Chapter 3: System Operations

This chapter will help you develop preventive maintenance and other operational programs to keep your system running smoothly and effectively. You can refer to this information to establish expectations for your certified operator or other staff who may be responsible for system operations or water quality sampling.

![MC900280780[1]]()

**CHAPTER TOPICS**

This chapter addresses:

* + Operations and maintenance program
	+ Emergency response program
	+ Water production and consumption
	+ Water right self-assessment
	+ Water use efficiency program (for nonmunicipal suppliers)

Each section includes a purpose statement, background on the requirement, and instructions. Most sections have links to more information or resources.

3.1 Operations and Maintenance Program

**Purpose**

To identify operations and maintenance duties to maintain effective operations.

**Background**

The best way to keep your water system running effectively is to document the operational activities, schedule preventive maintenance activities, and keep the information easily accessible. This section is useful for defining expectations for the system’s operator or other staff and when ownership or responsibility for the water system changes.

All water systems **must** operate under a comprehensive operations and maintenance program (WAC 246-290-415).

**How to complete this section**

*Your sanitary surveyor may review your maintenance schedule and can help you determine whether it is complete.*

Follow the steps below to complete Table 3-1. You can use Table 3-1 as your operations and maintenance (O&M) program. If you already have an O&M program, maintain a copy in this section rather than completing the table. Be sure to review the activities in Table 3-1 to ensure your O&M program covers all aspects of system operations.

**Step 1** Summarize the current maintenance activities and how frequently you perform them.

**Step 2** Indicate normal settings, positions, or readings for pump controls, electrical switches, valves, and gauges. If you make seasonal adjustments, record the adjustments and the approximate period (or other trigger) to make them.

**Step 3** Develop a list of supplies and spare parts that must be kept on-hand. Include the name and phone number of the supplying vendor.

**Step 4** Develop a list of specialty service providers. This includes electricians, excavators, pipe fitters, welders, tank inspectors, and well pump and control valve vendors.

**Table 3-1
Operations and Maintenance Program**

**Section 1 – Routine Maintenance Schedule**

| **Maintenance and operational activity** | **Applicable? (check box)** | **Responsible party** | **Frequency** |
| --- | --- | --- | --- |
| Yes | No |
| Measure and record production from each source  | [ ]  | [ ]  |       |       |
| Recalibrate source meters | [ ]  | [ ]  |       |       |
| Measure water level in each well (static and pumping level)  | [ ]  | [ ]  |       |       |
| Measure chlorine residual  | [ ]  | [ ]  |       |       |
| Flush dead ends | [ ]  | [ ]  |       |       |
| Exercise main line valves | [ ]  | [ ]  |       |       |
| Record use of treatment chemicals (disinfection, iron or manganese removal) | [ ]  | [ ]  |       |       |
| Maintain chemical feed pumping equipment | [ ]  | [ ]  |       |       |
| Recalibrate water quality monitoring instruments | [ ]  | [ ]  |       |       |
| Inspect reservoir hatches, vents, and overflow outlets for tight seals and intact screens | [ ]  | [ ]  |       |       |
| Inspect and clean reservoir interior | [ ]  | [ ]  |       |       |
| Inventory spare parts, chemcial supplies, and equipment. | [ ]  | [ ]  |       |       |
| Check air-water level in hydropneumatic tank(s) | [ ]  | [ ]  |       |       |
| Test cross-connection control devices (by a backflow assembly tester) | [ ]  | [ ]  |       | Must be completed once a year |
| Review water system security features and processes (fencing, locks) | [ ]  | [ ]  |       |       |
| Test all alarm functions | [ ]  | [ ]  |       |       |
| Others?      | [ ]  | [ ]  |       |       |

**Section 2 - Control Position for Valves, Switches, Relays, and Timers**

Indicate normal settings, positions, or readings for pump controls, electrical switches, valves, or gauges. Describe any seasonal differences in pump, reservoir, and valve control settings.

|  |  |
| --- | --- |
| **Type of switch, valve or control** | **Normal and seasonal settings** |
|       |       |
|       |       |
|       |       |

**Section 3 - Suppliers List**

Develop a list of supplies you periodically order and include the supplier’s name and phone number.

|  |  |  |
| --- | --- | --- |
| **Type of supply, spare part, or specialty service** | **Name of supplier or contractor** | **Phone number(s)** |
|       |       |       |
|       |       |       |
|       |       |       |

**For more information**

[***Preventive maintenance program: Guide for small public water systems using groundwater***](http://www.doh.wa.gov/portals/1/documents/pubs/331-351.pdf) **(331-351)** provides a schedule of routine O&M tasks for small drinking water systems using groundwater.

3.2 Emergency Response Plan

**Purpose**

To identify and document responses to routine and nonroutine emergencies that may affect system operations.

**Background**

Most water systems have routine operating emergencies such as pipe breaks, pump malfunctions, and power outages. Less common emergencies result from chemical spills, floods, earthquakes, windstorms, or droughts. The key is to think about what you’ll do ahead of time and document those activities in an emergency response plan so that you can respond quickly and efficiently.

Each emergency has unique effects on a water system. Floods can cause bacterial contamination. Earthquakes can damage sources and pipes. Storms can disrupt power supplies resulting in contamination due to a loss of system pressure. What is common among these emergencies is the threat to the system’s ability to deliver safe and reliable drinking water.

All water systems must take reasonable security measures to protect raw water intake facilities, water treatment facilities, storage facilities, pump houses, and distribution systems from possible damage or intruders (WAC 246-290-415).

**How to complete this section**

Table 3-2 is a template to create an emergency response plan. If you already have an emergency response plan, maintain a copy in this section rather than completing the template.

Table 3-2
Emergency Response Plan

**Section 1 – System Information**

Document basic system information.

|  |  |
| --- | --- |
| **Basic system description** *For example: ABC Water System has 1 well that is 180 feet deep. The well pumps through a pump house and disinfection facilities into a 2,000-gallon concrete storage reservoir.* |       |

**Section 2 – Taking Action**

List the person responsible for taking the following actions during an emergency.

| **Name**  | **Responsibilities during an emergency** | **Contact numbers** |
| --- | --- | --- |
|       | Notifying DOH.  |       |
|       | Assessing facilities and operations.  |       |
|       | Making repairs or contacting contractors.  |       |

**Section 3 – Emergency Reference List**

List important parties to contact.

| **Emergency contact** | **Phone Number(s)** | **Emergency contact** | **Phone number(s)** |
| --- | --- | --- | --- |
| County emergency services |       | Certified operator(s) |       |
| Local health jurisdiction |       | System engineer or engineering consultant |       |
| Department of Ecology spill response |       | Electrician |       |
| Water testing lab |       | Electric utility |       |
| DOH water quality contact |       | Pump service |       |
| Neighboring water system |       | Equipment rental  |       |
| DOH emergency after hours contact | 1-877-481-4901 | Other |       |

**Section 4 – Response Actions for Specific Events**

Identify action to take in the following events.

|  |  |  |
| --- | --- | --- |
|  | **Immediate actions to take***(assess damage, contact DOH, contact repair service)* | **Who should be notified** *(DOH, customers, repair service, county)* |
| Power outage |       |       |
| **Line break** |       |       |
| **Chlorine treatment failure** |       |       |
| **Source pump failure** |       |       |
| **Coliform MCL**  |       |       |
| **Severe reduction or loss of source** |       |       |
| **Other:** |       |       |

**Section 5 –Alternative Water Supplies**

Identify alternative water supplies that may be available if your supply becomes unexpectedly unavailable.

**Note:** Alternative supplies can include emergency sources and emergency interties or the temporary use of bottled water or tanker trucks. You must obtain DOH approval before putting any emergency source or alternative supply of water into service. Requirements for using and maintaining emergency drinking water are in [***Emergency drinking water sources***](http://www.doh.wa.gov/portals/1/Documents/pubs/331-317.pdf) **(331-317).**

**Emergency sources**

List available emergency sources.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Emergency source name | **WFI source number** | **Maintained in operable condition?** | **Availability** *How much water can be produced each day, how soon can it begin?* | **Is the water safe for drinking?** |
|       |       |       |       |       |
|       |       |       |       |       |

**For more information**

* [***Truck Transportation: Emergency water supply for public use***](http://www.doh.wa.gov/portals/1/Documents/pubs/331-063.pdf) **(331-063)** provides guidance for water systems that truck or receive potable water for the public during emergencies.
* [***Emergency Disinfection of Small Systems***](http://www.doh.wa.gov/portals/1/Documents/pubs/331-242.pdf) **(331-242)** explains when you need emergency disinfection and how to do it. Tables show how much chlorine bleach to use for disinfecting wells and storage reservoirs.

3.3 Water Production

**Purpose**

To document how much water the system’s sources produce.

**Background**

A record of source water pumped can tell you if your system is functioning properly. It will also help determine whether your system’s water usage is within allowed water right limits.

Water systems must measure and record total water produced by each source (WAC 246-290-496). This section allows you to record monthly production totals in your SWSMP as required by WAC 246-290-105(4)(h).

If you do not have a source meter installed on each source, include your plan and schedule to install one in Chapter 5 (Next Steps) and in Section 4.2 (Component Replacement and Other Planned Improvements).

**How to complete this section**

Follow the steps below to complete Table 3.3. You will need to convert your raw source production values into gallons. You can use the conversion table below.

**Step 1** Insert the year for the data you are recording. Try to use the most recent full year of water production data.

**Step 2** Insert the DOH source number (well # from WFI) for each source in the second row.

**Step 3** Insert the source production value (in gallons) for each month for each source.Then, add each source’s monthly production values togetherand insert the combined total in the bottom row under “***Total Water Produced.”***

**Conversion Table**

|  |  |  |
| --- | --- | --- |
| **Convert from** | **To** | **By** |
| Cubic feet of water | Gallons of water | Multiplying the number of cubic feet by 7.485 to arrive at gallons |
| Acre-ft of water | Gallons of water | Multiplying the number of acre-ft by 325,851 to arrive at gallons |
| Gallons of water | Acre-ft of water | Divide the number of gallons by 325,851 to arrive at acre-ft |

**Table 3-3**

**Total Water Production**

|  |
| --- |
| **Reporting Year**       |
|  | **Source No.****\_\_\_\_\_** | **Source No.****\_\_\_\_\_** | **Source No.****\_\_\_\_\_** |
| January |       |       |       |
| February |       |       |       |
| March  |       |       |       |
| April  |       |       |       |
| May |       |       |       |
| June |       |       |       |
| July |       |       |       |
| August  |       |       |       |
| September |       |       |       |
| October |       |       |       |
| November |       |       |       |
| December |       |       |       |
| **Total Water Produced** |       |       |       |

3.4 Water Consumption

**Purpose**

To document the amount of water users connected to the system consume.

**Note: Skip this section if:**

* Your water system serves only one connection.
* Your system provides water service to multiple connections but the connections are not metered.

**If your system is a municipal water supplier, you must have service meters installed on all service connections by January 22, 2017.** A noncommunity system is a municipal water supplier if it provides water for residential-type uses to at least 25 people for at least 60 days a year. Most noncommunity water systems are not municipal water suppliers and, therefore, are not required to install service meters. See our [Municipal Water Law webpage](http://www.doh.wa.gov/CommunityandEnvironment/DrinkingWater/WaterSystemDesignandPlanning/MunicipalWaterLaw.aspx) for more information.

**Background**

Knowing how much water your customers use on an annual basis will help you ensure that your supplies and distribution facilities can meet the demand. All water systems must include consumption data as part of a SWSMP.

Knowing the difference between how much water your source produced and how much your customers used will help you determine how much water your system is losing to leaks. We call this “distribution system leakage” or DSL. When you consider water pumping and treatment costs, DSL is more expensive than you may think. See our [Water Use Efficiency webpage](http://www.doh.wa.gov/CommunityandEnvironment/DrinkingWater/WaterSystemDesignandPlanning/WaterUseEfficiency.aspx) for more information.

**How to complete this section**

Follow the steps below to complete Table 3.4

**Step 1** Insert the year for the data you are recording at the top of the table. Try to use the most recent full year of water consumption data. The 12-month reporting period does not need to match the calendar year. However, to measure DSL, you must use the same 12-month period that you used to record source production data.

**Step 2** Determine total consumption for all nonresidential connections for the 12-month reporting period. Convert the total into gallons using the conversion table provided in Section 3.3. Insert this total under ***“Nonresidential consumption.”***

**Step 3** Determine total consumption for all residential connections (if you serve any) for the 12-month reporting period. Convert the total into gallons. Insert this total under ***“Residential consumption.”***

**Step 7** Determine the total water consumed by adding the total annual consumption for each customer class. Insert this total under ***“Total consumption.”***

**Table 3-4**

**Total Water Consumption**

|  |
| --- |
| **Reporting Year**       |
| **Customer class** | **Total combined consumption (gallons)** |
| Nonresidential consumption (business or other facilities)  |       |
| Residential consumption (homes) |       |
| Total consumption  |       |

**For more information**

See our [Water Use Efficiency webpage](http://www.doh.wa.gov/CommunityandEnvironment/DrinkingWater/WaterSystemDesignandPlanning/WaterUseEfficiency.aspx) for comprehensive guidance, fact sheets, and resources.

3.5 Water Rights Self-Assessment

**Purpose**

To document that the system can legally withdraw and use water consistent with the system needs.

**Background**

Water can only be put to use after a person has a water right permit from Ecology (state water code, 1917 for surface water and 1945 for groundwater). All public water systems using surface water or groundwater with wells pumping 5,000 or more gallons per day, or irrigating one-half or more acres, must have a water right. After water is put to use according to the permit conditions, Ecology will issue a water right certificate.

If you have a water right permit or certificate, you must include a water right self-assessment in your SWSMP (WAC 246-290-105). A water right self-assessment is a DOH form that allows you to compare your water right’s allowable quantities of water against the amount of water you are using.

**How to complete this section**

Table 3.5 is a water right self-assessment form. The items below describe a field on the form. You’ll find all requested information on your water right permit or certificate, except for Item 11 (existing consumption). You must know how much water your source produced for the year (withdrawn from ground) to complete this item. Refer to the annual water production total you identified in Section 3.3 of your SWSMP.

**Water Right Permit and Certificate Inventory**

1. **Permit or certificate number**: This is the number Ecology assigns upon receipt of a water right permit application. It’s usually at the top of the permit or certificate.
2. **Name of right holder**: This person obtained the original water right permit or certificate. Use the name listed on the permit or certificate, even if it isn’t the name of the current permit or certificate owner.
3. **Priority date**: This is the date at the top of the permit or certificate (next to the permit or certificate number).
4. **Source name and number**: If any permits or certificates are for multiple sources, identify the individual sources used (well 1, well 2) as it appears on water right documents. Use a separate line for each source. Do not use DOH-assigned source numbers.
5. **Maximum instantaneous flow rate (Qi):** This is the amount of water that can be taken from the source during a peak operation period. For surface water, the flow rate is expressed in cubic feet per second (cfs). For groundwater, the flow rate is expressed in gallons per minute (gpm). One cfs equals 448.8 gpm. Indicate the units of measurement you are using for each source. You must note any situations where the allowed flow rate will be limited.
6. **Maximum annual quantity (Qa):** This is the amount of water that can be taken from the source on an annual basis. It is expressed in terms of acre-feet. One acre-foot equals 43,560 cubic feet or 325,851 gallons of water.
7. **Primary or supplemental**: Use this column to indicate whether a particular source is for primary or supplemental use. This information is usually in the "quantity, type of use, period of use" section.
8. **Water obtained through interties**: You must account for water obtained through interties (where a separate purveyor holds the water rights) for nonemergency supply purposes. This is to ensure consideration of all supply sources when evaluating water right adequacy. Identify the maximum volume of water allowed for purchase through such interties. You must account for any limiting conditions or temporary agreements that affect the long-term use of the intertie.
9. **Other information**: Include any other supporting information or materials related to your water right as necessary. This may include written materials needed to describe any water right limiting parameters.
10. **Water right totals**: Identify the total maximum instantaneous and annual withdrawal rates specified on system water rights. Make sure you fully understand how your rights relate to one another. In many cases supplemental water rights are not issued in addition to existing rights (not all such rights are additive). Contact your [Ecology regional office](http://www.ecy.wa.gov/org.html) if you aren’t sure how to quantify your water right permits and certificates.
11. **Existing consumption:** This is the total amount of water that all your sources produced for the year. Refer to your total source production values in Section 3.3. Divide the total gallons produced from all sources by 325,851 to determine total acre-feet pumped. If your system is using more water on an annual basis than allowed under your water right, contact the Department of Ecology to explore changing your water rights.

Table 3-5
Water Rights Self-Assessment − Existing Status

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Permit certificate or claim number** | **Name on document** | **Priority****Date** (List oldest first) | **Source Name and Number** | **Any portion supplemental?**(If yes, explain in footnote) | **Existing****Water rights** | **Existing consumption** | **Current water right status**(Excess/Deficiency) |
| Maximum Instantaneous Flow Rate (Qi) | Maximum Annual Volume (Qa) | Maximum Instantaneous Flow Rate (Qi) | Maximum Annual Volume (Qa) | Maximum Instantaneous Flow Rate (Qi) | Maximum Annual Volume (Qa) |
| **Permits/****Certificates**1.  |       |       |       |       |       |       |       |       |       |       |
| 2. |       |       |       |       |       |       |       |       |       |       |
| 3. |       |       |       |       |       |       |       |       |       |       |
| 4. |       |       |       |       |       |       |       |       |       |       |
| **Claims**1. |       |       |       |       |       |       |       |       |       |       |
| 2. |       |       |       |       |       |       |       |       |       |       |
| 3. |       |       |       |       |       |       |       |       |       |       |
| 4. |       |       |       |       |       |       |       |       |       |       |
| **TOTAL** |  |  |  |  |       |       |       |       |       |       |
| **Intertie name or****Identifier** | **Name of purveyor** **Providing water** | **Existing limits on intertie use** | **Existing consumption through intertie** | **Current intertie supply status** (Excess/Deficiency) |
| Maximum Instantaneous Flow Rate (Qi) | Maximum Annual Volume (Qa) | Maximum Instantaneous Flow Rate (Qi) | Maximum Annual Volume (Qa) | Maximum Instantaneous Flow Rate (Qi) | Maximum Annual Volume (Qa) |
| 1.       |       |       |       |       |       |       |       |
| 2.       |       |       |       |       |       |       |       |
| 3.       |       |       |       |       |       |       |       |
| 4.       |       |       |       |       |       |       |       |
| **TOTAL**  |  |       |       |       |       |       |       |
| **Pending water right application** (New/Change) | **Name on** **application** | **Date submitted** | **Any portion** **supplemental?** (If yes, explain in footnote) | **Pending water rights** |
| Maximum Instantaneous Flow Rate (Qi) Requested | Maximum Annual Volume (Qa) Requested |
| 1.       |       |       |       |       |       |
| 2.       |       |       |       |       |       |
| 3.       |       |       |       |       |       |
| 4.       |       |       |       |       |       |

.

3.6 Water Use Efficiency Program

**Purpose**

To develop the system’s Water Use Efficiency Program.

**Background**

Using water efficiently improves the lifespan of your system facilities and reduces your pumping and treatment costs. Developing a Water Use Efficiency (WUE) Program is the foundation for using water wisely.

All water systems must include a WUE program as part of their SWSMP (WAC 246-290-105). A WUE program is a plan you develop and follow to increase water supply and water demand efficiency. If you supply water to other connections, your WUE program should focus on 1) having service meters on all customer connections, so you know how much water they use, and 2) encouraging customers to use water efficiently.

If you don’t serve other connections, your WUE program needs only to focus on having a source meter installed on each active source, so you know 1) how much water your well is producing and 2) you are using that water responsibly.

The WUE program described in this section is appropriate for nonmunicipal water suppliers. Most noncommunity systems do not qualify as municipal water suppliers, although there are some exceptions. If you believe your system is municipal water supplier, see our [Water Use Efficiency webpage](http://www.doh.wa.gov/CommunityandEnvironment/DrinkingWater/WaterSystemDesignandPlanning/WaterUseEfficiency.aspx).

*A noncommunity system is a municipal water supplier if it provides a “residential use” of water to a nonresidential population of 25 or more people for at least 60 days a year.*

Our [***Water Use Efficiency Guidebook***](http://www.doh.wa.gov/portals/1/Documents/pubs/331-375.pdf) **(331-375)** will help you develop a WUE program that meets the Water Use Efficiency Rule (WAC 246-290-810).

**Note:** Contact your [DOH regional office](http://www.doh.wa.gov/ehp/dw/Staff_Lists/dwnames.htm) before you start developing a WUE program as a municipal water supplier.

**How to complete this section**

Table 3-6 is a template to develop a short WUE program. Complete the three sections. If you already have a WUE program, maintain a copy in this section.

**Section 1 - Your source of water supply.**

|  |  |  |
| --- | --- | --- |
| **Do you have a source meter installed on each active groundwater source?**  |       | If no, include your plan and schedule to install a source meter on each active source in Chapter 5(Next Steps) and Section 4.2 (Planned Improvements and Replacements). All water systems **must** measure and record total water produced by each source (WAC 246-290-496).  |
| **If you have a source meter, do you read it regularly?**  |       | If no, start reading your source meter on a monthly basis and calculating the annual totals. Record the results in Section 3.3 (Water Production). Periodically review for drastic increases (sudden leaks), gradual declines (declining well productivity), and to ensure that annual usage is within water right limits.  |
| If yes, record the results in Section 3.3 (Water Production). Periodically review for drastic increases (sudden leaks), gradual declines (declining well productivity), and to ensure that annual usage is within water right limits.  |

**Section 2 - Your customers.**

|  |  |  |
| --- | --- | --- |
| **Do you provide water to residential or other service connections?**  |       | If no, focus on knowing how much water your source produces annually and what you can do to use water efficiently. Visit our [Water Use Efficiency webpage](http://www.doh.wa.gov/CommunityandEnvironment/DrinkingWater/WaterSystemDesignandPlanning/WaterUseEfficiency.aspx) for water saving tips and other resources.  |
| If yes, focus on encouraging your customers to use water efficiently. Visit our [Water Use Efficiency webpage](http://www.doh.wa.gov/CommunityandEnvironment/DrinkingWater/WaterSystemDesignandPlanning/WaterUseEfficiency.aspx) for educational brochures and other resources.  |
| **If you serve other connections, do you have service meters installed on all connections?**  |       | If no, consider installing service meters. Service meters allow you to charge based on water use. Charging for water based on the amount used encourages efficient use of the resource, prolongs the lifespan of your facilities, and helps you to cover system expenses and future improvement costs.  |
| If yes, start reading the meters (even if you don’t charge based on amount of water used) and record the results in Section 3.4 (Water Consumption). Knowing how much water is consumed and comparing that to the amount of water your source produced during the same period tells you how much water is being lost to leaks, called distribution system leakage (DSL). See our [Water Use Efficiency webpage](http://www.doh.wa.gov/CommunityandEnvironment/DrinkingWater/WaterSystemDesignandPlanning/WaterUseEfficiency.aspx) to learn how to determine DSL and ways to reduce it. |

**Section 3 – Encouraging efficient water use.**

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| **List action you took, or plan to take, to reduce your water use or to encourage your customers to use water more efficiently.** Be sure to include future actions in Chapter 5 (Next Steps).  | **Completion Date** |
|       |       |
|       |       |
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**For more information**

Visit our [Water Use Efficiency webpage](http://www.doh.wa.gov/CommunityandEnvironment/DrinkingWater/WaterSystemDesignandPlanning/WaterUseEfficiency.aspx) for comprehensive guidance, fact sheets, and resources.