CHAPTER 8

OPERATION AND MAINTENANCE PROGRAM

INTRODUCTION

This chapter summarizes the operation and maintenance programs maintained by the District to ensure performance and reliability of the water storage and distribution system. The District operates and maintains eight storage reservoirs, ten master meters, three booster stations, and approximately 280 miles of water main. All water supplied to the District is provided by a wholesale contract with SPU.

WATER SYSTEM ORGANIZATION

The District is a special purpose district that has the authority to operate under Title 57 of the Revised Code of Washington (RCW). District staff is organized into six departments: Engineering, Operations, Finance, Information Systems, Human Resources, and Fleet/Facilities. Figure 8-1 presents an organizational chart for the District's Operations Department. The Operations Department is responsible for the operation and maintenance of the water and sewer collection systems. The Operations Department is also responsible for emergency response planning and drills.

Routine water utility work and assignments include, at a minimum, the following tasks:

- Water main inspections, flushing, and repair
- Water service replacement and repair
- Reservoir maintenance, inspection and repair
- Booster station maintenance, inspection and repair
- Valve maintenance and repair
- Meter reading
- PRV maintenance, inspection and repair

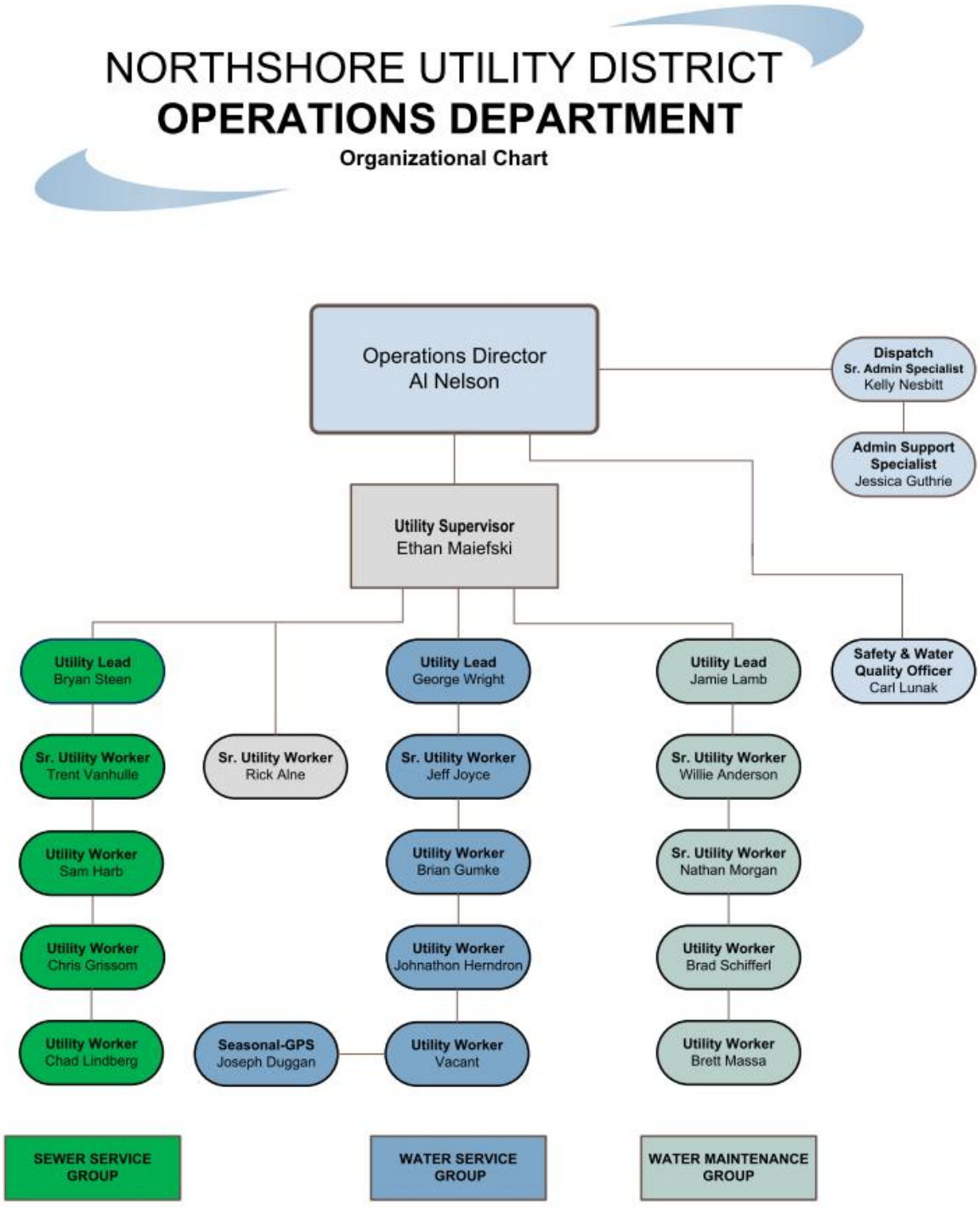

FIGURE 8-1

Organization Chart

OPERATOR CERTIFICATION

DOH requires all Group A water systems to have at least one certified Water Distribution Manager (WDM) in accordance with WAC 246-292-050. The District serves a population of greater than 50,000 people and is therefore required to have a WDM Level 4 on staff. In addition, the District is required to ensure that a Cross-Connection Specialist (CCS) oversees the Cross-Connection Control Program. The services of a Backflow Assembly Tester (BAT) must be maintained either on staff or from a contracting agency to periodically inspecting, testing, and monitoring backflow prevention assemblies in accordance with WAC 246-290-490.

Table 8-1 identifies the number of District employees for each certification status. The District is in compliance with all operation certification requirements.

TABLE 8-1

District Operator Certification Status(1)

Certification	No. of Employees
Water Distribution Manager In Training (WDM-OIT)	2
Water Distribution Manager 1 (WDM-1)	6
Water Distribution Manager 2 (WDM-2)	5
Water Distribution Manager 3 (WDM-3)	3
Water Distribution Manager 4 (WDM-4)	3
Water Distribution Specialist (WDS)	3
Cross-Connection Control Specialist	15
Backflow Assembly Tester (BAT)	1
Traffic Control Certification	20
Construction Site Erosion and Sediment Control	6
AC Pipe Certification	21
CPR Certification	20
First Aid Certification	21

(1) As of October 2016.

SYSTEM OPERATION AND CONTROL

The location of the major system facilities are shown on Figure 1-2. A description of the normal operation of each facility is provided in Chapter 4.

SCADA SYSTEM

The water utility has a Supervisory Control and Data Acquisition (SCADA) system with master control station located at the District office. The system uses Wonderware

software to provide a graphical user interface, allowing the operator to monitor and control various system parameters.

The data management system records the SCADA monitoring data, which is stored on the District's network. This data can then be accessed by the operations and engineering staff to evaluate facility performance.

The SCADA system is also equipped with alarms to allow staff to respond to abnormal system conditions such as pump, motor, or power failure.

FACILITY PERFORMANCE EVALUATION

Review of facility performance provides a means for the District's water utility staff to evaluate and optimize the operation and control of the distribution system facilities. The District routinely collects, either manually or automatically, a summary and analysis of operating information. The information allows the District to determine the effectiveness of their preventive maintenance program. Table 8-2 lists the routine operating information collected by the operation staff.

TABLE 8-2

Facility Performance Evaluation

Facility	Means of Evaluation	Parameter Evaluated	Evaluation Schedule	Location
Master Meters	SCADA	Flow Rate	Continuously	All master meters
		Production Volume	Daily	
		Turbidity	Continuously	Master Meter 7
		pH	Continuously	Master Meters 4, 5B, and 7
		Chlorine Residual	Continuously	
Reservoirs	SCADA Manually	Water Level	Continuously	All reservoirs
		Chlorine Residual	Continuously	
Booster Stations	SCADA	Run Time	Continuously	Inglemoor, Norway Hill, and Lake Forest Park Booster Stations
		Discharge Pressure		
		Pump On/Off Status		
		Flow Rate		
Control Valves	Manually	Inlet Pressure	Annually	All control valves
		Outlet Pressure		
Interties	SCADA	Flow Rate	Continuously	City of Bothell Intertie
		On/Off Status		
Generators	SCADA	On/Off Status	Continuously	Inglemoor Booster Station
		Runtime		
		Fuel Level		

PREVENTIVE MAINTENANCE

Planning for present and future maintenance of the water system utilities is an important task, as important as planning water main extensions and other physical improvements. The maintenance effort must be continuous in order for the District to continue to fulfill its role as a water service provider in the future.

The role of maintenance is to preserve the value of the physical infrastructure and ensure that the District can continue to provide a safe and reliable water supply. The most cost-effective method for maintaining a water collection system is to provide a planned preventative maintenance (PM) program. Through a planned PM program, the optimum level of maintenance activities can be provided for the least total maintenance cost.

The District's PM program involves defining the tasks to be performed, scheduling the frequency of each task, and then providing necessary staff to perform the task. For large and complex water systems, the administration, scheduling, and record keeping generated by the PM program may be the greatest challenge. The District has a GIS based online maintenance program that includes valves, line flushing, control valves, and hydrant numbers. This program helps identify and track where maintenance is needed or has been completed. Appendix K has inspection forms and screenshots of the online maintenance system, that the District uses for preventative maintenance.

SCADA SYSTEM

The SCADA system is monitored continuously to ensure that it is operating correctly. Alarms notify the District if something is not operating correctly. Over the last 4 years, the District has spent more than 1,500 hours each year on upgrading SCADA and telemetry system wide.

MASTER METERS

The District visits and inspects each master meter on a monthly schedule. During each visit, District staff visually inspects the conditions of the vault, piping, valves, meter, and sump pump.

RESERVOIR

The District maintenance staff visits each reservoir site twice weekly and performs a visual inspection. A full exterior reservoir inspection occurs every 6 months and an exterior cleaning occurs every 2 years. On average, every 3 to 5 years each reservoir is drained, and the interior is cleaned and inspected. Table 8-3 provides a summary of the routine storage facility maintenance duties.

AUTOMATIC METER READING

The District replaced all 21,000 meters from March 2011 to July 2012 with Automatic Meter Reading devices. The meter reading software also notifies the District of any unusual readings which are investigated by the District. This helps prevent inaccurate meters and identify potential leaks.

TABLE 8-3

Reservoir Preventive Maintenance Schedule

Reservoir Equipment	Scheduled Maintenance
Screens and vents	Replaced when tank exterior is coated
Ladders, cages, and safety devices	Replaced when tank exterior is coated
Security devices	Hatches, gates, ladder guards, etc. are checked twice weekly and monitored continuously by the SCADA system, cameras, motion sensors
Roof	Checked annually and repaired as necessary
Concrete and steel integrity	Checked during tank cleaning
Exterior coatings	Repaired as necessary
Interior coatings	Checked and repaired during tank cleanings
Pressure transducer	Monitored continuously, repaired and calibrated as needed

BOOSTER STATIONS

The District maintenance staff visits each booster station monthly and performs a visual inspection. Each site visit includes visual inspection for cleanliness, leaks, damage, and proper operation, as well as checking pumps, bearings, motors, alarms, and sensors. Each booster station is painted annually to prevent corrosion.

INTERTIES

The District visits and inspects each metered intertie on a monthly schedule. During each visit, District staff visually inspect the condition of the vault, piping, valves, meter, and sump pump. Minor repairs are corrected during the visit and other repairs are completed as necessary.

DISTRIBUTION SYSTEM

The District exercises all valves in the system every two years and makes any casting adjustments or repairs as needed. Water main flushing for the entire system occurs every 3 years with a focus on dead ends and known problem areas. Leak detection is

performed for 1 week annually and all leaks that are discovered are repaired. Maintenance records of all system work are kept on file.

FIRE HYDRANTS

The District inspects and tests all hydrants every 2 years. The hydrants are painted, repaired, or replaced as needed depending on conditions found during inspection. More than 1,300 hydrants have been inspected and exercised each year since 2010. If these hydrants are found to be inoperable, they are typically repaired within 24 hours.

CROSS-CONNECTION CONTROL PROGRAM

The District has implemented a cross-connection control program and appointed a cross-connection control specialist. All backflow prevention assemblies are tracked in a database maintained by the District. All customers with backflow assemblies are notified annually of their duty to test the assemblies. A copy of the District's Cross Connection Control Program and the program's establishing resolution are included in Appendix L.

EMERGENCY RESPONSE PROGRAM

Water utilities have the responsibility to provide water supply in a reliable manner at all times. Therefore, utilities must reduce or eliminate the effects of natural disasters, accidents, and intentional acts.

Though it is not possible to anticipate all potential disasters affecting the District's water system, formulating procedures to manage and remedy several common emergencies is appropriate. The District provides guidelines for the general assessment of an emergency situation in the Emergency Response Manual. The Manual recommends establishing an Emergency Operations Center (EOC). Once a general assessment of the situation has been completed, the Manual provides "decision trees" outlining step-by-step procedures for emergency situations such as severe weather events, earthquakes, power failure, and communication failure.

The District maintains two emergency phone number lists for use by District personnel. One list is District staff phone numbers, addresses, and cell phone numbers. The second list includes the numbers for emergency services, generator rentals, adjacent utilities, fuel suppliers, parts suppliers, safety equipment, pumper trucks, contractors, and consultants. The emergency phone numbers are updated frequently and kept in the Emergency Response Manual.

Table 8-4 provides a list of emergency preparedness tasks and their various stages of completion that the District is currently pursuing. With the exception of tasks that will be ongoing, the District intends to complete the tasks within the next 3 years.

TABLE 8-4

Emergency Preparedness Tasks and Projects

Task	Status
Educate customers regarding emergency preparedness	Ongoing
Coordinate emergency response and preparedness with neighboring jurisdictions	Ongoing
Identify non-potable water sources for back-up firefighting water	Complete
Make plan to house and feed District employees and families during an emergency event	Complete
Purchase emergency supplies	Complete
Prepare employees and their families for emergency response	Complete
Distribute emergency water to customers	Complete
Stock repair materials	Complete
Install a portable emergency supply storage trailer	Complete
Install back-up communications and data processing equipment	Complete
Ensure adequate cash/credit available for emergency purchases	Complete
Construct security improvements at reservoir and master meter sites	Complete
Install isolation valve actuators at reservoir outlets	Complete
Implement recommendations of the Inglemoor Transmission Main Seismic and River Crossing Study	Complete
Construct SEOC	Complete

SAFETY PROCEDURES

Work place hazards for this system are primarily limited to confined space entry, electrical equipment, and traffic hazards associated with doing work in the right of way. Confined space issues are a concern for water system facilities, due to the potential for falls and the potential for lethal gasses in underground facilities such as valve vaults.

Operator training is an important component in maintaining a safe and reliable water system. At a minimum, all personnel performing water system related duties receive training in the following areas:

- Confined space
- Trenching and shoring
- Traffic flagging
- First Aid

MAINTENANCE RECORD SYSTEM

The District maintains a system database that serves, along with various other functions, to track customer complaints and maintenance work orders. When a complaint or a work order is filed, the work in question is assigned a specific number. The database will call up this number until the work in question is completed. Construction completion reports for all distribution main replacement and extension projects are maintained. This is the District's method of tracking work orders and ensuring completion.

STAFFING RESPONSIBILITIES

The District has outlined the tasks of the various roles within the water utility.

WATER QUALITY COORDINATOR

The Water Quality Coordinator receives all inspection requests, attends preconstruction and plan review meetings, and coordinates with Supervisors when staffing assistance is needed. The Coordinator manages tank levels and performs all routine and investigative water samples.

DISPATCH

The Dispatch acts as communications hub for operations, processes work orders, develops reports, drafts letters, prepares notifications, and responds to customer service calls.

WATER SUPERVISOR

The Water Supervisor develops weekly, monthly, and annual work schedules and oversees the progress of those schedules. The supervisor ensures that performance plans are adhered to and resources are allocated appropriately. This position ensures that performance evaluations are completed on time and ensures that proper training is provided to guide and assist employees with continued development.

UTILITY LEAD WATER SERVICE

The Utility Lead Water Service works closely and communicates with the Supervisor and reinforces the Supervisor's expectations. This position develops daily work schedules and regularly meets with crew regarding upcoming workload assignments. This position consistently plans, guides, coaches, and directs crews to perform work duties as assigned and in a safe, efficient manner.

WATER SERVICE GROUP CREW

The Water Service Group Crew performs a wide variety of work tasks, including maintenance of fire hydrants, system valves, water services, paving, roadway cuts and patches, booster stations, reservoir work, inspections, control valves, emergency repairs, water main flushing, vehicles and equipment, electrical, and telemetry controls.

UTILITY LEAD WATER METERING

The Utility Lead Water Metering is responsible for receiving and providing response to all water customer service calls related to billing and leaks. This position works closely with the Supervisor and consistently communicates and reinforces the Supervisor's expectations. Develops daily work schedules and regularly meets with crew regarding upcoming workload assignments. This position consistently plans, guides, coaches, and directs crews to perform work duties as assigned. The Utility Lead Water Metering frequently works with the Water Service Group Crew and is charged with ensuring specific work tasks are completed in a safe and efficient manner.

WATER METERING GROUP CREW

The Water Metering Group Crew performs specialized work tasks concentrated in the areas of customer service and water metering. Typical duties of this work group consist of meter readings, meter installations, testing, maintenance, repairs and replacement of all meters (including domestic, irrigation, fire, and master meters), door tag issuance, and service notifications, customer leaks, account activation and deactivation, meter box/vault, meter setters, and water service repairs (outside roadway).

UTILITY LOCATOR

The Utility Locator responds, manages, and performs utility locates and line marker installations. This position also performs leak checks, follows up on easement issues, and responds to customer service calls. The Locator reports to the Water and Sewer Supervisors and is backed up by various assigned individuals within the workgroups.