to the wide variety of wastes, wastewater and site conditions, the latest available scientific information shall be used to demonstrate that violations will not occur.

Section 26. Discharge to Public Sewerage System. The discharge of commercial/industrial wastewater to a public sewerage system shall be allowed provided a letter of verification from the public sewerage system manager is submitted to the Department of Environmental Quality stating that the municipal system is capable of handling the added organic and/or hydraulic loads. The applicant shall demonstrate (1) that the wastewater will not adversely impact the treatment works and/or discharge or (2) that pretreatment of the wastewater shall be provided to eliminate the adverse impacts. The design and construction of any pretreatment device shall reduce the pollutants to the limits imposed by the public sewerage system manager.

Section 27. Domestic Wastes from Commercial/Industrial Facilities. Commercial/industrial facilities which generate waste that is entirely domestic waste shall be designed in compliance with Chapter 25 or Part B or ~~Part D~~ of Chapter XI. When the commercial/industrial facility generates a combined domestic and commercial/industrial waste, the facility may be designed in compliance with Chapter 25 or Part B ~~or Part D~~ of this chapter provided the applicant can demonstrate that the commercial/ industrial waste will not interfere or adversely impact the treatment works or the discharge.

Section 28. Biological Treatment Ponds. This section includes the standards for ponds that accept commercial/ industrial waste and wastewater that is primarily organic and utilizes biological organisms for treatment and do not meet the requirements of Section 27. The presence of toxic wastes, hazardous substances, and/or petroleum products shall not interfere or adversely impact the treatment process or disposal system.

(a) Location.

(i) Extraneous surface water and groundwater shall be excluded from entering the wastewater pond or entering the wastewater flow into the pond.

(ii) Ponds shall not be located within the ordinary high water mark of perennial rivers, streams, or creeks; nor in the bottoms of rivers, streams, creeks, draws, coulees, or other natural drainages into which natural runoff may flow and/or enter.

(iii) Ponds shall be protected from structural damage during the 100-year flood event.

(b) Basis of design.

(i) Aerobic, facultative, and anaerobic ponds shall be designed based on the type, strength characteristics, and anticipated flow rates of the wastewater. Loading rates shall be determined on a case-by-case basis using the best available technology, reference, and/or pilot studies. The affect of any toxic wastes, hazardous substances, and/or petroleum products on the wastewater treatment works and disposal system shall be evaluated. All anaerobic ponds shall be followed by an aerobic process if the system discharges to surface waters of the state.

When seepage is considered part of the design, the potential effect of groundwater mounding on the seepage rate shall be evaluated.

(ii) In addition to the above, all nonsurface water discharging ponds shall be designed on the basis of a water balance that considers net evaporation and seepage. They shall be designed to provide sufficient storage for retention of all wastewater and rainfall during the wettest occurring year of a ten-year period. Seepage shall be controlled to maintain a minimum water depth of two feet in the primary cell during the driest occurring year of a ten-year period.

(c) Pond layout.

(i) Discharging treatment systems and ponds that require liners to protect groundwater shall consist of a minimum of two cells. The largest cell shall not contain more than 55 percent of the total waste volume at the design capacity.

(ii) Inlet structures shall be submerged and located to properly distribute the wastewater flow throughout the pond(s) and shall prevent short circuiting. Influent wastewater shall not erode or disturb the liner, seal, or dike. Submerged multiple inlets are recommended. The pipe shall discharge at least ten feet from the toe of the slope.

(iii) Outlet structures from discharging treatment systems shall be capable of multilevel drawoff and have an overflow device. Outlet structures shall prevent short circuiting, prevent floating debris from discharging, and keep outlet velocities at a minimum so as not to erode or disturb the receiving channel. Erosion control material shall be designed based on flow velocities and quantities. Ice formation shall neither stop the overflow nor damage the outlet structure.

(iv) All pipe protruding through a dike or embankment shall have adequate seepage controls. Capabilities shall exist to drain the ponds for maintenance purposes. By-pass piping for each individual pond cell shall be provided.

(v) A manhole or vented cleanout wye shall be installed prior to the entrance of the influent pipe into the primary pond(s) and shall be located as close to the dike as topography permits. The influent pipe invert should be at least six inches above the maximum operating level of the pond.

(vi) The maximum water depth shall be six feet in the primary cell(s) of non-aerated aerobic or facultative systems. The maximum water depth shall be 15 feet in aerated cells. The maximum water depth for subsequent cells or other types of ponds shall be determined on a case-by-case basis.

The minimum water depth shall be three feet in the primary cell(s) and two feet in subsequent cell(s). Cells designed for high-rate infiltration may be allowed to be dry periodically provided that the applicant can demonstrate that vegetation will be controlled and a regular maintenance program is provided.

(vii) Free board shall be provided to protect embankments and dikes from overtopping from wave action, and shall be a minimum of three feet above the high water level. For ponds less than two acres, two feet of freeboard may be acceptable.

(d) Pond construction.

(i) Soils used in constructing the pond bottom and dike cores (not including the liner) shall be relatively incompressible, have a low permeability, and be free from organic material or trash. The soil shall be compacted at a water content that will insure structural stability, minimize hydraulic seepage, and minimize settling. The soil shall provide an adequate foundation for the liner, if used.

(ii) On ponds that are not specified to receive an artificial liner, no rocks larger than six inches in length shall be permitted in any of the designated embankment.

On ponds that are specified to be lined with an artificial liner, rocks larger than six inches in length shall not be placed within five feet of the interior slope of any pond embankment. Material containing by volume less than 25 percent of rock larger than six inches and less than 12 inches in length may be placed in the remainder of the embankment.

(iii) Outer dike slopes shall not be steeper than one vertical to two horizontal. Flatter slopes may be required to maintain slope stability. Outer dike slopes shall prevent surface runoff from entering the ponds.

Inner dike slopes shall be sloped between one vertical to four horizontal and one vertical to three horizontal. Flatter inner slopes may be allowed where vegetation due to the shallower slopes will not interfere with treatment or the dike's integrity. Interior slopes surfaced with concrete paving or riprap may be constructed at slopes of one vertical to two horizontal.

(iv) The minimum top dike width shall be eight feet to permit access of maintenance vehicles. Top dikes wider than eight feet shall be required when necessary to assure structural stability.

(v) The pond bottom shall be sufficiently flat to insure a minimum water depth as required in Section 28 (c)(vi).

(e) Dike protection.

(i) Interior embankments shall be protected from wave action with riprap, paving, or other erosion resistant material. The following conditions may be exempted from the riprap requirements:

(A) Ponds of one surface acre or less;

(B) Ponds with an artificial liner;

(C) Embankments cut into natural slopes when a soil liner is not provided; or

(D) Ponds which are sheltered from wind or where winds are slow enough that significant erosion will not occur.

(ii) Exterior of dikes, top of dikes, and all interior dike surfaces where riprap or a seal is not provided shall be covered with topsoil and seeded with suitable dryland grasses to prevent erosion. A uniform coarse graded gravel may be substituted for the vegetation requirement.

(f) Liners.

(i) Seepage limits. The seepage through the pond bottom and side walls shall not cause a violation of the groundwater standards as described in Chapter VIII (Quality Standards for Wyoming Groundwaters) of the Wyoming Department of Environmental Quality, Water Quality Rules and Regulations. Liners shall be required if the wastewater characteristics or site conditions will not insure the protection of the groundwater for which it is classified.

If the applicant cannot document that the facility poses no threat to groundwater and elects not to perform a subsurface study in accordance with Chapter III, Section 15(a) and (b), then the groundwater shall be protected from contamination by the wastewater with a liner equivalent to three feet of soil having a permeability of 10-7 cm/sec or less. When an applicant performs a subsurface study, the requirement for the liner shall be determined based on the results of the study and the groundwater protection required. In no instance shall the maximum seepage rate exceed 1/8 inch per day in the primary pond(s).

(ii) Soil and bentonite liners. The specifications for a soil or bentonite liner shall be based upon the results of a preliminary testing program and shall contain at a minimum the type of material, optimum and acceptable range in water content, acceptable range for compaction, and maximum allowable particle size.

Soil or bentonite liners used to protect groundwater quality shall meet the following criteria: Written certification that the soil liner was constructed in accordance with specifications shall be provided by a Wyoming registered professional engineer or an independent soils laboratory. Tests for water content and density shall be taken during application of each lift. Additionally, either permeability testing of undisturbed core samples from the in-place seal, or detailed tests such as particle size distribution and Atterburg limits confirming that the soil used in the liner construction was the same soil initially tested, shall be provided. In all cases, at least one test shall be provided per acre per lift, except for core sampling of the in-place liner, where one core of the completed liner shall be tested per acre.

(iii) Synthetic liners. The thickness requirements for synthetic liners shall be determined on a case-by-case basis but shall not be less than 30 mil. The type of liner shall be compatible with the wastewater characteristics. The synthetic liner shall have a permeability equivalent to that required in Section 28(f)(i).

Synthetic liners shall be anchored to prevent movement, slippage, and flotation. The synthetic liner shall be protected from degradation by ultraviolet light, ice damage and settling of underdrain trenches. An air venting system may be required beneath the synthetic liner to expel gases trapped during installation, produced by decomposing organic material, or produced by a fluctuating water table.

(iv) Uniformity. The pond bottom shall be smooth with a maximum tolerance of ± 6 inches.

(v) Prefilling. All ponds shall be prefilled to the two foot level to protect the liner, to prevent weed growth, to encourage rapid startup of the biological process and discourage odor, to reduce freeze up problems for late fall startups, to confirm the seal's integrity and to maintain the water of the seal at or above optimum conditions. The raw wastewater shall not be used for prefilling purposes except for anaerobic ponds.

(vi) Exfiltration evaluation. All ponds designated with a maximum exfiltration rate shall be tested for exfiltration. A maximum exfiltration rate not in excess of the design rate shall be deemed acceptable. If the exfiltration rate is deemed excessive, the seal shall be repaired and the test procedure repeated. This procedure shall be repeated until the maximum exfiltration rate criteria is met. Results of all testing shall be submitted to DEQ.

(g) Miscellaneous. A permanent flow measuring device shall be installed at the outfall of discharging pond sites and shall measure the effluent under all climatic conditions. The accuracy of the flow measuring device must be within ten percent of the actual flow. Ponds with a maximum daily discharge of less than 50,000 gallons per day may be exempted from installing a permanent flow measuring device.

Section 29. Feedlots. This section includes the standards for wastewater retention systems for feedlot runoff. The basic concept of retention systems is to intercept and collect runoff and wastes from the animal feeding area until it can be disposed of via land application. Although retention systems are usually the most economical method of treatment, other systems will be evaluated on a case-by-case basis.

(a) Location.

(i) Groundwater shall be excluded from entering the wastewater pond or the wastewater flow into the pond.

(ii) Ponds shall not be located within the ordinary highwater mark of perennial rivers, streams, or creeks. Ponds not containing hazardous or toxic wastes may be located within the ordinary high water mark of intermit tent rivers, streams, creeks, draws, coulees, or other natural drainages provided a by-pass ditch is installed capable of passing the 24 hour - 100 year precipitation event.

(iii) The wastewater retention system shall be as near to the animal feeding operation as possible to keep construction to a minimum. The retention ponds shall be located outside the pen area for safety and maintenance purposes. Sufficient space must be left between streams or drainage areas to allow construction of the necessary collection ditches and retention ponds.

(b) Basis of design. All livestock confinement areas, alleyways, etc., shall be graded to prevent accumulation of surface waters and to drain all contaminated water to the retention system. Collection ditches shall be provided when necessary to intercept contaminated water. The wastewater retention system shall be designed to contain the 25 year, 24 hour precipitation event. Wastewater in the retention pond shall be removed and disposed of as soon as possible after a precipitation event. The applicant shall demonstrate that equipment is available for removing the wastewater.

(i) Diversion ditches. The animal feeding area shall be protected with diversion ditches that will direct uncontaminated runoff from areas above and adjacent to the site away from the ponds and shall be capable of diverting the 25-year, 24 hour precipitation event.

(ii) Collection ditches. Collection ditches shall be constructed around the feeding area to intercept the contaminated runoff and transport it to the settling and/or retention pond. The depth shall be adequate to handle the design flow and shall have a bottom slope sufficient to produce a velocity of not less than two feet per second. Side slopes shall not be steeper than eight horizontal to one vertical.

(iii) Settling pond. A settling pond ahead of the retention pond is recommended to accumulate the solids in the waste flow and to simplify their removal and final disposal. The surface area shall be sized to reduce the flow velocity below one foot per second to allow settling of solids. The pond shall be between three to six feet deep to allow sufficient capacity for holding the solids and yet allow easy removal of the solids. The outlet structure shall minimize the overflow of solids into the retention pond.

(iv) Retention pond. The retention pond shall be capable of containing all runoff from the feeding area for the design storm until the contaminated runoff can be disposed. If a settling pond is not provided before the retention pond, the design volume shall be increased by 10 percent to accommodate collection of solids.

(c) Retention pond layout.

(i) The shape and depth shall facilitate ease of cleaning and maintenance. A minimum freeboard of 1.5 feet shall be required above the high water level of the spillway.

(ii) Spillways shall be provided on all retention ponds to pass flows in excess of the 25 year, 24 hour precipitation event. The spillway shall be placed above the design high water level.

(d) Retention pond construction. The retention pond construction shall meet the following requirements:

(i) Soils used in constructing the pond bottom and dike cores (not including the liner) shall be relatively incompressible, have a low permeability, and be free from organic material or trash. The soil shall be compacted at a water content that will insure structural stability, minimize hydraulic seepage, and minimize settling. The soil shall provide an adequate foundation for the liner, if used.

(ii) On ponds that are not specified to receive an artificial liner, no rocks larger than six inches in length shall be permitted in any of the designated embankments.

On ponds that are specified to be lined with an artificial liner, rocks larger than six inches in length shall not be placed within five feet surface of the interior slope of any pond embankment. Material containing by volume less than 25 percent of rock larger than six inches and less than 12 inches in length may be placed in the remainder of the embankment.

(iii) Outer dike slopes shall not be steeper than one vertical to two horizontal. Flatter slopes may be required to maintain slope stability.

Inner dike slopes shall be sloped between one vertical to four horizontal and one vertical to three horizontal. Flatter inner slopes may be allowed where vegetation due to the shallower slopes will not interfere with treatment or the dike's integrity. Interior slopes surfaced with concrete paving or riprap may be constructed at slopes of one vertical to two horizontal.

(iv) The minimum top dike width shall be eight feet to permit access of maintenance vehicles. Top dikes wider than eight feet shall be required when necessary to assure structural stability.

(v) The pond bottom may be sloped to facilitate pumping but shall not exceed a 0.5 percent slope.

(e) Liners.

(i) Seepage limits. The seepage through the pond bottom and side walls shall not cause a violation of the groundwater standards as described in Chapter VIII (Quality Standards for Wyoming Groundwaters) of the Wyoming Department of Environmental Quality, Water Quality Rules and

Regulations. Liners shall be required if the wastewater characteristics or site conditions will not insure the protection of the groundwater for which it is classified.

If the applicant cannot document that the facility poses no threat to groundwater and elects not to perform a subsurface study in accordance with Chapter III, Section 15(a) and (b), then the groundwater shall be protected from contamination by the wastewater with a liner equivalent to three feet of soil having a permeability of 10-7 cm/sec or less. When an applicant performs a subsurface study, the requirement for the liner shall be determined based on the results of the study and the groundwater protection required. In no instance shall the maximum seepage rate exceed 1/8 inch per day in the primary pond(s).

(ii) Soil and bentonite liners. The specifications for a soil or bentonite liner shall be based upon the results of a preliminary testing program and shall contain at a minimum the type of material, optimum and acceptable range in water content, acceptable range for compaction, and maximum allowable particle size.

Soil or bentonite liners used to protect groundwater quality shall meet the following criteria: Written certification that the soil liner was constructed in accordance with specifications shall be provided by a Wyoming registered professional engineer or an independent soils laboratory. Tests for water content and density shall be taken during application of each lift. Additionally, either permeability testing of undisturbed core samples from the in-place seal, or detailed tests such as particle size distribution and Atterburg limits confirming that the soil used in the liner construction was the same soil initially tested, shall be provided. In all cases, at least one test shall be provided per acre per lift, except for core sampling of the in-place liner, where one core of the completed liner shall be tested per acre.

(iii) Synthetic liners. The thickness requirements for synthetic liners shall be determined on a case-by-case basis but shall not be less than 30 mils. The type of liner shall be compatible with the wastewater characteristics. The synthetic liner shall have a permeability equivalent to that of Section 29(e)(i).

Synthetic liners shall be anchored to prevent movement, slippage, and flotation. The synthetic liner shall be protected from degradation by ultraviolet light, ice damage and settling of underdrain trenches. An air venting system may be required beneath the synthetic liner to expel gases trapped during installation, produced by decomposing organic material, or produced by a fluctuating water table.

(iv) Exfiltration evaluation. All ponds designated with a maximum exfiltration rate shall be tested for exfiltration. A maximum exfiltration rate not in excess of the design rate shall be deemed acceptable. If the exfiltration rate is deemed excessive, the seal shall be repaired, and the test procedure repeated. This procedure shall be repeated until the maximum exfiltration rate criteria is met. Results of all testing shall be submitted to the Department of Environmental Quality.

Section 30. <u>Non-biological Treatment Ponds.</u> This section includes the standards for non-biological treatment ponds or ponds that accept commercial/industrial waste or wastewater that is primarily non-biological in nature and does not utilize biological organisms for treatment. Radiological affects considered by the Nuclear Regulatory Commission (NRC) from non-surface discharging treatment works within a NRC licensed permit boundary are exempt from this section.

(a) Location.

(i) Extraneous surface water and groundwater shall be excluded from entering the wastewater pond or entering the wastewater flow into the pond.

(ii) Ponds shall not be located within the ordinary high water mark of perennial rivers, streams, or creeks. Ponds not containing hazardous or toxic wastes may be located within the ordinary high water mark of intermit tent rivers, streams, creeks, draws, coulees, or other natural drainages provided a by-pass ditch is installed capable of passing the 24 hour - 100 year precipitation event. All other ponds shall be protected from structural damage during the 100-year flood event.

(b) Basis of design.

(i) Ponds shall be designed based on the type of wastewater, the wastewater strength characteristics, and the anticipated flow rates. Loading rates shall be determined on a case-by-case basis using the best available technology, reference, and/or pilot studies. The affect of any toxic wastes, hazardous substances, and/or petroleum products on the wastewater treatment process and disposal system shall be evaluated.

Where seepage is considered part of the design, the potential effect of groundwater mounding on the seepage rate must be evaluated.

(ii) In addition to the above, non-surface ater discharging ponds shall be designed on the basis of a water balance that considers net evaporation and seepage. Non-discharging ponds shall be designed to provide sufficient storage to retain all wastewater and rainfall during the wettest occurring year of a ten year period.

(c) Pond layout.

(i) Dischargingtreatmentsystemsandpondsthatrequire liners to protect groundwater shall consist of a minimum of two cells. The largest cell shall not contain more than 55 percent of the total waste volume at the design capacity.

(ii) Inlet and intracell structures for discharging treatment systems shall prevent short circuiting, and shall not erode or disturb the liner, seal or dike.

(iii) Outlet structures from a discharging treatment system shall have an overflow device, prevent short circuiting, prevent floating debris from discharging, and keep outlet velocities to a minimum so as not to erode or disturb the receiving channel. Erosion control material shall be designed based on flow velocities and quantities. Ice formation shall neither stop the overflow nor damage the outlet structure.

(iv) All pipe protruding through a dike or embankment shall have adequate seepage controls. Capabilities shall exist to drain the ponds for maintenance purposes.

(v) A manhole or vented cleanout wye shall be installed prior to the entrance of the influent pipe into the primary pond(s) and shall be located as close to the dike as topography permits. The influent pipe invert should be at least six inches above the maximum operating level of the pond.

(vi) The maximum and minimum water depth shall be determined on a case-by-case basis. However, the design engineer must demonstrate that ponds with less than two feet water depth will not have vegetation problems.

(vii) Freeboardshallbeprovidedtoprotectembankments and dikes from overtopping from wave action, and shall be a minimum of three feet above the high water level. For ponds less than two acres, two feet of freeboard may be acceptable.

(d) Pond construction.

(i) Soils used in constructing the pond bottom and dike cores (not including the liner) shall be relatively incompressible, have a low permeability, and be free from organic material or trash. The soil shall be compacted at a water content that will insure structural stability, minimize hydraulic seepage, and minimize settling. The soil shall provide an adequate foundation for the liner, if used.

(ii) On ponds that are not specified to receive an artificial liner, no rocks larger than six inches in length shall be permitted in any of the designated embankment.

On ponds that are specified to be lined with an artificial liner, rocks larger than six inches in length shall not be placed within five feet of the interior slope surface of any pond embankment. Material containing by volume less than 25 percent of rock larger than six inches and less than 12 inches in length may be placed in the remainder of the embankment.

(iii) Outer dike slopes shall not be steeper than one vertical to two horizontal. Flatter slopes may be required to maintain slope stability. Outer dike slopes shall prevent surface runoff from entering the ponds.

Inner dike slopes shall be sloped between one vertical to four horizontal and one vertical to three horizontal. Flatter inner slopes may be allowed where vegetation due to the shallower slopes will not interfere with treatment or the dike's integrity. Interior slopes surfaced with concrete paving or riprap may be constructed at slopes of one vertical to two horizontal.

(iv) The minimum top dike width shall be eight feet to permit access of maintenance vehicles. Top dikes wider than eight feet shall be required when necessary to assure structural stability.

(e) Dike protection.

(i) Interior embankments shall be protected from wave action with riprap, paving, or other erosion resistant material. The following conditions may be exempted from the riprap requirements:

(A) Ponds of one surface acre or less;

(B) Ponds with an artificial liner;

(C) Embankments cut into natural slopes where a soil liner is not provided; or

(D) Ponds which are sheltered from wind or where winds are slow enough that significant erosion will not occur.

(ii) Exterior of dikes, top of dikes, and all interior dike surfaces where riprap or a seal is not provided shall be covered with topsoil and seeded with suitable dryland grasses to prevent erosion. A uniform coarse graded gravel may be substituted for the vegetation requirement.

(f) Liners.

(i) Seepage limits. The seepage through the pond bottom and side walls shall not cause, a violation of the groundwater standards as described in Chapter VIII (Quality Standards for Wyoming Groundwaters) of the Wyoming Department of Environmental Quality, Water Quality Rules and

Regulations. Liners shall be required if the wastewater characteristics or site conditions will not insure the protection of the groundwater for which it is classified.

If the applicant cannot document that the facility poses no threat to groundwater and elects not to perform a subsurface study in accordance with Chapter III, Section 15(a) and (b), then the groundwater shall be protected from contamination by the wastewater with a liner equivalent to three feet of soil having a permeability of 10-7 cm/sec or less. When an applicant performs a subsurface study, the requirement for the liner shall be determined based on the results of the study and the groundwater protection required. In no instance shall the maximum seepage rate exceed 1/8 inch per day in the primary pond(s).

(ii) Soil and bentonite liners. The specifications for a soil or bentonite liner shall be based upon the results of a preliminary testing program and shall contain at a minimum the type of material, optimum and acceptable range in water content, acceptable range for compaction, and maximum allowable particle size.

Soil or bentonite liners used to protect groundwater quality shall meet the following criteria. Written certification that the soil liner was constructed in accordance with specifications shall be provided by a Wyoming registered professional engineer or an independent soils laboratory. Tests for water content and density shall be taken during application of each lift. Additionally, either permeability testing of undisturbed core samples from the in-place seal, or detailed tests such as particle size distribution and Atterburg limits confirming that the soil used in the liner construction was the same soil initially tested, shall be provided. In all cases, at least one test shall be provided per acre per lift, except for core sampling of the in-place liner, where one core of the completed liner shall be tested per acre.

(iii) Synthetic liners. The thickness requirements for synthetic liners shall be determined on a case-by-case basis but shall not be less than 30 mils. The type of liner shall be compatible with the wastewater characteristics. The synthetic liner shall have a permeability equivalent to that of Section 30(f)(i).

Synthetic liners shall be anchored to prevent movement, slippage, and flotation. The synthetic liner shall be protected from degradation by ultraviolet light, ice damage and settling of underdrain trenches. An air venting system may be required beneath the synthetic liner to expel gases trapped during installation, produced by decomposing organic material, or produced by a fluctuating water table.

(iv) Prefilling. For soil or bentonite liners, a method of maintaining the seal at or above optimum moisture conditions is required.

(v) Exfiltration evaluation. All ponds designated with a maximum exfiltration rate shall be tested for exfiltration. A maximum exfiltration rate not in excess of the design rate shall be deemed acceptable. If the exfiltration rate is deemed excessive, the seal shall be repaired and the test procedure repeated. This procedure shall be repeated until the maximum exfiltration rate criteria is met. Results of all testing shall be submitted to the Department of Environmental Quality.

(g) Miscellaneous. A permanent flow measuring device shall be installed at the outfall of discharging pond sites and shall measure the effluent under all climatic conditions. The accuracy of the flow measuring device must be within ten percent of the actual flow. Ponds with a maximum daily discharge of less than 50,000 gallons per day may be exempted from installing a permanent flow measuring device.

Section 31. Sedimentation Control Facilities. This section includes the standards for sedimentation control facilities. Those sedimentation control facilities that are regulated under Water Quality Rules and Regulations, Chapter X, "Performance/Design Standards for Surface Coal Mining Runoff Control Facilities" are exempted from this section.

(a) Location. The sedimentation control facilities shall be as near to the affected lands as possible to keep construction and containment volumes to a minimum. Sedimentation control facilities shall be located off-channel when possible. Runoff from unaffected lands should be by-passed around the containment area. All affected lands must drain to a sedimentation control facility.

(b) Basis of design. Sedimentation control facilities shall control all runoff from areas which drain into the facility from a 10 - year 24 - hour precipitation event in addition to the estimated sediment storage volume for one year be always available. The pond shall be drained down to the permanent pool level as soon as the effluent meets the discharge parameters. The applicant shall demonstrate that equipment or outlet structures are available for draining the pond.

(c) Layout.

(i) Inlet ditches or structures shall not erode or disturb the pond bottom.

(ii) Outlet structures, if used, shall have an overflow device, prevent short-circuiting, prevent floating debris from discharging and shall not erode or disturb the dike. All pipe protruding through a dike shall have adequate seepage control. The point of discharge into a channel shall be protected against erosion and erosion control devices shall be designed based on flow velocities.

(iii) Spillways. Sedimentation control facilities that individually contain more than 2.0 acre-feet of runoff or that individually have more than 2.0 acres of surface area or that are located on-channel shall have a spillway to by-pass precipitation events in excess of the design event. Spillways shall safely pass the 25 year flood event except when the impoundment height is greater than twenty feet or capacity exceeds twenty acre-feet; in which case the spillway shall safely pass the 100-year flood event.

(iv) By-pass ditches. If by-pass ditches are provided to transport runoff from unaffected lands, they shall be designed to pass the runoff from a 25 year precipitation event.

(v) Freeboard. Freeboard shall be provided to protect embankments and dikes from overtopping from wave action and shall be a minimum of one foot above the high water level. For ponds less than two acres, one-half foot of freeboard may be acceptable.

(d) Construction.

(i) Soils used in constructing the pond bottom and dike cores shall be relatively incompressible, have a low permeability, and be free from organic material or trash. The soil shall be compacted at a water content that will insure structural stability, minimize hydraulic seepage, and minimize settling.

Rocks larger than six inches in length shall not be placed within five feet of the interior slope surface of any pond embankment. Material containing by volume less than 25 percent of rock larger than six inches and less than 12 inch in length dimension may be placed in the remainder of the embankment.

(ii) Outer dike slopes shall not be steeper than one vertical to two horizontal. Flatter slopes may be required to maintain slope stability. Inner dike slopes shall be sloped between one vertical to four horizontal and one vertical to three horizontal.

(iii) The minimum top dike width shall be sufficient to provide structural stability.

(iv) Riprap or other acceptable erosion control shall be installed on the inner dike slopes at all anticipated levels of water. Dikes cut into existing ground shall be exempted from riprap requirements. Ponds that have less than 2.0 acres of surface area shall also be exempted.

~~PART D~~

~~SEPTIC TANK AND/OR SOIL ABSORPTION SYSTEMS AND OTHER SMALL WASTEWATER SYSTEMS~~

~~Section 32. General. This part contains the minimum standards for the design and construction of sewerage systems, treatment works and disposal systems for domestic wastes and industrial wastes generated by facilities other than specifically covered by other parts of this Chapter.~~

~~Section 33. Definitions Specific to Part D.~~

~~(a) "Absorption system" means a system constructed under the surface of the ground which receives and distributes effluent from a pretreatment device effectively filtering the effluent through soil or media.~~

~~(b) "Aerobic unit" means a covered, watertight receptacle which receives wastewater. The unit removes settleable solids, floatable material, and a part of soluble organic matter by the use of aerobic biological treatment.~~

~~(c) "Building drain" means the building drain is that part of the lowest piping of a drainage system which receives the discharge from soil, waste and other drainage pipes inside the walls of the building and conveys it to the building sewer beginning two feet (.6m) outside the building wall.~~

~~(d) "Building sewer" means the building sewer is that part of the horizontal piping of a drainage system which extends from the end of the building drain and conveys the building drain discharge to the septic tank or other onsite sewage disposal facility.~~

~~(e) "Domestic sewage" means the liquid- and waterborne wastes derived from the ordinary living processes, free from industrial wastes, and of such character as to permit satisfactory disposal without special treatment.~~

~~(f) "Dosing system" means the system of tanks, pumps or syphons, and piping located between the septic tank and soil absorption system which is intended to apply a large quantity of settled wastewater to the absorption system in a short period of time.~~

~~(g) "Hydrogeological study" means a study of the occurrence, distribution, quality and movement of the shallowmost groundwater of the site and the potential impact of wastewaters on the groundwater.~~

~~(h) "Impermeable soil" means any soil which has a percolation rate greater than 60 minutes per inch.~~

~~(i) "Pump Tank" means a tank in which the dosing pumps or syphons are installed.~~

~~Section 34. Design Flows. The sewerage system, treatment works and disposal system shall have a minimum absorption area based on the minimum peak design flows listed in Table 1 below.~~

~~Table 1~~

~~Quantities of Domestic Sewage Flows~~

~~Type of Establishment~~	~~Flow~~ ~~(gallons per day per______)~~
~~Residential Units~~	
~~Single Family Dwellings~~	~~150/bedroom~~
~~Multiple Family Dwelling (with laundry capabilities)~~	~~150/bedroom~~
~~Multiple Family Dwelling (without laundry capabilities)~~	~~120/bedroom~~
~~Cottages~~	~~50/person~~
~~Mobile Home Parks~~	~~350/home*~~
~~Commercial Facilities~~	
~~Airports~~	~~4/passengers~~
~~Bar~~	~~3/patron~~
~~Bathhouses and swimming pools~~	~~10/person~~
~~Campgrounds (individual sewer outlets available)~~	~~100/site~~
~~Campgrounds (service building only)~~	~~75/site~~
~~Car or truck wash~~	~~200/vehicle~~
~~Church (no food preparation and/or dishwashing)~~	~~5/seat~~
~~Church (food preparation and/or dishwashing)~~	~~7/seat~~
~~Country Club~~	~~100/member~~
~~Factories~~	~~30/employee~~
~~Hospital~~	~~200/bed~~
~~Laundry (self-service)~~	~~600/machine or 50/cycle~~
~~Motels~~	~~80/double bed,~~ ~~40/single bed~~
~~Office building~~	~~30/employee~~
~~Restaurant (toilet and kitchen wastes)~~	~~13/meal~~
~~Restaurant (kitchen wastes)~~	~~6/meal~~
~~Restaurant (additional for bars and lounges)~~	~~2/meal~~
~~Restaurant (kitchen wastes with disposable service)~~	~~2/meal~~
~~Rest Home~~	~~100/resident~~
~~Schools~~	
~~Boarding~~	~~100/resident student~~
~~Day, without gyms, cafeterias, or showers~~	~~15/student~~
~~Day, with cafeterias only~~	~~20/student~~
~~Day, with cafeteria, gym and showers~~	~~25/student~~
~~Service stations~~	~~10/vehicle served~~

~~Type of Establishment~~	~~Flow (gallons per day per______)~~
~~Shopping Center~~	~~2/parking space~~
~~Store, Retail~~	~~30/employee~~
~~Theaters:~~ ~~-Movie~~	~~5/seat~~
~~-Drive-In~~	~~15/vehicle space~~
~~Warehouses~~	~~30/employee~~

~~* Must consider flow into the soil absorption system from mobile homes where taps are allowed to run to prevent freezing.~~

~~Section 35. Isolation.~~

~~(a) Domestic wastewater. The isolation distances listed below apply when domestic wastewater is the only wastewater present.~~

~~(i) If the flow is less than 2000 gallons per day (gpd), the minimum isolation distance (in feet) shown in Table 2 shall be maintained.~~

~~Table 2~~

~~From~~	~~To Septic Tank Or Equivalent~~	~~To Absorption System~~
~~Wells (includes neighboring wells)~~	~~50~~	~~100~~
~~Property lines~~	~~10~~	~~10~~
~~Building Foundation (without foundation drains)~~	~~5~~	~~10~~
~~Building Foundation (with foundation drains)~~	~~5~~	~~25~~
~~Potable Water Pipes~~	~~25~~	~~25~~
~~Septic tank~~		~~10~~
~~Stream or Surface Body of Water (including seasonal and intermittent)~~	~~50~~	~~50~~

~~(ii) If the flow is greater than 2000 gpd but less than 10,000 gpd, the minimum isolation distances (in feet) shown in Table 3 shall be maintained.~~

~~Table 3~~

~~From~~	~~To Septic Tank Or Equivalent~~	~~To Absorption System~~
~~Wells (includes neighboring wells)~~	~~50~~	~~200~~
~~Property lines~~	~~10~~	~~10~~
~~Building Foundation (without foundation drains)~~	~~5~~	~~10~~
~~Building Foundation (with foundation drains)~~	~~5~~	~~50~~
~~Potable Water Pipes~~	~~25~~	~~50~~

~~Septic tank~~		~~10~~
~~Stream or Surface Body of Water (including seasonal and intermittent)~~	~~50~~	~~100~~

~~(iii) For systems larger than 10,000 gallons per day, the isolation distance shall be determined by a hydrogeological study in accordance with Section 15(b) of Chapter III, but shall not be less than those in subsection two above.~~

~~(b) Non-domestic wastewater. For disposal of wastewaters other than domestic wastewater, the isolation distances required shall be determined from a hydrogeological study in accordance with Section 15(b)of Chapter III.~~

~~(c) Location. Absorption systems shall not be located beneath buildings, parking lots, roadways or other similarly compacted areas.~~

~~Section 36. Site Suitability.~~

~~(a) Soil exploration. Soil exploration to a minimum depth of four feet below the bottom of the proposed absorption system shall be made to provide information on subsoil conditions.~~

~~(b) Soil evaluation.~~

~~(i) No less than three percolation tests shall be run in the proposed absorption system location. The percolation tests shall be performed in accordance with Appendix A of this part. The type of soil encountered at the percolation test location shall be specified.~~

~~(ii) An evaluation of the soil texture by a person experienced in soils classification, may be used to estimate the percolation rate, but at least one percolation test shall be performed.~~

~~(c) Groundwater protection and bedrock or impermeable soil separation.~~

~~(i) For single family homes, the depth to bedrock or impermeable soil must be at least four feet from the bottom of the absorption system stone and the natural ground surface. The depth to seasonally high groundwater must be at least four feet from the bottom of the absorption system stone and at least two feet from the natural ground surface.~~

~~(ii) For all systems other than single family homes up to 2000 gallons per day, the depth to bedrock or impermeable soil must be at least four feet from the natural ground surface. The depth to seasonally high groundwater must be at least four feet from the bottom of the absorption system stone and at least two feet from the natural ground surface. Also, a minimum of three feet of unsaturated soil shall be maintained between the bottom of the absorption system stone and the estimated groundwater mound imposed on the seasonally high groundwater table. The height of the groundwater mound may be estimated from Figures 1 through 6. The average daily flow should be used and may be estimated as 0.6 times the flow determined from Table 1.~~

~~(iii) For all systems larger than 2000 gallons per day, a minimum of three feet of unsaturated soil shall be maintained between the bottom of the absorption system stone and the estimated groundwater mound imposed on the seasonally high groundwater table. The maximum height of the groundwater mound shall be estimated by the design engineer.~~

~~(d) Excessively permeable soils. Soils having a percolation rate of one minute per inch or less are unsuitable for subsurface sewage disposal. These soils may be used if a six inch layer of soil having a percolation rate of five minutes per inch or greater is placed between the leach system stone and the existing soil. The soil absorption system shall be sized based on the percolation rate of the fill material.~~

~~(e) Sloping ground installations.~~

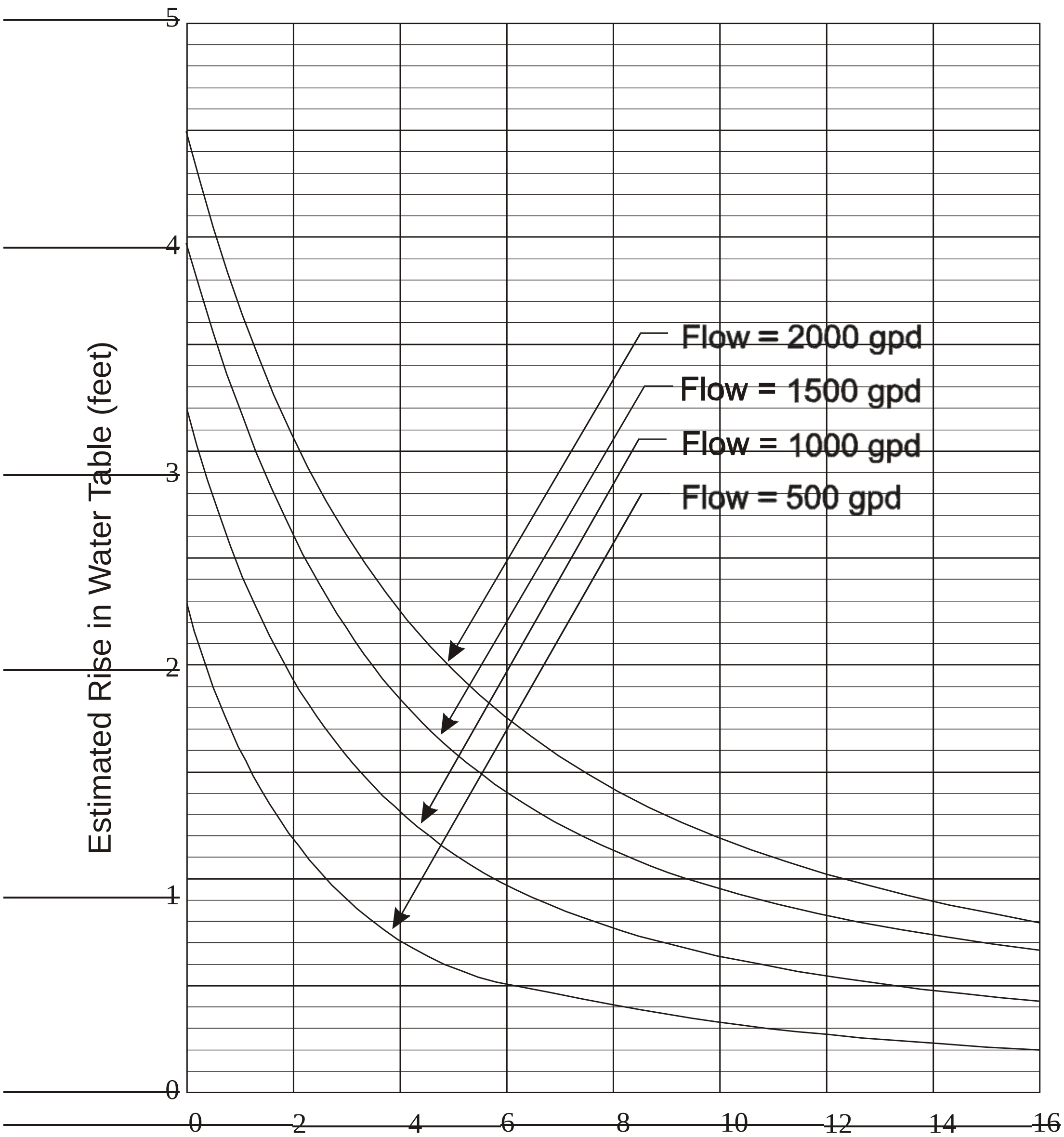
~~(i) Absorption systems shall not be located in an area where the natural slope is steeper than stated below. The following are the maximum permissible slopes on which an absorption system may be constructed.~~

~~Percolation Rate (min/inch)~~	~~Maximum Slope*~~
~~Faster than 5~~	~~25%~~
~~6-45~~	~~20%~~
~~46-60~~	~~15%~~

~~* Flatter slopes may be required where the effluent may surface downslope.~~

~~(ii) All absorption systems must be located at least 15 feet from the top of any break in slope which exceeds the maximum allowed in subsection (i) above "Saturated Thickness": Distance between the seasonally high groundwater table and the under- lying impervious layer, such as: clay, bedrock, or soils with a significantly lower permeability.~~

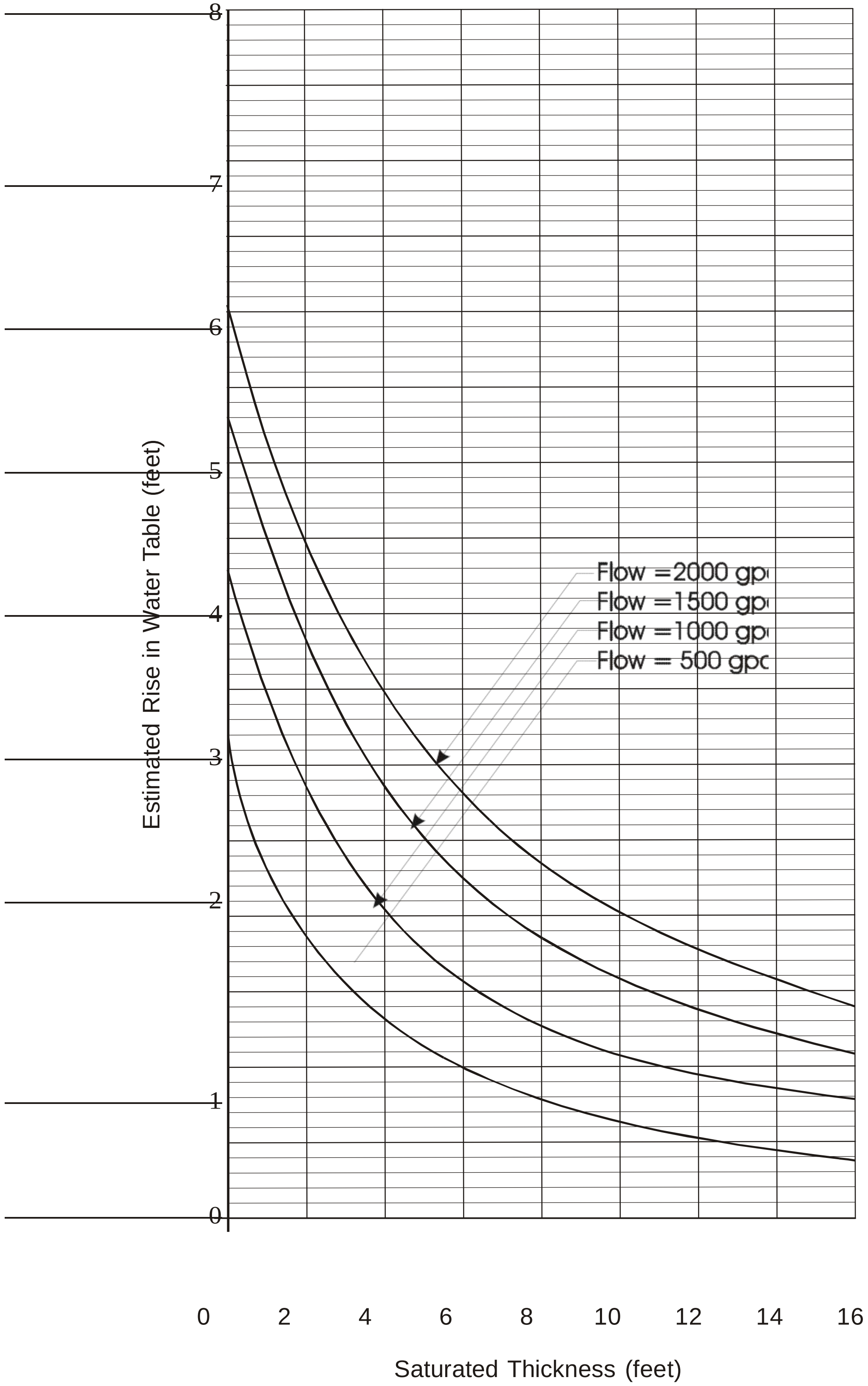
~~"Estimated Rise in Water Table": The estimated distance the water table will rise at the center of the absorption system above the initial water table when the indicated flow is applied daily.~~



~~Saturated Thickness (feet)~~

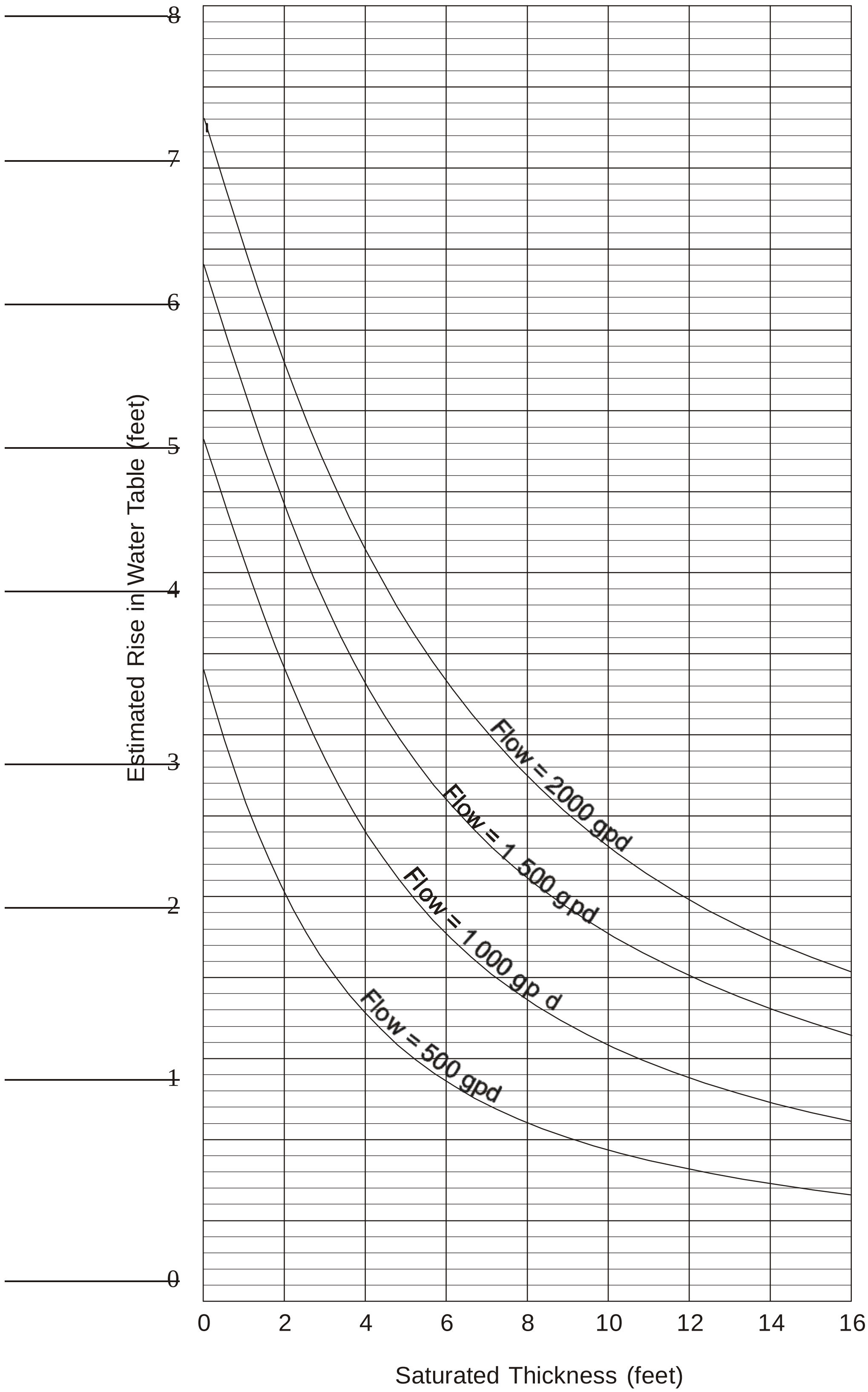
~~BASED ON A SOIL PERCOLATION RATE = 10 min/inch~~

~~FIGURE 1~~



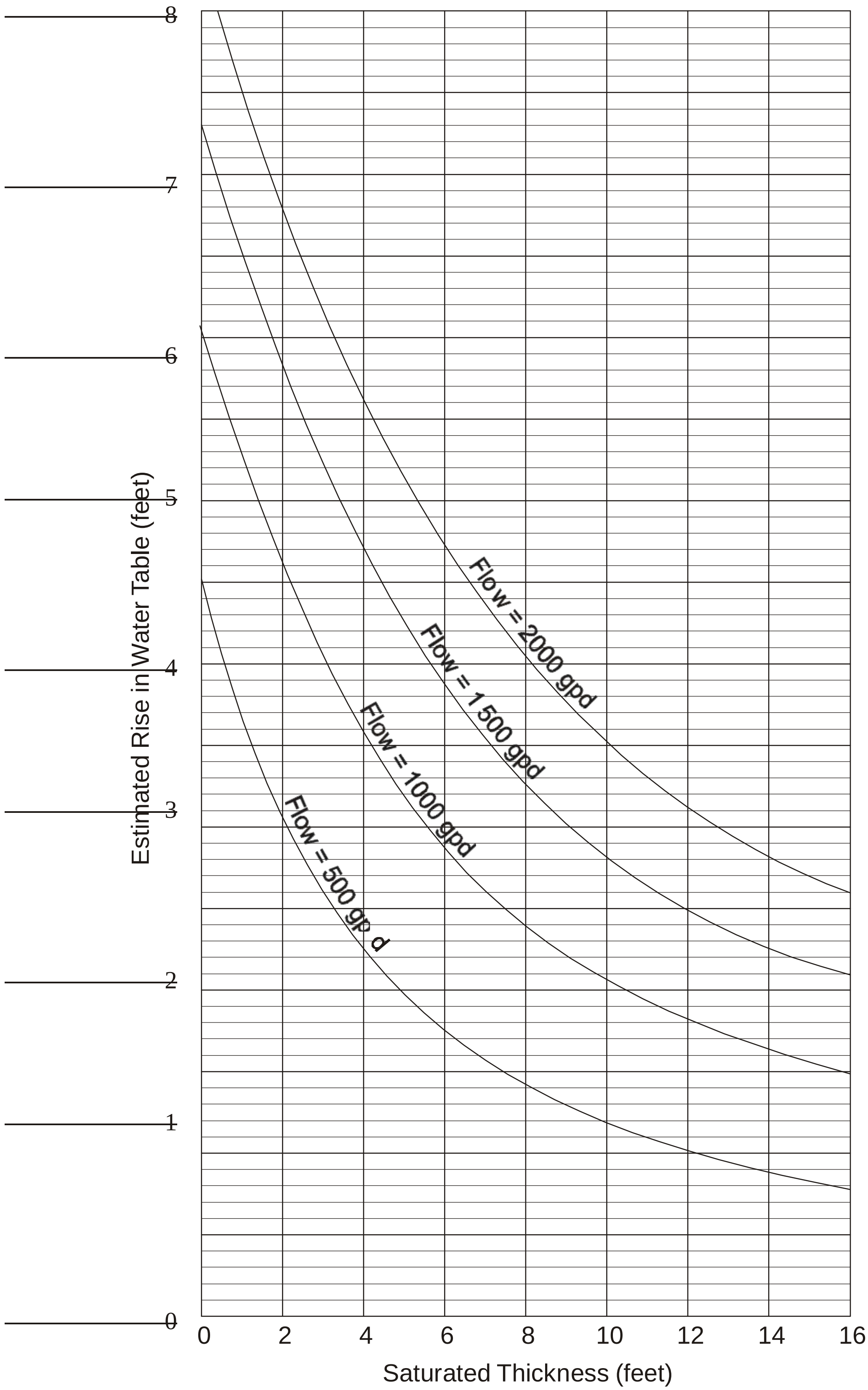
BASED ON A SOIL PERCOLATION RATE = 30 min/inch

FIGURE 3



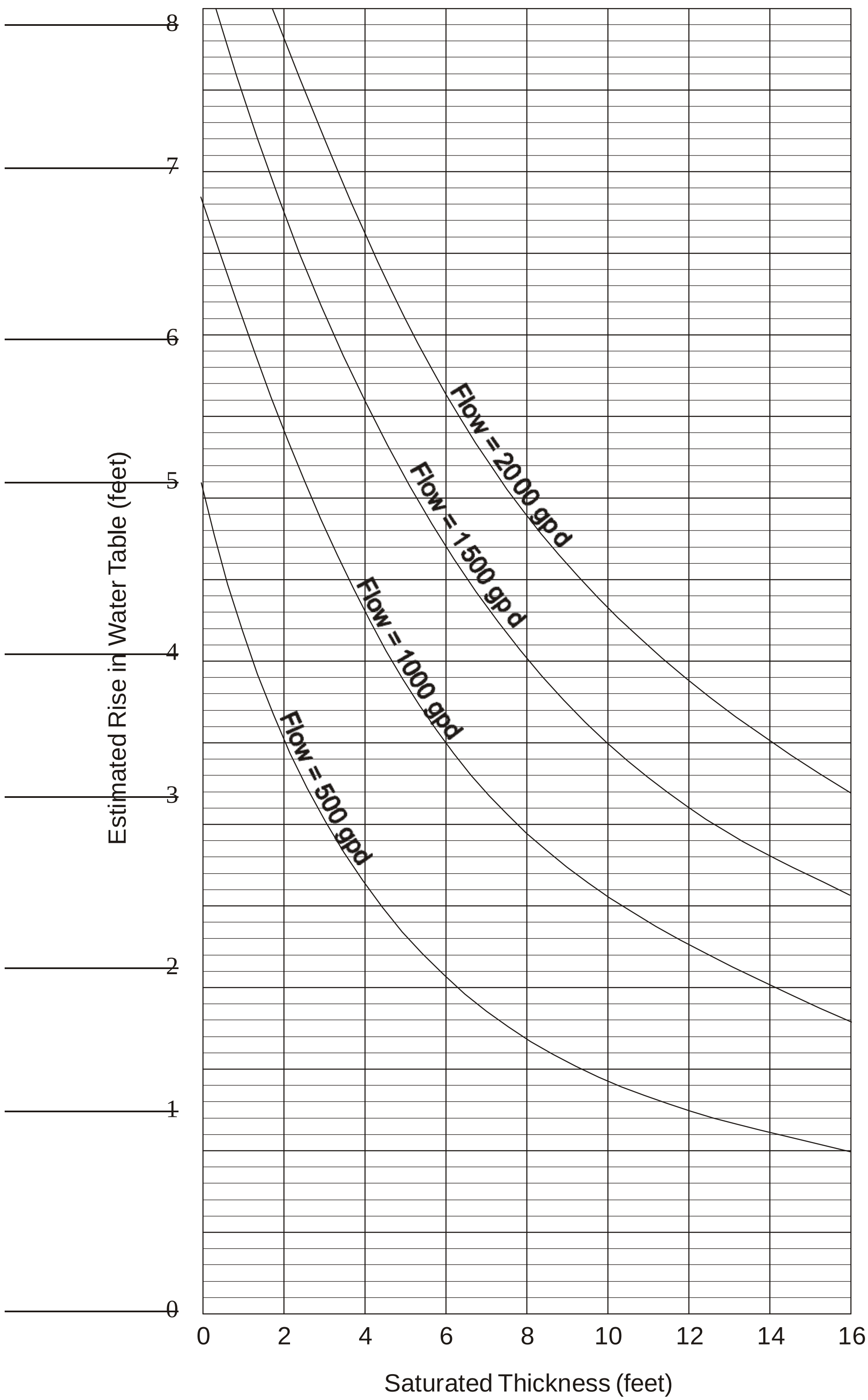
BASED ON A SOIL PERCOLATION RATE = 30 min/inch

FIGURE 4



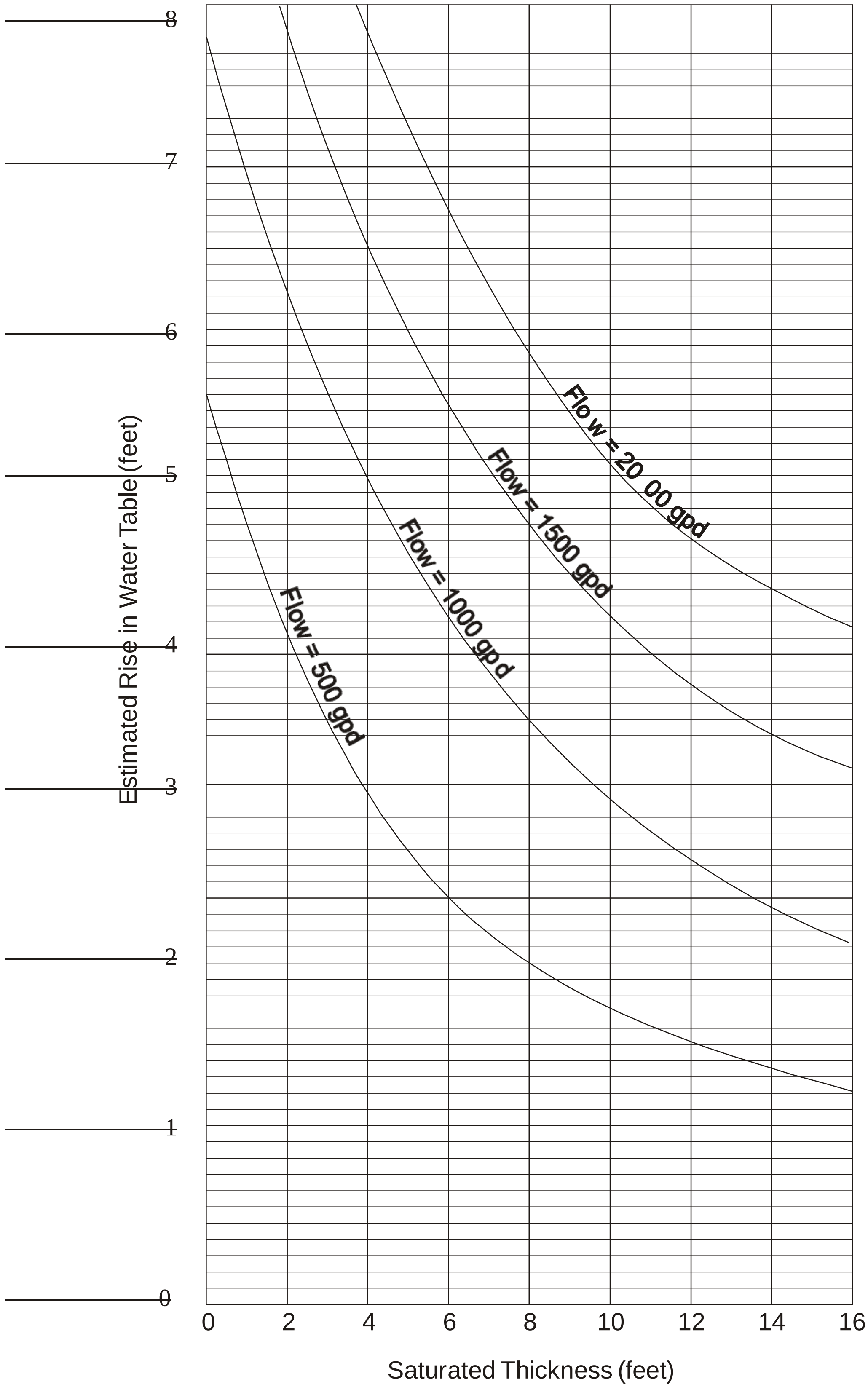
BASED ON A SOIL PERCOLATION RATE = 40 min/inch

FIGURE 4



BASED ON A SOIL PERCOLATION RATE = 50 min/inch

FIGURE 5



BASED ON A SOIL PERCOLATION RATE = 60 min/inch

FIGURE 6

~~Section 37. Building Sewer Pipes.~~

~~(a) Building drain pipe. All building drain pipe shall comply with the standards published in the Uniform Plumbing Code 1982 or other locally approved, nationally recognized plumbing code.~~

~~(b) Building sewer pipe. All building sewers shall be installed in accordance with the Uniform Plumbing Code - 1982 or other locally approved nationally recognized plumbing code. In the absence of an approved plumbing code, the building sewer shall comply with the following:~~

~~(i) Material. Polyvinyl Chloride (PVC), Acrylonitrile - Butadiene - Styrene (ABS), cast or ductile iron, portland cement, or vitrified clay pipe shall be used for sewer pipes. The septic tank inlet and outlet pipes shall be cast or ductile iron or schedule 40 PVC and shall extend past the septic tank excavation to solid ground.~~

~~(ii) Size. Building sewer pipes shall not be smaller than four inches in diameter. They shall be sized to handle the peak hourly flow from the building.~~

~~(iii) Slope. Building sewer pipes should be laid at a minimum slope of 1/4 inch per foot, but shall not be flatter than 1/8 inch per foot.~~

~~(iv) Alignment. Building sewer pipes should be laid in a straight line. Any single change or cumulative change of alignment of 22 ½ degrees or greater shall be served by a cleanout.~~

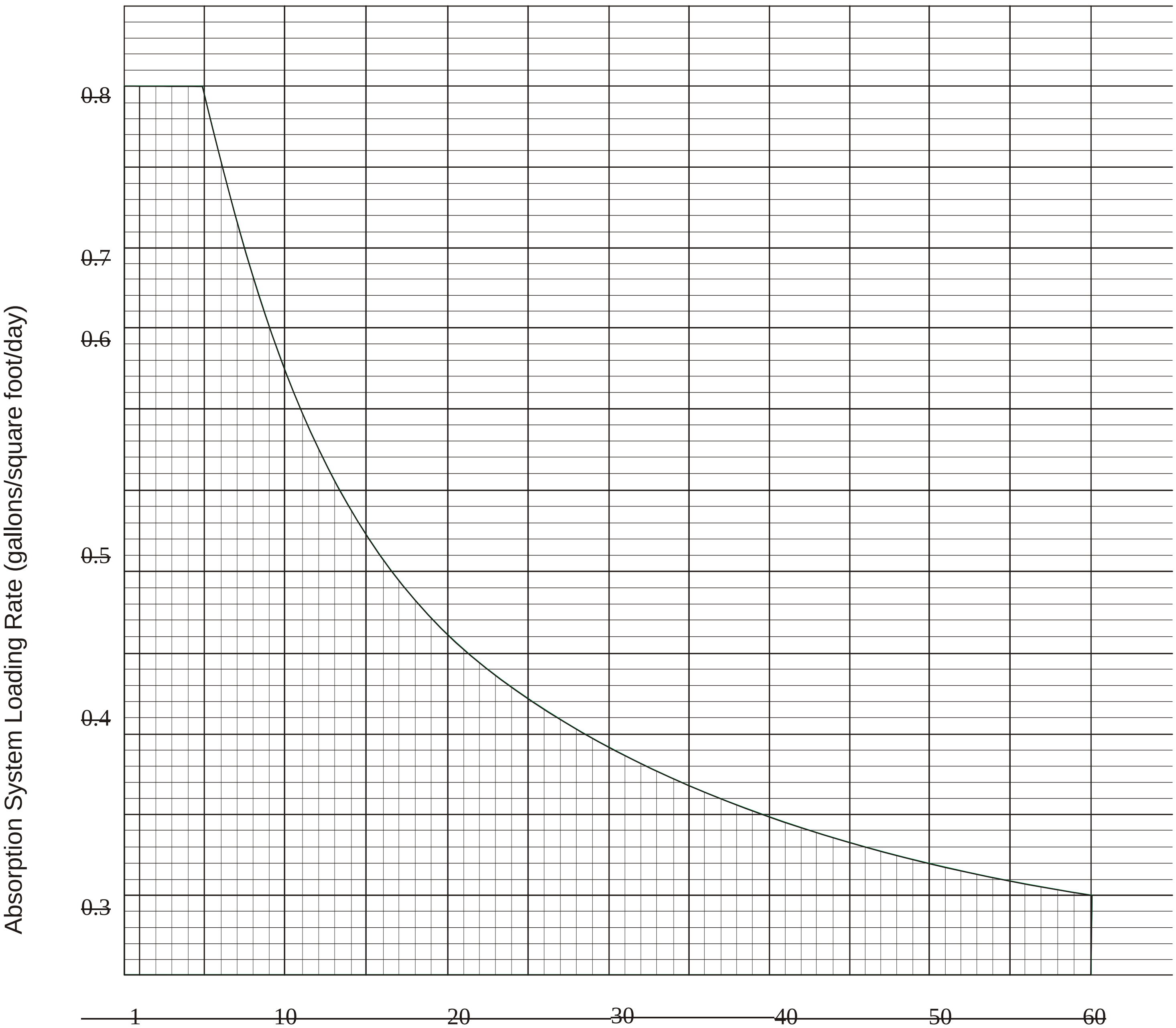
~~(v) Cleanouts. Cleanouts shall be provided every 100 feet maximum.~~

~~(vi) Backfilling. All sewer piping shall be laid on a firm bed throughout its entire length. It shall be protected from damage due to rocks, hard lumps of soil, debris and the like. Special care shall be utilized to prevent lateral movement or ovalation during backfill. The backfill material shall be compacted to a density at least equivalent to the trench walls. Backfill over the pipe shall be of sufficient depth to protect the pipe from expected traffic loads and the wastewater from freezing.~~

~~Section 38. Soil Absorption System Sizing.~~

~~(a) Trench bed and seepage pit systems. The total stated in Section 34 and with the allowable loading rate as determined by using Figure 7. The total infiltrative surface is the sum of the sidewall and bottom areas of the absorption system below the invert of the distribution pipe.~~

~~(b) Soils with a percolation rate of 60 minutes per inch or greater are unacceptable for standard absorption systems.~~



~~Percolation Rate, (min/inch) FIGURE 7~~

~~Section 39. Pretreatment.~~

~~(a) Septic tanks.~~

~~(i) Material. The septic tank shall be constructed of durable material not subject to excessive corrosion or decay and structurally capable of supporting the loads to which it will be subjected. The tank shall be water-tight.~~

~~(ii) Size.~~

~~(A) Residential units serving no more than 4 families. Minimum liquid volume of septic tanks shall be 1000 gallons for residences through four bedroom capacity. Additional capacity of 250 gallons per bedroom shall be provided for each bedroom over four.~~

~~(B) Commercial/industrial units. Septic tanks shall have a minimum effective liquid capacity sufficient to provide at least 36 hour retention at peak flow or 1,000 gallons, whichever is greater.~~

~~(iii) Configuration.~~

~~(A) The septic tank shall have a length to width ratio of no less than two to one, or be so partitioned as to provide protection against short circuiting of flow. The water depth shall be no less than four feet nor greater than six feet. The septic tank inlet shall be provided with a tee or baffle. The outlet shall be provided with a tee or baffle that extends into the middle third of the water depth to prevent floating or settled solids from carrying over into the disposal field or bed. The inlet pipe shall be at least three inches higher than the outlet pipe.~~

~~(B) If the septic tank is partitioned, the volume of the first compartment must be at least 50 percent of the total required volume. The partition shall allow venting of the tank.~~

~~(C) The outlet elevation shall be designed to provide a distance of 20 percent of the liquid depth between the top of the liquid and the bottom of the septic tank cover for scum storage.~~

~~(iv) Access. A manway access shall be provided to each compartment of the septic tank for inspection and cleaning. The manway access shall have a minimum opening of 20 inches in the least dimension. Both inlet and outlet devices shall be accessible. A cleanout having a minimum diameter of six inches shall be provided in each tank compartment and shall extend to the ground surface and be capped.~~

~~(v) Installation. The septic tank shall be placed on a level grade and a firm bedding to prevent settling.~~

~~(b) Aerobic units.~~

~~(i) Residential units serving no more than four dwelling units. Aerobic treatment units can be used as a pretreatment device for a single residential unit serving no more than four families provided the unit carries the seal of testing and approval from the National Sanitation Foundation (NSF) for the NSF Standard No. 40 - 1978. The unit shall be sized based on the flow quantities stated in Section 34. No reduction in the sizing of soil absorption systems or the final treatment systems shall be permitted if an aerobic unit is used instead of a septic tank.~~

~~(ii) Commercial and residential units serving more than four families. Aerobic units treating wastewater generated from other than a single residential unit serving four families or less shall meet the design requirements of Part B or Part C of Chapter XI.~~

~~(c) Interceptors - grease, oil, silt and sand.~~

~~(i) When required. Liquid wastes containing grease, oil, or silt and sand shall provide an interceptor before the septic tank. Waste streams from residential living units are exempt from this requirement.~~

~~(ii) Material. The interceptor shall meet the material requirements of Section 39 (a)(i).~~

~~(iii) Sizing. Interceptors shall be sized using one of the following formulas:~~

~~Commercial kitchens (grease, garbage)~~

~~number meals/peak hour~~	**~~X~~**	**~~waste flow rate*~~**	**~~X~~**	**~~retention time**~~**	**~~X~~**	**~~storage factor***~~**	**=**	**~~interceptor size (liquid capacity)~~**

~~Car wash (sand, silt, oil)~~

~~Total washer equipment flow rate*~~	**~~X~~**	**~~60~~**	**~~X~~**	**~~Retention time**~~**	**~~X~~**	**~~Storage factor***~~**	**=**	**~~Interceptor size (liquid capacity)~~**

~~Laundries (grease, lint, silt)~~

~~# cycles/machine/hr~~	**~~X~~**	**~~waste flow rate*~~**	**~~X~~**	**~~retention time**~~**	**~~X~~**	**~~storage factor***~~**	**=**	**~~Interceptor size (liquid capacity)~~**

~~*Waste flow rate - see Table 1.~~

~~ Retention Times -~~**

~~Commercial kitchen waste:~~	
~~Dishwasher and/or disposal~~	~~2. 5 hours~~
~~Single service kitchen:~~	
~~Single serving with disposal~~	~~1. 5 hours~~
~~Car washers~~	~~2. 0 hours~~
~~Laundries~~	~~2. 0 hours~~

~~*Storage Factors~~**

~~Fully equipped commercial kitchen~~	
~~8 hr. operation:~~	~~1~~
~~16 hr. operation:~~	~~2~~
~~24 hr. operation:~~	~~3~~
~~Single service kitchen~~	~~1. 5~~
~~Carwashers~~	
~~self-serve:~~	~~1. 5~~
~~employee operated:~~	~~2~~
~~Laundries (allows for rock filters)~~	~~1. 5 (~~

~~(iv) Configuration. Interceptors shall have a minimum of two compartments with the first compartment having at least 50 percent of the total required volume. Each compartment shall be vented.~~

~~(v) Access. The access shall meet the requirements of Section 39(a)(iv).~~

~~(vi) Location. Interceptors shall be located so that they are easily accessible for inspection, cleaning, and removal of the collected wastes. Interceptors shall be placed as close as practical to the fixture it serves. The wastewater from fixtures not producing grease, oil, or sand and silt shall bypass the interceptor.~~

~~Section 40. Dosing Systems Following Septic Tanks.~~

~~(a) Pumping systems for flow up to 2000 gallons per day.~~

~~(i) Pump tank. Where only one pump is provided, the pump tank shall have the minimum volume as required in Table 4 below. The tank shall comply with the material requirements for septic tanks. The pump tank shall be vented. The vent shall have a downward turn that terminates at least 12 inches above ground and be provided with a screen. The pump tank shall have an access manhole provided with an opening at least 20 inches in least dimension.~~

~~Table 4~~

~~Pump Tank~~

~~Volume (gallons) Required Between~~

~~AVERAGE FLOWS (gallons per day)~~	~~"OFF" & "ON" SWITCH~~	~~"ON" & "ALARM" SWITCH~~	~~"ALARM" SWITCH & TANK INLET~~	~~RECOMMENDED PUMP CAPACITY (gpm)~~
~~0-499~~	~~100~~	~~50~~	~~200~~	~~10~~
~~500-900~~	~~200~~	~~100~~	~~400~~	~~20~~
~~1000-1499~~	~~300~~	~~100~~	~~600~~	~~30~~
~~1500-2000~~	~~400~~	~~100~~	~~800~~	~~40~~

~~(ii) Pumps.~~

~~(A) Sizing. The pump shall have a flow rate of at least ten gallons per minute when installed. The pressure loss (feet of head) of the system can be calculated by adding: the elevation difference between the discharge outlet at the soil absorption system and the low water level in the pump tank; and the friction losses incurred in the pressure transfer pipe and distribution piping. Table 5 may be used to estimate the head loss of the pipe when pumping ten gallons per minute and using plastic pipe.~~

~~Table 5~~

~~Diameter (inches)~~	~~Head Loss per 100 feet of pipe (in feet)~~
~~1~~	~~12~~
~~1 ¾~~	~~4~~
~~1 ½~~	~~2~~

~~(B) Installation/removal. The pump shall be installed in the tank so that it can be removed without entering the tank. This can be accomplished by (1) looping the pipe up near the access manhole with a pipe union provided at the top of the loop, (2) using a quick disconnect sliding coupler, or (3) using a pitless adapter. Chains, cable, or piping can be used to lift the pump out of the tank if designed for this loading. Setting the pump on an 8-inch block minimizes the transfer of any solids that may enter the pump tank.~~

~~(C) Electrical controls. The electrical control system for the wastewater pump shall consist of a "pump off" switch, a "pump on" switch, and a "high water alarm" switch which shall be located to provide the necessary volumes as stated in Table 4. All electrical controls (pump electrical cord, switches, etc.) shall comply with the National Electrical Code - 1981, Class 1, Group D, Division 1 locations. All openings around the cables or cords entering the tank shall be sealed.~~

~~(iii) Pressure transfer pipe. The pressure transfer piping between the tank and the leach system shall be designed to drain after each pump cycle to prevent freezing. This can be accomplished by either eliminating the check valve at the pump or by providing a weep hole in the pipe in the tank. If the pipe is long, the tank shall be enlarged by the volume of the pipe. to accommodate the volume of liquid drained from the pipe.~~

~~(b) Syphons. Where automatic syphons are used, they shall be designed to empty the syphon tank in less than 20 minutes. The syphon tank shall be sized in accordance with Section 40(a)(i) above.~~

~~(c) For all systems exceeding 2000 gallons per day. The pumping system shall comply with the standards of Part B of Chapter XI.~~

~~Section 41. Subsurface Treatment and Disposal Systems.~~

~~(a) General requirements.~~

~~(i) Replacement area. .An area shall be designated and shown on the plans for future installation of a replacement absorption system. If a trench system is used, the replacement area may include the area between the trenches if sufficient spacing has been provided. At least three feet of undisturbed soil shall remain between the existing and replacement trench side walls.~~

~~(ii) Protection. Effort shall be made to protect the natural absorptive properties of the soil. Soil absorption systems shall not be installed during adverse weather or soil conditions. Rain, severely cold temperatures, or excessively moist soils are considered adverse weather or soil conditions. All smeared or compacted surfaces shall be restored to their original infiltrative conditions prior to placement of the stone.~~

~~(iii) Runoff. Surface runoff shall be diverted around or away from all soil absorption systems.~~

~~(iv) Stone. Soil absorption system stone shall be sized between 1/2-inch to 2 1/2inches. At least two inches of stone shall be placed over the distribution pipe, and at least six inches of stone shall be placed under and beside the distribution piping. A minimum of 12 inches of stone shall be placed between a seepage pit wall and structural liner. The stone shall be free from sand, silt, and clay.~~

~~(v) Gravity pipe. All plastic gravity absorption system pipes shall have a minimum diameter of four inches and shall conform to ASTM standard D2729. Piping in all horizontally constructed absorption systems shall be layed with the holes centered around the vertical axis at the bottom of the pipe.~~

~~All field tile pipe shall be spaced 1/4 inch apart. Piping in horizontally constructed absorption systems shall have a maximum slope of three inches per 100 feet.~~

~~(vi) Pressure pipe. All pressure distribution piping shall be designed to withstand the anticipated pressures with a safety factor of two, provide uniform application of the wastewater, and have non-clogging orifices.~~

~~(vii) Distribution box. If a distribution box is used, it shall be installed to provide uniform distribution of the wastewater and shall be placed so that it will not be subject to frost heave.~~

~~(viii) Stone cover. A suitable cover such as untreated building paper, filter cloth, or straw shall be placed over the stone prior to backfilling the system.~~

~~(ix) Earth cover. A minimum of 12 inches of earth shall be placed over the absorption system stone. The earth shall be permeable soil that will allow aeration of the system and will support the growth of grass. The earth cover shall be graded to insure that water will not pond on the surface.~~

~~(x) Levelness. The bottom of soil absorption systems and each segment of a sidehill system shall be level.~~

~~(b) Special requirements for seepage pits. If a structural lining is needed to support stone in a seepage pit, it shall be constructed of durable material not subject to excessive corrosion or decay and structurally capable of supporting the loads to which it will be subjected. The lining shall be perforated or otherwise designed to allow the passage of wastewater. Seepage pits shall be separated by a minimum distance equal to 3 times their diameter.~~

~~(c) Special requirements for mounded systems.~~

~~(i) Sizing.~~

~~(A) The infiltrative surface between the stone and the fill material shall be sized based on the flow rate as determined by Section 34 and the allowable loading rate as determined by Figure 7 of Section 38 for the percolation rate of the fill. The total infiltrative surface is the sum of the sidewall and bottom areas of the stone - soil interface below the distribution pipe.~~

~~(B) The interface area between the fill soil and the native soil shall be sized based on the infiltration rate of the native soil as determined by Figure 7 of Section 38 but shall not be smaller than a system designed to the requirements of subsection (ii) below.~~

~~(ii) Grade. The finished grade shall extend at least three feet horizontally beyond the stone and then be sloped to the parent soil at a grade no steeper than four horizontal to one vertical.~~

~~(iii) Fill soil. The fill soil that is placed between the native soil and the stone shall have a minimum percolation rate of five minutes per inch. Topsoil shall be placed over the mound to promote vegetative cover.~~

~~(iv) Preparation. All trees, roots, and other organic matter shall be removed from the area to be occupied by the mound.~~

~~(d) Special requirements for trench systems. A minimum separation of three feet or a horizontal distance equal to 1.25 times the vertical depth of the trenches, whichever is greater, of undisturbed soil shall be maintained between adjacent trench sidewalls.~~

~~(e) Special requirements for serial sidehill trench or bed systems.~~

~~(i) Separation. A minimum of three feet of undisturbed soil shall be maintained between adjacent trench or bed side walls.~~

~~(ii) Levelness. The bottom of each serial trench or bed system shall be level.~~

~~(iii) Overflow. The overflow pipe between serial leach systems shall be set no higher than the mid-point of the upstream distribution pipe. The overflow pipe shall not be perforated.~~

~~(f) Special requirement for bed systems. The distribution system piping shall be spaced no more than 10 feet apart.~~

~~Section 42. Evapotranspiration Beds.~~

~~(a) Sizing. The area of evapotranspiration beds shall be determined using the following formula:~~

$$AREA = 586\left[\frac{Q}{PET - P}\right]$$

~~where:~~

~~Area = Area of the evapotranspiration bed at the ground surface in square feet~~

~~Q = Average daily sewage flow, gallons per day, (0.6 times the flow determined from Table 1)~~

~~PET = Potential evapotranspiration rate in inches per year~~

~~P = Annual precipitation rate in inches per year~~

~~(b) Construction.~~

~~(i) If an impervious barrier is necessary for the protection of groundwater it shall be installed between the evapotranspiration bed and the native soil. It shall be a polyvinyl chloride sheet with a minimum thickness of 20 mils or equivalent. A 3 inch layer of sand shall be placed under and over the liner.~~

~~(ii) The bottom 12 inches of the bed shall be filled with clean stone 1/2 - 2 1/2 inches in diameter.~~

~~(iii) Perforated pipe complying with Section 41(a)(v) shall be placed in the stone.~~

~~(iv) Four inches of pea gravel (less than 1/4-inch in diameter) or durable filter cloth shall be placed over the stone.~~

~~(v) A 24-inch uniform sand layer in the size range of D50 (0.10mm) shall be placed on top of the pea gravel or filter cloth.~~

~~(vi) A six inch layer of sandy topsoil shall be placed on top of the evapotranspiration bed.~~

~~(vii) The bed should be vegetated with small shrubs and/or grasses such as fescue, brome, or alfalfa.~~

~~(viii) The evapotranspiration bed shall be placed at a depth sufficient to prevent surcharging of the septic tank.~~

~~Section 43. Holding Tanks.~~

~~(a) Uses. Holding tanks shall not be used for residential systems when other alternative systems are available, except on a temporary, seasonal or intermittent basis, or when used to correct a failed subsurface disposal system when other alternatives are unavailable. Use of holding tanks for new construction is prohibited. Where holding tanks are allowed, they shall be sized on the basis of seven days storage at the flow rate determined from Table 1.~~

~~(b) Acceptance. A letter of verification from the local receiving agency, denoting acceptance of the wastewater generated shall be submitted with the plans.~~

~~(c) Location. The location and construction of holding tanks shall meet the requirements for septic tanks in Sections 35(a)(i) and Section 39(a)(i) respectively.~~

~~(d) Vent. Each holding tank shall be provided with a two inch minimum diameter vent ending in a return elbow above final grade. The vent shall terminate at least 30 feet from any door, window, or fresh air inlet. The vent should be screened.~~

~~(e) Alarm. All holding tanks shall be equipped with a high water level alarm. The device shall be an audible alarm or an indoor illuminated alarm. The alarm level shall be placed at 3/4 the depth of the tank.~~

~~(f) Pumpout. A six inch pump out pipe which extends to the surface shall be provided. It shall be capped at all times.~~

~~Section 44. Privies.~~

~~(a) General requirements.~~

~~(i) All privies shall be designed and constructed to prevent access by flies and rodents.~~

~~(ii) If indoor plumbing is installed, the grey water disposal method shall meet the requirements of Section 34 through 43. The minimum design flow for grey water shall be obtained from Table 1 with a reduction of 33 percent allowed for the elimination of black wastes.~~

~~(iii) The privy shall consist of a vault and an outhouse building.~~

~~(b) Isolation. The isolation requirements for privies shall comply with Section 35(a)(i) for absorption systems.~~

~~(c) Soil exploration. Soil exploration to a minimum depth of 4 feet below the bottom of the proposed vault shall be made to provide information on subsoil condition.~~

~~(d) Groundwater and bedrock separation.~~

~~(i) The depth to seasonally high groundwater and bedrock or impermeable soil shall be at least four feet from the bottom of an unlined vault.~~

~~(ii) The depth to seasonally high groundwater from the bottom of a water tight vault shall be sufficient to prevent floatation of the empty vault.~~

~~(e) Sizing. Vaults shall have a minimum capacity of 500 gallons per riser and shall be a minimum of 4.5 feet deep.~~

~~(f) Construction.~~

~~(i) The vault shall be constructed and installed to resist breakage and damage imposed by frost heave, uplift pressures from a fluctuating water table, loads imposed by the outhouse building and soils, and damage that may be caused by vandalism or rough cleaning procedures. The vault shall be constructed to prevent access by flies.~~

~~(ii) Materials used for vault construction shall be resistant to alkali attack, hydrogen sulfide gas, and other corrosive elements associated with decomposing waste.~~

~~(iii) A clean-out manhole shall be installed and shall have a minimum opening of 20 inches in the least dimension. The manhole shall be located outside of the outhouse building and be equipped with a tightfitting secure cover.~~

~~(iv) The vault shall be ventilated to a point outside and above the outhouse building. The outhouse building shall have a set of vents installed near the floor on two opposite sides of the building and a roof vent that has a rain cap. All vents shall be screened.~~

~~(g) Vault additives. No chemical or biological additive shall be placed in the vault that may adversely effect the operation of a sewage treatment facility where the vault waste will ultimately be disposed or that may adversely impact the quality of the groundwater as specified in Chapter VIII, "Quality Standards for Groundwater of Wyoming".~~

~~Section 45. Chemical Toilets.~~

~~(a) General requirements. Chemical toilets shall only be used in the containment of body wastes. These requirements apply only to the use of chemical toilets for permanent structures.~~

~~(b) Greywater. If indoor plumbing is installed, a separate greywater disposal is required and shall meet the requirements of Section 34 through 43. The minimum design flows for greywater shall be obtained from Table 1 with a reduction of 33 percent allowed for the elimination of blackwater wastes.~~

~~(c) Disposal. All chemical toilet wastes shall be disposed of at an approved wastewater facility. A letter of verification from the receiving agency, denoting acceptance of the wastewater generated shall be submitted with the plans. These wastes shall not be discharged into a soil absorption system.~~

~~(d) Construction. Chemical toilets shall be constructed and installed to resist breakage or damage from routine usage. Outdoor chemical toilets shall be adequately stabilized and secured to prevent overturning. Materials used shall be resistant to the sewage wastes and the chemicals encountered. The holding compartment of the toilet shall be constructed to prevent accessibility to the public and to disease transmitting vectors.~~

~~(e) Additives. No chemical or biological additive shall be placed in the toilet that may adversely affect the operation of a sewage treatment facility where the toilet waste will ultimately be disposed or that may adversely impact the quality of the groundwater as specified in Chapter VIII, "Quality Standards for Groundwater of Wyoming."~~

~~Section 46. Small Non-discharging Waste Stabilization Ponds.~~

~~(a) General requirements.~~

~~(i) The use of this section for small nondischarging waste stabilization ponds applies only to those systems defined as small wastewater systems. All other treatment systems shall meet the requirements of Part B or Part C of Chapter XI as applicable.~~

~~(ii) Non-discharging waste stabilization ponds shall only be constructed in soils where the percolation rate exceeds 60 minutes per inch and the soil is at least 1 foot thick on both the sides and bottom of the pond. If the 60 minute per inch percolation rate cannot be obtained, a sufficient clay shall be incorporated into the top foot of soil until the 60 minute per inch percolation rate is reached. An impermeable artificial liner of 20 mils in thickness may be substituted.~~

~~(b) Isolation. The isolation distances shall meet the requirements for absorption systems as specified in Section 35(a)(i).~~

~~(c) Groundwater protection and bedrock or impermeable soil separation.~~

~~(i) For single family homes, the depth to seasonally high groundwater shall be at least four feet from the bottom of pond.~~

~~(ii) For all "small wastewater systems" other than single family homes, a minimum of three feet of unsaturated soil shall be maintained between the bottom of the pond and the estimated groundwater mound imposed on the seasonally high groundwater table. The height of the groundwater mound can be estimated from Figures 1-6, Section 36 in conjunction with the average daily sewage flow.~~

~~(d) Sizing.~~

~~(i) The area of the lagoon shall be calculated based on the following formula:~~

$$\cancel{A = \frac{586 \times Q}{(365 \times S) + (E - P)} \times 1.3}$$

~~A = Area of the lagoon at the 5 foot water level in square feet~~

~~Q = Average daily sewage flow, gallons per day, (0.6 times the flow determined from Table 1)~~

~~S = Soil permeability in inches per day "S" cannot be greater than 0.25 inches per day "S" shall equal zero for an artificial liner or for bedrock~~

~~E = Annual evaporation rate in inches per year~~

~~P = Annual precipitation rate in inches per year~~

~~(ii) A minimum water level of at least two feet shall be maintained in the pond at all times, including start-up.~~

~~(iii) A minimum free board of two feet shall be provided between the lowest embankment berm and the maximum water level. The maximum water level shall not be less than five feet.~~

~~(e) Construction requirements.~~

~~(i) The slopes of the inside dikes shall not be steeper than three horizontal to one vertical nor flatter than four horizontal to one vertical. The slopes of the outside dikes shall not be steeper than three horizontal to one vertical and shall not allow surface runoff to enter the pond.~~

~~(ii) All organic material and debris shall be removed from the pond site prior to construction.~~

~~(iii) All fill material shall consist of impervious material that is well compacted and free of rocks, frozen soil, or other large material.~~

~~(iv) The minimum top width of the dike shall be eight feet.~~

~~Section 47. Commercial/Industrial Wastes.~~

~~(a) General requirements. Those requirements listed in Section 32 through 43 and 46 that are applicable to the specific commercial/industrial wastewater or combination of commercial/industrial and domestic wastewater shall apply to this section.~~

~~(b) Hydrogeologic investigation. If the wastewater is classified as, or determined to be hazardous and/or toxic and/or contain petroleum products, the applicant shall demonstrate to the administrator that any discharge or seepage from the wastewater facility will not cause a violation of the surface and/or groundwaters of the state in accordance with Chapter I, "Quality Standards for Wyoming Surface Waters" and Chapter VIII, "Quality Standards for Wyoming Groundwaters." Due to the wide variety of wastes, wastewater and site conditions, the latest available scientific information shall be used to demonstrate that violation will not occur.~~

~~(c) Impact. If the impact of the hazardous and/or toxic substance and/or petroleum products cannot be determined and mitigated, disposal of the wastewater using a soil absorption system shall be prohibited.~~

~~(d) Pre-treatment. Pre-treatment of the wastewater to remove the hazardous and/or toxic substance(s)and/or petroleum products shall be required prior to disposal if deemed necessary to protect the groundwater of the state.~~

~~APPENDIX A Percolation Test Procedure~~

~~(a) Location. The percolation test holes shall be spaced uniformly over the proposed absorption field site. A minimum of three test holes are required.~~

~~(b) Preparation. A 4 inch to 12 inch hole shall be dug or bored to the proposed depth of the absorption field. The walls shall be vertical. To expose a natural soil surface, the sides and bottom shall be scraped with a sharp pointed instrument and the loose material shall be removed from the hole. Coarse sand or gravel shall be placed in the bottom of the hole to prevent it from scouring and sealing.~~

~~(c) Presoaking. The purpose of presoaking is to have the water conditions in the soil reach a stable condition similar to that which exists during continual wastewater application. The minimum time of presoaking varies with soil conditions but must be sufficiently long so that the water seeps away at a constant rate. The following presoaking instructions are usually sufficient to obtain a constant rate.~~

~~(i) In sandy soils, place 12 inches of water in the hole and allow it to seep away. Fill the hole again with 12 inches of water and if the water seeps away in ten minutes or less, it indicates that the soil is excessively permeable and requirements in Section 36(d) of these regulations shall be followed. If the water remains after ten minutes, additional saturation is necessary. Refer to Appendix A(c)(ii) below.~~

~~(ii) In other soils, maintain 12 inches of water in the hole for at least four hours. After the four hours of water contact, allow the soil to swell for 12 hours before starting the percolation rate measurement as stated in Appendix A (d) below.~~

~~(d) Percolation rate measurement. The water level should be adjusted to six inches above the gravel initially and after each time interval measurement when necessary.~~

~~(i) In other soils, establish a fixed reference point and measure the drop in water level at constant intervals. The water level drop should be measured to the nearest 1/8 of an inch. The test may be terminated when the water drop is consistent for three consecutive measurements.~~

~~(ii) The percolation rate for each hole is calculated as follows:~~

$$\cancel{\frac{\text{Time Interval (Minutes)}}{\text{Final Water Level Drop (inches)}} = \text{Percolation Rate (minutes/inch)}}$$

~~If only three to five percolation tests are performed, the design percolation rate for the absorption system is the slowest rate from all the holes tested. If six or more percolation tests are performed, the design percolation rate for the absorption system is the average of all the holes tested as determined by the above formula.~~

PART E

WASTE AND WASTEWATER LAND APPLICATION FACILITIES

Section 48. General. This part contains the minimum standards for the design and construction of waste and wastewater land application facilities.

Section 49. Definitions Specific to Part E.

(a) "Direct consumption" or "direct food chain crops" means vegetable, grain or fruit crops grown for direct human consumption.

(b) "Indirect food chain crops" means forage or grain crops utilized by grazing animals and thereby one step removed from human consumption.

(c) "Land application/treatment" is the application of wastes or wastewater to the land at a predetermined rate for the purpose of renovation by any or all of the following processes: chemical and microbial degradation, plant uptake and assimilation, or soil adsorption and accumulation in the profile.

(d) "Overland flow land application system" is a system in which treatment is accomplished by the application of wastewater to a sloping, largely impermeable site. Treatment mechanisms include filtration, sedimentation, microbial oxidation, and crop uptake. Typical application rates range from 0.0392-0.3136 yd3/yd/hr.

(e) "Primary treatment level" (as related to pathogenic organism reduction) is that level of fecal coliform reduction (a minimum of 25 percent reduction) achieveable by primary sedimentation in single cell discharging lagoons operated within the limits described in Part B, Section 13(c).

(f) "Rapid infiltration system" is a land application system in which treatment is accomplished by the percolation of large quantities of wastewater through a sufficient depth of coarse or highly permeable soil profile. Treatment is accomplished by filtration, microbial oxidation (which may include nitrification denitrification), and soil adsorption. Application rates for these systems generally exceed four inches per week, and may exceed 100 inches per week on soils capable of transmitting a range of .30 to 20 inches of water per hour through the most restrictive layer.

(g) "Slow rate land application system" is an irrigation system in which wastewater treatment is achieved chiefly by microbial oxidation (nitrification - denitrification), plant uptake of nutrients and adsorption on soil and organic matter. Application rates for systems in this category range from 0.5-4 inches per week on soils capable of transmitting 0.06-6.0 inches of water per hour through the most restrictive layer.

(h) "Sludge" means any mixture or suspension of liquid and solid wastes having a total suspended solids content greater than ten percent by weight.

(i) "Soil" is the collection of natural bodies occupying parts of the earth's surface that support plants and that have properties due to the integrated effect of climate and living matter acting upon parent material, as conditioned by relief, over periods of time.

Section 50. Site Requirements.

(a) The method for determining the size of a particular land site for accomplishing the treatment level necessary to comply with an NPDES permit or to maintain a groundwater aquifer within its present class shall be based on the number of acres (hectares) required to reduce the waste constituent identified as requiring the largest land area, based on soil assimilative capacity. The ratio used for this determination is expressed as:

Required Land Treatment Area = G/C

Where:

G = generation rate = the yearly amount of the controlling constitutent to be applied for land treatment. G is listed in kilograms per year (kg/yr) or pounds per year (lbs/yr).

C = plant-soil assimilative capacity = to the yearly amount of the control ling constituent which can be assimilated by plant uptake, soil ad sorption and accumulation, transformation or degradation, and allow survival and maintenance of indigenous or crop plant species. C is listed in kilograms per hectare per year (kg/ha/yr) or pounds per acre per year (lbs/ac/yr).

Wastewater constituents or categories of constituents from which the land-limiting factor will be selected are generally grouped as:

Organics	Nitrogen
Phosphorus	Heavy metals
Salts, acids and bases	Water
Oil and grease	

(b Slope. Slow rate irrigation systems (generally less than 4.0 inches/wk application rate) will not be developed on slopes greater than 15 percent unless the site is terraced, gated pipe is placed on the contour, or vegetation, application rate and soil infiltration rate are such that runoff and erosion would not result.

Overland flow systems will not be developed on sites having less than two percent or greater than eight percent slope.

(c) Soil profile. The minimum depth of unsaturated soil strata on which a land treatment system may be developed is five feet for a slowrate system and ten feet for a rapid infiltration system, unless underdrains or pumped recovery wells are employed for lowering the water table. The applicant should refer to Part A, Section 5 for innovative technology permit requirements.

(d) Runoff and erosion. All land treatment sites will be protected from upslope runoff by diversion ditches capable of intercepting the overland flow from a 10 - year 24 - hour storm event, unless it is otherwise demonstrated that a storm of this size will not have an impact on the site. A runoff collection ditch is required at the base of overland flow slopes or on sloping irrigation sites where site conditions are such that overapplication of wastewater and/or seasonal precipitation events may threaten to pollute surface waters of the state. Provisions for storage, return and reapplication are required where a runoff collection ditch is required.

Section 51. Pretreatment Water Quality Requirement. Pretreatment of wastewater shall provide sufficient organic and inorganic solids reduction, maintaining the estimated infiltration rate of the soil surface.

Section 52. Disinfection and Pathogen Control. Waste water effluent containing pathogenic organisms to be sprayed on agricultural lands supporting indirect food chain crops must achieve fecal coliform limits of 1000 colonies/100 ml (30 day geometric mean) before spray irrigation.

Wastewater containing pathogenic organisms that is surface applied to agricultural lands supporting indirect food chain crops must achieve a fecal coliform reduction equivalent to the primary treatment level (see Section 2(e)).

Wastewater effluent containing pathogenic organisms that is to be used for surface or spray irrigation of direct human consumption crops or for irrigation of golf courses, highway rest areas and rights-of-way (R.O.W.s), parks, playgrounds or similar domestic, commercial and industrial zones must achieve fecal coliform limits of 200/100 ml by positive disinfection.

Section 53. Buffer Zone. A buffer strip of varying width is required around all land treatment sites located within one- fourth mile upwind of current residential, commercial or industrial development where wastewater containing pathogenic organisms or capable of producing odors is to be spray irrigated. A 100 foot buffer zone is required for the spray irrigation of secondary municipal effluent. A 150 foot buffer zone is required around sites sprayed with primary municipal effluent.

The minimum allowable buffer strip for spray irrigation of wastewaters not containing pathogenic organisms or odor-producing substances is 30 feet.

Section 54. Land Application of Municipal Sewage Sludge and Septic Tank Pumpings. Before municipal sewage sludge and septic tank pumpings can be applied to soils, minimum public health criteria must be met with respect to reduction of pathogenic organisms, limitation of PCBs, and limitation of cadmium and other heavy metals.

(a) Reduction of pathogens. Sludges applied to a land surface or soil incorporated must undergo a Process to Significantly Reduce Pathogens(PSRP) before application.

PSRPs may include, but not be limited to, any one of the following:

(i) Anaerobic digestion - with a solids retention time (SRT) of eight to ten days at 95° F (35°C).

(ii) Aerobic digestion - minimum volatile solids reduction of 40 percent by any combination of time and temperature in the digester resulting in 475 degree days stabilization. (A minimum digester liquid temperature is approximately 40°F (4.4°C) resulting in a maximum winter retention of 108 days).

(iii) Windrow Composting - maintenance of pile temperatures at 131°F (55°C) for two days or 140°F(60°C) for .5 days to achieve approximately a 15 log reduction of the f2 bacteriophage, as monitored at the coldest pile location.

(iv) Individual static or extended aerated pile composting - according to the design developed by researchers at Beltsville, Md. A standard for destruction of pathogens is the maintenance of pile temperatures at approximately 68°C (154°F) for 10 days followed by storage in a curing pile for 30 days.

(v) Lime stabilization - addition of sufficient quantities of lime to maintain the pH at 12 for two hours.

(vi) Chlorine oxidation - the required chlorine is dependent on the type of sludge and percent solids, as follows:

Type of Sludge	percent SS	Chlorine Requirement lb/1000 gal
Primary Sludge	4.0	17
Waste-activated sludge with		
prior primary treatment	0.7	7
no primary treatment	0.7	7
from contact stabilization	0.7	7
Sludge from low and high rate trickling filters	1.0	10
Digester supernatant	0.3	20-010
Septage	1.2	6

From: R.C. Neal of BIF
1 lb/1,000 gal = 0.12 kg/l

In addition, public access to the site must be restricted for 12 months and access by grazing animals restricted for one month. If crops for direct human consumption are grown within 18 months after the application, the sludge must not come into direct contact with the edible portion of the crop.

Septic tank pumpings that are to be land applied must undergo a PSRP unless public access to the site is restricted for 12 months and grazing animal access is restricted for one month.

Where sludge or septic tank pumpings do come into direct contact with the edible portion of a direct consumption crop, or were dried sludge (greater than 40 percent solids) is utilized on parks, golf courses, highway R.O.W.s, or made available to the general public, the sludge or septage must undergo a Process to Further Reduce Pathogens (PFRP).

Disclaimer: Sludge or septage that has been subjected to a PFRP is considered to have an insignificant pathogenic organism content; such sludge is not, however, considered to be 100 percent pathogen free.

PFRPs may include, but not be limited to, any one of the following:

(i) Composting - storage for three months following windrowing, pile composting, or any previously mentioned PSRP.

(ii) Heat drying - use of a flash or rotary kiln drier. (iii) Pasteurization - at 158° F (70° C) for 30 minutes.

(iv) Lime conditioning - of stabilized sludge to pH of10.2-11.

(v) Gamma ray irradiation - 400 krads or greater dosage with Ce-137 or Co-60 source for dried, composted sludge of approximately 80 percent solids.

(vi) Electron beam (beta irradiation) - 400 krads dosage for liquid digested sludge.

(b) PCBs (Polychlorinated Biphenyls). Sludges containing greater than 10 mg/kg of PCBs that are land applied where a crop is grown for animal feed or pasture must be soil incorporated unless the annual application is less than 0.4 lbs/acre.

(c) Cadmium and other heavy metals.

(i) Sludges containing a significant quantity (greater than 2 mg/kg) of cadmium may be applied to land where direct human consumption crops are grown if the background soil pH is 6.5 or greater and the sludge pH is 6.2 or greater.

(ii) The maximum annual cadmium application rate to land where any direct human consumption crops are grown must not exceed 0.5 kg/ha (0.44 lbs/acre).

(iii) In addition, maximum cumulative cadmium application to any given land site where direct food chain crops are grown or capable of being grown shall not exceed 5 kg/ha (4.4 lb/ ac) for a soil with cation exchange capacity less than 5 meq/100 g, 10 kg/ha (8.9 lbs/ac) for a soil with a cation exchange capacity of 5-15 meq/100 g and 20 kg/ha (17.8 lbs/ac) when the cation exchange capacity is greater than 15 meq/100 g. Maximum cumulative loadings of other metals based on soil cation exchange capacity are as follows:

Soil Cation Exchange Capacity
(meq/100 gms)

lbs/acre

Metal	<5	5-10	15
Lead	500	1000	2000
Zinc	250	500	1000
Copper	125	250	500
Nickel	50	100	200

(iv) Where the background soil pH is less than 6.5 and is adjusted by amendment (e.g. limestone) above that level, the following requirements must be met:

(A) Only indirect food chain crops (animal feed) may be grown, or

(B) Soil pH must be maintained at 6.5 or greater when sludge is applied or when the direct consumption crop is planted.

(C) The metal application rates in Section 54 (c) (i)-(iii) apply.

(v) Where the background soil pH is less than 6.5 and no adjustment is planned, the following requirements must be met:

(A) Only indirect food chain crops (animal feed) may be grown.

(B) The annual cadmium application rate shall not exceed 0.5 kg/ha (0.44 lbs/acre)

(C) The maximum cumulative cadmium application shall not exceed 5 kg/ha (4.4 lbs/ac).

(D) Maximum cumulative applications of lead, zinc, copper and nickel shall not exceed 500, 250, 125 and 50 lbs/acre respectively, regardless of the cation exchange capacity of the soil.

(d) Site limitations.

(i) Sludge and septage must not be applied to sites with a slope greater than five percent whether or not it is soil incorporated, unless the site is protected by a runoff collection ditch, in which case the site slope must not exceed eight percent. Sludge or septage application to frozen or snow-covered ground will require the installation of a runoff collection ditch on slopes greater than three percent.

(ii) Sludge application sites must be located a minimum distance of 300 feet from the definable high water line of all surface water bodies unless the sludge is subsurface injected, in which case the above distance is reduced to 50 feet.

(iii) Sludge application sites must be located a minimum distance of 300 feet from any public water supply wells, whether surface applied or subsurface injected.

(iv) Sludge application sites must be located a minimum distance of 1500 feet from residential developments, unless the sludge is subsurface injected, in which case the above distance reduces to 300 feet.

(v) Sludge application sites must be located a minimum distance of 300 feet from nonresidential developments or public road R.O.W.s, unless the sludge is subsurface injected, in which case the above distance reduces to 50 feet.

Section 55. Irrigation Water Quality.

(a) The surface infiltration rate and hydraulic conductivity of the soil profile shall be approximated by the appropriate tests and used in determining an average annual application rate.

(b) Indigenous or crop plant species shall be capable of survival and maintenance under the conditions of increased soil moisture, salinity, and alkalinity, the classes of which will be determined by use of Figure 1, Tables 1-3 and a soil textural analysis. Waste and wastewater analyses required for this evaluation include electrical conductivity (EC in umhos/cm @ 25°C), sodium (Na+), calcium (Ca^{2+}), magnesium (Mg^{2+}), bicarbonate (HCO^{3}), 2- chloride (Cl^{-}), sulfate ($SO4^{2-}$), Boron (B) and Selenium (Se), and calculation of the Sodium Adsorption Ratio (SAR) by use of the formula:

$$SAR = \frac{[Na^{+}]}{\sqrt{\dfrac{[Ca^{2+}] + [Mg^{2+}]}{2}}}$$

(c) Numerical water quality criteria for special situations.

(i) For continuous and unrestricted irrigation of direct consumption crops or of parks, playgrounds, highway rest areas and rights-of-way (R.O.W.s), or domestic, commer cial and industrial grounds with treated municipal wastewater effluent, the following quality criteria shall not be exceeded:

(ii) For disposal of limited volumes of industrial wastewater and sludge of less than 10 percent solids, the following criteria shall not be exceeded:

pH	4.5 - 9.0 s.u.
BOD	10+.0 mg/l Daytime
BOD	30 mg/l Dusk-Dawn
TSS	5.0 mg/l Daytime
TSS	100 mg/l Dusk-Dawn Fecal Coliforms 200/100 ml (positive disinfection)
TDS	480.0 mg/l
Electrical Condutivity, (EC)	750 micromhos/cm@25°C Sodium Adsorption Ratio (SAR 10
Chlorides (Cl-)	213 mg/l
Sulfates (SO42-)	192 mg/l
Bicarbonates (HO3-)	Not greater than 50 percent of the total anion concentration in meq/l
Aluminum (Al)	5.0 mg/l
Arsenic (As)	1.0 mg/l
Beryllium (Be)	0.1 mg/l
Boron (B)	0.6 mg/l
Cadmium (Cd)	0.01 mg/l
Cobalt (Co)	0.5 mg/l
Chromium (Cr)	0.1 mg/l
Copper (Cu)	0.2 mg/l Iron
(Fe)	5.0 mg/l
Lead (Pb)	5.0 mg/l
Lithium (Li)	0.1 mg/l
Manganese (Mn)	10.0 mg/l
Nickel (Ni)	0.2 mg/l
Selenium (Se)	0.1 mg/l
Vanadium (V)	0.1 mg/l
Zinc (Zn)	2.0 mg/l

(ii) For disposal of limited volumes of industrial wastewater and sludge of less than 10 percent solids, the following critieria shall not be exceeded:

pH	4.5 - 9.0 s.u.
Electrical Conductivity (EC)	3,250 micromhos/cm @25°C
Total Dissolved Solids	2,100 mg/l
Sodium Adsorption Ratio (SAR)	26
Potassium	In combination with sodium, will not produce an SAR greater than 26
Chlorides (Cl-)	1,500 mg/l
Sulfates (SO42-)	960 mg/l
Bicarbonates (HCO3-)	Not greater than 50 percent of the total anion concentration, meq/l
Arsenic (as H3AsO4, Arsenious Acid)	0.1 mg/l
Boron (as H3BO3, Boric Acid)	2.0 mg/l
Chromium (Cr)	1.0 mg/l
Copper (Cu)	1.0 mg/l
Nickel (Ni)	0.2 mg/l
Selenium (Se)	0.2 mg/l

Zinc (Zn)	2.0 mg/l
Oil and grease	20,000 lbs/ac when soil incorporated (surface 6 inches) 2,000 lbs/ac when surface applied

(iii) All other continuous disposal land application systems will be approved on a site specific, case by case basis by use of the applicable standards and guidelines.

Section 56. Effluent Quality.

(a) Surface water protection. Discharge from a land treatment system to a surface water body will be regulated by the NPDES permit process.

(b) Groundwater protection. Percolation water from land treatment of waste or wastewater shall not degrade groundwater quality to the point at which it is no longer suitable for its current or potential use as described in Chapter VIII of the Wyoming Water Quality Regulations.

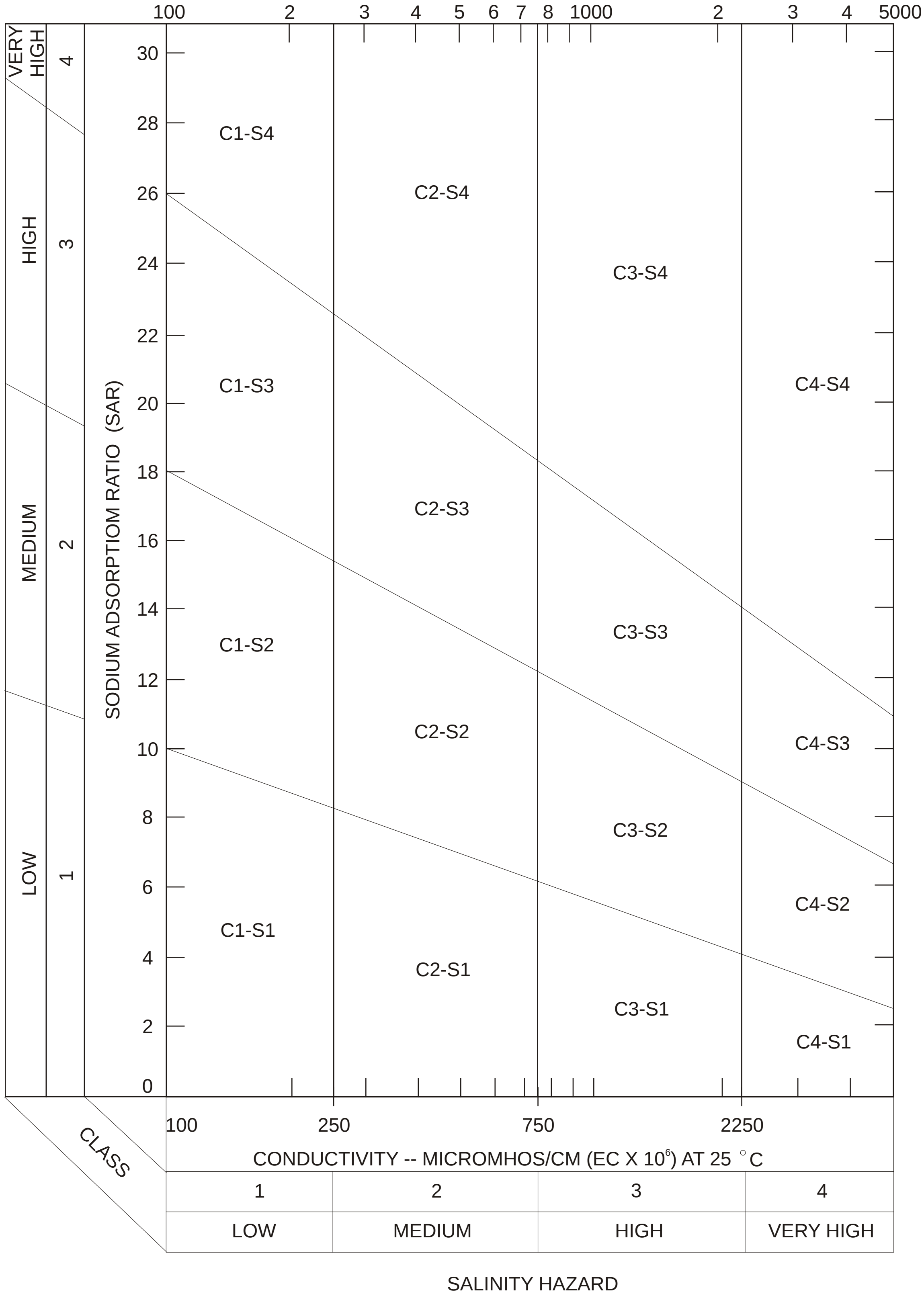


Figure I - Diagram for the classification of irrigation waters

Permissibility Classes for <u>Salinity</u>

Class C1, low salinity: --

Good water with little or no likelihood of salt accumulation under the leaching provided by average irrigation practices, except where sub-surface drainage is inadequate.

Class C2, medium salinity: --

Can be used if a moderate amount of leaching occurs. Plants with moderate salt tolerance can be grown in most cases without special practices for salinity control.

Class C3, high salinity: --

Cannot be used on soils with restricted drainage. With adequate drainage, considerable excess water must be applied to each irrigation; irrigations must be made more frequently, and plants with a good salt tolerance should be selected.

Class C4, very high salinity: --

Not usable under ordinary conditions. On very light and permeable soils with excellent drainage, water may be usable with a large amount of excess leaching water, frequent irrigations, and very salt-tolerant crops.

Permissibility Classes for <u>Alkalinity</u>

Class S1, low sodium: --

Good for almost all soils and all Wyoming crops.

Class S2, medium sodium: --

Can cause alkali problems on heavy clayey soils, with low leaching, unless gypsum (or equivalent soil amendments)are present or added to the soils.

Class S3, high sodium: --

May create harmful levels of exchangeable sodium in all soils and will require special management—good drainage, high leaching, and organic matter additions. Soils containing natural gypsum may not develop alkali troubles. Chemical amendments may be necessary, but are not feasible with waters of very high salinity.

Class S4, very high sodium: --

Generally unsuited for irrigation. Special conditions of low salinity water, favorable gypsum content of soils, tolerant crops, and special management may permit use of these waters.

These water classes are based on recommendations of the United States Regional Salinity Laboratory and numerous state agricultural experiment stations.

TABLE 1 - Boron Class Limits

Class	Limits -- parts per million Sensitive Crops	Semi-tolerant crops	Tolerant crops	Description
1	Below 0.33	Below 0.67	Below 1.00	Very Low. No effect on crops.
2	0.33 – 0.67	0.67 – 1.33	1.00 – 2.00	Low. Very slight effect on crops.
3	0.67 – 1.00	1.33 – 2.00	2.00 – 3.00	Moderate. Significant yield depression.
4	1.00 – 1.25	2.00 – 2.50	3.00 – 3.75	High. Large yield depression anticipated.
5	Over 1.25	Over 2.50	Over 3.75	Very high. Non- usable.

TABLE II - Selenium Class Limits

Class	Limits -- parts per million	Description
1	0.00 – 0.10	Low. No plant toxicity anticipated.
2	0.11 – 0.20	Medium. Usable -- possible long-term accumulation under particular conditions and should be watched
3	0.21 – 0.50	High. Doubtful -- probably toxic accumulation in plants except under especially favorable conditions
4	Over 0.50	Very High. Non-usable under any conditions.

TABLE III. CHLORIDE AND SULFIDE LIMITS FOR THREE CLASSES OF IRRIGATION WATERS

Class	Chlorides		Sulfates	
	meq/l	mg/l	meq/l	mg/l
I. - Excellent to good; or suitable for most plants under most conditions	less than 2-5.5	71.1 - 195.5	4 - 10	192 - 480
II- Good to injurious; harmful to some under certain conditions of soil, climate and practices	2 -16	71.1 - 568.0	4 - 20	192 - 960
III- Injurious to unsatisfactory; unsuitable under most conditions	6 -16	213 - 568	12 - 20	576 - 960

PART F

MOBILE HOME PARK AND CAMPGROUND SEWERAGE AND PUBLIC WATER SUPPLY DISTRIBUTION SYSTEMS

Section 57. General. This part contains the minimum standards for the design and construction of mobile home park and/or campground wastewater facilities and public water supply systems.

Section 58. Sewage System Standards.

(a) If sewerage system services are to be provided by a second person, a letter of verification from the system manager stating that they are capable of handling added organic and/or hydraulic loads shall be provided by the owner/operator of the system.

(b) A mobile home park or campground sewerage system, treatment works and disposal system shall comply with Part A, B, C, and/or D of Chapter XI except as follows:

(i) Mobile home park sewerage systems, treatment works and disposal systems shall be designed on the basis of not less than 350 gallons per site per day. Camp ground sewerage systems, treatment works and disposal systems shall be designed on the basis of not less than 100 gallons per site per day for all sewered sites or 75 gallons per site per day for all unsewered sites.

(ii) Sanitary sewers shall not be smaller than six inches in diameter. They shall be installed at a slope equal to or greater than 0.6 feet per 100 feet.

(iii) Not more than two mobile homes or campground sites shall be served by a sanitary sewer service connection pipe of a least four inches in diameter, provided the main branch of the service pipe is served by a cleanout and provided it is not longer than 50 feet. It shall be installed at a minimum slope of 1/4 inch per foot. The riser portion of the service connection pipe shall be constructed of cast iron or schedule 40 plastic pipe. The riser shall be terminated at least four inches above finished grade and shall not be located closer than five feet from a potable water service riser. The service connection pipe shall connect to the sewerage system at a maximum 45 degree bend in the direction of sewage flow.

(iv) Not more than one mobile home shall be served by a sanitary sewer service riser pipe. The riser shall be located so as to minimize the length of pipe required to connect the mobile home drain. The riser pipe shall be capped or plugged when not in use.

(v) The connection of the mobile home drain to the riser pipe shall be sealed.

(vi) If sewer service is provided to sites in a campground, the sanitary sewer service connection pipe shall comply with subsections (iii) and (iv) above.

(vii) Service connection pipes for campgrounds shall be trapped below the frost line. Section 59. Potable Water Supply Standards.

(a) The potable water distribution system serving any building, mobile home lot, campground site or other appurte nance within a mobile home park or campground which is connected to a public water supply shall be considered an extension or modification of the public supply.

(b) If water is to be obtained from a public water supply, a letter of verification shall be provided from the public water supply system manager stating that the required flow can be supplied at a minimum pressure of 20 pounds per square inch under all conditions of flow throughout the proposed distribution system. A normal working pressure of 35 pounds per square inch shall be maintained in the distribution system.

(c) The public water supply serving mobile home sites, buildings and other facilities within a mobile home park shall be designed, constructed or installed and protected in accordance with Chapter XII of the Water Quality Rules and Regulations, except as follows:

(i) The water supply source shall be capable of supplying the peak water demand to a mobile home park distribution system according to the following table:

Homes	Gallons per Minute
25	65
50	105
75	145
100	180
150	235
200	285
each additional mobile home over 200	1 gpm

(ii) If fire protection is provided, the flow required shall be in addition to the requirements of subsection (i) above.

(iii) Each mobile home shall be provided with a potable water service connection pipe. It shall be 3/4 inch nominal pipe size or larger. The riser portion of the pipe shall be constructed of type K copper or steel pipe from a point below the frost line to the point of connection to the mobile home piping. The riser shall terminate at least four inches above finished grade and shall be protected from damage. The service connection pipe shall be provided with a curb stop below frost penetration. A stop and waste valve with a weep hole below grade shall not be used.

(iv) The distribution system shall be of sufficient size to supply the required volume of water at a minimum pressure of 20 pounds per square inch under all conditions of demand. A working pressure of 35 pounds per square inch shall be maintained under average day demand conditions. The distribution system mains shall not be smaller than 1 1/2 inches in diameter. If fire protection is provided, the distribution system shall meet the requirements of Chapter XII of the Water Quality Rules and Regulations.

(v) If the potable water is pumped to the distribution system from wells or storage facilities, the pumps shall be capable of meeting the maximum day demand with the largest pumping unit out of service.

(vi) Water storage facilities shall be provided when the potable water source cannot meet the peak demand.

(d) The public water supply serving campground sites, buildings and/or other facilities within a campground shall be designed, constructed and protected in accordance with Chapter XII of the Water Quality Rules and Regulations except as follows:

(i) The public water supply source shall be capable of supplying water to a campground distribution system at a rate of 0.5 gpm/site.

(ii) Below ground stop and waste valves with weep holes below ground shall not be permitted.

(iii) A minimum pressure of 20 pounds per square inch shall be maintained throughout the distribution system under all conditions of flow. A working pressure of 35 pounds per square inch shall be maintained under average day demand conditions.

(iv) The distribution piping shall not be smaller than one inch in diameter. Service pipes shall not be smaller than 1/2 inch in diameter.

~~PART G~~

~~WELL CONSTRUCTION~~

~~Section 60. General Information. This part contains minimum standards for design and construction and for the abandonment of wells covered by this part. The applicant or permittee shall provide for design and construction to protect groundwaters of the state in accordance with the water quality standards contained in Chapter VIII, Water Quality Rules and Regulations.~~

~~All American Society for Testing of Materials (ASTM), American Water Works Association (AWWA) and American Petroleum Institute (API) specifications listed are intended to mean the latest revision.~~

~~Section 61. Definitions Specific to Part G.~~

~~(a) "Abandoned well" means a well regulated under this part for which use has been discontinued for more than one year and the owner does not desire to maintain this well for future use; or its use has been permanently discontinued or is in such a state of disrepair that it cannot be used for its intended purpose.~~

~~(b) "Annular space" means the space between the well casing and the wall of the drilled hole or between two well casings.~~

~~(c) "Artificial recharge well" means well constructed to introduce water into the ground as a means of replenishing groundwater basins.~~

~~(d) "Commercial, municipal and industrial waste well" means well constructed to dispose of unusable waste or contaminated water resulting from a commercial activity, municipal collection, storage or treatment facility or an industrial activity.~~

~~(e) "Conductor casing" means a tubular retaining structure installed in the upper portion of a well between the wall of the drilled hole and the inner well casing.~~

~~(f) "Confining formation" means an impermeable bed or a bed of distinctly lower permeability than the adjacent material in which groundwater may be moving.~~

~~(g)"Destroyed well" means a well that has been properly filled so that it cannot produce water nor act as a vertical conduit for the movement of groundwater.~~

~~(h) "Geothermal well" means a well constructed to extract or return water to the ground after it has been used for heating or cooling purposes.~~

~~(i) "Key seating" means a stuck drill pipe or casing caused by an abrupt change in direction or dogleg in the drilled hole.~~

~~(j) "Miscellaneous discharge well" means a well constructed for a special process discharge of limited time and scope.~~

~~(k) "Observation and monitor well" means a well constructed for the purpose of observing or monitoring groundwater conditions.~~

~~(l) "Production casing" means a tubular retaining structure installed in the upper portion of a well between the wall of the drilled hole and the inner well casing.~~

~~(m) "Sounding tube" means the access to the well casing that allows the water level in the well to be periodcally determined. All sounding tubes should have a screw cap.~~

~~(n) "Special process discharge well" means a well constructed for the use of a subsurface discharge for recovering a product or fluid at the surface. Special process discharges are defined in detail in Chapter IX, Wyoming Water Quality Rules and Regulations.~~

~~(o) "Test well" means a well constructed for obtaining information needed to design a well prior to its construction. Test wells are cased and could be converted to observation or monitoring wells.~~

~~(p) "Watertight" means impermeable to water except when under such pressure that structural discontinuity is produced.~~

~~Section 62.m Application. These standards shall apply to the types of wells listed below. Before a change of use for an existing well can occur, construction standards contained in this part shall be met for the new use.~~

~~(a) Well type list requiring permits under Water Quality Rules and Regulations.~~

~~(i) Commercial, municipal and industrial waste wells.~~

~~(ii) Special process discharge wells.~~

~~(iii) Artificial recharge and miscellaneous discharge wells.~~

~~(iv) Geothermal wells.~~

~~(v) Observation and monitoring wells.~~

~~(vi) Test wells.~~

~~(b) Standards concerning construction, maintenance and operation of oil or gas producing,storage, injection or disposal wells are administered by the Oil and Gas Conservation Commission and therefore are not contained herein.~~

~~Section 63. Well Construction Not Specifically Covered By This Part; Deviations.~~

~~(a) The administrator may grant a deviation from the standards provided the applicant or permittee can supply documentation of reliability, mechanical integrity, design and construction to protect groundwaters of the state in accordance with the water quality standards contained in Chapter VIII, Wyoming Water Quality Rules and Regulations. Such documentation shall include:~~

~~(i) Theoretical technology; or~~

~~(ii) Full scale operation at another site with similar conditions; or~~

~~(iii) A pilot project of scope and length to justify a deviation.~~

~~Section 64. Well Location/Siting.~~

~~(a) The top of the casing shall terminate above grade or above any known conditions of flooding from runoff or standing water.~~

~~The area around the well shall slope away from the well. Surface drainage shall be directed away from the well.~~

~~(b) Where a well is to be near a building, the well shall be located at a distance from the building to provide access for repairs, maintenance, etc.~~

~~Section 65. Sealing the Annular Space. The annular space shall be sealed to protect it against contamination or pollution by entrance of surface and/or shallow subsurface waters. Annular seals shall be installed to provide protection for the casing against corrosion, to assure structural integrity of the casing, and to stabilize the upper formation.~~

~~(a) Minimum depths of seal below ground surface for various uses of wells will be:~~

~~Type Well~~	~~Minimum Depth of Seal~~
~~Commercial, municipal and industrial waste~~	~~30 feet~~
~~Special process discharge~~	~~30 feet~~
~~Artificial recharge and miscellaneous discharge~~	~~30 feet~~
~~Geothermal wells~~	~~30 feet~~
~~Observation and monitoring~~	~~20 feet~~
~~Test wells~~	~~20 feet~~

~~(b) Sealing conditions. Following are requirements to be observed in sealing the annular space.~~

~~(i) Wells situated in unconsolidated, caving material shall have an oversized hole, at least four inches greater in diameter than the production casing, drilled. A conductor casing shall be installed. The space between the conductor casing and the production casing shall be filled with sealing material. The conductor casing may be withdrawn as the sealing material is placed.~~

~~(ii) Wells situated in unconsolidated material stratified with significant clay layers shall have an oversized hole of at least four inches greater in diameter than the production casing drilled, with the annular space filled with sealing material. If a clay formation is encountered within five feet of the bottom of the seal, the seal should be extended five feet into the clay formation.~~

~~(iii) Wells situated in soft consolidated formations shall have an oversized hole of at least four inches greater in diameter than the production casing. The annular space between the production casing and the drilled hole shall be filled with sealing material.~~

~~(iv) Wells situated in "hard" consolidated formations (crystaline or metamorphic rock) shall have an oversized hole drilled with the annular space filled with sealing material.~~

~~(c) Sealing material. The sealing material shall consist of neat cement grout, sand-cement grout, bentonite clay or concrete.~~

~~(i) Cement used for sealing mixtures shall meet the requirements of ASTM C150 "Standard Specifications for Portland Cement" or API 10B "Recommended Practices for Testing Oil-Well Cements and Cement Additives". Materials used as additives for Portland Cement mixtures in the field shall meet the requirements of ASTM C494 "Standard Specifications for Chemical Admixtures for Concrete" or API RP 10B.~~

~~(ii) Neat cement shall be composed of one sack of Portland Cement (94 pounds) to 4½ to 6½ gallons of clean water.~~

~~(iii) Sand-cement grout shall be composed of not more than two parts by weight of sand and one part of Portland cement to 4½ to 6½ gallons of clean water per sack of cement.~~

~~(iv) Concrete used shall be "Class A" or "Class B". Aggregates shall meet the requirements of ASTM C33 "Standard Specifications for Concrete Aggregates".~~

~~(v) Special quick-setting cement, retardants to setting, and other additives, including hydrated lime to make the mix more fluid or bentonite to make the mix more fluid and reduce shrinkage, may be used.~~

~~(vi) Bentonite clay mixtures shall be composed of bentonite clay and clean water thoroughly mixed before placement so that there are no balls, clods, etc.~~

~~(vii) Used drillers mud or cuttings or chips from drilling the borehole shall not be used as sealing material.~~

~~(viii) The minimum time that must be allowed for materials containing cement to "set" shall be in accordance with ASTM C150 or API RP10B.~~

~~When necessary these times may be reduced by use of accelerators as determined by the well contractor.~~

~~(d) Thickness of seal. The thickness of the seal shall be at least two inches and not less than three times the size of the largest coarse aggregate used in the sealing material.~~

~~(e) Placement of seal. Before placing the seal, all loose cuttings, chips, or other obstructions shall be removed from the annular space by flushing with water or fluid drilling mud. The sealing material shall be placed when possible, in one continuous operation from the bottom up. The fluid used to force the final sealing material through the casing shall remain under pressure, to prevent back flow, until the sealing material is set.~~

~~Section 66. Surface Construction Features.~~

~~(a) Openings. Openings into the top of the well which are designed to provide access to the well, i.e., for measuring, chlorinating, adding gravel, etc., shall be protected against entrance of surface waters or foreign matter by installation of water tight caps or plugs. Access openings designed to permit the entrance or egress of air or gas shall terminate above the ground and above known flood levels and shall be~~

~~protected against the entrance of foreign materials by installation of down turned and screened "U" bends. All other openings (holes, crevices, cracks, etc.) shall be sealed.~~

~~A sounding tube, taphole with plug or similar access for the introduction of water level measuring devices may be affixed to the casing of the well as long as the proper seal is maintained. Access ports for water level or pressure measuring devices are required by the State Engineer on all wells greater than four inches diameter.~~

~~Section 67. Casing.~~

~~(a) The casing shall provide structural stability to prevent casing collapse during installation as well as drillhole wall integrity when installed, be of required size to convey liquid at a specified injection/recovery rate and pressure, and be of required size to allow for sampling.~~

~~(i) Steel casing shall meet the following conditions:~~

~~(A) Standard and line pipe. This material shall meet one of the following specifications:~~

~~(I) API Std. 5L, "Specifications for Line Pipe."~~

~~(II) API Std. 5LX, "Specifications for High- Test Line Pipe."~~

~~(III) ASTM A53 "Standard Specification for Pipe Steel, Black and Hot Dipped, Zinc Coated Welded and Seamless."~~

~~(IV) ASTM A120 "Standard Specifications for Pipe, Steel, Black and Hot-Dipped Zinc-Coated (Galvanized) Welded and Seamless, for Ordinary Uses."~~

~~(V) ASTM A134 "Standards Specifications for Electric-Fusion (arc) - Welded Steel Plate Pipe (Sizes 16 in. and over)."~~

~~(VI) ASTM A135 "Standard Specifications for Electric - Resistance - Welded Steel Pipe."~~

~~(VII) ASTM A139 "Standard Specification for Electric-Fusion (arc) - Welded Steel Pipe (Sizes 4" and over)."~~

~~(VIII) ASTM A211 "Standard Specifications for Spiral - Welded Steel or Iron Pipe."~~

~~(IX) AWWA C200 "AWWA Standard for Steel Water Pipe 6 inches and Larger."~~

~~(B) Structural steel. This material shall meet one of the following specifications:~~

~~(I) ASTM A36 "Standard Specification for Structural Steel."~~

~~(II) ASTM A242 "Standard Specifications for High Strength Low Alloy Structural Steel."~~

~~(III) ASTM A283 "Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates, Shapes and Bars of Structural Quality."~~

~~(IV) ASTM A441 "Tentative Specifications for High-Strength Low Alloy Structural Manganese Vanadium Steel."~~

~~(V) ASTM A570 "Standard Specification for Hot- Rolled Carbon Steel Sheet and Strip, Structural Quality."~~

~~(C) High Strength Carbon steel sheets or "well casing steel." Each sheet of material shall contain mill markings which will identify the manufacturer and specify that the material is well casing steel which complies with the chemical and physical properties published by the manufacturer.~~

~~(D) Stainless Steel casing shall meet the provisions of ASTM A409 "Standard Specification for Welded Large Diameter Austenitic Steel Pipe for Corrosive or High Temperature Service."~~

~~(ii) Plastic can also be used for casing in many locations and under a variety of circumstances. The two groups of plastic materials available are thermoplastics and thermosets.~~

~~(A) Thermoplastics. This material shall meet the requirements of ASTM F 480 "Standard Specification for Thermoplastic Water Well Casing Pipe and Couplings made in Standard Dimension Ratios (SDR)."~~

~~(B) Thermosets. This material shall meet the requirements of the following specifications.~~

~~(I) ASTM D2996 "Standard Specification for Filament Wound Reinforced Thermosetting Resin Pipe."~~

~~(II) ASTM D2997 "Standard Specification for Centrifugally Cast Reinforced Thermosetting Resin Pipe."~~

~~(III) ASTM D3517 "Standard Specification for Reinforced Plastic Mortar Pressure Pipe."~~

~~(IV) AWWA C950 "AWWA Standards for Glass - Fiber - Reinforced Thermosetting - Resin Pressure Pipe."~~

~~(iii) Concrete pipe used for casing should conform to the following specifications:~~

~~(A) ASTM C14 "Standard Specifications for Concrete Sewer, Storm Drain, and Culvert Pipe."~~

~~(B) ASTM C76 "Standard Specification for Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe."~~

~~(C) AWWA C300 "AWWA Standards for Reinforced Concrete Pressure Pipe, Steel Cylinder Type, for Water and Other Liquids."~~

~~(D) AWWA C301 "AWWA Standards for Prestressed Concrete Pressure Pipe, Steel Cylinder Type, for Water and Other Liquids."~~

~~(iv) Galvanized sheet metal pipe or natural wood shall not be used as casing.~~

~~(b) All casing shall be placed with sufficient care to avoid damage to casing sections and joints. All joints in the casing above the perforations or screens shall be watertight. The uppermost perforations shall be at least below the minimum depth of seal. Casing shall be equipped with centering guides to ensure even thickness of annular seal and/or gravel pack.~~

~~(i) Metallic casing. Steel casing may be joined by either welding or by threading and coupling.~~

~~(ii) Plastic (non-metallic) casing. Depending on the type of material and its fabrication, plastic casing may be joined by solvent welding or may be mechanically joined. Compatability between potential contaminants and the sealing agent used shall be demonstrated.~~

~~Section 68. Sealing/Cementing Off Strata. Where a well penetrates more than one aquifer or water bearing strata, every aquifer and/or strata shall be sealed off to prevent migration of water from one aquifer or strata to another.~~

~~(a) Strata shall be sealed off by placing impervious material opposite the strata and opposite the confining formation(s). The seal shall extend above and below the strata no less than ten feet. The sealing material shall fill the annular space in the interval to be sealed, and the surrounding void spaces which might absorb the sealing material. The sealing material shall be placed from the bottom to the top of the interval to be sealed.~~

~~(b) Commercial, municipal and industrial waste and artificial recharge wells shall be sealed/cemented in order that all aquifers are isolated over the entire length of casing(s) and shall be surrounded by a minimum of two inches of sealant. The sealant/cement plug used to isolate the aquifer(s) shall extend 50 feet above and below the interface between confining layer and the aquifer(s).~~

~~(c) Sealing material shall consist of neat cement, cement grout, or bentonite clay as per Section 65(c).~~

~~Section 69. Well Construction, Completion, Development and Evaluation.~~

~~(a) Developing, redeveloping, or conditioning a well shall be done by methods which will not cause damage to the well or cause adverse subsurface conditions that may destroy barriers to the vertical movement of water between aquifers.~~

~~(b) The well opening shall be closed with a cover to prevent the introduction of undesirable material into the well and to insure public safety whenever the well is not in use or when maintenance is being performed on the well.~~

~~(c) During well development, every well shall be tested for plumbness and alignment in accordance with AWWA or API approved standards, i.e., deviation checks. The plumbing and alignment tests shall be documented to ensure problems such as key seating, or fatigue failures will not occur.~~

~~(d) All injection/recharge wells used for discharge of commercial, municipal or industrial wastes shall inject fluid through a tubing with a packer set immediately above the injection zone or tubing with an approval fluid seal as an alternative.~~

~~(e) At a minimum, all commercial, municipal and industrial waste, special process discharge, artificial recharge and miscellaneous discharge wells deviation checks and cement bond logs shall be conducted and documented. The Water Quality Division should be contacted prior to well construction or operation to determine the need for addition al logs and tests.~~

~~Section 70. Plugging and Abandonment.~~

~~(a) All wells that are no longer useful (including test wells) must be plugged in order to assure that groundwater supply is protected and preserved for further use and to eliminate the potential physical hazard. A well is considered "abandoned" when it has not been used for a period of one year, unless the owner demonstrates his intention to use the well again by properly maintaining the well in such a way that:~~

~~(i) The well has no defects which will allow the impairment of quality of water in the well or in the water bearing formations penetrated.~~

~~(ii) The well is covered and the cover is watertight.~~

~~(iii) The well is marked so that it can be clearly seen.~~

~~(iv) The area surrounding the well is kept clear of brush or debris.~~

~~Observation or test wells used in the investigation or management of usable sources of groundwater by state agencies or by engineering or research organizations are not considered "abandoned" so long as they are maintained for this purpose. These wells shall be covered with an appropriate cap, and labeled for their particular use.~~

~~(b) Preliminary work. Before a well is plugged and abandoned, it shall be investigated by the permittee (owner/ operator) to determine its condition, details of construction and whether there are obstructions that will interfere with the process of filling and sealing.~~

~~(c) Filling and sealing. Following are requirements to be observed when plugging wells.~~

~~(i) Wells wholly situated in unconsolidated material in an unconfined groundwater zone shall have the uppermost 30 feet sealed with impervious material. The remainder of the well shall be filled with clay, sand, or other suitable inorganic matters as described in paragraph e.~~

~~(ii) Wells penetrating several aquifers or formations containing usable water sources shall have the uppermost 30 feet sealed with an impervious material. All screened or perforated intervals shall be sealed to prevent vertical movement of waters from the producing or injected formation. Impervious material shall be placed opposite the confining formation above and below (and including) the screened or perforated interval for a minimum of 50 feet or more.~~

~~(iii) Any uncased hole below the well shoe shall be filled with an impervious material as described in paragraph e. to a depth of at least 50 feet above the shoe.~~

~~(iv) Whenever production casing has been severed or inadvertently removed the well bore shall be filled with impervious material from a point 50 feet below to a point 50 feet above the point of severance or to the surface limit.~~

~~(v) Wells penetrating creviced or fractured rock shall have the portions of the well opposite this formation sealed with neat cement, sand cement grout or concrete. If these formations extend to considerable depth, alternate layers of coarse stone and cement grout or concrete may be used to fill the well.~~

~~(vi) Wells in nonfractured, consolidated formations shall have the uppermost 30 feet filled with impervious material and the non-creviced, consolidated formation portion of the well may be filled with clay or other suitable material.~~

~~(d) Placement of material. The following requirements shall be observed in placing fill or sealing a plugged or abandoned well.~~

~~(i) No material shall be placed in the well unless the administrator has been notified that plugging and abandonment operations are to commence. A minimum of 30 days notice must be given.~~

~~(ii) The well shall be filled with the appropriate material as described in paragraph e. from the bottom of the well up.~~

~~(iii) Sealing materials shall be placed in the interval or intervals to be sealed by methods that prevent free fall, dilution and/or separation of aggregates from cementing materials.~~

~~(iv) When the underground pressure head producing flow is such that a counterpressure must be applied to force a sealing material into the annular space, this counter-pressure shall be maintained for the length of time required for the cementing mixture to set as specified in Section 65, paragraph (c) (viii) of this part.~~

~~(v) To assure that the well is filled and there has been no bridging of the material, verification shall be provided that the volume of material placed in the well installation at least equals the volume of the empty hole.~~

~~(e) Material. Requirements for sealing and fill materials are as follows.~~

~~(i) Impervious sealing materials. Sealing materials shall have a permeability of 10 - 7 cm/sec or less. Impervious materials include neat cement, sand-cement grout, concrete, and bentonite clay as described in Section 66, paragraph (c). Used drilling muds are not acceptable.~~

~~(ii) Filler material. Materials such as clay, silt, sand, gravel, crushed stone, native soil, and mixtures of these materials, as well as those described in the preceeding paragraph may be used as filler material. Material containing organic matter or used drilling muds shall not be used.~~

~~(f) Markings. The top of the plug of any plugged and abandoned well shall show clearly, by permanent markings, whether inscribed in the cement or on a steel plate embedded in the cement, the permit number, well identification number and date of plugging.~~

~~(g) Reports. Within 15 days after a well has been plugged and abandoned, the owner shall file a plugging record with the Water Quality Division.~~

REGULATIONS FOR PERMIT TO CONSTRUCT, INSTALL OR MODIFY PUBLIC WATER SUPPLIES, WASTEWATER FACILITIES, DISPOSAL SYSTEMS, BIOSOLIDS MANAGEMENT FACILITIES, TREATED WASTEWATER REUSE SYSTEMS AND OTHER FACILITIES CAPABLE OF CAUSING OR CONTRIBUTING TO POLLUTION

CHAPTER 3

Section 1. **Authority.** This regulation is promulgated pursuant to the Wyoming Environmental Quality Act. Specifically, W.S. 35-11-301 stipulates that no person, except when permit authorized, shall: construct, install, modify or operate any public water supply, sewerage system, treatment works, disposal system or other facility, excluding uranium mill tailing facilities, capable of causing or contributing to pollution, except that no permit to operate shall be required for any publicly owned or controlled sewerage system, treatment works, disposal system or public water supply. W.S. 35-11-304 stipulates that to the extent requested, authority to enforce and administer W.S. 35-11-301 (a) (iii) and (v) shall be delegated to qualifying municipalities, water and sewer district or counties. Delegation of authority is limited to small wastewater facilities, publicly owned or controlled non-discharging treatment works, sewerage systems and public water supply distribution systems.

Section 2. **Applicability.**

(a) Except as provided in paragraphs (b), (c), (d), and (e) below, these regulations shall apply to all public water supplies as defined in Section 3 (a) (iv) of these regulations and to all private, municipal, commercial and industrial (including mining) sewerage systems, treatment works, disposal facilities, biosolids management facilities, treated wastewater systems and other facilities capable of causing or contributing to pollution.

(b) Pursuant to the provisions of W.S. 35-11-301 (a) (iii) as amended by the Session Laws of Wyoming, 1987, passed by the 1987 Legislative Session, effective March 13, 1987, uranium mill tailing facilities are excluded from the requirement to obtain a permit to construct, install, modify or operate a facility capable of causing or contributing to pollution. The following requirements are applicable to these facilities.

(i) Decrees existing as of March 13, 1987 remain in full force and effect.

(ii) These facilities shall not cause a violation of quality standards for surface or ground waters as contained in Chapters 1 and 8, Wyoming Water Quality Rules and Regulations.

(c) Pursuant to the provisions of W.S. 35-11-109 (a) (ii) and W.S. 35-11-1104 (a) (iii), the following facilities being regulated by other agencies of the State of Wyoming, while subject to the requirements of the Wyoming Environmental Quality Act, will not require the issuance of a permit:

(i) Noncommercial pits and ponds permitted by the Wyoming Oil and Gas Conservation Commission for the storage, treatment and disposal of drilling fluids, produced waters, emergency overflow wastes or other oil field wastes associated with the maintenance and operation of oil and gas exploration and production wells on a lease, unit or communitized area;

(ii) Noncommercial underground disposal into Class II injection wells, as defined under the federal Safe Drinking Water Act, of salt water, non potable water and oil field wastes related to oil and gas production and permitted by the Wyoming Oil and Gas Conservation Commission.

(d) These regulations do not apply to the following facilities inasmuch as these facilities are authorized by a permit issued pursuant to the provisions of this act, or they discharge into a facility or facilities authorized by a permit issued pursuant to the provisions of this act:

(i) Sanitary landfills, pits at sanitary landfills, and sludge disposal sites permitted by the Solid and Hazardous Waste Division;

(ii) Sediment control structures where the out-fall enters into another sediment control structure which was permitted under this chapter and was designed and constructed to treat the additional loading;

(iii) Treatment works, sediment impoundments, disposal systems, biosolid facilities, land application or treated wastewater reuse systems regulated by the Land Quality Division under Article 4 of the Wyoming Environmental Quality Act;

(iv) Class V facilities requiring permits under Chapter 16 of these regulations including multiple small wastewater systems discharging more than 2,000 gallons per day within any five (5) acre area under one ownership;

(v) Supporting facilities for Class I injection wells permitted under Chapter 13, requiring a Chapter 3 permit, may be included as a single permit under Chapter 13 of these regulations; and

(vi) Confined swine feeding operations permitted under Chapter 20 of these regulations.

(vii) Facilities permitted by a local agency delegated authority under W.S. 35-11-304.

(e) Pursuant to the provisions of W.S. 35-11-109 (a) (ii), and in order to minimize duplicative permitting of biosolids facilities regulated by the U.S. Environmental Protection Agency (EPA), the state will accept an EPA permit as a state permit meeting the requirements of W.S. 35-11-301 (a) (iii). The recipient of the EPA permit will submit a copy of the EPA permit to the Water Quality Division, Department of Environmental Quality (WQD/DEQ). A state permit will be issued only in the following instances:

(i) Where EPA does not regulate the land application or disposal of biosolids or domestic septage by issuance of an Authorization To Land Apply or Surface Dispose Sludge Under the National Pollution Discharge Elimination System;

(ii) Where commercial waste treatment, storage and disposal facilities are involved in accordance with W.S. 35-11-307;

(iii) Where waste treatment, storage and disposal facilities are used for more than ten (10) dried tons of sewage sludge per day in accordance with W.S. 35-11-307;

(iv) Where biosolids are prepared out side of the state and brought into the state for land application or surface disposal; or

(v) Where treated wastewater is prepared outside of the state and brought into the state for land application.

(f) Initial emergency response activities to stop and contain a release, as defined in Chapter 4 of these regulations, that enters or threatens to enter waters of the state or presents an immediate threat to human health, safety or the environment, while subject to the requirements of the Wyoming Environmental Quality Act and Chapter 4 of these regulations, will not require a permit under this chapter.

(g) To facilitate 'one-stop' permitting, facilities requiring a permit under this chapter may be included as an individual permit under Chapter 16.

Section 3. **Definitions.**

(a) The definitions in Section 35-11-103 (a) and (c) of the Wyoming Environmental Quality Act apply to this chapter. For example:

(i) "Department" means the Department of Environmental Quality established by the Wyoming Environmental Quality Act;

(ii) "Director" means the director of the Department of Environmental Quality;

(iii) "Administrator" means the administrator of the Water Quality Division of the department.

(iv) "Public water supply" means any water supply as defined in W.S. 35-11-103 (c) (viii). A public water supply includes the source, treatment system, waste disposal system, distribution system, service connections, finished water storage and pumping stations.

(v) "Small wastewater system" means any sewerage system, disposal system or treatment works having simple hydrologic and engineering needs which is intended for wastes originating from a single residential unit serving no more than four families or which distributes 2,000 gallons or less of domestic sewage per day.

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

(i) "Biosolids" means solid, semi-solid, or liquid residues generated during the treatment of domestic sewage in a treatment works. Biosolids include, but are not limited to, domestic septage; scum or solids removed in primary, secondary, or advanced wastewater treatment processes; and a material derived from biosolids. Biosolids do not include ash generated during the firing of biosolids in a biosolids incinerator or grit and screenings generated during preliminary treatment of domestic sewage in a treatment works.

(ii) "Communitized area" means an area involving more than one lease where a cooperative agreement is developed for the drilling and operation of a single oil or gas well by one operator in accordance with a spacing order of the Wyoming Oil and Gas Conservation Commission and any subsequent well density order.

(iii) "Domestic septage" means either liquid or solid material removed from a septic tank, cesspool, portable toilet, Type III marine sanitation device, or similar treatment works that receives only domestic sewage. Domestic septage does not include liquid or solid material removed from a septic tank, cesspool, or similar treatment works that receives either commercial wastewater or industrial wastewater and does not include grease removed from a grease trap at a restaurant.

(iv) "Domestic sewage" means waste and wastewater that is primarily from human or household operations that is discharged to or otherwise enters a treatment works.

(v) “General permit” means a permit issued by the director to construct, install, modify or operate all facilities of a specific type located within the State of Wyoming where coverage for each facility of that type can be permitted thereunder. The administrator or a designee has the authority to issue acceptance of coverage under the general permit.

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

(vii) “Individual permit” means a permit issued by the director to construct, install, modify or operate a specific facility at a certain location. The permit may include all facilities requiring a permit under this chapter at a specific location.

(viii) "Noncommercial pits and wells" means pits and wells operated by an oil and gas operator and intended to receive wastes from oil or gas wells on a lease, unit or communitized area.

(ix) "Non-discharging treatment works" means any plant or other works used for the purpose of treating, stabilizing or holding wastes without any addition of any pollution or wastes to any waters of the state.

(x) "Permit" means written authorization issued by the division duly executed which authorizes the permittee to land apply wastes, reuse treated wastewater or construct, install, or modify the facilities as set forth in this chapter.

(xi) “Permit by rule” means a system authorizing the construction, installation, modification, or operation of a facility provided the owner of the facility agrees to and meets the design, construction and performance standards of applicable regulations.

(xii) "Publicly owned or controlled facility" means a system for which a municipality, county or water and sewer district receives a permit to discharge and/or construct, modify or install any public water supply, sewerage system, treatment works, disposal system or other facility capable of causing or contributing to pollution. If an entity other than a municipality, county or water and sewer district is the applicant or recipient of a permit under Chapter 2 and 3 of the Wyoming Water Quality Rules and Regulations, the facility will be deemed to not be publicly owned or controlled.

(xiii) "Receiver" means any zone, interval, formation or unit in the subsurface into which fluids and pollutants are or may be discharged.

(xiv) "Sedimentation control structures" means any collection ditch, containment ditch or other conveyance or impoundment used to convey runoff to an impoundment or impound runoff for the purpose of settling out sediment or suspended solids. The impoundment will individually contain less than two acre feet of runoff in addition to sediment storage or contain less than two acres in surface area, whichever is smaller. Non-soil strainer dikes, terraces, riprap and mulches are primarily intended for soil conservation purposes and do not require permits to construct.

(xv) "Sedimentation pond" means a primary sediment control structure designed, constructed and maintained to slow down water runoff to allow sediment to settle out, including, dams or excavated depressions or natural depressions in excess of two acre feet. The term does not include strainer dikes, terraces, riprap, check dams, mulches, or other secondary sediment control structures.

(xvi) "Sewage collection facility" means a sewerage system, including pipelines, conduits, storm sewers, pumping stations, force mains, and all other construction, devices, appurtenances and facilities used for collection or conducting wastes to an ultimate point for treatment or disposal.

(xvii) "Treated wastewater" means domestic sewage discharged from a treatment works after completion of the treatment process.

(xviii) "Treatment works" means either a publicly or privately owned device or system used to treat either domestic sewage or a combination of domestic sewage and commercial or industrial waste of a liquid nature.

(xix) "Unit" means a combination of leases by a cooperative agreement to provide for a single operator of a number of oil and gas wells during exploration and/or production.

(xx) "Wastewater facilities" means sewerage systems, disposal systems and treatment works.

(xxi) "Water distribution facility" means pipelines, conduits, pumping stations, storage facilities and all other constructions, devices, appurtenances and facilities used for collecting or conducting water from the source to an ultimate point for treatment and from the treatment facility to the service connections of a public water supply.

Section 4. **Prohibitions**. No person, except when authorized by permit issued pursuant to the Act and these regulations, shall:

(a) Construct, install, or modify any public water supply, sewerage system, treatment works, disposal system or other facility capable of causing or contributing to pollution;

(b) Construct, install, or modify any facility in non-compliance with the terms and conditions of an issued permit;

(c) Construct, install, or modify a facility with a permit that has expired or has been suspended or revoked;

(d) Commence construction or modification of any industrial facility capable of causing or increasing water pollution in excess of standards established by the department before a permit is obtained pursuant to W.S. 35-11-801 (c);

(e) Discharge wastes into an exempted or permitted treatment works, sewerage or disposal system which are inconsistent with the type or quantity of wastes for which the facility is designed;

(f) Land apply or surface dispose of biosolids or domestic septage; or

(g) Reuse treated wastewater.

Section 5. **Permit Compliance**.

(a) Construction, installation, or modification of facilities shall be allowed only in accordance with the terms and conditions of permits issued pursuant to the Act and provisions of these regulations.

(b) No construction, installation or modification of a public water supply, sewerage system, treatment works, disposal system or other facility, excluding uranium mill tailings facilities, capable of causing or contributing to pollution shall be allowed unless a permit to construct, install or modify has been obtained from the administrator. The permit shall be an individual permit, a general permit, or a permit by rule.

(c) The issuance of a permit to construct does not relieve the permittee of its responsibility to properly plan, design, construct, operate and maintain the facility described in the application and permit conditions.

(d) Land application or surface disposal shall be allowed only in accordance with the terms and conditions of permits issued pursuant to the Act and provisions of these regulations.

(e) Reuse of treated wastewater shall be allowed only in accordance with the terms and conditions of permits issued pursuant to the Act and provisions of these regulations.

Section 6. **Individual Permit Application Requirements**. The following procedures will be followed in applying for a permit.

(a) Any person who proposes to construct, install or modify a facility required to be permitted by this chapter shall submit a written application on forms provided by the administrator.

(b) Applications for individual permits shall contain the following information:

(i) Application for a permit to construct, install or modify must be accompanied by three copies of plans, specifications, design data or other pertinent information covering the project, and any additional information required by the administrator. In instances where an environmental monitoring program is required as determined by the administrator, the application shall also include a proposed monitoring program to satisfy the requirements of Section 15;

(ii) All plans, specifications and reports submitted under this chapter shall be sealed, signed, and dated by a licensed professional engineer under W.S. Title 33, Chapter 29 and/or by a licensed professional geologist under W.S. Title 33, Chapter 41, as applicable;

(iii) All plans and specifications must conform to common and accepted engineering practices as determined by the administrator or as defined by applicable Water Quality Division regulations;

(iv) Any person who prepares biosolids or domestic septage for land application or surface disposal shall submit a written application for a permit on forms provided by the administrator;

(v) Any person who applies biosolids or domestic septage who does not have a written agreement with the preparer shall submit a written application on forms provided by the administrator;

(vi) Any person who prepares treated wastewater for reuse shall submit written application for a permit on forms provided by the administrator;

(vii) Any person who applies treated wastewater and who does not have a written agreement with the preparer shall submit a written application on forms provided by the administrator.

Section 7. **General Permits**.

(a) The department shall develop and the director shall issue a general permit for the installation, modification, construction or operation of new systems for the following classes of facilities:

(i) Small wastewater facilities that do not require a permit under Chapter 16 of these regulations;

(ii) Extensions to or modifications of existing sewage collection facilities and public water supply distribution facilities, excluding finished water storage facilities, booster pump systems and sewage lift systems;

(iii) Monitoring wells or other subsurface investigation facilities, including boreholes, test holes installed using direct push methods, soil vapor surveys, and test pits, used to characterize subsurface conditions at sites where pollution is known to exist;

(iv) Pilot plants constructed to obtain data to demonstrate compliance with Section 5, Chapter 11 or Section 5, Chapter 12 of these regulations.

(b) The department shall develop a general permit for each type of facility listed in subsection (a) which contains requirements to protect surface and ground water resources and to provide safe and adequate water for public water supply systems.

(c) The administrator shall provide public notice and opportunity for public comment on the draft general permit before it is issued by the director. The public comment period shall include:

(i) Notice in a paper of statewide circulation and direct mailing to persons on the division mailing list;

(ii) A minimum 30 day public comment period;

(iii) An opportunity for a public hearing if the administrator determines there to be a significant degree of public interest in the draft permit;

(iv) The preparation of a written analysis of how the division responded to public comments. This analysis shall be made available to all persons who commented on the proposed permit.

(d) Interested persons may appeal the issuance of the general permit in accordance with the department's Rules of Practice and Procedure.

(e) Application for coverage under a general permit must be accompanied by three copies of the application form, plans, specifications, design data or other pertinent information concerning the project.

(f) All facilities described in subsection (a) shall be designed, constructed or operated such that they meet or exceed minimum design standards as specified in Chapters 11 and 12 of these regulations.

(g) All plans, specifications and reports submitted under this chapter shall be sealed, signed, and dated by a licensed professional engineer under W.S. Title 33, Chapter 29 and/or by a licensed professional geologist under W.S. Title 33, Chapter 41, as applicable.

(h) Application for coverage under the general permit shall be made on forms provided by the department which require a signature of agreement requirement by the applicant to abide by all conditions of the permit.

(i) Applicants will be covered under the general permit as soon as the administrator or a designee issues a written statement of acceptance to allow the installation, modification, construction or operation under the general permit. Operational, record keeping, and reporting requirements shall remain in effect for the life of the facility.

Section 8. **Permit by Rule**.

(a) The following facilities are permitted by rule in accordance with the requirements of this section:

(i) Monitoring wells, boreholes, test holes installed using direct push methods, soil vapor surveys, and test pits that are used to characterize subsurface conditions at sites where pollution is not known to exist;

(ii) Monitoring wells and other subsurface investigation facilities used to obtain information for a permit application under Section 17 of this chapter.

(b) When pollution is found in facilities described in subsection (a) (i) and (ii) that has entered or threatens to enter waters of the state, including groundwater, the property owner or owner of the test facility shall immediately notify the Water Quality Division and submit a report within three (3) months after the initial samples have been collected describing:

(i) The name, address, and telephone number of the operator and the owner, if not the same for the specified property;

(ii) A legal description of the specified property by ¼ section, township and range or by latitude and longitude if accurate to within ten (10) meters;

(iii) The type, nature and known extent of the pollution;

(iv) A brief description of the suspected source, or sources of pollution;

(v) A description of any known imminent or immediate threat to human health or safety, or to the environment;

(vi) A description of any corrective actions that have been taken or are planned to be taken;

(vii) Any sample results obtained must be provided to the department;

(viii) All plans, specifications and reports submitted under this section shall be sealed, signed and dated by a licensed professional engineer under W.S. Title 33, Chapter 29 and/or by a licensed professional geologist under W.S. Title 33, Chapter 41, as applicable.

(c) Monitoring wells shall be designed and constructed to protect groundwater resources according to Chapter 26 of these regulations. In addition, proper sealing to prevent intermingling of different quality aquifers and pollution of groundwater from the surface shall be emphasized, as well as proper design and materials used in drilling and construction. The use of toxic glue is prohibited.

(d) Monitoring wells shall be plugged and abandoned in accordance with Chapter 26 of these regulations. All other subsurface investigation facilities must be abandoned by proper sealing to prevent surface contamination from reaching groundwater and to prevent the intermingling of aquifers.

(e) The administrator may request information from the owner or operator of a facility permitted by rule to determine whether that facility may be causing a violation of groundwater use standards in Chapter 8 of these regulations, the construction standards found in this chapter, Chapter 11, and Chapter 25 of these regulations, or any other requirements of this chapter. Any request for information under this section shall be made in writing and include a brief statement of the reasons for requesting the information. An owner or operator shall submit the information within the time frame provided in the request for information.

(f) The administrator may require any owner or operator of a facility permitted by rule to obtain an individual permit for that facility when a review of the information submitted under subsection (b) indicates that the permit by rule would not be protective of groundwater in that specific case.

(g) Failure of the owner or operator to meet the requirements under this section is a violation of these regulations.

Section 9. **Application Processing Procedures.**

(a) All individual permit applications will be processed in the following manner.

(i) The administrator shall review each application or resubmittal within 60 days from the date the application or resubmittal is received.

(ii) Incomplete applications will be processed in the following manner:

(A) Additional information shall be requested in detail or the application may be returned to the applicant. Incomplete permit applications will result in permit denial;

(B) If an application is denied because of incompleteness necessitating a request for additional information, the applicant shall have a maximum of six months to comply with the request. If the applicant fails to provide the requested information within that period, the entire incomplete application shall be returned;

(C) Resubmittal of information by an applicant on an incomplete application will be processed as described in this section.

(iii) All plans and specifications must meet or exceed minimum design standards and these regulations. Applications for modification of existing facilities permitted by the division to increase capability to treat, hold, or dispose of wastes may be approved requiring only the modification to meet minimum design standards if the existing facility is not in violation of applicable regulations. Facilities not in compliance will require modifications to other portions of the facility to bring the facility into compliance with applicable regulations. Other modifications will be allowed if minimum standards for the modification are met.

(iv) Each application must be submitted with all supporting data necessary for review. Processing of the application with respect to recommendations or required changes will be done in accordance with the provisions of applicable statutes, rules and regulations of the administrator.

(v) The administrator shall promptly notify the applicant in writing of all actions taken on the application. If the conditions of the permit are different from the proposed application submitted by the applicant for review, the notification shall include reasons for the changes made.

(vi) If, upon review of an application, the administrator determines that a permit is not required under the Environmental Quality Act, the administrator shall notify the applicant of this determination in writing. Such notation shall constitute final action on the application.

(vii) The administrator may provide opportunity for public comment and hold a public meeting prior to recommending permit approval where the administrator determines that significant public interest exists with respect to permit issuance requirements of Section 14 (a).

(viii) If upon review of an application, the director determines that a permit should not be granted, the director shall notify the applicant in writing of the permit denial and state the reasons for denial.

(ix) If the applicant is dissatisfied with the conditions or denial of any permit issued by the director, the applicant may request a hearing in accordance with Section 14.

(x) Interested persons may appeal the issuance of the individual permit in accordance with the department's Rules of Practice and Procedure.

(b) All applications for coverage under a general permit will be processed in the following manner:

(i) The installation, construction, modification or operation shall not commence until written notification of coverage under the general permit has been received from the department;

(ii) The department may require any applicant to obtain an individual permit for the facility when a review of the information submitted indicates that a general permit would not be protective of surface or groundwater standards and public health. Any person covered by a general permit may at any time apply for and obtain an individual permit. Once issued, an individual permit will replace coverage by the general permit for that facility;

(iii) The department shall take action on each general permit application or resubmittal within 60 days from the date the application or resubmittal is received;

(iv) Interested persons may appeal the decision regarding coverage under the general permit in accordance with the department's Rules of Practice and Procedure.

Section 10. **Sedimentation Control Structures.**

(a) In lieu of individual permits for every sedimentation control structure, an applicant may request the division to permit a sedimentation structure control plan.

(b) A sedimentation control structure permitted under this section cannot obtain wastewater from any other source than natural runoff.

(c) The sedimentation control structure shall not be located in a drainage channel which accepts runoff from undisturbed areas.

(d) All sedimentation control structures permitted by this section shall be constructed before lands are affected, except sedimentation control structures for topsoil piles shall be completed within 15 days after the need arises.

(e) All facilities constructed under a permit issued pursuant to this section shall submit the following information within 30 days after construction is completed:

(i) Exact size, location and capacity of the facility;

(ii) Amount of disturbed area and other information used to size the facility.

(f) The permit application for a sedimentation control structure plan must contain:

(i) Design information which will be used to size individual facilities to meet requirements of applicable Wyoming Water Quality Rules and Regulations;

(ii) Provisions for dewatering;

(iii) Typical design and construction details of the facilities; and

(iv) Plan view indicating all areas to be covered by the application and the topography of the area.

Section 11. **Construction and Operation in Compliance with Issued Permit.** The permittee shall:

(a) Conduct all construction, installation, or modification of any facility permitted consistent with the terms and conditions of the permit. Unauthorized changes, deviations or modifications will be a violation of the permit. A new application or amended application must be filed with the administrator to obtain modification of a permit. No modification shall be implemented until a new or modified permit has been issued or a waiver given pursuant to subsection b;

(b) Request in writing authorization to utilize materials and/or procedures different from those specified in the terms of the issued permit. Such requests shall be directed to the administrator. A waiver may be granted if materials and/or procedures specified in the permit cannot be obtained or accomplished and alternative materials and procedures meet minimum standards. In order to prevent undue delay during construction, the administrator may grant a waiver orally, upon oral request, provided that this request is followed by a written request within five (5) days;

(c) Conduct the operation in accordance with statements, representations, and procedures presented in the complete application and supporting documents, and permit conditions as accepted and authorized by the administrator;

(d) Conduct all land application or surface disposal operations in accordance with all statements, representations and procedures presented in the complete permit application and supporting documents; and the terms and conditions of the permit;

(e) Reuse treated wastewater in accordance with all statements, representations and procedures presented in the complete permit application and supporting documents; and the terms and conditions of the permit.

Section 12. **Duration and Termination of Permits; Transfer of Permits.**

(a) The duration of construction, installation, modification, reuse of treated wastewater or land application permits will be variable, but shall not exceed five (5) years from the date of issuance. The expiration date for construction, installation or modification will be recorded on each permit issued. Those permits issued without a specified expiration date will be in force no more than five (5) years from date of issuance.

(b) Permits will be issued only to the official applicant of record, who must be the preparer or applier of the treated wastewater or biosolids or the owner of the permitted facility, for only the type of construction or land application or surface disposal of record and shall be automatically terminated:

(i) Within 60 days after sale or exchange of the facility unless application for transfer is received pursuant to subsection (c) of this section;

(ii) When activities authorized by a permit are completed. Conditions and terms of a construction permit, treated wastewater reuse permit, land application or surface disposal permit remain in effect throughout the life and post monitoring period of the facility;

(iii) Upon issuance of a new, renewed or modified permit;

(iv) Upon written request of the permittee.

(c) Permits shall be transferred to new owners by completion and submittal of ownership transfer forms by the new owner to the administrator. The new owner shall also submit a written request from the existing owner to transfer ownership. The administrator shall act within 30 days after receipt of the request.

(d) Any conditions established in a construction, installation or modification permit will be automatically transferred to the new owner whenever a transfer of ownership of the facility occurs.

(e) Individual authorizations for coverage provided under a general permit are for the life of the facility unless notified otherwise by the department.

(f) Coverage for facilities permitted by rule shall extend until the facility is properly closed or until a notice is provided that coverage is denied, revoked or issued pursuant to another section under this chapter.

Section 13. **Renewal of a Permit**. A permit may be renewed where construction, reuse of treated wastewater, land application or surface disposal has not been completed by filing a notice with the administrator stating that there will not be any changes in the plans for construction, installation, or modification of a permitted facility, treated wastewater reuse system, land application or surface disposal system.

Section 14. **Denial of a Permit or Coverage under a General Permit.**

(a) The director may deny a permit for any of the following reasons:

(i) The application is incomplete or does not meet applicable minimum design, construction, treated wastewater reuse, land application or surface disposal standards as specified by Wyoming Water Quality Rules and Regulations;

(ii) The land application, surface disposal, treated wastewater reuse, or the project, if constructed, will cause a violation of applicable state surface or groundwater standards;

(iii) The project does not comply with applicable state and local water quality management plans as specified in Section 18 of this chapter;

(iv) The project, if constructed, would result in hydraulic and/or organic overloading of wastewater facilities;

(v) The project, if constructed, would result in public water supply demand in excess of source, treatment or distribution capabilities; or

(vi) Other justifiable reasons necessary to carry out the provisions of the Environmental Quality Act.

(b) Except for denial based upon incompleteness of an application, if the director proposes to deny issuance of a permit, the applicant shall be notified by registered or certified mail of the intent to deny and the reason for denial.

(c) In the case of denial of a permit by the director, the applicant, may request a hearing before the Environmental Quality Council. A request for hearing shall be made in accordance with the Department of Environmental Quality's Rules of Practice and Procedure. Any hearing shall be conducted pursuant to the regulations of the department.

(d) The department may deny coverage under a general permit for any of the reasons listed in this section or the failure of the applicant to demonstrate compliance with the terms and conditions of the general permit.

Section 15. **Modification of a Permit.** Either before the permitted activity is completed or during the review of the permit application, the administrator may, for good cause, modify a permit.

(a) Modification of individual permits.

(i) When reviewing an individual permit application or before the permitted activity is completed, the administrator may modify a permit due to the following reasons:

(A) Existing, unknown or changing site conditions that would prevent compliance with the division's regulations; or

(B) Receipt of additional information; or

(C) Incomplete application on review items where the applicant agrees with the modification; or

(D) Review items not in compliance with minimum standards where the applicant agrees with the modification; or

(E) Any other reason necessary to effectuate applicable statutes, standards or regulations.

(ii) The administrator shall notify the permittee by registered or certified mail of intent to modify the permit.

(iii) Such notification shall include the proposed modification and the reasons for modification and time frame to have modifications constructed, installed or operational. Modification requirements shall be implemented before construction, installation, or modification of a facility is completed.

(iv) The modification shall become final within 20 days from the date of receipt of such notice unless within that time the permittee requests a hearing before the Environmental Quality Council. Such request for hearing shall be made in writing to the administrator and shall state the grounds for the request. Any hearing held shall be conducted pursuant to the regulations of the department.

(v) A copy of the modified permit shall be forwarded to the permittee as soon as the modification becomes effective.

(b) Modification of general permits.

(i) The director shall review each general permit at a minimum of every five (5) years from the date of issuance, make modifications as needed and reissue the general permit.

(ii) All proposed modifications shall be subject to public notice and opportunity for public comment according to Section 7 (c) before the modification is approved.

Section 16. **Suspension or Revocation of a Permit.** The administrator may suspend or revoke an individual permit or coverage under a general permit before construction, installation or modification of a facility, reuse of treated wastewater, land application or surface disposal is completed for the reasons set forth below, in item (b).

(a) Before a permit may be suspended or revoked, the permittee shall be given an opportunity to show compliance with all lawful requirements for the retention of the permit.

(b) The administrator shall notify the permittee by registered or certified mail of its intent to suspend or revoke the permit in the event that it becomes necessary due to:

(i) Noncompliance with the terms of the permit; or

(ii) Unapproved modifications in design or construction; or

(iii) False information submitted in the application; or

(iv) Changing site conditions which would result in violations of applicable regulations; or

(v) Noncompliance with requirements of Section 18; or

(vi) Any other reason necessary to effectuate applicable statutes, standards or regulations.

(c) The notification shall include the reasons for suspension or revocation.

(d) The suspension or revocation shall become final 20 days from the date of receipt of such notice unless within that time the permittee requests a hearing before the Environmental Quality Council. Such a request for hearing shall be made in writing to the administrator and shall state the grounds for the request. Any hearing held shall be conducted pursuant to the regulations of the department.

Section 17. **Environmental Monitoring Program for Protection of Waters of the State; Permit Application Requirements.** Sedimentation ponds, sedimentation control structures, small wastewater systems, sewerage systems, reuse of treated wastewater, land application or surface disposal of biosolids, land application of domestic septage and public water supplies are specifically exempt from the requirements of Section 17. All other applications for a permit to construct a treatment works, disposal systems or other facility capable of causing or contributing to pollution shall contain the following:

(a) Documentation that the facility poses no threat of discharge to groundwater. If an applicant proposes a facility of this nature and can provide the documentation, a subsurface investigation is not required. The documentation shall consist of data which demonstrates that:

(i) Facility construction will not allow a discharge to groundwater by direct or indirect discharge, percolation or filtration; or

(ii) The quality of wastewater will not cause any violation of groundwater standards; or

(iii) Existing soils or geology will not allow a discharge to groundwater.

(b) If the documentation required above cannot be provided, a subsurface study shall be provided as part of the application to demonstrate the groundwater standards contained in applicable Wyoming Water Quality Rules and Regulations are adhered to. The application shall contain the following information:

(i) Type, quantity, source and chemical, physical, radiological and toxic characteristics of fluids, wastes or other materials to be held, treated or disposed;

(ii) The name, description, depth, geology, and hydrology of any receiver which may be affected by the proposed facility;

(iii) A map indicating existing well locations, topography, proposed facility locations and surface water features. The map shall also include proposed monitoring wells if required by subsection (c);

(iv) Types of soils, soil permeability and soil assimilation capabilities at the site;

(v) Information on existing water wells, including well completion, yield, water use, water quality and other relevant data. This information shall be required for wells within ¼ mile radius of the proposed facility. The above information shall be obtained for all domestic and public water supplies located in a one mile radius of the proposed facility. In aquifers where groundwater movement is rapid, the administrator may require the above information on wells within a three (3) mile radius based on geohydrology;

(vi) The study shall contain pre-operational monitoring wells located to accurately characterize the subsurface environment and shall include the following items:

(A) Well locations;

(B) Well completion information;

(C) Depth to groundwater;

(D) Background water quality;

(E) Direction of groundwater movement;

(F) Hydraulic conductivity;

(G) Geology and types of soils;

(H) Depth to base of the water zone.

(vii) Hydraulic information which may need to be submitted in the application include:

(A) Potentiometric surface (water table) map;

(B) Identification of aquifers:

(I) Distribution and depth range;

(II) Aquifer characteristics;

(III) Aquifer test data.

(C) Water quality variations.

(viii) The following information shall be furnished if available:

(A) General geology:

(I) Surface geology maps:

(1.) Area distribution of formations or units;

(2.) Dip and strike;

(3.) Faults, dikes, sills and other intrusives or extrusives.

(II) Area geologic reports.

(III) Stratigraphic information:

(1.) Columnar or stratigraphic section;

(2.) Lithologies of rock units;

(3.) Thickness of rock units.

If any of the above information is unavailable, the administrator may request the permittee to produce any information deemed necessary.

(c) Whenever the discharge of any pollution or wastes into waters of the state may be caused, threatened or allowed, or the physical, chemical, radiological, biological or bacteriological properties of any waters of the state may be altered, by a facility, a monitoring program shall be required and shall be adequate to insure knowledge of migration and behavior of the pollution or wastes. Such programs shall be described and contained in a submitted application for a permit to construct. The extent and design of a monitoring system will be influenced by the pollution potential of the proposed facility or modification.

(d) A monitoring program, as determined by the administrator to carry out the provisions of the Act, shall consist of any or all of the following:

(i) Operational monitoring;

(ii) Post-discharge or post-operational monitoring;

(iii) Record keeping and reporting.

(e) A monitoring program shall include plans for monitoring the quality of affected or potentially affected surface water and groundwater. The plans shall include the following as determined appropriate by the administrator to carry out the provisions of the act:

(i) Stratigraphic and depth interval to be monitored by each well;

(ii) Details of monitor well(s) construction;

(iii) Details of how the monitoring program will be carried out, from preparation to site abandonment;

(iv) Background water quality obtained from representative samples which characterize water quality and water quality variability for each monitor well;

(v) Background water quality for wells and surface water which might be impacted. This information will vary depending on site specifics based on geohydrology;

(vi) A description of how representative sampling will be accomplished;

(vii) Parameter list(s) and frequency of sampling after operation begins.

(f) The permittee is responsible for properly installing, operating, maintaining and removing all necessary monitoring equipment.

Section 18. **Compliance with State and Local Water Quality Management Plans.** No permit may be issued for any facility which is in conflict with an approved water quality management plan. No permit will be issued for any facility which is in conflict with a Department of Environmental Quality approved wellhead protection or source water protection plan adopted by local government.

Section 19. **Delegation to Local Governmental Entities.** The administrator with the approval of the director is hereby authorized to delegate to the municipality, water and sewer district or county upon their request the authority to enforce and administer the provisions of W. S. 35-11-301 (a) (iii) and (v) subject to the requirements of 35-11-304.

Section 20. **Existing Delegation Agreements.** Delegation agreements existing prior to July 1, 1982, shall remain in force until renegotiated in order to meet the requirements of W.S. 35-11-304 (a) or otherwise terminated by the administrator with the approval of the director.

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prevent intermingling of different quality aquifers and pollution of groundwater from the surface shall be emphasized, as well as proper design and materials used in drilling and construction. The use of toxic glue is prohibited.

(d) Monitoring wells shall be plugged and abandoned in accordance with Chapter ~~11~~ 26 of these regulations. All other subsurface investigation facilities must be abandoned by proper sealing to prevent surface contamination from reaching groundwater and to prevent the intermingling of aquifers.

(e) The administrator may request information from the owner or operator of a facility permitted by rule to determine whether that facility may be causing a violation of groundwater use standards in Chapter 8 of these regulations, the construction standards found in this chapter and in Chapter 11 and Chapter 25 of these regulations, or any other requirements of this chapter. Any request for information under this section shall be made in writing and include a brief statement of the reasons for requesting the information. An owner or operator shall submit the information within the time frame provided in the request for information.

(f) The administrator may require any owner or operator of a facility permitted by rule to obtain an individual permit for that facility when a review of the information submitted under subsection (b) indicates that the permit by rule would not be protective of groundwater in that specific case.

(g) Failure of the owner or operator to meet the requirements under this section is a violation of these regulations.

Section 9. **Application Processing Procedures**

(a) All individual permit applications will be processed in the following manner.

(i) The administrator shall review each application or resubmittal within 60 days from the date the application or resubmittal is received.

(ii) Incomplete applications will be processed in the following manner:

(A) Additional information shall be requested in detail or the application may be returned to the applicant. Incomplete permit applications will result in permit denial;

(B) If an application is denied because of incompleteness necessitating a request for additional information, the applicant shall have a maximum of six months to comply with the request. If the applicant fails to provide the requested information within that period, the entire incomplete application shall be returned;

(C) Resubmittal of information by an applicant on an incomplete application will be processed as described in this section.

(iii) All plans and specifications must meet or exceed minimum design standards and these regulations. Applications for modification of existing facilities permitted

CHAPTER 12

Design and Construction Standards for Public Water Supplies

Section 1. **Authority**. These standards are promulgated pursuant to W.S. 35-11-101 through 35-11-1207. Specifically, W.S. 35-11-302 requires the administrator to establish standards for the issuance of permits for construction, installation, or modification of any public water supply.

Section 2. **Purpose**. The purpose of these standards is to:

(a) Ensure that the design and construction of public water supplies meet the purpose of the Environmental Quality Act.

(b) Prevent, reduce and eliminate pollution and enhance the waters of the State of Wyoming by ensuring that the design and construction of public water supplies are capable of the required treatment and distribution providing continued operation to protect the health, safety and welfare of the users and operators.

These standards pertain only to permits required pursuant to Chapter 3, Wyoming Water Quality Rules and Regulations.

Section 3. **Intent**. The design and construction standards included in these regulations are directed toward conventional public water systems. These standards impose limiting values of design for which a construction, installation, or modification permit application and plans and specifications can be evaluated by the division.

The terms "shall" and "must" are used when practice is sufficiently standardized to permit specific delineation of requirements or when safeguarding public health or protection of water quality justifies such definite action. Other terms, such as "should", "recommend", and "preferred" indicate desirable procedures or methods which allow deviations provided the purpose of these regulations can be accomplished.

The applicant shall use the date referenced copy of other standards referred to in these regulations. Where no date is listed for the referenced standards, the standards used shall be those in effect when these regulations become effective.

Section 4. **Definitions**. The following definitions supplement those contained in W.S. 35-11-103 of the Wyoming Environmental Quality Act.

(a) “Auxiliary source of supply” means any water supply on or available to the water user’s system other than an approved public water supply acceptable to the water supplier. These auxiliary waters may include water from another supplier’s public potable water supply or any natural source(s), such as a well, spring, river, stream, harbor, and so forth; used waters; or industrial fluids. These waters may be contaminated or polluted, they may be objectionable or they may be from a water source which the water supplier is uncertain of sanitary control.

(b) "Average daily demand" means the total annual water use divided by the number of days the system was in operation.

(b) "Backflow" means the undesirable reversal of flow of water or mixtures of water and other liquids, gases, or other substances into the distribution system of the public water supply from any other source or sources.

(c) “Backflow incident” means any identified backflow to a public water supply distribution system or to the potable water piping within the water user’s system benefitting from a water service connection to the public water supply distribution system.

(d) “Back-pressure” means a form of backflow caused when the pressure of the water users’ system is greater than that of the water supply system. This could be caused by a pump, elevated tank, elevated piping, boiler, pressurized process, pressurized irrigation system, air pressure or any other cause of pressure.

(e) “Back-siphonage” means a form of backflow caused by negative or reduced pressure in the water supply system. This situation can be caused by loss of pressure due to high water demands, a line break, excessive fire fighting flows, etc.

(f) “Containment” means the practice of installing approved backflow prevention devices at the water service connection of the water user in order to protect the public water supply from any backflow from the water users system.

(g) “Contamination” means an impairment of a public water supply by the introduction or admission of any foreign substance which degrades the quality of the potable water or creates a health hazard.

(h) “Cross connection” means any actual or potential connection between a potable water supply and any other source or system through which it is possible to introduce contamination into the system.

(i) “Degree of hazard” means either a high or low hazard situation where a substance may be introduced into a public water supply through a cross connection. The degree of hazard or threat to public health is determined by a hazard classification.

(j) “Domestic services” means services using potable water for ordinary living processes and not for commercial or industrial uses, fire protection systems with antifreeze or other chemicals, heating systems, etc. Examples may include residences, churches, office buildings, schools, etc.

(k) “Dual check” means a device conforming to ASSE Standard #1024 consisting of two independently acting check valves. Dual check valves are allowed only for residential water service connections that have a low hazard potential with back pressure or backsiphonage under continuous pressure.

(l) "Groundwater source" includes all water obtained from dug, drilled, bored, jetted or driven wells; springs which are developed so that the water does not flow on the ground and protected to preclude the entrance of surface contamination; and collection wells.

(m) “Hazard classification” means a determination by a hazard classification surveyor as to high hazard or low hazard and the potential cause of backflow as either back-pressure or back-siphonage.

(n) “High hazard” means a situation created when any substance which is or may be introduced into a public water supply poses a threat to public health through poisoning, the spread of disease or pathogenic organisms, or any other public health concern.

(o) “Isolated” when referring to cross connections means the proper approved backflow prevention devices have been installed at each point of cross connection within the water user's system. This requires the installation of an approved backflow protection device at each source of possible contamination. This type of control has the advantage of protecting health within the water user's system as well as protecting the public water supply.

(p) “Low hazard” means a situation created when any substance which is or may be introduced into a public water supply does not pose a threat to public health but which does adversely affect the aesthetic quality of the potable water.

(q) "Maximum daily demand" means the demand for water exerted on the system over a period of 24 consecutive hours, for the period during which such demand is greatest.

(r) "Maximum hour demand" means the highest single hour demand exerted on the system. This may or may not occur on the maximum day.

(s) "Mineralized water" means any water containing more than 500 mg/L total dissolved solids.

(t) "Offstream reservoir" means a facility into which water is pumped during periods of good quality and high stream flow for future release to treatment facilities.

(u) "Surface water source" includes all tributary streams and drainage basins, natural lakes and artificial reservoirs or impoundments upstream from the point of the water supply intake.

(v) “Water service connection” means any water line or pipe connected to a distribution supply main or pipe for the purpose of conveying water to a water user’s system.

(w) “Water supplier” means any entity that owns or operates a public water supply, whether public or private.

(x) “Water user” means any entity, whether public or private, with a water service connection to a public water supply. The water user is also identified as a customer of a public water supply.

(y) “Water user’s system” means that portion of the user’s water system between the water service connection and the point of use. This system includes all pipes, conduits, tanks, fixtures, and appurtenances used to convey, store or utilize water provided by the public water supply.

Section 5. **Facilities and Systems not Specifically Covered by these Standards**. This section is provided to encourage new technology and equipment and provide a process for evaluating and permitting designs which deviate from these regulations. The proposed construction of facilities and processes not in compliance with these regulations will be permitted provided that the facility, when constructed, can operate meeting the purpose of these regulations.

(a) Each application for a permit to construct a facility under this section shall be evaluated on a case-by-case basis using the best available technology. The following information should be included with the application:

(i) Data obtained from a full scale, comparable installation which demonstrates the acceptability of the design; and/or

(ii) Data obtained from a pilot plant operated under the design condition for a sufficient length of time to demonstrate the acceptability of the design; and/or

(iii) Data obtained from a theoretical evaluation of the design which demonstrates a reasonable probability of the facility meeting the design objectives; and

(iv) An evaluation of the flexibility of making corrective changes to the constructed facility in the event it does not function as planned.

(b) If an applicant wishes to construct a pilot plant to provide the data necessary to show the design will meet the purpose of the act, a permit to construct must be obtained.

Section 6. **Engineering Design Report.**

(a) Scope and purpose. An engineering design report shall be submitted with each application. The purpose of the report shall be to describe and provide technical justification for all aspects of the proposed construction, modifications and/or installations. The report should address existing conditions (if any), known or suspected problems, proposed actions, and the reasoning used to arrive at those proposed actions. There is no minimum or maximum size for the report, provided it meets the purpose of this section.

(b) Water distribution (water works) systems. The engineering design report for all new water distribution system extensions shall include:

(i) A description of the service area including scaled vicinity plan map(s) of the project with regard to adjacent and proposed development, elevations, and topographic features.

(ii) Current and projected system water demand for average day, maximum day, maximum hour, needed fire flows and per capita maximum daily flows.

(iii) Information on fire protection and fire flow capabilities of the proposed system.

(iv) Description of high service pumping systems and finished water storage facilities.

(c) Treatment facilities. The engineering design report shall include:

(i) A description of the facility site and location, including a scaled site plan, and:

(A) Present and projected facility property boundaries.

(B) Flood protection indicating predicted elevation of 25- and 100-year flood stages. The facility shall be protected from damage and be capable of being operated during the 100-year flood or maximum flood of record, whichever is greater. Flooding resulting from ice jams shall be considered.

(C) Present and proposed access.

(D) Distances from current habitation, the closest major treated water transmission line, the closest treated water storage facility, and the water source.

(E) Fencing and/or security.

(F) Topographic features and contours with indicated datum.

(G) Soil and subsurface geological characteristics. Provide a soils investigation report of the proposed site suitable for structural design of the proposed facilities.

(ii) A detailed description of the service area for the project including a scaled plan showing land use and boundaries.

(iii) A detailed description of the recycle flows and procedures for reclamation of recycle streams.

(iv) A detailed description of disposal techniques for settled solids, including a description of the ultimate disposal of sludge.

(v) Sources of water supply shall be described to include:

(A) Groundwater sources.

(I) Geology of aquifer and overlying strata.

(II) Summary of source exploration data, including test well depth and method of construction; test pumping rates and duration; and water levels and specific yield.

Water quality, including biological, radiological and chemical quality data sufficient to determine necessary treatment processes and compliance with all drinking water standards as determined by the administrator. The same water quality data for all secondary sources shall also be provided.

(III) Sources of possible contamination around well and in any known recharge areas, including location of any waste sites, industrial facilities and wastewater disposal areas.

(B) Surface water sources.

(I) Safe annual yield, the quantity of water available from the source during the average and driest years of record.

(II) Hydrological data, stream flows and diversion records.

(III) Representative water quality data, including bacteriological, radiological, chemical and physical data. These data shall be sufficient to determine the necessary process and the ability to meet water quality standards.

(IV) Description of the watershed noting sources of potential contamination.

(V) Description of any anticipated changes in water quality.

(VI) Description of any diversion dams, impoundments or reservoirs and appurtenances.

(vi) Plant design conditions, including:

(A) Historical and design population.

(B) Existing and projected maximum daily demand flows and demand variations.

(C) Complete description of existing facilities.

(D) Where applicable, a complete description of proposed treatment process including:

(I) Unit process design criteria addressing flash mixing, flocculation and settling basin size and equipment description; retention times; unit loadings and overflow rates; filter area and proposed filtration rate; backwash rate and volume requirements; chemical feeder capacities and ranges; and disinfection feeder capacities and ranges.

(II) Chemical requirements, including dosages and feed rates.

(III) Chemical delivery, handling, and storage systems.

(IV) Waste generation including types and volumes.

(V) Waste stream recycling, including holding basin capacities, pump sizes and recycle rates.

(VI) Methods of ultimate waste disposal.

(VII) Low service pumping facilities.

(E) Description of on-site restrooms and sanitary sewer facilities.

(vii) Summary of automatic operation and control systems, including basic operation, manual override operation, and maintenance requirements.

(viii) Description of the on-site laboratory facilities and a summary of those tests to be conducted on-site. If no on-site laboratory is provided, a description of plant control and water quality testing requirements, and where the testing will be conducted shall be included. Description of cross control measures to be provided at chemical feed tanks, filters, washdown taps, direct connection to sewer or other relevant protection.

(d) Hazard classification. The engineering design report shall include a hazard classification or specify the default classification identified in Section 14 (i) (i) (B) which shall be applicable to the project. A hazard classification shall include the following:

(i) A determination of the degree of hazard of all water service connections to be connected to the proposed project.

(ii) A determination of the potential cause of backflow for all water service connections.

Section 7. **Plans and Specifications Content**.

(a) All plans for water works and treatment facilities shall have a suitable title showing the following:

(i) Name of owner and location of project.

(ii) North arrow and drawing scale.

(iii) Name, Wyoming registration number, and seal or signature of the engineer.

(b) All plans shall contain a site plan of the proposed project with topography and boundaries of the project. Datum used shall be indicated.

(c) Water lines. Plans for transmission and distribution lines shall include:

(i) A detailed plan view at a legible scale of each reach of the water line showing all existing and proposed streets, adjacent structures, physical features, and existing locations of utilities. The location and size of all water lines, valves, access manholes, air-vacuum release stations, thrust blocking, and other appurtenances shall be indicated. Pertinent elevations shall be indicated on all appurtenances.

(ii) Profiles of all water lines shall be shown on the same sheet as the plan view at legible horizontal and vertical scales, with a profile of existing and finished surfaces, pipe size and material, valve size, material and type. The location of all special features such as access manholes, concrete encasements, casing pipes, blowoff valves, airvacuum relief valves, etc., shall be shown.

(iii) Special detail drawings, scaled and dimensioned to show the following:

(A) The bottom of the stream, the elevation of the high- and low-water levels, and other topographical features at all locations where the water line is near or crosses streams or lakes.

(B) Cross-section drawing of the pipe bedding.

(C) Additional features not otherwise covered by specifications.

(iv) Location of any sewer lines within 30 feet (9 m) horizontally. Sewers that cross water lines shall be shown on the profile drawings.

(d) Storage tanks, pumping stations and treatment facilities. Plans shall be submitted showing the relation of the proposed project to the remainder of the system. Layouts and detail plans shall show the following:

(i) Site location and layout including topographic and physical features, proposed arrangement of pumping or treatment units, existing facilities, existing and proposed piping and valving arrangements, access drive, power supply, fencing, embankments, clearwells, waste and sludge ponds, etc.

(ii) Schematic flow diagram(s) and hydraulic profile(s) for facility treated water, and flow diagram for sludge and wastewater flows.

(iii) Plan(s) and section view(s) of each treatment facility process unit with specific construction details, features and pertinent elevations. Details of each unit should include, but are not limited to: inlet and outlet devices, baffles, valves, arrangement of automatic control devices, mixers, motors, chemical feeders, sludge scrapers, sludge disposal, or other mechanical devices.

(e) Wells. Plan and profile drawings of well construction shall be submitted showing diameter and depth of drill holes, casing and liner diameters and depths, grouting depths, elevation and designation of geological formations, water levels, and other details to describe the proposed well completely.

(f) Specifications. Technical specifications shall accompany the plans for new water lines, pump stations, treatment facilities, wells, or additions/modifications to existing systems or facilities. Where plans are for extensions to water distribution systems, the specifications may be omitted, provided it is stated that the work is to be constructed under specifications authorized by the Water Quality Division. Specifications on file must conform to this standard. The specifications accompanying construction drawings shall include:

(i) Identification of construction materials.

(ii) The type, size, strength, operating characteristics, rating or requirements for all mechanical and electrical equipment, including machinery, valves, piping, electrical apparatus, wiring and meters; laboratory fixtures and equipment; operating tools; special appurtenances; and chemicals, when applicable.

(iii) Construction and installation procedure for materials and equipment.

(iv) Requirements and tests of materials and equipment to meet design standards.

(v) Performance tests for operation of completed works and component units.

(vi) Specialized requirements for tests, analyses, disinfection techniques, and other special needs.

(vii) Requirements for well construction and testing. The collection of the following must be recorded and reported to the Wyoming Department of Environmental Quality, Water Quality Division.

(A) Geological data.

(B) Well construction data. Well construction data shall include screen locations, size of screen openings, screen intervals, accurate records of drill hole diameters and depths, assembled order, size and length of casing and liners, casing wall thickness, grouting depths, formations penetrated, water levels, and location of any blast charges.

(C) Well test data. Well test data shall include test pump capacity-head characteristics; static water level; depth of test pump setting; time of starting and ending each test cycle; pumping rate; pumping water level; drawdown; and water recovery rate and levels.

(g) Technical specifications shall require that all water service connections will be provided with backflow prevention devices in accordance with the requirements of Section 14 (i) of these regulations.

Section 8. **General Design Considerations.**

(a) Design basis. The capacity of the water treatment or water production system shall be designed for the maximum daily demand at the design year. Where water use records are not available to establish water use, the equivalent per capita water use shall be at least 125 gpd (475 liters per day) and 340 gpd (1,285 liters per day) to size facilities for average and maximum daily water demand, respectively.

(b) Siting requirements.

(i) Location. Treatment facilities shall be located such that no sources of pollution may affect the quality of the water supply or treatment system. The facilities shall not be located within 500 feet of landfills, garbage dumps, or wastewater treatment systems.

(ii) Flood protection. All treatment process structures, mechanical equipment, and electrical equipment shall be protected from the maximum flood of record or the 100-year flood, whichever is greater. The treatment facilities shall remain fully operational and accessible during the 100-year flood.

(c) Level of treatment. Treatment shall be provided to produce a potable water that is bacteriologically, chemically, radiologically, and physically safe as determined by the administrator.

(i) Surface supplies. Treatment shall include:

(A) Chemical addition/coagulation, flocculation, sedimentation, filtration and disinfection; or

(B) Where the raw water maximum turbidity is less than 50 TU and is not attributable to clay and maximum color is less than 30 TU, treatment facilities may include slow sand filtration and disinfection; or

(C) Where the maximum monthly average raw water turbidity is less than 25 TU, the color is less than 30 TU and fecal coliform organisms are less than 100 mpn/100 ml, treatment facilities may be diatomaceous earth filters and disinfection.

(ii) Groundwater supplies. Groundwater supply facilities shall provide disinfection equipment and connections, as a minimum.

(d) Hydraulic and treatment reliability.

(i) Multiple units. Treatment facilities with 100,000 gallons per day (gpd) (378.5 m^3/day) capacity and over shall provide duplicate units, as a minimum, for chemical feed, flocculation, sedimentation, filtration and disinfection. Treatment facilities under 100,000 gpd (378.5 m^3/day) capacity shall provide duplicate units as described above or may provide finished water system storage equal to twice the maximum daily demand.

(ii) Multiple equipment. All treatment facility pumping shall provide the maximum daily flow with the largest single unit not in service. Finished water pumping in combination with finished water storage that floats on the distribution systems shall provide the maximum hour flow with the single largest unit not in service. When fire protection is provided, pumping and finished water storage that floats on the system shall provide the fire demand plus the maximum daily demand, or the maximum hour demand, whichever is greater.

(iii) Alternative power source. Where the finished water storage volume that floats on the distribution system is not capable of supplying the maximum daily demand, an alternative power shall be provided for the finished water pumps. The combined finished water storage volume and pumping capacity supplied by alternative power shall be at least adequate to provide the maximum daily demand. Acceptable alternative power sources include an engine generator, engine drive pumps, or a second independent electrical supply.

(e) Housing. Process equipment, including filters and appurtenances, disinfection, chemical feed and storage, electrical and controls, and pipe galleries shall be housed.

(f) Electrical.

(i) Equipment location. Service transformers and other critical electrical equipment shall be located above the 100-year flood and above-grade. Transformers shall be located so that they are remote or protected by substantial barriers from traffic. Motor controls shall be located in superstructures and in rooms that do not contain corrosive atmospheres.

(ii) Code requirements. Electrical design shall comply with the National Electrical Code as enacted and amended by the Wyoming Department of Fire Prevention and Electrical Safety. Areas in which the occurrence of explosive concentrations of hazardous gases, flammable fluids, or explosive dusts can occur shall be designed for hazardous locations in accordance with the National Electrical Code Class 1, Groups C and D, Division 1 locations.

(g) Structural.

(i) Construction materials. Construction materials shall be selected, apportioned, and/or protected to provide water tightness, corrosion protection, and resistance to weather variations.

(ii) Coatings. Coatings used to protect structures, equipment, and piping shall be suitable for atmospheres containing moisture and low concentrations of chlorine. Surfaces exposed in chemical areas shall be protected from chemical attack. Paints shall not contain lead, mercury, or other toxic metals or chemicals.

(iii) Geological conditions. Structural design shall consider the seismic zone, groundwater, and soil support. Soils investigations shall be made, or adequate previous soils investigations shall be available to develop structural design.

(h) Safety. The Wyoming Occupational Health and Safety (OHSA) Rules and Regulations shall be complied with. The following items shall also be provided:

(i) Instruction manuals. Instruction manuals shall be provided for all mechanical and electrical equipment describing operation, maintenance, and safety.

(ii) Handrails. In addition to all Wyoming OHSA requirements, barriers around treatment basins shall be provided.

(iii) Warning signs. Warning signs for pipes or hose bibs containing nontreated water, electrical hazards, mechanical hazards, chemical hazards, or other unsafe features shall be provided. Warning signs shall be permanently attached to the structure or appropriate equipment.

(iv) Equipment guards. Shields to protect operators from rotating or moving machinery shall be provided.

(v) Lighting. Provisions shall be made to light walkways, paths, and other accessways around basins, in buildings and on the site. All areas shall be lit in a manner that the failure of one lighting fixture will not cause an area to be dark, or the loss of power will not cause a room or enclosed area to be dark.

(vi) Climate conditions. Design of facilities such as exposed stairs, walkways, and sidewalks shall include nonskid surfaces.

(i) Instrumentation.

(i) Metering. The treatment facility shall have a flow measuring device provided for raw water influent and clear well effluent. The accuracy of the device shall be at least plus or minus two percent of span.

(ii) Type. All flow meters shall provide totalized flow. For plants with a maximum daily flow of 50,000 gpd (189 m^3/d) or more, the meter shall also include recording of instantaneous flow rate.

(iii) Controls. Automatic controls shall be designed to permit manual override.

(iv) Alarms. High effluent turbidity and chlorine leaks (when chlorine gas is used) shall be alarmed at an attended location.

(j) Sample taps. Sample taps shall be provided so that water samples can be obtained from each water source and from appropriate locations in each unit operation of treatment. Taps shall be consistent with sampling needs and shall not be of the petcock type. Taps used for obtaining samples for bacteriological analysis shall be of the smooth-nosed type without interior or exterior threads, shall not be of the mixing type, and shall not have a screen, aerator, or other such appurtenance.

(k) Ventilation. All enclosed spaces shall be provided with forced ventilation, except pumping station wetwells or clearwells. In areas where there are open treatment units exposed to the room, ventilation shall be provided to limit relative humidity to less than 85 percent but not less than 6 air changes per hour. In electrical and equipment rooms, ventilation shall be provided to limit the temperature rise in the room to less than 15° F (8° C) above ambient, but not less than 6 air changes per hour. Rooms housing chlorine storage and/or feeders shall have provisions for exhausting the room contents in 2 minutes and continuous ventilation to provide not less than 12 air changes per hour.

(l) Dewatering of treatment units. All treatment units, channels, basins, clearwells and wetwells shall be provided with drains or sumps that facilitate draining the unit for access and maintenance. Drainage shall be to the process waste system, filter washwater system or sanitary sewer. Basin slabs shall be designed to successfully resist the hydrostatic uplift pressure or an area dewatering system shall be provided. Considerations must be given in structural design to long span breakage in basins designed to resist uplift.

(m) Cold weather protection. All equipment not required to be in or on open basins (such as clarifier drives and flocculator) shall be housed in heated, lighted, and ventilated structures. Structure entrances shall be above grade. Piping shall be buried below frost level, placed in heated structures, or provided with heat and insulated.

(n) Chemical storage. All chemical storage shall be housed or buried. Areas designated for storage of specific chemicals shall be separated from areas designated for other reactive chemicals. Liquid storage containers shall be isolated from other portions of the structure by a curb that will contain ruptured tank contents. Concrete floors, walls, and curbs in chemical storage and feed areas shall be coated to protect the concrete from aggressive chemicals. Floors in polymer feed and storage areas shall be provided with nonslip surfaces. Rooms for chlorine storage and feed equipment shall be gastight and be provided with entry from outdoors. All toxic chemical storage areas shall be provided with lighting and ventilation switched from outside the room near the door. All toxic chemical storage areas shall be provided with windows either in the door or near the door to permit viewing the room from outside. Explosive chemicals shall be stored to protect operations personnel and equipment from injury or damage.

(o) Facility water supply. The facility water supply service line and the plant finished water sample tap shall be supplied from a source of finished water at a point where all chemicals have been thoroughly mixed, and the required disinfectant contact time has been achieved. There shall be no cross-connections between the facility water supply service line and any piping, troughs, tanks, or other treatment units containing wastewater, treatment chemicals, raw or partially treated water. The potable plant water supply line shall have provisions to prevent backflow.

(p) Design capacities. The plant capacity shall include maximum daily water demand, filter backwash quantities, and industrial water use. In the absence of data, filter backwash quantity shall be five percent of the maximum daily demand.

(q) Monitoring equipment. Water treatment plants having a capacity of 0.5 mgd (1892.6 m^3/d) or more shall be provided with continuous finished water turbidimeters (including recorders).

(r) Labels. All process piping shall be labeled to identify materials being conveyed.

Section 9. **Source Development**.

(a) Surface water.

(i) Structures.

(A) Design of reservoir or river intake structures.

(I) Facilities for withdrawal of water from more than one level shall be provided in impoundments if the maximum water depth at the intake is greater than 20 feet (6.1 m). All ports or intake gates shall be located above the bottom of the stream, lake, or impoundment. The lowest intake point shall be located at sufficient depth to be kept submerged at low water levels.

(II) Where water temperatures are 34° F (1° C) or less, the velocity of flow into the intake structure shall not exceed 0.5 feet per second (.152 m/s). Where intakes are located in shady reaches of a stream, facilities shall be available to diffuse air into the flow stream at a point in front of the intake pipe.

(III) Inspection manholes shall be located a maximum of every 1,000 feet (304.8 m) for pipe sizes 24 inches (0.61 m) and larger. Where pipelines operate by gravity and the hydraulic gradeline is below the ground surface, concrete manholes may be used. Where the pipeline is pressurized or the hydraulic gradeline is above ground, bolted and gasketed access ways shall be used.

(IV) Devices shall be provided to minimize entry of fish and debris from the intake structure.

(B) Offstream reservoir. Offstream reservoirs shall be constructed to assure that:

(I) Water quality is protected by controlling runoff into the reservoir.

(II) Dikes are structurally sound and protected against wave action and erosion.

(ii) Impoundments and reservoirs. The site of any impoundment or reservoir shall be cleared of all brush, trees, and other vegetation to the high water elevation.

(iii) Raw water supply piping. No customer service connection shall be provided from the raw water transmission line to the treatment plant, unless there are provisions to treat the water to meet these standards, or the sole purpose of the service is for irrigation or agricultural water use.

(b) Groundwater.

(i) Number and capacity. The total developed groundwater source, along with other water sources, shall provide a combined capacity that shall equal or exceed the design maximum daily demand. A minimum of 2 wells, or 1 well and finished water storage equal to twice the maximum daily demand shall be provided. Where 2 wells are provided, the sources shall be capable of equaling or exceeding the design average daily demand with the largest producing well out of service.

(A) General considerations.

(I) Every well shall be protected from and remain operational during the 100-year flood or the largest flood of record, whichever is greater.

(II) All wells shall be disinfected after construction, repair, or when work is done on the pump, before the well is placed in service. Disinfection procedures shall be those specified in AWWA A-100 for disinfection of wells.

(B) Relation to sources of pollution. Every well shall be located further from any of the sources of pollution listed below. The isolation distances listed below apply when domestic wastewater is the only wastewater present.

(I) If the domestic sewage flow is less than 2,000 gallons per day (7,560 L/day), the following minimum isolation distance shall be maintained:

Source of Domestic Wastewater	*Minimum Distance to Well*
Sewer	50 feet (15.2 m)
Septic tank	50 feet (15.2 m)
Disposal field	100 feet (30.5 m)
Seepage pit	100 feet (30.5 m)
Cesspool	100 feet (30.5 m)

(II) If the domestic sewage flow is greater than 2,000 gpd (7,560 L/day) but less than 10,000 gpd (37,800 L/day), the following minimum isolation distances shall be maintained:

Source of Domestic Wastewater	*Minimum Distance to Well*
Sewer	50 feet (15.2 m)
Septic tank	50 feet (15.2 m)
Disposal field	200 feet (61 m)
Seepage pit	200 feet (61 m)
Cesspool	200 feet (61 m)

(III) For systems larger than 10,000 gallons per day (37,800 L/day), the isolation distance shall be determined by a hydrogeological study, in accordance with the requirements of Section 15 of Chapter 3 Water Quality Rules and Regulations, but shall not be less than those listed above.

(IV) For wastewaters other than domestic wastewater, the isolation distance required shall be determined by a hydrogeological study, in accordance with the requirements of Section 15 of Chapter 3 Water Quality Rules and Regulations.

(C) Relation to buildings.

(I) When a well is adjacent to the building, the well shall be located so that the centerline, extended vertically, will clear any projection from the building by not less than 3 feet (0.91 m), and will clear any power line by not less than 10 feet (3.05 m).

(II) When a well is to be located inside a building, the top of the casing and any other well opening shall not terminate in the basement of the building, or in any pit or space that is below natural ground surface unless the well is completed with a properly protected submersible pump. Wells located in a structure must be accessible to pull the casing or the pump. The structure shall have overhead access.

(D) Relation to property lines. Every well shall be located at least 10 feet (3.05 m) from any property line.

(ii) Testing and records.

(A) Yield and drawdown tests. Yield and drawdown tests shall be performed on every production well after construction or subsequent treatment and prior to placement of the permanent pump. The test methods shall be clearly indicated in the specifications. The test pump capacity, at maximum anticipated drawdown, shall be at least 1.5 times the design rate anticipated. The test shall provide for continuous pumping for at least 24 hours or until stabilized drawdown has continued for at least 6 hours when test pumped at 1.5 times the design pumping rate.

(B) Plumbness and alignment requirements. Every well shall be tested for plumbness and alignment in accordance with AWWA A-100. The test method and allowable tolerance shall be stated in the specifications.

(iii) Well construction.

(A) Protection during construction. During any well construction or modification, the well and surrounding area must be adequately protected to prevent any groundwater contamination. Surface water must be diverted away from the construction area.

(B) Well types and construction methods.

(I) Dug wells. Dug wells shall be used only where geological conditions preclude the possibility of developing an acceptable drilled well.

(1.) Every dug well, other than the buried slab type, shall be constructed with a surface curbing of concrete, brick, tile or metal, extending from the aquifer to above the ground surface. Concrete grout, at least 6 inches (0.15 m) thick, shall be placed between the excavated hole and the curbing for a minimum depth of 10 feet (3.05 m) below original or final ground elevation, whichever is lower, or to the bottom of the hole, if it is less than 10 feet (3.05 m).

(2.) The well lining in the producing zone shall readily admit water, and shall be structurally sound to withstand external pressures.

(3.) The well cover or platform shall be reinforced concrete with a minimum thickness of 4 inches (10 cm). The top of the platform shall be sloped to drain to all sides. The platform shall rest on and overlap the well curbing by at least 2 inches (5 cm), or it may be cast with the curbing or the concrete grout. Adequately sized pipe sleeve(s) shall be cast in place in the platform to accommodate the type of pump, pump piping or wiring proposed for the well. Pump discharge piping shall not be placed through the well casing or wall.

(4.) A buried slab type of construction may be used if the dug well is greater than 10 feet (3.05 m) deep. The well lining shall be terminated a minimum of 10 feet (3.05 m) below the original or final ground elevation, whichever is lower. A steel-reinforced concrete slab or platform, at least 4 inches (10 cm) thick, shall rest on and overlap the lining. A standard unperforated well casing shall extend from the concrete slab to at least 12 inches (30 cm) above the original or final ground surface, whichever is higher. This casing shall be firmly imbedded in the slab or connected to a pipe cast in the slab to ensure that the connection is watertight. The excavation above the slab shall be backfilled with a bentonite slurry or clean earth thoroughly tamped to minimize settling.

(II) Drilled, driven, jetted, or bored wells.

(1.) A drilled well may be constructed through an existing dug well provided that an unperforated casing extends to at least 12 inches (30 cm) above the original ground or final surface, whichever is higher. A seal of concrete, at least 2 feet (0.61 m) thick, shall be placed in the bottom of the dug well to prevent the direct movement of water from the dug well into the drilled well. The original dug well shall be adequately protected from contamination as described above.

(2.) Every drilled, driven, jetted, or bored well shall have an unperforated casing that extends from a minimum of 12 inches (30 cm) above ground surface to at least 10 feet (3.05 m) below ground surface. In unconsolidated formations, this casing shall extend to the water table or below. In consolidated formations, the casing may be terminated in rock or watertight clay above the water table.

(III) Sand or gravel wells. If clay or hard pan is encountered above the waterbearing formation, the permanent casing and grout shall extend through such materials. If a sand or gravel aquifer is overlaid only by permeable soils, the permanent casing and grout shall extend to at least 20 feet (6.1 m) below original or final ground elevation, whichever is lower. If a temporary outer casing is used, it shall be completely withdrawn as grout is applied.

(IV) Gravel pack wells. The diameter of an oversized drill hole designed for the placement of an artificial gravel pack shall allow a thickness of gravel or sand outside the casing sufficient to block the movement of natural materials into the well. The size of the openings in the casing or screen shall be based on the size of the gravel or sand used in the gravel pack.

(1.) Gravel pack shall be well-rounded particles, 95 percent siliceous material, that are smooth and uniform, free of foreign material, properly sized, washed, and then disinfected immediately prior to or during placement. Gravel pack shall be placed in one uniformly continuous operation.

(2.) After completion, the well shall be overpumped, surged, or otherwise developed to ensure free entry of water without sediment. A gravel-packed well shall be sealed in one of two ways to prevent pollution to the groundwater supply:

If a permanent surface casing is not installed, the annular opening between the casing and the drill hole shall be sealed in the top 10 feet (3.05 m) with concrete or cement grout.

If a permanent surface casing is installed, it shall extend to a depth of at least 10 feet (3.05 m). The annular opening between this outer casing and the inner casing shall be covered with a metal or cement seal.

(3.) Gravel refill pipes, when used, shall be Schedule 40 steel pipe incorporated within the pump foundation and terminated with screwed or welded caps at least 12 inches (30 cm) above the pump house floor or concrete apron. Gravel refill pipes located in the grouted annular opening shall be surrounded by a minimum of 1-1/2 inches (3.8 cm) of grout. Protection from leakage of grout into the gravel pack or screen shall be provided.

(V) Radial water collector.

(1.) Locations of all caisson construction joints and porthole assemblies shall be indicated on drawings. The caisson wall shall be reinforced to withstand the forces to which it will be subjected. The top of the caisson shall be covered with a watertight floor. The pump discharge piping shall not be placed through the caisson walls.

(2.) Provisions shall be made to assure that radial collectors are essentially horizontal.

(3.) All openings in the floor shall be curbed and protected from entrance of foreign material.

(VI) Infiltration lines. Where an infiltration line is used, the source shall be considered a surface source requiring treatment defined in Section 8(c) (i) unless, (1) the water system owner is in complete control of the surrounding property for a distance of 500 feet around the periphery of the infiltration system; (2) the area is fenced to exclude trespass; and (3) the infiltration collection lines are a minimum of 40 inches below the ground surface at all points within the infiltration collection system.

(VII) Limestone or sandstone wells. In consolidated formations, casing shall be driven a minimum of 5 feet into firm bedrock and cemented into place.

(VIII) Artesian wells.

(1.) When artesian water is encountered in a well, unperforated casing shall extend into the confining layer overlying the artesian zone. This casing shall be adequately sealed with cement grout into the confining zone to prevent both surface and subsurface leakage from the artesian zone. The method of construction shall be such that during the placing of the grout and the time required for it to set, no water shall flow through or around the annular space outside the casing, and no water pressure sufficient to disturb the grout prior to final set shall occur. After the grout has set completely, drilling operations may be continued into the artesian zone. If leakage occurs around the well casing or adjacent to the well, the well shall be recompleted with any seals, packers or casing necessary to eliminate the leakage completely.

(2.) If water flows at the surface, the well shall be equipped with valved pipe connections, watertight pump connections, or receiving reservoirs set at an altitude so that flow can be stopped completely. There shall be no direct connection between any discharge pipe and a sewer or other source of pollution.

(IX) Wells that penetrate more than one aquifer.

(1.) Where a well penetrates more than one aquifer or water-bearing strata, every aquifer and/or strata shall be sealed off to prevent migration of water from one aquifer or strata to another. Strata shall be sealed off by placing impervious material opposite the strata and opposite the confining formation(s). The seal shall extend above and below the strata no less than 10 feet. The sealing material shall fill the annular space in the interval to be sealed, and the surrounding void spaces which might absorb the sealing material. The sealing material shall be placed from the bottom to the top of the interval to be sealed.

(2.) Sealing material shall consist of neat cement, cement grout, or bentonite clay.

(X) Wells that encounter mineralized or polluted water.

(1.) Any time during the construction of a well that mineralized water or water known to be polluted is encountered, the aquifer or aquifers containing such inferior quality water shall be adequately cased or sealed off so that water shall not enter the well, nor will it move up or down the annular space outside the well casing. If necessary, special seals or packers shall be installed to prevent movement of inferior quality water. Mineralized water may be used if it can be properly treated to meet all drinking water quality standards as determined by the administrator. When mineralized water is encountered, it shall not be mixed with any other waters from different aquifers within the well. If a well is penetrating multiple aquifers, mineralized water shall be excluded from the well if water is taken from other non-mineralized aquifers.

(2.) In gravel packed wells, aquifers containing inferior quality water shall be sealed by pressure grouting, or with special packers or seals, to prevent such water from moving vertically in gravel packed portions of the well.

(XI) Conversion of existing oil or gas wells, or exploration test holes, into water wells.

(1.) Existing oil and gas wells, seismic test holes, or mineral exploration holes may be converted for use as water wells provided that the wells can be completed to conform to the minimum construction standards cited in this chapter. This does not relieve the applicant from obtaining appropriate permits.

(2.) Information on the geologic conditions encountered in the well at the time of the original drilling shall be used to determine what special construction standards shall be met in order to eliminate all movement of pollutants into the well or along the annular space surrounding the casing. If no original geologic information is available, an electric or other geophysical log is required to supplement known information.

(C) Construction materials.

(I) Casing. The casing shall provide structural stability to prevent casing collapse during installation as well as drill hole wall integrity when installed, be of required size to convey liquid at a specified injection/recovery rate and pressure, and be of required size to allow for sampling.

(1.) Temporary steel casing. Temporary steel casing used for construction shall be capable of withstanding the structural load imposed during its installation and removal.

(2.) Permanent steel casing. Permanent steel casing pipe shall be new pipe meeting AWWA Standard A-100 specifications for water well construction. The casing shall have full circumferential welds or threaded coupling joints to assure a watertight construction.

a. Standard and line pipe. This material shall meet one of the following specifications:

API Std. 5L, "Specifications for Line Pipe."

API Std. 5LX, "Specifications for High-Test Line Pipe."

ASTM A53 "Standard Specification for Pipe Steel, Black and Hot Dipped, Zinc-Coated Welded and Seamless."

ASTM A120 "Standard Specifications for Pipe, Steel, Black and Hot-Dipped Zinc-Coated (Galvanized) Welded and Seamless, for Ordinary Uses."

ASTM A134 "Standards Specifications for Electric-Fusion (arc) - Welded Steel Plate Pipe (sizes NPS 16 inches and over)."

ASTM A135 "Standard Specifications for Electric - Resistance - Welded Steel Pipe."

ASTM A139 "Standard Specification for Electric-Fusion (arc) - Welded Steel Pipe (Sizes 4" and over)."

ASTM A211 "Standard Specifications for Spiral - Welded Steel or Iron Pipe."

AWWA C200 "AWWA Standard for Steel Water Pipe 6 inches and Larger."

b. Structural steel. This material shall meet one of the following specifications:

ASTM A36 "Standard Specification for Structural Steel."

ASTM A242 "Standard Specifications for High Strength Low Alloy Structural Steel."

ASTM A283 "Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates, Shapes and Bars of Structural Quality."

ASTM A441 "Tentative Specifications for High-Strength Low Alloy Structural Manganese Vanadium Steel."

ASTM A570 "Standard Specification for Hot-Rolled Carbon Steel Sheet and Strip, Structural Quality."

c. High-strength carbon steel sheets or "well casing steel". Each sheet of material shall contain mill markings which will identify the manufacturer and specify that the material is well casing steel which complies with the chemical and physical properties published by the manufacturer.

d. Stainless steel casing shall meet the provisions of ASTM A409 "Standard Specification for Welded Large Diameter Austenitic Steel Pipe for Corrosive or High Temperature Service".

(3.) Nonferrous casing materials. Nonferrous or plastic material may be used as a well casing. It must be resistant to the corrosiveness of the water and to the stresses to which it will be subjected during installation, grouting, and operation. The material shall be nontoxic. All joints shall be durable and watertight.

a. Thermoplastics. This material shall meet the requirements of ASTM F 480 "Standard Specification for Thermoplastic Water Well Casing Pipe and Couplings made in Standard Dimension Ratios (SDR)".

b. Thermosets. This material shall meet the requirements of the following specifications:

ASTM D2996 "Standard Specification for Filament Wound Reinforced Thermosetting Resin Pipe."

ASTM D2997 "Standard Specification for Centrifugally Cast Reinforced Thermosetting Resin Pipe."

ASTM D3517 "Standard Specification for Reinforced Plastic Mortar Pressure Pipe."

AWWA C950 "AWWA Standards for Glass - Fiber - Reinforced Thermosetting - Resin Pressure Pipe."

c. Concrete pipe used for casing should conform to one of the following specifications:

ASTM C14 "Standard Specifications for Concrete Sewer, Storm Drain, and Culvert Pipe."

ASTM C76 "Standard Specification for Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe."

AWWA C300 "AWWA Standards for Reinforced Concrete Pressure Pipe, Steel Cylinder Type, for Water and Other Liquids."

AWWA C301 "AWWA Standards for Prestressed Concrete Pressure Pipe, Steel Cylinder Type, for Water and Other Liquids."

(4.) Casing diameter. The casing diameter (inside diameter) shall be a minimum of one size larger than the largest dimension/diameter of the pump or pumping structure. If a reduction in casing diameter is made, there shall be adequate overlap of the casing to prevent misalignment and to prevent the movement of unstable sediment into the well. To prevent the migration of mineralized, polluted, or otherwise inferior quality water, lead or neoprene packers shall be installed to seal the annular space between casings.

(II) Packers. Packers shall be material that will not impart taste, odor, toxic substance, or bacterial contamination to the well water.

(III) Screens.

(1.) Screens shall be constructed of materials resistant to damage by chemical action of groundwater or cleaning operations, and have size of openings based on sieve analysis of formation and/or gravel-pack materials. The screen shall have sufficient diameter to provide adequate specific capacity and low aperture entrance velocity. The entrance velocity shall not exceed 0.1 feet per second (3 cm/sec).

(2.) The screen shall be installed so that the pumping water level remains above the screen under all operating conditions, and shall be provided with a bottom plate or washdown bottom fitting of the same material as the screen.

(3.) For a nonhomogeneous aquifer having a uniformity coefficient less than 3.0 and an effective grain size less than 0.01 inches, an artificial filter or screen shall be used.

(IV) Grout and grouting requirements. All permanent well casing, except driven Schedule 40 steel casing, shall be surrounded by a minimum of 2 inches (5.1 cm) of grout. All temporary construction casings shall be removed. Where removal is not possible or practical, the casing shall be withdrawn at least 5 feet to ensure grout contact with the native formation.

(1.) Neat cement grout. Cement conforming to ASTM Standard C150 and water, with not more than 6 gallons (13.62 L) of water per sack of cement, must be used for 2 inch (5.1 cm) openings. Additives used to increase fluidity must meet ASTM C494.

(2.) Concrete grout. Equal parts of cement conforming to ASTM Standard C150 and sand, with not more than 6 gallons (13.62 L) of water per sack of cement, may be used for openings larger than 2 inches (5.1 cm). Where an annular opening larger than 4 inches (10 cm) is available, gravel not larger than 1/2 inch (1.27 cm) in size may be added.

(3.) Clay seal. Where an annular opening greater than 6 inches (15.2 cm) is available a clay seal of clean local clay mixed with at least 10 percent swelling bentonite may be used.

(4.) Application. Prior to grouting through creviced or fractured formations, bentonite or similar materials may be added to the annular opening in the manner indicated for grouting. After cement grouting is applied, work on the well shall be discontinued until the cement or concrete grout has properly set.

Sufficient annular opening shall be provided to permit a minimum of 2 inches (5.1 cm) of grout around permanent casings, including couplings.

When the annular opening is 4 or more inches (10 cm) and less than 100 feet (30.5 m) in depth and concrete grout is used, the grout may be placed by gravity through a grout pipe installed to the bottom of the annular opening in one continuous operation until the annular opening is filled.

When the annular opening exceeds 6 inches (15.2 cm), and less than 100 feet (30.5 m) in depth and a clay seal is used, it may be placed by gravity.

(5.) Guides. The casing must be provided with sufficient guides welded to the casing to permit unobstructed flow and uniform thickness of grout.

(V) Upper terminal well construction.

(1.) Permanent casing for all groundwater sources shall project at least 12 inches (30.5 cm) above the pumphouse floor or concrete apron surface and at least 18 inches (0.46 m) above final ground surface. The concrete floor or apron shall slope away from the casing at a slope of 1 inch per foot (8.33 cm/m).

(2.) Where a well house is constructed, the floor surface shall be at least 6 inches (15.2 cm) above the final ground elevation and shall slope away from the casing at a slope of 1/2 inch per foot (4.16 cm/m).

(3.) Sites subject to flooding shall be provided with an earthen berm surrounding the casing and terminating at an elevation at least 2 feet (0.61 m) above the highest known flood elevation, or other suitable protection shall be provided.

(4.) The top of the well casing at sites subject to flooding shall terminate at least 3 feet (0.91 m) above the 100-year flood level or the highest known flood elevation, whichever is higher.

(5.) The casing and/or well house shall be protected from entrance by animals.

(VI) Development.

(1.) Every well shall be developed to remove the native silts and clays, drilling mud or finer fraction of the gravel pack. Development shall continue until the maximum specific capacity is obtained from the completed well.

(2.) Where chemical conditioning is required, the specifications shall include provisions for blasting and cleaning. Special attention shall be given to assure that the grouting and casing are not damaged by the blasting.

(VII) Capping requirements. A welded metal plate or a threaded cap shall be used for capping a well. A properly fitted, firmly driven, solid wooden plug may be used for capping a well until pumping equipment is installed. At all times during the progress of work, the contractor shall provide protection to prevent tampering with the well or entrance of surface water or foreign materials.

(D) Well pumps, discharge piping and appurtenances.

(I) Line shaft pumps. Wells equipped with line shaft pumps shall have the casing firmly connected to the pump structure or have the casing inserted into a recess extending at least 1/2 inch into the pump base, have the pump foundation and base designed to prevent water from coming into contact with the joint, and avoid the use of oil lubrication at pump settings less than 400 feet (122 m).

(II) Submersible pumps. Where a submersible pump is used, the top of the casing shall be effectively sealed against the entrance of water under all conditions of vibration or movement of conductors or cables. The electrical cable shall be firmly attached to the rise pipe at 20 foot (6.1 m) intervals or less, and the pump shall be located at a point above the top of the well screen.

(III) Discharge piping.

(1.) The discharge piping shall have control valves and appurtenances located above the wellhouse floor. The piping shall be protected against the entrance of contamination and be equipped with a check valve, a shutoff valve, a pressure gauge, a means of measuring flow, and a smooth-nosed sampling tap located at a point where positive pressure is maintained. Where a submersible pump is used, a check valve shall be located in the casing in addition to the check valve located above ground to prevent negative pressures on the discharge piping.

(2.) For pipes equipped with an air release-vacuum relief valve, the valve shall be located upstream from the check valve, with exhaust/relief piping terminating in a downturned position at least 18 inches (0.46 m) above the floor and covered with a 24 mesh corrosion-resistant screen. The discharge piping shall be valved to permit test pumping and control of each well.

(3.) All exposed piping, valves and appurtenances shall be protected against physical damage and freezing.

(4.) The piping shall be properly anchored to prevent movement, and shall be protected against surge or water hammer.

(5.) The discharge piping shall be provided with a means of pumping to waste, but shall not be directly connected to a sewer.

(IV) Pitless well units. A pitless adaptor or well house shall be used where needed to protect the water system from freezing. A frost pit may be used only in conjunction with a properly protected pitless adaptor.

(1.) All pitless units shall be shop fabricated from the point of connection with the well casing to the unit cap or cover. They shall be threaded or welded to the well casing, and be of watertight construction throughout. The materials and weight shall be at least equivalent and compatible to the casing.

(2.) Pitless units shall have field connection to the lateral discharge from the pitless unit of threaded, flanged or mechanical joint connection, and the top of the pitless unit shall terminate at least 18 inches (0.46 m) above final ground elevation or 3 feet above the 100-year flood level or the highest known flood elevation, whichever is higher.

(3.) Provisions shall be made to disinfect the well. The unit shall have facilities to measure water levels in the well; a cover at the upper terminal of the well that will prevent the entrance of contamination; a contamination-proof entrance connection for electrical cable; an inside diameter as great as that of the well casing, up to and including casing diameters of 12 inches (30.5 cm), to facilitate work and repair on the well, pump, or well screen; and at least one check valve within the well casing.

(V) Casing vent. Provisions shall be made for venting the well casing to atmosphere. The vent shall terminate in a downturned position, at or above the top of the casing or pitless unit in a minimum 1-1/2 inch (3.8 cm) diameter opening covered with a 24 mesh corrosion-resistant screen. The pipe connecting the casing to the vent shall be of adequate size to provide rapid venting of the casing.

(VI) Water level management. Every well greater than 4 inches (10 cm) in diameter shall be equipped with an access port that will allow for the measurement of the depth to the water surface; or in the case of a flowing artesian well, with a pressure gauge that will indicate pressure. An air line used for level measurement shall be provided on all wells greater than 4 inches (10 cm) in diameter. Installation of water level measuring equipment shall be made using corrosion-resistant materials attached firmly to the drop pipe or pump column and in such a manner as to prevent entrance of foreign materials.

(VII) Discharge measuring device. Every well shall be piped so that a device capable of measuring the total well discharge can be placed in operation at the well for well testing. Every well field (or when only one well is present, every well) shall have a device capable of measuring the total discharge.

(VIII) Observation wells. Observation wells shall be constructed in accordance with the requirements for permanent wells if they are to remain in service after completion of a water supply well. They shall be protected at the upper terminal to preclude entrance of foreign materials.

(IX) Well abandonment. Test wells and groundwater sources which are not in use shall be sealed in accordance with requirements of ~~Part G of Chapter 11~~ Chapter 26, Water Quality Rules and Regulations.

Wells shall be sealed by filling with neat cement grout. The filling materials shall be applied to the well hole through a pipe, tremie, or bailer.

Section 10. **Treatment.**

(a) Design capacity. The capacity of the water treatment or water production system shall be designed for the maximum daily demand at the design year.

(b) Presedimentation. Raw waters which have episodes of turbidity in excess of 1,000 TU for a period of one week or longer shall be presettled.

(i) Detention time. Basins without mechanical sludge collection equipment shall have a minimum detention time of three days. Basins with mechanical sludge collection equipment shall have a minimum detention time of three hours.

(ii) Inlet. Inlet flow shall be evenly dispersed along the inlet of the basin.

(iii) Drains. Basins shall have a minimum of one 8-inch (20 cm) drain line to completely dewater the facility.

(iv) Bottom slope. Basins shall have a bottom slope to drain of 1/4 inch per foot (20 mm/m) without mechanical sludge collection equipment and 2 inches per foot (16 cm/m) with mechanical sludge collection equipment.

(v) Bypass. Basin bypass provisions shall be included in the process piping.

(c) Rapid mix. Rapid dispersal of chemicals throughout the water shall be accomplished by mechanical mixers, jet mixers, static mixers, or hydraulic jump.

(i) Mixing intensity. For mechanical mixers, the minimum Gt (velocity gradient (sec-1) x t (sec)) provided at maximum daily flow shall be 27,000.

(ii) Mixing time. The detention time in a flash mixing chamber shall not exceed 30 seconds at maximum daily flow conditions.

(iii) Drain. The basin shall have a drain.

(d) Flocculation. The low velocity agitation of chemically treated water shall be accomplished by mechanical flocculators.

(i) Detention time. A minimum of 10 minutes detention time shall be provided.

(ii) Mixing intensity. The velocity gradient (G value) imposed shall be adjustable by providing variable speed drives or shall be designed to be 30 sec-1 if a single basin is provided, 20 sec-1 in the final basin of a two stage system, and 10 sec-1 in the final basin of a three stage system. For a single speed drive system, the tip speed of the mixer shall not exceed 3 feet per second (0.91 m/sec). Variable speed drives shall provide tip speeds of 0.5 to 3.0 feet per second (0.15-0.91 m/sec).

(iii) Drains. Flocculation basins shall have a minimum of one drain line to dewater the facility.

(iv) Piping. The velocity of flocculated water through pipes or conduits to settling basins shall not be less than 0.5 or greater than 1.5 feet per second (0.15-0.46 m/sec).

(e) Sedimentation basins.

(i) Diameter. The maximum diameter in circular basins shall be 80 feet.

(ii) Overflow rate. The basin overflow rate shall not exceed 1,000 gpd/ft^2 (41 m^3/m^2·d) at design conditions.

(iii) Weir loading rate. Weir loading rates shall not exceed 20,000 gpd/ft (2480 m^{3}m·d) of length. The weir length shall be computed as the length of the centerline of the launder. Where the weir is located at 3/4 the radius, the weir may be loaded at 36,000 gpd/ft (4464 m^3/m·d).

(iv) Side water depth. The minimum basin side water depth shall be 8 feet (2.43 m) if mechanical sludge collection equipment is provided or basins or basin sludge hopper segments are less than 100 square feet (9.3 m) in surface area and 15 feet (4.6 m) if basins are manually cleaned. Mechanical sludge collection equipment includes mechanically driven drives that use scrapers or differential water level to collect the sludge.

(v) Freeboard. The outer walls of settling basins shall extend at least 12 inches (30.5 cm) above the surrounding ground and provide at least 12 inches (30.5 cm) of freeboard to the water surface. Where basin walls are less than 4 feet (1.22 m) above the surrounding ground, a fence or other debris barrier shall be provided on the wall.

(vi) Inlet devices. Inlets shall be designed to distribute the water equally and at uniform velocities. Open ports, submerged ports, and similar entrance arrangements are required. A baffle should be constructed across the basin close to the inlet end and should project several feet below the water surface to dissipate inlet velocities and provide uniform flows across the basin.

(vii) Velocity. The velocity through settling basins shall not exceed 0.5 feet per minute (0.15 m/min). The basins must be designed to minimize short-circuiting.

(viii) Sludge collection. If settleable organics are present in the water or if there is a history of organically related taste and odor problems, mechanical sludge collection shall be provided.

(ix) Sludge removal. Sludge removal design shall provide that sludge pipes shall be not less than 6 inches (15.2 cm) in diameter and arranged to facilitate cleaning. Valves on the sludge line shall be located outside the tank.

(x) Flushing lines. Flushing lines or hydrants shall be provided near the basins.

(xi) Drainage. Basin bottoms shall slope toward the drain at not less than 1 inch per foot (8 cm/m) where mechanical sludge collection equipment is provided and 1/4 inch per foot (2 cm/m) where no mechanical sludge collection equipment is provided.

(f) Softening sedimentation - clarification. Conventional sedimentation - clarification as described above shall be provided in softening operations, except for softening a groundwater supply of constant quality. Where a groundwater supply is softened, the requirements may be modified as follows:

(i) Overflow rate. The basin overflow rate at the design flow shall not exceed 2,100 gpd/ft^2 (86 m^3/m^2·d).

(ii) Sludge. Mechanical sludge removal shall be provided and shall be designed to handle a load of 40 lbs/foot (60 kg/m) of collector scraper arm length.

(iii) Other design considerations shall be the same as conventional sedimentation - clarification.

(g) Solids contact units. These treatment units are acceptable for combined softening and clarification of well water where water quality characteristics are not variable and flow rates are uniform. The units shall be designed to meet the criteria detailed previously.

(i) Such units may be considered for use as clarifiers without softening when they are designed to meet the criteria detailed in the conventional sedimentation - clarification.

(ii) These units may also be used for other treatment purposes, such as rapid mixing, flocculation, etc., when the individual components of the solids contact units are designed in accordance with the design criteria for that individual treatment process as described above.

(h) Settling tube clarifiers. Shallow depth sedimentation devices or tube clarifier systems of the essentially horizontal or steeply inclined types may be used when designed as follows:

(i) Sludge removal. Sludge shall be removed using 45 or steeper hoppered bottoms, or mechanical devices that move the sludge to hoppers, or devices that remove settled sludge from the basin floor using differential hydraulic level.

(ii) Tube cleaning. A method of tube cleaning shall be provided. This may include a provision for obtaining a rapid reduction in clarifier water surface elevation, a water jet spray system, or an air scour system. Where cleaning is automatic, controls shall be provided to cease clarifier operation during tube cleaning and a 20 minute rest period.

(iii) Tube placement. Tops of tubes shall be more than 12 inches (0.3 m) from the underside of the launder and more than 18 inches (0.46 m) from the water surface.

(iv) Loading rates. The maximum overflow rate shall be less than 2.0 gpm/sq ft (62.7 m^3/m^2·d) based on the surface area of the basin covered by the tubes.

(v) Effluent launderers. The spacing between effluent launderers shall not exceed three times the distance from the water surface to the top of the tube modules.

(i) Filtration.

(i) Pressure granular media filters. Vertical or horizontal pressure filters shall not be used for filtration of surface waters. Pressure filters may be used for groundwater filtration, including iron and manganese removal.

(ii) Gravity filters.

(A) Slow rate sand filters. These types of filters may be used when maximum raw water turbidity is less than 50 TUs and the turbidity present is not attributable to colloidal clay. Maximum color shall not exceed 30 units.

(I) Loading rates. The allowable loading rates at maximum daily demands shall not exceed 0.1 gpm/ft^2 (5.9 m^3/m^2.d) unless satisfactory pilot testing is completed prior to design which shows a higher rate is appropriate.

(II) Number of filters. At least two units shall be provided. Where only two units are provided, each shall be capable of meeting the plant design capacity at the maximum filtration rate. Where more than two filter units are provided, the filters shall be capable of meeting the plant design at the maximum filtration rate with one filter removed from service.

(III) Underdrains. Each filter unit shall be equipped with a main drain and an adequate number of lateral underdrains to collect the filtered water. The underdrains shall be so spaced that the maximum velocity of the water flow in the lateral underdrain will not exceed 0.75 feet per second (0.22 m/sec). The maximum spacing of the laterals shall not exceed 12 feet (3.7 m).

(IV) Filter material. Filter sand shall be placed on graded gravel layers for a minimum sand depth of 30 inches (0.76 m). The effective size shall be between 0.15 mm and 0.35 mm. The uniformity coefficient shall not exceed 2.0. The sand shall be clean and free from foreign matter. The supporting gravel shall conform to the size and depth distribution provided for rapid rate gravity filters.

(V) Depth of water on filter beds. Design shall provide a depth of at least 3 feet (0.91 m) of water over the sand. Influent water shall enter the water surface at a velocity of less than 2 feet per second (0.61 m/sec). An overflow shall be provided at the maximum water surface elevation.

(VI) Appurtenances. Each filter shall be equipped with loss of head gauge; an orifice, Venturi meter, or other suitable metering device installed on each filter to control the rate of filtration; and an effluent pipe designed to maintain the water level above the top of the filter sand.

(VII) Covers. When covers are provided for temperature or sunlight control, they shall be designed to allow adequate headroom above the top of the sand and adequate access ports or manholes.

(B) Rapid rate filters.

(I) Loading rates. The maximum allowable loading rates at maximum daily demands shall not exceed 3 gpm/ft^2 (177 m^3/m^2·d) for single media filters or 5 gpm/ft^2 (295 m^3/m^2·d) for dual or mixed media filters. Each filter shall have a rate limiting device to prevent the filter from exceeding the maximum rate.

(II) Filter compartment design. The filter media compartment shall be constructed of durable material not subject to corrosion or decay and structurally capable of supporting the loads to which it will be subjected.

(1.) There shall be an atmospheric break between filtered and non-filtered water, accomplished by double wall construction.

(2.) The compartment walls shall be vertical and shall not protrude into the filter media.

(3.) There shall be a minimum of 2½ feet (0.76 m) of headroom above the top of the filter compartment walls.

(4.) Neither floor nor roof drainage shall enter the filter. If the top of the filter compartment is at floor level, a minimum 4 inch curb shall be constructed around the box.

(5.) Walkways or observation platforms shall be provided for each filter compartment. Walk-ways around the filter shall be a minimum of 24 inches wide.

(6.) Effluent line shall be trapped or submerged below the low water level in the clearwell to prevent air from entering the filter bottom. The velocity in the filter influent line shall not exceed 4 feet per second (1.2 m/sec). An overflow from the influent of the filter compartment shall be provided.

(7.) The distance between the operating water level in the filter and the high water level in the clearwell or effluent trap shall be 10 feet (3.05 m) minimum. The minimum operating water level over the media shall be 3 feet (0.91 m), and the minimum depth of the filter box shall be 8-1/2 feet (2.6 m).

(III) Washwater troughs. Washwater troughs shall be constructed to provide for not more than 6 feet (1.8 m) clear distance between troughs. The troughs shall not cover more than 25 percent of filter area.

(1.) Minimum clearance between the bottom of trough and top of unexpanded media shall be 12 inches (30.5 cm).

(2.) Minimum distance between the weir of the trough and the unexpanded media shall be 30 inches (0.76 m).

(3.) The trough and washwater waste line shall be sized to carry a filter backwash rate of 20 gpm/ft^2 (1181 $m^3/m^2 \cdot d$) plus a surface wash rate of 2.0 gpm/ft^2 (118 $m^3/m^2 \cdot d$).

(IV) Backwash system.

(1.) The backwash system shall be sized to provide a minimum backwash flow rate of 20 gpm/ft^2 (1181 $m^3/m^2 \cdot d$). Washwater storage shall be designed to provide two 20 minute washes in rapid succession. Where multiple units are not required and only one filter compartment is present, backwash storage capabilities may be reduced to provide one 20 minute backwash. Where pumps are used to provide backwash to the filter or to supply water to a washwater tank, the washwater pumps shall be in duplicate.

(2.) The backwash and surface wash washwater supply shall be filtered and disinfected.

(3.) Washwater rate shall be controlled by a separate valve, manual or automatic, on the main washwater line. Washwater flow rates shall be metered and indicated.

(4.) Air-assisted backwash systems may be used when the design precludes disturbing the gravel support.

(5.) A surface wash system shall be provided. The system shall be capable of supplying 0.5 gpm/ft^2 (29.5 $m^3/m^2 \cdot d$) for system with rotating arms and 2.0 gpm/ft^2 (118 $m^3/m^2 \cdot d$) with fixed nozzles, at a minimum pressure of 50 psi (344 kPa). The surface wash shall use filtered and disinfected water or air and filtered disinfected water. The supply system shall be provided with adequate backflow prevention.

(V) Filter materials. For rapid rate filters, coarse-to-fine beds of mixed or dual media or fine-to-coarse single media beds may be used.

(1.) Types of filter media:

a. Anthracite. Clean crushed anthracite, or a combination of anthracite and other media shall have an effective size of 0.45 mm - 0.55 mm with uniformity coefficient not greater than 1.65 when used alone, or an effective size of 0.8 mm - 1.2 mm with a uniformity coefficient not greater than 1.65 when used as a cap. The anthracite shall meet the requirements of AWWA B100.

b. Sand. Sand shall have an effective size of 0.45 mm to 0.55 mm, a uniformity coefficient of not greater than 1.65, and shall meet the requirements of AWWA B100.

c. Granular activated carbon (GAC). Granular activated carbon media may be used in place of anthracite. There must be means for periodic treatment of granular activated carbon filter material for control of bacterial and other growths. Provisions must be made for replacement or regeneration if GAC is used for filtration.

d. Torpedo sand or garnet. A layer of torpedo sand or garnet shall be used as a supporting media for filter sand.

(2.) Sand for single media beds. The media shall be clean silica sand having a depth of not less than 24 inches (0.61 m), an effective size of from 0.45 mm to 0.55 mm, and a uniformity coefficient not greater than 1.65. A 3 inch (7.6 cm) layer of torpedo sand or other high density material shall be used as a supporting media for the filter sand. The material shall have an effective size of 0.8 mm to 2.0 mm, and a uniformity coefficient not greater than 1.7.

(3.) Anthracite for single media beds. Clean crushed anthracite or a combination of sand and anthracite may be used. Such media shall have an effective size from 0.45 mm to 0.55 mm, and a uniformity coefficient not greater than 1.65.

(4.) Gravel. When used as a supporting media, gravel shall consist of coarse aggregate in which a high proportion of the particles are rounded and tend toward a generally spherical or equidimensional shape. It shall possess sufficient strength and hardness to resist degradation during handling and use, be substantially free of harmful materials, and exceed the minimum density requirement. The gravel shall meet the requirements of AWWA B100.

(5.) Multi-media. Filter beds of this type shall contain a depth of fine media made up of anthracite coal, specific gravity 1.5; silica sand, specific gravity 2.6; and garnet sand or ilemite, specific gravity 4.2 - 4.5.

a. Bed depths and distribution of the media shall be determined by the water quality, but shall not be less than 10 inches (0.25 m) of fine sand and 24 inches (0.61 m) of coal. The relative size of the particles shall be such that hydraulic grading of the material during backwash will result in a filter bed with pore space graded progressively from coarse to fine in the direction of filtration (down).

b. The multi-media shall be supported on two layers of special high density gravel placed above the conventional silica gravel supporting bed. The special gravel shall have a specific gravity not less than 4.2. The bottom layer shall consist of particles passing No. 5 and retained on No. 12 U.S. mesh sieves and shall be 1-1/2 inches (3.8 cm) thick. The top layer shall consist of particles passing No. 12 and retained on No. 20 U.S. mesh sieves, and shall be 1-1/2 inches (3.8 cm) thick.

(6.) Dual media. Coal sand filters shall consist of a coarse coal layer above a layer of fine sand. The media shall consist of not less than 8 inches (20 cm) of sand and 15 inches (0.38 m) of coal on a torpedo sand or garnet layer support of not less than 3 inches (7.8 cm) on the gravel support.

(VI) Filter bottoms. Acceptable filter bottoms and strainer systems shall be limited to pipe, perforated pipe laterals, tile block and perforated tile block. Perforated plate bottoms or plastic nozzles shall not be used.

(VII) Appurtenances. Every filter shall have influent and effluent sampling taps; indicating loss of head gauge; indicating effluent turbidimeter; a waste drain for draining the filter compartment to waste; and a filter rate flow meter. Every filter shall provide polymer feed facilities including polymer mixing and storage tank and at least one feed pump for each filter compartment. On plants having a capacity in excess of 0.5 MGD, recorders shall be provided on the turbidimeters.

(VIII) Filter rate control. Filter rate control shall be such that the filter is not surged. Filter rate of flow shall not change at a rate greater than 0.3 gpm/ft^2 (17.7 m^3/m^2·d) per minute. Filters that stop and restart during a cycle shall have a filter to waste system installed. Declining flow rate filters shall not be used unless the flow rate for each filter is controlled to rates less than allowed in 10 (i)(ii)(B) and there are four or more individual filters.

(IX) A filter to waste cycle shall be provided after the filter backwash operation. The filter to waste cycle shall be at least 10 minutes.

(j) Diatomaceous earth filtration. These types of filters may be used as the filtration process to remove turbidity from surface waters where turbidities entering the filters do not exceed 25 TU and where total raw water coliforms do not exceed 100 organisms/100 ml. These filters may be used where the raw water quality exceeds the above limits when flocculation and sedimentation are used preceding the filters. Diatomaceous earth filters may also be used for removal of iron from groundwaters.

(i) Types of filters. Pressure or vacuum diatomaceous earth filtration units will be considered for approval.

(ii) Precoat. A precoating system shall be provided.

(A) Application. A uniform precoat shall be applied hydraulically to each septum by introducing a precoat slurry to the filter influent line and employing a filter to waste or recirculation system.

(B) Feed capabilities. Diatomaceous earth in the amount of 0.20 lb/ft^2 (1 Kg/m^2) minimum of filter area shall be used with recirculation. When precoating is accomplished with a filter to waste system, 0.3 lbs/ft^2 (1.5 Kg/m^2) minimum shall be provided.

(iii) Body feed. A body feed system to apply diatomaceous earth slurry continuously during the filter run shall be provided. Continuous mixing of the body feed slurry tank during the filter cycle shall be provided.

(iv) Filtration.

(A) Rate of filtration. The maximum rate of filtration shall not exceed 1.5 gpm/ft^2 (88.6 m^3/m^2·d) of septum area. The filtration rate shall be controlled by a positive means.

(B) Head loss. The head loss shall not exceed 30 psi (206 kPa) for pressure diatomaceous earth filters, or a vacuum of 15 inches of mercury (50.8 kPa) for vacuum system.

(C) Recirculation. A recirculation or holding pump shall be provided to maintain differential pressure across the filter when the unit is not in operation in order to prevent the filter cake from dropping off the filter elements. A minimum recirculation rate of 0.1 gallons per minute per square foot (5.9 m^3/m^2·d) of filter area shall be provided. The filter control system shall prevent automatic restart after power failure.

(D) Septum or filter element. The filter elements shall be structurally capable of withstanding maximum pressure and velocity variations during filtration and cleaning cycles, and shall be spaced so that not less than 2 inches (5.1 cm) are provided between elements or between any element and a wall.

(E) Inlet design. The filter influent shall be designed to prevent scour of the diatomaceous earth from the filter element.

(v) Appurtenances. Every filter shall provide sampling taps for raw and filtered water; loss of head or differential pressure gauge; rate of flow indicator, with totalizer; and a throttling valve used to reduce rates during adverse raw water conditions.

(vi) Monitoring. A continuous monitoring turbidimeter is required on the filter effluent from each filter unit for plants treating surface water.

(k) Disinfection. Chlorine, chlorine dioxide, ozone or other disinfectant as approved by the administrator may be used for disinfection. Where the primary disinfectant is ozone, chlorination equipment shall be provided to enable maintaining a residual disinfectant throughout the distribution system. Automatic proportioning of disinfectant feed to flow rate is required where the plant flow control is automatic.

(i) Chlorination equipment.

(A) Type. Solution feed gas chlorinators or hypochlorite feeders of the positive displacement type shall be provided.

(B) Capacity. The chlorinator capacity shall be such that a minimum 5 mg/L disinfection dose can be added on the maximum day. The equipment shall be of such design that it will operate accurately over the desired feeding range.

(C) Standby equipment. Standby equipment of sufficient capacity shall be available to replace the largest chlorinator unit, except for a well water system providing no treatment other than disinfection.

(D) Automatic switchover. Automatic switch-over of chlorine cylinders shall be provided.

(E) Diffuser. The chlorine solution injection/diffuser shall provide a rapid and thorough mix with all the water being treated. If the application point is to a pipeline discharging to a clearwell, the chlorine shall be added to the center of the pipe at least 10 pipe diameters upstream of the discharge into the clearwell.

(F) Injector/Eductor. For gas feed chlorinators, the injector/eductor shall be selected based on solution water pressure, injector waterflow rate, feed point backpressure, and chlorine solution line length and size. The maximum feed point backpressure shall not exceed 110 psi (759 kPa). Where backpressure exceeds 110 psi (750 kPa), a chlorine solution pump shall be used. Gauges shall be provided for chlorine solution pressure, feed water pressure and chlorine gas pressure, or vacuum.

(ii) Points of application and contact time.

(A) At plants treating surface water, provisions shall be made for applying disinfectant to the raw water, filter influent, and filtered water.

(B) For plants treating groundwater, provisions shall be made for applying disinfectant to a point in the finished water supply line prior to any commercial, industrial, or municipal user. Agricultural users may remove water from the supply line prior to disinfectant application point.

(C) Where free chlorine residual is provided, 1/2 hour contact time shall be provided for groundwaters and 2 hours for surface waters. Where combined residual chlorination is provided, 2 hours contact time for groundwater and 3 hours contact for surface water shall be provided.

(D) When chlorine is applied to a groundwater source for the purpose of maintaining a residual, no contact time is required.

(iii) Testing equipment. Chlorine residual test equipment recognized in the 15th Edition of *Standard Methods for the Examination of Water and Wastewater* shall be provided and shall be capable of measuring residuals to the nearest 0.1 mg/L in the range below 0.5 mg/L, to the nearest 0.3 mg/L between 0.5 mg/L and 1.0 mg/L and to the nearest 0.5 mg/L between 1.0 mg/L and 2.0 mg/L.

(iv) Chlorinator piping.

(A) Cross-connection protection. The chlorinator water supply piping shall be designed to prevent contamination of the treated water supply. At all facilities treating surface water, pre- and post- chlorination systems shall be independent to prevent possible siphoning of partially treated water into the clearwell. The water supply to each eductor shall have a separate shutoff valve. No master shutoff will be allowed. Chlorine solution feed water shall be finished water.

(B) Pipe material. The pipes carrying liquid or gaseous chlorine shall be Schedule 80 black steel pipe with forged steel fittings. Bushings shall not be used. Vacuum piping for gaseous chlorine may be polyethylene tubing. Gas piping between the chlorine pressure reducing valve of the chlorinator and the ejector shall be PVC or polyethylene. Piping for aqueous solutions of chlorine beyond the ejector shall be PVC, fiberglass or steel pipe lined with PVC or saran.

(v) Maximum withdrawal. The maximum withdrawal rate of gaseous chlorine shall be limited to 40 lbs/day (18.1 kg/day) for 100 or 150 lb (45.4 or 68.0 kg) cylinders and 400 lbs/day (181 kg/day) for 2,000 lb (907 kg) cylinders, unless chlorine evaporators are employed.

(vi) Ozonation equipment.

(A) Capacity. The ozonator capacity shall be such that an applied dose of at least 10 mg/L can be attained at the maximum daily flows. The equipment shall be of such design that it will operate ± 5 percent over the desired feeding range.

(B) Piping. Injection equipment and piping in contact with ozonated air and air water emulsions shall be of stainless steel, teflon or other material resistant to ozone. Valves carrying ozonized air shall be made of metal coated with ozone resistant materials.

(C) Application. Ozone may be applied to the water directly as a gas or by an injector system similar to a chlorine injector system. In gas applications, depth of submergence of the diffusers shall be a minimum of 10 feet (3.05 m). Diffusion shall be fine bubble or mixed.

(D) Contact time and point of application. Ozone shall be applied at a point which will provide contact time not less than 30 minutes. At plants treating surface water, provisions should be made for applying a disinfectant to the raw water, filter influent, filtered water and final contact basin. At plants treating groundwater, provisions should be made for applying ozone to the clear-well inlet.

(E) Testing equipment. Testing equipment shall enable measurement of residuals to the nearest 0.1 mg/L in the range below 0.5 mg/L and to the nearest 0.2 mg/L above 0.5 mg/L.

(F) Ozone destruct. An ozone destruct device shall be provided to destruct all ozone contractor off gases.

(G) The use of ozone for disinfection will be allowed only if a chlorine or combined chlorine residual is provided in the distribution system.

(l) Softening.

(i) Lime or lime soda process. Design standards for rapid mix, flocculation and sedimentation are the same as for conventional treatment previously outlined. Lime or lime soda softened effluent shall be filtered.

(A) Hydraulics. When split treatment is used, the bypass line shall be sized to carry total plant flow, and a means of measuring and splitting the flow shall be provided.

(B) Chemical feed point. Lime and recycled sludge shall be fed directly into the rapid mix basin.

(C) Stabilization. Provisions shall be made to chemically stabilize waters softened by the lime or lime soda process.

(D) Sludge collection. Mechanical sludge removal equipment shall be provided in the sedimentation basin. Sludge recycling to the rapid mix shall be provided.

(E) Disinfection. The use of excess lime shall not be considered a substitute for disinfection. Disinfection, as previously outlined, shall be provided.

(ii) Cation exchange process.

(A) Pretreatment requirements. Pretreatment is required when the content of iron, manganese, or a combination of the two, is 1 mg/L or more. Water with 5 units or more turbidity shall not be applied directly to the cation exchange softener.

(B) Design. The units may be of pressure or gravity type, of either an upflow or downflow design. Automatic regeneration based on volume of water softened shall be used. A manual override shall be provided on all automatic controls.

(C) Exchange capacity. The design capacity for hardness removal shall not exceed 20,000 grains per cubic foot (45,880 g/L) when resin is regenerated with 0.3 pounds (.14 kg) of salt per kilograin (2.29 g/L) of hardness removed.

(D) Depth of resin. The depth of the exchange resin shall not be less than 2 feet (0.6 m).

(E) Flow rates. The flow applied to the softening unit shall not exceed 7 gpm/ft^2 (413 m^3/m^2·d) of bed area. The minimum backwash rate shall be 6 gpm/ft^2 (354 m^3/m^2·d) of bed area or shall provide a minimum of 150 percent bed expansion at winter water temperatures. A positive means of controlling flow must be present.

(F) Underdrains and supporting gravel. The bottoms, strainer systems and support for the exchange resin shall conform to criteria provided for rapid rate gravity filters.

(G) Brine distribution. Facilities shall be included for even distribution of the brine over the entire surface of both upflow and downflow units.

(H) Cross-connection control. Backwash, rinse and air relief discharge pipes shall be installed in such a manner as to prevent any possibility of back siphonage.

(I) Bypass piping and equipment. A by-pass shall be provided around softening units to produce a blended water of desirable hardness. Totalizing meters must be installed on the bypass line and on each softener unit. An automatic proportioning or regulating device and shutoff valve shall be provided on the bypass line.

(J) Additional limitations.

(I) Silica gel resins shall not be used for waters having a pH above 8.4 or containing less than 6 mg/L silica and shall not be used when iron is present.

(II) When the applied water contains a chlorine residual, the cation exchange resin shall be a type that is not damaged by residual chlorine.

(III) Phenolic resin shall not be used.

(K) Brine and salt storage tanks.

(I) Salt dissolving or brine tanks and wet salt storage tanks shall be covered and constructed of corrosion-resistant materials.

(II) The makeup water inlet shall be protected from back siphonage. Water for filling the tank shall be distributed over the entire surface by pipes above the maximum brine level in the tank. The tanks shall be provided with an automatic declining level control system on the makeup water line.

(III) Wet salt storage basins shall be equipped with manholes or hatchways for access and for direct dumping of salt from truck or railcar. Openings shall be provided with raised curbs and watertight covers having overlapping edges similar to those required for finished water reservoirs.

(IV) Overflows, if provided, must be turned down, have a proper free fall discharge and be protected with corrosion-resistant screens or self-closing flap valves.

(V) Two wet salt storage tanks or compartments designed to operate independently shall be provided.

(VI) The salt shall be supported on graduated layers of gravel under which is a suitable means of collecting the brine.

(L) Salt and brine storage capacity. Total salt storage capacity shall provide for at least 30 days of operation.

(M) Brine pump or eductor. An eductor may be used to transfer brine from the brine tank to the softeners. If a pump is used, a brine measuring tank or means of metering shall be provided to obtain proper dilution.

(N) Stabilization. Facilities for stabilizing corrosion control shall be provided.

(O) Construction materials. Pipes and contact materials shall be resistant to the aggressiveness of salt. Plastic and red brass are acceptable piping materials. Steel and concrete shall be coated with a non-leaching protective coating which is compatible with salt and brine.

(P) Housing. Bagged salt and dry bulk salt storage shall be enclosed and separated from other operating areas in order to prevent damage to equipment.

(m) Aeration. Aeration may be used to help remove tastes and odors due to dissolved gases from decomposing organic matter; to reduce or remove objectionable amounts of carbon dioxide, hydrogen sulfide, etc.; to introduce oxygen to assist in iron and/or manganese removal; and to strip volatile organic compounds for controlling the formation of trihalomethanes by removing the trihalomethane precursors.

(i) Natural draft aeration - tray type. The design shall provide perforations in the distribution pan to provide uniform distribution of water over the top tray. The discharge shall be through a series of three or more trays. Tray material shall be resistant to aggressiveness of the water and dissolved gases. The loading rate shall not exceed five gpm/ft^2 (203 L/m^2) of total tray area.

(ii) Forced or induced draft aeration. Devices shall:

(A) Be constructed and located so that air introduced into the column shall be free from obnoxious fumes, dust, and dirt. All sections of the aerator shall be easily reached or removed for maintenance.

(B) Provide distribution of water uniformly over the top tray and discharge through a series of five or more trays.

(C) Be constructed so that the water outlet is adequately sealed to prevent unwarranted loss of air. Material shall be resistant to the aggressiveness of the water and dissolved gases. Loading shall be provided at a rate not to exceed five gpm/ft^2 (203 L/m^2) of total tray area.

(iii) Pressure aeration. Pressure aeration may be used for oxidation purposes only; it is not acceptable for removing dissolved gases.

(iv) Protection of aerators. All aerators except those discharging to lime softening or clarification plants shall be protected from contamination by birds and insects by using louvers and 24 mesh screen.

(v) Disinfection. Disinfection must be provided as a final treatment to all waters receiving aeration treatment.

(vi) Bypass. A bypass shall be provided around all aeration units.

(vii) Volatile organics removal. Volatile organic compounds may be stripped by packed tower or diffused aeration methods.

(n) Iron and manganese control. Iron and manganese control, as used here, refers solely to treatment processes designed specifically for this purpose.

(i) Removal by oxidation, detention, and filtration.

(A) Oxidation. Oxidation may be accomplished by aeration or by chemical oxidation using chlorine, potassium permanganate, ozone, hydrogen peroxide, or chlorine dioxide.

(B) Detention following aeration. A minimum detention time of 20 minutes shall be provided following aeration. The detention basin shall be designed as a holding tank with sufficient baffling to prevent short-circuiting. Sedimentation basins shall be provided when treating water with iron and/or manganese above 2 mg/L, or where chemical coagulation is used to reduce the load on the filters. Provisions for sludge removal shall be made.

(C) Filtration. Gravity or pressure filters shall be provided. Where pressure filters are used, the following criteria supplements that found in Section 10(i).

(I) Rate of filtration. The rate shall not exceed 3 gpm/ft^2 (176 m^3/m^2·d) of filter area.

(II) Design criteria. The filters shall have a minimum side wall shell height of 5 feet, and an air release valve on the highest point of each filter. Each filter shall have a means to observe the wastewater during backwashing and also a manhole to facilitate inspection and repairs.

(ii) Removal by the lime soda softening process. These processes shall conform to the lime soda process in Section 10(i).

(iii) Removal by manganese greensand filtration. Provide feed capability of potassium permanganate to the influent of a manganese greensand filter.

(A) An anthracite media cap of at least 6 inches (0.15 m) shall be provided over manganese green-sand.

(B) The filtration rate shall not exceed 4 gpm/ft^2 (236 $m^3/m^2 \cdot d$).

(C) Provide a minimum backwash capability of 12 gpm/ft^2 (708 $m^3/m^2 \cdot d$), with a rate control device.

(D) Air washing or surface washing is required.

(iv) Removal by ion exchange. This process of iron and manganese removal shall not be used for water containing more than 0.3 mg/L of iron, manganese or combination of the two. This process is not acceptable where either the raw water or washwater contains dissolved oxygen.

(v) Sequestration by polyphosphates. This process shall not be used when iron, manganese or a combination of the two as exceeds 1.0 mg/L. The total phosphate applied shall not exceed 10 mg/L as PO_4. Where phosphate treatment is used, facilities shall be provided for maintaining a 0.5 mg/L free or combined chlorine residual at remote points in the distribution system.

(A) The stock phosphate solution tank shall be covered. Facilities shall be provided for disinfecting the solution tank. The facilities shall be capable of providing a minimum of 10 mg/L free chlorine residual.

(B) Polyphosphates shall not be applied ahead of iron and manganese removal treatment. The point of application shall be prior to any aeration, oxidation or disinfection if no iron or manganese removal treatment is provided.

(vi) Sequestration by sodium silicates. Sodium silicate sequestration of iron and manganese shall be used for groundwater supplies prior to air contact. Rapid oxidation of the metal ions by chlorine, chlorine dioxide, ozone, hydrogen peroxide, or other strong oxidant must accompany or closely precede the sodium silicate addition. Injection of sodium silicate shall not occur at a point more than 15 seconds after oxidation feed point. Feed and dilution equipment shall be sized on the basis of feed solutions stronger than 5 percent silica as $Si0_2$. Sodium silicate addition may be used only on water containing up to 2 mg/L of iron, manganese or a combination of the two. Sodium silicate addition shall not be used on waters where 20 mg/L or more $Si0_2$ is required or where the amount of added and naturally occurring silicate will exceed 60 mg/L as $Si0_2$.

(A) Facilities shall be provided for maintaining a chlorine residual of 0.5 mg/L throughout the distribution system.

(B) Sodium silicate shall not be applied ahead of iron or manganese removal treatment.

(vii) Testing equipment. Testing equipment shall be provided for all iron and manganese control plants.

(A) The equipment should have the capacity to measure the iron content to a minimum of 0.1 mg/L and the manganese content to a minimum of 0.05 mg/L.

(B) Where polyphoshate sequestration is practiced, phosphate testing equipment shall be provided.

(o) Fluoridation and defluoridation.

(i) Fluoride compound storage. Storage tanks shall be covered; all storage shall be inside a building. Storage tanks for hydrofluosilic acid shall be vented to the atmosphere at a point outside the building.

(ii) Chemical feed equipment. Fluoride feed equipment shall meet the following requirements.

(A) Scales or loss of weight recorders shall be provided for dry chemical feeds. Feeders shall be accurate to within five percent of any desired feed rate.

(B) The point of application of hydrofluosilic acid, if into a horizontal pipe, shall be in the lower half of the pipe. Fluoride compound shall not be added before lime soda softening or ion exchange softening.

(C) A fluoride solution shall be applied by a positive displacement pump having a stroke rate not less than 20 nor more than 95 strokes per minute. Fluoride solutions shall not be injected to a point of negative pressure.

(D) All fluoride feed lines and dilution water lines shall be isolated from potable water supplies by either an air gap above the solution tank or a reduced pressure principal backflow preventor.

(E) Water used for sodium flouride dissolution shall have a hardness not exceeding 50 mg/L. Softening shall be provided for the solution water where hardness exceeds 45 mg/L.

(F) Flow meters for treated flow rate and fluoride solution water shall be provided.

(iii) Protective equipment. Protective equipment, including air purifying respirators approved by the National Institute of Occupational Safety and Health and emergency showers, shall be provided for operators handling fluoride compounds.

(iv) Dust control.

(A) Provisions shall be made to allow the transfer of dry fluoride compounds from shipping containers to storage bins or hoppers in such a way as to minimize the quantity of fluoride dust which may enter the room in which the equipment is installed. The enclosure shall be provided with an exhaust fan and dust filter which places the hopper under a negative pressure. Air exhausted from fluoride handling equipment shall discharge through a dust filter to the outside atmosphere of the building. The discharge shall not be located near a building fresh air intake.

(B) A floor drain shall be provided.

(v) Testing equipment. Equipment shall be provided for measuring the quantity of fluoride in the water.

(vi) Defluoridation. Where fluoride removal is required the following methods are acceptable:

(A) Activated alumina may be employed in open gravity filter tanks or pressure filter tanks. The minimum media depth shall be 5 feet. The units shall not be loaded at a rate exceeding 4 gallons per minute per square foot (236 $m^3/m^2 \cdot d$). The activated alumina media shall be in mesh sizes ranging from 28 to 48. Regeneration facilities shall be provided to regenerate the media. These shall include both weak caustic and weak acid systems.

(B) Bone char filtration or lime softening with magnesium addition.

(p) Stabilization. Stabilized water is a water that does not tend to corrode the pipe nor deposit large quantities of scale.

(i) Carbon dioxide addition.

(A) Recarbonation basin design shall provide a minimum total detention time of 20 minutes. Two compartments consisting of a mixing compartment having a detention time of at least three minutes and a reaction compartment are required. Each compartment shall have a minimum depth of 8 feet (2.4 m).

(B) Plants generating carbon dioxide from combustion shall have top recarbonation tanks in order to dissipate carbon monoxide gas. Care shall be taken to prevent the basin off-gases from entering any treatment plant structure.

(C) The recarbonation basin shall be sloped to a drain.

(ii) Acid addition. Facilities shall be provided for feeding both acid and alkalinity, such as sodium carbonate, lime or sodium bicarbonate.

(iii) Polyphosphates. The feeding of polyphosphates is applicable for sequestering calcium in lime softened water, corrosion control, and in conjunction with alkali feed following ion exchange softening. Chlorination equipment and feed points shall be available to chlorinate the phosphate solution tank to maintain a 10 mg/L free chlorine residual and to maintain a 0.5 mg/L residual in the distribution system.

(iv) Alkali feed. Unstable water created by ion exchange softening shall be stabilized by an alkali feed. An alkali feeder shall be provided for all ion exchange water softening plants.

(v) Control. Laboratory equipment shall be provided for determining the effectiveness of stabilization treatment. This shall include testing equipment for hardness, calcium, alkalinity, pH and magnesium, as a minimum.

(q) Taste and odor control. Provision shall be made for the control of taste and odor at all surface water treatment plants.

(i) Flexibility. Plants treating water that is known to have taste and odor problems shall be provided with equipment that makes at least two of the control processes available.

(ii) Chlorination. When chlorination is used for the removal of some objectionable odors, two hours of contact time must be provided to complete the chemical reactions involved.

(iii) Chlorine dioxide. Chlorine dioxide can be used in the treatment of any taste and odor that is treatable by an oxidizing compound. Provisions shall be made for proper storing and handling of the sodium chlorite to eliminate any danger of explosion.

(iv) Powdered activated carbon. Provisions shall allow the addition of carbon to the presedimentation basin influent, rapid mix basin, and clarifier effluent. Carbon feed equipment shall be capable of feeding from 0 to 40 mg/L at plant design flows.

A provision shall be made for adequate dust control. Powdered activated carbon shall be handled as a potentially combustible material. It shall be stored and used in a building or compartment as nearly fireproof as possible. Carbon feeder rooms shall be designed for hazardous locations, National Electric Code, Class 1, Groups C and D, Division 1.

(v) Granular activated carbon adsorption units. Open or closed carbon contacting may be used for taste and odor control by adsorption of organics. The loading rate shall not exceed 10 gpm/ft^2 (236 $m^3/m^2 \cdot d$). The minimum empty bed contact time shall be 20 minutes. Provisions shall be made for moving carbon to and from the contactors.

(vi) Potassium permanganate. The application point shall be in the raw water or ahead of the clarifier influent. Facilities shall be capable of feeding not less than 10 mg/L of permanganate.

(vii) Ozone. Thirty minutes of contact time must be provided to complete the chemical reactions involved. The facilities shall be capable of an applied ozone feed rate of 15 mg/L minimum.

(r) Microscreening. A microscreen will be allowed as a mechanical supplement to treatment. The microscreening shall be capable of removing suspended matter from the water by straining. It may be used to reduce nuisance organisms and organic loadings. It shall not be used in place of filtration or coagulation.

(i) Screens shall be of a corrosion-resistant material, plastic or stainless steel.

(ii) Bypass piping shall be provided around the unit.

(iii) Protection against back siphonage shall be provided when potable water is used for washing the screen.

(iv) Washwaters shall be wasted and not recycled to the microscreen.

(s) Organics removal by granular carbon adsorption.

(i) Adsorption of organics on granular activated carbon. Water to be treated may be contacted with granular activated carbon. The pH of the water shall be less than 9.0. The turbidity of the applied water shall be less than 2 TU when packed beds are used.

(ii) Contact time. The carbon beds or columns shall provide a minimum of 20 minutes of empty bed contact time at design flow. Surface loading rates shall not exceed 10 gpm/ft^2 (590 $m^3/m^2 \cdot d$).

(iii) Carbon bed or column design.

(A) If an upflow countercurrent contactors is used, it may be either packed or expanded. A single unit is acceptable. If a downflow contactor is used, two or more beds in parallel are required.

(B) Contactors may be designed as open gravity units, or pressure beds. They may be constructed of concrete, steel, or fiberglass reinforced plastic. Steel vessels shall be protected against corrosion by coaltar epoxy coating, rubber or glass lining, or other means.

(C) All carbon beds or columns shall be equipped with provisions for flow reversal and bed expansion. Combination downflow filter contactors shall have backwashing facilities to provide up to 50 percent bed expansion and shall meet the same backwash criteria as rapid filters.

(D) Inlet and outlet screens shall be 304 or 316 stainless steel or other suitable materials.

(E) Carbon beds and columns shall have a means for removing spent carbon and introducing makeup or regenerated carbon.

(F) Pressure contactors shall be equipped with air-vacuum release valves fitted with a stainless steel screen, slot size 0.036 mm (0.14 inches), to prevent plugging with carbon.

(t) Radionuclides. Where radionuclide removal is practiced, the waste shall be evaluated for its classification as a hazardous or low level radioactive waste and disposed of as required by the Nuclear Regulatory Commission or other appropriate authority.

(u) Waste handling and disposal. Disposal of any waste sludge or liquid shall meet all the requirements of Chapter 11 of the Water Quality Rules and Regulations where applicable.

(i) Sanitary and laboratory wastes. The sanitary and laboratory wastes from water treatment plants, pumping stations, etc., shall not be recycled to any part of the water plant. Waste from these facilities must be discharged directly to a sanitary sewer system when feasible, or to an on-site waste treatment facility permitted by the Wyoming Department of Environmental Quality.

(ii) Brine waste. The waste from ion exchange plants, demineralization plants, etc., may not be recycled to the plant. Where discharging to a sanitary sewer, a holding tank shall be provided to prevent the overloading of the sewer and/or interference with the waste treatment processes. The effect of brine discharge to sewage lagoons may depend on the rate of evaporation from the lagoons. Where disposal to an off-site waste treatment system is proposed, it must be demonstrated that the sewer and the facility have the required capacity and dilution capability. The impact on any treatment system discharge shall be evaluated.

(iii) Lime softening sludge. Acceptable methods of treatment and disposal are as follows:

(A) Sludge lagoons. Lagoons shall be designed on the basis of providing a surface area of 0.7 acres (.28 ha) per million gallons per day (3785 m^3/day) (average day) per 100 mg/L of hardness removed, based on a usable lagoon depth of 5 feet (1.5 m). At least 2 lagoons shall be provided. An acceptable means of final sludge disposal must be provided. Provisions must be made for convenient cleaning of the lagoons.

The design of lagoons shall provide for location above the 100-year flood or adequately protected from the 100-year flood. There shall be means of diverting surface water runoff so that it does not flow into the lagoons. Minimum free-board of 3 feet (0.66 m) shall be present. An adjustable decanting device for recycling the overflow shall be present. There shall be an accessible effluent sampling point.

(B) Land application of liquid lime sludge shall comply with Part E of Chapter 11 of the Water Quality Rules and Regulations.

(C) Disposal at a suitable landfill shall be authorized by the Solid Waste Management Program of the Department of Environmental Quality.

(D) Mechanical dewatering of sludge may be employed.

(E) Recalcination of sludge may be employed.

(F) Lime sludge drying beds shall not be used.

(iv) Alum sludge.

(A) Lagooning may be used as a storage and interim disposal method for alum sludge. The volume of alum sludge storage lagoons shall be at least 100,000 gallons (378.5 m^3) per 1,000,000 gpd (3,785 m^3/d) of treatment plant capacity.

(B) Discharge of alum sludge to sanitary sewers may be used only when the sewage system has the capability to adequately handle the flow and sludge.

(C) Mechanical dewatering of sludge may be employed.

(D) Alum sludge drying beds may be used.

(E) Alum sludge may be acid treated and recovered.

(F) Disposal at a suitable landfill shall be authorized by the Solid Waste Management Program of the Department of Environmental Quality.

(v) Iron and manganese waste. Waste filter washwater from iron and manganese removal plants may be disposed by filtration, by lagooning, or by discharge to the sewer system.

(A) Sand filters. Sand filters should have a total filter area of not less than 100 square feet (9.29 m^2) in a minimum of 2 compartments. The filter shall have sufficient surface area and capacity to contain, in a volume of 2 feet (0.61 m) above the level of the sand, the entire volume of washwater produced by washing the production filters.

(I) The filter shall not be subject to flooding by surface runoff or flood waters. Finished grade elevation shall be such as to facilitate maintenance, cleaning and removal of surface sand as required.

(II) The filter media shall consist of a minimum of 12 inches (30.4 cm) of sand, 3 inches (7.6 cm) of supporting small gravel or torpedo sand, and 9 inches (0.22 m) of gravel in graded layers. All sand and gravel shall be washed to remove fines. Filter sand shall have an effective size of 0.3 to 0.5 mm and a uniformity coefficient not to exceed 3.5.

(III) The filter shall be provided with an underdrain collection system, and provision shall be made for an accessible sample point.

(IV) Overflow devices from these filters shall not be permitted.

(V) Where freezing may occur, provisions shall be made for covering the filters during the winter months.

(VI) Iron and manganese waste filters shall provide an atmosphere air break between adjacent compartments that contain finished water and unfiltered water.

(B) Washwater recovery lagoons. Filter backwash wastewater may be recovered by washwater recovery lagoons. Decanted filter backwash wastewater from the lagoons shall be recycled to the head of the plant. Lagoons shall provide 250,000 gallons of storage (946 m^3) for each 1,000,000 gallons per day (3,785 m^3/day) of treatment capacity. Lagoons shall have a minimum usable depth of 3 feet (0.91 m), a length 4 times the width, and a width of at least 3 times the water depth.

Section 11. **Chemical Application**.

(a) General.

(i) Chemical application. Chemicals shall be applied by such means as to prevent backflow or back siphonage between multiple points of feed through common manifolds.

(ii) General equipment design. General equipment design shall be such that:

(A) Feeders will be able to supply the necessary amounts of chemical throughout the feed range at all times.

(B) Chemical contact materials and surfaces are resistant to the aggressiveness of the chemical solution.

(C) Corrosive chemicals are introduced in such a manner as to minimize potential for corrosion.

(D) Chemicals that are incompatible are not stored or handled together.

(E) All chemicals are conducted from the feeder to the point of application in separate conduits.

(F) Chemical feeders and pumps operate at no lower than 20 percent of the feed range.

(G) Slurry type chemicals, especially lime, are fed by gravity where practical.

(b) Facility design.

(i) Number of feeders. A separate feeder shall be provided for each chemical applied.

(ii) Control. Feeders may be manually or automatically controlled. Automatic controls shall be designed to allow override by manual controls. Where plant flow rates are not manually controlled, chemical feed rates shall be automatically proportioned to flow.

Calibration cylinders shall be provided for each chemical system, enabling exact measurement of chemical feed dose.

(iii) Dry chemical feeders. Dry chemical feeders shall measure chemicals volumetrically or gravimetrically; they shall be provided with a solution water system and mixer in the solution tank and; shall completely enclose chemicals to prevent emission of dust to the operating room.

(iv) Positive displacement pumps. Positive displacement pumps shall be sized for the maximum pressure at the point of injection. A backpressure valve shall be provided in instances where chemicals can flow by gravity through the pump and pump check valves.

(v) Liquid chemical feeders - siphon control. Liquid chemical feeders shall be such that chemical solutions cannot be siphoned into the water supply.

(vi) Cross-connection control. Cross-connection control must be provided to assure that the service water lines discharging to solution tanks shall be protected from backflow and that liquid chemical solutions cannot be siphoned through solution feeders into the water supply. No direct connection shall exist between any sewer and a drain or overflow from the feeder, solution chamber or tank. All drains shall terminate at least 6 inches (0.15 m) or 2 pipe diameters, whichever is greater, above the overflow rim of a receiving sump, conduit or waste receptacle.

(vii) In-plant water supply. The in-plant water supply shall be of sufficient quantity and pressure to meet the chemical system needs. A minimum capability of 15 gpm at 50 psi is required.

There shall be a new means of controlling and measuring the water when used for preparing specific solution concentrations by dilution, i.e., rotometer and control valve. The water shall be properly treated for hardness when hardness affects the chemical solution.

(viii) Storage of chemicals.

(A) Storage space or tank volume shall be provided for at least 30 days of chemical supply. The storage shall provide protection from intermixing of 2 different chemicals.

(B) Storage tanks and pipelines for liquid chemicals shall be specific to the chemical and not for alternates.

(C) Liquid chemical storage tanks must have a liquid level indicator, an overflow and a receiving basin or drain capable of receiving accidental spills or over-flows, and be located in a contained area sized to store the total contents of a ruptured tank.

(D) All chemical storage tanks shall be constructed of materials which are resistant to the chemical which they store. The tank shall not lose its structural integrity through chemical action or be subject to corrosion.

(ix) Solution and slurry tanks.

(A) Feed and dilution systems shall be designed to maintain uniform strength of solution in solution tanks. A mixer shall be provided to mix the tank contents when batching solutions. Continuous agitation shall be provided to maintain slurries in suspension. A means shall be provided to measure the solution level in the tank. Chemical solution tanks shall have a cover. Large tanks with access openings shall have such openings curbed and fitted with overhanging covers.

(B) Subsurface locations for solution tanks shall be free from sources of possible contamination, and assure positive drainage for groundwaters, accumulated water, chemical spills and overflows.

(C) Overflow pipes, when provided, shall be turned downward, with the end screened. They shall have a free fall discharge and be located where noticeable.

(D) Acid storage tanks must be vented to the outside atmosphere, but not through vents shared with any other material.

(E) Each tank shall be provided with a valved drain, protected against backflow by an air gap of 6 inches (0.15 m) or 2 pipe diameters, whichever is greater.

(x) Day tanks.

(A) Day tanks shall be provided where bulk storage of liquid chemical is provided and a dilute solution is to be fed, or where chemicals are manually batched. Day tanks shall meet the requirements of solution tanks. Tanks shall be properly labeled to designate the chemical contained.

(B) Hand pumps may be used to transfer chemicals from a carboy or drum. A tip rack may be used to permit withdrawal into a bucket from a spigot. Where motor-driven transfer pumps are provided, a liquid level limit switch and an overflow from the day tank shall be provided.

(C) Continuous agitation shall be provided to maintain chemical slurries in suspension. A mixer shall be provided to mix the initial dilution.

(xi) Feed lines:

(A) Shall be of durable material, resistant to the chemical handled.

(B) Shall be readily accessible for maintenance when located within structures.

(C) Shall be protected against freezing.

(D) Shall be readily cleanable by using plugged crosses for 90° bends.

(E) Shall slope upward from the chemical source to the feeder when conveying gases.

(F) Shall be designed consistent with scale-forming or solids-depositing properties of the water, chemical, solution, or mixtures conveyed.

(G) Shall be color coded.

(H) Shall have a connection for a flushing line.

(xii) Handling.

(A) Carts, elevators and other appropriate means shall be provided for lifting chemical containers.

(B) Provisions shall be made for the transfer of dry chemicals from shipping containers to storage bins or hoppers to minimize the quantity of dust which may enter the room in which the equipment is installed. Provisions shall also be made for disposing of empty bags, drums or barrels which will minimize exposure to dusts. Control may be provided by using:

(I) Vacuum/pneumatic equipment or closed conveyor systems.

(II) Facilities for emptying shipping containers in special enclosures.

(III) Exhaust fans and dust filters which put the hoppers or bins under negative pressure.

(C) Provision shall be made for measuring quantities of chemicals used to prepare feed solutions.

(xiii) Housing. Floor surfaces shall be smooth and impervious, slip-resistant and well drained with 2.5 percent minimum slope. Vents from feeders, storage facilities and equipment exhaust shall discharge to the outside atmosphere above grade and remote from air intakes.

(c) Specific chemicals.

(i) Chlorine gas.

(A) Respiratory protection equipment. Respiratory protection equipment, meeting the requirements of the National Institute of Occupational Safety and Health (NIOSH), shall be available where chlorine gas is handled, and shall be stored at a convenient location, but not inside any room where chlorine is used or stored. The units shall use compressed air, have at least a 30 minute capacity, and be compatible with or exactly the same as units used by the fire department responsible for the plant.

(B) Chlorine leak detection. Where ton containers are used, or where plants store more than 1000 lbs (454 kg) of chlorine, continuous electronic chlorine leak detection equipment shall be provided.

(C) Repair kits. Repair kits approved by the Chlorine Institute shall be provided for plants employing chlorine gas chlorination. The chlorine repair kits shall be available for each size container stored at the facility.

(D) Feed and storage areas. Chlorine gas feed and storage shall be enclosed and separated from other operating areas. The chlorine room shall be provided with a shatter resistant window installed in an interior wall. The room shall be constructed in such a manner that all openings between the chlorine room and the remainder of the plant are sealed. The doors shall be equipped with panic hardware, assuring ready means of exit and opening outward only to the building exterior.

(E) Ventilation. Where chlorine gas is used, the room shall have an exhaust ventilating system with a capacity which provides one complete air change every two minutes. The ventilating system shall take suction within 18 inches (0.46 m) of the floor, as far as practical from the door and air inlet, with the point of discharge so located as not to contaminate air intakes to any rooms or structures.

Air intakes shall be through louvers near the ceiling. Louvers for chlorine room air intake and exhaust shall facilitate airtight closure.

Separate switches for the fan and lights shall be located outside of the chlorine room and at the inspection window. Outside switches shall be protected from vandalism. A signal light indicating fan operation shall be provided at each entrance when the fan can be controlled from more than one point.

Vents from feeders and storage shall discharge to the outside atmosphere, above grade. The room location shall be on the prevailing downwind side of the building away from entrances, windows, louvers, walkways, etc.

Floor drains shall discharge to the outside of the building and shall not be connected to other internal or external drainage systems.

(F) Cylinders. Full and empty cylinders of chlorine gas shall be isolated from operating areas, restrained in position to prevent upset, stored in rooms separate from ammonia storage, and stored in areas not in direct sunlight or exposed to excessive heat.

(G) Heating. Chlorinator rooms shall be heated to 60° F (15.6° C) and be protected from excessive heat. Cylinders and gas lines shall be protected from temperatures above that of the feed equipment.

(H) Feed lines. Pressurized chlorine feed lines shall not carry chlorine gas beyond the chlorinator room.

(ii) Acids and caustics.

(A) Acids and caustics shall be kept in closed corrosion-resistant shipping containers or in covered bulk storage units.

(B) Acids and caustics shall be pumped in undiluted form from original containers or bulk storage units through suitable pipe or hose to the point of treatment or to a covered day tank.

(C) An emergency deluge shower and eye wash shall be provided where corrosive chemicals are stored or used.

(iii) Sodium chlorite. Provisions shall be made for proper storage and handling of sodium chlorite to eliminate any danger of explosion. No hydrocarbons or organics shall be stored with sodium chlorite.

Section 12. **Pumping Facilities**.

(a) Total dynamic head. The total dynamic head rating of pumping units shall be based on pipe friction, pressure losses from piping entrances, exits, appurtenances (bends, valves, etc.), and static head at the design flow.

(b) Location.

(i) The pumping station shall be elevated or protected to a minimum of 3 feet above the 100-year flood elevation, or 3 feet above the highest recorded flood elevation, whichever is higher.

(ii) The station shall be accessible to operating personnel at all times, and during all weather.

(iii) The site around the station shall be graded to lead surface drainage away from the station.

(iv) The station shall have security installed to prevent vandalism and entrance by unauthorized persons or animals.

(c) Pumping stations - raw and finished water.

(i) They shall have outward opening doors.

(ii) They shall have a floor elevation or a main level entry of at least 6 inches above finished grade. All floors shall slope at least 2-1/2 inches in every 10 feet to a suitable drain. Pumps shall have an outlet for drainage from pump glands without discharging onto the floor.

(iii) They shall have any underground structures waterproofed.

(d) Wetwells. Finished water wetwells shall be covered. All vents shall be turned down and screened. Finished water wetwells shall be located above the groundwater table and the top of the walls from the wetwell shall be at least 18 inches above finished grade.

(e) Equipment servicing. Pump stations shall be provided with craneways, hoist beams, eyebolts, or other facilities for servicing or removing pumps, motors or other heavy equipment. They shall be rated for not less than 50 percent more than the weight of the heaviest single item to be lifted. Openings in floors and roofs shall be provided as needed for removal of heavy or bulky equipment.

(f) Stairways and ladders. Stairways or ladders shall be provided between all floors, and in pits or compartments which must be entered. They shall have handrails on both sides, and treads of non-slip material. The Wyoming Occupational Health and Safety Rules and Regulations shall be complied with.

(g) Heating. Provisions shall be made for heating to maintain a minimum temperature of 40° F (4° C) if not typically occupied and 50° F (10° C) if occupied.

(h) Ventilation. All accessible pumping station areas shall be ventilated. Ventilation may be continuous or intermittent. If intermittent, ventilation in areas normally visited by operating personnel shall be started automatically at not greater than 30 minute intervals. Permanently installed drywell ventilation shall provide at least 6 air changes per hour if continuous, and 12 air changes per hour if intermittent. Intermittent ventilating equipment shall ensure starting upon entry of operating personnel. Wetwells shall be designed to permit the use of portable blowers that will exhaust the space and continue to supply fresh air during access periods.

(i) Dehumidification. In below ground pumping stations, a means for dehumidification shall be provided. The facilities shall be sized to maintain the dewpoint at least 2 below the coldest anticipated temperature of water to be conveyed in the pipes.

(j) Lighting. Lighting levels shall be sufficient to permit safe operation and maintenance of all equipment within the pumping stations, but not less than 30 foot candles. All areas shall be lit in such a manner that the failure of 1 lighting fixture or lamp will not cause the area to be completely dark.

(k) Sanitary and other conveniences. All pumping stations that are manned for four or more hours per day shall be provided with potable water, lavatory and toilet facilities. Wastes shall be discharged to the sanitary sewer or to an on-site waste treatment system.

(l) Pumps. At least two pumping units shall be provided. With the largest pump out of service, the remaining pump or pumps shall be capable of providing the maximum pumping rate of the system.

(m) Suction lift. Pumps shall be selected so that the net positive suction head required at maximum flow (NPSHR) is less than the net positive suction head available (NPSHA) minus 4 feet (1.2 m) based on the hydraulic conditions and altitude of the pumping station. If this condition is not met, then priming shall be provided.

Priming water must not be of lesser sanitary quality than that of the water being pumped. Vacuum priming may be used.

When an air operated ejector is used, the screened intake shall draw clean air from a point at least 10 feet above the ground or other source of possible contamination.

(n) Surge control. Piping systems shall be designed to withstand the maximum possible surge (water hammer) from the pumping station, or adequate surge control provided to protect the piping. Pressure relief valves are not acceptable surge control.

(o) Booster pumps.

(i) Booster pumps shall not produce a pressure less than 5 psi in suction lines. Where the suction line has service connections, booster pump intake pressure shall be at least 35 psi (138 kPa) when the pump is in normal operation and shall be provided with a low pressure cutoff switch if the suction line pressure is a minimum of 20 psi (69 kPa).

(ii) Automatic or remote control devices shall have a range between the start and cutoff pressure which will prevent cycling of more than 1 start every 15 minutes.

(iii) In-line booster pumps shall be accessible for servicing and repairs. The access opening and vault shall be large enough to remove the pump.

(iv) Individual home booster pumps shall not be allowed for any individual service from the public water supply main.

(p) Automatic and remote controlled stations. Conditions that may affect continuous delivery of water shall be alarmed at an attended location.

(q) Appurtenances.

(i) Valves.

(A) All pumps except submersibles shall have a suction and discharge valve to permit satisfactory operation, maintenance and repair of the equipment. Submersible pumps shall have a check valve and discharge valve to permit satisfactory operation, maintenance and repair of the equipment.

(B) If foot valves are necessary, they shall have a net valve area of at least 2-1/2 times the area of the suction pipe and they shall be screened.

(C) Each pump shall have an individual suction line or the lines shall be so manifolded that they will ensure similar hydraulic and operating conditions.

(D) Check. All pumps shall be provided with a check valve located between the pump and the discharge shutoff valve, except where arranged so that backflow is not possible under normal operating conditions.

(E) Air release. Air release valves shall be provided where the pipe crown is dropped in elevation.

(ii) Gauges. Each pump shall have a standard pressure gauge on its discharge line. Each pump shall have a compound gauge on its suction line, except wet pit type pumps.

(iii) Water seals. Water seals shall not be supplied with water of a lesser sanitary quality than that of the water being pumped. Where pumps are sealed with potable water and are pumping water of lesser sanitary quality, the seal shall be supplied from a break tank open to atmospheric pressure. The tank shall have an air gap of at least 6 inches (0.15 m) or 2 pipe diameters, whichever is greater, between the feeder line and the spill line of the tank.

(iv) Controls. Pumps, their prime movers and accessories, shall be controlled in such a manner that they will operate at rated capacity without overload. Provision shall be made to prevent energizing the motor in the event of a backspin cycle. Electrical controls shall be located above grade.

Section 13. **Finished Water Storage.**

(a) General. Steel finished water storage structures shall be provided using the requirements of the AWWA D100 or AWWA D103. All tank design and foundation design shall be performed by a registered professional engineer and the plans or contractor-furnished information shall so designate the registered engineer providing the design. Materials other than steel may be used for water storage tanks.

(i) Sizing. Storage facilities shall have the capacity to meet domestic demands, and where required, fire protection storage.

(A) Water systems serving less than 50,000 gallons (189 m^3) on the design average daily demand shall provide clearwell and system storage capacity equal to the average daily demand.

(B) Water systems serving from 50,000 to 500,000 gallons (189-1,892 m^3) on the design average daily demand shall provide clearwell and system storage capacity equal to the average daily demand plus fire storage, based on recommendations established by the State Fire Marshall or local fire agency.

(C) Water systems serving in excess of 500,000 gallons (1.892 m^3) on the design average daily demand shall provide clearwell and system storage capacity equal to 25 percent of the design maximum daily demand, plus added fire storage based on recommendations established by the State Fire Marshall or local fire agency.

(D) Storage need not be provided in a well supply system where a minimum of two wells are provided and the maximum hour demand or fire demand, whichever is greater, can be supplied with the largest well out of service.

(ii) Location of ground level reservoirs.

(A) The bottom of reservoirs and standpipes shall be above or protected from the 100year flood or highest flood of record, whichever is greater.

(B) When the bottom is below normal ground surface, it shall be placed above the groundwater table. Sewers, drains, standing water, and similar sources of possible contamination must be kept at least 50 feet (15.2 m) from the reservoir. Watermain pipe, pressure tested in place to 50 psi (345 kPa) without leakage, may be used for gravity sewers at distances greater than 20 feet (6.1 m) and less than 50 feet (15.2 m).

(C) The top of the reservoir walls shall not be less than 18 inches (0.46 m) above normal ground surface. Clearwells constructed under filters are exempted from this requirement when the total design gives the same protection.

(iii) Protection. All finished water storage structures shall have suitable watertight roofs which exclude birds, animals, insects, and excessive dust.

(iv) Protection from trespassers. Security-type fencing, locks on access manholes, and other precautions shall be provided to prevent trespassing, vandalism, and sabotage at above ground storage facilities. Below ground level storage facilities may be exempt from the fencing requirements.

(v) Drains. No drain on a water storage structure may have a direct connection to a sewer or storm drain. Water storage structures drained to sewer or storm drains shall be drained through piping which allows an air gap such that the drain pipe is at least three pipe diameters above the ground level at the drain point to the sanitary or storm drain.

(vi) Overflow. All water storage structures shall be provided with an overflow which is brought down to an elevation between 12 and 24 inches (0.3-0.61 m) above the ground surface, and discharges over a drainage inlet structure or a splash plate. No overflow may be connected directly to a sewer or a storm drain. All overflow pipes shall be located so that any discharge is visible.

(A) When an internal overflow pipe is used on elevated tanks, it shall be located in the access tube. For vertical drops on other types of storage facilities, the overflow pipe shall be located on the outside of the structure.

(B) The overflow of a ground level structure shall open downward and be screened with noncorrodible screen installed within the pipe at a location least susceptible to damage by vandalism.

(C) The overflow pipe shall be of sufficient diameter to permit wasting of water in excess of the filling rate.

(vii) Access. Finished water storage structures shall be designed with access to the interior for cleaning and maintenance. Manholes above the waterline shall be framed at least 4 inches (0.1 m) above the surface of the roof at the opening; on ground level structures, manholes should be elevated a minimum of 24 inches (0.61 m) above the top. The manholes shall be fitted with a solid watertight cover which overlaps the framed opening and extends down around the frame at least 2 inches (5 cm). The cover shall be hinged at 1 side and shall have a locking device. The man-hold shall have a minimum inside opening diameter of 24 inches.

(viii) Vents. Finished water storage structures shall be vented. Overflows shall not be considered as vents. Open construction between the sidewall and roof is not permissible. Vents shall prevent the entrance of surface water and rainwater, and shall exclude birds and animals.

(A) For elevated tanks and standpipes, 24 mesh noncorrodible screen may be used.

(B) For ground level structures, the vents shall terminate in an inverted U construction with the opening a minimum of 24 inches (0.61 m) above the roof and covered with 24 mesh noncorrodible screen installed within the pipe at a location least susceptible to vandalism.

(ix) Roof and sidewall. The roof and sidewalls of all structures shall be watertight with no openings except properly constructed vents, manholes, overflows, risers, drains, pump mountings, control ports, or piping for inflow and outflow.

(x) Painting and/or cathodic protection. Protection shall be given to metal surfaces by paints or other protective coatings, by cathodic protective devices, or by both. Materials and procedures shall conform to AWWA Standard D102. Paint systems, after proper curing, shall not transfer any substance to the water which will be toxic or cause tastes or odors. Paints containing lead or mercury shall not be used. All paints and other protective coatings shall be compatible.

(xi) Disinfection. Finished water storage structures shall be specified to be disinfected in accordance with AWWA Standard D105. Sampling shall be specified.

(b) Plant storage.

(i) Washwater tanks. Washwater tanks shall be sized, in conjunction with available pump units and finished water storage, to provide the backwash water required by Section 10 (i). The storage and pumping shall be sized so that a minimum of two filters may be backwashed in rapid succession.

(ii) Clearwell. Clearwell storage shall be sized, in conjunction with distribution system storage, to relieve the filters from having to follow fluctuations in water use. Where water is pumped from clearwater storage to the system, an overflow shall be provided.

(iii) Adjacent compartments. Finished water must be separated from unfinished water in adjacent compartments by double walls.

(iv) Basins and wetwells. Receiving basins and pump wetwells for finished water shall be designed as finished water storage structures.

(c) Hydropneumatic tanks. Hydropneumatic (pressure) tanks may be used as the only storage facility when the system serves less than 50 homes. When servicing more than 50 homes, ground or elevated storage designed in accordance with Section 13(a) should be provided. Pressure tank storage is not to be considered for fire protection purposes. Pressure tanks shall meet ASME code requirements or local laws and regulations for the construction and installation of unfired pressure vessels.

(i) Location. The tank shall be located above normal ground surface and be completely housed.

(ii) Sizing. The capacity of the wells and pumps in a hydropneumatic system shall be at least 10 times the average daily consumption rate. The gross volume of the hydropneumatic tank, in gallons, shall be at least 10 times the capacity of the largest pump, rated in gallons per minute. For example, a 250 gpm (1,364 m^3/d) pump should have a 2,500 gallon (9.46 m^3) pressure tank.

(iii) Piping. The tank shall be plumbed with bypass piping.

(iv) Appurtenances. Each tank shall have an access manhole, a drain, and control equipment consisting of pressure gauge, water tight glass, automatic or manual air blowoff, means for adding air, and pressure operated startstop controls for the pumps.

Section 14. **Distribution Systems.**

(a) Materials.

(i) Types of commercial pipe approved for water systems include:

(A) PVC water pipe: ASTM D2241, less than 4" diameter (10 cm); AWWA C900: 4" (10 cm) and larger diameter.

(B) Asbestos cement pressure pipe: AWWA C400.

(C) Ductile iron pipe: AWWA C151.

(D) Glass fiber - reinforced thermosetting - resin pressure pipe: AWWA C950.

(E) Polyethelyene: AWWA C901.

(F) Polybutelyene: AWWA C902.

(ii) Used materials. Watermains and valves which have been used previously for conveying potable water may be reused provided they are in good working order and can meet these standards. No other used materials may be employed.

(iii) Joints. Packing and jointing materials used in the joints of pipe shall be flexible and durable. Flanged piping shall not be used for buried service except for connections to valves; push-on or mechanical joints shall be used.

(iv) Service connections. Service connections shall mean and include any water line or pipe connected to a distribution supply main or pipe for the purpose of conveying water to a building or dwelling. All service connections shall be constructed in conformance with the Uniform Plumbing Code.

(b) Watermain design.

(i) Pressure. All watermains, including those not designed to provide fire protection, shall be sized after a hydraulic analysis based on flow demands and pressure requirements. The system shall be designed to maintain a minimum pressure of 20 psi (138 kPa) at ground level at all points in the distribution system under all conditions of flow. The normal working pressure in the distribution system shall be not less than 35 psi (276 kPa).

(ii) Diameter. The minimum size of a watermain for providing fire protection and serving fire hydrants shall be 6 inches (0.15 m) diameter when service is provided from 2 directions, or where the maximum length of 6 inches pipe serving the hydrant from 1 direction does not exceed 250 feet, or 8 inches (0.2 m) where service is provided from 1 direction only. Larger size mains shall be provided as necessary to allow the withdrawal of the required fire flow while maintaining the minimum residual pressure of 20 psi (138 kPa).

(iii) Fire protection. When fire protection is to be provided, system design shall be such that fire flows can be served.

(iv) Small mains. Any main smaller than 6 inches (0.15 m) shall be justified by hydraulic analysis and future water use.

(v) Hydrants. Only watermains designed to carry fire flows shall have fire hydrants connected to them.

(vi) Deadends. Deadends shall be minimized by looping.

(vii) Flushing. Where deadend mains occur they shall be provided with a flushing hydrant or blowoff for flushing purposes. Flushing devices shall be sized to provide flows which will give a velocity of 2.5 feet per second minimum in the watermain being flushed. No flushing device shall be directly connected to any sewer.

(c) Valves. Valves shall be provided on watermains so that inconvenience and sanitary hazards will be minimized during repairs. Valves shall be located at not more than 500 foot (152 m) intervals in commercial districts and at not more than 1 block or 800 foot (244 m) intervals in other districts.

(d) Hydrants.

(i) Hydrant leads. The hydrant lead shall be a minimum of 6 inches (0.15 m) in diameter. Valves shall be installed in all hydrant leads.

(ii) Protection from freezing. Provisions shall be made to protect fire hydrant leads and barrels from freezing. The use of hydrant weep holes is not allowed when groundwater levels are above the gravel drain area. In these cases it will be necessary to pump the hydrant dry or use other means of dewatering.

(iii) Drainage. Hydrant drains shall not be connected to or located within 10 feet (3.05 m) of sanitary sewers or storm drains.

(e) Air relief valves; Valve, meter and blowoff chambers.

(i) Air relief valves. In all transmission lines and in distribution lines 16 inches and larger at high points (where the water pipe crown elevation falls below the pipe invert elevation), provisions shall be made for air relief. Fire hydrants or active service taps may be substituted for air relief valves on 6- and 8-inch lines. Manholes or chambers for automatic air relief valves shall be designed to prevent submerging the valve with groundwater or surface water.

(ii) Chamber drainage. Chambers, pits or man-holes containing valves, blowoffs, meters, or other such appurtenances to a distribution system, shall not be connected directly to any storm drain or sanitary sewer, nor shall blowoffs or air relief valves be connected directly to any sewer. Such chambers or pits shall be drained to the surface of the ground where they are not subject to flooding by surface water or to absorption pits underground. Where drainage cannot be provided, a sump for a permanent or portable pump shall be provided.

(f) Excavation, bedding, installation, backfill.

(i) Excavation. The trench bottom shall be excavated for the pipe bell. All rock shall be removed within 6 inches (15.2 cm) of the pipe. The trench shall be dewatered for all work.

(ii) Bedding. Bedding shall be designed in accordance with ASTM C12 - types A, B, C - for rigid pipe and ASTM D2321 - types I, II, III - for flexible pipe.

(iii) Installation. The pipe shall be joined to assure a watertight fitting. Ductile iron pipe shall be installed in accordance with AWWA 600 and PVC piping shall be installed in accordance with AWWA manual M23.

(iv) Backfill. Backfill shall be performed without disturbing pipe alignment. Backfill shall not contain debris, frozen material, unstable material, or large clods. Stones greater than 3 inches (7.6 cm) in diameter shall not be placed within 2 feet (0.6 m) of pipe. Compaction shall be to a density equal to or greater than the surrounding soil.

(v) Cover. All watermains shall be located to protect them from freezing and frost heave.

(vi) Blocking. All tees, bends, plugs, and hydrants shall be provided with reaction blocking, tie rods, or joints designed to prevent movement.

(vii) Pressure and leakage testing. All types of installed pipe shall be specified to be pressure tested and leakage tested in accordance with AWWA Standard C600.

(viii) Disinfection. All new, cleaned, repaired, or reused watermains shall be specified to be disinfected in accordance with AWWA Standard C601. Specifications shall include detailed procedures for the adequate flushing, disinfection, and microbiological testing of all watermains.

(g) Separation of watermains, sanitary sewers and storm sewers.

(i) Horizontal and vertical separation from sewer lines. Minimum horizontal separation shall be 10 feet (3 m) where the invert of the watermain is less than 1.5 feet (0.46 m) above the crown of the sewer line. Minimum vertical separation shall be 1.5 feet (0.46 m) at crossings. Joints in sewers at crossings shall be located at least 10 feet (3 m) from water mains. The upper line of a crossing shall be specially supported. Where vertical and/or horizontal clearances cannot be maintained, the sewer or water line shall be placed in a separate conduit pipe.

(ii) Sewer manholes. No water pipe shall pass through or come in contact with any part of a sewer manhole.

(h) Surface water crossings.

(i) Above water crossings. The pipe shall be adequately supported and anchored, protected from damage and freezing, and accessible for repair or replacement.

(ii) Underwater crossings. A minimum cover of 2 feet (0.61 m) shall be provided over the pipe. When crossing water courses which are greater than 15 feet (4.6 m) in width, the following shall be provided:

(A) The pipe shall be of special construction, having flexible watertight joints.

(B) Valves shall be provided at both ends of water crossings so that the section can be isolated for testing or repair; the valves shall be easily accessible and not subject to flooding; and the valve closest to the supply source shall be located in a manhole.

(i) Cross-connections.

(i) Cross-connections. There shall be no water service connection installed or maintained between a public water supply and any water user whereby unsafe water or contamination may backflow into the public water supply.

(A) Applicability. In order to protect all public water supplies from the possibility of the introduction of contamination due to cross connections, the water supplier shall require backflow prevention devices for each water service connection in accordance with Table 1 which appears at the end of this section. The water supplier shall take appropriate actions which may include immediate disconnection for any water user that fails to maintain a properly installed backflow prevention device or comply with other measures as identified in Section 14 (i) of these regulations.

(I) Any high hazard non-residential connection to any public water supply shall be protected by the appropriate backflow prevention device.

(II) Any service connection made to facilities constructed under a permit to construct issued after adoption of this regulation, Section 14 (i), shall be in full compliance with this section. This requirement applies to all service connections made or initially activated after the adoption of this regulation.

(III) Water suppliers shall establish record keeping and management procedures to ensure that requirements of this regulation for installation and maintenance of backflow prevention devices are being met.

(B) The method of backflow control, selected from Table 1, shall be determined based upon the degree of hazard of the cross connection and the cause of the potential backflow. Hazards shall be classified as high hazard or low hazard. The potential cause of the backflow shall be identified as being back-siphonage or back-pressure.

(I) Residential water service connections shall be considered to be low hazard back-siphonage connections, unless determined otherwise by a hazard classification.

(II) Domestic non-residential water service connections shall be considered to be low hazard back-pressure connections, unless determined otherwise by a hazard classification conducted by the water supplier. Examples include schools without laboratories, churches, office buildings, warehouses, motels, etc.

(III) Any water user's system with an auxiliary source of supply shall be considered to be a high hazard, back pressure cross connection. A reduced pressure principle backflow device shall be installed at the water service connection to any water user's system with an auxiliary source of supply.

(IV) All water loading stations shall be considered high hazard connections. A device, assembly, or method consistent with Table 1 shall be provided.

(V) Non-domestic commercial or industrial water service connections shall be considered to be high hazard back pressure connections, unless determined otherwise by a hazard classification. Examples include restaurants, refineries, chemical mixing facilities, sewage treatment plants, mortuaries, laboratories, laundries, dry cleaners, irrigation systems, facilities producing or utilizing hazardous substances, etc. For some of these service connections, a hazard classification may result in a determination of a back-siphonage or low hazard classification. The backflow prevention device required shall be appropriate to the hazard classification. Where potential high hazards exist within the non-residential water user's system, even though such high hazards may be isolated at the point of use, an approved backflow prevention device shall be installed and maintained at the water service connection.

(C) Determination of the hazard classification of a water service connection is the responsibility of the water supplier.

(D) Hazard classifications shall be conducted by hazard classification surveyors that are certified by the USC-Foundation for Cross-Connection Control and Hydraulic Research, the American Association of Sanitary Engineers (ASSE), or by another state certification program approved by the administrator, by a certified water distribution system operator employed by the public water supply, or by a professional engineer licensed in Wyoming.

(E) All backflow prevention devices must be in-line serviceable (repairable), in-line testable except for devices meeting ASSE Standard #1024, and installed in accordance with manufacturer instructions and applicable plumbing codes.

(F) All backflow prevention devices must have a certification by an approved third party certification agency. Approved certification agencies are:

(I) American Society of Sanitary Engineers (ASSE),

(II) International Association of Plumbing/Mechanical officials (IAPMO), and

(III) Foundation for Cross-Connection Control and Hydraulic Research, University Of Southern California (USC_FCCCHR).

(G) Backflow prevention devices at water service connections shall be inspected and certified by a certified backflow assembly tester at the time of installation. Certification of the assembly tester shall be by one of the following:

(I) The American Society Sanitary Engineers (ASSE),

(II) American Backflow Prevention Association (ABPA),

(III) A state certification program approved by the administrator.

(H) Backflow prevention devices installed at high hazard non-residential cross connections shall be inspected and tested on an annual basis by a certified backflow assembly tester.

(I) The administrator may conduct inspections of backflow prevention devices. If any device is found to be defective or functioning improperly, it must be immediately repaired or replaced. Failure to make necessary repairs to a backflow prevention device will be cause for the water service connection to be terminated.

(J) All public water suppliers shall report any high hazard backflow incident within seven (7) days to the Wyoming Department of Environmental Quality, Water Quality Division. The backflow incident shall be reported on a form provided by the administrator.

(ii) Recycling water. Neither steam condensate nor cooling water from engine jackets or other heat exchange devices shall be returned to the public water supply after it has passed through the water service connection.

TABLE 1
Backflow Prevention Devices, Assemblies and Methods

Device, Assembly or Method	Degree of Hazard				Notes
	Low Hazard		High Hazard		
	Back-Siphonage	Back-Pressure	Back-Siphonage	Back-Pressure	
Airgap	X		X		See Note 1
Atmospheric Vacuum Breaker	X		X		Not allowed under continuous pressure situations
Spill-proof Pressure-type Vacuum Breaker	X		X		
Double Check Valve Backflow Preventer	X	X			
Pressure Vacuum Breaker	X		X		
Reduced Pressure Principle Backflow Preventer	X	X	X	X	See Note 2
Dual Check	X				Restricted to residential and domestic services

Note 1 Minimum Airgap for Water Distribution. For spouts with an effective opening diameter of one-half inch or less, the minimum airgap when the discharge is not affected by side walls shall be one inch. The minimum airgap when the discharge is affected by sidewalls shall be one and one-half inches. For effective openings greater than one-half inch, the minimum airgap shall be two times the effective opening diameter when the discharge is not affected by side walls. The minimum airgap when the discharge is affected by sidewalls shall be three times the effective opening diameter.

Note 2 Extreme Hazards. In the case of any water user's system where, in the opinion of the water supplier or the administrator, an undue health threat is posed because of the presence of extremely toxic substances or potential back pressures in excess of the design working pressure of the device, the water supplier may require an air gap at the water service connection to protect the public water system.

Section 15. **Laboratory Requirements**.

(a) Test procedures. Test procedures for analysis of monitoring samples shall conform to the 15th Edition of *Standard Methods for the Examination of Water and Wastewater*.

(b) Testing requirements. All treatment plants shall have the capability to perform or contract for the self-monitoring analytical work required by the Safe Drinking Water Act and/or state regulation. All plants shall, in addition, be capable of performing or contracting the analytical work required to assure good management and control of plant operation and performance.

(c) Minimum requirements.

(i) Location and space. The laboratory shall be located away from vibrating machinery or equipment which might have adverse effects on the performance of laboratory instruments or the analyst and shall be designed to prevent adverse effects from vibration.

Where a full-time chemist is proposed to work in the laboratory, a minimum of 400 square feet (37.2 m^2) of floor space shall be provided in the laboratory. If more than two persons will be working in the laboratory, 100 square feet (9.3 m^2) of additional space shall be provided for each additional person.

(ii) Materials. Walls shall have an easily cleaned, durable and impervious surface. Two exit doors or openings shall be located to permit a straight exit from the laboratory; one exit shall be directly to the outside of the building. Panic hardware shall be used. Interior doors shall have glass windows.

(iii) Cabinets and bench tops. Cabinet and storage space shall be provided for dust-free storage of instruments and glassware.

Bench top height shall be 30 inches (0.91 m). Tops should be field joined into a continuous surface with acid, alkali, and solvent resistant cements.

(iv) Hoods. Fume hoods shall be provided where reflux or heating of toxic or hazardous materials is required. A hood shall not be situated near a doorway, unless a secondary means of exit is provided. All switches, electrical outlets, and utility and baffle adjustment handles shall be located outside the hood. Light fixtures shall be explosion-proof. Twenty-four hour continuous exhaust capability shall be provided. Exhaust fans shall be explosion-proof.

(v) Sinks. The laboratory shall have a minimum of 2 sinks per 400 ft^2 (37.2 m^2) (not including cup sinks). Sinks shall be double well with drainboards and shall be made of epoxy resin or plastic. All water fixtures shall be provided with reduced pressure zone backflow preventers. Traps constructed of glass, plastic, or lead and accessible for cleaning shall be provided.

(vi) Ventilation and lighting. Laboratories shall be separately heated and cooled, with external air supply for 100 percent makeup volume. Separate exhaust ventilation shall be provided. Ventilation outlet locations shall be remote from ventilation inlets.

Lighting shall provide 100 foot candles at the bench top.

(vii) Gas. If gas is required in the laboratory, natural gas shall be supplied.

(viii) Water still. Distilled water shall conform to the quality specified by *Standard Methods for the Examination of Water and Wastewater*, 15th Edition.

(ix) Emergency shower and eye wash. All laboratories shall be equipped with an emergency eye wash and shower that is located within the laboratory.

(d) Portable testing equipment. Portable testing equipment shall be provided where necessary for operational control testing.

Section 16. **Operation and Maintenance Manuals.**

(a) Where required. Plant operation and maintenance manuals are required for each new or modified treatment or pumping facility. The manuals shall provide the following information as a minimum:

(i) Introduction.

(ii) Description of facilities and unit processes within the plant from influent structures through effluent structures.

(iii) Plant control system.

(iv) Utilities and systems.

(v) Emergency operation and response.

(vi) Permit requirements and other regulatory requirements.

(vii) Staffing needs.

(viii) Index to manufacturer's manuals.

(b) When required. Acceptance of the final operation and maintenance manuals is required prior to plant startup.

(c) Description of facilities. The description of facilities and unit processes shall include the size, capacity, model number (where applicable) and intended loading rate.

(i) Each unit. The manual shall describe each unit, including the function, the controls, the lubrication and maintenance schedule. The manual shall also include start-up operations; routine operations; abnormal operations; emergency or power outage operations; bypass procedures; and safety.

(ii) Flow diagrams. The manual shall provide flow diagrams of the entire process, as well as individual unit processes. The flow diagrams shall show the flow options under the various operational conditions listed above.

(d) Operating parameters. The O & M manual shall provide the design criteria for each unit process. The data shall include the number, type, capacity, sizes, etc., and other information, as applicable.

(e) Troubleshooting guide. Each equipment maintenance manual shall include a section on troubleshooting. These manuals are to be indexed in the plant O & M manual. The troubleshooting guide shall include typical operation problems and solutions. The guide shall include a telephone number for factory troubleshooting assistance.

(f) Emergency procedures. The plant O & M manual shall detail emergency operations procedures for possible foreseeable emergencies, including power outage, equipment failure, development of unsafe conditions, and other emergency conditions. The details shall include valve positions, flow control settings, and other information to ensure continued operation of the facility at maximum possible efficiency.

The manual shall also detail emergency notification procedures to be followed to protect health and safety under various emergency conditions.

(g) Safety. The manual shall provide general information on safety in and around the plant and its components. Each unit process discussion shall include applicable safety procedures and precautions. For unit processes or operations having extreme hazards (such as chlorine, closed tanks, etc.), the discussion shall detail appropriate protection, rescue procedures, and necessary safety equipment.

(h) Maintenance manuals. Maintenance manuals shall be required for each piece of equipment. These manuals must meet the requirements of the engineer and contractor for installation and startup of equipment. The information included in the manufacturer's manuals shall not be included in the O & M manual.

The manual shall have a neatly typewritten table of contents for each volume arranged in a systematic order. The general contents shall include product data; drawings; written text as required to supplement product data for the particular installation; and a copy of each warranty, bond and service contract issued.

The manuals for equipment and systems shall include a description of unit and component parts; operating procedures; maintenance procedures and schedules; service and lubrication schedule; sequence of control operation; a parts list; and a recommended spare parts list.

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(VII) Discharge measuring device. Every well shall be piped so that a device capable of measuring the total well discharge can be placed in operation at the well for well testing. Every well field (or when only one well is present, every well) shall have a device capable of measuring the total discharge.

(VIII) Observation wells. Observation wells shall be constructed in accordance with the requirements for permanent wells if they are to remain in service after completion of a water supply well. They shall be protected at the upper terminal to preclude entrance of foreign materials.

(IX) Well abandonment. Test wells and groundwater sources which are not in use shall be sealed in accordance with requirements of Chapter ~~11~~ 26, Water Quality Rules and Regulations.

Wells shall be sealed by filling with neat cement grout. The filling materials shall be applied to the well hole through a pipe, tremie, or bailer.

Section 10. **Treatment.**

(a) Design capacity. The capacity of the water treatment or water production system shall be designed for the maximum daily demand at the design year.

(b) Presedimentation. Raw waters which have episodes of turbidity in excess of 1,000 TU for a period of one week or longer shall be presettled.

(i) Detention time. Basins without mechanical sludge collection equipment shall have a minimum detention time of three days. Basins with mechanical sludge collection equipment shall have a minimum detention time of three hours.

(ii) Inlet. Inlet flow shall be evenly dispersed along the inlet of the basin.

(iii) Drains. Basins shall have a minimum of one 8-inch (20 cm) drain line to completely dewater the facility.

(iv) Bottom slope. Basins shall have a bottom slope to drain of 1/4 inch per foot (20 mm/m) without mechanical sludge collection equipment and 2 inches per foot (16 cm/m) with mechanical sludge collection equipment.

(v) Bypass. Basin bypass provisions shall be included in the process piping.

(c) Rapid mix. Rapid dispersal of chemicals throughout the water shall be accomplished by mechanical mixers, jet mixers, static mixers, or hydraulic jump.

Class V Injection Wells and Facilities
Underground Injection Control Program

CHAPTER 16

Section 1. Authority and Purpose. These regulations are promulgated pursuant to W.S. 35-11-101 through 1413, specifically 302, and no person shall cause, threaten or allow violations of any provision contained herein. These regulations fulfill Wyoming state obligations under Section 1422 of the Federal Safe Drinking Water Act and Federal Underground Injection Control regulations found in 40 CFR 124 and 40 CFR 144-148 (both as of December 7, 1999).

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) "Area of review" means the area for which information and analyses shall be submitted as part of an underground injection control permit application, and reviewed for issuance of a permit. The area of review must include all portions of an aquifer which will be affected in a measurable way within ten (10) years of the granting of a permit, assuming that the permit is complied with.

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

(d) “Cesspool” means a drywell that receives solely untreated domestic sewage, and which sometimes has an open bottom and/or perforated sides.

(e) “Class V facility” means any property which contains an injection well, drywell, or subsurface fluid distribution system which is not defined as a Class I, II, III, or IV well in Chapter 13, Water Quality Rules and Regulations. The Class V facility includes all systems of collection, treatment, and control which are associated with the subsurface disposal. Appendix A of this chapter contains a list of Class V facilities.

(f) "Domestic sewage" means liquids or solid wastes obtained from humans and domestic activities including wastewater from activities such as showers, toilets, human wash basins, food preparation, clothes washing, and dishwashers.

(g) "Draft permit" means a document indicating the tentative decision by the department to issue or deny, modify, revoke and reissue, or terminate a permit. A notice of intent to terminate a permit and a notice of intent to deny a permit are types of draft permits. A denial of a request for modification, revocation and reissuance, or termination is not a draft permit. A draft permit for issuance shall contain all conditions and content, compliance schedules and monitoring requirements required by this chapter.

(h) "Drywell" means a well, other than an improved sinkhole or subsurface distribution system, completed above the water table so that its bottom and sides are typically dry, except when receiving fluids.

(i) "Duly authorized representative" means a specific individual or a position having responsibility for the overall operation of the regulated facility or activity. The authorization shall be made in writing by a responsible corporate officer and shall be submitted to the administrator.

(j) "Fact sheet" means a document briefly setting forth the principal facts and the significant factual, legal, methodological, and policy questions considered in preparing the draft permit. Fact sheets for Class I wells are incorporated into the public notice.

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

(l) "General permit" means a permit issued to a class of operators, all of which inject similar types of fluids for similar purposes. General permits require less information to be submitted by the applicant than individual permits and do not require public notice for a facility to be included under the authorization of a general permit.

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

(n) "Groundwaters of the state" are all bodies of underground water which are wholly or partially within the boundaries of the state.

(o) "Hazardous waste" means a hazardous waste as defined in Chapter 2, Section 1 (c), Wyoming Hazardous Waste Rules and Regulations.

(p) "Improved sinkhole" means a naturally occurring karst depression which has been modified by man for the purpose of directing and emplacing fluids into the subsurface.

(q) "Individual permit" means a permit issued for a specific facility operated by an individual operator, company, municipality, or agency. An individual permit may be established as an area permit and include multiple points of discharge that are all operated by the same person.

(r) "Injectate" means the wastewater being disposed of through any underground injection facility after it has received whatever pretreatment is done.

(s) "Lithology" means the description of rocks on the basis of their physical and chemical characteristics.

(t) "Permit" means a Wyoming Underground Injection Control permit, unless otherwise specified.

(u) “Permit by rule” means an authorization included in these rules which does not require either an individual permit or a general permit. A facility which is permitted by rule must meet the requirements found in this chapter, but is not required to apply for and obtain a permit to construct and operate the facility.

(v) "Permittee" means the named permit holder.

(w) "Point of compliance" means a point at which the permittee shall meet class of use standards for the receiver.

(x) “Point of injection” means the last accessible sampling point prior to waste fluids being released into the subsurface environment through a Class V injection well. For example the ‘point of injection’ of a Class V septic system might be the distribution box - the last accessible sampling point before the waste fluids drain into the underlying soils. For a dry well, it is likely to be the well bore itself.

(y) “Public hearing” means a non-adversary hearing held by the administrator or director of the department. The hearing is conducted pursuant to Chapter 3 of the Wyoming Department of Environmental Quality Rules of Practice and Procedure.

(z) "Radioactive waste" means any waste which contains radioactive material in concentrations which exceed those listed in 10 CFR Part 20, Appendix B, Table II, Column 2 as of December 22, 1993.

(aa) "Receiver" means any zone, interval, formation or unit in the subsurface into which fluids and pollutants are discharged.

(bb) "Responsible corporate officer" means a president, secretary, treasurer, or vice president of the corporation in charge of a principal business function, or any other person who performs similar policy- or decision-making functions for the corporation.

(cc) "Secondarily affected aquifer" means any aquifer affected by migration of fluids from an injection facility, when the aquifer is not directly discharged into.

(dd) “Septic system” means a facility that is used solely to emplace domestic sewage below the surface and is comprised of a septic tank and subsurface fluid distribution system.

(ee) “Source water protection area” means the area delineated for the protection of ground and surface water sources for a public water supply under a department approved plan developed pursuant to Section 1453 of the Safe Drinking Water Act.

(ff) “Subsurface fluid distribution system” means an assemblage of perforated pipes or drain tiles used to distribute fluids below the surface of the ground. Subsurface fluid distribution systems include but are not limited to drain fields, leach fields, mounded leach fields, leach lines, bed type distribution systems, and gravel-less chamber type distribution systems.

(gg) “Vadose Zone” means the unsaturated zone in the earth, between the land surface and the top of the first saturated aquifer. The vadose zone contains water at less than saturated conditions.

(hh) "Underground source of drinking water" means those aquifers or portions thereof which have a total dissolved solids content of less than 10,000 mg/l, and are classified as either Class I, II, III, IV (a), or Special (A), pursuant to Chapter 8, Quality Standards for Wyoming Groundwaters, Water Quality Rules and Regulations.

(ii) “Water quality management area” means the area delineated for the protection of water quality under a department approved plan developed under Sections 303, 208 and/or 201 of the Federal Clean Water Act, as amended.

(jj) "Well" means a bored, drilled, or driven shaft; a hole dug whose depth is greater than the largest surface dimension; an improved sinkhole; or a subsurface fluid distribution system.

(kk) “Wellhead protection area” means the area delineated for the protection of a public water supply utilizing a groundwater source under a department approved plan developed pursuant to Section 1428 of the federal Safe Drinking Water Act.

Section 3. Applicability. These regulations shall apply to any discharge to the subsurface, including the vadose zone, for all of the types of discharges listed in Appendix A of this chapter.

Section 4. Timing of Compliance with These Regulations. Any Class V permit issued under Chapters 9 or 16, Water Quality Rules and Regulations, prior to the effective date of these regulations shall remain in effect until replaced by an individual permit, a general permit or permit by rule pursuant to this chapter. Existing individual permits issued under Chapters 9 or 16 will be reviewed on a five (5) year basis pursuant to Section 5 (a)(vii) of this chapter. Any individual permit issued pursuant to Chapters 9 or 16 prior to the effective date of these regulations fulfills all of the requirements to obtain a permit under this chapter.

(a) All operators of existing systems which are required to obtain an individual permit under these regulations shall obtain a permit by April 14, 2000.

(b) General permits.

(i) Within two (2) years of the effective date of the general permit, all operators of existing facilities which require coverage shall:

(A) Apply for coverage under the general permit;

(B) Apply for an individual permit for the facility;

(C) Retain an existing permit issued under Chapter 9; or

(D) Cease discharging fluids to the subsurface.

(ii) All operators of facilities which are required to be covered by a general permit which are constructed after the effective date of these regulations shall apply for and obtain coverage prior to the construction of the facility.

(iii) Facilities will be covered by general permits as soon as the department has issued a written statement of acceptance to construct and operate the facility under the general permit. The department will issue a statement either accepting the operation for coverage under a general permit, or denying coverage under a general permit within 60 days of the date when the operator has requested coverage.

(c) Permit by rule.

(i) All operators of existing facilities permitted by rule shall submit inventory information to the department within one (1) year of the effective date of this chapter.

(ii) All operators of facilities permitted by rule which are to be constructed after the effective date of these regulations shall submit inventory information to the department prior to constructing the facility.

Section 5. Permits Required; Processing of Permits; and Requirements Applicable to All Permits.

(a) Permits required.

(i) Construction, installation, modifications or operation of Class V facilities shall be allowed only in accordance with these regulations.

(ii) Discharges into, or construction of, any Class V facility are prohibited unless permitted pursuant to this chapter.

(iii) Every facility shall be covered by one of the three types of permitting systems: individual; general; or permit by rule. The following sections of these regulations describe the permitting method for and subclasses of facilities. The owner or operator of a facility which can be covered by a general permit or authorized under permit by rule may apply for and be permitted by an individual permit if the owner or operator desires. Operators who do not meet the requirements for a general permit or permit by rule must obtain an individual permit prior to installation or construction of the Class V facility.

(iv) Permits may be issued for individual facilities or they may be issued on an area basis for multiple points of discharge operated by the same person.

(v) A separate permit to construct is not required under Chapter 3, Water Quality Rules and Regulations for any Class V facility. Requirements of the Chapter 3 permit to construct will be included in the underground injection control permit issued under this chapter.

(vi) All permits issued under this chapter, whether individual permits, or general permits, shall be for no more than ten (10) years duration.

(vii) Each permit shall be reviewed by the department at least once every five (5) years for continued validity of all permit conditions and contents. Permits that do not satisfy the requirements of these regulations are subject to modification, revocation and reissuance, or termination pursuant to this chapter.

(viii) Sections of permit applications filed under this chapter which represent engineering work shall be sealed, signed, and dated by a licensed professional engineer as required by Wyoming Statutes, Title 33, Chapter 29.

(ix) Sections of permit applications filed under this chapter which represent geologic work shall be sealed, signed, and dated by a licensed professional geologist as required by Wyoming Statutes, Title 33, Chapter 41.

(b) Permit processing procedures applicable to all Class V facilities, individual and general permits.

(i) The director may deny an individual permit for any of the following reasons:

(A) The application is incomplete;

(B) The project, if constructed and/or operated, will cause violation of applicable state surface or groundwater standards;

(C) The application contains a proposed construction or operation which does not meet the requirements of this chapter;

(D) The permitted facility would be in conflict with or is in conflict with a state approved local wellhead protection plan, state approved local source water protection plan, or state approved water quality management plan; or

(E) Other justifiable reasons necessary to carry out the provisions of the Environmental Quality Act.

(ii) If the director intends to deny an individual permit for any reason other than an incomplete or deficient application, a draft permit shall be prepared and public notice issued pursuant to Section 13 of this chapter.

(iii) Permits may be modified, revoked and reissued, or terminated either in response to a petition from any interested person (including the permittee) or upon the administrator's initiative. However, permits may only be modified, revoked and reissued, or terminated for the reasons specified in Section 5 (b) (vi) of this chapter. All requests shall be in writing and shall contain facts or reasons supporting the request.

If the administrator decides the petition is not justified, the petitioner shall be sent a brief written response giving the reason for the decision. A request for modification, revocation and reissuance, or termination shall be considered denied if the administrator takes no action within 60 days after receiving the written request. Denials of requests for modification, revocation and reissuance, or termination are not subject to public notice and comment. Denials by the administrator may be appealed for hearing to the Environmental Quality Council by a letter briefly setting forth the relevant facts.

(iv) The administrator may modify a permit when:

(A) Any material or substantial alterations or additions to the facility occur after permitting or licensing, which justify the application of permit conditions that are different or absent in the existing permit;

(B) Any modification in the operation of the facility is capable of causing or increasing pollution in excess of applicable standards or permit conditions;

(C) Information warranting modification is discovered after the operation has begun that would have justified the application of different permit conditions at the time of permit issuance;

(D) Regulations or standards upon which the permit was based have changed by promulgation of amended standards or regulations, or by judicial decision after the permit was issued;

(E) Cause exists for termination, as described in this section, but the department determines that modification is appropriate; or

(F) Modification is necessary to comply with applicable statutes, standards or regulations.

(v) Minor modifications of permits may occur with the consent of the permittee without following the public notice requirements. Minor modifications will become final 20 days from the date of receipt of such notice. For the purposes of this chapter, minor modifications may only:

(A) Correct typographical errors;

(B) Require more frequent monitoring or reporting by the permittee;

(C) Change an interim compliance date in a schedule of compliance, provided the new date is not more than 120 days after the date specified in the existing permit and does not interfere with attainment of the final compliance date requirement;

(D) Allow for a change in ownership or operational control of a facility where the administrator determines that no other change in the permit is necessary, provided that a written agreement containing a specific date for transfer of permit responsibility, coverage, and liability between the current and new permittees have been submitted to the administrator;

(E) Change quantities or types of fluids injected which are within the capacity of the facility as permitted and, in the judgment of the administrator, would not interfere with the operation of the facility or its ability to meet conditions described in the permit and would not change its classification;

(F) Change construction requirements approved by the administrator pursuant to department rules and regulations provided that any such alteration shall comply with the requirements of this chapter; or

(G) Amend an abandonment plan.

(vi) The administrator may revoke and reissue or terminate a permit for any of the following reasons:

(A) Noncompliance with terms and conditions of the permit;

(B) Failure in the application or during the issuance process to disclose fully all relevant facts, or misrepresenting any relevant facts at any time; or

(C) A determination that the activity endangers human health or the environment and can only be regulated to acceptable levels by a permit modification or termination.

(vii) The administrator may modify a permit to resolve issues that could lead to the revocation of the permit under Section 5 (b) (vi) of this chapter. The administrator, as part of any notification of intent to terminate a permit, shall order the permittee to proceed with reclamation on a reasonable time period.

If the administrator tentatively decides to modify or revoke and reissue a permit, a draft permit incorporating the proposed changes shall be prepared. The administrator may request additional information and, in the case of a modified permit, may require the submission of an updated application. In the case of revoked and reissued permits, the administrator shall require the submission of a new application.

(viii) In a permit modification under Section 5 (b) (iv) of this chapter, only those conditions to be modified shall be reopened when a new draft permit is prepared. All other aspects of the existing permit shall remain in effect for the duration of the unmodified permit and the modified permit shall expire on the date when the original permit would have expired. When a permit is revoked and reissued under this section, the entire permit is reopened as if the permit has expired and is being reissued. When the entire permit is reopened, the modified permit shall be issued for no more than ten (10) years. During any revocation and reissuance proceeding, the permittee shall comply with all conditions of the existing permit until a new final permit is issued.

(ix) Permit modifications, revocations or terminations shall be developed as a draft permit and are subject to the public notice and hearing requirements outlined in Section 13.

(x) Transfer of a permit is allowed only upon approval by the administrator. When a permit transfer occurs pursuant to this section, the permit rights of the previous permittee will automatically terminate.

(A) The proposed permit holder shall apply in writing as though that person was the original applicant for the permit and shall further agree to be bound by all of the terms and conditions of the permit; and

(B) Transfer will not be allowed if the permittee is in noncompliance with any term and conditions of the permit, unless the transferee agrees to bring the facility back into compliance with the permit.

(c) Permit conditions.

(i) All individual and general permits issued under this chapter shall contain the following conditions:

(A) A requirement that the permittee comply with all conditions of the permit, and any permit noncompliance constitutes a violation of these regulations and is grounds for enforcement action, permit termination, revocation, or modification;

(B) A requirement that if the permittee wishes to continue injection activity after the expiration of the permit, the permittee must apply to the administrator for, and obtain, a new permit;

(C) A stipulation that it shall not be a defense for a permittee in an enforcement action that it would have been necessary to halt or reduce the permitted activity in order to maintain compliance with the conditions of this permit;

(D) A requirement that the permittee shall take all reasonable steps to minimize or correct any adverse impact on the environment resulting from noncompliance with this permit;

(E) A requirement that the permittee properly operate and maintain all facilities and systems of treatment and control which are installed or used by the permittee to achieve compliance with the conditions of this permit. Proper operation and maintenance includes effective performance, adequate funding and operator staffing and training, and adequate laboratory and process controls including appropriate quality assurance procedures. This provision requires the operation of back-up or auxiliary facilities or similar systems only when necessary to achieve compliance with the conditions of the permit;

(F) A stipulation that the filing of a request by the permittee, or at the instigation of the administrator, for a permit modification, revocation, termination, or notification of planned changes or anticipated non-compliance, shall not stay any permit condition;

(G) A stipulation that this permit does not convey any property rights of any sort, or any exclusive privilege;

(H) A stipulation that the permittee shall furnish to the administrator, within a specified time, any information which the administrator may request to determine whether cause exists for modifying, revoking and reissuing, or terminating the permit, or to determine compliance with the permit. The permittee shall also furnish to the administrator, upon request, copies of records required to be kept by the permit;

(I) A requirement that the permittee shall allow the administrator, or an authorized representative of the administrator, upon the presentation of credentials, during normal working hours, to enter the premises where a regulated facility is located, or where records are kept under the conditions of this permit, and inspect the discharge and related facilities, review and copy reports and records required by the permit, collect fluid samples for analysis, measure and record water levels, and perform any other function authorized by law or regulation;

(J) A requirement that the permittee furnish any information necessary to establish a monitoring program pursuant to Section 11 of this chapter;

(K) A requirement that all samples and measurements taken for the purpose of monitoring shall be representative of the monitored activity, and records of all monitoring information be retained by the permittee. The monitoring information to be retained shall be that information stipulated in the monitoring program established pursuant to the criteria in Section 11 of this chapter;

(L) A requirement that all applications, reports, and other information submitted to the administrator contain certifications as required in Section 6 (c) (xii) of this chapter, and be signed by a person who meets the requirements to sign permit applications found in Section 6 (c) (xi), or for routine reports, a duly authorized representative;

(M) A requirement that the permittee give advance notice to the administrator as soon as possible of any planned physical alteration or additions, other than authorized operation and maintenance, to the permitted facility and receive authorization prior to implementing the proposed alteration or addition;

(N) A requirement that any modification which may result in a violation of a permit condition shall be reported to the administrator, and any modification that will result in a violation of a permit condition shall be reported to the administrator through the submission of a new or amended permit application;

(O) A requirement that any transfer of a permit must first be approved by the administrator, and that no transfer will be approved if the facility is not in compliance with the existing permit unless the proposed permittee agrees to bring the facility into compliance;

(P) A requirement that monitoring results shall be reported at the intervals specified elsewhere in the permit;

(Q) A requirement that reports of compliance or non-compliance with, or any progress reports on interim and final requirements contained in any compliance schedule, if one is required by the administrator, shall be submitted no later than 30 days following each schedule date;

(R) A requirement that confirmed noncompliance resulting in the migration of injected fluid into any zone outside of the permitted receiver must be orally reported to the administrator within 24 hours, and a written submission shall be provided within five (5) days of the time the permittee becomes aware of the excursion. The written submission shall contain:

(I) A description of the noncompliance and its cause;

(II) The period of noncompliance, including exact dates and times, and, if the noncompliance has not been controlled, the anticipated time it is expected to continue; and

(III) Steps taken or planned to reduce, eliminate, and prevent reoccurrence of the noncompliance.

(S) A requirement that the permittee report all instances of noncompliance not already required to be reported under paragraphs (c) (i) (P) through (R) of this section, at the time monitoring reports are submitted. The reports shall contain the information listed in paragraph (c) (i) (R) of this section;

(T) A requirement that in the situation where the permittee becomes aware that it failed to submit any relevant facts in a permit application, or submitted incorrect information in a permit application or in any report to the administrator, the permittee shall promptly submit such facts or information;

(U) A requirement that the injection facility meet construction requirements outlined in Section 10 of this chapter, and that the permittee submit notice of completion of construction to the administrator and allow for inspection of the facility upon completion of construction, prior to commencing any injection activity;

(V) A requirement that the permittee notify the administrator at such times as the permit requires before conversion or abandonment of the facility;

(W) A requirement that an abandonment report, detailing the compliance abandonment procedures outlined the original permit application, or describing any deviations from the original plan, be submitted as soon as practicable after abandonment; and

(X) A requirement that injection may not commence until construction is complete.

(ii) In addition to the conditions required of all permits, the administrator may establish, on a case-by-case basis, conditions as required for monitoring, schedules of compliance, and such additional conditions as are necessary to prevent the migration of fluids into underground sources of drinking water.

(d) Records and reports required for general and individual permits.

(i) The permittee shall submit a written report to the administrator of all remedial work concerning the failure of equipment or operational procedures which resulted in a violation of a permit condition, at the completion of the remedial work.

(ii) Routine periodic reports required by the permit shall be submitted to the administrator within 30 days following the end of the period covered in the report. Reports shall include the following information:

(A) If the permit requires, an accounting of the total volume of injectate for the period covered by the report, the year to date, and the life of the facility to date; and

(B) An analysis of the physical, chemical and other relevant characteristics of the injected fluid.

(iii) For any aborted or curtailed operation, in lieu of an annual report, a complete report shall be submitted within 30 days of complete termination of the discharge or associated activity.

(iv) The permittee shall retain all monitoring records required by the permit for a period of three (3) years following facility closure.

Section 6. Individual Permits.

(a) The operator shall submit an application and obtain a permit prior to the construction, installation, modification or operation of any facility in the following subclasses: 5A3; 5B3; 5B5; 5C1; 5C2; 5C3; 5D1; 5D3; 5D4; 5E3, 5E4 and 5F2 unless the facility is covered by a general permit. In addition, any facility not authorized under Sections 7 and 8, and operators directed by the administrator to obtain an individual permit, shall obtain an individual permit under this section.

(b) The operator is responsible to make application for and obtain a permit. Each application must be submitted with all supporting data required in this chapter.

(c) A complete application for a Class V facility individual permit shall include:

(i) A brief description of the nature of the business and the activities to be conducted that require the applicant to obtain a permit under this chapter;

(ii) The name, address and telephone number of the operator, and the operator's ownership status and status as a federal, state, private, public or other entity;

(iii) The name address and telephone number of the facility. Additionally, the location of the facility shall be identified by section, township, range and county.

(iv) A calculation of the area of review, to include:

(A) A calculation to determine the maximum area affected by the injected waste for all Class V facilities constructed or modified after the effective date of these regulations. This calculation determines the total amount of void space around and down gradient from the point of injection and uses accepted groundwater theory to determine the extent of any affected groundwater around the facility.

(B) A Class V area of review shall never be less than the area of potentially impacted groundwater.

(C) All areas of review shall be legally described by township, range and section to the nearest ten (10) acres as described under the general land survey system.

(v) Information about the proposed facility including:

(A) A description of the substances proposed to be discharged, including type, source, and chemical, physical, radiological and toxic characteristics; and

(B) Construction and engineering details in accordance with Section 10 of this chapter and Chapter 11 Water Quality Rules and Regulations.

(vi) Information, including the name, description, depth, geologic structure, faulting, fracturing, lithology, hydrology, and fluid pressure of the receiver and any relevant confining zones. The fracture pressure of the receiver shall be submitted only if the injection is under pressure into a confined aquifer.

(vii) Water quality information including background water quality data which will facilitate the classification of any groundwaters which may be affected by the proposed discharge. This must include information necessary for the division to classify the receiver and any secondarily affected aquifers under Chapter 8, Wyoming Water Quality Rules and Regulations.

(viii) A topographic and other pertinent maps, extending at least one (1) mile beyond the property boundaries of the facility, but never less than the area of review, depicting:

(A) The facility and each of its intake and discharge structures;

(B) Each well, drywell or subsurface fluid distribution system where fluids from the facility are injected underground;

(C) Other wells, springs, and surface water bodies, and drinking water wells listed in public records or otherwise known to the applicant within the area of review; and

(D) Bedrock and surficial geology, geologic structure, and hydrogeology in the area.

(ix) A list of other relevant permits, whether federal or state, that the facility has been required to obtain, such as construction permits. This includes a statement as to whether or not the facility is within a state approved water quality management plan area, a state approved wellhead protection area or a state approved source water protection area.

(x) Detailed plans for monitoring the volume and chemistry of the discharge, and water quality of selected water wells within the area of review in accordance with Section 11 of this chapter;

(xi) All applications for permits, reports, or information to be submitted to the Administrator shall be signed by a responsible officer as follows:

(A) For a corporation - a responsible corporate officer means:

(i) A president, secretary, treasurer, or vice president of the corporation in charge of a principal business function, or any other person who performs similar policy or decision making functions for the corporation; or

(ii) The manager of one or more manufacturing, production, or operating facilities employing more than 250 persons or having gross annual sales or expenditures exceeding $25 million (in second quarter 1980 dollars), if authority to sign documents has been assigned or delegated to the manager in accordance with corporate procedures.

(B) For a partnership or sole proprietorship -- by a general partner or the proprietor, respectively;

(C) For a municipality, state, federal or other public agency -- by either the principal executive officer or ranking elected official.

(xii) The application shall contain the following certification by the person signing the application:

"I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

(d) All data used to complete permit applications shall be kept by the applicant for a minimum of three (3) years from the date of signing.

(e) The applicant shall submit five (5) copies of the permit application to the division.

(f) Within 60 days of submission of the application, the administrator shall make an initial determination of completeness. An application shall be determined complete when the administrator receives an application and any supplemental information necessary to determine compliance with these regulations.

(g) Resubmittal of information by an applicant on an incomplete application will begin the process described in paragraph (f) of this section.

(h) During any 60 day review period where an application is determined complete, the administrator shall prepare a draft permit for issuance or denial, prepare a fact sheet on the proposed operation, and provide public notice pursuant to Section 13.

(i) A denial of the application by the department is appealable by the applicant to the Environmental Quality Council in accordance with the Rules of Practice and Procedure. Requests for appeal must be in writing, state the reasons for appeal, and be made to both the director and the chairman of the Environmental Quality Council.

Section 7. General Permits.

(a) The department may develop and issue general permits pursuant to these regulations which cover Class V facilities for the following subclasses: 5A1, 5A2, 5B1, 5C4, 5C5, 5C6, 5D1, 5D2, 5E1, 5E3, and 5E5. The administrator may issue general permits in other categories as the need arises. 5E3 facilities which were permitted as small wastewater systems prior to April 14, 1998 are permitted by rule under Section 8 (c) (v) and are not covered by this section. Facilities in these subclasses which have already been issued individual permits under Chapter 9 or Chapter 16, Water Quality Rules and Regulations may continue under these permits until they are terminated, revoked and reissued, or canceled at the request of the operator. Coverage shall not be extended to any facility if such a facility would be in violation of any state approved source water protection area. Facilities in these subclasses not presently covered by an individual permit will be authorized by permit by rule until the general permit for the specific subclass is issued. The operator of a facility listed in this section shall have two (2) years after the date of issuance of the general permit to:

(i) Obtain coverage under the issued general permit;

(ii) Submit an application and receive an individual permit under this chapter;

(iii) Continue to be covered by a permit issued pursuant to Chapter 9 of these regulations; or

(iv) Abandon the facility in accordance with Section 12.

(b) If a general permit has been issued by the department, an operator of a facility must register the facility with the department and sign a statement agreeing to be bound by the conditions of that permit. Failure to register for general permit coverage, when available, is the same as operation of a facility without a permit, unless an individual permit has been obtained.

(c) In order to be covered by a general permit, an operator must submit all information required in Section 6 (c) (i), (ii), and (iii), plus any additional information required to be submitted or reported in the issued general permit. The submittal requesting coverage by a general permit shall be signed by a person meeting the same signatory requirements of Section 6 (c) (xi) and shall be certified in accordance with Section 6 (c) (xii). Facilities will be covered by general permits as soon as the department has issued a written statement of acceptance to allow the construction and operation of the facility under the general permit. The department will issue an authorization accepting the operation for coverage under the general permit or denying coverage under the general permit, within 60 days of the date when the operator requested coverage. Requests for coverage under a general permit, which do not meet the requirements for general permit pursuant to this chapter, may be denied by the administrator.

(d) Once issued, general permits must remain the same for all persons covered by the permit. A general permit may be modified in accordance with Section 5 (b) (iv). Any such modification must cover all persons covered by the permit.

(e) General permits shall also include:

(i) The permit conditions required in Section 5 (c) (i);

(ii) A requirement to submit information necessary for the department to make an assessment of the vulnerability of the environment and public health to the injection from the Class V well. Such information may include the depth to the groundwater table at the disposal field, groundwater quality or existing available information on the lithology, geology, hydrogeology and the location of the following items within 1/4 mile of the Class V facility:

(A) All water supply wells and the uses of each respective well;

(B) All property boundaries and land uses;

(C) All surface water bodies or springs; and

(D) All known sources of groundwater contamination or pollution.

(E) All state approved source water protection areas, wellhead protection areas, 201 service areas, or water quality management plan areas.

(iii) Depth below the ground surface for the point of injection and for the well screening in all wells within the area of review;

(iv) A requirement for facilities constructed after April 14, 1998 that the operator certifies the facility will meet the design, construction, and operational performance requirements in Section 10 for the specific subclass of facility.

(v) A requirement that the operator submit the disposal capacity of the facility in gallons per day as calculated using Table 1, ~~Chapter 11, Section 34~~ Chapter 25. Some facilities may be required to monitor the volume of injectate actually disposed of, or the volume of water used in the area served by the Class V facility.

(f) The administrator may require any operator covered by a general permit to obtain an individual permit for the facility when a review of the information submitted under this section indicates that the general permit would not be protective of groundwater in that specific case. Any operator covered by a general permit may at any time apply for and obtain an individual permit for the same facility. Once issued, an individual permit will replace coverage by the general permit for that facility.

(g) General permits will contain the subclass of injection facility covered, the geographic area covered, the general nature of the fluids to be discharged, and the location of the receiver where the discharge will be allowed. General permits will follow the public notice requirements of Section 13 of this chapter. During each five (5) year review of a general permit, a public notice shall be issued by the department stating that a five (5) year review has been done, listing the facilities covered by a general permit, and stating where the public may obtain a copy of the permit.

(h) Operators of new injection facilities who believe that their facility may be covered by a general permit in class 5C6 facilities may apply for coverage under the general permit for that subclass. If not accepted for coverage under this general permit, the operator shall apply for an individual permit under subclass 5C3.

(i) Operators of new injection facilities who believe that their facility may be covered by a general permit in class 5E5 facilities may apply for coverage under the general permit for that subclass. If not accepted for coverage under this general permit, the operator shall apply for an individual permit under subclass 5E3.

(j) In order to obtain coverage under the general permit all operators of class 5C6 and 5E5 shall submit detailed construction drawings and an abbreviated groundwater study showing the approximate depth to groundwater and a list of water wells within one half mile of the facility.

(k) General permits may be written to require the operator to monitor the water quality of the injected fluid and to submit the information to the department. Existing facilities under this section may be required to monitor injectate quality on a one time basis, on a quarterly basis, a semi-annual basis or annual basis depending on the ability of the facility to cause adverse environmental damage or affect human health.

(l) General permits for Class 5C5 coal bed methane injection facilities shall require that:

(i) Each operator provide background information showing that the class of use under Chapter 8 for each injection zone will not be violated by the injection of coal bed methane produced water;

(ii) A valid pressure falloff curve be recorded for each well within one (1) year of the start of injection into that well; and

(iii) The pressure of injection be continuously recorded and that the pressure of injection be limited to no more than the fracture pressure of the receiving formation. This requirement can be met by assuming that the fracture gradient of the receiver is .70 psi/foot of depth and using the depth of the topmost perforation in making the calculation.

Section 8. Permit by Rule. The types of Class V facilities listed in this section represent minimal threats to pollute groundwater. The referenced facilities which meet the requirements of this section are permitted by rule. A permit by rule requires the owner or operator to submit information contained in this section before construction, installation or modification of a facility and to meet the performance standards contained in this section and in Section 10 of this Chapter. No facility shall be located within a state approved local wellhead protection area, state approved source water protection area or a state approved water quality management area which is in conflict with any of those plans.

(a) A facility permitted by rule under this section shall meet the following conditions:

(i) In addition to the information listed in Section 6 (c) (i), (ii) and (iii) of this chapter, the operator shall submit the following inventory information to the department prior to construction for facilities constructed after the effective date of these regulations and within one

(1) year of the effective date of these regulations for existing facilities: (Facilities which are already registered with the Underground Injection Control Program, or which were issued a permit under Chapters 3, 9 or 16, need not send a new registration, but may be asked for updated information from time to time.)

(A) The location of the facility, either a complete legal description or latitude and longitude preferably within a (ten) 10 meter accuracy;

(B) Type and general description of the quality of the injected fluid;

(C) The disposal capacity of the facility in gallons per day;

(D) Depth of injection zone; and

(E) Whether or not the facility is operating, temporarily abandoned, or permanently abandoned.

(ii) The facility shall be designed, constructed and operated to protect groundwater standards contained in Chapter 8, Water Quality Rules and Regulations and performance standards found in this section and in Section 10 of this chapter;

(iii) Chemical, bacteriological, radiological additives, hazardous substances or toxic substances additives shall not be mixed in the injected fluid at any time during use of the water, prior to injection or during injection; and

(iv) Any violation of the requirements of these regulations by a Class V facility operator permitted by rule shall be reported to the department by telephone within twenty-four (24) hours of the time when the operator becomes aware of the violation. A written report shall be filed by the operator with the department within seven (7) days detailing steps which have been taken and will be taken to eliminate the violation.

(b) All facilities, referenced in this section, which do not meet the requirements of subsection (a) shall obtain an individual permit under this chapter. For facilities constructed or modified after the effective date of these regulations requiring an individual permit, the owner or operator shall obtain the permit prior to any construction.

(c) The following classes of facilities are permitted by rule under this section:

(i) 5B2 facilities, except any facility which injects wastewater or contains polluted groundwater or surface water in concentrations above the receiver use standards contained in Chapter 8, Water Quality Rules and Regulations;

(ii) After the effective date of these regulations, coal bed methane operators cannot be covered by 5B2 aquifer recharge rule authorizations. All coal bed methane disposal systems must be covered by a general permit or an individual permit under this chapter if they inject into a USDW, or a Class II permit issued by the Wyoming Oil and Gas Conservation Commission if they inject into a Class VI aquifer;

(iii) 5B4 facilities, provided that the water injected will not cause a groundwater standards violation under Chapter 8, Water Quality Rules and Regulations;

(iv) 5B6 and 5B7 facilities;

(v) 5D5 facilities, except those facilities receiving water polluted above the receiving groundwater class of use standards contained in Chapter 8, Water Quality Rules and Regulations and facilities injecting swimming pool wastes into a Class I groundwater;

(vi) 5E3 facilities which were originally permitted under a small wastewater system permit issued by the Department of Environmental Quality or a local government delegated the authority to issue small wastewater system permits, located within any five (5) acres of land where the cumulative maximum peak daily wastewater flow injected from other small wastewater system permitted facilities under the same ownership would exceed 2,000 gallons per day; and

(vii) 5F1 facilities, provided that information contained in Section 10 (m) of this chapter is submitted.

(d) A permit by rule where the operator has provided the necessary information shall be valid until the facility is properly closed pursuant to these regulations or until a permit has been issued or denied under this chapter.

(e) The administrator may request information from the owner or operator of a well or facility permitted by rule to determine whether the facility may be causing a violation of groundwater use standards in Chapter 8, Water Quality Rules and Regulations, the construction standards found in this chapter and in Chapter 11, Water Quality Rules and Regulations, or any other requirements of this chapter. Such information may include, but is not limited to:

(i) Analysis of injected fluids and periodic submission of reports of such monitoring;

(ii) Groundwater monitoring and periodic submission of reports of such monitoring;

(iii) Description of receiving strata; and

(iv) Well locations and down gradient use of groundwater.

(f) Any request for information under this section shall be made in writing and include a brief statement of the reasons for requesting the information. An owner or operator shall submit the information within the time frames provided in the request for information.

(g) The administrator may require any operator permitted by rule to obtain an individual permit for the facility when a review of the information submitted under Section 8 (e) of this chapter indicates that the permit by rule would not be protective of groundwater in that specific case.

Section 9. Prohibitions.

(a) In addition to the requirements in W.S. 35-11-301 (a), no person shall:

(i) Conduct any authorized injection activity in a manner that results in a violation of any permit condition or representations made in the application, the request for coverage under the general permit, individual permit, or permit by rule. A permit condition supersedes any application content;

(ii) Discharge to any zone except the authorized discharge zone as described in the permit; or

(iii) Construct, install, modify or improve an authorized injection facility except in compliance with the permit requirements.

(b) The construction of any Class 5C4 facility after the effective date of these regulations is prohibited.

(c) No person shall inject any hazardous waste which has been banned from land disposal pursuant to Chapter 13, Wyoming Hazardous Waste Rules and Regulations unless the disposal conforms to that chapter.

(d) No drainage facility, subclass 5D1 through 5D5 shall be constructed so as to directly receive any waste other than natural precipitation or natural groundwater unless permitted under an individual permit.

(e) No heating and cooling facility, subclass 5A1 through 5A3, shall be constructed so as to receive any waste other than cooling water. No corrosion inhibitors, scale inhibitors, biocides, antifreeze agents, salts, or refrigerants shall be added to the water prior to injection.

(f) No abandoned drinking water well shall be used as a disposal well unless it can be demonstrated that the waste being disposed of will leave the class of use of the affected groundwater unchanged. The class of use referred to is determined under Water Quality Rules and Regulations, Chapter 8 Quality Standards for Wyoming Ground Waters.

(g) No wastewater produced by electric power generation from geothermal fluids shall be disposed of in any Class V injection facility. Such wells are Class I injection wells and are covered by Chapter 13, Water Quality Rules and Regulations.

(h) No wastewater produced by recovery of brines and extraction of halogens shall be disposed of in any Class V injection facility. Such wells are Class I injection wells and are covered by Chapter 13, Water Quality Rules and Regulations.

(i) No person shall construct and/or operate any cesspool after April 14, 1998. No Class V facility which receives domestic sewage shall be constructed and/or operated after April 14, 1998 unless the waste is first treated in a septic tank, or other pre-treatment device. Prior to closure of any cesspool, the operator shall notify the administrator 30 days in advance.

(j) The operation of any Class V septic system with liquid waste visible on the ground surface shall be considered a failure of the system and a violation of these regulations.

(k) An operator of a facility which is authorized by rule is prohibited from injection into the facility:

(i) Upon failure to submit inventory information prior to construction for facilities constructed after April 14, 1999; and

(ii) Upon failure to comply with a request for information under Section 8 (e) of this chapter.

(l) Pumping domestic sewage out of any Class V facility for any use other than disposal to an approved facility is prohibited.

Section 10. Construction and Operation Standards for Class V Facilities.

(a) All Class V facilities must meet or exceed the design standards of these regulations including Part B ~~and G~~ of Chapter 11 and Chapter 26, Water Quality Rules and Regulations.

(b) All Class V facilities shall be constructed to permit the use of testing devices, and allow monitoring of injected fluid quality. Class V facilities shall be constructed to provide for metering of the injectate volume if the individual or general permit requires such metering.

(c) All heating and cooling facilities (5A1, 5A2 and 5A3) shall include:

(i) Provision for the use of non-toxic circulating medium in closed loop systems or an operating system which cannot be made to operate with fluid leaking;

(ii) Provision for operations without the use of corrosion inhibitors, biocides, or other toxic additives in open loop systems;

(iii) Provisions to control the total dissolved solids of waters injected into open loop systems to the class of use standard;

(iv) Provisions for automatic shutdown of the system in the event of a fluid loss from a closed loop system or a loss of any product to an open loop system;

(v) Provisions to ensure that injected water does not come to the surface or flood any subsurface structure in the immediate vicinity of the injection system; and

(vi) Provisions to ensure that known groundwater contamination is not spread by the direct injection of contaminated water or by movement of contamination from one zone to another caused indirectly by the injection.

(d) All mining, sand and backfill facilities (5B1) shall include:

(i) Provision for insuring mechanical integrity of any well designed to remain in service for more than 60 days;

(ii) Provision for controlling the type of material injected and to insure that no hazardous waste is injected;

(iii) Provision for leak detection in all surface piping;

(iv) Provision for insuring that the backfill remains within the permitted area of injection; and

(v) Provision to insure that the injection does not cause a groundwater standards violation for the class of use of the receiver.

(e) All beneficial use injection facilities (5B2, 5B3, 5B4, 5B5, 5B6, and 5B7) shall include:

(i) Plans to insure that contaminants do not enter the injection stream;

(ii) Information to show that the injection will accomplish the desired goal stated in the application; and

(iii) Target restoration values for the groundwater in the affected area being remediated for 5B5 facilities.

(f) All commercial and industrial Class V facilities (5C1, 5C2, 5C3 and 5C4) shall:

(i) Include a pre-treatment plan to insure that toxic materials (substances) are not discharged to the groundwater at concentrations higher than the class of use standards found in Chapter 8, Wyoming Water Quality Rules and Regulations or any primary drinking water standard found in 40 CFR 141 (as of June 6, 2001), whichever is more stringent;

(ii) Conform to applicable construction standards found in Chapter 25, Wyoming Water Quality Rules and Regulations; and

(iii) Include, at a minimum, annual sampling of the waste injected as part of the monitoring plan for the facility.

(g) When a 5C3 facility receiving slaughter house wastes can demonstrate that no violations of groundwater standards will occur, the facility shall be:

(i) Designed for the following minimum disposal capacities:

(A) 300 gallons per day for plant cleanup plus;

(B) 25 gallons per head of cattle slaughter capacity;

(C) 40 gallons per head of hog slaughter capacity;

(D) 35 gallons per head of sheep slaughter capacity; and

(E) Appropriate capacity for any other species slaughtered on a per head basis.

(ii) Designed to prevent the disposal of blood and viscera into the septic system except as a small incidental portion of the total flow. Blood and viscera shall be sent to a rendering plant or other approved disposal or recycling system.

(iii) A grease trap shall be provided ahead of the septic system with a total capacity equal to one half of the total required capacity of the septic tank.

(h) All drainage facilities (those with the code number 5D on Appendix A) shall include:

(i) A plan to preclude the inadvertent introduction of contaminants into the wastewater stream;

(ii) An operations and maintenance manual detailing maintenance required, reporting requirements for known spills affecting the facility, and steps to be taken to prevent the introduction of contaminants in the event of a spill within the area served by the facility; and

(iii) Maps showing the area where runoff will be transported to the drainage facility.

(i) All agricultural drainage facilities (5D1) injecting surface runoff from animal waste piles, feedlots, or dairy operations for which a demonstration can be made that the groundwater standards can be met, shall be designed for treatment in a septic tank, lagoon, or other treatment technology prior to injection. The following requirements apply to these systems:

(i) The treatment facility shall be sized for the strength and solids content of the wastewater to be treated;

(ii) The flow capacity requirements shall include all runoff from operations within the collection area and all runoff from precipitation up to and including a 25 year, 24 hour design storm; and

(iii) The flow capacity requirements for drainage from a fully enclosed dairy or feeding operation shall be as follows:

(A) 20 gallons per day per animal up to 50 pounds;

(B) 100 gallons per day per animal up to 500 pounds; and

(C) 200 gallons per day per animal over 500 pounds.

(iv) The subsurface fluid distribution system shall be designed in accordance with general design requirements found in Chapter 25.

(j) All sewage disposal (5E) facilities shall:

(i) Conform to applicable construction standards found in Chapter 25, Wyoming Water Quality Rules and Regulations;

(ii) Comply with applicable sections of Chapter 11, Parts B and C, Water Quality Rules and Regulations for all piping systems or storage facilities feeding existing or Class V facilities constructed after the effective date of these regulations; and

(iii) Be designed for the maximum daily peak flow determined from Table 1 of Chapter 25, Water Quality Rules and Regulations. In addition, whenever multiple points of discharge under one owner within any five (5) acres of land have a design capacity under Chapter 25 to inject more than a total of 2,000 gallons per day of domestic sewage, they shall be permitted under this chapter in the same manner that they would be permitted if all the waste were delivered to a single point of discharge.

(k) All aquiculture return flow facilities (5E1) shall include pretreatment in a lagoon, septic tank, or oxidation ditch sized for the strength and volume of the wastes to be disposed of.

(l) All domestic wastewater treatment plant disposal facilities (5E4) shall also include:

(i) Provisions for filtering of the waste and disinfection of the injectate;

(ii) An environmental monitoring program, including pre-discharge, operational monitoring, and post discharge monitoring;

(iii) Monitoring of the injectate on at least a weekly basis for Nitrate as N, Ammonia as N, and coliform bacteria;

(iv) Design to prevent groundwater standards violations as defined by Chapter 8, Water Quality Rules and Regulations;

(v) The points of compliance shall be at down gradient monitor wells installed on land owned by the same utility that operates the treatment plant and injection facilities whenever the point of injection is not the point of compliance; and

(vi) Requirements for the submission, approval and conformance with an operational and maintenance manual.

(m) All cathodic protection facilities (5F1) shall include:

(i) A seal of sodium bentonite or sodium bentonite grout is required from the surface to a minimum depth of three (3) feet. A second sodium bentonite or sodium bentonite grout seal is required for a minimum thickness of three (3) feet, just above the top of the coke breeze. After the sodium bentonite has been placed in the hole, it shall be hydrated to insure a proper seal. The remainder of the hole between these seals may be backfilled with cuttings. The above seals may be placed directly in the hole or may be placed outside of a surface pipe of sufficient length to reach down to the anodes. If a surface pipe is used, no seals are required inside the pipe except during final abandonment.

(ii) All aquifers encountered while drilling shall be isolated from one another using a bentonite seal of at least two (2) feet in vertical dimension.

(iii) The coke breeze shall be a high quality product containing a minimum of leachable metals or organic pollutants. The coke breeze shall not discharge any pollutant which will cause a groundwater standard violation.

(iv) Surface access to the anode shall be kept sealed and locked at all times when the anode is not actually being serviced.

(v) Each separate aquifer penetrated shall require a separate breather pipe. Each aquifer shall remain in hydrologic isolation from each other if they were isolated prior to installation.

(vi) If it becomes necessary to wet any anode installed under this section, only water from a public water supply or water meeting all of the standards for Class I groundwater of the state shall be used unless the division is first supplied with an analyses of the water for approval.

(vii) Each 5F1 facility shall be marked in the field with a sign showing the name, address, and telephone number of the operator who installed the system. Upon abandonment, such markers shall remain in place.

(viii) A 5F1 facility shall not be installed within 200 feet of any pipeline, wellhead, storage tank, mud pit or other potential source of pollution unless the operator's surface rights prevent this requirement from being met.

(n) Except for beneficial use facilities, Class V facilities shall not be located within 200 feet of any active public water supply well, regardless of whether or not the well is completed in the same aquifer. This minimum distance may increase or the existence of a Class V facility may be prohibited within a state approved wellhead protection area, source water protection area or water quality management plan area.

(o) Class 5C6 and 5E5 facilities shall meet the construction standards and separation distances appropriate for the design flow as shown in Chapter 25.

(p) Class 5C5 coal bed methane injection facilities shall:

(i) Provide for metering of water injected into each well;

(ii) Be constructed to insure that the water injected reaches the intended receiver and only the intended receiver. The intended receiver shall be identified by geologic formation and/or member name as well as the depth of that receiver below ground surface;

(iii) Provide for disinfection of the water injected if analysis shows that coliform bacteria, sulfate reducing bacteria or iron fixing bacteria are present in the water as pumped from the coal seam. Treatment methods must be methods that would be appropriate for treating water in a public water supply system;

(iv) Provide for injection at a pressure of less than the fracture pressure of the receiver; and

(v) Provide for monitoring of the quality of the injected water on a periodic basis.

(vi) Provide notification of the intent to obtain coverage under the general permit to all surface owners, mineral owners or water rights owners, oil and gas owners and the owners of coal leases within one-half mile of the proposed point of injection.

(vii) Provide for pressure testing of the casing before injection and at least once every five (5) years thereafter. The casing shall be pressure tested up to an indicated surface pressure of 700 psi and held for 15 minutes. A passing result is indicated if the casing still has 690 psi at the end of the 15 minute shut in time.

Section 11. Environmental Monitoring Program.

(a) The monitoring program shall be adequate to ensure knowledge of migration and behavior of the discharge in the receiver.

(i) Monitoring may be required for any circumstance where groundwaters of the state could be affected by a Class V facility.

(ii) The extent and design of a monitoring system shall be sufficient to deal with the pollution potential of the proposed discharge.

(iii) Before construction or installation of a Class V facility, a monitoring program, when required, shall be adequate to establish baseline conditions of the receiver.

(b) The monitoring program shall consist of any or all of the following:

(i) Pre-discharge or pre-operational monitoring;

(ii) Operational monitoring;

(iii) Post-discharge or post-operational monitoring;

(iv) Record keeping and reporting;

(v) Such additional requirements established by the administrator to meet the purposes of the Environmental Quality Act and these regulations.

(c) Each monitoring program shall include maps and cross-sections, where appropriate, showing the location, lithology, and screening interval of each monitoring site.

(d) The operator is responsible for properly installing, operating, maintaining and removing all necessary monitoring equipment.

(e) The operator shall develop and follow a written waste analysis plan that describes the procedures to be carried out to obtain detailed chemical and physical analyses of a representative samples of the waste, including quality assurance procedures to be used. Once approved by the department, the operator shall not deviate from the plan without filing an amended plan and obtaining department approval for that amended plan. At a minimum, any plan shall include:

(i) The parameters for which the waste will be analyzed, the rationale for the selection of these parameters, and the test methods to be used to test for these parameters; and

(ii) The sampling method that will be used to obtain a representative sample of the waste.

(iii) The operator shall repeat the analysis of the injected wastes in the manner and on the schedule described in the waste analysis plan or when operating changes occur that may significantly alter the characteristics of the waste stream.

(f) All Class V permits shall contain a point of compliance. The point of compliance shall be the point of injection or specific monitor wells located down gradient of the injection facilities.

(i) For facilities where the point of compliance is the point of injection, the fluid to be injected shall be limited to the class of use standards for the receiver as found in Chapter 8 of these regulations or any primary drinking water standard found in 40 CFR 141, (as of June 6, 2001) whichever is more stringent. The permittee may be required to maintain monitor wells in the vicinity of the discharge for the purpose of monitoring flow direction and monitoring groundwater quality in the event of non-compliance with the permit.

(ii) For facilities where the point of compliance is at one or more down gradient monitor wells, the department shall establish permit limitations at the monitor well(s) consistent with the class of use of the receiver or any secondarily affected aquifer or surface water. Where necessary to protect existing or future uses, permit limitations may be established at the point of compliance which are more stringent than the class of use standard.

(iii) Facilities where subsurface treatment is anticipated may be required to monitor the injected fluid at the point of injection. Permit limits may be established at the point of injection which exceed the class of use standard for the affected aquifer, provided that a demonstration is made showing that a class of use standards violation will not occur at a point of compliance downgradient from the point of injection. Permit limits of this nature are intended to provide early warning of possible non-compliance at the point of compliance.

(g) Procedures and methods for sample collection and analyses shall be implemented by the permittee to ensure that the samples are representative of the groundwater, water, or wastes being sampled.

(h) Sample collection of groundwater shall be of such frequency and of such variety (season, time, location, depth, etc.) to properly describe the groundwater, and shall be accomplished by the methods and procedures described in the U.S. Environmental Protection Agency manual RCRA Groundwater Monitoring Technical Enforcement Guidance Document, September, 1986, unless alternate methods and procedures are approved by the administrator.

(i) Analysis of all samples shall be accomplished pursuant to Chapter 8, Water Quality Rules and Regulations, Sections 7 and 8.

Section 12. Abandonment of Class V Facilities.

(a) After the effective date of these regulations, Class V facilities may be abandoned in place if the following conditions are met and if it can be demonstrated to the satisfaction of the administrator that:

(i) No hazardous waste has ever been discharged through the facility;

(ii) No radioactive waste has ever been discharged through the facility;

(iii) All piping allowing for the discharge has either been removed or the ends of the piping have been plugged in such a way that the plug is permanent and will not allow for a discharge; and

(iv) All accumulated sludges are removed from any septic tanks, holding tanks, lift stations, or other waste handling structures prior to abandonment;

(b) Facilities which cannot demonstrate compliance with subsection (a) (i) or (a) (ii) of this section, may be abandoned in place if:

(i) Tests are run on sludges accumulated in the septic tanks, holding tanks, lift stations, or other waste handling structures which shows that none of these materials contain characteristic hazardous waste or radioactive waste;

(ii) Monitoring of the groundwater in the immediate area of the facility shows that there are no toxic materials (substances) present in the groundwater at levels higher than class of use standards, which are present as a result of the injection; or

(iii) Some other method is determined to be acceptable to the administrator which demonstrates compliance with Chapter 8 of these regulations and prevents the movement of fluid containing any contaminant into an underground source of drinking water, if the presence of that contaminant may cause a violation of any primary drinking water standard found in 40 CFR 141 (as of June 6, 2001).

(c) Facilities which cannot make the demonstrations required under either subsection (a) or (b) of this section shall be excavated to the point where contamination is no longer visible in the soil. At that point, samples shall be taken of the soil for all hazardous constituents which may have been discharged through the system. Materials excavated shall be removed from the site for disposal under approval of the Solid and Hazardous Waste Management Division.

(d) Cathodic protection (5F1) facilities will be considered to have made the demonstrations required under subsections (a) and (b) if no waste has been disposed of into the facility. After they have fulfilled their useful purpose, they shall be abandoned by filling all breather pipes with an impervious material and removing all surface installations down to a depth of three (3) feet. All anodes where the construction included a surface casing shall also have the surface casing cut off three (3) feet below grade and a plug or cap shall be installed on the surface casing. It is not necessary to remove the coke breeze, anodes, and seals during abandonment. The administrator may approve other alternatives for abandonment if they provide adequate environmental protection.

(e) Prior to abandoning any class 5C4 automotive waste disposal facility, the operator shall provide 30 days notice to the administrator.

Section 13. Public Participation, Public Notice and Public Hearing Requirements.

(a) Public notice is not required for minor modifications as described by Section 5 (b) (v) of this chapter or for a permit denial where the application is determined incomplete.

(b) Public notice is not required for any facility permitted by rule or for any facility covered under general permit. The department shall issue one public notice creating the general permit and then notice at each subsequent five (5) year review.

(c) The administrator shall give public notice if a draft permit has been prepared or a hearing has been scheduled.

(d) Public notice of the preparation of a draft permit shall allow at least 30 days for public comment. Public notice of a public hearing shall be given at least 30 days before the hearing. Public notice of the hearing may be given at the same time as public notice of the draft permit and the two notices may be combined.

(e) Public notice shall be given by:

(i) Mailing a copy of the notice to the following persons:

(A) The applicant, by certified or registered mail. For general permits this includes all persons registered as operators of facilities which the department believes will be covered by the general permit;

(B) The U.S. Environmental Protection Agency;

(C) Wyoming Game and Fish Department;

(D) Wyoming State Engineer;

(E) State Historical Preservation Officer;

(F) Persons on the mailing list developed by including those who request in writing to be on the list and soliciting persons for "area lists" from participants in proceedings in that area; and

(G) Any unit of local government having jurisdiction over the area where the facility is proposed to be located.

(ii) Publication of the notice in a newspaper of general circulation in the location of the facility or operation; and

(iii) At the discretion of the administrator, any other method reasonably expected to give actual notice of the action in question to the persons potentially affected by it, including press releases or any other forum or medium to elicit public participation.

(f) All public notices issued under this chapter shall contain the following minimum information:

(i) Name and address of the department;

(ii) Name and address of permittee or permit applicant, and, if different, of the facility or activity regulated by the permit. For general permits, this includes a list of existing facilities and the location of each facility which will be covered by the general permit. If new facilities may be covered under a general permit as they are constructed, then that fact will also be stated;

(iii) A brief description of the business conducted at the facility or activity described in the permit application or the draft permit. For general permits a generic statement of the type of facility to be covered is all that is required;

(iv) Name, address and telephone number of a person from whom interested persons may obtain further information, including copies of the draft permit, as the case may be, statement of basis or fact sheet, and the application;

(v) A brief description of comment procedures, procedures to request a hearing, and other procedures which the public may use to participate in the final permit decision; and

(vi) Any additional information considered necessary and proper.

(g) In addition to the information required in (f) of this section, any notice for public hearing shall contain the following:

(i) Reference to the date of previous public notices relating to the permit;

(ii) Date, time and place of hearing; and

(iii) A brief description of the nature and purpose of the hearing, including applicable rules and procedures.

(h) The department shall provide an opportunity for the applicant, permittee, or any interested person to submit written comments regarding any aspect of a permit or to request a public hearing.

(i) All information received on or with the permit application shall be made available to the public for inspection and copying except such information as has been determined to constitute trade secrets or confidential information pursuant to W.S. 35-11-1101.

(j) During the public comment period, any interested person may submit written comments on the draft permit and may request a public hearing. Requests for public hearings must be made in writing to the administrator and shall state the reasons for the request.

(k) The administrator shall hold a hearing whenever the administrator finds, on the basis of requests, a significant degree of public interest in a draft permit. The administrator has the discretion to hold a hearing whenever such a hearing may clarify issues involved in a permit decision.

(l) The public comment period shall automatically extend to the close of any public hearing. The administrator may also extend the comment period by so stating at the public hearing.

(m) The director shall render a decision on the draft permit within 30 days after the completion of the comment period if no hearing is requested. If a hearing is held, the director shall make a decision on any department hearing as soon as practicable after receipt of the transcript or after the expiration of the time set to receive written comments.

(n) At the time a final decision is issued, the department shall respond, in writing, to those comments received during the public comment period or comments received during the allotted time for a hearing held by the department. This response shall:

(i) Specify any changes that have been made to the permit; and

(ii) Briefly describe and respond to all comments voicing a legitimate regulatory concern that is within the authority of the department to regulate.

(o) The response to comments shall also be available to the public.

(p) Requests for a contested case hearing on a permit issuance, denial, revocation, termination, or any other final department action appealable to the Council, shall be made in writing to the chairman of the Environmental Quality Council and the director and state the grounds for the request pursuant to the Wyoming Department of Environmental Quality Rules of Practice and Procedure.

APPENDIX A
SUBCLASSES OF CLASS V FACILITIES

SUBCLASS	DESCRIPTION
	HEATING AND COOLING FACILITIES
5A1	Direct Heat Reinjection Facilities - Reinject geothermal fluids used to provide direct heat for large buildings, developments or aquiculture facilities.
5A2	Heat Pump/Air Conditioner Return Flow Facilities - Reinject groundwater used to heat or cool a building in a ground based heat pump system, or used to inject heat only using a closed loop heat pump system.
5A3	Cooling Water Return Flow Facilities - Receive non-contact cooling water from industrial processes, both open and closed loop processes.
	BENEFICIAL USE INJECTION FACILITIES
5B1	Mining, Sand or Backfill Facilities - Used to inject a fluid mixture of sand, cement, fly ash used as a pozzalin, or mill tailings into mined out portions of underground mines.
5B2	Aquifer Recharge Facilities - Receive water specifically for storage of water underground. Must be coupled with the ability to withdraw stored water at a later date for beneficial use. Coal bed methane operators cannot dispose of their produced water in class 5B2 injection wells after the effective date of these rules.
5B3	Saline Water Intrusion Barrier Facilities - Receive fresh water to prevent the continued migration of saline water into a fresh water aquifer. Includes projects installed to control contaminant plumes by injection of clean water.
5B4	Subsidence Control Facilities - Receive fresh water for the purpose of controlling subsidence caused by an overdraft of water, oil or natural gas.
5B5	Facilities which inject fluids and are used to prevent, control or remediate aquifer pollution, which are not owned or controlled by the Department of Environmental Quality. All 5B5 facilities are covered under Article 16 of the Environmental Quality Act.

SUBCLASS	DESCRIPTION
5B6	Department Controlled Facilities - Facilities which inject fluids and are used to prevent, control or remediate pollution, remediate subsiding mine sites, or produce other beneficial results which are owned or controlled by the Department of Environmental Quality. These facilities include but are not limited to, facilities under the supervision of Water Quality Division's Underground Storage Tank Program, facilities under the control and direction of the Abandoned Mined Lands Program, and facilities under the supervision of the Solid and Hazardous Waste Management Division. Control may be exercised through ownership, operation, or by administrative orders, stipulated settlements, consent decrees or other legal methods which result in control of a facility by the department.
5B7	Air sparging facilities - Facilities used to inject only air for the purpose of either encouraging microbial breakdown of hydrocarbons or removing of volatile chemicals by vapor extraction.
	COMMERCIAL AND INDUSTRIAL FACILITIES
5C1	Air Scrubber Waste Disposal Facilities - Inject wastes from air scrubbers used to remove sulphur, fly ash, or other contaminants.
5C2	Water Treatment Brine Disposal Facilities - Receive brine from water softening or other water treatment.
5C3	Industrial Process Water and Waste Disposal Facilities - Receive wastes generated by industrial and commercial processes. Examples include but are not limited to wastes from car washing, taxidermy, metal plating, printing, silk screening, refining, slaughter houses, and chemical manufacturing companies.
5C4	Automotive Waste Disposal Facilities - Inject waste from floor drains or sinks where repair work is done on machinery of any description.
5C5	Coal Bed Methane Injection Facilities - Inject groundwater produced in the process of coal bed methane extraction into a receiving aquifer containing water of the same or lower class of use.
5C6	Small Commercial Disposal Systems - Inject wastewater which is of similar quality to domestic sewage which does not technically meet the definition of domestic sewage, in quantities of less than 2,000 gallons per day.

SUBCLASS	DESCRIPTION
	DRAINAGE FACILITIES
5D1	Agricultural Drainage Facilities - Receive irrigation tailwaters, other field drainage, animal yard, feedlot, or dairy runoff, and other agricultural wastewater.
5D2	Storm Water Drainage Facilities - Receive storm water runoff from paved areas, including parking lots, streets, residential subdivisions, building roofs, highways, etc.
5D3	Improved Sinkholes - Receive storm water runoff from developments located in karst topographic areas.
5D4	Industrial Drainage Facilities - Receive storm runoff from areas susceptible to spills, leaks, and other chemical discharges.
5D5	Special Drainage Facilities - Receive water from sources other than direct precipitation. Examples of this type include landslide control drainage facilities, potable water tank overflow drainage facilities, swimming pool drainage facilities, and lake level control drainage facilities.
	SEWAGE DISPOSAL FACILITIES
5E1	Aquaculture Return Flow Facilities - Receive injectate from aquaculture operations.
5E2	Untreated Domestic sewage Disposal Facilities - Receive untreated domestic sewage from single or multiple sources. Does not include subsurface fluid distribution systems with septic tanks ahead of the subsurface fluid distribution system. Includes all cesspools, regardless of capacity.
5E3	Domestic Subsurface Fluid Distribution Systems - Receive more than 2,000 gallons per day of domestic sewage with only primary treatment such as effluent from a septic tank. In addition, any facility injecting domestic sewage within any five (5) acres of land is a class 5E3 facility whenever multiple 5E facilities under one owner inject a cumulative maximum peak design flow of more than 2,000 gallons per day of domestic sewage.
5E4	Domestic Wastewater Treatment Plant Disposal Facilities - Dispose of treated domestic waste after treatment to at least secondary treatment standards.

SUBCLASS	DESCRIPTION
5E5	Small Domestic Subsurface Fluid Distribution Systems - Receive less than 2,000 gallons per day as an average of a typical week, of domestic sewage with only primary treatment in a septic tank. These systems are designed to accept more than 2,000 gallons per day at a peak and are not small wastewater systems. No class 5E5 system has a required design capacity in excess of 5,000 gallons per day.
	MISCELLANEOUS CLASS V FACILITIES
5F1	Cathodic Protection Facilities - Facilities constructed with coke breeze and dust control oil for use as a permanent anode in a cathodic protection system for a fluid conveyor system or fluid containment system composed of metallic material.
5F2	All other facilities that inject fluids into or above an underground source of drinking water which do not fall into Classes I, II, III, or IV injection facilities.

APPENDIX B
TYPES OF PERMITS REQUIRED
TIMING OF COMPLIANCE

TYPE	DESCRIPTION	TYPE OF PERMIT	WHEN REQUIRED
5A1	Direct Heat Reinjection Facilities	General Permit	2 years after date of general permit
5A2	Heat Pump/Air Conditioner Return Flow Facilities	General Permit	2 years after date of general permit
5A3	Cooling Water Return Flow Facilities	Individual Permit	April 14, 2000
5B1	Mining, Sand or Backfill Facilities	General Permit	2 years after date of general permit
5B2	Aquifer Recharge Facilities	Permit by Rule	register by April 14, 1999
5B3	Saline Water Intrusion Barrier Facilities	Individual Permit	April 14, 2000
5B4	Subsidence Control Facilities	Permit by Rule	register by April 14, 1999
5B5	Facilities used to prevent, control or remediate aquifer pollution, which are not owned or controlled by the Department of Environmental Quality.	General Permit	2 years after the date of the general permit
5B6	Department Controlled Facilities	Permit by Rule	register by April 14, 1999
5B7	Air Sparging Facilities	Permit by Rule	register by April 14, 1999
5C1	Air Scrubber Waste Disposal Facilities	Individual Permit	April 14, 2000
5C2	Water Treatment Brine Disposal Facilities	Individual Permit	April 14, 2000
5C3	Industrial Process Water and Waste Disposal Facilities	Individual Permit	April 14, 2000

TYPE	DESCRIPTION	TYPE OF PERMIT	WHEN REQUIRED
5C4	Existing Automotive Waste Disposal Facilities	General Permit	2 years after date of general permit
5C4	New Automotive Waste Disposal Facilities	Ban	April 14, 1998
5C5	Coal Bed Methane Injection Facilities	General Permit	within 6 months of the date of issue for the general permit for existing facilities, and before injection for all new facilities
5C6	Small Commercial Disposal Systems	General Permit	2 years after the date of the general permit
5D1	Agricultural Drainage Facilities	General Permit	2 years after the date of the general permit
5D2	Storm Water Drainage Facilities	General Permit	2 years after date of general permit
5D3	Improved Sinkholes	Individual Permit	April 14, 2000
5D4	Industrial Drainage Facilities	Individual Permit	April 14, 2000
5D5	Special Drainage Facilities	Permit by Rule	register by April 14, 1999
5E1	Aquaculture Return Flow Facilities	General Permit	2 years after date of general permit
5E2	Existing Untreated Domestic sewage Disposal Facilities (Cesspools)	Ban	April 14, 1998
5E3	Existing Domestic Subsurface Fluid Distribution Systems	General Permit	2 years after date of general permit
5E3	Existing Domestic Subsurface Fluid Distribution Systems - Permitted as a small wastewater facility	Permit by Rule	register by April 14, 1999

TYPE	DESCRIPTION	TYPE OF PERMIT	WHEN REQUIRED
5E4	New Domestic Wastewater Treatment Plant Disposal Facilities	Individual Permit	April 14, 2000
5E5	Small Domestic Subsurface Fluid Distribution Systems	General Permit	2 years after the date of the general permit
5F1	Cathodic Protection Facilities	Permit by Rule	register by April 14, 1999
5F2	All other facilities that inject fluids into or above an underground source of drinking water which do not fall into Classes I, II, III, or IV injection facilities.	Individual Permit	April 14, 2000

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protection areas, 201 service areas, or water quality management plan areas.

(iii) Depth below the ground surface for the point of injection and for the well screening in all wells within the area of review;

(iv) A requirement for facilities constructed after April 14, 1998 that the operator certifies the facility will meet the design, construction, and operational performance requirements in Section 10 for the specific subclass of facility.

(v) A requirement that the operator submit the disposal capacity of the facility in gallons per day as calculated using Table 1, Chapter ~~11~~ 25~~, Section 34~~. Some facilities may be required to monitor the volume of injectate actually disposed of, or the volume of water used in the area served by the Class V facility.

(f) The administrator may require any operator covered by a general permit to obtain an individual permit for the facility when a review of the information submitted under this section indicates that the general permit would not be protective of groundwater in that specific case. Any operator covered by a general permit may at any time apply for and obtain an individual permit for the same facility. Once issued, an individual permit will replace coverage by the general permit for that facility.

(g) General permits will contain the subclass of injection facility covered, the geographic area covered, the general nature of the fluids to be discharged, and the location of the receiver where the discharge will be allowed. General permits will follow the public notice requirements of Section 13 of this chapter. During each five (5) year review of a general permit, a public notice shall be issued by the department stating that a five (5) year review has been done, listing the facilities covered by a general permit, and stating where the public may obtain a copy of the permit.

(h) Operators of new injection facilities who believe that their facility may be covered by a general permit in class 5C6 facilities may apply for coverage under the general permit for that subclass. If not accepted for coverage under this general permit, the operator shall apply for an individual permit under subclass 5C3.

(i) Operators of new injection facilities who believe that their facility may be covered by a general permit in class 5E5 facilities may apply for coverage under the general permit for that subclass. If not accepted for coverage under this general permit, the operator shall apply for an individual permit under subclass 5E3.

(j) In order to obtain coverage under the general permit all operators of class 5C6 and 5E5 shall submit detailed construction drawings and an abbreviated groundwater study showing disposed of in any Class V injection facility. Such wells are Class I injection wells and are covered by Chapter 13, Water Quality Rules and Regulations.

(i) No person shall construct and/or operate any cesspool after April 14, 1998. No Class V facility which receives domestic sewage shall be constructed and/or operated after April 14, 1998 unless the waste is first treated in a septic tank, or other pre-treatment device. Prior to closure of any cesspool, the operator shall notify the administrator 30 days in advance.

(j) The operation of any Class V septic system with liquid waste visible on the ground surface shall be considered a failure of the system and a violation of these regulations.

(k) An operator of a facility which is authorized by rule is prohibited from injection into the facility:

(i) Upon failure to submit inventory information prior to construction for facilities constructed after April 14, 1999; and

(ii) Upon failure to comply with a request for information under Section 8 (e) of this chapter.

(l) Pumping domestic sewage out of any Class V facility for any use other than disposal to an approved facility is prohibited.

Section 10. Construction and Operation Standards for Class V Facilities.

(a) All Class V facilities must meet or exceed the design standards of these regulations including Part B ~~and G~~ of Chapter 11 and Chapter 26, Water Quality Rules and Regulations.

(b) All Class V facilities shall be constructed to permit the use of testing devices, and allow monitoring of injected fluid quality. Class V facilities shall be constructed to provide for metering of the injectate volume if the individual or general permit requires such metering.

(c) All heating and cooling facilities (5A1, 5A2 and 5A3) shall include:

(i) Provision for the use of non-toxic circulating medium in closed loop systems or an operating system which cannot be made to operate with fluid leaking;

(ii) Provision for operations without the use of corrosion inhibitors, biocides, or other toxic additives in open loop systems;

(iii) Provisions to control the total dissolved solids of waters injected into open loop systems to the class of use standard;

(iv) Provisions for automatic shutdown of the system in the event of a fluid loss from a closed loop system or a loss of any product to an open loop system;

(v) Provisions to ensure that injected water does not come to the surface or flood any subsurface structure in the immediate vicinity of the injection system; and

(vi) Provisions to ensure that known groundwater contamination is not spread by the direct injection of contaminated water or by movement of contamination from one zone to another caused indirectly by the injection.

(d) All mining, sand and backfill facilities (5B1) shall include:

(i) Provision for insuring mechanical integrity of any well designed to remain in service for more than 60 days;

(ii) Provision for controlling the type of material injected and to insure that no hazardous waste is injected;

(iii) Provision for leak detection in all surface piping;

(iv) Provision for insuring that the backfill remains within the permitted area of injection; and

(v) Provision to insure that the injection does not cause a groundwater standards violation for the class of use of the receiver.

(e) All beneficial use injection facilities (5B2, 5B3, 5B4, 5B5, 5B6, and 5B7) shall include:

(i) Plans to insure that contaminants do not enter the injection stream;

(ii) Information to show that the injection will accomplish the desired goal stated in the application; and

(iii) Target restoration values for the groundwater in the affected area being remediated for 5B5 facilities.

(f) All commercial and industrial Class V facilities (5C1, 5C2, 5C3 and 5C4) shall:

(i) Include a pre-treatment plan to insure that toxic materials (substances) are not discharged to the groundwater at concentrations higher than the class of use standards found in Chapter 8, Wyoming Water Quality Rules and Regulations or any primary drinking water standard found in 40 CFR 141 (as of June 6, 2001), whichever is more stringent;

PART A.
INTRODUCTION AND GENERAL REQUIREMENTS

Section 1. **Authority.** This regulation is promulgated pursuant to the Wyoming Environmental Quality Act, W.S. 35-11-101 through W.S. 35-11-1207, specifically, W.S. 35-11-301 (a) (iii) and W.S. 35-11-302 (a) (ix).

Section 2. **Severability.** If any section or provision of this regulation, or the application of that section or provision to any person, situation, or circumstance is adjudged invalid for any reason, the adjudication does not affect any other section or provision of these regulations or the application of the adjudicated section or provision to any other person, situation, or circumstance. The Environmental Quality Council declares that it would have adopted the valid portions and application of this regulation without the invalid part, and to this end the provisions of this regulation are declared to be severable.

Section 3. **Definitions.** The following definitions supplement those definitions contained in Section 35-11-103 of the Wyoming Environmental Quality Act.

(a) "Adjacent" means two (2) or more housed facilities separated at their closest points by distances not greater than one (1) mile.

(b) "Agronomic rate" means the annual total nutrient application rate designed:

(i) To provide the amount of the limiting constituent needed by the food crop, feed crop, fiber crop, cover crop, or vegetation grown on the land; and

(ii) To minimize the amount of the limiting constituent that runs off to surface waters or passes through the root zone of the crop or vegetation grown on the land to the groundwater.

(c) "Animal unit" means a unit of measurement for any feeding operation relating to the number of swine. Two and one-half (2 ½) swine constitute one (1) animal unit.

(d) "Animal waste" means animal excreta or other commonly associated wastes of animal husbandry including, but not limited to, bedding, litter, or feed losses. Dead animals are not considered animal waste.

(e) "Application" means all the information submitted to obtain a permit to construct and operate a confined swine feeding operation. The application includes the completed "application for confined swine feeding permit" form and the accompanying management plan.

(f) “Best available technology” or “BAT” means that technology and practice that has been tested, proven, and practiced at a number of locations and offers the best performance and protection for the environment and public health and safety for the local site conditions.

(g) “BMP” means best management practice, as defined by Chapter 1, Wyoming Water Quality Division Rules and Regulations.

(h) "Closed facility" and "closure" mean a confined swine feeding operation at which operations have been properly terminated and the site restored to the conditions specified by these regulations and the closure plan as approved as part of the current permit allowing operation of the confined swine feeding operation.

(i) “Common ownership” means the ownership of a confined swine feeding operation as a sole proprietor, or a major ownership interest held by a person or entity, in each of two (2) or more feeding operations as a joint tenant, tenant in common, shareholder, partner, member, beneficiary, limited liability company or other equity interest holder. The majority ownership interest is a common ownership interest when it is held directly or indirectly through a partnership, a corporation, a closely held corporation, a limited liability corporation or partnership, parent or affiliate corporation, a spouse, a dependent child, or other legal entity or any combination thereof.

(j) “Complete application” means an application for a permit and a management plan that has all the necessary components. The major elements of each component as identified by this regulation must be present for the application to be complete. A complete application may or may not be technically adequate.

(k) “Confined swine feeding operation” means an operational unit where swine are confined, fed, and maintained for a total of 45 consecutive days or more in any 12 month period and the operational unit is designed to confine an equivalent of 1,000 or more animal units.

(l) "Corrective action" means all actions necessary to eliminate the threat to public health and safety and the threat to the environment from a release to the environment of pollutants from an operating or closed confined swine feeding operation and to restore the environmental conditions as required.

(m) “Dilute liquid wastes” means those liquid wastes resulting from confined swine feeding operations utilizing a minimum fresh water flushing flow of four (4) gallons/hour/1000 lbs of animal weight on site.

(n) “Division” means the Wyoming Department of Environmental Quality/Water Quality Division.

(o) “Direct human consumption crops” means crops consumed directly by humans. These include but are not limited to fruits, vegetables, and grains grown for human consumption.

(p) "Housed facility" means any structure that is used to enclose, contain, or shelter swine and to treat or store wastes originating from the operation. This includes feed pens and confinement areas that may not be sheltered by a roof, but contain manure or animal waste.

(q) "Indirect human consumption crops" means crops utilized by grazing animals.

(r) "Lagoon" means a manmade or natural basin that is intended for containment, treatment or disposal of animal wastes and wastewater.

(s) "Land application" means the beneficial use of animal waste products by the spraying or spreading of animal wastes onto the land surface; the injection of animal waste below the land surface; or the incorporation of animal waste into the soil so that the animal waste can either condition the soil or fertilize crops or vegetation grown on the soil.

(t) "Liquid wastes" means animal wastes with a solids content of five (5) percent or less by weight. These animal wastes are generally produced when feces and urine are diluted by wash water or flushing water.

(u) "Management plan" means a comprehensive plan for managing the animal wastes from a confined swine feeding operation. The management plan is a mandatory part of the application for a permit. It includes the following:

(i) Construction plan;

(ii) Operation plan;

(iii) Animal waste management plan; and

(iv) Financial assurance, closure and corrective action plan.

(v) "Manure" means animal excreta or other commonly associated animal wastes of animal husbandry including, but not limited to, bedding, litter, or feed losses.

(w) "Manure slurries" means animal wastes with a solids content of five (5) to ten (10) percent by weight that are primarily feces and urine, and when agitated, behave as a liquid. Manure with a solids content greater than ten (10) percent by weight that does not pass the paint filter test shall be managed as a manure slurry.

(x) "Manure storage facility" means any structure, storage basin, bunker, pad, etc., other than a lagoon utilized to store animal waste.

(y) "Monitoring" means all procedures and techniques used to systematically collect, analyze, and inspect data on operational parameters of the confined swine feeding operation or on the quality of the air, groundwater, surface water and soil.

(z) “Notice of Intent” is the notice provided to the division, local governments, and the public by a potential applicant for a permit that the construction and operation of a confined swine feeding operation at a specific site is being considered.

(aa) “Occupied dwelling” means a permanent building or fixed mobile home that is occupied on a permanent or temporary basis as a residence.

(bb) “Operational unit” means all adjacent common ownership housed facilities or housed facilities on noncontiguous, common ownership lands that utilize a common area or system for the storage, treatment, or disposal of animal wastes.

(cc) “Operator” means those legal entities or persons who control activities associated with the housed facilities that are part of a confined swine feeding operation as set forth in these regulations.

(dd) "Owner" means those legal entities or persons in whose name the deed for the land occupied by the housed facility is recorded. Owner also includes any legal entity or person with a general interest in any real property that is part of the housed facility.

(ee) “Pathogen” means a disease causing organism. This includes, but is not limited to, certain bacteria, protozoa, viruses, cysts, and viable helminth ova.

(ff) "Permit" means written authorization duly executed by the director which authorizes the permittee to construct or operate a confined swine feeding operation as set forth in these regulations.

(gg) “Permittee” means all owners and operators bound by the permit.

(hh) “Public hearing” means a non-adversarial meeting held by the administrator or the director. The meeting shall be conducted pursuant to Chapter 3 of the Wyoming Department of Environmental Quality Rules of Practice and Procedure.

(ii) "Release" means, but is not limited to, any spilling, leaking, pumping, pouring, emptying, emitting, discharging, dumping, escaping, leaching, or unauthorized disposal of any animal waste product, organic or non-organic, from a confined swine feeding operation which may result in the pollution of groundwater, surface water, soils, or air.

(jj) “Relinquished facility” means a facility for which the permittee is not capable or willing to complete closure in compliance with the permit.

(kk) "Sludge" means the accumulated solids settled from a wastewater treatment facility.

(ll) “Slurry” means a mixture of liquids and undissolved solids that behaves primarily as a liquid.

(mm) "Soil" means all unconsolidated material overlaying bedrock.

(nn) “Solid manure” means animal wastes with a solids content greater than ten percent (10%) by weight produced by separating liquid and solid wastes. Solid manure must pass the paint filter test, as defined by Method 9095A from EPA Test Methods For Evaluating Solid Waste.

(oo) “Swine” means butcher or breeding pigs that are over 55 pounds weight. For purposes of determining animal units, three (3) pigs each weighing less than 55 pounds that have been weaned from the sow shall be counted as one (1) swine.

(pp) “Technically adequate” means that the information presented in an application for a permit is scientifically sound, meets all requirements of the regulations and is sufficient to allow the administrator to determine whether to approve or disapprove the proposed permit.

(qq) “Treatment facility” means an animal waste receiving facility designed to digest or alter the animal waste either mechanically or biologically.

(rr) “Vector” means a carrier that is capable of transmitting a pathogen from one organism to another including, but not limited to, flies, other insects, rodents, birds, and vermin.

(ss) "Waste collection system" means a system, including pipelines, conduits, pumping stations, force mains, and all other construction, devices, appurtenances, and facilities used for collecting animal wastes or conducting animal wastes to an ultimate point for treatment or disposal. The waste collection system is considered to start at the end of or immediately beneath the feeding floor. The collection system shall include all piping, channels, and appurtenances that transfer the animal waste and flush water from the feeding floor to the animal waste treatment or storage facility.

(tt) “Waste storage facilities” are structures or other receptacles that store animal waste for periods of 14 days or more. Animal waste receiving facilities not designed specifically to alter the animal waste either mechanically or biologically shall be considered storage facilities. Some decomposition of animal waste may occur during extended periods of storage.

Section 4. **Purpose.** This regulation sets forth the requirements and process for applying for and obtaining a permit for a confined swine feeding operation.

Section 5. **Applicability.**

(a) These regulations shall apply to all confined swine feeding operations that file a permit application after February 28, 1997.

(b) These regulations shall apply to confined swine feeding operations that filed a permit application before February 28, 1997 if there is an increase in animal unit capacity above permitted levels.

(c) These regulations shall apply to all confined swine feeding operation animal waste produced by operations permitted under this regulation.

(d) These regulations shall apply to any housed facilities that can be considered an operational unit due to common ownership and collectively meet the criteria of a confined swine feeding operation.

(e) Modifications of facilities, exempted from the provisions of these regulations, which do not result in an increase in animal unit capacity above permitted levels, shall be regulated by the provisions of Chapters 3 and 11 of the Water Quality Division Rules and Regulations.

(f) These regulations supersede Chapter 3, except for Section 15, and Chapter 11 for confined swine feeding operations.

Section 6. **Prohibitions.**

(a) No person shall construct or operate a confined swine feeding operation prior to receiving a permit in accordance with these regulations.

(b) No person shall construct, modify, or operate any confined swine feeding operation unless authorized and in compliance with a permit.

(c) No person shall construct, modify, or operate a confined swine feeding operation with a permit that has expired or has been suspended or revoked.

(d) No person shall construct, modify, or operate any confined swine feeding operation without complying with all financial assurance requirements of these regulations.

(e) No person shall discharge animal waste to the surface waters of the state.

Section 7. **Requirements for an Application for a Permit.** The following procedures shall be used when applying for a permit:

(a) Any person who proposes to construct, modify, or operate a confined swine feeding operation shall submit a written application for a permit on forms provided by the administrator.

(b) The application for a permit shall be accompanied by a management plan. A complete management plan shall have the following components:

(i) Construction plan;

(ii) Operation plan;

(iii) Animal waste management plan; and

(iv) Financial assurance, closure, post closure, and corrective action plan.

(c) The application for approval of a permit or for modification of an approved permit must be accompanied by three (3) copies of plans, specifications, design data, or other pertinent information covering the project and any additional information requested by the administrator.

(d) In instances where a groundwater monitoring program is required as determined by the administrator, the application shall also include a proposed monitoring program to satisfy the requirements of Section 15, Chapter 3, Wyoming Water Quality Division Rules and Regulations.

(e) All construction plans and specifications submitted shall carry the seal and signature of the designing engineer in accordance with W.S. 33-29-114 through 33-29-139.

(f) All plans and specifications must conform to common and accepted professional practices as determined by the administrator or as defined by applicable division regulations.

(g) The application form shall be signed by all owners and operators that have a participation in the confined swine feeding operation. The persons signing the permit shall be:

(i) For a sole proprietorship or family farm, the proprietor or the farmer.

(ii) For a corporation, limited liability company, or other form of legal entity, an individual having responsibility for the overall operation of the regulated facility and the authority to encumber the entity.

(iii) For a partnership, a general partner.

(h) One permit shall be issued listing all applicants of record. Each owner or operator signatory to the permit shall be jointly and severely liable for compliance with all terms of the permit.

Section 8. **Construction Plan Content.**

(a) An engineering design report that describes existing conditions, problems, and the proposed solution is required as part of the management plan. The engineering design report shall include:

(i) A description of the confined swine feeding operation site and vicinity. A site plan prepared on a 7 ½' USGS Quadrangle or a high color reproduction shall be included. Everything within two (2) miles of the site perimeter shall be shown. This plan shall indicate the location of occupied dwellings, public or private schools, incorporated municipalities, domestic water wells, wetlands, and perennial streams within the setback distances specific in W.S. 35-11-302 (a) (ix) (C) and Sections 24 and 25 of these regulations.

(ii) A detailed description of the project and site plan, including:

(A) Present and projected confined swine feeding operation property.

(B) Flood vulnerability.

(I) Indicate areas subject to flooding by a 100 year event.

(II) Indicate areas subject to flooding by the maximum probable flood event.

(C) Present and proposed access.

(D) Distances from occupied dwellings.

(E) Prevailing wind direction.

(F) Proposed fencing and any other site security measures.

(G) Topographic features and contours with indicated datum. The datum must be a standard datum recognized by the U.S. Geological Survey.

(H) Two (2) permanent benchmarks within one (1) mile of the facility tied to the reference datum.

(I) A geologic report signed and sealed by a licensed professional geologist in accordance with W.S. 33-41-101 through 33-41-121 that includes:

(I) A stratigraphic column that illustrates the thickness and geologic names of alluvial materials and geologic formations that comprise the unsaturated, or vadose, zone.

(II) A description of the lithology and hydraulic conductivity of materials and geologic formations comprising the unsaturated zone, the first encountered groundwater section, and the uppermost aquifer underlying the proposed facility.

(III) A potentiometric map of the uppermost water table that illustrates the locations and use of all wells within one (1) mile of the proposed facility, clearly identifying those wells producing in whole, or in part, from the uppermost aquifer. Include project borings or wells.

(IV) A description of the uppermost aquifer in terms of its confinement or unconfinement, type and amount of porosity.

(J) Baseline surface water quality: Baseline water quality shall be established for all surface waters within two (2) miles of the facility. Where adequate water quality records are not available, four (4) quarterly samples shall be performed. All quarterly sampling need not be completed when the permit application is submitted.

(K) Baseline groundwater quality: Baseline groundwater quality shall be established for any unconfined aquifer and any other Class I, II, or III aquifers being produced within two (2) miles of the facility. All wells owned or developed by the common ownership controlling the facility shall be sampled and tested one (1) time for the parameters listed in Table 1 of Chapter 8 of the Water Quality Division Regulations. The permit applicant shall make all reasonable efforts within the applicant's control to obtain water samples from private wells as necessary to test all aquifers.

(iii) Design conditions, including:

(A) Initial or existing and proposed animal capacity, expressed as number of head and as live animal weight.

(B) Initial or existing and projected waste generation rates and generation rate variations.

(C) Shock loads, with cause and frequency.

(D) Initial or existing and projected waste characteristics.

(E) Projected treated waste characteristics.

(F) Climate conditions at the confined swine feeding operation site.

(G) Existing or proposed water supply.

(H) Odor control requirements.

(I) Dust control requirements.

(J) Pathogen control requirements.

(K) Vector control requirements.

(iv) A demonstration that groundwater quality class of use as identified in Chapter 8, Wyoming Water Quality Rules and Regulations shall be protected in accordance with Chapter 3, Section 15, Wyoming Water Quality Division Rules and Regulations.

(v) Specific requirements of any applicable approved water quality management, source water or well head protection plan.

(vi) Design calculations for animal waste collection systems.

(vii) Design calculations for animal waste storage and animal waste treatment facilities.

(b) Detailed plans shall be prepared and submitted.

(i) All plans shall have a suitable title block and legend that includes:

(A) Name of permittee and location of project.

(B) The revision date and number.

(C) North arrow and graphical drawing scale.

(D) Name, seal, and signature of the engineer. The engineer must have a current registration in the State of Wyoming.

(ii) All plans shall be tied to the reference datum used for the project.

(iii) All drawings shall be scaled and dimensioned.

(iv) The first page of each plan set shall be a cover sheet with an index to the plans. The second page shall be the site plan referred to in Section 8 (a) (ii).

(v) Detailed plans of the animal waste collection systems shall include:

(A) Site location and layout, including existing and proposed buildings and facilities.

(B) Locations and dimensions of animal waste collection systems, including those in and under buildings. Constructed pits and flushing gutters shall be shown. All animal waste transmission lines (sewers) and appurtenances shall be shown.

(C) Detailed cross sections and profiles. The location of all cross sections and profiles shall be identified on the plan views.

(D) Schematic flow diagrams and hydraulic profiles.

(vi) Detailed plans of the animal waste storage and animal waste treatment facilities shall include:

(A) Detailed cross sections. The location of all cross sections should be identified on the plan views.

(B) Construction details. Special emphasis shall be given to primary and secondary containment features. All mechanical and electrical devices and lines associated with animal waste management shall be shown.

(C) Additional features affecting animal waste management not otherwise shown on the drawings or covered in the specifications.

(c) The specifications accompanying the construction drawings shall include the following information for all construction related to animal waste management:

(i) Identification of required performance characteristics of all construction materials.

(ii) The type, size, strength, operating characteristics, rating or requirements for all mechanical and electrical equipment; laboratory fixtures and equipment; operating tools; special appurtenances; and chemicals where applicable.

(iii) Construction and installation procedures.

(iv) Testing requirements to assure materials and equipment meet design standards.

Section 9. **Operation Plan Content.** An operation plan is required for each new or modified confined swine feeding operations. The plan shall be finalized and approved prior to the approval of the permit. The plan shall include a description of the operation of the following as necessary for the proper management of animal waste facilities:

(a) Feeding and production facilities.

(b) Animal waste collection systems.

(c) Animal waste storage facilities.

(d) Animal waste and wastewater application systems.

(e) Description of emergency operation and response actions.

(f) Sampling, analysis and reporting requirements appropriate for the operation.

(g) Disposal of other wastes:

(i) Non-manure solid wastes incidental to the operation.

(ii) Dead animals.

(h) Operation and maintenance manual.

Section 10. **Animal Waste Management Plan Content.** The animal waste management plan shall address the following, if applicable:

(a) The amount of animal waste to be generated at the facility and a description of storage methods.

(b) The estimated time period that animal waste must be stored before land application.

(c) The total amount of the controlling constituents produced by the operation

(d) The controlling constituents requirements or uptake values for the vegetation or crops to receive the animal waste.

(e) The acreage to receive the animal waste except when solid wastes are sold or given away.

(f) A description of the animal waste conveyance or transportation method to get the animal waste to the land application sites.

(g) A demonstration that adequate and suitable land is available upon which to land apply the animal waste in accordance with the requirements of these regulations.

(h) The estimated application rate in terms of tons of animal waste and controlling constituents per acre, including:

(i) A description of animal waste and soil sampling and analysis procedures to determine application rates.

(ii) A description of record keeping systems for location, dates and rates of animal waste application, and for animal waste and soil testing results.

(i) The planned method and time of application.

(j) Written agreements with landowners for land application must be included in the plan, if animal waste is to be applied on property not owned by the permittee.

(i) Agreements with landowners for land application shall allow the division to assume the agreement in the event that a facility is relinquished.

(ii) Agreements with landowners for land application must provide right of entry for the division for the life of the agreement to monitor for compliance with the permit.

(k) Procedures and methods to control odors from animal confinement areas, lagoons, animal waste storage facilities, and land application sites.

(l) Procedures and methods to control vectors associated with confined swine feeding operations.

(m) If the animal waste is to be utilized for uses other than land application, the animal waste management plan must demonstrate that the protection of waters of the state, public health and safety, and the environment is equal to or greater than that provided by land application conducted in accordance with these regulations.

Section 11. **Financial Assurance Plan Content.** The financial assurance plan shall be consistent with Parts E and F of these regulations and shall contain the following:

(a) A relinquished site closure plan and an estimate of associated costs in accordance with Sections 44 and 47 of these regulations.

(b) A calculation of the corrective action contingency bond amount prepared in accordance with Section 48.

(c) The financial assurance instruments shall be in amounts determined by the administrator to be adequate to carry out the activities contained in the relinquished site closure plan plus the corrective action contingency bond amount plus solid waste transfer, treatment, storage or disposal bond amounts as required by Section 21. The entire amount of financial assurance provided shall be available to remedy any violation of this regulation or any other violations of the Environmental Quality Act associated with the confined swine feeding operation permitted by this regulation.

(d) Provision for annual review and updating of the financial assurance instruments.

Section 12. **Application Processing Procedures.**

(a) Each application for a confined swine feeding operation permit must be submitted with all supporting data necessary for review. Processing of the application shall be in accordance with the provisions of applicable statutes of the state and regulations of the division.

(b) The administrator or a designated representative shall review each application and resubmittal within 30 days of receipt in order to determine if it is complete. This completeness review shall determine if all of the components of a management plan, as defined in these regulations, are addressed in the application. All items not specified as incomplete shall be deemed to be complete.

(c) If an application is determined to be incomplete, the necessary information to complete the application shall be requested by the administrator or his designated representative.

(d) Upon determination than an application is complete, the applicant shall be directed to provide public notice according to Section 13 (b) of these regulations. The public notice of a complete application is intended to allow the public the opportunity to provide comment during the technical review of the proposed permit.

(e) Permit applications determined to be complete shall be reviewed for technical adequacy in the following manner:

(i) A technical review shall be completed by the division within 60 days of the determination that the application is complete.

(ii) Additional information may be requested by the administrator or his designated representative to satisfy the technical review and demonstrate that the proposed confined swine feeding operation shall meet the requirements of these regulations.

(iii) Review of additional information submitted shall be completed by the division within 60 days of receipt. If the information submitted is still inadequate to allow the Administrator and Director to make a decision to deny or approve the application, more information may be requested of the applicant subject to the procedures outlined in this sub-section. All items not specified as technically inadequate shall be deemed to be adequate for purposes of this subsection.

(f) The applicant shall have a maximum of six (6) months to fully comply with any request for necessary or additional information under this subsection.

(i) If the applicant fails to completely satisfy the request for information within eight (8) months of the determination that the application is complete, the permit application shall be terminated.

(ii) The Notice of Intent referred to in Section 13 (a) shall be automatically revoked by the termination of the application.

(iii) The director has the discretion for good cause to extend the time period to satisfy the request for information beyond eight (8) months from the determination that the application was complete.

Section 13. **Notice of Intent, Public Participation, Public Notice, and Public Hearing Requirements.**

(a) A prospective applicant for a confined swine feeding operation permit must file a Notice of Intent with the division. A Notice of Intent is filed for the purpose of establishing a date to fix setback requirements in accordance with Section 24 of these regulations and to keep the public fully informed. The official date of the notification of intent shall be the date that it is received by the division.

(i) The party filing the Notice of Intent shall have a maximum of 12 months from the filing date to submit a completed permit application.

(ii) If a completed permit application has not been submitted within 12 months, the Notice of Intent shall expire.

(iii) The Notice of Intent shall be filed upon forms provided by the division and shall include the following information:

(A) Identification of the submitting party.

(B) Size and type of proposed confined swine feeding operation.

(C) Legal description of the proposed housed facility.

(D) A list of all property owners of record within one (1) mile of the perimeter of the proposed housed facility.

(E) The signature of a responsible official for the submitting party and the date.

(iv) The prospective applicant shall:

(A) Send a copy of the Notice of Intent to all property owners within the one (1) mile perimeter by certified mail, return receipt requested.

(B) Provide a Notice of Intent to any local government having jurisdiction over the area where the facility or operation is proposed to be located or to any jurisdiction within five (5) miles of the location. The division shall receive verification that this requirement was met.

(C) Publish in a newspaper of general circulation in the area of the proposed facility a copy of the Notice of Intent to be filed with the division. The division shall be provided a certified published copy of this public notice.

(b) When a proposed permit filed with the division is determined to be complete, a public notice shall be issued by the applicant.

(i) The public notice shall include the following information:

(A) The names, addresses, and phone numbers of the division and applicant personnel whom interested persons may contact to review the application.

(B) The name, address, and phone number of the applicant for the confined swine feeding operation permit.

(C) The location of facilities to be constructed, including the housed facility and land application areas.

(D) A brief description of the proposed confined swine feeding operation.

(E) A brief description of comment and public hearing procedures.

(F) Any additional information considered necessary by the division.

(ii) The applicant shall provide public notice by:

(A) Mailing the notice to any unit of local government (including counties) having jurisdiction over the area where the facility or operation is proposed to be located or jurisdiction within five (5) miles of the location. The division shall be provided a copy of this notice.

(B) Mailing by first class mail the public notice to all persons and organizations on a general mailing list of interested parties provided by the division.

(C) Publishing in a newspaper of general circulation and any local papers in the area of the proposed facility, a public notice prepared by the division. The division shall be provided a certified published copy of this public notice.

(iii) The intent of the public notice is to provide the public an opportunity to comment. The comment period shall be a minimum of 30 days from the date of publication. During the public comment period, any interested person may submit written comments on the permit application to the division. Any interested person may submit a written request detailing the need for a public hearing.

(c) When an application for a proposed operation is determined to be technically adequate, the administrator shall hold a public hearing upon finding a significant degree of public interest. The administrator also has the discretion to hold a public hearing whenever such a hearing may clarify issues involved in the review of a permit.

(i) If a public hearing is to be held, the administrator shall provide a notice of the public hearing. Notice of a public hearing shall be given at least 30 days before the hearing. A notice of public hearing shall be provided after the permit application has been determined by the administrator to be technically adequate to make a decision to either approve or deny the permit.

(ii) The applicant shall be required to provide a public hearing place in the vicinity of the proposed confined swine feeding operation. Such hearing place shall accommodate such attendance as might reasonably be expected. The hearing place shall conform to the accessability standards of the Americans with Disabilities Act.

(iii) The notice of public hearing shall contain the following information in addition to that information required by Section 13 (b) (i):

(A) Reference to previous public notices relating to the proposed permit.

(B) Any additional information considered necessary by the division.

(C) Date, time, and place of the public hearing.

(D) A brief description of the nature and purpose of the public hearing.

(iv) The public comment period shall automatically extend to the close of any public hearing. The administrator may also extend the comment period by so stating at the public hearing.

Section 14. **Approval or Denial of a Permit Application.** A permit shall be approved if the permit application complies with all provisions of these regulations and the Wyoming Environmental Quality Act. The management plan shall show that the proposed confined swine feeding operation can be operated in compliance with these regulations.

(a) The administrator shall not render a final recommendation to the director on a proposed permit until after the completion of the final comment period and the public hearing, if one is held. The administrator shall make a decision as soon as reasonably possible. Before a final decision is issued, the administrator shall prepare a written response to all comments received during the comment period. The written response shall be provided to members of the public upon request. The written response shall:

(i) Specify any changes made to the management plan as the result of public comment.

(ii) Briefly describe and respond to all comments voicing a legitimate regulatory concern that is within the authority of the division to regulate.

(b) The director may deny a permit for any of the following reasons:

(i) The application does not meet applicable minimum design, construction, or operation standards as specified by these regulations.

(ii) The facility, if constructed, would cause violation of applicable state surface or groundwater standards.

(iii) The project does not comply with applicable state and local water quality management plans or approved well head or source water protection plans.

(iv) The facility does not comply with the setback requirements of W.S. 35-11-302 (a) (ix).

(v) The application does not demonstrate the use of BAT to reduce odors, pathogens, and vectors.

(vi) The application does not meet the requirements for financial assurance as required in Part F of these regulations.

(vii) Other justifiable reasons necessary to carry out the provisions of the Environmental Quality Act.

(viii) The application is incomplete according to Sections 7 through 11.

(c) The procedures to be followed in case of denial are as follows:

(i) The director shall notify the applicant by registered or certified mail of the decision to deny the permit application and the reason for denial.

(ii) The applicant may request a contested case hearing before the Environmental Quality Council pursuant to the Wyoming Department of Environmental Quality Rules of Practice and Procedure.

Section 15. **Periodic Review of the Management Plan.**

(a) Prior to 90 days of the fifth anniversary of the date of issuance of the permit and every five (5) years thereafter, the permittee shall submit to the division a report of review of the management plan. The report shall evaluate compliance of the confined swine feeding operation with the permit and address the following items:

(i) Record of compliance with applicable regulations and statutes.

(ii) A determination of whether BAT is incorporated in the permit as required for animal waste management practices.

(iii) Status of any closure activities or corrective actions that are underway.

(iv) Compliance with financial assurance requirements.

(b) The administrator or a designated representative shall evaluate the review within 60 days of receipt. The division may request additional information or modifications as necessary to satisfy the requirements of subparagraph (a) above.

(c) The division shall publish a notice of the availability of the management plan review and the division's findings in accordance with the procedures for a public notice as described by Section 13 (b) (ii) of these regulations.

Section 16. **Transfer of a Permit.** A confined swine feeding operation permit may be transferred upon submittal of a written request to the administrator signed by all present and proposed parties to the permit. A transfer shall be requested within 60 days of sale or transfer of real estate or real property, or change of operator.

(a) The administrator shall approve or deny the transfer within 30 days after receipt of the request.

(b) The administrator may refuse to approve the transfer of the permit if:

(i) The proposed permittee fails to provide adequate financial assurance; or

(ii) The proposed permittee or a controlling interest in the proposed permittee has a pattern or history of significant violations of the Environmental Quality Act or similar acts in other jurisdictions of the United States.

(c) The new permittee must acknowledge and accept all conditions of the permit.

Section 17. **Modification of a Management Plan.** A management plan may be modified with the approval of the administrator upon demonstration that the modification complies with this and other applicable regulations.

(a) The permittee may request a modification to the management plan. Modifications shall be requested when necessary to correct operational problems or to incorporate best available technology (BAT). Modifications to the operation may be requested at the permittee's discretion.

(b) The permittee must receive approval from the administrator for a modification before initiating any change in operational procedures including but not limited to the following:

(i) Increasing the number of animals permitted at the operation.

(ii) Changing animal waste treatment, storage, or disposal practices from those permitted at the facility.

(iii) Changing the nature and volume of the animal waste generated at the facility.

(iv) Disposing of animal waste at any locations other than those identified in the permit.

(c) The administrator may require the permittee to modify a management plan as necessary because of:

(i) Significant changes to the operation.

(ii) Significant advances in BAT.

(iii) Changes to the operation determined by the administrator to be necessary to ensure that the operation complies with the Environmental Quality Act and related statutes and regulations.

(iv) Discovery of existing, unknown, or changing site conditions that could prevent construction or subsequent operations from complying with applicable statutes and regulations.

(v) Discovery of inaccurate or false information in the permit.

(vi) Failure to comply with the permit and these regulations.

Section 18. **Probation or Suspension of a Permit.**

(a) The director may place a permit on probation for violation or the threat to violate the terms and conditions of the permit or these regulations. If the permittee fails to resolve the issues leading to probation within 90 days, the director may suspend or revoke the permit. The director shall notify the permittee by registered or certified mail of the department's intent to place the permit on probation. The notification shall include the effective date and the reasons for probation. A permit may be suspended or revoked without being placed on probation.

(b) The director may suspend a permit for:

(i) A substantial noncompliance with the terms and conditions of the permit or these regulations.

(ii) Unapproved modifications in design, construction, or operation.

(iii) Failure to submit records and information required to show compliance with the permit.

(iv) Violation of any financial assurance requirements.

(v) Failure to request a transfer pursuant to Section 16 of these regulations within 60 days of sale or exchange of an operational unit. Failure to apply for a permit transfer upon sale or exchange of an operational unit is a violation of these regulations that shall allow the director to declare forfeiture of the financial assurance provided by the permittee of record.

(vi) Any other reason necessary to achieve compliance with applicable statutes, standards, or regulations.

(c) The director shall notify the permittee of record by registered or certified mail of the department's intent to suspend the permit. The notification shall include the effective date, the actions with completion dates necessary to lift the suspension, and the reasons for suspension.

(d) If the permittee chooses not to comply with the terms of the suspension, the permittee shall request a hearing before the Environmental Quality Council under the provisions of Section 19, Permit Termination. In the event of such a hearing, the Environmental Quality Council shall have the option of recommending permit revocation.

(e) Nothing in this section shall be construed to limit or contravene enforcement authority of the department pursuant to the Environmental Quality Act.

Section 19. **Permit Revocation.**

(a) A permit shall be revoked upon written request of the permittee and demonstration that the closure in accordance with Section 43 and any corrective action requirements in accordance with Section 45 of these regulations have been satisfactorily completed.

(b) A permit may be revoked by the director for:

(i) Obtaining a permit by misrepresentation, failure fully to disclose all relevant facts, or false information submitted in the application.

(ii) Changing site conditions that cannot be addressed by modifications to prevent violation of the Environmental Quality Act or applicable regulations.

(iii) A pattern or history of violations of the permit or these regulations.

(iv) Failure to comply with the terms of a permit suspension.

(v) Any other reason necessary to achieve compliance with applicable statutes, standards, or regulations.

(vi) The director shall notify the permittee of record by registered or certified mail of the department's intent to terminate the permit. The notification shall include the effective date and detailed requirements of the permit revocation, including:

(A) The date that all animals must be removed from the facility.

(B) The date that all animal waste must be removed from the facility.

(C) The date that closure must begin. A closure plan shall be prepared and approved in accordance with Section 43 of these regulations before closure shall begin.

(vii) The revocation notice shall become final 60 days from the date of receipt of notice unless within that time the operator requests a hearing before the Environmental Quality Council. Such a request shall be made in accordance with the Wyoming Department of Environmental Quality Rules of Practice and Procedure.

(viii) Failure to comply with the terms of the revocation notice, as modified by the contested case hearing if applicable, shall be cause for forfeiture of financial assurance.

(ix) Financial assurance must be maintained by the permittee until the closure and any corrective actions necessary have been completed and approved by the division.

Section 20. **Compliance with State and Local Water Quality Management Plans.** A management plan or permit shall not be approved for any facility that is in conflict with an approved water quality management plan, source water protection plan, or well head protection plan.

Section 21. **Solid Waste Transfer, Treatment, Storage or Disposal.** Any solid waste transfer, treatment, storage or disposal facility, as defined in Chapter 1 of the Wyoming Solid Waste Rules and Regulations, which is located within the boundaries of a confined swine feeding operation shall be permitted by the Water Quality Division under the authority of these regulations. Storage, treatment (incineration or composting), or disposal (burial) of dead swine is a regulated facility as defined in Chapter 1 of the Wyoming Solid Waste Rules and Regulations.

(a) The permit application shall include solid waste management facilities constructed or operated as part of the confined swine feeding operation. The permit application shall address the requirements and standards described in Chapter 2 "Sanitary Landfill Regulations" or Chapter 6 "Transfer, Treatment and Storage Facility Regulations" of the Wyoming Solid Waste Rules and Regulations.

(b) Financial assurance requirements associated with any solid waste management facility shall be addressed under the provisions of Section 50 of these regulations and calculated according to Solid and Hazardous Waste Division Chapter 2 "Sanitary Landfill Regulations", Chapter 6 "Transfer, Treatment and Storage Facility Regulations" and Chapter 7 “Financial Assurance Requirements.”

Section 22. **Relationship to Other Programs.**

(a) The Wyoming Department of Environmental Quality, Air Quality Division requires new sources of air emissions to obtain a permit. The disposal of dead swine by incineration is considered such a source.

(b) The Wyoming State Engineer regulates the appropriation and use of water and the safety of dams.

(i) All water well construction requires a permit from the State Engineer. Appropriate water rights must be granted by the State Engineer before the use or detention of surface water.

(ii) Lagoons with above ground berms or dikes may be subject to regulations administered by the State Engineer governing safety of dams.

(c) The Wyoming Department of Environmental Quality, Water Quality Division requires a storm water permit for construction activities including clearing, grading, and excavation activities that disturb a total land area as designated by the National Pollutant Discharge Elimination System (NPDES) Regulations.

(d) Approval of a permit for a confined swine feeding operation does not relieve the permittee of the responsibility to comply with any local requirements including land use, zoning, or permitting requirements established by any local government.

Section 23. Permit Conditions.

(a) The permittee shall:

(i) Conduct all construction and operation of a confined swine feeding operation consistent with the management plan and the permit. Unauthorized changes, deviations, or modifications are a violation of the permit. An amended application or request for revision to an approved permit must be filed with the administrator to obtain approval of a modification. No modification shall be started until a modified management plan has been approved pursuant to Section 17 of these regulations.

(ii) Request authorization of the administrator to use materials or procedures different from those specified in the permit. A modification to a permit component may be granted if materials cannot be obtained or procedures cannot be accomplished and alternative materials or procedures meet the standards specified in these regulations. To prevent delaying construction, the administrator may grant a modification orally, upon oral request. A written request for modification must be submitted within five (5) days. Failure to do so may result in the administrator revoking the oral modification.

(iii) Conduct the operation according to statements, representations, and procedures contained in the permit.

(b) Routine maintenance and repair of the facilities that collect, convey, treat, or store animal waste shall not require notification of the division or modification of the permit.

(c) The owner of the facility shall allow authorized representatives of the department, upon presentation of credentials, in compliance with the permittee's established, printed biosecurity protocols, and at reasonable times to:

(i) Enter upon the premises of the operation, land application areas, or premises where records are kept as required by the permit.

(ii) Read or copy any records required to be kept under the terms of the permit.

(iii) Inspect any facilities, equipment, and land application areas covered under the permit.

(iv) Sample any animal waste, wastewater, sludge, residuals, and by-products covered under the provisions of the permit. This includes soils of land application areas.

(d) A permit does not allow the permittee to violate any provision of the Environmental Quality Act or any other applicable regulation.

PART B.
SETBACK REQUIREMENTS FOR SITING

Section 24. **Setbacks.** A confined swine feeding operation shall comply with W.S. 35-11-302 (a) (ix) (C). Swine confinement areas, animal waste storage facilities, or animal waste treatment facilities shall not be within:

(a) One (1) mile of an occupied dwelling without the written consent of the owner of the house.

(b) One (1) mile of a public or private school without the written consent of the school's board of trustees or board of directors.

(c) One (1) mile of the boundaries of any incorporated municipality without the resolution and consent of the governing body of the municipality.

(d) One-fourth (¼) mile of a water well permitted for current domestic purposes without the written consent of the owner of the well.

(e) One-fourth (¼) mile of a perennial stream unless it is proved to the division that potential adverse effects to the water quality of the stream can be avoided.

Section 25. **Setback Determination.** The date for determining whether a permit complies with setback requirements shall be fixed according to Section 13 (a).

(a) Dwellings or schools may be constructed or municipal limits extended to closer than one (1) mile of confined swine feeding operations. Entities intruding into the one (1) mile setback zone after filing of the Notice of Intent shall be considered to have waived permanently their rights to protection of the setback requirement with respect to that operation.

(b) Permitted confined swine feeding operations shall have the right to operate and modify their permits, including expansions, based on conditions as of the setback date fixed according to Section 13 (a).

(c) The one (1) mile setback is considered part of the odor management for a confined swine feeding operation. Odor complaints from entities intruding into the fixed setback zone shall be evaluated at a distance of one (1) mile from the nearest portion of the confined swine feeding operation.

Section 26. **Waivers.** The setback distances specified in these regulations may be waived with the consent of the party benefitted by the setback distance.

(a) A waiver granted by a private property owner becomes effective upon being recorded with the county clerk of the county where the affected property is located.

The waiver shall reflect the full legal description of the proposed confined swine feeding operation site, the full legal description of the property for which the waiver is granted and the signature of the owner of record as of that date. A certified copy of this recording shall be provided to the division as part of the permit application. If the proposed confined swine feeding operation site is in a different county than the affected property, the waiver shall also be filed in the county where the proposed confined swine feeding operation site is located.

(b) Public schools and incorporated municipalities shall approve a waiver of setback requirements by action of the governing body. A certified copy of the final action approving the waiver shall be included with the application.

PART C.
DESIGN AND OPERATION STANDARDS

Section 27. **Purpose of Design and Operation Standards.** The purpose of these designs and operation standards is to ensure that the design, construction ,and operation of confined swine feeding operations and any associated facilities capable of causing or contributing to pollution comply with the Environmental Quality Act.

Section 28. **General.** This part contains the minimum standards for the design, construction, and operation of a confined swine feeding operation. The applicant shall demonstrate to the administrator that there shall be no surface discharge and that any subsurface discharges from the confined swine feeding operation or animal waste management activities shall not cause a violation of standards for groundwaters of the state as established by Wyoming Water Quality Rules and Regulations, Chapter 8, Quality Standards for Wyoming Groundwaters.

Section 29. **Groundwater Protection.**

(a) The design of a confined swine feeding operation shall demonstrate protection of groundwaters of the state in compliance with Chapter 3, Section 15 of the Wyoming Water Quality Division Rules and Regulations.

(b) These regulations provide minimum design requirements designated to prevent a threat of discharge to groundwater in accordance with Chapter 3, Section 15 (a). Alternate designs may be approved if justified by a complete subsurface investigation in accordance with the provisions of Chapter 3, Section 15 (b).

Section 30. **Surface Water Protection.** A confined swine feeding operation shall not allow any animal waste to enter the surface waters of the state.

(a) All animal confinement areas, animal waste collection, waste storage, and animal waste treatment areas shall either be constructed above the 100 year/24 hour floodplain or protected by diversion channels and dikes from the 100 year/24 hour flood.

(b) All animal waste storage and animal waste collection structures shall be operated with sufficient freeboard to always contain the maximum probable precipitation event safely.

Section 31. **Approval of Alternative Technology and Designs.**

(a) Each application for a permit for a confined swine feeding operation under this section shall be evaluated on a case-by-case basis and compared to best available technology. The following information, if available, shall be included with the application:

(i) Data obtained from a full scale, comparable installation that demonstrates the acceptability of the design.

(ii) Data obtained from a pilot plant operated under the design condition for a sufficient length of time to demonstrate the acceptability of the design.

(iii) Data obtained from a theoretical evaluation of the design that demonstrates a reasonable probability of the facility meeting the design objectives.

(iv) An evaluation of the flexibility of making corrective changes to a constructed facility that does not function as planned.

(v) An evaluation of the risk and potential costs of failure of the proposed facility or technology. The financial assurance plan must reflect this evaluation. The administrator may choose to increase or decrease the corrective action bond amount determined under Section 49 based on this evaluation.

(b) A pilot plant may be constructed to provide the data necessary to satisfy these regulations. A separate permit to construct for the pilot plant shall be obtained under the provisions of Chapter 3 of the Wyoming Water Quality Division Rules and Regulations.

Section 32. **Domestic Wastes at Confined Swine Feeding Operations.** No human or domestic wastes shall be allowed to mix with the animal waste collection, storage, treatment, and disposal operations at a confined swine feeding operation. Separate domestic waste collection and treatment facilities shall be constructed and maintained. Such domestic waste facilities shall be permitted under Chapter 3 and designed according to Chapter 25 of the Wyoming Water Quality Division Rules and Regulations or by the appropriate local agency delegated permitting authority for small wastewater systems.

Section 33. **Animal Waste Collection Systems.** The design and construction of animal waste and wastewater collection systems for confined swine feeding operations shall meet the following minimum standards:

(a) Gutters and trenches that do not have a constant hydraulic head against the joints or the structure, such as those designed to be free draining and are frequently flushed or scraped, shall have a watertight design.

(i) Construction shall be of air entrained concrete with a 28-day compressive strength of 4000 psi or better. The minimum thickness of any section shall be four (4) inches. All joints shall be keyed construction and sealed with a high quality elastomeric caulk. Any other materials proposed for gutter construction shall be evaluated under the provisions of Section 31 of these regulations.

(ii) Flushing gutters shall have a minimum grade of 0.4 percent.

(iii) Gutters shall be flushed at least every 12 hours or scraped once each 48 hours. Each gutter shall be inspected weekly and any build ups removed or freed using manual scraping or pressure washers.

(iv) Gutters shall be cleaned and visually inspected at least annually for water tightness. Any probable leaks shall be repaired immediately.

(b) Gutters and trenches that normally retain manure and flush water and are subject to a constant hydraulic head shall be described as pull plug gutters. Any waste containment structures normally subject to hydraulic head, including pull plug gutters, shall have secondary containment with a leak collection and recovery system.

(i) Construction shall be of air entrained concrete with a 28-day compressive strength of 4000 psi or better. The minimum thickness of any section shall be four (4) inches. All joints shall be keyed construction and sealed with a high quality elastomeric caulk. All expansion joints shall have bulb type water stops. Any other materials proposed for gutter construction will be evaluated under the provisions of Section 31.

(ii) The secondary containment shall consist of a geomembrane at least 20 mils thick installed by the manufacturer's recommendations, a geosynthetic clay liner or a compacted clay liner at least one foot thick with a permeability of 1×10^{-6} cm/sec or less. Compacted clay liners shall be constructed, tested, and certified in accordance with the provision of Section 35 (d) (i) (A). The secondary containment shall be graded to the recovery system with a minimum grade of 0.4 percent.

(iii) The secondary containment surfaces shall drain by gravity into the recovery system. The recovery pump shall have a totalizing hour meter and a high level alarm.

(A) The amount of the liquids being recovered from the secondary containment surface shall be determined and recorded on a weekly basis. If the calculation of liquids recovered exceeds 60 gallons/week/thousand square feet of confinement building, repair of the gutters and trenches must be completed within six (6) months. The permittee shall report any exceedance of this rate to the division within seven (7) days.

(B) If the high level alarm is activated or the recovery rate exceeds 120 gallons/week/thousand square feet of confinement building the gutters must be drained immediately and operated as free draining, daily flush type gutters until repairs are made. The permittee shall report any exceedance of this rate to the division within 48 hours.

(iv) Pull plug gutters shall be charged to a minimum depth of six (6) inches with fresh or recycled water before receiving animal wastes.

(v) A minimum clearance of six (6) inches must be maintained between the top of the animal waste and the bottom of the trench cover.

(vi) Pull plug gutters shall be drained and recharged at least every 14 days.

(c) Collection lines convey animal waste and flush water from the gutters and trenches to treatment or storage facilities. This section contains the minimum standards for the design and construction of animal waste piping and transfer systems.

(i) Collection lines shall be designed to accommodate the maximum instantaneous flows. If storm water is collected and introduced to the animal waste treatment or storage facilities, the design of the collection system and the treatment or storage system shall be adequate to accommodate the maximum instantaneous and annual precipitation rates.

(ii) Collection line layouts shall allow isolation of individual lines for testing and cleaning.

(iii) Pipe materials shall resist acid and alkaline solutions, organic solvents, and other animal waste constituents and environmental conditions encountered.

(iv) Pipe materials shall be chosen and the pipeline shall be designed to withstand all trench and superimposed surface live loads with a minimum factor of safety. Rigid pipes shall have a minimum factor of safety of 1.5, and flexible pipes shall have a minimum factor of safety of 1.25.

(v) Piping shall be tested for integrity after all trenches are backfilled. The testing results shall be certified by a Wyoming licensed engineer. Leakage tests shall be infiltration, exfiltration, or air tests. All flexible piping shall be tested for deflection. Deflection tests shall be made with a mandrel or other technology producing comparable data.

(A) Infiltration or exfiltration shall not exceed a maximum of 200 gallons per inch diameter per mile per day (1200 liters/cm/km/day) with a minimum of two (2) feet (0.6 m) of head over the top of the pipe.

(B) Air tests shall conform to ASTM C-828-80.

(C) A maximum five (5) percent deflection after flexible pipe is backfilled for 30 days is allowed. A mandrel of 95 percent of pipe diameter shall be used. No mechanical pulling of a mandrel is permitted.

(vi) Potable water shall be protected according to the AWWA Manual M14, which addresses cross-connection control.

(vii) If animal waste or waste water is pumped, the pumping station shall be designed if possible so that failure shall not result in any release. If such design is not possible, a redundant, fail safe design of the pumping station shall be required.

(d) Gravity drained lines shall be tested at least every five (5) years for leakage according to Section 33 (c) (v) of these regulations. Test results shall be included in the annual report. Lines failing the leakage test shall be repaired within 30 days. After repair, the integrity of the line must be verified by retesting.

(e) Pressure lines shall be tested annually for leakage according to Section 33 (c) (v) (A). Test results shall be included in the annual report. Lines failing the leakage test shall be removed from service and repaired immediately. After repair, the integrity of the line must be verified by retesting.

Section 34. **Animal Waste Storage Facilities.** The design and construction of animal waste storage facilities for confined swine feeding operations shall meet the following minimum standards:

(a) Animal waste storage structures shall be required to have secondary containment and liquid recovery systems incorporated because they are subject to a constant hydraulic head.

(b) A total minimum animal waste storage capacity equal to nine (9) months waste production shall be provided to allow for the limited periods when manure slurries may be land applied.

(c) The design of the operational unit shall permit any animal waste storage structure to be removed completely from service for repair without significant impact to the feeding operation.

(d) Concrete construction shall conform to recommendations of the "Concrete Manure Storage Handbook," MWPS-36 dated 1994, or later version as adopted by division policy, published by the MidWest Plan Service and available from the land grant universities of the North Central Region.

(e) Structures interior to or beneath swine housing facilities constructed of concrete, shall meet the following requirements: (Construction of other materials shall be addressed pursuant to Section 31 of these regulations.)

(i) Construction shall be of air entrained concrete with a 28-day compressive strength of 4000 psi or better. All joints shall be keyed construction and sealed with a high quality elastomeric caulk. All expansion joints shall have bulb type water stops.

(ii) The secondary containment shall consist of a geomembrane liner at least 30 mils thick installed according to the manufacturer's recommendations, a geosynthetic clay liner, or a compacted clay liner at least one (1) foot thick with a permeability of 1 X 10^{-6} cm/sec or less. Compacted clay liners shall be constructed, tested, and certified in accordance with the provision of Section 35 (d) (i) (A). The secondary containment shall be graded to the recovery system with a minimum grade of 0.4 percent.

(A) The secondary containment surfaces shall drain by gravity into the recovery system. The recovery pump shall have a totalizing hour meter and a high level alarm.

(B) The amount of the liquids being recovered from the secondary containment surface shall be determined and recorded on a weekly basis. If the calculation of liquids recovered exceeds 60 gallons/week/thousand square feet of confinement building, repair of the storage tank or pit must be completed within six (6) months. The permittee shall report any rate greater than this to the division within seven (7) days.

(C) If the recovery rate exceeds 120 gallons/week/thousand square feet of confinement building, the storage facility must be emptied within 60 days and repairs made. The permittee shall report any rate greater than this to the division within 48 hours.

(D) If the high alarm level is reached, the division must be notified immediately. The storage tank must be emptied immediately.

(iii) Animal waste shall not be allowed to accumulate to within one (1) foot of the bottom of the floor slats.

(iv) Interior or under floor animal waste storage facilities shall be mechanically ventilated. If the exhaust gas from this mechanical ventilation is determined to be a source of problem odors, treatment of the exhaust gas shall be required. A positive odor control technology resulting in either the adsorption or destruction of the odor causing gases shall be installed.

(f) Above grade structures are subject to the following requirements:

(i) Above grade structures shall be surrounded with a containment dike designed to hold a minimum of 1.5 times the tank volume.

(ii) Secondary containment shall be designed and operated pursuant to Section 34 (e) (ii) of these regulations.

(iii) A floating cover shall be maintained on uncovered above ground structures. Other BAT may be employed or required instead of a floating cover.

(g) Below grade external structures shall be either concrete or lined earthen storage basins.

(i) Concrete structures and secondary containment systems shall be designed according to this section.

(ii) Lined earthen storage basins shall be designed according to Section 35 (c) and (d) of these regulations.

(A) Only earthen basins with geomembrane liners and secondary containment shall be allowed. The geomembrane liner shall be a minimum of 60 mils thick and installed according to the manufacturer's instructions.

(B) The engineering design report must show the animal waste removal operations shall not damage the integrity of the liner.

(iii) A floating cover shall be maintained on uncovered below grade external structures. Other BAT may be employed or required instead of a floating cover.

Section 35. **Animal Waste Treatment Facilities.** The construction and operation of solids separators and liquid animal waste treatment lagoons shall meet the following minimum standards. Methane generation, composting, and other treatment systems are encouraged. Permitting of such systems shall be reviewed under provisions of Section 31 of these regulations. When considering alternate technology, primary emphasis shall be given to environmental protection, improved odor management, and pathogen control. The appropriate MidWest Plan Service publications are the preferred basis for alternative designs.

(a) Solids separation techniques may be used to remove solids from the animal waste. To be considered separated solid manure, the solids content must be greater than ten (10) percent by weight and the resultant mass must pass the paint filter test, i.e., when the mass is placed in a paint filter no liquid shall drain through the filter.

(i) Separated solids shall be stored on a water tight paved surface:

(A) The storage area shall be sloped to a gutter that drains to the liquid animal waste treatment facility.

(B) The storage area shall not receive precipitation runoff from other areas of the facility.

(C) The storage floor or pavement shall have adequate structural integrity for the equipment used to load or remove the solids.

(ii) Operation of the solids separator and solids storage area shall follow the odor, dust, and vector control procedures required by Sections 40, 41, and 42 of these regulations.

(A) All solids shall be removed from the storage area and the area cleaned within 30 days after the spring thaw each year.

(B) Pesticides and rodenticides shall be employed as necessary to control rodents or insects breeding or feeding on the solids. The vector control agents used shall not leave any residuals in or on the solid animal waste.

(iii) The solids storage area shall be large enough to hold six (6) months' production of animal wastes unless the management plan demonstrates the ability to use the animal wastes in a more timely fashion.

(b) Wastewater treatment lagoons receiving liquid animal wastes diluted with water to a solids content of five (5) percent or less by weight shall be sized and constructed according to this section and one of the following references, USDA Part 651 Agricultural Waste Management Field Handbook, MWPS-8 Swine Housing and Equipment Handbook, or MWPS-18 Livestock Waste Facilities Handbook, or later version as adopted by division policy. The design report shall reflect which reference is used as the basis of design. Lagoons receiving dilute liquid wastes as defined in Section 3 (m) may be designed as single cell compacted clay lined structures. Lagoons receiving animal wastes other than dilute liquid wastes shall be designed with a minimum of two (2) cells with the capability to continue confined swine feeding operations with one (1) cell removed from service for maintenance or repair.

(c) Earthwork standards.

(i) Soils used in constructing the lagoon bottom and dike cores (not including the liner) shall be relatively incompressible, have low permeability, and be free from organic material or trash. The soil shall be compacted at a water content that shall ensure structural stability, reduce hydraulic seepage, and reduce settling. The soil shall provide an adequate foundation for the liner, if used.

(ii) For lagoons that are not specified to receive a geomembrane liner, no rocks larger than six (6) inches in length shall be permitted in any of the designated embankment.

(iii) For lagoons specified to be lined with a geomembrane liner, rocks larger than six (6) inches in length shall not be placed within five (5) feet of the interior slope of any lagoon embankment. Material containing by volume less than 25 percent of rock larger than six (6) inches and less than 12 inches in length may be placed in the remainder of the embankment.

(iv) Outer dike slopes shall not be steeper than one (1) vertical to three (3) horizontal. Flatter slopes may be required to maintain slope stability. Outer dike slopes shall prevent surface runoff from entering the lagoons.

(v) Inner dike slopes shall be sloped between one (1) vertical to four (4) horizontal and one (1) vertical to three (3) horizontal. Flatter inner slopes may be allowed where vegetation, due to the shallower slopes, shall not interfere with treatment or the dike's integrity. Interior slopes surfaced with concrete paving or riprap may be constructed at slopes of one (1) vertical to two (2) horizontal.

(vi) The minimum top dike width shall be 12 feet to allow access to maintenance vehicles. Top dikes wider than 12 feet shall be required when necessary to assure structural stability.

(vii) The minimum freeboard at the maximum operating level shall be three (3) feet.

(viii) Interior embankments shall be protected from wave action with riprap, paving, or other erosion resistant material. The following conditions may be exempted from the riprap requirements:

(A) Lagoons of one (1) surface acre or less.

(B) Lagoons with a geomembrane liner.

(C) Embankments cut into natural slopes when a soil liner is not provided.

(D) Lagoons sheltered from wind or where wind velocities are low enough that significant erosion shall not occur.

(ix) Exterior of dikes, top of dikes, and all interior dike surfaces where riprap or a seal is not provided shall be covered with topsoil and seeded with suitable dry land grasses to prevent erosion. A coarse uniform graded gravel may be substituted for the vegetation requirement.

(x) The seepage through the lagoon bottom and side walls shall not cause a violation of the groundwater standards as described in Chapter 8, Quality Standards for Wyoming Groundwaters, Water Quality Division Rules and Regulations.

(d) The allowable permeability of a compacted clay liner shall be based on the type of lagoon construction and the type of liquid animal waste contained in the lagoon.

(i) The specifications for compacted clay liners shall be based upon the results of a preliminary testing program and shall contain the type of material, optimum and acceptable range in water content, acceptable range for compaction, and maximum allowable particle size. Compacted clay liners used to protect groundwater quality shall meet the following criteria:

(A) The tests for water content and density shall be taken during the placement of each lift of the liner. A total minimum liner thickness of one (1) foot shall be provided and shall be constructed with maximum lifts of one-half (0.5) foot. Either permeability testing of undisturbed core samples from the in-place seal, or detailed tests such as particle size distribution and Atterburg limits shall be conducted. Detailed tests should confirm that the soil specified was used for liner construction. One (1) test shall be conducted per acre per lift. For core sampling of the in-place liner, one (1) core of the completed liner shall be tested per acre. The permittee shall provide the division written certification by a Wyoming registered professional engineer that the soil liner was constructed according to the permit and that final testing indicated results within the allowable limits established by the permit.

(B) For compacted clay liners, a method of maintaining the seal at or above optimum moisture conditions is required.

(ii) Unlined lagoons or lagoons using compacted clay liners as the primary liner shall require a subsurface investigation and monitoring plan according to the provisions of Chapter 3, Section 15 (b), (c), and (d).

(A) Lagoons receiving dilute liquid wastes may be designed as a single cell system. Dilute liquid waste systems shall not have a combined evaporation and exfiltration rate that exceeds 25 percent of the minimum daily inflow from operations.

(B) Multiple cell lagoons shall not have a combined evaporation and exfiltration rate that interferes with the treatment processes occurring in the lagoons.

(iii) Control of the exfiltration from lagoons may be provided by a cone of depression. The cone of depression created by the withdrawal of groundwater to provide water for the operation must be adequate to intercept all leachate from the lagoon. Water rights for the pumping necessary to create the cone of depression must be adjudicated before the issuance of a permit for a confined swine feeding operation using this method of animal waste treatment.

(e) Geosynthetic clay liners installed according to the manufacturer's instructions are acceptable. Geosynthetic clay liners shall have a maximum hydraulic conductivity of 1 X 10^{-8} cm/sec. The liner manufacturer shall have more than ten million square feet of its product installed. The liner installation contractor shall be approved by the manufacturer. Geosynthetic clay liners used as primary liners require:

(i) Surface erosion and abrasion protection provided shall be acceptable to the liner manufacturer. The factor of safety for slope failure of the composite liner shall be shown to be at least 1.5:1. Primary geosynthetic clay liners shall be installed over a compacted clay liner. The compacted clay liner shall have a minimum thickness of one (1) foot and a maximum permeability of 1 X 10^{-5} cm/sec. Compacted clay liners shall be constructed, tested, and certified in accordance with the provision of Section 35 (d) (i) (A). This type of construction shall satisfy the requirements for a subsurface investigation as required by the provisions of Chapter 3, Section 15 (b). A monitoring system installed according to the provisions of Chapter 3, Section 15 (b) shall be required.

(ii) Geosynthetic clay liners may be used as secondary liners. Overlying leachate collections systems shall be sand blankets at least four (4) inches in thickness. Synthetic drainage media shall not be used with geosynthetic clay liners.

(f) Geomembrane liners constructed of polyvinyl chloride or polypropylene shall be at least 30 mils in thickness. High density polyethylene liners shall be at least 60 mils in thickness. The liner manufacturer shall have more than ten million square feet of its product installed. Geomembrane liners installed and operated according to this section shall satisfy the requirements for a subsurface investigation and monitoring as required by the provisions of Chapter 3, Section 15 (b).

(i) Secondary containment shall be required for all geomembrane liners. The secondary containment shall be one of the following:

(A) A compacted clay liner with a maximum permeability of 1 X 10^{-6} cm/sec.

(B) A geosynthetic clay liner.

(C) A geomembrane liner with a minimum thickness of 20 mils backed by a compacted clay liner one (1) foot thick with a maximum permeability of 1 X

10^{-5} cm/sec.

(D) Compacted clay liners shall be constructed, tested, and certified in accordance with the provision of Section 35 (d) (i) (A).

(ii) Geomembrane liners require a secondary containment system.

(A) The drainage layer between the primary and secondary liners shall have a minimum hydraulic transmissivity of one (1) gpm/foot. Synthetic drainage media may be used when the secondary liner is a geomembrane. All other construction shall require a durable granular filter blanket with a minimum thickness of four (4) inches. The drainage layer shall have a minimum grade of 0.4 percent.

(B) Perforated or slotted collection lines shall be installed in the drainage layer arranged to create sub-cells with a maximum area of two (2) acres or less. A means of monitoring the collection system to isolate a leak to an individual sub-cell shall be provided. No portion of the drainage layer should be more than 100 feet from a collection line.

(C) The collection lines shall drain to a sump enclosed by the secondary liner. The sump shall be designed so that the maximum high liquid level during operating conditions is below the invert of any collection line discharging to the sump. The sump shall be large enough to allow the pump installed to operate with a minimum pumping time of two (2) minutes between the automatic start and stop levels. A high level alarm shall be installed.

(D) The recovery pump in the sump shall be self-priming and capable of pumping a volume at least four (4) times the failure rate of flow designated in the permit for the lagoon. The pump shall have a totalizing hour meter that records total time of operation.

(E) Monitoring requirements are as follows:

(I) High level alarms shall be continuously monitored.

(II) The totalizing hour meters shall be read at least weekly. If the calculated recovery rate exceeds the allowable for the smallest sub-cell, the inflow from each sub-cell must be measured to determine individual sub-cell compliance.

(F) Reporting and required repair actions are as follows:

(I) If the recovery rate exceeds 400 gpd/acre for any sub-cell as delineated by the recovery system, the permittee shall notify the division within seven (7) days. Repair of the primary liner must be scheduled within 12 months.

(II) If the recovery rate exceeds 800 gpd/acre for any sub-cell as delineated by the recovery system, the division shall be notified within 48 hours. Repair of the primary liner must be scheduled within 60 days.

(III) If the high alarm level is reached, the division must be notified immediately. Repairs must be initiated immediately.

PART D.
ANIMAL WASTE MANAGEMENT

Section 36. **Application Controls.** The animal waste management plan is part of the permit for a confined swine feeding operation and shall address storage, treatment, and land application of all animal waste produced at the feeding operation including liquid animal waste, manure slurry, solid manure, and sludge. The animal waste management plan shall demonstrate the use of best available technology (BAT) to control odors for all aspects of the operation. The use of animal waste generated by a confined swine feeding operation including liquid animal waste, manure slurry, solid manure, and sludge shall meet the following minimum standards:

(a) Animal waste that is land applied shall be applied at such rates and in a manner to prevent surface and groundwater contamination.

(b) Animal waste shall not be applied at a rate or in any manner that shall allow any surface runoff from the application site.

(c) Buffer zones shall be established for land application areas. Buffer zone requirements for land application are independent of the setback requirements as set forth in Sections 24, 25 and 26. In conjunction with other measures required by these regulations, buffer zones help provide pathogen and odor management.

(d) Animal waste applied at agronomic rates is exempt from the requirements of Chapter 3, Section 15, Wyoming Water Quality Division Rules and Regulations.

(e) The method for determining the required land treatment area for application of animal wastes shall be based upon the determination of the "agronomic rate" of the crops or vegetation present on the site. The application rate for animal waste constituents shall be limited to appropriate plant uptake values to protect surface and groundwater. The ratio used for this determination is expressed as:

Required Land Treatment Area = L/U

Where:

L= the yearly amount of the controlling constituent to be applied for land treatment. L is expressed in kilograms per year (kg/yr) or pounds per year (lbs/yr).

U= plant assimilative capacity = the yearly amount of the controlling constituent that can be assimilated by plant uptake. U is expressed in kilograms per hectare per year (kg/ha/yr) or pounds per acre per year (lbs/ac/yr).

(f) The following list of constituents shall be evaluated by the permittee to determine the controlling constituents. The method of selecting the controlling constituents shall be documented in the permit applications.

(i) Organics.

(ii) Nitrogen.

(iii) Phosphorus.

(iv) Metals.

(v) Salts, acids, and bases.

(g) The initial selection of the constituents of concern shall be made by the permittee by estimating chemical make up of animal wastes based on published data or data available from similar operations and by sampling soils at proposed application sites. The constituents of concern selected once land application begins shall be derived from analyses of representative animal waste product samples and soil samples from the application sites.

(h) The permittee shall maintain records to demonstrate compliance with the animal waste management plan and monitoring and reporting requirements as specified:

(i) Animal waste management plans shall be reviewed annually by the permittee and updated as necessary to reflect changes in procedures and management. Permittees shall notify the division of any changes or updates to the plan and submit changes and updates for review and approval. A representative sample of the animal waste to be land applied shall be collected not more than 30 days before every land application event. The permit shall identify the required sampling parameters. After a sufficient number of samples have been collected and analyzed, the administrator may adjust the frequency of sampling or the parameters analyzed.

(ii) The soils at each application site shall be sampled and analyzed at least annually before application of the animal waste. The analysis shall include the controlling constituents and phosphorus, potassium, nitrogen, copper, and zinc. The soil samples shall be taken at a minimum rate of one (1) for each ten (10) acres, or as required by variations in soil type. If the soil type is the same on adjacent ten (10) acre tracts, the samples from up to 40 acres may be composited for a single analysis. Soil samples shall be taken in the root zone and below the root zone before repeated seasons of application of animal waste.

(iii) Written records shall be kept of all animal waste applied to the land. Records shall include:

(A) Date of application.

(B) Amount of animal waste applied.

(C) Identification of the application sites.

(D) Acreage of application sites.

(E) Method of application.

(F) Application rate.

(G) Crop or vegetation on the application sites.

(H) Plant assimilative capacity for controlling constituents.

(I) Concentration of controlling constituents in the animal waste.

(J) Amount of controlling constituents of concern applied to the site and soil samples to monitor controlling constituents of concern in the soil.

(iv) All records shall be kept at the facility and made available to a representative of the division upon request. All records shall be compiled in a format identified in the permit and shall be included in a report submitted to the division annually.

(v) The permittee is required to provide immediate oral notification and follow-up written notification to the division of any violations or non-compliance with the terms and conditions of the permit including the animal waste management plan.

Section 37. **Liquid Animal Wastes.**

(a) Site requirements:

(i) Liquid animal waste may be applied by center pivot sprinkler on slopes with a grades of up to ten (10) percent. Overland flow irrigation systems shall not be developed to spread liquid animal wastes on sites having greater than one (1) percent slope or less than 0.4 percent slope.

(ii) The minimum depth of unsaturated soil strata on which a land application system may be developed is four (4) feet.

(iii) All land application sites shall be protected from up slope runoff by diversion ditches capable of intercepting the overland flow from a 25-year 24-hour storm event. Diversion ditches are not required if it can be shown that a storm of this size will not have an impact on the site.

(b) Pretreatment of liquid animal waste shall provide sufficient organic and inorganic solids reduction to ensure that the infiltration rate of the soil surface is maintained.

(c) Pathogen controls.

(i) Spray irrigation application shall not leave the property used as the land application site.

(ii) Surface runoff containing animal wastes shall not leave the application site.

(iii) Liquid animal wastes shall be only applied to lands with a low potential for public access.

(iv) Public access to all application sites shall be restricted by signing at points of potential public access. The access restriction shall apply one (1) year after the application of liquid animal wastes.

(v) Crops shall not be harvested during the seven (7) days after the application of liquid animal wastes.

(vi) Direct human consumption crops, which are consumed fresh, shall not be harvested during the 90 days after the application of liquid animal wastes.

(vii) Turf grass or sod grown on land where liquid animal wastes are applied shall not be harvested for one (1) year after application of liquid animal wastes.

(d) Buffer zone.

(i) A buffer zone of one-fourth (¼) mile is required between a land application site and any building with human occupancy or area of public use, not including public roadways.

(ii) Liquid animal waste shall not leave the property where it is applied.

(iii) Liquid animal waste shall not be land applied within 200 feet of a perennial, intermittent, or ephemeral water body or water well permitted for current domestic purposes.

(e) Method of application.

(i) Liquid animal waste shall be evenly distributed over application sites at a rate that shall not exceed the agronomic rate and at a rate that shall not result in any surface runoff from the site.

(ii) Land application of liquid animal waste shall not be undertaken when soil is saturated, frozen, or covered with ice or snow or immediately before or during a storm event.

(iii) Surface application by means other than center pivot irrigation may be used when the land slope is no more than five (5) percent or when the yearly average soil loss is less than five (5) tons per acre as determined by the Universal Soil Loss Equation. Injection or surface application with immediate incorporation shall be used when the land slope exceeds five (5) percent and the yearly soil loss is greater than five (5) tons per acre as determined by the Universal Soil Loss Equation.

(iv) Sprinkler type land application systems shall be equipped with a backflow prevention device to protect any water source or well connected to the system. The required level of protection is a reduced-pressure principal backflow prevention device or air gap. All devices must be approved by the Foundation for Cross-Connection Control, University of Southern California.

Section 38. **Manure Slurries and Sludges.**

(a) Manure slurries and sludges shall not be applied where the land slope exceeds five (5) percent or the yearly soil loss is greater than five (5) tons per acre as determined by the Universal Soil Loss Equation or in any manner that will allow surface runoff to transport animal waste from the application site.

(b) The minimum depth of unsaturated soil strata on which a land application system may be developed is four (4) feet.

(c) All land application sites shall be protected from up slope runoff by diversion ditches capable of intercepting the overland flow from a 25-year 24-hour storm event. Diversion ditches are not required if it can be shown that a storm of this size will not have an impact on the site.

(d) Pathogen controls.

(i) Spray irrigation application shall not leave the property used as the land application site.

(ii) Manure slurries and sludges shall be applied only to lands with a very low potential for public access.

(iii) Public access to all application sites shall be restricted by signing at points of potential public access. The access restriction shall apply one (1) year after the application of manure slurries.

(iv) Crops shall not be harvested for 90 days after the application of manure slurries and sludges.

(v) Direct human consumption crops, which are consumed fresh, shall not be harvested for one year after the application of manure slurries and sludges.

(vi) Turf grass or sod grown on land where manure slurries or sludges are applied shall not be harvested for one year after application of liquid animal wastes.

(e) Buffer zones shall be required to protect the public from exposure to pathogens or odors that might be present in manure slurries or sludges.

(i) A buffer zone of one-fourth (¼) mile is required between a land application site and any building with human occupancy or area of public use, not including public roadways.

(ii) Manure slurries or sludges shall not leave the property where they are applied.

(iii) Manure slurries or sludges shall not be land applied within 200 feet of a perennial, intermittent, or ephemeral water body or water well permitted for current domestic purposes.

(f) Method of application.

(i) Manure slurries and sludges shall be evenly distributed over application sites at a rate that shall not exceed the agronomic rate and at a rate that shall not result in any surface runoff from the site.

(ii) Land application of manure slurries and sludges shall not be undertaken when soil is saturated, frozen, or covered with ice or snow or immediately before or during a storm event.

(iii) Sprinkler type land application systems shall be equipped with a backflow prevention device to protect any water source or well connected to the system. The required level of protection is a reduced-pressure principal backflow prevention device or air gap. All devices must be approved by the Foundation for

Cross-Connection Control, University of Southern California.

(iv) All manure slurries and sludges shall be injected or incorporated within six (6) hours after application.

(g) Metals. Sludges shall not be land applied if the metals concentrations exceed the ceiling pollutant levels established by Section 14, Pollutant Limits, Chapter 15, Water Quality Division Rules and Regulations.

Section 39. Solid Manure Wastes.

(a) Buffer zone.

(i) A buffer zone of 200 feet is required between a land application site and current residential, commercial, school, or industrial development lands where solid manure is to be spread.

(ii) Solid manure shall not be land applied within 200 feet of a perennial or intermittent water body or water well permitted for current domestic purposes.

(iii) Solid manure shall not leave the property where it is applied.

(b) Pathogen controls:

(i) Solid manure wastes shall not leave the application site when solid manure wastes are land applied.

(ii) Solid manure wastes shall be applied only to lands with a low potential for public contact with the solid manure wastes or the soil. This restriction does not preclude hunting or fishing.

(iii) Crops shall not be harvested for 30 days after the application of solid manure wastes.

(iv) Direct human consumption crops, which are consumed fresh, shall not be harvested for one (1) year after the application of solid manure wastes.

(v) Turf grass or sod grown on land where solid manure wastes are applied shall not be harvested for landscaping for one year after application of solid manure wastes.

(c) Solid manure wastes may be sold or given away. The permittee must maintain a record of who received solid manure and the amount received. The permittee must assure that the use of the solid manure complies with the requirements of this regulation.

Section 40. **Odor Controls.**

(a) Best available technology (BAT) shall be used to control odors in all phases of animal waste management.

(b) The one (1) mile separation of confined swine feeding operations from occupied dwellings, schools, and incorporated municipalities required by W.S. 305-11-302 (a) (IX) is an odor control provision.

(c) Odor emissions shall not cause a violation of Wyoming Air Quality Standards related to odors.

(d) The animal waste management plan shall include a proposal for controlling odors from animal housing areas, lagoons, storage facilities, and land application sites. The plan shall include a checklist of potential odor sources and identify specific management practices to reduce odors from each source. Potential management practices include, but are not limited to, the following:

(i) Mechanical incorporation of liquid animal waste, manure slurries, solid manure, and sludge.

(ii) Avoidance of land application when wet humid conditions exist.

(iii) Limiting of land application of manure slurries and sludges to the time from one (1) hour after sunrise to one (1) hour before sunset.

(iv) Conducting activities that increase odor emissions during periods of favorable wind conditions.

(v) Controlling volatile solids loading rates for lagoons.

(vi) Aeration of lagoons.

(vii) Collection and treatment of emissions.

(viii) A list of specific actions to be taken by the permittee if odors are identified as a problem.

Section 41. **Dust Controls.**

(a) Particulate concentrations shall meet Wyoming Air Quality Standards.

(b) The animal waste management plan shall include a proposal for controlling dust from the confined swine feeding operation and facility roads. The proposal shall identify management practices including but not limited to the following:

(i) Maintenance of animal waste moisture content of 20 to 30 percent.

(ii) Solid set sprinklers or portable spray equipment to control dust.

(iii) Conducting activities that could increase dust emissions during periods of favorable wind conditions.

(iv) A list of specific actions to be taken by the permittee if dust is identified as a problem.

Section 42. **Vector Controls.** The animal waste management plan shall include a proposal for controlling vectors associated with the confined swine feeding operation. The plan shall include a checklist of potential vector sources and identify specific management practices to control each of these sources. Management practices to be considered include:

(a) Normal management practices used to ensure no accumulation of organic or inorganic materials that create a harborage for rodents, flies, or other vectors.

(b) A list of specific actions to be taken by the permittee if vectors are identified as a problem. These actions should be listed for each vector problem, (e.g., actions to be taken for fly problems, actions to be taken for rodent problems, etc.).

PART E.
CLOSURE REQUIREMENTS

Section 43. **Closure by Permittee.** A permittee intending to close a confined swine feeding operation shall notify the division by certified mail. The notice of intended closure shall be given as soon as possible and at least 180 days before initiation of closure. Simultaneous notice shall be made by the permittee to the governing body of each locality and adjacent property owners within one (1) mile of the permitted operation by certified mail.

(a) Closure Plan Standards.

(i) Closure procedures shall be carried out according to plans approved by the administrator. A closure plan shall be submitted concurrent with the notice of intended closure. In reviewing any closure, the administrator may require such modifications as may be deemed necessary by the administrator for the protection of human health and safety and the protection of the environment.

(ii) The permittee shall close the facility according to the closure plan. The post-closure monitoring period shall continue for a minimum of three (3) years after the date of completing closure. The minimum post-closure monitoring period shall be extended if the administrator determines it is needed to protect human health and safety or the environment.

(b) Closure completed by the permittee shall provide for the following:

(i) Removal and disposal of all animal waste materials.

(ii) Removal of all structures, lagoons, and miscellaneous structures, not incorporated into an approved post-closure use.

(iii) Placement of topsoil and revegetation of the disturbed areas.

(iv) Any other requirement necessary to protect human health and safety and the environment.

(c) The closure plan shall provide for the following post-closure activities:

(i) Evaluation of the beneficial use of structures and other permit related facilities not removed as part of the closure plan. Those facilities for which there is not a documented beneficial use shall be removed and the affected areas reclaimed.

(ii) Monitoring of post closure site impacts on water quality, to include sampling, analysis, and reporting.

(iii) Periodic inspection by the permittee.

(iv) Certification of final closure by the permittee.

(v) Any other requirement determined by the administrator necessary to protect human health and safety and the environment.

(d) Closure inspection:

(i) After the permittee or other responsible party has completed closure of the facility the division shall be so notified. The division shall inspect all closed confined swine feeding operations to determine if the closure is complete and meets the approved plan. The division shall provide written inspection results to the permittee after the inspection. If the closure is not satisfactory, the division shall specify necessary steps to bring the site into compliance with closure requirements. When the closure is satisfactory, the permittee or other responsible party shall be so notified.

(ii) Notification by the division that the closure is satisfactory shall not act as a waiver of any remedy under these regulations or under law that may be available to the State of Wyoming. Such notification does not relieve the permittee of responsibility for corrective action. Environmental problems caused by the operation discovered anytime shall require corrective action by the permittee. Corrective action shall be completed by the permittee according to the regulations of the division and other applicable laws, and regulations.

Section 44. **Relinquished Facility Closure Plan.**

(a) Relinquished facility closure plans shall be based on returning the site to its approximate original contour and stable condition. Financial assurance amounts shall be based on costs for closure of a relinquished facility.

(b) A relinquished facility closure plan shall be submitted with the permit application for approval and determination of financial assurance amounts.

(c) If the permittee fails to close the facility, the state shall close the facility according to the relinquished facility closure plan or as modified by the division with the approval of the director. Specifically the requirements to remove all structures and to restore the approximate original contours may be waived with the approval of the director.

(d) The relinquished facility closure plan shall provide for the following:

(i) Removal and disposal of all animal waste materials.

(ii) Removal of all structures, lagoons, and miscellaneous structures.

(iii) Restoration of approximate contour and replacement of topsoil.

(iv) The revegetation and restoration of the site to a stable condition.

(v) Fence installation, signage, and maintenance to protect the revegetation.

(vi) Reseeding as necessary to complete revegetation.

(vii) Periodic inspection by the administrator or designated agent.

(viii) Post-closure monitoring to include sampling, analysis, and reporting for a minimum of three (3) years.

(ix) Any other requirement necessary to protect human health and safety and the environment.

(x) A detailed estimate of the costs for a third party contractor to carry out the closure plan, with a complete listing of all assumptions upon which the cost estimate is based, and a 15 percent contingency factor.

Section 45. **Corrective Action Requirements.**

(a) In the event of an unauthorized release of animal waste or other contamination to the environment, the permittee shall:

(i) Immediately notify the division.

(ii) Initiate immediate measures that shall:

(A) Prevent further release to the environment.

(B) Prevent further migration of the released substance into surrounding soils, air, and waters of the state.

(C) Identify, monitor, mitigate, and remediate any threat to human health or safety and the environment associated with the release.

(iii) Prepare a plan to investigate the release, the release site and any surrounding area that may be affected by the release. The plan shall include but not be limited to the following items:

(A) Comprehensive surface and subsurface investigations to define the extent and degree of contamination.

(B) A schedule for conducting the investigation.

(iv) Submit the investigation plan to the division within 30 days. The extent of contamination study should begin when the plan has been approved and all necessary permits obtained.

(v) Conduct the extent of contamination study according to the approved plan and submit a written report of the findings to the division.

(vi) If required by the administrator, develop a remediation plan. The remediation plan shall be submitted to the division for approval. The remediation plan shall be implemented when the administrator has approved the plan and all necessary permits have been obtained.

(b) Violation of any of these requirements or permit conditions, after notice as required by these rules, shall constitute immediate grounds for forfeiture of the financial assurance accepted pursuant to these regulations.

(c) If deemed necessary by the division, the permittee shall be required to close the facility and cease all further activities that generate, store, or deposit animal waste materials.

PART F.
FINANCIAL ASSURANCE STANDARDS

Section 46. **Purpose.** The purpose of this part of these regulations is to establish financial assurance requirements in accordance with W.S. 35-11-302 (a) (ix). Permittees of all confined swine feeding operations permitted under Chapter 20, Water Quality Division Rules and Regulations shall provide financial assurance for relinquished facility closure, and corrective actions. The amount shall be adequate for corrective action, closure and post-closure requirements, as required by these regulations and the administrator. Nothing in these regulations shall relieve the permittee of confined swine feeding operations of liability for closure and corrective action costs. Violation of any of the financial assurance requirements of these regulations shall be cause for revocation of a bond or other form of financial assurance and the denial or revocation of the permit.

Section 47. **Closure Bond Amount Determination.**

(a) The closure plan for a relinquished confined swine feeding operation shall include an itemized written projection of the estimated cost of closing the facility. The cost estimate shall be based upon the current Means Site Work & Landscape and Repair & Remodeling Cost Data and the current Wyoming Department of Transportation Weighted Average Bid Prices.

(b) The permittee shall provide the information necessary to determine closing costs for closure after forfeiture of financial assurance in accordance with Section 44 of these regulations. When determining closure costs for financial assurance requirements, the administrator may also consider information from other sources.

(c) Revised relinquished facility closure cost estimates shall be submitted to the division annually.

(d) When the revised cost estimates are approved by the division, the permittee shall have 90 days to adjust the amount of financial assurance provided after receipt of notification by the division.

Section 48. **Corrective Action Contingency Bond Amount Determination.**

(a) The corrective action contingency bond amount shall be determined using the following formula:

$$\text{Bond Amount} = \text{Maximum Rate} \ X \ f_w \ X \ f_g \ X \ f_{i.}$$

From Table 1, the Maximum Rate is determined by the proposed size of the facility.

From Table 2, f_w is a factor that accounts for groundwater monitoring, secondary containment with a liquid collection and recovery system, setback distance of the facility from the permittee's down gradient property line and the class of groundwater that underlies the facility.

From Table 3, f_g is a factor that accounts for the saturated hydraulic conductivity and the thickness of the least permeable stratum between the lowest point of construction and the first encountered groundwater.

The effects of variations in the cost index are corrected for by the factor $f_{i.}$. The factor f_i is a weighted annual average of the Bureau of Labor Statistics Producer Price Indexes for Capital Equipment, WPUSOP3200; Material and components for construction, WPUSOP2200; and Machinery and equipment, WPU114. On December 31 of each year, $f_{i.}$ shall be calculated for the coming year by dividing the weighted annual index value for the previous year by 100. For example, the $f_{i.}$ for 1998 is calculated by dividing the weighted annual index for 1996, 141.5, by 100. The $f_{i.}$ for 1998 is 1.415.

(b) Table 1

Maximum Rate Determination*	
Number of Swine at the Confined Swine Feeding Operation	Maximum Rate
2500 - 5000	$2,800,000
5000 - 10,000	$3,100,000
10,000 - 20,000	$3,500,000
20,000 - 50,000	$4,400,000

* The Maximum Rate is based on estimates of the cost of remediation and subsequent monitoring of the worst case release from a facility housing the range of swine numbers listed.

** Bond amounts for facilities greater than 50,000 animals shall be determined by the department based on a case-by-case analysis of the potential corrective action costs.

(c) Table 2

Determination of Groundwater Classification Factor (f_w)				
Groundwater Monitoring	Liquid Collection and Recovery System (Secondary Containment)	Setback Distance from Animal Waste Facility*	Groundwater Classification	f_w
Yes/No	No		Class I	1
No	Yes		Class I	0.7
Yes	Yes	Less than ½ mile	Class I	0.4
Yes	Yes	Greater than ½ mile	Class I	0.25
Yes/No	No		Class II-III	1
No	Yes		Class II-III	0.4
Yes	Yes	Less than ½ mile	Class II-III	0.2
Yes	Yes	Greater than ½ mile	Class II-III	0.1
Yes/No	No		Class IV-VI	1
No	Yes		Class IV-VI	0.2
Yes	Yes		Class IV-VI	0.1

* To Down Gradient Property Boundary or Area Controlled by Groundwater Easement

(d) Table 3

Determination of Vadose Zone Factor (f_g)*		
Saturated Hydraulic Conductivity (k) of Least Permeable Stratum between Impoundment and First Encountered Groundwater	Thickness of Least Permeable Stratum	f_g
Hydraulic conductivity $k > 10^{-4}$ cm/s	Less than 75 ft.	1
$k > 10^{-4}$ cm/s	75 to 250 ft.	0.9
$k > 10^{-4}$ cm/s	Greater than 250 ft.	0.75
10^{-4} cm/s > k > 10^{-6} cm/s	20 to 30 ft.	0.8
10^{-4} cm/s > k > 10^{-6} cm/s	30 to 100 ft.	0.65
10^{-4} cm/s > k > 10^{-6} cm/s	Greater than 100 ft.	0.5
Low Permeability Media $k < 10^{-6}$ cm/s	3 to 10 ft.	0.4
Low Permeability Media $k < 10^{-6}$ cm/s	Greater than 10 ft.	0.2

* For facilities developed within highly sensitive hydrogeologic settings (e.g. fractured, faulted or karst terrain) or within Zones of Contribution to public drinking water systems, the value for (f_g) will be established by the administrator.

(e) The corrective action contingency bond amount shall be recalculated each year in accordance with Section 11, Financial Assurance Plan Content. When the bond amount is recalculated, the permittee shall have 90 days to adjust the amount of financial assurance provided after receipt of notification by the division.

Section 49. **Financial Assurance for Facility Closure and Corrective Action.**

(a) General.

(i) Every confined swine feeding operation permitted under these regulations shall provide financial assurance equal to the sum of the costs estimated following Section 47 for closure; Section 21 and the appropriate Solid and Hazardous Waste Division Rules and Regulations for a solid waste facility, if required; and Section 48 for the corrective action contingency bond.

(ii) Final determination of the amounts of financial assurance requirements shall be made by the division.

(iii) The department shall have the right to conduct an independent review of a surety or a financial institution for its ability to assure performance under the instrument of financial assurance. The department shall deny, in whole or in part, any proposed form of financial assurance determined inadequate or lacking in soundness.

(iv) Evidence of the selected forms of financial assurance shall be filed with the division as part of the permit application. Financial assurance shall be accepted by the division before a permit is approved. Valid financial assurance shall be a condition of conducting a confined swine feeding operation.

(v) The division may reject the proposed forms of assurance of financial responsibility if the evidence submitted, in the division's sole judgment, does not adequately assure that funds will be available as required by these regulations. The permittee shall be notified by the administrator of the decision to accept or reject the proposed forms of financial assurance according to Section 14, Approval or Denial of a Permit Application.

(vi) All forms of financial assurance shall be made payable to the department upon demand and shall not be subject to any liens or setoffs. The submittal and acceptance of any form of financial assurance shall be conditioned upon the requirements set forth in these regulations.

(b) Failure to provide an increased amount of financial assurance required by these regulations shall be a failure to satisfy the requirement to demonstrate financial assurance and shall be cause for revocation of the financial assurance and the permit.

Section 50. **Forms of Financial Assurance.** Financial assurance shall be accepted in a lump sum to be used for any purpose under these regulations. Financial assurance shall be executed in the amount calculated following the methods specified in these regulations. By offering the forms of financial assurance required to meet closure and corrective action requirements, the permittee of a confined swine feeding operation and its surety represent that the form of financial assurance offered is binding, irrevocable, unconditional, is financially guaranteed by assets sufficient to meet the obligation, is a valid instrument made payable to the department, and fully complies with these regulations. The following forms of financial assurance may be accepted:

(a) A letter of credit. A letter of credit shall be subject to the following conditions:

(i) A letter of credit shall be accepted only from a bank or lending institution licensed to do business in the State of Wyoming and subject to banking laws and regulations of the State of Wyoming with more than 50 percent of the bank's assets residing in the U.S.

(ii) The letter shall be irrevocable during its term. The department may approve the use of a letter of credit as security according to a schedule approved within the permit. Any bank or lending institution issuing a letter of credit shall notify the director in writing by certified mail at least 90 days before the maturity date or expiration of the letter of credit agreement of its intent not to extend the letter of credit. A letter of credit shall be forfeited if not replaced by another form of financial assurance 30 days before expiration of the letter of credit. All forms of financial assurance shall be approved by the department before being accepted. A forfeited letter of credit shall be converted to cash by the bank or lending institution and the cash transferred to the department.

(iii) Letters of credit shall be made payable to the department both in writing and upon the records of the bank issuing the letter of credit. Letters of credit must be payable upon demand by the department and the lending institutions or banks issuing letters of credit are required to waive all rights of set off or liens against the letters of credit.

(iv) The letter of credit shall not be more than ten (10) percent of the bank's capital surplus account as shown on a balance sheet and a financial statement certified by a certified public accountant in good standing.

(v) No bank or lending institution shall issue a letter of credit to any person or entity, on any permit or financial assurance requirement required of that person or entity, in excess amounts allowed under W.S. 13-3-402. Violation of this provision shall be deemed a violation of the permit and the department shall declare forfeiture of the letter of credit.

(vi) In addition to those requirements set forth above, letters of credit shall provide that:

(A) The bank or lending institution shall give prompt notice to the permittee and the director by certified mail of any notice received or action filed alleging the insolvency or bankruptcy of the bank or lending institution, or alleging any violations of regulatory requirements that could result in suspension or revocation of the bank or lending institution's charter or license to do business.

(B) In the event the bank or lending institution becomes unable to fulfill its obligations under the letter of credit for any reason, notice shall immediately be given to the permittee and the director by certified mail. In the event the permittee becomes aware that the institution providing a letter of credit has become unable to fulfill its obligations, the permittee shall immediately notify the director by certified mail.

(C) The permittee is in violation of the permit if the financial assurance becomes invalid due to failure of the issuing bank or lending institution. The bank or lending institution shall be considered incapacitated due to bankruptcy, insolvency, lapse, suspension, or revocation of its charter or license to do business in Wyoming, or violation of the requirements set forth in these regulations. The director shall issue a notice of violation to any permittee without financial assurance requiring replacement coverage within 60 days. During this period the director or a designated representative shall conduct weekly inspections to ensure continuing compliance with the permit. If any other permit conditions are violated, the director may suspend the permit.

(vii) Nothing herein shall limit the right to serve any process, notice ,or demand required or permitted by law to be served upon the bank.

(b) Surety bonds. A surety shall not be considered good and sufficient for purposes of these regulations unless:

(i) It is licensed to do business in the State of Wyoming.

(ii) The surety holds the highest rating under the following rating services:

(A) Standard and Poors.

(B) Moodys.

(C) Others accepted by the division.

(iii) The estimated bond amount does not exceed the limit of risk as provided for in W.S. 26-5-110, nor raise the total of all bonds held by the applicant under that surety above three (3) times the limit of risk.

(iv) The surety agrees:

(A) Not to cancel the bond, except where the department gives prior written approval of a good and sufficient replacement form of financial assurance complying with these regulations.

(B) To be jointly and severally liable with the permittee for closure and corrective actions as required by Part E of this regulation.

(C) To provide immediate written notice to the department and permittee once it becomes unable or may become unable to fulfill its obligations under the bond.

(D) To warrant in the bond instrument that the bond is authorized, is fully enforceable, and is backed by sufficient assets to guarantee execution on the bond.

(E) To further warrant that the bond shall be payable to the department upon demand and shall not be subject to any liens or setoffs.

(v) If, for any reason, the surety becomes unable to fulfill its obligations under the bond, the permittee and surety shall immediately provide the required notice to the department. The permittee shall have 60 days to secure alternative bonding complying with the provisions of these regulations. Failure to provide notice to the department or failure to secure alternative bonding shall result in suspension of the permit.

(c) Federally insured certificate of deposit. The department shall not accept an individual federally insured certificate of deposit in an amount in excess of the maximum insurable amount as determined by the FDIC. Such certificates of deposit shall be made payable to the department both in writing and upon the records of the bank issuing the certificate of deposit. All certificates of deposit shall be retained by the Wyoming State Treasurer and shall be payable on demand. The department shall require the bank or lending institution issuing the certificate to waive all rights of set off or liens against the certificate. The amount of the certificate of deposit shall be calculated after any penalty for payment before maturity is deducted.

(d) Government-backed securities. In lieu of a bond, the permittee or its principal may deposit government securities registered solely in the department's name and backed by the full faith and credit of the United States. The market value of the securities shall be utilized to value the security.

(e) Cash. In lieu of a bond, the permittee or its principal may provide cash to be retained on deposit by the Wyoming State Treasurer in the name of the department. Interest shall not be earned on amount of cash deposited in lieu of a bond or other form of financial assurance.

Section 51. **Release of the Permittee from the Requirements of Financial Assurance.**

(a) No bond or other form of financial assurance may be canceled by the surety unless 60 days prior written notice is given the director and the director gives written consent, which may be granted only when the requirements of these regulations have been fulfilled.

(b) When closure and corrective actions required by a permit are complete, financial assurance shall be released by the department.

(i) When the administrator determines that initial closure activities have been completed for a permit, financial assurance less retainages shall be released.

(ii) A sufficient amount of financial assurance shall be retained to pay for estimated costs of post-closure activities. This portion of the financial assurance shall be held for a period of at least three (3) years after initial facility closure activities are completed.

(iii) The corrective action contingency bond amount shall be reduced 20 percent per year after initial closure activities have been completed. The reduction rate may be adjusted by the administrator if justified to provide for the costs of unresolved remedial action requirements. Such amounts shall be held until remedial actions are complete.

(iv) Release of any amounts of financial assurance shall not release the permittee or other responsible person from any responsibility for meeting closure or corrective action requirements.

Section 52. **Forfeiture of Bond or Other Form of Financial Assurance.**

(a) Bond or other financial assurance forfeiture proceedings shall occur only after the department provides notice to the owner and any surety in accordance with W.S. 35-11-421 that a violation exists and the Council has approved the request of the director to begin forfeiture proceedings.

(b) With the approval of the Council, the director may:

(i) Collect forfeited funds from financial assurance provided under these regulations.

(ii) Expend forfeited funds to remedy and abate the circumstances for which any financial assurance was provided.

(d) Use of all financial assurance shall not relieve the permittee or other responsible parties from responsibility and liability for closure and corrective action costs. The Wyoming Attorney General may bring suit to recover any costs incurred by the state for closure or corrective action costs not covered by collected financial assurance monies.

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sufficient length of time to demonstrate the acceptability of the design.

(iii) Data obtained from a theoretical evaluation of the design that demonstrates a reasonable probability of the facility meeting the design objectives.

(iv) An evaluation of the flexibility of making corrective changes to a constructed facility that does not function as planned.

(v) An evaluation of the risk and potential costs of failure of the proposed facility or technology. The financial assurance plan must reflect this evaluation. The administrator may choose to increase or decrease the corrective action bond amount determined under Section 49 based on this evaluation.

(b) A pilot plant may be constructed to provide the data necessary to satisfy these regulations. A separate permit to construct for the pilot plant shall be obtained under the provisions of Chapter 3 of the Wyoming Water Quality Division Rules and Regulations.

Section 32. **Domestic Wastes at Confined Swine Feeding Operations.** No human or domestic wastes shall be allowed to mix with the animal waste collection, storage, treatment, and disposal operations at a confined swine feeding operation. Separate domestic waste collection and treatment facilities shall be constructed and maintained. Such domestic waste facilities shall be permitted under Chapter 3 and designed according to Chapter 25 ~~11~~ of the Wyoming Water Quality Division Rules and Regulations or by the appropriate local agency delegated permitting authority for small wastewater systems.

Section 33. **Animal Waste Collection Systems.** The design and construction of animal waste and wastewater collection systems for confined swine feeding operations shall meet the following minimum standards:

(a) Gutters and trenches that do not have a constant hydraulic head against the joints or the structure, such as those designed to be free draining and are frequently flushed or scraped, shall have a watertight design.

(i) Construction shall be of air entrained concrete with a 28-day compressive strength of 4000 psi or better. The minimum thickness of any section shall be four (4) inches. All joints shall be keyed construction and sealed with a high quality elastomeric caulk. Any other materials proposed for gutter construction shall be evaluated under the provisions of Section 31 of these regulations.

(ii) Flushing gutters shall have a minimum grade of 0.4 percent.

(iii) Gutters shall be flushed at least every 12 hours or scraped once each 48 hours. Each gutter shall be inspected weekly and any build ups removed or freed using manual scraping or pressure washers.

(iv) Gutters shall be cleaned and visually inspected at least annually for water

STANDARDS FOR THE REUSE OF TREATED WASTEWATER

CHAPTER 21

Section 1. **Authority and Purpose**. It is the intent of these regulations to encourage and facilitate the productive and safe reuse of treated wastewater as a viable option in the management of the state's scarce water resources. The use of treated wastewater for non-potable purposes through "source substitution" or replacing potable water used for non-potable purposes is encouraged. This part contains the minimum standards for the reuse of treated wastewater as defined in these regulations. This chapter replaces and supersedes the portions of part E, Chapter 11, Wyoming Water Quality Rules and Regulations pertaining land application of treated wastewater.

(a) These regulations establish standards that address the primary health concerns associated with the reuse of treated wastewater. The regulations establish criteria to address the risk of pathogen exposure and infectious disease risks associated with various specified uses of treated wastewater. The regulations establish standards for the following:

(i) The level of wastewater treatment required;

(ii) Treatment reliability requirements;

(iii) Upper limits for water quality parameters;

(iv) Site access restrictions; and

(v) Management practices.

(b) In addition, the standards in this part include the parameters to be monitored, frequency of monitoring, record keeping and reporting requirements when treated wastewater is reused.

(c) These regulations establish the degree of control required for wastewater reuse through site access limitations, management practices and crop restrictions that will be commensurate with the level of treatment provided, reliability of the treatment process, quality of the wastewater and the intended use. As the quality of the wastewater and the reliability of the treatment process increases, the regulatory controls are reduced to a level consistent with protecting public health and the environment.

(d) Pathogen reduction and public health impacts related to infectious disease agents are the major concerns associated with the reuse of treated wastewater. Chemical and toxic pollutants in treated domestic sewage are generally not a concern and are not targeted for state regulation in this chapter. There are additional constituents, such as total dissolved solids, that should be considered as part of an overall irrigation management program but are not regulated by this chapter.

Section 2. **Applicability.**

(a) These regulations apply to any person who prepares or applies treated wastewater from domestic sewage.

(b) These regulations are not applicable if the primary intent is to provide treatment and/or disposal of a wastewater. Treatment and disposal are regulated under appropriate sections of Chapter 25, Wyoming Water Quality Rules and Regulations.

(c) If the reuse of treated wastewater involves the construction of facilities for the disinfection, delivery, storage or land application, a construction permit is required in accordance with the provisions of Chapters 3 and 11, Wyoming Water Quality Rules and Regulations. Such a permit constitutes approval to reuse the treated wastewater. This permit is not an operational permit and does not require periodic renewal. If there are no structural facilities requiring a construction permit, the reuse of wastewater will be authorized by a land application permit issued in accordance with these regulations. The land application permit is not an operational permit and does not require periodic renewal.

(d) These regulations are not applicable to the discharge of a treated wastewater which is subject to a discharge permit issued pursuant to Chapter 2, Wyoming Water Quality Rules and Regulations.

(e) These regulations are not applicable to treated wastewater reused at reclamation sites regulated by the Land Quality Division under Article 4 of the Wyoming Environmental Quality Act.

(f) These regulations are not applicable to treated wastewater reused for irrigation of grass, shrubs and trees at the treatment works.

(g) These regulations are not applicable to the disposal of gray water.

(h) These regulations are not applicable to groundwater recharge projects which are regulated by the Underground Injection Control Program of the Department of Environmental Quality, Water Quality Division.

Section 3. **Definitions**. The following definitions supplement those definitions contained in Section 35-11-103 of the Wyoming Environmental Quality Act.

(a) “Agricultural land” is land on which a food crop, a feed crop, or a fiber crop is grown. This includes range land and land used as pasture.

(b) “Agronomic rate” is the wastewater application rate designed to: (1) provide the amount of nitrogen needed by the food crop, feed crop, fiber crop, cover crop, or vegetation grown on the land; and (2) minimize the amount of nitrogen in the treated wastewater that passes below the root zone of the crop or vegetation grown on the land to the ground water.

(c) “Class A wastewater” is treated wastewater which has received advanced treatment and/or secondary treatment and a level of disinfection so that the maximum number of fecal coliform organisms is 2.2/100 ml or less.

(d) “Class B wastewater” is treated wastewater which has received the equivalent of secondary treatment and a level of disinfection so that the maximum fecal coliform level is greater than 2.2/100 ml but less than 200/100 ml.

(e) “Class C wastewater” is treated wastewater which has received the equivalent of primary treatment and a level of disinfection so that the maximum fecal coliform level is 200/100 ml or greater but less than 1000/100 ml.

(f) “Contaminate a groundwater aquifer” means to introduce a substance that causes the maximum contaminant level for water quality parameters specified in Chapter 8, Wyoming Water Quality Rules and Regulations to be exceeded or that causes the existing concentration of pollutants in ground water to increase when the existing concentration of the parameters in the ground water exceeds the maximum contaminant level specified in Chapter 8, Wyoming Water Quality Rules and Regulations.

(g) “Direct human consumption food crops” are crops consumed directly by humans. These include, but are not limited to fruits, vegetables and grains grown for human consumption.

(h) “Domestic sewage” is waste and wastewater that is primarily from human or household operations that is discharged to or otherwise enters a treatment works.

(i) “Forest” is a tract of land thick with trees and underbrush.

(j) “Ground water” is subsurface water that fills available openings in rock or soil material such that they may be considered water saturated under hydrostatic pressure.

(k) “Indirect human consumption crop” are crops utilized by grazing animals and are thereby one step removed from human consumption.

(l) “Land application” is the spraying or spreading of wastewater onto the land surface or the injection of wastewater below the land surface.

(m) “Land with a high potential for public exposure” is land that the public uses frequently and there are no restrictions or limitations on public access during irrigation periods. This includes, but is not limited to public parks, ball fields, cemeteries, plant nurseries, turf farms, golf courses and a reclamation site located in a populated area (e.g., a construction site located in a city).

(n) "Land with moderate potential for public exposure" is land that is accessible to the public but access is limited during irrigation periods. This would include the facilities in (n) where signing and fencing is provided to restrict access.

(o) "Land with a low potential for public exposure" is land that the public uses infrequently. This includes, but is not limited to agricultural land, forest, and a reclamation site located in an unpopulated area (e.g., a strip mine located in a rural area).

(p) "Municipal wastewater" means the discharge from a publicly owned or controlled treatment system receiving primarily domestic wastewater or a combination of domestic, commercial and industrial wastewater that is normally treated in a primary, secondary or advanced wastewater treatment process.

(q) "Pathogenic organisms" are disease-causing organisms. These include, but are not limited to certain bacteria, protozoa, viruses, and viable helminth ova.

(r) "Pasture" is land on which animals feed directly on feed crops such as legumes, grasses, grain stubble, or stover.

(s) "Permitting authority" is the Department of Environmental Quality, Water Quality Division.

(t) "Pollutant" is an organic substance, an inorganic substance, a combination of organic and inorganic substances, or a pathogenic organism that, after discharge and upon exposure, ingestion, inhalation, or assimilation into an organism either directly from the environment or indirectly by ingestion through the food chain, could, on the basis of information available to the permitting authority, cause death, disease, behavioral abnormalities, cancer, genetic mutations, physiological malfunctions (including malfunctions in reproduction), or physical deformations in either organisms or offspring of the organisms.

(u) "Pollutant limit" is a numerical value that describes the amount of a pollutant allowed per unit amount of wastewater (e.g., milligrams per liter).

(v) "Range land" is open land used for grazing by livestock and/or wildlife on which the natural potential plant community is dominated by grasses, grasslike plants, forbs and shrubs.

(w) "Reclamation site" is drastically disturbed land that is reclaimed using waste-water. This includes, but is not limited to, strip mines and construction sites.

(x) "Runoff" is rainwater, leachate, or other liquid that drains overland on any part of a land surface and runs off of the land surface.

(y) "Treated wastewater" is domestic sewage discharged from a treatment works after completion of the treatment process.

(z) "Treatment works" is either a publicly or privately owned device or system used to treat either domestic sewage or a combination of domestic sewage and commercial or industrial waste of a liquid nature.

Section 4. **Compliance with Other Laws and Regulations.** Nothing in these regulations or the permits issued pursuant to these regulations shall be construed to relieve the recipient of a permit of the need to comply with any other law, rule or regulation. It is the duty of the permittee to comply with all applicable federal, state and local laws or regulations in the exercise of activities authorized pursuant to these regulations. Specifically, the permittee is responsible for complying with the water right requirements of the Wyoming State Engineers Office.

Section 5. **Compliance Period.**

(a) Compliance with the standards in these regulations shall be achieved as expeditiously as practicable, but in no case later than one year after final adoption. When compliance with the standards requires construction of new or modified treatment facilities, compliance with the standards shall be achieved as expeditiously as practicable, but in no case later than two years after final adoption.

(b) Water reuse facilities operating under authority granted by the Department of Environmental Quality are required to notify the department of the nature and requirements of the existing authorization. Existing authorized facilities are not required to comply with the requirements of these regulations unless the administrator determines it is necessary to revise the existing authorization in order to protect public health and the environment. Existing facilities are required to comply with the monitoring and reporting requirements of Sections 13, 14, 15 and 16.

Section 6. **Permits, Enforceability and Applications.**

(a) The requirements in these regulations may be implemented through:

(i) A land application permit issued by the Department of Environmental Quality, Water Quality Division in accordance with these regulations;

(ii) A construction and operation permit issued by the Department of Environmental Quality, Water Quality Division in accordance with Chapters 11 and 3I, Wyoming Water Quality Rules and Regulation; or

(iii) A general statewide operation permit issued by the Water Quality Division, Department of Environmental Quality for the Land Application of Treated Wastewater.

(b) No person shall prepare or use treated wastewater except in accordance with the requirements of these regulations.

(c) Applications for permits shall be submitted to the Department of Environmental Quality, Water Quality Division in accordance with the requirements of Chapter 3, Wyoming Water Quality Rules and Regulations. The application materials submitted shall be adequate to demonstrate compliance with all requirements of this part. It shall be the responsibility of the applicant to demonstrate that the proposed reuse of treated wastewater will not endanger public health or the environment.

(d) The person who prepares treated wastewater and makes it available to another person for reuse shall provide, as part of the application required by Section 6 (c), a demonstration that all of the requirements of this chapter will be met. This will include access restrictions, management practices, record keeping and reporting requirements which may be the responsibility of another person who will apply the treated wastewater. This demonstration may be in the form of either a written agreement with the applier specifying his or her responsibilities or a separate permit application from the applier. If the method selected is an agreement, the agreement must cover appropriate access restrictions, management practices, record keeping and reporting requirements of this chapter. If the method selected is a separate permit for the applier the permit application by the applier must address the same requirements.

(e) Any person who prepares treated wastewater outside of the state to be applied within the state must either obtain a permit to land apply in accordance with this chapter or provide the wastewater to a person who has a permit.

(f) Any person who prepares treated wastewater outside of the State of Wyoming that is to be applied to land within the State of Wyoming and opts not to obtain a permit shall provide written notice, prior to the initial application of treated wastewater to the reuse site by the applier, to the Department of Environmental Quality, Water Quality Division. The notification shall include the following:

(i) The location, by either street address or latitude and longitude, of each reuse site;

(ii) The approximate time period the treated wastewater will be applied to the site;

(iii) The name, address, telephone number, and National Pollutant Discharge Elimination System permit number (if appropriate) for the person who prepares the treated wastewater;

(iv) The name, address, telephone number of the person who will reuse the treated wastewater; and

(v) Documentation that the requirements of this regulation have been met.

Section 7. **Exclusions.**

(a) Treatment processes. These regulations do not establish requirements for processes used to treat wastewater.

(b) Selection of a reuse practice. This chapter does not require the selection of a reuse practice. The determination of the manner in which treated wastewater is to be reused is a local determination.

Section 8. **General Management Practices.**

(a) Treated wastewater shall be applied for the purpose of beneficial reuse and shall not exceed the irrigation need or demand of the vegetation at the site. Winter irrigation is considered to be beneficial reuse.

(b) Treated wastewater shall not be applied to agricultural land, forest, a public contact site, or a reclamation site at a application rate that is greater than the agronomic rate for the vegetation at the site.

(c) Treated wastewater shall not be applied in a manner that will contaminate a groundwater aquifer.

(d) Treated wastewater will be applied in a manner and time that will not cause any surface runoff to leave the application site and enter surface waters of the state.

(e) Direct human consumption food crops shall not be harvested for 30 days after application of treated wastewater.

(f) Animals shall not be allowed to graze on the land for 30 days after application of Class C treated wastewater.

(g) Fencing and signing shall be provide at sites where Class B treated wastewater is proposed for reuse on land with a moderate potential for public exposure.

(h) Signing shall be provided at sites where Class B or Class C treated wastewater is proposed for reuse on land with a low potential for public exposure in order to protect the health and safety of workers.

Section 9. **Site Isolation Requirements.** No person shall reuse treated wastewater on an application site except in accordance with the restrictions specified below.

(a) Isolation of spray irrigation systems.

(i) Wind drift shall not leave the application site.

(ii) If Class A or Class B wastewater is reused for irrigation, a 30 foot buffer zone is required between the reuse site and adjacent property lines. Public right-of-ways may be utilized to meet this requirement for a buffer zone.

(iii) If Class C wastewater is reused for irrigation a 100 foot buffer zone is required between the reuse site and adjacent property lines and any public right-of-way.

(iv) A 30 foot separation distance is required between reuse sites and all surface waters.

(v) A 100 foot separation distance is required between reuse sites and all potable water supply wells.

(vi) Surface runoff shall not leave the application site.

(b) Isolation distances between reuse sites irrigated by flood irrigation systems.

(i) Surface runoff shall not leave the application site.

(ii) If Class A or Class B wastewater is reused for irrigation, a 30 foot buffer zone is required between the reuse site and adjacent property lines. Public right-of-ways may be utilized to meet this requirement for a buffer zone.

(iii) If Class C wastewater is reused for irrigation, a 30 foot buffer zone is required between the reuse site and adjacent property lines and any public right-of-way.

(iv) A 30 foot separation distance is required between reuse sites and all surface waters.

(v) A 100 foot separation distance is required between reuse sites and all potable water supply wells.

(c) Drip irrigation systems. The buffer zone requirements of Section 9 (a) (ii) and 9 (b) (ii) for Class A and B wastewaters may be met by the use of drip irrigation systems.

Section 10. **Minimum Level of Wastewater Treatment.** Treated wastewater must receive the equivalent of primary treatment and a maximum fecal coliform value of less than 1000/100 ml in order to be reused in accordance with these regulations.

Section 11. **Treatment Reliability.**

(a) The ability of the treatment process to deliver the class of treated wastewater required for a particular use will be considered by the permitting authority when approving or denying wastewater reuse in accordance with Section 6. The criteria for evaluating treatment reliability may include the following as appropriate:

(i) Multiple units and equipment;

(ii) Alternative power sources;

(iii) Alarm systems and instrumentation;

(iv) Operator certification and stand-by capability;

(v) Bypass and dewatering capability;

(vi) Frequency of sampling;

(vii) Hydraulic and organic loading design capabilities; and

(viii) Emergency storage.

(b) Where treatment reliability cannot be provided by existing facilities, the reuse may be approved based upon the preparer's ability to dispose of the treated wastewater in an acceptable alternative manner or to reuse the treated wastewater for a less restrictive authorized reuse as indicated in Section 12.

Section 12. **Authorized Reuse.**

(a) Class A wastewater may be used for the following purposes:

(i) Irrigation of land with a high potential for public exposure;

(ii) Irrigation of land with a moderate potential for public exposure;

(iii) Irrigation of land with a low potential for public exposure;

(iv) Irrigation of direct human consumption food crops; and

(v) Irrigation of indirect human consumption food crops.

(b) Class B wastewater may be used for the following purposes:

(i) Irrigation of land with a moderate potential for public exposure;

(ii) Irrigation of land with a low potential for public exposure;

(iii) Irrigation of direct human consumption food crops; and

(iv) Irrigation of indirect human consumption food crops.

(c) Class C wastewater may be used for the following purposes:

(i) Irrigation of land with a low potential for public exposure; and

(ii) Irrigation of indirect human consumption food crops.

Section 13. **Monitoring.**

(a) Sampling. Representative samples of the treated wastewater that is to be reused shall be collected and analyzed by the person who prepares the wastewater.

(b) Methods. Waste constituents shall be analyzed in accordance with 40 CFR Part 136, Guidelines Establishing Test Procedures for the Analysis of Pollutants.

(c) Parameters. The treated wastewater shall be analyzed for the following:

(i) Fecal coliform;

(ii) Nitrate as N;

(iii) Ammonia as N;

(iv) pH;

(v) Parameters identified in 40 CFR Part 122, Appendix D, Table III, when required by the NPDES permit; and

(vi) Other parameters identified in the permit.

(d) Frequency for monitoring for these pollutants shall be:

(i) For lagoon systems, once per month or the frequency specified in the NPDES discharge permit whichever is more frequent;

(ii) For mechanical plants, once per week or the monitoring frequency specified in the NPDES discharge permit whichever is more frequent; and

(iii) For monitoring of parameters identified in Section 13 (c) (v), shall be conducted at the frequency specified in the NPDES discharge permit.

Section 14. **Noncompliance Actions, Reporting and Monitoring Requirements.** In the event that the monitoring program identified in Section 13 indicates noncompliance with the fecal coliform levels associated with the class of wastewater and the appropriate authorized reuse identified in Section 12, the responsible party shall take the following actions.

(a) Discontinue the reuse of treated wastewater immediately. The responsible party may discharge in compliance with the requirements of an NPDES permit or convert to any authorized reuse which is consistent with the quality of the treated wastewater.

(b) Report the noncompliance to the permitting authority as soon as possible, but no later than the next working day.

(c) Initiate monitoring of the parameter in noncompliance on a daily or more frequent basis in order to adequately demonstrate that the treated wastewater can reliably meet the reuse criteria.

(d) Report the results on the noncompliance monitoring to the permitting authority. Upon adequate demonstration by the responsible party that the reuse criteria can be reliably met, the permitting authority may grant verbal and written authorization to re-institute the discontinued reuse.

(e) The responsible party shall provide a written report within 15 days of the resolution of the event which will contain the following:

(i) A description of the noncompliance and its cause;

(ii) The period of the noncompliance, including dates and times;

(iii) All monitoring data related to the noncompliance and the return to compliance; and

(iv) Steps taken or planned to reduce, eliminate or prevent reoccurrence of the noncompliance.

Section 15. **Record Keeping.**

(a) A person who prepares treated wastewater shall develop the following information and shall retain the information for five (5) years.

(i) The concentration of each applicable pollutant listed in Section 13 (c) in the treated wastewater at the frequency specified in Section 13 (d).

(ii) A description of how the minimum level of treatment requirements in Section 10 are met.

(iii) A description of how the treatment reliability requirements in Section 11 are met.

(iv) The following certification statement: "I certify, under penalty of law, that the level of treatment requirements in Section 10 of Chapter 21, Wyoming Water Quality Rules and Regulations, the treatment reliability requirements in Section 11 and the water quality parameters have been met. This determination has been made under my direction and supervision. I am aware that there are significant penalties for false certification."

(b) A person who prepares treated wastewater shall obtain the following information from any person who reuses the treated wastewater and shall retain the information for five years.

(i) The location, by either street address or latitude and longitude, of each site on which treated wastewater is applied.

(ii) The number of acres on each site on which treated wastewater is applied.

(iii) The date and time treated wastewater is applied to each site.

(iv) The cumulative amount of treated wastewater applied to each site.

(v) The following certification statement: "I certify, under penalty of law, that the general management practices in Section 8 of Chapter 21, Wyoming Water Quality Rules and Regulations, and the site isolation requirements in Section 9 have been met. This determination has been made under my direction and supervision. I am aware that there are significant penalties for false certification."

Section 16. **Reporting.**

(a) A person preparing treated wastewater shall submit the information in Section 15 (a) and (b) to the permitting authority on an annual basis.

(b) A person who reuses treated wastewater shall submit the information in Section 15 (b) to the person who prepares the treated wastewater on an annual basis if he or she is operating under an agreement with the applier. If the application is regulated by a permit, the information shall be submitted to the permitting authority.

Section 17. **Operation and Maintenance Manual.**

(a) Any person responsible for the application of treated wastewater shall provide an operation and maintenance manual as part of the agreement or permit application required by Section 5 (d).

(b) The operation and maintenance manual shall include the following:

(i) Description of the facilities;

(ii) Description of the application system;

(iii) Procedures for emergency operation and spill events;

(iv) Procedures for meeting permit and regulatory requirements;

(v) Maintenance and operation requirements for any mechanical equipment; and

(vi) Description of how the monitoring, record keeping and reporting requirements of this chapter will be met.

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by this chapter.

Section 2. **Applicability.**

(a) These regulations apply to any person who prepares or applies treated wastewater from domestic sewage.

(b) These regulations are not applicable if the primary intent is to provide treatment and/or disposal of a wastewater. Treatment and disposal are regulated under appropriate sections of Chapter ~~11~~ 25, Wyoming Water Quality Rules and Regulations.

(c) If the reuse of treated wastewater involves the construction of facilities for the disinfection, delivery, storage or land application, a construction permit is required in accordance with the provisions of Chapters 3 and 11, Wyoming Water Quality Rules and Regulations. Such a permit constitutes approval to reuse the treated wastewater. This permit is not an operational permit and does not require periodic renewal. If there are no structural facilities requiring a construction permit, the reuse of wastewater will be authorized by a land application permit issued in accordance with these regulations. The land application permit is not an operational permit and does not require periodic renewal.

(d) These regulations are not applicable to the discharge of a treated wastewater which is subject to a discharge permit issued pursuant to Chapter 2, Wyoming Water Quality Rules and Regulations.

(e) These regulations are not applicable to treated wastewater reused at reclamation sites regulated by the Land Quality Division under Article 4 of the Wyoming Environmental Quality Act.

(f) These regulations are not applicable to treated wastewater reused for irrigation of grass, shrubs and trees at the treatment works.

(g) These regulations are not applicable to the disposal of gray water.

(h) These regulations are not applicable to groundwater recharge projects which are regulated by the Underground Injection Control Program of the Department of Environmental Quality, Water Quality Division.

Section 3. **Definitions**. The following definitions supplement those definitions contained in Section 35-11-103 of the Wyoming Environmental Quality Act.

(a) "Agricultural land" is land on which a food crop, a feed crop, or a fiber crop is grown. This includes range land and land used as pasture.

(b) "Agronomic rate" is the wastewater application rate designed to: (1) provide the amount of nitrogen needed by the food crop, feed crop, fiber crop, cover crop, or vegetation

Minimum Standards for Subdivision Applications

CHAPTER 23

Section 1. **Authority.** This regulation is promulgated pursuant to the Wyoming Environmental Quality Act. Specifically, W.S. 35-11-302 (a) (xi) stipulates that the administrator shall develop standards for subdivision applications submitted to the department under W.S. 18-5-306.

Section 2. **Applicability.** These regulations shall apply to all subdivision permits as required by W.S. 18-5-305 and 306 and submitted to the department upon or after the effective date this rule.

Section 3. **Definitions.**

(a) The definitions in Section 35-11-103(a) and (c) of the Wyoming Environmental Quality Act apply to this chapter. For example:

(i) "Administrator" means the administrator of the Water Quality Division of the department.

(ii) "Department" means the Department of Environmental Quality established by the Wyoming Environmental Quality Act;

(iii) "Director" means the director of the Department of Environmental Quality;

(iv) "Public water supply" means any water supply as defined in W.S. 35-11-103(c) (viii).

(b) The following definitions, contained in Section 18-5-302(a) of Article 3, Real Estate Subdivisions as of July 1, 2001, apply to this chapter:

(i) "Sewage System" means all pipelines, conduits, pumping stations, force mains and other constructions used for collecting or conducting wastes to a treatment plant or disposal system; any plant or other works used for the purpose of treating, stabilizing or holding wastes; and any system used for disposing of wastes, either by surface or underground methods, including any treatment plant, disposal wells and absorption fields;

(ii) "Subdivider" means any person who lays out any subdivision or parts thereof either for the account of the subdivider or others;

(iii) "Subdivision" means the creation or division of a lot, tract, parcel or other unit of land for the immediate or future purpose of sale, building development or redevelopment, for residential, recreational, industrial, commercial or public uses. The word "subdivide" or any derivative thereof shall have reference to the term subdivision, including mobile home courts, the creation of which constitutes a subdivision of land.

(iii) "Water supply system" includes development of the source and all structures for conveyance of raw water to the treatment plant or delivery systems; all water treatment plants including disinfection facilities; and all finished water delivery systems including pipelines, pumping stations and finished water storage facilities. Separate water supply systems used solely for irrigation or stock water are not included.

(c) The following definition supplements those definitions contained in Section 35-11-103 of the Environmental Quality Act.

"Enhanced treatment system" means a facility or system reviewed and approved by the administrator in accordance with Section 5, Chapter 11,Wyoming Water Quality Rules and Regulations, that will meet or exceed the applicable standards contained within this chapter.

Section 4. **Submittal and Processing of Subdivision Applications**

(a) Submittal of subdivision applications. Prior to subdivision permit approval by the board of county commissioners, and pursuant to W.S. 18-5-306 (c) and 307, the county, subdivider, or county planning and zoning commission shall send three (3) copies of the portions of the application containing evaluations of the proposed sewage system and water supply system to the department for review of the safety and adequacy of the proposed sewage system and proposed water supply system.

(b) Processing of applications

(i) Pursuant to W.S. 18-5-306(c):

(A) The department may request assistance from the state engineer, the Wyoming water development office and any other state agency or county governmental entity in preparing its review. Any agency or entity requested to assist in the review shall fully cooperate to the extent possible with the department and shall furnish the information or recommendations requested within the time period specified by the department;

(B) The department shall file its written comments and recommendations on the application with the commission or board within 30 days after receipt of the application. The department may extend its review period for an additional 30 days if an extension is necessary to complete the review.

(ii) Incomplete applications will be processed in the following manner:

(A) Additional information shall be requested from the applicant within 30 days of the department's receipt of the application. If the applicant fails to remedy an incomplete application within 60 days of the department's receipt of the application, the department will file an adverse recommendation with the commission or board.

(B) Applications containing plans, specifications, reports, maps, and other documentation submitted under this chapter that are not signed, sealed, and dated, when required, by a licensed professional engineer under W.S. Title 33, Chapter 29, a licensed professional geologist under W.S. Title 33, Chapter 41 or a licensed land surveyor under W.S. Title 33, Chapter 29 will be deemed incomplete by the department and returned to the applicant without further review.

Section 5. **Requirements Applicable to All Applications**

(a) All plans, specifications, reports, maps, and other documentation submitted under this chapter must meet or exceed the standards contained within these regulations to be deemed complete;

(b) All plans, specifications, reports, maps, and other documentation submitted under this chapter shall be signed, sealed, and dated, when required, by a licensed professional engineer under W.S. Title 33, Chapter 29, a licensed professional geologist under W.S. Title 33, Chapter 41, and by a licensed land surveyor under W.S. Title 33, Chapter 29, as applicable.

(c) The administrator may, upon review of submitted documentation, modify any, or all, requirements of this chapter when:

(i) The subdivision includes one or more lots with existing sewage systems, water supply systems, or on-lot wells; or

(ii) Holding tanks are used to fully contain on-lot sewage.

Section 6. **Exemptions from Provisions.** Exemptions to the provisions of this chapter are defined in W.S. 18-5-303 and W.S. 18-5-306.

Section 7. **Standards for Sewage Systems**

(a) All applications shall contain the following information:

(i) Identification of the type of sewage system to serve the subdivision and identification of the entity or entities responsible for the design, construction, operation and maintenance of the proposed facility;

(ii) An assessment of the adequacy of the proposed sewage system in relation to the proposed population density of the subdivision and any other existing or proposed land

and water uses in the vicinity of the subdivision that may affect the adequacy of the system; and

(iii) Demonstration that the proposed sewage system will meet all county, state and federal standards.

The demonstration shall include, but not be limited to addressing the relationship of the development to any local or state approved water quality management plans established pursuant to Section 201 of the federal Clean Water Act, 33 U.S.C. Section 1281 and demonstrate no conflict exists with any state approved local wellhead protection plan or local source water protection plan.

(b) In addition to the information required in part (a) of this section, applications proposing the use of a new central sewage system shall contain the following:

(i) An estimate of the average and maximum number of gallons per day of sewage generated by the proposed subdivision;

(ii) A demonstration that technical requirements and design standards of the department of environmental quality applicable to central sewage systems can and will be met. The demonstration shall include, but not be limited to the information contained within Chapter 11, Section 6 of Wyoming Water Quality Rules and Regulations;

(iii) An estimated schedule for the development and occupancy of the proposed subdivision; and

(iv) A detailed demonstration that the proposed sewage system for the subdivision is compatible with the proposed water supply system for the subdivision. The demonstration must determine that the operation of the sewage system will not affect the suitability or safety of the proposed water supply system and include a determination of the potential impacts of downgradient use of groundwater. The demonstration shall include:

(A) Documentation that the facility poses no threat of discharge to groundwater; or

(B) A subsurface study and a contaminant fate and transport analysis demonstrating that groundwater standards contained within Chapter 8, Wyoming Water Quality Rules and Regulations will not be exceeded.

(v) Confirmation that the owner of the subdivision collection system will provide for certified operators pursuant to Chapter 5, Wyoming Water Quality Rules and Regulations.

(c) In addition to the information required in part (a) of this section, applications proposing to connect to an existing central sewage system shall contain:

(i) Certification by the owner of the wastewater collection and treatment facilities that the system can and will provide adequate service to the proposed subdivision. This certification should address the willingness and a commitment of the owner to provide service as well as the ability of all downstream sewers, lift stations and treatment facilities to handle the hydraulic and organic loading from the proposed subdivision.

(A) The certification shall clearly identify the point of connection if the connection is not within the boundaries of the proposed subdivision.

(B) It is the responsibility of the owner to consider the capacity and ability of the system to provide sewer service to the proposed subdivision in accordance with existing laws, regulations and permit requirements.

(ii) The information required by Section 6, Chapter 11, Wyoming Water Quality Rules and Regulations shall be provided by a registered professional engineer. If the necessary information is not already available, the owner of the sewage system has the discretion to require the subdivider to provide the required information.

(iii) The party responsible for operation and maintenance of the subdivision collection system will provide for certified operators pursuant to Chapter 5, Wyoming Water Quality Rules and Regulations.

(d) In addition to the information required in part (a) (i) of this section, applications proposing the use of on-lot sewage systems shall contain information to document the following:

(i) Separation of the drainfield relative to groundwater and impervious soils will meet or exceed the minimum standards established in Chapter 25 of Wyoming Water Quality Rules and Regulations.

(ii) Soil percolation rates will meet or exceed the minimum standard established in Chapter 25 of Wyoming Water Quality Rules and Regulations.

(A) Percolation tests must be performed according to the procedure described in Chapter 25, Appendix A of Wyoming Water Quality Rules and Regulations or other procedures approved by the department.

(B) Percolation tests are required for every third lot, or for each soil type as mapped by the Natural Resource Conservation Service (NRCS), whichever requires the least number of percolation tests.

(I) A copy of the NRCS county soil map must be submitted if soil types and distributions were used to establish the number of percolation tests required.

(II) Percolation test data and results from existing permitted on-lot sewage systems on properties adjoining the proposed subdivision may be substituted for new tests when the existing test results were obtained from the same type of soils as those that exist within the proposed subdivision.

(C) Percolation test data, results, and map illustrating test locations shall be submitted in the application.

(iii) Topographic slope, or grade, for sufficient area within each lot within the proposed subdivision will meet or exceed the applicable minimum standards established in Chapter 11, Part D of Water Quality Rules and Regulations, and will not result in a direct or indirect discharge of pollution at the surface, into a surface water body, or into a wetland.

(iv) A 1:24,000 scale U.S.G.S. topographic map illustrating and identifying watersheds located on, or draining into, under, or over the proposed subdivision, including all ephemeral, intermittent, and perennial streams, surface waters, wetlands, and watershed boundaries within one-quarter (¼) mile of the proposed subdivision shall be included in the application.

(v) Each lot contains sufficient area for a replacement leach field.

(vi) The proposed population density of the subdivision, determined from the proposed type of use (e.g., residential, commercial, industrial, multiple use) of the subdivision.

(A) Applications for subdivisions proposing non-domestic use, or domestic use that exceeds 2000 gallons of wastewater per day on one or more lots of the subdivision must identify:

(I) The type(s), strength, and chemical composition of non-domestic wastes most likely to be disposed of, including the average and maximum daily flows;

(II) Specific lots within the subdivision where the disposal of non-domestic wastewater could occur; and

(III) Design(s) and treatment capabilities of the type(s) of on-lot sewage systems proposed to treat such wastes.

(vii) Groundwater and surface water use is protected, as documented by:

(A) Characterization of the geologic setting from well logs, soil borings, and/or published geologic maps and reports, including documentation of:

(I) Thickness, lithology, and extent of surficial materials;

(II) Stratigraphy, lithology, thickness, and extent of underlying geologic formations; and

(III) Faults, fractures, and karst features.

(B) Characterization of the hydrogeologic setting from well logs, soil borings, test pits, and/or published geologic maps and reports, including documentation of:

(I) Depth to groundwater, including seasonal fluctuations;

(II) Degree of groundwater hydraulic confinement;

(III) Vadose zone thickness, stratigraphy, and lithology; and

(IV) Degree of hydraulic connection and interaction between groundwater and surface water, where applicable.

(C) Classification of groundwater that is unconfined or semi-confined, according to the standards established within Chapter 8 of Wyoming Water Quality Rules and Regulations must be established according to the following:

(I) A survey of the existing wells permitted by the State Engineers Office and completed within the unconfined or semi-confined aquifer within one (1) mile of the proposed subdivision must be included and contain:

(1.) A map illustrating well names and locations relative to the proposed subdivision;

(2.) State Engineers Office permitted use for each well; and

(3.) State Engineers Office appropriated production volume for each well.

(II) If there are no permitted wells within one (1) mile of the proposed subdivision a field survey shall be performed to identify and record all potential locations where unpermitted water users may be located and potential water use.

(III) If the well surveys in subsections (I) and (II) of this part do not reveal any existing wells used for domestic purposes, ambient groundwater quality of the unconfined or semi-confined aquifer must be established, either from existing representative sample results or by collection of new representative samples. At a minimum, analytical laboratory results must be provided for:

(1.) Total Dissolved Solids (TDS)

(2.) Nitrate + Nitrite as N

(3.) Total Coliform

(4.) Sulfates

(5.) Chloride

(6.) Zinc

(7.) Lead

(8.) Copper

(9.) Arsenic

(10.) pH

(11.) Selenium

(12.) Additional constituents as may be deemed necessary by the department to classify the groundwater.

(D) When groundwater is unconfined or semi-confined and is Class I groundwater as defined in Chapter 8 of Wyoming Water Quality Rules and Regulations, the following additional documentation must be provided:

(I) Horizontal and vertical extent of the aquifer;

(II) Type of flow (i.e., diffuse, porous, or conduit) within the aquifer;

(III) Direction and degree of hydraulic gradient;

(IV) Hydraulic conductivity of the saturated zone; and

(V) Porosity of the saturated zone.

(viii) Separation distances to wells and property boundaries are adequate, according to the following:

(A) Except as provided for in sub-part (B) of this part, where unconfined groundwater is Class I as defined in Chapter 8 of Wyoming Water Quality Rules and

Regulations, small wastewater systems designed in accordance with Chapter 25, requirements and these regulations may be used provided that:

(I) The analysis described in Appendix A is provided in the application and determines that nitrates from on-lot sewage systems will not exceed 10 mg/L at the downgradient property boundary;

(II) The minimum isolation distances between drainfields and wells (completed or proposed within the unconfined aquifer), property boundaries, or surface waters as determined by the analysis described in Appendix B and provided in the application will be achieved or exceeded on each lot; and

(III) The analysis described in Appendix C is provided in the application and determines that nitrates from on-lot sewage systems will not exceed 10 mg/L in existing or proposed on-site public water supply wells, or off-site public water supply wells (completed or proposed within the unconfined aquifer).

(B) Unless the application materials demonstrate through fate and transport analysis that leachate will not impair ground water and/or surface water quality or use, enhanced treatment systems capable of achieving, at a minimum, the enhanced treatment standard must be used where:

(I) Small wastewater systems overlying unconfined Class I groundwater as defined in Chapter 8 of Wyoming Water Quality Rules and Regulations and designed in accordance Chapter 25, Wyoming Water Quality Rules and Regulations fail to comply with one or more of the standards established in Section 7 (viii) (A) (I) through (III) of this section; or

(II) The geologic setting of the proposed subdivision indicates that sewage leachate may come into contact with faults, fractures, or karst features.

(C) Enhanced treatment systems must be capable of achieving, at a minimum, the following treatment standards prior to additional treatment or subsurface discharge:

(I) Fecal Coliform: < 800 colonies/100 mL (Maximum 30 day geometric mean);

(II) Total Kjeldahl Nitrogen: < 25 mg/L (Maximum 30 day average).

(D) Where an enhanced treatment system is used it must be constructed and operated in conjunction with a subsurface disposal system that meets or exceeds the requirements of Chapter 25, Wyoming Water Quality Rules and Regulations.

(E) Where enhanced treatment systems are proposed or required, applications must contain a system design, developed and certified by a Wyoming licensed engineer, documenting the system's ability to achieve the required treatment standards, and include:

(I) Plan view and cross-section view of a proto-type enhanced wastewater treatment system;

(II) Enhanced treatment system performance standards for the proposed system(s);

(III) Number of bedrooms or average daily volume of wastewater flow; and

(IV) Operation and maintenance (O&M) requirements necessary to ensure optimum system performance, which include:

(1.) Sampling points for effluent quality monitoring prior to discharge to the leach field shall be identified.

(2.) A conceptual schematic of how the system is constructed and how it is designed to work, including the flow paths of the waste, re-circulation pathways, detention or contact times, etc.

(3.) A complete set of the manufacturer's O&M recommendations and specifications for the system, including part names and identification numbers for each of the system components for replacement purposes.

(4.) A summary or overview of the O&M requirements for all aspects of the system, identifying by component the frequency of inspection or servicing required and type of service needed to be performed to maintain the proper performance of the system.

(ix) Identification of the nearest facility that can and will accept septage wastes, and any limits, or conditions, of acceptance.

Section 8. **Standards for Water Supply Systems**

(a) All applications shall contain the following information:

(i) Identification of the type of water supply system proposed to serve the subdivision and identification of the entity or entities responsible for the design, construction, operation and maintenance of the proposed facility;

(ii) The estimated average and maximum number of gallons per day for the subdivision water supply system;

(iii) Documentation that the proposed water supply system will be compatible with and not adversely affected by the sewage system proposed for the subdivision or any other sources of pollution within a reasonable distance;

(iv) List of all surface and groundwater rights which will be used or which may be affected, including state engineer application and permit numbers and description of expected effects;

(v) Plans for the mitigation of water right conflicts resulting from the use of water within the proposed subdivision; and

(v) The information required by W.S. 18-5-306 (a) (xi).

(b) In addition to the information required in part (a) of this section, applications proposing to connect to an existing water supply system shall contain the following:

(i) Documentation concerning the potability of the proposed water supply for the subdivision as evidenced by historic water quality analytical data and current compliance status;

(ii) Certification by the owner of the water distribution and treatment facilities that the system can and will provide adequate service to the proposed subdivision. This certification should address the willingness and a commitment of the owner to provide service, as well as the hydraulic capacity of the distribution system and the ability of the treatment facilities to provide potable water to the proposed subdivision;

(A) The certification shall clearly identify the point of connection if the connection is not within the boundaries of the proposed subdivision.

(B) It is the responsibility of the owner to consider the capacity and ability of the system to provide water service to the proposed subdivision in accordance with existing laws, regulations and permit requirements.

(iii) The information required by Section 6, Chapter 12, Wyoming Water Quality Rules and Regulations shall be provided by a registered professional engineer. If the necessary information is not already available, the owner of the water system has the discretion to require the subdivider to provide the required information.

(vi) The party responsible for operation and maintenance of the subdivision distribution system will provide for certified operators pursuant to Chapter 5, Wyoming Water Quality Rules and Regulations.

(c) In addition to the information required in part (a) of this section, applications proposing to develop a new centralized water supply system shall contain the following:

(i) A demonstration that the water supply system is sufficient in terms of quality, quantity and dependability and will be available to ensure an adequate water supply system for the type of subdivision proposed. The report shall include a narrative summary of:

(A) Where the water supply system source is derived from groundwater, the geologic setting of the water supply system source and the area of influence such as nearby communities, sources of pollution, surface water bodies and aquifers described by a Wyoming registered professional geologist;

(B) A written report demonstrating that the proposed source is sufficient in terms of quality, quantity and dependability for the type of subdivision proposed;

(C) Source of the water to be used including proposed and existing surface and groundwater facilities and their locations;

(D) The proposed disposal of water not consumed, including water obtained under permits, storm drainage, dewatering, sewage and other wastewater sources;

(E) A delineation of primary sources of water, secondary sources and occasional or seasonal sources;

(F) Graphic location of all water supply sources including wells, raw water intakes, treatment facilities, treated water storage facilities and ponds;

(G) Documentation of all data sources on the occurrence and availability of surface and groundwater;

(H) Historic stream flows and well levels;

(I) Senior water rights;

(J) Flood damage and flood protection; and

(K) Impact of and protection from supply shortages.

(ii) The information required by Chapter 12, Section 6 of Wyoming Water Quality Rules and Regulations.

(iii) Confirmation that the owner of the subdivision distribution system will provide for certified operators pursuant to Chapter 5, Wyoming Water Quality Rules and

Regulations.

(iv) Water quality data that is representative of the proposed drinking water source must be provided for the metals, inorganic constituents, and microbial constituents with Maximum Contaminant Levels (MCLs) established pursuant to the federal Safe Drinking Water Act.

(d) In addition to the information required in part (a) of this section, applications proposing to use on-lot wells or surface water that will serve fewer than 25 people shall contain information describing the potential availability and quality of groundwater or surface water proposed within the subdivision. This information may consist of new data, existing data on other working wells in the area, or other data, including drilling logs, from a test well drilled within the proposed subdivision indicating soil types, depth, quantity and quality of water produced in the test well.

(i) For subdivisions proposing to use on-lot wells or surface water that will serve individual residences or fewer than 25 people, water quality data that is representative of the proposed drinking water source must be provided for the following analytes:

(A) Total Dissolved Solids (TDS)

(B) Nitrate + Nitrite as N

(C) Total Coliform

(D) Sulfates

(E) Calcium

(F) Magnesium

(G) Sodium

(H) Chloride

(I) Iron

(J) Zinc

(K) Lead

(L) Fluoride

(M) Manganese

(N) Copper

(O) Arsenic

(P) pH

(Q) Additional constituents as may be deemed necessary by the department.

(ii) Documentation of activities, within a distance of one quarter (¼) mile of the subdivision's external boundaries, that may have potential to adversely effect the quality of the drinking water supply.

Section 9. **Delegation of Review Authority to Counties**

(a) Pursuant to W.S. 18-5-306 (c), to the extent requested by a county government, the administrator of the Water Quality Division, with the approval of the director of the Department of Environmental Quality, shall delegate authority to the county to:

(i) Review and approve any reports or studies required by this chapter and directed at determining the safety and adequacy of the proposed sewage or water supply system contained as part of a subdivision application;

(ii) Review and approve enhanced treatment systems, in accordance with Section 5, Chapter 11 of Wyoming Water Quality Rules and Regulations, that will meet or exceed the applicable standards within this chapter;

(iii) Issue construction permits as required by W.S. 35-11-301(a) (iii), and;

(iv) Issue operating permits as authorized by W.S. 35-11-301 (a) (iii).

(b) Any authority delegated under this section shall be subject to the following conditions:

(i) The county entity shall demonstrate to the administrator of the Water Quality Division that all sewage or water supply systems will be reviewed by a qualified professional with expertise in surface and groundwater protection from pollution and safe and adequate water supply systems;

(ii) The county entity shall demonstrate that the review of water supply and sewage systems will be in a manner as stringent as the Department of Environmental Quality would require under this section;

(iii) The review of subdivisions with a proposed sewage system consisting of wastes requiring an underground injection control permit under Department of Environmental Quality regulations or sewage systems with a proposed surface water discharge shall not be delegated to the county; and

(iv) The administrator shall periodically review the administrative programs of each county governmental entity receiving a delegation of authority under this section and may, with the consent of the director, revoke or temporarily suspend the delegation agreement entered into with any entity which has failed to perform its delegated duties or has otherwise violated the terms of its agreement of delegation.

(c) To ensure consistent application of this rule, delegation agreements shall include an identification of methods and reporting for oversight of the county's delegated authority.

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Appendix A

Cumulative Nitrate Loading Analysis

In order to calculate the nitrate concentration from multiple septic systems at the downgradient property boundary of the proposed subdivision the following nitrogen mass balance equation (Wehrmann Model) is used. If C_o exceeds 10 mg/L NO_3^- as N, WDEQ recommend to the County Commission that the subdivision not be approved unless modified to achieve the standards within this chapter.

$$C_o = V_b\, C_b + V_i\, C_i + V_s\, C_s - V_p\, C_p / (V_b + V_i + V_s - V_p)$$

Where:

C_o = diluted concentration of NO_3^- as N leaving the subdivision
V_b = volume of ground water entering the subdivision from upgradient area
C_b = ambient concentration of NO_3^- as N contained in the ground water entering the subdivision
V_i = volume of precipitation infiltrating beneath the subdivision
C_i = concentration of NO_3^- as N contained in the infiltrating precipitation
V_s = volume of septic effluent introduced beneath the subdivision
C_s = concentration of NO_3^- as N contained in the septic effluent (assume 40 mg/L for conventional septic systems, and manufacturer specifications (mg/L) for enhanced treatment systems)
V_p = volume of ground water pumped by wells beneath the subdivision (use only if same aquifer as V_s)
C_p = concentration of nitrate-nitrogen contained in the pumped ground water

Source: Wehrmann, H.A. 1984. Managing Ground Water Nitrate Quality by Mass Balance Modeling in the Rockton-Roscoe Area, Illinois. In *Proceedings of the NWWA Eastern Regional Conference on Ground Water Management*, National Water Well Association, Dublin, Ohio, pp. 558-587.

Appendix B

Minimum Isolation Distance Analysis

VERTICAL TRAVEL TIME CALCULATION:

The following equation is used to determine the vertical travel time *(t_1)* from the leach field to the water table:

Given: $t_1 = d * \theta \div 0.5(\alpha)$

Where:

$\mathbf{t_1}$ = vertical travel time (years)
α is total recharge (effluent + precipitation in cm/yr)
θ is volumetric soil moisture in a sandy clay (mL/cm^3)
d is the depth to groundwater (cm)
0.5 is the infiltration factor (assumes 50% of precipitation will infiltrate the soil)

(Note: α, θ, and **d** will change from site to site.)

Example calculation of α:

Assuming that 100 gallons per day of wastewater will be generated per bedroom, a typical 3 bedroom house is expected to discharge an average of 300 gallons per day.

Total yearly effluent discharge = 300 gallons/day * 365 days/year * 1 ft^3/7.48 gallons
= 14,639 ft^3

Next, calculate the required soil absorption surface area (square feet) by referencing Figure 7 of Chapter 11, Part D, Section 38 (a) of Water Quality Rules and Regulations. The sizing of a leach field is dependant upon the soil percolation rate and the average daily effluent discharge. For this example use the median soil percolation rate of 15 minutes per inch. Also, use the previously calculated 300 gallons per day effluent discharge per house.

Required soil absorption infiltrative area = 300 gallons/day * 1ft^2 day/0.52 gallons = 577 ft^2

Next, calculate the pro-rated inches per year of effluent recharge to the aquifer:

14,639 ft^3 * (577 ft^2)-1 = 25.4 ft * 12 inches/ft = 304 inches/year

To obtain TOTAL average annual recharge to the aquifer (effluent + precipitation) add the average annual precipitation for the area (15 inches/year) to the pro-rated effluent recharge, which equates to 319 inches/year or 810 cm/year (α). Note the average annual precipitation for an area can be obtained from Chapter 17, Wyoming Water Quality Rules and Regulations (Figure 2) or from the USDA. National Resources Conservation Service.

Volumetric Soil Moisture Content at Field Capacity

Soil Type	**Volumetric Soil Moisture Content @ Field Capacity, θ, mL/cm^3**
Cobble sand	0.045
Sand	0.062
Sandy loam	0.190
Loam	0.232
Silty loam	0.284
Sandy clay loam	0.244
Clay loam	0.310
Silty clay loam	0.342
Sandy clay	0.321 (default)
Silty clay	0.371
Clay	0.378

* Source: WDEQ Water Quality Rules and Regulations, Chapter 17

HORIZONTAL TRAVEL TIME CALCULATION:

The following equation is used to determine, based upon the advective flow equation, the distance at which leachate in groundwater will reach a downgradient well or surface water body, or migrate beyond the property boundary over a travel-time period of two years*.

The distance (x) which leachate will migrate vertically (t_1) and horizontally (t_2) over a travel-time period of two years (t) is calculated as follows:

Calculate horizontal travel time (t_2):

(t_2) = 2 years - (t_1)

Where:

(t_1) = vertical travel time

Calculate the horizontal linear velocity:

Given: $v = ki/n$

Where:

v = average groundwater linear velocity
k = hydraulic conductivity of the saturated aquifer (feet/day)
i = hydraulic gradient (feet/feet)
n = effective porosity (dimensionless)

Next, calculate the horizontal travel distance, x:

$x = t_2 * v$

t_2 = horizontal time of travel
x = the minimum allowable isolation distance

* If the calculated vertical travel time is 2 years or greater the horizontal travel time analysis does not need to be completed.

Source: Fetter, C.W. 1994. Applied Hydrogeology, 3rd Edition, Prentice-Hall, New Jersey, 691 pp.

Appendix C

Public Water Supply Analysis

The following equations are used to calculate the nitrate concentration at a public drinking water supply well from drainfields that fall within the capture zone of the well, as defined below. If *Cp* exceeds 10 mg/L NO_3^- as N, WDEQ will recommend to the County Commission that the subdivision not be approved unless modified to achieve the standards within this chapter.

First, calculate the capture zone for the water supply well using the following formula:

$$\text{CFR} = \sqrt{Qt / 7.48nHpi}$$

Where:

CFR = Calculated fixed radius of pumping well
Q = average annual pumping rate (gallons/year)
t = time of travel (years); assume 2 years unless a steady-state capture zone is calculated.
7.48 = conversion factor (ft^3 to gallons)
n = effective porosity
H = length of well screen (feet)
pi = 3.14

Next, the volume of aquifer water flowing beneath a drainfield located within the capture zone is calculated using the following formula:

$$Qleach = (KiA)7.48*z$$

Where:

Qleach = volume of water flowing beneath the drainfield (gallons/day)
K = hydraulic conductivity (feet/day)
i = hydraulic gradient
A = cross-sectional dimensions of drainfield (length x depth); assumed to be 75 feet long by 30 feet deep.
z = number of wastewater treatment systems within the CFR

Next, the nitrate concentration beneath the drainfield is calculated by mixing the septic leachate with the aquifer water flowing beneath the drainfield (*Qleach*) using the following formula:

$$Cr = ((Qseptic * Cseptic) + (Qleach * Cleach)) / (Qseptic + Qleach)$$

Where:

Cr = diluted nitrate concentration beneath the septic drainfield (mg/L)
Qseptic = discharge of septic (gallons/day) = (300 **z*)
Cseptic = average nitrate concentration of septic leachate (assume 40 mg/L for conventional septic systems; manufacturer specifications (mg/L) for enhanced treatment systems)
Qleach = volume of water flowing beneath the drainfield (gallons/day)
Cleach = ambient nitrate concentration in ground water (mg/L)
300 = average daily leachate discharge for a 3 bedroom home
z = number of wastewater treatment systems within the CFR

Next, the volume of water contained within the well cylinder (from pumping) is calculated using the following equation:

*Qwell = n((pi)(HCFR^2))**7.48 / 730

Where:

Qwell = well discharge (gallons/day)

Finally, the concentration of nitrates within the well cylinder is calculated using the following equation:

*Cp = ((Qleach + Qseptic*Cr)+(Qwell*Cwell)) / (Qleach + Qseptic + Qwell)*

Where:

Cp = Concentration of nitrates within the pumping well (mg/L)
Cwell = ambient nitrate concentration in ground water (mg/L) = *Cleach*

facilities that the system can and will provide adequate service to the proposed subdivision. This certification should address the willingness and a commitment of the owner to provide service as well as the ability of all downstream sewers, lift stations and treatment facilities to handle the hydraulic and organic loading from the proposed subdivision.

(A) The certification shall clearly identify the point of connection if the connection is not within the boundaries of the proposed subdivision.

(B) It is the responsibility of the owner to consider the capacity and ability of the system to provide sewer service to the proposed subdivision in accordance with existing laws, regulations and permit requirements.

(ii) The information required by Section 6, Chapter 11, Wyoming Water Quality Rules and Regulations shall be provided by a registered professional engineer. If the necessary information is not already available, the owner of the sewage system has the discretion to require the subdivider to provide the required information.

(iii) The party responsible for operation and maintenance of the subdivision collection system will provide for certified operators pursuant to Chapter 5, Wyoming Water Quality Rules and Regulations.

(d) In addition to the information required in part (a) (i) of this section, applications proposing the use of on-lot sewage systems shall contain information to document the following:

(i) Separation of the drainfield relative to groundwater and impervious soils will meet or exceed the minimum standards established in Chapter 25 ~~11, PartD, Section 36(c)~~ of Wyoming Water Quality Rules and Regulations.

(ii) Soil percolation rates will meet or exceed the minimum standard established in Chapter 25 ~~11, Part D, Appendix A~~ of Wyoming Water Quality Rules and Regulations.

(A) Percolation tests must be performed according to the procedure described in Chapter 25, Appendix A ~~11, Part D, Sections 36(d) and 38(b)~~, of Wyoming Water Quality Rules and Regulations or other procedures approved by the department.

(B) Percolation tests are required for every third lot, or for each soil type as mapped by the Natural Resource Conservation Service (NRCS), whichever requires the least number of percolation tests.
(I) A copy of the NRCS county soil map must be submitted if soil types and distributions were used to establish the number of percolation tests required.

(II) Percolation test data and results from existing permitted on-lot sewage systems on properties adjoining the proposed subdivision may be substituted for new tests when the existing test results were obtained from the same type of soils as those that exist within the proposed subdivision.

(C) Percolation test data, results, and map illustrating test locations shall be submitted in the application.

(iii) Topographic slope, or grade, for sufficient area within each lot within the proposed subdivision will meet or exceed the applicable minimum standards established in Chapter 25 ~~11, Part D~~ of Water Quality Rules and Regulations, and will not result in a direct or indirect discharge of pollution at the surface, into a surface water body, or into a wetland.

(iv) A 1:24,000 scale U.S.G.S. topographic map illustrating and identifying watersheds located on, or draining into, under, or over the proposed subdivision, including all ephemeral, intermittent, and perennial streams, surface waters, wetlands, and watershed boundaries within one-quarter (¼) mile of the proposed subdivision shall be included in the application.

(v) Each lot contains sufficient area for a replacement leach field.

(vi) The proposed population density of the subdivision, determined from the proposed type of use (e.g., residential, commercial, industrial, multiple use) of the subdivision.

(A) Applications for subdivisions proposing non-domestic use, or domestic use that exceeds 2000 gallons of wastewater per day on one or more lots of the subdivision must identify:

(I) The type(s), strength, and chemical composition of non-domestic wastes most likely to be disposed of, including the average and maximum daily flows;

(II) Specific lots within the subdivision where the disposal of non-domestic wastewater could occur; and

(III) Design(s) and treatment capabilities of the type(s) of on-lot sewage systems proposed to treat such wastes.

(vii) Groundwater and surface water use is protected, as documented by:

(A) Characterization of the geologic setting from well logs, soil borings, and/or published geologic maps and reports, including documentation of:

(I) Thickness, lithology, and extent of surficial materials;

(II) Stratigraphy, lithology, thickness, and extent of underlying geologic formations; and

(6.) Zinc

(7.) Lead

(8.) Copper

(9.) Arsenic

(10.) pH

(11.) Selenium

(12.) Additional constituents as may be deemed necessary by the department to classify the groundwater.

(D) When groundwater is unconfined or semi-confined and is Class I groundwater as defined in Chapter 8 of Wyoming Water Quality Rules and Regulations, the following additional documentation must be provided:

(I) Horizontal and vertical extent of the aquifer;

(II) Type of flow (i.e., diffuse, porous, or conduit) within the aquifer;

(III) Direction and degree of hydraulic gradient;

(IV) Hydraulic conductivity of the saturated zone; and

(V) Porosity of the saturated zone.

(viii) Separation distances to wells and property boundaries are adequate, according to the following:

(A) Except as provided for in sub-part (B) of this part, where unconfined groundwater is Class I as defined in Chapter 8 of Wyoming Water Quality Rules and Regulations, small wastewater systems designed in accordance with Chapter 25 ~~11, Part D~~, requirements and these regulations may be used provided that:

(I) The analysis described in Appendix A is provided in the application and determines that nitrates from on-lot sewage systems will not exceed 10 mg/L at the downgradient property boundary;

(II) The minimum isolation distances between drainfields and wells (completed or proposed within the unconfined aquifer), property boundaries, or surface waters as determined by the analysis described in Appendix B and provided in the application will be achieved or exceeded on each lot; and

(III) The analysis described in Appendix C is provided in the application and determines that nitrates from on-lot sewage systems will not exceed 10 mg/L in existing or proposed on-site public water supply wells, or off-site public water supply wells (completed or proposed within the unconfined aquifer).

(B) Unless the application materials demonstrate through fate and transport analysis that leachate will not impair ground water and/or surface water quality or use, enhanced treatment systems capable of achieving, at a minimum, the enhanced treatment standard must be used where:

(I) Small wastewater systems overlying unconfined Class I groundwater as defined in Chapter 8 of Wyoming Water Quality Rules and Regulations and designed in accordance Chapter 25, ~~11, Part D~~ Wyoming Water Quality Rules and Regulations fail to comply with one or more of the standards established in Section 7 (viii) (A) (I) through (III) of this section; or

(II) The geologic setting of the proposed subdivision indicates that sewage leachate may come into contact with faults, fractures, or karst features.

(C) Enhanced treatment systems must be capable of achieving, at a minimum, the following treatment standards prior to additional treatment or subsurface discharge:

(I) Fecal Coliform: < 800 colonies/100 mL (Maximum 30 day geometric mean);

(II) Total Kjeldahl Nitrogen: < 25 mg/L (Maximum 30 day average).

(D) Where an enhanced treatment system is used it must be constructed and operated in conjunction with a subsurface disposal system that meets or exceeds the requirements of Chapter 25 ~~11, Part D~~, Wyoming Water Quality Rules and Regulations.

(E) Where enhanced treatment systems are proposed or required, applications must contain a system design, developed and certified by a Wyoming licensed engineer, documenting the system's ability to achieve the required treatment standards, and include:

(I) Plan view and cross-section view of a proto-type enhanced wastewater treatment system;

(II) Enhanced treatment system performance standards for the proposed system(s);

Where:

t_1 = vertical travel time (years)
α is total recharge (effluent + precipitation in cm/yr)
θ is volumetric soil moisture in a sandy clay (mL/cm^3)
d is the depth to groundwater (cm)
0.5 is the infiltration factor (assumes 50% of precipitation will infiltrate the soil)

(Note: α, θ, and **d** will change from site to site.)

Example calculation of α:

Assuming that 100 gallons per day of wastewater will be generated per bedroom, a typical 3 bedroom house is expected to discharge an average of 300 gallons per day.

Total yearly effluent discharge = 300 gallons/day * 365 days/year * 1 ft^3/7.48 gallons
= 14,639 ft^3

Next, calculate the required soil absorption surface area (square feet) by referencing Figure 7 of Chapter 25 ~~11, Part D, Section 38 (a)~~ of Water Quality Rules and Regulations. The sizing of a leach field is dependant upon the soil percolation rate and the average daily effluent discharge. For this example use the median soil percolation rate of 15 minutes per inch. Also, use the previously calculated 300 gallons per day effluent discharge per house.

Required soil absorption infiltrative area = 300 gallons/day * 1ft^2 day/0.52 gallons = 577 ft^2

Next, calculate the pro-rated inches per year of effluent recharge to the aquifer:

14,639 ft^3 * (577 ft^2)-1 = 25.4 ft * 12 inches/ft = 304 inches/year

To obtain TOTAL average annual recharge to the aquifer (effluent + precipitation) add the average annual precipitation for the area (15 inches/year) to the pro-rated effluent recharge, which equates to 319 inches/year or 810 cm/year (α). Note the average annual precipitation for an area can be obtained from Chapter 17, Wyoming Water Quality Rules and Regulations (Figure 2) or from the USDA. National Resources Conservation Service.

CHAPTER 25

SEPTIC TANK AND/OR SOIL ABSORPTION SYSTEMS
AND OTHER SMALL WASTEWATER SYSTEMS

Section 1. General. This part contains the minimum standards for the design and construction of sewerage systems, treatment works and disposal systems for domestic wastes and industrial wastes generated by facilities other than specifically covered by other parts of this Chapter.

Section 2. Definitions

(a) "Absorption system" means a system constructed under the surface of the ground which receives and distributes effluent from a pretreatment device effectively filtering the effluent through soil or media.

(b) "Aerobic unit" means a covered, watertight receptacle which receives wastewater. The unit removes settleable solids, floatable material, and a part of soluble organic matter by the use of aerobic biological treatment.

(c) "Building drain" means the building drain is that part of the lowest piping of a drainage system which receives the discharge from soil, waste and other drainage pipes inside the walls of the building and conveys it to the building sewer beginning two feet (.6m) outside the building wall.

(d) "Building sewer" means the building sewer is that part of the horizontal piping of a drainage system which extends from the end of the building drain and conveys the building drain discharge to the septic tank or other onsite sewage disposal facility.

(e) "Domestic sewage" means the liquid- and waterborne wastes derived from the ordinary living processes, free from industrial wastes, and of such character as to permit satisfactory disposal without special treatment.

(f) "Dosing system" means the system of tanks, pumps or syphons, and piping located between the septic tank and soil absorption system which is intended to apply a large quantity of settled wastewater to the absorption system in a short period of time.

(g) "Hydrogeological study" means a study of the occurrence, distribution, quality and movement of the shallowmost groundwater of the site and the potential impact of wastewaters on the groundwater.

(h) "Impermeable soil" means any soil which has a percolation rate greater than 60 minutes per inch.

(i) "Pump Tank" means a tank in which the dosing pumps or syphons are installed.

Section 3. <u>Design Flows.</u> The sewerage system, treatment works and disposal system shall have a minimum absorption area based on the minimum peak design flows listed in Table 1 below.

Table 1

Quantities of Domestic Sewage Flows

Type of Establishment	Flow (gallons per day per______)
Residential Units	
Single Family Dwellings	150/bedroom
Multiple Family Dwelling (with laundry capabilities)	150/bedroom
Multiple Family Dwelling (without laundry capabilities)	120/bedroom
Cottages	50/person
Mobile Home Parks	350/home*
Commercial Facilities	
Airports	4/passengers
Bar	3/patron
Bathhouses and swimming pools	10/person
Campgrounds (individual sewer outlets available)	100/site
Campgrounds (service building only)	75/site
Car or truck wash	200/vehicle
Church (no food preparation and/or dishwashing)	5/seat
Church (food preparation and/or dishwashing)	7/seat
Country Club	100/member
Factories	30/employee

Type of Establishment	Flow (gallons per day per______)
Hospital	200/bed
Laundry (self-service)	600/machine or 50/cycle
Motels	80/double bed, 40/single bed
Office building	30/employee
Restaurant (toilet and kitchen wastes)	13/meal
Restaurant (kitchen wastes)	6/meal
Restaurant (additional for bars and lounges)	2/meal
Restaurant (kitchen wastes with disposable service)	2/meal
Rest Home	100/resident
Schools	
Boarding	100/resident student
Day, without gyms, cafeterias, or showers	15/student
Day, with cafeterias only	20/student
Day, with cafeteria, gym and showers	25/student
Service stations	10/vehicle served
Shopping Center	2/parking space
Store, Retail	30/employee
Theaters: Movie	5/seat

Type of Establishment	Flow (gallons per day per______)
Drive-In	15/vehicle space
Warehouses	30/employee

* Must consider flow into the soil absorption system from mobile homes where taps are allowed to run to prevent freezing.

Section 4. Isolation.

(a) Domestic wastewater. The isolation distances listed below apply when domestic wastewater is the only wastewater present.

(i) If the flow is less than 2000 gallons per day (gpd), the minimum isolation distance (in feet) shown in Table 2 shall be maintained.

Table 2

From	To Septic Tank Or Equivalent	To Absorption System
Wells (includes neighboring wells)	50	100
Property lines	10	10
Building Foundation (without foundation drains)	5	10
Building Foundation (with foundation drains)	5	25
Potable Water Pipes	25	25
Septic tank		10

Stream or Surface Body of Water (including seasonal and intermittent)	50	50

(ii) If the flow is greater than 2000 gpd but less than 10,000 gpd, the minimum isolation distances (in feet) shown in Table 3 shall be maintained.

Table 3

From	To Septic Tank Or Equivalent	To Absorption System
Wells (includes neighboring wells)	50	200
Property lines	10	10
Building Foundation (without foundation drains)	5	10
Building Foundation (with foundation drains)	5	50
Potable Water Pipes	25	50
Septic tank		10
Stream or Surface Body of Water (including seasonal and intermittent)	50	100

(iii) For systems larger than 10,000 gallons per day, the isolation distance shall be determined by a hydrogeological study in accordance with Section 15(b) of Chapter III, but shall not be less than those in subsection two above.

(b) Non-domestic wastewater. For disposal of wastewaters other than domestic wastewater, the isolation distances required shall be determined from a hydrogeological study in accordance with Section 15(b)of Chapter III.

(c) Location. Absorption systems shall not be located beneath buildings, parking lots, roadways or other similarly compacted areas.

Section 5. Site Suitability.

(a) Soil exploration. Soil exploration to a minimum depth of four feet below the bottom of the proposed absorption system shall be made to provide information on subsoil conditions.

(b) Soil evaluation.

(i) No less than three percolation tests shall be run in the proposed absorption system location. The percolation tests shall be performed in accordance with Appendix A of this part. The type of soil encountered at the percolation test location shall be specified.

(ii) An evaluation of the soil texture by a person experienced in soils classification, may be used to estimate the percolation rate, but at least one percolation test shall be performed.

(c) Groundwater protection and bedrock or impermeable soil separation.

(i) For single family homes, the depth to bedrock or impermeable soil must be at least four feet from the bottom of the absorption system stone and the natural ground surface. The depth to seasonally high groundwater must be at least four feet from the bottom of the absorption system stone and at least two feet from the natural ground surface.

(ii) For all systems other than single family homes up to 2000 gallons per day, the depth to bedrock or impermeable soil must be at least four feet from the natural ground surface. The depth to seasonally high groundwater must be at least four feet from the bottom of the absorption system stone and at least two feet from the natural ground surface. Also, a minimum of three feet of unsaturated soil shall be maintained between the bottom of the absorption system stone and the estimated groundwater mound imposed on the seasonally high groundwater table. The height of the groundwater mound may be estimated from Figures 1 through 6. The average daily flow should be used and may be estimated as 0.6 times the flow determined from Table 1.

(iii) For all systems larger than 2000 gallons per day, a minimum of three feet of unsaturated soil shall be maintained between the bottom of the absorption system stone and the estimated groundwater mound imposed on the seasonally high groundwater table. The maximum height of the groundwater mound shall be estimated by the design engineer.

(d) Excessively permeable soils. Soils having a percolation rate of one minute per inch or less are unsuitable for subsurface sewage disposal. These soils may be used if a six inch layer of soil having a percolation rate of five minutes per inch or greater is placed between the leach system stone and the existing soil. The soil absorption system shall be sized based on the percolation rate of the fill material.

(e) Sloping ground installations.

(i) Absorption systems shall not be located in an area where the natural slope is steeper than stated below. The following are the maximum permissible slopes on which an absorption system may be constructed.

Percolation Rate	Maximum Slope*

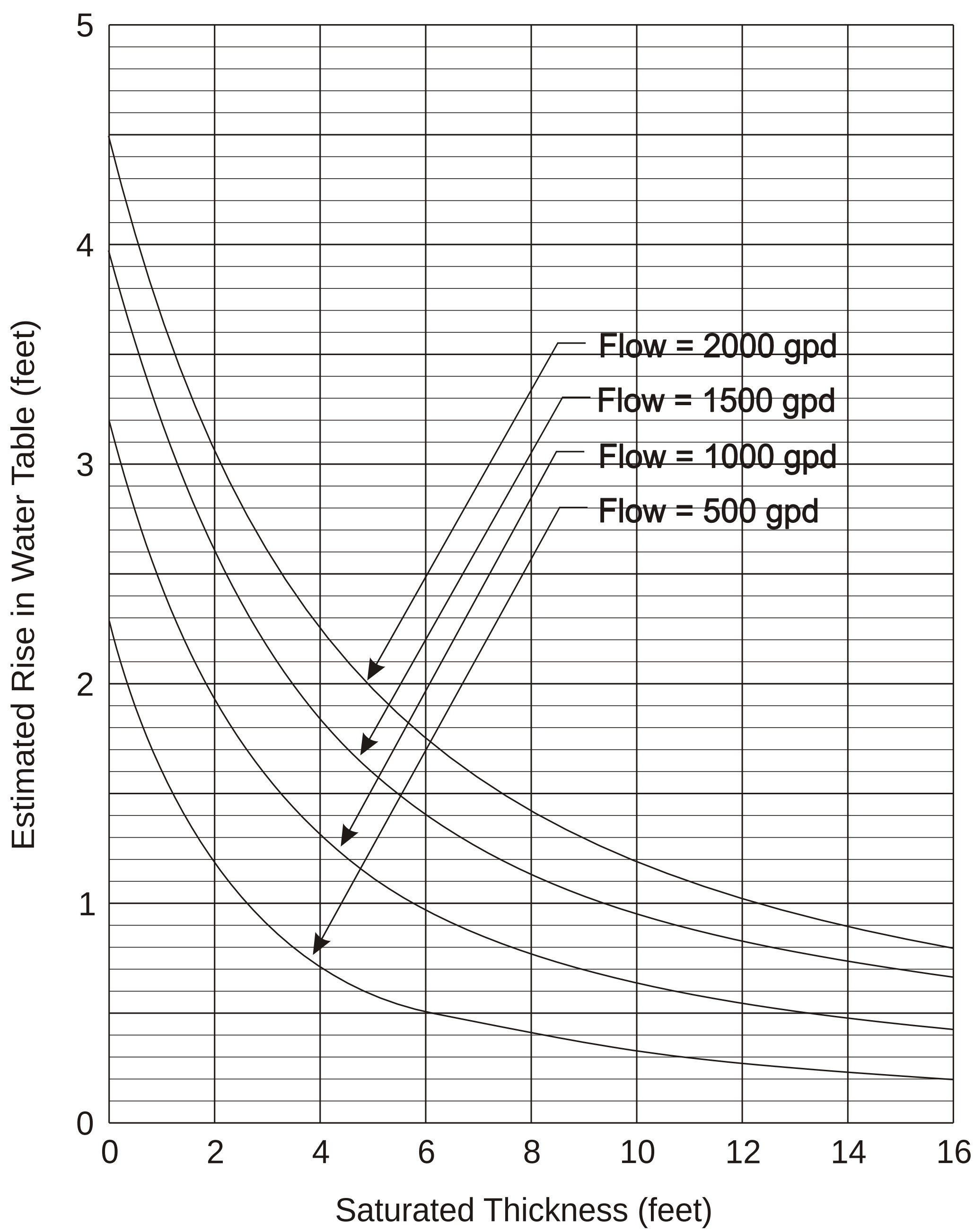
(min/inch)	
Faster than 5	25%
6-45	20%
46-60	15%

* Flatter slopes may be required where the effluent may surface downslope.

(ii) All absorption systems must be located at least 15 feet from the top of any break in slope which exceeds the maximum allowed in subsection (i) above.

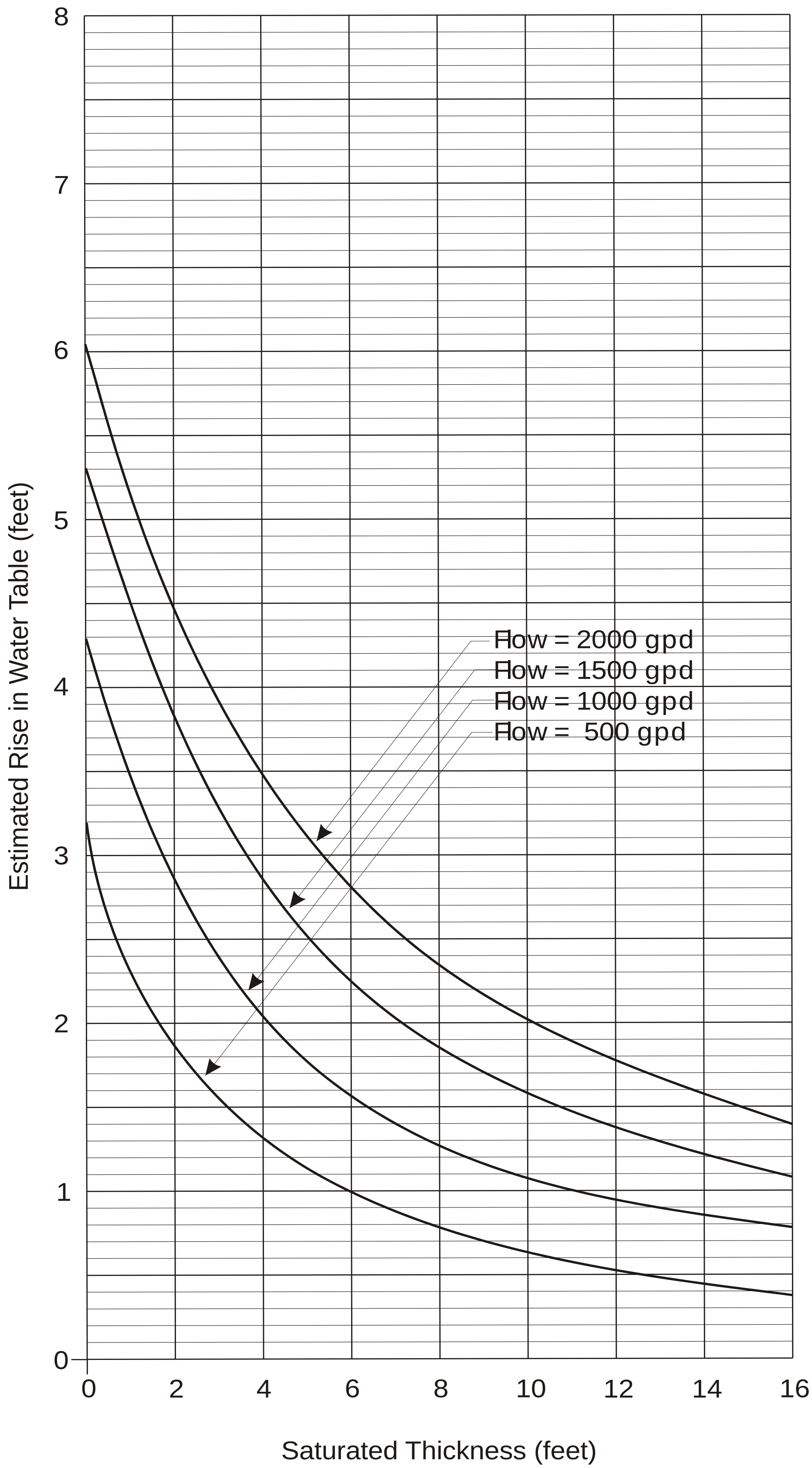
“Saturated Thickness”: Distance between the seasonally high groundwater table and the under-lying impervious layer, such as: clay, bedrock, or soils with a significantly lower permeability.

“Estimated Rise in Water Table”: The estimated distance the water table will rise at the center of the absorption system above the initial water table when the indicated flow is applied daily.



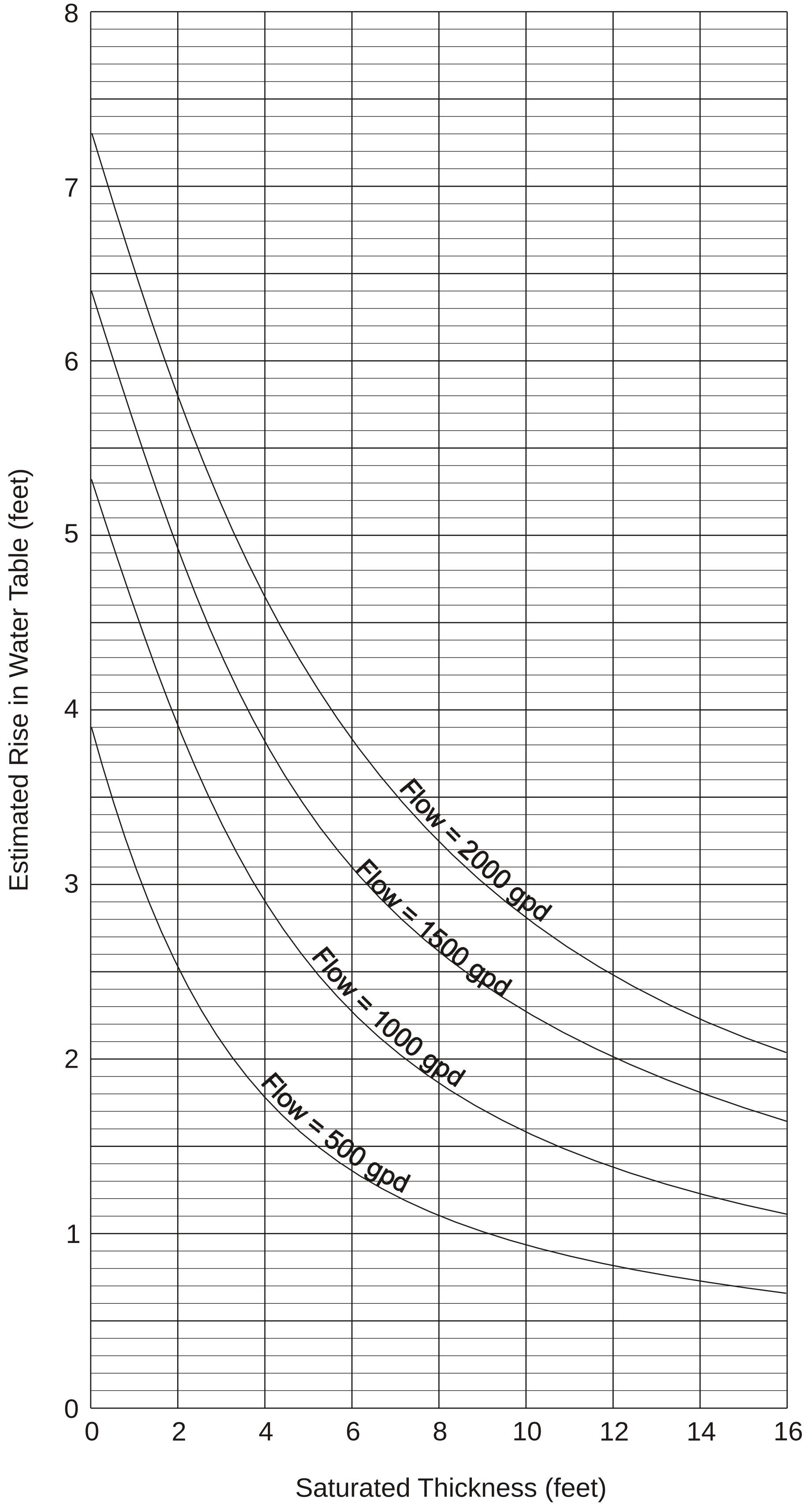
BASED ON A SOIL PERCOLATION RATE = 10 min/inch

FIGURE 1



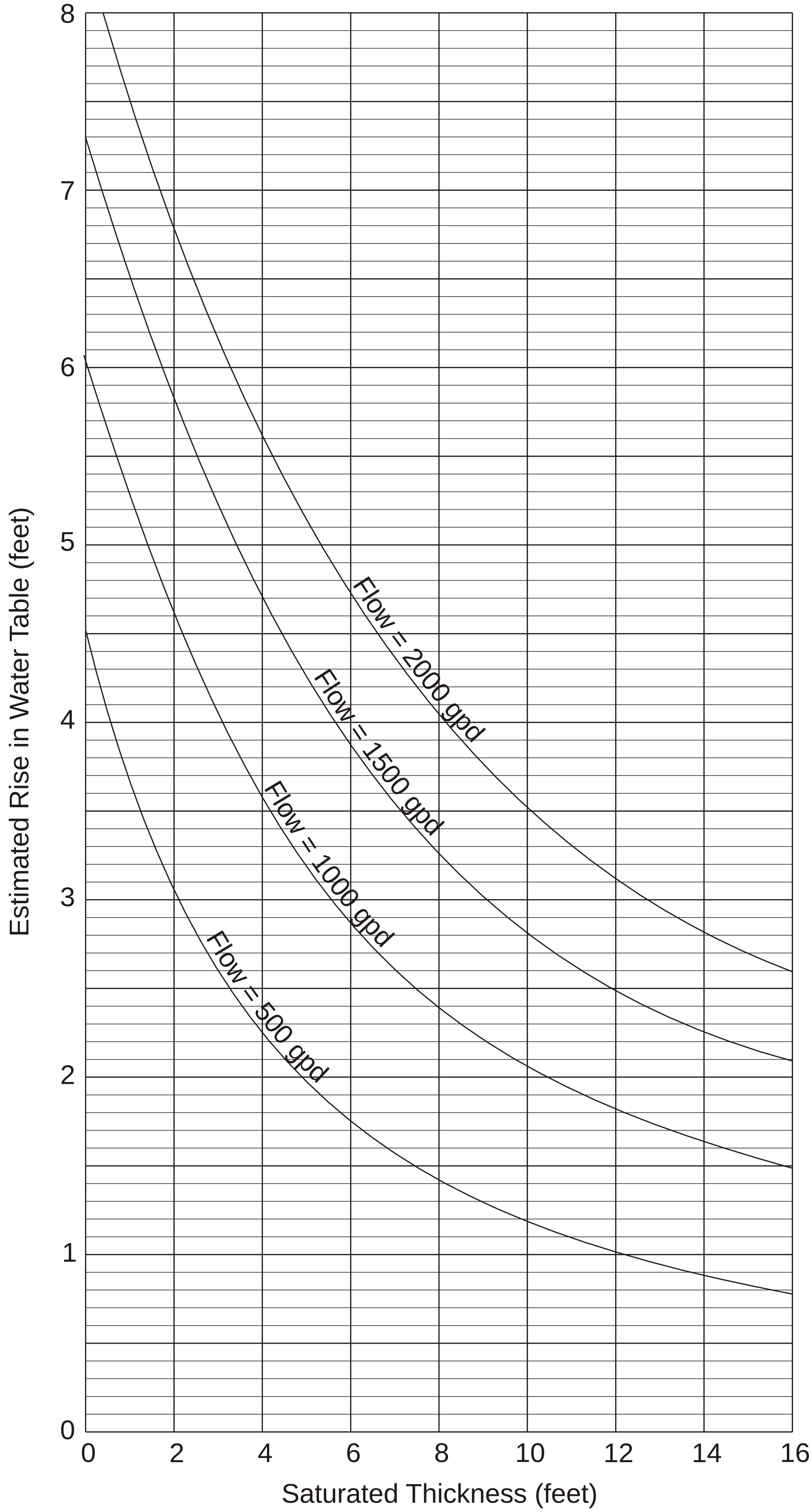
BASED ON A SOIL PERCOLATION RATE = 20 min/inch

FIGURE 2



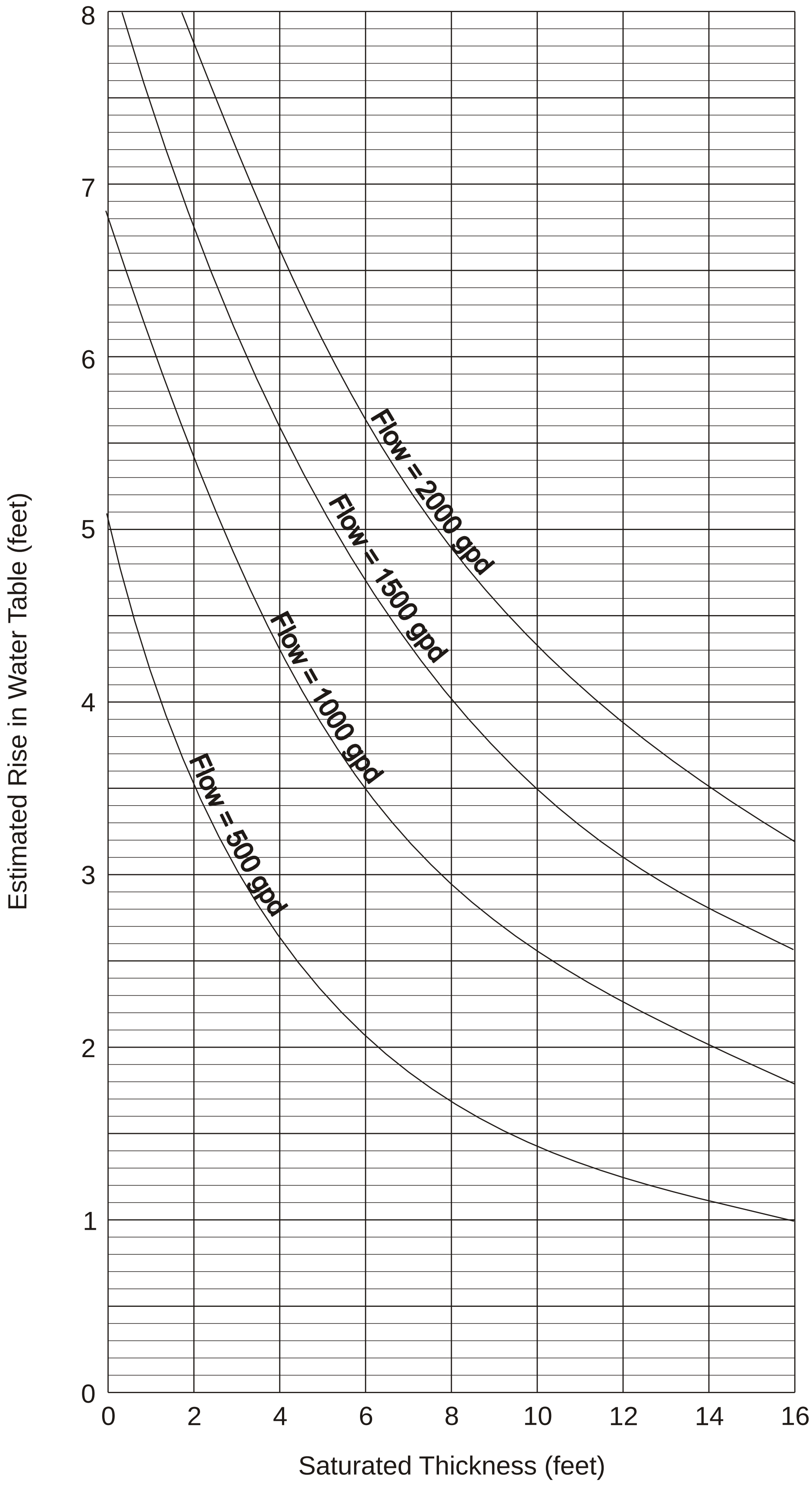
BASED ON A SOIL PERCOLATION RATE = 30 min/inch

FIGURE 3



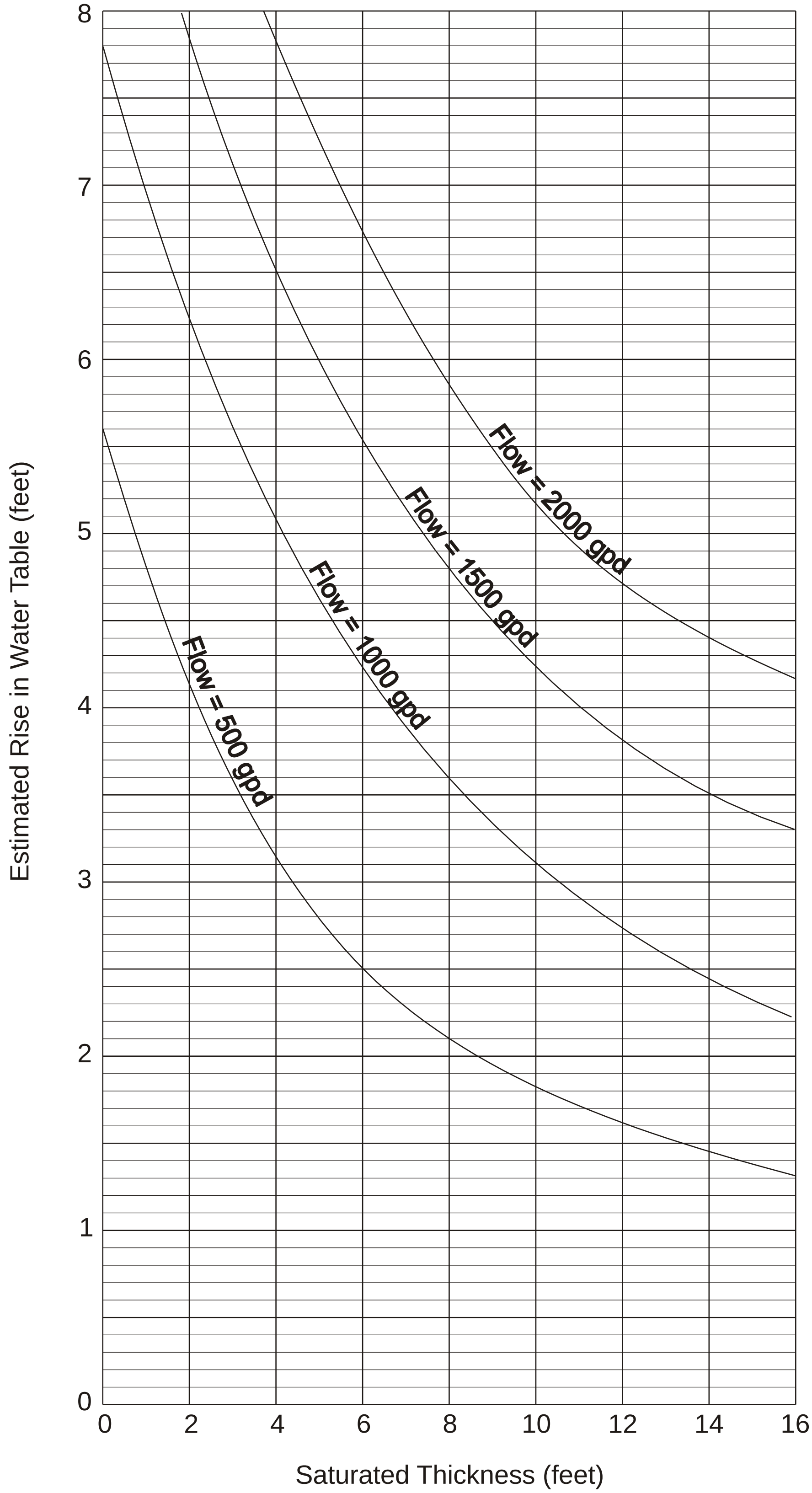
BASED ON A SOIL PERCOLATION RATE = 40 min/inch

FIGURE 4



BASED ON A SOIL PERCOLATION RATE = 50 min/inch

FIGURE 5



BASED ON A SOIL PERCOLATION RATE = 60 min/inch

FIGURE 6

Section 6. Building Sewer Pipes.

(a) Building drain pipe. All building drain pipe shall comply with the standards published in the Uniform Plumbing Code-1982 or other locally approved, nationally recognized plumbing code.

(b) Building sewer pipe. All building sewers shall be installed in accordance with the Uniform Plumbing Code - 1982 or other locally approved nationally recognized plumbing code. In the absence of an approved plumbing code, the building sewer shall comply with the following:

(i) Material. Polyvinyl Chloride (PVC), Acrylonitrile - Butadiene - Styrene (ABS), cast or ductile iron, portland cement, or vitrified clay pipe shall be used for sewer pipes. The septic tank inlet and outlet pipes shall be cast or ductile iron or schedule 40 PVC and shall extend past the septic tank excavation to solid ground.

(ii) Size. Building sewer pipes shall not be smaller than four inches in diameter. They shall be sized to handle the peak hourly flow from the building.

(iii) Slope. Building sewer pipes should be laid at a minimum slope of 1/4 inch per foot, but shall not be flatter than 1/8 inch per foot.

(iv) Alignment. Building sewer pipes should be laid in a straight line. Any single change or cumulative change of alignment of 22 ½ degrees or greater shall be served by a cleanout.

(v) Cleanouts. Cleanouts shall be provided every 100 feet maximum.

(vi) Backfilling. All sewer piping shall be laid on a firm bed throughout its entire length. It shall be protected from damage due to rocks, hard lumps of soil, debris and the like. Special care shall be utilized to prevent lateral movement or ovalation during backfill. The backfill material shall be compacted to a density at least equivalent to the trench walls. Backfill over the pipe shall be of sufficient depth to protect the pipe from expected traffic loads and the wastewater from freezing.

Section 7. Soil Absorption System Sizing.

(a) Trench, bed and seepage pit systems. The total infiltrative surface of a soil absorption system shall be calculated based on the flow rate as determined by the criteria stated in Section 3 and with the allowable loading rate as determined by using Figure 7. The total infiltrative surface is the sum of the sidewall and bottom areas of the absorption system below the invert of the distribution pipe.

(b) Soils with a percolation rate of 60 minutes per inch or greater are unacceptable for standard absorption systems.

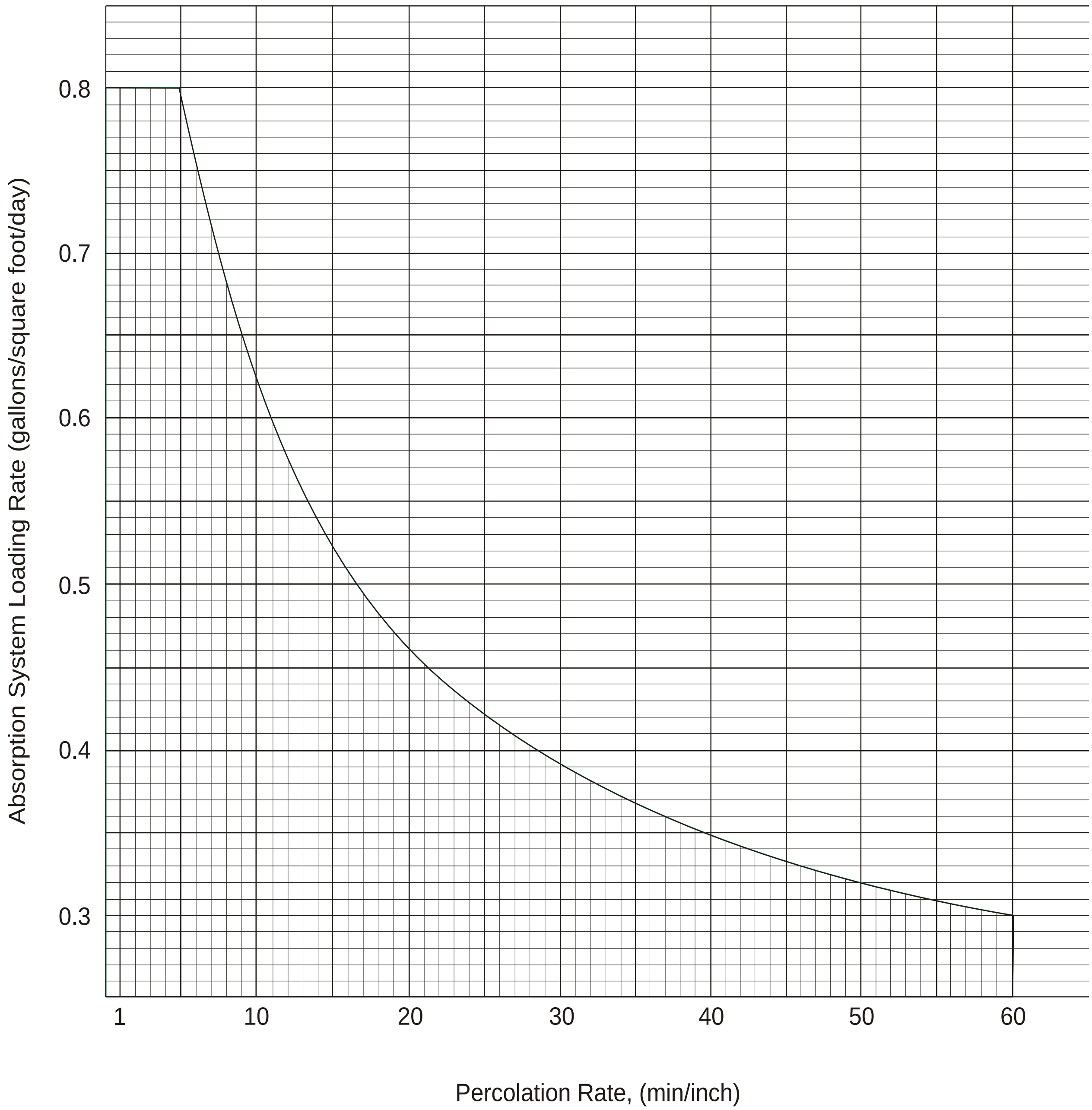

0.8
0.7
0.6
0.5
0.4
0.3
Absorption System Loading Rate (gallons/square foot/day)
1
10
20
30
40
50
60
Percolation Rate, (min/inch)

FIGURE 7

Section 8. Pretreatment.

(a) Septic tanks.

(i) Material. The septic tank shall be constructed of durable material not subject to excessive corrosion or decay and structurally capable of supporting the loads to which it will be subjected. The tank shall be water-tight.

(ii) Size.

(A) Residential units serving no more than 4 families. Minimum liquid volume of septic tanks shall be 1000 gallons for residences through four bedroom capacity. Additional capacity of 250 gallons per bedroom shall be provided for each bedroom over four.

(B) Commercial/industrial units. Septic tanks shall have a minimum effective liquid capacity sufficient to provide at least 36 hour retention at peak flow or 1,000 gallons, whichever is greater.

(iii) Configuration.

(A) The septic tank shall have a length to width ratio of no less than two to one, or be so partitioned as to provide protection against short circuiting of flow. The water depth shall be no less than four feet nor greater than six feet. The septic tank inlet shall be provided with a tee or baffle. The outlet shall be provided with a tee or baffle that extends into the middle third of the water depth to prevent floating or settled solids from carrying over into the disposal field or bed. The inlet pipe shall be at least three inches higher than the outlet pipe.

(B) If the septic tank is partitioned, the volume of the first compartment must be at least 50 percent of the total required volume. The partition shall allow venting of the tank.

(C) The outlet elevation shall be designed to provide a distance of 20 percent of the liquid depth between the top of the liquid and the bottom of the septic tank cover for scum storage.

(iv) Access. A manway access shall be provided to each compartment of the septic tank for inspection and cleaning. The manway access shall have a minimum opening of 20 inches in the least dimension. Both inlet and outlet devices shall be accessible. A cleanout having a minimum diameter of six inches shall be provided in each tank compartment and shall extend to the ground surface and be capped.

(v) Installation. The septic tank shall be placed on a level grade and a firm bedding to prevent settling.

(b) Aerobic units.

(i) Residential units serving no more than four dwelling units. Aerobic treatment units can be used as a pretreatment device for a single residential unit serving no more than four families provided the unit carries the seal of testing and approval from the National Sanitation Foundation (NSF) for the NSF Standard No. 40 - 1978. The unit shall be sized based on the flow quantities stated in Section 3. No reduction in the sizing of soil absorption systems or the final treatment systems shall be permitted if an aerobic unit is used instead of a septic tank.

(ii) Commercial and residential units serving more than four families. Aerobic units treating wastewater generated from other than a single residential unit serving four families or less shall meet the design requirements of Part B or Part C of Chapter XI.

(c) Interceptors - grease, oil, silt and sand.

(i) When required. Liquid wastes containing grease, oil, or silt and sand shall provide an interceptor before the septic tank. Waste streams from residential living units are exempt from this requirement.

(ii) Material. The interceptor shall meet the material requirements of Section 8 (a)(i).

(iii) Sizing. Interceptors shall be sized using one of the following formulas:

Commercial kitchens (grease, garbage)

Number of meals per peak hour	X	Waste* Flow rate	X	Retention** time	X	Storage*** factor	X	Interceptor size(liquid capacity)

Car wash (sand, silt, oil)

Total washer equipment flow rate (GPM)	X	60	X	Retention time	X	Storage factor	=	Interceptor size (liquid capacity)

Laundries (grease, lint, silt)

Number of machines X 2 cycles per hour	X	Waste flow rate	X	Retention time	X	Storage factor	=	Interceptor size (liquid capacity

* Waste flow rate - see Table 1.

** Retention Times -

Commercial kitchen waste:

Dishwasher and/or disposal 2.5 hours

Single service kitchen:	
Single serving with disposal	1.5 hours
Car washers	2.0 hours
Laundries	2.0 hours

***Storage Factors -

Fully equipped commercial kitchen	8 hr. operation: 1
	16 hr. operation: 2
	24 hr. operation: 3
Single service kitchen	1.5
Carwashers	self-serve: 1.5
	employee operated: 2
Laundries	1.5 (allows for rock filter)

(iv) Configuration. Interceptors shall have a minimum of two compartments with the first compartment having at least 50 percent of the total required volume. Each compartment shall be vented.

(v) Access. The access shall meet the requirements of Section 8(a)(iv).

(vi) Location. Interceptors shall be located so that they are easily accessible for inspection, cleaning, and removal of the collected wastes. Interceptors shall be placed as close as practical to the fixture it serves. The wastewater from fixtures not producing grease, oil, or sand and silt shall bypass the interceptor.

Section 9. Dosing Systems Following Septic Tanks.

(a) Pumping systems for flow up to 2000 gallons per day.

(i) Pump tank. Where only one pump is provided, the pump tank shall have the minimum volume as required in Table 4 below. The tank shall comply with the material requirements for septic tanks. The pump tank shall be vented. The vent shall have a downward turn that terminates at least 12 inches above ground and be provided with a screen. The pump tank shall have an access manhole provided with an opening at least 20 inches in least dimension.

Table 4

Pump Tank
Volume (gallons) Required Between

AVERAGE FLOWS (gallons per day)	"OFF" & "ON" SWITCH	"ON" & "ALARM" SWITCH	"ALARM" SWITCH & TANK INLET	RECOMMENDED PUMP CAPACITY (gpm)
0-499	100	50	200	10
500-999	200	100	400	20
1000-1499	300	100	600	30
1500-2000	400	100	800	40

(ii) Pumps.

(A) Sizing. The pump shall have a flow rate of at least ten gallons per minute when installed. The pressure loss (feet of head) of the system can be calculated by adding: the elevation difference between the discharge outlet at the soil absorption system and the low water level in the pump tank; and the friction losses incurred in the pressure transfer pipe and distribution piping. Table 5 may be used to estimate the head loss of the pipe when pumping ten gallons per minute and using plastic pipe.

Table 5

Diameter (inches)	Head Loss per 100 feet of pipe (in feet)
1	12
1¼	4
1½	2

(B) Installation/removal. The pump shall be installed in the tank so that it can be removed without entering the tank. This can be accomplished by (1) looping the pipe up near the access manhole with a pipe union provided at the top of the loop, (2) using a quick disconnect sliding coupler, or (3) using a pitless adapter. Chains, cable, or piping can be used to lift the pump out of the tank if designed for this loading. Setting the pump on an 8-inch block minimizes the transfer of any solids that may enter the pump tank.

(C) Electrical controls. The electrical control system for the wastewater pump shall consist of a “pump off” switch, a “pump on” switch, and a “high water alarm” switch which shall be located to provide the necessary volumes as stated in Table 4. All electrical controls (pump electrical cord, switches, etc.) shall comply with the National Electrical Code - 1981, Class 1, Group D, Division 1 locations. All openings around the cables or cords entering the tank shall be sealed.

(iii) Pressure transfer pipe. The pressure transfer piping between the tank and the leach system shall be designed to drain after each pump cycle to prevent freezing. This can be accomplished by either eliminating the check valve at the pump or by providing a weep hole in the pipe in the tank. If the pipe is long, the tank shall be enlarged by the volume of the pipe To accommodate the volume of liquid drained from the pipe.

(b) Syphons. Where automatic syphons are used, they shall be designed to empty the syphon tank in less than 20 minutes. The syphon tank shall be sized in accordance with Section 9(a)(i) above.

(c) For all systems exceeding 2000 gallons per day. The pumping system shall comply with the standards of Part B of Chapter XI.

Section 10. Subsurface Treatment and Disposal Systems.

(a) General requirements.

(i) Replacement area. An area shall be designated and shown on the plans for future installation of a replacement absorption system. If a trench system is used, the replacement area may include the area between the trenches if sufficient spacing has been provided. At least three feet of undisturbed soil shall remain between the existing and replacement trench side walls.

(ii) Protection. Effort shall be made to protect the natural absorptive properties of the soil. Soil absorption systems shall not be installed during adverse weather or soil conditions. Rain, severely cold temperatures, or excessively moist soils are considered adverse weather or soil conditions. All smeared or compacted surfaces shall be restored to their original infiltrative conditions prior to placement of the stone.

(iii) Runoff. Surface runoff shall be diverted around or away from all soil absorption systems.

(iv) Stone. Soil absorption system stone shall be sized between 1/2-inch to 2 1/2inches. At least two inches of stone shall be placed over the distribution pipe, and at least six inches of stone shall be placed under and beside the distribution piping. A minimum of 12 inches of stone shall be placed between a seepage pit wall and structural liner. The stone shall be free from sand, silt, and clay.

(v) Gravity pipe. All plastic gravity absorption system pipes shall have a minimum diameter of four inches and shall conform to ASTM standard D2729. Piping in all horizontally constructed absorption systems shall be layed with the holes centered around the vertical axis at the bottom of the pipe. All field tile pipe shall be spaced 1/4 inch apart. Piping in horizontally constructed absorption systems shall have a maximum slope of three inches per 100 feet.

(vi) Pressure pipe. All pressure distribution piping shall be designed to withstand the anticipated pressures with a safety factor of two, provide uniform application of the wastewater, and have non-clogging orifices.

(vii) Distribution box. If a distribution box is used, it shall be installed to provide uniform distribution of the wastewater and shall be placed so that it will not be subject to frost heave.

(viii) Stone cover. A suitable cover such as untreated building paper, filter cloth, or straw shall be placed over the stone prior to backfilling the system.

(ix) Earth cover. A minimum of 12 inches of earth shall be placed over the absorption system stone. The earth shall be permeable soil that will allow aeration of the system and will support the growth of grass. The earth cover shall be graded to insure that water will not pond on the surface.

(x) Levelness. The bottom of soil absorption systems and each segment of a sidehill system shall be level.

(b) Special requirements for seepage pits. If a structural lining is needed to support stone in a seepage pit, it shall be constructed of durable material not subject to excessive corrosion or decay and structurally capable of supporting the loads to which it will be subjected. The lining shall be perforated or otherwise designed to allow the passage of wastewater. Seepage pits shall be separated by a minimum distance equal to 3 times their diameter.

(c) Special requirements for mounded systems.

(i) Sizing.

(A) The infiltrative surface between the stone and the fill material shall be sized based on the flow rate as determined by Section 3 and the allowable loading rate as determined by Figure 7 of Section 7 for the percolation rate of the fill. The total infiltrative surface is the sum of the sidewall and bottom areas of the stone - soil interface below the distribution pipe.

(B) The interface area between the fill soil and the native soil shall be sized based on the infiltration rate of the native soil as determined by Figure 7 of Section 38 but shall not be smaller than a system designed to the requirements of subsection (ii) below.

(ii) Grade. The finished grade shall extend at least three feet horizontally beyond the stone and then be sloped to the parent soil at a grade no steeper than four horizontal to one vertical.

(iii) Fill soil. The fill soil that is placed between the native soil and the stone shall have a minimum percolation rate of five minutes per inch. Topsoil shall be placed over the mound to promote vegetative cover.

(iv) Preparation. All trees, roots, and other organic matter shall be removed from the area to be occupied by the mound.

(d) Special requirements for trench systems. A minimum separation of three feet or a horizontal distance equal to 1.25 times the vertical depth of the trenches, whichever is greater, of undisturbed soil shall be maintained between adjacent trench sidewalls.

(e) Special requirements for serial sidehill trench or bed systems.

(i) Separation. A minimum of three feet of undisturbed soil shall be maintained between adjacent trench or bed side walls.

(ii) Levelness. The bottom of each serial trench or bed system shall be level.

(iii) Overflow. The overflow pipe between serial leach systems shall be set no higher than the mid-point of the upstream distribution pipe. The overflow pipe shall not be perforated.

(f) Special requirement for bed systems. The distribution system piping shall be spaced no more than 10 feet apart.

Section 11. Evapotranspiration Beds.

(a) Sizing. The area of evapotranspiration beds shall be determined using the following formula:

$$\text{AREA} = 586\left[\frac{Q}{PET - P}\right]$$

where:

Area = Area of the evapotranspiration bed at the ground surface in square feet

Q = Average daily sewage flow, gallons per day, (0.6 times the flow determined from Table 1)

PET = Potential evapotranspiration rate in inches per year

P = Annual precipitation rate in inches per year.

(b) Construction.

(i) If an impervious barrier is necessary for the protection of groundwater it shall be installed between the evapotranspiration bed and the native soil. It shall be a polyvinyl chloride sheet with a minimum thickness of 20 mils or equivalent. A 3 inch layer of sand shall be placed under and over the liner.

(ii) The bottom 12 inches of the bed shall be filled with clean stone 1/2 - 2 1/2 inches in diameter.

(iii) Perforated pipe complying with Section 10(a)(v) shall be placed in the stone.

(iv) Four inches of pea gravel (less than 1/4-inch in diameter) or durable filter cloth shall be placed over the stone.

(v) A 24-inch uniform sand layer in the size range of D50 (0.10mm) shall be placed on top of the pea gravel or filter cloth.

(vi) A six inch layer of sandy topsoil shall be placed on top of the evapotranspiration bed.

(vii) The bed should be vegetated with small shrubs and/or grasses such as fescue, brome, or alfalfa.

(viii) The evapotranspiration bed shall be placed at a depth sufficient to prevent surcharging of the septic tank.

Section 12. Holding Tanks.

(a) Uses. Holding tanks shall not be used for residential systems when other alternative systems are available, except on a temporary, seasonal or intermittent basis, or when used to correct a failed subsurface disposal system when other alternatives are unavailable. Use of holding tanks for new construction is prohibited. Where holding tanks are allowed, they shall be sized on the basis of seven days storage at the flow rate determined from Table 1.

(b) Acceptance. A letter of verification from the local receiving agency, denoting acceptance of the wastewater generated shall be submitted with the plans.

(c) Location. The location and construction of holding tanks shall meet the requirements for septic tanks in Sections 4(a)(i) and Section 8(a)(i) respectively.

(d) Vent. Each holding tank shall be provided with a two inch minimum diameter vent ending in a return elbow above final grade. The vent shall terminate at least 30 feet from any door, window, or fresh air inlet. The vent should be screened.

(e) Alarm. All holding tanks shall be equipped with a high water level alarm. The device shall be an audible alarm or an indoor illuminated alarm. The alarm level shall be placed at 3/4 the depth of the tank.

(f) Pumpout. A six inch pump out pipe which extends to the surface shall be provided. It shall be capped at all times.

Section 13. Privies.

(a) General requirements.

(i) All privies shall be designed and constructed to prevent access by flies and rodents.

(ii) If indoor plumbing is installed, the grey water disposal method shall meet the requirements of Section 3 through 12. The minimum design flow for grey water shall be obtained from Table 1 with a reduction of 33 percent allowed for the elimination of black wastes.

(iii) The privy shall consist of a vault and an outhouse building.

(b) Isolation. The isolation requirements for privies shall comply with Section 4(a)(i) for absorption systems.

(c) Soil exploration. Soil exploration to a minimum depth of 4 feet below the bottom of the proposed vault shall be made to provide information on subsoil condition.

(d) Groundwater and bedrock separation.

(i) The depth to seasonally high groundwater and bedrock or impermeable soil shall be at least four feet from the bottom of an unlined vault.

(ii) The depth to seasonally high groundwater from the bottom of a water tight vault shall be sufficient to prevent floatation of the empty vault.

(e) Sizing. Vaults shall have a minimum capacity of 500 gallons per riser and shall be a minimum of 4.5 feet deep.

(f) Construction.

(i) The vault shall be constructed and installed to resist breakage and damage imposed by frost heave, uplift pressures from a fluctuating water table, loads imposed by the outhouse building and soils, and damage that may be caused by vandalism or rough cleaning procedures. The vault shall be constructed to prevent access by flies.

(ii) Materials used for vault construction shall be resistant to alkali attack, hydrogen sulfide gas, and other corrosive elements associated with decomposing waste.

(iii) A clean-out manhole shall be installed and shall have a minimum opening of 20 inches in the least dimension. The manhole shall be located outside of the outhouse building and be equipped with a tightfitting secure cover.

(iv) The vault shall be ventilated to a point outside and above the outhouse building. The outhouse building shall have a set of vents installed near the floor on two opposite sides of the building and a roof vent that has a rain cap. All vents shall be screened.

(g) Vault additives. No chemical or biological additive shall be placed in the vault that may adversely effect the operation of a sewage treatment facility where the vault waste will ultimately be disposed or that may adversely impact the quality of the groundwater as specified in Chapter VIII, "Quality Standards for Groundwater of Wyoming".

Section 14. Chemical Toilets.

(a) General requirements. Chemical toilets shall only be used in the containment of body wastes. These requirements apply only to the use of chemical toilets for permanent structures.

(b) Greywater. If indoor plumbing is installed, a separate greywater disposal is required and shall meet the requirements of Section 3 through 12. The minimum design flows for greywater shall be obtained from Table 1 with a reduction of 33 percent allowed for the elimination of blackwater wastes.

(c) Disposal. All chemical toilet wastes shall be disposed of at an approved wastewater facility. A letter of verification from the receiving agency, denoting acceptance of the wastewater generated shall be submitted with the plans. These wastes shall not be discharged into a soil absorption system.

(d) Construction. Chemical toilets shall be constructed and installed to resist breakage or damage from routine usage. Outdoor chemical toilets shall be adequately stabilized and secured to prevent overturning. Materials used shall be resistant to the sewage wastes and the chemicals encountered. The holding compartment of the toilet shall be constructed to prevent accessibility to the public and to disease transmitting vectors.

(e) Additives. No chemical or biological additive shall be placed in the toilet that may adversely affect the operation of a sewage treatment facility where the toilet waste will ultimately be disposed or that may adversely impact the quality of the groundwater as specified in Chapter VIII, "Quality Standards for Groundwater of Wyoming."

Section 15. Small Non-discharging Waste Stabilization Ponds.

(a) General requirements.

(i) The use of this section for small nondischarging waste stabilization ponds applies only to those systems defined as small wastewater systems. All other treatment systems shall meet the requirements of Part B or Part C of Chapter XI as applicable.

(ii) Non-discharging waste stabilization ponds shall only be constructed in soils where the percolation rate exceeds 60 minutes per inch and the soil is at least 1 foot thick on both the sides and bottom of the pond. If the 60 minute per inch percolation rate cannot be obtained, a sufficient clay shall be incorporated into the top foot of soil until the 60 minute per inch percolation rate is reached. An impermeable artificial liner of 20 mils in thickness may be substituted.

(b) Isolation. The isolation distances shall meet the requirements for absorption systems as specified in Section 4(a)(i).

(c) Groundwater protection and bedrock or impermeable soil separation.

(i) For single family homes, the depth to seasonally high groundwater shall be at least four feet from the bottom of pond.

(ii) For all "small wastewater systems" other than single family homes, a minimum of three feet of unsaturated soil shall be maintained between the bottom of the pond and the estimated groundwater mound imposed on the seasonally high groundwater table. The height of the groundwater mound can be estimated from Figures 1-6, Section 5 in conjunction with the average daily sewage flow.

(d) Sizing.

(i) The area of the lagoon shall be calculated based on the following formula:

$$A = \frac{584 \times Q}{(365 \times S) + (E - P)} \times 1.3$$

A = Area of the lagoon at the 5 foot water level in square feet

Q = Average daily sewage flow, gallons per day, (0.6 times the flow determined from Table 1)

S = Soil permeability in inches per day "S" cannot be greater than 0.25 inches per day "S" shall equal zero for an artificial liner or for bedrock

E = Annual evaporation rate in inches per year

P = Annual precipitation rate in inches per year

(ii) A minimum water level of at least two feet shall be maintained in the pond at all times, including start-up.

(iii) A minimum free board of two feet shall be provided between the lowest embankment berm and the maximum water level. The maximum water level shall not be less than five feet.

(e) Construction requirements.

(i) The slopes of the inside dikes shall not be steeper than three horizontal to one vertical nor flatter than four horizontal to one vertical. The slopes of the outside dikes shall not be steeper than three horizontal to one vertical and shall not allow surface runoff to enter the pond.

(ii) All organic material and debris shall be removed from the pond site prior to construction.

(iii) All fill material shall consist of impervious material that is well compacted and free of rocks, frozen soil, or other large material.

(iv) The minimum top width of the dike shall be eight feet.

Section 16. Commercial/Industrial Wastes.

(a) General requirements. Those requirements listed in Section 1 through 12 and 15 that are applicable to the specific commercial/industrial wastewater or combination of commercial/industrial and domestic wastewater shall apply to this section.

(b) Hydrogeologic investigation. If the wastewater is classified as, or determined to be hazardous and/or toxic and/or contain petroleum products, the applicant shall demonstrate to the administrator that any discharge or seepage from the wastewater facility will not cause a violation of the surface and/or groundwaters of the state in accordance with Chapter I, "Quality Standards for Wyoming Surface Waters" and Chapter VIII, "Quality Standards for Wyoming Groundwaters." Due to the wide variety of wastes, wastewater and site conditions, the latest available scientific information shall be used to demonstrate that violation will not occur.

(c) Impact. If the impact of the hazardous and/or toxic substance and/or petroleum products cannot be determined and mitigated, disposal of the wastewater using a soil absorption system shall be prohibited.

(d) Pre-treatment. Pre-treatment of the wastewater to remove the hazardous and/or toxic substance(s) and/or petroleum products shall be required prior to disposal if deemed necessary to protect the groundwater of the state.

APPENDIX A

Percolation Test Procedure

(a) Location. The percolation test holes shall be spaced uniformly over the proposed absorption field site. A minimum of three test holes are required.

(b) Preparation. A 4 inch to 12 inch hole shall be dug or bored to the proposed depth of the absorption field. The walls shall be vertical. To expose a natural soil surface, the sides and bottom shall be scraped with a sharp pointed instrument and the loose material shall be removed from the hole. Coarse sand or gravel shall be placed in the bottom of the hole to prevent it from scouring and sealing.

(c) Presoaking. The purpose of presoaking is to have the water conditions in the soil reach a stable condition similar to that which exists during continual wastewater application. The minimum time of presoaking varies with soil conditions but must be sufficiently long so that the water seeps away at a constant rate. The following presoaking instructions are usually sufficient to obtain a constant rate.

(i) In sandy soils, place 12 inches of water in the hole and allow it to seep away. Fill the hole again with 12 inches of water and if the water seeps away in ten minutes or less, it indicates that the soil is excessively permeable and requirements in Section 5(d) of these regulations shall be followed. If the water remains after ten minutes, additional saturation is necessary. Refer to Appendix A(c)(ii) below.

(ii) In other soils, maintain 12 inches of water in the hole for at least four hours. After the four hours of water contact, allow the soil to swell for 12 hours before starting the percolation rate measurement as stated in Appendix A (d) below.

(d) Percolation rate measurement. The water level should be adjusted to six inches above the gravel initially and after each time interval measurement when necessary.

(i) In other soils, establish a fixed reference point and measure the drop in water level at constant intervals. The water level drop should be measured to the nearest 1/8 of an inch. The test may be terminated when the water drop is consistent for three consecutive measurements.

(ii) The percolation rate for each hole is calculated as follows:

$$\frac{\text{Time Interval (Minutes)}}{\text{Final Water Level Drop (inches)}} = \text{Percolation Rate (minutes/inch)}$$

If only three to five percolation tests are performed, the design percolation rate for the absorption system is the slowest rate from all the holes tested. If six or more percolation tests are performed, the design percolation rate for the absorption system is the average of all the holes tested as determined by the above formula.

Chapter 26

WELL CONSTRUCTION STANDARDS

Section 1. <u>General Information</u>. This part contains minimum standards for design and construction and for the abandonment of wells covered by this part. The applicant or permittee shall provide for design and construction to protect groundwaters of the state in accordance with the water quality standards contained in Chapter VIII, Water Quality Rules and Regulations.

All American Society for Testing of Materials (ASTM), American Water Works Association (AWWA) and American Petroleum Institute (API) specifications listed are intended to mean the latest revision.

Section 2. <u>Definitions Specific to Chapter 26</u>.

(a) "Abandoned well" means a well regulated under this part for which use has been discontinued for more than one year and the owner does not desire to maintain this well for future use; or its use has been permanently discontinued or is in such a state of disrepair that it cannot be used for its intended purpose.

(b) "Annular space" means the space between the well casing and the wall of the drilled hole or between two well casings.

(c) "Artificial recharge well" means well constructed to introduce water into the ground as a means of replenishing groundwater basins.

(d) "Commercial, municipal and industrial waste well" means well constructed to dispose of unusable waste or contaminated water resulting from a commercial activity, municipal collection, storage or treatment facility or an industrial activity.

(e) "Conductor casing" means a tubular retaining structure installed in the upper portion of a well between the wall of the drilled hole and the inner well casing.

(f) "Confining formation" means an impermeable bed or a bed of distinctly lower permeability than the adjacent material in which groundwater may be moving.

(g) "Destroyed well" means a well that has been properly filled so that it cannot produce water nor act as a vertical conduit for the movement of groundwater.

(h) "Geothermal well" means a well constructed to extract or return water to the ground after it has been used for heating or cooling purposes.

(i) "Key seating" means a stuck drill pipe or casing caused by an abrupt change in direction or dogleg in the drilled hole.

(j) “Miscellaneous discharge well” means a well constructed for a special process discharge of limited time and scope.

(k) “Observation and monitor well” means a well constructed for the purpose of observing or monitoring groundwater conditions.

(l) “Production casing” means a tubular retaining structure installed in the upper portion of a well between the wall of the drilled hole and the inner well casing.

(m) “Sounding tube” means the access to the well casing that allows the water level in the well to be periodically determined. All sounding tubes should have a screw cap.

(n) “Special process discharge well” means a well constructed for the use of a subsurface discharge for recovering a product or fluid at the surface. Special process discharges are defined in detail in Chapter IX, Wyoming Water Quality Rules and Regulations.

(o) “Test well” means a well constructed for obtaining information needed to design a well prior to its construction. Test wells are cased and could be converted to observation or monitoring wells.

(p) “Watertight” means impermeable to water except when under such pressure that structural discontinuity is produced.

Section 3. Application. These standards shall apply to the types of wells listed below. Before a change of use for an existing well can occur, construction standards contained in this part shall be met for the new use.

(a) Well type list requiring permits under Water Quality Rules and Regulations.

(i) Commercial, municipal and industrial waste wells.

(ii) Special process discharge wells.

(iii) Artificial recharge and miscellaneous discharge wells.

(iv) Geothermal wells.

(v) Observation and monitoring wells.

(vi) Test wells.

(b) Standards concerning construction, maintenance and operation of oil or gas producing,storage, injection or disposal wells are administered by the Oil and Gas Conservation Commission and therefore are not contained herein.

Section 4. Well Construction Not Specifically Covered By This Part; Deviations.

(a) The administrator may grant a deviation from the standards provided the applicant or permittee can supply documentation of reliability, mechanical integrity, design and construction to protect groundwaters of the state in accordance with the water quality standards contained in Chapter VIII, Wyoming Water Quality Rules and Regulations. Such documentation shall include:

(i) Theoretical technology; or

(ii) Full scale operation at another site with similar conditions; or

(iii) A pilot project of scope and length to justify a deviation.

Section 5. Well Location/Siting.

(a) The top of the casing shall terminate above grade or above any known conditions of flooding from runoff or standing water.

The area around the well shall slope away from the well. Surface drainage shall be directed away from the well.

(b) Where a well is to be near a building, the well shall be located at a distance from the building to provide access for repairs, maintenance, etc.

Section 6. Sealing the Annular Space. The annular space shall be sealed to protect it against contamination or pollution by entrance of surface and/or shallow subsurface waters. Annular seals shall be installed to provide protection for the casing against corrosion, to assure structural integrity of the casing, and to stabilize the upper formation.

(a) Minimum depths of seal below ground surface for various uses of wells will be:

Type Well	Minimum Depth of Seal
Commercial, municipal and industrial waste	30 feet
Special process discharge	30 feet
Artificial recharge and miscellaneous discharge	30 feet
Geothermal wells	30 feet
Observation and monitoring	20 feet

Test wells	30 feet

(b) Sealing conditions. Following are requirements to be observed in sealing the annular space.

(i) Wells situated in unconsolidated, caving material shall have an oversized hole, at least four inches greater in diameter than the production casing, drilled. A conductor casing shall be installed. The space between the conductor casing and the production casing shall be filled with sealing material. The conductor casing may be withdrawn as the sealing material is placed.

(ii) Wells situated in unconsolidated material stratified with significant clay layers shall have an oversized hole of at least four inches greater in diameter than the production casing drilled, with the annular space filled with sealing material. If a clay formation is encountered within five feet of the bottom of the seal, the seal should be extended five feet into the clay formation.

(iii) Wells situated in soft consolidated formations shall have an oversized hole of at least four inches greater in diameter than the production casing. The annular space between the production casing and the drilled hole shall be filled with sealing material.

(iv) Wells situated in "hard" consolidated formations (crystaline or metamorphic rock) shall have an oversized hole drilled with the annular space filled with sealing material.

(c) Sealing material. The sealing material shall consist of neat cement grout, sand-cement grout, bentonite clay or concrete.

(i) Cement used for sealing mixtures shall meet the requirements of ASTM C150 "Standard Specifications for Portland Cement" or API 10B "Recommended Practices for Testing Oil-Well Cements and Cement Additives". Materials used as additives for Portland Cement mixtures in the field shall meet the requirements of ASTM C494 "Standard Specifications for Chemical Admixtures for Concrete" or API RP 10B.

(ii) Neat cement shall be composed of one sack of Portland Cement (94 pounds) to 4½ to 6½ gallons of clean water.

(iii) Sand-cement grout shall be composed of not more than two parts by weight of sand and one part of Portland cement to 4½ to 6½ gallons of clean water per sack of cement.

(iv) Concrete used shall be "Class A" or "Class B". Aggregates shall meet the requirements of ASTM C33 "Standard Specifications for Concrete Aggregates".

(v) Special quick-setting cement, retardants to setting, and other additives, including hydrated lime to make the mix more fluid or bentonite to make the mix more fluid and reduce shrinkage, may be used.

(vi) Bentonite clay mixtures shall be composed of bentonite clay and clean water thoroughly mixed before placement so that there are no balls, clods, etc.

(vii) Used drillers mud or cuttings or chips from drilling the borehole shall not be used as sealing material.

(viii) The minimum time that must be allowed for materials containing cement to "set" shall be in accordance with ASTM C150 or API RP10B.

When necessary these times may be reduced by use of accelerators as determined by the well contractor.

(d) Thickness of seal. The thickness of the seal shall be at least two inches and not less than three times the size of the largest coarse aggregate used in the sealing material.

(e) Placement of seal. Before placing the seal, all loose cuttings, chips, or other obstructions shall be removed from the annular space by flushing with water or fluid drilling mud. The sealing material shall be placed when possible, in one continuous operation from the bottom up. The fluid used to force the final sealing material through the casing shall remain under pressure, to prevent back flow, until the sealing material is set.

Section 7. Surface Construction Features.

(a) Openings. Openings into the top of the well which are designed to provide access to the well, i.e., for measuring, chlorinating, adding gravel, etc., shall be protected against entrance of surface waters or foreign matter by installation of water tight caps or plugs. Access openings designed to permit the entrance or egress of air or gas shall terminate above the ground and above known flood levels and shall be protected against the entrance of foreign materials by installation of down turned and screened "U" bends. All other openings (holes, crevices, cracks, etc.) shall be sealed.

A sounding tube, taphole with plug or similar access for the introduction of water level measuring devices may be affixed to the casing of the well as long as the proper seal is maintained. Access ports for water level or pressure measuring devices are required by the State Engineer on all wells greater than four inches diameter.

Section 8. Casing.

(a) The casing shall provide structural stability to prevent casing collapse during installation as well as drillhole wall integrity when installed, be of required size to convey liquid at a specified injection/recovery rate and pressure, and be of required size to allow for sampling.

(i) Steel casing shall meet the following conditions:

(A) Standard and line pipe. This material shall meet one of the following specifications:

(I) API Std. 5L, "Specifications for Line Pipe."

(II) API Std. 5LX, "Specifications for High-Test Line Pipe."

(III) ASTM A53 "Standard Specification for Pipe Steel, Black and Hot Dipped, ZincCoated Welded and Seamless."

(IV) ASTM A120 "Standard Specifications for Pipe, Steel, Black and Hot-Dipped Zinc-Coated (Galvanized) Welded and Seamless, for Ordinary Uses."

(V) ASTM A134 "Standards Specifications for Electric-Fusion (arc) - Welded Steel Plate Pipe (Sizes 16 in. and over)."

(VI) ASTM A135 "Standard Specifications for Electric - Resistance - Welded Steel Pipe."

(VII) ASTM A139 "Standard Specification for Electric-Fusion (arc) - Welded Steel Pipe (Sizes 4" and over)."

(VIII) ASTM A211 "Standard Specifications for Spiral - Welded Steel or Iron Pipe."

(IX) AWWA C200 "AWWA Standard for Steel Water Pipe 6 inches and Larger."

(B) Structural steel. This material shall meet one of the following specifications:

(I) ASTM A36 "Standard Specification for Structural Steel."

(II) ASTM A242 "Standard Specifications for High Strength Low Alloy Structural Steel."

(III) ASTM A283 "Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates, Shapes and Bars of Structural Quality."

(IV) ASTM A441 “Tentative Specifications for High-Strength Low Alloy Structural Manganese Vanadium Steel.”

(V) ASTM A570 “Standard Specification for Hot-Rolled Carbon Steel Sheet and Strip, Structural Quality.”

(C) High Strength Carbon steel sheets or “well casing steel.” Each sheet of material shall contain mill markings which will identify the manufacturer and specify that the material is well casing steel which complies with the chemical and physical properties published by the manufacturer.

(D) Stainless Steel casing shall meet the provisions of ASTM A409 “Standard Specification for Welded Large Diameter Austenitic Steel Pipe for Corrosive or High Temperature Service.”

(ii) Plastic can also be used for casing in many locations and under a variety of circumstances. The two groups of plastic materials available are thermoplastics and thermosets.

(A) Thermoplastics. This material shall meet the requirements of ASTM F 480 “Standard Specification for Thermoplastic Water Well Casing Pipe and Couplings made in Standard Dimension Ratios (SDR).”

(B) Thermosets. This material shall meet the requirements of the following specifications.

(I) ASTM D2996 “Standard Specification for Filament Wound Reinforced Thermosetting Resin Pipe.”

(II) ASTM D2997 “Standard Specification for Centrifugally Cast Reinforced Thermosetting Resin Pipe.”

(III) ASTM D3517 “Standard Specification for Reinforced Plastic Mortar Pressure Pipe.”

(IV) AWWA C950 “AWWA Standards for Glass - Fiber - Reinforced Thermosetting - Resin Pressure Pipe.”

(iii) Concrete pipe used for casing should conform to the following specifications:

(A) ASTM C14 “Standard Specifications for Concrete Sewer, Storm Drain, and Culvert Pipe.”

(B) ASTM C76 “Standard Specification for Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe.”

(C) AWWA C300 “AWWA Standards for Reinforced Concrete Pressure Pipe, Steel Cylinder Type, for Water and Other Liquids.”

(D) AWWA C301 “AWWA Standards for Prestressed Concrete Pressure Pipe, Steel Cylinder Type, for Water and Other Liquids.”

(iv) Galvanized sheet metal pipe or natural wood shall not be used as casing.

(b) All casing shall be placed with sufficient care to avoid damage to casing sections and joints. All joints in the casing above the perforations or screens shall be watertight. The uppermost perforations shall be at least below the minimum depth of seal. Casing shall be equipped with centering guides to ensure even thickness of annular seal and/or gravel pack.

(i) Metallic casing. Steel casing may be joined by either welding or by threading and coupling.

(ii) Plastic (non-metallic) casing. Depending on the type of material and its fabrication, plastic casing may be joined by solvent welding or may be mechanically joined. Compatability between potential contaminants and the sealing agent used shall be demonstrated.

Section 9. Sealing/Cementing Off Strata. Where a well penetrates more than one aquifer or water bearing strata, every aquifer and/or strata shall be sealed off to prevent migration of water from one aquifer or strata to another.

(a) Strata shall be sealed off by placing impervious material opposite the strata and opposite the confining formation(s). The seal shall extend above and below the strata no less than ten feet. The sealing material shall fill the annular space in the interval to be sealed, and the surrounding void spaces which might absorb the sealing material. The sealing material shall be placed from the bottom to the top of the interval to be sealed.

(b) Commercial, municipal and industrial waste and artificial recharge wells shall be sealed/ cemented in order that all aquifers are isolated over the entire length of casing(s) and shall be surrounded by a minimum of two inches of sealant. The sealant/cement plug used to isolate the aquifer(s) shall extend 50 feet above and below the interface between confining layer and the aquifer(s).

(c) Sealing material shall consist of neat cement, cement grout, or bentonite clay as per Section 65(c).

Section 10. Well Construction, Completion, Development and Evaluation.

(a) Developing, redeveloping, or conditioning a well shall be done by methods which will not cause damage to the well or cause adverse subsurface conditions that may destroy barriers to the vertical movement of water between aquifers.

(b) The well opening shall be closed with a cover to prevent the introduction of undesirable material into the well and to insure public safety whenever the well is not in use or when maintenance is being performed on the well.

(c) During well development, every well shall be tested for plumbness and alignment in accordance with AWWA or API approved standards, i.e., deviation checks. The plumbing and alignment tests shall be documented to ensure problems such as key seating, or fatigue failures will not occur.

(d) All injection/recharge wells used for discharge of commercial, municipal or industrial wastes shall inject fluid through a tubing with a packer set immediately above the injection zone or tubing with an approval fluid seal as an alternative.

(e) At a minimum, all commercial, municipal and industrial waste, special process discharge, artificial recharge and miscellaneous discharge wells deviation checks and cement bond logs shall be conducted and documented. The Water Quality Division should be contacted prior to well construction or operation to determine the need for addition al logs and tests.

Section 11. <u>Plugging and Abandonment</u>.

(a) All wells that are no longer useful (including test wells) must be plugged in order to assure that groundwater supply is protected and preserved for further use and to eliminate the potential physical hazard. A well is considered "abandoned" when it has not been used for a period of one year, unless the owner demonstrates his intention to use the well again by properly maintaining the well in such a way that:

(i) The well has no defects which will allow the impairment of quality of water in the well or in the water bearing formations penetrated.

(ii) The well is covered and the cover is watertight.

(iii) The well is marked so that it can be clearly seen.

(iv) The area surrounding the well is kept clear of brush or debris.

Observation or test wells used in the investigation or management of usable sources of groundwater by state agencies or by engineering or research organizations are not considered "abandoned" so long as they are maintained for this purpose. These wells shall be covered with an appropriate cap, and labeled for their particular use.

(b) Preliminary work. Before a well is plugged and abandoned, it shall be investigated by the permittee (owner/ operator) to determine its condition, details of construction and whether there are obstructions that will interfere with the process of filling and sealing.

(c) Filling and sealing. Following are requirements to be observed when plugging wells.

(i) Wells wholly situated in unconsolidated material in an unconfined groundwater zone shall have the uppermost 30 feet sealed with impervious material. The remainder of the well shall be filled with clay, sand, or other suitable inorganic matters as described in paragraph e.

(ii) Wells penetrating several aquifers or formations containing usable water sources shall have the uppermost 30 feet sealed with an impervious material. All screened or perforated intervals shall be sealed to prevent vertical movement of waters from the producing or injected formation. Impervious material shall be placed opposite the confining formation above and below (and including) the screened or perforated interval for a minimum of 50 feet or more.

(iii) Any uncased hole below the well shoe shall be filled with an impervious material as described in paragraph e. to a depth of at least 50 feet above the shoe.

(iv) Whenever production casing has been severed or inadvertently removed the well bore shall be filled with impervious material from a point 50 feet below to a point 50 feet above the point of severance or to the surface limit.

(v) Wells penetrating creviced or fractured rock shall have the portions of the well opposite this formation sealed with neat cement, sand cement grout or concrete. If these formations extend to considerable depth, alternate layers of coarse stone and cement grout or concrete may be used to fill the well.

(vi) Wells in nonfractured, consolidated formations shall have the uppermost 30 feet filled with impervious material and the non-creviced, consolidated formation portion of the well may be filled with clay or other suitable material.

(d) Placement of material. The following requirements shall be observed in placing fill or sealing a plugged or abandoned well.

(i) No material shall be placed in the well unless the administrator has been notified that plugging and abandonment operations are to commence. A minimum of 30 days notice must be given.

(ii) The well shall be filled with the appropriate material as described in paragraph e. from the bottom of the well up.

(iii) Sealing materials shall be placed in the interval or intervals to be sealed by methods that prevent free fall, dilution and/or separation of aggregates from cementing materials.

(iv) When the underground pressure head producing flow is such that a counterpressure must be applied to force a sealing material into the annular space, this counter-pressure shall be maintained for the length of time required for the cementing mixture to set as specified in Section 65, paragraph (c) (viii) of this part.

(v) To assure that the well is filled and there has been no bridging of the material, verification shall be provided that the volume of material placed in the well installation at least equals the volume of the empty hole.

(e) Material. Requirements for sealing and fill materials are as follows.

(i) Impervious sealing materials. Sealing materials shall have a permeability of 10 - 7 cm/sec or less. Impervious materials include neat cement, sand-cement grout, concrete, and bentonite clay as described in Section 66, paragraph (c). Used drilling muds are not acceptable.

(ii) Filler material. Materials such as clay, silt, sand, gravel, crushed stone, native soil, and mixtures of these materials, as well as those described in the preceeding paragraph may be used as filler material. Material containing organic matter or used drilling muds shall not be used.

(f) Markings. The top of the plug of any plugged and abandoned well shall show clearly, by permanent markings, whether inscribed in the cement or on a steel plate embedded in the cement, the permit number, well identification number and date of plugging.

(g) Reports. Within 15 days after a well has been plugged and abandoned, the owner shall file a plugging record with the Water Quality Division.