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13. Operations and Maintenance Program

The primary role of the Utility’s Operations and Maintenance (O&M) Program is to operate and maintain the infrastructure that extracts water from surface and groundwater sources, provides storage, and transports the water through the distribution and delivery system to customers. The O&M Program is also responsible for the maintenance of all reclaimed water lines inside the City. This includes the LOTT Alliance line that runs from the treatment plant to its Capital Lake pump station.

The O&M Program helps meet the Drinking Water Utility’s Goal 4:

**Improve, operate and maintain the infrastructure to ensure reliable delivery of high quality water to a growing population.**

Strategies for improving the infrastructure are discussed in Chapter 9 (Source Infrastructure), Chapter 10 (Storage), and Chapter 11 (Transmission/Distribution Infrastructure). Water quality strategies are in Chapter 12. O&M Program strategies for 2009-2014 are:

- Continue and improve the Utility’s maintenance management program, including preventive maintenance, repairs and replacements.
- Develop the Utility’s Emergency Response Program and improve facility security.
- Continue and improve Program Management, including safety, asset management and implementing the service meter strategy.

Following a review of applicable regulations, this chapter describes O&M Program activities, including maintenance management, emergency response and program management. New Level of Service (LOS) standards are presented, followed by the strategies and activities planned for 2009-2014 and implementation requirements.

### 13.1 OPERATIONS AND MAINTENANCE REGULATIONS

As summarized in Chapter 4, Legal and Policy Framework, the O&M Program is guided by a number of state regulations. Details on the Utility’s compliance with operator certification requirements are presented below, with reference to other applicable regulations.

**Operator Certification**

The Washington State Department of Health (DOH) requires all public water systems with more than 100 service connections to have a certified operator. Certifications are mandatory for staff members who are in direct charge of a public water system or major segments of the system and who are responsible for monitoring or improving water quality. (See Chapter 70.119 RCW and Chapter 246-292 WAC.)
At the end of 2005, the Utility was reorganized to separate the Water Quality Program from the O&M Program. The O&M Program at that time included Drinking Water Operations and Pump Stations which were managed by one supervisor who was also designated as the water purveyor. In 2006, the Utility met with DOH to determine the mandatory water works operator requirements. Based on a review of the Utility’s organization chart, DOH required mandatory certification for five positions. In 2008, the Utility created a new supervisor position in Pump Stations to balance the number of direct reports to the supervisor. With the creation of this new position, the water purveyor designation is the Pump Stations supervisor and DOH now requires mandatory certification for six positions, as shown in Table 13.1.

**Table 13.1. Mandatory Certifications**

<table>
<thead>
<tr>
<th>Position</th>
<th>Classification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water Operations Supervisor</td>
<td>Water Distribution Manager (WDM) 4</td>
</tr>
<tr>
<td>Pump Stations Supervisor</td>
<td>WDM 4</td>
</tr>
<tr>
<td>Water Operations Lead Worker</td>
<td>WDM 3</td>
</tr>
<tr>
<td>Water Quality Supervisor</td>
<td>Water Treatment Plant Operator (WTPO) 1</td>
</tr>
<tr>
<td>Water Quality Specialist</td>
<td>WTPO 1</td>
</tr>
<tr>
<td>Water Monitoring Assistant</td>
<td>WTPO 1</td>
</tr>
</tbody>
</table>

A WTPO 2 certification will be required should the Utility install ultraviolet, iron or manganese treatments.

Certification is also available on a voluntary basis to individuals interested in the Water Distribution Manager (WDM) and Cross-Connection Specialist (CCS) classifications. These voluntary certifications demonstrate staff incentive and competence and are an index of the professionalism and expertise available to efficiently operate the City’s water system. Table 13.2 lists Utility staff and their certification status.

**Other Regulations**

Chapter 246-290 WAC, Part 5 contains detailed regulations covering operations and maintenance, system reliability, emergency response and metering. Olympia’s compliance with these regulations is described in the following section.

As required by Chapter 246-294 WAC, the City maintains a Drinking Water Operating Permit for the water system.
Table 13.2. Water Operations and Water Quality Staff Water Certifications

<table>
<thead>
<tr>
<th>Name</th>
<th>Certification Number</th>
<th>State Certification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bonsall, Mark</td>
<td>11167</td>
<td>CCS</td>
</tr>
<tr>
<td>Coke, Steve</td>
<td>6185</td>
<td>CCS, BAT, WDM 4</td>
</tr>
<tr>
<td>Cole, Jeremy</td>
<td>10219</td>
<td>WDM 3, CCS</td>
</tr>
<tr>
<td>Curley, Daisy</td>
<td>11502</td>
<td>WTP 1</td>
</tr>
<tr>
<td>Daniels, Curt</td>
<td>6329</td>
<td>WDM 2, CCS, BAT</td>
</tr>
<tr>
<td>Edwards, John</td>
<td>10928</td>
<td>WDM 2, CCS, BAT</td>
</tr>
<tr>
<td>Floyd, Doug</td>
<td>4389</td>
<td>WDM 4, WTP 1, BAT</td>
</tr>
<tr>
<td>Gallagher, Mike</td>
<td>7939</td>
<td>WDM 3, CCS</td>
</tr>
<tr>
<td>Dave Karniss</td>
<td>12013</td>
<td>WDM 2</td>
</tr>
<tr>
<td>Main, Ed</td>
<td>10739</td>
<td>WDM 1</td>
</tr>
<tr>
<td>Maxfield, Meliss</td>
<td>11529</td>
<td>WDM1, WTP 1, CCS</td>
</tr>
<tr>
<td>Miller, Cara</td>
<td></td>
<td>WDM1</td>
</tr>
<tr>
<td>Norton, Dave</td>
<td>7875</td>
<td>WDM 3, CCS</td>
</tr>
<tr>
<td>Osborne, Jim</td>
<td>7965</td>
<td>WDM 2</td>
</tr>
<tr>
<td>Reimers, Cheri</td>
<td>9485</td>
<td>WDM 4, CCS, WTP 1</td>
</tr>
<tr>
<td>Salazar, Leo</td>
<td>7344</td>
<td>WDM 2, CCS</td>
</tr>
<tr>
<td>Sloan, Dustin</td>
<td>10880</td>
<td>WDS, WDM 2, CCS</td>
</tr>
<tr>
<td>Vessey, Mike</td>
<td>7809</td>
<td>WDM 4, CCS, BAT</td>
</tr>
<tr>
<td>Witt, Ken</td>
<td>10319</td>
<td>WDM 2, CCS, BAT</td>
</tr>
<tr>
<td>Woods, Eric</td>
<td>10802</td>
<td>WDM 1</td>
</tr>
</tbody>
</table>

Acronyms: WTP=Water Treatment Plan Operator, WDM=Water Distribution Manager, BAT=Backflow Assembly Tester, and CCS=Cross Connection Specialist.

13.2 O&M PROGRAM ACTIVITIES

The O&M Program is the most visible component of the Drinking Water Utility, with staff in the field operating and maintaining water storage facilities, pumping equipment, valves, pipes, hydrants and meters.

O&M staff visually inspect or remotely monitor (using telemetry) critical system components; provide routine maintenance, repair and replacement services; maintain accurate system maps and records; and develop and test the Utility’s Emergency Response Plan. In addition, O&M staff makes sure there is adequate water volume to meet fire protection and peak flow needs, thereby maintaining system reliability, performance and water quality.

The Program manages:

- Seven water supply sources (McAllister Springs and six wells)
- Five booster pump stations
- 11 storage tanks
- Over 275 miles of distribution pipe
- 2,500 fire hydrants
13. Operations and Maintenance Program

- 8,400 valves
- 18,827 service connections

In addition to Maintenance Management, activities include Emergency Response and Program Management (safety, asset management and planning for upgrading and replacing service meters).

**Maintenance Management**

The O&M Program conducted an extensive analysis of the tasks, labor and frequency of service needed in order for the Utility to maintain a sound maintenance management program (see Appendix 13-1). The Utility also contracted with HDR to assess the effectiveness of the Utility’s O&M Program in supporting asset management industry practices related to the maintenance, repair, rehabilitation and replacement of equipment; and supporting the level of service standards described in Section 13.3.

The O&M Program currently uses a straightforward, subjective assessment of service levels related to the program’s core functions, such as hydrant maintenance, valve exercise program, pipe flushing, new service installations, and pump station, source facilities and water meter maintenance. The consultant’s recommendations are incorporated in the actions planned for 2009-2014 (Section 13.4, Strategy 3).

The staff is organized into two crews, one responsible for pump stations and source and storage facilities, and one responsible for the distribution and transmission system piping.

**Supply, Storage and Pump Station Maintenance**

The pump station staff is responsible for all pump stations and other mechanical equipment and facilities at the supply sources and storage tanks. Activities are described below.

**Supply Sources**

Maintenance activities at McAllister Springs and the six supply wells described in Chapter 9 include the following:

- General building and grounds maintenance.
- Electrical repair and maintenance.
- Inspection and scheduling of equipment maintenance.
- Inspection, scheduling and repair of treatment equipment (i.e., chlorine pumps, injector, analyzers and pressure regulators) and changing out chlorine tanks.
- Telemetry alarm checks, repairs, loading programs, re-calibration, upgrades, etc.

Preventive maintenance is done on a schedule (see Appendix 13-1). Breaks and other problems are immediately fixed. Replacement occurs when equipment becomes unreliable.
Storage Tanks

The pump station staff is also responsible for maintenance of equipment and facilities associated with the Utility’s 11 storage tanks described in Chapter 10. They conduct the following activities:

- Grounds maintenance.
- Interior tank cleaning (supported by contractors).
- Electrical repairs and maintenance.
- Exercise, flushing and inspection of equipment.
- General maintenance, repair or replacement of parts or equipment.
- Telemetry alarm checks, repairs, loading programs, re-calibration, upgrades, etc.

Preventive maintenance is done on a schedule (see Appendix 13-1). Breaks and other problems are immediately fixed. Replacement occurs when equipment becomes unreliable. Both Bush and Stevens Field storage tanks were replaced in 2007.

In 2008, the O&M Program began increasing the cleaning schedule for tank interiors to once in five years instead of on a six to seven year cycle.

Distribution System Pump Stations

Pump station staff is also responsible for maintenance of the five pump stations located throughout the distribution system as described in Chapters 9 and 11. These activities are similar to those described above and include:

- Grounds maintenance.
- Electrical repairs and maintenance.
- Exercise, flushing and inspection of equipment.
- General maintenance, repair or replacement of parts or equipment.
- Telemetry alarm checks, repairs, loading programs, re-calibration, upgrades, etc.

Preventive maintenance is done on a schedule (see Appendix 13-1). Breaks and other problems are immediately fixed. Replacement occurs when equipment becomes unreliable.

Transmission and Distribution System

The distribution system staff is responsible for maintaining the pipes that make up the distribution and transmission systems. These facilities are described in Chapter 11. The Utility contracts out for leak detection activities and in 2008 completed a survey of the entire distribution system. Results indicate very few leaks, most associated with leaking hydrant bleeders and leaking valve packing. All of these were repaired. The O&M Program will evaluate the frequency of future leak detection efforts. Maintenance activities are described below for:
• Valves
• Service lines
• Hydrants
• Water meters

Preventive maintenance is done on a schedule. Breaks and other problems are immediately fixed. Replacements occur on a limited basis.

**Valve Maintenance**

Distribution system staff exercise and flush the system’s 8,400 valves on a three-year cycle. The staff is also responsible for installing new valves, and handling general maintenance and replacement activities.

Preventive maintenance is based on a schedule shown in Appendix 13-1. Breaks and other problems are immediately fixed.

**Service Line Maintenance**

Water distribution staff is responsible for abandoning, installing, replacing, repairing and relocating service lines. Service line maintenance is a low priority and only becomes a high priority when breaks and other service losses occur; these are immediately tended to. This group also installs new sample stations or replaces old ones when requested by Water Quality Program staff.

**Hydrant Maintenance**

The water distribution staff is responsible for flushing, exercising, installing, raising/adjusting, replacing or relocating the system’s 2,500 hydrants. The current flushing schedule is once every three years. Preventive maintenance is a high priority to prevent leaks or breaks and make sure the hydrants are functional for fire fighting.

**Water Meter Maintenance**

Meter readers from the Utility Billing staff install or replace most residential meters when needed. Water Quality staff replace or install commercial meters and irrigation meters. Water distribution crews respond to after-hours customer service calls for turning meters on and off. Preventive meter maintenance is rarely done. Breaks and other problems are immediately fixed when reported. Historically, meters have been replaced on a limited basis; see below and Appendix 13-2 for current meter replacement planning.

**Reclaimed Water System**

The water distribution staff is responsible for initial flushing to all reclaimed water lines at the beginning of the irrigation season, re-painting valve box covers, and making any needed line repairs.
Emergency Response

A variety of emergencies may threaten the Utility’s ability to deliver safe and reliable drinking water. The purpose of emergency response planning is to identify specific response actions to be taken during an emergency that will maintain quantity and quality of water, protect employees, minimize disruption to the public and preserve property.

To improve the security of critical facilities, the Utility hired the consulting firm EES in 2004 to conduct a Vulnerability Assessment, and began installing several security enhancements in 2007. The assessment specifically addresses physical technologies, Utility policies and operational procedures relevant to the City’s critical potable facilities.

Emergency Response Plan

The Utility’s Emergency Response Plan (ERP), updated in 2009, includes the core elements from EPA’s publication, *Emergency Response Plan Guidance for Small and Medium Community Water Systems*. The ERP follows an “all hazards” approach to emergency planning. This means that whatever the emergency might be, the same formula, outlined in the ERP, is used to respond. There may be different people in different roles, depending on who is available, or the type of emergency. But all Utility staff are trained in the contents of the ERP, table top exercises on most likely hazards, the incident command system, personal and property protection, communications, and return to work procedures.

The ERP also includes responses learned from recent flooding and wind events. A field guide was also developed to provide a quick and practical direction to staff on how they should respond to a variety of emergency situations. Because of its sensitive nature, the field guide is not publicly available nor are several sections of the ERP. Relevant excerpts from the ERP are included in Appendix 13-3. Contact the Water Quality supervisor with questions regarding additional content for this document. The ERP contents include:

- Plan overview – mission and goals; coordination with Citywide Emergency Planning efforts; and coordination with regional, state and national emergency planning efforts.
- Incident command system – roles, responsibilities and severity of emergencies. See Appendix 13-3, Appendix A of the ERP for an emergency contacts and call-up list.
- General system information.
- System vulnerabilities – a general description of system vulnerabilities by infrastructure type.
- Events that cause emergencies – natural verses human-caused hazards.
- Communication – procedures for both internal and external communication, including alerts to local law enforcement, state and local health officials neighboring water systems.
and customers. See Appendix 13-3, Section 7 of the ERP for detailed communication procedures, including customer notification.

- Threat evaluation – procedures for evaluating the creditability of a threat such as a security breach, unusual water quality or consumer complaint. See Appendix 13-3, Section 8 of the ERP for detailed threat evaluation procedures.

- Contamination threat response – procedures for responding to a contamination event, isolating the contamination and sampling for contamination. See Appendix 13-3, Section 9 of the ERP for detailed contamination threat response procedures.

- Water shortage procedures – drought response plan and alternative sources.

- Replacement equipment and chemical supplies.

- Personnel safety – shelter and first aid.

- Property protection – procedures for protecting facilities, equipment and vital records.

- Returning to normal operations – procedures for inspecting, flushing and disinfecting the system; verifying satisfactory water quality, coordinating with DOH on system condition and water quality results; and notifying customers.

The ERP has 14 appendices, including a priority customer list, emergency contact list, equipment inventory, hazard analysis, water quality reporting forms and critical facility schematics and operational specifics. One appendix is the Spill Response Plan (see Chapter 8) and another is the Contingency Plan (see below).

**Contingency Plan**

DOH guidelines require the City to address long-term replacement of the principal source of supply. Long-term, the City plans to replace McAllister Springs with a less vulnerable Wellfield, and to develop Briggs Well as a seventh well source.

The Utility maintains a contingency plan so it can be prepared to maintain water supply to its customers if one or more supply sources should be lost. The Utility’s new Level of Service standard for system reliability is that the Utility will maintain capacity to meet winter demand (inside use only) with loss of the largest water source. This would require complete curtailment of all outside and non-essential water use. This standard is within the Utility’s current and planned capacity (see Chapter 5). (See Section 13.3 below for more on Levels of Service.)

**Potential for Loss of Supply**

Water supply could be lost due to contamination of a water source or damage to a source or transmission line due to natural events like an earthquake or human-caused threats. To prevent contaminants from reaching a supply source, it may be necessary to cease pumping operations until corrective actions can be completed. Under extreme circumstances, the City may need to permanently abandon or temporarily shut down a source because of source contamination.
Contamination risks are described in Chapter 8 and detailed in Appendix 8-4. Hazardous material spills or discharges can result in contamination of a single well or an entire wellfield. Loss of supply at McAllister Springs through a source or transmission failure would have a significant impact on system reliability.

Loss of one or more of the supply wells would not have as dramatic an impact. If loss occurred during peak season, some curtailment could be needed.

Some system reliability is provided through standby (or emergency) storage in each pressure zone (see Chapter 10). The Utility’s reliability standard provides for supply capacity in addition to this storage capacity.

**Contingency Measures**

Complete curtailment of all outside and non-essential water use would allow customers to meet basic needs for consumption, sanitation and general commerce. The restriction on outdoor water use would need to be strictly enforced to ensure that indoor uses are not affected.

The Utility’s Drought Response Plan (Appendix 6-2) establishes procedures to follow if curtailment is required and outlines four progressive levels of curtailment: advisory, voluntary, mandatory, and emergency. The Utility’s experience during previous emergencies at McAllister Springs has shown that customers are very responsive in reducing use to minimal levels even during peak use periods.

**Operations and Maintenance Program Management**

O&M Program management activities include developing and implementing standard operating procedures, conducting an employee safety program, developing an asset management program, planning to upgrade and replace service meters, and record keeping.

**Standard Operating Procedures**

The O&M Program hired a consultant in 2006 to help develop Standard Operating Procedures (SOP). For the most critical Utility activities, these SOPs provide detailed steps on completing the activity, including safety and health considerations.

SOPs were also developed for reclaimed water, dealing with such issues as start up procedures, inspection and testing of backflow devices, and determining unauthorized connections. Each Operations and Water Quality vehicle contains a binder with up-to-date copies of the SOPs, Emergency Action Plans (EAPs) and Fall Protection Plans. The Water Resources Director and Water Operations, Pump Stations and Water Quality Supervisors also have copies in their offices.

The SOPs are reviewed annually, and updated as necessary. The SOP binder contains:

- Physical address of sources, storage tanks and booster pump stations.
- Day and after hours phone number of Utility emergency staff contacts.
- Distribution System Procedures
13. Operations and Maintenance Program

- Water Quality Procedures
  - Notifying Water Quality staff when work is being done on the water system that might impact water quality.
  - Changing chlorine cylinders.
  - Responding to a chlorine alarm.
  - Cleaning up chemical spills.

- Emergency Procedures
  - Excavating for emergency repairs.
  - Providing emergency fire flow.
  - Responding to a power failure at McAllister Springs.

- Pump Station and Storage Tank Procedures
  - Pump station checks that do not require a confined space permit.
  - Pump station checks that require confined space entry permit.
  - Operating the Waukeshaw propane-powered pump at McAllister Springs.
  - Operating the Meridian storage tank under routine and emergency conditions.
  - Fall protection plans for Meridian 1 & 2, Boulevard Bush, Eastside, Elliott and Hoffman storage tanks.

- Reclaimed Water Procedures
  - Identifying unauthorized connections to the reclaimed water system.
  - Flushing and dechlorinating the reclaimed water system.
  - Inspecting and testing backflow assemblies on reclaimed water.
  - Inspecting potential sites for reclaimed water service.
  - Monitoring total chlorine residual of reclaimed water.
  - Painting control box lids on reclaimed water.
  - Repairing reclaimed water mains.

Safety Program

The Utility has an active safety program guided by the City’s Safety Coordinator. A safety committee is made up of Water Resources employees, representing the Drinking Water, Wastewater and Storm and Surface Water utilities. The safety committee meets monthly to monitor and discuss ways to improve safety. The committee reviews accidents or near misses as well as new training opportunities or regulations. Monthly trainings for staff are given by either the Safety Coordinator or an experienced outside professional. Some of the training topics include:

- Personal protection equipment
- Flagging
- Cranes, hoists and rigging
- Fall protection
- Lock out procedures
• Confined space procedures
• Respiratory protection
• Handling asbestos
• Chlorine systems

The Utility has developed an action plan to ensure implementation of the Public Works
Department’s Employee Safety and Health Handbook. The action plan identifies priority elements
of the handbook and these elements are routinely discussed at staff meetings. Material Safety
Data Sheets for each chemical used are located next to the safety bulletin board, along with
safety and first aid equipment. As mentioned under Standard Operating Procedures, the Utility
has written protocols for safely dealing with such hazardous tasks as handling asbestos pipe,
changing chlorine cylinders and preventing falls.

Asset Management

The Utility is developing a more formal process for managing its assets (infrastructure and
equipment). An effective asset management process will enable the Utility to make decisions
about when to repair and replace infrastructure based on risk of failure, rather than simply on
age or location. With this capacity the Utility can provide agreed-upon levels of customer
services at the lowest life cycle costs.

An effective asset management process will help the Utility:

• Determine levels of service, and measures of service levels important to customers (see
current levels of service, Section 13.3).
• Develop measures tying employee work to the desired outcome or customer service
level.
• Develop business case evaluations for asset decisions using a triple-bottom line
approach (financial, social, environmental); and for selecting the best means to
accomplish a desired level of service.
• Map workflows for maintenance, asset replacement and capital facilities planning, and
set priorities for workflow improvements; this ensures that assets are built to standards
and maintained to function optimally.
• Make course corrections based on "lessons learned", the advent of new technologies, or
changes in levels of service standards.

The Utility has begun developing the data systems for asset management by incorporating all
assets into the City’s GIS mapping system. A complete data system will allow the Utility to:

• Inventory each asset by its location, condition, value and cost to the Utility
• Prioritize investment decisions based on criticality (both risk of failure and consequence
of failure).
• Schedule when to repair, replace and/or expand each asset.


**Meter Replacement Program**

**Current Program**

The Drinking Water Utility currently has approximately 20,000 service meters in the drinking water system. About 57 percent are manual read meters and 43 percent are “touch” read meters.

The Drinking Water Utility has four full time staff that read meters and perform other meter related service work. Approximately 98% of meters are read and billed bi-monthly, and 2% of meters (typically larger accounts) are read and billed monthly.

The Utility’s current annual budget for service meter replacement is $107,000. This annual budget is currently sufficient to replace approximately 469 single-family meters per year.

Current industry standard for meter replacement is every 15-20 years. Conservatively assuming a replacement schedule of 15 years, the Utility would need to replace approximately 1,330 meters per year to keep pace with industry standards. For years, the Utility’s investment in service meter replacement has not kept pace with industry standards. As a result, aging and unreliable service meters are an increasing challenge for the Utility.

To date, the Utility’s replacement strategy has been to replace meters when they stop working. Given our mostly bi-monthly meter reading schedule, we may lose as much as two months of revenue per failed meter.

**Current Challenges**

Aging meters generally under-count and worsen as they age, affecting revenue recovery and customer equity. The Utility’s current investment in meter replacement is not keeping pace with our aging inventory. The Utility is also suffering from malfunctioning data transmission components that frequently transmit readings below actual water consumption. This is a long-standing problem occurring primarily in our “Master” brand meters.

Our current meter reading efficiency (based on the number of readings a meter reader can obtain in a working day) is approximately 50% below the nationwide industry standard. The industry standard has improved due to the on-going movement from manual reading to automated meter reading (AMR) systems.

Our meter reading accuracy standard is for 99% or more of all meter readings to be correct on the first read. We are occasionally unable to meet this standard primarily due to the component problem with the “Master” meter brand meters. All meter readings identified as incorrect during pre-billing review require return trips for re-reads, consuming time, effort and increasingly expensive fuel.

Based on the Utility’s current service meter portfolio, staff estimates that an investment of $3.3 million is needed during the planning period to get back to industry standards. This investment would replace all meters more than 15 years old and replace all failing Master Meter
brand meters. This cost estimate assumes touch read style meters and temporary project
funded employees for installation.

The replacement of large numbers of service meters creates a significant opportunity to
potentially transition to a more automated meter reading system. Over the past three years,
staff has evaluated costs and benefits of different meter reading approaches to help make
decision on our service meter standard moving forward.

Service Meter Technologies

The following is a brief description of the four main types of service meter reading technologies
currently used by water utilities:

Manual Meter Reading Technologies:

- **Manual Read** – Requires the meter reader to visually obtain the meter reading directly
  from the meter register. The meter readings are then manually entered into a handheld
  electronic device that later downloads the data to the billing system. Typical meter
  reads per person per day = 300 to 500.

- **Touch Read** – Touch read systems enable the meter reader to gather readings through an
  outside meter reading device (touch pad) connected to the meter register. The meter
  reader still must visit each meter; however, this type of meter reading is generally more
  efficient. Capital costs are higher for the touch pad equipment than the manual read
  equipment. Typical meter reads per day per person = 350 to 600.

Automated Meter Reading Technologies:

- **Mobile Radio** – A mobile radio system enables the meter reader to collect meter readings
  while walking, cycling, or driving by a meter equipped with a radio frequency (RF)
  reading device. Currently used by City of Tumwater. Capital costs are higher than a
  touch read system; however, the operational costs of meter reading are lower. Typical
  meter reads per day per person = 5,000 to 10,000.

- **Fixed Radio** – Fixed radio systems are fully automatic. Meter readings are captured
  through a system of electronic collectors located throughout the utility’s service area that
  transmit readings back to a central utility location. Currently used by City of Lacey.
  Additional capital costs over mobile radio include an array of collectors and repeaters
  positioned through the service area. Operational costs are lowest with a fixed radio
  system. Avoided vehicle trips and fuel consumption are significant environmental
  benefits of a fixed radio system. Typical meter reads per day per person = unlimited.

Water Service Meter Strategic Plan – Key Findings

In 2006, responding to the challenges highlighted above, the Utility hired a consultant (HDR
Engineering, Inc.) to develop a Water Service Meter Strategic Plan (Appendix 13-2). The
following goals helped shape the plan:
• Obtain accurate and reliable meter data.
• Be efficient and reliable in collecting and processing water meter data.
• Establish a strategy that allows the Utility to efficiently and cost-effectively acquire, replace and maintain service meters.
• Fully realize Utility revenue based on the quantity of water actually delivered to customers.

HDR evaluated the total cost of a service meter replacement program for each of the four meter reading technologies. A 2006 net present value cost comparison of capital and operational costs over a planning horizon of 15 years indicated that mobile radio technology appears to be the least costly option under most scenarios. Manual and touch read technologies are less expensive in the short-term due to lower up-front capital costs; however, automated reading technologies appear to be a better value over the long-term.

In addition, in a weighting of other non-cost considerations, automated mobile and fixed radio technologies scored higher overall than manual and touch read technologies. These non-cost considerations included:

• Risk/Liability – radio technologies lower risk of injury to staff.
• Data Management – radio technologies can provide greater detail for water use trend analyses and improved (quicker) response to customer inquiries on water use.
• Customer Contact – manual technologies provide a greater presence in the community.
• Adaptable to Technology – radio technologies provide the greatest flexibility to adapt to changes in technology.
• Staff Impact – manual technologies create the least impact on existing meter reading staff.
• Public Acceptance – public acceptance of radio technologies (such as radio signals and the visual appearance of repeaters) may be less than current manual technologies.
• Environmental Impacts – radio technologies require significantly less driving and fuel consumption than manual approaches.

After evaluating these cost and non-cost considerations, automated meter reading technologies appeared to be best suited for Olympia in the long run. Cost considerations further improve if the utility moves to monthly meter reading and billing in the future. Increased investment in service meter replacement will also help to resolve customer inequities due to under-reporting and increase baseline utility revenue.

Given the findings of the Service Meter Strategic Plan, the City Council Finance Committee directed staff to perform a Request for Qualifications (RFQ) in early 2009 from automated meter reading vendors. The RFQ had vendors propose the best solution for the City, whether it be a mobile, fixed or hybrid system. After an initial selection process, three vendors were selected to
make presentations of their proposed solution. Two recommended a hybrid system of fixed and mobile, while one proposed a fixed solution only.

**Transition to Automated Meter Reading Technology**

Based on information obtained through the RFQ, staff estimates the costs of complete transition to a mobile automated meter reading (AMR) system at $4.9 million. This estimate assumes that all meters greater than 10 years old would be replaced with AMR equipment, while those meters less than 10 years old would be kept and retrofitted with AMR equipment.

Given the estimate of $3.3 million to bring our service meter portfolio up to current industry standards, the “marginal cost” of transition to automated meter reading is estimated at $1.6 million. Due to operational savings achieved with automated meter reading (estimate of 2 FTE reduction and associated savings), the “marginal cost” of AMR transition can be achieved without a rate increase to utility customers. The annual operational savings would more than pay for the annual debt service costs on the initial investment in AMR. The critical investment of $3.3 million in service meter replacement does trigger the need for rate adjustment and has been factored into the financial strategy found in Chapter 15.

Based on the metering plan recommendations, feedback from other municipal utilities, and further staff analysis, the Utility plans to deploy automated meter reading during this planning period (see Section 13.4). The Capital Improvement Program found in Chapter 14 includes a total of $5 million over a four year period (2011-2014) for service meter replacement and the transition to automated meter reading. The Utility also intends to establish mobile AMR as the standard for new development installation as soon as possible in 2010. As part of the transition, staff will work with service meter vendors on options for fixed/mobile AMR hybrid options where beneficial.

**Record Keeping**

Operational and water quality records are maintained according to WAC 246-290-480. These requirements and the required retention period are listed in Table 12.8 in Chapter 12, Water Quality. Specific procedures for water quality records are discussed in Chapter 12.

Project reports and construction documents are retained and archived through the Public Works Technical Services Line of Business. Public notices are retained electronically and a hard copy is placed in the DOH file, located in the Water Quality office.

**13.3 LEVELS OF SERVICE**

Municipal utilities in the United States and elsewhere commonly use Level of Service (LOS) standards to evaluate whether the physical system and operations are functioning to an
adequate level. LOS can be defined in terms of the customer’s experience of utility service and/or technical standards based on professional expertise of utility staff.

The Utility complies with all regulatory standards for water quality and system design and operation. In addition to these minimum standards, the LOS standards address issues of concern for customers that influence decisions on infrastructure investments.

LOS standards can help guide investments in maintenance, repair and replacement; and for new assets can be used to establish design criteria and prioritize needs. Using a structured decision process that incorporates LOS can help a utility achieve desired service outcomes while minimizing life-cycle costs.

For this Water System Plan, the Utility has developed its first formal set of LOS standards. Previously, the Utility relied on informal LOS standards, based on professional experience and system history, to evaluate whether the system was performing adequately from a customer’s point of view.

Utility staff used the following criteria in selecting LOS:

- Specific goal or expectation.
- Focused on customer and community.
- Quantifiable and measurable.
- Relatively simple to understand and apply.
- Constrained by available budgets for maintenance, repair and replacement.

The selected LOS are in these areas:

- System performance (including service interruption due to breakage, pressure, system reliability).
- Sustainability (energy efficiency).
- Customer service (response to water quality and service-related complaints).

LOS standards related to the O&M Program are described below. See Chapter 12 for water quality LOS standards.

**System Performance**

- **Service interruption due to line breaks.** During a three year period, no customer will experience more than three service interruptions due to a line break; such service interruptions will average four hours or less.

- **Pressure.** Water will be delivered to new construction at a minimum pressure of 40 psi at the service meter.

- **System reliability with largest source off-line.** Utility will meet winter demand (inside use only) with the loss of our largest water source. This would require complete
curtailment of all outside and non-essential water use, particularly during peak use periods. (See above, Contingency Planning.)

**Sustainability**

- **Energy efficiency.** All pumps are rated 80 percent efficient or higher, unless it is not cost-effective to do so (i.e. the value of energy savings would not “pay back” the cost of the improvement within five years).

**Customer Service**

LOS standards for responsiveness to Water Quality and Service-Related Complaints are:

- The Utility responds to main breaks within 15 minutes during work hours and within one hour during non-work hours, with a goal of no customer complaints about loss of service.

- The Utility responds to low pressure and water quality complaints by the end of the following business day.

**13.4 2009 – 2014 O&M PROGRAM**

The Operations and Maintenance Program strategies and activities for 2009-2014 are designed to help meet the Drinking Water Utility’s Goal 4:

*Improve, operate and maintain the infrastructure to ensure reliable delivery of high quality water to a growing population.*

O&M Program strategies for 2009-2014 are:

1. Continue and improve maintenance management, including preventive maintenance, repairs and replacements.

2. Develop the Utility’s Emergency Response Program and improve facility security.

3. Continue and improve Program Management, including safety, asset management and service meter strategy.

This section presents the ongoing and new O&M Program activities and new activities for 2009 – 2014.

**Strategy 1. Continue and improve maintenance management, including preventive maintenance, repairs and replacements.**

For details on current activities, please see the Maintenance Management Program, *Appendix 13-1.*
Ongoing Activities

1. Source facilities:
   - Check equipment efficiency and capacity annually.
   - Maintain per manufacturer recommendations.
   - Clean and repair as needed.
   - Maintain building and grounds in a park-like manner.

2. Storage facilities:
   - Inspect hatches, screens and alarms quarterly.
   - Inspect exterior quarterly and clean interior every five years.
   - Repaint and repair tanks as needed.

3. Pump Stations:
   - Check efficiency of all equipment annually.
   - Maintain per manufacturer recommendations.
   - Clean and repair as needed.
   - Maintain buildings and grounds in a park-like manner.

4. Fire Hydrants:
   - Exercise and test operation of each hydrant every two years, lubricate and do minor repairs and painting as needed.
   - Replace all two-port hydrants and all hydrants on main lines less than 6-inches in diameter.

5. Service Lines:
   - Replace after two leaks or to correct flow or pressure problems.
   - Move services from inside buildings to front of businesses in the downtown area.
   - Install new service connections to existing mains for in-fill lots only (not new developments) within 10 working days of request.

6. Transmission lines:
   - Repair leaks as needed.
   - Identify transmission lines that are reaching the end of serviceability.
   - Identify all cross country mains and their easements or right-of-way requirements.
   - Replace AC (asbestos cement) pipe as funding is available.
   - Repair or recondition blow-off (air-relief) valves.
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7. Valves:
   • Maintain, operate and exercise each system valve every two years (includes air release
     valves, blow-off valves and pressure-reducing valves).
   • Add or replace valves based on condition, distance between valves and location.

8. Meters:
   • Test and repair 3-inch and larger meters every three years.

9. Reclaimed water system:
   • Repair leaks on transmission lines.
   • Install new service lines and small main extensions.
   • Do initial flushing at the beginning of the irrigation season.

10. Other
   • Adjust water system components to street level in conjunction with annual asphalt
       overlay/street reconstruction projects.
   • Hoffman Storage Tank interior coating and Elliott Storage Tank exterior coating are CIP
       projects described in Chapter 10, Storage Infrastructure.

New Activities
1. By 2012, transition some or all of small diameter water main replacement projects from
   contractors to City crews for increased efficiency. Begin replacing small diameter mains
   at a rate of 3200 to 4000 feet per year. (See Chapter 14, CIP.)
2. Update prioritization list of 2-inch and smaller main replacements.
3. Increase flushing of valves and hydrants from a three-year cycle to a two-year cycle.
4. Complete service meter replacement project and transition to automatic meter reading
   (AMR) technology over a 4-year period beginning in 2011. (See Chapter 14, CIP.)

Strategy 2. Develop the Utility’s emergency response program
and improve facility security.

Ongoing Activities
1. Continue to maintain and be prepared to implement the water system emergency
   response plan.
2. Store emergency supplies such as food, water, batteries and cell phone charges at several
   water facilities.
3. Conduct tabletop and/or field exercises annually.
4. Maintain existing security equipment at critical facilities.

**New Activities**

1. Improve facility security by installing surveillance and other security equipment at the Utility’s critical facilities as needed. (See Chapter 14, CIP.)

2. Install fencing to improve security as needed.

3. Ensure pump station telemetry system hardware and software are updated as needed. Replace equipment when it reaches its expected useful life and take full advantage of efficiencies that may be gained by upgrading software.

4. Purchase a portable generator that can power booster pump stations during power outages. (See Chapter 14, CIP.)

**Strategy 3. Continue and improve O&M program management, including safety, asset management and meter replacement.**

**Ongoing Activities**

1. Coordinate with Storm and Surface Water and Wastewater Utilities to expand and improve inventory management systems. Provide funding to support just-in-time inventory delivery and parts management.

2. Continue using the work order system to schedule and record water system jobs.

3. Coordinate with Storm and Surface Water and Wastewater Utilities and Technical Services to improve information systems and mapping data management (GIS).

4. Continue employee safety program, including safety committee review of accidents, review of new regulations and available training, and monthly staff training sessions.

5. Continue other routine functions such as Maintenance Center office management, inventory management and equipment storage.

**New Activities**

1. Ensure that all Utility infrastructure is accurately depicted on maps and related databases.

2. Develop and implement a formal asset management process in coordination with Public Works and City-wide efforts.

3. Refine the meter replacement strategy to prioritize and schedule replacement of existing meters and installations of new meters using automatic meter reading technology.

4. Clearly identify relationships between work activities outlined in the Maintenance Plan strategies and how they support Levels of Service.
5. Implement the following consultant recommendations for improving the Maintenance Management Program:

- Complete implementation of a Geographic Information System (GIS) which links to Sungard’s HTE™ computerized maintenance management software (CMMS) and/or other asset management software.

- Develop and implement technologies to support the formal asset management process developed as part of Item 2 above. Technologies will support data entry, facilities tracking, criticality ratings based on staff’s “best professional judgment” and a Condition/Inspection Program.

- Develop a formal Condition and Inspection Initiative which will:
  - Determine and list inspection task currently performed and compare with industry practices. Identify gaps.
  - Determine the level and type of inspections needed for each asset class necessary to accurately assess condition.
  - Determine the frequency of inspections and outline decision criteria that guide the Utility to increase or decrease the inspection frequency.
  - Develop inspection codes for each asset class to be entered as an asset attribute.
  - Develop condition ratings appropriate to the asset class.
  - Integrate the Condition and Inspection Initiative with CMMS and GIS database systems.

- Develop a Maintenance, Repair, Rehabilitation and Replacement (M3R) Decision Program:
  - Define actions to take when assets fail to meet a condition or performance target based on either a condition inspection or upon a failure.
  - Leverage the use of CMMS software to trigger an M3R evaluation.
  - Align the M3R process with the Utility’s strategies.
  - Document the program in the Utility’s Maintenance Management Plan.

13.5 O&M PROGRAM IMPLEMENTATION

This section includes current staff and additional staffing needed to support the planned program and meet the new Level of Service standards.

Current Staffing

The O&M Program currently is budgeted for 16.5 employees, divided into two crews. The Water Operations Supervisor oversees distribution system activities, and the Pump Stations Supervisor oversees sources, booster pump stations and storage tank facilities. Both
supervisors report to the Director of Water Resources. The function of each staff position and its full-time equivalent (FTE) is detailed below.

**Water Operations**

- Water Operations Supervisor (1.0 FTE). Directs, plans, and organizes operation and maintenance of the distribution system and reclaimed water.
- Water Distribution Lead Worker (1.0 FTE). Oversees and assists with day-to-day distribution and reclaimed water system maintenance and repair activities.
- Water Distribution Maintenance Worker II (11.0 FTEs). Performs day-to-day distribution system maintenance and repair duties.
- Water Distribution Locator (1.0 FTE). Performs utility locates prior to construction or repair activities by City contractors, property owners or staff. Calls for all City utilities are dispatched from one call center.
- Inventory Control Specialist I (0.5 FTE).
- Water Resources Maintenance Worker I (0.5 FTE). This position, new in 2008, is shared on a six-month basis with Stormwater/Wastewater Operations.

**Pump Stations**

- Pump Station Supervisor (1.0 FTE). Directs, plans and organizes operation and maintenance of pump stations and source and storage facilities.
- Pump Stations Remote Systems Technician (1.5 FTE). Ensures all remote systems necessary to operate the water system are functioning at capacity.

**Staffing Needs**

Analysis of the maintenance management program ([Appendix 13-1](#)) identified a need for an additional 3.0 FTE by 2012. More staff is needed in order to make the transition to replacing small-diameter mains in-house, support asset management and meet the desired levels of customer service.

Systematically replacing small diameter (4-inches and under) pipe is a priority for this planning period, and it will be more cost-effective for Utility staff, rather than contractors, to do this work. Also, the Utility can ensure better customer service when the work is done by City employees. Replacements will be done on an emergency basis and on a schedule as pipes reach the end of their design life. Funding for this work will be transferred from the Capital Budget to the Operating Budget.