



ENVIRONMENTAL CONSERVATION

Water Supply Division

GUIDANCE SHEET

(1)
WSID (2)

Operations and Maintenance Manual

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Preface

This Operation and Maintenance (O&M) Manual was completed by (4) as a requirement of the Vermont Water Supply Rule (WSR), Subchapter 21-7. The document should be updated at least annually with the date the update occurs recorded in the space provided on the front cover of this document.

The purpose of the O&M Manual is to provide a stand-alone document to allow daily routine and trouble shooting operation by a properly trained operator including testing and monitoring requirements necessary for this particular system. As such, no piece of information is "too small" to be included in the document, as the more information that is included, means the less information that is unknown.

Used in conjunction with "as-built" water system blue prints, the document should be usable for full system maintenance to insure an adequate water supply is available to all users of the water system and public health is protected. Because of this, this manual reflects only actual installation of equipment, facilities, and treatment, NOT plans, future additions or "wish-lists". This qualifying statement should be kept in mind for all future updates of this document.

The Water System must be operated and maintained in accordance with its permitted, engineered design and in compliance with this approved document.

I. General System Description

Permitted Source

The approved or permitted source(s) for the Water System is(are):

1. Source WL001(or IN001) – (5)
2. Source WL002 (or IN002) – (6)
3. Source WL003 (or IN003) (emergency source) – The Water Supply Division must be notified prior to any use of this non-permitted, unapproved source. The phone number for the Division is 1-800-823-6500 or 802-241-3400. (7)

A map showing all sources relative to the area is contained in the Appendix A, titled “Water System Maps”. (8)

Raw Water Mains and Storage (if applicable)

Prior to treatment or distribution raw water is pumped directly to the raw water storage tank. This tank is located (9a). The capacity of the tank (in gallons) is (9b) and the tank is generally operated at (9c)% of maximum capacity. The vent, overflow and drain for the tank are located at (9d), respectively. The drain can be manually opened or closed by turning the valve located (9e). Prior to opening the drain, the following things should be completed: (9f). A schematic drawing of the raw water storage is contained in Appendix B, titled “Water System Schematic Drawings”. (9g)

(10)

Raw Water Treatment

Prior to distribution and finished water storage, the raw water is treated with the following process(es) in the specified order:

(11)

1. Chlorination – Chlorine is added to the raw water for the purpose of disinfection prior to consumption by any users on the water system. This disinfection system is operated on a continuous basis (12)% Sodium Hypochlorite solution (12a) is added to the raw water line via a flow-paced injection system composed of a positive displacement chemical feed pump (12b) that draws the diluted chlorine solution from a (12c)gallon holding tank/reservoir and directly injects it to the raw water line (see Section IV – Normal Operations, for information on adding solution or tank/pump maintenance). The chemical feed pump is plugged into an outlet that is controlled by a solenoid valve to ensure that the circuit is only “live” when the well pump that is located inside the source is on and pumping water. (12d) This ensures that the chlorine is added to the system only when the pump is on and fresh raw water is added to the system. An additional safeguard is a flow-sensor either immediately prior to the chlorine injection point to halt the chemical feed system if water flow stops, or to stop water flow if the chemical feed solution stops. This sensor records actual flow of water in the pipe to guard against accidental injection of chlorine when the source pump is on but no water is being added to the system. If the sensor does not detect water flow it de-energizes the outlet, preventing the introduction of chlorine into the system. The other flow sensor will halt water flow if there is a chemical feed pump failure. Following the injection point and prior to the water entering the distribution system, the treated water flows to (12e) to ensure that proper disinfection occurs by ensuring a minimum of 20 minutes of contact time is applied (12f) After this contact time, the water may enter the distribution system. (13)
2. Potassium Permanganate (Algae, Zebra Mussel control, Iron and Manganese, taste and odor control)
3. Sediment Filter Cartridge
4. Ion Exchange (water softener unit)
5. Phosphate Addition (sequester iron and manganese, corrosion control, lead & copper)

6. Soda Ash (raise raw water pH)
7. Filtration (slow sand, rapid sand, pressure sand, conventional, direct)
8. Filtration
9. Fluoridation
10. Anion exchange
11. Activated Carbon

A schematic drawing of the entire treatment train is contained in Appendix B, titled "Water System Schematic Drawings". (14)

Finished Water Storage

Finished water (water ready to be consumed) is stored in a 15a – gallon storage tank made out of (15b) called (15c) that is located (15d) The storage tank has an overflow that discharges Additionally, there is a drain that can be manually opened or closed by turning the valve located (15f) Prior to opening the drain, the following things should be completed: (15g) A schematic drawing of the finished water storage, piping, valve ties, etc. is contained in Appendix B, titled "Water System Schematic Drawings". (15h)

(16)

Below is a table summarizing the pertinent information of each of the storage tanks for the Water System.

Storage Tank Summary Table

Tank	Tank name	Size	Type	Location	Overflow Location	Drain Valve Location
001	Big Tank	100,000	Steel	Old Smith Farm	SW corner of bank behind tank	Marked with orange pole, NE corner

System Pressure Maintenance

Pressure in the distribution system is maintained and/or regulated by (17) the (18) is located (19) Routine maintenance for each of these systems is discussed in further detail in Section IV – Normal Operations. (20)

Pump Station Summary Table

Pump Station #	Pump Station Name	Number of Hydropneumatic Tanks and sizes	Number of Booster pumps	Low/high pressure (psi)	Location
001	Big Pumper	3 – 100 gallon	2	55-80	Jones Farm Rd.

Distribution System

(21)

Source Protection Area

Groundwater Source

The source protection area for each of the water system sources has been delineated and is described in detail in the system Source Protection Plan (SPP). A Source Protection Plan identifies the potential sources of contamination in a specific land surface area, assesses the risks of these potential sources of contamination, describes how to manage the risk from the potential sources of contamination, and discusses how to handle simple emergencies that may be associated with inadequate source water quality or quantity. Activities within the protection area are managed by the Water System through their Source Protection Plan to minimize their effect on the drinking water source. Any activity which may contaminate the water supply is prohibited from being located within the isolation zone for the source. A copy of the Water Supply Division-approved SPP, including maps) is attached as an appendix to this document (See Appendix C). (22)

AND/OR

Surface Water Source

The source protection area for each of the water system sources has been delineated and is described in detail in the system Source Protection Plan (SPP). A Source Protection Plan identifies the potential sources of contamination in a specific land surface area, assesses the risks of these potential sources of contamination, describes how to manage the risk from the potential sources of contamination, and discusses how to handle simple emergencies that may be associated with inadequate source water quality or quantity. Activities within the protection area are managed by the Water System through their Source Protection Plan to minimize their effect on the drinking water source. Any activity which may contaminate the water supply is prohibited from being located within the isolation zone for the source. A copy of the Water Supply Division-approved SPP, including maps) is attached as an appendix to this document (See Appendix C). (22)

II. System Schematic

A current and continually updated system schematic makes routine, as well as emergency maintenance on a water system significantly easier. Contained within this section of this document is a system-wide schematic of the distribution system. This schematic is a representation of all system components as well as all known hydrants, blow-offs, air-releases, valves, meters, and connections. All items are "tied-in" to a known, permanent location so that they can be easily located, even if the item becomes hidden (such as by snow or dirt). (23)

The following table identifies and describes each of the items listed on the schematic: (24)

(25)

Item	Location	Description	Function
Valve 001	Main St / Smith Rd	12" gate valve	Shuts off all water to north side of system
Valve 008	300 block Ryan Rd.	8" gate valve	Shutoff valve for Ryan Park, open 7 th in flushing routine
Hydrant 056	Elementary School	ISO Fire Hydrant	Provides fire protection for elementary school, used in system flushing
Etc.			
Etc.			
Etc.			

III. Startup Procedure

Initial Flushing and Disinfection

All walls, pipes, tanks, and equipment that can convey or store potable water must be disinfected in accordance with American Water Works Association (AWWA) standards – see www.awwa.org/bookstore/category for available guidance documents.. These procedures must be followed to ensure that the water system has been properly prepared to supply safe drinking water. The steps that should be completed are as follows (26)

1. Add chlorine disinfectant to the source (27)
2. *xxx*
3. *xxx*
4. *xxx*
5. *xxx*
6. *xxx*
7. *xxx*

Sequenced Start-up Procedure

In order to start the operation of the water system, the following sequence of events must be completed, in order (28):

1. Turn on power to system components (29)

IV. Normal Operations

The operations of the Water System can be broken down into a number of categories that are defined by how often certain tasks must be completed. Many of the tests and tasks are necessary for compliance with drinking water regulations while others are requirements of the equipment or chemical manufacturer to ensure the reliability of the product and water system. Some tasks will only need to be completed on an annual (or less frequent) basis; however they cannot be forgotten about! Other items of a good water system need daily or even continuous monitoring. If your water system has a residential population of greater than or equal to 3,300 persons, the Emergency Response Plan shall also address these issues. This section has a checklist for items that must be completed less frequently to ensure that they are being completed as often as is necessary. It also provides a record of maintenance that has been completed, that can be used to show regulatory compliance for different facets of the system. Each item listed in the checklist has a corresponding entry on the following page that gives details about how to do the required task.

The page following the maintenance records and directions is the compliance monitoring schedule provided by the Water Supply Division. (30)The Water System monitoring schedule is updated annually in December of each year and includes a schedule of each chemical group that must be monitored for and the quarter in which the compliance sample must be collected (31). The schedule shows a two-year period; however only the first year is a required sampling schedule. The second year shows an estimated sampling schedule that may be used for planning and budgeting purposes, but a formal schedule will again be provided in December, prior to the schedule becoming official.

Daily Tasks

- Ensure that all continuous monitoring devices are operating correctly by grab sample analysis if the monitoring devices are used for reporting purposes. If the instruments are not used for reporting purposes, ensure proper operation by a visual inspection of the instrument (attend to, log, and clear alarms) and flow through the instrument
- Conduct a general site inspection. Check all storage tank hatches and building locks for signs of unauthorized entry, leakage, etc.
- Inspect Chemical Feed Systems for proper operation, that dosage rates are accurate and/or potential problems
- Collect necessary compliance samples (pH, chlorine residual, fluoride residual, etc.);
- Add new charts to chart recording devices
- Monitor, measure and log all measurements, residual analyses, including the total amount of water produced by each source
- Xxx
- Xxx
- Xxx

Routine Tasks

(32)

Monthly							
Task	Date last completed						
Collect Bacteriological Sample for TCR compliance <i>(if applicable)</i>							
Record Monthly Source Water Production (daily if introducing chemicals)							
Submit Monthly Report to Water Supply Division							
Fill Chemical Solution Tanks <i>(if applicable/needed)</i>							
Chemical feed pump draw down tests							
Calibrate All Analysis Equipment/Replace fluids as necessary/clean and flush as needed							
System maintenance (pumps, valves, etc.)							
Quarterly							
Task	Date last completed						
Collect Required Chemical Monitoring Samples							
Calibrate All Analysis Equipment							
Semi-Annually							
Date last completed							
Test Fire Hydrants							
Inspect Surface Water Intake							
Calibrate All Analysis Equipment							
Annually							
Exercise All Valves in Distribution System							
Calibrate All Analysis Equipment							
Anti siphon and Backflow prevention device testing							
Flush Distribution System (unidirectional)							
Prepare/distribute consumer confidence report (Due July 1)							
Less Than Annual Frequency							
Task	Frequency	Date last completed					
Inspect and Clean Storage Tanks	Every 5 years						

Update Monitoring Waivers & SPP	Every 3 years			
Apply to renew Permit to Operate	Based on permit expirati on date			
Renew Certified Operator certification	Every 3 years			

Directions for Completing Routine Tasks

Daily Tasks (33)

(The following is an example. Directions for ALL tasks that are identified in the checklist on the previous page should be accounted for in these pages)

- Check all continuous monitoring devices – Flow-meter, online chlorine analyzer and turbidity analyzer (34) must be checked for proper operation. Is the power on to all equipment? Are readings within the expected range? Is there a read-out on all equipment? Are results being charted? Has all daily maintenance (calibration, reagent addition, new chart added, etc) been completed?
- Security check of property, equipment and tanks – A visual inspection of all storage tanks and buildings on the property must be completed. Walk completely around all structures and check the tops of all building that have an accessible roof. Check all entryways, hatches and locks for signs of disturbance.
- Chemical feed system monitoring - How many gallons of water did you produce and how many gallons (or pounds) of each chemical did you use (calculate dosage as a double check of residuals that were measured). Any leaks on the feed lines? Does secondary containment have any solution in it? Carrier water flows ok? Etc.
- Etc. –
- Etc. –

Monthly Tasks (35)

- Collect bacteriological samples for TCR compliance – Check Bacteriological Sampling Plan located in Appendix I of this manual for sampling location. Properly prepare sampling location and collection materials (according to standard operating procedures). Measure disinfectant residual if disinfectant is present in the system. Collect sample and send to (36).
- Record monthly water production – Go to master source water meter and record the total gallons produced on the front of the yellow monthly reporting sheet located (37). Subtract reading from the first day of the month (already recorded on sheet) to determine total water production for the month. Ensure that back of form has recorded daily water production, chlorine residuals, and any other daily chemical monitoring that is required by the Permit to Operate and mail to the Water Supply Division listed at the bottom of the front of the form.
- If disinfecting, did the Water System meet daily CT goal during peak hourly flow?
- Submit Monthly Report to Water Supply Division.
- Provide water bill to customers.
- Etc. -
- Etc. -
- Etc. –

Semi-Annual Tasks

- Flush Distribution System –
- Inspect Surface Water Intake –
- Read distribution system meters at service connections(might be done more often) - Visit each service connection and record the number shown on the service connection water meter. Check to ensure that the value recorded is within the bounds of reason, e.g. there isn't a grossly significant error signifying a potential leak.
- Etc. -
- Etc. –

Annual Tasks

- Exercise all valves in distribution system –
- Etc. –
- Etc. –

Less Frequent Than Annual Frequency

- Inspect and clean storage tanks –
- Etc. –
- Etc. –
-

V. Safety

Personal Safety

Operation of a drinking water system poses some job-related hazards that must be adequately addressed to ensure not only an adequate supply of safe drinking water, but to provide for the health and safety of all employees associated with the water system. These hazards include, but are not limited to slips, trips, falls, electrocution, drowning, engulfment, asphyxiation, and chemical poisoning. The table below lists many of the known hazards associated with the standard operation of the (38) water system, as well as the precautions that must be taken to lessen the likelihood of a potential injury. Precautions include the use of appropriate personal protective equipment (PPE) including, but not limited to, gloves, face shields, SCUBA, and respirators. Material Safety and Data Sheets for all chemicals used in the water system are contained in Appendix D of this document (39) The location of all permit or non-permit required confined spaces is identified on the map titled "Confined Spaces" located in Appendix A – Water System Maps (40).

(41)

Hazard	Location	Necessary Precautions
Sodium Hypochlorite	Pump-house and storage room	Proper PPE: gloves, eye-shield, appropriate ventilation. Note that oxidizing compound will deteriorate electrical equipment
Sodium Hydroxide	Pump-house and storage room	Proper PPE: gloves, eye-shield, appropriate ventilation
electrocution	Electrical panel	Follow lock-out tag-out procedures, disconnect main power before work
drowning	Storage tanks, pond	Two person system for work in and around potential drowning locations, life-vests as appropriate
Fluoride	Pump-house and storage room	Proper PPE: gloves, eye-shield, appropriate ventilation
Soda Ash	Pump-house and storage room	Proper PPE: gloves, eye-shield, appropriate ventilation

System Safety

Besides the inherent personal risks involved in operating a drinking water system, there are additional safety issues that must be considered to ensure that all users of the water system, as well as the system itself remains safe. This is the main function of the water system - to ensure that water is protected from the source to the tap for all users. Included in this definition is the often overlooked facet of system safety. If a portion of the system breaks down, then your main job (supplying safe drinking water) has been upset because the system has been disrupted. Timely completion of the daily and monthly tasks identified in Section IV should make system safety much easier to obtain and maintain, but problems will still occur. Knowing how to deal with those problems as they occur (or even preventing them) will make operation of the water system significantly more reliable. The following system safety-related issues are duplicated in Section VII – Troubleshooting without the “effect” column and an expanded “fix” column.

(42)

Hazard	Effect	Fix
Burned out lights in pump-house	Increased risk of slips, trips falls; decreased security	Replace light bulbs
No disinfectant in system	Increased risk of bacteriological contamination or actual colonization of bacteria; possible regulatory consequences	Check injection pump, lines, and disinfectant reservoir, replace as necessary and search for the source of contamination, (leaking water line, cross-connection, back-pressure, etc.) as necessary.
Low pressure in distribution	Angered customers; increased risk of backflow situations; potential regulatory consequences	Check pressure systems, check for system leaks, booster pump failures; identify low pressure cause
Elevated disinfectant levels	Angered customers; risk of harm to consumers; possible regulatory consequences	Check injection pump, lines, and disinfectant reservoir, especially anti-siphon valve, replace as necessary; take appropriate measures to solve problem
Identified Cross-Connection	Potential harm to consumers through ingestion of non-potable water; contamination of entire distribution system	Remove cross-connection immediately. Install appropriate backflow protection
Etc.		
Etc		
Etc.		

VI. Contingency Plan

Despite your best efforts as an operator, there will be times that events are out of your control. During these times, it is possible that your supply of water will no longer be available for use by the consumer. For this reason it is imperative that a contingency plan be already developed and practiced (as is necessary, applicable or practical) so that again, your highest priority – supplying safe drinking water – can experience minimal or no interruption. Your contingency plan is also contained in the Division-approved SPP for the water system. It is copied here for convenience. (43) A full Emergency Response Plan is included in Appendix J of this document. (44)

Required Notification

Before implementing the water system's contingency plan, the water system must contact the Water Supply Division at 1-800-823-6500, 802-241-3400, or if after-hours by pager at 802-741-5311. Additionally the water system must notify: (45)

Alternate Water Supply Made Available

An alternate water supply has been identified for use in emergency situations. Prior to the use of any unapproved source, you must make sure that all required notification as required by the Division has been completed (see section immediately prior to this one). The alternate supply for the (46) water system is (47) which is located. (48) In order to start using this source, the following steps should be completed in order: (49)

- 1.
- 2.
- 3.
- 4.
- 5.
- 6.
- 7.

Sequenced System Shutdown

In addition to the start-up of the emergency source and distribution system, shutdown of the main water system may be necessary due to contamination or other unsafe conditions. The following steps must be completed, in order, to ensure the safe shut-down of the main water system: (50)

- 1.
- 2.
- 3.
- 4.
- 5.
- 6.
- 7.
- 8.

Posting of any Notice Required for Use of Emergency Source

Use of most emergency sources will require the posting of either a "Do Not Use" or a "Don Not Drink" (the exception being when 100% of the emergency supplied water is bottled). This Public Water Notice may eventually be removed by the Water Supply Division, pending the submission of satisfactory water quality test results. Sample Notices are contained in Appendix E of this document. (51)

Public notice must be delivered to all customers of the water system as soon as possible (prior to any potential consumption of the emergency source water), but **no later than 24 hours** after switching to

the emergency source. Public notice may be given by hand-delivery, broadcast media (TV and radio) and/or placed in conspicuous public places throughout the distribution system. The notice must stay posted during the entire period that notification is required.

VII. Trouble Shooting Operation Problems

During the course of daily operations there are literally thousands of potential problems that could occur. Some of these problems are so obscure and rare that it is futile to try and address every single issue in print; however, the vast majority of problems that occur can be predicted and a plan to address them completed prior to the actual event ever occurring. This section of the Operation & Maintenance Manual offers a view to dozens of potential problems geared toward a quick solution to ensure very limited or zero interruption of water service to the customer. (52)

Problem	Remedy
No water	
Broken Well Pump	
Chemical overfeed	
Chemical underfeed	
No disinfectant residual	
Disinfectant residual too high	
High water alarm	
Low Water Alarm	
Service Connection Break	
Main Line Break	
Leaking Hydrant	
Stuck Valve	
Broken Valve Handle	
Clogged Filter	

Lightning Strike of pump-house	
Broken Booster Pump	
Flooded Pressure Tank	
Leaking Storage Tank	
Leaking Chemical Storage Tank	
Security Breach of Building	
Security Breach of Storage Tank	
Security Breach of Source	
Dead Animal in Storage Reservoir	
Low Water Pressure in Distribution System	
Broken Master Water Meter	
Chemical Spill in Pump House	
Flooded Meter Pit	
Frozen Main Line	
Frozen Service Connection line	
Low pressure in distribution system	
High pressure in distribution system	

Public disease outbreak. (caused by waterborne bacteria/parasites)	
Fire Hydrant hit by automobile	
Lost/Can't find an isolation valve	
Customer complaints	See customer complaint procedure in Section XIII of this manual
Insufficient Yield	
No electrical power or low voltage	
Pump Failure	
Electrical Controls failure	
Discolored Water	
Taste associated with water	
Odor associated with water	
Treated water discharge to environment	

VIII. Distribution

Main Line Description

The main distribution lines of the water system are composed of (53) that is approximately (54) years old. Main line shutoff valves are located on the system-wide schematic that is contained in Section II of this document and the valve tie books show measured locations from fixed objects, make, model, open/shut direction(s), and maintenance history (if applicable) (55). Additionally, a less detailed map showing only key shut-off points is contained in Appendix A, "Water System Maps". (56) Shut-offs can all be operated manually; any special directions for a particular shut-off are noted next to that valve on the map in Appendix A. (57)

System Flushing

All distribution valves should be operated at least once annually. Unidirectional distribution system flushing – following the distribution flow of water to the ends of the system - should be conducted annually at a minimum and is a good way to also incorporate a valve-exercising program. Sound distribution maintenance practices are an important part of ensuring future system reliability. The following method should be adhered to in all flushing for the water system. Strict adherence to this protocol will ensure that the entire system is adequately flushed and that no "pockets" of water remain stagnant in the system as well as ensure that pipe interiors are flushed to scouring velocity to prevent build up on the interior of the piping and that any sediments that are present in the piping are removed. When the system has been routinely disinfecting the water with chlorine it is also important to ensure that all water is dechlorinated prior to, or at, the discharge point to prevent an intentional release of chlorine to the environment. The entire flushing protocol is also included in Appendix F – Standard Operating Procedures, of this document. (58) Each time that system flushing is completed, the date should be recorded in the appropriate table in Section IV of this document and in the valve tie books (for systems that have valve tie books).

Special Appurtenances

The following items need different or additional maintenance relative to the standard valves identified above. Each of these appurtenances should be maintained according to the manufacturer or installer's instructions which are included alongside their descriptions. Each of these items is included in the detailed system schematic in Section II of this document; additionally, a less detailed drawing showing their locations is included in Appendix A. (59) Each of the individual items is represented in Appendix B with either a manufacturer's schematic or a drawn representation of the item. (60)

- (61)

Fire Protection

(62) The distribution system is equipped with (insert number of hydrants) for fire protection. Each of these hydrants is included in the detailed system schematic in Section II of this document, additionally, a less detailed drawing showing their locations is included in Appendix A (63) The fire hydrants are utilized in the distribution system unidirectional flushing program that is completed (64) per year.

During annual inspection of the fire hydrants, the rated flow per hydrant, pumping capacity, minimum fire-fighting pressures and any other pertinent data is collected and produced by the testing organization. Test results for the fire system and each hydrant are contained in Appendix G of this document. (65)

IX. Maintenance Program

Most maintenance of the water system is addressed in Section IV of this manual "Normal Operations". Within Section IV is the maintenance log associated with all tasks identified in this section. As scheduled maintenance is completed it must be logged in Section IV. Contained within this section is more detailed information and direction regarding specific attributes of the system including specification sheets for all components of the water system. The following list includes all equipment within the water system, the year it was installed or purchased, and a maintenance schedule for each component (the checklist is in Section IV).

(66)

Equipment List

Item	Year Installed	Maintenance Schedule	Estimated Replacement date	Estimated Cost	Vendor Contact
Well Pump	1997	As needed	2012	\$	Pumps r' Us; 1-800-555-5555
LMI Chlorine pump	2001	quarterly	2006	\$	LMI; 1-800-555-5555
GE Booster Pumps	1994	quarterly	2014	\$	GE; 1-800-555-5555
Hach in-line turbidimeter	1990	daily		\$	Hach; 1-800-555-5555
pH Probe/meter	2004	daily		\$	Hach; 1-800-555-5555
RPZ backflow preventer	1990	2x/year		\$	Pipes n' stuff; 1-800-555-5555
Well				\$	
Hydropneumatic tank				\$	
Telemetry/Controls				\$	
Transmission Main				\$	
Etc				\$	
Etc				\$	
etc					

Specification Sheets

Specification sheets for all equipment in the water system are contained in Appendix H titled "Technical Specification Sheets", of this manual. (67) These sheets are updated as new equipment replaces old equipment.

X. Vendor List

This section of the O&M Manual is a constantly evolving compilation of vendors for chemicals, parts and equipment used in the daily operations of the water system. Some of this information is duplicated from Section IX, but this list should be assumed to be a complete listing of any vendor that is currently being used by the water system or has been used in the past (although a note should be made if they are not to be used in the future). It is also a convenient location to keep track of additional vendors that may be used in the future. (68)

Vendor	Phone Number	Supply what?
Water Supply Division	800-823-6500 802-241-3400 802-741-5311 (pager)	Technical and regulatory support and Guidance www.vermontdrinkingwater.org
Vermont Occupational Health & Safety (VOSHA)	802-828-2765	29CFR 1910 (OSHA Regulations)
		Chemical supplier (chlorine, sodium hydroxide, soda ash, etc)
		Grab sample testing equipment (chlorine residual test kit, pH probe)
		Online analyzer technical support and supply
		Well pump supplier
		Storage tank cleaning company
		Pressure tank supplier
		Plumbing supplies (pipes, valves, unions, etc)
		Storage tank construction company
		Engineering firm that designed system
		Laboratory that does testing
		Shipping company that delivers water samples
		Pipe locators and metal locators
		Dig Safe

XI. Official Water System Records and Maintenance Procedures

All water system files and records are the responsibility of the system owner and are to be managed by them and maintained by properly trained and certified drinking water system operators. Files and records are kept (69). The files maintained by the water system include:

(70)

- This Operation & Maintenance Manual
- Source Protection Plan
- The Complete Vermont Water Supply Rule
- Valves Book
- Hydrants Book
- Maintenance Record
- Regulatory Compliance Test Results
- Water Supply Division Correspondence
- Billing and warranty Documents
- Emergency Response Plan
- Customer Complaints
- Water Quality Data
- Chemical Analyses Results (10 yrs)
- Bacteriological Analyses Results (5 yrs)
- Drinking Water Violations (3 yrs)
- Copies of Public Notices –including Consumer Confidence Reports – (3 yrs)
- Etc.
- Etc.
- Etc.

(71)

All files are updated at a frequency that corresponds to each item; however all manuals and books are to be updated a minimum of **one time per year**.

XII. Customer Notification

(72) The water system is required to provide annual drinking water quality reports to all of their customers. This document is called a Consumer Confidence Report (CCR) and must be delivered to all customers by July 1 of each year. The CCR summarizes the quality of water that the water system has provided over the previous year relative to state and federal safe drinking water standards. The water system must complete a certification statement that it has provided this information to all customers. Simply stated, your customers should have confidence that the product with which you are providing them is high quality drinking water.

Distribution of any information or notification (including the CCR) to customers of the water system must be accomplished by mail or an alternative direct delivery method, which must be specified in the certification statement and submitted to the Water Supply Division. "Good faith" efforts must be made to reach all non-bill paying customers (i.e. consumers that are provided water for free or as part of a larger contract like mobile home park fees). (73)

The following information must include specific information in order to be considered complete. This includes, but is not necessarily limited to, all of the items from the following list:

1. The violation or situation, including the contaminant(s) of concern, and (as applicable) the contaminant(s) level(s);
2. When the violation or situation occurred;
3. Any potential adverse health effects from the drinking water;
4. The population at risk, including subpopulations particularly vulnerable if exposed to the contaminant in their drinking water;
5. Whether alternative water supplies should be used;
6. What actions consumers should take, including when they should seek medical attention, if known;
7. What the Water System is doing to correct the violation or situation;
8. When the Water System expects to return to compliance or resolve the situation;
9. Your name, business address, and phone number or those of a designee of the Water System as a source of additional information concerning the notice; and
10. A statement encouraging notice recipients to distribute the notice to others, where applicable.

XIII. Customer Complaint Procedures

(74)

General Procedure

The general procedure for handling customer complaints is as follows (75)

Appeal Process

If the customer is not satisfied with the action(s) taken or not taken by water system personnel, they have a right to an appeal. That process follows: (76)

Relevant Phone Numbers

Water System Owner	xxx-xxx-xxxx
Water System Operator	xxx-xxx-xxxx
Vermont Water Supply Division	800-823-6500 802-241-3400
Vermont Department of Health Protection	800-439-8550

(77)

Consumer Affairs and Public Information Division (Department of Public Service)	800-xxx-xxxx 802-xxx-xxxx
------------------------------------------------------------------------------------	------------------------------

Complaint Forms *(to be completed by water system personnel fielding the complaint)*

Upon receipt of any customer complaint, the person receiving the complaint must complete a Customer Complaint Form and submit it to (78). A copy of these forms is included in Appendix E – Sample Documents/Forms. (79)

XIV. Water Conservation Program

Water conservation strategies to ensure the long-term ability to provide adequate quantities of safe drinking water to all users have been instituted by the water system. On a daily basis this includes the required use of (80). The water system proactively monitors the total production of water on a daily and monthly basis and when any anomalies are noted, appropriate leak detection strategies are employed. The standard operating procedure associated with leak detection is contained in Appendix F. (81)

During periods of low water, either through drought or other uncontrolled water shortage, the water system may periodically ask consumers to conserve water. These additional restrictions will be conveyed to all users in a manner consistent with Section XII – Customer Notification, of this O&M Manual. These restrictions may include, but are not limited to car-wash and lawn watering bans as well as (82). The water system owner/responsible person and operator should make this decision together and then follow notification procedures as appropriate. (83)

XV. Cross-Connection Control Program

Cross-connections are defined as actual or *potential* connections between a potable and a non-potable water supply, or a connection whereby contaminants can flow into (back pressure) or be drawn into the potable water supply. Cross-connections are a very serious threat to public health and must be controlled through in-depth knowledge and understanding of the water distribution system infrastructure and hydraulics, as well as administration of a strict backflow prevention and cross-connection control program.

While detection and identification of cross-connections may seem to be readily apparent, it can be much more complicated in practice as many cross-connections may be subtle or in hidden locations. Again, education and general knowledge of not only the water system, but basic hydraulics is a necessary tool in fully evaluating the risk posed by connections in a water system. Always keep in mind that water flow, without appropriate backflow devices, is *not* obligated by some unwritten governing law to flow in only one direction. Reversal of hydraulic gradient (one possible cause being a pressure loss within the system), so that water flows opposite the direction you would like it to go, is a very real possibility that must be understood so that it can be prevented. This is called backflow or back-siphonage and is one possible means of non-potable liquid entering the distribution system. A second very common situation is the submersion of meters, valves or other "open" pipes that may allow the entrance of non-potable fluids into the distribution system, again potentially through the principle of backflow identified above.

To mitigate the potential of cross-connections in the distribution system a comprehensive control program has been instituted. This includes (84). The standard operating procedures for backflow preventer installation, testing and maintenance is included in Appendix E of this document. (85)A written explanation and agreement between all relevant parties identifies who is responsible for installation, testing and maintenance of backflow protection devices is also contained in Appendix E (86). This agreement also identifies who will be held accountable for violations of this agreement and/or failure of backflow protection devices that would have been preventable through adequate maintenance or testing.

There are several manuals that give guidance on types of backflow prevention as well as cross-connections that are routinely identified in all types of water systems. The U.S. EPA Cross-connection Manual (EPA Manual 816-R-03-002) and the American Water Works Association Manual 14 are two that can give overall guidance to the water system on the management of day-to-day cross-connection control.

XVI. State of Vermont Water Supply Rule

The Agency of Natural Resources, Department of Environmental Conservation, Environmental Protection Rules, Chapter 21 – The Water Supply Rule including all appendices is located *(87)*. This rule is updated as the state issues periodic revisions to the current standard, approximately once every two years.

Appendix A

Water System Maps

Appendix B

Water System Schematic Drawings

Appendix C

Source Protection Plan

Appendix D

Material Safety and Data Sheets (MSDS)

Appendix E

Sample Documents and Forms

Appendix F

Standard Operating Procedures

Appendix G

Fire Hydrant Testing and Information

Appendix H

Technical Specifications

Appendix I

Sampling Plans

Appendix J

Emergency Response Plan

This guidance sheet and related environmental information are available electronically via the internet. For information visit us through the Vermont Homepage at <http://www.vermont.gov> or visit VT WSD directly at <http://www.vermontdrinkingwater.org>

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