9 Operations and Maintenance

This chapter summarizes the programs and procedures used to ensure the safe and reliable supply of potable water to District customers. It describes water system management and personnel, operator certification requirements, system operations, supervisory control and data acquisition (SCADA) and telemetry systems, asset management, the emergency response program, safety procedures, the cross-connection control program, the records keeping and reporting program, design and construction standards, and any recommended improvements.

9.1 Water System Management and Personnel

The District is guided by a Board consisting of three Commissioners who are elected by the public and who serve terms of 6 years. Each Commissioner represents a given area that has political boundaries similar to those of the three elected Skagit County Commissioners. The Commissioners are responsible for establishing District policy and for appointing three officers: the General Manager, the Auditor, and the Treasurer (Figure 9-1). The General Manager is responsible for achieving the short- and long-term goals established by the Commission.

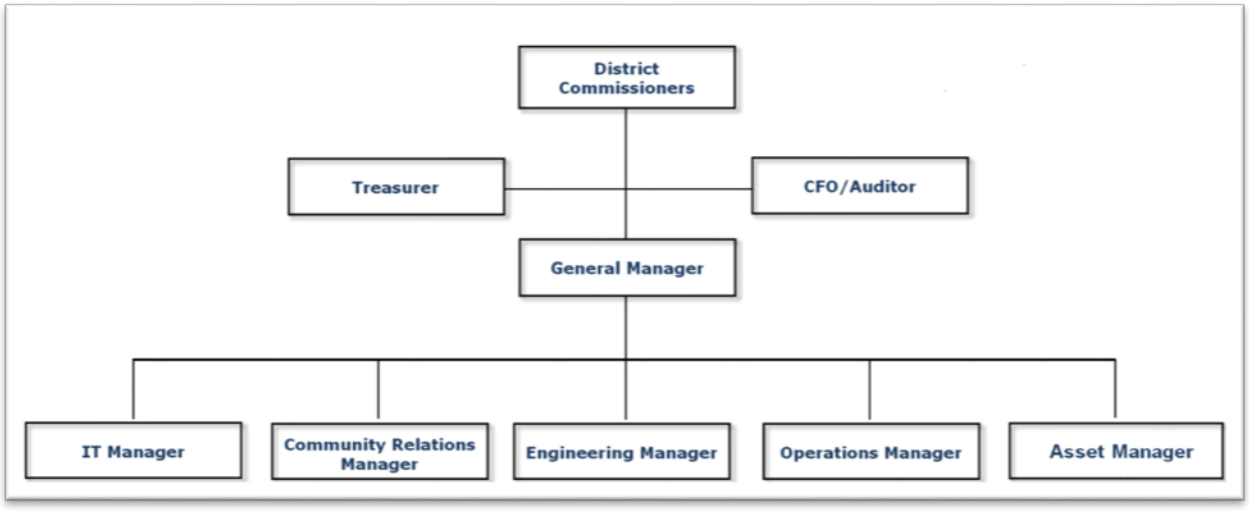

Figure 9-1. Organizational Chart of District Management

9.1.1 General Manager

The General Manager manages District operations in accordance with the objectives and policies of the Commission and in conformance with the statutory requirements of RCW 54.16.100. The General Manager establishes short-term and long-term systemic business plans and objectives for the District, and makes recommendations for action to the Commission. The General Manager executes the plans for capital improvements and operational goals through the work of the Engineering Manager and the Operations Manager, who report directly to the General Manager.

9.1.2 Treasurer/CFO

The Treasurer, as appointed by the District Commissioners, provides the overall direction for District fiscal and accounting functions in accordance with the policies and objectives of the General Manager and in compliance with legal and regulatory limitations. The Treasurer is responsible for ensuring a fiscally sound organization. As a member of the General Manager's management team, the Treasurer participates in short- and long- term planning to support the District's mission and vision. The Treasurer develops and maintains systems and procedures that conform to generally accepted accounting principles within the confines of governing laws and District resolutions.

9.1.3 Auditor

The Auditor is appointed by the Commission and reports to the General Manager for administrative functions. The Auditor monitors financial activities within the District and prepares financial analyses of operations, including interim budget status information. The Auditor establishes and monitors the District's internal controls and financial policies, and prepares and monitors the District's annual operating and capital budgets. In the absence of the General Manager, the Auditor serves as Assistant General Manager. The Auditor is responsible for establishing and maintaining effective systems of internal control designed to ensure compliance in areas under the audit authority of the Washington State Auditor; Washington State Departments of Revenue, Labor and Industries, Employment Security, and Public Employee Retirement System; and the Internal Revenue Service.

9.1.4 Community Relations Manager

The Community Relations Manager strengthens and maintains strong working relationships between the District and its customer/owners. The Community Relations Manager oversees the District's customer service department, water meter readers, departmental budget, and staffing and personnel, and ensures the integrity of existing customer services by developing new programs and services, as appropriate. News releases to keep the community informed about District issues and activities, and responses to media inquiries, are responsibilities of the Community Relations Manager. This includes providing evening and weekend on-call duty to meet public information responsibilities regarding water outages and emergencies such as fires and accidents.

9.1.5 IT Manager

Reporting directly to the General Manager, the IT Manager is responsible for the direction, management, and integrity of the District's data and phone networks, applications, and web environments. This position is responsible for information systems infrastructure and services to support District operational and administrative functions, including security and SCADA.

9.1.6 Asset Manager

Reporting directly to the General Manager, the Asset Manager is responsible for the District's Asset Management Program and performs tasks related to the implementation and maintenance of the Computerized Maintenance Management System to assist the District in making prudent, cost effective decisions on maintaining and replacing District infrastructure. The Asset Manager is also responsible for management of the District's asset database and the GIS mapping system.

9.1.7 Engineering Manager

Reporting directly to the General Manager, the Engineering Manager is responsible for planning and carrying out system improvements, environmental planning and permitting, and the design and construction of the District's Capital Improvement Plan. The Engineering Manager provides direct management of the Construction and Engineering departments (Figure 9-2). The Construction Department is supervised by the Construction Superintendent, who manages the construction of prioritized projects, while the Engineering Department is supervised by the Engineering Supervisor, who oversees those performing capital design work and reviewing private development submittals. Other senior staff within the Engineering Department also report directly to the Engineering Manager. The Engineering Manager works closely with the Operations Manager in the coordination of repairs, planning, and emergency response.

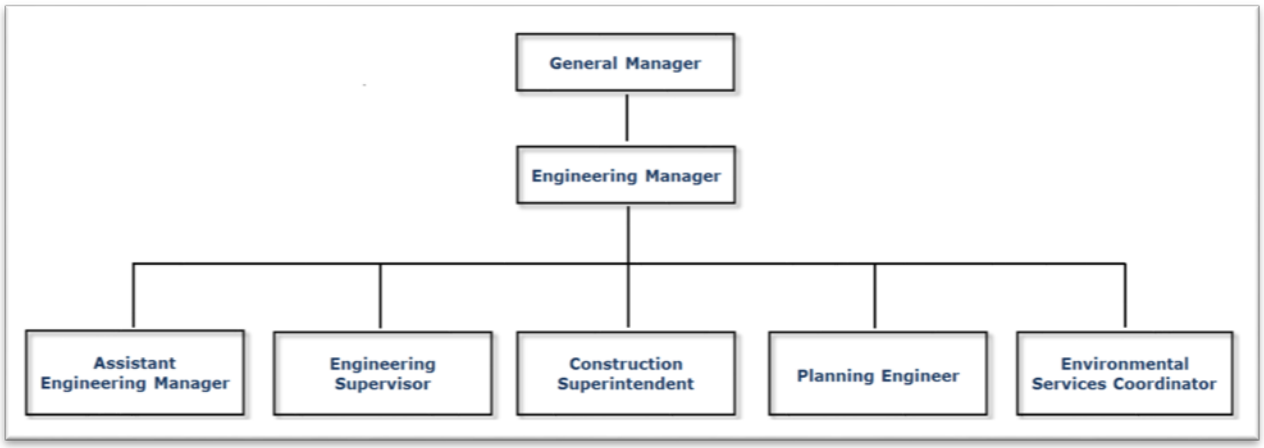

Figure 9-2. Engineering Organizational Chart

9.1.7.1 Assistant Engineering Manager

Reporting to the Engineering Manager, the Assistant Engineering Manager is responsible for design and project management of District projects. The Assistant Engineering Manager works as a team leader to organize and direct the efforts of the Engineering Department toward meeting strategic goals. Activities include preparing budgets, project planning and management, prioritizing tasks, controlling costs, coordinating with the District's Operations Department, and monitoring project progress.

9.1.7.2 Engineering Supervisor

Reporting to the Engineering Manager, the Engineering Supervisor is responsible for daily supervision and management of the District's Engineering Department, including oversight of engineering personnel and management of routine engineering projects. This includes supervising the design and development of District projects that are small- to mid-scale. Other responsibilities include supervising the District's overall Cross-Connection Control Program (CCCP); coordinating with engineers, technicians, and inspectors to ensure that plan review, inspection, and compliance with the CCCP are implemented; and coordinating engineering activities with the Engineering Manager, Planning Engineer, Environmental Services Coordinator, Contract Administrator, and Operations Manager in the development of Local Utility Districts and other projects.

9.1.7.3 Construction Superintendent

Reporting to the Engineering Manager, the Construction Superintendent is responsible for managing the Construction Division to construct and maintain the District's infrastructure. The Construction Superintendent provides supervision to the Construction Division to repair, replace, and construct extensions of the District's water system. The Construction Superintendent ensures that service interruptions are coordinated with customers and other departments by providing sufficient advance notice, coordinates on-call response to emergency situations and restoration of service, and assists with interpretation and/or revisions to District policy, practices, and procedures.

9.1.7.4 Planning Engineer

Reporting to the Engineering Manager, the Planning Engineer is primarily responsible for the planning and coordination of short-term and long-term programs and projects for the District. Other tasks include representing the District on issues concerning federal, state, or local water planning, resource, or regulatory matters. The Planning Engineer maintains and updates the District's pipeline hydraulic model, forecasts future water demands, and outlines long-term operational and maintenance requirements for all District water systems.

9.1.7.5 Environmental Services Coordinator

Reporting to the Engineering Manager, the Environmental Services Coordinator is responsible for coordinating all District environmental planning and permitting activities and the management and enforcement of the District's Watershed Control Program. Tasks include writing and reviewing land use and environmental permits, researching and writing grant funding applications, facilitating easement actions, participating in outreach activities, supporting District planning efforts, monitoring the activities within the District's watershed, coordinating with watershed landowners for potential future land clearing activities, and being the point person for District-wide environmental activities. The Environmental Services Coordinator coordinates all land use and environmental permitting activities for the District's water system, including satellite systems and within the Judy Reservoir watershed. The Environmental Services Coordinator participates in and coordinates community and district outreach activities and initiatives, and serves as a liaison between the Engineering,

Operations, and Community Relations departments on permitting, natural resource management, and community outreach initiatives and issues.

9.1.8 Operations Manager

Reporting to the General Manager, the Operations Manager is responsible for supervising the general operation and maintenance of the District's water system, including overseeing the District's source waters, the WTP and processes, and storage and distribution system. The Operations Manager and staff work closely with the Engineering Department in response to emergencies and in the design of water system improvements.

The Operation Manager's direct responsibility includes oversight of two water quality divisions: (1) Distribution, and (2) the WTP, with appropriate staff as shown in Figure 9-3. The Operations Manager sees that employees are trained in the safe use of tools and equipment and that they follow the safety codes of the Washington Industrial Safety and Health Act of 1973 (WISHA), and ensures that key Operations staff members are appropriately certified to perform their duties. Responsible for the distribution system, the Operations Manager ensures the functionality of the District's water system 24 hours per day, including responses to emergency trouble calls, reports of water main failures and leaks, water distribution issues, and long-term planning. The Operations Manager also provides technical expertise and support to the overall water distribution system, and in conjunction with other District departments, resolves issues to ensure long-term quality and continuity of water service to each customer. Overall, the Operations Manager ensures proper operation of systems through the timely maintenance and repair of water main and water service line equipment, meters, valves, and other equipment or appurtenances. The Operations Manager coordinates with the Water Treatment Plant Superintendent to develop service levels and establish operating criteria for the WTP.

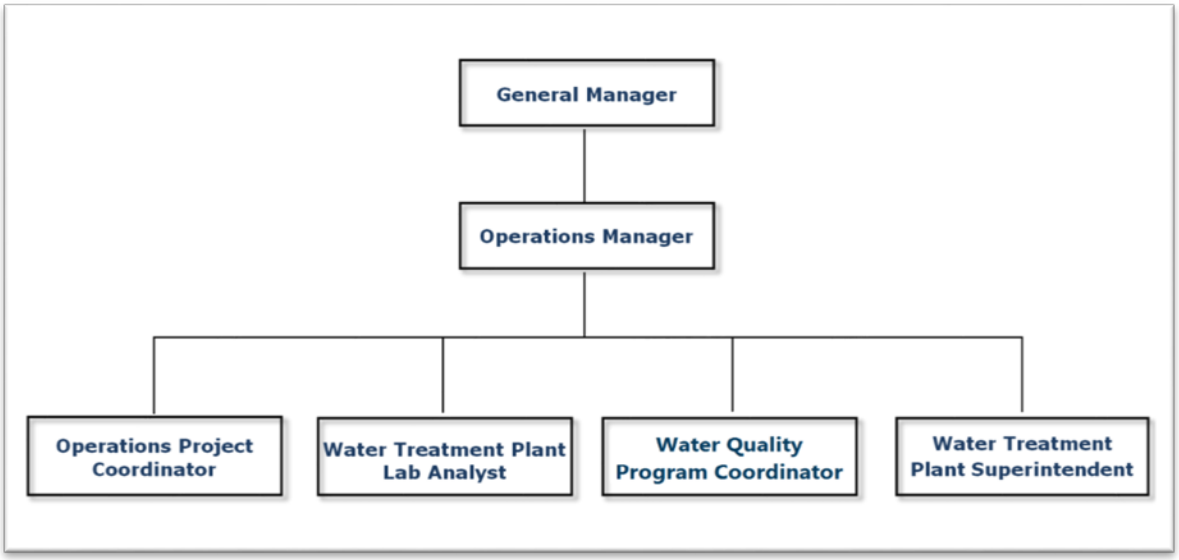

Figure 9-3. Operations Organizational Chart

9.1.8.1 Water Treatment Plant Superintendent

Reporting to the Operations Manager, the Water Treatment Plant Superintendent is responsible for the day-to-day operation of the District's WTP. In conjunction with the Operations Manager and the Construction Superintendent, the Water Treatment Plant Superintendent provides technical expertise and support to staff members who operate the water distribution system, and in conjunction with other District departments, resolves issues to ensure long-term quality and continuity of water service to each customer. The Water Treatment Plant Superintendent ensures that equipment is properly maintained, that the inventory of chemicals is at proper levels, that production matches demand, that security systems are in place, and that repair and maintenance are coordinated with District staff.

9.1.8.2 Water Treatment Plant Lab Analyst

The Water Treatment Plant Lab Analyst reports to the Operations Manager and operates the water treatment laboratory. The work involves a combination of field sampling and laboratory testing responsibility related to chemical, physical, and biological analyses of water samples. Maintenance of laboratory facilities and equipment and various other tasks associated with water quality assurance and control, as well as process control in compliance with applicable regulations, are responsibilities of the Lab Analyst. The Lab Analyst also works closely with the Water Treatment Plant Superintendent by providing results required by regulatory agencies and by conducting chemical, biological, and physical investigations of raw water and treated water, ensuring compliance with standard testing methods, procedures, and regulations. The Lab Analyst samples potable water from designated sample sites and logs the results, develops and oversees a chemical hygiene program for safety requirements, monitors Material Safety Data Sheets (MSDS) compliance for safety gear and practices in the laboratory, and follows all applicable regulations concerning disposal of hazardous waste.

9.1.8.3 Operations Project Coordinator

Reporting to the Operations Manager, the Operations Project Coordinator has primary responsibility for ensuring organizational effectiveness by providing coordination of the District's functions. Working with the management team, the Operations Project Coordinator also contributes to the research, development, and implementation of strategies, policies, practices, and procedures to improve the same in support of the District's mission. The Operations Project Coordinator plays a significant role in long-term planning and asset management, including strategic planning with the Operations Manager toward operational excellence.

9.2 Operator Certifications

9.2.1 Key Personnel Required to have Certifications

State public health and safety requirements, through RCW 70.119, mandate that operators of public water systems be recognized as competent through the Washington State Water Works Certification Program. Requiring minimum levels of operator competency at various levels within the District organization ensures that the water system is run prudently and that water supplies meet minimum standards. The law requires that each individual responsible for daily technical operation of the water system(s) be certified as a Water Distribution Manager. The Water and Wastewater Operator Certification Board of Examiners has adopted a policy that requires shift supervisor positions, any position that involves sole decision-making authority for major water quality control programs, and any position that involves the overall daily technical operation of a public water system, distribution system, or purification plant be staffed by individuals who hold the appropriate operator certificate.

The District's WTP is staffed with eight employees: the Water Treatment Plant Supervisor and seven Water Treatment Plant Operators. The Water Treatment Plant Supervisor maintains a certification of Water Treatment Plant Operator 4 (WTPO-4). In order to work any shifts at the WTP by themselves, such as the night shift, the Water Treatment Plant Operators must maintain a certification level of WTPO-3. If the WTPO 3 certification level is not met, then an operator is only allowed to work when other operators are present. At any given time, a minimum of one operator is present at the plant, while often there are two or more.

9.2.2 Experience Requirements

The District's internal culture places value on education and certification of its employees. These values are backed by (a) offering in-house training to help employees prepare for certification exams and (b) linking field employees' internal advancement directly to furthering their depth of knowledge and attainment of certifications. Table 9-1 summarizes the District's advancement requirements for members of the Teamsters Union, who are the primary operators of the District's water system.

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Table 9-1

Worker Hierarchy Organization Plan Providing Experience Requirements

WATER TREATMENT PLANT WORKERS			
District Wage Classification	**WTPO Level**	**District Experience**	**Total Experience**
6	4	2	10
	3	4	10
5	4	0	8
	3	0	6
4	2	0	3
3	1	0	1
2			
1			
Beginner			

NOTES:
A new WTP Worker will typically be hired as either a Level 3, 4, or 5. Additional certifications, a minimum of 2 years experience at the existing position and a satisfactory performance evaluation is required to be considered for promotion.

CONSTRUCTION WORKERS				
District Wage Classification	**WDS Certification**	**WDM Level**	**District Experience**	**Total Experience**
Foreman	X	3	10	17
6	X	2	6	13
5	X	2	4	11
4	X	1	2	9
3	X			7
2				5
1				3
Beginner				1

NOTES:
A new Construction Worker will typically be hired as either a Level Beginner, 1, 2, or 3. Additional certifications, a minimum of 2 years experience at the existing position and a satisfactory performance evaluation is required to be considered for promotion.

WATER DISTRIBUTION WORKERS						
District Wage Classification	**WDS Certification**	**CCS Certification**	**WDM Level**	**WTPO Level**	**District Experience**	**Total Experience**
6	X	X	3	2	8	15
5	X	X	2	1	6	13
4	X		1		4	11
3	X		1		2	9
2						
1						
Beginner						

NOTES:
A new Water Distribution Worker will typically be hired as either a Level 3 or 4. Additional certifications, a minimum of 2 years experience at the existing position and a satisfactory performance evaluation is required to be considered for promotion.

METER TECHNICIANS				
District Wage Classification	**WDS Certification**	**WDM/CCS Level**	**District Experience**	**Total Experience**
6	X	2/X	8	15
5	X	2/X	6	13
4	X	1	4	11
3	X	1	2	9
2				
1				
Beginner				

NOTES:
A new Meter Technician will typically be hired as either a Level 3 or 4, and will need District experience. Additional certifications, a minimum of 2 years experience at the existing position and a satisfactory performance evaluation is required to be considered for promotion.

WATER QUALITY TECHNICIAN					
District Wage Classification	**WDS Certification**	**CCS Certification**	**WDM Level**	**District Experience**	**Total Experience**
6	X	X	2	8	8
5	X	X	2	6	6
4	X		1	4	4
3	X			2	2
2					
1					
Beginner					

NOTES:
A new Water Quality Technician will typically be hired as either a Level 3 or 4. Additional certifications, a minimum of 2 years experience at the District and a satisfactory performance evaluation is required for advancement.

MECHANIC				
District Wage Classification	**WDS Certification**	**WDM Level**	**District Experience**	**Total Experience**
6				15
5				
4				
3				
2				
1				
Beginner				

NOTES:
A new Mechanic will typically be hired as a Level 6, with 15 years experience in the automotive mechanic field.

CARPENTER				
District Wage Classification	**WDS Certification**	**WDM Level**	**District Experience**	**Total Experience**
6				15
5				
4				
3				
2				
1				
Beginner				

NOTES:
A new Carpenter will typically be hired as a Level 6, with 15 years of experience in the carpentry field.

STOREKEEPER				
District Wage Classification	**WDS Certification**	**WDM Level**	**District Experience**	**Total Experience**
6	X	2	10	15
5				
4				
3				
2				
1				
Beginner				

NOTES:
A new Storekeeper is typically hired from existing staff, will have a minimum of 10 years District experience, and will already be a Level 6.

The District works closely with the Pacific Northwest subsection of the American Water Works Association (AWWA) and the Washington Environmental Training Center (WETRC) to ensure that employees receive their required triennial 3.0 continuing education units (CEUs) to maintain their certifications. Personnel are encouraged to attend local (within 100 miles) programs when they are offered, provided the session is applicable to the employee's position at the District. The District also funds attendance at training outside the state if the benefits to the employee and the District are significant.

As illustrated in Table 9-2 below, the District's internal culture results in a wealth of redundant knowledge and certificated employees.

Table 9-2. Number of Certified Staff Members

Certification Level	Number Certified
Cross-Connection Specialist	15
Water Distribution Specialist	26
Water Distribution Manager 1	7
Water Distribution Manager 2	19
Water Distribution Manager 3	4
Water Distribution Manager 4	8
Basic Treatment Operator	3
Water Treatment Plan Operator 1	1
Water Treatment Plan Operator 2	0
Water Treatment Plan Operator 3	6
Water Treatment Plan Operator 4	2

9.3 Routine System Operations

Chapter 2 of this Water System Plan describes the District's facilities in detail and should be referenced for statistical information relating to the system's characteristics. This section focuses on the organizational structure, staffing, and specific operations at each component of the system.

9.3.1 Water Treatment

Water treatment in Judy Reservoir is a function of the District's Operations Department. Led by the Operations Manager, the Water Treatment Plant Superintendent is responsible for operation of the source water and water treatment facilities. Reporting to the Superintendent are seven Water

Treatment Plant Operators who carry out the daily tasks of operating the filtration plant, the grounds, raw water intakes, and reservoir.

9.3.1.1 Source Water

OPERATIONS

As discussed in Chapter 2, Judy Reservoir is supplied by five sources of raw water: Gilligan Creek, Mundt Creek, Turner Creek, Salmon Creek, and the Skagit River. Chapter 7 provides specific information about each of these water rights and the amount of water the District may divert.

The *Skagit River Pump Station and Pipeline Operations and Maintenance Manual* by Kennedy/Jenks (2010) is incorporated in the Water System Plan by reference. This document provides operational and maintenance procedures specific to the Skagit River intake, pump, and pipes.

As described in Chapter 2, diversions from the Skagit River are used to supplement diversions from the four streams to achieve the raw water volumes required by the Judy System. With a focus on maintaining operational efficiency, instream flows, and raw water quality, the District strives to balance the contribution from each of the raw water sources. Source water from the streams gravity-feeds through pipe diversions to Judy Reservoir. Diverting water from the Skagit River, however, requires an exceptional amount of power to energize the pumps that lift the water to Judy Reservoir. Current power rate structures include both a demand charge and a usage charge. The demand charge is a monthly lump sum cost applied to each billing period. Demand charges are established by applying a rate to the highest level of power use during a month. Rates for demand charges vary throughout the year and are lower during the months of April through September. Also, demand charges for the months of April through November are at least 60% of the highest demand charge incurred during the previous months of December through March. As a result, diverting water from the Skagit River during the months of December through March creates monthly demand charges for the following months of April through November regardless of the amount of power used during these billing periods.

In addition to the demand charges that the District is required to pay, there are constraints established on the use of the pumps based on Puget Sound Energy's (PSE's) ability to provide adequate power. The District's agreement with PSE says that the District can use 3 of the 5 pumps at the SRD at any time. In an emergency situation when more than 3 pumps are required, the District can utilize 4 or 5 pumps by providing advance notification to PSE of the increased electrical demand. However, if the District would like to have regular use of 4 or 5 pumps, then an upgrade to PSE facilities will be required at the District's cost. At the current time, the regular use of 4 or 5 pumps is not anticipated during this planning period, so the District has not budgeted for any upgrade to PSE infrastructure. The District will continue to monitor the pump usage and the electrical demands and notify PSE if there are any changes to the operating scenarios.

As discussed in Section 8.3.2.2, when individual stream turbidities exceed 5 NTU or color exceeds 35 color units, water from that stream is typically not diverted into Judy Reservoir. And conversely, if the Skagit River water turbidity exceeds 10 NTU, it is not pumped into Judy Reservoir. With the multiple sources available, the NTU and color criteria usually allow the District to select a source that is suitable.

As a result of the conditions described above, the more cost efficient source water from the streams is maximized in accordance with instream flows and water quality parameters. Each year, the District analyzes climate and snowpack forecasts to calculate an estimate of the potential diversions available from the streams during the upcoming rainy season. Estimated stream diversions and system demands are used to forecast diversions from the Skagit River and establish target elevation levels for Judy Reservoir. Diversions from the Skagit River are then scheduled during the least costly periods of the year (April through October) to achieve these target reservoir levels. These forecasts are revisited and adjusted on a monthly basis throughout the year. Figure 9-4 is shows an example of how the Judy Reservoir water level is managed for any given year, using 2013 as the example. The graph shows the actual water level at the reservoir and the actual volume of water taken from the streams and from the Skagit River. In this case, the graph shows the state of the reservoir in August, so the water level is dropping during the high demand part of the year. At this point, the District plans to divert water from the Skagit River to raise the level in the reservoir because this is the least costly time of the year to perform this task. The graph also shows the point at which it is planned to stop diverting water from the river and start taking water from the streams. The goal during the last half of the year is to raise the forecasted water level in the reservoir to begin the cycle over again the following year.

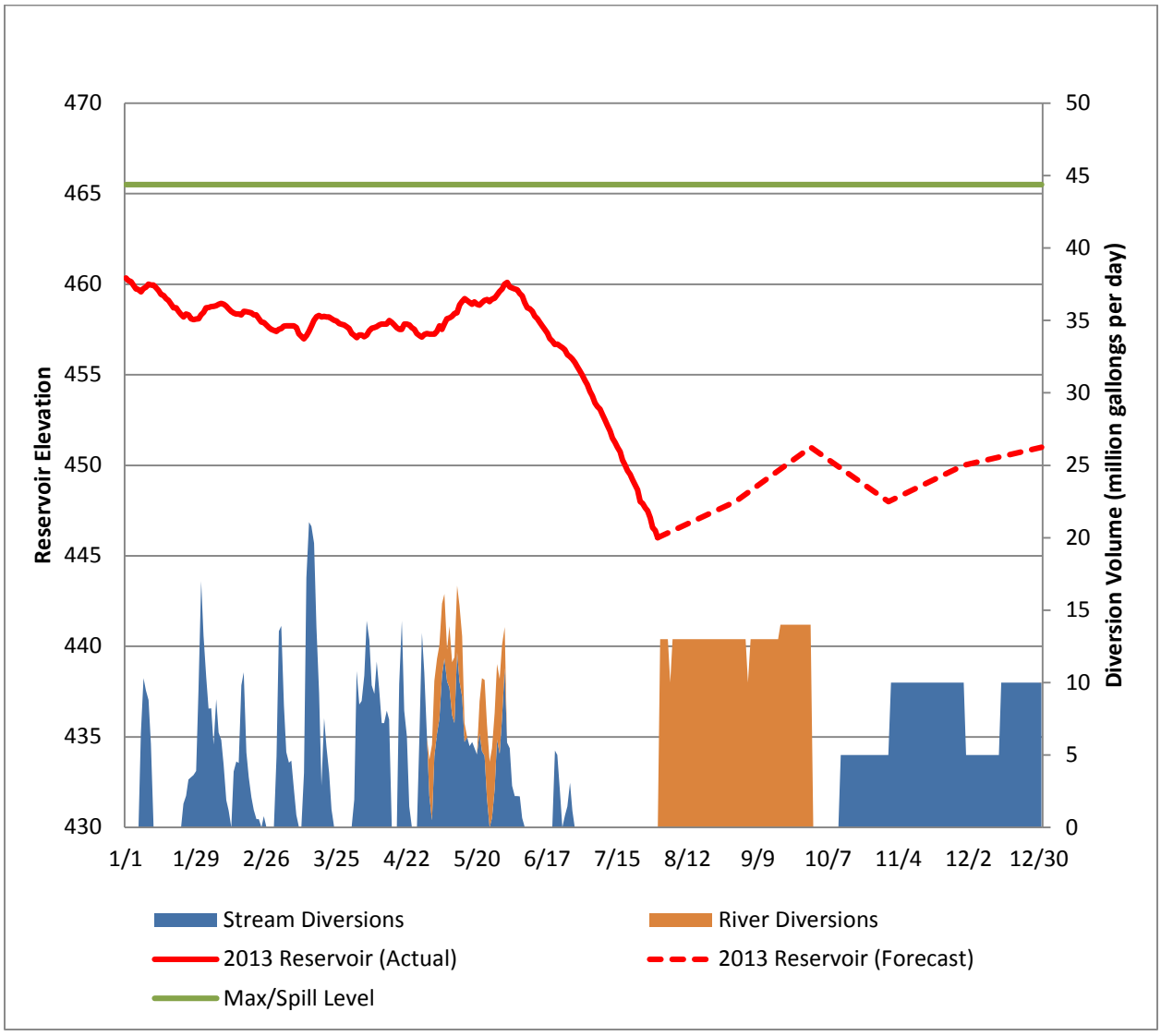

Figure 9-4. Reservoir Management Plan Using 2013 as an Example

MAINTENANCE

Routine, preventative maintenance of the water intakes is essential to their long-term efficient operation. Routine inspections provide opportunities to identify other maintenance needs before they become catastrophic problems. Other routine maintenance measures that District personnel perform are listed below.

Daily:

- Clear primary diversion racks
- Adjust valves to targeted flows
- Record staff gage and flow measurements

- Test for turbidity and color
- Check diversion intakes
- Measure intake flow
- Read the stream gages

Weekly:

- Three times per week scour/air burst Skagit River diversion intakes
- Check security / status of locked access gates
- Check road and drain culvert integrity
- Measure A & B dam drain weirs

Monthly:

- Measure A & B dam piezometers

Bi-annually:

- Clear Gilligan Creek diversion rack

Yearly:

- Perform road and culvert maintenance as necessary

Other:

- Mow grass areas
- Maintain vegetation on dam
- Repair erosion
- Monitor damage from wildlife
- Dredge reservoir
- Dredge intake

9.3.1.2 Treatment Facility

The Judy Reservoir WTP is a direct filtration facility placed in service in 1990 and expanded in 2006. This section summarizes more detailed documents on operation and maintenance of the WTP, and includes them by reference. These documents include the *Skagit Water Treatment Plant Operations Manual (*CH2M HILL 1990) and *Water Treatment Plan As-Builts, CO-3234 (*CH2M HILL 1990 and 2007). As shown in Table 9-3, the WTP has a treatment capacity of 24 MGD with a peak hydraulic capacity of 30 MGD.

Table 9-3. Water Treatment Plant Capacities

Design Flow	Treatment Capacity	24 MGD
	Hydraulic Capacity	30 MGD
Flocculation	Retention Time	17 minutes
	Number of Trains	2
	Basins per Train	4 (8 total)
	Basin Length	18 feet
	Basin Width	18 feet
	Basin Depth	16.4 feet
	Flocculators per Basin	1 (8 total)
	Flocculator Energy Input (max)	70/sec
Filters	Number of Filter Beds	8
	Loading Rate Capacity	6.0 gpm/sq ft
	Filter Area	500 sq ft
	Filter Height	24.5 ft
	Height to Backwash	9.5 ft
	Four Old Filters	
	Media	3 feet anthracite 1 foot sand
	Underdrains	Low Profile Stainless Steel
	Backwash System	Air Scour Blowers
	Design Loading Rate	2-5 SCFM/sq ft
	Blower Capacity	2,500 SCFM @ 6.3 psi
	Blower Power	100 Hp
	Four New Filters	
	Media	18-inches anthracite 1 foot sand 18-inches gravel
	Underdrains	Ceramic Block Underdrains
	Backwash System	Hydraulic Nozzle Sweeps

FILTRATION PROCESS

In general, the raw water impounded in Judy Reservoir flows by gravity from one or more gates of the intake tower in Judy Reservoir to the raw water pumping station (see Figure 9-5 below). The raw water is disinfected with chlorine dioxide (ClO_2) and pumped up to the control building; carbon dioxide and coagulant aids are also added at this stage. The water flows through an in-line static flash mixer to two 2-stage flocculation basins. The water flows from there to the filter basins. There are four filter basins, 500 square feet each, utilizing a high-speed filtration process through coal and sand filter media. The filtered water is disinfected again with chlorine and flows by gravity to three finished water reservoirs (clearwells) near the WTP; these include one steel 3-MG tank and two steel 1.22-MG tanks. Caustic soda (NaOH) and ammonia (NH_3) are added before the clearwells to produce a chloramines residual. Finished water from the clearwells flows by gravity down the transmission lines to the distribution system and the District's customers.

Use of the WTP filters is alternated to maintain finished water production and backwashed regularly to remove suspended solids, including microorganisms, which are trapped by the filter media. The filter backwash water is diverted to the backwash water recycle basin; filter-to-waste water is also diverted to the recycle basin. Two recycle pumps send the backwash and filter-to-waste water from the recycle basin to one of two 19,000-square-foot settling lagoons. The majority of the water from the lagoons is decanted back to Judy Reservoir and the backwash solids remain. The District contracts for the solids to be removed and disposed of off-site.

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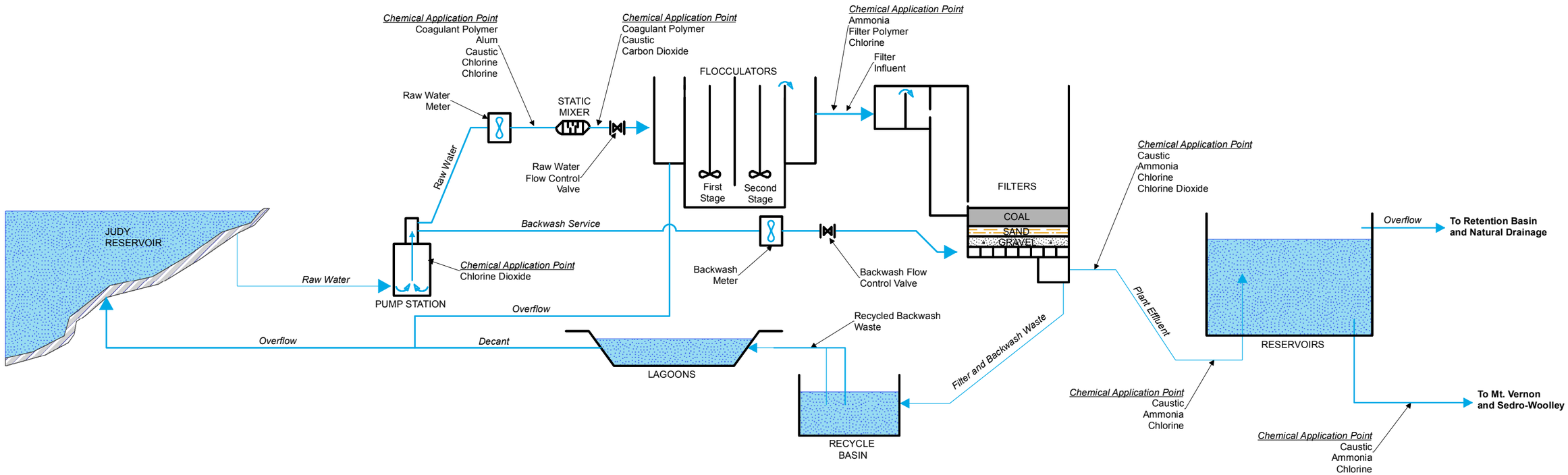

Skagit PUD
PUBLIC UTILITY DISTRICT

N

Water Treatment Plant Process Schematic

2013 Skagit PUD Water System Plan

Coordinate System: WA State Plan North, NAD83 | Not to Scale | **Figure 9-5**

STAFFING

The WTP is semi-automated to allow for unattended operation, although there are operators on-site 24 hours per day, 7 days per week. Operators work in three shifts:

Day Shift – The Day Shift Operator is directly responsible for the WTP operation while on duty. The Operator must collect all pertinent readings and perform all lab checks, dosage checks, equipment inspections, routine operations and maintenance, and other tasks as assigned.

Swing Shift – The Swing Shift Operator is directly responsible for the WTP operation while on duty. The Operator must collect all pertinent readings and perform all lab checks, dosage checks, equipment inspections, routine operations and maintenance, and other tasks as assigned.

Night Shift – The Night Shift Operator is directly responsible for the WTP operation while on duty. The Operator must collect all pertinent readings and perform all lab checks, dosage checks, equipment inspections, routine operations and maintenance, and other tasks as assigned.

The operator on duty is required to completely fill out the Weekly Operator Checklist for his or her period of duty, record all chemical feed data, record all completed maintenance tasks in equipment logs, calculate and log CT at the end of the shift, and record a brief description of shift events on the daily calendar.

The WTP Superintendent schedules work shifts, oversees the day-to-day operation of the WTP, and assumes operator duties as scheduled. The control building at the WTP is centrally located, allowing operators to control and monitor WTP functions and receive WTP alarms. The control system includes trending software to log data regarding WTP processes and production.

The WTP control system is the basis for the District's supervisory control and data acquisition (SCADA) system, providing monitoring and alarm indication from remote water facilities, remote data logging, and control of specific functions at the remote sites. The SCADA system is discussed in Section 9.4.

MAINTENANCE

The operations staff members at the Judy Reservoir WTP conduct routine preventative maintenance and repairs to the assets at the raw water facilities and the plant. These activities, along with staffing, are recorded in a daily log. Some of the more common preventative maintenance includes the activities listed below.

Daily:

- Check water service pumps and backwash filters
- Record chemical usage

- Verify that chemical feed calibration is correct
- Calibrate process control analyzers
- Inspect pump and check lubricants/fluid levels
- Maintain facility and grounds

Weekly:

- Calibrate turbidity and pH meters
- Fill bulk chemical needs

Monthly:

- Change lead/lag chemical feed systems and service pumps

Quarterly:

- Run-test the backup generation equipment

Bi-annually:

- Inspect and clean media
- Inspect filter bed scour system
- Inspect heating, ventilation, and air conditioning (HVAC) system filters and belts

Yearly:

- Dispose of sludge
- Perform major servicing of raw water pumps
- Perform major servicing of diesel generators and engines
- Rebuild chlorine and chlorine dioxide generators
- Perform maintenance on air compressor

9.3.2 Transmission and Distribution

Transmission and distribution account for the reservoirs, pumps, valves, and pipes that supply the District's customers. The daily tasks relating to these operational functions are distributed between the District's Operations and Engineering divisions.

The Operations Manager supervises four Distribution Operators and the Water Quality Program Coordinator to help maintain the distribution system. The Operations Manager is responsible for operations and maintenance of the District's mechanical systems, reservoirs, pressure control valves, and interties.

The Construction Superintendent, who reports to the Engineering Manager, supervises 12 construction workers and the Construction Foreman. The Construction Superintendent is responsible for overseeing construction projects, for maintaining hydrants and mains, and for exercising valves.

9.3.2.1 Piping and Valves

The distribution piping network is described in Chapter 2. Refer to Chapter 2 for detailed information regarding the system and age of pipes.

The 12 construction workers are typically sent out in two groups: one group of 8 that is responsible for the construction of new water line replacement projects, tie-ins to the existing system, and other larger projects; and one group of 4 that is responsible for leak repairs, meter service installations, and other maintenance-type projects. The District has typically installed new water lines throughout the year, even in the winter during inclement weather.

The District is in the process of implementing a Computerized Maintenance Management System (CMMS) that will utilize a software program called Cityworks. This program will help the District implement and coordinate a maintenance program for the distribution system involving maintenance duties such as valve exercising, valve repairs, raising valve boxes, and the overall identification of the status of the distribution system. These duties will be planned for the winter months when the construction of new water lines is not efficient or practical. The Operations Manager, the Engineering Manager, and the Construction Superintendent will coordinate the efforts of the 12 construction workers, along with the Distribution Operators, to perform the preventative maintenance planned through the CMMS.

Legislation has recently passed at the state level that places all fire hydrants under District ownership. As a result, maintenance of the fire hydrants will also be included in the duties for the District staff as part of the CMMS.

9.3.2.2 Pump Stations and Pressure-Reducing Valves

Statistical data associated with the District's pumps and automatic control valves are contained in Chapter 2. Automatic control valves are monitored by the District on a regular basis. These valves are normally associated with mainline meters (pressure-reducing valves [PRVs] between pressure zones) and reservoirs (altitude valves), and are monitored with these other facilities as scheduled. Control valves are repaired or rebuilt as deemed necessary by the District. Control valves are listed

in Table 2-9 and are principally of the diaphragm-type. New diaphragm valves are ordered with an interior epoxy coating and stainless steel trim to minimize maintenance requirements.

District employees visit booster and well pump stations on a regular basis. Booster pumps are checked for power source and pressure inconsistencies, overheating, and leaks two to three times per week, and preventative maintenance on motors is performed annually or as required.

The well systems / booster pump sites are monitored by the SCADA system, which notifies the District on-call personnel of specific failures and allows immediate response via a computer connection at any time from almost any location. The District monitors the booster and well pump stations constantly and visits them as required, and at least twice weekly.

As mentioned in Chapter 2, not all of the District's booster pump stations have a dual pump setup to provide for redundancy. However, the District then keeps at least one spare pump in stock at the warehouse in the event that a failure occurs at any booster pump station. So even though there is not the immediate redundancy of a dual pump booster station, the District has an additional pump that can be installed in the place of a failed pump within hours.

The District has a large standby generator and transfer switches at most of its critical facilities. The priority during a widespread power loss would be refilling critical tanks in the Judy System and remote systems. If the power loss was limited to a closed system, the District would consider using a generator or booster stations depending on the duration of the outage and the ability to avoid interference with electrical repair crews.

Pumps at District treatment facilities, groundwater sources, and distribution systems are checked on a regular basis to ensure that their power sources are intact, their input and output pressures are within range, and there are no indications of imminent failure. Pump motors are maintained annually or as required. Other routine preventative maintenance is listed below.

Daily:

- Monitor 24 hours per day for loss of pressure, pump failure, smoke alarm, intrusion, flooding, power loss, etc.

Weekly:

- Check pressure
- Visually inspect systems

Biannually:

- Check pump amperage
- Verify flow volumes for deviation

Yearly:

- Lubricate all pumps and motors
- Replace well pumps and motors
- Rebuild PRVs

9.3.2.3 Reservoirs

The majority of the District's reservoirs are located where they can obtain the best hydraulic advantage, in many cases remote from dense population. This is an advantage in that catastrophic failure would not normally physically damage a large area or populace. Reservoirs are all checked on a regular basis to ensure they are intact, working properly, and the water is cycling adequately. The District currently monitors storage reservoirs through the SCADA system and by weekly site inspections.

The District has developed a regular schedule of interior and exterior cleaning for its reservoirs, with a painting schedule. Exterior cleaning is scheduled when a reservoir's appearance is undesirable or when it becomes difficult to monitor exterior finish integrity.

Interior cleaning is performed in each reservoir at least every 5 to 7 years through underwater diving services. Timing depends on need, and on the complexity of draining a reservoir and removing it from service for the period it is under repair. Recent diving technology improvements allow interior cleaning and repair of storage reservoirs while they remain in service. While this method is more expensive, it mitigates other negative impacts and makes the process more attractive than conventional methods. The District considers this option when selecting a maintenance method.

An inspection checklist for District storage facilities was developed for preventative maintenance. The checklist is included as Table 9-4.

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Table 9-4. Storage Facility Inspection Checklist

Skagit PUD #1 O&M schedule for storage facilities

Daily or weekly

- ☐ Check storage tank for signs of security breaches – damaged fences, open gates, graffiti, vandalism, etc.
- ☐ Check water level indicator – functioning, adequate amount of stored water, excessive water use.
- ☐ Check storage tank and site after any adverse weather – high winds, heavy snow, ice, rains, etc.

Monthly

- ☐ Check water level indicator
- ☐ Verify all openings are protected from surface runoff, windblown contaminants, insects, birds and animals.
- ☐ Check tank overflow lines for signs of damage, such as, screens, flapper valves, check valves, splash plate, etc.
- ☐ Check control valves for proper positions, open or closed and any leaks.
- ☐ Check ladder access locks, roof access hatches, and controls that are readily visible from the ground for damage, vandalism, or other conditions.

Quarterly

- ☐ Check water level indicator.
- ☐ Visually inspect tank exterior and roof for signs of damage, corrosion, degradation, leakage, or structural problems, with particular focus on all openings into the reservoir: reservoir roof and side wall vents, access hatch, and overflow outlet.
- ☐ Check tank supporting structure for signs of damage, corrosion, degradation, structural or seismic inadequacy.
- ☐ Tank catwalks/ladders free from signs of damage, corrosion, degradation, structural condition, vandalism, etc.
- ☐ Tank area for water ponding, poor drainage areas, excessive vegetation, unhealthy tress, fire hazards, etc.

Annually or seasonally

- ☐ Check storage tank structural, seismic and sanitary integrity – leaks, corrosion, cracks, supports, warping, etc.
- ☐ Exercise valves and make repairs as needed.
- ☐ Document inspection and maintenance activity as part of an O&M program.
- ☐ Inventory and evaluate storage facilities capacity, condition, replacement costs and plan for improvements
- ☐ Plan for storage facility improvements and budget for the associated cost.

Three to five year inspections

- ☐ Drain, inspect, clean and disinfect storage tank or use a diving maintenance service without draining tank.
- ☐ Respond to any evidence of storage tank problems – see storage tank troubleshooting guide.

Employee name/number _____ Date _____

9.3.2.4 Equipment

The District's mechanic reports to the Operations Manager. The mechanic is responsible for routine maintenance and repair of the District's vehicle fleet, construction equipment, and emergency pumps and generators. Most work is performed in the District's shop. When the maintenance or repair requires specialized work or resources not immediately available to the mechanic, the work is outsourced. In addition to the equipment manufacturer's suggested maintenance practices, the mechanic performs the preventative measures listed below.

Daily:

- Visual check of vehicles and equipment leaving the yard
- Fuel vehicles
- Check fluid levels and air pressure
- Wash vehicles

Weekly:

- Maintain security gate to yard
- Replace wearing parts on equipment
- Reinforce parts for vactor truck

Monthly:

- Update records to reflect maintenance performed and fluid and parts consumed maintaining vehicles for the month

Yearly:

- Conduct a comprehensive examination of equipment
- Weatherize equipment not used for winter
- Check all fire extinguishers
- Prepare equipment for next year's construction season

9.3.3 Meters and Utility Billing

The following section provides a brief explanation of how the meter and billing system is constructed and how it generally operates. Chapter 3 of the District's Water Policy Manual sets out specific policies related to services, meters, and billing.

9.3.3.1 Organization

Metering and utility billing function through the Customer Service branch of the District, which is headed by the Community Relations Manager. Reporting to the General Manager, the Community Relations Manager oversees the work of the Customer Service Supervisor and the Meter Crew Leader (Figure 9-6).

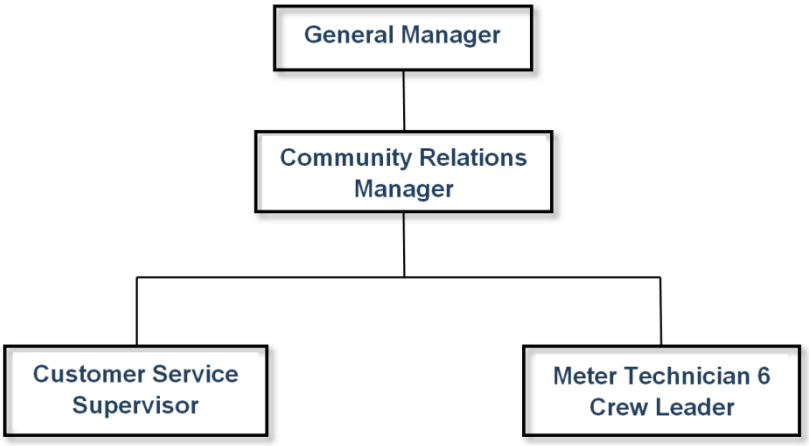

Figure 9-6. Community Relations/Metering Organization Chart

The Customer Service Supervisor oversees the work of the Billing Clerk and four Customer Service Representatives. Customer Service is the customer's first contact for all questions related to service. Generally, these contacts are related to monthly usage statements and payment, establishing and terminating accounts, and concerns about meters and suspected leaks. If the calls require service, the Customer Service Representative contacts the Meter Crew Leader to schedule an investigation and repair.

The Meter Crew is made up of the Crew Leader and three Meter Technicians. The crew leader is responsible for scheduling the work of the three technicians. The crew leader also investigates potential repairs and coordinates with contractors needing temporary service. Two of the technicians are responsible for reading the District's meters. When these two technicians are not reading meters they are performing repairs or conducting maintenance. The remaining technician is responsible for turning on and off water service when requested or as a result of delinquent payment.

9.3.3.2 Meter Reading and Billing

The District has divided the customer base into several groups, known as cycles, so that reading and billing can be distributed evenly throughout the months and years. There are a total of nine cycles. Cycles 1–4 are residential services that are billed on even months. Cycle 1 represents those meters that are read the first week of an even month, Cycle 2 is the second week of an even month, etc.

Similarly, Cycles 5–8 correspond to the meters that are read and billed on odd months. The last cycle, Cycle 9, represents the commercial meters that are read and billed every month.

Utility billing is done on the same cyclic basis as the meters are read. The District produces and mails all customer water bills using in-house equipment and personnel. Additional information ("billing inserts") such as a quarterly newsletter, conservation information, etc., may also be included in the same envelope with a water bill at various times of the year. Currently, customers may pay their bill by mail using the envelope enclosed with the bill, or may pay in person at the District headquarters in Mount Vernon or at any one of three designated branch offices of Skagit State Bank (one in Burlington, one in Mount Vernon, and one in Sedro-Woolley). The District also accepts payment by electronic funds transfers from a customer's bank and is currently considering Internet-based billing. Use of this technology could incorporate use and payment history as well as accept credit card payments.

9.3.3.3 Maintenance and Repair

The District performs routine maintenance and calibration on all meters 2 inches and larger. Every year the District contracts with a private firm to calibrate these larger meters. The number of meters calibrated each year is one-third of the meters in this size range. Therefore, each meter is calibrated every third year.

Beyond performing routine maintenance on meters 2 inches and larger, the District's meter technicians conduct spot repairs as needed. When not engaged in reading meters, crews repair leaks and uncover buried meters.

9.3.4 Warehouse

Under the General Manager, the Chief Financial Officer/Auditor (CFO) is the lead purchasing agent. Under the direction of the CFO are two storekeepers (Figure 9-7) who are responsible for maintaining warehouse inventories and filling all purchases requiring a purchase order (more than $100 in value).

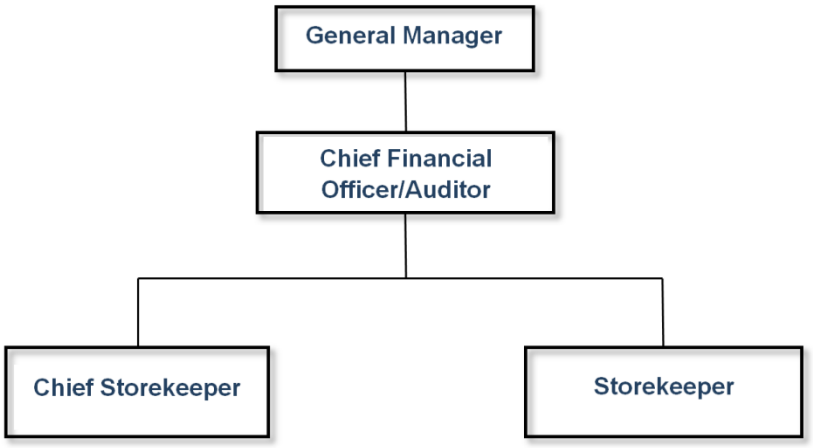

Figure 9-7. Purchasing and Warehouse Organizational Chart

Commonly purchased items are stored in the warehouse. These items include service corporations, tubing used for service connections, fittings, pipe, office supplies, common tools, and expendable parts like saw blades. When the inventory of these items becomes depleted, the storekeepers, through standard purchasing procedure, order materials to resupply the inventory. Asset management software that the District is currently implementing will allow the storekeepers to set target levels for reordering. When the inventory falls to this target level, the storekeeper will be notified that supplies need to be reordered. Access to the warehouse is limited to very specific individuals.

The storekeepers maintain inventory levels based on historical demand. Service trucks are stocked with frequently used parts and supplies. When parts from a service truck are incorporated into a project, the materials used are reported to the storekeeper, who resupplies the service truck. Other parts are removed from inventory and go directly to the site. This is common on construction projects where valves, piping, and large fittings are incorporated into the project.

With very few exceptions, all materials purchased go to the warehouse prior to use. Two of the more common exceptions are when materials such as asphalt or backfill are being incorporated into a construction project and are delivered directly to the site. Another exception is the chemicals consumed in the purifications process. The WTP is located 12 miles from the District's warehouse. Rather than delivering these chemicals to the warehouse, unloading them, reloading them, and delivering them to the WTP, it is more practical to ship them directly to the WTP. An added benefit of direct shipping is reducing risk by transferring the chemicals fewer times.

Fueling for the District is coordinated through a typical fuel management vendor. The District employs multiple levels of accounting to verify the proper use of fuel.

9.4 SCADA and Telemetry Systems

The District has extensive SCADA systems throughout its service area. SCADA systems are typically found on reservoirs, wells, pump stations, mainline meters, intakes, and treatment facilities. The degrees to which the systems are able to be controlled by SCADA vary from site to site depending on the equipment and type of communication connections. In total, the District has 61 sites using SCADA systems.

The capabilities of these sites range from full control to simply monitoring. Of the 61 SCADA sites, 25 have full control because they can be fully monitored and operated from remote locations and mobile devices. The remaining 36 sites have monitoring capabilities only. Types of communication lines serving the sites include DSL, telephone, radio, and limited Wi-Fi capability.

The District's SCADA systems are monitored by the Distribution Operators in the Operations Department. During normal business hours, the systems are monitored from the District offices. After normal working hours, the systems are monitored by the on-call Distribution Operator. While the operators monitor the systems for necessary corrective action before an alarm goes off, additional protections are in place should an event or power outage be overlooked. Redundancy includes an alarm system that automatically makes multiple calls to operators and managers when an alarm is activated.

9.5 Asset Management

The District is in the process of implementing a functional asset management database from which assets can be properly tracked and routinely maintained. The District is implementing a software program called Cityworks, which is a CMMS. Cityworks will operate as a GIS-centric asset management program that will standardize data and allow the users to reuse, coordinate, and share information in an efficient and effective manner by making the GIS geo-database the asset registry. At this time, the District will focus the asset registry on hard assets such as pipes, valves, and hydrants. Soft assets such as permits, licenses, easements, and other land use activities may be implemented at a later date.

The goal of the CMMS program is to coordinate and prioritize the District's maintenance program involving such things as valve exercising, valve repairs, raising valve boxes, replacing or rebuilding pumps, inspecting reservoirs, painting or coating reservoirs, and replacing pipes. Performing tasks such as condition assessments to determine remaining service life of an asset will help the District to focus its time and money on those assets that are in need of replacement, rather than running that asset to failure or replacing it before it was necessary. One of the important areas where a CMMS will be valuable is to perform condition assessments on existing transmission and distribution piping so that the District can adjust its capital replacement programs to better focus on long-range strategies while meeting immediate demands. In the meantime, the District has developed a modified approach to its annual pipe replacement as discussed in Section 10.2.

Another goal of the CMMS is to provide an accurate and reliable water system map that uses the asset database to provide accurate coordinates for the assets. The District has already completed many activities required for the construction of an asset database that is linked with the GIS system. Staff has used hand-held Global Positioning System (GPS) units to collect coordinate information on all of the District's water meters, valves, and fire hydrants. This information is being combined with the existing AutoCAD water system map to produce a GIS-based water system map that contains all of the asset information so that assets are shown in actual coordinates and can be found on-site.

9.6 Emergency Response Program

9.6.1 General

Safe and reliable drinking water is vital to every community. Planning for events that may threaten the system's ability to deliver safe and reliable drinking water is an essential part of managing a drinking water system.

Each emergency has unique effects on different parts of a water system. Events that demand a response range from routine operating emergencies such as pipe breaks, pump malfunctions, coliform contamination, and power outages to more serious non-routine emergencies that may result from intentional acts of sabotage, chemical spills, floods, earthquakes, windstorms, or droughts.

All supervisory and senior staff members from the District have obtained certifications from the Federal Emergency Management Agency (FEMA) for Incident Command System (ICS) 100 and 200, National Incident Management System (NIMS) 700, and National Response Framework (NRF) 800. This training will allow the District to communicate efficiently and effectively with local, state, and federal agencies in the event of an emergency or disaster. Figure 9-8 is a typical organizational structure for the Incident Command System.

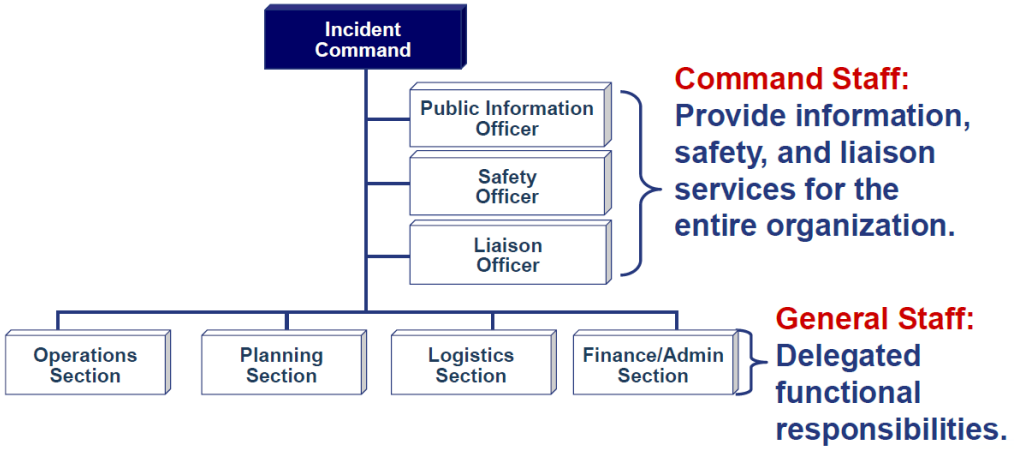

Figure 9-8. Incident Command Organization

Depending on the type of incident, different District staff members are responsible for filling the various roles within the ICS organizational structure. Table 9-5 below is an organizational chart of the Incident Command System in terms of how it applies to the District and which staff are typically assigned to specific roles.

Table 9-5. Incident Command System Roles

Title	Role During an Emergency	District Staff
Incident Commander	• Provides overall leadership for incident response. • Delegates authority to others. • Takes general direction from agency administrator/ official. • Ensures incident safety. • Provides information services to internal and external stakeholders. • Establishes and maintains liaison with other agencies participating in the incident. • Establishes incident objectives. • Directs staff to develop the Incident Action Plan. • Assesses the need for staff. • Takes responsibility for all activities and functions until delegated and assigned to staff.	Typically filled by first respondent, then it will transfer to more senior staff as they arrive on-site. District role will likely be filled by: Bob Powell – General Manager, or Mike Fox – Operations Manager, or George Sidhu – Engineering Manager
Public Information Officer (PIO)	• Advises Incident Commander on information dissemination and media relations. Incident Commander approves information that the PIO releases. • Obtains information from and provides information to Planning Section. • Obtains information from and provides information to community and media.	Kevin Tate Community Relations Manager
Safety Officer	• Advises Incident Commander on issues regarding incident safety. • Works with Operations to ensure safety of field personnel. • Ensures safety of all incident personnel.	Position currently vacant
Liaison Officer	• Assists Incident Commander by serving as point of contact for agency representatives who are helping to support the operation. • Provides briefings to and answers questions from supporting agencies.	Mark Handzlik, P.E. Assistant Engineering Manager Or Dale Wardell – Water Treatment Plant Superintendent
Operations Section Chief	• Develops and implements strategy and tactics to carry out the incident objectives. • Organizes, assigns, and supervises the tactical field resources. • Supervises resources in staging area.	District role will likely be filled by: Mike Fox – Operations Manager, or George Sidhu – Engineering Manager, or Dale Wardell – Water Treatment Plant Superintendent, or Construction Superintendent

Title	Role During an Emergency	District Staff
Planning Section Chief	• Gathers, analyzes, and disseminates information and intelligence. • Manages the planning process. • Compiles the Incident Action Plan. • Manages technical specialists.	District role will likely be filled by: George Sidhu - Engineering Manager, or Mark Handzlik – Assistant Engineering Manager
Logistics Section Chief	• Provides resources and services required to support incident activities. • Develops portions of the Incident Action Plan and forwards them to Planning Section. • Contracts for and purchases goods and services needed at the incident.	District role will likely be filled by: Scott Kilpatrick – Chief Storekeeper, or Kurt Van Burkleo – Operations Coordinator
Finance/Administration Section Chief	• Responsible for financial and cost analysis. • Oversees contract negotiations. • Tracks personnel and equipment time. • Processes claims for accidents and injuries. • Works with logistics to ensure resources are produced.	Vanessa Dales – Treasurer

The District's Emergency Response Plan (ERP) is currently being edited to reflect the protocols of the ICS and NIMS systems so that the District can cooperate efficiently and effectively with local, state, and federal agencies in the event of an emergency. The ERP will address situations in which the District will be required to take a lead role in an incident, such as a major water line break or a water treatment plant disaster. However, it is more likely that the District will be required to act in a supporting role to other agencies by providing water for fire suppression, furnishing potable water for residents, or shutting down portions of the system to assist in reducing damage. To maximize the District's preparedness and response time in a disaster situation, the District has contracted with a third-party vendor who provides disaster recovery solutions and emergency response services. The vendor's services include providing temporary offices, power, computers, and communication services. The vendor also maintains a copy of the District's ERP, staff contacts, and community contacts. The schedule for completing important milestones in the District's Emergency Response Program is as follows:

Completion of updated Emergency Response Plan utilizing protocols from ICS and NIMS training	July 2015
Participation in tabletop exercise with Skagit County Emergency Management Division as a supporting agency	Dec 2015
Participation in tabletop exercise with Skagit County Emergency Management Division as a supporting agency	Dec 2016

Because the ERP may contain sensitive information, it will not be incorporated into the Water System Plan. The ERP will be stored in a safe and secure location both in hard copy and on a secure server that is available in times of emergency. A copy of the current ERP's table of contents is included in Appendix K.

9.6.2 Federal Statutes

Title IV of the Public Health Security and Bioterrorism Preparedness and Response Act, Public Law 107-188, requires drinking water facilities serving populations of more than 3,300 to perform vulnerability assessments and to prepare an ERP that incorporates the results of the vulnerability assessment. Developing an ERP can require significant time and effort.

It is important to note that the water system ERP is a "living" document that receives periodic updates. It is maintained in a three-ring binder notebook to accommodate revisions. The ERP is flexible and easily implemented during an emergency, with the ability to provide removable checklists of tasks for different people and different situations, depending on the emergency.

The Bioterrorism Act requires drinking water utilities to identify plans, procedures, and equipment that can be implemented or utilized in the event of a terrorist or intentional attack, or that can obviate or significantly lessen the impact of a terrorist or other intentional attack on the utility.

The Bioterrorism Act also calls for coordination with local emergency planning committees.

9.6.3 State Statutes

The operations and maintenance section of the state rule, Chapter 246-290-415 (2)(b) WAC, requires public water systems in Washington to have an ERP as part of a water system plan or small water system management program. It also requires that systems employ reasonable security measures to protect the raw water intake facilities, water treatment processes, storage facilities, pump houses, and distribution systems from possible damage or intruders.

9.7 Safety Procedures

9.7.1 General

The personal safety and health of District employees are of primary importance. The District is committed to providing a safe work environment for all staff. The District wants each employee to have a safe and productive work setting, and return home free from injury each day to family and friends. All activities are conducted in accordance with the Department of Occupational Safety and Health/Washington Industrial Safety and Health Administration (DOSH/WISHA) requirements.

The District provides training, equipment, and safe work procedures and practices to ensure that all activities will be performed safely and efficiently. Supervisors are responsible for the safety of their employees, and as a part of their daily duties, must check the workplace for unsafe conditions, watch

employees for unsafe actions, and take prompt action to eliminate any hazards. Supervisors are trained and are expected to be leaders, setting a proper example by showing dedication and support in compliance with all policies, laws, rules and regulations, and good practice. In addition, all employees are responsible for performing their jobs in accordance with the established facility safety rules, regulations, and procedures.

The District has three core documents that complete the District's safety procedures: the Safety Manual, the Water Treatment Plant Process Safety Manual and Risk Management Plan, and the Chlorination Process Safety Manual. Attached as Appendix O are copies of the covers and tables of contents for these documents.

9.7.2 Organization

The District's safety program is guided by a Safety Committee. The committee is composed of both staff and management such that the number of staff members always exceeds the number of managers serving on the committee.

The committee is organized with a Chair, Secretary, and regular members. Each term is 2 years and the number of members ranges from 3 to 10. Members are required to meet once a month to approve minutes, review recent incidents, and review new procedures. These monthly meetings are then followed with a training video or presentation regarding a safety issue. Construction crews and office staff receive training specific to their work.

9.8 Cross-Connection Control Program

9.8.1 Overview

The District annually reviews its cross-connection program. Attached in Appendix P is the table of contents for the most current copy of the District's Cross-Connection Control Program (CCCP) document and a copy of the District's most recent Annual Summary Report (ASR).

The purpose of the District's CCCP is to protect the public water system from contamination via cross-connections. Reporting to the Engineering Supervisor, the Cross-Connection Control Coordinator organizes the District's program (Figure 9-9).

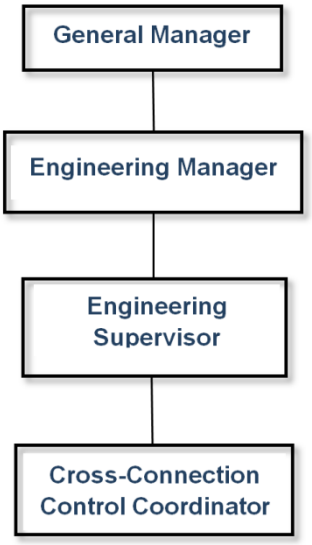

Figure 9-9. Cross-Connection Control Program Organizational Chart

Resolution 1744-97 and Water Policy Manual 2004 Section 2.5.5 Cross Connections Control, give the District the authority to operate the CCCP. The District's program meets the requirements of the State of Washington regulation WAC 246-290-490.

Under this authority, the District ensures that cross-connections between the District's distribution system and a customer's premises are eliminated or controlled by the installation of a State of Washington approved backflow preventer. Selection of the backflow prevention device is based on industry standards and guidance, including the type of hazard and the risk. Customers failing to install, maintain, repair, inspect, or test backflow prevention assemblies required by the District may have service suspended until the condition is remedied.

9.8.2 Use of a Qualified Cross-Connection Specialist

The District strives to coordinate with the Authorities Having Jurisdiction (AHJ)—the cities of Mount Vernon, Sedro-Woolley, and Burlington, as well as Skagit County—on issues concerning cross-connections within the customer's property lines. The District refers to WAC 246-290-490, Cross-connection control; the Pacific Northwest Section (PNWS) AWWA *Cross-Connection Control Manual*, Seventh Edition (current edition), 2012; the current *Manual of Cross-Connection Control* (USC Manual), 2011; and Section 2.5.5 of the District's Water Policy Manual on issues concerning cross-connection control. The District ensures that at least one person certified as a Cross-Connection Specialist (CCS) is employed to develop and implement the CCCP. The CCS's responsibilities include the following:

1. Administer the CCCP.
2. Evaluate service connections for backflow hazards.

3. Provide information for the Annual Summary Report (ASR) to DOH.
4. Assist with public education.
5. Investigate water quality concerns where backflow is suspected.
6. Ensure that backflow preventers are installed in accordance with the requirements of WAC 246-290-490(6).
7. Keep current records of all backflow preventer testing, air gaps installed in lieu of approved backflow preventers, test kit calibration, and tester certification.
8. Help eliminate or control cross-connections between the distribution system and customer's premises.
9. Ensure quality control for backflow testing.

9.8.3 Maintenance of Program Records

An adequate record system is essential for the operation of a cross-connection control program. These records form the basis for any enforcement action or legal defense by the District, and provide a basis for comparing test results of different backflow assemblies.

Records are kept in the Program Health Hazard Evaluation file. This hard copy file system retains records on all services that have a cross-connection preventative device installed. These records will be kept on file for the life of the backflow prevention assembly. Individual files are composed of the following items:

- Copies of all cross-connection control correspondence with the customer.
- Copy of health hazard evaluation reports complete with filed drawings.
- Copies of backflow prevention assembly test reports for all assemblies.
- A master list of service connections and/or customer's premises where approved backflow prevention assemblies protect the water system from contamination, and the assessed hazard of each connection. These records will be kept for as long as the premises pose a cross-connection hazard to the water system.
- Inventory information on the following:
    - Approved air gaps installed in lieu of approved assemblies, including exact location, assessed hazard, installation date, history of health hazard evaluations, inspection results, and person conducting the inspections.
    - Approved backflow prevention assemblies including exact location, assembly description (type, manufacturer, model, size, and serial number), assessed hazard, installation date,

history of health hazard evaluations, tests and repairs, test results, and the backflow assembly tester (BAT) performing the tests.

- An annual Cross-Connection Control Summary Report and Backflow Incident Report will be made available to DOH upon demand. These reports will describe the status of the District's cross-connection control program as well as any backflow incidents that occurred. These records will be kept on file for 5 years.

In addition to the hard copy files, electronic backups of many documents exist in the District's electronic filing system. At a minimum, backflow prevention assembly test report forms are entered into a computer program that tracks assembly testing and dates of tests. Backflow prevention assemblies that are replaced are double-checked to ensure that they appear on the list of approved assemblies. If they do not appear on the list, the customer is issued a letter to replace with an approved assembly.

9.8.4 Recent CCC Report

Each year the District completes a Public Water System Cross-Connection Control Activities Annual Summary Report (ASR). A copy of this report is submitted to DOH for review. The report assists the District in assessing the effectiveness of the CCCP. Over the past 5 years, the District has been improving on the successes from previous years. Working with DOH, the District will continue to improve its record of compliance. Appendix P contains a copy of the 2011 ASR.

9.9 Records Keeping and Reporting Program

The District maintains several hard copy file storage systems. The Engineering Department maintains the most extensive file, i.e., the Construction Order (CO) file. This file is a catalog of all construction-related projects since the inception of the District, for which the District has records. The Program Health Hazard Evaluation file, or Cross-Connection file, is also maintained by the Engineering Department.

Financial and administrative files are maintained by the administrative staff. The administrative files contain a historical record of the Commissioners' actions in the form of approved meeting minutes, resolutions, contracts, and all other matters of record. The Finance Department maintains copies of its records.

The WTP maintains its own set of files at the facility because it is impractical to maintain hard-copy files at the Engineering and Operations office 12 miles away. All information in these files is related to the WTP including the Daily Activity Log, Water Quality Test Reports, the Monthly Chemical Usage Report, and the Surface Water Treatment Protection Plan.

These files are also duplicated electronically on District servers. While the District's goal is to make all documents available electronically, there is a backlog given the volume of information that needs scanning.

The electronic files are subdivided into the various categories: Engineering, Operations, and the WTP files. Access to each file is limited, requiring permission based on who uses the information and to what degree. These permissions are established through standard cataloging of information. In the near future, the District will also carry much of this information within the District's Geographic Information System (GIS). The District's GIS will also reference all infrastructure for better implementation of the District's asset management program.

9.10 Design and Construction Standards

The District's water system design and construction standards are described in the District's Water Policy Manual (see Appendix G), and are also detailed in Appendix Q. Appendix G contains all of the District's policies, procedures, and process in terms of managing extensions and improvements to the District's infrastructure. Appendix Q includes engineering standard documents that are used by District staff to provide water service requirements and plan review and approval. When a new project is submitted to the District, all of the documents must meet the requirements of the Plan Review Checklist prior to being reviewed by an Engineering Technician. After the documents have been reviewed by the District, all approved sheets will receive a Plan Approval stamp from the Engineering Manager with his signature.

The District has a set of Engineering Standards for Design and Construction that were last updated in February 2009. This document is meant to provide guidance and direction for consulting engineers on the design of infrastructure projects and the selection of materials that are acceptable to the District. An update to the Engineering Standards for Design and Construction is in process to provide additional detail and specificity to certain material standards and construction practices. When complete, the standards will be presented as a stand-alone document separate from the Water Policy Manual and will be available at the District's Engineering counter and on the website.

The design standards used by the District are a compilation of industry standards, District practice, and District experience. They are modified as needed to reflect current practice and regulation. By reference, the most current versions of the following standards are incorporated into the District's standards:

- Minimum Design Standards, Chapter IV, Regional Supplement, Skagit County Coordinated Water System Plan
- Washington State Department of Transportation Standard Specifications for Road, Bridge, and Municipal Construction, including the American Public Works Association (APWA) Supplement
- Standards of the American Water Works Association

- International Association of Plumbing and Mechanical Officials (IAPMO) Uniform Plumbing Code
- International Conference of Building Officials (ICBO) Uniform Building Code
- Water System Design Manual, Washington State Department of Health
- Recommended Standards for Water Works, Great Lakes – Upper Mississippi River Board of State Sanitary Engineers
- Cross-Connection Control Requirements, AWWA Pacific Northwest Section

The District also has construction standards regarding the planned discharge of potable water during events such as water line flushing, discharging of hydrostatic test water, and water line draining to facilitate repairs. The standards involve the de-chlorination of the water to a chlorine concentration of 0.1 ppm or less through the use of sodium thiosulfate or ascorbic acid (vitamin C) and discharging to either a storm sewer or a sanitary sewer. Where possible, discharges to a sanitary sewer are preferred because of the neutralizing capabilities of the organic matter in the sewer.

9.11 Recommended Improvements

The District has modified its internal organization over the years in search of a more efficient division of responsibilities among Engineering, Construction, and Operations. With the implementation of a CMMS and a focus on improved maintenance, the challenge for the District is to balance the maintenance needs of such a large system with the goal of continued replacement of aging and undersized pipe.

The District continues to improve its safety and emergency response. These two items are very important to the District. In the future, key staff should receive training in their responsibilities related to emergency response or evacuation.

This Water System Plan references several reports, but does not incorporate them directly. While the District is not advocating for full incorporation of these documents, it is prudent to have a central location, or library, where all information can be quickly gathered.

The District's electronic filing system is serviceable; however, it lacks many of the components of a true document management system. This has been budgeted for and will greatly enhance the way the District shares and uses electronic information.

The District's computer hydraulic model is used to develop capital projects and provide developers and engineers planning information for required infrastructure improvements. It is important to improve the quality and accuracy of the District's hydraulic model by performing flow tests in each pressure zone to help calibrate the model.

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