TEMPLATE

For the Development of a

Manual of Operations and Maintenance

Revised May 2023

Nevada Division of Environmental Protection

 Bureau of Safe Drinking Water

|  |  |  |
| --- | --- | --- |
| **Acronym/Abbreviation** |  | **Definition** |
| µg/L |  | micrograms per liter  |
| AWWA |  | American Water Works Association |
| BSDW |  | Bureau of Safe Drinking Water |
| BWO |  | Boil Water Order |
| CFR  |  | Code of Federal Regulations |
| CFS |  | Cubic Feet per Second |
| CPWS |  | Community Public Water System |
| E. coli |  | Escherichia coli  |
| EPA |  | United States Environmental Protection Agency |
| GPM |  | Gallons per Minute |
| IOC |  | Inorganic Chemicals |
| MCL |  | Maximum Contaminant Level |
| mg/L |  | Milligrams per liter  |
| MRDL |  | Maximum Residual Disinfectant Level |
| MGD |  | Million Gallons per Day |
| NAC |  | Nevada Administrative Code |
| NCWS |  | Non-Community Water System |
| NDEP |  | Nevada Division of Environmental Protection |
| NRS  |  | Nevada Revised Statute |
| NTNC |  | Non-transient/non-community |
| O&M  |  | Operations and Maintenance |
| OSHA |  | Occupational Health and Safety Administration |
| ppm |  | parts per million |
| PWS |  | Public Water System |
| SCADA  |  | Supervisory Control and Data Acquisition |
| SDWA |  | Safe Drinking Water Act |
| SMCL |  | Secondary Maximum Contaminant Levels |
| SNHD |  | Southern Nevada Health Department |
| SOC |  | Synthetic Organic Chemicals |
| TT |  | Treatment Technique |
| VOC |  | Volatile Organic Chemicals |
| WCHD |  | Washoe County Health Department |

Table of Contents

[Introduction 5](#_Toc135808918)

[Requirements for a Manual of Operations and Maintenance 6](#_Toc135808919)

[Section 1: System Information 8](#_Toc135808920)

[Section 1.1 System and Contact Information 8](#_Toc135808921)

[Section 1.2 Service Area Map or Vicinity Map 12](#_Toc135808922)

[Section 1.3 System Overview 13](#_Toc135808923)

[Section 1.4 Water Source Description 15](#_Toc135808924)

[Section 2: System Components 16](#_Toc135808925)

[Section 2.1 Source Water 17](#_Toc135808926)

[Section 2.1.1 Wells 17](#_Toc135808927)

[Section 2.1.2 Surface Water Diversion, Spring Source, or Wholesale Intertie 19](#_Toc135808928)

[Section 2.2 Disinfection 21](#_Toc135808929)

[Section 2.3 Treatment 23](#_Toc135808930)

[Section 2.3.1 Non-Surface Water Treatment (groundwater and springs) 23](#_Toc135808931)

[Section 2.3.2 Surface Water Treatment 25](#_Toc135808932)

[Section 2.4 Water Storage Tanks / Reservoirs 27](#_Toc135808933)

[Section 2.4.1 Storage Specifications 27](#_Toc135808934)

[Section 2.4.2 Hydropneumatic (Pressure Tanks) Systems 28](#_Toc135808935)

[Section 2.5 Distribution System 30](#_Toc135808936)

[Section 2.5.1 Distribution System Pumps 30](#_Toc135808937)

[Section 2.5.2 Isolation Valves 32](#_Toc135808938)

[Section 2.5.3 Air Release or Air/Vacuum Valves 32](#_Toc135808939)

[Section 2.5.4 Pressure Reducing Valves (PRV) 33](#_Toc135808940)

[Section 2.5.5 Flush Assemblies 33](#_Toc135808941)

[Section 2.5.6 Fire Hydrants 34](#_Toc135808942)

[Section 2.5.7 System Flushing 34](#_Toc135808943)

[Section 2.5.8 Flow Meters 35](#_Toc135808944)

[Section 2.5.9 Routine Operations and Maintenance of the Distribution System 37](#_Toc135808945)

[Section 2.6 System Monitoring (Telemetry and/or SCADA) 38](#_Toc135808946)

[Section 2.6.1 Controls Specifications 38](#_Toc135808947)

[Section 2.7 Spare Parts Inventory 40](#_Toc135808948)

[Section 3: Water Quality Monitoring 41](#_Toc135808949)

[Section 3.1 Monitoring Assessment Plan and Monitoring Status Report 41](#_Toc135808950)

[Section 3.2 Distribution Sample Maps/Plans 41](#_Toc135808951)

[Section 3.3 Entry Point and Source Samples 42](#_Toc135808952)

[Section 3.4 Sampling Records 42](#_Toc135808953)

[Section 4: Personnel Safety 43](#_Toc135808954)

[Section 4.1 Potential Water System Hazards to Consider 44](#_Toc135808955)

[Section 4.2 Safety Plan Resources 45](#_Toc135808956)

[Section 4.3 Confined Space 45](#_Toc135808957)

[Section 5: Communications 46](#_Toc135808958)

[Section 5.1 Public Notice 46](#_Toc135808959)

[Section 5.1.1 Coliform Positive Results 46](#_Toc135808960)

[Section 5.2 Notification Types 47](#_Toc135808961)

[Section 5.3 Customer Complaints 49](#_Toc135808962)

[Section 5.4 Communications Records 50](#_Toc135808963)

[Section 6: Routine Maintenance 51](#_Toc135808964)

[O&M Checklists for Wells and Well Pumps 52](#_Toc135808965)

[O&M Checklists Chlorine Disinfection 55](#_Toc135808966)

[O&M Checklists: Storage Tanks 57](#_Toc135808967)

[O&M Checklists for Distribution Components 63](#_Toc135808968)

[O&M Checklists for System Monitoring (SCADA) 68](#_Toc135808969)

[APPENDIX 70](#_Toc135808970)

[AWWA C651 Disinfection of Water Mains 71](#_Toc135808971)

[AWWA C652 Disinfection of Water Storage Facilities 72](#_Toc135808972)

[AWWA C653 Disinfection of Water Treatment Plants 73](#_Toc135808973)

[AWWA AC654 Disinfection of Water Wells 74](#_Toc135808974)

[Links to Forms and Fees available from NDEP (nv.gov) 75](#_Toc135808975)

[Do Not Drink & Boil Water Orders 75](#_Toc135808976)

[Bacteriological Monitoring 75](#_Toc135808977)

[Disinfectant and Disinfection Byproducts 75](#_Toc135808978)

[Consumer Confidence Reports 75](#_Toc135808979)

[Lead and Copper  75](#_Toc135808980)

# Introduction

Preparing a Manual of Operation and Maintenance (O&M) is an essential part of managing a water system. A water system’s Manual of O&M is a “living document” that should be modified based on experience and practical application. It should be reviewed and updated regularly or when there is a modification to the system’s infrastructure or management. At the very minimum, the Manual of O&M should be updated prior to a Sanitary Survey.

This “Template for the Development of a Manual of Operations and Maintenance” (referred to as Template from hereon) is intended to provide a consistent format which can be used by small to medium sized drinking water systems. A companion document titled, “Guidance and Suggested Format for the Development of a Manual of Operations and Maintenance” (referred to as Guidance from hereon) is available to assist in completing the Template. Both the Guidance and Template (in Microsoft Word) are available from the Nevada Division of Environmental Protection, Bureau of Safe Drinking Water’s website: <https://ndep.nv.gov/water/drinking-water/forms>

“Template” Format

* It is highly recommended to review the “Guidance” document as it discusses key components of operation and maintenance with examples of how you may present information in your O&M Manual.
* The “Template” is in Microsoft Word providing the opportunity to customize your O&M Manual to be specific for your system – add sections, take them out, as appropriate. It is generally recommended that your Manual “flows” like your system: from the water source, to treatment, to storage and pumping, and then to the distribution components.
* Having a Manual of O&M in a consistent format assists regulatory agencies conduct their reviews for compliance.
* Consistent formatting also aids operators that operate more than one public water system or have experience working elsewhere.
* Since your Manual of O&M may contain sensitive information, make sure to keep it stored in a safe and secure location. At a minimum, it is recommended you have one copy stored on-site, one master digital version, and one off-site to ensure the document is available in the event you are unable to access your offices or facilities. Regardless of a water system size, it should be protected against possible sabotage, terrorism, or vandalism.
* There are “Suggested Maintenance Checklists” for various components included in Section 6. These are intended to assist in documenting routine maintenance and use in the field.

The Template and Guidance document have been prepared and periodically updated under the direction of staff of NDEP BSDW. If you have questions or comments, please call the Facility Manager assigned to your water system. The general number for NDEP BSDW is (775) 687-9521. Feedback is beneficial for future updates of this Template.

# Requirements for a Manual of Operations and Maintenance

**In Nevada, all public water systems are subject to requirements set forth in the Nevada Administrative Code (**[**NAC 445A**](https://www.leg.state.nv.us/nac/NAC-445A.html#NAC445A)**). For revised regulations that have not yet been codified, please see the** [**BSDW website**](https://ndep.nv.gov/water/drinking-water)**.**

The section specifically pertaining to a Manual of Operations and Maintenance states:

[[NAC 445A.6667](http://www.leg.state.nv.us/nac/NAC-445A.html#NAC445ASec6667)](https://www.leg.state.nv.us/nac/NAC-445A.html#NAC445ASec6667) Manual of operations and maintenance: A supplier of water shall prepare a Manual of Operations and Maintenance regarding all of the facilities of the public water system and submit the Manual to the Division or the appropriate district board of health for review and approval. The manual must:

1. Describe normal procedures for the operation and maintenance of each facility of the public water system and procedures for use in emergencies.
2. Include any plans required pursuant to [NAC 445A.535](https://nv-my.sharepoint.com/personal/bgrant_ndep_nv_gov/Documents/RCAC%20Manual%20Templates/NAC%E2%80%82445A.535) or subsection 9 of NAC [445A.66795](https://nv-my.sharepoint.com/personal/bgrant_ndep_nv_gov/Documents/RCAC%20Manual%20Templates/NAC%E2%80%82445A.66795).
3. Be maintained at each facility of the public water system at all times for use by the operators and other personnel of the facility.

So, what does that mean and what does it involve?

A Manual of Operation and Maintenance is an operating guide for personnel who operate and maintain the public water system. The primary purpose is to:

* Explain the functional operation of the system’s facilities and their interactions to produce drinking water that meets all regulatory requirements
* Describe the capabilities and limitations of the system
* Identify maintenance procedures to manage the processes of the system over time

You may already have plans or procedures developed that can be incorporated into your Manual. This will be a good opportunity to review existing procedures and update them before incorporating them into the Manual of O&M.

**Submitting Documents**

After completing your Manual of Operations and Maintenance, it must be submitted to the Nevada Division of Environmental Protection Bureau of Safe Drinking Water or the appropriate District Board of Health for review.

Submit the following documents:

* Two (2) paper copies of the Application for Approval of a Water Project available at <https://ndep.nv.gov/water/drinking-water/engineering-reviews/applications-forms>
	+ Typically, systems submitting just the Manual of O&M or other plans only need to complete the first two pages.
* 1 USB drive with a complete copy of the documents in PDF. If that is not possible, Microsoft Word is sufficient.
* Two (2) paper copies of these documents. Including appendices.

Deliver the above documents to the Bureau of Safe Drinking Water at the following address:

NDEP Bureau of Safe Drinking Water

Attn: Project Coordinator

901 S. Stewart Street, Suite 4001

Carson City, Nevada 89701

**OR** to the appropriate District Board of Health.

# Section 1: System Information

## Section 1.1 System and Contact Information

|  |  |
| --- | --- |
| System Number or Reference (SDWIS ID) |  |
| Distribution Classification Required (D1, D2, etc.) |  |
| Treatment Classification Required(T1, T2, etc.) |  |
| System Name and Address |  |
| Location/Town |  |
| Population Served and Service Connections | Population: ConnectionsNo. of Residential Connections:No. of Commercial Connections:No. of Other Connections: |
| System Owner |  |
| Name, Title, and Phone Number of Person Responsible for Maintaining and Implementing the Operation and Maintenance Plan | Name: Title: Phone:Cell:Email: |
| Seasonal Operation? Operational dates? |  |

**Managerial & Administrative Contacts:**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **Contact Name** | **Title** | **Phone** | **Email** |
| Administrative Contact |  |  |  |  |
| Financial Contact |  |  |  |  |
| Legal Contact |  |  |  |  |
| Other |  |  |  |  |

**System Operators and Certifications:** *(*[*NAC 445A.617 to NAC 445A.652*](http://www.leg.state.nv.us/nac/NAC-445A.html#NAC445ASec617)*)*

|  |  |  |  |
| --- | --- | --- | --- |
| **Name, Title** | **Distribution Grade** | **Treatment Grade** | **Phone** |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |

**Regulatory Agencies and Contacts:**

Nevada Division of Environmental Protection (NDEP)

|  |  |  |
| --- | --- | --- |
| **NDEP BSDW**  | **General Phone** | **Website** |
| BSDW Front Desk | (775) 687-9521 | <https://ndep.nv.gov/water/drinking-water> |
| All contacts for BSDW | [Bureau of Safe Drinking Water Contacts | NDEP (nv.gov)](https://ndep.nv.gov/contact-us/bureau-of-safe-drinking-water-contacts) |
| **Contact Title** | **Name** | **Email** | **Phone** |
| BSDW Facility Manager |  |  |  |
| Health District Facility Manager (if applicable) |  |  |  |

**Local Emergency Response**

|  |  |
| --- | --- |
| **Police** | 911 |
| **Police (non-emergency)** |  |
| **Fire** | 911 |
| **Fire (non-emergency)** |  |
| **Hazmat** |  |
| **NDEP Spill Hotline** | (775) 687-9485 |
| Others?  |  |

**Laboratories**

|  |  |  |  |
| --- | --- | --- | --- |
| **Name** | **Address** | **Phone** | **Lab Capabilities** |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |

**Suppliers and Vendors**

|  |  |  |
| --- | --- | --- |
|  | **Name** | **Phone** |
| Pipe Supply |  |  |
| Chemicals |  |  |
| Pumps / Motors |  |  |
| Safety |  |  |
| Others? |  |  |
|  |  |  |
|  |  |  |

**Contractors / Repair Services**

|  |  |  |
| --- | --- | --- |
|  | **Name** | **Phone / Emergency Phone** |
| Pipe Repairs |  |  |
| Electrician |  |  |
| Plumber |  |  |
| Well Driller |  |  |
| SCADA. |  |  |
| Tank Divers |  |  |
| Others? |  |  |
|  |  |  |
|  |  |  |

## Section 1.2 Service Area Map or Vicinity Map

Please include or insert a drawing or attachment that shows the relationship of your system to other nearby communities within the general area to locate and orient your system for reference.

|  |
| --- |
| **Service Area** |
|  |

## Section 1.3 System Overview

|  |
| --- |
| **System/Facilities** |
|  |

|  |
| --- |
| **Simplified Graphic or Flow Chart of Water System**  |
|  |

## Section 1.4 Water Source Description

|  |
| --- |
| **Check the box(es) that applies to your water source** |
|[ ]  Groundwater  |  |
|[ ]  Surface Water  | Name of Source: |
|[ ]  Spring | Name of Springs (if applicable): |
|[ ]  Purchased Water (Treated) | Name of Supplier: |

# Section 2: System Components

Provide a general overview of the primary components of your system. More specific information will be documented further in the manual.

|  |  |
| --- | --- |
| **Primary components of the water system:** | **Brief Description (location, capacity, requirements, etc.)** |
| Source Water:Wells and Well Pumps, Surface Water Diversions, Spring Collection Systems |  |
| Treatment/ Disinfection  |  |
| Storage Tanks/ Reservoirs |  |
| Distribution System |  |
| SCADA and other System Monitoring Devices |  |
| Other |  |

## Section 2.1 Source Water

Your system may have one or more sources of water: groundwater well, surface water diversion, spring source, wholesale inter-tie OR a combination of source types. Even if the source is only intended to be an emergency source or supplemental, it must be identified.

## Section 2.1.1 Wells

([NAC 445A.66855 to NAC 445A.6693](https://www.leg.state.nv.us/nac/NAC-445A.html#NAC445ASec66855), inclusive: General requirements and design)

For revised regulations that have not yet been codified, please see the BSDW website.

|  |
| --- |
|  **Photograph of Well(s)** |
|  |

**Well Specifications**

**COPY FORMAT AND ADD AS MANY WELLS/PUMPS AS NECESSARY**

|  |  |
| --- | --- |
| **Well ID** |  |
| **Location** |  |
| **Well Depth** (feet) |  |
| **Well Casing Material** |  |
| **Screen Interval Depths** |  |
| **Pump Type** |  |
| **Pump Manufacturer**(If Available) |  |
| **Pump Horsepower**(If Available) |  |
| **Designed** (GPM)(If Available) |  |
| **Date Installed**(If Available) |  |
| **Date of Last Flow Rate Test**(If Available) |  |
| **Static Level** (feet below ground level -If Available) |  |
| **Drawdown** (feet below ground level - If Available) |  |

**Normal Operations**

Include relevant operating procedures for normal operation of your well system.

**Maintenance**

Routine maintenance procedures will need to be identified and documented for each system component. Incorporate any system specific maintenance activities as well as those recommended by the manufacturer and/or installer. Include the routine maintenance procedures in “Section 6: Routine Maintenance” of your completed document.

## Section 2.1.2 Surface Water Diversion, Spring Source, or Wholesale Intertie

|  |
| --- |
| **Source Water Photograph** |
|  |

**Source Water Specifications**

**COPY FORMAT AND ADD AS MANY SOURCES AS NECESSARY**

|  |  |
| --- | --- |
| **Source**  |  |
| **Location** |  |
| **Conveyance structure; diversion, collection, or intertie** |  |
| **Other details as applicable** |  |
|  |  |
|  |  |

**Normal Operations**

Include relevant operating procedures for normal operation of your source water structure.

**Maintenance**

Routine maintenance procedures will need to be identified and documented for each system component. Incorporate any system specific maintenance activities as well as those recommended by the manufacturer and/or installer. Include the routine maintenance procedures in “Section 6: Routine Maintenance” of your completed document.

## Section 2.2 Disinfection

([NAC 445A.66825 to 445A.6685, inclusive](https://www.leg.state.nv.us/nac/NAC-445A.html#NAC445ASec66825))

For revised regulations that have not yet been codified, please see the BSDW website.

If your water system does not provide disinfection of your finished water, please check:

 [ ]  “Not Applicable”.

**If disinfection other than chlorination is used, update the table to reflect your system.**

|  |
| --- |
| **Disinfection** |
| What type of disinfection is used? |  |
| Where is disinfection input? |  |
| Typical % of concentration level? |  |
| Typical contact time in distribution?(if available) |  |
| What is the primary purpose of disinfection? Pathogen destruction or for residual in the distribution system? |  [ ]  Pathogen destruction [ ]  To maintain a residual in the distribution system |
| Target maximum residual? |  |
| Target minimum residual? |  |
| Typical temperature of water source? |  |
| How often is pH checked? |  |
| Typical pH range? |  |
| Other disinfectants? |  |
| Additional information |  |
| Dilution ratio |  |

|  |
| --- |
| **Disinfection System Graphic or Photograph** |
|  |

**Normal Operations**

Describe operating procedures for normal operation of your treatment systems.

**Maintenance**

Routine maintenance procedures will need to be identified and documented for each system component. Incorporate any system specific maintenance activities as well as those recommended by the manufacturer and/or installer. Include the routine maintenance procedures in “Section 6: Routine Maintenance” of your completed document.

## Section 2.3 Treatment

## Section 2.3.1 Non-Surface Water Treatment (groundwater and springs)

If your water system does not provide treatment of the source water, please check:

 [ ]  “Not Applicable”.

**Modify the table as applicable to reflect your system:**

|  |
| --- |
| **Treatment Processes** |
| The source water does not meet drinking water standards. The contaminants exceeding the standards are as listed. |  Avg Concentration Units (mg/l or µg/l)Primary : Secondary:  |
| Identify the type of treatment and expected reduction level of the contaminate. |  |
| Typical flow rate (GPM, GPH, MGD or other) |  |
| Automated or manual? | [ ]  Automated[ ]  Manual |
| Identify operational considerations of the treatment process. |  |
| Describe how the water quality may change besides lowering the level of the contaminant of concern. |  |
| If an ion exchange process is being used, what is the name of the filter media? |  |
| What triggers backwashing? |   |
| Approx. frequency of backwashing? |  |
| What triggers regeneration of the media? Approximate frequency? |  |
| Type of solution is used for regeneration? |  |
| Anticipated years till media replacement |  |

**Provide a Graphic Representation of your Treatment Processes.**

Please include a basic flowchart illustrating key components such as: treatment pumps, injection locations, isolation valves, sampling taps, tanks used for chemicals or treatment, and other appurtenances.

|  |
| --- |
| **Treatment System Graphic**  |
|  |

**Normal Operations**

Describe operating procedures for normal operation of your treatment systems.

**Maintenance**

Routine maintenance procedures will need to be identified and documented for each system component. Incorporate any system specific maintenance activities as well as those recommended by the manufacturer and/or installer. Include the routine maintenance procedures in “Section 6: Routine Maintenance” of your completed document.

## Section 2.3.2 Surface Water Treatment

Is the source water surface water or groundwater under the direct influence of surface water?

 [ ]  Yes  [ ]  No

**If no**, not applicable

**If yes:** - In a table, include a summary of all technical information regarding each treatment process. These processes may include, but are not limited to, screening, pre-sedimentation, coagulation, flocculation, sedimentation, filtration, and disinfection.

|  |
| --- |
| **Filtration System Graphic**  |
|  |

**Normal Operations**

Describe routine operating procedures for normal operation of your surface water treatment system.

**Maintenance**

Routine maintenance procedures will need to be identified and documented for each system component. Incorporate any system specific maintenance activities as well as those recommended by the manufacturer and/or installer. Include the routine maintenance procedures in “Section 6: Routine Maintenance” of your completed document.

## Section 2.4 Water Storage Tanks / Reservoirs

*(*[*NAC 445A.67065 to NAC 445A.67095, inclusive*](https://www.leg.state.nv.us/nac/NAC-445A.html#NAC445ASec67065)General Requirements and design*)*

For revised regulations that have not yet been codified, please see the BSDW website.

|  |
| --- |
| **Water Storage Tank(s) / Reservoir(s) Graphic or Photograph** |
|  |

## Section 2.4.1 Storage Specifications

Does your system have Hydropneumatic (Pressure) tank(s) and a gravity storage tank?

 [ ]  Yes  [ ]  No

**If yes**, then complete both Sections 2.4.1 and 2.4.2

Does your system only have Hydropneumatic (Pressure) tank(s)?

 [ ]  Yes  [ ]  No

**If yes**, then complete Section 2.4.2

**If no**, then complete this section 2.4.1 describing storage details.

**Modify the table as applicable to reflect your system:**

|  |
| --- |
| **Storage Details** |
| Location |  |
| Type |  |
| Material |   |
| Storage Volume |  |
| Year Constructed |  |
| Condition | [ ]  Poor [ ]  Fair [ ]  Good |
| Date of Last Inspection |  |
| Inspection Frequency |  |
| Turnover Rate (If known) |  |

|  |  |
| --- | --- |
| **Security Specifications** | **Notes** |
| Fence |  |
| Lighting |  |
| Locks installed |  |
| Key codes securely documented |  |
| Alarm system |  |
| Other |  |

**Normal Operations**

Include relevant operating procedures for normal operation of your storage and/or pressure tank system.

**Maintenance**

Routine maintenance procedures will need to be identified and documented for each system component. Incorporate any system specific maintenance activities as well as those recommended by the manufacturer and/or installer. Include the routine maintenance procedures in “Section 6: Routine Maintenance” of your completed document.

## Section 2.4.2 Hydropneumatic (Pressure Tanks) Systems

*(*[*NAC 445A.6706*](https://www.leg.state.nv.us/nac/NAC-445A.html#NAC445ASec6706)*)*

**Modify the table as applicable to reflect your system**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Pressure System ID or Name** | **Size (gallons)** | **Location** | **Operating Pressure** **(PSI)** | **Make/Model/Serial Number** |
|  |  |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |

**Normal Operations**

Include relevant operating procedures for normal operation of your storage and/or pressure tank system.

**Maintenance**

Routine maintenance procedures will need to be identified and documented for each system component. Incorporate any system specific maintenance activities as well as those recommended by the manufacturer and/or installer. Include the routine maintenance procedures in “Section 6: Routine Maintenance” of your completed document.

## Section 2.5 Distribution System

*(*[[*NAC 445A.67105 to NAC 445A.67145, inclusive*](https://www.leg.state.nv.us/nac/NAC-445A.html#NAC445ASec67105)](http://www.leg.state.nv.us/nac/NAC-445A.html#NAC445ASec67105)*General Requirements and Design)*

For revised regulations that have not yet been codified, please see the BSDW website.

|  |
| --- |
| **Distribution System Graphic** (can be a simple line drawing) |
|  |

## Section 2.5.1 Distribution System Pumps

*(*[*NAC 445.6702 to NAC 445A.6706, inclusive*](https://www.leg.state.nv.us/nac/NAC-445A.html#NAC445ASec6702)General Requirements and Design*)*

For revised regulations that have not yet been codified, please see the BSDW website.

The source of power for pumping facilities must be identified as described in [NAC 445A.6705](https://www.leg.state.nv.us/nac/NAC-445A.html#NAC445ASec6705)

Are the distribution system pump(s) electrically powered?

 [ ]  Yes  [ ]  No

If no, then identify the means of power:

This table must correlate with the booster pumps shown on the distribution system map and identify their locations, size, and type.

**Modify the table as applicable to reflect your system**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Pump Name** | **Manufacturer/ Model Number** | **Pump Location** | **Flow Capacity GPM)** | **RPM** | **Horsepower (HP)** | **Type of Pump** |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |

**Normal Operations**

Include relevant operating procedures for normal operation of your Distribution System Pumps.

**Maintenance**

Routine maintenance procedures will need to be identified and documented for each system component. Incorporate any system specific maintenance activities as well as those recommended by the manufacturer and/or installer. Include the routine maintenance procedures in “Section 6: Routine Maintenance” of your completed document.

## Section 2.5.2 Isolation Valves

Typically, there are a variety of types and sizes of valves throughout a water system. Ideally, your drinking water distribution system should have sufficient isolation valves to make repairs with minimal service disruption to customers.

Malfunctioning, closed, frozen, and lost valves can make isolating for emergency or routine repairs difficult and often have a substantial impact on system performance. A distribution system valve preventative maintenance program enhances the operator’s capability to prolong the life of the valves; ensure that the valves can be located, accessed, and operated; and allows the utility to better plan capital and operating budgets.

|  |
| --- |
| **Describe Your Valve Preventative Maintenance Program** |
|  |

**Modify the table as applicable to reflect your system**

|  |  |  |  |
| --- | --- | --- | --- |
| **Valve #** | **Manufacturer / Model Number** | **Location** | **Size** (in) |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |

## Section 2.5.3 Air Release or Air/Vacuum Valves

These assemblies are part of the distribution system that need to be checked and maintained on a regular basis. Expand the table as necessary.

**Modify the table as applicable to reflect your system**

|  |  |  |
| --- | --- | --- |
| **Air/Vac Assembly** (No.) | **Location** | **Above Grade or Below Grade** |
|  |  | [ ]  Yes  [ ]  No |
|  |  | [ ]  Yes  [ ]  No |
|  |  | [ ]  Yes  [ ]  No |
|  |  | [ ]  Yes  [ ]  No |
|  |  | [ ]  Yes  [ ]  No |

## Section 2.5.4 Pressure Reducing Valves (PRV)

Maintenance will help to ensure that the pressure reducing valve continues to function efficiently and reliably. Expand the table as necessary.

**Modify the table as applicable to reflect your system**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **PRV**(No.) | **Make/Model** | **Location**(GPS if available) | **Pressure Zone****From - To** | **Pressure IN** | **Pressure OUT** |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
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## Section 2.5.5 Flush Assemblies

Maintenance will help to ensure that the flush assembly is intact and able to function when needed. Expand the table as necessary.

**Modify the table as applicable to reflect your system**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Flush Assy.**(No.) | **Make/Model** | **Type** | **Location**(GPS if available) | **Flow Capacity** (gpm) |
|  |  |  |  |  |
|  |  |  |  |  |
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## Section 2.5.6 Fire Hydrants

Fire hydrants are primarily to provide water for fire suppression at a specified flow and pressure. They can also be used for flushing or other approved uses. Coordination with the local fire authority is paramount to ensure the water system is supplying sufficient flow, pressure and quantity for fire suppression. It is important the lines of responsibility be communicated and formally established. Maintenance of hydrants may be performed by the fire department as they have a serious interest in making sure they are functioning as intended.

The fire authority may conduct flow/pressure tests at hydrants. This may stir up material within the water lines resulting in customer complaints of discolored water, bad odors, tastes etc. Ideally, the fire department will notify the water system of when and what areas of the system they are conducting their tests.

Describe your system’s role in the maintenance of fire hydrants and any agreements with the jurisdictional fire department within your service area.

**Modify the table as applicable to reflect your system**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Hydrant**(No.) | **Make/Model** | **Type**(Dry/Wet Barrel) | **Location**(GPS if available) | **Flow Capacity** (GPM) | **Inspection Frequency** | **Color** |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
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## Section 2.5.7 System Flushing

Routine flushing should be performed on a regular basis. The frequency largely depends upon the material accumulation and the velocity and volume through the pipes when being delivered. Flushing of water distribution systems is critical to ensure customers receive the best water quality. Aging infrastructure, poor quality pipelines and high temperatures are all contributing factors to scale and biofilm building up inside pipelines. It is an important maintenance task to ensure water is pushed through the system at a decent velocity to clear out stagnant water. Dead-end mains, typically in cul-de-sacs, at the end of rural streets, or even in a looped line, are known problem areas for water stagnation. Residential neighborhoods under construction and large underpopulated developments often have slow-moving or stagnant drinking water.

Flushed water must be discharged to an acceptable location. When viable, flushing the line into a sanitary sewer manhole is best, assuming it is acceptable to the jurisdiction responsible. Flushing water into a storm drain or water way may constitute an unauthorized discharge unless permitted by NDEP Water Pollution Control, (775) 687-9418. In a case where a sanitary sewer manhole is not available, a basin with confinement may be an option. Here again, check with NDEP.

Describe your system’s flushing program (There is a sample flushing program in Section 6 of the Guidance).

**Modify the table as applicable to reflect your system**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Location** | **Hydrant/Flush Assembly Number** | **Flushing Volume**(Gallons) | **Pressure Needed**(psi) | **Disinfection****Type** | **De-Chlorination****Required**(Yes/No) |
|  |  |  |  |  |  |
|  |  |  |  |  |  |
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## Section 2.5.8 Flow Meters

Flow meters should be tested and calibrated per the manufacturer’s recommendation. If your water system does not have the capability to perform this service without proper equipment or training. It is recommended to explore contracting this service out.

Describe your flow meter calibration program*.*

Identifying and listing all your system meters may not be practical, however, identifying the types of meters and housings may be a helpful reference.

**Modify the table as applicable to reflect your system**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Location** | **Meter Type** | **Housing** | **Measures in (?) Units**  | **Frequency of Readings** |
|  |  |  |  |  |
|  |  |  |  |  |
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## Section 2.5.9 Routine Operations and Maintenance of the Distribution System

**Normal Operations**

Include relevant operating procedures for normal operation of your distribution system.

**Maintenance**

Routine maintenance procedures will need to be identified and documented for each system component. Incorporate any system specific maintenance activities as well as those recommended by the manufacturer and/or installer. Include the routine maintenance procedures in “Section 6: Routine Maintenance” of your completed document.

## Section 2.6 System Monitoring (Telemetry and/or SCADA)

Utilities have become very dependent upon SCADA systems. Water systems and other utilities have become targets of cyberattacks, ransomware and terrorism. Maintenance of your software and SCADA systems is as important as any other component of your water system. Recognize that in the event your SCADA systems were to be compromised, your system would need to be operated manually.

The United States Environmental Protection Agency has developed [self-assessment tools for Cybersecurity](https://view.officeapps.live.com/op/view.aspx?src=https%3A%2F%2Fwww.epa.gov%2Fsystem%2Ffiles%2Fdocuments%2F2023-03%2FEPA%2520Water%2520Cybersecurity%2520Assessment%2520Tool%25201.0_0.xlsx&wdOrigin=BROWSELINK) to assist water systems evaluate their vulnerability to cyber threats.

|  |
| --- |
| **Controls Graphic** (can be a simple line drawing)  |
|  |

## Section 2.6.1 Controls Specifications

|  |
| --- |
| **Monitoring/Controls installed on:** |
| Well(s) |  [ ]  Yes  [ ]  No [ ]  Not applicable |
| Booster Pump Station |  [ ]  Yes  [ ]  No [ ]  Not applicable |
| Pump (Other) |  [ ]  Yes  [ ]  No [ ]  Not applicable |
| Valves (Water Treatment) |  [ ]  Yes  [ ]  No [ ]  Not applicable |
| Motors  |  [ ]  Yes  [ ]  No [ ]  Not applicable |
| Tanks/ Reservoirs |  [ ]  Yes  [ ]  No [ ]  Not applicable |
| Tracking Hydraulic Pressure |  [ ]  Yes  [ ]  No [ ]  Not applicable |

|  |
| --- |
| **Components** |
| Remote Terminal Unit (RTU) Types and Locations? |  |
| Programmable Logic Controller Type and Locations? |  |
| Security Software |  |
| Wireless Configuration  |  |
| Computer Hardware Purchase Date and Vendor  |  |
| Software last update |   |
| Software Vendor |  |
| Where is software backup stored? |  |
| Monitor Locations |  |
| # of Cell Phones with SCADA Access  |  |

**Operations and Maintenance for SCADA/Controls**

**Normal Operations**

Include relevant operating procedures for normal operation of your control/SCADA system.

**Maintenance**

Routine maintenance procedures will need to be identified and documented for each system component. Incorporate any system specific maintenance activities as well as those recommended by the manufacturer and/or installer. Include the routine maintenance procedures in “Section 6: Routine Maintenance” of your completed document.

## Section 2.7 Spare Parts Inventory

Maintaining an inventory of critical replacement parts allows for more successful operation of the water system. Water systems must maintain certain key inventory components specific to chlorination equipment ([NAC 445A.6683.3](https://www.leg.state.nv.us/nac/NAC-445A.html#NAC445ASec6683)), water wells ([NAC 445A.6686](https://www.leg.state.nv.us/nac/NAC-445A.html#NAC445ASec6686)), and pumps (NAC [445A 66995](https://www.leg.state.nv.us/nac/NAC-445A.html#NAC445ASec66995)). Additionally, it is recommended the water system have an inventory of spare parts for other system components so that repairs can be made quickly.

Identify your system’s spare parts inventory in the table and expand as necessary.

**Modify the table as applicable to reflect your system**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Associated System Component** | **Part Type** | **Part Number** | **Quantity** | **Supplier** | **Date Stocked** | **Check Date** |
|  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |
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# Section 3: Water Quality Monitoring

## Section 3.1 Monitoring Assessment Plan and Monitoring Status Report

All water systems are required to sample in adherence with their established monitoring plans. The monitoring assessment plan and monitoring status reports are provided by the Bureau of Safe Drinking Water and can be provided when requested. The monitoring assessment plan dictates which contaminants you are required to sample for, where the samples must be taken, and when the samples must be taken. The monitoring status report includes which samples must be taken in the given year, and when recent samples were reported to BSDW. A **current** copy of your monitoring assessment plan and monitoring status must be included in this document.

## Section 3.2 Distribution Sample Maps/Plans

Include a copy of your **approved** site sample plan for those contaminants tested for in the distribution system. This may include total coliform, lead and copper, and disinfection byproducts.

## Section 3.3 Entry Point and Source Samples

Describe any procedures used, as approved by BSDW, to collect samples at the entry point(s) and source(s). These samples, including nitrate, VOCs, metals, and more are often collected from a smooth nose sample tap located in the well house. Typically, the source samples are taken prior to any treatment and the entry point samples are collected after treatment, but before the treated water enters the distribution system. Refer to your Monitoring Assessment Plan to determine which samples must be taken at these points.

Frequently, the laboratory being used for analysis of samples will provide appropriate containers, preservative (if needed) and specific sampling instructions. On-site care must be taken by the sampler to ensure the collection does not result in contamination of the sample.

## Section 3.4 Sampling Records

All water sampling results must be maintained for not less than 3 years ([NAC 445A.536](https://www.leg.state.nv.us/nac/NAC-445A.html#NAC445ASec536)). Please describe where historical and recent sample results may be found. This may reference either a physical or digital location.

If records are available through an online account, please include a link to the website.

# Section 4: Personnel Safety

For immediate emergency response to serious health conditions, **call 911**

**Identify where:**

First Aid Kits are located:

Automated External Defibrillator (AED) is located:

Eye Wash/Emergency Shower facilities are located:

The operation and maintenance of water systems can be dangerous. The combination of chemical use, electrical components and confined space issues can create hazardous situations for a system operator and staff. The following Section does not include all components of a safety plan but can be used to assist in the beginnings of a plan. If the water system has an established safety plan, include the document or a reference:

IDENTIFY WHERE A HARD COPY OF OUR SAFETY PLAN IS AVAILABLE:

IDENTIFY WHERE A DIGITAL VERSION OF OUR SAFETY PLAN IS AVAILABLE:

## Section 4.1 Potential Water System Hazards to Consider

The following checklist can be used to identify potential safety hazards encountered in the operation of the water system. If a hazard is identified in the system, you should work to develop an appropriate safety plan to minimize risks. Additionally, if any of the listed, or other, chemicals are present, ensure all Safety Data Sheets (SDS) are provided and made readily available.

|  |
| --- |
| **POTENTIAL HEALTH HAZARDS** |
| **General** |
|[ ]  Electrical |
|[ ]  Extreme Heat |
|[ ]  Extreme Cold |
|[ ]  Hazardous Insects/Animals |
|[ ]  Trenches |
|[ ]  Falls |
|[ ]  Confined Space |
|[ ]  Heavy Equipment |
|[ ]  Highway Work Zones |
|[ ]  Power or Hand Tool Use |
|[ ]  Noise |
|[ ]  Weather related/Lightening/Snow /Ice |
|[ ]  Other (please enter specific hazards) |
|[ ]  Other (please enter specific hazards) |
|[ ]  Other (please enter specific hazards) |
|[ ]
| **Chemicals Present** |
|[ ]  Sodium Hypochlorite (Enter solution strength) |
|[ ]  Calcium Hypochlorite |
|[ ]  Liquid Chlorine |
|[ ]  Gaseous Chlorine |
|[ ]  Chlorine Dioxide |
|[ ]  Ammonia |
|[ ]  Other (please enter specific chemical)  |
|[ ]  Other (please enter specific chemical) |
|[ ]  Other (please enter specific hazards) |
|[ ]  Other (please enter specific hazards) |
|[ ]  Other (please enter specific hazards) |

## Section 4.2 Safety Plan Resources

Additional safety resources are available from Federal and State Occupational Safety & Health Administration (OSHA).

Nevada OSHA has the Nevada Safety Consultation and Training Section (SCATS). SCATS may provide free safety consultations to small to medium Nevada businesses. See <https://www.4safenv.state.nv.us/>

Other resources: [American Water Works Association (AWWA) and your risk management authority.](https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=&cad=rja&uact=8&ved=2ahUKEwjTmM7Bh9vvAhV7SjABHYFgCWEQFjAAegQIAhAD&url=https%3A%2F%2Fdir.nv.gov%2FOSHA%2FHome%2F&usg=AOvVaw0TOkB3apw5oXw7DhcGT3cO)

**Establishing a Safety Program in the Utility Guide**

This free guide from AWWA includes information on:

* Establishing a safety program in your utility
* Understanding your safety requirements
* Key steps for establishing a safety policy
* Tips for a successful implementation

Available as a [free download on awwa.org](https://www.awwa.org/Publications/Books/Safety)

## Section 4.3 Confined Space

The simplest confined space program for small systems is not to enter confined spaces. Confined Spaces can be extremely dangerous. Many people have died unknowingly entering a confined space. Vaults with valves, cross connection control devices or PRVs could be a confined space. If you are not sure about the definition of a confined space or what a confined space is or the requirements to enter a confined space – contact your facilities manager, technical assistance provider, or safety professional for advice. If your system has an approved confined space program, use this space for reference location of the plan and any necessary equipment.

**Also See:**

[Confined Spaces - Overview | Occupational Safety and Health Administration ([osha.gov](https://www.osha.gov/))](https://www.osha.gov/confined-spaces)

may provide free safety consultations to small to medium Nevada businesses. See [<https://www.4safenv.state.nv.us/>](https://www.4safenv.state.nv.us/)

# Section 5: Communications

## Section 5.1 Public Notice

The water system may need to send out notice to customers regarding water quality or availability concerns. The most common reasons for sending out public notice are confirmed and unconfirmed bacteriological contamination and pressure loss events. The following sections provide guidance on various types of public notice. To ensure all public notice is completed appropriately, you must coordinate your efforts with BSDW.

## Section 5.1.1 Coliform Positive Results

The Nevada Administrative Code (NAC) requires certified laboratories to report Total Coliform sample results that are present (detected) for Coliform bacteria or E. coli to the “proper authority” with a phone call. The proper authority is the public water system involved and the Nevada Department of Environmental Protection, Bureau of Safe Drinking Water. Do not leave a voice mail or an email unless you have already spoken directly to someone. If E. coli is determined after hours, contact the SPILL HOT LINE. If total coliform is determined after hours, contact the regulatory authority by 9 am the next business day.

NDEP – Bureau of Safe Drinking Water (BSDW) – 775-687-9521

Nevada Spill Hotline (After Hours) - 775-687-9485

901 S. Stewart St. Suite 4001

Carson City, NV 89701

Or Local Health District (if applicable)

Boil water advisory and order templates can be found below, or through the Bureau of Safe Drinking Waters website.

If your customers are unable to boil water, such as at a gas station, utilize Out of Order or Do Not Drink signage. Alternatively, consider shutting off water access until the situation is resolved, if possible.

## Section 5.2 Notification Types

**Tier 1 - Notify within 24 hours.**

Any time a situation occurs where there is the potential for human health to be immediately impacted, water suppliers have 24 hours to notify the public of the situation. Water suppliers must use media outlets such as television, radio, and newspapers, post their notice in public places, or personally deliver a notice to their customers in these situations.

Tier 1 violations are:

* E. coli MCL violations; failure to test for E. coli.
* Nitrate/Nitrite MCL violation; failure to take confirmation.
* Chlorine Dioxide MRDL violation; failure to take repeat.
* Exceedance of maximum turbidity level, where the State determines Tier 1 is required.
* Nitrate exceedances for NCWS allowed to exceed standard.
* Waterborne disease outbreak or another waterborne emergency
* Other situations as determined by the primacy (regulating) agency.

**Tier 2 - Notify as soon as possible, but within 30 days of the violation.**

Any time a water system provides water with levels of a contaminant that exceeds EPA or state standards or that has not been treated properly, but that does not pose an immediate risk to human health, the water system must notify its customers as soon as possible, and no later than within 30 days of the violation. Notice may be provided via the media, posting, or through the mail.

Tier 2 violations are:

* All other MCL, MRDL, and TT violations that are not Tier 1.
* Monitoring and testing procedure violations, where State requires a Tier 2 (rather than Tier 3) notice.
* Failure to comply with variance and exemption (V&E) conditions

**Tier 3 - Notify within one year of the violation.**

When water systems violate a drinking water standard that does not have a direct impact on human health (for example, failing to take a required sample on time) the water supplier has up to one year to provide a notice of this situation to its customers. The extra time gives water suppliers the opportunity to consolidate these notices and send them with annual water quality reports (consumer confidence reports).

Tier 3 violations are:

* All other monitoring or testing procedure violations not already requiring a tier 1 or tier 2 notice.
* Operation under a Variance or Exemption
* Special public notices:
	+ Exceedance of Fluoride SMCL
	+ Announcing the availability of unregulated monitoring results

Boil Water Orders are available at [Do Not Drink & Boil Water Orders | NDEP (nv.gov)](https://ndep.nv.gov/water/drinking-water/information-for-public-water-systems/do-not-drink-boil-water-orders) and include:

E. coli Present samples

* [Precautionary Boil Water Order Public Notice](https://ndep.nv.gov/uploads/water-drinking-pws-donotdrink-docs/BWO_Unconfirmed_E._coli_%282019%29.doc)
* [Official Boil Water Order Public Notice English](https://ndep.nv.gov/uploads/water-drinking-pws-donotdrink-docs/BWO_Confirmed_Ecoli_PN_%282019l%29.doc)
* [Official Boil Water Order Public Notice Spanish](https://ndep.nv.gov/uploads/water-drinking-pws-donotdrink-docs/bwo_confirmed_ecoli_pn_official_spanish.doc)

Other Boil Water Order Events Boil Water Rescind Notice

* [Precautionary Boil Water Order Guidance for Public Water Systems](https://ndep.nv.gov/uploads/water-drinking-pws-donotdrink-docs/precautionary_boil_water_guidance.doc)
* [Loss of Pressure Boil Water Order Public Notice](https://ndep.nv.gov/uploads/water-drinking-pws-donotdrink-docs/BWO_Precautionary_LOP_%282019%29.doc)
* [Boil Water Order Rescind Notice Template](https://ndep.nv.gov/uploads/water-drinking-pws-donotdrink-docs/bwo_sample_rescind_notice_wate_systems.doc)

Do Not Drink Orders

* [Nitrate Public Notice Template](https://ndep.nv.gov/uploads/water-drinking-pws-donotdrink-docs/nitrate_do_not_drink_english_spanish.doc)
* [Unknown Water Quality Public Notice Template](https://ndep.nv.gov/uploads/water-drinking-pws-donotdrink-docs/DoNotDrink_PN_Unknown_%282019%29.doc)
* [Do Not Drink Notice Rescind Template](https://ndep.nv.gov/uploads/water-drinking-pws-donotdrink-docs/do_not_drink_sample_rescind_notice.doc)

## Section 5.3 Customer Complaints

Reviewing and responding to customer complaints is a valuable tool in the successful operation of a water system. It is recommended that your utility establish a protocol to respond to all

customer complaints. Sample below.

|  |
| --- |
| **Water Quality/Consumer Complaint Report Form**  |
| **Instructions:**This form is provided to guide the utility while evaluating water quality data or consumer complaints.  |
| Complaint is based on: | [ ] Quality [ ]  Quantity [ ]  Color [ ]  Odor [ ]  Other:  |
| What is the water quality complaint? |  |
| What are the specifics of the color, odor, pressure or taste associating the complaint? |  |
| Do other consumers have the same complaint? |  |
| Are the unusual water quality observations sporadic over a wide area, or are they clustered in a particular area?  |  |
| What is the extent of the area?  | [ ]  A pressure zone [ ]  A neighborhood [ ]  A city block [ ]  A street [ ]  A building |
| Based on recent complaints, does the unusual water quality appear to be part of a trend (i.e., occurring over several days or longer)? |
| **Internal Questions for System Operators:** |
| What is the baseline of “normal” water quality for…? | Quality:Quantity:Color:Odor: |
| Have there been any operational changes at the plant or in the affected area of the system? | [ ]  Yes[ ]  No |
| Has there been any flushing or distribution system maintenance in the affected area?  | [ ]  Yes[ ]  No |
| Has there been any repair or construction in the area that could impact water quality? | [ ]  Yes[ ]  No |
| Is the property protected by a cross connection control device?  | [ ]  Yes[ ]  No |
| Name of person completing form: | Date/time: |
| Name of person reviewing complaint: | Date/time: |
| What was the outcome? | Date/time: |

## Section 5.4 Communications Records

Various communications, such as those with the Bureau of Safe Drinking Water, the lab used, and for system repairs or upgrades, must be maintained. Please describe how communications are stored for your system. Ensure that all records are maintained for no less than 3 years.

# **Section 6:** Routine Maintenance

Checklists of suggested general maintenance activities for system components are provided. These checklists are intended to identify and document your system’s routine maintenance procedures. The checklists are general and address most water system components, but not all. It will be up to you, the preparer, on behalf of the water system to modify the maintenance checklists to match the system components and actual maintenance practices.

Once complete, the checklists will be a resource for your operators and for use in the field. Ensure that any system specific maintenance activities, including those recommended by the manufacturer and/or installer.

## **O&M Checklists for Wells and Well Pumps**

These are suggested check lists based upon common maintenance. Please be aware that your system components may have critical maintenance practices recommended by the designer, manufacturer or installer.

|  |
| --- |
| **WELL AND WELL PUMPS**(These check sheets are intended for use in the field) |
| **Daily or Weekly** |
| [ ]   | Check well house interior and grounds for general cleanliness, evidence of rodents, bird nests, and similar that may pose threats.  |
| [ ]  | Check any warning lights or alarms – low water level in well, intrusion, power outage, pump failure, etc.,  |
|[ ]  Read source water meter. Record water-production data in well house log.  |
|[ ]  Read pump run hour meters and record data in well house log (unless automatic data storage is available).  |
|[ ]  Check pump-cycling rate. If it runs continuously or cycles more than predetermined design times per hour.  |
|[ ]  Check well house buildings for signs of security problems – graffiti, vandalism, doors or locks damaged, entry, etc.  |
|[ ]  Check wells source site after any adverse weather – high winds, heavy snow, ice, rains, and so on. Look for indications of erosion and surface water entering the casing. |
|[ ]  Review source related customer complaints and evaluate corrective actions and planning. |
| **WELL AND WELL PUMPS**(These check sheets are intended for use in the field) |
| **Monthly**  |
|[ ]  Check well water level if source capacity is marginal or there are drought conditions.  |
|[ ]  Check area for excessive vegetation or dangerous conditions – uncut grass, brush, dead trees, fire hazard, etc.  |
|[ ]  Check well house control valves for proper positions, open or closed. You should post this information.  |
|[ ]  Check source control system – pressure switch settings, cycling, pressure tanks, water levels, etc.  |
|[ ]  Check well house valves for damage or leaks.  |
|[ ]  Check for leaks – read source meter when you expect the water usage to be zero.  |
|[ ]  Check source pump cycling and pressure switch settings, on/off pressures, and line pressures. Is there evidence that may prompt new settings? |
| ☐ | Check well site for water ponding, poor drainage areas, channeling effecting the well casing, excessive vegetation, unhealthy trees, fire hazards, etc. Be sure to observe the well site through an entire pump cycle.  |
|[ ]  Monitor complete pumping cycle to ensure proper operation. |
|[ ]  Check area for evidence of rodent intrusion and burrowing.  |
| **WELL AND WELL PUMPS**(These check sheets are intended for use in the field) |
| **Quarterly**  |
|[ ]  Measure source pump capacity in gallons per minute (GPM) to detect pump output problems. |
|[ ]  Check source facilities conditions – corrosion, vent screens, vehicular or other damage, animal activity, etc.  |
|[ ]  Check cold weather protection – insulation, heating system, alarm system, and so on.  |
|[ ]  Verify sanitary integrity of the sources – screened vents, no unprotected openings, electrical box sealed, etc.  |
|[ ]  Evaluate source use designations (permanent, seasonal, emergency, or inactive).  |
|[ ]  Operate valves and test run emergency source wells to waste. Do not supply distribution system unless coordinated with BSDW.  |
|[ ]  Implement seasonal start-up or shut-down procedures. |
|[ ]  Observe areas surrounding the well house for new sources of potential contamination such as; erosion, animal enclosures, new development, infiltration basins, etc. Review Wellhead or Watershed Protection Plans if available.  |
|[ ]  Review source water quality test results for trends, such as increasing nitrate or seasonal coliform problems.  |
|[ ]  Check electrical meter readings to see if there are significant changes in efficiency. |
|[ ]   |
| **WELL AND WELL PUMPS**(These check sheets are intended for use in the field) |
| **Annually or Seasonal** |
|[ ]  Evaluate general source capacity to meet water system demand. Use water use and production records.  |
| **System Specific O&M for Wells and Well Pumps** |
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|[ ]   |
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Maintain a log of all preventive maintenance completed on your water well and pump system. Photographs with adequate field notes or videotape with audio explanation can be valuable tools. **Include a reference to the location where all records are kept.**

## **O&M Checklists Chlorine Disinfection**

These are suggested check lists based upon common maintenance. Please be aware that your system components may have critical maintenance practices recommended by the designer, manufacturer, or installer.

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| **CHLORINE DISINFECTION**(These check sheets are intended for use in the field) |
| **Daily or Weekly**  |
|[ ]  Check for any security issues at the treatment plant and surrounding area – fences, gates, doors, locks, any evidence of tampering or vandalism. |
|[ ]  Check solution level in the tank: Refill if necessary and be sure to replace the cover. We recommend posting procedure to mix chlorine solution in the treatment building. The solution tank should be visibly marked to make measuring the number of gallons remaining easy and accurate. |
|[ ]  Verify that the supply of sodium hypochlorite is adequate for normal operation – 30 to 60 days. |
|[ ]  Check for leaks or excessive chlorine smell. Locate and repair any leaks and improve ventilation, if needed. |
|[ ]  Check pump for unusual vibrations or warmth, indicating worn or damaged bearings or gears. Take care; it may be hot. |
|[ ]  Test the free chlorine residual in the distribution system using an EPA approved test kit. Evaluate and log results into a monthly chlorination residual report form. Are free chlorine levels consistent? |
|[ ]  Adjust the pump feed-rate control as needed. Adjust the controls only when the pump is running and never force the controls. Typically, the feed-rate control should be in the middle of its range. This makes it possible to adjust the dosage easily. If adjustments to controls no longer meet chlorine demand, you may have to adjust your solution strength, or possibly get a different size hypo-chlorinator. |
|[ ]  Record results of all tests, chemical use, water production, and maintenance in a daily logbook. |
|[ ]  Check records of logbooks for unusual data, trends and other indicators or possible problems. |

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| **CHLORINE DISINFECTION**(These check sheets are intended for use in the field) |
| **Quarterly**  |
|[ ]  Calibrate chemical feed pump to verify the performance of the pump output – follow manufacturer’s instructions. |
|[ ]  Wash and clean the chlorine solution tank if there is any sediment build-up. Clean the chlorinator, lines, injector quill/valve and foot valve as needed – follow manufacturer’s instructions. Ensure spent chlorine solutions are disposed of in accordance with the Bureau of Water Pollution Control. |
|[ ]   |
| **Annually or Seasonal**  |
|[ ]  Clean the chlorinator and replace the O-rings, valves and worn or damaged parts – use the spare parts kit to make repairs and follow manufacturer’s instructions. You should have a back-up chemical feed pump to provide continuous disinfection. |
| **System Specific O&M for Chlorine Disinfection** |
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Maintain a log of all preventive maintenance completed on your treatment and disinfection system. Photographs with adequate field notes or videotape with audio explanation can be valuable tools. **Include a reference to the location where all records are kept.**

## **O&M Checklists: Storage Tanks**

These are suggested check lists based upon common maintenance. Please be aware that your system components may have critical maintenance practices recommended by the designer, manufacturer, or installer.

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| **WATER STORAGE FACILITIES – RESERVOIRS AND TANKS**(These check sheets were designed to be printed separately and used in the field) |
| **Daily or Weekly**  |
|[ ]  Check any warning lights or alarms – low water level, high water level, intrusion, power outage, and so on. |
|[ ]  Check storage tank for signs of security breaches – damaged fences, open gates, graffiti, vandalism, etc. |
|[ ]  Check water level indicator – functioning, adequate amount of stored water, excessive water use. |
|[ ]  Check the overflow line, vents, ladder access locks, roof access hatches, and controls that are readily visible from the ground for damage, vandalism, or other conditions. |
|[ ]  Check storage tank and site after any adverse weather – high winds, heavy snow, ice, rains, etc. |
| **Monthly**  |
|[ ]  Check water level indicator. |
|[ ]  Verify all openings are protected from surface runoff, windblown contaminants, insects, birds, and animals. |
|[ ]  Check tank overflow lines for signs of damage, such as, screens, flapper valves, check valves, splash plate, etc., |
|[ ]  Check area for excessive vegetation or dangerous conditions – uncut grass, brush, dead trees, fire hazard, etc. |
|[ ]  Check control valves for proper positions, open or closed.  |
|[ ]  Check control valves for damage or leaks.  |
|[ ]  Check low water temperature alarm – cold weather only. |
|[ ]  Check high water temperature limit switch – when heating system in service.  |
| **WATER STORAGE FACILITIES – RESERVOIRS AND TANKS** (continued) |
| **Quarterly**  |
|[ ]  Thoroughly inspect the exterior of storage tanks for structural defects, corrosion, leaks. |
|[ ]  Check mechanical water level indicators are functional. |
|[ ]  Inspect tank exterior and roof for signs of damage, corrosion, degradation, leakage, or structural problems. |
|[ ]  Inspect all openings into the reservoir roof and sidewall vents, access hatch, overflow outlet, etc., |
|[ ]  Check tank-supporting structure for signs of damage, corrosion, degradation, structural or seismic inadequacy.  |
|[ ]  Tank catwalks/ladders free from signs of damage, corrosion, degradation, structural condition, vandalism, etc. |
|[ ]  Tank area and roof for water ponding, poor drainage areas, excessive vegetation, unhealthy trees, fire hazards, etc. |
|[ ]  Tank area free from combustible storage, trash, debris, brush, or other material that could present a fire hazard. |
|[ ]  Tank area free of accumulation of material on or near parts resulting in accelerated corrosion or rot. |
|[ ]  Tank and support free of ice buildup. |
|[ ]  Check earth embankments for erosion, burrowing animals, improper drainage, and leakage. |
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| **WATER STORAGE FACILITIES – RESERVOIRS AND TANKS** (continued) |
| **Annually or Seasonal**  |
|[ ]  Thoroughly inspect the interior of storage tanks for structural defects, corrosion, leaks, and cleaning needs such as sediment and biofilm buildup. |
|[ ]  Storage tanks will be cleaned and disinfected following all construction, maintenance, and repairs using an AWWA-approved cleaning method. |
|[ ]  Check storage tank’s structural, seismic, and sanitary integrity – leaks, corrosion, cracks, supports, warping, etc. |
|[ ]  Inspect storage tank interior coating for pitting, concrete spalling, rot, corrosion, rust, water level sensors, biofilm build-up etc. |
|[ ]  Operate (Exercise) valves and make repairs as needed. |
|[ ]  Document inspection and maintenance activity as part of an O&M program. |
|[ ]  Inventory and evaluate storage facilities capacity, condition, replacement costs and plan for improvements. |
|[ ]  Evaluate stored water for clarity, sediments, floating materials or films, unusual odors, insects, birds, or animals. |
|[ ]  Plan for storage facility improvements and budget for the associated cost. |
|[ ]  Inspect overflow discharge area for integrity and damage from erosion or rodents. |
| **WATER STORAGE FACILITIES – RESERVOIRS AND TANKS** (continued) |
| **Three to Five Years**  |
|[ ]  Inspect and consider the timing for recoating the exterior and interior.  |
|[ ]  Approved methods can be found in the AWWA Standard C654 for Disinfection of Water-Storage Facilities |
|[ ]  Have tank inspected by a professional. |
|[ ]  Drain, inspect, clean, and disinfect storage tank or use a diving maintenance service without draining tank. |
|[ ]  Respond to any evidence of storage tank problems  |
| **SYSTEM SPECIFIC FOR RESERVOIRS AND TANKS** |
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Maintain a log of all preventive maintenance completed on your water system. Photographs with adequate field notes or videotape with audio explanation can be valuable tools. **Include a reference to the location where all records are kept.**

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| **HYDROPNEUMATIC (PRESSURE) TANKS**(These check sheets were designed to be printed separately and used in the field) |
| **Daily or Weekly** |
|[ ]  Check for sediments in Hydro pneumatic tanks by visually checking sight tube. |
|[ ]  Complete security inspection of pump house or well house and surrounding areas. |
|[ ]  Check for leaks in pressure tank lines, valves, and connections. |
|[ ]  Check water line pressures using pressure gauges installed in the pump house. |
|[ ]  Check condition of exterior surface of pressure tanks, note corrosion or damage. |
|[ ]  Calculate the number of pump cycles per hour. |
|[ ]  Check the functioning of any air compressors used to maintain water levels in pressure tank. |
|[ ]   |
| **Monthly** |
|[ ]  Check bladder tanks for waterlogged condition – use manufacturer’s procedures.  |
|[ ]  Check air-to-water ratios in Hydro pneumatic tanks by visually checking sight tube. |
|[ ]  Maintain air compressors on Hydro pneumatic tanks. |
|[ ]  Verify control systems and alarms are functioning properly and settings are proper. |
|[ ]  Check ASME pressure relief valve function. |
|[ ]   |
|[ ]   |
| **HYDROPNEUMATIC (PRESSURE) TANKS**(These check sheets were designed to be printed separately and used in the field) |
| **Quarterly** |
|[ ]   |
|[ ]   |
| **Annually** |
|[ ]  Check pressure tank supports for anchor, structural condition, and seismic integrity. |
|[ ]  Check pressure tanks for rust, corrosion, and damage. |
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| **System Specific O&M for Pressure Tanks** |
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Maintain a log of all preventive maintenance completed on your water system. Photographs with adequate field notes or videotape with audio explanation can be valuable tools. **Include a reference to the location where all records are kept.**

## **O&M Checklists for Distribution Components**

These are suggested check lists based upon common maintenance. Please be aware that your system components may have critical maintenance practices recommended by the designer, manufacturer, or installer.

* Distribution Pumps
* Valves – Valve Working Program
* Air Vacs/Air Release
* Pressure Reducing Valves
* Flush Assy/Fire Hydrants
* Sample Flushing Program
* Meters

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| **Distribution Pumps** |
| **Daily or Weekly**  |
|[ ]  Check Packing |
|[ ]  Check pump for bearings that may be noisy |
|[ ]  Check bearing oil for water and/or unusual color |
|[ ]  Check temperature of bearings by feel |
|[ ]  Inspect all bearing and oil rings |
|[ ]  Check for oil leaks, especially around gaskets |
|[ ]  Check that flow indicator and needle valve adjustments are functioning properly |
|[ ]  Check all mechanical seal conditions |
|[ ]  Check for leaks at casings and gaskets |
|[ ]  Listen for cavitation problems. |
|[ ]   |
|  |  |
| **Monthly**  |
|[ ]  Add oil to the bearing reservoirs, if necessary. |
|[ ]  Check that oil level is correct distance from shaft centerline. |
|[ ]  Clean out debris from bearing brackets.  |
| **Quarterly**  |
|[ ]  Apply light coat of rust protection to exposed surfaces |
| **Annually or Seasonal**  |
|[ ]  Inspect couplings for sign of wear |
|[ ]  Check driver shaft for damage |
|[ ]  Tighten bolts if necessary |
|[ ]  Do an oil change out, if required. Check manual. |
|[ ]  Inspect for damaged or missing insulation |
| **Three to Five Years**  |
|[ ]  Develop and evaluate as part of a Priority Replacement Schedule, Capital Improvement Plan and Asset Management.  |
|[ ]   |
| **SYSTEM SPECIFIC O&M FOR PUMPS** (Other than Well Pumps) |
|[ ]   |
|[ ]   |

Maintain a log of all preventive maintenance completed on your pumping system. Photographs with adequate field notes or videotape with audio explanation can be valuable tools. **Include a reference to the location where all records are kept.**

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| **Distribution Components – (Recommended at a minimum) Annually** |
| **Isolation Valves** |
|[ ]  Clean out valve enclosures to ensure access  |
|[ ]  Operate (Exercise) valve by fully closing and opening |
|[ ]  Periodic testing of valves, such as pressure testing or flow testing, can help identify any problems that may not be apparent during routine operation or inspection. |
|[ ]  Valves that are beyond repair or have reached the end of their useful life should be replaced promptly to prevent system failures. |
| **Air Release or Air/Vac Assemblies** |
|[ ]  Inspect ARVs and AVVs regularly to ensure that they are operating correctly. Check for any leaks or signs of corrosion, and make sure that the valve is functioning correctly |
|[ ]  Keep the area around the valve clean and free from debris. Dirt and debris can clog the valve and prevent it from operating correctly. |
|[ ]  Calibrate the valve periodically to ensure that it is releasing or allowing air into the system at the correct pressure. |
|[ ]  Test the valve periodically to ensure that it is operating correctly. This can be done by closing the valve and checking the pressure in the system, or by using a pressure gauge. |
| **Pressure Relief Valves (PRVs)** |
|[ ]  Regular inspection of PRVs is critical to ensure that they are working properly. Inspect the valve housing, control valve, and any associated components for damage, wear, or corrosion. |
|[ ]  Check that the pressure gauge readings are consistent with the setpoint pressure and the pressure drop across the valve. If the valve is not functioning properly, it may need to be adjusted or replaced. |
| ☐ | PRVs can become clogged with debris or sediment over time, so it's important to clean them periodically. This involves shutting off the water supply and removing the valve assembly for cleaning. Clean the valve seat and trim, as well as any strainers or filters. |
|[ ]  Use the manufacturer's recommended lubricant and apply it to the valve stem, gland, and other moving parts. |
|[ ]  Keep accurate records of PRV maintenance and testing, including the date, the results of the tests, and any maintenance or repairs performed. |
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| **Flush Assemblies/ Fire Hydrants** |
|[ ]  The flow rate of flush assemblies should be calibrated periodically to ensure that they are functioning as intended |
|[ ]  Flush assemblies should be cleaned regularly to prevent clogging and ensure proper operation. |
|[ ]  Verify the integrity of the assembly – look for evidence of leakage. These are typically below grade and attached at low points making them easy to be neglected. |
|[ ]  Keep accurate records of flush assembly maintenance, including the date, and any repairs performed. |
|[ ]  Regularly inspect fire hydrants to identify any signs of damage, corrosion, or leaks. Inspect caps, gaskets, and nozzles to ensure they are in good working condition. |
|[ ]  Apply lubrication to the operating nut and any other moving parts to ensure smooth operation. |
|[ ]  Regularly paint fire hydrants to protect against rust and ensure they are visible and easy to locate in case of an emergency. |
|[ ]  If any damage or issues are identified during the inspection of fire hydrants, make necessary repairs or replacements promptly to avoid any problems during an emergency. |
|[ ]  Follow manufacturer guidelines for maintenance and to keep accurate records of maintenance activities |
|[ ]   |
| **Meters** |
| [ ]  | Dirt and debris can build up inside the water meters, which can lead to inaccurate readings. Cleaning the meters with a soft brush or cloth can help ensure that they are functioning correctly. |
|[ ]  Water meters can become less accurate over time due to wear and tear. Calibration involves checking the accuracy of the meter and making any necessary adjustments to ensure it is measuring water usage accurately. |
|[ ]   |
|[ ]   |

## O&M Checklists for System Monitoring (SCADA)

These are suggested check lists based upon common maintenance. Please be aware that your system components may have critical maintenance practices recommended by the designer, manufacturer or installer.

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| **SYSTEM MONITORING (SCADA)**(These check sheets were designed to be printed separately and used in the field) |
| **Daily or Weekly**  |
|[ ]  Visual Inspection SCADA Security; Gates, Locks, Night Lighting, etc.,  |
| **Monthly**  |
|[ ]  Test Emergency Electrical Power Source |
|[ ]  Solar Panels – Visually Inspect for debris, dust and clean if necessary  |
|[ ]  Run Software Security Scans  |
|[ ]  Visual Inspection of all system components |
| **Quarterly**  |
|[ ]  Functional testing by simulating control commands or alarm conditions and verifying on/off functionality  |
|[ ]  Assess Condition of Solar Panels [ ]  Good [ ]  Fair [ ]  Poor |
|[ ]  The United States Environmental Protection Agency has developed [self-assessment tools for Cybersecurity](https://view.officeapps.live.com/op/view.aspx?src=https%3A%2F%2Fwww.epa.gov%2Fsystem%2Ffiles%2Fdocuments%2F2023-03%2FEPA%2520Water%2520Cybersecurity%2520Assessment%2520Tool%25201.0_0.xlsx&wdOrigin=BROWSELINK) to assist water systems evaluate their vulnerability. |
| **Annually or Seasonal**  |
|[ ]  Assess needed modifications and costs to include in the annual budget  |
|[ ]  Replace hardware and update software that has reached its official end-of-life or no longer supported by the manufacturer or vendor.  |
|[ ]  Inspect Grounding System |

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| **SYSTEM MONITORING (SCADA)** (continued) |
| **Three to Five Years**  |
|[ ]  Solar Panels – Consider replacement, check solar panels supports. |
|[ ]  Check Antenna Alignment  |
|[ ]  Replace backup batteries as required by manufacturer |
|[ ]   |
|[ ]   |
| **SYSTEM SPECIFIC O&M FOR SCADA** |
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Maintain a log of all preventive maintenance completed on your SCADA system. Photographs with adequate field notes or videotape with audio explanation can be valuable tools. **Include a reference to the location where all records are kept.**

# **APPENDIX**

**As you develop the Manual of O&M, the Appendix of your Manual must contain at a minimum, a copy of your:**

* Emergency Response Manual
* Cross Connection Control Plan

**For your reference, include the most recent edition of:**

* AWWA C653 Disinfection of Water Treatment Plants,
* AWWA C654 Disinfection of Water Wells,
* AWWA C651 Disinfection of Water Mains
* AWWA C652 Disinfection of Storage Facilities
* Forms and Fees available from NDEP (nv.gov)

## AWWA C651 Disinfection of Water Mains

## AWWA C652 Disinfection of Water Storage Facilities

## AWWA C653 Disinfection of Water Treatment Plants

## AWWA AC654 Disinfection of Water Wells

## Links to Forms and Fees available from NDEP (nv.gov)

### Do Not Drink & Boil Water Orders

* [Boil Water Orders](https://ndep.nv.gov/water/drinking-water/information-for-public-water-systems/do-not-drink-boil-water-orders)
* [Do Not Drink Orders](https://ndep.nv.gov/water/drinking-water/information-for-public-water-systems/do-not-drink-boil-water-orders)

### Bacteriological Monitoring

* [TCR Sampling Plan [Forms]](https://ndep.nv.gov/water/drinking-water/information-for-public-water-systems/bacteriological-monitoring)
* [RTCR Level 1 Assessment Form](https://ndep.nv.gov/water/drinking-water/information-for-public-water-systems/bacteriological-monitoring)
* [RTCR Seasonal Startup Checklist](https://ndep.nv.gov/water/drinking-water/information-for-public-water-systems/bacteriological-monitoring)
* [Seasonal Systems SOP Template](https://ndep.nv.gov/water/drinking-water/information-for-public-water-systems/bacteriological-monitoring)

### Disinfectant and Disinfection Byproducts

* [Chlorine Residual Compliance Procedures SM4500 Cl-G](https://ndep.nv.gov/water/drinking-water/information-for-public-water-systems/disinfection-byproducts)
* [Disinfection Byproducts [Forms]](https://ndep.nv.gov/water/drinking-water/information-for-public-water-systems/disinfection-byproducts)

### Consumer Confidence Reports

* [Consumer Confidence Reports (external link to ccriwriter.com)](https://ofmpub.epa.gov/apex/safewater/f?p=140:LOGIN_DESKTOP)
* [Certificate of Delivery for a Consumer Confidence Report](https://ndep.nv.gov/uploads/documents/AA_Certificate_of_delivery_template.doc)

### Lead and Copper

* [Lead and Copper [Forms]](https://ndep.nv.gov/water/drinking-water/information-for-public-water-systems/chemical-monitoring)