

Appendix R
Operation and Maintenance Program Details

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Appendix R Operations and Maintenance Program Details

R.1 Standard Operating Procedures

There are specific procedures for start-up and shutdown of certain facilities, as well as safety issues and performance evaluations. Based on the type of facility, startup and shutdown cycles could occur more than once per year or only once every several years. The procedures are general for a type of facility will be adapted as necessary for each specific facility.

Supply Source – Wells

Start-Up Procedures for the Wells

1. Check all valves to make sure they are in the correct positions.
2. Check power supply to make sure nothing is locked off or tagged out.
3. Check oil and packing of the pump motor assembly.
4. Pre-lube column of non-submersible pumps for 15 to 20 minutes.
5. Make sure mainline valve is shut.
6. Start and flush well for approximately 20 minutes two to three times or until water is clear.
7. Take bacteriological sample and wait for results. (Minimum of 48 hours.)
8. When satisfactory bacteriological results obtained, set all valves for normal operation.
9. Check any chemical and filter media levels
10. Perform chemical injection startup – chlorine, fluoride, and pH and filter plant startup.
11. Adjust start set points in the telemetry system before placing the well into automatic operation.

Shutdown Procedures for the Wells

1. Shut off mainline valve to the system.
2. Check power to make sure it is off and tag out.
3. Winterize if necessary.
4. Winterize chemical injection system – chlorine, fluoride, and pH and filter plants.

Safety Procedures for Wells

Wells are characterized by loud noises, fast rotating assemblies and electrical hazards. Safety procedures to mitigate these hazards should be followed. PPE should be used for whatever chemicals are used at each well. Confined space procedures will need to be followed for certain areas of specific wells also.

Meter Reading Procedures for Wells

Meters are read and information transferred to a form during regular well visits, at least twice per week.

Performance Evaluation for Wells

The Wells are monitored 24 hours a day using a computer that is integrated with telemetry monitoring equipment. When a parameter exceeds the preprogrammed limits, an alarm is presented at the computer station. This station is monitored during normal work hours by District staff. After hours, the computer is programmed to dial the on-call pager and deliver a text message identifying the type of problem that was detected. The on-call staff person uses the on-call laptop computer, from home or in the field, to access and control the telemetry system in the same manner they would, were they in the office.

Supply Source - Regional Supply Connection

Start-Up Procedures for the Regional Supply Connection

1. Notify Cascade, Bellevue and Issaquah for the South Regional Connection, and Cascade and Redmond for the North Regional Connection.
2. Flush the regional line to the District connection point.
3. Take a bacteriological sample at the connection point and wait for notification of results
4. Test operational functionality of control valve, meters, SCADA of facility prior to turning on to system.
5. Set a specific flow rate per Cascade operational contract.

Shutdown Procedures for the Regional Supply Connection

1. Notify Cascade, Bellevue and Issaquah for the South Regional Connection, and Cascade and Redmond for the North Regional Connection.
2. Isolate the regional line at the District connection point.

Safety Procedures for Regional Supply Connection

Confined space (at both North and South Regional Connection) and fall protection (at South Regional Connection) safety procedures need to be followed.

Meter Reading Procedures for Regional Supply Connection

Meter reading is done at the end of every month (south end) and supply reading to Cascade, Bellevue and Issaquah. Meter reading at the north end is done monthly and used to verify Redmond's meter reading.

Performance Evaluation for Regional Supply Connection

The Regional Connections are monitored 24 hours a day using a computer that is integrated with telemetry monitoring equipment. When a parameter exceeds the preprogrammed limits, an alarm is presented at the computer station. This station is monitored during normal work hours by District staff. After hours, the computer is programmed to dial the on-call pager and deliver a text message identifying the type of problem that was detected. The on-call staff person uses the on-call laptop computer, from home or in the field, to access and control the telemetry system in the same manner they would, were they in the office.

Treatment Facilities

Start-Up Procedures for the Treatment Facilities

NaOH – Sodium Hydroxide for pH Adjustment

1. Fill all lines with water and check for leaks
2. Fill lines with caustic soda
3. Turn on caustic pump, fill day tank and dial in the appropriate feed rates for pH levels
4. Check pH levels (done daily) and adjust feed rate as necessary.

Cl₂ – Chlorine Generator

1. Take a meter reading for Cl₂ system water meter
2. Check system for general fitness
3. Turn on the water softener
4. Fill Cl₂ Generation system with water
5. Fill the brine tank with salt
6. Turn the generation system on (for 0.08 Cl₂ solution)
7. Fill the injection system with water
8. Check injection system for leaks
9. Open valves and turn system on to allow injection of Cl₂ solution into system.
10. Dial in injection pump feed rate for flow pacing (match feed rate for supply source rate and appropriate Cl₂ concentration)
11. Check for appropriate Cl₂ residual

F – Fluoride Injection System

1. Take a meter reading for F system water meter
2. Fill saturator ½ full with water
3. Add saturator with Fluoride (1/4 to 1/3 of tank size)
4. Check valve alignments for flow to the injection system, and to the system
5. Fill injection system from saturator
6. Turn on injection pump
7. Check for appropriate Fluoride level

ATEC filters – for Manganese Removal

1. Check media levels in each tank
2. Energize system with water (backflush)
3. Dial in the Cl₂ levels for each particular system (0.4 – 0.6 free residual EG)
4. Take sample after the discharge point to check for Mg levels

Ferric Chloride (coagulant to settle Mg removed by the ATEC system)

1. Record setpoints on both pumps and volume of ferric chloride within barrel.
2. Insert flexible suction tube into the barrel of ferric chloride.
3. Close the two ball valves on the drain lines.
4. Close the ball valve on the bottom of the Calibration Column.
5. Open the red handled ball valve near the injection point. The injection point is located at the static mixer, which is on the south wall near the backwash tanks.
6. Open all five ball valves on the pump suction lines (2 on each pump and 1 main suction line ball valve in the lower right-hand corner of the pump skid).
7. Open all six ball valves on the pump discharge lines.
8. Turn the 3-way ball valve located at the upper left-hand corner of the pump skid to the left to direct flow towards the injector.
9. At the Main Control Panel turn the HOA switch (MP-5 and 6) for one pump to HAND and verify flow. Turn switch to OFF and verify operation of the second pump.
10. Turn the HOA switch MP-5 and MP-6 to AUTO.

Shutdown Procedures for the Treatment Facilities NaOH – Sodium Hydroxide for pH Adjustment

1. Turn off caustic pump
2. Drain and flush lines
3. Isolate valves so the caustic cannot leak back into the system.

Cl₂ – Chlorine Generator

1. Shut off Generation system
2. Turn off injection pump
3. Isolate system from injection pump

4. Drain off the injection system
5. Empty out the storage tank
6. Take a meter reading for Cl₂ system water meter

F – Fluoride Injection System

1. Shut off the injection pump
2. Drain the system
3. Isolate the injection pump from the system
4. Empty saturator tank
5. Take a meter reading for F system water meter

ATEC filters – for Manganese Removal

1. Isolate system

Ferric Chloride (coagulant to settle Mg removed by the ATEC system)

1. At the Main Control Panel turn the HOA switches for pumps MP-5 and MP-6 to OFF.

Safety Procedures for Treatment Facilities

NaOH – Sodium Hydroxide for pH Adjustment

1. Eye protection, gloves and aprons should be worn when handling NaOH.
2. MSDS procedures for exposure or spills should be followed

Cl₂ – Chlorine Generator

1. Eye protection, gloves and aprons should be worn when handling Cl₂
2. MSDS procedures for exposure or spills should be followed

F – Fluoride Injection System

1. Particulate Face Shield, dust mask, eye protection, gloves and aprons should be worn when handling Sodium Fluoride
2. MSDS procedures for exposure or spills should be followed

ATEC filters – for Manganese Removal

1. Gloves and aprons should be worn when handling the filter media
2. MSDS procedures for exposure or spills should be followed

Ferric Chloride (coagulant to settle Mg removed by the ATEC system)

1. Eye protection, gloves and aprons should be worn when handling Ferric Chloride
2. MSDS procedures for exposure or spills should be followed

Meter Reading Procedures for Treatment Facilities

NaOH – Sodium Hydroxide for pH Adjustment

Hour run meters for the pump are read to track duration of use.

Cl₂ – Chlorine Generator

Water meter for Cl₂ is read to use in calibration of the Cl₂ dosage

F – Fluoride Injection System

Water meter for F is read to use in calibration of the F dosage

ATEC filters – for Manganese Removal

Backwash meters read to track with unbilled water use and recording sewer use.

Ferric Chloride (coagulant to settle Mg removed by the ATEC system)

Ferric Chloride is delivered in 55-gallon barrels. The volume of liquid within the barrel is measured using a sonic level gage.

Performance Evaluation for Treatment Facilities

Certain pieces of the treatment facilities, such as chemical feed equipment, are monitored 24 hours a day using a computer that is integrated with telemetry monitoring equipment. When a parameter exceeds the preprogrammed limits, an alarm is presented at the computer station. This station is monitored during normal work hours by District staff. After hours, the computer is programmed to dial the on-call pager and deliver a text message identifying the type of problem that was detected. The on-call staff person uses the on-call laptop computer, from home or in the field, to access and control the telemetry system in the same manner they would, were they in the office.

Storage Facilities

Start-Up Procedures for the Storage Facilities

1. Verify no debris or materials are in the tank
2. Verify the tank is ready for operation by checking all inlets, outlets, screens and alarm and measuring devices.
3. Spray down interior with disinfectant (heavily chlorinated water) per AWWA standards.

4. Start filling and take bacteriological samples as filled at different levels
5. Verify SCADA operation
6. Open valves and put on-line

Shutdown Procedures for the Storage Facilities

1. Drain tank as much as possible into the water system
2. Where possible, pump remainder into water system
3. Isolate the tank from the water system, including modifying setpoints for operating system as appropriate
4. Drain remainder of tank, dechlorinating the water prior to discharge to any storm water system

Safety Procedures for Storage Facilities

Operation and maintenance of storage tanks can have hazards such as confined space or fall protection depending on the task. Appropriate PPE gear and procedures need to be used, based on activity.

Performance Evaluation for Storage Facilities

The Storage Facility water levels are monitored 24 hours a day using a computer that is integrated with telemetry monitoring equipment. When a parameter exceeds preprogrammed limits, an alarm is presented at the computer station. This telemetry is monitored during normal work hours by District staff. After hours, the computer is programmed to dial the on-call pager and deliver a text message identifying the type of problem that was detected. The on-call staff person uses the on-call laptop computer, from home or in the field, to access and control the telemetry system in the same manner they would, were they in the office.

Water Distribution System

Start-Up Procedures for the Water Distribution System

1. Install pipe and appurtenances with chlorine granules placed during installation. New pipe is kept disconnected from District's active water system during installation and testing.
2. Fill pipe using cross connection controls in place to prevent contamination
3. Pressure test per AWWA procedure
4. Allow 24 hours minimum contact time after filling for disinfection
5. Flush to appropriate discharge point (directly to sewer, or dechlorinate if discharging to environment)
6. Collect samples for bacteriological testing
7. If samples show no bacteria, schedule and connect to existing District active water system using following process:
 - a. Swab connection piping and fittings with 200 ppm chlorine solution before

- connection
- b. Flush final connection to remove air and dechlorinated water in connection
- c. For existing customer reconnection, flush and connect new service lines to new water services. Notify customers of outage and reconnect new water services to existing customer service line
- d. For new water service installation (e.g., plat), crimp service line, trim to desired length, dechlorinate new setter and fittings, install in designated location, and place meter box. Flow new setter to ensure that setter flows freely

Shutdown Procedures for the Water Distribution System

1. Evaluate shutdown effect on the system
2. Determine isolation valves
3. Notify customers affected by the shutdown (48 hours in advance for planned shutdown)
4. Shutdown meters connected to area
5. Shutdown appropriate isolation valves
6. Verify that the main has been isolated

Safety Procedures for Water Distribution System

The water system should be considered a high-pressure system. Workers also need to be cognizant of the potential for creating problems in the system outside of the immediate area of their work, due to the interconnectivity within the system. Pressure issues and water hammer are examples of problems that can travel long distances through the system. Different safety procedures will be necessary based on the type of task being done on the distribution system. Accessing the distribution system may involve trench safety, fall hazards, and exposure to heavy equipment and traffic. PPE and safety procedures appropriate to the specific task should be followed.

Performance Evaluation for Water Distribution System

The integrated telemetry/computer system collects and stores field information that is periodically provided to the Engineering Department and Planning Engineer. The field results are compared to the predicted results from the District's hydraulic analysis model, H2OMap. During initial calibration of the H2OMap model several flow tests were conducted to monitor fire- flow events at numerous sites throughout the District.

Booster Pump Stations

Start-Up Procedures for the Booster Pump Stations

1. Perform a visual inspection of all mechanical and electrical systems
2. Energize water piping and check for leaks
3. Flush water through and bleed out all air throughout the booster system

4. Set all appropriate valves for booster operation
5. If system has been off for a significant time or is new, flush and take bacteriological sample
6. Check setpoints for operation (make sure pumps are not set to come on immediately)
7. Turn HOA switch to Off
8. Turn power supply On
9. Operate the system manually to determine valves open and close appropriately
10. Set set-points for automatic operation, check SCADA operation
11. Turn HOA switch to Automatic

Shutdown Procedures for the Booster Pump Stations

1. Turn HOA switch to Off
2. If taking the Booster system off-line for a significant period of time, turn power off
3. If taking the Booster system off-line for a short period, turn pump disconnect switch off
4. Isolate system
5. Drain booster pump system to take pressure off of system

Safety Procedures for Booster Pump Stations

Booster Pump Stations are characterized by loud noises, fast rotating assemblies and electrical hazards, and require safety procedures for these hazards be followed. Confined spaces exist at certain booster pump stations, which require additional safety procedures. In addition, use of PPE are required for any chemicals located at a particular booster pump stations, such as at the Section 36 BPS.

Meter Reading Procedures for Booster Pump Stations

Hour run meters are normally read twice per week. SCADA hour run times are checked against manual meter readings on a monthly basis.

Performance Evaluation for Booster Pump Stations

The Booster Pump Stations are monitored 24 hours a day using a computer that is integrated with telemetry monitoring equipment. When a parameter exceeds the preprogrammed limits, an alarm is presented at the computer station. This station is monitored during normal work hours by District staff. After hours, the computer is programmed to dial the on-call pager and deliver a text message identifying the type of problem that was detected. The on-call staff person uses the on-call laptop computer, from home or in the field, to access and control the telemetry system in the same manner they would, were they in the office.

Pressure Reducing Stations

Start-Up Procedures for the Pressure Reducing Stations

1. Determine pressure settings for downstream pressure zone
2. Visually inspect connections within the vault
3. Open downstream valve to introduce downstream pressure to the station
4. Bleed air out of the system
5. Set up Pressure Relief Valve to predetermined system relief pressure
6. Ensure flow in the system below PRV through normal use or hydrant flush
7. Set bypass PRV downstream pressure setting
8. Set primary PRV downstream pressure setting
9. Verify operation of each by varying flows
10. Retest the Pressure Relief Valve with high pressure in system
11. Shut off hydrant
12. Document pressure settings

Shutdown Procedures for the Pressure Reducing Stations

1. Shut the downstream valve first
2. Shut the upstream valve second
3. Shut the pressure relief valve
4. Bleed water out of the system
5. Document that the PRV has been shut down
6. Notify the Fire District is the fire flow in the downstream zone has been adversely impacted

Safety Procedures for Pressure Reducing Stations

Procedures to mitigate for confined space, fall protection, high pressure water awareness, and engulfment should be followed in Pressure Reducing Stations.

Performance Evaluation for Pressure Reducing Stations

Evaluate pressure settings and operation annually

Control Valves

Start-Up Procedures for the Control Valves

If the control valve is electronically operated, start with the power disconnected. Open the incoming mainline valve, then open the appropriate control valves and petcocks. Energize power to the control valve for operation. Check operations by allowing some water to flow through the control valve. Set any associated Pressure Reducing Valves. Once the control valve is set and operational open downstream mainline valve and put into operation.

Shutdown Procedures for the Control Valves

If the valve is electronically operated, the power should be disconnected first. Isolate the control valve by shutting the downstream mainline valve off, and then shutting the incoming mainline valve. Shut off all controls and petcocks.

Safety Procedures for Control Valves

Standard safety precautions are followed for any control valves located in confined space or traffic areas.

Performance Evaluation for Control Valves

The settings and operations of each control valve are checked at least annually to verify proper operation.

Interties

Start-Up Procedures for the Interties

1. Notify affected entity of intention to activate the intertie
2. Verify that all systems are intact and operational
3. Get meter reading
4. Flush system and take sample if necessary.
5. Open the lower pressure side of the intertie first
6. Check any verify settings as appropriate
7. Open the higher pressure side of the intertie second
8. Verify system operation

Shutdown Procedures for the Interties

1. Notify affected entity of intention to close the intertie
2. Close the lower pressure side of the intertie
3. Close the upper pressure side of the intertie
4. Read the meter and provide readings to appropriate parties.
5. Drain intertie

Safety Procedures for Interties

Procedures to mitigate for confined space, fall protection, high pressure water awareness, and engulfment are to be followed in Pressure Reducing Stations.

Meter Reading Procedures for Interties

Meters are read upon startup and shut down and monthly during operation.

Performance Evaluation for Interties

Check operation monthly when in operation. Verify meter calibration as necessary.

R.2 System Operations and Preventative Maintenance Programs

Most water system tasks can be categorized as either operation or preventative maintenance. The District has prepared a detailed estimate of the hours for routine operations and preventative maintenance tasks. The maintenance tasks and corresponding annual staff hours are presented in Table R-1.

Based on the estimated staff hours needed to complete a task, the FTEs required to complete this task is calculated for each task group in the tables. One FTE is equal to 1,788 staff hours (260 available workdays less 15 days' vacation, 10 days sick leave, and 11.5 days of holidays).

As described in Table R-1 the Water Operators work for District routine and preventative maintenance requires 20,572 hours per year, representing 11.51 FTEs. When the contract work for Cascade Water Alliance is included the figures are 20,722 hours per year, representing 11.59 FTEs.

**Table R-1
Routine and Preventative Maintenance Staffing Level Evaluation**

Operations Function	Task	Activity	Task Frequency	Annual Staff Hours	FTE
Water Administration	<i>Vehicle Maintenance</i>	Routine general maintenance and inspections, checking physical condition and fluid levels to ensure vehicle is road worthy and ready for service.	Weekly	280	0.2
	<i>Tool and Equipment Maintenance</i>	Tool and Equipment maintenance	Weekly	300	0.2
	<i>Outside Department Support (DE, CIP, ENG, CS)</i>	Water operations support of DE's, CIP's special engineering projects and customer service requests.	Support as needed by other departments	800	0.5

Table R-1 (cont.)

Routine and Preventative Maintenance Staffing Level Evaluation

Operations Function	Task	Activity	Task Frequency	Annual Staff Hours	FTE
Water Administration (cont.)	<i>Field Admin (Meetings, School, Training)</i>	Operational training and administrative support for reliability centered maintenance (RCM) project	Training schedule varies by employee. RCM project work is weekly.	4,455	2.5
Total	Water Administration			5,835	3.3
Wells and Production	<i>Pump Run</i>	Routine inspections for maintenance, site security and data collection to verify well pumps, motors and associated production equipment is operating correctly and that buildings and sites are secure	2 times weekly	500	0.3
	<i>Well Equipment Maintenance</i>	Maintenance and inspections for equipment at a well facility: Control Valves, Dehumidifiers, Heaters, discharge vaults and pumps etc.	Monthly, Annually	193	0.1
	<i>Pump and Motor Maintenance</i>	Oil changes and bearing lubrication of well motors.	Annually	250	0.1

**Table R-1 (cont.)
Routine and Preventative Maintenance Staffing Level Evaluation**

Operations Function	Task	Activity	Task Frequency	Annual Staff Hours	FTE
Wells and Production (cont.)	<i>Generator Maintenance</i>	Routine general maintenance and inspections, checking physical condition and fluid levels to ensure generator is ready for service in an emergency.	Weekly	80	0
	<i>Well Monitoring</i>	Routine inspection and logging of production and monitoring well levels.	Monthly	250	0.1
	<i>Facility Maintenance</i>	Maintenance of building structure	Annually	100	0.1
Total	Wells and Production			1,373	0.8
Water Treatment	<i>Water Samples</i>	Routine collection of system and source water samples for compliance with federal and state drinking water regulations.	Weekly	850	0.5
	<i>Daily Treatment Testing Wells and Boosters</i>	Routine inspections, maintenance and data collection at water treatment facilities to monitor and verify chemical pumps, skids and associated treatment and process monitoring equipment is operating correctly.	2 times weekly	616	0.3
	<i>Treatment Equipment Maintenance Wells and Boosters</i>	Inspection, maintenance and calibration of treatment pumps, piping and water quality analyzers and testing equipment	Monthly, quarterly and annually	1,280	0.7
Total	Water Treatment			2,746	1.5

**Table R-1 (cont.)
Routine and Preventative Maintenance Staffing Level Evaluation**

Operations Function	Task	Activity	Task Frequency	Annual Staff Hours	FTE
Water Storage	<i>Reservoir Inspections and Maintenance</i>	Visual inspections of water storage tanks and reservoirs and related components for security, safety and maintenance purposes. Pressure washing is done for tank maintenance	Tank inspections every 6 months. Maintenance approx. every 3 years.	458	0.3
	<i>Reservoir Draining & Cleaning</i>	Drain, inspect & place storage tank back online. Includes operations required to take the tank off-line.	Each tank approximately every 10 years (80 hrs/tank)	192	0.1
Total	Water Storage			650	0.4
Booster Stations	<i>Pump Run</i>	Routine inspections for maintenance, site security and data collection to verify booster station pumps, motors and associated production equipment is operating correctly and that buildings and sites are secure	2 times weekly	400	0.2
	<i>Booster Equipment Maintenance</i>	Maintenance and inspections for equipment at a booster station: Control valves, Dehumidifiers, Heaters, discharge vaults and pumps etc.	Monthly, Annually	100	0.1
	<i>Pump and Motor Maintenance</i>	Oil changes and bearing lubrication of booster pump motors.	Annually	166	0.1

**Table R-1 (cont.)
Routine and Preventative Maintenance Staffing Level Evaluation**

Operations Function	Task	Activity	Task Frequency	Annual Staff Hours	FTE
Booster Stations (cont.)	<i>Generator Maintenance</i>	Routine general maintenance and inspections, checking physical condition and fluid levels to ensure generator is ready for service in an emergency.	Weekly	10	0
	<i>Facility Maintenance</i>	Maintenance of building structure	Annually	10	0
Total	Booster Stations			686	0.4
Water Mains and Appurtenances	<i>Valve Survey</i>	Locating, operating and exercising valves to confirm that all valves in the distribution system are accessible and function properly.	25% annually (every valve every 4 years)	1,200	0.7
	<i>Hydrant Survey</i>	Visual inspection and operation of fire hydrants to verify proper function, visibility, and accessibility for maintenance and emergency use. Maintenance specific information like manufacturer and distance to the foot valve are verified, while inspection date and static pressure are recorded.	25% annually (every hydrant every 4 years)	1,200	0.7

**Table R-1 (cont.)
Routine and Preventative Maintenance Staffing Level Evaluation**

Operations Function	Task	Activity	Task Frequency	Annual Staff Hours	FTE
Water Mains and Appurtenances (cont.)	<i>Blow off Survey</i>	The inspection and operation of blow off valves is incorporated into the District's water main flushing program. Inspections consist of locating and confirming blow off assemblies are accessible, and then operated/ flushed to verify proper function	25% annually (every blow off every 4 years)	300	0.2
	<i>Air Vac Survey</i>	Locating and confirming air and vacuum release assemblies are accessible and function properly. Maintenance related information like manufacturer and size are verified, and operational status and inspection dates are recorded and stored in the CMMS database.	25% annually (every valve every 4 years)	400	0.2
	<i>Leak Detection</i>	Systematic monitoring and recording of water mains and appurtenances to detect leaks.	As needed or per customer request.	250	0.1
	<i>Water Main Flushing</i>	Regular flushing and cleaning of water mains improves chlorine residuals and water aesthetics (appearance, taste and odor) in low flow or dead end areas of the District.	13,000 ft. quarterly, and additional mains upon customer request.	260	0.2

**Table R-1 (cont.)
Routine and Preventative Maintenance Staffing Level Evaluation**

Operations Function	Task	Activity	Task Frequency	Annual Staff Hours	FTE
Water Mains and Appurtenances (cont.)	<i>PRV Maintenance</i>	Maintenance inspections consist of cycling/ operating pressure reducing valves via pilot systems, checking and recording pressure settings and ensuring proper valve function. Pressure relief valves are tested and reset. Scheduled rebuilds of pilot systems and valves.	Inspections performed annually. Pilot systems rebuilt every 3 years or as needed. Full valve disassembly and rebuilds every 6 years.	1,000	0.6
	<i>Water Mains</i>	Reactive Work Category: Repair of water mains - Hit by contractor or pipe failure	Anticipate avg of 2 per year	400	0.2
	<i>Water Services</i>	Reactive Work Category: Installation of new services or repairs to existing lines	Anticipate avg of 10 new installs or service line leak repairs	1,000	0.6
	<i>Locates</i>	Marking underground water and sewer utilities for excavation per RCW 19.122.030	2450 locates annually	1,880	1.1
	<i>Easements</i>	Assisting Building Maintenance and Grounds crew with water easement maintenance	2 easements annually	20	0
Total	Water Mains and Appurtenances			7,910	4.4

**Table R-1 (cont.)
Routine and Preventative Maintenance Staffing Level Evaluation**

Operations Function	Task	Activity	Task Frequency	Annual Staff Hours	FTE
Water Meters	<i>Meter Maintenance</i>	Automated Metering Infrastructure (AMI) support and large meter testing	AMI Project support as needed Meter testing as needed, and routine interval TBD because of new AMI system	1,372	0.8
Total	Water Meters			1,372	0.8
Regional System Maintenance – Under Contract to CWA					
Cascade Water Alliance (CWA)	<i>Maintenance and Operations of Bellevue Issaquah Pipeline (BIP) for CWA</i>	Maintaining pipeline and appurtenances – Locates, special projects.	Monthly	150	0.1
Total	Regional System Maintenance			150	0.1

R.3 Preventative Maintenance Program – Extraordinary Operating Conditions

Most preventative maintenance activities take place with minimal system interruption. In addition, the system has been developed to have redundancy, so that the temporary loss of a facility does not disrupt service provision. However, there are some tasks that require major equipment be taken offline during which time the system operations may need to be modified. These are noted in the table, as extraordinary operations, and a more detailed explanation of operational considerations is provided in Table R-2.

**Table R-2
Preventative Maintenance - Extraordinary Operating Conditions**

Facility	Impact on Operations
<i>Storage Tanks</i>	
3-MG Tank	The 3-MG Tank is the only tank in the 700 Pressure Zone. The Well 4 boosters can supply domestic and fire flows to the north end of the Plateau Zone without the tank being online, thus avoiding an interruption of service, but would need to operate on a continuous basis. Alternatively, NESSWD may be able to provide water as well.
297 Tank	<p>The 297 Tank is the only tank in the 297 Zone and providing storage for the 297 Zone. When the 297 Tank is offline the valley wells, Wells 7, 8 and 9, or the Regional Line provide the source of water for the 297 Zone. Several PRVs can also provide a source of water to the 297 Zone from the higher-pressure zones, although they would be operating at a higher flow rate than normal.</p> <p>The 297 Tank also serves as a source of water for the 297 and SE 43rd Booster Stations pumping from the 297 Zone to the 650 Zone. This is especially true for the 297 Booster Pump Station, located immediately adjacent to the tank. Again, the valley wells and Regional Line can provide the source for the booster pump stations, and the 43rd Booster Pump Station is not likely to be directly affected by work at the 297 Tank site.</p>
<i>Booster Pump Stations</i>	
Well 4 Booster Pump	The Well 4 Booster Pump Station provides water to the 700 Pressure Zone by boosting water following treatment at the Well 4 Treatment Facility. If the Well 4 Booster Pump Station is completely off-line (all pumps non-operational) the District may arrange with NESSWD to provide water to the 700 Pressure Zone.
<i>Pressure Reducing Stations</i>	
14 Sole Source Pressure Reducing Stations	Fourteen (14) of the District pressure reducing stations supply pressure zones that have only one PRV providing supply, with no redundancy. When these PRVs are rebuilt or require major maintenance the District keeps operational either the primary or bypass PRV valve during maintenance of the other valve in the station. The Fire District may be notified during major maintenance of the larger valve as fire flow could be compromised.

R.4 Chemicals, Equipment, Supplies, and Maintenance Contractors

Table R-3 provides a list of vendors the District currently uses for chemical, equipment, and part supplies and maintenance contractors.

**Table R-3
Chemicals, Equipment, Supplies, and Maintenance Contractors**

	Supplier	Contacts	Notes
<i>Chemicals</i>			
Sodium Hydroxide (Caustic) Partial Loads	Univar (Kent)	(253) 872-5000 Fax (253) 872-5041 Jennifer Perras (253) 872-5040 Cell (206) 249-6109	Wells 1, 2, and 10 Order Per Gallon (Wet)
Sodium Hydroxide (Caustic) Full Loads	JCI Jones Chemicals (Tacoma)	Michelle Trammell (253) 274-0104	Well 9 Order Per Gallon (Wet)
Sodium Fluoride	Cascade Columbia Distribution (Seattle)	(800) 683-9724 (206) 282-6334 Fax (206) 282-6330 Kevin Rock (206) 255-7299	Wells 1, 2, 4, 9, 10, 13, Section 36 Order Per Bag / 50 Pound Bags / 40 Bags Per Pallet
Sodium Chloride	Cascade Columbia Distribution (Seattle)	(800) 683-9724 (206) 282-6334 Fax (206) 282-6330 Kevin Rock (206) 255-7299	Well 4 Treatment Facility Per Drum, Order Size 20 Tons
Sodium Chloride	Cascade Columbia Distribution (Seattle)	(800) 683-9724 (206) 282-6334 Fax (206) 282-6330 Kevin Rock (206) 255-7299	Wells 1, 2, 9, 10, 12, 13, Section 36 Order Per Bag/50 Pound Bags / 49 Bags Per Pallet

**Table R-3 (cont.)
Chemicals, Equipment, Supplies, and Maintenance Contractors**

	Supplier	Contacts	Notes
Ferric Chloride	Cascade Columbia Distribution (Seattle)	(800) 683-9724 (206) 282-6334 Fax (206) 282-6330 Kevin Rock (206) 255-7299	Well 4 Treatment Facility Order in groups of (4) 55 gallon drums
Filter Media	A TEC (Longview)	(360) 414-9223 Fax (360) 397-0375 Bill Ketchum (360) 693-6202 Cell (360) 901-2273	Need specific volume and media size when ordering
<i>Equipment/Power</i>			
Chlorine Pumps	TMG Services (Tacoma)	(800) 562-2310	
	Pumptech, (Bellevue)	(425) 644-8501	Grundfos Pumps
Caustic Pumps (Injection Pump)	Milton Roy (Warminster, PA)	(215) 441-0800	
	Pumptech (Bellevue)	(425) 644-8501	Grundfos Pumps
Fluoride Pumps	Pumptech (Bellevue)	(425) 644-8501	Grundfos Pumps
Control Valves	GC Systems (Sumner)	(800) 525-9425	
Well Pumps	Cascade Machinery	(800) 289-0500 (206) 762-0500	U.S. Motors, GE Motors
		(206) 762-0500	
Well Pumps	Utilities Service Co., Inc.	(206) 246-5674 Ed Mola Cell (206) 730-6193	
Well Service	Pump Tech (Bellevue)	(425) 644-8501	

Table R-3 (cont.)

Chemicals, Equipment, Supplies, and Maintenance Contractors

	Supplier	Contacts	Notes
Electric Power	Tanner Electric (North Bend)	(425) 888-0623	Puget Sound Energy supplies power to most facilities; Tanner Electric supplies power to Well 12 and to the Well 12 Booster Station
Electric Power	Puget Sound Energy (Bellevue)	(800) 321-4123	
Diesel Fuel (All brands)	Associated Petroleum Products (Tacoma)	(800) 929-5243 Becky Lantz (253) 207-4267	
<i>Supplies/Parts</i>			
Miscellaneous Parts	Ferguson Enterprises (Woodinville)	(425) 486-9600 Tom Roselli (253) 538-8275 Cell (253) 283-5483	
Miscellaneous Parts	H.D. Fowler Company (Bellevue)	(425) 746-8400 Ryan Huff Cell (206) 255-4314	
Miscellaneous Parts	HD Supply Waterworks (Seattle)	(206) 722-4800 Mark Thommasen Cell (206) 255-8519	
Miscellaneous Parts	H. B. Jaeger Co. LLC (Snohomish)	(877) 707-5958 Brodie Van Noy Cell (425) 754-5400	
Miscellaneous Parts	Pollard Water (Redmond)	(800) 437-1146	
Miscellaneous Parts	Consolidated Supply Co. (Seattle)	(206) 784-0047 Charlie Sandoval Cell (425) 922-4581	DFW Meter Box Items

**Table R-3 (cont.)
Chemicals, Equipment, Supplies, and Maintenance Contractors**

	Supplier	Contacts	Notes
Meters	Ferguson Enterprises (Woodinville)	(425) 486-9600	3" and 4" Omni Meters
Meters	Consolidated Supply Co. (Seattle)	(206) 784-0047 Charlie Sandoval Cell (425) 922-4581	Mueller Meters for AMI
Electrical Supplies	North Coast Electric (Bellevue)	(425) 641-3400	
Electrical Supplies	Stusser Electric (Bellevue)	(425) 454-3339	
Batteries	Interstate Batteries of Seattle (Seattle)	(800) 562-3212	
<i>Maintenance Contractors</i>			
Generator Maintenance	Cummins Northwest, Inc. (Renton)	(425) 235-3400	
SCADA Maintenance	Performance Information Technologies	(425) 440-0626	Wonderware
Telemetry Maintenance	S&B Inc. (Bellevue)	(425) 644-1700	
PLCs for Telemetry	S&B Inc. (Bellevue)	(425) 644-1700	
Groundwater Protection	CDM (Bellevue)	(425) 453-8383	
Water Testing	Water Management Labs (Tacoma)	(253) 531-3121	Certified Testing Laboratory
Water Testing	AmTest (Redmond)	(425) 885-1664	Certified Testing Laboratory

**Table R-3 (cont.)
Chemicals, Equipment, Supplies, and Maintenance Contractors**

	Supplier	Contacts	Notes
Water Testing	Seattle Public Utilities	Wylie Harper, P.E. Drinking Water Quality Director (206) 684-7880	Certified Testing Laboratory
Communication (Mobile Radios and Base Radios and DSL)	Westhill Electronics (Bothell)	Russ Wentz (425) 486-0777 Cell (206) 605- 3444	
	Accu Comm, Inc. (Mukilteo)	(800) 404-9344	
	Qwest (Seattle)	(888) 777-9569	

R.5 Area Agencies and Institutions of Note

Table R-4 provides a list of local agencies and institutions relevant to the District's purpose, and their contact information.

**Table R-4
Area Agency/Institution Contact List**

The Alarm Center	1 (800) 252-8338
Office/Shop	Acct# -1756335
Well 10	Acct# 515-5091
Well 1	Acct# 515-5092
Inglewood Lift Station	Acct# 523-1960
Emergency	911
911 Center, non-emergency	206-296-3311
NORCOM (Fire Dispatch), non-emergency	425-557-5700

**Table R-4 (cont.)
Area Agency/Institution Contact List**

Police Departments	
Issaquah Police Department	425-837-3200
King County Sheriff	206-296-3311
Redmond Police Department - records	425-556-2500
Redmond Dispatch 24 hour	425-885-1333
Sammamish Police Department - Main Admin	425-295-0770
Sammamish Police (24 hour non- emergency dispatch)	206-296-3311
Washington State Patrol – Bellevue District	425-401-7788
Fire Districts	
Eastside Fire & Rescue	425-313-3200
EF&R Battalion Chief Duty Officer – 24 hour Cell	425-765-1676
EF&R Battalion Chief Fax	425-557-7640
EF&R Fire Station 81 – Pine Lake	425-313-3381
EF&R Fire Station 82 –Sahalee	425-313-3382
EF&R Fire Station 83 – Klahanie	425-313-3383
King County Fire District #27 - Fall City	425-222-5841
KCFD #27 On-Call Duty Officer Cell	425-941-8975
King County Fire District #34 - Redmond	425-556-2226
KCFD #34 Fire Station Battalion Chief	425-556-2234
Federal	
EPA – Region 10 Seattle Office	1-800-424-4372
Federal Emergency Management Agency (FEMA) Region 10 Office	425-487-4600
FEMA general phone line	1 (800) 621-3362
Washington State	
Department of Ecology 24 hour	425-649-7000
Department of Transportation	206-440-4697
Department of Transportation – Emergency	206-440-4490
Department of Fish & Wildlife (Nuisance Wildlife)	425-775-1311
OSHA	1 (800) 321-6742
WA State Dept of Labor & Industries	1 (800) 423-7233
Department of Health 24-Hour Drinking Water Emergencies	1 (877) 481-4901

**Table R-4 (cont.)
Area Agency/Institution Contact List**

King County	
Department of Emergency Management Office (ECC when activated)	206-296-3830
Animal Control – Regional Animal Services of King Co.	206-296-7387
King County Wastewater Treatment Division (Sewer) 24 hour Emergency/Overflows	206-263-3801
South Treatment Plant, Renton – 24 hour Emergency/Overflows	206-263-1760
Public Health – Seattle/King County Emergency/24 hour number	206-296-4774
Roads 24-Hour Road Helpline	206-477-8100
King County Roads Dispatch	206-296-8100
Water and Land Resources Division General Information	206-477-4800
Josh Baldi - Division Director -	206-477-9440
Hazardous Waste Pick-up Information Office	206-477-4466
Department of Assessments Office	206-296-7300
Local Water and Sewer Assessments Office	206-296-3913
Ana Schoenecker, Customer Service	206-296-4606
Ana.schoenecker@kingcounty.gov Duty Officer 24 Hr	
Cities/Special Districts	
City of Bellevue Main	425-452-6800
Utilities O& M and 24-hr Emergency Response	425-452-7840
Joe Harbour, Operations Manager	425-452-2014
Andrew Lee, Deputy Operations Director	425-452-7675
City of Issaquah – Public Works Office	425-837-3400
Emergency: Police Dispatch (will contact water/sewer utilities)	425-837-3200
City of Redmond – Public Works Office	425-556-2800
Emergency: Police Dispatch (will contact water/sewer utilities)	425-556-2500

**Table R-4 (cont.)
Area Agency/Institution Contact List**

City of Sammamish Public Works	
Main Office	425-295-0500
MOC Administrative Assistant: Colleen Rupke	425-952-2115
Public Works 24-hour response: emergency dispatch	425-295-0700
Emergency Manager: Andrew Stevens	425-295-0549
Public Works Internal Service Manager: Martin Bohanan	425-952-2116
Street/Stormwater Maintenance Supervisor: Dan Johnson	425-592-2118
Parks Maintenance Supervisor: Mike Keller	425-592-2122
Northeast Sammamish Sewer & Water District	
Office	425-868-1144
Emergency/Laura Keough, Gen Manager	
Ames Lake Water District	
Office	425-222-7003
Emergency: Jeremy Reier, Water Operator	425-864-3663
Emergency: Bob Pancoast, General Manager	206-819-4215
Overdale Water Association	
Dale Timmons, Board of Trustees, dmtimmons@aritechnologies.com	H: 425-391-0437 C: 206-900-1613
Union Hill Water Association	
Office/24 hr.	425-497-1812
Field Supervisor – Don Erickson	425-466-4289
Cedar River Water	
Office – 24 Hr	425-255-6370
Washington Water Service Company	
Operations Field Office/Issaquah	877-408-4060
Dawnbreaker	
Water Association President - Brian Ott	425-788-6105
Water Operator: Kevin Odegard, NW Water Systems	360-876-0958