

CHAPTER 5

OPERATIONS AND MAINTENANCE PROGRAM

5.1 INTRODUCTION

This Chapter summarizes the operation and maintenance programs maintained by the District to ensure performance and reliability of the wastewater collection system. As of December 2013, the District maintains and services approximately 150 miles of gravity sewer main, 8 miles of low pressure force main, 19 lift stations, approximately 15 miles of force main, 420 grinder pumps, and a supervisory control and data acquisition (SCADA) system. This Chapter includes a discussion of the responsibility and authority, normal system operation, routine preventive maintenance criteria, current staffing organization and needs, new construction, records, safety, and emergency response procedures.

The primary objective of this chapter is to provide documentation of satisfactory wastewater management operations in accordance with WAC 173-240. This objective includes a description of the staff organization, existing facilities and their normal operation, as well as safety procedures and an emergency response program. A more detailed Operations and Maintenance Program has been prepared in a separate document entitled "Volume II: Wastewater Operation and Maintenance Manual."

5.2 WASTEWATER SYSTEM ORGANIZATION

The District is governed by a five-member Board of Commissioners that sets the general policies for the operation of the District. Currently, the five board members are Tom Harman, Karen Moran, Lloyd Warren, Robert Abbott, and Mary Shustov. The current General Manager is Jay Krauss and oversees the daily operations of the District.

The District Headquarters and Operations Facility are located at 1510 228th Avenue SE in Sammamish.

As of December 2013, the District employs an Operations department including a field staff of 17 and five office and administrative staff, and 27 additional staff from the Administration, Finance and Customer Service, and Engineering departments. A complete organizational chart for the District is presented in Figure 5-1. This

chart illustrates the specific personnel positions and corresponding responsibility for the District’s wastewater system.

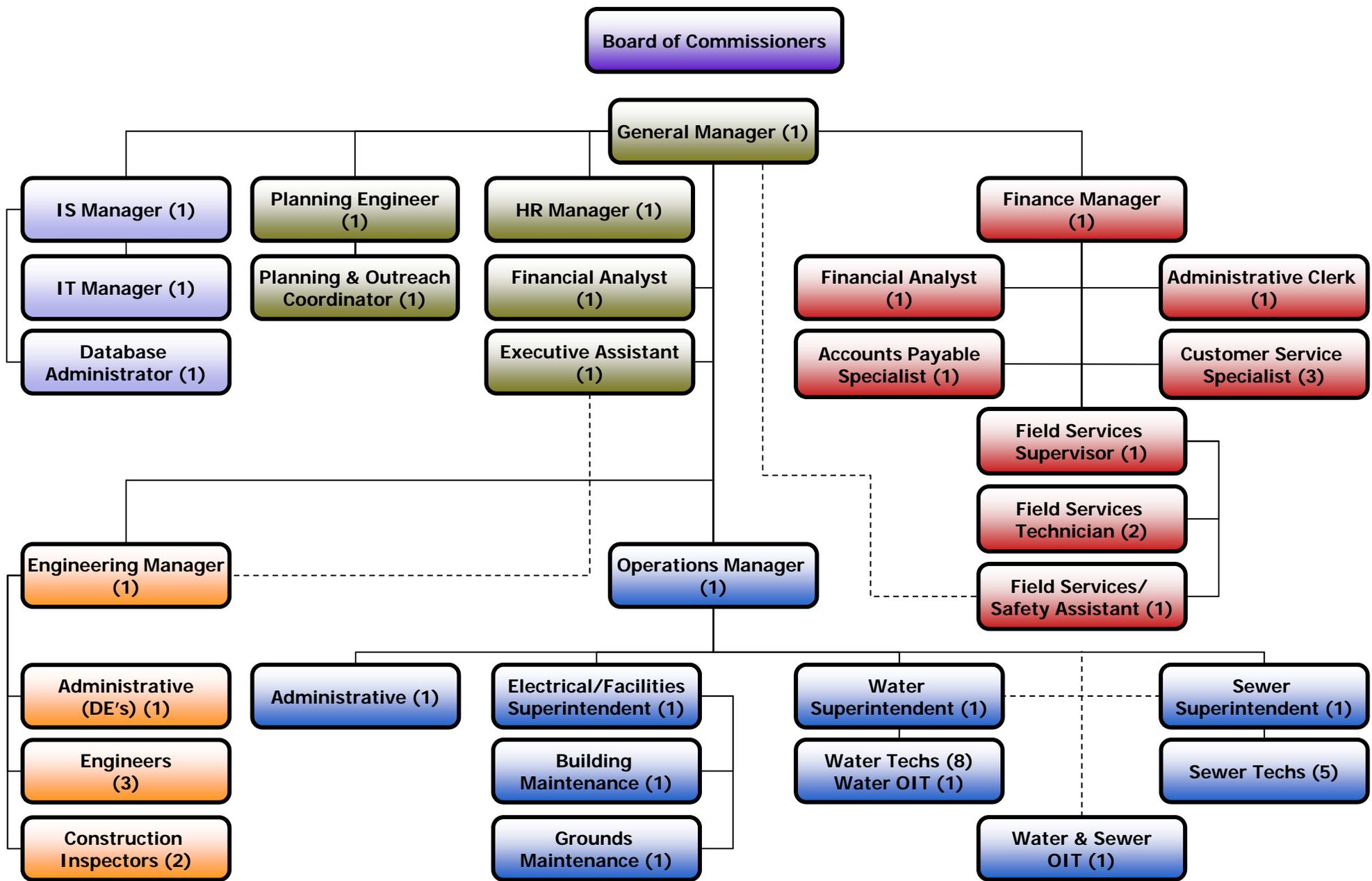
The Operation and Maintenance staff is a collectively pooled work group consisting of staff charged with water, sewer, and facilities maintenance duties. Routine wastewater utility work and assignments include, but are not limited to, the following tasks:

- Grinder pump maintenance, replacement, and repair
- Sewer gravity main maintenance, inspections, and repair
- Gravity manhole inspection and repair
- Wet well maintenance and repair
- Lift station maintenance and repair
- Plan review and project punch list preparation in collaboration with engineering
- Odor control facility maintenance and operation
- Management of the District’s pretreatment (FOG) program
- Closed-circuit television (CCTV) inspection
- SCADA system maintenance assistance.

5.3 OPERATOR CERTIFICATION

There are currently no Washington State certification requirements for wastewater collection system operators. However, the Department of Ecology encourages participation for utilities that do not operate a wastewater treatment plant. Collection crew members are expected to have a mechanical aptitude, with experience with pipelines and pumps and their controls preferred. At a minimum, all personnel performing wastewater system related duties receive training in the following areas:

- Confined space
- Fall protection
- Commercial driver’s licenses (CDLs)
- Work zone traffic control safety
- Asbestos cement (AC) pipe work
- Eye and face protection
- Hand and power tool safety
- Hearing loss prevention
- Outdoor heat exposure
- Portable ladder safety
- Respiratory protection



**SAMMAMISH PLATEAU
 WATER & SEWER DISTRICT**
 WASTEWATER COMPREHENSIVE PLAN

 FIGURE 5-1
 ORGANIZATIONAL CHART

 Gray & Osborne, Inc.
 CONSULTING ENGINEERS

- Wastewater work safety program
- Vehicular safety program
- First Aid/CPR/blood borne pathogens
- Occupational Safety and Health Association (OSHA) safety training
- Lockout/tagout
- Work in excavations
- National Incident Management System (NIMS) and Incident Command System (ICS) training

Both the District and the Department of Ecology encourage participation in a program of collection system certification. The District currently has seven employees that have certification as a Collection System Maintenance Operator.

5.3.1 SAFETY PROGRAM

The District places a high value on the safety of its employees. The District is committed to providing a safe workplace for all employees and has developed this accident prevention program for injury prevention to involve management, supervisors, and employees in identifying and eliminating hazards that may develop during our work process. The District's Accident Prevention Program includes three sections; 1) the Basic Safety Program, with the most recent update adopted by Resolution No. 4210 on January 7, 2013, 2) Hazard Specific Safety Programs, and 3) Training Outlines. Interested individuals may examine the District's Accident Prevention Program at the District's office.

It is the basic safety policy of the District that no task is so important that an employee must violate a safety rule or take a risk of injury or illness in order to get the job done. Employees are required to comply with all District safety rules and are encouraged to actively participate in identifying ways to make the District a safer place to work. The Basic Safety Program addresses subjects including:

- Management Commitment
- Safety and Health Responsibilities
- Employee Participation
- Safety Committee
- Hazard Recognition
- Incident Response
- Hazard Prevention and Control
- Disciplinary Policy

There are eighteen Hazard Specific Safety Programs, including the most recently developed Wastewater Work Safety Program. Each of these programs must be periodically reviewed and updated, with one to three programs reviewed annually.

Whenever reasonably possible the District designs its facilities and equipment to eliminate employee exposure to hazards. Where these engineering controls are not reasonably possible, the District writes work rules that effectively limit employee exposure to the hazard. When the above methods of control are not possible or are not fully effective, employees are required to use personal protective equipment (PPE). For sewer workers, use, maintenance, cleaning and storage of appropriate PPE is essential for reducing risk from exposure to wastewater for both the sewer worker and other District employees and household members.

There are workplace hazards that operations personnel are exposed to that are intrinsic to sewer utility work. These hazards are grouped into categories in Table 5-1 below. This table lists the workplace hazards and the locations where these are typically found.

TABLE 5-1

Typical District Sewer System Workplace Hazards

| Type of Hazard | Location of Hazard |
|---------------------------------|--|
| Wastewater | Sewer System |
| Confined Spaces | Manholes Lift Station Wet Wells Control Structure Vaults for Valves, Air Vacs, Pig Launch, & Odor Control |
| Falls | Manholes Control Structure Lift Stations Vaults Tops of large vehicles |
| Electrical - Lockout/Tagout | Pumps Generators Control Panels Compressors |
| Non-Electrical - Lockout/Tagout | High Pressure Fluids Compressors |

TABLE 5-1 - (continued)**Typical District Sewer System Workplace Hazards**

| Type of Hazard | Location of Hazard |
|---------------------|--|
| Heavy Equipment | Backhoes Dump Trucks Jet and Vac Trucks Forklift |
| Work in Excavations | New sewer construction Sewer maintenance or repair work |

Table 5-2 summarizes the certification of sewer staff personnel as of December 2012.

TABLE 5-2**District Wastewater Personnel Certification Summary**

| Certification | Quantity ⁽¹⁾ |
|--------------------------------------|-------------------------|
| Commercial Drivers License (Class A) | 6 |
| Competent Person Training/Trenching | 7 |
| Confined Space Entry | 7 |
| CPR/First Aid | 7 |
| Fork Lift Operator | 6 |
| Service Crane Truck Operator | 7 |
| Traffic Control Flagger | 7 |

(1) All District personnel and certification information was provided by the District in December 2012.

5.4 SYSTEM OPERATION AND CONTROL

The locations of the major sewer system components are shown on Figure 1-14, and a schematic describing the flow pattern of the existing system is provided in Figure 1-15. A description of the normal operation of each facility is provided in Volume II: O&M Manual.

5.4.1 SCADA SYSTEM

The existing SCADA system controls and monitors the operation of various wastewater system components. The Master Control Panel (MCP), which is the logic center of the SCADA system, is located at the District Headquarters, at 1510 228th Avenue SE in Sammamish, Washington, in King County. It consists of an operator interface, a programmable logic controller (PLC), and communication network. The SCADA system provides an analog display of all the District’s lift stations.

The SCADA system is also equipped with alarms to allow staff to respond to conditions such as pump, motor, or power failures before a sewer spill occurs. Examples of the District’s SCADA system monitoring and reporting capabilities and alarms include:

5.4.1.1 Monitoring Capabilities

- Wet well levels
- Pump run times, and pump failures
- Generator status, along with run, starts, and fail counts
- Communications, RTU Panel and commercial power, fail counts and hours
- Flow meter

5.4.1.2 Alarms

- Operator in trouble
- Station flood
- Air compressor trouble
- Power/phase fail
- Communication fail
- Intrusion
- Fire/smoke alarm
- Water seal fail
- High wet well level
- Low wet well level
- Pump fail
- Generator running
- Fuel low

5.4.1.3 Reports

- Daily, weekly, and monthly flow
- Hourly pump run time

The SCADA system also has the capacity to add additional lift stations. Additional information can be found in “Volume II: Wastewater Operation and Maintenance Manual.”

5.4.2 COMPUTERIZED MAINTENANCE MANAGEMENT SYSTEM

The District maintains a computerized maintenance management system (CMMS) to support the wastewater utility operations within the District. The CMMS provides data management of operational activities utilizing a Work Order system generated for each asset including inventory, construction, maintenance, inspections, monitoring and training. The CMMS has been fully integrated and is compatible with other key software systems at the District including GIS and SCADA, and will be utilized for asset management to identify future rehabilitation and replacement (R&R) projects. The CMMS is also used for the District’s drinking water utility operations and stores a full inventory of the District’s water and sewer assets.

5.4.3 GRAPHICAL INFORMATION SYSTEM (GIS)

The Geographical Information System (GIS) database and related maps functions as an essential tool for the Operations Department. The GIS is an interface for all relevant sewer system information, including the District’s lift stations, sewers, and manholes and is maintained and updated on a regular basis. The GIS for the sewer system is linked to the District’s computerized maintenance and management system to assist in the routine maintenance of the District’s sewer system.

5.4.4 CUSTOMER RESPONSE

A Work Order is generated for any issue raised by the public. Depending on the nature of the issue, a staff member may be contacted to confirm if a public health issue is apparent. If the issue does not require immediate attention, staff will respond as soon as feasible.

5.5 FACILITY PERFORMANCE EVALUATION

Review of facility performance provides a means for the District’s wastewater utility staff to evaluate the operation and optimize control of the wastewater collection system facilities. The District routinely collects operating information. The information allows the District to evaluate the operation of the collection system and to determine the effectiveness of their preventive maintenance program. Table 5-3 lists the routine operating information collected by the operation staff.

TABLE 5-3

Facility Performance Evaluation and Maintenance

| Facility | Parameter Evaluated | Means of Evaluation | Evaluation Schedule |
|------------------------------|-------------------------------|--|--|
| Lift Stations | Pump Start/Stop | SCADA/Manual | SCADA = Continuously |
| | Motor Speed/ Amperage | Manual | |
| | Run Time | SCADA/Manual | Manual = Weekly |
| | Alarms | SCADA | |
| | Visual Inspection | Manual | |
| Wet Wells | Cleaning Maintenance | Manual | Annually |
| Residential Grinder Pumps | Pump Start/Stop | Manual | Every 2 years |
| | Amperage | | |
| | Alarms | | |
| | General Condition | | |
| Gravity Sewers | Roots | TV Inspection And Jetting (separately) | Every 6 months to 12 years, Average Every 5-6 years |
| | Debris Buildup | | |
| | Buildup | | |
| | Infiltration | | |
| Lateral Inspections | Conformance to code, Leaks | Field Inspection | With TV Inspection of Gravity Main |
| | Overall Condition | | |
| | | | |
| Manholes | Fats, Oils, and Grease; | Visual | Critical Manholes Annually, Others 3 years |
| | Corrosion | | |
| | Inflow | | |
| | Surcharge | | |

TABLE 5-3 – (continued)

Facility Performance Evaluation and Maintenance

| Facility | Parameter Evaluated | Means of Evaluation | Evaluation Schedule |
|----------------|-------------------------------|-------------------------------|-------------------------|
| Force Mains | Scum Buildup | Pigging | Quarterly to Annually |
| Air/Vac Valves | Cleaned | Manual | Annually |
| Generators | Engine Operation Load Test | Automatic Contract Service | Weekly Every 2 years |

5.6 PREVENTIVE MAINTENANCE

Planning for present and future maintenance of the wastewater system facilities is as important as planning gravity sewer main extensions, lift stations, force mains, and other physical improvements. The maintenance effort must be continuous in order for the District to continue to fulfill its role as a wastewater collector in the future.

The role of maintenance is to preserve the value of the physical infrastructure and ensure that the District can continue to provide a safe and reliable wastewater collection system. The most cost-effective method for maintaining a wastewater collection system is to provide a planned preventive maintenance (PM) program. Through a planned PM program, the optimum level of maintenance activities can be provided for the least total maintenance cost.

The District's PM program involves defining the tasks to be performed, scheduling the frequency of each task, and providing necessary staff to perform the task.

5.6.1 SCADA SYSTEM

The SCADA system continuously monitors District facilities to ensure proper operation. Alarms, such as high wet well level, notify the District of problems in the collection system. If a SCADA alarm is activated after hours, the system contacts an "on-call" staff member for investigation and response.

5.6.2 LIFT STATIONS

The District visits and inspects each lift station on a weekly basis. Lift station wet wells are cleaned at least once each year and the pumps are also inspected and serviced on an annual basis. The complete maintenance schedule for the lift stations is provided in Table 5-4, which includes all maintenance items that are performed weekly, monthly, quarterly, and annually. Additional detail can be found in the “Operation and Maintenance Manual.”

TABLE 5-4

Lift Station Maintenance Schedule

| Weekly | Monthly | Annually |
|---|--|--|
| <ul style="list-style-type: none"> • Write down run-time hours • Check pump filters • Check pump cycle counter • Inspect check valves for rags • Check ventilation operational • Check for leaks in dry well • Drain sump • Exercise/lube gate valves • Blowdown bubbler | <ul style="list-style-type: none"> • Replace pump filters • Clean check valves • Clean and sanitize dry well • Drain air compressors • Clean out drain sumps • Check telemetry | <ul style="list-style-type: none"> • Inspect interior and piping paint • Check all force mains that discharge to manholes • Grease all pumps • Check all electric panels • Inspect pump impellers • Clean house thoroughly |

The District has 13 lift stations that are provided with a standby generator that will operate the station during a loss of commercial power. The six lift stations without backup generators generally collect wastewater from smaller residential basins and have mobile generators that will be utilized during a power outage. The complete maintenance schedule for the generator is provided in Table 5-5.

TABLE 5-5

Generator Maintenance Schedule

| Weekly | Monthly | Biannually |
|---|---|--|
| <ul style="list-style-type: none"> • Visual inspection of permanent generators | <ul style="list-style-type: none"> • Perform test run • Check oil • Check oil filter • Check air filter • Check battery fluid level • Check battery terminals for corrosion • Check alternator output volts • Check coolant level • Check fan belts • Check fuel level • Check rpm | <ul style="list-style-type: none"> • Complete maintenance • Load barrier testing |

5.6.3 FORCE MAINS

The District has a goal to exercise force main valves on an annual basis. The District's force mains are designed to achieve scouring velocities that self-clean under normal system operations and therefore require no maintenance. However, the District makes an attempt to pig force mains identified for this type of maintenance, quarterly to annually, or as required, with some force mains requiring greater frequency than others. Air- and vacuum-relief assemblies may be located at the high points in the force mains. These assemblies are checked every six months or as needed to ensure proper operation. Failure of the assembly may cause an air blockage in the force main, which can reduce pumping capacity. The complete maintenance schedule for force mains is provided in Table 5-6.

TABLE 5-6

Force Main Maintenance Schedule

| Quarterly | Twice per Year | Annually |
|--|---|---|
| <ul style="list-style-type: none"> Pig force mains (Inglewood, Camden Park) | <ul style="list-style-type: none"> Visually check Air Relief Assemblies Visually check Vacuum Relief Assemblies | <ul style="list-style-type: none"> Pig force mains (North Lake, Central Lake, Beaver Dam, Trossachs) |

5.6.4 MANHOLES AND GRAVITY SEWER LINES

The District performs periodic inspections and flushing of the gravity sewers and cleaning of manholes. The District’s manholes are inspected once every three years. Critical manholes may be inspected annually. The gravity sewers are inspected once every five to six years on average. In some cases, segments of pipe have been identified to receive more frequent inspection and jetting (every six months). Mains that have been shown to need very little maintenance can go as long as 12 years between inspections. The complete maintenance schedule for manholes and gravity sewers is provided in Table 5-7.

TABLE 5-7

Manholes and Gravity Sewers Maintenance Schedule

| Twice per Year | Annually | Multi-Years |
|---|---|--|
| <ul style="list-style-type: none"> Inspection and jetting of specific problem sewer mains. | <ul style="list-style-type: none"> Visual inspection of critical manholes CCTV critical pipes | <ul style="list-style-type: none"> Visual inspection of manholes every 3 years TV inspection of most sewer mains every 5 to 6 years TV inspection of specific low problem sewer mains every 12 years. |

5.6.5 RESIDENTIAL GRINDER PUMPS

The District owns and maintains the grinder pumps within its service area. Currently, the District maintains 420 grinder pump systems which are located primarily in low-lying areas and near shorelines such as Pine Lake, Beaver Lake, and Lake Sammamish. The District visits, inspects and performs routine maintenance at each of the grinder pumps every two years, or as needed for specific grinder pumps with maintenance issues. The District has a program to replace grinder pumps as they near the end of their useful life. The complete maintenance schedule for grinder pumps is provided in Table 5-8.

TABLE 5-8

Grinder Pumps Maintenance Schedule

| As-Needed | Annually | Biannually |
|---|--|---|
| <ul style="list-style-type: none"> Respond to customer calls 24/7 - 365. | <ul style="list-style-type: none"> Specifically identified Grinder Pumps with on-going maintenance issues | <ul style="list-style-type: none"> Inspect and clean each grinder pump system and perform routine maintenance by recording amperage and pressure |

5.6.6 FATS, OILS, AND GREASE PROGRAM

The District’s Board of Commissioners passed Resolution No. 3778 in January 2009 which regulates the discharges of fats, oil, and grease (FOG) into the District’s sewer collection system and subsequently the KCDNR sewer system. The regulations are in compliance with those set by the King County Industrial Waste Program (KCIW) and are designed to aid in the prevention of sanitary sewer blockages and obstructions from contributions and accumulation of animal- or vegetable-derived FOG, which are discharged to the sanitary sewer system from industrial or commercial establishments, particularly food preparation and serving facilities. The FOG treatment systems prevalent in the District include oil/water separators, grease traps, and grease interceptors. The District requires grease interceptors to be serviced and emptied every 60 calendar days. The District’s FOG Program is included in Appendix H.

5.7 EMERGENCY RESPONSE PROGRAM

Wastewater utilities have the responsibility to provide collection of wastewater in a reliable manner at all times. Therefore, utilities must reduce or eliminate the effects of natural disasters, accidents, and intentional acts.

Though it is not possible to anticipate all potential disasters affecting the District's wastewater system, formulating procedures to manage and remedy several common emergencies is appropriate. The District provides guidelines for the general assessment of an emergency situation in its separate Emergency Response Plan. The Plan provides procedure guidelines for emergency situations such as severe weather events, earthquakes, power failure, and communication failure.