



## DRINKING WATER AND GROUNDWATER PROGRAM GUIDANCE

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Community Water System Pilot Study Submittal Guidance

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*This document is intended solely as guidance and does not contain any mandatory requirements except where requirements found in statute or administrative rule are referenced. Any regulatory decisions made by the Department of Natural Resources in any matter addressed by this guidance will be made by applying the governing statutes and administrative rules to the relevant facts.*

**Community Water System Pilot Study Submittal Guidance**  
Sections NR 811.44, NR 811.46, NR 811.50 (3), NR 811.53, Wis. Adm. Code

**Purpose:** This guidance is intended to provide supplemental information to code requirements and provide department expectations for operation and design of pilot studies at community water systems. The guidance document intends to highlight and emphasize areas of pilot study design and operation that are often overlooked and includes a list of items to be addressed as part of the initial pilot study submittal to the department for review and subsequent approval. This document is intended to be used alongside the applicable code requirements of ch. NR 811, Wis. Adm. Code not in replacement of them.

**Background:** Section NR 811.44, Wis. Adm. Code provides the department requirement for the basis of when pilot studies are required and a general list of information to include a pilot study submittal request. Additional pilot study considerations are provided in s. NR 811.46, Wis. Adm. Code for arsenic removal, in s. NR 811.50, Wis. Adm. Code for membrane filtration, and in s. NR 811.53, Wis. Adm. Code for organics removal. The details the code section are often seen as general and can result in questions which can result in a lack of clarity from some external stakeholders on the exact requirements and expectations of the department.

This guidance was created by the department's Public Water Engineering Section to provide a clearer understanding for department plan review staff, department field staff, community water system staff and consultants of the information necessary to be submitted for review and approval of a pilot study proposal.

**Document Organization:** This guidance outlines the information necessary to be included in a pilot study proposal to meet the requirements of ch. NR 811, Wis. Adm. Code and to improve transparency of the information requested to satisfy applicable pilot study proposal code requirements.

**Periodic Review Required:** This guidance will be periodically reviewed by the department's Public Water Engineering Section and updates made as necessary based on internal staff review and comments from other staff and external stakeholders.

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**Pilot study submittal requirements:** Department review and approval of a pilot study proposal is required prior to operation of the pilot study equipment. Information for the pilot study proposal can take many forms including formal engineering reports or technical reports. Information below are items considered and evaluated during department review of pilot study proposals

**General pilot study proposal information submitted for review should include all of the following:**

- A brief project description and intended treatment goal for the pilot plant
- Target finished water quality and any pilot plant operational objectives
- Location of pilot plant equipment
- Security measures for the pilot plant
- Responsible parties for operating the pilot plant and water quality sampling
- Measures, if necessary, to maintain the safety of the pilot plant operator
- Pilot plant water supply information:
  - Pilot plant water source
  - Backflow prevention to protect the source water supply **Note:** Check valves are not considered adequate backflow prevention. Backflow prevention must meet the requirements of ch. SPS 382, Wis. Adm. Code.
  - Provide a list of the most recent SDWA raw water quality information
  - Anticipated pilot system flow rates
- Summary of pilot equipment setup (line diagrams of setup are recommended)
- Length of pilot plant operation **Note:** The pilot plant must operate for a minimum of 2 treatment cycles, but the department may require the pilot to include additional treatment cycles if deemed necessary to characterize the efficacy of the pilot plant
- Pre-treatment information:
  - Pre-treatment required prior to the pilot plant
  - Equipment to simulate pre-treatment processes such as aeration or detention
  - Ability to modify or include additional pre-treatment
  - Pre-treatment objectives, examples may include
    - pH adjustments to enhance removal, prevent fouling, reduce corrosivity
    - Oxidation of removal of co-contaminants (e.g. Iron, sulfates, manganese etc.)
    - Oxidation of contaminant for removal (e.g. Arsenic (III) to Arsenic (V))
    - Coagulant additions
- Chemical addition information:
  - List of chemicals to be added and purpose of each chemical in pilot plant operation
  - Order of chemical addition in pilot plant (or include in line diagram)
  - Anticipated chemical doses and feed rates
  - Confirm pilot study chemical feed mimics anticipated full-scale treatment system
  - Verify all chemicals are NSF/ANSI 60 certified
- Water quality sampling discussion:
  - List of parameters collected prior to and during the pilot study
  - Location of analysis where will each sample be analyzed (Lab vs. field)
  - Discussion of need for confirmation samples at beginning or end of pilot for field measurements or previous compliance samples
  - Frequency of sampling of each parameter
  - Location in pilot plant that samples will be collected from
- Measurement and recording of other operational parameters:

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- Flow rates
- Head loss
- Time to filter breakthrough
- Any other operational parameters
- Air to water ratios (for aeration system pilot systems)
- Discharge of treated pilot plant water and backwash water (if applicable) information:
  - Minimum 2 pipe diameter free-air break where required
  - Requirements for treatment of the wastewater or backwash water prior to discharge
  - Where floor drains are used for discharge, provide building floor drains discharge locations (sanitary sewer, ground surface, etc.)

**If the proposed pilot study proposal includes operation of filtration or ion exchange (IEX) equipment, provide the following information:**

- Filter/IEX media information and discussion:
  - Type of media including effective sizes, specific gravity, uniformity coefficients, and acid solubility
  - Depth of each media layer
  - Loading rates of pilot system
  - A minimum of 2 filter/IEX runs will be performed
  - Will filter media satisfy the applicable specifications and depths of s. NR 811.49 (1)(f), Wis. Adm. Code
- Backwash/Regeneration information and discussion:
  - Type of backwash/regeneration (combined water/air, water only, etc.)
  - What is the source of the backwash/regeneration water?
  - The air and/or water flow rates from each step of the backwash/regeneration
  - The duration of each step of the backwash/regeneration
  - Conditions to trigger backwash/regeneration
  - Information used to verify backwash/regeneration was complete or if rates need to be adjusted?
  - Will the backwash frequency and rates meet the requirements of s. NR 811.49 (1)(k), Wis. Adm. Code?
  - Will the full scale system include provisions for recycling backwash water? If yes, will a means of recycling backwash water be piloted?
- Filter Operations and Design:
  - Identification of normal filtration rates. Justification for filtration rates exceeding standards found in s. NR 811.49 (1)(c), Wis. Adm. Code are necessary
  - Will the full scale filtration system include provisions to take one filter out of service (e.g. backwash or maintenance) while maintaining the filtration rates through each vessel or cell at or below the piloted rate?

**If the proposed pilot study proposal includes the operation membrane equipment, the following must be included:**

- Challenge testing reporting for the maximum cryptosporidium and giardia lamblia log removal (if applicable)

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- The pilot study shall be 9 to 12 months for microfiltration and ultrafiltration and 2 to 7 months for reverse osmosis and nanofiltration membranes
- The general protocol and sampling schedule shall follow the US EPA Membrane Filtration Guidance
- Necessity of pre- treatment and post- treatment
- Cold and warm water flux
- Backwash optimization
- Chemical cleaning optimization
- Fouling potential
- Operating and transmembrane pressure
- Integrity testing procedures and calculations of LRVs
- Bypass ratio
- Amount of reject water
- System recovery
- Process efficiency
- Particulate or organism removal efficiencies
- Any other design and monitoring considerations

**If the proposed pilot study proposal includes treatment equipment which may remove radiological materials, the following must be included:**

- Unity Equation calculations for all wastewater to be discharged from pilot plant
- Disposal of pilot study media which may contain radiological materials
- The radiation protection section of the department of health services shall be contacted to obtain a radioactive material license to operate pilot and full scale installations when uranium will be concentrated on the resin or media to a level greater than 170 picocuries per gram at any time during use, including just prior to backwashing, regeneration, or disposal.

**Pilot System Report:** A final report summarizing the results of the pilot study and making recommendations for full-scale treatment equipment must be submitted to the department for review and comment (s. NR 811.44 (2), Wis. Adm. Code). The department expectations are full scale treatment designs should mirror treatment operations in the pilot. This includes but is not limited to treatment operations, pre-treatment processes, filtration rates, filter medias and depths, and backwash/cleaning procedures where practicable.