

Section 7

Operation and Maintenance Program

This section summarizes the current O&M program for the wastewater system, including the STEP collection system, WRF, and reclaimed water distribution system. Future O&M program needs are identified based upon evaluation of the existing staffing and procedures, and the anticipated wastewater system growth discussed in previous sections.

7.1 Wastewater System Management and Personnel

The City of Yelm is governed by an elected mayor and a seven-member city council. The mayor and council review and approve wastewater system policy recommendations prepared by the Public Works Department and executive staff. Established policies provide the framework for wastewater system management, operation, and maintenance.

The City currently has five full-time wastewater system personnel who operate the WRF and STEP collection system on a day-to-day basis. Wastewater staff also have the primary O&M responsibility for the reclaimed water distribution system and facilities at Cochrane Park, with water utility staff performing maintenance on the reclaimed water customer meters. Additional City staff contribute to planning and administrative functions of the wastewater system along with their other duties. The wastewater system organizational chart is shown in Figure 7-1.

In total, the City currently employs five FTEs in the Public Works Department for the operation and maintenance of the wastewater system. Taking into account all City staff who contribute to the wastewater system administration, the number of wastewater system FTEs involved in the operation of the wastewater utility increases to seven. A general synopsis of the responsibilities of each staff member is provided below:

- **Mayor and City Council:** The Mayor and City Council set policy and rate schedules; approve ordinances; and serve as a sounding board for public response, feedback, and guidance. The Mayor and Council also approve the wastewater system budgets, set citywide priorities, and provide funding and support for projects.
- **City Administrator:** The City Administrator works with the Project Manager, Public Works Director, and City Council to implement and execute the policies established by the Mayor and Council, manage project issues, oversee annual wastewater system budget preparation, and work with the funding agencies to fund system improvements.
- **Project Manager:** The Project Manager works with the Executive Department on budget preparation for capital improvement needs; planning for the collection system, WRF, and reclaimed water system; and execution of capital improvement projects.
- **Public Works Director:** The Public Works Director works directly with wastewater system staff to ensure that the system is operated efficiently. The Public Works Director is responsible for the development, negotiation, and administration of all reclaimed water User Agreements. The Public Works Director also manages the day-to-day operation of the reclaimed water system. Additional responsibilities include staff oversight, plan review for new projects, and responding to customer complaints.

- **Water Reclamation Facility Manager:** The primary responsibility of the WRF Manager is to ensure continuous, efficient, and economical operation of the WRF while meeting the goal of producing an effluent that meets the requirements of the facility discharge permit. The WRF Manager coordinates the work of operations staff and is also responsible for wastewater system record-keeping and reporting.
- **Operations staff:** Operations staff, including the WRF Manager, conduct the day-to-day work necessary to maintain, operate, test, and repair the wastewater system to ensure proper operation and system longevity.

7.2 Operator Certification

WAC 173-230 requires that the WRF is operated under the direct supervision of a certified operator. The WRF is classified as a Class III treatment facility. The wastewater treatment process is required to be supervised by an operator certified at a level that is equal to or greater than the facility classification. The state does not currently require certification for sewer collection or reclaimed water distribution system maintenance operators at this time.

The following staff members have certifications related to the wastewater system's operation.

Jim Doty
Position: WRF Manager
Certification: WWTP manager group IV certification #6449

Aris McClelland
Position: WRF/Collection System Operator
Certification: Group II certification #7684

Randy Hatch
Position: WRF/Collection System Operator
Certification: Group III certification #7003

Robert Rhoades
Position: WRF/Collection System Operator
Certification: Group III certification #7118

Tony Edwards
Position: Assistant Treatment Plant Operator
Certification: In-Training

City policy is to maintain a well-qualified, technically trained staff. The City annually allocates funds for personnel training, certification, and membership in professional organizations. The City believes that the time and money invested in training, certification, and professional organizations are repaid many times in improved safety, skills, and confidence.

7.3 System Operation and Maintenance

This section summarizes wastewater collection and reclaimed water system O&M activities discussed previously in Sections 3 and 5, respectively. Additional O&M activities are also identified for the WRF and the City's pretreatment program. The O&M activities for each wastewater system component (including

reclaimed water distribution) are then evaluated with respect to the staff effort required to complete the tasks on an annual basis. Total required staff time, in FTEs, is evaluated to determine the adequacy of existing staffing levels. Future staffing level requirements are estimated based upon projected system growth.

7.3.1 Collection System

Operation and maintenance of the STEP wastewater collection system is discussed in Section 3.4. Routine O&M activities include maintenance of the STEP tanks and internal equipment as well as collection system valves. A majority of collection system STEP tanks are scheduled to be maintained at 3-year intervals, while a small number of tanks (approximately 55, mostly commercial) are maintained more frequently based upon a history of service calls. Collection system valves and ARVs are exercised every 2 years. Non-routine maintenance is required when a STEP system failure triggers an audible alarm and the customer calls the City. In the past 2 years (2010 and 2011), the City has received approximately 250 service calls. The City's current O&M database is discussed in Section 3.4.2.

7.3.2 Pretreatment Program

Collection system staff are responsible for implementing the City's pretreatment program, which is concerned primarily with minimizing the amount of FOG that enters the collection system. FOG may accumulate in the collection system or interfere with treatment processes at the WRF. The existing pretreatment program includes biannual inspections of the approximately 50 grease traps installed at various commercial connections throughout the collection system and any additional inspections that result from high FOG concentrations detected in STEP tanks. As discussed in Section 3.4.3, the City plans to develop and implement a revised pretreatment standard based upon Chapter 10, Traps and Interceptors, of the UPC. The pretreatment standard will include the following components:

- Design criteria and installation requirements per the UPC
- Minimum owner maintenance frequency
- Record-keeping and other owner responsibilities
- City inspection/compliance evaluation procedures
- Sampling frequency, locations, and acceptable limits (to include a high FOG threshold)
- Charges to customers whose STEP tanks require frequent service due to misuse or inadequate maintenance
- Administrative enforcement and owner petition procedures

7.3.3 Water Reclamation Facility

The individual treatment components and systems of the WRF are described in detail in Section 4.4. It is beyond the scope of this document to describe the equipment O&M activities required to efficiently operate the WRF. Detailed O&M activities for the WRF are described in the City of Yelm Water Reuse Project Operation and Maintenance Manual (Skillings-Connolly and Esvelt Environmental Engineering, 2000) prepared to meet WAC 173-240-080 requirements, and reviewed/approved by Ecology. In response to concerns about the WRF operators not having detailed guidelines for aspects of the WRF that have changed since the O&M Manual was first prepared, Brown and Caldwell prepared a comprehensive set of SOPs for typical modes of operation to help the WRF operators prevent upsets and prepare for winter operation, while also providing contingency plans for operation following a significant plant upset. Final SOPs, including those for reclaimed water distribution during and following upset events, were prepared in March 2012 to update the O&M Manual and are included as Appendix 7A. The SOPs are maintained with the existing O&M Manual and include the following:

- SOP 1: Correcting Nitrogen Removal Efficiency in WRF Effluent
- SOP 2: Preparing the WRF for Winter Operation
- SOP 3: Preparing the WRF for Summer Operation
- SOP 4: Securing Reclaimed Water during a Permit Parameter Excursion
- SOP 5: Restarting Reclaimed Water Distribution System
- SOP 6: Sludge Wasting Adjustments
- SOP 7: Waste Sludge Storage
- SOP 8: Correcting High Turbidity in WRF Effluent
- SOP 9: Sand Filter PAX Addition and Effluent Turbidity Control
- SOP 10: PAX Addition for Filamentous Bacteria Control
- SOP 11: Correcting High Total Coliform Counts in WRF Effluent
- SOP 12: Yelm WRF Lab Testing Inventory

In addition to the daily operation and maintenance of the individual treatment equipment components of the WRF necessary to meet the discharge limits of the NPDES Permit, operation and maintenance of the WRF includes sampling and analysis, and reporting and record-keeping. Monitoring, reporting, and record-keeping requirements are discussed in Sections 7.4 and 7.7.

7.3.4 Reclaimed Water System

Operation and maintenance of the reclaimed water system is discussed in Section 5.2. Most system components, including flow meters, storage tanks, valves and valve boxes, and hydrants, require only annual inspection and/or testing. When RIBs are functioning properly, water drains entirely from the RIBs during scheduled rest cycles. Water ponding indicates clogging of the RIB and requires cleaning by removing 1 to 2 inches of the surface soil and replacing it with clean sand. Maintenance of the wetlands at Cochrane Park has been minimal to date; a maintenance schedule will be developed, and will contain elements such as routine inspection and removal of invasive species, sediment and undesirable vegetation, as well as general site maintenance. Section 5.2.3.6 describes maintenance activities at the Cochrane Park wetland in more detail.

SOPs developed for the WRF (see above) discuss how to operate the reclaimed water system in the event that reclaimed water permit limits cannot be achieved or how to restart the reclaimed water system after a permit limit exceedance.

Monitoring, reporting, and record-keeping requirements for the reclaimed water system are discussed in Sections 7.4 and 7.7.

7.3.5 Operation and Maintenance Task Summary

Staffing requirements were evaluated as part of the development of this GSP to determine staffing requirements necessary to efficiently operate, maintain, repair, and collect and report the information necessary to properly operate the wastewater system. Staff interviews, review of required work, current workloads, method of organizing work, and the actual amount of time available to conduct the work after vacations, sick leave, and training were used to determine staffing requirements. Table 7-1 shows the estimated time to conduct wastewater system O&M tasks. Although some O&M efforts shown in Table 7-1 will increase as improvements identified in the GSP are implemented (e.g., more time for STEP tank/pump maintenance) and other efforts will decrease (e.g., asset management system will reduce time for record-keeping), the estimates in Table 7-1 are appropriate for the near-term operation and maintenance of the wastewater utility.

Table 7-1. Wastewater System Operation and Maintenance Task Summary		
Work activity	Days required annually	Assumptions
Administrative		
Vacation	75	15 days per year for 5 FTEs
Sick leave	60	12 days per year for 5 FTEs
Training	10	Current schedule (2 days for five wastewater staff)
WRF administration	52	
Pretreatment administration	6	
Monthly financial administration	26	
Collection system record-keeping	52	
Inspections/locates/plan reviews	104	
DMRs and Ecology reporting	17	
Collection system		
Routine STEP tank and equipment maintenance	105	
High frequency tank maintenance (outlook tanks)	31	
Weekly and quarterly pumping	58	
Non-routine service calls (tank alarms)	65	
Pretreatment program		
Grease trap inspections and sampling	6	50 hours annually
Water reclamation facility		
Daily WRF operations	156	24 hours per week
GBT operations	65	10 hours per week
Equipment maintenance activities	98	15 hours per week for equipment maintenance
Instrument calibration	52	8 hours per week
Sampling and analysis	247	38 hours per week
Grounds maintenance	26	8 hours per week for 6 months
Reclaimed water system		
Sampling and analysis	-	Included with WRF sampling and analysis
Distribution system maintenance	10	
Cochrane Park system maintenance	10	
Total days required to complete the necessary work	1,331	
Total number of working days available per FTE	249	11 holidays per year
Number of Public Works Dept. FTEs required	5.3	1,331 days required divided by 249 days per FTE year
Current water system FTEs	5	

Table 7-1 shows that enough FTEs are associated with the wastewater utility to perform the tasks necessary to operate and maintain the existing wastewater system. As the system continues to expand, the time required to complete these tasks will increase and additional staff and operators will be required. Based upon a current (2012) sewer population of 7,847, the population served by each wastewater system FTE is approximately 1,480 (7,847 divided by 5.3). Table 7-2 provides an estimate of

future staffing needs based upon this population:FTE ratio, the population projections presented in Section 2, and an estimate of the percentage of wastewater utility O&M tasks that are fixed versus those that will increase with system growth (approximately 55 percent of the tasks are fixed and will not increase as the system increases). For example, the effort for most administrative tasks is not anticipated to increase significantly with wastewater system growth and is “fixed” with respect to system size.

Table 7-2. Projected Wastewater Utility FTE Requirements

Year	Projected population	Population increase	Added wastewater utility FTEs ^a	Total wastewater utility FTEs
“Without MPC” scenario				
2012	7,847	0	0	5.3
2020	13,976	6,129	1.9	7.2
2030	20,094	12,247	3.7	9.0
“With MPC” scenario				
2012	7,847	0	0	5.3
2020	15,220	7,373	4.4 ²	9.7
2030	25,289	17,442	6.2 ^b	11.5

a. Added FTEs is equal to the population increase divided by 1,480 (population to FTE ratio) multiplied by 45% (the percentage of wastewater utility effort that is not fixed).

b. The added FTEs under the “with MPC” scenario are higher than would be calculated from the population increase projections directly attributed to the MPC. It is assumed that 2.5 FTE (2 for treatment plant O&M and 0.5 for collection system O&M) are required upon startup of the new MPC wastewater collection and treatment systems, regardless of population projections. These 2.5 FTE are in addition to the 1.9 FTE (2020) and 3.7 FTE (2030) required for system growth outside of the MPC.

The estimated FTE presented in Tables 7-1 and 7-2 do not include demands on utility, planning, and executive staff that will occur when an upgrade is under construction at the existing WRF or when the MPC facilities are being designed and constructed. During these periods, utility staff will have additional O&M duties such as inspection, training, temporary facility operation, etc. The City will evaluate the need for hiring additional staff on a temporary basis during these periods.

7.3.6 O&M Documentation and Record-Keeping

The WRF O&M Manual, wastewater and reclaimed water SOPs, and individual equipment manuals are stored at the WRF for ease of reference and to facilitate maintenance. The City will develop a computerized inventory tracking and maintenance system over the next 2–3 years to better manage spare parts and track regularly scheduled maintenance tasks. Implementation of the inventory tracking maintenance system is included in the Capital Improvement Program presented in Section 9.

7.4 Water Quality Management Plan

The wastewater system is regulated jointly by Ecology and Health under NPDES and State Reclaimed Water Discharge Permit WA0040762. The permit for the WRF was initially issued in October 1999 and was most recently reissued in July 2011. The most recent version of the NPDES permit and accompanying Fact Sheet are provided in Appendix 1A.

The NPDES permit and Fact Sheet describe the regulatory basis for requirements related to wastewater collection, treatment, and disposal as well as reclaimed water production and usage. This section summarizes wastewater system monitoring as required in Special Condition S2 of the NPDES permit, and evaluates the adequacy of current monitoring procedures.

All monitoring data required by Health and Ecology, except for flow, temperature, conductivity, and pH, must be prepared by a laboratory registered or accredited under the provisions of *Accreditation of Environmental Laboratories*, WAC Chapter 173-50. The laboratory and lab personnel at the WRF are currently accredited for BOD, TSS, fecal and total coliform, ammonia, total chlorine residual, and DO analysis. All other monitoring samples are sent to a contract laboratory (Edge Analytical in Burlington, Washington) for analysis.

7.4.1 Influent Monitoring Schedule

Influent entering the WRF is sampled at the influent flow meter. Continuous flow measurements are recorded by the influent flow meter while composite samples are collected via automatic samplers programmed for the necessary compositing schedule. The influent monitoring schedule is summarized in Table 7-3.

Parameter	Sampling frequency	Sample type
Flow	Continuous	Meter
BOD	2/week	24-hour composite
TSS	2/week	24-hour composite

7.4.2 Effluent Monitoring Schedule

The WRF is permitted to discharge treated effluent to the Centralia Power Canal and the Nisqually River as well as to distribute Class A reclaimed water for irrigation and/or groundwater recharge/infiltration. Effluent discharged to both surface water and for reclaimed water distribution is sampled at the exit point from the chlorine contact chamber. Total residual chlorine is measured in the surface water outfall line, after sulfur dioxide addition for dechlorination. Continuous flow and turbidity measurements are recorded by metering equipment, while composite samples are collected via automatic samplers programmed for the necessary compositing schedule. Grab and sample types listed as “measurement” in the permit require immediate sampling analysis and are collected by the WRF operator manually. Quarterly samples are collected in March, June, September, and December.

Surface water and reclaimed water monitoring schedules are summarized in Tables 7-4 and 7-5.

7.4.3 Reclaimed Water Distribution Monitoring Schedule

Influent to the rapid infiltration basins at Cochrane Park is sampled quarterly (March, June, September, and December) from catch basin 4 in pond 3. Grab samples are collected manually by wastewater system staff and analyzed for the following parameters:

- Ammonia
- Chloride
- Fecal coliform
- Nitrate
- Nitrite
- TKN
- Total dissolved solids

Table 7-4. Effluent Discharge to Surface Water Monitoring Schedule

Parameter	Sampling frequency	Sample type
Flow	Continuous	Meter
BOD	2/week	24-hour composite
TSS	2/week	24-hour composite
pH	Daily	Measurement
Fecal coliform	2/week	Grab
Dissolved oxygen	Daily	Measurement
Total residual chlorine	Daily	Grab
Temperature	Daily	Measurement
Hardness	Monthly	Grab
Total ammonia	Monthly	24-hour composite
Total metals ^a	Quarterly	Grab or 24-hour composite

a. Total lead must be sampled for on a monthly basis when discharging to the Nisqually River.

Table 7-5. Effluent Discharge for Reclaimed Water Distribution Monitoring Schedule

Parameter	Sampling frequency	Sample type
Flow	Continuous	Meter
BOD	2/week	24-hour composite
TSS	2/week	24-hour composite
Total coliform	Daily	Grab
Turbidity	Recorded every 4 hours	Meter
Total residual chlorine	Daily	Grab
Dissolved oxygen	Daily	Grab
pH	Daily	Measurement
Temperature	Daily	Measurement
Hardness	Monthly	Grab
Total Kjeldahl nitrogen (TKN)	Monthly	24-hour composite
Nitrate	Monthly	24-hour composite
Nitrite	Monthly	24-hour composite
Total dissolved solids	Monthly	Measurement
Alkalinity	Monthly	24-hour composite
Conductivity	Monthly	24-hour composite
Chloride	Monthly	24-hour composite
Fluoride	Monthly	24-hour composite
Sulfate	Monthly	24-hour composite
Total metals	Quarterly	Grab or 24-hour composite
Total trihalomethanes	Quarterly	Grab or 24-hour composite
Priority pollutant scan	Annual	Grab or 24-hour composite

7.4.4 Groundwater Monitoring Schedule

Samples from six groundwater monitoring wells (see Figure 5-2) located at the infiltration area in Cochrane Park are collected quarterly (March, June, September, and December). Groundwater grab samples are analyzed for the following parameters:

- Static well water level elevation
- Temperature
- DO
- pH
- Conductivity
- Nitrate
- Nitrite
- TKN
- Ammonia
- Total dissolved solids
- Fecal coliform
- Chloride
- Fluoride
- Dissolved organic carbon
- Total trihalomethanes

Additional annual (March) groundwater samples are collected for cations and metals.

7.4.5 Other Monitoring Requirements

The NPDES Permit requires monitoring of the sludge depth within individual STEP tanks once every 3 years, or as needed. As discussed in Section 3.4.1, the City currently inspects tanks (on average) approximately every 4 years and is working toward developing a formalized 3-year inspection program.

7.4.6 Adequacy of Monitoring Program

The City is currently in compliance with all NPDES Permit monitoring requirements. The City will review new NPDES permit requirements as reissued by Ecology and Health. No program modifications are recommended.

7.5 Cross-Connection Control Program

According to Ecology's *Criteria for Sewage Works Design*, Section E1-3.4.6, in order to receive regulatory approval for all reclaimed water projects and facilities, an approved CCC program is required. CCC is necessary where the potable water system connects to sites containing reclaimed water treatment facilities or use areas. CCC is implemented on the potable water system by water utility staff. The program manual is a standalone document that was developed in 2001 and updated in 2010. The City's CCC manual is provided in Appendix 7B. The manual provides the following information:

- Adoption of an ordinance that establishes legal authority to implement the CCC program
- Priorities for conducting the system inventory
- Consequences for failing to comply with the ordinance
- Qualified testers of the backflow prevention assemblies (BPAs) and Cross-Connection Control Specialists (CCCSs)

- Guidelines for assessing the degree of hazard associated with identified cross-connections
- Guidelines for appropriate application of BPAs
- Standards for installation and testing of approved BPAs
- Detailed procedures for conducting hazard surveys of new and existing connections
- Requirements that only approved BPAs shall be installed when required
- Procedures to ensure that all installed BPAs are tested as required
- Methods to provide an adequate system of records
- General information available to the water system customer describing the methods and purpose of the City's CCC program

7.6 Customer Complaint Response Program

City staff document customer complaints and actions taken to address complaints in the City's database of routine and non-routine service calls. Complaints may be filed at City Hall and/or at the Public Works Facility. If the homeowner/commercial entity is not satisfied by the alarm or complaint resolution, they may fill out and submit a Citizen Action Request Form (see Appendix 1G) at City Hall.

7.7 Record-Keeping and Reporting

This section summarizes wastewater system record-keeping and reporting as required in Special Condition S3 of the NPDES permit, and evaluates the adequacy of current procedures.

7.7.1 Reporting Requirements

DMRs, which summarize monitoring results for each month, must be submitted to Ecology and Health no later than the 15th day of the month following the completed monitoring period. Annual priority pollutant sampling data must be submitted to Ecology within 45 days following monitoring. See Section 7.4 for a summary of the monitoring data collected, including the monitoring schedule.

All out-of-compliance samples must be reported to Ecology in the DMR submittal. The NPDES permit also requires immediate reporting (to Ecology and Health) of the failure of the WRF disinfection system, collection system overflow, WRF bypass to surface water, and oil or hazardous material spills. Any other noncompliance that may endanger public health or the environment, or the exceedance of maximum day or instantaneous maximum discharge limits, must be reported to Ecology within 24 hours. The City must provide a written report to Ecology for any immediate or 24-hour reporting condition that includes the following:

- A description of the noncompliance and cause
- The period of noncompliance, including exact dates and times
- The estimated time noncompliance is expected to continue if it has not already been corrected
- Steps taken or planned to reduce, eliminate, and prevent recurrence of the noncompliance
- If the noncompliance involves an overflow prior to the WRF, an estimate of the quantity (in gallons) of untreated overflow

An annual CCC report must be submitted to Health by a certified CCCS identifying all devices tested and any cross-connection incidents that occurred in the water system.

7.7.2 Record-Keeping

The City must retain records of all monitoring information for a minimum of 3 years. Records must include all calibration and maintenance records, and all original recordings for continuous monitoring instrumentation, copies of all reports required by the NPDES Permit, and records of all data used to

complete the application for the NPDES Permit. For each measurement or sample taken, the following information must be recorded:

- The date, exact place, method, and time of sampling or measurement
- The individual who performed the sampling or measurement
- The date the analyses were performed
- The individual (or lab) who performed the analyses
- The analytical techniques or methods used
- The results of all analyses

Records specific to reclaimed water that must be maintained at the WRF or a centralized City location include the following:

- Records of all analyses performed, records of operational problems, unit process and equipment breakdowns, and diversions to emergency storage or disposal; and all corrective or preventative action taken.
- Process or equipment failures triggering an alarm that is key to maintaining reliability of reclaimed water quality must be recorded as a separate record file. The recorded information shall include the time and cause of failure and corrective actions taken to remediate and prevent reoccurrence.

The City must maintain a copy of the current NPDES Permit at the WRF and make it available upon request to Ecology inspectors.

7.7.3 Adequacy of Record-Keeping and Reporting Program

The City is currently in compliance with all NPDES Permit record-keeping and reporting requirements. Wastewater and reclaimed water system records are maintained at the WRF, with backup information maintained at the Public Works Facility. The City will review new NPDES Permit requirements as reissued by Ecology and Health. No program modifications are recommended.

7.8 Operation and Maintenance Improvements

Cost estimates and schedules for identified improvements associated with the O&M program are described in detail in Section 9. A summary of O&M program improvements is presented below:

- **WRF control system (SCADA) and instrumentation upgrades:** As part of short-term WRF improvements discussed in Section 4.9, control system and instrumentation upgrades will provide improved data collection, recording, and trending capability that will increase treatment reliability in advance of long-term treatment capacity improvements.
- **Computerized inventory tracking and maintenance system:** As discussed in Section 3.4.3, the City will develop a computerized inventory tracking and maintenance system to better organize system record-keeping, track regularly scheduled maintenance tasks, manage spare parts, and generate reports on system operating parameters. Software combining record-keeping and scheduling functions will save time and effort for City staff and will become more critical as the collection system grows and ages.

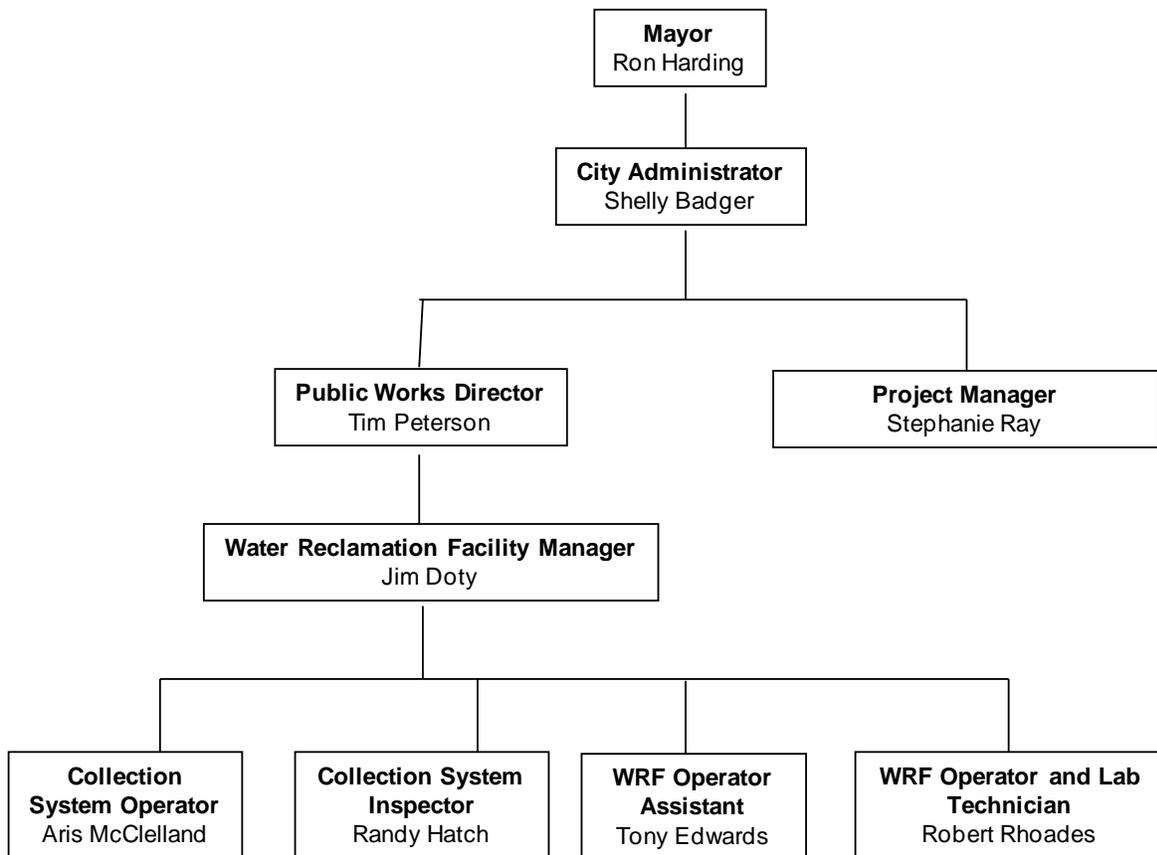


Figure 7-1. City of Yelm wastewater system organizational chart