Operations and Maintenance

8

INTRODUCTION

The City of Stanwood's (City) water operations and maintenance (O&M) program consists of the following elements.

1. Normal operation of the water supply, treatment, and distribution system.
2. Emergency operation of the water system with one or more of the components not available for normal use due to natural or man-made events.
3. Preventive maintenance program for ensuring that the water system is maintained in accordance with generally accepted standards.
4. Cross-connection control program, as required by state law, to ensure that there is no threat to the integrity of the water supply due to contamination from a customer's operations.

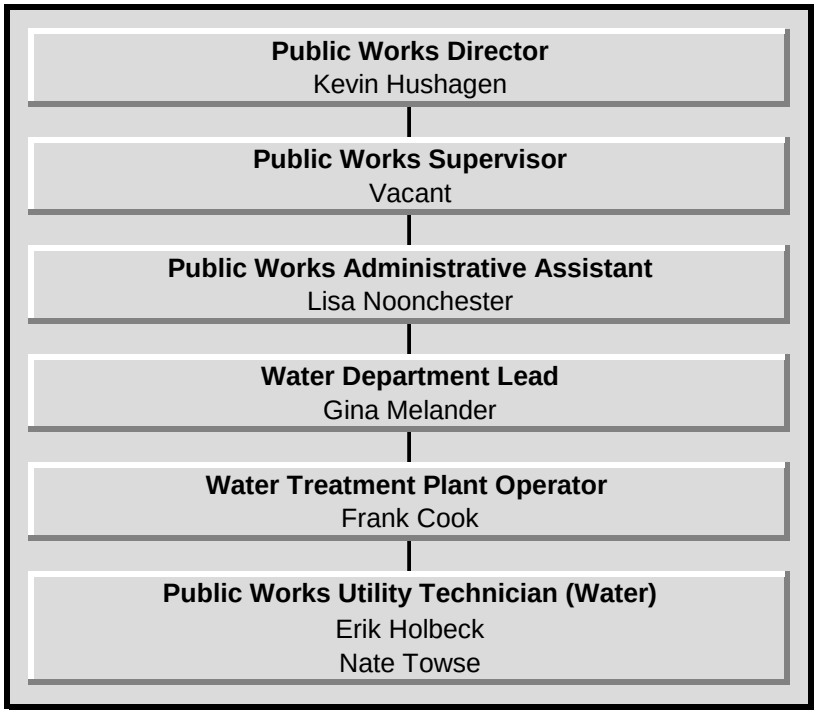
NORMAL OPERATIONS

City Personnel

The City's water department functions under the direction of the Public Works Director. The Public Works Supervisor supervises daily operations of the water department and reports to the Public Works Director as shown in **Table 8-1**.

The current water department O&M staff consists of several maintenance personnel that function under the Public Works Supervisor, as shown in **Table 8-1**. The water system tasks that are performed by the O&M staff include inspection, testing, installation, and repair of system facilities; routine operation and preventive maintenance; record keeping; administrative tasks; general clerical work; and corrective or breakdown maintenance required in response to emergencies.

Table 8-1
Water Department Organization Chart



Personnel Responsibilities

The key responsibilities of the water operations and maintenance staff are summarized below:

Public Works Director – Directs the activities of all divisions of the Public Works Department. Represents the City at regional activities.

Public Works Supervisor – Plans and directs the maintenance and operations activities of the water and sewer divisions. May represent the City at regional activities.

Public Works Administrative Assistant – Provides secretarial and administrative services to the utility divisions.

Water Department Lead – Performs maintenance and operation of water facilities and related work. Normally is in charge of job site activities.

Water Treatment Plant Operator – Oversees the operation and maintenance of the City's water treatment facilities and is responsible for the cross connection control specialist (CCS) program. Conducts complex water sampling and testing procedures and prepares water quality reports for review by the Public Works Supervisor.

Public Works Utility Technician (Water) II/III – Performs higher level technical aspects of maintenance, operation, and repair of water facilities and related work.

Public Works Utility Technician (Water) I – Performs manual labor and operates light equipment for maintenance and construction of water facilities. May perform meter-reading tasks.

Certification of Personnel

Washington State Administrative Code (WAC) Chapter 246-292 requires that the City's water system is operated under the direct supervision of a Certified Operator. The City's water system requires a Water Distribution Manager. The addition of the Bryant Well Field Water Treatment Facility in 2008 added the requirement of a Water Treatment Plant Operator. In addition, specialty certification is required for backflow device inspection and testing. **Table 8-2** shows the current certifications of the City's water O&M staff. It is City policy to maintain a well-qualified, technically trained staff. The City annually allocates funds for personnel training, certification, and membership in professional organizations, such as the American Water Works Association (AWWA). The City believes that the time and money invested in training, certification and professional organizations are repaid many times in improved safety, skills, and confidence.

Table 8-2
Personnel Certification

Name	Position	Certification
Kevin Hushagen	Public Works Director	WDS2, WDM3, WTPO2, CCS
Gina Melander	Water Department Lead	WDS1, WDM2, WTPO2, CCS
Erik Holbeck	Public Works Utility Technician (Water)	WDM2, WTPO2, CCS, BAT
Frank Cook	Public Works Utility Technician (Water)	WDM2, WTPO2, CCS, BAT

Certification Definitions
WTPO - Water Treatment Plant Operator
WDM - Water Distribution Manager
WDS - Water Distribution Specialist
CCS - Cross Connection Control Specialist
BAT - Backflow Assembly Tester

Available Equipment

The water department has several types of equipment available for daily routine operation and maintenance of the water system. The equipment is stored at the City's Public Works facility. If additional equipment is required for specific projects, the City rents or contracts with a local contractor for the services needed. A stock of supplies in sufficient quantities for normal system operation and maintenance and anticipated emergencies is stored at the Public Works facility. A list of major equipment used in the normal operation of the water system is shown in **Table 8-3**.

Table 8-3
Equipment List

Major Equipment
1 - 2 yd Dump Truck
1 - 1 Ton Service Trucks
2 - Small Pickup Trucks
1 - Trailer Mounted Air Compressor
1 - Caterpillar Backhoe
1 - 16' Trailer
Minor Equipment
1 - 3" Centrifugal Trash Pumps
1 - 2" Centrifugal Trash Pumps
1 - Locator
1 - Compactor
1 - Leak Detecting Device
Miscellaneous small tools, etc.
Communications Equipment
Cell Phones for all staff
Readily Available Equipment
1 - 5 yd Dump Truck
1 - 2 yd Dump Truck
1 - Street Sweeper
1 - John Deere Back Hoe
1 - Light Plant
1 - Vactor Truck

The following representatives typically provide supplies and chemicals to the City.

- Supplies: H.D. Fowler, 6016 29th Drive NE, Marysville, WA 98288, (360) 651-2400
- Supplies: HB Jaeger, 1830 16th Street, Snohomish, WA 98290, (360) 568-5958
- Supplies: HD Supply, 5823 238th Street SE, Woodinville, WA 98072, (425) 483-2724
- Supplies: Ferguson Water Works, 1012 132nd Street SW, Everett, WA 98204, (425) 742-4748

The water department utilizes several different types of communications equipment to ensure a reliable and redundant means of communication within the department. All employees are equipped with cellular telephones and some of the cell phones are equipped with two-way radios that are capable of communicating with similar two-way radios at the Public Works facility and other departments. The cellphones also provide personnel the capability to communicate, as necessary, with other cities, emergency support services, and Snohomish County (County).

Routine Operations

Routine operations involve the analysis, formulation, and implementation of procedures to ensure that the facilities are functioning efficiently, and meeting pressure requirements and other demands of the system. The utility's maintenance procedures are good, with repairs being made promptly so customers receive high-quality water service.

Continuity of Service

As a municipality, the City has the structure, stability, authority and responsibility to ensure that water service will be continuous. For example, changes in the City Council or staff would not have a pronounced effect on the City's customers or quality of service.

Routine Water Quality Sampling

The Washington State Department of Health (DOH) has adopted federal regulations that specify minimum monitoring requirements for water systems. The sampling requirements depend on the population served, source type, and treatment provided. The specific requirements are contained in WAC 246-290-300, and the minimum monthly routine coliform sampling requirements are summarized in Table 2 of the April 1999 "Drinking Water Regulations." DOH also provided the City with an annual summary of all required water quality testing. The City currently performs all routine coliform sampling throughout the distribution system. Further discussion of the water quality monitoring program is contained in **Chapter 6** and **Appendix J**.

Cross-connection Control

The City adopted a cross-connection control program in 1987 to comply with WAC 246-290-490 pertaining to contamination of potable water due to cross connections. The Cross-Connection Control Program was updated with the Comprehensive Water System Plan and is included in **Appendix G**. Backflow prevention devices are required at service connections where a potential for contamination exists, as outlined in the City's Municipal Code. A copy of the Water Utility Regulations Code, Chapter 12.18, which outlines the City's cross-connection control program, is contained in **Appendix N**. The Water Treatment Plant Operator is required to be a certified Cross-connection Control Specialist, as shown in **Table 8-2**.

Recordkeeping and Reporting

DOH has enacted regulations for recordkeeping and reporting that may be found in WAC 246-290-480. The regulations identify recordkeeping and reporting procedures for operations and water quality testing.

Recordkeeping

Records shall be kept for chlorine residual and other information as specified by DOH. DOH requires retention of critical records dealing with facilities and water quality issues as summarized below.

- Bacteriological analysis results: 5 years.
- Chemical analysis results: for as long as the system is in operation.
- Daily source meter readings: 10 years.

- Other records of operation and analyses as may be required by DOH: 3 years.
- Documentation of actions to correct violations of primary drinking water standards: 3 years after last corrective action.
- Records of sanitary surveys: 10 years.
- Project reports, construction documents and drawings, inspection reports, and approvals: life of the facility.
- Construction Completion Reports: life of the facility.

The City's recordkeeping procedure is as follows.

1. The field technicians provide information to the Public Works Technician Lead (Water) or Water Treatment Plant Operator, who must review the information prior to submittal to the Public Works Supervisor. Upon review of the information/report, the Public Works Supervisor shall be the responsible party to file all documents to the reporting agencies.
2. The information is given to the secretary and is filed at the Public Works facility.

Reporting

1. The City must report the following to DOH.

- Within 48 hours: A failure to comply with the primary standards or treatment technique requirements specified in Chapter 246-290 WAC.
- Within 48 hours: A failure to comply with the monitoring requirements specified in Chapter 246-290 WAC.
- As soon as practical, but no later than 24 hours: All Tier 1 violations, including a violation of a primary maximum contaminant level (MCL). A complete list of Tier 1 violations is located in Code of Federal Regulations (CFR) 141.202.
- As soon as practical, but no later than 24 hours: A backflow incident per WAC 246-290-490 (8)f.

2. The City must submit to DOH all applicable reports required by Chapter 246-290 WAC. Monthly reports are due by the tenth day of the following month, unless otherwise specified.
3. Daily source meter readings must be made available to DOH on request.
4. Total annual water production records for each source must be made available to DOH upon request.
5. A water facilities inventory and report form (WFI) must be submitted to DOH within 30 days of any change in name, category, ownership, or responsibility for management of the water system.
6. The City must notify DOH of the presence of:

- Coliform in a sample within 10 days of notification by the testing laboratory; and

- Fecal coliform or E. coli in a sample by the end of the business day in which the City is notified by the testing laboratory.

7. When a coliform MCL violation is determined, the City must:

- Notify DOH within 24 hours of determining acute coliform MCL violations;
- Notify DOH before the end of the next business day when a non-acute coliform MCL is determined; and
- Notify water customers in accordance with WAC 246-290-495.

8. If volatile organic compound (VOC) monitoring is required, a copy of the results of the monitoring and any public notice must be sent to DOH within 30 days of receipt of the test results.

Other Reports

Several other reports are required for Washington State agencies, including the Department of Revenue, Department of Labor and Industries, Department of Social and Health Services, Department of Ecology, and the Employment Security Department. All these reports are completed according to their instructions.

Operations and Maintenance Records

Facilities Operations and Maintenance Manuals

O&M manuals are available for staff members' reference. These manuals are kept on file at the Public Works facility with relevant copies at major facilities, such as the Bryant Well Field Water Treatment Facility. The City intends to maintain its policies of requiring complete O&M manuals for all new equipment.

Mapping and As-Built Drawing Records

Drawing maintenance is essential to maintenance crews, City planners, developers, and anyone else needing to know how the water system is laid out throughout the City. The drawing records are stored in an organized file at the Public Works facility and are maintained by the Public Works Department.

Operations and Maintenance Records

Records are stored at the Public Works facility for the following items.

- Well sounding and static water levels
- Water usage
- Bacteriological tests
- Backflow and cross connections
- Inorganic chemical tests
- VOC tests
- Synthetic organic compound tests
- Water samples from new developments
- Lead and copper tests

- Chlorination levels
- Water used for construction
- Hydrant repairs
- Precipitation
- Hydrant meter forms
- Water maintenance
- Pump motor tests
- Hydrant databases
- Confined spaces
- Vandalism forms
- Water consumable inventory
- Water main flushing
- Water main notes
- Water worksheets
- Customer complaints

Safety Procedures and Equipment

Safety is a primary concern and responsibility of all water O&M staff. The City has taken steps toward educating its staff and providing resources to ensure a safe working environment. The City will strive to improve its safety program on an ongoing basis. The AWWA publishes a manual entitled *Safety Practices for Water Utilities (M3)* that describes safety programs and provides guidelines for safe work practices and techniques for a variety of water utility work situations.

The following identifies procedures to be followed for O&M tasks that involve the most common potential work place hazards in the water system.

Use of Chlorine or Chlorine Products

Standard Procedure – Handle with care, provide adequate ventilation, and wear safety glasses and rubber gloves.

Use of Water Treatment Chemicals

Standard Procedure – Follow material safety data sheets (MSDS) and facility standard operating procedures contained in the *Bryant Well Field Treatment Facility Operation and Maintenance Manual.*

Working in Confined Spaces

Standard Procedure – Follow state requirements for confined space entry.

Working Around Heavy Equipment

Standard Procedure – Obtain proper training and follow all safety procedures.

Working in Traffic Areas

Standard Procedure – Wear proper clothing and provide adequate signage and flagging for work area.

Working on or Around Water Reservoirs

Standard Procedure – Follow proper safety harness procedures for working on tall structures.

Working in or Around Pump Stations

Standard Procedure – Obtain proper training and follow all safety procedures for working on pumps and electrical equipment.

Working on Asbestos Cement (AC) Water Main

Standard Procedure – Obtain proper training and follow all safety procedures for working with asbestos materials.

The Public Works Department follows all appropriate Occupational Safety and Health Administration (OSHA) and Washington Industrial Safety and Health Act (WISHA) regulations in its day-to-day operations and complies with the following state requirements:

- WAC 296-62-145 to 14529 Part M – Entry into confined spaces.
- WAC 296-155-650 to 66411 Part N – Shoring of open ditches.
- WAC 296-155-429 – Lockout-tagout for work on energized or de-energized equipment or circuits.
- Chapter 296-155 WAC Part C1 – Fall restraint for access to the top of the City's water reservoirs.
- Manual on Uniform Traffic Control Devices (MUTCD) – Traffic control for work in the public right-of-way.

Additional safety procedures are documented in the City's Accident Prevention Program.

EMERGENCY OPERATIONS

Capabilities

The City is well equipped to accommodate short-term system failures and abnormalities in accordance with WAC 246-290-420. Its capabilities are as follows.

Multiple Supply Capability

The City could lose the operation of one of its groundwater wells without adversely impacting its ability to meet normal customer demands. By the end of 2014, the City will have three operational wells that could be used to provide customers with water in an emergency.

Multiple Reservoirs

Water storage is provided by five active reservoirs that are located at two different sites. The duplication of reservoirs in two of the pressure zones provides sufficient redundancy to prevent service disruption when one of the reservoirs is out of service for cleaning, painting, or repairs.

Distribution System

The City has attempted to loop water mains wherever possible to improve water circulation (i.e., water quality) and minimize impacts to the system in the event that a portion of the distribution system must be taken out of service for maintenance or repairs.

Emergency Equipment

The City is equipped with the necessary tools to deal with common emergencies. If a more serious emergency should develop, the City will hire a local contractor who has a stock of spare parts necessary to make repairs to alleviate the emergency condition.

Emergency Telephone

Key or on-call personnel can be reached by the Police Department and all emergency situations are resolved by calling 911 or the water emergency number (360) 629-9781 extension 6.

On-call Personnel

The on-call person is equipped with a service vehicle and can generally respond to a call within 40 minutes. A list of emergency telephone numbers is provided to each on-call employee. New employees are not placed "on-call" until they are familiar with the water system and maintenance procedures and have met the minimum standards, certification, and qualifications.

Material Readiness

Some critical repair parts, tools, and equipment are on-hand and kept in fully operational condition. As repair parts are used, they are re-ordered. Inventories are kept current and adequate for most common emergencies that can reasonably be anticipated. The City has ready access to an inventory of repair parts, including parts required for repair of each type and size of pipe within the service area.

Emergency Response Plan and Vulnerability Assessment

A Vulnerability Assessment and Emergency Response Plan have been prepared that conform to the requirements of the Bioterrorism Act of 2002. The documents contain a vulnerability assessment of the City's water system facilities, a contingency operation plan for responding to emergency events, a list of water personnel responsible for making decisions in emergency situations and other elements. The Vulnerability Assessment and Emergency Response Plan also contain detailed action plans and other confidential information that is exempt from public disclosure under the provisions of the Revised Code of Washington (RCW) 42.56.210. They are available for review by authorized personnel on a need-to-know basis. Contact the Emergency Response Plan Administrator for additional details.

An update to the City's Emergency Response Plan, including a review of the City's e-coli response plan is identified as an improvement in Chapter 9.

Public Notification

The Federal Safe Drinking Water Act (SDWA) and WAC 246-290-495 require purveyors to notify their customers if any of the following conditions occur.

- Failure to comply with a primary MCL described under WAC 246-290-310.
- Failure to comply with a surface water treatment technique.
- Failure to comply with monitoring requirements under Chapter 246-290 WAC.
- Failure to comply with testing requirements.
- Failure to comply with a DOH order.
- Failure to comply with a variance or exemption schedule from DOH.
- If the system is identified as a source of waterborne disease outbreak.
- If DOH issues the system a category red operating permit.
- If DOH issues an order.
- If the system is operating under a variance or exemption.

Specific notice content, distribution channels, and time limit requirements, as specified in WAC 246-290-495, must be in compliance when notification is required. The City's public notification notice and organizational chart for response is included in **Appendix P**.

PREVENTIVE MAINTENANCE

Maintenance schedules that meet or exceed manufacturer's recommendations have been established for all critical components in the City's water system. The following schedule is used as a minimum for preventive maintenance.

Storage Facilities

Daily	Visual and audio inspections.
Weekly	Check security and inspect facilities for proper operation.
Annually	Clean and check interior condition, vents, hatches, etc., on reservoirs.
As Needed	Repaint interior and exterior as needed on reservoirs (estimated 10 to 20 year frequency).

Bryant Well Field Treatment Facility

Daily	Perform activities on "Daily Checklist" in facility O&M Manual.
Weekly	Perform activities on "Weekly Checklist" in facility O&M Manual.
Monthly	Perform activities on "Monthly Checklist" in facility O&M Manual.
Bi-Monthly	Perform activities on "Bi-Monthly Checklist" in facility O&M Manual.
Quarterly	Perform activities on "Quarterly Checklist" in facility O&M Manual.
Semi-Annually	Perform activities on "Semi-Annual Checklist" in facility O&M Manual.
Annual	Perform activities on "Annual Checklist" in facility O&M Manual.
As Required	Perform activities on "Variable Checklist" in facility O&M Manual.

Distribution System

Water Mains	
Annually or As Needed	Leak survey.
Annually	Flush.
Wells	
Daily	Log and record volume delivered and current supply rate.
Weekly	Check security.
Annually	Check all valves and screens; check control valve settings.
As Needed	Maintain electrical and mechanical equipment; paint structures and piping.
Booster Pump Stations	
Daily	Visual and audio inspection.
Weekly	Observe and record motor current draw (three phases); check packing; log and record volume delivered and pump motor hours; check motor oil level; measure and record discharge pressure; check motor noise, temperature and vibration.
Weekly	Check security.
Annually	Change motor oil.
Annually	Take inventory of parts, pumps and motors.
As Needed	Calibrate flow meter; maintain electrical and mechanical equipment; paint structures and piping.
Engine Generator Sets	
Weekly	Operate to achieve normal operating temperatures; observe output.
As Needed	Replace fluids and filters in accordance with manufacturer's recommendations (or more frequently depending on amount of use).
As Needed	Perform tune-up; replace parts as necessary.
Pressure Reducing Stations	
Annually	Flush and check all valves and screens; check pressure settings; rebuild and paint every five years, or as necessary.

Isolation Valves	
Annually	Locate valve boxes and check accuracy of measurements and permanence of landmarks in valve record book. Operate full open/closed; uncover where buried; clean out valve boxes and repair as necessary.
Hydrants	
Semi-Annually	Check for leakage and visual damage. Operate and flush; check drain rate; lubricate as necessary; measure pressure; paint as necessary. Check nozzle and cap threads, clean and lubricate per manufacturer's recommendations. Replace lost and damaged gaskets. Check and operate auxiliary valve in accordance with the valve maintenance schedule. Leave in open position. Inspect drain system to ensure proper drainage and protection from freezing weather.
Meters	
2 to 10-Year Intervals	Time and measure volume of meter-delivered flow; dismantle, clean and inspect all parts; replace worn or defective parts; retest meter for accuracy. Frequency varies based on meter size.
Air and Vacuum Release Valve Assemblies	
Annually	Flush and inspect.
Blowoff Assemblies	
Annually	Flush and inspect.
Telemetry and Control System	
Monthly	Visually inspect cabinets and panels for damage, dust. and debris.
Semi-Annually	Inspect inside of cabinets and panels for damage, dust. and debris.
Semi-Annually	Vacuum clean all modules.
Semi-Annually	Test alarm indicator units.
Semi-Annually	Clean and flush all pressure sensitive devices.
Semi-Annually	Visually inspect all meters to coordinate remote stations.
Annually	Check master and remote telemetry units (RTUs) for proper operation; repair as necessary.

Tools and Equipment

Rolling Stock	
Daily	Check all fluid levels and brakes.
As Needed	Replace fluids and filters in accordance with manufacturer's recommendations (or more frequently depending on type of use).
Tools	
As Needed	Clean after each use; lubricate and maintain as necessary.

STAFFING

The preventive maintenance procedures, as well as the normal and emergency operations of the utility, are described in the previous sections. The hours of labor and supervisory activity required to effectively provide this ongoing maintenance and operations schedule forms the basis for determining adequate staffing levels.

Current Staff

The current staff includes supervisory personnel, technicians, maintenance workers, and office personnel engaged in operating and maintaining the water system. There are currently four full-time employees and one temporary summer employee supporting the water system. Since the Public Works Director also supports the other City utilities, only a portion of his time is available for the water utility. There is additional staff that could assist the Water Department staff in an emergency but not as part of their routine daily work. Therefore, the water utility is supported by approximately four and a half full-time field staff equivalents.

Recommended Staff Level

A water system is a complex assortment of equipment and parts that require both operation and maintenance. The estimated level of effort required to provide effective operation and maintenance in this document is based on a compilation of national standards, such as those provided by the AWWA, and the pro-forma standards provided by similar water systems in the Pacific Northwest.

The available hours of a person during a year are not the total hours worked. There are many hours spent in training, non-work status, and other activities that deduct from the 2,080 hours in pay status during a year. The total available hours are typically reduced to 1,540, as shown in **Table 8-4**.

Table 8-4
Annual Available Hours per Person

Time Available Per Year Per Person	
Beginning Hours Available	2,080
Less average vacation of 3 weeks per year	-120
Less average sick leave of 2 weeks per year	-80
Less holidays of 10 days per year	-80
Less average training of 40 hours per year	-40
Less average small tasks other than above of 1 hour per day	-220
Net Total Available Hours Per Year Per Person	1,540

Preventive maintenance is the work performed to keep the water system in the condition necessary to provide the expected service. Preventive maintenance needs are based on the physical composition of the water system. Each component has a preventive maintenance need that ranges from minor to significant. **Table 8-5** provides the detail of the recommended staffing level for the water system's preventive maintenance program. The largest single activity is the Bryant Well Field Treatment Facility which is comprised of many mechanical devices that require routine maintenance. As shown in **Table 8-5**, approximately 2.3 full-time employees are recommended for the preventive maintenance program.

Table 8-5
Preventive Maintenance Staff Needed

Description	Total Units In System	Frequency (Times/Year)	Time/Unit (Hours)	Time/Year (Hours)
Preventive Maintenance				
Hydrants	355	1	0.5	178
Isolation Valves, Hydrant Valves	1,084	1	0.25	271
Air and Vacuum Release Valves	4	1	0.5	2
Blowoff Assemblies	24	1	0.25	6
Meters	2,292	0.1	2	458
Leak Survey of Water Mains	66 miles	1	0.5	33
Flushing Water Mains	66 miles	1	5	328
Booster Pump Station	3	1	40	120
Pressure Reducing Stations	11	1	6	66
Bryant Water Treatment Facility	1	1	1680	1,680
Sources	5	1	50	250
Reservoirs	5	1	30	150
Telemetry and Control System	1	1	40	40
Total Hours Required				3,581
Total Full Time Staff Required (based on 1,540 hours per year per person)				**2.3**

The other component of O&M staffing is operations. Operations includes all activities other than preventive maintenance, such as water meter reading and repair of broken water mains. As a system ages, many of these activities can be expected to increase. Some operations staff demands can be reduced by replacing infrastructure with more efficient technology. Each technology or equipment upgrade should be analyzed for cost effectiveness. **Table 8-6** provides the recommended staffing level for the water system's operations program. As shown in **Table 8-6**, approximately 4.2 full-time employees are of staff is recommended for the operations program.

Table 8-6
Operations Staff Needed

Description	Total Units In System	Frequency (Times/Year)	Time/Unit (Hours)	Time/Year (Hours)
Operations				
Monitor System	11	260	0.3	858
False Alarm Response	1	12	2	24
Meter Reading	2,292	12	0.05	1,375
Groundskeeping	8	12	4	384
Inventory	1	1	40	40
Meter Repair/Replace	25	1	4	100
Main Breaks	12	4	8	384
System Failures	4	4	8	128
Hydrant Repairs	10	1	8	80
Service Connections	100	1	8	800
Main Connections	6	1	24	144
Water Quality Sampling	8	12	0.5	48
Administration	1	260	8	2,080
Total Hours Required				6,445
Total Full Time Staff Required (based on 1,540 hours per year per person)				**4.2**

To achieve the level of operations and maintenance shown in **Table 8-7**, approximately 6.5 full-time personnel are required for the water system alone. The City's current available staff is lacking 2 full-time equivalents (FTE) to meet these requirements. In addition, as the water system expands in the future, additional review of staffing needs will be required. The City plans to add staff to optimize preventive maintenance and meet the additional requirements from system expansion, as the budget allows.

Table 8-7
Total Staffing Recommendation

Total Staff Recommended	
Preventive Maintenace Hours	3,581
Operations Hours	6,445
Total Hours	10,027
Total Full Time Staff Required (based on 1,540 hours per year per person)	**6.5**

OPERATION AND MAINTENANCE IMPROVEMENTS

Other proposed improvements not mentioned above are addressed in **Chapter 9** and included in the City's Capital Improvement Program.