



(ix) Monitoring, Measurement, and Program Modifications: The Enrollee shall:

(a) Maintain relevant information that can be used to establish and prioritize appropriate SSMP activities;

The City has multiple ongoing programs that support the collection and management of data and information essential to successful implementation of its Sewer System Management Plan (SSMP). Major SSMP activities are established and prioritized as follows:

- **Information Management Systems**

The City's information management systems are an integral and essential element of the operation and maintenance program. All attributes of each sewer segment are included in a comprehensive inventory database. Information regarding all maintenance activities, sewer condition, overflows, and odor complaints is entered into electronic information management systems. This information is routinely evaluated to document maintenance needs, identify problem locations, and assist in analysis of overflow events and odor complaints. This data coupled with flow information is overlaid on a GIS base map of the sewer system to quickly identify and visualize problem areas, communicate actual condition and maintenance needs to operation and maintenance staff, prioritize cleaning and root removal activities, and provide for corrective measures. Through its information system, the City is able to monitor hydraulic and structural condition of its collection system and consequently focus on the areas of greatest need. The GIS maps are a primary tool used to prioritize and schedule sewer assessments and maintenance activities in their preventive maintenance program. In summary, the City performs extensive and continuing data collection and analysis leading to an effective and efficient use of City resources and optimization of its wastewater collection and conveyance system.

- **Sewer Condition Assessment**

To assess the condition of CCTV inspected sewers, the City uses a five-category rating system based on the types and severity of defects. They range from A (excellent) to E (emergency) condition. The condition ratings trigger follow-up actions that could include increased monitoring and maintenance to keep a problem sewer fully operational while a capital improvement project is being developed and implemented to provide long-term solution. Rehabilitation or replacement 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 on 10-year cycles. Category C condition sewers are considered to be in fair condition and are scheduled for follow-up inspections once every five

years. Category D condition sewers are closely monitored and are included in the Wastewater Capital Improvement Program (WCIP) for replacement or rehabilitation within five years. Increased preventive measures are taken for Category D condition sewers, as appropriate, to avoid emergency situations and follow-up inspections are conducted annually. Category E condition sewers are considered emergency. These are sewers where a pipe failure has already occurred or there is a full flow obstruction. Condition E sewers are immediately repaired and restored to condition A or B sewers.

- **Operation and Maintenance Program**

The City has an extensive proactive and preventive maintenance program for its collection system. Maintenance is performed by staff assigned to one of thirteen maintenance sections. 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. The critical sewers are identified, prioritized and scheduled for maintenance based on a comprehensive review of maintenance history and system characteristics of all sewers in the City including overflows, blockages, excessive maintenance, age, pipe material, and condition assessment records.

In an effort to prevent overflows, flow monitoring and CCTV records are reviewed to identify potential weaknesses in the system. Sewer locations that exhibit high flow levels and sewers that are in poor condition are identified through this process. These assessment activities may trigger further reviews to determine cause and/or may trigger immediate or accelerated corrective actions. Maintenance priorities are set based on the relative severity of the problem.

In addition to the focused preventive maintenance efforts, the City has implemented a proactive maintenance program where “non-problem” sewers are also scheduled for maintenance and cleaning on a less frequent basis. This proactive maintenance program was implemented in July 2000 and provides for cleaning and maintenance of the entire system at least once every five years. Included in this program is a system-wide biennial maintenance hole inspection program. On an annual basis, the City performs approximately 105,000 preventive maintenance cleanings, which is equivalent to approximately 4,500 miles of sewers.

- **Overflow Emergency Response**

Managers and staff meet monthly to review emergency response actions and collaborate on methods and procedures that will improve performance. Aggressive performance standards for timely response to sewer overflows are established and communicated to overflow response teams. Response protocol is reviewed periodically and updated as needed based on a review of established and actual response times.

- **Odor and Corrosion Abatement**

The City has a four-pronged approach to odor control: regular maintenance, system-wide treatment, site-specific corrective action, and capital improvement including new and state-of-the-art odor control facilities. As described above most system –related odor problems are resolved by regular cleaning. However,

some complex odor problems, such as airflow restrictions in a line due to high flow, cannot be resolved by maintenance. In these instances the City will implement site-specific actions, including flow diversions, chemical addition and the use of relief sewers. The City has also implemented an aggressive, system-wide odor control program at a cost approaching \$3 million per year. Under this program, chemicals are injected into the system at key locations to reduce the levels of hydrogen sulfide, the predominant source of odors. This program has been extremely successful in reducing hydrogen sulfide levels by over ninety percent since 1997. The City is also including permanent odor treatment facilities in its new major sewer construction projects at a cost approaching \$45 million. These new odor facilities will capture hydrogen sulfide through the use of fans and treat these sewer gases using highly advanced treatment technologies.

The City has a very aggressive corrosion abatement program for sewers that are susceptible to deterioration and are unprotected from corrosion. The spraying magnesium hydroxide on the crowns of sewers is extending the life of these sewers. Approximately 40 miles of sewers are sprayed annually at a cost of \$500,000.

- **System Evaluation and Capacity Assurance Plan**

The City regularly monitors and evaluates hydraulic performance of the entire sewer system. There are 35 automatic “real time” flow monitors and 75 additional “near time” monitors located in the 650-mile primary sewer system. The monitors use radio transmission to send data to a central location. In addition, flow gauging is performed at over 600 strategic locations throughout the City’s secondary sewer system on either a quarterly, semi-annual, or annual cycle. Special gauging, which is short-term monitoring (one day to a week long) which monitors maintenance hole flow depth only is performed at any maintenance hole upon request by planners, engineers, or operators. Gauging data is compared to historical data and any unusual change in flow depth is investigated to validate the change and determine the cause. Blockages are removed immediately. Sewer capacity planning is prioritized based on the current and projected hydraulic conditions as described below:

Two d/D (ratio of sewer flow depth to sewer diameter) levels are considered in capacity planning for existing sewers, Trigger d/D and Relief d/D.

The Relief level is the highest Peak Dry Weather Flow (PDWF) d/D in a sewer that will accommodate the projected peak wet-weather flow to be handled by a sewer pipe. This means that hydraulic relief of the sewer must be in place and operational by the time the PDWF in the pipe reaches the Relief level. The Relief d/D is currently 0.75 for all City sewers per the Sewer Design Manual.

The Trigger level is (by definition) the PDWF d/D that triggers initiation of sewer relief projects. The Trigger d/D is smaller than the Relief d/D to allow for an increase in flow level during the time it takes to plan for, design, and build the relief projects. The difference between the Trigger and Relief levels is referred to as the buffer.

While the Relief d/D is currently 0.75 across the City for all existing sewers, the Trigger d/D varies on a project by project basis because each project's tributary area has its own unique characteristics such as population growth projection, commercial and industrial discharge forecast, and other contributing factors that determine how quickly flows are projected to increase over time.

In addition, the Sewer Design Manual requires d/D of 0.5 for the design of all new sewers. Existing sewers are replaced or relieved by the time d/D reaches 0.75. Replacement and relief sewers are designed for a PDWF d/D of 0.5 for the projected design year. Figure 9-1 which is a graphical depiction of the foregoing is an excerpt from the City's Sewer Design Manual.

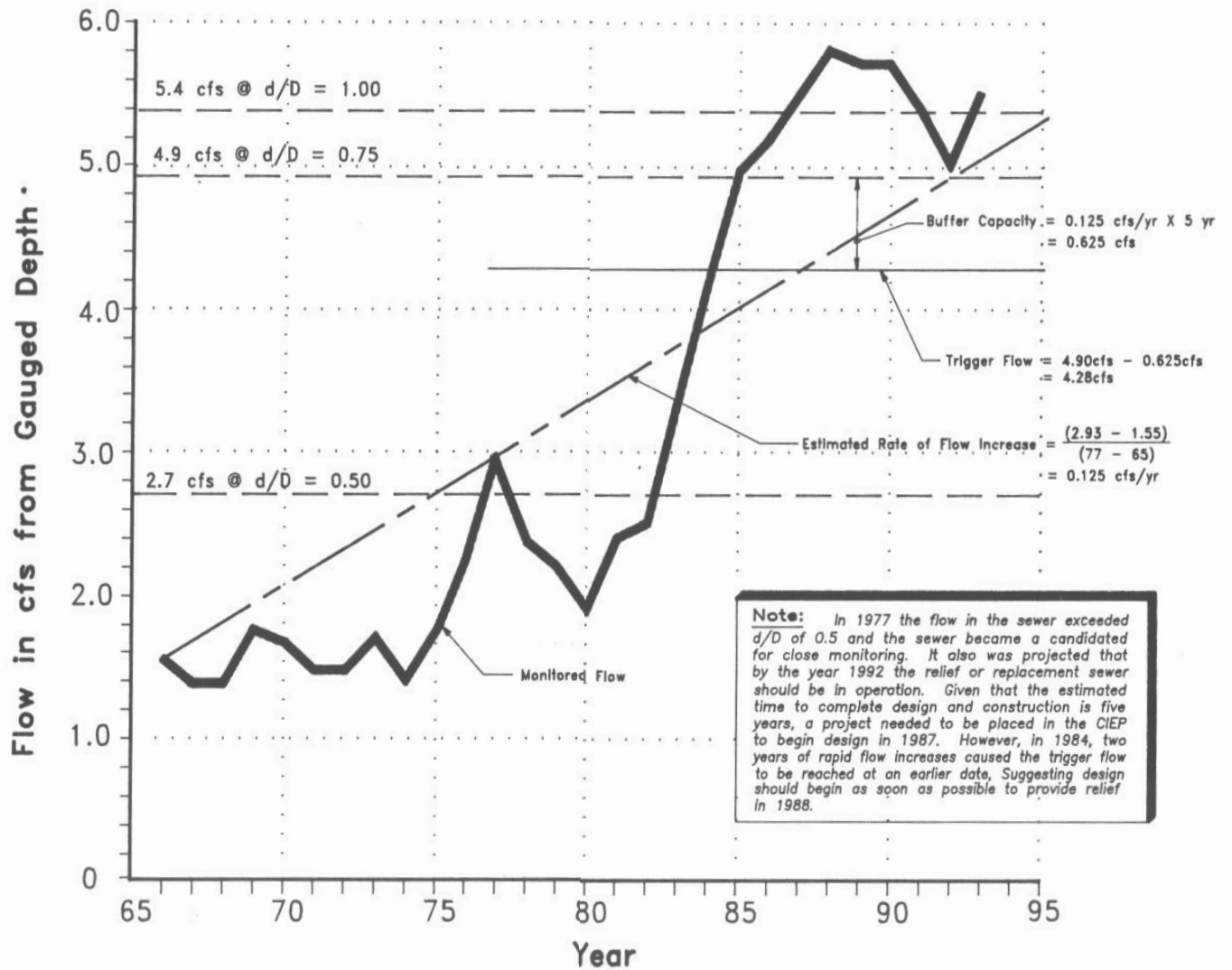


Figure F257
Trigger Flow and Buffer Capacity in Sewers

* Note: Monitored Flow is in 15-inch-diameter pipe, $s = 0.008$, $n = 0.013$, in Lankershim Blvd. S/W of Hamlin St. at MH# 427-01-128 (NH-7).

Figure 9-1

(b) Monitor the implementation and, where appropriate, measure the effectiveness of each element of the SSMP;

The City's SSMP is a well-integrated plan with each element designed to complement and support the other elements. Each year as a part of the City's Bureau of Sanitation's Five-Year Strategic Planning, the SSMP goals are set, the deliverables required to meet goals are defined and prioritized, lead and support offices and resources are assigned, and progress is measured and reported to ensure meeting or exceeding goals and achieving full compliance with the SSMP requirements. Overall SSMP performance is evaluated and reported to management quarterly, and annually following the end of each fiscal year. Any plan updates necessary to enhance the SSMP performance are identified and become a part of the following year's Five-Year Strategic Planning as a part of this process.

(c) Assess the success of the preventative maintenance program;

The City assesses the success of its programs by analyzing the condition assessment results and keeping track of the quantities and trends of various types of sewer blockages and overflows as well as odor problems and complaints. Successful practices are continued and program adjustments are made when appropriate.

Examples of these assessments include: weekly condition assessment review meetings, monthly Sanitary Sewer Overflow (SSO) reviews, monthly performance meetings with chemical root control contractors, annual capacity assurance review, and a comprehensive annual review of the preventive maintenance program.

The City's preventive measures also include community outreach and education programs on the workings of the sewer system and steps the public can take to help reduce blockages and overflows.

(d) Update program elements, as appropriate, based on monitoring or performance evaluations;

This Sub-part lists some examples of ongoing monitoring and review processes that are part of the City's system performance evaluation and continual improvement.

- **Annual review of preventive maintenance**

On an annual basis a comprehensive review of the maintenance program is conducted. The critical sewers are identified, prioritized and scheduled for maintenance based on a comprehensive review of maintenance history and system characteristics of all sewers in the City including overflows, blockages, excessive maintenance, age, pipe material and condition assessment records.

In an effort to prevent overflows, flow monitoring and CCTV records are reviewed to identify potential weaknesses in the system. Sewer locations that exhibit high flow levels and sewers that are in poor condition are identified through this process. These assessment activities may trigger further reviews to determine cause and/or may trigger immediate or accelerated corrective actions. Maintenance priorities are set based on the relative severity of the problem.

- **Fats, Oils, and Grease (FOG) Control Program**

The City is implementing a robust program that includes ongoing user education and involvement. As a result, amendments and improvements are made to the program with active support of the food service establishments. The program goal is to eliminate all preventable sewer overflows caused by grease. FOG-related overflows decreased by about 85% from 290 in Fiscal Year 2000/01 when the program was initiated to 43 in 2006/07.

- **Root Control Program**

The City has an aggressive root control program that entails chemically treating problem sewer reaches using environmentally friendly chemicals. The program includes root growth monitoring by CCTV inspection, mechanical root removal, and chemical treatment with herbicide to prevent root re-growth. Currently, the City's root control program includes root removal from more than 1,000 miles and chemical treatment in more than 350 miles of sewers per year. Similar to the grease control program, the goal is to eliminate all preventable sewer overflows caused by roots.

Recognizing that private sewer laterals are a major source of tree roots intrusion into the sewer system, beginning in 2006 the City expanded the root control program by the addition of a community outreach and education program whereby property owners in root hot spots are informed of the need for inspection of their private laterals. Property owners are also provided helpful information on routine maintenance and permit requirements and contracting tips on corrective actions required to protect the laterals from further damage, save costs, and prevent sewage overflows on private properties and in City streets. Additional information on this community service program may be obtained at:

Web site: <http://www.lasewers.org/sewers/roots/>
Email: sewr.root@lacity.org

Phone: (323) 342-1566

- **Stormwater Inflow and Infiltration Prevention (SIIP) Program**

In the late 1990's and early 2000's, the City identified sources of unauthorized discharges of stormwater into the sanitary sewer system using smoke testing. These included roof drains, yard area drains, parking lot drains, downspouts, and other sources draining directly to the sewer system. The Bureau of Sanitation and Department of Building and Safety jointly sent notices to property owners that included evidence of such unauthorized connections and informed of the need for corrective actions as required by City ordinances. Follow-up inspections and surveys conducted in the mid 2000's revealed the success of the SIIP Program. It is estimated that an annual average of more than 8 million gallons per day (mgd) of extraneous water has been excluded from the system.

- **Flow Monitoring Expansion Program**

Flow monitoring is an important activity that supports planning and operation & maintenance. To effectively manage the system, it is essential to gather flow data to support resource allocation for operation & maintenance as well as for planning and design to build future relief or replacement sewers. To meet this need, the City expanded its flow monitoring program by installing 110 permanent monitors that continually measure flow quantities at strategic locations in the City's major sewers and interceptors. When the unrestricted flow in a pipe reaches a predetermined "trigger flow" depth, a planning study will be initiated to clearly define and validate the problem; evaluate future needs; and develop, evaluate, and recommend alternatives for implementing sewer relief or replacement projects.

Trending reports are used to project future flows and prioritize planning studies, design and construction projects. Sewers where peak dry weather flow levels reach 75 percent of the pipe diameter receive the highest priority. The trigger flow concept described in Paragraph (a) above, Sup-paragraph **System Evaluation and Capacity Assurance Plan** ensures that projects planning are initiated sufficiently in advance so that capital improvements are implemented to provide additional capacity by the time needed.

- **Model of Urban Sewer Evaluation (MOUSE)**

The City has been an industry leader in using leading edge technology to model and assess the hydraulic performance of its complex network of pipes, diversion structures, flow splits, and pumping plants and predict future flows. The City has been utilizing models as planning and operation & maintenance tools since early 1980's and is currently expanding its sewer modeling capability. In addition, the City recently implemented a new technology that will greatly improve the accuracy of wet weather flow prediction using radar generated instantaneous rainfall data. Historic data from the National Weather Service will be used to refine the accuracy of rainfall simulations used for assessing various historic storm impacts on the City's sanitary sewer system.

- **Sewer Design Manual**

The City's Bureau of Engineering maintains a highly advanced and practical sewer design manual through periodic reviews and updates. The manual serves as a guide for all phases of sewer work and provides design criteria, specifications, and standard details. The City Engineer issues Special Orders whenever new criteria or standards are developed to meet a particular need or to provide for cutting-edge methods that have not yet been included in the manual. The requirements set forth in these Special Orders become a part of the Sewer Design Manual as the Manual is updated periodically.

- **Construction**

To avoid construction related sewer overflows to comply with the City's "zero [construction] spill" policy, the Bureau of Contract Administration requires that a spill prevention and response plan be developed and implemented for all sewer construction projects. The City's zero spill policy is documented in the Brown Book which is an adaptation of the "Standard Specifications for Public Works Construction (Green Book)" including the City's amendments and additions that address specific City needs and wants and policy requirements. On June 15, 2007, the Board of Public Works adopted the 2006 Edition of the Green Book. On November 28, 2007, the corresponding City of Los Angeles, Department of Public Works, Additions and Amendments to the 2006 Edition of the Standard Specifications for Public Works Construction (Brown Book) was issued.

- **Project (ad hoc) Teams**

Ad hoc teams are formed to address specific issues as they are identified. For example, a Strategic Planning Team (SPT) was formed with the specific mission to develop a plan to meet new NPDES stormwater permit conditions without increasing staff. This was done by increasing organizational efficiency and effectiveness through critical assessment of each ongoing task. The SPT is a joint labor/management team that identifies related functions, tasks and sub-tasks, personnel requirements, actual labor expenditures, and workload requirements. Core business activities are identified and a task analysis of each activity is used to determine appropriate staffing levels and equipment needs. The effectiveness of the joint labor/ management review process is evident by the reductions in staffing levels while achieving increases in the level of core services.

(e) Identify and illustrate SSO trends, including: frequency, location, and volume.

SSO trends are identified and tracked through a state-of-the art GIS tracking system. When complaints are called in, they are uploaded to a master database and plotted on a City-wide map. The City's information management system is an integral part of the operation and maintenance program. All attributes of each sewer pipe gravity and pressure segment are included in a comprehensive inventory database. Information regarding each new overflow and odor complaint is entered into a maintenance management database. This information is evaluated to document locations, causes, and frequency of overflows and odors. This data is overlain on a GIS base map of the sewer system to quickly identify and visualize problem areas; communicate conditions and needs to City policy makers and management; and prioritize maintenance activities, urgent and emergency repairs, and mid- and long-term solutions.

References

City of Los Angeles CCTV Inspection Manual

City of Los Angeles FOG Control Ordinance

City of Los Angeles, Bureau of Sanitation, Industrial Waste Management Division FOG Program Enforcement Response Plan

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

Standard Specifications for Public Works Construction (Green Book), the 2006 Edition

City of Los Angeles, Department of Public Works, Additions and Amendments to the 2006 Edition of the Standard Specifications for Public Works Construction (Brown Book)

City of Los Angeles, Bureau of Engineering Sewer Design Manual

City of Los Angeles Master Specifications

Flow Meter and Data Acquisition Operation and Maintenance Manuals

Integrated Plan for the Wastewater Program

Primary and Secondary Basin Plans

City of Los Angeles 10-year WCIP

Navigate LA User's Manual