Public Water Supply Manual

Part IV

Noncommunity System Design Standards

394-2128-108

pennsylvania
DEPARTMENT OF ENVIRONMENTAL PROTECTION

DEPARTMENT OF ENVIRONMENTAL PROTECTION
Bureau of Safe Drinking Water

DOCUMENT NUMBER: 394-2128-108

TITLE: Public Water Supply Manual - Part IV
Noncommunity System Design Standards

EFFECTIVE DATE:

AUTHORITY: Pennsylvania's Safe Drinking Water Act (35 P.S. §721.1 *et seq.)* and regulations at 25 Pa. Code Chapter 109

POLICY: Department of Environmental Protection (DEP) staff will follow the guidance and procedures presented in this document to direct and support implementation of permitting activities for noncommunity water systems under the drinking water management programs

PURPOSE: The purpose of this document is to establish a rational and reasonable basis for staff decisions which will promote quality, timely and consistent service to the public and regulated community.

APPLICABILITY: This guidance will apply to all noncommunity water systems.

DISCLAIMER: The policies and procedures outlined in this guidance document are intended to supplement existing requirements. Nothing in the policies or procedures shall affect regulatory requirements.

The policies and procedures herein are not an adjudication or a regulation. There is no intent on the part of the Department to give these rules that weight or deference. This document establishes the framework, within which DEP will exercise its administrative discretion in the future. DEP reserves the discretion to deviate from this policy statement if circumstances warrant.

PAGE LENGTH: 40 pages

DEFINITIONS: See 25 Pa. Code Chapter 109

PUBLIC WATER SUPPLY MANUAL
USER'S GUIDE

The Public Water Supply Manual is a comprehensive publication designed to provide necessary, useful information to public water suppliers concerning Pennsylvania's Safe Drinking Water Program administered by the Department of Environmental Protection (DEP). The manual contains essentially everything the public water supplier will need to know about the Safe Drinking Water Program, including: design and construction standards; water quality standards; monitoring, reporting and operating requirements; emergency measures; and information on government agency programs and contacts.

In accordance with § 109.602 of the Safe Drinking Water Regulations, a public water system must be designed to provide an adequate and reliable quantity and quality of water to the public that complies with the primary and secondary MCLs, MRDLs and treatment techniques and conforms to accepted standards of engineering and design in the water supply industry. The standards outlined within this manual conform to accepted standards of engineering and design in the water supply industry and align with standards of the American Water Works Association and the Great Lakes – Upper Mississippi River Board Ten States Standards. An alternate design that does not meet the criteria identified in this manual may be approved by DEP if the water supplier can demonstrate the alternate design is capable of providing an adequate and reliable quantity and quality of water to the public.

Technical guidance documents are on DEP's website @ www.dep.pa.gov.

The following is a summary of the Public Water Supply Manual Parts. Following the summary is a Table of Contents for each part in the Public Water Supply Manual.

Part I - Summaries of Key Requirements

Part I is no longer published as a compilation of all the summaries of key requirements. The summaries of key requirements are available as individual documents. Additional summaries are added as new rules and regulations arc adopted.

Part II - Community System Design Standards

Part II provides detailed design and construction standards for all community water systems except bottled water systems, bulk water haulers, vended water systems, and retail water facilities. Part II also contains instructions for submitting a public water system permit application.

Part III - Bottled Water, Bulk Water Hauling, Water Vending Machines, and Retail Water Facilities

Part III provides detailed design and construction standards for bottled water systems, vended water systems, retail water facilities, and bulk water haulers, including information on submitting a public water system permit application.

Part IV - Noncommunity System Design Standards

Part IV provides detailed design and construction standards for Noncommunity Water Systems Approvals, and information on the procedures to be followed to obtain Noncommunity Water System Approvals.

Part V - Operations and Maintenance

Part V provides the needed information to develop an Operations and Maintenance Plan as required under Section 109.702 of DEP's Safe Drinking Water Regulations. This is a comprehensive guidance document covering all aspects of public water system operations including operation and maintenance standards.

Part V has been developed as two separate documents. Each is designed for specific type systems:

- Sections I and II are for surface water systems and the larger groundwater systems.
- Appendix A, Operations and Maintenance for Small Groundwater Systems, is a condensed version containing information needed by small groundwater systems having limited treatment (disinfection and corrosion control).

Part VI - Emergency Response

Part VI discusses the measures which a water supplier should take to prepare for emergency circumstances and explains how to prepare an emergency response plan.

Part VII - Cross-connection Control/Backflow Prevention

Part VII provides the basic information needed by a public water supplier to establish an effective cross-connection control program.

PART IV - NONCOMMUNITY DESIGN STANDARDS

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PART IV

NONCOMMUNITY DESIGN STANDARDS

Introduction

The purpose of Part IV of the Public Water Supply Manual is to outline the procedures and provide design standards for noncommunity approvals. Noncommunity water systems (NCWS) that utilizes groundwater, which requires treatment no greater than hypochlorite or ultraviolet light disinfection to provide water of a quality that meets the primary MCLs established under Chapter 109, Subchapter B (relating to MCLs, MRDLs, or treatment technique requirements), and are not covered under one of the acts outlined in Chapter 1.3, are required to submit a Noncommunity Water System Application. Noncommunity Water System Applications are required for new, modified, or change of ownership to NCWSs.

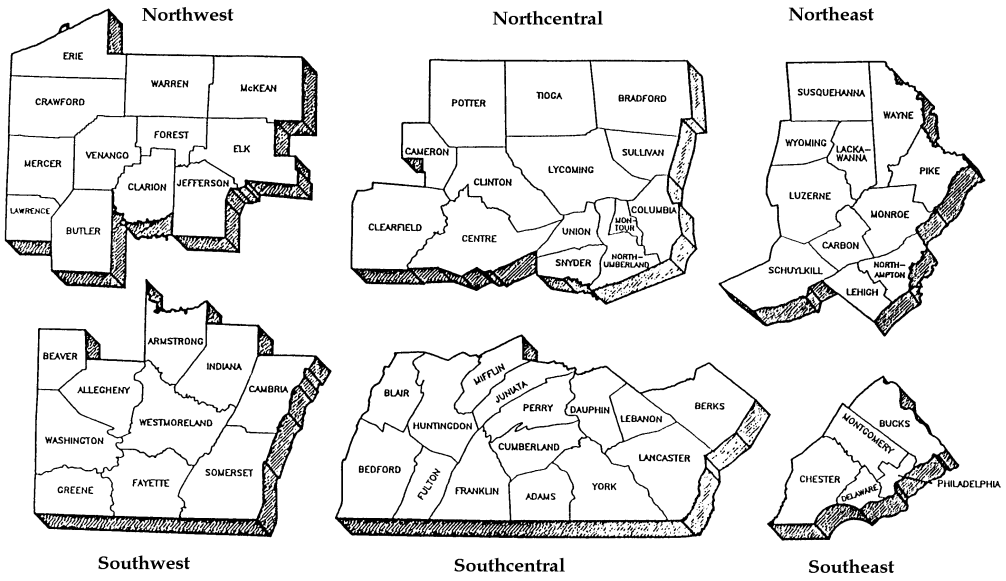
NCWS that utilize a source other than groundwater, or utilize a groundwater source which requires treatment greater than hypochlorite or ultraviolet light disinfection to provide water quality that meets the primary MCLs established under Chapter 109, Subchapter B, will be required to submit a complete permit application and obtain a construction and operation permit as outlined in Section 109.5 of DEP's Safe Drinking Water Regulations (25 Pa. Code Chapter 109). Systems required to obtain PWS permits shall refer to Part II of the PWSM, Community Design Standards, for permit requirements and design standards.

The terms "must," "will," "shall," or "required" indicate when a design practice is sufficiently standardized to authorize specific delineation of requirements, or where safeguarding the public health justifies definitive criteria or action.

The terms "should" or "recommend" indicate procedures, criteria, or methods that are not required, but provide ease of operation, flexibility and reliability to the PWS.

An alternate design that does not meet the criteria identified in this manual may be approved by DEP if the water supplier can demonstrate the alternate design is capable of providing an adequate and reliable quantity and quality of water to the public. Applicants need to explain the basis of the altered approach and why another approach may be more applicable.

Figure 0.1
DEP Regional Offices



Northwest Region
230 Chestnut St.
Meadville, PA 16335-3481
Main Telephone: 814-332-6945
24-Hour Emergency:
1-800-373-3398

Counties: *Butler, Clarion, Crawford, Elk, Erie, Forest, Jefferson, Lawrence, McKean, Mercer, Venango and Warren*

Northcentral Region
208 W. Third St., Suite 101
Williamsport, PA 17701
Main Telephone: 570-327-3636
24-Hour Emergency:
570-327-3636

Counties: *Bradford, Cameron, Clearfield, Centre, Clinton, Columbia, Lycoming, Montour, Northumberland, Potter, Snyder, Sullivan, Tioga and Union*

Northeast Region
2 Public Square
Wilkes-Barre, PA 18701-1915
Main Telephone: 570-826-2511
24-Hour Emergency:
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Pittsburgh, PA 15222-4745
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Southcentral Region
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Harrisburg, PA 17110
Main Telephone: 717-705-4700

Southeast Region
2 E. Main St.
Norristown, PA 19401
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484-250-5900

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Statewide Number for Emergencies: 1-800-541-2050

PART IV

CHAPTER 1 – NONCOMMUNITY APPLICATIONS

1.1 General

The purpose of this chapter is to outline the procedures and provide basic design considerations for noncommunity approvals.

1.2 Definitions

Public Water System (PWS): A system which provides water to the public for human consumption which has at least 15 service connections or regularly serves an average of at least 25 individuals daily at least 60 days out of the year.

Community Water Systems (CWS): A PWS which serves ***year-round*** residents.

Noncommunity Water Systems (NCWS): A PWS which serve ***transient and nontransient*** public.

Transient Noncommunity Water System (TNCWS): A noncommunity water system which serves a transient population of at least 25 persons per day for at least 60 days per year.

Nontransient Noncommunity Water System (NTNCWS): A noncommunity water system that regularly serves at least 25 of the **same** persons over six months per year.

Primary disinfection: Providing a disinfectant to kill or inactivate bacteria, viruses, and other potentially harmful organisms in drinking water.

Secondary disinfection: Providing additional disinfectant to water received from a public water supply that has already been treated to meet all Safe Drinking Water Act requirements.

Groundwater Under the Direct Influence of Surface water (GUDI): Any water beneath the surface of the ground with the presence of insects or other macroorganisms, algae, organic debris or large diameter pathogens such as Giardia lamblia and Cryptosporidium, or significant and relatively rapid shifts in water characteristics such as turbidity, temperature, conductivity or pH which closely correlate to climatological or surface water conditions. The term does not include finished water.

Surface Water Identification Protocol (SWIP): The methodology utilized by DEP to determine if a groundwater source for public water supply is GUDI.

New Source: A source of water supply that has not been approved under a valid PWS permit or noncommunity approval.

1.3 Permit Requirements

As outlined in 25 Pa. Code § 109.505(a), a NCWS must obtain a PWS permit unless it meets any of the following criteria:

1. It is licensed under the Public Eating and Drinking Places Act (P. L. 926, No. 369) (35 P.S. § § 655.1—655.13), *

2. It is permitted under the Seasonal Farm Labor Act (43 P.S. § § 1301.101—1301.606), *

3. It is permitted under the Public Bathing Law (35 P.S. § § 672—680d), ** or

4. It uses only groundwater which requires treatment no greater than hypochlorite or ultraviolet light disinfection to reduce total coliform bacteria concentrations to undetectable levels in the finished water, and otherwise provides water quality that meets the primary MCLs established under Chapter 109, Subchapter B (relating to MCLs, MRDLs or treatment technique requirements).

* The *Public Eating & Drinking Place License* and the *Seasonal Farm Labor Camp Permit* are both administered by the Pennsylvania Department of Agriculture.

** The *Public Bathing Place Permit* is administered by the Pennsylvania Department of Health.

1.4 Submission of Applications: Noncommunity Water System Application vs. Public Water Supply Permit

Figure 1.1 display the Noncommunity Water System Application vs. Public Water Supply Permit decision process.

1.4.1 Noncommunity Water System Application

Water suppliers shall not construct or modify a PWS prior to receiving approval from DEP. NCWSs that utilize groundwater, which requires treatment no greater than hypochlorite or ultraviolet light disinfection to provide water of a quality that meets the primary MCLs established under Chapter 109, Subchapter B (relating to MCLs, MRDLs, or treatment technique requirements), and are not covered under one of the acts outlined in Chapter 1.3, are required to submit a Noncommunity Water System Approval Application. A Noncommunity Water System Approval Application is required for a new or modified NCWS or for a change of ownership to a NCWS. Processes depicted in Figure 1.1.

Note: under 25 Pa. Code § 109.505(a), the Department retains the right to require a NCWS that meets the requirements in the above paragraph to obtain a construction and an operation permit, if, in the judgment of the Department, the NCWS cannot be adequately regulated through standardized specifications and conditions.

The Noncommunity Water System Application shall include:

1. New source sampling results (if involves new source)

2. Pump test results (if involves new source)

3. Well construction log (if involves new source)

4. A summary of the basis of design

5. A treatment system schematic

6. A site map that includes property lines, buildings, water treatment system location, well site(s), water line distribution system locations, on-lot disposal systems, and the sewerage line locations.

7. Equipment and Materials Specifications

8. Noncommunity Water System Application Forms (3900-FM-BSDW****)

9. The application fee

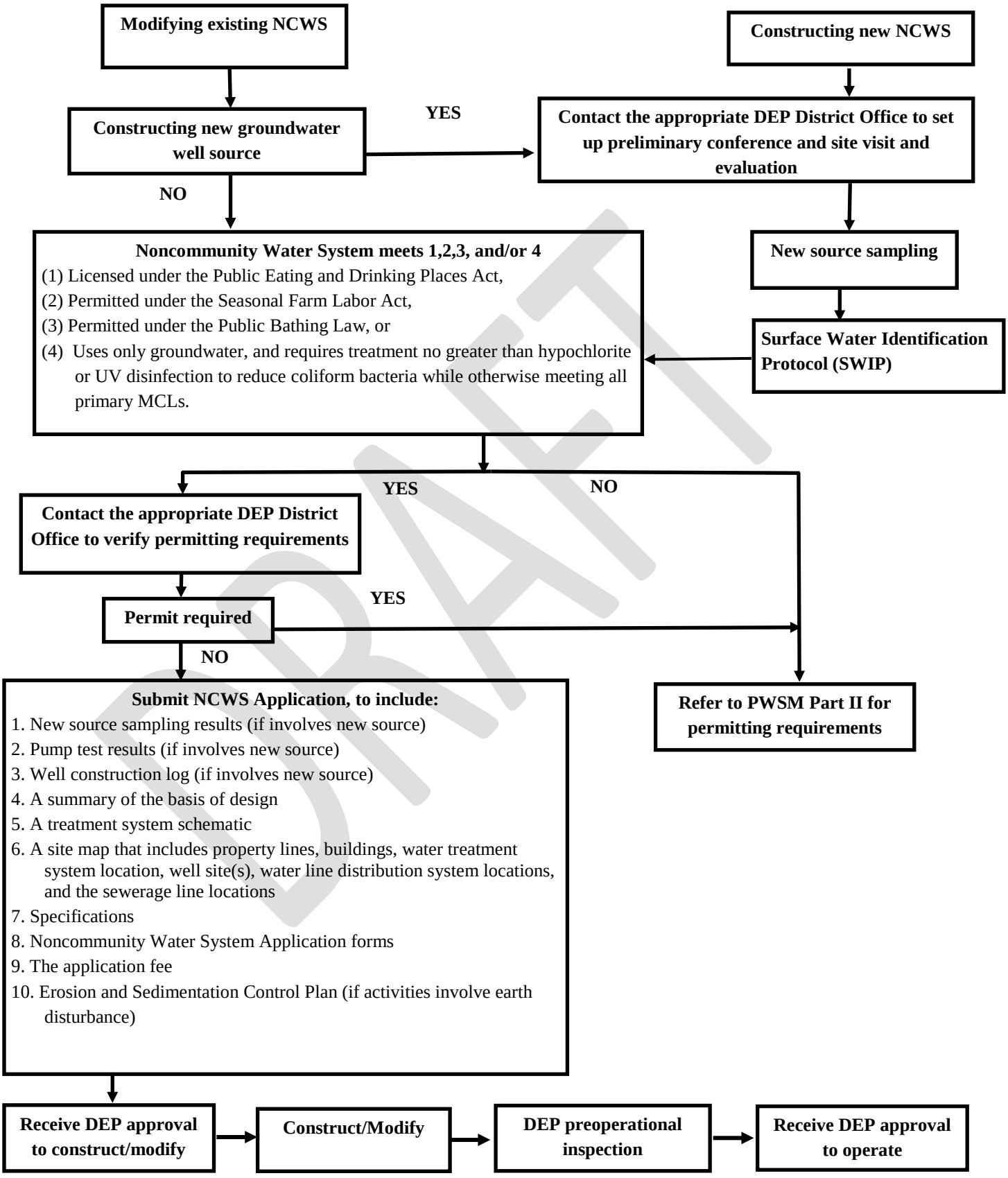
10. County Conservation District approval of the Erosion and Sedimentation Control Plan (if activities involve earth disturbance greater than 5 acres)

1.4.2 Public Water Supply Permit

A NCWS that uses a source other than groundwater or a groundwater source that requires treatment greater than hypochlorite or ultraviolet light disinfection to provide water of a quality that meets the primary MCLs established under Chapter 109, Subchapter B (relating to MCLs, MRDLs, or treatment technique requirements) is required to obtain PWS a construction and operation PWS permit.

Systems required to obtain PWS permits shall refer to Part II of the PWSM, Community Design Standards, for permit requirements and design standards. For systems with the ability to close in the event of a treatment system or equipment failure, the redundancy requirements in Part II may be considered optional.

Figure 1.1: NCWS Approval and Permitting Process Flowchart



1.5 Design Considerations

The following design considerations shall be evaluated for a NCWS:

1. Connecting to an existing, approved PWS (a groundwater source may be developed if connection to a permitted public water system is not within an economical piping distance);
2. Dependability of the source of water;
3. Raw water quality;
4. Potential and known sources of contamination; and
5. A balanced system of supply, pumping, treatment, distribution, and finished water storage facilities to meet the average and the instantaneous peak demands.

1.6 Water Volume Requirements

NCWS shall be designed to provide at least the minimum quantity of potable water demand as determined from Table 1.1, with a minimum flow rate of two gallons per minute at each outlet or plumbing fixture.

1.7 Redundancy and Resiliency

NCWSs without the ability to close in the event of a system or treatment breakdown (e.g. hospitals and health care facilities) should provide backup power and redundant sources, finished water storage, pumps, and treatment systems that will allow the NCWS to remain operational in the event of a power, source, pump, or treatment system failure.

1.8 Chemicals and Materials

Incompatible chemicals shall not be stored together. Refer to Form 3940-FM-BSDW0559, Chemical Compatibility Table, for details and storage requirements.

Under the requirements of 25 Pa. Code § 109.606 of the Safe Drinking Water Regulations, all chemicals or materials (i.e., paints, coatings, liners, etc.) which may come in contact with the raw or finished drinking water must be acceptable to DEP.

1.8.1. ANSI/NSF 60 (Drinking Water Treatment Chemicals – Health Effects

Chemicals which come in contact with or affect the quality of the water shall be certified for conformance with ANSI/NSF Standard 60 (Drinking Water Treatment Chemicals - Health Effects) or meet the food grade standards of the United States Pharmacopeia.

Chemicals that have been repackaged (transferred between containers) after leaving the manufacturing facility and before reaching the water supplier are not acceptable, unless the repackaging site has been certified for conformance with ANSI/NSF Standard 60.

1.8.2. ANSI/NSF 61 (Drinking Water System Components – Health Effects)

Materials or equipment used in construction or modification of a PWS which come in contact with the water or drinking water treatment chemicals shall meet the requirements of ANSI/NSF Standard 61 (Drinking Water System Components – Health Effects). PWS must ensure the leachate requirements for all contaminants (metals and non-metals), as well as the lead-free requirements of ANSI/NSF Standard 61 are met. Materials and equipment include but are not limited to:

- Pipes, fittings, and related products
- Protective barrier materials (e.g. coatings, linings, liners, cement, cement ad-mixtures, etc.)
- Joining and sealing materials (e.g. adhesives, lubricants, elastomers, etc.)
- Process media (e.g. activated carbon, sand, ion exchange resin, regenerated media, etc.)
- Mechanical devices used in treatment and distribution (e.g. valves, pumps, filters, chlorinators, etc.)

If no product can be found that meets both the system requirements and is certified to ANSI/NSF Standard 61, it is the PWS responsibility to provide evidence that the selected product meets the leachate requirements for all contaminants (metals and non-metals), as well as the lead-free requirements of NSF/ANSI Standard 61.

1.8.3. ANSI/NSF General

It is the responsibility of the PWS, the design engineer, contractor, or supplier to provide evidence of certification to NSF/ANSI Standard 60 and/or 61. The following American National Standards Institute (ANSI) accredited third-party certification bodies provide product certification to the new lead-free requirement for manufacturers of drinking water system and plumbing materials:

- Intertek Testing Services NA, Inc.
- NSF International (NSF)
- Truesdail Laboratories, Inc.
- Underwriters Laboratories (UL), LLC
- Water Quality Association (WQA)
- CSA Group
- ICC Evaluation Service (ICC-ES), LLC
- International Association of Plumbing and Mechanical Officials Research & Testing (IAPMO R&T)

Information on products and equipment that are certified by these organizations recorded on the organization's website.

1.9 Physical Connection

No physical connection shall be established between any NCWS and a CWS unless the connection is in accordance with the provisions of Part VII (Cross-Connection Control/Backflow Prevention).

Table 1.1: Recommended Peak Daily Demand Design Criteria	
User Category	**Demand**
Residential	
Manufactured housing spaces (per space)	150
Single family residences (per resident)	75
Boarding house (per boarder)	75
Apartments (per resident)	65
Boarding house (per resident non-boarder)	15
Commercial	
Department stores (per public toilet)	400
Shopping Center (per 1,000 ft^2)	250
Beauty shops (per operator)	200
Laundromat (per washer)	200
Hotels (per room)	100
Motels (per room)	100
Offices (per employee)	15
Airports (per passenger)	3.5
Service station (per vehicle)	10
Bar	
Per employee	15
Per customer	3
Restaurants	
Per patron	10
For bar and/or lounge, add (per patron)	2
Bus service area (no food service) (per patron)	5

Table 1.1 (Continued): Recommended Water Demand Data to Meet Peak Daily Demand	
Recreational and Seasonal	
Campgrounds (per site)	
With water and sewer	100
With water, only	50
No water or sewer	30
Camps	
Hunting and summer residential	50
Day (no meals served)	15
Work or construction camps	50
Fairgrounds, Picnic Grounds and Parks	
For showers and bathhouses, add (per patron)	25
Toilets only (per patron)	10
Swimming Pools and Bath houses (per patron)	10
Highway rest area (per patron)	5
Theater	
Movie (per seat)	5
Drive-in (per space)	5
Institutional	
Hospitals (per bed)	150
Prisons (per inmate)	120
Other institutions (per bed)	100
Rest/Retirement homes (per resident)	75
Schools (per student)	
Boarding	75
With cafeteria, gym and showers	30
With cafeteria, only	15
No cafeteria, gym or showers	10
Churches	
Per seat	3
Per meal served, add	3
Industrial (per person)	
Factories	35
Warehouses	35

CHAPTER 2 – SOURCE DEVELOPMENT AND CONSTRUCTION

2.1 General

2.1.1 Introduction

In accordance with 109.602(a) and 109.604(b) of the Safe Drinking Water Regulations, all sources serving a PWS shall be designed to provide an adequate and reliable quantity and quality of water to the public and be located to prevent or minimize impacts from potential sources of contamination and causes of diminution, respectively. The PWS is responsible for verifying their source water meets these requirements through a new source testing program that includes water quantity and quality analyses and a demonstration of acceptable source location, design, and construction. The project applicant must submit a Noncommunity Water System Application and receive approvals from DEP prior to construction and operation of the water system.

2.1.2 Preliminary Conference

To discuss requirements of the Noncommunity Water System Application, the project applicant should consult with the appropriate DEP regional office prior to design and construction of a public water supply source. During the conference with DEP staff, the project applicant will have the opportunity to ask questions and learn details about the technical requirements for source approval.

2.1.3 Source Water

If connecting to an existing CWS is not an economical or reasonable alternative, the source water for a NCWS should be derived from groundwater wells or an existing NCWS.

Sources such as springs, groundwater under the direct influence of surface water (GUDI) wells, and surface water will only be permitted when development of an acceptable groundwater well proves impossible or uneconomical. Where a spring or surface water source is the only option, treatment commensurate with the type of source will be required. When a source other than groundwater is proposed, the project applicant shall refer to DEP's Public Water Supply Manual, Part II, for treatment and source development guidance.

2.1.4 Existing Unapproved Wells

Wells that already exist, but have not previously been approved by DEP, shall meet the same location and construction standards as proposed (new) wells.

2.1.5 Source Location and Minimum Setback Distances

Minimum setback distances between wells and potential sources of contamination shall be great enough to provide assurances that surface and subsurface flow of contaminated water will not reach the well. Each proposed source location should be field-surveyed to evaluate the character and location of possible sources of contamination, types of geologic formations present, depth to the source aquifer, direction of groundwater flow, and the effect of well pumping on groundwater movement.

The following minimum lateral distances shall apply (see Table 2.1); however, setback requirements may be altered based of site specific factors.

Table 2.1: Contamination Setback Requirements	
Source of Contamination	**Setback Distance (feet)**
Wastewater treatment plants and lagoons, chemical (nondrinking water) or petroleum storage tanks, landfills, or any surface or subsurface wastewater or solid waste disposal field	300
Cesspools, drain fields, manure storage areas, sewage pump stations, building or yard used for Livestock of poultry, or other contaminants that may drain into the soil	100
Septic Tanks, Sanitary Sewers lines	50

2.2 Source Water Quantity Testing

The pumping test provides data necessary to evaluate source quantity and quality and confirm the water supplier made a reasonable effort to obtain the highest-quality source available. When the proposed source pumping rate is less than 100,000 gallons per day, the test must be conducted according to the instructions provided in Chapter 2.2. For sources with a proposed pumping rate greater than or equal to 100,000 gallons per day, the procedure provided in DEP's *Aquifer Testing Guidance for Public Water Systems,* DEP ID: 394-2125-001 shall be followed.

2.2.1 Planning

It is strongly advised that the water supplier contact their appropriate DEP regional office during the planning phase of a pumping test. The test should be scheduled to avoid heavy rain events or subsequent rapid changes in water-table elevation. Two-weeks advance notification must be given to DEP regional office.

2.2.2 Test Execution

The pumping test must be executed in accordance with the instructions provided in Chapter 2.2 by a Pennsylvania licensed well driller, a licensed professional geologist, or an individual working under the direct supervision of a licensed well driller or licensed professional geologist.

2.2.3 Test Duration

For transient noncommunity well sources, a minimum 6-hour pumping test should be conducted. For nontransient noncommunity well sources, a minimum 12-hour pumping

test should be conducted. In addition, recovery test (as described in 2.2.11) is required regardless of public water system classification.

2.2.4 Test Pump Installation

If using a temporary pump, the depth placement shall be equivalent to the final depth placement of the permanent pump.

A power source must be continuously available to the pump; loss of power will interrupt the test and invalidate the data.

2.2.5 Static Water Level

The static water level is the distance in feet from the ground surface to the surface of the groundwater column inside the well. The static water level is measured after a 12-hour period of initial pump installation and no pumping (i.e. static conditions). The static water-level measurement must be made immediately prior to turning on the pump and the data shall be included in the NCWS Approval Application.

2.2.6 Pumping Rate

The well shall be pumped at a constant rate of at least the anticipated permanent design pumping rate (i.e. the proposed pumping rate for the source) and discharge throughout the test must be kept within 5 percent of the constant rate. Control of the pumping rate should be adjusted with use of a valving system and not by adjusting the pump speed. The pumping rate should be measured and recorded frequently at the beginning of the test (i.e. every 15 minutes for the first two hours) and approximately hourly thereafter. The measurements shall be recorded in gallons per minute and provided in the Noncommunity Water System Approval Application.

2.2.7 Discharge Water

Wastewater generated during the pumping test must be conveyed away from the test well and any monitoring wells or points to prevent artificial recharge to the aquifer. Proper erosion and sedimentation controls shall be utilized and any necessary discharge approvals shall be obtained prior to pumping. If the wastewater displays signs pollution, testing must be suspended immediately and the appropriate DEP regional office shall be notified.

2.2.8 Depth to Water

The depth to water, also referred to as water level, is the distance measured in feet from the ground surface to the water surface in the well. Measurements are made at various times throughout the pumping test and recovery test. Depth to water may be measured manually with a water-level probe from a consistent measuring point on the well casing or with a pressure transducer. If a pressure transducer is utilized, select a type that can cover the range of anticipated drawdown. Pressure transducers must be calibrated before and after the test. When pressure transducers are utilized, manual measurements must be taken periodically throughout the test. If the well being tested exhibits unexpectedly excessive

drawdown, testing must be suspended immediately and the appropriate DEP regional office contact be notified.

2.2.9 Depth to Water, Pumping

Depth to water in the test well shall be accurately measured during the pumping test. Data shall be recorded to the nearest hundredth of a foot. Measurement frequency of the measurements during the pumping test is provided in the Table 2.2:

Table 2.2: Measurement Frequency

Time Since Start of Pumping Test (minutes)	Time Between Measurements (minutes)
0 – 15	1
16 – 60	5
61 – 120	10
121 – 360	30
361 – 1,440	60

2.2.10 Water Quality Sampling

Just prior to termination of the pumping test, water-quality samples shall be collected for chemical analysis in accordance with the applicable New Source Sampling requirements. Laboratory results must be included with the Noncommunity Water System Application.

2.2.11 Depth to Water, Recovery

The depth to water during recovery is the distance in feet from the ground surface to the water level in the test well, beginning immediately after pumping has ceased. Depth to water shall be accurately measured during recovery and data shall be recorded to the nearest hundredth of a foot on the pumping test form. Measurement frequency during for the recovery test is every 5 minutes for the first hour after the pump was turned off and every 0.5 hour thereafter until the water level has recovered by 90 percent or a maximum of 3 hours.

2.2.12 Additional Monitoring

Dependent on source location, construction, and the proposed pumping rate, DEP may require additional depth-to-water monitoring in nearby existing wells or wells constructed for the sole purpose of monitoring. Monitoring of surface-water features may also be required if the pumping could result in an adverse impact to a water resource.

2.2.13 Test Results and Reporting

As part of the Noncommunity Water System Approval Application, all test data and results shall be submitted to DEP. The test results must demonstrate that the source can provide a sustainable quantity to meet the intended use.

2.3 Source Water Quality Testing

The minimum number of samples collected and laboratory analyses to be performed for each water-quality parameter depends on the characteristics of the source and system classification.

Project applicants must contact the appropriate DEP regional office prior to any sample-collection efforts.

2.3.1 Nontransient Noncommunity Water System (NTNCWS) Sources

All new source samples shall be collected under pumping conditions toward the conclusion of the pumping test when the water-quality characteristics are most representative of operational conditions. New source samples collected from wells that intend to serve a NTNCWS shall be analyzed by a DEP-accredited laboratory in accordance with DEP's technical guidance, *New Source Sampling Requirements for Groundwater Sources for Community and Noncommunity Systems*, DEP ID: 393-3130-208.

Other parameters which a sanitary survey may determine as having a potentially adverse impact on the quality of the raw water should also be included in the analysis so that background information for future comparison is available.

2.3.2 Transient Noncommunity Water System (TNCWS) Sources

All new source samples shall be collected under pumping conditions toward the conclusion of the pumping test when the water-quality characteristics are most representative of operational conditions. New source samples collected from wells that intend to serve a TNCWS shall be analyzed by a DEP-accredited laboratory in accordance with DEP's technical guidance, *New Source Sampling Requirements for Transient Noncommunity Groundwater Sources*, DEP ID: 393-3130-308.

Other parameters which a sanitary survey may determine as having a potentially adverse impact on the quality of the raw water should also be included in the analyses so that background information for future comparison is available.

2.3.3 Special Cases

Additional SWIP requirements will be imposed by DEP if a well source is susceptible to surface water influence. The project applicant should contact the appropriate DEP regional office for details regarding any special monitoring requirements.

2.3.4 Finished Water Sources

At least one set of samples shall be collected and tested for all the parameters to be determined by DEP. Contact the appropriate DEP regional office for the current list of parameters to be tested. The results of the analysis obtained by the source/selling water system may be used to satisfy this requirement provided the samples were collected and analyzed within the routine monitoring schedule for that category of parameters. The results submitted should be from samples collected as close to the proposed point of interconnection as is possible, and preferably from the exact location.

2.3.5 Laboratory Analysis

All analyses of water-quality samples must be performed by a laboratory certified in accordance with DEP's Safe Drinking Water Regulations. Measurements of basic water-

quality parameters including temperature, turbidity, pH, and conductivity may be measured in the field with properly calibrated instrumentation.

2.4 Source Construction Requirements

2.4.1 Well Construction

The water supply well shall be constructed in a manner that is protective of public health. To demonstrate that the water supply well meets construction standards set forth by DEP, the project applicant shall submit in the Noncommunity Water System Approval Application. Construction must be approved by DEP prior operation of the well.

2.4.1.1 General

The actual on-site work of drilling, constructing, altering, and repairing a well shall be under the supervision of a competent water-well driller with a valid license and rig permit issued by the Commonwealth of Pennsylvania (Act 610 of 1956, 32 P.S. § 645.12, and 17 Pa. Code Chapter 47).

A listing of Pennsylvania-licensed drillers, including contact information and services offered, is provided at the following weblink: http://www.dcnr.pa.gov/Business/WaterWellDrillersLicensing/LicensedWaterWellDrillers/Pages/default.aspx

2.4.1.2 Erosion and Sediment Control

Best Management Practices (BMP's) should be utilized for erosion and sediment control.

2.4.1.3 Drilling Fluids and Additives

All fluids and additives used during drilling and well construction activities should not impart any toxic substances to the water or promote bacteriological contamination, be in accordance with the American Water Works Association Standard A100 Water Wells (Standard A100), and approved by DEP prior to use. Water used during drilling and well construction shall be obtained from an approved public water supply source to assure water quality meets the standards established in the Safe Drinking Water Act.

2.4.1.4 Plumbness and Alignment

Every well shall be tested for plumbness and alignment in accordance with the latest version of Standard A100. The test method and allowable tolerances shall be clearly stated in the specifications. At a minimum, a 40-foot section of pipe or rigid dummy of the same length, having an outside diameter of not more than 0.5 inches less than the inside diameter of the well casing or hole being tested, should move freely throughout the length of the well casing or hole to the lowest anticipated pump setting.

2.4.1.5 Minimum Protected Depths

All water supply wells shall be cased, grouted, and water tight to such depths of at least 50 or as necessary to exclude pollution from surface runoff and from polluted aquifers above the aquifer being used as a source of supply.

In consolidated rock formations, if ferrous casing is used, the casing shall be equipped with a drive shoe and seated by driving it into the surface of the consolidated formation until a seal is obtained. If nonferrous casing is used, it must be seated into component rock for a length of at least 5 feet (1.5 meters), and must be cemented in place.

2.4.1.6 Temporary Casings

Temporary casings used for construction shall be capable of withstanding the structural load imposed during its installation and removal.

2.4.1.7 Permanent Well Casing Material

Protective casing of wrought iron or steel shall have minimum weights and thickness as specified in Standard A100. Well casing material other than wrought iron or steel must be resistant to the corrosiveness of the water and to the stresses to which it will be subjected during installation, grouting, and operation. Casing and grouting materials must be compatible.

1. Ferrous casings shall:
    - be new pipe meeting American Society for Testing and Materials (ASTM) or American Petroleum Institute (API) specifications for water well construction.
    - have additional thickness and weight if minimum thickness is not considered sufficient to ensure reasonable life expectancy of the well.
    - be capable of withstanding forces to which it is subjected.
    - be equipped with a drive shoe when driven.
    - have full circumferential welds or threaded pipe joints.
2. New wells should not be constructed used polyvinyl chloride plastic (PVC) well casing.
3. Other nonferrous casing:
    - Other nonferrous casing shall meet appropriate ANSI/ASTM or NSF Standards for well casing applications as outlined in Standard A100. Nonferrous casing materials shall not impart taste, odor, or toxic substances to the well water.

2.4.1.8 Packers

Packers shall be of materials that will not impart taste, odor, toxic substances, or bacterial contamination to the well water.

2.4.1.9 Screens

Well screens, when used, shall:

1. be designed according to aquifer thickness and stratigraphic layering.
2. provide the maximum amount of open area while still maintaining structural strength.
3. have appropriate screen-aperture size based on a sieve analysis of the material contained in the surrounding geological formation or gravel pack.
4. be constructed of materials resistant to damage by chemical action of groundwater or cleaning operations.
5. have sufficient length and diameter to provide adequate specific capacity and low aperture velocity. Usually, the entrance velocity should not exceed 0.1 feet per second.
6. installed so that the pumping water level remains above the screen under all operating conditions.
7. be designed and installed to permit removal or replacement without adversely affecting watertight construction of the well.
8. be provided with a bottom plate or wash down bottom fitting of the same material as the screen.

2.4.1.10 Chemical Conditioning

Chemicals used during conditioning shall be acceptable to DEP. In general, specifications covering the chemical conditioning of wells shall be submitted to DEP for approval before the work is initiated. Chemical conditioning procedures shall be included in the specifications and shall contain information concerning method, equipment, chemicals, testing for residuals, disposal of wastes, and inhibitors used. Chemicals certified under ANSI/NSF Standard 60 are deemed acceptable to DEP.

2.4.1.11 Grouting

All permanent well casings shall be surrounded by a minimum of 1.5 inches of grout for the entire length of casing, including couplings, unless prior approval is obtained from DEP. Grouting materials shall conform to Standard A100.

1. **Application:**

- All grouting shall be performed within 24-hours of the completion of the drilling by adding the mixture, from the bottom of the annular opening upward, in one continuous operation until the annular opening is filled.
- Grout shall not be installed in the borehole until the annular space is completely cleared of all obstructions.
- When the annular opening is less than 4 inches wide, as measured on one side of the casing, grout shall be installed under pressure by means of a grout pump in one continuous operation.
- After grouting is applied, work on the well shall be discontinued until the grout has properly set.
- Alternate application methods may be approved by DEP on a case-by-case basis.

2. **Guides:**

   A protective casing must be provided with sufficient guides welded to the casing to permit unobstructed flow and uniform thickness of grout.

2.4.1.12 Gravel Packs

Gravel packs, when installed in the annular space between screen/casing and borehole for stabilizing the formation, shall:

1. Be properly sized well-rounded particles that are 95 percent siliceous, smooth and uniform, and free of foreign and carbonate materials.
2. Be protected from contamination prior to installation and be washed and disinfected immediately prior to or during placement.
3. Be installed in one uniform continuous operation.
4. Have a minimum thickness of 3 inches and a maximum thickness of 12 inches, depending on aquifer characteristics.
5. Extend to a minimum of 20 feet above the screen.
6. Have a minimum of 1.5 inches of grout surrounding all gravel refill pipes that are located in the grouted annular space.
7. Have protection from grout leakage into the gravel pack and well screen.

2.4.1.13 Upper Terminal Well Construction

1. Casing length shall extend 18 inches above final grade or well house floor, whichever is greater.

2. A pump discharge water meter should be provided to determine water production.

3. A tap, which discharges in a downward direction and away from the well casing, shall be provided for raw water sampling.

4. Adequate support for the well pump and drop pipe shall be provided.

5. Where a well house is constructed, the floor shall:

    - be at least 6 inches thick,
    - extend at least 3 feet in all directions from the well,
    - be at least 6 inches above the final ground elevation,
    - slope ¼ inch per foot towards a screened 4-inch floor drain to atmosphere.

6. The top of the well casing at sites subject to flooding shall be at least 3 feet above the highest known flood elevation or as directed by DEP.

7. Wells shall not be located in pits.

8. Drilled wells with the prime mover mounted on the casing shall:

    - Have the casing extended 18 inches above the floor and be equipped with a flange or suitable sanitary seal.
    - Have the casing firmly connected to the pump structure or have the casing inserted into a recess extending at least 1 inch into the base of the pump if a watertight connection is not provided.
    - Have the base of the pump not less than 18 inches above the pump room floor or apron.
    - Have the pump foundation and base designed to prevent water from contacting the joint between the casing and the prime mover.

2.4.1.14 Well Development

Every water supply well shall be developed to remove all fluids used during drilling activities, the native silts and clays, drilling mud, and/or the finer fraction of the gravel pack. Development should continue until the maximum specific capacity is obtained from the completed well.

2.4.1.15 Capping

The well shall be equipped with a bolted and lockable sanitary well cap to prevent contamination from surface water and infestation of insects and small animals. The sanitary seal shall also provide a small screened vent to allow for air exchange.

2.4.1.16 Well Construction Log

Well construction logs shall be created for all wells and submitted to DEP with the Noncommunity Water System Application. The logs shall be prepared by the licensed well driller who drilled the well or a licensed professional geologist. At a minimum, the well log(s) shall include:

1. the type, size, weight, and depth of all casing(s).
2. a description and location of all drive shoes and casing centralizers.
3. amount, the material type, and depth of grout along with a description of the application process.
4. a description of the lengths and location of all open-hole intervals or screened intervals.
5. a description of the gravel pack materials, thickness, and depth.
6. the depth of the production pump setting.
7. a list of all materials used, including quantities.

2.4.1.17 Well Decommissioning

Wells no longer being used, including but not limited to, observation points, and test wells shall be sealed by such methods as necessary to restore the controlling hydrogeologic conditions which existed prior to construction and to eliminate potential pathways for the migration of contamination. Wells shall be sealed in accordance with the requirements outlined in the Department of Conservation and Natural Resources (DCNR) Water-Well Abandonment Guidelines. All forms submitted to DCNR, and copies of their approval, should be submitted to DEP.

2.4.1.18 Special Construction Methods

Special construction may be necessary for wells drilled in sand and gravel sediments, carbonate rock, and when naturally flowing artesian conditions exist.

1. Sand and Gravel Well
    - To prevent leakage, permanent casing and grout should extend through all clay or hard pan layers that are above the aquifer.
    - When permeable soils overlay the aquifer, with DEP approval, the casing and grout shall extend to a minimum of 25 feet below ground surface, but, when possible, extend a minimum of 50 feet below the ground surface. To meet the minimum depth requirements, other well construction features including the gravel pack may need to be modified and approved by DEP. Any modification shall not subject the source to surface water contamination.

- If the use of temporary casing is needed during well-construction activities, the casing shall be removed from the borehole as grout is applied to the annular space.

2. Carbonate Rock Well

   - When the depth of unconsolidated formations above the water-bearing rock exceeds 50 feet, permanent well casing shall be seated at a minimum of 5 feet into competent rock that is not weathered.

   - When the depth of unconsolidated formations is less than 50 feet, depth of casing and grout shall be a minimum of 50 feet and seated into component rock that is not weathered.

   - To meet the minimum depth requirements, other well construction features may need to be modified and approved by DEP. Any modification shall not subject the source to surface water contamination.

3. Naturally Flowing Artesian Well

   - Flow from a naturally flowing artesian well shall be controlled to prevent discharge from around the casing by tightly sealing the juncture between the borehole and the well casing and stopping or reducing the discharge of water from within the well casing

   - Casing shall be set in the impermeable (confining) layer.

   - The well shall be pressure grouted to ensure a proper seal around the casing.

   - Pitless adapters shall be welded or screwed onto the casing. Compression fittings shall not be used.

2.4.1.19 Well Pumps, Discharge Piping, and Appurtenances

1. Wells equipped with line shaft pumps shall:

   - Have the pump structure effectively sealed to the well casing to prevent entrance of surface water.

   - Have the casing firmly connected to the pump structure or have the casing inserted into a recess extending at least 0.5 inches into the pump base.

   - Have the pump foundation and base designed to prevent water from coming into contact with the joint.

2. 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 riser pipe at 20-foot intervals.

3. Discharge piping – Discharge piping shall:

   - Have control valves and appurtenances located above the pump house floor when an aboveground discharge is provided.

   - Be protected against the entrance of contamination.

   - Be equipped with a check valve (in addition to any check valve within the well), 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 applicable, be equipped with an air release-vacuum relief valve located upstream from the check valve, with exhaust/relief piping terminating in a downturned position at least 18 inches above the floor and covered with a 24-mesh corrosion resistant screen.

   - Be valved to allow test pumping and control of each well.

   - Have all exposed piping, valves, and appurtenances protected against physical damage and freezing.

   - Be properly anchored to prevent movement.

   - Be protected against surge or water hammer.

4. Pumping to waste

   Provisions should be provided for pumping to waste. No waste piping shall be directly connected to a sewer. Piping and valves should be installed in a manner that allows pumping of the well to waste at the permitted rate while not affecting the status of other permitted sources.

2.4.1.20 Pitless Well Units

A pitless well unit includes a section of casing, the pitless adapter, and the well cap or cover which extends the upper end of casing to above grade.

2.4.1.20.1 General

The pitless well units shall:

1. Be shop-fabricated from the point of connection with the well casing to the unit cap or cover.

2. Be threaded or welded to the well casing, or use compression fittings certified by the Water Systems Council under Recommended Standards (PAS-1). Flexible couplings are not acceptable.

3. Be of watertight construction throughout.

4. Be of materials and weight at least equivalent and compatible to the casing.

5. Have field connection to the lateral discharge from the pitless unit of threaded, flanged, or mechanical joint connection.

6. Terminate at least 18 inches above final ground elevation, or 3 feet above the highest known flood elevation, whichever is higher, or as DEP directs.

2.4.1.20.2 Design

The design of the pitless unit shall make provisions for:

1. Access to disinfect the well.

2. A properly constructed casing vent.

3. Facilities to measure water levels in the well.

4. A cover at the upper terminal of the well that will prevent the entrance of contamination.

5. A contamination-proof entrance connection for electrical cable.

6. An inside diameter as great as that of the well casing, up to and including casing diameters of 12 inches, to facilitate work and repair on the well, pump, or well screen.

7. At least one check valve within the well casing.

2.4.1.20.3 Connection

If the connection to the casing is by field weld, the shop-assembled unit must be designed specifically for field welding to the casing. The only field welding, drilling, or cutting permitted will be that which is needed to connect a pitless unit to the casing.

2.4.1.20.4 Grouting the pitless unit:

Grout shall only be placed to a level immediately below the point where the adapter is connected to the well casing.

2.4.1.21 Casing Vent

Provisions shall be made for venting the well casing to the atmosphere. When ventilation is not provided by the sanitary well cap, the vent shall terminate in a downturned position, at or above the top of the casing or pitless unit, no less than 18 inches above grade or floor or 3 feet above the highest known flood elevation, whichever is higher, or as DEP directs. The vent shall have a minimum 1.5-inch 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. Where vertical turbine pumps are used, vents into the side of the casing may be necessary to provide adequate well venting. Installation of these vents shall be in accordance with the requirements of DEP.

2.4.1.22 Water Level Measurement

1. Provisions should be made for periodic measurement of water levels in the completed well.

2. If a permanent water-level measuring equipment is installed, it 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.

2.4.1.23 Observation Points

When observation points are provided, they shall be:

1. Constructed in accordance with the requirements for permanent sources if they are to remain in service after completion of a water-supply source.

2. Protected at the upper terminal to preclude entrance of foreign materials.

2.4.1.24 Wellhead Security

All water-supply wells and monitoring wells shall be constructed to deter vandals. At a minimum, all wellheads shall be protected by at least one of the following:

1. Installation of a locked cap.

2. Installation of security fencing.

3. Enclosure within a lockable building.

2.4.2 Spring Sources

Spring sources will not be accepted as a source of potable water for a NCWS except with the specific approval of DEP and only when an alternate source of supply is unavailable. Where the use of a spring cannot be avoided, the project applicant should refer to PWSM, Part II, Community Design Standards for technical details concerning requirements for surface water sources. Flowing springs, where a stream is created by the groundwater discharge and flows along a natural channel, will require submission of the Application for Surface Water Allocation form.

If a spring source must be proposed, the source construction shall provide a water-tight structure and additional features that ensure surface water, insects, and small animals cannot enter the structure (see Figure 2.1).

1. Springs shall be provided with an encasement of concrete or other durable material to prevent contamination, and should be installed so as not to restrict the flow of water into the encasement.

2. The walls of the encasement shall be extended above the elevation of the surrounding ground by a minimum of 1 foot to prevent the entrance of surface water.

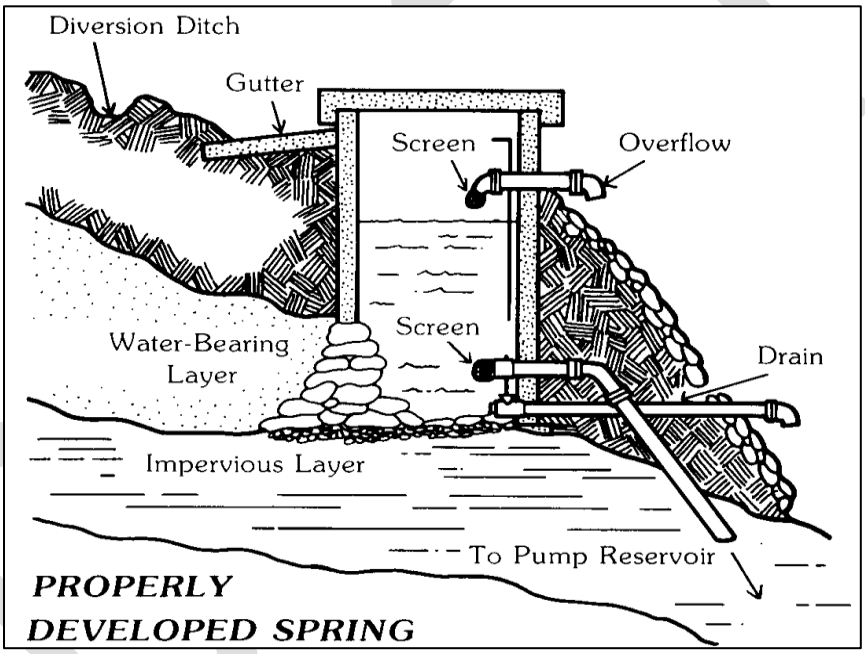
3. The walls of the encasement shall be capped with a solid, water-tight cover that forms a waterproof seal.

4. The encasement shall be provided with all overflow construction to prevent erosion of the earth surrounding the structure. The overflow shall open downward and should have a solid flapper or duckbill valve. If a solid flapper is used, a 24-mesh noncorrodible screen shall be provided.

5. The joint between the encasement wall and any pipe passing through the wall shall be constructed and installed to prevent the entrance of surface water.

6. A diversion ditch should be provided around the spring structure to prevent surface water from flowing into the collecting compartment.

Figure 2.1: Properly Developed Spring



2.4.3 Cisterns

Cisterns are not considered acceptable as a source of potable water for a NCWS. Where cisterns are used as finished water storage reservoirs, the design standards in Chapter 6, Finished Water Storage, apply.

2.4.4 Surface Water Sources

Surface water source will not be accepted as a source of potable water for a NCWS, except with the specific approval of DEP and only when an alternate source of supply is unavailable. If a surface water source is proposed:

1. The system shall meet the requirement in 109.605(1) of DEP's Safe Drinking Water Regulations and Part II of the PWSM, Community Water Design Standards.

2. Project applicants proposing the use of a surface-water source are required to obtain construction and operation permits as outlined in 109.503 and 109.504 of the Safe Drinking Water regulations.

2.5 Disinfection of Well Sources

All well sources must be properly disinfected in accordance with the latest AWWA C-654 Standard using NSF Standard 60 certified chlorine. Disinfection shall occur before the well is placed into service and after work is done on the well or pump that could contaminate the water source.

CHAPTER 3 –TREATMENT

3.1 General

Systems utilizing surface water or GUDI wells or springs shall meet the design standards in PWSM Part II, Community Design Standards and obtain a construction and operation permit as outlined in DEP's Safe Drinking Water Regulations 25 Pa. Code Chapter 109.5.

Systems utilizing groundwater sources not subject to surface water influence or contamination shall adhere to the following:

1. Disinfection by chlorination is recommended for all NCWSs and may be required to ensure safe bacteriological quality.

2. Systems that are required to provide 4-log virus inactivation shall meet the requirements PWSM Part II, Community Design Standards and 25 Pa. Code § 109.1302 and obtain a construction and operation permit as outlined in DEP's Safe Drinking Water Regulations 25 Pa. Code Chapter 109.5.

3. DEP will determine the need for additional treatment following evaluation of the source water quality.

4. Treatment equipment shall not be located in pits.

5. A separate room or building should be used to house the water treatment, chemicals, and equipment which is accessible only to authorized personnel.

3.2 Disinfection

For primary disinfection, systems shall follow criteria in this Chapter. For secondary disinfection using chlorine, chloramines or chlorine dioxide, systems shall obtain a construction and operation permit as outlined in DEP's Safe Drinking Water Regulations 25 Pa. Code § 109.5. Systems required to obtain PWS permits shall refer to Part II of the PWSM, Community Design Standards, for permit requirements and design standards.

Primary disinfection: Using a disinfectant to kill or inactivate bacteria, viruses, and other potentially harmful organisms in drinking water.

Secondary disinfection: Providing additional disinfectant to water received from a public water supply that has already been treated to meet all Safe Drinking Water Act requirements.

3.2.1 Chlorination

1. Sodium hypochlorite is the preferred method of chlorination. Gas chlorinators of the solution feed type and tablet chlorinators should not be utilized. If gas chlorination must be utilized, the chlorine system shall meet the design standards of PWSM Part II, Community Design Standards, Chapter 4.2.

2. Systems shall be designed such that before entering the distribution system the chlorination system provides a minimum of 20 minutes of effective chlorine contact time (T) based on minimum volume (V), maximum flow rate (Q), and baffling factor (BF).

$$\mathbf{T}\ (\text{minutes}) = \frac{\mathbf{V}\ (\text{gallons}) \times \mathbf{BF}}{\mathbf{Q}\ (\text{gallon per minute})}$$

   See Table 3 for details on baffling factors.

3. The chlorination system shall be capable of maintaining a chlorine residual of 0.2 mg/L throughout the distribution system.

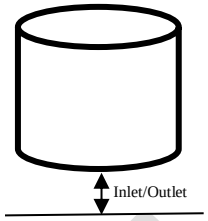
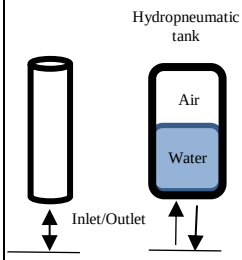
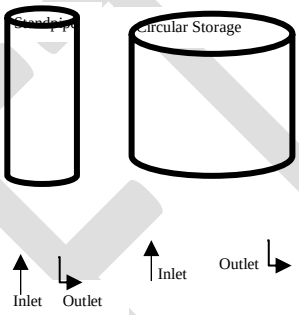
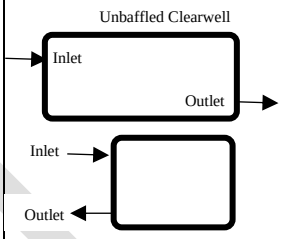
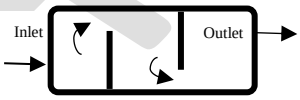
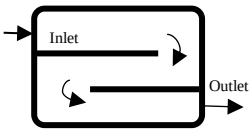
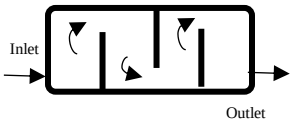
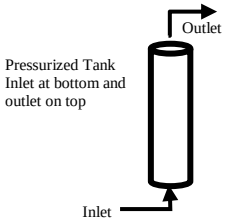
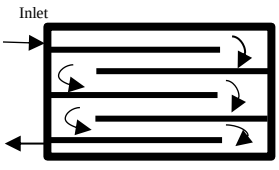
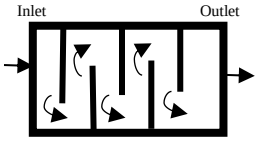
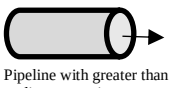
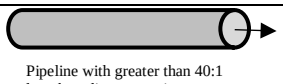
4. Chlorine residual test equipment that utilizes an EPA approved method and can meet the requirements of EPA's Method 334 shall be provided. The test equipment must utilize a digital readout and be capable of measuring residuals to the nearest 0.01 mg/L in the range of 0-1.0 mg/L, to the nearest 0.1 mg/L between 1.0 - 2.5 mg/L, and to the nearest 0.2 mg/L above 2.5 mg/L.

5. Nontransient noncommunity water systems that utilize chemical disinfection and transient noncommunity water systems that utilize chemical disinfection in accordance § 109.1302(b) shall utilize EPA Method 334 for determination of the chlorine residual.

6. The injection location should be after any softener (if provided).

7. Chemical feed systems, handling, and storage shall comply with the requirements in Chapter 4, Chemical Feed Systems, Handling and Storage.

Table 3.1: Typical Noncommunity Baffling Factors

Baffling Factor			
No Contact Time Atmospheric or pressurized storage vessels with a single combined inlet/outlet or hydropneumatic bladder tanks	0.0		
Unbaffled Atmospheric vessel with separate inlet and outlet lines, and no internal baffles (e.g. standpipe, circular storage tanks, or unbaffled clearwells). These vessels equipped with diffuser walls or plates on inlet and outlet can use a 0.2 baffling factor.	0.1		
Poorly Baffled Atmospheric vessel with single or multiple inlets and outlets with two (2) baffles	0.3		
Average Baffled Atmospheric vessel with separate inlet and outlet lines with three (3) or more baffles or pressurized vessels with inlet at the bottom and outlet at the top.	0.5		
Superior Baffled Atmospheric rectangular vessel with separate inlet and outlet lines with at least five (5) or more internal baffles.	0.7 Outlet		
Near-Plugflow Pipeline with a greater than 5:1 length to diameter ratio.	0.9		
Plugflow Pipeline with a greater than 40:1 length to diameter ratio**.**	1.0		

3.2.2 Ultraviolet (UV) Disinfection

For disinfection credit under the Long Term 2 Enhanced Surface Water Treatment Rule (LT2ESWTR) or Groundwater Rule (GWR) using ultraviolet (UV) disinfection are required to obtain a construction and operation permit as outlined in DEP's Safe Drinking Water Regulations 25 Pa. Code Chapter 109.5. Systems required to obtain PWS permits shall refer to Part II of the PWSM, Community Design Standards, for permit requirements and design standards.

The following are requirements to reduce the amount bacteria in disinfected drinking water using UV for NCWSs using groundwater sources not subject to the requirements of the LT2ESWTER or GWR:

3.2.2.1 General

1. UV systems shall be approved under the National Sanitation Foundation (NSF) International Standard 55: Ultraviolet Microbiological Water Treatment Systems or equivalent third-party certification.

2. There may be no buried piping downstream of UV disinfection unless secondary disinfection is also provided to maintain a disinfectant residual in the buried pipe.

3. UV systems and components shall be designed and constructed so that their intended purpose is accomplished when installed and operated according to the manufacturer's instructions. Components shall not be adversely affected by the normal environment to which they are subjected. Normal environment includes usual vibration, electrical shock, humidity, climate conditions, and cleaning procedures as prescribed by the manufacturer.

3.2.2.2 Design and Installation Criteria

1. A 5-micron cartridge filter (or smaller if required by the manufacturer) shall be provided just prior to UV treatment.

2. The flow rate through the unit shall not exceed the flow rate the unit was NSF 55 certified for.

3. The UV system shall have a lamp status indicator (visual means of verifying electrical operation of lamps).

4. The unit shall have an automatic rate-of-flow control device, accurate within the expected range of operating pressures, so that the maximum design flow rate of the unit is not exceeded.

5. A UV intensity sensor shall be provided. The UV intensity sensor shall be calibrated or replaced as per the manufacturer's recommendations.

6. Audible alarms and shutdowns shall be provided in the event of low UV intensity and lamp or sensor failure.

7. An automatic shut-off valve shall be provided to ensure water enters the distribution system only after the minimum UV dosage is applied. An override function shall not be provided on the shut-off valve.

8. If the operation of the UV unit is synchronized with the operation of the well pump, a flow or time delay mechanism shall be provided to allow for completion of the manufacturer's required warm-up period before water flows into the unit.

9. The unit shall be installed according to the manufacturer's recommendations. This shall allow for ease of access for disassembly, repairs, cleaning, and/or replacement.

10. The unit shall be installed inside a protected enclosure not subject to extreme temperature which could cause a malfunction.

11. The manufacturer-recommended cleaning procedures shall be used for cleaning the system. The treatment chamber shall be designed so that at least one end can be dismounted for cleaning.

12. Spare UV lamps and other necessary equipment shall be provided to allow for prompt repair by qualified personnel properly instructed in the operation and maintenance of the equipment.

13. The UV unit shall not be equipped with a bypass.

3.3 Cartridge Filtration

For surface water (or GUDI well) treatment, systems are required to obtain a construction and operation permit as outlined in 25 Pa. Code § 109.505. Systems required to obtain PWS permits shall refer to Part II of the PWSM, Community Design Standards, for permit requirements and design standards.

For inorganic particle removal, systems shall meet the following requirements:

3.3.1 General

1. Cartridge filters must be discarded once the particulate loading capacity of the filter is expended.

2. The life expectancy of a cartridge filter is dependent on many factors, including the quality and volume of water being treated and the type of cartridge filter being used. The manufacturer's recommended guidelines for cartridge filter replacement should be closely followed.

3.3.2 Materials

System components such as housing, cartridges, gaskets, and O-rings shall be certified for conformance with ANSI/NSF Standard 61. The filter housing shall be constructed to withstand a hydrostatic pressure of at least 125 psi.

3.3.3 Design

1. When various types of cartridges or elements with different purposes and performances are available from the manufacturer, they shall bear differentiating

identifications that are easily identifiable and clearly visible. Such identification shall be fully explained on the package containing the element or cartridge.

2. Waste connections or outlets, if provided, shall be through an air gap of not less than 1-inch. Special attention must be given to prevent the potential for cross connection/backflow between untreated and treated water.

3. Frequent start and stop operation of the cartridge filter should be avoided. The following operations are recommended to avoid frequent start and stop cycles:

   - Install a slow opening and closing valve ahead of the filter to reduce flow surges.
   - Reduce the flow through the cartridge filter to as low as possible to lengthen filter run times.
   - Install a recirculating pump that returns treated water back to a point ahead of the cartridge filter.

4. A pressure relief valve should be incorporated into the cartridge filter housing.

5. Pressure gauges should be provided before and after each filter element to properly monitor system pressure loss.

3.3.4 Installation

1. All units shall be readily accessible for maintenance, service, inspection, and cleaning. The cartridges and other replacement components shall be readily removable and easily replaceable.

2. Spare cartridges and other replacement components shall be provided to allow prompt replacement.

3.4 Ion Exchange Softening

1. Systems treating for a primary MCL exceedance are required to obtain a construction and operation permit as outlined in 25 Pa. Code § 109.505. Systems required to obtain PWS permits shall refer to Part II of the PWSM, Community Design Standards, for permit requirements and design standards.

2. DEP does not require that water be softened.

3. The finished water total hardness should be at least 80 mg/L (5 grains per gallon) expressed as $CaCO_3$. The recommended range for finished water hardness is 120 mg/L to 150 mg/L (7 to 9 grains per gallon) expressed as $CaCO_3$.

4. Iron, manganese, or a combination of the two, should not exceed 0.3 mg/L in the water as applied to the ion exchange resin. Pretreatment for iron and manganese is required when the content of iron, manganese, or a combination of the two is 1 mg/L or more. Waters having a turbidity of 5 NTUs or more should not be applied directly to the cation exchange softener.

5. The rate of softening should not exceed 7 gpm per square foot of bed area and the backwash rate should be 6 to 8 gpm per square foot of bed area.

6. The design capacity of hardness removal should not exceed 20,000 grains/ft^3 when the resin is regenerated with 0.3 pounds of salt per kilograin of hardness removed.

7. Softening system shall be certified for conformance with ANSI/NSF Standard 44.

8. Backwash, rinse, and air relief discharge pipes shall be installed in such a manner as to prevent any possibility of brine waste back-siphoning.

9. A blending line must be provided around each softening unit to produce a blended water as well as to provide operation of this system when the unit is out of service. Flow meters should be provided on blending bypass lines to allow control of the blending rate.

10. Brine measuring or salt dissolving tanks must be covered and constructed of corrosion-resistant material.

11. Tanks subject to pressurization shall comply with ASME Code requirements or an equivalent requirement of state and local laws and regulations for the construction and installation of unfired pressure vessels.

3.5 Iron and Manganese Treatment

Iron and manganese control, as used herein, refers solely to treatment processes designed specifically for this purpose. The treatment process used will depend upon the quality of the raw water. The selection of one or more treatment processes must meet specific local conditions as determined by engineering investigations, including chemical analysis of representative samples of water to be treated. It may be necessary to conduct a pilot plant study to gather all information to be used as the basis of design. Consideration should be given to adjusting pH of the raw water to optimize the chemical reaction.

3.5.1 General

Smooth-nosed sampling taps shall be provided for control purposes. Taps shall be located on each raw water source, each treatment unit influent, and each treatment unit effluent line.

3.5.2 Removal by Oxidation, Detention, and Pressure Filtration

3.5.2.1 Oxidation

Oxidation should be provided by sodium hypochlorite or permanganate. Aeration may be used in some circumstances.

3.5.2.2 Detention

A minimum of 20 minutes of detention time is recommended be provided, but at a minimum the manufacturer's detention time shall be provided. The detention basin may be designed as a holding tank with no provisions for sludge collection, but with sufficient baffling to prevent short-circuiting. All vessels used for reaction or detention shall be equipped with a drain to allow blow off of settled particulates.

3.5.2.3 Filtration

1. The maximum rate should not exceed 4.0 gpm per square foot of filter area.
2. Each filter must be capable of individual filtration and backwashing with an arrangement of piping as simple as possible to accomplish these purposes.
3. The filter media shall have a total depth of at least 24 inches and should not be more than 30 inches.
4. The filter sand shall have an effective size range of 0.45 mm to 0.55 mm and a uniformity coefficient no greater than 1.65.
5. The top of the washwater collectors shall be at least 18 inches above the surface of the media.
6. The underdrain system shall efficiently collect the filtered water and uniformly distribute the backwash water at a rate not less than 15 gpm per square foot of filter area.
7. Backwash flow indicators and controls shall be easily readable while operating the control valves.
8. An air release valve shall be provided on the highest point of each filter.
9. Filtration systems shall be constructed shall prevent cross-connection.

3.5.3 Removal by manganese coated greensand filtration

This process generally consists of the continuous or batch feed of sodium hypochlorite or permanganate to the influent of a manganese greensand filter.

1. The permanganate or sodium hypochlorite should be as far ahead of the filter as practical and to a point immediately before the filter.
2. An anthracite media cap of at least 6 inches should be provided over manganese greensand. The anthracite media shall have an effective size of 0.8 mm to 1.2 mm and a uniformity coefficient no greater than 1.85.
3. The normal filtration rate should not exceed 3 gpm per square foot.
4. Minimum backwash rate should be 12 gpm per square foot at 60°F water temperature, and the backwash cycle should last 10 to 15 minutes.
5. Sample taps shall be provided:
    - Prior to addition of any oxidants.
    - Immediately ahead of filtration.
    - At the filter effluent.

6. Backwash water must be discharged to the sanitary sewer through an air gap of not less than 1 inch.

3.5.4 Removal by Ion-Exchange

This process of iron and manganese removal by ion-exchange should not be used for water containing more than 0.3 mg/L of iron, manganese, or a combination thereof.

3.5.5 Sequestration by Polyphosphates

Polyphosphate treatment may be less effective for sequestering manganese than it is for iron.

1. This process shall not be used when the manganese raw water level exceeds 0.30 mg/L. It is not recommended when iron or combination of iron and manganese exceeds 0.5 mg/L and shall not be used when iron, or a combination of iron and manganese exceeds 1.0 mg/L

2. The total phosphate applied shall not exceed 10 mg/L as PO_4. The product feed rate shall not exceed the limit established under ANSI/NSF Standard No. 60, or as otherwise established by DEP.

3. Chlorine disinfection shall be provided if sequestration by polyphosphate is used. Satisfactory free chlorine residuals must be maintained in the distribution system.

4. Chemical feed systems, handling, and storage shall conform to the requirements of Chapter 4, Chemical Feed Systems, Handling and Storage.

5. Stock phosphate solution must be kept covered and disinfected by carrying approximately 10 mg/L free chlorine residual, unless the phosphate is not able to support bacterial growth and the phosphate is being fed undiluted from the covered shipping container. Phosphate solutions having a pH of 2.0 or less may also be exempt from this requirement by DEP.

6. Polyphosphates shall not be applied ahead of any treatment system.

7. Phosphate chemicals must be acceptable to DEP. Chemicals certified under ANSI/NSF Standard 60 are deemed acceptable to DEP.

8. A means of measuring the phosphate level in the water shall be provided.

CHAPTER 4 - CHEMICAL FEED SYSTEMS, HANDLING, AND STORAGE

4.1 General

Under DEP Safe Drinking Water regulations, all chemicals or materials (e.g. paints, liners, etc.) which may come in contact with the raw or finished drinking water must be acceptable to DEP. Chemicals which may come in contact with, or affect the quality of, the water and which are certified for conformance with ANSI/NSF Standard 60 (Drinking Water Treatment Chemicals-Health Effects), or meet the food grade standards of the United States Pharmacopeia, are acceptable to DEP.

4.2 Chemical Feed Systems

1. A metering chemical feed pump shall be supplied that is capable of providing, at all times, the necessary amount of chemical at an accurate rate, throughout the range of feed.

2. Chemical feed pumps shall be as near as practical to the feed point.

3. All chemicals shall have separate feed lines, feed pumps, and chemical storage.

4. The metering chemical feed pump shall operate at no lower than 20% of the feed pump's capacity unless the pump is equipped with two independent adjustment mechanisms, such as pump pulse rate and stroke length, in which case the pump shall operate at no lower than 10% of the feed system's capacity.

5. Chemical feed rates should be proportional to the rate of flow; otherwise, the feed pumps shall be synchronized with the operation of the well pump.

6. Provisions must be made to protect all equipment from freezing.

7. Metering chemical feed pumps and chemical storage tanks shall be certified for conformance with ANSI/NSF Standard 61 for sodium hypochlorite.

8. Chemicals shall be certified for conformance with ANSI/NSF Standard 60 (Drinking Water Treatment Chemicals-Health Effects).

9. The pipes supplying water for the dissolving of chemicals, or for make-up water, shall be introduced via an air gap or other approved method for preventing back-siphoning that meets Part VII, Cross-connection Control/Backflow Prevention, of the PWSM.

10. Chemical storage and feed pumps shall not be located in pits.

4.3 Solution Tanks

1. The pipes supplying water for the dissolving of chemicals, or for make-up water, shall be connected via an air gap or other approved method for preventing back-siphoning that meets Part VII, Cross-connection Control/Backflow Prevention, of the PWSM.

2. Chemical solution tanks shall be provided with suitable covers and should be of sufficient capacity to provide at least one day's (24 hours) worth of storage.

3. Secondary containment shall be provided and able to hold 110% of the largest storage tank volume.

4.4 Chemical Feed Lines

Chemical feed lines shall be easily accessible for repair or cleaning, protected against damage and freezing, corrosion resistant, as short as possible, and provide adequate slope to permit draining.

4.5 Storage of Chemicals

Incompatible chemicals shall not be stored in the same room (see Document No. 3940-FM-BSDW0559, Chemical Compatibility Table).

4.6 Operator Safety

Safety equipment (e.g. rubber or neoprene gloves, aprons, goggles, etc.) should be provided and may be required in some cases.

CHAPTER 5 - PUMPING EQUIPMENT

5.1 General Design

1. Pumps and appurtenant equipment shall be designed and installed to ensure a contamination-proof and frost-proof installation.

2. Each well pump shall be provided with a foot-valve or, where appropriate, a priming chamber or vacuum-producing device to prevent cavitation.

3. In a screened well, the pump setting and suction inlet shall be located so that the pumping level of the water cannot be drawn below the top of the screen.

4. Suction lift pumps should not be used where the maximum suction head exceeds 22 feet.

5. Gauges shall be provided on the discharge line of all pumps. Where physically possible, gauges shall also be provided on the suction line of pumps.

6. Redundant pumps should be provided for systems without the ability to close (e.g. hospitals).

5.2 Location

The pumping station shall be located so that the proposed site will meet the requirements for sanitary protection of water quality, hydraulics of the system, and protection against interruption of service by fire, flood, or any other hazard.

1. For new construction, pumps shall not be located in a pit. Systems with an existing pump pit shall be of watertight construction to avoid flooding.

2. The location shall permit convenient access for the removal and repair of the pump, drop pipe, and other accessories.

3. The pump shall be suitably mounted to avoid objectionable vibration and noise, and to prevent damage to pumping equipment.

4. The pump controls and/or accessories shall be protected from weather.

5.3 Pump Controls

The following controls/appurtenances are required on all pumps:

1. Pressure switch;

2. Thermal overload switch;

3. Where water is pumped into a vented tank, a manual off/on/auto switch;

4. Where water is pumped into a pressurized system, a pressure relief valve.

5.4 Cross-Connections/Interconnections

1. There shall not be, at any point in the pumping station, any cross-connection or interconnection between a potable water supply and any other source of water, unless that connection has appropriate provisions to prevent backflow and back-siphoning, and has been approved by DEP.

2. Steam exhaust or cooling water engine jackets or any other heat-exchange devices shall not be returned to the potable supply.

3. No plumbing fixtures or devices shall be installed which will provide interconnection or make possible the backflow of sewage or wastes into the water supply system.

4. No water may be returned to the potable water supply from heat pumps, or any other heat exchange devices.

PART IV

CHAPTER 6 - FINISHED WATER STORAGE

6.1 General

Finished water storage should be provided as an integral part of each NCWS and shall:

1. Provide a minimum working pressure of 35 psig.
2. Be designed to permit dewatering for cleaning and maintenance.
3. Be provided with a suitable watertight roof or cover (for reservoirs, standpipes, or elevated tanks).
4. Be provided with an adequate pressure relief valve and air volume control, and shall have a rated working pressure in excess of the maximum system pressure (for hydropneumatics tanks).
5. Protect vents with down-facing elbows or mushroom-type caps fitted with a 24-mesh, noncorrodible screen.
6. For protective coatings or liners which come in contact with potable water, use only coatings or liners that are certified for potable water use under NSF Standard 61, or are otherwise acceptable to DEP.
7. Be disinfected in accordance with AWWA's standard for disinfection of water-storage facilities prior to being placed into service.
8. Should not have a volume greater than 5 times the average daily demand of the system.
9. Where storage must be provided for fire protection, separate potable water storage should be provided. Where separate storage cannot be provided, facilities shall be designed to minimize average water age, while maintaining an adequate disinfectant residual at all times.
10. Where a combined potable and fire flow system must be provided, the water system must include a disinfection system capable of maintaining an acceptable disinfectant residual in the finished water delivered to the distribution system after the tank.

6.2 Elevated or Standpipe Storage

Elevated or standpipe storage should be provided where usage exceeds 30,000 GPD. A storage volume equal to one to five times the average daily demand is recommended.

6.2.1 Standards

Storage tanks shall:

1. Be constructed in accordance with the appropriate AWWA's Standards.
2. Be painted in accordance with AWWA's Standards using products approved for potable water use under NSF Standard No. 61, or by using a paint or coating otherwise acceptable to DEP.

6.2.2 Design Criteria

Finished water storage design shall ensure:

1. The maximum variation between high and low levels in storage structures providing pressure to a distribution system should not exceed 30 feet.

2. The tank is provided with an overflow which is brought down to an elevation of 12 to 24 inches above ground surface, and is discharged over a drainage inlet or splash plate. All overflow pipes shall be located so that any discharge is visible. Disposal of overflow water must be consistent with the requirements of the Clean Streams Law (CSL).

3. When an internal overflow pipe is used on elevated tanks, it should be located in the access tube. For vertical drops on other types of storage facilities, the overflow pipe should be located on the outside of the structure.

4. The overflow pipe shall be of sufficient diameter to allow overflow of water in excess of the maximum filling rate. The overflow shall open downward and be screened with a 24-mesh, noncorrodible screen. The overflow shall not connect directly to a sewer or storm drain.

5. The tank includes entrance hatches, a screened vent, and an OSHA-approved access ladder.

6. The piping and valving arrangement shall allow the tank to be removed from service.

7. A drain is provided.

8. Sample lines and taps should be provided to allow sampling of water directly from the tank even if the tank is out of service for repair, maintenance or emergency condition.

9. The tank does not have a direct connection to a sewer or storm drain.

10. Security measures are provided; to include access locking hatches and ladder locks. Use of a chain link fence, security alarms, and cameras should be considered.

11. A low-level warning light and/or alarm is provided.

12. A suitable control system is provided (e.g. telemetering).

6.3 Ground Level Storage

1. The bottom of the tank be above the normal groundwater table and the 100-year flood plain.

2. The tank be constructed no closer than 50 feet to sewers, drains, standing water, and other sources of pollution.

3. The tank be watertight and constructed to prevent entry of birds, animals, insects, and excessive dust.

4. Security be provided by fencing, locks, and other measures as required to prevent trespassing and vandalism.

5. The tank does not have a direct connection to a sewer or storm drain.

6. An access manhole be located above the waterline of the tank. The access manhole shall be framed at least four inches above the surface of the roof and fitted with a solid, watertight, locked cover which overlaps the framed opening by at least two inches.

7. A 24-mesh screened overflow be installed to have a minimum air gap of 12 inches above a splash block located at ground surface. The overflow shall not connect directly to a sewer or storm drain.

8. Grading is such that surface water drains away from the tank.

6.4 Standards – Underground Fiberglass Tanks

Fiberglass storage tank installations shall adhere to the above standards (Section 6.1 and 6.4.1) and shall also:

1. Be pressure tested according to manufacturer's instructions and the fittings shall be soap bubble tested prior to use.

2. Be anchored to a concrete pad and backfilled with pea gravel material meeting manufacturer's recommendations.

3. Have a combined weight (to include the empty tank, the concrete pad, and the backfill supported on the concrete pad) sufficient to prevent flotation of the empty tank.

6.5 Hydropneumatic Systems

1. Pressure tanks shall meet American Society of Mechanical Engineers (ASME) code requirements or an equivalent requirement of state and local laws and regulations for the construction and installation of unfired pressure vessels. Non-ASME factory-built hydropneumatic tanks may be allowed if approved by DEP.

2. Hydropneumatic tanks shall not be used to provide disinfection contact time.

3. Hydropneumatic tanks shall be located entirely above normal ground surface (no tank or portion of a tank may be buried or in an underground vault) and be completely housed with adequate heat.

4. Hydropneumatic tanks should be located after all treatment systems, to allow treatment systems to operate at relatively uniform flow rate before the tanks and allowing the hydropneumatic tanks to meet variations in demand.

5. Hydropneumatic tanks should be located after any required chlorine contact time is achieved. Where tanks must be located before chlorination is effectively completed, the chlorine contact system must include a rate of flow controller to limit flow through the chlorination segment to ensure adequate contact time is provided.

6. The gross volume of the hydropneumatic tank, in gallons, should be at least 10 times the capacity of the largest pump, rated in gpm, unless other measures (e.g. variable speed drives in conjunction with the pump motors) are provided to meet the maximum demand.

7. The hydropneumatic tank(s) shall have bypass piping to permit operation of the system while the tank is being repaired or painted.

8. Each tank shall have a drain and control equipment consisting of a pressure gauge, sample tap, automatic or manual air blow-off, means for adding air, and pressure operated start-stop controls for the pumps. A pressure relief valve shall be installed and capable of handling the full rate of flow at the pressure vessel design limit. Where practical, there shall be an access manhole measuring 24 inches in diameter.

9. Sample taps shall be located at least six inches above the floor in a location that will allow operators to use the tap to fill sample containers.

PART IV

CHAPTER 7 - DISTRIBUTION SYSTEMS

7.1 General Requirements

Water distribution systems shall be designed to maintain treated water quality. Special consideration should be given to distribution main sizing, providing for design of multidirectional flow, adequate valving for distribution system control, and provisions for adequate flushing. Systems should be designed to maximize turnover and to minimize residence times while delivering acceptable pressures, flows and disinfectant residuals.

1. Distribution mains are to be laid using the loop system to eliminate dead ends when practicable. Dead ends, if unavoidable, shall be provided with a flushing hydrant or blow-off system for flushing purposes. Each flushing device shall be adequately protected against damage and contamination, should extend at least 12 inches above grade, and be provided with an independent self-draining shut-off valve.

2. Every service line shall be horizontally separated at least ten feet from a sanitary sewer, 10 feet from a septic tank, distribution box, disposal field or seepage pit, and 25 feet from a cesspool, by undisturbed or compacted earth.

3. Fire suppression systems (sprinkler systems) should be separate from the drinking water system and must contain adequate backflow and back-siphonage provisions to protect the drinking water system.

7.2 Standards

7.2.1 Sizing

1. The distribution system shall be sized and designed to always provide a minimum pressure of 20 psi at any point in the system. The design shall ensure freedom from contamination. The normal working pressure should be at least 35 psi when using pressure tanks for pump control and pressure regulation.

2. Water mains for providing fire protection and serving fire hydrants shall be a minimum of 6 inches in diameter. Adequate flows and pressures must be available for approval of fire hydrants.

3. Consideration should be given to future water usage when sizing the distribution system.

7.2.2 Material

Pipes, fittings, valves and fire hydrants shall conform to the latest standards for drinking water issued by ASTM, AWWA and ANSI/NSF, where such standards exist, and be acceptable to DEP. All plastic pipes for potable water use also must be approved by NSF and bear the logo "NSF-pw" indicating such approval. DEP may approve materials for which there are no accepted standards provided acceptable supporting information is provided. Special attention must be given to selecting materials which will protect against both internal and external corrosion and, where appropriate, reduce as much as possible the oxidation potential between dissimilar metals.

7.2.3 Valving

Valving should be provided within the distribution system to allow repair with minimal disruption of service. The number and location of valves will depend on the nature and layout of the distribution system.

7.2.4 Flushing Hydrants

Flushing hydrants shall be provided at dead ends for systems not provided with fire hydrants. Hydrants should be sized to provide a minimum velocity of 2.5 feet per second in the water main.

7.2.5 Freeze Protection

All water lines shall be installed at a depth sufficient to provide protection from freezing. All service lines and distribution mains intended for year-round water service should be provided with sufficient earth cover to prevent freezing.

7.2.6 Parallel Installation of Water/Sewer Lines and Manholes

1. Water mains shall be laid at least 10 feet horizontally from any existing or proposed gravity sewer, septic tank, leach field, and/or subsoil treatment system. The distance shall be measured edge to edge. If such horizontal separation is not possible, the bottom of the distribution main shall be at least 18 inches above the top of the sewer.

2. No water mains should be closer than 10 feet from any sewer manhole and in no event, shall a water main pass through or come in contact with any part of a sewer manhole. The distance shall be measured edge to edge.

7.2.7 Crossing of Waterlines/Sewers

1. Water mains crossing sewers shall provide a minimum vertical distance of 18 inches between the outside of the water main and outside of the sewer. This shall be the case where the water main is either above or below the sewer with preference to the water main located above the sewer.

2. At crossings, one full length of water pipe shall be located so both joints will be as far from the sewer as practically possible. Special structural support for the water and sewer and sewer pipes may be required.

7.2.8 Pressure Testing

The installed pipe shall be pressure tested and leakage tested in accordance with the appropriate AWWA standard (C-600 or C-605).

7.2.9 Disinfection

All new or repaired service lines and distribution mains must be adequately disinfected in accordance with AWWA Standard for Disinfection of Water Mains (AWWA C-651) prior to being placed into service.

7.2.10 Seasonal Systems

Seasonal systems shall be designed to allow the system to dewatered, re-pressurized, flushed, disinfected and coliform tested.