Department of Health and Human Services
Maine People Living
Safe, Healthy and Productive Lives

Department of Health and Human Services
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MAINE DRINKING WATER PROGRAM (DWP) UV POLICY

IMPORTANT NOTIFICATION: The EPA Ground Water Rule (GWR) which takes effect in 2009 requires ground water systems with E. coli present in the raw water to install treatment capable of 4-log inactivation or removal of viruses. Currently available UV treatment equipment may not (as of the date of this policy, most single units do not) meet this level of virus inactivation unless several units are installed in series, which is a very expensive method of maintaining GWR compliance. Chlorination systems on the other hand, can be modified to meet the GWR virus inactivation requirement by simply increasing the chlorine dose or providing more contact time, both of which will likely be less expensive than providing 4-log virus inactivation with a UV disinfection system. Therefore, when evaluating UV disinfection as an alternative, please be aware that after a UV system is installed and approved per this policy, the presence of E. coli may require the subsequent installation of a continuous chlorination system or substantial additional UV disinfection equipment in order to meet the requirements of the GWR.

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PURPOSE: This policy is written to specify the requirements for installing ultraviolet disinfection for a small ground water public drinking water source.

SCOPE: This policy is applicable for small ground water sources only. For large ground water sources and all surface water sources, consult the EPA Ultraviolet Disinfection Guidance Manual. This policy applies when disinfection is required by the DWP. UV systems installed without a requirement for disinfection must be reviewed and approved as treatment per the Maine Rules Relating to Drinking Water, Section 3: Facilities Approval, Submission of Engineering Plans.

ORIGINATOR/OWNER: Nathan Saunders

DEFINITIONS:

Small ground water source is generally defined as a system obtaining drinking water from one to three, six inch diameter bedrock wells or similar sized gravel pack wells that are not considered GUI (ground water under the influence of surface water). For this policy, a public water system with a small ground water source serves a population of 500 people or less. Any system that does not fit this basic description of a small ground water source should refer to the EPA Ultraviolet Disinfection Guidance Manual for applicable guidance.

Raw water: water coming directly from the well, before any treatment.

RESPONSIBILTIES:

Engineering reviews and approve UV disinfection systems with input from the applicable Rule Specialist.

INTRODUCTION:

Ultra Violet (UV) Light treatment devices may be used to treat bacteriologically unsafe groundwater from drinking water wells. However, the DWP expects water system owners to take all steps possible to obtain a naturally safe water source before considering treatment. A naturally safe water source provides the best long-term public health protection and there is no reliance on a treatment device to assure safe water. There must be a determination that the bacteriologically unsafe water is not due to the influence of surface water.

Recent research has demonstrated the effectiveness of UV as a primary disinfectant. While this policy statement does not specifically cover UV treatment for surface water or groundwater under the direct influence of surface water (GUI), it is not the intent of this policy to discourage such use. Please refer to the EPA UV Disinfection Guidance Manual and contact the DWP when investigating the use of UV disinfection on a surface water or GUI source.

When a naturally safe groundwater source is not available, or the system owner wishes to provide UV treatment for other reasons, the following criteria shall apply. Supplemental disinfection to provide a residual in the water distribution system may be required by the DWP. When UV light treatment devices are used for non-drinking water related purposes (such as process water used in a fish processing plant), the UV device must be approved by the appropriate state or federal agency.

A. UV TREATMENT SYSTEM STARTUP REQUIREMENTS

1. System specifications and schematics shall be submitted to the DWP for review and approval prior to system installation.

2. Before startup of a UV treatment system:

    - The water system should be thoroughly disinfected (shock chlorinated).

    - The system must be inspected and approved by the DWP. Final inspection will be completed by the PWS Inspector and shall take place with the installer present to ensure adequate description of the installation and functionality of the UV unit.

3. The system shall be installed by a licensed plumber. Documentation verifying this shall be made available to the DWP inspector.

4. Approval requires demonstration that the system meets the criteria included in this policy.

B. CRITERIA FOR UV WATER TREATMENT DEVICES

1. UV water treatment devices must be ANSI/NSF Standard 55 - Ultraviolet Microbiological Water Treatment System certified.
2. The design and installation of the UV reactor shall ensure that the manufacturer's maximum rated flow and pressure cannot be exceeded. Flow restriction may be accomplished by installing a flow meter as a controlling device, by installing a flow restricting orifice, or by another method that satisfies this requirement.
3. The UV assemblies shall be accessible for visual observation, cleaning and replacement of the lamp, lamp jackets, and sensor window/lens.
4. An automatic shutdown valve shall be installed in the water supply line after of each UV treatment system that will be activated whenever the water treatment system loses power or is tripped by a monitoring device when the dosage is below its alarm point of 40 mJ/cm^2. When power is not being supplied to the UV unit the valve shall be in a closed (fail-safe) position.
5. A bypass may be installed but may only be used if an approved disinfection alternative is in use, or a Boil Water Order is issued. A durable plastic instruction tag shall be securely attached to the by-pass valve stating this requirement and that the Maine Drinking Water Program must be called before using the bypass. For further guidance on operating in bypass mode, please contact DWP personnel by phone at 207-287-2070.
6. Failure of the UV unit must immediately shut down the flow of water through the UV device. This can be accomplished with an automatic shut-off valve, installed after the UV unit, which receives its shut-off signal directly from the failed UV unit. The automatic valve shall be normally closed in a power off condition. Without a redundant UV unit, this will result in a complete water system shutdown unless a bypass is used per section B.5 above. A sufficient number (required number plus one) of parallel UV treatment systems can be provided to assure a continuous water supply when one unit is out of service.
7. All water from the well shall be treated. The well owner may request a variance to treat only that portion of the water supply that is used for potable purposes provided that the daily average and peak water use is determined and signs are posted at all non-potable water supply outlets. See B.5 above on the use of a by-pass.
8. The well or booster pump(s) shall have adequate pressure capability to maintain minimum water system pressure after the water treatment devices.
9. For required disinfection, sampling taps shall be installed before and after the UV unit. A receptacle for the connection of portable power is recommended.

C. PRETREATMENT

A 5 micron filter should be provided as minimum pretreatment.

D. PROCESS CONTROL WATER QUALITY MONITORING

Total coliform monitoring and other parameters required by the DWP will be used to evaluate UV treatment effectiveness. The minimum monitoring frequency will be as follows:

(1) Startup and 2 weeks after start up - one raw and one treated sample.

(2) Monthly thereafter - treated water.

(3) Monitoring for additional parameters or total coliform on an increased frequency may be required by the DWP.

E. ONLINE MONITORING, REPLACEMENT PARTS

UV light intensity of each installed unit shall be monitored continuously. Treatment units and the water system shall automatically shutdown if the UV dosage falls below the required output of 40 mJ/cm^2. Each owner shall have available on site at least one replacement sleeve, lamp, 5 micron filter and any other components necessary to keep the treatment system in service. A maintenance agreement can substitute for having replacement components on hand. The maintenance agreement shall be made available for inspection by the DWP upon request.

F. SEASONAL OPERATIONS

UV water treatment devices that are operated on a seasonal basis shall be inspected and cleaned prior to use at the start of each operating season. The UV water treatment system including the filters shall be disinfected prior to placing the water treatment system back into operation. A procedure for shutting down and starting up the UV treatment system shall be developed for or by each owner based upon manufacturer recommendations and submitted in writing to the DWP.

G. RECORD KEEPING AND ACCESS

A record shall be kept of the water quality test data, dates of lamp replacement and cleaning, when the device was shutdown and the reason for shutdown, and the dates of prefilter replacement. The DWP shall have access to the UV water treatment system and records.

H. WATER QUALITY CHARACTERISTICS

The water supply entering the UV unit should be analyzed for the following water quality parameters and the results shall be included in the UV application. Pretreatment may be necessary for UV installations if the water quality exceeds any of the following maximum limits. When an initial sample exceeds a maximum limit, a check sample should be taken and analyzed.

Parameter	**Maximum (Minimum)**
UV 254nm Transmittance	(80 percent)
Dissolved Iron	0.3 mg/L
Dissolved Manganese	0.05 mg/L
Hardness	120 mg/L*
Hydrogen sulfide (if odor is present)	Non-Detectable
Iron Bacteria	None
pH	6.5 to 9.5
Suspended Solids	10 mg/L
Turbidity	1 .0 NTU
Total Coliform	1,000/100 ML
E. coli	**

* A higher hardness may be acceptable if experience with similar water quality and reactors shows there are no treatment problems or excessive maintenance required.

** These organisms may indicate that the source is either a surface water or ground water under the direct influence of surface water and may require additional filtration pretreatment. Consult the DWP for guidance.

Water quality entering the UV unit should be evaluated and pretreatment equipment should be designed to handle water quality changes. Variable turbidity caused by rainfall events is of special concern.

Maine DWP UV System Approval Checklist

PWS Name: _____ PWSID# _____
PWS Inspector: _____ Date: _____
UV Mgfr _____ Model _____ S/N _____

1. UV unit has been installed by a licensed plumber [UV A.] ☐
2. Water system has been thoroughly disinfected (shock chlorinated) [UV A.] ☐
3. ANSI/NSF Standard 55 Certified [UV B.1] ☐
4. Flow will shutdown upon UV unit failure [UV B.4, UV B.6] ☐
5. Instruction tag present on bypass valve/device. [UV B.5] ☐
6. All water from well is treated, unless variance provided by DWP [UV B.7] ☐
7. Well or booster pump(s) providing min. system pressure required [UV B.8] ☐
8. For required disinfection, sampling taps installed before and after UV unit [UV B 9] ☐
9. Water quality monitoring set up per UV policy [UV D] ☐
10. Replacement lamp(s) and filter (if filter is installed) present or maintenance agreement in place [UV E] ☐
11. Record keeping for water quality, lamp replacement, shutdowns etc. [UV G] ☐

UV system approved? Yes ☐ No ☐

[Date]
PWSID:

[Contact Name]
[Address]

Dear _____,

The Drinking Water Program (DWP) has completed its review and inspection of the Ultra Violet Light Disinfection System at your facility. Specifically, the system includes [describe the system]. This treatment is being installed due to [describe reason]. Based on meeting the criteria of DWP Policy on Ultra Violet Light for Treatment of Public Water Supplies as recorded on the attached checklist,

Approval for the UV Disinfection System is granted.

The DWP will ask to see maintenance records during future inspections. If you have any questions or comments, please contact me by phone at ___-_____ or by e-mail at _____._____@maine.gov

Yours for Safe Drinking Water,

[PWS Inspector Name]
DWP PWS Inspection Team

cc: [DWP Rule Specialist]
[DWP PWS Inspection Team Manager]

ASSOCIATED DOCUMENTS:
1. EPA Ultraviolet Disinfection Guidance Manual

SUPERCEDED DOCUMENTS: None

RETENTION:

This document is retained per the DWP Documentation Control Procedure.

Maine DWP UV System Approval Checklists are retained per the DWP Record Control Procedure

REVISION LOG

Section	Page	Rev.	Date	Description Of Change	Approved by:
All	All	G	12/26/08	Re-write to reduce requirements	Roger Crouse
All	All	H	1/10/17	Changes related to the DWP Reorganization	Nathan Saunders