

## CHAPTER 7

# **OPERATION AND MAINTENANCE**



## **INTRODUCTION**

A comprehensive maintenance program allows the City to use the existing collection system and pumping facilities for their maximum design life at their fullest capacity. The same facilities will therefore accommodate greater flow rates from more customer connections, which minimize the need to construct new facilities. A properly maintained facility is also less likely to fail. Operating costs of the utility are reduced because of lower damage compensation costs and overtime costs for maintenance personnel. An effective maintenance program also protects the environment and the public health by minimizing the potential for sewage overflows.

The current Operation and Maintenance (O&M) program discussed in this chapter consists of routine operations, preventative maintenance and emergency procedures.

### **NORMAL OPERATIONS**

Normal operation of the City's sewer system is managed by the Operations Division of the Public Works Department.

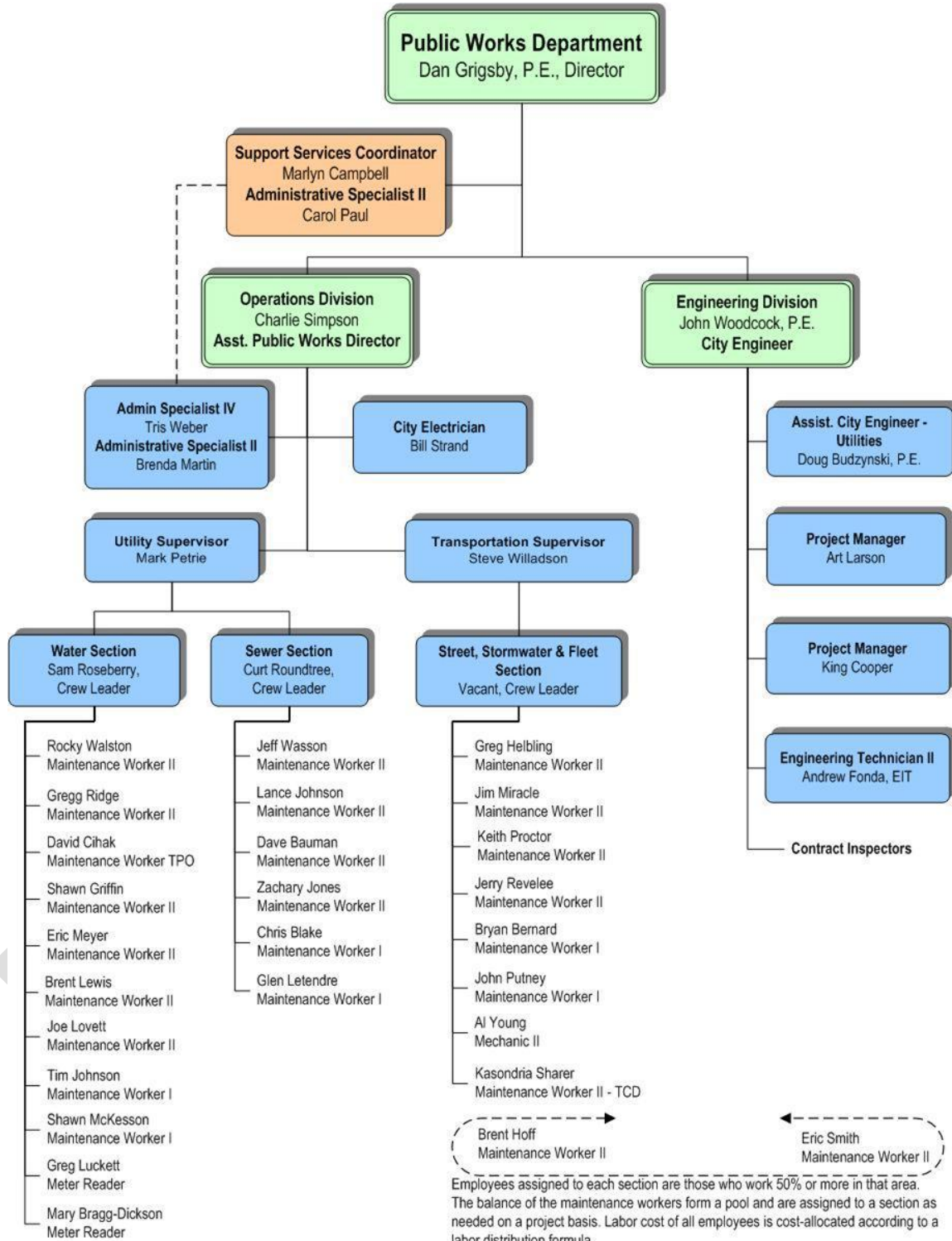
#### ***Organizational Structure***

The Operations Division is under the direction of the Assistant Public Works Director, Mr. Charlie Simpson. He reports to the City's Public Works Director, Mr. Dan Grigsby. The sewer operations section of the Operations Division is staffed by a Lead Sewer Worker (Curt Roundtree) with four Maintenance Workers and one Laborer. In addition, if necessary, other support staff and equipment is available to sewer operations from the water and storm – streets operations sections. **Chart 7-1** illustrates the organization of Bonney Lake's Public Works Department.

Training is offered through such organizations as the APWA (local section), various trade organizations, Washington Environmental Training Center, Green River Community College and by industrial training specialists. The City will continue its policy of supporting and promoting training.

The level of staff training will need to keep pace as the complexity of the system and the number of customers increase. New employees need orientation and basic information; while more experienced employees need continued training. The City utilizes cross-training between the sewer and water systems to ensure personnel are available for emergencies in any City system.

**Chart 7-1  
Organizational Structure**



### ***Communication***

To function efficiently, an operations and maintenance team must be able to communicate on a regular basis and in an effective manner. The normal channels of communication available to City staff are:

- Vehicular two-way radios;
- Cellular Phones;
- Daily work assignment meetings;
- Emergency phone numbers for "on-call" employees;
- Pagers; and
- Regular staff meetings.

### ***Equipment***

The equipment available for daily use includes rolling stock, shop tools, and incidental equipment as well as other portable equipment for field use. The primary equipment is described in **Table 7-1 – Sewer Department Equipment List**.

The City is investigating the purchase of a new equipment truck for sewer maintenance. This would replace one of the City's older existing trucks. The City is also considering purchasing an additional portable generator.

### ***Routine Operations and Preventative Maintenance***

Maintenance schedules should meet or exceed manufacturer's recommendations for all critical components in the sewer system. The following sections list the City's existing operations and maintenance requirements for all facilities.

#### ***Lift Station Maintenance***

Each lift station is maintained weekly, monthly, semi-annually and annually.

##### ***Weekly Lift Station Maintenance (All Lift Stations)***

General: Inspect for abnormalities such as asphalt depressions, hatch openings and signs of vandalism.

Wet Well: Check structure, catwalk and ventilation; check for unusual odors (e.g. paint, solvents).

<b>Table 7-1 Sewer Department Equipment List</b>	
1995 Freightliner Dump Truck	
1988 Case Backhoe Model 580K	
2005 Chevrolet 2500 Flatbed Truck	
2006 Godwin Pump	
2007 1 ton Service Body 4x4	
2007 1.5 ton Drop Side Dump Truck	
2005 Ford Ranger Pickup Truck #1	
2005 Ford Ranger Pickup Truck #2	
2005 Ford Ranger Pickup Truck #3	
Portable Message Board	
Portable Message Board	
1986 Cummins Generator 50 kW	
1986 Cummins Generator 50 kW	
1999 Chevrolet Silverado 1/2 Ton Pickup Truck	
2005 Chevrolet Silverado Pickup Truck	
Trailer Wood Box Sides	
1993 Chevrolet 3/4 Ton 4X4 Pickup Truck	
1998 Vactor Ford Truck	
Miscellaneous small tools, etc.	
<b>Communications Equipment</b>	
Two-Way Radios in All Vehicles	
Cell Phones with Two-Way Radios	
<b>Equipment Available from Water Operations</b>	
2000 Ford Ranger Pickup	
1991 Ford Ranger Pickup	
1982 Concrete Cutter	
1998 Pavement Cutter	
1995 Ford F250 3/4 Ton Pickup Truck	
1994 Chevrolet S-10 Pickup Truck (meter van)	
2003 Chevrolet S10 Pickup	
2003 Chevrolet S10 Pickup	
2002 XAS 96 JD Portable Air Compressor	
2002 John Deere 410 G Backhoe	
1998 Brush Mower	
1995 Ford F350 1 Ton Flatbed Truck	
1980 GMC 7000 Series Boom Truck	
1995 Ford F350 1 Ton Service Box Truck	
1987 Eager Beaver Trailer	
1999 Ford Ranger Excab Pickup Truck	
1975 GMC 5 Yard Dump Truck	
1975 GMC 5 Yard Dump Truck	
2002 5 Yard Dump Truck	
1989 GMC Vandura 3/4 Ton Van	
1994 Chevrolet Pickup Truck	
1999 4900 International Dump Truck	
1999 Paros Trailer PET 71612	
225 kW Emergency Generator	
15 kW Emergency Generator	
Jack Hammers (2 each)	
Portable Compactor (Case)	
Miscellaneous small tools, etc.	

## **CHAPTER 7**

---

Dry Well: Inspect for telemetry malfunctions and general cleanliness, paint, etc.; check level controls for float operation and bubbler system failures and check pumps for any operating abnormalities; ensure that all pumps are operating on automatic; record in log weekly operating time for each pump and note any differences from previous week.

### *Weekly Maintenance*

Check grate at top of the interceptor going down SR 410 (near Myers Road).

### *Monthly Lift Station Maintenance*

Start up and check generator at:

- All lift stations with generators (all except Lift Stations 5 and 16).
- Portable generators.

### *Quarterly Lift Station Maintenance*

Extract wet well grease from:

- Lift Station 18.

Check levels of Bioxide at:

- Lift Station 9;
- Lift Station 10;
- Lift Station 19.

### *Semi-annual (twice a year) Lift Station Maintenance*

Extract wet well grease from:

- Lift Station 17.

### *Yearly Lift Station Maintenance*

Grease and lube all pumps (all lift stations).

Change oil in generator and check anti-freeze level at:

- All lift stations with generators (all except Lift Stations 5 and 16); and
- Portable generators.

Clean and Inspect all City owned Grinder Pumps.

- 90 grinders city wide.

Check cathodic protection of underground fuel tank at:

- Lift Station 17.

### *Every 2 to 5 Years Lift Station Maintenance*

Change odor control filter at:

- Lift Station 14.

Leak test underground fuel tank at:

- Lift Station 17 (every 3 years).

### **Pipeline Maintenance**

Pipeline maintenance consists of pipeline cleaning as necessary. City vacor truck is used to clean pipelines. In the past, the City has cleaned about a quarter of the system each year. Its current goal is to clean half of the system each year.

### **Manhole Maintenance**

Maintenance staff periodically inspects manholes to determine the need for maintenance and/or repairs. Manholes should be inspected once every two years in conjunction with the City's pipeline cleaning program.

### **Safety**

The City participates in a Safety Operations Resource Team (SORT) with other cities through the Water and Sewer Risk Management Pool. SORT creates safety programs to ensure a safe work environment as well as compliance with OSHA and WISHA regulations. The City designates one employee as a Safety Officer (currently, Mr. Dave Bauman). This employee is responsible for conducting safety meetings which are held with the crew on a monthly basis, acting as the City's SORT representative, inspecting and maintaining safety equipment and reviewing safety incidents. The City also has a Safety Committee which meets monthly.

### **Inspections**

City staff inspects connections to and extensions of the sewer system for conformance with City standards. In addition, City staff inspects the construction of City facilities.

### **Records**

Adequate records are an essential tool in City management and operation, providing the supporting data for operations assessment and long-term planning, while saving time and reducing difficulty when trouble arises.

The City keeps the following types of records.

Lift station logs on operation, maintenance and repair.

- Personnel
- Facility maintenance and repair
- Regularly kept work logs
- Inspection reports

## CHAPTER 7

---

- Work orders
- Safety meeting minutes
- Plat maps and as-built drawings
- Material Safety Data Sheet (MSDS) listings
- Confined space entry records
- Telemetry recordings

Up-to-date maps of the sanitary sewer system are essential for operation and maintenance. The City's consulting engineers create and update the City's maps. Changes or additions to the sanitary sewer system are added to system maps as they occur. Plat maps and as-built drawings show the gravity and force-main sizes and locations; manhole locations, numbers and elevations; clean out locations; pipe types; valve and air-vac locations; and tee and side sewer stub locations. Construction drawings provide information on lift station facilities such as wet well and dry well sizes, ventilation equipment, electrical information, easement locations, etc. Plat maps and construction drawings for new sanitary sewer extensions and facilities will continue to be recorded.

### **Staffing**

The hours of labor and supervisory activity required to effectively conduct on-going maintenance and operations form the basis for identifying needed staffing levels.

The current staff organization is illustrated in **Chart 7-1**. There are five operation and maintenance employees, including the leadworker and utility maintenance workers. The tasks performed include inspecting and repairing system facilities, routine preventive maintenance, record keeping, administrative tasks, construction inspection and corrective action during emergencies.

The hours of work required to adequately maintain the sanitary sewer system are shown in **Table 7-2 – Staffing Requirements**. The annual hours total approximately 11,600, or approximately 222 crew hours per week. This requires six crew members working full time (i.e., 40 hours per week) excluding vacation, sick leave and any task not related to preventive maintenance.



## Maintenance and Operations

<b>Table 7-2</b>				
<b>Staffing Requirements</b>				
Description	Total Units In System	Frequency (Times/Year)	Time/Unit (Hours)	Time/Year (Hours)
<b>Preventive Maintenance</b>				
Lift Stations				
-Daily	22	260	2	520
-Monthly	22	260	6	1,560
-Quarterly	6	16	6	96
-Semi-Annually	1	2	12	24
-Annually	22	22	15	330
Grinder Pumps	90	90	4	360
Community Drainfield (Falling Water)	1	52	8	416
Sewer Main Flushing	81 miles	50%/yr	28	1,134
Manhole Inspection	1656	50%/yr	1.5	1,242
Sewer Main TV Inspection	81 miles	25%/yr	16	324
Manhole Rehabilitation	1656	10%/yr	2	331
Grate Inspection	1	104	1	104
I & I Monitoring	N/A	30	2	60
Safety	N/A	260	0.5	130
Construction Inspection	N/A	260	2	520
Record Keeping	N/A	260	1	260
Vehicle and Equipment Upkeep	N/A	260	0.5	130
<b>Operations</b>				
Monitor System	22	260	0.25	1,430
False Alarm Response	1	12	2	24
Groundskeeping	22	12	1	264
Inventory	1	1	40	40
Service Connections	150	1	1	150
Main Connections	5	1	12	60
Administration	1	260	8	2,080
<b>Total Requirements</b>				
Total Hours Required				11,589
<b>Total Full Time Staff Required</b> (based on 1,540 hours per person per year)				<b>8</b>
<b>Time Available Per Year Per Person</b>				
<b>Beginning Hours Available</b>				2,080
Less average vacation of 3 weeks per year				-120
Less average sick leave of 2 weeks per year				-80
Less holidays of 10 days per year				-80
Less average training of 40 hours per year				-40
Less average small tasks other than above of 1 hour per day				-220
<b>Net Total Available Hours Per Year Per Person</b>				<b>1,540</b>

## **CHAPTER 7**

---

If the utility considers the hours necessary for vacation, holiday, illness, meetings, training, on-the-job travel and startup time, then the total number of hours available for performing the work of operation and maintenance diminishes to a level of approximately 1,540 hours per year, or 30 hours per week per crew member. At this rate, a staff of eight full-time maintenance crew members is necessary.

### **Emergency Operations Plan**

The City plans to develop an Emergency Response Plan to provide proper manpower and equipment response upon the failure of City facilities, the interruption of service due to power outages/catastrophic event. Currently, during off hours, at least one staff member is on-call in case of an emergency.

The sewer lift stations are the most vulnerable. In order to provide time to respond, the stations have additional capacity in the wet well or in separate overflow chambers. During power failures, the regional lift stations have emergency generators, and the City's mobile generator is used to provide temporary power in the event a dedicated emergency generator fails.

### **Sewer System Construction Standards**

The City has standard construction specifications and details for sewer improvements to the system (**Appendix I**). These standards are regularly improved based on the availability of new technology (materials and methods) and performance of the existing facilities. Through the active involvement of the maintenance staff, the standards are revised to increase the longevity and reduce the maintenance of the City's sewer facilities.

## **OPERATION AND MAINTENANCE EVALUATION**

Currently, preventive maintenance of sewer system facilities consists of standard lift station maintenance, periodic manhole inspection and pipeline flushing. Additional preventive maintenance of the system is necessary in order to reduce the number of emergency situations which currently occur and to optimize system reliability.

### ***Deficiencies and Recommendations***

Manhole inspection and rehabilitation, odor control and wet well cleaning are additional standard maintenance procedures necessary to optimize the sewer system operation.

### **Manhole Inspection and Rehabilitation**

#### *Deficiency*

Based on the I&I values for the system, it is likely that a number of manholes in the City are subject to inflow and infiltration problems. The City needs to identify manholes with I&I problems and raise or seal the manholes.

#### *Recommendation*

Clean and rehabilitate existing manholes based on a manhole inspection program. Rehabilitation includes I&I prevention; frame and cover replacement; raising or sealing; and ladder replacement. The City's manhole maintenance standard should be to inspect all manholes yearly.

### **Manhole Inflow Reduction Program**

#### *Deficiency*

Some manholes within the sewer system are submerged during extreme rainfall events acting like catch basins draining roadway runoff into the sewer system. This stormwater inflow stresses the existing sewer system, causing several facilities and pipelines to reach capacity.

#### *Recommendation*

The City needs to initiate a program to locate and identify where these manholes are and takes steps to seal these manholes. The first step is to identify areas which are subject to flooding during extreme rainfall events. Manholes in these areas subjected to submergence should be waterproofed using frame and cover gaskets and sealing compounds. The City should continue to identify manholes experiencing inflow problems and correct the leaks as part of an annual inflow reduction effort.

### **Odor Control**

#### *Deficiency*

The City has odor control systems at Lift Station 14 and Bioxide injections systems at Lift Stations 9, 10 and 19, to help reduce hydrogen sulfide generation in the City's longer force mains. The City does receive some odor complaints from residents near Lift Stations 12 and 13.

#### *Recommendation*

The City should monitor the odor concerns at these lift stations and determine whether odor control systems are warranted.

## **CHAPTER 7**

---

### **Pipeline Video Inspection Program**

#### *Deficiency*

The City needs to have an updated understanding of the condition of its collections system.

#### *Recommendation*

The City should continue its annual video inspection program with the objective of maintaining a sewer system condition data base for prioritizing eventual system replacement. Also, the video inspection program will enable the City to identify potential problems and correct them prior to an accident occurring, such as an overflow. This program will improve the system's overall reliability. Older areas of the sewer system with concrete pipe and pipelines with flat slopes should be inspected first.

### **Critical Pipe Section Monitoring Program**

#### *Deficiency*

As I&I loading on the City's system increase, some portions of the collection system will approach their design capacity. In an effort to prevent overflow during extreme rainfall events, the City needs to understand which parts of its system are particularly susceptible to capacity limitations.

#### *Recommendation*

The City should monitor wastewater flows within the sewer system at key locations during wet weather periods, namely November through February. For each monitoring location, the City should also collect dry weather baseline flow data for 7 to 14 days to allow evaluation of I&I. Specifically, the City should utilize its flo-totes to monitor flows in pipelines expected of having capacity problems as identified in the proposed I&I program. The City should monitor these pipe sections to identify the extent of the problem. If any capacity problems are discovered, the City should review pipe capacity and pump rate information to determine the most effective way to eliminate the capacity problem.

### **Standard Procedures and Recordkeeping**

#### *Deficiency*

The City should have a clear understanding of how I&I impacts capacity at each lift station. The City's telemetry system records pumping information and times; however, only a few of the City's lift stations have flow totalizing meters (including: Lift Stations 2, 9, 10, 19, and 20).

### *Recommendation*

The City should install flow meters at each lift station and have them monitored by the telemetry system. City staff should review this information on a regular basis and compare with manual readings at the lift station. This should help identify any problems with telemetry equipment or possible pump malfunctions on a more timely basis.

### **Power or Equipment Failures at Lift Stations**

#### *Deficiency*

All but one of the City's existing lift stations have back up power generation capability. In addition, only the newest lift stations (Lift Stations 2, 9, 10, 19 and 20) have bypass pumper ports. These pumper ports allow for a portable pump to be used to by pass lift stations in the event of either equipment or power failures.

#### *Recommendation*

The City has plans for having a generator installed at Lift Station 16. The City should install pumper ports at all stations that do not currently have one.

### **Flushing Program**

#### *Deficiency*

Many sections of sewer main may be susceptible to physical deterioration and loss of flow capacity due to solids build up in the pipe. This can be caused when minimum scouring velocities are not achieved in a pipe section due to lower than design flow rates being experienced as the system builds out or to inadequate pipe slopes.

#### *Recommendation*

The City should prepare and implement a sewer main flushing program to prioritize pipe sections that are the most susceptible to degradation from sediment deposits. Parameters should include low flows, shallow slopes, pipe material, and the critical importance factor of each main section (i.e. collector versus regional interceptor). The program should address requirements such as staff hours, scheduling, and flushing equipment.