



iv. Operation and Maintenance Program

Operation and Maintenance Program: The SSMP must include those elements listed below that are appropriate and applicable to the Enrollee's system:

(a) Maintain an up-to-date map of the sanitary sewer system, showing all gravity line segments and manholes, pumping facilities, pressure pipes, valves and applicable stormwater conveyance facilities;

A comprehensive set of sewer "S" and more detailed "Wye" maps show all the features of the City's sanitary sewer systems. These maps have been converted to Geographic Information System (GIS) maps and are the basis for "Navigate LA", which is a collection of electronic files that can be used in the field for locating pipelines, maintenance holes, service connections and other features of the City's systems. Modern state-of-the-art customized electronic GIS maps of the entire sanitary sewer systems and other information layers are actively used in system management, work prioritization, and management decisions. The maps are routinely updated to include new or rehabilitated sewers. The Bureau of Engineering District Offices and the Bureau of Contract Administration are responsible for providing as-built information to the Bureau of Engineering's Mapping Group for updating the maps.

Navigate LA is an easy to use desktop application that combines the power of electronic mapping with over 250 layers of data, linked databases and reports. This mapping is an invaluable data source for field locating utilities, avoiding damage and service disruption. Navigate LA will also be used for initial planning studies to locate potential conflicts to new construction or rehabilitation.

(b) Describe routine preventive operation and maintenance activities by staff and contractors, including a system for scheduling regular maintenance and cleaning of the sanitary sewer system with more frequent cleaning and maintenance targeted at known problem areas. The Preventative Maintenance (PM) program should have a system to document scheduled and conducted activities, such as work orders;

The City operates and maintains the largest wastewater sanitary sewer system in the nation, serving a population of over four million within a 600 square mile service area. The City's system consists of more than 6500 miles of sewers, 140,000 maintenance holes, and 46 pump stations. In addition, there are about 700,000 privately owned sewer laterals with total length of more than 11,000 miles. The City also provides wastewater conveyance and treatment services to 29 satellite agencies under contractual agreements but is not responsible for satellite agencies' sewer system management.

The Department of Public Works, Bureau of Sanitation, Wastewater Collection Systems Division's operation and maintenance manuals guide the frequency of sewer cleaning and

maintenance of pump stations and equipment. Tasks and their frequency are determined based on operation and maintenance experience, past performance, manufacturer's recommendations and site-specific conditions. Scheduled and completed tasks are catalogued and tracked by work orders in a maintenance management system called Enterprise Maintenance Planning and Control (EMPAC). Pump run times are routinely monitored and used in scheduling routine maintenance. Maintenance program includes preventive, proactive, predictive, and corrective maintenance; maintenance engineering; and quality control.

The Enterprise Maintenance Planning and Control (EMPAC) is an asset management and maintenance system the Wastewater Collection Systems Division utilizes to manage work, track warehouse parts, and streamline maintenance related purchases. The Division also uses the Field Automation Sanitation Trucks (FAST) which is a field data access component to EMPAC. FAST greatly reduces the amount of paperwork in collecting closure data for work orders. Work orders are closed in the field, thus reducing data entry by clerks and supervisors. Geographic Information System (GIS) integration ties EMPAC assets to actual field locations, searchable by street address or intersection. Real-time access to data in the field enables crews to work more efficiently.

Sewer System Preventive and Proactive Maintenance

The City has a proactive and preventive maintenance program for its sewer system. Six maintenance yards are strategically located throughout the City to minimize travel time and maximize efficiency. Preventive maintenance is focused on critical and problematic areas. Maintenance is performed by staff assigned to each of the six maintenance yards. Problem sewers are identified, prioritized and scheduled for maintenance based on comprehensive review of the maintenance history and system characteristics of all the sewers in the City including overflows, blockages, excessive maintenance, age, material, condition, etc. Maintenance includes high velocity sewer cleaning, bucketing, mechanical and manual rodding of sewers. The City's sewers are classified into two groups: primary sewers (greater than 15 inches in diameter) and secondary sewers (15 inches or smaller in diameter). Primary sewers have been divided into 26 and secondary sewers into 218 basins.

All problem sewers are inspected as soon as possible, usually within 48 hours after the initial occurrence of an overflow, by closed circuit television (CCTV) to identify any necessary repairs or special maintenance needs.

Flow monitoring and CCTV inspection records are reviewed to identify deficiencies. Sewers that exhibit high flow levels or operational failure are identified. These may trigger further reviews to determine cause and/or immediate or accelerated corrective actions. Priorities and schedules are set based on the severity of the problem.

In addition to the preventive maintenance, the City implements a proactive maintenance program where "non-problem" sewers are also scheduled for maintenance and cleaning, but on a less frequent basis. The City's proactive maintenance program provides cleaning and maintenance of the "non-problem" secondary sewers at least once every five years. Also, the City developed and implemented a system-wide biennial maintenance hole inspection program. Proactive maintenance of secondary sewers is performed on a basin by basin basis.

The City implements a quality control/quality assurance test designed to examine the effectiveness of cleaning. After cleaning a sewer, a sampling of pipes are inspected by

closed circuit television (CCTV) to ensure that cleaning has restored the flow area of the sewer to at least 95 percent of the pipe diameter. Any sewer that fails the test is re-cleaned and the crew is retrained on the proper procedures.

- **Fats, Oils, and Grease (FOG) Cleaning**

Overflows caused by blockages from FOG are monitored for location and needed cleaning frequency. The City has increased the rotation of cleaning in sewers with repeated FOG-related blockages or overflows.

- **Root Control Strategy**

In addition to the City's routine maintenance activities including mechanical root removal, the City started a program in 2002 to control the growth of roots in sewers by the use of environmentally safe chemicals. The effectiveness of chemical root control treatment is carefully monitored and the frequency of treatment and application rates adjusted as required to eliminate blockages caused by roots.

In 2006, the City started a community outreach and education program to control roots in private sewer laterals located in root hot spots. A root control pamphlet http://www.lasewers.org/sewers_shared/pdf/tree_roots_brochure.pdf is mailed to properties in root hot spots where there is significant tree roots intrusion into the mainline sewers, requiring frequent root removal and chemical treatment to avoid sewer blockages. The City also dedicated a helpline (323) 342-1566, an email address sewr.root@lasewers.org, and a web site <http://www.lasewers.org/sewers/roots/index.htm> to this program.

- **Odor Control Strategy**

In 1997, the City started a proactive chemical odor control program. It entails injecting chemicals (Sodium Hydroxide) at key locations reducing the hydrogen sulfide levels (source of the foul odors) in sewers. The City's program has been effective in reducing the hydrogen sulfide levels in those key areas by over 95%. In addition, the City is continuing to work towards improving the effectiveness of the overall odor control efforts.

As a part of its sewer system capital improvement, the City implemented a state-of-the-art corrosion control program where the internal walls of corrosion susceptible sewers are routinely sprayed with magnesium hydroxide to slow down the corrosion and extend the life of sewers until they can be replaced or rehabilitated. The implementation of these programs have marginalized and eliminated much of the odor complaints.

Twelve (12) interim carbon odor scrubbers are being operated along major interceptor sewers in odor hot spots. Meanwhile, state-of-the-art permanent air treatment facilities (ATFs) are being studied, designed, and constructed that will be operated in lieu of some or all of these scrubbers.

Pump Stations Maintenance

All of the City's 46 sewage pump stations have built-in backup emergency and redundancy systems. The Venice Pumping Station serves as the main center for monitoring and control of all pump stations. The City has upgraded its pump stations and equipped them with state-of-the-art controls, emergency backups, and redundancy systems. This has eliminated overflows caused by power outages and mechanical failure.

As a part of routine preventive maintenance program, the Bureau of Sanitation's Wastewater Collection Systems Division's staff conducts scheduled preventive maintenance of pumps and related accessories. On the average, each station is visited for inspection/maintenance about 80 times in each year by the various crafts. A crew spends about 30 minutes to 2 hours in a station for every scheduled preventive maintenance visit.

Construction-Related Overflow Prevention

In a determined effort to reach the City's goal to have no preventable dry weather overflows and wet weather overflows during all but most severe storm events, the Bureaus of Engineering, Contract Administration and Sanitation issued a "Joint Statement of Policy Pertaining to the Prevention of and Response to Construction Contract-Related Sewage Spills," which clearly documents the City's spill avoidance policy. The policy clearly states the responsibilities of each Bureau in prevention, spill response, reporting, public information dissemination and follow up. The policy requires, among other provisions, coordination among the Bureaus in pre-design reviews to determine appropriate means for preventing sewage overflows and to determine appropriate sewage flow control requirements during construction to be included in the design, bid and contract documents. The Policy further requires that flow control requirements be explained to potential bidders at the pre-bid meeting. The contractor is required to provide an Emergency Response Plan for controlling sewage flow during the construction. The Bureau of Sanitation reviews and approves the Contractor's Emergency Response Plan prior to start of construction. The policy requires a sign-off for private development projects by the Bureau of Sanitation.

A map of all sewer construction projects is continuously updated by the Bureau of Engineering. Contact information for each ongoing construction project, including the names and telephone or pager numbers of the inspector, the inspector's supervisor and contractor's contact person, is prepared by the Bureau of Contract Administration and forwarded to the Bureau of Sanitation's Wastewater Collection Systems Division for staff information and use.

The Bureau of Contract Administration's inspector is responsible for communicating the City's "no-spills" policy and project plans and specifications to the contractor, enforcing the plans and specifications and ensuring the contractor responds appropriately in case of emergencies. The inspector is required to explain the City's "no-spills" policy to the contractor, remind them of their responsibility to prevent overflows and respond with quick mitigating action if an overflow does occur. Bureau of Contract Administration form M-159, Sewage Spill Prevention Preconstruction Meeting Check List, covering the bypass plan and implementation and Emergency Response Plan is discussed during the pre-construction meeting with the construction contractor. The construction contractor is required to sign the checklist agreeing to comply with these plans. A City inspector is on site during sewage bypasses.

(c) Develop a rehabilitation and replacement plan to identify and prioritize system deficiencies and implement short-term and long-term rehabilitation actions to address each deficiency. The program should include regular visual and TV inspections of manholes and sewer pipes, and a system for ranking the condition of sewer pipes and scheduling rehabilitation. Rehabilitation and replacement should focus on sewer pipes that are at risk of collapse or prone to more frequent blockages due to pipe defects. Finally, the rehabilitation and replacement plan should include a capital

improvement plan that addresses proper management and protection of the infrastructure assets. The plan shall include a time schedule for implementing the short- and long-term plans plus a schedule for developing the funds needed for the capital improvement plan;

The City has a Rehabilitation and Replacement Plan. As a part of this Plan, structural deficiencies are identified and needed improvements are developed and implemented systematically. The Rehabilitation and Replacement Plan implementation entails a variety of short- and long-term activities that ensure the sustainability of the sanitary sewer system infrastructure.

Short Term:

The City staff and private contractors perform CCTV inspection in support of operational activities. All sewers are being or will be inspected by CCTV. Each maintenance hole to maintenance hole segment is assigned a condition rating from A to E. Condition E pipes are immediately rehabilitated on an emergency basis and condition D pipes, which are not considered to be in imminent danger of failure, are placed in a capital improvement program as a CIP project in a priority order based on sewer condition. Condition D pipes are scheduled for replacement or rehabilitation, as appropriate, within five years. These sewers are scheduled for re-televising annually until the CIP project is complete. In addition to CCTV inspection, the City physically inspects each maintenance hole every two years. This information is also used to identify short-term rehabilitation needs.

Follow-up CCTV inspections are conducted at overflow locations usually within 48 hours of overflow occurrence to identify the extent of necessary repairs or any special maintenance needs.

The life of the sewers is being extended by spraying magnesium hydroxide on the crowns of brick/concrete pipes, reinforced concrete pipes without liner, and concrete pipes with clay tile liners susceptible to corrosion and deterioration. About 40 miles of susceptible sewers are annually sprayed through the crown-spraying program. Other chemicals or methods may be used at the City's discretion.

Long Term:

In its sewer overflow prevention program, the City conducts comprehensive and systematic inspections and assessments of all components of its sewer system. Inspections are used to identify problems requiring repair and prioritize needed improvement projects for inclusion in the City's capital improvement program. The City sewers are classified into two groups: primary sewers (greater than 15 inches in diameter) and secondary sewers (15 inches or smaller in diameter). Primary sewers have been divided into 26 and secondary sewers into 218 basins.

The City uses state-of-the-art closed circuit television (CCTV) equipment to inspect and assess the condition of secondary sewers. Secondary sewer basins are cleaned and inspected in priority order. CCTV inspections are prioritized using a ranking system that incorporates age, size, construction material, spill history, and known problem sewers. Some primary sewers are also inspected, depending on size and flow levels. Inspection and maintenance of remaining primary sewers at the City's discretion may be contracted to private contractors.

To assess the condition of CCTV inspected sewers, the City uses a five category rating system based on the types and severity of defects. The Categories range from Category A (Excellent) to Category E (Emergency Condition). The condition ratings trigger a follow-up action that includes either rehabilitation within a certain time frame or a follow-up inspection. Rehabilitation projects are developed and scheduled for implementation on a prioritized basis with other identified needs. Category A and B Sewers are in excellent to good condition and are scheduled for continued inspections and monitoring. Category C condition sewers are considered to be in fair condition and are scheduled for follow-up inspections every five years until repairs have been completed. Category D condition sewers are in a condition that requires close monitoring and may require rehabilitation within five years and are included in CIP program for planning, design and construction. Preventive measures are intensified, as appropriate, to avoid emergency situations and follow-up inspections are conducted annually. Category E condition sewers are considered in an emergency condition. These are sewers where a pipe failure has already occurred or there is a full flow obstruction/blockage and immediate repairs are initiated.

In addition to the CCTV Program, the City recently implemented a program to visually inspect and document the condition of each of the approximately 140,000 maintenance holes in the City's 6500-mile system on a two- year cycle. CCTV inspections together with routine flow gauging and physical inspections provide up-to-date data that is used by the City to evaluate the hydraulic and structural condition of its sanitary sewer system. From this assessment, deficiencies are identified, evaluated, improvement projects identified and scheduled.

The City has identified short and long-term plans through the development of a Rehabilitation and Replacement Report and Plan (Rehab Plan). This report was completed in June 2006, and plays an integral part in documenting the City's legal/regulatory compliance and the overall activities aimed at reducing overflows and protecting public health and the environment. The Rehab Plan provides a summary of current project mileage and forecasted mileage for future projects. The following are key Rehabilitation and Replacement efforts as identified in the Rehab Plan:

- By the end of FY 2014 the City will have planned rehabilitation and replacement projects in the top 100 priority basins out of the 218 secondary basins.
- Over a 7-year period (FY 2008 through FY 2014), the City will repair, rehabilitate, or replace a minimum average of 60 miles of gravity sewers per year, for a minimum total of 420 miles.

Individual Rehabilitation and Replacement Projects are identified and described in the Capital Improvement Program (CIP). A CIP budget and plan is prepared annually and covers a 5 to 10-year period. This annual report contains a planned expenditure summary for identified projects, followed by a detailed project description along with a 10-year project expenditure plan.

(d) Provide training on a regular basis for staff in sanitary sewer system operations and maintenance, and require contractors to be appropriately trained;

Training comes under various City programs. It includes formal classroom training, informal on-the-job and hands-on training. Training is facilitated by both City staff and by outside training workshops. Most of the internal functional and safety training is provided through the Bureau Sanitation's and Human Resources Development Division (HRDD). Training courses are added and existing courses are modified to stay current with the rapidly changing technology and requirements, including computer-aided and online training. On-the-Job cross training is actively pursued to ensure staff has a proficient working knowledge of each and every specific part of a task. City Staff is cross-trained so that critical tasks can be done without interruption even when the crew members change. Task proficiency is a requirement for all job positions and promotions, and training records (Training Information Management System (TIMS)) are maintained to monitor completed classes and schedule employee training.

Crews are initially trained in the proper operation and maintenance of all new major mobile equipment and facilities by the contractor/manufacturer. Written operation and maintenance manuals are used as resource material for initial start-up training as well as new staff training. HRDD is responsible for providing operational training on sewer cleaning equipment.

Safety training is an integral part of the City's program. Every staff member receives formal training. Staff is trained in confined space entry. Employees are trained in hazardous materials management, as required by regulations.

HRDD prepares employees to respond to major emergencies and disasters and has established an operation center and emergency response teams. Emergency training exercises are conducted and documented annually.

The Fats, Oils, and Grease (FOG) Control Ordinance became effective on August 5, 2001. As part of the FOG Control Program, the City authorized and provided funding for Industrial Waste, Senior Industrial Waste and Chief Industrial Waste Inspectors. Training for these new staff additions was initiated with the implementation of the FOG Control Program on October 15, 2001. The training program consists of a comprehensive series of courses and lessons that are designed to provide inspectors with specific skills and knowledge necessary for their everyday operations.

In addition to the specific courses, inspector training is enhanced with presentations conducted by the FOG Control Program engineering staff who continuously research and develop new training materials associated with the SSMP and the FOG Control Program. To maintain expertise, FOG Control Program staff routinely attends seminars, as well as present information at specialty conferences. The City also invests in presentations by vendors.

In order to ensure a complete and thorough inspection of a food service establishment (FSE), Standard Operating Procedures (SOPs) have been developed to guide inspectors through inspection process in a systematic fashion. A summary of the process is contained in the appendixes to FOG SOP 001 reference below.

The City identifies training needs for staff development in its annual budget and provides adequate funding for tuition reimbursement. The City also maintains a library of self-improvement training courses and encourages and rewards self-training.

(e) Provide equipment and replacement part inventories, including identification of critical replacement parts.

City crews maintain the pump stations but do not perform repair or replacement of underground pipelines. Repair and replacement of underground pipelines are contracted out to licensed contractors who have the equipment, materials and staff to complete the work. The City maintains an electronic inventory of equipment, replacement parts, and supplies and follows a structured process to ensure an up-to-date accounting and complete inventory of equipment and replacement parts for their specific duties. Parts that are needed for preventive maintenance are identified ahead of time for each specific maintenance task. Parts are secured prior to the start of preventive maintenance. Redundancy is provided for key pump station equipment and all pump stations have backup power to minimize the risk of a complete shut-down. As a backup, managers have credit authority to purchase needed materials and supplies from local vendors of non-stock items when they are critically needed. There has been little need to purchase parts through this means, which attests to the City's readiness.

The City maintains equipment such as sump pumps, portable generators, traffic control and night lighting systems, in a ready state for immediate deployment in an emergency.

The City has a procedure for pre-qualifying manufactures and equipment vendors and, in some cases, purchasing sole-source equipment to standardize equipment and parts. This additional procurement option reduces inventories, simplifies procurement procedures, and reduces training and operation & maintenance costs.

References

Sewer "S" Maps and "Wye" Maps

Navigate LA User's Manual

Bureau of sanitation, Wastewater Collection Systems Division's Operation & Maintenance Manuals

Bureau of sanitation, Wastewater Collection Systems Division's Pump Station Maintenance Schedules and Service Guide

Wastewater Collection Systems Division Enterprise Maintenance Planning and Control (EMPAC)

Bureaus of Engineering, Contract Administration, Sanitation; "Joint Statement of Policy Pertaining to the Prevention of and Response to Construction Contract-Related Sewage Spills; March 1997

Bureau of Contract Administration, Bureau Manual, Division C

City of Los Angeles, CCTV Inspection Manual

Condition Assessment Report (Structural)

Wastewater Collection Systems Division Crown Spraying Procedures

City of Los Angeles, Wastewater Collection System Rehabilitation and Replacement Report and Plan, June 2006

HRDD Training Materials

Self-study courses including online training

Bureau of Sanitation, Industrial Waste Management Division, Fats, Oils, and Grease Standard Operating Procedures 001

Training, Information, and Management System (TIMS)

Bureau of Sanitation Materials Management System Warehouse Manual

Enterprise Maintenance Planning and Control (EMPC)