Engineering, Planning and Development Guidance Document

Developed to Consolidate the Rules and Policies of Practice by the Public Water Supply Section

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The N.C. Division of Water Resources Public Water Supply Section gratefully acknowledges the contributions of the following technical experts:

Jeffrey D. Coggins, PE, Black and Veatch

William Dowbiggin, PE, BCEE, CDM

Randy Gould, PE, Rivers and Associates (now Moore County Public Utilities)

David Heiser, PE, CDM

James K. Holley, LG, Groundwater Management Associates

Tom Howell, PE, Rivers and Associates

Mary E. Sadler, PE, Hazen and Sawyer

Eddie Sasser, PE, Highfill Infrastructure Engineering

Al Slover, UMC, North Carolina Rural Water Association

Scott Smart, PE, Aqua North Carolina

Todd Taylor, PE, Town of Harrisburg (now Jewell Engineering)

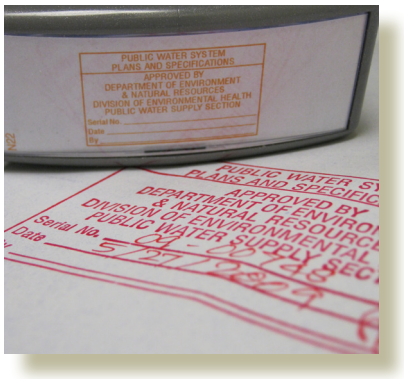
Marty Wilson, UMC, North Carolina Rural Water Association

1.0 Introduction to Engineering, Planning and Development Guidance Document

The *Engineering, Planning and Development Guidance* (EPD) is an informational document developed to consolidate the rules and policies of practice by the Public Water Supply Section (PWS Section). This guidance is intended to provide planners and design engineers with the minimum acceptable requirements, rules and standards by which water system projects will be evaluated when reviewed by the PWS Section.

The PWS Section reviews approximately 2,000 water project submittals every year. Many of these submittals lack sufficient information about the proposed project for the review engineer to make an informed decision regarding the project's viability. Additionally, many submittals to the PWS Section contain design components that directly conflict with established rules and policies. Proposed projects submitted to the PWS Section that contain inadequate information or that have design components in conflict with current rules and policies increase review time and waste resources. This guidance was developed to decrease review time by providing the water project designer with all of the information needed to design and submit a proposed project in accordance with PWS Section requirements.

The EPD is a work in progress. When complete, it will contain the 12 chapters listed below. In an effort to provide greater availability of information, the PWS Section will release additional chapters for use as they are completed. **Note that the chapters and appendices in bold are included in this early release:**



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2. **Submittals**
3. **Water System Management Plans and Other Required Water System Plans**
4. **Review and Approvals**
5. **Environmental Review**
6. General Design Considerations
7. **Special Considerations for New Systems**
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Some of the material in this early release contains references to chapters that are not yet complete. Additional reference details will be included in the existing material as new chapters are released.

The information represented in this document does not cover every possible water system design scenario nor does it address every function of the PWS Section. This guidance should be used to assist in water system project development, submittal to the PWS Section for review, project construction, and placement of the project into service.

1.1 The use of "must" and "should" in the text

This document identifies the difference between rules and recommendations through the use of "must" and "should" in the text. Every statement in the text preceded by a "must" is a rule or required action. Every statement in the text preceded by a "should" is a recommendation that represents best practice. The design engineer's adherence to statements containing "should" is not mandatory but the PWS Section may require sufficient explanation as to why best practice has not been used in the design process.

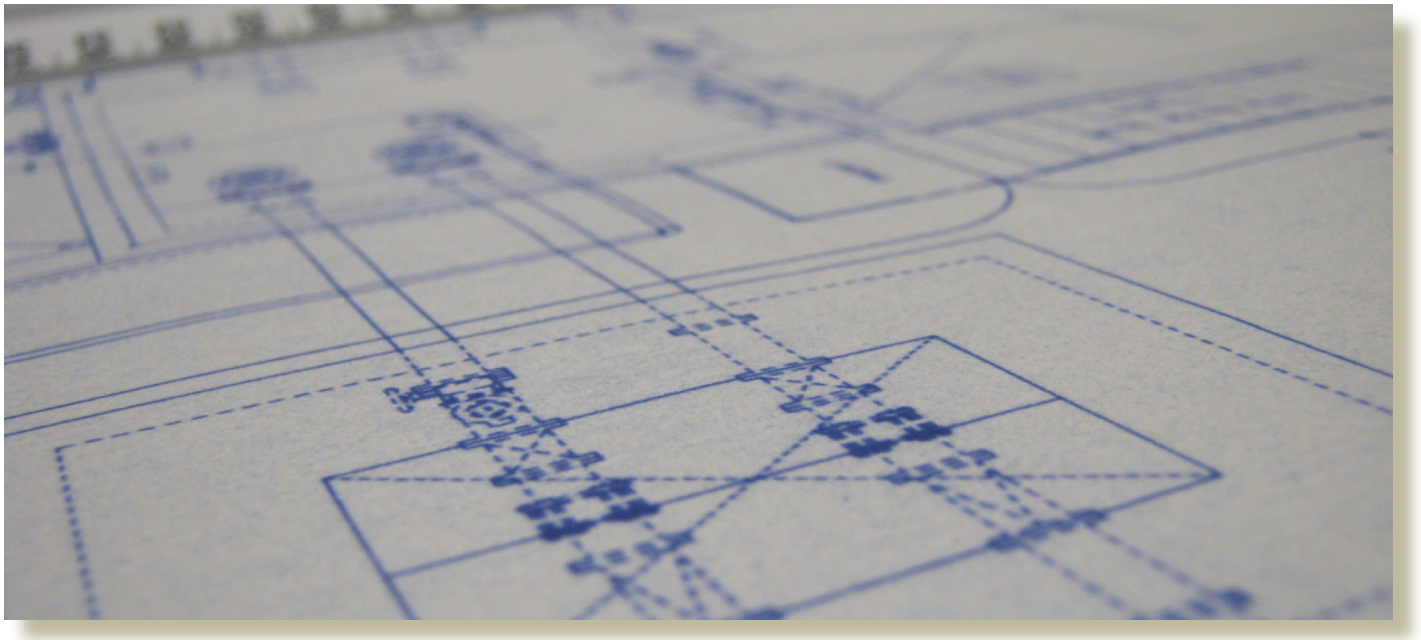
1.2 Applicability of This Document

This document was written to assist in the design of projects for community and non-transient, non-community water systems. All projects submitted to the PWS Section for review must meet all PWS Section rule requirements.

Design engineers may propose water system projects that differ from the conventional design parameters discussed in this document. Any unique or alternative water system designs submitted to the PWS Section may require an extended period for review so the soundness of the design and potential impacts to public health can be evaluated.

1.3 Rule Reference Format

All rule references in this document follow the standard North Carolina Administrative Code reference format of title number followed by "NCAC" and then by chapter (or subchapter if one exists). The PWS Section rules are located in the North Carolina Administrative Code Title 15A, Subchapter 18C and are referenced in this document as 15A NCAC 18C. Similarly, rule references from other regulatory agencies will be represented in the same format. The PWS Section rules are available online at http://www.ncwater.org/pws/rulesreg.htm. All North Carolina Administrative Codes are available online at http://ncrules.state.nc.us/ncac.asp.



2.0 Submittals

This chapter describes the information that must be incorporated into the plans, specifications and reports that are submitted to the PWS Section for review. It also discusses the procedure for submittal of plans,

2.1 Projects Subject to PWS Section Review

All projects that intend to construct, alter, or expand a community or non-transient, non-community water system must submit documentation as described in Section 2.2. Additionally, any non-community water system using surface water or groundwater under the direct influence of surface water is required to submit documentation as described in Section 2.2.

Service connections for new customers offered by public water systems do not require review by the PWS Section. A public water system is responsible for ensuring that their system is protected from cross-connection by controls installed in accordance with Rule .0406(b) and Appendix 'B' Figure '2' of the Rules Governing Public Water Systems. It is also the responsibility of the public water system to ensure that the customer-owned plumbing complies with the NC Plumbing Code. In some cases, the public water system may choose to require the entity being served to obtain PWS Section approval. The PWS Section will review and approve service lines when requested.

All other types of projects must be submitted to the PWS Section for review.
Projects that do require review are discussed in more detail in [CHAPTER 4, SECTION 4.1].

2.1.1 Water System Management Plan

Every community and non-transient, non-community system must submit three copies of its Water System Management Plan to the PWS Section for review. The Water System Management Plan provides a comprehensive overview of the system owner's ability to finance, operate, and manage the system in a viable manner.

If complete, the Water System Management Plan will be "deemed complete" by the PWS Section. A water system will not be granted Authorization to Construct for any project until a Water System Management Plan that encompasses the scope of the proposed project has been "deemed complete" as described in [CHAPTER 3]. A flow chart that depicts how the Water System Management Plan fits into the plan review process is available in Chapter 4, Figure 1. Additional information regarding Water System Management Plans is available online at: www.ncwater.org/pws/CapDev/CapDevForms.htm.

Note that the Water System Management Plan review process is separate from the review of plans, engineer's report, and specifications. The Water System Management Plan must be submitted with a check for the applicable fee. Each Water System Management Plan receives a serial number and is a separate project from project-specific plans, engineer's report, and specifications.

2.2 Documents Required for PWS Section Review

The following items with a check for the applicable amount must be submitted to the PWS Section prior to review:

- Application for Approval (three copies),
- Plans (three copies),
- Specifications (three copies),
- Engineer's report (three copies),
- Water System Management Plan (three copies if not previously submitted and deemed complete), and
- Check for applicable fee.

All documents must be mailed to the following address:

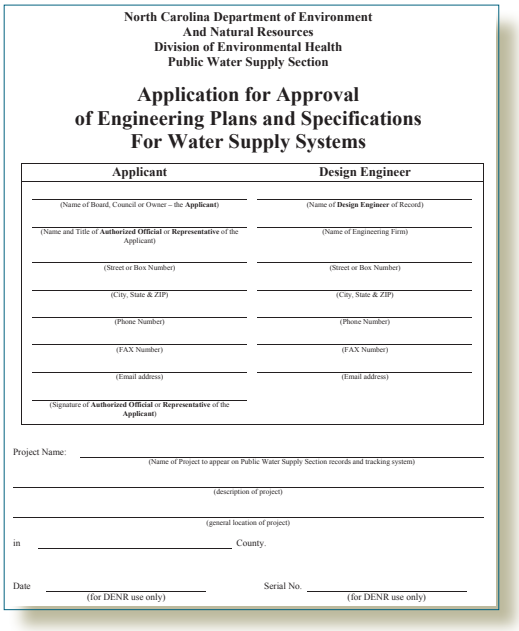
PWS Section Plan Review Unit
1634 Mail Service Center
Raleigh, NC 27699-1634

The entire application package must be submitted for review at least 60 days prior to the date upon which action by the PWS Section is desired. Water System Management Plans must be submitted at least 60 days prior to the date upon which action by the PWS Section is desired. If the PWS Section review engineer requires additional documentation or clarification for the project, then additional time will be required for review. The review status of application packages submitted to the PWS Section can be tracked through the Plan Review Tracking System. The Plan Review Tracking System website is available at: www.ncwater.org/pws_reports/plan/MenuPlan.asp.

Note that the PWS Section is evaluating options for the electronic submittal of project documents. The PWS Section may not require submittal of triplicate documents in the future.

2.3 Application for Approval

The Application for Approval must be completed and signed by the applicant, and is available online at: www.ncwater.org/pws/prforms.html.



North Carolina Department of Environment
And Natural Resources
Division of Environmental Health
Public Water Supply Section

Application for Approval of Engineering Plans and Specifications For Water Supply Systems

Applicant	Design Engineer
(Name of Board, Council or Owner – the **Applicant**)	(Name of **Design Engineer** of Record)
(Name and Title of **Authorized Official** or **Representative** of the Applicant)	(Name of Engineering Firm)
(Street or Box Number)	(Street or Box Number)
(City, State & ZIP)	(City, State & ZIP)
(Phone Number)	(Phone Number)
(FAX Number)	(FAX Number)
(Email address)	(Email address)
(Signature of **Authorized Official** or **Representative** of the **Applicant**)	

Project Name: _____
(Name of Project to appear on Public Water Supply Section records and tracking system)

_____
(description of project)

_____
(general location of project)

in _____ County.

Date _____ Serial No. _____
(for DENR use only) (for DENR use only)

2.3.1 Description of Proposed Project

The Application for Approval must contain a satisfactory description of the proposed project. A proposed water main extension project should not be described as "water main extension," "water lines" or anything that is not specific to the project. The project description should be specific to the work that is proposed. Below is an example of an acceptable project description for a proposed water main extension.

"1000 feet of 6-inch water main, 200 feet of 4-inch water main, hydrants, valves and appurtenances* to supply water to Andrews Street and Smith Lane in Anytown, NC."

* An appurtenance is an apparatus or an instrument such as a valve, reducer, blow-off, etc.

Use existing roads, intersections, and landmarks as references so the PWS Section review engineer can determine the location of the proposed project.

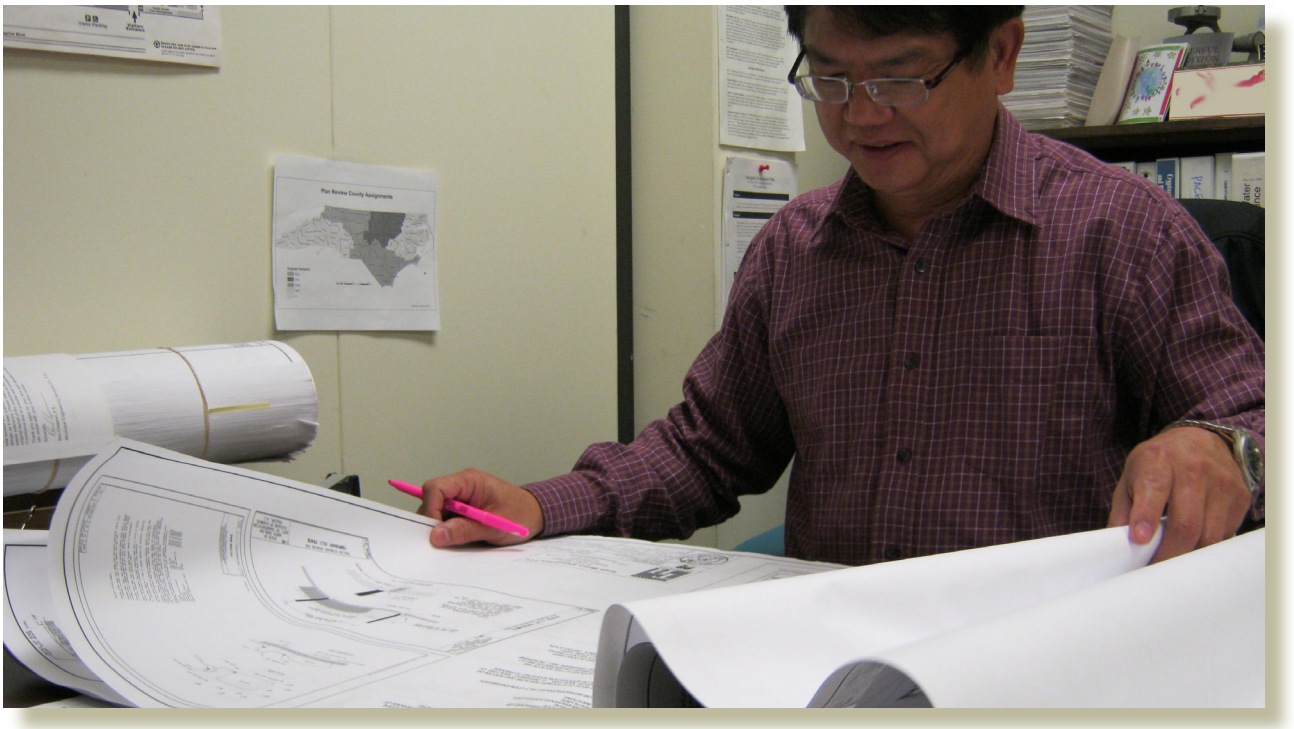
Questions regarding the Application for Approval can be directed to the plan review engineer assigned to the county in which the proposed project is located. The name and contact information for the plan review engineer are available online at: www.ncwater.org/pws/counties.htm.

2.4 Plans

Plans submitted to the PWS Section for review must accomplish the following:

- General View - Provide a view that encompasses the project in its entirety and its relation to existing municipalities and landmarks.
- Plan View - Provide specific information regarding the water infrastructure that is to be constructed or altered.
- Detail View – Provide scale views or associated dimensions of required devices and appurtenances.
- Profile View – Provide when directional drilling or boring beneath bodies of water or other obstacles is proposed. Provide a view that shows the vertical relationships of the final ground elevation, proposed water lines, body of water or other obstacles, utilities, sanitary sewers, storm sewers, and process sewers. Profile views are helpful to the PWS Section review engineer and should be included in the plans when crossings with water lines are present even if directional drilling or boring have not been used.

Plan sheets must be at least 11 inches wide by 17 inches long and must not be greater than 36 inches wide by 48 inches long. All plans submitted for review must be certified in accordance with 21 NCAC 56 .1103 for Standard Certification Requirements. The Standard Certification Requirements are available online at: www.ncbels.org/rulesandlaws.html. The PWS Section will not review plans that have not been certified according to 21 NCAC 56 .1103. Each page of plans containing design information must be sealed and signed by a Professional Engineer with current registration in North Carolina.



2.4.1 General View

The general view should include a vicinity map and can be incorporated into the title page to the plans. The general view should contain the following information:

- Title of the proposed project,
- Overall project layout,
- North point,
- Prominent landmarks and roads.

2.4.2 Plan View

The plan views must contain all information necessary for the PWS Section to perform a fully informed review of the proposed project. Every plan sheet must contain the following information:

• Title of the proposed project;

- Scale;
- North point;
- All known sources of pollution that are present within the area depicted on plan sheets, such as bodies of water, culverts, septic tanks, cesspools, disposal fields, etc.;
    - Some of the setback requirements for wells established in 15A NCAC 18C .0203 may extend beyond the boundaries of the plan sheet.
    - It is the engineer's responsibility as an agent of the water system owner to evaluate potential sources of pollution for interference with water supplies.
- Diameter, length, and material of all proposed water mains;
- All water system components;
    - For water mains, include all valves, hydrants, and other appurtenances.
- Diameter, length, and material of all sewers and drains (sanitary, storm, and process). Indicate force mains when they are present;
- All utilities;
- Information to verify the vertical separation distances of all water main crossings with utilities, sanitary sewers, storm sewers, and process sewers when profile views are not included with the submitted plans; and
- Depth of cover of water mains.

Additionally, any occurrence of phased construction should be clearly represented on the plan sheets upon submittal to the PWS Section for review.

2.4.3 Detail View

Detail views provide scale drawings of the appurtenances specified in the proposed project. When a project requires backflow prevention, a manufacturer name and model number for each appropriate backflow prevention device must be provided for PWS Section review. The term "or equivalent" may follow the manufacturer name and model number so that an equivalent backflow prevention device of a different manufacturer may be installed. Additionally, construction techniques and technologies should be represented as well as general notes to aid the contractor during construction activities.

Standard details included in specifications may satisfy this need.
Examples of devices, techniques, and general notes that should be included in the detail view.

Examples of devices, techniques, and general notes that should be included in the detail view are listed below.

1. Appurtenances and Devices
   - Backflow prevention devices. Include minimum clearance distances from enclosures.
   - Enclosures for backflow prevention devices.
   - Fire hydrants and fire hydrant assemblies.
   - Meters.
   - Inline valves.
   - Chemical feed.
   - Sample taps.

2. Technologies and Techniques
   - Reaction blocking or other thrust restraint system details for waterlines.
   - New or unconventional technologies.
   - Pipe encasement.
   - Pipe bedding.

3. General notes
   - Proper trenching, pipe laying, and backfill procedures.
   - Minimum sewer crossing and separation distance requirements.
   - Minimum water main depth requirements.
   - Proper procedure for flushing and disinfecting new water system components.

2.4.4 Profile View

Profile views provide a view of the vertical separation distances of proposed water mains from bodies of water and other obstacles, final ground elevation, utilities, sanitary sewers, storm sewers, and process sewers. Profile views may be incorporated into the plan view sheets. Every profile view must contain the following information:

- Title of the proposed project.
- Vertical scale. The vertical scale must be selected such that separation distances between objects can be easily determined.
- Horizontal scale. The horizontal scale in the profile view must match the horizontal scale used in the plan view sheets.
- Stations. Stations should be depicted on plan and profile views when profile views are used.
- All bodies of water and other obstacles.
- Diameter, length, and material of all proposed water mains.
- All valves, hydrants, and other appurtenances.
- Diameter, length, and material of all sewers and drains (sanitary, storm, and process). Indicate force mains when they are present.
- All utilities.

Profile views should be submitted in the circumstances discussed in Section 2.4 unless the vertical separation distances of all utility crossings with water lines can be clearly notated on the plan sheets.

2.4.5 Specifications

The specifications for materials, equipment, workmanship, and test procedures must be presented in a specifications document. The cover sheet must contain the project name, and must be sealed and signed by a Professional Engineer with current registration in North Carolina in accordance with 21 NCAC 56 .1103.

Systems with PWS Section-approved standard specifications do not need to submit specifications for review of water main extension projects. Only units of local government may develop standard specifications for review by the PWS Section. The list of systems with approved standard specifications is available online at: www.ncwater.org/pws/PlanReview/stdspecs.html. Only those listed systems may reference the approved standard specifications.

The cover sheet must contain the project name, and must be sealed and signed by a Professional Engineer.

The list of systems with approved standard specifications is available online at: www.ncwater.org/pws/PlanReview/stdspecs.html.

2.5.1 Standards of Manufacture, Installation and Performance

The specifications must provide the minimum standards for design, installation, performance, and manufacturing of products used in the proposed project. Standards must be based on PWS Section rule requirements, testing, and common practice within the industry.

With the exception of initial disinfection requirements, the PWS Section accepts American Water Works Association (AWWA) standards that pertain to design, installation, performance, and manufacturing. In addition, chemical additives must be third party certified under the American National Standards Institute / NSF International (ANSI/NSF) Standard 60 or 61. Please review section 2.5.1.4 for acceptable disinfection and bacteriological sampling standards.

2.5.1.1 Acceptable Standards of Manufacture

According to the PWS Section rules, water distribution materials must be manufactured to the appropriate AWWA standards, section C, or NSF standards No. 14, or equivalent standards. Listed below are acceptable standard material references for the most common water system components.

- Polyvinyl chloride (PVC) Waterlines at least two-inch diameter and less than four-inch diameter – ASTM D2241.* Waterline must meet AWWA C605 hydrostatic leak test requirements based on testing pressure of at least 150 pounds per square inch gauge (psig).
- PVC Waterlines four-inch diameter to 12-inch diameter – AWWA C900 for PVC Pressure Pipe and Fabricated Fittings or ASTM D2241*.
- Ductile Iron Pipe and Fittings – Based on device, use the appropriate standard in the AWWA C100 series.
- Valves and Hydrants – Based on device, use the appropriate standard in the AWWA C500 series.
- Polyethylene (PE) Waterlines four-inch diameter to 63-inch diameter – AWWA C906 for PE Pressure Pipe and Fabricated Fittings.
- Steel Waterlines 6-inch diameter and greater – AWWA C200 for Steel Pipe.
- Concrete Pipe – AWWA C300 for Reinforced Concrete Pressure Pipe, Steel-Cylinder Type.

*ASTM D2241 governs standard dimensional rating (SDR) pipe. Some water systems in North Carolina have found SDR 26 to be unreliable. The PWS Section does not recommend use of SDR 26 pipe.

2.5.1.2 Acceptable Standards for Installation

Listed below are acceptable standard installation methods for the most common water system components:

- Ductile iron components – AWWA C600 for the Installation of Ductile-Iron Water Mains and Their Appurtenances.
- PVC components – AWWA C605 for the Underground Installation of Polyvinyl Chloride Pressure Pipe and Fittings for Water.
- Polyethylene (PE) components – AWWA manual M55 for PE Pipe Design and Installation.
- Any additional manufacturer recommendations that are more stringent than the standards above.

2.5.1.3 Acceptable Standards for Performance

Listed below are acceptable standard methods for pressure and leakage testing for the most common water components as well as acceptable practices to aid in the determination of fire flow needs:

- Preparation for Use and Hydrostatic Pressure Test – The AWWA standards C600 for ductile iron and C605 for PVC contain methods acceptable to the PWS Section for the preparation, leak identification, and hydrostatic testing of ductile iron and PVC waterlines. In general, hydrostatic test pressure should be at least 150 psig.
- AWWA Manual M31 for Distribution System Requirements for Fire Protection.

2.5.1.4 Acceptable Standards for Initial Disinfection and Bacteriological Sampling

Initial disinfection of water supply systems must be accomplished in accordance with 15A NCAC 18C .1000. Water distribution systems and storage tanks must be disinfected in accordance with 15A NCAC 18C .1003. This method requires that the distribution system be flushed to remove sediment and other foreign matter. Following initial flushing activities, a chlorine solution must be introduced to water in the distribution system sufficient to result in an initial chlorine residual of at least 50 milligrams per liter. The chlorine solution must remain in the distribution system for 24 hours. Specifications must describe the method applied.

Exception: *For initial disinfection of water mains requiring very large volumes of water, the engineer may propose the Slug Method of disinfection as defined in AWWA C651 for Disinfecting Water Mains, Section 4.4.4. Initial disinfection of large water storage tanks (tanks 500,000 gallons and greater) may be accomplished according to AWWA C652 for Disinfection of Water-Storage Facilities using Chlorination Method 2. This method calls for spray or brush application of a 200-milligram per liter (mg/L) solution of available chlorine to all parts of the storage facility that would come in contact with potable water. Refer to C652 Method 2 for details.*

Following initial disinfection activities, the disinfecting solution must be flushed from the system with potable water from an approved water source until the chlorine solution is dispelled. Disposal of heavily chlorinated water may be regulated by the Division of Water Quality. For more information, refer to http://portal.ncdenr.org/web/wq.

Initial disinfection of water supply systems must be accomplished in accordance with 15A NCAC 18C .1000. Water distribution systems and storage tanks must be disinfected in accordance with 15A NCAC 18C .1003.

Representative samples of the water must then be collected. Bacteriological tests must be analyzed by a state-certified laboratory. A list of state-certified labs can be found online at: www.ncwater.org/pws/Compliance/electronic_reporting.html.
Water lines or water storage tanks that fail bacteriological testing must be recleaned and retested for bacteriological contamination prior to placement into service.

2.5.2 Design Specifications

The proposed project must be designed to comply with PWS Section rules. The specifications must contain the following information regarding the design of the proposed project:

- Minimum depth of cover for water lines;
- Minimum lateral and vertical separation distances between water and sewer lines; and
- Minimum vertical separation distances between water lines and non-sewer utility lines.

2.5.3 Materials Specifications

Specifications for all distinct types of water lines, valves, tapping sleeves, fire hydrants, backflow prevention devices and their enclosures, meters, gauges, service saddles, valve boxes, meter boxes, concrete, stone, detectable tape, and other materials or devices to be used in the proposed project must be called out. See Section 2.5.4 for submittal requirements regarding backflow prevention devices and fire hydrants.

2.5.4 Backflow Prevention Devices and Fire Hydrants

All distinct types of backflow prevention devices and fire hydrants must be identified in the project submittal. The material and installation specifications may be discussed in the specifications document or the detail views that accompany the plan sheets.

2.5.4.1 Backflow Prevention Devices

Note that specific manufacturer and model information are required for backflow prevention devices and their enclosures.

- Any double-check valve assembly or reduced pressure zone device must be approved by either the Foundation for Cross-Connection Control and Hydraulic Research at the University of Southern California (USC), or the American Society of Sanitary Engineering (ASSE).

The design engineer should contact the system that will supply the water prior to selecting placement of a backflow prevention device. Backflow prevention device enclosures must also be identified and the engineer must explain how drainage needs described in 15A NCAC 18C Appendix B will be met.

2.5.4.2 Fire Hydrants

Fire hydrants must be specified and should be in compliance with local fire authority standards. AWWA Manual M17 is a helpful resource for understanding fire hydrant design, testing, and operation. Dry barrel fire hydrants should meet requirements of AWWA C502, and wet barrel fire hydrants (if used) should meet requirements of AWWA C503.

Exception: *The listed AWWA standards do not cover hydrants designed to meet pressures in excess of 150 psig. If pressure is expected to exceed 150 psig, hydrants should be specified in consultation with the fire department.*

Fire hydrants must never be installed on any main smaller than six inches and must be installed on mains capable of meeting fire flows as described in Section 2.6.3.

It is important that flushing devices do not resemble fire hydrants, so that there is not confusion between the different devices. Some water systems have used flushing hydrants on water mains that cannot support fire flows. When flushing hydrants are used, it is critical for water systems to communicate to the fire department that flushing hydrants cannot be used for fire-fighting purposes.

2.6 Engineer's Report

The engineer's report must be a comprehensive evaluation of the proposed project and its impact to all affected water systems. The cover sheet of the engineer's report must state the name of the proposed project, engineer's contact information, and seal and signature of the design engineer in accordance with 21 NCAC 56 .1103.

If the applicant intends to seek Partial Final Approval for a project, then the engineer's report should adequately describe project phasing. See Section 2.6.7 for additional information regarding phased projects.

The PWS Section has developed a Recommended Template Engineer's Report for Water Main Extensions to be used for water main extension projects that do not propose treatment, pumping, or water storage. Complex or unique design conditions must be addressed in a supplemental document.

Projects not eligible to use the Recommended Template Engineer's Report for Water Main Extensions form must submit an engineer's report that must contain the information listed in Sections 2.6.1 through 2.6.8.

The cover sheet of the engineer's report must state the name of the proposed project, engineer's contact information, and seal and signature of the design engineer.

2.6.1 Applicant Information

- Name and mailing address of authorized individual listed on the Application for Approval.
- E-mail address of applicant.
- Phone number of applicant.

2.6.2 Project Description

- Name of the proposed project.
- Location of proposed project.
- The type of facility to be served by proposed project.
- Notation of the presence and type of fire protection.
- Population and number of connections to be served by proposed project.

2.6.3 Design Basis for Proposed Project

For all projects, pressures must be at least 30 psig during peak demand at all locations. Where fire flow is provided, pressures must be at least 20 psig at maximum daily demand plus fire flow at all points in the project. For all projects, the engineer's report must describe:

- Minimum project water pressure measured as psig. Water pressure may be determined using hydrant flow tests, models calibrated off of known system information, or calculations.
    - Hydrant flow tests. The engineer should provide locations of hydrants relative to the project; flow, static and residual pressures determined from the flow test; and calculated flow at a residual pressure of 20 psig.
    - Calibrated hydraulic model. The engineer should provide a summary of model output with a verbal or pictorial description of the model.
    - Calculation. The engineer should determine pressure or head at the main or storage tank; evaluate elevation changes, friction losses and minor losses.
- Maximum non-fire flow project demand including domestic, in-ground irrigation, commercial, industrial, etc. as applicable (measured in gallons per day). Note that all local government water systems of any size and community water systems having 1,000 or more connections or 3,000 or more individuals must require separate meters for new in-ground irrigation systems on lots platted and recorded after July 1, 2009 as required by North Carolina General Statute 143-355.4.
- Water mains designed to carry fire protection flows. Proposed new water mains must be capable of maintaining at least 20 psi in the distribution system during peak demand (minimum required fire flow plus domestic demand) per Rule .0901. The engineer's report must document that at least 20 psi pressure can be maintained at peak demand.
- Length, diameter, material of pipe to be installed.
- Useful life of all components of proposed project.
- Any new or alternative proposed technologies and justification for use.

For projects including a new or expanded source, the engineer's report must describe:

- Hydrological or hydrogeological data;
- Stream flow rates or well yields;
- Analytical results for chemical, mineral, bacteriological, and physical qualities; and
- Location and nature of sources of pollution.

Additional details to be included in engineer's reports for sources are discussed in [CHAPTER 8].

For projects including treatment, the engineer's report must describe proposed treatment processes including:

- Treatment types and objectives,
- Chemicals to be applied,
- Estimated chemical feed rates,
- Chemical feed pumps, and
- Anticipated chemical storage and delivery plans.

Additional details to be included in engineer's reports for treatment are discussed in [CHAPTER 9].

2.6.4 Information of System to be Expanded by Proposed Project

A system is considered to be expanding any time it experiences a permanent increase in demand, such as through additional connections or the wholesaling of water. The connection of a proposed project to an existing system constitutes an expansion of the existing system. Any proposed project that will result in the expansion of an existing system must provide the following information about the existing system that is being expanded:

- Name and description of existing water system to be expanded.
- If proposed project will connect to a previously approved phase, provide project number and description of approved phase.
- Public Water System Identification number (PWSID) of existing system.
- Willingness to Serve Letter from existing water system for projects that are proposing to connect to existing water system of different ownership.
- Current storage capacity of existing system (measured as gallons).
- Current number of connections in existing system.
- Current average and maximum daily demand of existing system (measured as gallons per day).
- Current average and maximum daily treated water supply entering the distribution system. Treated water supply consists of water produced and treated by the system and treated water purchased from other water systems.

Note that the existing system must be evaluated to ensure that adequate storage capacity and treated water supply exist to serve the proposed project.

2.6.5 Changes in Water Demand

The engineer's report must address the potential for the area served by the proposed project to experience an increase or decrease in demand in five-year increments up to 20 years. The engineer's report should also indicate if the proposed project will be constructed in multiple phases.

2.6.6 Alternative Sources of Supply

If multiple water sources are available, discuss potential sources and rationale for choosing the source that is to be used, such as financial considerations, operational requirements, operator qualifications, reliability, and water quality considerations.

2.6.7 Additional Information Helpful to the PWS Section

In addition to the information that must be included in the engineer's report, inclusion of supplemental information regarding the project is helpful to the PWS Section and can aid the review process. For example, some projects involve multiple agencies. Inclusion of the agencies and each agency-assigned project number is helpful to the PWS Section during the review process.

2.7 Fees

The PWS Section charges a processing fee for each initial submittal. The fees can be found online at: www.ncwater.org/pws/prfees.htm and are also listed on the Application for Approval. Each initial submittal should be accompanied by a check for the appropriate fee. The check is to be made payable to:

NCDENR - Public Water Supply Section
The check is to be mailed to:
Public Water Supply Section
1634 Mail Service Center
Raleigh, NC 27699

2.8 New Well Projects

Documentation for new wells and associated infrastructure must be submitted to the PWS Section regional office that serves the county where the well or wells are located. PWS Section contacts (by county) can be found online at: www.ncwater.org/pws/counties.htm. New wells are discussed in detail in [CHAPTER 8].

2.8.1 New Well documents required for PWS Section review

The following documents must be submitted to the PWS Section regional office with the Application for Approval, applicable fee, plans, specifications, and engineer's report for all new well projects.

- Well Driller's log with signature and certification number of well driller.
- Twenty-four hour well yield and drawdown signed by individual qualified to perform the testing.
- Calculated total dynamic head (static head, friction head losses, and operating pressure of system).
- Manufacturer's performance curves for pump(s) selected. Operating range of pump(s) must be indicated on performance curve(s).
- Engineer's well construction verification statement. The verification statement must be signed and sealed. By policy, the PWS Section will also accept a certification from a N.C.-Licensed Geologist.
- Well site deed and recorded plat with location of well.
- Laboratory analytical test results of new well(s). Detailed listing of required analytical tests available in [CHAPTER 8].
- All new water infrastructure associated with the well and connection of the well to the previously approved water infrastructure.

The design engineer should bind the above bulleted documents into the engineer's report to facilitate review by the PWS Section review engineer. The PWS Section must have three legible copies of documentation in order to review a project.

2.9 Storage Tank Reconditioning

Systems must notify the PWS Section prior to reconditioning a water storage tank. The PWS Section has developed a streamlined process and form that must be completed and submitted to PWS Section regional office at least 30 days prior to the commencement of reconditioning activities. The Application for Water Tank Reconditioning Plan Approval form is available online at: www.ncwater.org/pws/planrev.htm.

The Application for Water Tank Reconditioning Plan Approval form is available online at: www.ncwater.org/pws/planrev.htm.

2.10 Revised Projects

Any divergence from previously approved plans or specifications must be submitted for approval as a revision. In some instances, only a portion of previously approved plans and specifications must be revised. In this case, the revised documents are submitted to the PWS Section by the design engineer with instructions regarding what the revision is intended to replace. In other instances, an entire project must be revised. In this case, the revised project is submitted by the design engineer with instructions to terminate the project that the revision is to replace.

Some examples of changes to plans or specifications that require resubmittal are:

- Change in location for any item (water main, backflow prevention device, etc.).
- Equipment substitution that does not qualify as an equivalent, or was not originally identified in approved specifications.
- Use of a technology or technique other than what was approved. For example, the use of a bore-and-jack method of running water line in place of excavation and backfill methods if the bore-and-jack method was never approved during the initial review process.

2.10.1 Submittal of Revised Projects

Each revised project submittal must include a cover letter that describes the elements of the project that have been replaced or revised. The design engineer must indicate that no changes have been made to items that have not been resubmitted. Additionally, the cover letter should indicate if the original engineer's report and / or specifications are to be used during review of the revised project.

Revised projects should be submitted to the PWS Section with the following documentation listed below to facilitate review.

- Check for appropriate fee determined by the project type.
- One copy of original Approval Letter granted by the PWS Section for project.
- Plan, detail, and profile sheets that differ from plans that were approved. Indicate in cover letter that no changes have been made to sheets that have not been resubmitted.
- Specifications that differ from previously approved specifications. Specifications need not be resubmitted if they have not changed since approval. Indicate in cover letter that no changes have been made to specifications that have not been resubmitted.
- Engineer's report that differs from previously approved engineer's report. The engineer's report need not be resubmitted if required elements have not changed since approval. Indicate in cover letter that no changes have been made to the engineer's report that has not been resubmitted.

See Section 2.2 to determine the number of copies of each document to submit.

Each revised project submittal must include a cover letter that describes the elements of the project that have been replaced or revised. The design engineer must indicate that no changes have been made to items that have not been resubmitted.

2.11 Digital Submittal

The PWS Section now provides the option of partial digital submittal. Applicants and consulting engineers using the digital submittal option will provide the PWS Section with one complete paper copy and two CDs including all required documents. Required documents include the Application for Approval; plans, specifications and engineer's report. The file format for digital copies is pdf, with the application, plans, specifications and engineer's report each in a separate folder. Each page within a folder must be saved as a separate file. It is important to always provide two complete digital sets on separate CDs.

3.0 Water System Management Plans and Other Required Water System Plans

In 1996, revisions to the Safe Drinking Water Act introduced the concept of capacity development. Capacity development is the process of implementing technical, managerial and financial practices to improve compliance with drinking water regulations. States were required to evaluate the capacity of existing and new water systems on an ongoing basis.

The state Public Water Supply, or PWS, Section reviews the following documents and has implemented these associated milestones in order to evaluate a water system's capacity:

- Approved plans and specifications and a completed engineer's report before an Authorization to Construct will be awarded for any project;
- A complete Water System Management Plan, or WSMP, before an Authorization to Construct will be issued for any project;
- A certified Emergency Management Plan before the final approval will be issued for any project; and
- A certified Operation and Maintenance Plan before the final approval will be issued for any project.

Copies of additional pertinent documents may be requested to confirm compliance with other agencies' requirements.

3.1 Water System Management Plan

A Water System Management Plan is a document describing the financial and managerial organization of a water system as pertaining to the system's availability to comply with requirements of 15A NCAC 18C. New and expanding community and non-transient, non-community systems must have a complete Water System Management Plan before the PWS Section will issue an Authorization to Construct for a project. Large or complex water systems may need to provide more details in their Water System Management Plans than small systems.

Be sure to include the following items with every Water System Management Plan submittal:

- $75 fee;
- A completed copy of the Water System Management Plan certification, available at http://www.ncwater.org /pws/CapDev/forms/WSMP_Certification.pdf; and
- A completed Water System Management Plan.

A Water System Management Plan presents:

- Organization details;
- Ownership;
- Management qualifications;
- Management training;
- Policies;
- System monitoring, reporting and recordkeeping; and
- Financial plans.

The format of a Water System Management Plan is flexible. Some of the examples that are provided in this chapter are typical of some small water systems.

The Water System Management Plan need not follow the format of the examples provided in this chapter. It is helpful to follow the outline scheme shown in http://www.ncwater.org/pws/CapDev/forms/WSMP_Reporting_Req_Summary_Sheet.pdf. All water systems are different, and staff with each system must develop their own unique descriptions.

A Water System Management Plan can be generalized so it supports multiple project applications made over several years. Pertinent organization details would be positions rather than specific employees. Pertinent budget development and rate structure policies would be a description of budgeting processes rather than capital plans specific to any individual project. Once deemed complete, most WSMPs can be considered current for several years. However, applicants seeking project funding from the PWS Section's Loans and Grants Unit are required to have a WSMP with a deemed complete date of less than two years old at the time of the funding of the application.

3.1.1 Organization Details

A. Description/chart of organizational structure for management of a water system.

Identify the water system owner and other positions responsible for running the water system. An organizational chart is often a helpful way to demonstrate who has responsibility for the water system. Organizational charts can also address requirements of section B below.

B. Positions responsible for policy decisions and for system operation

Describe primary responsibilities of key personnel:

- Which position manages, approves policy, approves expenditures and has authority to hire and fire?
- Which position performs routine tasks such as maintenance, monitoring and reporting? Submits reports? Makes technical decisions?

Water systems required to submit a WSMP must have an operator in responsible charge, or ORC. As defined in 15A NCAC 18D, ORCs may be required for treatment, distribution and cross connection. As defined by the Environmental Protection Agency, or EPA, cross-connections are actual or potential connections between a potable and non-potable water supply.

The water system owner has the primary responsibility for meeting drinking water regulations. The ORC is normally an employee or a contract employee of the owner. The water system owner and ORC should clearly establish roles. Commonly, the ORC performs or oversees needed maintenance, performs or oversees process control tests, verifies that chemicals are fed properly and collects compliance samples as needed. ORC duties may also include:

- Handling customer complaints;
- Addressing emergencies, malfunctions and breakdowns;
- Responding to the PWS Section during inspections or consultation;
- Overseeing and coordinating repairs or new installations;
- Having a working knowledge of regulations;
- Establishing standard operating procedures and updates as needed; and
- Verifying and submitting reports or forms required of the system.

The water system owner is ultimately responsible for the water system and liable for any non-compliance. The owner should provide direction to the ORC, be available to the ORC to discuss system needs, and adequately fund operations and maintenance. Figure 1 presents an example of an organizational chart for a privately owned water system with a contract operator. Figure 2 presents an example of an organizational chart for a municipal water system.

Figure 1. Example organizational chart for a privately owned community water system.

Mr. Smith, Owner

- Named on permit. – Funds needed maintenance.
- Directs operator activities and available to discuss needs.
- Keeps copies of all system records.
- **Ultimately responsible for the water system.**

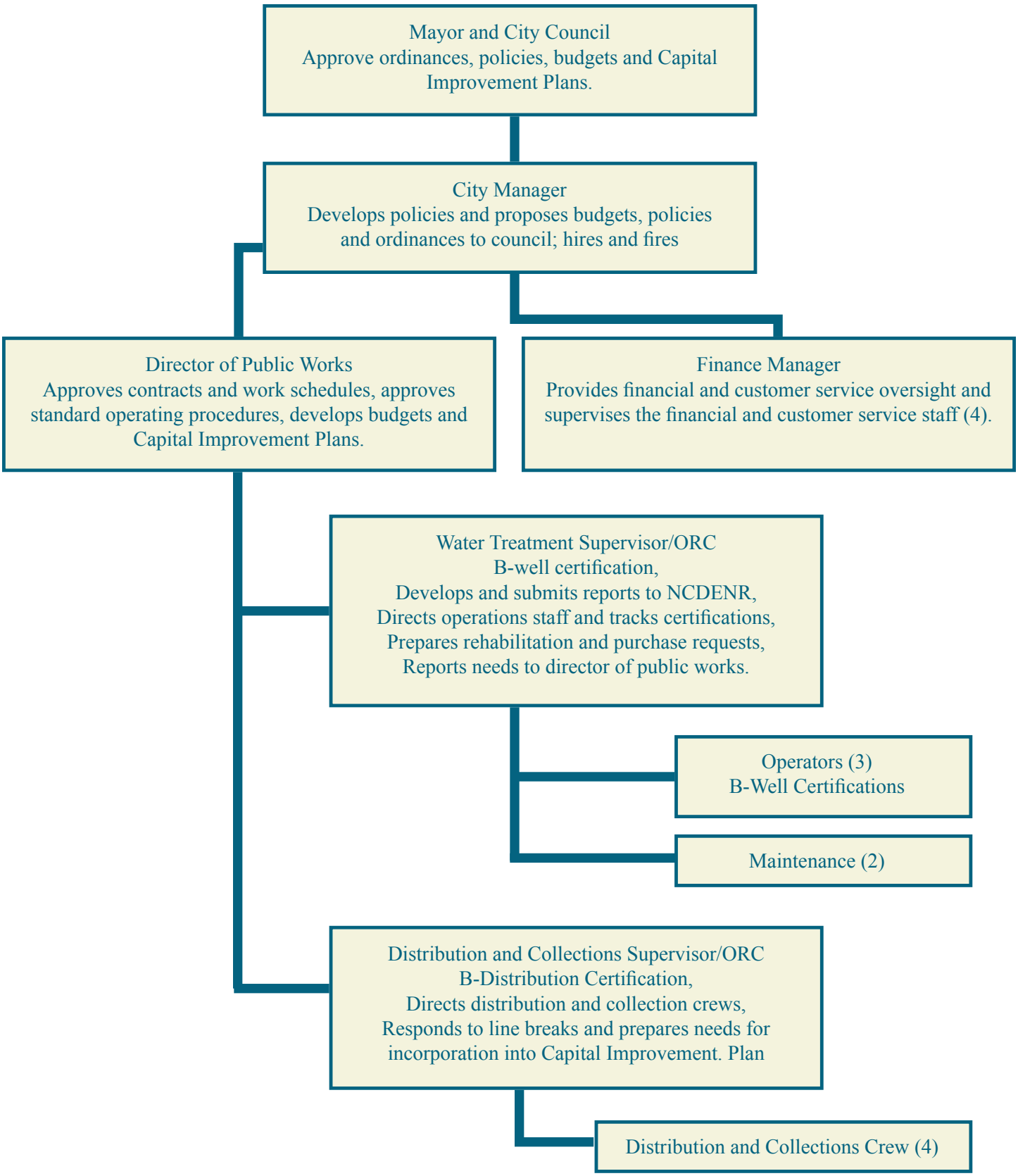
Mr. Jones, ORC

- Contract treatment operator with C-well license.
- Maintains treatment and distribution as agreed in contract.
- Visits plant, checks equipment, and verifies chemical levels at least twice per week, as required by the PWS Section.* Informs Mr. Smith of water system needs.

* The water system represented has a C-well and C-distribution system with 60 connections, serving 150 people. Number of visits required varies by system.

The example above includes specific information about required operator visits to the water plant. Detailed requirements vary based on system type and population served. For more information, see 15A NCAC 18C .1303.

Figure 2. Example organizational chart for a municipal water system.



C. Copies of contracts for systems not managed by owners
When the ORC is a contract employee, the contract must be provided as part of the WSMP. The contract must detail the ORC's responsibilities.

The statute limits the number of systems that can be served by the same ORC. When establishing a contract for water system operations, make sure the contract operator does not serve as ORC for too many systems at once. Also, make sure that the operator has a certification level at least as high as required for the system.

3.1.2 Ownership

A. Identify the legal structure of ownership (partnership, municipality, etc.)
Describe water system ownership such as an individual, a corporation, a municipality, or a school district. Disclose any foreseeable changes in ownership, such as plans to turn a new water system over to a homeowner's association.

Some water systems are made up of multiple districts with a centralized management and operational structure. Such systems should specify the statute under which the district was established. One WSMP may cover multiple districts.

B. Provide the complete address of the owner and the location of the system.
Provide the mailing address of the water system owner and the physical location of the water system. (If this information is provided on the Water System Management Plan Certification included with the package, it does not need to be repeated.)

C. State whether or not there are any legal orders that will affect control.
If legal proceedings limit the owner's control of any portion of the water system, describe what those proceedings are and how the water system will continue to serve customers reliably.

In most cases, the owner of a water system is clearly defined. Occasionally, as in the following example, water system ownership is not as clear. For example:

The county owns water system components, including water lines while town provides treated water and operates the lines. The county and town have entered into an agreement that clearly delineates the responsibilities of each party to ensure continuous safe and reliable service to customers. Issues considered and addressed in the agreement include procedures for authorizing connections and additional service areas, the potential interruption of water service, the protection of upstream and downstream water lines from contamination during interconnection or disconnection, and the performance of day-to-day operation including water sampling, repairs, billing and customer service.

Revenue sharing agreements can also lead to conflict or confusion when the responsibilities of each partner in the agreement are not clearly defined. For more information on water system partnerships or agreements, refer to the Environmental Finance Center's Tips and Guidelines for Establishing Water Partnership Agreements, available at http://efc.unc.edu/publications/2009/water_parternship_tips.pdf.
Purchase agreements are also discussed in Section 8.3.2 of this document.

When agreements such as purchase agreements, revenue sharing agreements, or other inter-local agreements are necessary to establish responsibility for the water system, a copy should be provided as an attachment to the WSMP.

D. Describe legal authority (ownership, easements) allowing operation.
Water systems must describe the legal authority allowing access to water system components. In some cases, the water system owner owns all the land and facilities surrounding pipes and any structures that must be accessed for maintenance.

In other cases water pipes run through land owned by others and the water system obtains easements from property owners to guarantee access for repair and maintenance. For example:

The county has purchased 25 acres of land to accommodate wells, the water plant and major transmission mains. Most other county water mains are located within North Carolina Department of Transportation rights of way. The county has also established 20,000 feet of easements; 20 feet wide to guarantee access to water mains not located within rights of way. All easements are professionally prepared and officially recorded.

3.1.3 Management Qualifications

A. Describe the qualifications and training of owners and operators of system. The water system owner is ultimately responsible for all activities occurring in a water system. The ORC is a professional charged with running the water system. Describe the owner's experience with water treatment, government, business management, or other applicable experience. Provide a list of any other water systems owned or operated within the last five years. Describe the ORC's technical training background, experience operating drinking water systems and related experience, such as maintenance or operating wastewater plants.

B. Names, identification numbers, penalties/violations (if any) of other owned or operated systems. Provide the name and water system identification number of all systems owned by the same water system owner within the last five years. Include systems that now have new owners. In addition, provide the names and water system identification numbers of any water systems managed under contract within the last five years.

When any of the systems listed have received violations resulting in penalties, describe how the violation occurred and how similar violations will be prevented at the water system covered by the WSMP.

3.1.4 Management Training

Certified operators are required to attend continuing education courses in order to maintain licensure. Water system owners should attend training, especially training focused on regulatory updates and water system management. For example:

The owner attends training on new drinking water rules in order to understand requirements, reviews all regulatory update publications produced by the PWS Section and attends financial management sessions offered at conferences. The ORC obtains at least six continuing education credits per year offered by drinking water training organizations such as The North Carolina Chapter of the American Waterworks Association, or AWWA, the North Carolina Waterworks Operators Association, the North Carolina Rural Water Association, and the PWS Section. The ORC focuses on technical subjects such as drinking water regulations, sampling techniques and maintenance techniques for water systems.

The PWS Section recommends that water system owners regularly attend training to familiarize themselves with any regulatory changes and develop a greater understanding of water system functions.

3.1.5 Policies

The WSMP must include a description of the following policies:

- Cross-connection control;
- Customer information, complaints and public education;
- Budget development and rate structure;
- Response and public notification if water quality violations occur;
- Customer connection, disconnection, billing and collection; and
- Safety procedures.

Policies can be simple or complex. Any policy should clearly communicate the expectations for the water system owner and employees, as to how each is expected to act or respond.

A. Cross connection control.
Water systems that are required to have five or more testable backflow prevention assemblies are required to have a cross-connection control operator. Water systems must have policies for cross-connection control. Cross-connection control programs oversee the installation, testing and maintenance of backflow prevention devices or assemblies. For more information on cross connection control programs, refer to the AWWA Manual of Water Supply Practices M14: *Recommended Practice for Backflow Prevention and Cross-Connection Control.* Guidance in 15A NCAC 18C Appendix B includes guidelines for cross-connection control devices under different situations, and applications of different devices are discussed in Chapter 12, Distribution.

Even those systems not required to have a cross-connection control operator must have cross-connection control policies intended to protect the drinking water supply from contamination. For example:

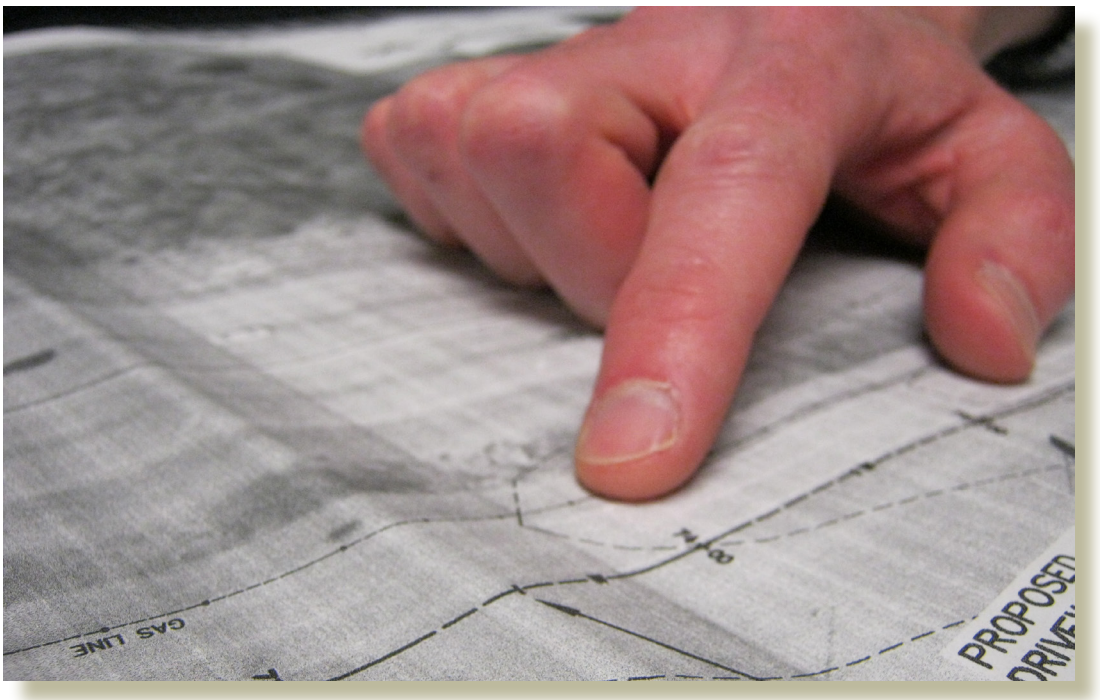
Cross connections control protection at the treatment facility includes chemical feed pumps wired to the well pumps so they operate simultaneously, installation of anti-siphoning devices for chemical feed systems, vacuum breakers on hose bibs and color coded pipes. The ORC tests for chlorine at the raw water sampling tap to confirm that backflow has not occurred and inspects the distribution system to ensure there are no connections to unapproved water systems or sources (i.e., private wells), submerged blow-offs, direct connections to sewers for flushing either the water system or sewer, or uncontrolled use of fire hydrants.

To protect the water system from cross connection hazards, the water system monitors customer usage to identify moderate or severe hazard uses and requires the installation of appropriate backflow prevention devices. All customers are required by ordinance to ensure their plumbing meets all applicable state and local plumbing code requirements. The water system owner has the legal right of entry and inspection of customer facilities and can disconnect service if an unprotected cross connection hazard is identified.

B. Customer information, complaints and public education.
All water systems should have procedures in place to investigate and address customer complaints and to educate customers on topics such as water quality, water conservation and source water protection. Customers are sometimes the first to become aware of problems in a water system, and water quality complaints should be taken very seriously. Large water systems may have a customer service department and should summarize their customer service policies in the WSMP.

A small water system is unlikely to have a customer service department, but should clearly assign responsibility for handling complaints to the owner or employees. A quick and thoughtful response to concerns reassures customers and helps them value the water system. For example:

If a water system customer has a complaint or question, the ORC will respond to the complaints as soon as possible and will talk to the customer. If the problem concerns water quality or amount of water available, the ORC will meet with the customer to examine the water available at the tap, recommend sampling as appropriate, and discuss solutions. Water quality data will be provided to customers on request and in the annual consumer confidence report. Consumer confidence reports will be mailed to each customer.



C. Budget development and rate structure

Water system rate structures should be set to provide for continued operation and maintenance of the water system. The process of budget development and rate structure varies. All systems must describe their process for developing budgets and setting rates. The description should include the frequency of rate and budget review and the process for adjusting rates and budgets. The PWS Section recommends all water systems consider asset management in support of long-range planning.

Units of local government regulated by the Local Government Commission, or LGC, and water systems regulated by the North Carolina Utilities Commission have complex processes for budget development and rate setting already in place. Such systems should briefly describe their processes for developing budgets, analyzing rates, recommending rate changes and developing a capital improvement plan.

Other community and non-transient, non-community water systems can use Worksheets 1, 2, and 3, described in Section 3.1.7 to develop budgets. Systems that bill for water should develop a rate structure that will meet their projected budget while preserving adequate revenues in a reserve account. Systems that do not charge separately for water should fund budgeted expenses and maintain a reserve. Such systems would be advised to set aside separate accounts for water system needs and other business needs in order to track expenses. It is the process and strategy of setting rates and maintaining reserves that is evaluated in the WSMP.

For more information, see EPA's Small System Rate Setting Guidance at:
www.epa.gov/ogwdw/smallsystems/pdfs/guide_smallsystems_final_ratesetting_guide.pdf.

D. Response and notification in the case of violations.

If the water system causes any violations of drinking water standards, the owner is responsible for directly notifying all residents of the violation, sometimes within 24 hours. Requirements for specific violation notices can be found in 15A NCAC 18C .1523. Public notice templates and associated instructions are included as an attachment to any violation letter and are available at: http://www.ncwater.org/pws/PN.html.

All water systems should be familiar with general public notice requirements, as some violation types necessitate public notice soon after receiving sample results. Water systems should not wait on the violation letter to provide notice. For example:

Notices are delivered to each home within the following intervals and methods:

- *For maximum contaminant level (MCL) violations of fecal coliform or nitrate—notices will be hand delivered to all homes as soon as possible but no more than 24 hours of the date the lab notifies the water system of noncompliant sample results. Customers will also be notified as soon as the problem has been resolved through radio and newspapers, phone calls, posted fliers, or notices delivered to homes.*
- *For other MCL violations, notices will be mailed within 30 days of the date the water system receives notification from the laboratory of the non-compliant sample(s). Customers will also be notified once the problem has been resolved. While not required, alerting customers that the violation has been resolved is a good idea and helps to reassure those using the water.*
- *For most monitoring violations, notice will be included in the Consumer Confidence Report which is mailed within 365 days of the date the violation is discovered.*

A quick reference guide for public notices is available at:
http://www.ncwater.org/pws/Compliance/RuleSummaries/PNQuickReference.pdf.
If desired, this guide may be incorporated as an attachment to the water system management plan.

E. Customer connection, disconnection, billing and collection.
Many units of local government have detailed policies for connection, disconnection, billing and collection. Such systems may either summarize their policies in the WSMP, or may provide the policies as an attachment. Units of local government may contact the UNC School of Government at at http://www.sog.unc.edu/ for additional guidance regarding water system policies.

Other systems should summarize individual procedures for connection, disconnection, billing, if applicable, and collection, if applicable.

F. Safety procedures
Several chemicals commonly used in water treatment are hazardous. Other risks to operators include heavy machinery, vehicles and confined spaces. The N.C. Department of Labor has extensive safety requirements. Water systems should set forth a policy statement in the WSMP indicating a commitment to safety and that all applicable safety regulations will be followed.

3.1.6 System monitoring, reporting and recordkeeping

A. Summarize the system monitoring and reporting requirements.
Water system monitoring and reporting requirements vary based on several factors such as system type and population served. A statement that "the system will comply with the green book'" does not demonstrate that the owner understands monitoring requirements. Instead, system specific sampling information must be provided.

Existing systems may supply a copy of the Sampling Status Report available at https://www.pwss.enr.state.nc.us/NCDWW/, unless they are adding new sources onto the system. New systems, or systems adding new sources, should fill out and submit sampling guidance available at http:// www.ncwater.org/pws/schedules.html. Population increases can trigger additional monitoring. If population is increasing, water systems should consult with the PWS Section Regional Office to determine how monitoring requirements may change.

B. Describe the procedures for keeping and compiling records.
Water system records must be kept on the premises, or at a convenient location near the premises, for reference and provided to the PWS Section for inspection.
Some records are not specifically governed by the regulations but are relevant to the water system as long as operations continue. The PWS Section recommends retaining the following records indefinitely:

- Plans and specifications, which provide the most detailed and accurate information possible on system components;
- Monitoring plans, which provide justification for selecting or changing sample sites; and
- Any other approval, variance, or waiver still applicable to system operation.

It is important for all water systems to protect water system records against damage. Some contract ORCs keep their own copies of records, but the water system owner is ultimately responsible for maintaining all records. The owner must provide records to the PWS Section on request. The owner and ORC should consult on filing procedures to be used by the system.

3.1.7 Financial plans

Required financial documentation varies based on the type of system. Units of local government are subject to financial oversight by the Local Government Commission, or LGC. Systems regulated by the North Carolina Utilities Commission are required to meet the utilities commission's financial requirements. Systems not regulated by either body must develop financial worksheets and submit them to the PWS Section.

Nonprofit water corporations may have oversight from the agency that funded the creation of the water system. Such systems should submit the worksheets described in the "Other water systems" section below as part of the water system management plan.

Units of local government must:

- Submit a copy of LGC approval of the debt issue for any project incurring debt.
- For projects not incurring debt, submit a copy of LGC-108C and the following true statement signed by a town official. "The town of ___ hereby states that it is in compliance with the N.C. General Statutes, Chapter 159, Article 3, The Local Government Budget and Fiscal Control Act."

  Please note: For routine projects covered by the water system management plan, LGC-108C for the latest calendar year provides the needed financial summary. If a project covered by the water system management plan is a large project such as the construction of a new water treatment plant that requires issuance of new debt with LGC approval, then the water system should submit LGC approval of that debt as a portion of the Water System Management Plan.

Utilities regulated by the North Carolina Utilities Commission must:

- Submit a copy of the Order Granting Franchise and Approving Rates from the North Carolina Utilities Commission; or
- Submit a copy of Order Recognizing Continuous Extension and Approving Rates from the North Carolina Utilities Commission

Other water systems must:

- Submit worksheets 1, 2 and 3 (community systems need to submit these to document the costs of running a water system, even if charges for water are included in rent or homeowners' association fees.) The worksheets can be found at http://www.ncwater.org /pws/CapDev/CapDevForms.htm. The worksheets must demonstrate positive cash flow for the next five years.
- Do one of the following:
  - Describe the creation of a cash reserve equal to one-eighth of annual system operating expenses and fund by the end of the first year AND describe the creation of an emergency cash reserve equal to cost of replacing the most expensive piece of equipment, to be funded by the end of the fifth year. Reserve amounts are calculated on Worksheet 1, and the water system management plan must describe plans to create reserve accounts and fund them as described on this worksheet; or
  - Applicants with multiple water systems may show reserves to meet expenses documented on worksheets 1, 2 and 3; or
  - Applicants may demonstrate equivalent financial capacity to comply with expenses documented on worksheets 1, 2 and 3.
- Describe budget and expenditure control procedures that prevent misuse of funds. For example, will the financial records be audited annually using generally accepted accounting procedures?

3.1.8 One water system management plan covering multiple systems under one owner or covering multiple projects

An applicant owning multiple water systems can submit one WSMP to cover all the systems owned. This plan should provide a clear list of the water system names and identification numbers included.

One WSMP can cover multiple projects. If systems provide sound financial and managerial information, the WSMP can be used until outdated. The water system should periodically review its WSMP to determine if it still applies to new projects or if it requires updating.

3.2 Operation and Maintenance Plan

Community and non-transient, non-community water systems must develop an Operation and Maintenance Plan before submitting an applicant certification for any project. This plan does not have to be submitted to the PWS Section but must be maintained at the water system, must be accessible to the operator on duty at all times and must be made available to the PWS Section staff visiting the water system.

Operation and Maintenance plans are system specific. Several tools and guides are available, including:

- Florida Operation and Maintenance Manual and Preventative Maintenance Logs at http://www.dep.state.fl.us/central/home/DrinkingWater/FieldCompliance/Onsite_Documentation/O&M_Manual.pdf; and
- EPA's Check Up Program for Small Systems at http://water.epa.gov/type/drink/pws/smallsystems/index.cfm.

3.3 Emergency Management Plan

Community and non-transient, non-community water systems must develop an Emergency Management Plan before submitting an applicant's certification for any project. For community water systems this plan:

- Identifies water system personnel responsible for emergency management and provides their contact information;
- Identifies foreseeable natural and human-caused emergency events including water shortages and power outages;
- Describes the emergency response plan for each identified event;
- Describes notification procedures; and
- Identifies and evaluates all facilities and equipment whose failure would result in a water outage or water quality violations.
- An Emergency Management Plan for non-transient, non-community systems contains the positions and phone numbers of responsible persons to contact in the event of an emergency. The Emergency Management Plan must be available to the operators of the water system at all times and must be made available to the PWS Section for inspection at any time.
- Guidance on developing an Emergency Management Plan is available at: http://www.ncwater.org/pws/security/emergplans.htm.

Community and non-transient, non-community water systems must develop an Emergency Management Plan before submitting an applicant's certification for any project.

3.4 Reassessing Water System Capacity

One WSMP can cover many projects at a water system. There is no set regulatory schedule for updating any of the plans described in this chapter. Water systems should review Water System Management Plans, Operation and Maintenance Plans, and Emergency Response Plans periodically to determine whether they are still appropriate. The PWS Section recommends that water systems review their plans each year when preparing to renew the system's operating permit. In this manner, systems can make minor needed updates annually without needing to completely rewrite a plan.

Each time a water system submits an application for a project, the system's representative either indicates that a new WSMP is being submitted that covers the project or that an existing WSMP covers the project. Each time a water system submits an applicant certification, the system's representative attests that an Operation and Maintenance Plan and an Emergency Management Plan are available to the operator and to the PWS Section on request. It is the water system's responsibility to review and update these documents as needed.

Water system changes triggering revisions might include:

- Addition of a new well or new treatments to the system, particularly if those additions increase the required operator certification level;
- A change in organizational structure of the system such as forming a new department;
- Projects requiring the water system to incur new debt;
- Installation of significant new infrastructure such as new storage tanks or many miles of water lines;
- Addition of a significant number of new customers, especially if billing procedures will change or if new maintenance protocols are developed; and
- Non-compliance issues that may be exacerbated by the changes.

Systems deciding to update a WSMP may either submit only those sections that need updating, or may submit a completely new plan to the PWS Section. Be sure to include a cover letter describing what updates are being made and providing the serial number of any existing WSMP.

4.0 Review and Approvals

This chapter describes the review and approval process for public water systems. It describes which types of projects must be submitted for PWS Section review and approval, roles of different branches within the PWS Section (including regional offices and plan review staff in the Central Office), and describes some types of projects that must be reviewed by other regulatory agencies for compliance with their rules.

4.1 Projects Requiring PWS Section Review

The following types of projects require review and approval by the PWS Section before construction may begin:

- Water sources (such as wells, springs, intakes, etc.). PWS Section Regional Office review is described in Section 4.4, and Plan Review roles are described in Section 4.5.
- Water treatment plants.
- Changes in water treatment. Proposed changes in treatment chemicals are also reviewed by the Compliance Services Branch to evaluate potential changes to treated water characteristics that can impact monitoring schedules. All initial questions regarding proposed changes in chemical treatment should be directed to the PWS Section Regional Office responsible for the county in which the project will be located. A list of county contacts is available online at: www.ncwater.org/pws/counties.htm.
- Pumps and pumping stations.
- Water storage tanks. Proposed new storage tanks are evaluated by the PWS Section Plan Review Unit as described in Section 4.5. Proposals for cleaning and repainting of storage tanks are evaluated by the PWS Section Regional Office as described in Section 4.4.
- Water mains and distribution system components. Service lines (i.e. lines owned by the public water system customers) are regulated under the North Carolina Plumbing Code and normally do not need to be reviewed by the PWS Section. The water system is responsible for ensuring that appropriate backflow prevention assemblies are installed on service lines in accordance with 15A NCAC 18C .0406(b).
- Raw water lines that convey water that will be treated for potable use.

See Chapter 5 for criteria that qualify a project for environmental review.

Projects that do not require review are discussed in more detail in [CHAPTER 2, SECTION 2.1].

Certain types of infrastructure projects listed above may require completion of environmental review prior to project approval.

4.2 Project Development

The PWS Section recommends pre-application consultation for complex projects such as:

- New surface water source,
- New or altered surface treatment,
- Major transmission mains,
- Any change in disinfectants,
- Use of nonconventional treatment,
- New intakes and raw water lines, or
- Other complex projects.

In addition to consultation, it is recommended that the design engineer submit a Preliminary Engineering Report (PER) for complex projects to the PWS Section for review.
The PER should contain the following information:

- Scope of work (what is proposed and why);
- Description of any existing facilities;
- Alternatives analysis;
- List of all recommended treatment processes; and
- Design parameters.

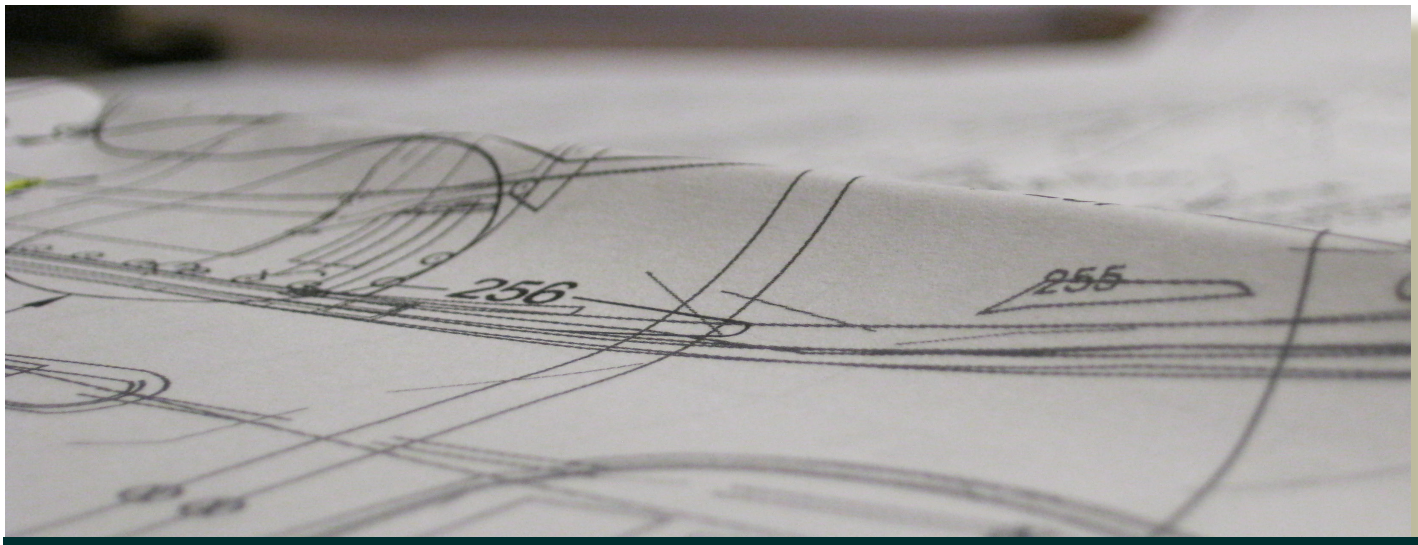
The PWS Section recommends pre-application consultation for complex projects.

The PWS Section provides comments as necessary after the PER has been submitted. Following consultation and review of the PER, the PWS Section may issue a letter of no objection to the proposed project and the project-specific engineer's report, plans, and specifications may be submitted for review. Note that the PER and project-specific engineer's report are not the same document. The minimum required elements of the project-specific engineer's report are discussed in detail in Chapter 2.

The PER consultation and submittal allows the PWS Section to review the proposed project before the expenses associated with detailed design and permit accrual have been realized.

Three copies of the PER should be submitted to the PWS Section.

Consult with the PWS Section at any time you have questions about a project. Technical Services and Plan Review staff contact information is available online at: www.ncwater.org/pws/staff.htm,
and Regional Office staff at: www.ncwater.org/pws/counties.htm#RO.



4.3 Review Process

This section describes the steps in project approval. The applicant may solicit bids prior to being granted Authorization to Construct, but no contracts may be awarded and water systems may not begin construction of a project until Authorization to Construct has been issued. Projects may not be placed into service until a Final Approval is issued.

4.3.1 Milestones in Review Process

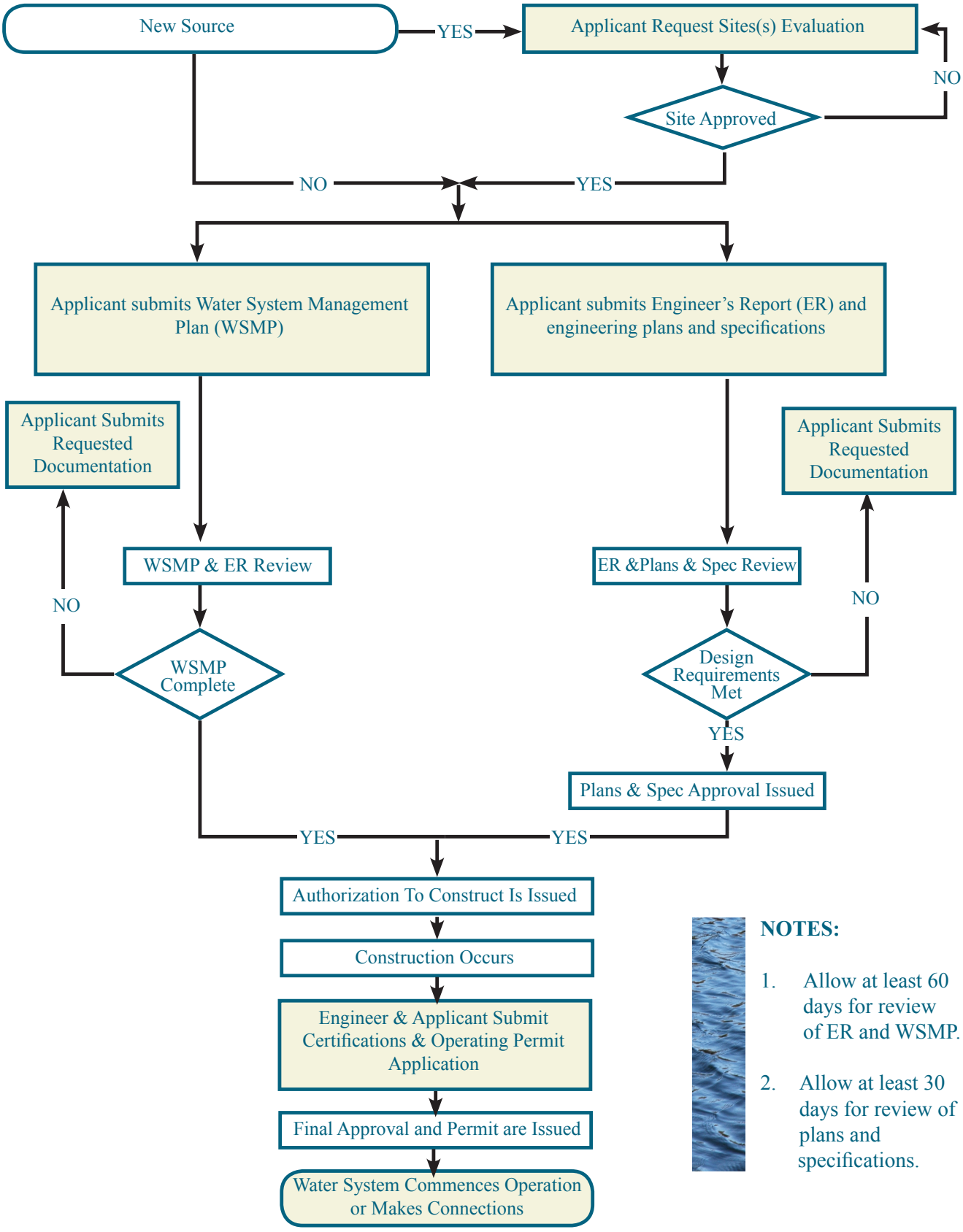
In general, all projects submitted to the PWS Section must meet the following milestones in the order they are listed below. A diagram of the plan approval process is shown in Figure 1.

1. Project documents submitted to the PWS Section. The water system must have a complete Water System Management Plan prior to construction activities. See Chapter 2 Submittals for details regarding minimum submittal requirements.
2. Project reviewed by PWS Section review engineer. Comments made by the PWS Section review engineer must be satisfactorily addressed prior to project plan approval. Additionally, the project must meet the requirements of all other regulatory authorities other than the PWS Section. See Section 4.7 for other potential requirements.
3. Project Approval. Plans and specifications are approved by the PWS Section review engineer if project satisfies all requirements of 15A NCAC 18C and information contained in this guidance document.
   - Project approval does NOT constitute Authorization to Construct.
4. Authorization to Construct. The project may be granted Authorization to Construct if:
   - Plans and specifications have been approved, and
   - Water System Management Plan has been deemed complete by the PWS Section.
5. Project constructed in accordance with approved plans and specifications.
   - Project **MUST NOT** be constructed until Authorization to Construct has been granted by the PWS Section.
6. Applicant's and Engineer's Certifications submitted to the PWS Section.
   - Applicant submits certification that a current Operations and Maintenance plan and Emergency Response plan are complete and onsite. If applicable, applicant certifies that system will have a certified operator prior to putting the system into service. Guidance for developing an Emergency Management plan can be found online at: www.ncwater.org/pws/security.html. The applicable Applicant Certification form is available online at: www.ncwater.org/pws/prforms.html.
   - Professional Engineer responsible for the project submits certification that project was completed in accordance with the approved plans and specifications. The Engineer Certification form is available online at: www.ncwater.org/pws/prforms.html.
7. Final Approval issued by the PWS Section.
8. Project placed into service.
   - Project MUST NOT be placed into service until Final Approval has been granted by the PWS Section.

Projects **MUST NOT** be constructed until Authorization to Construct has been granted by the PWS Section.

Projects **MUST NOT** be placed into service until Final Approval has been granted by the PWS Section.

Figure 1. Plan Approval Process



NOTES:

1. Allow at least 60 days for review of ER and WSMP.
2. Allow at least 30 days for review of plans and specifications.

4.3.2 Approvals Required Before Construction

The PWS Section issues one of the following types of approvals prior to construction for projects that have met the requirements of the plan review process:

- Standard Approval, or
- Limited Approval, or
- Tentative Approval.

Note that projects granted Standard Approval or Tentative Approval must not be constructed prior to issuance of an "Authorization to Construct" letter. See Section 4.3.3 for details regarding Authorization to Construct.

4.3.2.1 Standard Approval Process

A Standard Approval is granted prior to Authorization to Construct. This approval serves as formal confirmation from the PWS Section that the plans, engineer's report, and specifications submitted for project review meet the minimum design standards set forth in 15A NCAC 18C. **Projects with Standard Approval must not be constructed until an Authorization to Construct letter is issued.**

4.3.2.2 Limited Approval

Many community systems constructed before 1972 and many non-transient, non-community systems constructed before 1994 were not subject to the plan review process because they predate the adoption of plan review rules. These systems have not undergone the plan review approval process and thus cannot expand unless they are brought up to current standards. The PWS Section can issue Limited Approval to these systems for certain water improvement projects in order to protect the public health. It is important to note that Limited Approval is granted without any Authorization to Construct. Limited Approval may be granted in the following circumstances:

- Replacement of previously unapproved components of the water system.
- Alterations that will improve the viability of the water system.

Limited Approvals are not issued for projects that propose to expand water systems that have not successfully completed the plan review and approval process.

4.3.2.3 Tentative Approval

A Tentative Approval is granted prior to Authorization to Construct. A Tentative Approval may be issued by the PWS Section on occasions when the plans and specifications are fundamentally sound but incomplete because the water system must obtain funding from organizations that require a Tentative Approval from the PWS Section.

Tentative Approvals are issued most often for the installation of large-volume municipal wells. **Projects with Tentative Approval must not be constructed until an Authorization to Construct letter is issued.**

4.3.3 Authorization to Construct

The PWS Section issues an Authorization to Construct letter for projects that receive Standard or Tentative Approval. The Authorization to Construct letter allows for the construction of the project that was previously granted approval. As seen in Figure 1, the Authorization to Construct letter is issued only after the Water System Management Plan and engineer's report have been deemed complete and the plans and specifications for the project have been approved.

In general, Authorization to Construct for a project is valid for 24 months from the issue date. Extension requests can be submitted to the PWS Section by submitting an Authorization to Construct Extension Request form available online at: www.ncwater.org/pws/planrev.htm. Note that the North Carolina General Assembly has granted extensions for some projects through the Permit Extension Act of 2009. The Permit Extension Act of 2009 is available for review at: www.ncwater.org/pws/planrev.htm.

4.3.4 Approvals Required After Construction

One of the following approvals may be granted after project construction has been completed and full compliance with 15A NCAC 18C .0300 has been achieved:

- Final Approval.
- Partial Final Approval.

4.3.4.1 Final Approval

A Final Approval is granted when the applicant has complied fully with 15A NCAC 18C .0300. To receive Final Approval, a completed Applicant Certification and completed Engineer's Certification must be submitted to the PWS Section. See section 4.3.1, step 6 for details regarding the Applicant's Certification and Engineer's Certification. Upon receipt of Final Approval, the project may be placed into service.

4.3.4.2 Partial Final Approval

The PWS Section has developed a procedure to clarify what is needed for a partial final approval, available at www.ncwater.org/pws/PlanReview/Partial_Final_Approvals_External.pdf

4.3.5 Project Termination

Written notification of projects, or portions thereof, which will not be placed into service, should be sent by the project applicant to the PWS Section. The Engineer's Certification that seeks Partial Final Approval cannot contradict the Notice of Termination for projects in which some portions will be abandoned and other portions will be constructed.

4.4 PWS Section Regional Offices—Roles and Assistance Provided

If you have questions about a project, the PWS Section Regional Office is the first point of contact. The design engineer should contact the Regional Office for the county in which the project will be located prior to any water system construction activities, regardless of whether or not the activity requires plan review and approval. The PWS Section Regional Office staff provides assistance on many types of projects and inspects projects during and after construction. In unusual circumstances, the Regional Office staff may be able to help expedite projects to address an imminent threat to public health and can also discuss projects with Plan Review.

4.4.1 New Water Systems

When a new system is being planned, Regional Office staff is available to meet with the potential water system owner. They will describe the steps involved in establishing a water system and will supply documents explaining new system requirements. You should meet with the PWS Section Regional Office before beginning any work on a new water system.

4.4.2 New Wells

It is advised that you meet with the Regional Office staff before drilling any new public water supply well. The Regional Office staff will conduct a predrill investigation and discuss the required horizontal separation distances from sources of pollution that the owner of the well is responsible for verifying, as well as grading and drainage characteristics that are applicable to the site. Once the Regional Office staff gives preliminary approval for the well and assigns a public water system identification number, a Certified Well Driller may drill a test well or the production well and perform a drawdown test. Before moving forward with the well, an engineer must prepare plans and specifications. All documents required for new wells as described in Chapter 2 must be submitted to the Regional Office. The PWS Section Regional Office staff will evaluate documents for completeness. Once all required documents have been received, the Regional Office staff will issue a postdrill investigation letter and forward the documents to Plan Review. Additional information regarding new wells is available in [CHAPTERS 7 AND 8].

The Regional Office staff will conduct a predrill investigation.

The Regional Office staff will evaluate documents for completeness.

4.4.3 Water Treatment Plant Review

The PWS Section Regional Office staff review water plant projects and address any operational concerns. When developing a water plant, the PWS Section strongly recommends close consultation with the Regional Office as well as with Plan Review throughout the entire planning and design process. Water plant projects are initially submitted to Plan Review. Once projects have undergone an initial evaluation by the Plan Review Unit they will be forwarded to the Regional Office for evaluation and comment. Additional information regarding water treatment is available in [CHAPTER 9].

4.4.4 Tank Reconditioning

Tank reconditioning projects should be coordinated with the Regional Office. The form for such projects is submitted to the Regional Office and is discussed in Chapter 2. Staff will verify that the water system's plan for maintaining operations while reconditioning the tank will adequately protect public health.

4.4.5 Unusual Projects

When working on an unusual project or one that requires approvals outside of the PWS Section (such as a project requiring a discharge permit), contact the PWS Section Regional Office staff early to discuss plans. The Regional Office staff may have recommendations that would help in further project development.

4.4.6 Construction Inspections

The PWS Section Regional Office staff may inspect projects under construction. Staff verifies that projects were constructed in accordance with approved plans and specifications.

4.4.7 Emergency Project Approvals

Emergency approvals may be issued by the appropriate PWS Section Regional Office to address an imminent threat to public health. The Regional Office should be the first point of contact for emergency situations. All as-built construction plans for emergency projects are subject to review by the Plan Review Unit.

4.5 PWS Section Plan Review

The PWS Section Plan Review group evaluates designs for compliance with the Rules Governing Public Water Systems, accepted engineering principles and practices, industry standards, and feasibility. A flow diagram of the plan review process is included as Figure 1.

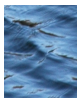
Plans and specifications submitted to the PWS Section for review are given a serial number unique to the project and logged into a database. All correspondence regarding a project should contain the unique serial number. Concerns about the design will be issued to the design engineer and applicant as comments. Once comments are resolved the plans will be approved. An Authorization to Construct will be issued if the water system has a Water System Management Plan that has been deemed complete.

Plan Review engineers are assigned to particular counties. Occasionally a reviewer will take on plans from a different county. When providing response to comments, be sure to contact the reviewer who submitted the comments to you.

All correspondence regarding a project should contain the unique serial number.

4.6 PWS Section Compliance Services Review

When plans are submitted for any new well or new treatment, the proposal is evaluated by the PWS Section Compliance Services Branch. Compliance Services staff will determine whether the proposed change will affect water quality parameter or contaminant monitoring requirements. In some cases, water systems will be notified that further action is required before plans can be approved.



Compliance Services staff will determine whether the proposed change will affect water quality parameter or contaminant monitoring requirements.

4.7 Other Agencies

Water system projects may be affected by other regulations, and other state and local government agencies may have additional requirements. Environmental review may be required under either state or federal regulation. The PWS Section Regional Office staff may be able to provide advice on permits, or contact the DENR Division of Environmental Assistance and Outreach at www.envhelp.org.

Some permitting requirements directly impact the process of water withdrawal or treatment, and common examples are described below. In these cases, the PWS Section will not approve plans until other required permits have been issued. As described in Section 4.2, the PWS Section recommends consultation during the planning stages of complex projects.

- Surface water withdrawal. Increasing surface water withdrawals or establishing a new intake is a lengthy process often requiring environmental review and many agencies' involvement.
  - Withdrawal volumes. The Division of Water Resources evaluates proposed water withdrawals for effects on instream flows. Withdrawals may be permitted through a variety of laws including environmental review, the N.C. Dam Safety Law, federal energy laws, or the Clean Water Act Sections 401 or 404. The Division of Water Resources website is available at: www.ncwater.org.
  - Environmental review. All new intakes and an increase of at least 1 million gallons per day withdrawn from an existing intake require environmental review. See [Chapter 5] for an overview of the environmental review process.
  - Water body classification. All watersheds must be classified as water supply watersheds before water may be withdrawn for treatment and use in a public water system. For more information about this process, refer to the Division of Water Quality Standards and Classifications Unit. The Division of Water Quality website is available at: http://portal.ncdenr.org/web/wq/home.
- Wastewater discharge. Water plants must dispose of backwash water and solids produced in the water treatment process. As discussed in [CHAPTER 9], keeping basins clean and properly managing waste residuals is a critical step in effective water treatment. Residuals management includes:
  - Removing sludge from treatment processes and concentrating that sludge by means of technologies such as belt presses or drying beds.
  - Disposal of solids. Water plants disposing of their own solids must obtain a permit for the disposal method selected.
  - Wastewater discharge. Water plants planning to discharge to a sewer system must obtain a flow acceptance letter from the owner of the sewer system. Water plants that are unable to discharge to a sewer system must obtain a permit for wastewater discharge, such as a National Pollutant Discharge Elimination System (NDPES) issued by the Division of Water Quality.
- Radionuclide removal. Treatments like ion exchange can remove radionuclides from a drinking water source. Water systems must develop an approved procedure for backwash water or waste disposal. Some examples of procedures that have been used are:
  - Water system obtains an NPDES permit for discharge of backwash water.
  - Water system obtains a permit from the Radiation Protection Section to haul and dispose of spent resin. The Radiation Protection Section website is available at: www.ncradiation.net.

5.0 Environmental Review

The North Carolina Environmental Policy Act was originally adopted in 1971, Chapter 113A Pollution Control and Environmental Article 1 Environmental Policy Act. This policy encourages wise, productive and beneficial use of the state's natural resources. The policy also encourages maintaining a healthy environment, preserving the state's natural beauty and creating public awareness of the environment through education.

On June 19, 2015, Session Law 2015-90, 2015 SEPA Reform, was signed into law. This law transformed the criteria significantly in which a SEPA review would be required. SEPA now involves significant expenditure of public money or use of public land for projects and programs significantly affecting the quality of the environment of the state.

Most public water supply projects are exempt from SEPA requirements. However, it is the applicant's responsibility to determine if SEPA requirements apply to a project. Drinking water projects funded by the *Drinking Water State Revolving Fund Program* must submit and have an "Environmental Information Document" approved by the Division of Water Infrastructure. http://portal.ncdenr.org/web/wi/planning

Additional SEPA information is available at the following link:
https://deq.nc.gov/node/82899

Contact Lyn Hardison, SEPA Environmental Review Coordinator, at (252) 948-3842 if you have questions pertaining to the DEQ SEPA process and regulations.

7.0 Special considerations for new systems

This chapter outlines a process written to assist small community and non-transient, non-community water system owners in the development of their system. The checklist below was developed for water system owners and design engineers and is intended as a useful outline of required activities for planning and designing well water systems and purchase water systems.

For more information on the process of drilling a new well, see Chapter 8, titled Sources. The discussion below is separated into new well water systems and new purchase water systems. New surface water systems are not addressed in this chapter due to their complexity.

The state Public Water Supply Section recommends that applicants interested in constructing a new water system review this checklist and complete as much of the Water System Management Plan (Chapter 3, titled Water System Management Plans and Other Required Water System Plans) as possible to gain an understanding of the significant financial and managerial obligations associated with owning a water system. Potential applicants should also review available alternatives to constructing a new water system. Potential alternatives may include obtaining water service from a nearby system.

The PWS Section recommends that a potential new water system owner hire a North Carolina licensed professional engineer as early as possible in the system development process. Hiring a professional engineer experienced in the design of new systems early in the process ensures continuity of site selection and design.

7.1 Steps for establishing a new well water system.

For more information, also refer to Section 8.1, Groundwater Sources. For a flow chart depicting requirements, refer to Chapter 4, Figure 1 Plan Approval Process.

Step 1: Owner contacts the appropriate PWS Section regional office and schedules a well site investigation.

The owner of the proposed well water system must address the points described in Section 8.1.2, Well Site Investigation Process, during the well site investigation.

Step 2: PWS Section regional office representative has no objection to the proposed well site and issues a preliminary well site approval letter.

The owner should verify that the contact and well identification information described in the preliminary well site approval letter is correct. It is important to note that the owner is solely responsible for meeting the requirements set forth in the preliminary well site approval letter.

Step 3: Obtain permits required for drilling well(s).

In addition to the preliminary well site approval letter issued by the PWS Section, refer to Section 8.1.4.1 of this document for a discussion of state and local permits required before drilling a well.

Step 4: Well(s) is drilled by a certified well driller in accordance with rules and regulations. Determine well capacity and water quality.
The owner must hire a North Carolina certified well driller. A listing of certified well drillers is available online at: http://portal.ncdenr.org/web/eh/wcc. Responsibilities of the well driller are discussed further in Section 8.1.4, Well Construction and Development.

Step 5: Water system owner or representative submits a Water System Management Plan, or WSMP.
The following guidance and forms may assist in the WSMP completion process:

- Guidance for developing your WSMP can be found in Chapter 3, titled Water System Management Plans and Other Required Water System Plans, and at: http://www.ncwater.org/pws/CapDev/CapDevForms.htm and also at: http://www.ncwater.org/pws/CapDev/WSMguidance_pg.htm.
- WSMP must be accompanied by a completed WSMP certification form. This form is available online at: http://www.ncwater.org/pws/CapDev/forms/WSMP_Certification.pdf.

Submit WSMP, WSMP certification form, and payment to the PWS Section for review.

The water system must have a WSMP deemed complete prior to Step 9. The PWS Section issues a letter to the applicant when the WSMP has been deemed complete.

Step 6: Owner submits *Application for Approval of Engineering Plans and Specifications for Water Supply Systems* **accompanied by the new well water system engineer's report, plans and specifications (i.e. application packet) developed by a professional engineer to the PWS Section regional office.**
Prior to designing the well water system, the professional engineer must review the well yield and laboratory sample results to determine if the well is capable of producing water of adequate quantity and quality to serve the project. If the well will be used to serve the project, the professional engineer must develop plans, an engineer's report, and specifications as described in Section 8.1.7, Well Design Review Process.

See Section 2.8 for details on how new well information should be submitted for review. The status of plans submitted for review can be tracked on the PWS Section plan review and tracking system website available at: www.pws3.denr.nc.gov/pages/PlanDataReview.aspx.

Any wells that will not be used must be properly abandoned in accordance with NCAC 15A 02C .0113.

Step 7: PWS Section regional office issues letter indicating that a complete application packet has been submitted for review.

- This letter acknowledges receipt of the application packet but does NOT grant plan approval or authorization to construct.
- The application packet is forwarded from the regional office to the PWS Section central office technical services branch for formal review.

Step 8: PWS Section issues plan approval letter.
Plan approval letter does NOT grant authorization to construct.

Step 9: PWS Section grants applicant authorization to construct.

- WSMP must be deemed complete (see Step 5) and plan approval must be granted (see Step 8) prior to PWS Section issuance of authorization to construct.
- Construction of system may begin.
- Authorization to construct is valid for two years unless otherwise indicated.

Step 10: Water system is constructed according to approved plans and specifications.

- Authorization to construct letter must be maintained onsite during construction.
- Any changes to approved plans, reports, or specifications must be addressed in accordance with 15A NCAC 18C .0306.
- Owner should maintain copies of approved plans and specifications for future reference.

Step 11: Select a certified operator.

The water system owner must hire a certified operator or become certified to serve as the system operator. A list of qualified operators and information about becoming a certified operator is available online from the Water Treatment Facility Operators Certification Board at: http://www.ncwater.org/pws/ncwtfocb.htm. Note that the operator in responsible charge must be designated on the *Application for Permit to Operate a Water System* that is mailed to the system owner after the system begins operation.

Step 12: Submit applicant certification to the PWS Section.

The applicant must submit the applicant certification certifying that the system will have a certified operator before beginning operation and that an operations and maintenance plan and emergency management plan have been completed for the system and are onsite. PWS Section guidance for the development of an effective emergency management plan is available online at: http://www.ncwater.org/pws/security.html.

Step 13: Submit engineer's certification to the PWS Section.

An engineer's certification certifies that system was constructed in accordance with approved plans, reports and specifications and in accordance with 15A NCAC 18C .0306.

Step 14: PWS Section issues final approval after system has satisfied ALL requirements.

- Contact regional office with projected start date.
- Contact a North Carolina-certified laboratory to schedule water sample analysis and secure sample bottles for water collection. A listing of North Carolina-certified laboratories is available online at: http://www.ncwater.org/pws/Compliance/electronic_reporting.html.

Step 15: System begins operation.

- The system is subject to all compliance regulations.
- Sampling requirements are available through the PWS Section Sampling Status Report online at: http://www.ncwater.org/pws/pws_data.htm#Schedules.
- PWS Section compliance forms are available online at: http://www.ncwater.org/pws/Compliance/compliance_forms.html.

7.2 Steps for Establishing a New Purchase Water System

Step 1: System negotiates contract to purchase water from a capable supplier.

For details, refer to Section 8.3.2, Purchase and Interconnection Agreements.

Step 2: Water system owner or representative submits a Water System Management Plan, or WSMP.

The following guidance and forms may assist in the WSMP completion process:

- Guidance for developing your WSMP can be found in Chapter 3, Water System Management Plans and Other Required Water System Plans and at: http://www.ncwater.org/pws/CapDev/CapDevForms.htm and also at: http://www.ncwater.org/pws/CapDev/WSMguidance_pg.htm.
- WSMP must be accompanied by a completed WSMP Certification form. This form is available online at: http://www.ncwater.org/pws/CapDev/forms/WSMP_Certification.pdf.

Submit a WSMP, WSMP Certification form, and payment to the PWS Section for review.

The water system must have a WSMP deemed complete prior to Step 9. The PWS Section issues a letter to the applicant when the WSMP has been deemed complete.

Step 3: Owner submits *Application for Approval of Engineering Plans and Specifications for Water Supply Systems* **accompanied by the new purchase water system engineer's report, plans and specifications (i.e. application packet) developed by a PE to the PWS Section Central Office.**

- For details, refer to Section 8.3.1, Interconnections.

See Chapter 2, Submittals for detailed project submittal requirements.
The status of plans submitted for review can be tracked on the PWS Section plan review and tracking system website available at: www.pws3.denr.nc.gov/pages/PlanDataReview.aspx.

Step 4: PWS Section issues plan approval letter.
Plan approval letter does **NOT** grant authorization to construct.

Step 5: PWS Section grants applicant authorization to construct.

- WSMP must be deemed complete (see Step 2) and plan approval must be granted (see Step 4) prior to PWS Section issuance of authorization to construct.
- Construction of system may begin.
- Authorization to Construct is valid for two years unless otherwise indicated.

Step 6: Water system is constructed according to approved plans and specifications.

- Authorization to construct must be maintained onsite during construction.
- Any changes to approved plans, reports, or specifications must be addressed in accordance with 15A NCAC 18C .0306.
- Owner should maintain copies of approved plans and specifications for future reference.

Step 7: Select a certified operator.
The water system owner must hire an operator or become certified to serve as the system operator. A list of qualified operators and information about becoming a certified operator is available online from the Water Treatment Facility Operators Certification Board at: http://www.ncwater.org/pws/ncwtfocb.htm. Note that the operator in responsible charge must be designated on the Application for Permit to Operate a Water System that is mailed to the system owner after the system begins operation.

Step 8: Submit applicant certification to the PWS Section.
The applicant must submit the applicant certification certifying that the system will have a certified operator before beginning operation and that an operations and maintenance plan and emergency management plan have been completed for the system and are onsite. PWS Section guidance for the development of an effective emergency management plan is available online at: http://www.ncwater.org/pws/security.html.

Step 9: Submit an engineer's certification to PWS Section.
An engineer's certification certifies that system was constructed in accordance with approved plans, reports, and specifications and in accordance with 15A NCAC 18C .0306.

Step 10: PWS Section issues final approval and new system letters after system has satisfied ALL requirements.

- Contact regional office with projected start date.
- Contact a North Carolina-certified laboratory to schedule water sample analysis and secure sample bottles for water collection. A listing of North Carolina-certified laboratories is available online at: http://www.ncwater.org/pws/Compliance/electronic_reporting.html.

Step 11: System begins operation.

- The system is subject to all compliance regulations.
- Sampling requirements are available through the PWS Section Sampling Status Report online at: http://www.ncwater.org/pws/pws_data.htm#Schedules.

8.0 Sources

Public water systems can use groundwater, surface water or a combination of both as sources of raw water. Water systems may also purchase water from other water systems in raw or treated form. Sources may be considered for permanent use, emergency use, seasonal use or other purposes. The PWS Section requirements described in this chapter helps ensure that raw water sources are selected, constructed and properly protected from potential sources of pollution. The water source selected should be the highest quality source reasonably available.

8.1 Groundwater Sources

Groundwater sources include drilled wells. The combined yield of all wells in the water system must provide the system's average daily demand in 12 hours of pumping time.

The following sections describe the process of design and approval of a new well. For additional information on establishing a new water system, refer to [Chapter 7, Special Considerations for New Systems] and documents referenced in that chapter.

8.1.1 Wells Requiring PWS Section Review

All wells proposed for a community or non-transient, non-community water system must be reviewed by the PWS Section to ensure that water quality and water quantity are sufficient to meet the water system's needs.

If a new transient non-community water system anticipates expanding the facility into a non-transient, non-community or a community system in the future, then the water system may submit the new well for the PWS Section's review and approval. In some cases, approval of the well can increase potential future uses of a property.

Community and non-transient, non-community systems must have the well approved before using it as public water supply well. Some examples of systems that have made this transition are:

- Churches, which become non-transient, non-community systems through the addition of a child care center or school;
- Businesses, which grow to serve more than 25 employees; and
- Campgrounds, which become community systems by adding permanent year-round residents.

Failure to construct wells that meet community or non-transient, non-community public water supply well standards will limit expansion of the water system.

8.1.2 Well Site Investigation Process

The PWS Section reviews potential sites where a well is proposed for a community or non-transient, non-community system before the well is drilled. This well site investigation allows the water system owner to eliminate unacceptable well sites from consideration before significant investment. The well must be appropriately located to ensure that the well has adequate separation from a potential source of contamination.

In many cases, the water system owner will hire an engineer before drilling a well. This is not required but is recommended when feasible to ensure continuity of site selection and design.

Prior to contacting the PWS Section for a preliminary investigation of the well site, the owner should:

- Determine property ownership as the area within 100 feet of a well must be owned or controlled by the water system owner;
- Protect the well lot from potential sources of pollution and be able to construct landscape features for drainage and diversion of pollution if needed; and
- Obtain a survey map of proposed development, including the locations of potential well sites.

Note that the PWS Section well site investigation is a visual review of the proposed well site. It is the design engineer's responsibility as an agent of the water system owner to conduct a more detailed review and to ensure that the well site meets all requirements of 15A NCAC 18C even if not clearly visible during the initial site review. Following review of a well site, the PWS Section Regional Office will issue a pre-drill investigation letter. In accordance with 15A NCAC 18C Rule .0305(b), the water system owner may drill a test well at this site in order to establish quantity and quality.

THE NORTH CAROLINA

BOARD OF REGISTRATION
FOR ENGINEERS AND LAND SURVEYORS

Be It Known That

HAVING GIVEN SATISFACTORY EVIDENCE OF THE NECESSARY QUALIFICATIONS WITH REGARD TO CHARACTER, EDUCATION, AND EXPERIENCE AS REQUIRED BY THE CURRENT NORTH CAROLINA ENGINEERING AND LAND SURVEYING ACT, WAS EXAMINED — DULY REGISTERED — AWARDED THIS CERTIFICATE — AND IS HEREBY AUTHORIZED TO PRACTICE AS A

PROFESSIONAL ENGINEER

IN THE STATE OF NORTH CAROLINA

IN TESTIMONY WHEREOF, THE BOARD OF REGISTRATION ISSUES THIS CERTIFICATE UNDER THE SEAL OF THE BOARD AND SIGNATURES OF THE CHAIRMAN AND SECRETARY

THIS 28TH DAY OF JANUARY 19 98

8.1.3 Well Site Requirements

The well site must meet the requirements of 15A NCAC 18C .0203 summarized in Table 1 below. In addition to these requirements, the well site must be graded or sloped so that surface water is directed away from the wellhead and the 100-foot radius lot is not subject to flooding. The supplier of water must be able to construct landscape features for drainage and diversion of pollution. The design engineer must conduct a thorough investigation to make certain that the well site meets all of the setback requirements of 15A NCAC 18C .0203.

Table 1: Minimum Well Site Setback Requirements (Rule .0203)

Distance (in feet)	Potential Source of Pollution
100	• From any sanitary sewage disposal system, sewer or sewer pipe (unless sewer is constructed of water main materials and joints, in which the sewer pipe shall be at least 50 feet from the well). • From buildings, mobile homes, permanent structures*, animal houses or lots, or cultivated areas to which chemicals are applied. • From surface water.* • From a chemical or petroleum fuel underground storage tank with secondary containment. • From any other potential source of pollution not listed in this table.
200	• From a subsurface sanitary sewage treatment and disposal system designed for 3,000 or more gallons of wastewater a day, unless your well water source is a confined aquifer.
300	• From any cemetery or burial ground.
500	• From a septage disposal site. • From a chemical or petroleum fuel underground storage tank without secondary containment. • From the boundary of a groundwater contamination area. • From a sanitary landfill or non-permitted non-hazardous solid waste disposal site.
1,000	• From a hazardous waste disposal site or in any location which conflicts with the North Carolina Hazardous Waste Management Rules cited in NCAC 13A.

*When compliance cannot be achieved, expanding non-community water systems may request waivers to the starred provisions as established in North Carolina Session Law 2011-394.

Note that water system infrastructure components such as a wellhouse and raw or finished water storage tanks can be located within the 100-foot radius.

The Source Water Assessment Program has mapped public water system wells and many potential sources of pollution. Its website, http://www.ncwater.org/pws/swap/, is a good website for initial review. However, the data sources referenced by the Source Water Assessment Program do not represent all potential sources of pollution.

8.1.3.1 Groundwater Under the Direct Influence of Surface Water

As described in Section 8.1.10, some wells are designated as Groundwater Under the Direct Influence of Surface Water (GWUDI). This designation is uncommon but imposes significant additional treatment and monitoring requirements. The PWS Section strongly encourages water systems to construct wells so they avoid a presumptive GWUDI designation. For more information about GWUDI designation, contact the PWS Section Regional Office.

8.1.4 Well Construction and Development

Well construction must meet the standards specified in 15A NCAC 2C .0107. It is important to note that local county well construction rules and ordinances may include additional requirements. Site specific conditions may necessitate additional construction recommendations.

15A NCAC 2C .0100 mandates reporting for all new well construction and mandates permits for some new wells. Forms and more information are available from the Division of Water Quality, Aquifer Protection Section at: http://portal.ncdenr.org/web/wq/aps.

Well construction methods must be documented in any project submitted to the PWS Section. Required documentation includes well head details, specifications for well construction and a well construction verification statement sealed by a Professional Engineer or Licensed Geologist. The well construction verification statement documents that the well was constructed as described in plans and specifications.

8.1.4.1 Well Construction

Minimum well construction requirements for water supply wells are specified in 15A NCAC 2C .0107. It is recommended that a Professional Engineer or Licensed Geologist (or their designated representative) experienced in the construction of water supply wells conduct on-site observation of all or part of the well's construction. At a minimum, certain critical phases of well construction such as installation and grouting of casing should be observed. The engineer's or professional geologist's certification verifies aspects of the well construction as described in Section 8.1.4.

Care must be exercised in order to minimize the introduction of contamination from the surface into the groundwater supply during well construction. To further protect against contamination by surface or shallow subsurface waters, the annular space between the drill hole and well casing must be properly grouted to a depth adequate to protect the groundwater supply.

In determining the grouting requirements of a specific well, consideration must be given to existing surface conditions and to subsurface geologic and hydrologic conditions. Improper grouting practices can result in the leakage of contaminants downward along the well casing into the groundwater supply. Additionally, subsurface formations that yield water of undesirable quality must be adequately sealed off to prevent contamination of the overlying or underlying water-bearing zones.

Wells constructed to obtain water from unconsolidated rock formations such as gravel, sand or shells must be cased at least one foot into the top of the water-bearing formation from which withdrawals are to be made. For coastal plain wells designed to obtain water from confined aquifers, it is recommended that the casing be grouted through the first confining unit.

Most public water supply wells in the piedmont and mountain regions of the state are designed to obtain water from consolidated bedrock formations. Some public water supply wells along the western boundary of the coastal plain region may also obtain water from the underlying bedrock formations. Typically, these wells are cased through the

unconsolidated material occurring at the surface and are completed as open-hole wells in the underlying bedrock. For wells completed in bedrock, 15A NCAC 2C .0107(d) requires that casing extend at least 20 feet below land surface (or at least 35 feet below land surface in portions of Anson, Cabarrus, Davidson, Montgomery, Randolph, Rowan, Stanly and Union Counties designated in 15A NCAC 02C .0117) and be firmly seated at least five feet into the bedrock. It has been the experience of the PWS Section that the area where the well casing seats into bedrock is the most common point of entry for bacteria and/or sediment laden shallow water entering these types of wells. Information from professionals in the groundwater field as well as individuals involved in the construction, repair and rehabilitation of water supply wells supports this observation. In order to avoid this and similar problems, the PWS Section recommends the grouting of the area where the casing seats into bedrock at a minimum. Where practical, the well casing should be grouted along its entire length to eliminate the uncertainty of properly sealing the casing where it seats into bedrock.

It may be necessary to obtain well construction permits from other agencies such as the Aquifer Protection Section in the Division of Water Quality or the local health department.

Some wells require registration or permitting for water withdrawals. Any groundwater withdrawal of more than 100,000 gallons per day requires registration with the Division of Water Resources.

Groundwater wells in the Central Coastal Plain Capacity Use Area must be registered with the Division of Water Resources if more than 10,000 gallons per day is withdrawn and must be permitted by the Division of Water Resources if more than 100,000 gallons per day of water is withdrawn. Contact the Division of Water Resources at www.ncwater.org and the Aquifer Protection Section at http://portal.ncdenr.org/web/wq/aps for additional information on the permit and registration requirements.

8.1.4.2 Drawdown Test

The well yield must be determined by conducting a drawdown test in accordance with 15A NCAC 2C .0110. Engineers should be aware that the drawdown test must continue until stabilization has been achieved. As a result, the test may need to continue beyond 24 hours.

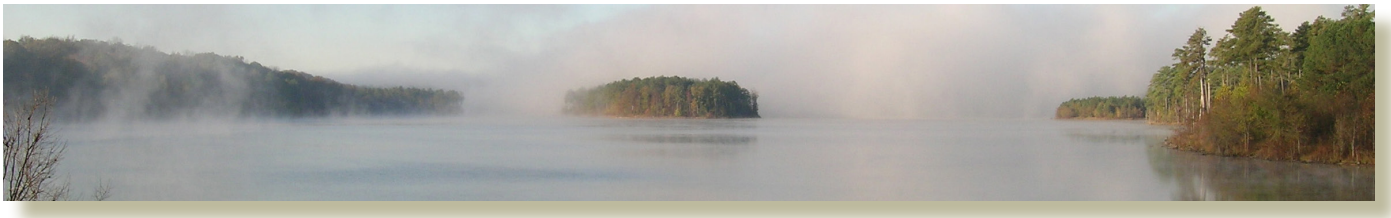
Well drawdown can interfere with the yield of another well. If two or more wells in a water system encroach on each other's 100-foot radius, a simultaneous drawdown must be conducted on the wells. Engineers should recognize that some wells may interfere with one another even when the wells are far apart and should use professional judgment based on knowledge of regional aquifer conditions to determine whether additional simultaneous drawdown testing is applicable.

When wells in confined aquifers do not come to equilibrium during a drawdown test, alternate drawdown methods supported by analysis and documentation may be submitted for review.

If the drawdown test was conducted more than two years prior to submittal of plans and specifications, then the engineer must verify that relative drawdown of that well remains the same. Factors to be considered include:

- Well degradation
- Static water level
- Well redeveloped as needed

If the engineer cannot justify that relative drawdown of the well remains the same, the drawdown test must be repeated.



8.1.4.3 Well Development and Disinfection

All wells must be developed by a certified well driller. Development must be conducted in accordance with 15A NCAC 2C .0107(i). After cleaning, the well must be disinfected in accordance with Rule .1002 and as described in detail in 15A NCAC 2C .0111. Discharge of the chlorinated water must meet the requirements of the Division of Water Quality, Surface Water Protection Section.

Once the well is drilled, developed and tested, it must be sealed and protected from contamination until final design is approved by the PWS Section.

8.1.4.4 New Well Water Samples

During the well design process, representative water samples, also known as new well analysis, must be collected and submitted to a North Carolina-certified water laboratory for analysis. Refer to www.ncwater.org/pws/Compliance/electronic_reporting.html for more information on certified laboratories.

The proposed water system number and the well identification number must be provided with water samples. Samples are typically collected at the end of the drawdown test. Well water samples must be analyzed for the following contaminants:

- Coliform;
- Volatile Organic Chemicals, or VOCs;
- "New Well" Inorganic Chemicals, which also includes turbidity, calcium, chloride, copper, lead, magnesium, silver, sulfate, acidity, zinc, color, total hardness, alkalinity and TDS;
- Nitrate and Nitrite, which in some cases may be included in the Inorganic Chemical analysis;
- Pesticides and Synthetic Organic Chemicals or SOCs;
- Radionuclides, which is required in community water systems and recommended in non-transient, non-community water systems;
- Asbestos in the designated asbestos-vulnerable counties: Alleghany, Ashe, Avery, Buncombe, Burke, Cabarrus, Caswell, Catawba, Clay, Davidson, Davie, Forsyth, Granville, Guilford, Halifax, Haywood, Iredell, Jackson, Macon, Madison, Mecklenburg, Mitchell, Rowan, Transylvania, Union, Vance, Yadkin and Wake's northern corridor (north of U.S. 1 and U.S. 70 intersection).

Ammonia has been detected in some wells in the coastal plain of North Carolina. The PWS Section recommends that an ammonia sample be collected at new coastal plain wells so that chlorine to ammonia ratios can be incorporated into design of chemical feed systems as appropriate.

If the new well analysis was conducted more than two years prior to submittal of plans and specifications, then all new well analyses must be repeated in conjunction with the verification of drawdown described in Section 8.1.4.2.

8.1.5 Ownership or Control of the Well Lot

The well lot must have a recorded deed or easement for plan approval. A well lot's deed or easement must clearly state the water system owner's permanent control of the land within a 100-foot radius around the well. A copy of the recorded deed or easement and a survey map of the proposed water system showing the boundary of well lot water main location must be submitted to the PWS Section when the plans and specifications are submitted.

8.1.6 Water Supply Well Design Requirements

8.1.6.1 Well Pump

Pumps and pumping equipment must conform to the requirements of 15A NCAC 2C .0109. Pumping capacity of the well must be less than or equal to the yield of the well determined by the drawdown test when pumping against maximum system total dynamic head. Engineers must determine total dynamic head needed to pump water from the lowest elevation identified during the drawdown test to the highest elevation in the system. The selected pump must be capable of supplying the required head at the design pumping capacity based on the manufacturer's pump performance curves.

If a well pump is already installed and the pump performance curve indicates that the pump will be pumping at a higher pumping rate than the 24-hour drawdown yield, then the system must install a lower capacity pump. As an alternative to pump replacement, the system may propose a reasonable method to reduce the pumping capacity (e.g., trimming the impellers, valve to throttle the pump). A timing device or telemetry on the pump allows the water system to determine the average and maximum pumping rates.

8.1.6.2 Upper Terminal of Well

15A NCAC 18C .0402 includes detailed requirements for installation of public water supply wells. In addition:

- The well must be protected from flooding.
  - The top of the casing must project at least one foot above the 100-year floodplain as required by 15A NCAC 18C .0203(4) and 15A NCAC 18C .0402. (Official North Carolina floodplain maps are available at: http://www.ncfloodmaps.com/.)
  - In addition, the PWS Section strongly recommends that per the Standards Governing Water Works ("Ten States' Standards"), the top of the well casing terminate at least three feet above the 100-year flood level.
  - Also per the Ten States' Standards, if the top of the slab surrounding the well would otherwise be less than two feet above the highest known flood elevation, then an earth mound should be provided to raise the slab to that elevation.
- Design engineers should consider the appropriateness of fencing for well protection even when other structures, such as a locked wellhouse, are provided.
- Comply with all the requirements of 15A NCAC 2C .0107(j).

8.1.7 Well Design Review Process

After a well has been drilled, developed and tested, the design engineer develops and submits three copies of plans, specifications and an engineer's report for well design. The PWS Section must issue plan approval and an Authorization to Construct before any construction can occur on the wellhead and treatment. Note that if the new well water treatment plant capacity is greater than 1 million gallons per day, an environmental assessment is also required as described in [Chapter 5, Environmental Review].

The project package must include all elements described in [Chapter 2]. The engineer's report for a new well system should include all data used in well design such as recorded well site deed or easement, drawdown test results, water quality results, total dynamic head calculations, pump curves with pump operating range and calculations for proposed treatments.

If any analytical results exceed a maximum contaminant level, then the design engineer must design treatment to remove the contaminant. If an alternative source of water is reasonably available, it is often more cost effective to remove the contaminated well from consideration as a source than to provide treatment. When estimating costs, engineers and water system owners should be aware that when treatment is provided to meet standards at the water system entry point, monitoring for that contaminant will never be reduced beyond annual frequency. In some situations, required monitoring may be more frequent than that specified in federal regulation.

Calculations for chemical feed must consider:

- Strength of chemical used,
- Feed rate of chemical,
- Chemical storage requirements,
- Days of chemical supply stored on site, and
- Description of flow-paced chemical feed.

Optional: Some units, like softeners, are typically supplied as a complete unit. If a single unit is supplied, a manufacturer's cut sheet may be used in the engineer's report as long as that cut sheet includes all components of the unit, feed rate, chemical constituents and provides all parameters needed for proper operation.

Three complete and separate, collated copies of the new well project package must be submitted to the PWS Section Regional Office responsible for the county in which the well is located. Refer to the PWS Section website for a list of county assignments. Each copy of the project package includes plans, specification and an engineer's report. All project documentation other than the plans and specifications should be included in the engineer's report.

The PWS Section Regional Office staff checks the package for completeness and notifies the design engineer if additional documents are needed. Once the three copies of the package are deemed complete, they are forwarded to the PWS Section Central Office Plan Review Unit. The reviewer will evaluate the documentation and address comments to the engineer with copy to the applicant.

A residential community water system using well water as its source of supply and designed to serve 50 or more connections must provide at least two wells. A travel trailer park or campground designed to serve 100 or more connections must also provide at least two wells. Another approved water supply source may be accepted (e.g. interconnection with another approved water system) in lieu of a second well.

8.1.8 Modification of Existing Wells

Existing wells with structural problems may be modified (e.g., liner in the well) in accordance with 15A NCAC 2C .0107 and .0112 as applicable. Water systems should consult with the PWS Section prior to any well modifications to determine whether plans and specifications are required. Some examples of well modification and action required are listed below:

- Placing a liner in the well does not require plan approval;
- Replacing a well casing with a same length and material does not require plan approval; or
- Drilling a well deeper requires a drawdown test, new well analysis and plan approval.

8.1.9 Water Bottling Facility Wells

The PWS Section reviews wells used at bottled water facilities. Once the applicant obtains final approval from the PWS Section for the well, the facility will be regulated by the North Carolina Department of Agriculture and Consumer Services.

8.1.10 Springs and Groundwater Under the Direct Influence of Surface Water

Sources designated as groundwater under the direct influence of surface water (GWUDI) sources are vulnerable to contamination by pathogens from nearby surface water or infiltrating precipitation. Groundwater sources that are determined to be GWUDI must comply with surface water treatment rule requirements. Wells presumptively identified as GWUDI trigger significant testing and verification. The GWUDI designation process including presumptive identification is outlined in Appendix B.

8.2 Surface Water Source

A surface water source may be used for a community or a non-transient, non-community water system with disinfection and other treatments (as described in [Chapter 9, Treatment]) as needed to meet the drinking water quality standards. A surface water source includes all tributary streams and drainage basins, rivers, natural lakes, artificial reservoirs or impoundments. Surface water sources should be considered based on quality and quantity. The best quality source available should be selected. Surface water sources must be derived from watersheds which are classified as water supply watersheds by the Division of Water Quality. Some surface water plants require off-steam storage, which is discussed in [Chapter 9, Treatment].

Any new or expanding intake requires Environmental Review as discussed in [Chapter 5]. The Environmental Review process must be completed and the appropriate documentation submitted to the PWS Section prior to project approval.

The Division of Water Resources must review surface water withdrawals. Questions concerning withdrawals should be addressed with the Division of Water Resources.

Completing classification of the surface water body, environmental review and registering the withdrawal is a time consuming process. Water systems should allot several years to complete these necessary steps before developing plans and specifications.

8.2.1 Surface Water Classifications

Surface water classifications by the Division of Water Quality are designations applied to surface water bodies, such as streams, lakes and rivers, which protect uses within these waters. Each classification has an associated set of water quality standards. More information on the Freshwater Classifications can be found under 15A NCAC 2B and is also available at: http://portal.ncdenr.org/web/wq/ps/csu. Note that a water treatment plant or intake will not be approved by the PWS Section unless the source has been classified by Division of Water Quality as a water supply source. Further information on the classification process can be found at: http://portal.ncdenr.org/web/wq/ps/csu/classifications#reclass. Additional details on sequencing of the approval process are provided in [Chapter 4, Review and Permitting].

8.2.2 Protection of Public Water Supplies

The PWS Section classifies surface water reservoirs as Class I, Class II and Class III. The level of protection for surface water sources is based on watershed type and reservoir type.

Class I reservoirs are reservoirs from which water flows directly to a treatment plant, or to a small intervening storage basin and then to a treatment plant. Class II reservoirs are reservoirs from which water flows to a Class I reservoir prior to final entrance to a water treatment plant. Class III reservoirs are impoundments used for electric power generation, flood control and similar purposes, and which also serve as a source of raw water for community water systems.

A margin of at least 50 feet around a Class I or Class II reservoir measured from the normal pool elevation must be owned or controlled by the water supplier per Rule .0403(f). Recreational activities are not permitted within 50 yards of any public water system intake. Recreational activities on a PWS Section Class I or Class II reservoir must be approved by the Commission for Public Health. Contact the PWS Section Regional Office for additional information about obtaining an approval for recreational use.

Permission requests for recreational day events, lasting one day or less can be approved by the PWS Section. Contact the PWS Section Regional Office for additional information.

Information on voluntary source water protection strategies can be found at: http://www.ncwater.org/pws/swap/.

8.2.3 Intake Structures and Location

Intake structures must provide withdrawal of water from more than one level if water quality varies with depth. Multiple inlets must be constructed so that they can be readily opened and closed for selection of the optimum water quality level.

The pipes, tunnels or flumes used for intake conduits must be designed to conduct water at self-cleaning velocities of at least two feet per second. A screen, accessible for cleaning, must also be provided to protect the raw water intake pumps. At least two pumping units with necessary appurtenances must be provided. Auxiliary facilities must also be provided to supply water during periods of power outage.

Section 401 and Section 404 Permits may be required for construction and/or modifications of intake structures. A Section 401 Permit is issued by the Division of Water Quality, and a Section 404 Permit is issued by the U.S. Army Corps of Engineers. Section 401 and Section 404 permits must be secured and verification of permit approvals be forwarded to the PWS Section before plans and specifications for intake facilities are approved.

8.2.3.1 Stream Intakes

An intake structure for an unimpounded stream must be constructed so that the intake will not be affected by flood water or damaged by floating debris. The intake must be located and designed to minimize entrance of sand, silt, fish and other debris. A bar screen or grating must be provided with the area of the openings designed to restrict the entrance velocity to 30 feet per minute or less. Design must prevent or disperse leaf and debris accumulation.

8.2.3.2 Reservoir Intakes

Where water quality varies enough with depth to affect the treatment process, reservoir intakes must be constructed with multiple inlets that can be readily opened and closed for selection of the optimum water quality level. A bar screen or grating must also be provided with the area of the openings designed to restrict the entrance velocity to 50 feet per minute or less.

8.2.4 Additional Sources and Expansion of Existing Water Treatment Plants

If it is not feasible to withdraw and treat additional water from the same source because of limitations on the existing facilities, then it may be necessary to develop a new water source. When a new or expanded surface water intake is needed, engineers and water system managers should be aware that the process of obtaining needed approvals can be time consuming. System planners should begin developing the source before water supply needs become critical.

Before developing additional sources to supply the water system, a water system manager should look for ways to reduce demand by conserving water, detecting leaks and repairing them, using reclaimed water for non potable use, or interconnecting with a nearby public water system. To the extent possible, use the highest quality additional sources and implement source water protection plans.

8.3 Purchased Water Sources

A water system can use potable purchased water as its sole source of water supply or to supplement its own sources. Interconnections and distribution piping for water purchases must be submitted to the PWS Section for review and approval.

8.3.1 Interconnections

The PWS Section must review plans and specifications for any interconnection. When two interconnecting water systems are public entities, a copy of the fully executed agreement between the systems must be submitted with plans and specifications. Water sampling stations should be provided on both sides of the water meter. In case a dispute occurs between buying and selling water systems on water quality, samples can be collected from both sides of the purchase meter.

Water quality is an important component of the contractual agreement between interconnected water systems. The PWS Section recommends that water systems obtaining water through an interconnection periodically collect samples for disinfection byproducts, coliform, disinfectant residuals and any other contaminants or water quality parameters as necessary at the point of interconnection to document the quality of water being transmitted.

8.3.2 Purchase and Interconnection Agreements

The agreement between two water systems to buy or sell water must be submitted to the PWS Section before plans the specifications are approved for any interconnection. The agreement between the two systems must address the following:

- Water quantity: clearly outline maximum and minimum water purchases and define expectations and lines of communication for emergency purchases; and
- Termination of contract: discuss under what conditions the contract to purchase or sell water can be terminated and describe who has responsibility to ensure continuous water service for customers.

Agreements between water systems are of varying levels of complexity. All parties should communicate expectations clearly when developing an agreement. The PWS Section strongly recommends that the following points be considered and be incorporated into the agreement as appropriate:

- Water rates: establish rates for routine and emergency purchases. As appropriate, clarify rates the purchasing water system may charge its customers.
- Water conservation: coordinate water conservation efforts between seller and purchaser.
- Service areas: confirm current and future service areas for each system.
- Pressure and storage requirements: define pressure requirements at the meter. If desired and if documented in the contract, the seller can provide some portion of the purchaser's needed storage.
- Access agreement: outline who has access to valves and meters and should assign responsibility for reading the meter or operating valves.
- Ownership and maintenance: establish responsibility for operation and maintenance of water meters, water lines and appurtenances.
- Water quality: define water quality expectations at the meter, identify who will sample at the meter location and establish lines of communication in case of problems.
    - Water quality expectations at the meter should cover disinfection byproducts, lead and copper, and coliform. Disinfection byproducts are a particular source of water quality concern, as these contaminants increase with increasing residence time. When required under the lead and copper rule, water quality parameters (such as pH and corrosion inhibitor residual) and associated ranges should be specified. If positive total coliform samples are identified in either the seller's or purchaser's system, entry point

sampling may help to identify where the problem lies. When a purchase groundwater system detects total coliform in any sample, additional follow up is required by 15A NCAC 18C .2202.

- o Periodic sampling is recommended on both sides of the meter. When developing a contract both parties should understand who will collect and who will pay for samples on each side of the meter.
- o The purchase water system is responsible for the quality of water at each of its customers' taps. In case of problems, both parties should understand who will adjust operations and who will pay any costs incurred.

- Public notice: when violations affect purchase water systems, then the purchase water system is required to give public notice to its own customers by 15A NCAC 18C .1523. Both parties to the agreement should understand who will deliver and pay for public notices.

Refer to Water System Partnerships Guidance developed by the Environmental Finance Center at http://www.efc.unc.edu/projects/partnerships.htm for more information on water system contracts or agreements.

8.4 Interbasin Transfer

Some interconnections and other water system projects include interbasin transfers. An interbasin transfer is a transfer of at least 2 million gallons per day of water on a maximum day basis from one river basin to another. Interbasin Transfer Law defines 38 river basins, rather than the 17 major basins that are typically used. Interbasin transfer is a lengthy and complex process, subject to public review. Contact the Division of Water Resources at: www.ncwater.org for more information on this process.

8.5 Treated Wastewater Reuse

Direct reuse of highly treated wastewater is not an approvable source of supply because health concerns from unregulated contaminants associated with reuse of treated wastewater are not fully understood. Public health is best protected by using the highest quality water source available.