Appendix P

OPERATION AND MAINTENANCE PLAN

City of Tumwater

Operation and Maintenance Plan

August 2019 Update

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Dan Smith, Water Resources Program Manager

August 2019

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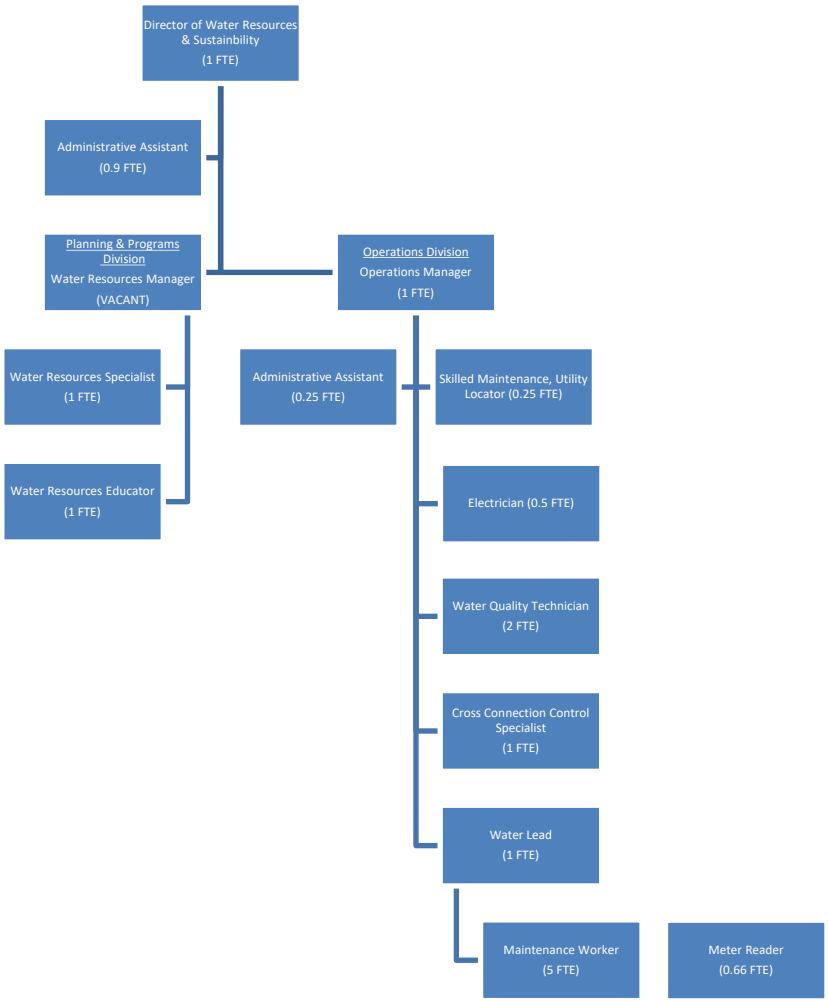
PURPOSE

The purpose of this plan is to provide information to water system personnel regarding the operation and maintenance of the water treatment and distribution system. This plan has been outlined to support the Comprehensive Water System Plan required by the WA Department of Health (DOH).

This plan shall be accessible to the operator on duty at all times and available to DOH upon request. This plan shall be revised as necessary to reflect any changes that may occur. At a minimum, this plan shall be revised concurrent with the Water System Plan update every ten years.

OPERATIONAL RESPONSIBILITIES

The Operations and Maintenance Division is part of the Water Resources & Sustainability (WRS) Department for the City of Tumwater. Both Water Resources and Operations share responsibilities for managing the water utility under the direction of the Director. The following is an organizational chart outlining the relationship between the two divisions.



OPERATOR CERTIFICATION

The Washington State Department of Health (DOH) administers the waterworks operator certification program. The City of Tumwater Operations Division personnel that routinely work with the water distribution system and are currently certified by the State can be found in Table 1, below. The table will be updated as needed to reflect current staff certifications.

Table 1: City of Tumwater Personnel Department of Health Certifications

Name	Title	Certification Level	Cert No.
Steve Craig	Operations Manager	WDM IV, Cross Connection Control Specialist, WTPO II	5536
Michael Thomas	Water Lead	WDM I IT	14627
Forrest Bailey	Cross Connection Control Specialist	Cross Connection Control Specialist and Backflow Assembly Tester	014683 and B6866
Curt Shields	Water Quality Technician	WDM IV and WTPO II	12887
Dennis Ashe	Water Quality Technician	WDM III and WTPO I	12335

DOH establishes minimum operator certification requirements for public water systems based on their size and complexity. DOH requires the City of Tumwater's public water system to be managed and operated by a certified Water Distribution Manager III or higher.

The City currently satisfies the certification requirements for the size and complexity of its water system. Tumwater encourages its employees to continue their professional growth, and pays for training and relevant certification fees. The Operations Division also encourages all maintenance and skilled maintenance workers currently working in the water distribution group to obtain a Washington State Water Distribution Manager Certification (WDM).

Water system maintenance personnel are required to obtain an Asbestos Cement Pipe Handling certification to repair or replace asbestos water lines. This certification requires an annual refresher class. A "Competent Person" trained in asbestos removal and inspection of any and all work dealing with asbestos pipe is required to be present during such activities in order to comply with Labor and Industries Standards.

Table 2: Operations Division personnel certified in Asbestos Cement Pipe Handling

Name	Title
Michael Erickson	Lead Maintenance Worker (Temporary)
Kahle Waters	Maintenance Worker
David Schwen	Maintenance Worker

Currently, there are three Operations staff certified as a "Competent Person" for asbestos removal and inspection. Asbestos pipe currently constitutes a minimal percentage, approximately 9%, of the City's distribution system. As repairs or replacement are necessary, the City will contract with a Competent Person to oversee the maintenance activity.

FUTURE OPERATOR CONSIDERATIONS

As the size and complexity of the water distribution system increases, maintaining the necessary level of knowledge on operating conditions, pending customer requests, regulatory matters, and health issues becomes more difficult. The City's current Water System Operator is the WRS Operations Manager. The direction given to water system operators by DOH is to have the operator be a person in "responsible charge". A person in "responsible charge" is one who is designated by the City to be the certified operator(s), and one who makes the decisions regarding the daily operational activities of a public water system, water treatment facility and/or distribution system that will directly impact water quality and/or quantity of drinking water. The Operator also makes decisions concerning process control and system integrity.

Typical responsibilities and activities associated with the operation of a public water system include the following:

- Ensure that all daily operation and maintenance activities of the water system are completed in accordance with acceptable public health practices and water industry standards.
- Perform water quality monitoring, maintain adequate records and take follow-up action, if necessary, to comply with state and federal drinking water regulations.
- Implement preventative maintenance programs; inspect treatment and other system components for malfunctions; keep adequate records; and make needed repairs.
- Analyze/review recording instrument readings and laboratory tests; determine sites and causes of any malfunctions; adjust various treatment processes or other components accordingly; and maintain a record of these.
- Implement a cross connection control program.
- Determine remedial actions in emergencies.

Recognizing that the above activities require detailed knowledge of the water system, it will be most efficient if the Certified Operator duties are solely focused on the water system. As the Operations Manager's time and attention is presently shared amongst three utilities (water, sewer and storm), street repair, and fleet maintenance, the City is reviewing options towards a management structure wherein the designated Certified Operator will focus solely on the water system and not share diverse responsibilities. While the current organizational structure is sufficient to meet the City's needs, the City will reevaluate this position annually as the system grows.

Considerations for the need of additional staff will be periodically addressed through a review of approaching thresholds, such as population served, number of connections, and water treatment requirements.

SAFETY PROGRAM

The City maintains a written safety program, which all employees are required to read upon hire. This program conforms to the Occupational Safety and Health Act (OSHA) and Washington Industrial Safety and Health Act (WISHA) regulations. Safety Data Sheets (SDS) are maintained on file for all chemicals as part of the workers right to know program and are readily available to all employees.

The City provides safety equipment and training to all pertinent employees, including first aid kits, fire extinguishers in all vehicles and regular job sites, and personal protective equipment. The Operations Division holds monthly safety meetings to address any current hazards and review safety procedures.

In the event of an immediate safety concern, staff shall notify supervisory personnel.

SAFETY CONSIDERATIONS FOR ALL MAINTENANCE ACTIVITIES

- Lock out/Tag out procedures will be followed when maintenance or repairs are required, including electrical, hydraulic and pneumatic.
- Hydraulic and pneumatic lock out requires that stored pressure will be bled off before continuing maintenance activity.
- Hearing protection is required when inside facilities while they are in operation.

CUSTOMER COMPLAINT RESPONSE

Customer concerns regarding service and quality are important performance measures to any public utility. It is the City's policy to respond by phone, or in person, to all customer concerns in an expeditious manner. All customer concerns and the City's response are recorded in the maintenance management database (Lucity) to establish any patterns, which might lead to improved service.

WRS Operations and Engineering are working to coordinate incoming reports and complaints received by various departments at the City, to track investigation activity, and to ensure an appropriate response was accomplished.

RECORDKEEPING AND REPORTING

The City maintains, at a minimum, the following records in digital or hard copy format for the specified time period:

Water Quality Analysis	**Duration**
Bacteriologic	5 years
Inorganic Chemical	Permanently
Volatile Organic Chemical	Permanently
Synthetic Organic Chemical	Permanently
Radionuclides	Permanently
Lead and Copper	Permanently
Source/Treatment Data	**Duration**
Well Logs	Permanently
Customer Records	**Duration**
Meter Readings	6 years
Service Account Records	Permanently
Complaints and Concerns	6 years
Cross Connection/Backflow Assembly Reports	Permanently
Other Records	**Duration**
Meter Test Records	Life of Meter
Maps and Drawings	Useful Life
Comprehensive Water System Plan	12 years
Water Quality Monitoring Plans	Useful Life
Equipment Maintenance Manuals	Life of Equipment
Valve Records	Valve Life
Hydrant Records	Hydrant Life
Wellhead Protection Plan	Permanently

The City reports all required information to DOH according to WAC 246-290-480 (2). Other records are available upon request.

WATER SYSTEM OPERATION AND CONTROL

Major system components and their functions are identified below.

WELLS

The City's water supply consists of seven primary wells, supplying water to two pack-tower aeration treatment plants. The water is then pumped to two reservoirs within the 350-elevation pressure zone. Well 3, 4, 6, 8, 16 and 17 are located in the Palermo Valley and supply water to the Palermo Aeration Treatment Plant. Wells 12 and 14 are located southwest of the Olympia Airport and supply water to the Bush Aeration Treatment Plant.

The water supply is supplemented with 4 additional sources, wells 9, 10, 11, and 15, located north of the Olympia Airport. These additional sources are utilized during high demand periods and during treatment plant maintenance. The City also maintains an emergency source, well 24, located on the Tumwater Valley Municipal Golf Course. All wells, with the exception of well 24, are controlled via radio or fiber optic telemetry and are set to turn on at various storage tank elevation points within the 350-zone.

Wells 3, 4, 6, 8, 16 and 17 and the Palermo Treatment Facility have an emergency power generator that allows the City maintain full production and treatment capability during power outages. The Bush treatment facility has a generator that is capable of operating both wells 12 and 14 and the aeration treatment facility. In the event of a failure at the Palermo Wellfield, the Bush treatment facility can provide production to meet the ***average*** daily demand.

RESERVOIRS

The City is divided into three pressure zones: 350, 454, and 549. The 350-zone consists of one 4-million gallon reservoir located on Barnes Blvd. and one 200,000-gallon (currently inactive) elevated reservoir located in the Tumwater Boulevard area. These two reservoirs supply water to the majority of the city as well as the two additional pressure zones through the use of booster stations located at the end of C St. SW and three additional reservoirs. The 454-pressure zone consists of one 1,000,000-gallon reservoir and one 80,000-gallon reservoir (currently inactive). Three 450-gpm booster pumps move water from the 350-pressure zone to both reservoirs in the 454-pressure zone.

The 549-pressure zone consists of a one million gallon reservoir and two booster pumps moving water from the 350-zone reservoir to the 549-pressure zone. Both the 454 and the 549 booster stations draw water from the same point near the 350-zone reservoir.

There are currently three interties between pressure zones controlled with Cla-Val pressure reducing/sustaining valves. In addition, there are two mainline pressure reducing valves controlling pressure within the 454 pressure zone and one pressure booster station increasing pressure to the Bush Mt. residential area.

TREATMENT PLANTS

Contamination of the Palermo Wellfield identified in the early 1990's prompted the City to examine treatment solutions. In 1999, construction was completed on the first packed tower aeration facility at the Wellfield. Because they achieve high air to water ratios and volatile contaminant removals approaching 99 percent, the packed tower system was chosen to remove volatile solvents previously detected in the groundwater. The aeration facility at Palermo employs a water distributor which introduces raw water evenly across the top of each tower, which is packed with plastic media engineered to maximize air-water contact. Air is blown upward through the tower against the direction of water flow. The treated water is collected at the bottom of the tower and pumped into the distribution system. This system is capable of treating 2,000 gpm. While the primary role of this aeration system is to remove contamination from volatile organic compounds, a secondary benefit is an increased pH through the removal of excess carbon dioxide. This secondary benefit helps decrease the corrosivity of the City's water and reduce the leaching of lead and copper in household plumbing.

The City has a second aeration facility at the Bush Wellfield capable of treating approximately 3,000 gpm. The sole function of this facility is to decrease the corrosivity of the water through the process described above. Volatile organic compounds have not been detected at the Bush Wellfield.

Packed tower systems, like other air stripping systems, are prone to clogging because of particulate buildup, rust-producing bacteria, and the precipitation of calcium carbonate. Historical operation has found the Palermo Wellfield more susceptible to the build-up of particulate matter, and therefore is scrubbed annually with ascorbic acid. All packed tower facilities are inspected semi-annually and scrubbed as needed.

DISINFECTION SYSTEMS

The treatment facilities and equipment will require checks and routine preventative maintenance to ensure proper operation. As the various components age, corrective maintenance activities will be required at an increasing frequency.

Routine O&M requirements for commercial-strength hypochlorite systems include:

- Replenishing the supply of hypochlorite solution. This involves coordinating monthly mini-bulk deliveries of solution at the Palermo WTF, Bush WTF, and booster pump stations (BPS). During the summer when the supplemental wells are in operation, additional transport of hypochlorite will be required, likely to be in two separate deliveries to fully replenish the tanks at supplemental well sites.
- Periodic verification/calibration and maintenance of the chemical metering pumps and residual analyzers.
- Periodic cleaning of the storage tanks and injection assemblies.
- Chlorination process monitoring and physical inspections.
- Preventative maintenance for electrical and mechanical components.
- Preparation of records and reports.

INTERTIES

For emergency purposes, the City of Tumwater maintains two interties with the City of Olympia, a 6-inch intertie on Capital Blvd at Carlyon Ave and an 8-inch intertie on Crosby Blvd at Mottman Rd. Both interties are controlled manually in cooperation with the City of Olympia.

The City installed an intertie and pressure reducing valve (PRV) between Lakeland Manor and the City's main water system. However, Lakeland Manor continues to be operated independently from the main water system.

DISTRIBUTION SYSTEM

The City's water distribution system consists primarily of 2-inch to 24-inch mains. The pipeline materials are primarily Asbestos-Cement (AC), Cast Iron (CI), Ductile Iron (DI), Galvanized (Galv.) and Polyvinyl Chloride (PVC). Individual service lines are primarily Galvanized (Galv.) or Polyethylene (PE), with some Copper (Cu), and Ductile Iron (DI).

The City has approximately 1,699 fire hydrants and approximately Update water service connections. All water service connections are metered.

BOOSTER STATIONS

There are currently three booster stations in operation providing water to the 454 and 549 pressure zones as well as supplying the Bush Mountain residential community.

Three 450-gpm-booster pumps move water from the 350-zone reservoirs to both reservoirs in the 454-pressure zone.

Two booster pumps move water from the 350-zone reservoir to the 549-pressure zone. Both the 454 and the 549 booster stations draw water from the same point near the 350-zone reservoir.

The Bush Mtn booster station increases service pressure for residential use and includes a by-pass to supply fire flow.

SYSTEM CONTROL AND TELEMETRY

The water system is monitored with a mix of radio-based and fiber optic network telemetry SCADA system. The SCADA system provides control, monitoring and alarms for the reservoirs, pump stations, wells and treatment facilities.

Future SCADA system improvements will utilize the City's growing fiber network as the primary communication backbone as the network becomes available at water facilities. The radio-based telemetry system will remain to provide communication redundancy as a backup in the event of a fiber network failure.

ROUTINE OPERATION OF TREATMENT FACILITIES

Routine maintenance is performed as recommended by manufacturer specifications. Operation and maintenance manuals supplied by the manufacturer are generally kept on file at the WRS Operations Office for reference. A system operation and maintenance schedule has been established for the listed system components below.

TREATMENT PLANT OPERATIONAL PROCEDURES

SHUT DOWN PROCEDURES

The following procedures are followed when plant maintenance is required:

1. Turn telemetry control of the pumps to the "*OFF*" position.
2. Verify system status using SCADA to include reservoir level and well pump status to ensure system demands will continue to be met during shut down period.
3. Turn local control to the *"OFF"* position.

STARTUP PROCEDURES

The City's aeration treatment facilities are normally set to automatic operation, activating when the water level in the 350-zone reservoir drops below a predetermined set point. During normal plant maintenance or a system failure, the following actions are taken to restart the plant:

1. Drain the sumps in the aeration towers.
2. Visually inspect equipment for readiness or failures.
3. Disinfect facility with chlorine as maintenance or repairs dictate; Chlorine must be circulated through the facility to disinfect entire plant.
4. Collect a bacteriological sample once all maintenance activities are complete.
5. When all maintenance and repair tasks have been completed, satisfactory bacteriological tests have been received, and lockouts removed, the facility can be opened to the system.
6. Reset all internal facility alarms and local HOA switch to automatic control mode.
7. Monitor and adjust chlorine feed rates as needed to maintain chlorine residual.

PREVENTATIVE MAINTENANCE

TREATMENT FACILITIES

Frequency	Action
Daily	1. Record production meter readings, collected automatically via telemetry. 2. Record pump running time, collected automatically via telemetry. 3. Check and record clearwell level, collected automatically via telemetry. 4. Conduct visual inspection of wells, Cla-Valves, equipment, buildings and fences.
Weekly	1. Inspect and clean all water system facilities. 2. Inspect security, locks, fences and gates. 3. Conduct grounds maintenance, including mowing and weeding. 4. Check and record pH levels. Data is recorded in the Operator's Log. 5. Visually inspect equipment, motors, belts pulleys, valves and air systems.
Monthly	1. Record data locally for all pumps and flow monitors. Data is recorded in the Pump Check Log. 2. Check operation of Cla-Valves. 3. Lubricate blower bearings. 4. Adjust Blower drive belts. 5. pH/Cl2 analyzer verification
Quarterly	1. Check belts on air compressor. 2. Change oil in air compressor. 3. Replace air compressor filters. 4. pH/chlorine analyzer calibration
Semi-Annual	1. Replace blower filters. 2. Inspect pack tower media, clean as needed. 3. Lubricate exhaust vent on Palermo Stripping Towers. 4. Exercise sump pump. 5. pH/Cl2 membrane cell replacement
Annually	1. Inspect and test flow meters. 2. Clean and Inspect Cla-Valves. 3. Inspect power and control systems. 4. Clean chlorine storage tanks.

WELLS

Frequency	Action
Daily	1. Review production meter readings, recorded automatically via telemetry. 2. Review pump running time, recorded automatically via telemetry. 3. Review well draw down data, recorded automatically via telemetry. 4. Visually inspect wells, Cla-Valves, equipment, buildings and fences.
Weekly	1. Grounds maintenance - mow and weed as needed.
Monthly	1. Record data locally for all pumps and flow monitors into the Pump Check Log. 2. Check operation of Cla-Valves. 3. Inspect and clean facilities.
Semi-Annually	1. Conduct draw down and recovery test. 2. Calculate and record specific capacity for each well.
Annually	1. Inspect and test flow meters. 2. Clean and inspect Cla-Valves. 3. Inspect power and controls systems.

Video inspection of wells is to be performed when well pump removal is required for maintenance and/or repair. Well rehabilitation will be required based on quarterly draw down and recovery test and/or specific capacity calculations.

RESERVOIRS

Frequency	Action
Daily	1. Visually check for signs of an overflow. 2. Visually inspect for integrity (leaking, cracking, or buckling). 3. Inspect fences and locks.
Monthly	1. Inspect ladders, hatches, and vents.
Annually	1. Inspect condition of painted surfaces (interior and exterior). 2. Inspect for sediment buildup on bottom or walls. 3. Inspect Corrosion Control equipment and adjust as necessary. 4. Exercise valves.
Every 3 Years	1. Conduct video inspection and clean as necessary.

BOOSTER STATIONS

Frequency	Action
Daily	1. Review production meter readings, collected and recorded automatically via telemetry. 2. Review pump running time, recorded automatically via telemetry.
Weekly	1. Grounds maintenance, mow and weed as needed
Monthly	1. Record data locally for all pumps and flow monitors. Data is recorded Pump 2. Check Log. 3. Check operation of Cla-Valves. 4. Inspect and Clean facilities.
Annually	1. Inspect and test flow meters. 2. Clean and inspect Cla-Valves. 3. Inspect power and control systems.

VALVES

Frequency	Action
Cyclical – Each valve inspected on an on-going rotational basis.	1. Visually inspect valve box and lid. 2. Clean debris from valve boxes as needed 3. Exercise valves — close and open fully a minimum of twice 4. Record condition of valve and number of turns to operate. Record data directly into Operations database. 5. Adjust valve boxes and/or install operating nut extension as needed. 6. Install valve box debris caps as needed. 7. Clear vegetation from around valves and valve markers. *Note: to be completed in conjunction with the UDF program.*

HYDRANTS

Frequency	Action
Annually	1. Clear vegetation from around and clean fire hydrants. 2. Inspect exterior surfaces of hydrant and guard posts. 3. Operate the hydrant fully. 4. Check for proper drainage. 5. Clean and lubricate access ports. 6. Where applicable, check oil reservoir and add as needed. 7. Install warning tag as needed. 8. Install Powder Coat hydrants as needed. 9. Document Inspection report in Lucity Asset Management System *Note: to be completed in conjunction with the UDF program.*

INTERTIES

Frequency	Action
Annually	1. Conduct mutual inspection with City of Olympia staff to verify intertie status.

WATER MAINS & SERVICES

Frequency	Action
Every 5 Years	1. Leak detection survey, completing 20% annually.

WATER METERS

Frequency	Action
Cyclical – Each meter inspected on an on-going rotational basis	1. Meter reading support; meter reader vacations, delinquent notices, customer service; Finance Department requests. 2. Meter repairs and calibrations.
Every 20 Years	1. Replace and calibrate water meters.

PRESSURE REDUCING VALVES/CONTROL VALVES

Frequency	Action
Annually Inspect	1. Clean and inspect all system PRVs. 2. Replace gaskets and O-rings. 3. Test, operate and exercise. 4. Rebuild valves every 3 years annual rotation.

MAIN FLUSHING – UDF PROGRAM

In 2009, the City completed a pilot Uni-Directional Flushing (UDF) program. The City anticipates implementation of a UDF program annually, cycling through the City to have flushed the entire distribution system every 5 years. The standard operating procedure for the UDF program is outlined below. Field flushing activities can be initiated after Engineering Department support is completed for map and flushing loop development, hydraulic modeling, preliminary inspections, public notification and pressure monitoring.

UNIDIRECTIONAL FLUSHING STANDARD OPERATING PROCEDURES

1. Isolate the section of water main to be flushed through valve sequencing. Use the field card for the specific flushing loop to identify the pre-flush valve sequencing requirements.
2. Mobilize at the hydrant/blowoff to-be-flushed and establish traffic control and field signage.
3. Identify and document any pre-existing site conditions that may present a potential liability if otherwise claimed to be due to flushing (e.g., property damage).
4. Plumb the hose with diffuser apparatus and pressure/sample tap assembly to the hydrant.
5. Identify the venue selected for water disposal and direct the hose and diffuser assembly to the appropriate location. Stabilize the diffuser. Avoid crossing private property and areas of vehicle traffic with the hose.
6. If discharging to a sanitary sewer, eliminate any potential for cross-connection.
7. Ensure there is an adequate supply of dechlorination tablets in the diffuser cell.
8. Slowly close the hydrant foot valve.
9. Slowly open the main hydrant valve to 100% open. Record the static hydrant pressure.
10. Check the reference cards for the appropriate pitot gauge reading based on the governing pipe diameter and the desired flushing velocity. Calculate the timing of sampling events.
11. Crack open the sidestream sample tap assembly.
12. Slowly open the foot valve to achieve the desired flow based on the pitot gauge reading, and allow the hydrant barrel to clear for 10 seconds.

13. Collect a water sample from the sidestream tap and measure and record chlorine residual and turbidity. Collect samples for any other analyses that are desired. Record any visual observations of discharge water.
14. Check the downstream flows into the sanitary sewer, storm system, or drainage ditches to ensure that flow is being drained properly and that there are no major water backups.
15. Measure the chlorine residual of the discharge to ensure that chlorine is fully neutralized.
16. Using water from the sidestream tap assembly, measure and record turbidity per the desired monitoring frequency until the following "flush-terminating" criteria are achieved:
    a. At least two pipe volumes have been displaced, and;
    b. Three consecutive turbidity measurements are within 1 NTU of each other.
    c. To conserve water, no more than 10 pipe volumes should be flushed.
17. Collect a water sample from the sidestream tap assembly and measure and record the final chlorine residual.
18. To terminate the flush: (1) fully close the foot valve; (2) fully close the main hydrant valve; and (3) fully open the hydrant foot valve.
19. Complete the data collection form. Document any problems/issues confronted, or required follow-up action.
20. Gather equipment, signs, and field notes.
21. Restore the site to its original condition.
22. Use the field card to identify the post-flush valve sequencing requirements.

EQUIPMENT, SUPPLIES, CHEMICALS AND SERVICE PROVIDERS

CHEMICALS

The City normally maintains a supply of chemicals adequate for its immediate needs, plus a small reserve. The City purchases its chemicals from the following suppliers:

NorthStar Chemical	Tacoma, WA	253-274-1988
Hach (Reagents)	Loveland, CO	(800) 227-4224

DISTRIBUTION COMPONENTS

The City maintains a stock of standard repair products for a variety of materials and in sizes from ¾-inch through 12-inch. A supply of repair parts for meters, fire hydrants, valves, and other appurtenances are also maintained. The City purchases repair materials from, and maintains a listing of emergency after-

hour contacts with, the following suppliers. The after-hours listing is kept on file in the WRS Operations Office.

Core & Main.	Tacoma, WA	(253) 380-3793
H.D. Fowler Co.	Olympia, WA	(360) 459-7300
Ferguson Waterworks	Olympia, WA	(253) 954-6902
HB Jaeger	Tumwater, WA	(425) 754-2286

WELLS

The City of Tumwater uses both submersible and vertical line shaft turbine pumps. The City enlists the services of a private firm(s) to retrieve the pumps in order to perform a majority of the maintenance activities.

The following are a list of local well drilling operations:

Hokkaido Drilling	Graham, WA	(253) 847-3579
Arcadia Drilling	Shelton, WA	(360) 426-3395
Holt Drilling	Puyallup, WA	(253) 845-7448
Richardson Well Drilling	Parkland, WA	(253) 537-7332
Oelke Drilling	Sumner, WA	(253) 863-7272
Aqua Flo	Puyallup, WA	(253) 952-9363

RESERVOIRS

The City of Tumwater's reservoirs are cleaned and inspected once every three years by underwater commercial divers or remotely operated vehicles. This service has been provided by:

Liquivision	Klamath Falls, OR	(800) 229-6959
ExTech	Deep River, CT	(860) 526-2610

The corrosion protection system was installed and has been inspected yearly by:

Norton Corrosion Limited	Woodinville, WA	(425) 483-1616

MAINS

The City of Tumwater conducts a leak detection survey on segments of the system completing approximately 20% annually. This service has been provided by:

Utility Services Associates	Seattle, WA	(800) 621-9292

CONTROL VALVES

Hydraulic operated control valves should be cleaned and inspected annually and repaired as required. This service has been provided by:

GC Systems	Sumner, WA	(800) 525-9425

Firms providing services within the city limits must have a current City of Tumwater business license and may be included on the small works roster for applicable projects. Small works roster is advertised and updated annually through WRS Projects & Programs.

WATER QUALITY MONITORING

The City of Tumwater monitors water quality at our source wells, in the distribution system, and at our customers taps according to the requirements of WAC 246-290 and 40 CFR 141. The specific requirements for the Tumwater water system and the anticipated schedule for carrying out those requirements is updated annually by DOH. Please note water quality monitoring requirements may change; compliance needs are reviewed with WRS Program staff as necessary. A summary of water quality monitoring requirements is provided below. For more detailed water quality monitoring information, including public notification requirements and procedures to follow during a water quality incident, refer to Appendix K of the 2019 Water System Plan.

SOURCE MONITORING

The City conducts source monitoring according to a schedule provided by DOH. Some contaminants are sampled at "standard" intervals, but where a risk from a certain contaminant or group of contaminants has been shown to be low DOH has granted the City a waiver to sample less frequently. A summary of current source monitoring requirements is shown below.

Test Panel	Source	standard - 1 year	standard - 3 year	standard - 6 year	waiver - 3 year	waiver - 6 year	waiver - 9 year
Nitrate	**All**	x					
Pesticides*	**All**				x		
Soil Fumigants*	**All**				x		
Complete Inorganic (IOC)	**All**						x
Herbicides	**All**						x
Gross Alpha	**All**			x			
Radium 228	**All**			x			
Manganese	2		x				
Volitile Organics (VOC)	2 9 14 15 23		x x			x x x	

*The City has a 3 year waiver for pesticides and soil fumigants at all of its sources, but no sampling requirements therefore this requirement is effectively waived.

DISTRIBUTION SYSTEM MONITORING

Water in the main distribution system is monitored for total coliform, disinfectant residual, disinfection by-products (total trihalomethanes and residual haloacetic acids), and asbestos.

Based on population the City is required to collect 70 coliform samples each month and monitor disinfection residual five days a week. With the adoption of regulatory changes in January 2017, the detectable residual disinfectant concentration was defined as 0.2 mg/L; however, the City has demonstrated the ability to measure lower free chlorine levels that are sufficient to kill harmful pathogens. In August 2017 the City received a waiver from DOH requiring maintenance of a free chlorine level greater than 0.04 mg/L. Chlorine residual monitoring is performed at the same time and location as monthly coliform sampling. Chlorine residual monitoring is performed using a colorimeter at representative sites throughout the distribution system. See Appendix K for a map of distribution monitoring sites.

Disinfection by-products are sampled once a year between September and October. Water systems with asbestos concrete pipes are required to sample the distribution system for asbestos. Less than ten percent of the Tumwater's distribution system is composed of this type of pipe and as a result the City has received a waiver to sample for asbestos every nine years.

MONITORING AT CUSTOMER'S TAPS

The City is required to monitor customer's taps for lead and copper every three years. Based on Tumwater's population the City is required to sample thirty sites within the main system. The EPA has created criteria for selecting sample sites to ensure that water system operators collect tap samples where the risk to lead and copper exposure is the highest. See Appendix K for a detailed discussion of lead and copper monitoring requirements.

WATER QUALITY TESTING LABORATORIES

Water quality testing and analysis has been provided by:

Thurston County Health	Olympia, WA	(360) 786-5465
Water Management Labs	Tacoma, WA	(253) 531-3121
Edge Analytical	Burlington, WA	(360) 757-1400

CROSS CONNECTION CONTROL

The City maintains a cross connection control program to ensure all non-residential and appropriate residential connections use effective cross connection control assemblies. For more information on the program, refer to Appendix Q of the 2019 Water System Plan.

WATER SYSTEM VULNERABILITY ASSESSMENT

BIOTERRORISM ACT

In response to the *Public Health Security and Bioterrorism Preparedness and Response Act of 2002 (Bioterrorism Act)*, the City of Tumwater completed a vulnerability assessment (VA) as required under the federal regulation. The Bioterrorism Act amends the Safe Drinking Water Act (SDWA) by adding section 1433, requiring community water systems to conduct vulnerability assessments by June 30, 2004 and certify that an Emergency Response Plan has been developed no later than December 31, 2004.

In May 2004, the City completed the VA, addressing pipes and constructed conveyances, physical barriers, water collection, pretreatment, treatment, storage, and distribution facilities, electronic, computer or other automated systems which are utilized by the public water system, the use, storage, or handling of various chemicals, and the operation and maintenance of the water system.

Additionally, the VA addressed the six basic elements identified below, as outlined in the federal guidance publication, *Baseline Threat Document.*

1. Characterization of the water system, including its mission and objectives;
2. Identification and prioritization of adverse consequences to avoid;
3. Determination of critical assets that might be subject to malevolent acts that could result in undesired consequences;
4. Assessment of the likelihood (qualitative probability) of such malevolent acts from adversaries (e.g., terrorists, vandals);
5. Evaluation of existing countermeasures; and
6. Analysis of current risk and development of a prioritized plan for risk reduction.

A number of recommendations were prepared as part of the VA. All immediate needs, or high priority items, have been addressed. Additional protective measures identified in the report are completed as feasible.

HAZARD ASSESSMENT

The City has assessed the vulnerability of the primary water system components due to a variety of common and likely hazards. The assessment is based on visual inspection, facility construction, and past experience of City personnel.

The tables below outline the potential risk to the City's facilities and a contingency plan in the event impacts are realized.

SEISMIC HAZARD

Structure	Risk Assessment	Contingency
Wells	There is low to moderate risk of a structural failure, and the risk of an aquifer shift due to seismic activity is unknown.	*Wellfields will be isolated to individual wells, evaluated, and returned to service on a case-by-case basis. Utilization of other wells in the system and interties as needed.*
Reservoir	There is a low risk of structural failure, and a moderate risk of landslides adversely effecting operation. However, the water main supplying the reservoir may fail due to earth movement isolating the reservoir from the system	*Reservoir and supply main will be taken off-line for evaluation and returned to service on a case-by-case basis. If the reservoirs are unable to be returned to service, the system would temporarily rely on interties and wells converted to pressure operated controls.*
Interties	There is a low to moderate risk of water main failure associated with the interties.	*Main service lines will be isolated from the interties. Service will be reliant upon supply wells until repairs can be made*
Booster Stations	There is low to moderate risk of a structural failure.	*Booster station and associated supply mains will be isolated for evaluation and/or repair. Service will be returned on a case-by-case basis. Water will be temporarily redirected from higher elevation reservoir to compensate pressure losses.*
System Controls	There is low risk of structural failure.	*Monitor and operate system manually.*

FLOODING HAZARD

Structure	Risk Assessment	Contingency
Wells	There is a low risk of flooding.	*Isolate the affected wells for evaluation and rely upon wells outside the flooded area.*
Reservoir	Not vulnerable.	
Interties	Not vulnerable.	
Booster Stations	Not vulnerable.	
System Controls	Not vulnerable.	

POWER HAZARD

Structure	Risk Assessment	Contingency
Wells	Highly vulnerable to power failure.	*Operate on emergency backup generators at Bush and Palermo well fields.*
Reservoir	Highly vulnerable to power failure.	*The system will operate on emergency backup generator at 454/549 reservoirs. The 350 zone will be monitored and operated manually*
Interties	Not vulnerable.	
Booster Stations	Highly vulnerable to power failure.	*Operate on emergency backup generators at C St.*
System Controls	Highly vulnerable to power failure.	*Operate on emergency backup generators.*

CONTAMINATION HAZARD

Structure	Risk Assessment	Contingency
Wells	There is a relatively low risk of contamination.	*Shut down and rely upon other wells.*
Reservoir	There is a low risk of contamination.	*Temporarily remove reservoir from service for evaluation and rely upon pressure zone interties for supply. Return to service on a case-by-case basis.*
Interties	There is a low risk of contamination.	*Interties will remain closed.*

Structure	Risk Assessment	Contingency
Booster Stations	There is a low risk of contamination.	*Take booster station offline and rely upon pressure zone interties. Return to service on a case-by-case basis.*
System Controls	Not vulnerable.	

VANDALISM

Structure	Risk Assessment	Contingency
Wells	There is a moderate risk of vandalism.	*Shut down and take well offline. Rely on unaffected wells until repairs can be made.*
Reservoir	There is a moderate risk of vandalism.	*Isolate reservoir and rely upon pressure zone interties until well.*
Interties	There is a low risk of vandalism.	*Shut down interties and rely upon other interties and wells until repairs can be made.*
Booster Stations	There is a moderate risk of vandalism.	*Isolate affected booster stations from service for evaluation and/or repair. Rely upon pressure zone interties until repairs are complete.*
System Controls	There is a moderate risk of vandalism.	*Monitor and operate system manually.*

EMERGENCY RESPONSE & CONTACT INFORMATION

Emergencies are considered to be one of two types, determined by the initial respondent. Emergencies may be of a basic or routine nature, such as leaking lines, damaged appurtenances, or interruption of service. The second emergency category deals with water quality, such as a cross connection or other contamination occurrence.

Operations is to be contacted at (360) 754-4150 for all emergencies. The initial respondent to any emergency that occurs after normal hours will be an "on-call" Operations employee. Upon determining the situation they will contact the appropriate personnel via the following call up lists.

ROUTINE EMERGENCIES

On-Call Personnel (After Hours)	(360) 754-4150
Steve Craig – Operations Manager	(360) 507-7635
Michael Thomas - Lead Maintenance Worker	(360) 239-3054

WATER QUALITY EMERGENCIES

On-Call Personnel (After Hours)	(360) 754-4150
Steve Craig, Operations Manager	(360) 507-7635
Dan Smith, Director	(360) 870-6938

STATE CONTACTS

Office of Drinking Water Hotline	(877) 481-4901
Department of Ecology Spill Response	(360) 407-6300