City of San Gabriel

CITY OF SAN GABRIEL

SEWER MASTER PLAN

JUNE, 2009

VOLUME I

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Volume I

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Note: The readers can view large scale exhibits included in the back pocket of this report.

EXECUTIVE SUMMARY

In June 2009 Winzler & Kelly was retained to prepare a comprehensive Sewer Master Plan for the City of San Gabriel. This report represents the results of that effort and supersedes prior Master Plan updates and studies. Where appropriate the data and information from the prior studies was used in the preparation of this study and report. These include the 2002 Sanitary Sewer Master Plan Update the March1999 Sanitary Sewer Study and the2003 Sanitary Sewer Assessment which was performed to collect available information about the sewer system, identify what is missing and provide recommendations on the steps necessary to complete the current Master Plan Update. This update provides the City with a comprehensive long term plan for implementation of the necessary repairs and improvements to bring the existing sewer system to a condition where it can provide the standard level of sewer service recommended by the Los Angeles County Sanitation District.
The primary objectives of this Sanitary Sewer Master Plan are:

- Analyze the capacity of the major segments of the existing sewer system
- Determine the physical condition of the existing pipes and manholes
- Address the inflow, infiltration, fats, oils and grease (FOG) control and State Waste Discharge requirements
- Develop a recommended Capital Improvement Program
- Address options to finance the improvement, maintenance and management costs

Currently, the City of San Gabriel Sewer System serves a population of approximately 43,000. The City encompasses approximately 4.13 square miles. The City's sewer system includes approximately 72 miles of sewer lines ranging in size from 8 to 21 inches in diameter and about 1,350 manholes.

PROJECT APPROACH

Winzler & Kelly commenced work by gathering manhole and pipeline data from the City's sewer atlas maps and records. To perform the capacity analysis of the existing pipe system the peak wastewater flows in the system were determined. Peak wastewater flow coefficients unique to the City of San Gabriel for various land uses as shown on City's General Plan were developed from flow monitoring stations and standards of the Los Angeles County Sanitation District (LACSD) as well as neighboring cities of Alhambra, Monterey Park, and Rosemead. These flows were compared to the hydraulic capacities of the sewer pipes to determine pipe deficiencies. The determination of the hydraulic deficiencies in the sewer system was based on applying the 0.5 to 0.75 d/D where d/D is sewer flow depth to pipe diameter ratio (depth of flow 50% to 75%) design standards.

Closed Circuit TV Inspection (CCTV) was used over a portion of the system to review and to evaluate the structural condition of the pipe system condition of the pipe.. Trouble spots such as cracked or broken pipes, offset joints, sagging pipes, oil, fats and grease (FOG), and blockages were identified and pipe deficiency ratings determined. Approximately 10 miles (51,300 feet) of sewer lines out of 72 miles of the City's collection system were inspected via CCTV

SEWER SYSTEM FINDINGS

Approximately 58 percent of the system is currently over capacity, flowing at more than 50% to more than 100% percent full (under pressure) during peak flow conditions. These pipelines will need to be upgraded to provide sufficient capacity in the system for the implementation of the 2004 General Plan. The condition survey of the sewer system found that 20% of the system will need repairs of low priority and about 50% of the system will require repairs of medium priority. A small portion of the system (about 0.6%) requires repairs of high priority.

CAPITAL IMPROVEMENT PROGRAM RECOMMENDATIONS

Based on the results of the sewer system capacity analysis and condition survey, several replacement and repair projects are proposed to mitigate the identified capacity and condition deficiencies. The cost of projects recommended over the next 20 years are presented in Table ES-1

Table ES-1
COST SUMMARY

Description	Cost $
Capacity Deficiency Projects	16,310,400
Structural Condition Repair Projects	14,092,700
Implementation of WDR	100,000
SUBTOTAL	30,503,100
Annual System Maintenance & Operation	350,000/year

STATE WASTE DISCHRAGE REQUIREMENTS

In order to address the requirements of the Federal Clean Water Act regarding the reduction of sanitary sewer overflows (SSO's) impact on natural streams, rainwater channels and ground water, the State Water Resources Control Board (SWRCB) adopted Order No. 2006-003 on May 2, 2006. The order addressed Statewide General Waste Discharge Requirements (WDR) for sewage collection systems and requires each sewer agency to monitor and report all SSO's to the State as well as prepare and adopt a Sewer System Management Plan (SSMP).

The SSMP is included in Volume IV

MASTER PLAN IMPLEMENTATION

The recommendations presented in this Master Plan are based on planning level calculations and estimates. Therefore, the need for and size of individual projects should be determined prior to design and additional field investigations. As the implementation of the Master Plan proceeds, it is anticipated that changes in the recommended projects may occur. The Master Plan is intended to be a working document to be refined and updated as additional planning information becomes available. Specifically the Capital Improvement Program (CIP) projects and schedule should be reviewed and revised as necessary at a minimum of every five (5) years, or whenever there are major changes in the assumptions (e.g. significant changes in land use projections).

CHAPTER 1.0 – INTRODUCTION

Historical Background

The City of San Gabriel was incorporated as a general law city on April 29, 1913 with a population of 1500. The rich history of the City dates back to 1771 with the founding of the Mission of San Gabriel.

The City is primarily a residential community with some commercial and industrial elements. Strong municipal services and specialized programs such as one-stop development permitting and redevelopment assistance distinguishes San Gabriel as one of the region's leading communities. To serve its citizens, the City operates and maintains a sewage collection system comprised of 72 miles of gravity sewer pipelines currently serving a population of approximately 43,000.

The LA County Sanitary District (LACSD) provides for the City's sewage treatment. The City's collection system connects to the LACSD interceptor system at several locations. Exhibit 2-1 in Chapter 2.0 shows the ten (10) LACSD connection (marked as "County Out Fall") locations within the City. Exhibit 2-2 in Chapter 2.0 shows LACSD facilities in City of San Gabriel.

Scope of Work

The primary objectives of this Master Plan are:

- Analyze the capacity of the major segments of the existing sewer system
- Determine the physical condition of the existing pipes and manholes
- Address the inflow, infiltration, grease control and State Waste Discharge Requirements
- Develop a recommended Capital Improvement Program
- Address options to finance the improvement, maintenance and management costs

This document will present the data collected and methodology used to create the sewer system database, capacity analysis and CCTV inspection. It also includes description of the existing sewer system, recommended criteria, analysis results and recommendations regarding a maintenance program, Capital Improvement Program and financing alternatives.

As a planning document, it is general in nature and based on the best information available at the time of the preparation of the Master Plan.

CHAPTER 2.0 – EXISTING SEWER SYSTEM

The majority of the sanitary sewer system was constructed between 1939 and 1942. Homeowners were given the option to connect to the sewer system at the time of construction. As the City grew through development, property owners continued to connect their properties to the sanitary sewer system. The City currently serves a population of 43,000 persons and 13,000 housing units .The housing units cover an area of about 52% of the City. The industrial and commercial areas cover about 16% of the City with 12% in community facilities, golf course, special purposes and 23% of the City area is street, flood channel and railways

The City's sanitary sewer system shown on Exhibit 2-1 in this Chapter is a gravity flow system that collects sewage generated from residential and commercial/industrial properties (from indoor plumbing systems) and discharges it to LA County Sanitation District (LACSD) trunk lines and then to their wastewater treatment plants. Exhibit 2-2 shows LACSD facilities within the City of San Gabriel. These lines collect approximately 8.6 Million Gallons Per Day (MGD) or 13.3 Cubic Feet Per Second of raw sewage per year. The system is comprised of 72 miles (380,000ft) of mainline sewers and about 1,350 manholes. A full scale map of the system is included at the end of this report.

The Pipe Inventory with sizes and lengths is given in Table 2.1

Table 2.1
Sewer Pipe Inventory

Size (Inches)	Length (Feet)	Length (Miles)
8	346,000	65.53
10	12,700	2.41
12	15,000	2.84
15	2,000	0.38
18	3,200	0.61
21	850	0.16
24	700	0.13
TOTAL	380,450	72.06

The City of San Gabriel Municipal Code Section 51.01 "Definitions" defines the house connection sewer (lateral) and the public sewer. The City maintains the mainline sewers and the individual property owners are responsible for the sewer lateral from the connection at the mainline sewer to the property structure.

The primary material used for construction of the sewers is Vitrified Clay Pipe (VCP). However, there is evidence that some concrete pipes were also utilized.

The change in the population demographics in San Gabriel is resulting in a change in the characteristics of the sewage effluent. There has been a noticeable increase in grease content and buildup within the sewer mains servicing areas of heavy restaurant operations as well as in some residential areas during the recent years.

Although property owners are responsible for maintaining sewer laterals, there is a recurring problem of root intrusion in the laterals. This is a common problem with VCP material.

CHAPTER 3.0 – SEWER MAINTENANCE PROGRAM

3.1 INTRODUCTION

A Comprehensive maintenance program is an important tool in assuring reliable system operation. This not only includes regular inspections and preventative maintenance, but also good record keeping. Accurate records are the backbone of any maintenance operation. They can be used for many purposes including: scheduling regular maintenance activities, allocating manpower, budgeting, pinpointing persistent problems, tracking equipment performance and maintenance history, and the identification of equipment which may be showing signs of failure.

Preventative Maintenance is a crucial element of the maintenance program. The Preventative Maintenance Program (PMP) consists of cleaning, inspection, condition assessment, and rehabilitation tasks.

Sewer inspection includes CCTV inspection and condition assessment of the system pipe lines, visual inspection of manholes and their flow channels, ground surface inspection of rights of way and easements, and odor and corrosion monitoring. Condition assessment includes review of the inspected data, and formulation of maintenance, rehabilitation and replacement needs.

3.2 EXISTING CITY MAINTENANCE PROGRAM

The City's Public Works Department maintains the sewer system. The City has been divided into 10 zones for routine annual maintenance. It takes operations staff about 10 months to clean the entire City using a rodder equipped truck. City crews also respond to "hot spots" on an as-needed basis. These high maintenance locations are cleaned at least once a month. The cause of these high maintenance problem areas has been grease, roots, sediment, and other household materials such as diapers that become lodged.

The operations staff also maintains records of all the routine maintenance and problem-area maintenance including the nature of the problem, the solution, and how long it took to clear the blockage.

3.3 STATEWIDE GENERAL WASTE DISCHARGE REQUIREMENTS

All federal and State agencies, municipalities, counties, districts and other public entities that own or operate sanitary sewer systems greater than one mile in length that collect and/or convey untreated or partially treated sewage to a publicly-owned treatment facility in the State of California are required to comply with requirements of the State Water Resources Control Board (SWRCB) Order No. 2006-003-DWQ.

This order requires the development and implementation of a system-specific Sewer System Management Plan (SSMP).

One of the elements of the SSMP is to establish an Operation and Maintenance Program (OMP). In this program, the City must describe routine preventative operation and maintenance activities by staff and contractors, including scheduled regular maintenance and cleaning of the system as well as a more frequent cleaning and maintenance at known problem areas. The preventative maintenance program should have a system to document scheduled and conducted activities such as work orders. The details of this program are scheduled to be submitted to the SWRCB by August 2, 2009.

3.4 MAINTENANCE STAFF REQUIREMENTS

In order to meet the SWRCB requirements regarding adequate maintenance staff the City will address the number of employees and equipment necessary to perform these tasks in the SSMP.

CHAPTER 4.0 –LAND USE PLANNING

4.1 INTRODUCTION

The formulation of design and performance standards is an important part of evaluating existing sanitary sewer systems. In existing systems these standards form the basis for the analysis of the system's capacity to convey sewer flows and eventually the improvement recommendations. One of the most important elements is the estimating of sewer design flows. Sewer flows can be reasonably estimated from land use and their corresponding Sewer Flow Coefficients. Land Use densities are established within the City's General Plan as well as the Mission District and Valley Boulevard Specific Plan documents. The Sewer Flow Coefficients are based on historical and empirical data and designate the amount of sewer flow that can be expected from a particular land use. For this reason land use designations become an important element in the analysis of the sewer capacity.

4.2 ZONING CLASSIFICATIONS AND GENERAL PLAN LAND USE

Table 4.2 below lists the City's various zoning categories and corresponding general plan land use categories. The General Plan Land Use Policy Map and the Zoning Map are displayed in Exhibits 4-1 and 4-2 respectively. For the purpose of this report, it is assumed that existing land use conditions in the City are depicted by the zoning classifications. The land use plan is essential in designing for the City's future infrastructure needs as it prescribes the future density and intensity of development. The General Plan Land Use as shown in Exhibit 4-1 have been utilized to calculate sewer flows that were subsequently used to perform a capacity analysis of the existing sewer system. Since the zoning classifications are not significantly different from the General Plan Land Use categories, it is assumed that capacity deficiencies identified within the analysis are also valid for existing conditions.

Table 4-2
ZONING CATEGORIES AND CORRESPONDING LAND USE DESIGNATIONS

Zone Abbr.	Zoning Designation	General Plan Land Use Category
R-1	Single Family Residence	Low Density Residential
R-1CC	Single Family Residence – Country Club	Low Density Residential
R-1A	Limited Two-Family Residence Zone	Medium Density Residential
R-2	Low Density Multiple Family Residence Zone	Medium Density Residential
R-3	Multiple Family Residence Zone	High Density Residential
C-1	Retail Commercial Zone	Village Commercial, General Commercial, Commercial Specific Plan
C-3	Commercial and Limited Manufacturing Zone	General Commercial, Commercial Specific Plan
M-1	Light Manufacturing Zone	Light Industrial
MD	Mission District Zone	Commercial Specific Plan
MF	Medical Facilities Zone	Medical Facilities
PF/OS	Public Facilities/Open Space Zone	Open Space/Landscaping, Park, Planned Park, Private Golf Course, Cemetery, Flood Control Channels
P-1	Automobile Parking Zone	N/A

4.3 LAND USE ISSUES AND CATEGORIES

The City's planning documents contain a thorough and adequate presentation of land use, economic, and development issues. Like many of its neighbors San Gabriel is considered a mature, "built out" City. The pattern of land use has for all intents and purposes been set. The planning documents emphasis improving and enhancing quality of life issues through development and redevelopment within the City. These issues are listed below and for more details refer to the full General Plan and the Mission District and Valley Boulevard Specific Plan documents.

- Neighborhood Preservation
- Neighborhood Development
- Mansionization
- Residential Densities
- Buffering
- Mission District Vitality
- Medical Facilities Zone
- Mixed Use Development
- Redevelopment
- Unincorporated County Areas
- Livable Communities
- Valley Boulevard

- Open Spaces

The land use plan for the City of San Gabriel is illustrated by Exhibit 4-1 (a full size map of this Exhibit is also included in the back pocket of this report). The categories of permitted land uses and their population and development intensity limitations are as follows:

Residential

Low Density……. 0-6 DU/Acre
Medium Density……..7-11 DU/Acre
High Density……12-25 DU/Acre
Specific Plan……> 40 DU/ Acre

Commercial

Village:
Building Intensity: Maximum building height of 2 stories and 35 feet and maximum Floor Area Ratio (F.A.R.) of 0.35 for 2-story structures and 0.45 for 1-story structures. Maximum building height of 3 stories and 45 feet and maximum F.A.R. of 1.0 for mixed use projects.
General:
Building Intensity: Maximum building height of 5 stories and 70 feet and maximum F.A.R. of 0.5 to 0.7. Maximum building height of 3 stories and 45 feet and maximum F.A.R. of 1.0 for mixed use projects.
Medical Facilities:
Building Intensity: Maximum building height of 70 feet and maximum F.A.R. of 3.0.
Commercial Specific Plan – Same as General Commercial

Industrial

Light Industrial: Building Intensity: Maximum building height of 2 stories and 35 feet and maximum F.A.R. of 0.5.

Circulation

- Freeway
- Freeway Interchange
- Arterial
- Collector
- Planned Grade Separation (interchange)
- Railroad

Open Space and Recreation

- Open Space/Landscaping
- Park
- Planned Park
- Private Golf Course

- Cemetery
- Flood Control Channels

Public Facilities

- High School
- Junior High School
- Elementary School
- School – Special
- School – Private
- Civic/Historic Area
- Police Station
- City Yard
- Fire Station
- Medical Center
- Post Office
- Library
- Water Pump Station
- Solid Waste Disposal

This land use plan has been utilized as the basis to calculate generated sewer flows used to perform the sewer system capacity analysis.

4.4 CONFORMANCE WITH PLANNING GOALS AND POLICIES

General Plan

The Sewer Master Plan is an implementation tool for the goals and policies of the City's General Plan. Below are specific goals and policies within the City's General Plan and a brief description of how the Sewer Master Plan addresses those goals and policies:

Chapter 5: Public and Environmental Safety; Goal 5.7 – Reduce potential harm and damage from environmental hazards

Identification and correction of deficiencies within the City's sewer collection system will reduce the potential for impacts to public safety.

Chapter 6: Community Facilities; CF-2, "Storm Drains" and "Sewer System"

The Sewer Master Plan will address these goals as follows:

Storm Drains: Correcting deficiencies within the City's sewer collection system to reduce the potential for sewer overflows to impact storm drain facilities.

Sewer System: The Sewer Master Plan accomplishes the goal of preparing a plan that identifies deficiencies and proposes solutions.

Chapter 6: Community Facilities; Goal 6.1 – Ensure that community facilities provide an adequate level of service so that new development has efficient and orderly service.

This Sewer Master Plan evaluates the demands of the City's existing development along with projected developed identified within long range planning documents to detail needs and propose implementation solutions that include funding sources.

Chapter 6: Community Facilities; Goal 6.8 - Improve the storm drains and sewer systems in the City in order to provide for density increases and better service.

New development and improvement of the existing community are critical to the growth of the City. This Sewer Master Plan accomplishes the City's goals of surveying the City's sewer system, developing a Capital Improvement Program, and identifying funding sources needed to ensure stable growth and improved service.

Chapter 6: Community Facilities; CF-5 – CF-7 – Implementation

The ultimate objective of every planning document is implementation of its established goals and policies. The Sewer Master Plan is the planning document responsible for implementing sewer collection system goals and policies established by the General Plan.

Chapter 8: Environmental Resources; ER-1 to ER-7

The sewer conveyance system plays a significant role in ensuring the environmental quality of the community. A properly designed, constructed, and maintained system will ensure that negative environmental impacts to resources are avoided. The implementation of this Sewer Master Plan will ensure environmental resources are protected.

CHAPTER 5.0 – SEWER SYSTEM CAPACITY ANALYSIS

5.1 INTRODUCTION

Realistic estimates of wastewater quantities produced by the various land uses within the City are essential because they become the basis for determining if the existing pipe systems have the capacity to convey peak flows and to recommend system improvements. Historically, the sewage flow coefficients (zoning coefficients) developed by the Los Angeles County Sanitation District (LACSD) for various land uses have been used for the design and evaluation of the City's wastewater system. The LACSD coefficients for peak flow in Cubic Feet per Second (cfs) per Acre were used as a starting point to compare with the ones calculated for the City of San Gabriel based on actual measured flows. The LACSD coefficients are shown in Table 5-1.

To ensure that the estimated sewer flows used to evaluate the City system are appropriate for existing and future conditions in the City of San Gabriel a review of these generalized coefficients was conducted.
In order to establish the recommended sewer flow coefficients for the City of San Gabriel, the flows monitored at thirty-two locations established prior to this study and six monitoring locations established for this study were analyzed. These measured flows were compared with flows calculated using LACSD coefficients. It should be noted that the coefficients used by LACSD are very generalized. These coefficients were reviewed to determine if they are appropriate for analyzing the existing and future land use densities in the City of San Gabriel. The land use densities and coefficient used by the cities of Alhambra, Monterey Park, and Rosemead were also compared. The following describes the rationale for establishing the recommended peak sewer flow coefficients used for the various modified land uses in the study for the City of San Gabriel:

5.2 FLOW MONITORING

Data collection and review is essential in developing the sewer flow coefficients and calculating the average daily and peak flows. In order to determine the impact of new development on an existing sewer system, temporary flow monitoring at various locations has been conducted since 1998. The City requires the following types of projects to conduct flow monitoring and CCTV inspection:

- Greater than 2 units
- Change in use from existing Single-Family Residential (SFR) to Multi-Family Residential
- Change in use from existing SFR in commercial retail zone to commercial residential (C/R)
- Increase in C/R above existing
- Specific plan cases that allow for greater density
- Mixed use development

These flow monitoring locations are shown on Exhibit 2-1 in Chapter 2.0 and a summary of results are found in Table 5-2 (a full size map of Exhibit 2-1 is also included in the back pocket of this report).

The measured flows and all other details of the monitoring locations are in Volume II.

The flow monitoring sites (SG01 thru SG32) were not monitored as part of this study, but were required by the City to be performed by various developers as well as some locations performed by Norris-Repke as part of the previous completed studies. The thirty-two (32) monitoring locations included sewage flows generated from multiple land uses.

The six (6) additional sites (SG33 thru SG38) were monitored as part of this study and are located exclusively in residential areas with four (4) in single-family areas and two (2) in multi-family residential areas.

All measured flow test data was compared with sewer flows calculated using the LACSD sewer flow generation zoning coefficients. Several inconsistencies were found in this comparison. The City's flow monitoring data from the thirty-two locations with multiple land uses varied from approximately 13 % to 733% of the flows calculated using LACSD coefficients. Table 5-3 contains the results of this comparison. Discarding very low and very high flows, average measured flows are from 140 to 160% of the flows calculated using LACSD coefficients

The flow monitoring data from the six (6) locations in residential areas (single-family and multi-family) monitored for this study resulted in sewer flows higher than the flows calculated using LACSD zoning coefficients. The results of the thirty-two (32) locations monitored prior to this study revealed sewer flows higher than those calculated using LACSD zoning coefficients. The measured flows as a percentage of calculated flows are 140 to 160. Table 5-4 shows this comparison for Single-Family Residences (R-1).

5.3 RECOMMENDED SEWER FLOW COEFFICIENTS

The land use plan of a city/community contains important information such as the density and intensity of development. The City of San Gabriel General Plan provides categories of permitted land uses and their population and development intensity. The details of the City of San Gabriel land uses are discussed in Chapter 4.0.

The land use categories of the City's General Plan are shown on Exhibit 4-1 in Chapter 4.0. These categories were slightly modified to develop corresponding sewer flow coefficients. The modified categories are:

- Low Density Residential (0-6 Du/Acre)

- Medium Density Residential (7-11 Du/acre)
- High Density Residential (12-25 Du/Acre)
- General and Village Commercial
- Commercial Specific Plan (Mission District Specific Plan)
- Commercial Specific Plan (Valley Blvd Specific Plan)
- Medical Facilities
- Light Industrial
- Open Spaces Recreational
- Schools, Playhouses and Missions
- Professional Offices and Public Facilities

The existing sewer system must have the capability and capacity of conveying the daily peak flow that generally occurs in the morning hours. Therefore, the coefficients developed need to be peak flow coefficients.

- **Low Density Residential**
  The results of flow monitoring data from stations SG33 and SG34 indicate consistency. The results of these two stations were compared with the flows calculated using a density of 6 Dwelling Unit (DU)/Acre from the City's General Plan, average daily flow of 250 gallons/DU and a peaking factor of 2.5 from LACSD standards. The measured peak sewer flow coefficient of 0.0062 from stations SG33 and SG34 and calculated peak sewer flow coefficient of 0.0058 are also consistent. Therefore, a peak sewer flow coefficient of 0.0060 cfs per acre for Low Density Residential was adopted.

- **Medium and High-Density Residential**
  The flow monitoring data collected during this study in two multi-family residential areas was not consistent, resulting in a coefficient of 0.006 (cfs per acre) and 0.018 (cfs per acre). The LACSD standard for average daily flow of 200 gallons/DU and a peaking factor of 2.5 was utilized to establish the sewer flow coefficient. The average density of 9 DU/Acre for medium density and 18.5 DU/Acre for high density were taken from the City's General Plan. The calculated peak sewer flow coefficients of 0.008 and 0.014 cfs per acre respectively for medium and high density residential areas were adopted for the City of San Gabriel.

- **Village Commercial and General Commercial**
  In order to establish an accurate coefficient the areas monitored should be large enough and must have similar land use. It was not possible to find a large enough exclusively commercial area to monitor flow from to establish a meaningful coefficient. Therefore, it was decided to use the LACSD peak sewer flow coefficient of 0.015 cfs per acre for this category.

- **Commercial Specific Plans**

  a. Valley Blvd. Specific Plan
  The Valley Blvd. specific plan adopted by the City has 50% to 60% higher density than general commercial areas. A Floor Area Ratio (FAR) of 2 to 3 is permitted in this land use compared with a FAR of 0.7 for commercial. Using LACSD estimated average daily sewage flows and peaking factor, the sewer flow coefficient of 0.021 cfs per acre as an average for FARs of 2 and 3 was calculated and used in this study.

  b. Mission District Specific Plan
  The Mission District Specific Plan adopted by the City is comprised of the Mission District Village, the Open Space Garden, the Mall, the Market Place, and R-1, R-2 and R-3 residential. The maximum Floor Area Ration (FAR) is 0.50 and 1.0 for a mixed-use project. The density in this area is much less than the Valley Blvd. Specific Plan. The peak sewer flow coefficient used for this area was 0.015 cfs/acre, same as general commercial.

- **Medical Facilities**
  Medical facilities and professional office buildings were considered similar. The coefficient of 0.008 cfs per acre is based on LACSD standard of 200 gallons/1000 Sq. ft. of gross floor area, which is similar to Medium Density Residential. The coefficient is also consistent with the City of Alhambra, a neighboring city.

- **Light Industrial**
  The LACSD standard does not have a coefficient designated for the light industrial land use. A review of the City of Monterey Park's standards provided a coefficient of 0.009 cfs per acre for Light Industrial. This coefficient seems reasonable and was used in this study.

- **Open Space Recreational**
  The LACSD standard does not have a coefficient for Open Space. A review of neighboring city standards indicated that the City of Alhambra assigns a 200 gallon/acre average flow. Based on that information a coefficient of 0.001 cfs per acre was used for this study.

- **Schools, Playhouses and Missions**
  The LACSD standard does not have a coefficient for schools, playhouses, and missions. A review of cities in Los Angeles County and Orange County was done. From that review a number of agencies were identified as using average flows of 20 to 25 gallons per day/per student for schools. We have assumed the same flow per person for playhouses and missions. The resulting coefficient is 0.0012 cfs per student/person.

- **Professional Offices and Public Facilities**
  The LACSD standard does not have a coefficient for these facilities. A review of neighboring city standards revealed that the City of Alhambra assigns an average flow of 2640 gallons per day per acres with a peaking factor of 2.5. Based on that information a coefficient of 0.01 cfs per acre was used for this study.

The recommended sewer flow coefficients for the City of San Gabriel are shown in Table 5-5.
The sewer flow coefficients of neighboring cities are shown in Table 5-6 for comparison only.

Table 5-1
LOS ANGELES COUNTY SANITATION DISTRICT (LACSD)
SEWER FLOW GENERATION ZONING COEFFICIENTS

Zone	Coefficient (cfs/Acre)
Agriculture……	0.001
Residential*:	
R-1……	0.004
R-2……	0.008
R-3……	0.012
R-4……	0.016*
Commercial:	
C-1 through C-4……	0.015*
Heavy Industrial:	
M1 through M-4……..	0.021*

*Individual building, commercial or industrial plant capacities shall be the determining factor when they exceed the coefficients shown.

+ Use 0.001 (cfs/unit) for condominiums only

Table 5-2
MEASURED PEAK FLOWS

Site No.	Peak Measured Flow (cfs)	Site No.	Peak Measured Flow (cfs)
SG01	0.20	SG20	0.82
SG02	0.55	SG21	0.15
SG03	0.86	SG22	0.90
SG04	1.58	SG23	0.14
SG05	0.30	SG24	0.14
SG06	2.23	SG25	4.24
SG07	0.87	SG26	2.88
SG08	1.51	SG27	1.41
SG09	2.08	SG28	0.08
SG10	0.88	SG29	0.39
SG11	0.14	SG30	2.52
SG12	0.58	SG31	1.70
SG13	1.50	SG32	0.22
SG14	4.16	SG33	0.29
SG15	2.28	SG34	0.13
SG16	8.45	SG35	0.32
SG17	0.22	SG36	0.25
SG18	0.47	SG37	0.26
SG19	0.42	SG38	0.21

Table 5-3
COMPARISON OF MEASURED AND CALCULATED FLOWS
(Peak Flows)

Site No.	Measured Flow (cfs)	Calculated Flow (cfs)	Measured Flows as % of Calculated Flows
SG01	0.20	0.07	286%
SG02	0.55	0.57	96
SG03	0.86	0.82	105
SG04	1.58	1.53	103
SG05	0.30	0.69	43
SG06	2.23	3.49	64
SG07	0.87	0.77	113
SG08	1.51	2.32	65
SG09	2.08	2.80	74
SG10	0.88	0.65	135
SG11	0.14	2.63	38
SG12	0.58	0.32	181
SG13	1.50	0.32	469
SG14	4.16	7.02	59
SG15	2.28	3.85	64
SG16	8.45	11.89	71
SG17	0.22	0.08	275
SG18	0.47	0.25	188
SG19	0.42	0.14	300
SG20	0.82	0.04	205
SG21	0.15	0.03	500
SG22	0.90	0.04	225
SG23	0.14	0.15	93
SG24	0.14	0.21	67
SG25	4.24	5.60	76
SG26	2.88	3.34	86
SG27	1.41	3.41	41
SG28	0.08	0.62	13
SG29	0.39	1.64	24
SG30	2.52	2.94	86
SG31	1.70	2.91	58
SG32	0.22	0.03	733

Table 5-4
COMPARISON BETWEEN MEASURED FLOWS VS. CALCULATED FLOWS
FOR SINGLE-FAMILY RESIDENCE (R-1)

Measuring Station	Manhole Number	Measured Flow (cfs)	Area (Acres)	Calculated Flow using LA County Coefficients (cfs)	Ratio: Measured Flow / Calculated Flow	Measured Coefficient: Measured Flow / Area	Coefficients adopted for City of San Gabriel
SG33	290	0.29	47	0.19	1.53	0.0062	0.0060
SG34	138	0.13	21	0.084	1.55	0.0062	0.0060
SG35	430	0.32	61	0.26	1.23	0.0052	0.0060
SG36	652	0.25	66	0.32	0.78	0.0038	0.0060

Table 5-5
COMPARISON BETWEEN MEASURED FLOWS VS. CALCULATED FLOWS
FOR MULTIPLE-FAMILY RESIDENCE
(MEDIUM TO HIGH DENSITY)

Measuring Station	Manhole Number	Measured Flow (cfs)	Area (acres)	Measured Coefficient: Measure of Flow / Area	Coefficient Adopted for City of San Gabriel
SG37	1109	0.26	39	0.0067	0.008 To 0.014
SG38	1205	0.21	12	0.018	0.008 To 0.014

Table 5-6
RECOMMENDED PEAK SEWER FLOW COEFFICIENTS
FOR THE CITY OF SAN GABRIEL

Zoning Description	Peak Sewer Flow cfs/Acre
Low Density Residential (0-6 DU/Acre)	0.006
Medium Density Residential (7-11 DU/Acre)	0.008
High Density Residential (12-25 DU/Acre)	0.014
General and Village Commercial	0.015
Mission District Specific Plan	0.015
Valley Blvd Specific Plan	0.021
Medical Facilities	0.008
Light Industrial	0.009
Open Spaces Recreational	0.001
Schools, Playhouses and Missions	0.0012 cfs per student or per person

Professional Offices and Public Facilities	0.01

Table 5-7
ZONING COEFFICIENTS (CFS/ACRE) OF NEIGHBORING CITIES

Zoning Description*	City of Alhambra		City of Monterey Park		City of Rosemead	
	ZC	PF	ZC	PF	ZC	PF
SFR or Low Density Residential	0.003	1.54 - 3.0	0.001	2.0	0.001	1.72 – 2.00
Medium Density Residential	0.004	1.54 – 3.0	NA		0.004	1.72 – 2.00
MFR/High Density Residential	0.008	1.54 – 3.0	0.004	2.0	0.006	1.72 – 2.00
Commercial	0.004	1.54 – 3.0	0.006	2.0	0.006	1.72 – 2.00
Industrial	NA		0.004	2.0	NA	

*Notes: SFR = Single Family Residential
MFR = Multi Family Residential
ZC = Zoning Coefficient (Sewer Flow Coefficient)
PF = Peaking Factor
NA = Not Available

5.5 HYDRAULIC ANALYSIS

The purpose of this analysis is to provide the City with information necessary to identify and prioritize capacity concerns within the City's existing main sewer lines. This analysis assesses system deficiencies and provides recommendations for necessary upgrades and improvements to mitigate capacity deficiencies. A capacity analysis of the following major sewer lines was conducted:

1. San Gabriel Blvd.
2. Del Mar Ave.
3. Stuhr/Arroyo/Ramona St.
4. San Marino St.
5. Walnut/Lafayette St.
6. West of Del Mar Ave. and Dewey St.
7. Santa Anita/Broadway/Clary St.

The sewer flow coefficients recommended in Section 5.4 and the Land Use plan (2004 General Plan) with the modified land use designations were used to calculate the sewage flow discharges. Most of the hydraulic analysis was performed per City's Land Use Plan. The Mission Specific Plan, Valley Blvd Specific Plan and Redevelopment Agency (RDA) areas were also analyzed for existing conditions. The existing land use conditions were determined from areal photographs of the City. The analysis for the existing land use condition was done to evaluate the impact of these areas due to their higher densities. Since the areas are relatively small, it was determined there were no significant difference in the sewer flow generation between existing land use and higher densities. Utilizing the determined peak sewage flows, a hydraulic analysis of the above selected sewer mains was performed. The adequacy of a sewage collection system is based upon its ability to convey the peak flows. Each pipe segment must be capable of carrying peak flow without surcharging the system. The design and analysis of sewer pipes is typically based upon depth to diameter ratio (d/D).

Deficiency criteria were developed to flag those sewer segments that may lead to hydraulic capacity problems. For this study the criteria of agencies such as the City of Los Angeles, County of Los Angeles, County of Orange, Irvine Ranch Water District, and Eastern Municipal Water District was evaluated. The criteria used by most of these agencies for the design of new systems state that sewer mains 12 inches in diameter and smaller are considered deficient if peak flow d/D (sewer flow depth to pipe diameter ratio) exceeds 50% and for sewer mains larger than 12 inches in diameter a maximum peak flow d/D of 75% is used. This criterion allows for additional system capacity to account for wet weather inflows, increased density, partial blockages and aging of the system.

However, considering that, the City of San Gabriel is a mostly developed city, the coefficients have been customized and inflow from wet weather does not appear to be a significant factor a revision to the standard design criteria was used. In addition replacing an existing sewer flowing just over 50% full that is operating in a satisfactory manner is questionable from a cost-benefit perspective. Therefore, the sewer mains with peak flow d/D less than 75% were not considered deficient. Sewer mains with d/D more than 50% and less than 75% have been flagged as low priority in the event the City ever wishes to upsize them to meet the industry criteria.

Exhibit 5-1 depicts the segment locations analyzed and Exhibit 11-1 shows the system deficiencies. The full size maps of these Exhibits are also included in the back pocket of this report. The system deficiencies have been prioritized as follows:

Low Priority: Depth of flow is more than 50% but less than 75%
Medium Priority: Depth of flow is more than 75% but less than 85%
High Priority: Depth of flow is more than 85% but less than 95%
Top Priority: Depth of flow is more than 95 % and pipe flowing full and under pressure

The results of the capacity analysis and recommended upgrades are shown in Tables 5-8.Through 5-14.

Table 5-8
SYSTEM DEFICIENCIES
AND RECOMMENDED UPGRADES

San Gabriel Blvd.

From Manhole (U/S)	To Manhole (D/S)	Diameter (IN)	Mannings	Slope Ft/Ft	Accum. Peak Flow (cfs)	% Full d/D	Priority*	Recommen-ded Upgrade	Length (Ft)
758A	758	8	0.015	0.0033	0.65	Full	H	12	
758	759	8	0.015	0.0020	0.65	Full	H	12	
759	760	8	0.015	0.0020	0.65	Full	H	12	1000
760	761	8	0.015	0.0116	0.83	.64	L	10	
761	762	8	0.015	0.0160	0.85	.58	L	10	
762	764	8	0.015	0.0160	0.86	.58	L	10	830
764	765	8	0.015	0.0040	1.04	Full	H	12	
765	766	8	0.015	0.0040	1.04	Full	H	12	
766	685	8	0.015	0.0040	1.04	Full	H	12	1227
685	756	8	0.015	0.0020	1.25	Full	H	15	58
756	700	10	0.015	0.0048	1.32	Full	H	12	120
700	329	12	0.015	0.0048	2.93	Full	H	15	
329	320	12	0.015	0.0048	3.44	Full	H	15	486
320	417	10	0.015	0.0140	3.40	Full	H	15	
417	425	10	0.015	0.0224	3.40	Full	H	15	
425	265	12	0.015	0.0120	3.41	Full	H	15	
265	472	12	0.015	0.0080	3.45	Full	H	15	
472	286	12	0.015	0.0112	3.47	Full	H	15	
286	770	12	0.015	0.0060	3.49	Full	H	15	
770	771	12	0.015	0.0096	3.53	Full	H	15	
771	772	12	0.015	0.0080	3.56	Full	H	15	
772	773	12	0.015	0.0112	3.60	Full	H	15	
773	774	12	0.015	0.0112	3.63	Full	H	15	
774	775	12	0.015	0.0112	3.67	Full	H	15	
775	776	12	0.015	0.0116	3.70	Full	H	15	
776	777	12	0.015	0.010	3.74	Full	H	15	
777	778	12	0.015	0.0112	3.77	Full	H	15	
778	849	12	0.015	0.0112	3.80	Full	H	15	
849	856	12	0.015	0.0120	3.83	Full	H	15	
856	917	12	0.015	0.0088	3.85	Full	H	15	
917	962	12	0.015	0.0088	3.85	Full	H	15	5225

***Low Priority (LP)** d/D = >50%To <75%; **Medium Priority (MP)** d/D = >75% To 100%;
High Priority (HP) d/D **=** >100**%** Under Pressure

Low Priority

Medium Priority

High Priority

Table 5-9
SYSTEM DEFICIENCIES
AND RECOMMENDED UPGRADES

Del Mar Avenue

From Manhole (U/S)	To Manhole (D/S)	Diameter (IN)	Mannings	Slope Ft/Ft	Accum. Peak Flow (cfs)	% Full d/D	Priority*	Recommen-ded Upgrade	Length (Ft)
620R	662	8	0.015	0.0039	0.51	67	L	10	
662	661	8	0.015	0.0076	0.51	54	L	10	625
610	611	8	0.015	0.0048	0.51	66	L	10	44
643	256	10	0.015	0.0092	1.18	58	L	12	
256	260	10	0.015	0.0136	1.18	52	L	12	600

***Low Priority (LP)** d/D = >50%To <75%; **Medium Priority (MP)** d/D = >75% To 100%;
High Priority (HP) d/D **=** >100**%** Under Pressure

Low Priority

Medium Priority

High Priority

Table 5-10
SYSTEM DEFICIENCIES
AND RECOMMENDED UPGRADES

Stuhr Dr./Arroyo Dr./Ramona St.

From Manhole (U/S)	To Manhole (D/S)	Diameter (IN)	Mannings	Slope Ft/Ft	Accum. Peak Flow (cfs)	% Full d/D	Priority*	Recommen-ded Upgrade	Length (Ft)
230B	230A	8	0.015	0.004	0.60	.75	M	12	
230	229R	8	0.015	0.004	0.70	.90	M	12	600
229R	228R	8	0.015	0.004	0.75	Full	H	12	
228R	227R	8	0.015	0.004	0.85	Full	H	12	
227R	226R	8	0.015	0.004		Full	H	12	
226R	225A	8	0.015	0.004		Full	H	12	
225A	225R	8	0.015	0.004		Full	H	12	
225R	224	8	0.015	0.0032	0.96	Full	H	12	
224	223	8	0.015	0.010	0.96	Full	H	12	
223	222A	8	0.015	0.010		Full	H	12	
222A	222	8	0.015	0.0073	1.09	Full	H	12	2425
222	558	10	0.015	0.0040	1.11	.76	M	12	
558	557	10	0.015	0.0040	1.19	.81	M	12	1125
556	644	12	0.015	0.0015	1.19	Full	H	15	
644	562	12	0.015	0.0015	1.19	Full	H	15	
562	645	12	0.015	0.0015	1.19	Full	H	15	
645	646	12	0.015	0.0015	1.19	Full	H	15	
646	658	12	0.015	0.0016	1.19	Full	H	15	
658	502	12	0.015	0.0020	1.19	Full	H	15	
502	501	12	0.015	0.0016	1.70	Full	H	15	
501	500	12	0.015	0.0016	1.70	Full	H	15	
500	499	12	0.015	0.0016	1.70	Full	H	15	2610
499	498	10	0.015	0.0092	1.70	.77	M	15	380
498	497	10	0.015	0.0156	1.70	.63	L	12	
497	496	10	0.015	0.0120	1.70	.69	L	12	
496	495	10	0.015	0.0152	1.70	.63	L	12	
495	494	10	0.015	0.0120	1.80	.72	L	12	
494	493	10	0.015	0.0140	1.90	.71	L	12	
493	492	10	0.015	0.0160	2.00	.70	L	12	1550
491	446	12	0.015	0.0060	2.13	.73	L	15	225
446	490	12	0.015	0.0028	2.13	Full	H	15	
490	913	12	0.015	0.0084	2.13	.65	H	15	305
913	914	12	0.015	0.0084	2.13	.65	L	15	740
740	741	12	0.015	0.0020	2.14	Full	H	15	
741	745	12	0.015	0.0020	2.19	Full	H	15	
745	746	12	0.015	0.0020	2.24	Full	H	15	
746	747	12	0.015	0.0020	2.27	Full	H	15	
747	811	12	0.015	0.0028	2.30	Full	H	15	
811	229	12	0.015	0.0048	2.40	Full	H	15	2330
214	225	15	0.015	0.0036	2.53	.65	OK		
225	226	15	0.015	0.0036	2.55	.65	OK		
226	227	15	0.015	0.0036	2.57	.65	OK		
227	865	12	0.015	0.0101	2.59	.70	OK		
814	731	15	0.015	0.0024	2.60	.78	M	15	250

***Low Priority (LP)** d/D = >50%to <75%; **Medium Priority (MP)** d/D = >75% To 100%;
High Priority (HP) d/D **=** >100**%** Under Pressure

Table 5-11
SYSTEM DEFICIENCIES
AND RECOMMENDED UPGRADES

San Marino Avenue

From Manhole (U/S)	To Manhole (D/S)	Diameter (IN)	Mannings	Slope Ft/Ft	Accum. Peak Flow (cfs)	% Full d/D	Priority*	Recommen-ded Upgrade	Length (Ft)
560R	625	8	0.015	0.0040	0.48	63	L	10	310
622	643	8	0.015	0.0040	0.63	77	M	10	265

***Low Priority (LP)** d/D = >50%To <75%; **Medium Priority (MP)** d/D = >75% To 100%;
High Priority (HP) d/D **=** >100**%** Under Pressure

Table 5-12
SYSTEM DEFICIENCIES
AND RECOMMENDED UPGRADES

Walnut/Lafayette St.

From Manhole (U/S)	To Manhole (D/S)	Diameter (IN)	Mannings	Slope Ft/Ft	Accum. Peak Flow (cfs)	% Full d/D	Priority*	Recommen-ded Upgrade	Length (Ft)
405	406	8	0.015	0.0054	0.40	52	L	10	430
408	277	8	0.015	0.0016	0.44	87	M	10	330
822	823	10	0.015	0.0068	0.91	55	L	10	
823	108	10	0.015	0.0080	0.92	53	L	10	830

***Low Priority (LP)** d/D = >50%To <75%; **Medium Priority (MP)** d/D = >75% To 100%;
High Priority (HP) d/D **=** >100**%** Under Pressure

Low Priority

Medium Priority

High Priority

Table 5-13
SYSTEM DEFICIENCIES
AND RECOMMENDED UPGRADES

West of Del Mar Ave. & Dewey St.

From Manhole (U/S)	To Manhole (D/S)	Diameter (IN)	Mannings	Slope Ft/Ft	Accum. Peak Flow (cfs)	% Full d/D	Priority*	Recommen-ded Upgrade	Length (Ft)
569	701	12	0.015	0.0064	2.61	Full	H	15	
701	721	12	0.015	0.0092	2.70	Full	H	15	
721	722	12	0.015	0.0096		Full	H	15	
722	723	12	0.015	0.0156		Full	H	15	
723	429	12	0.015	0.010		Full	H	15	
429	433	12	0.015	0.010		Full	H	15	
433	724	12	0.015	0.010		Full	H	15	
724	725	12	0.015	0.010		Full	H	15	
725	726A	12	0.015	0.0064	3.10	Full	H	15	
726A	726	12	0.015	0.010	3.15	Full	H	15	
726	415A	12	0.015	0.0052	3.28	Full	H	15	
415A	445	12	0.015	0.0030	3.31	Full	H	15	
445	727	12	0.015	0.0120	3.35	Full	H	15	
727	728	12	0.015	0.010		Full	H	15	
728	514	12	0.015	0.016		Full	H	15	
514	516	12	0.015	0.0042		Full	H	15	
516	518	12	0.015	0.0042	3.42	Full	H	15	
518	729	12	0.015	0.0052		Full	H	15	
729	729A	12	0.015	0.0052		Full	H	15	
729A	730	12	0.015	0.0052	3.51	Full	H	15	
730	731	12	0.015	0.0052	3.54	Full	H	15	5725
731	866	18	0.015	0.0071	6.12	67	OK		
866	861	18	0.015	0.0112	6.12	58	OK		
861	860	18	0.015	0.0021	6.12	Full	H	21	
860	859B	18	0.015	0.0020	6.12	Full	H	21	
859B	859A	18	0.015	0.0020		Full	H	21	
859A	859	18	0.015	0.0020		Full	H	21	
108	858	18	0.015	0.0028	7.05	Full	H	21	
858	862	18	0.015	0.0030	7.05	Full	H	21	2245

***Low Priority (LP)** d/D = >50%To <75%; **Medium Priority (MP)** d/D = >75% To 100%;
High Priority (HP) d/D **=** >100**%** Under Pressure

Low Priority

Medium Priority

High Priority

Table 5-14
SYSTEM DEFICIENCIES
AND RECOMMENDED UPGRADES

Santa Anita/Broadway/Clary St.

From Manhole (U/S)	To Manhole (D/S)	Diameter (IN)	Mannings	Slope Ft/Ft	Accum. Peak Flow (cfs)	% Full d/D	Priority*	Recommen-ded Upgrade	Length (Ft)
652	538R	8	0.015	0.0040	0.57	72	L	10	
585	650	8	0.015	0.0132			L	10	310
650	649A	8	0.015	0.0060	0.81	82	M	10	
649A	649	8	0.015	0.0060	0.81	82	M	10	505
640	592	10	0.015	0.0088	1.00	54	L	12	
592	593	10	0.015	0.0040	1.00	70	L	12	
593	640	10	0.015	0.0048	1.03	67	L	12	1210
641	636	10	0.015	0.0040	1.03	71	L	12	212
469	468	10	0.015	0.0120	1.15	53	L	12	
468	288	10	0.015	0.0060	1.19	68	L	12	800

***Low Priority (LP)** d/D = >50%To <75%; **Medium Priority (MP)** d/D = >75% To 100%;
High Priority (HP) d/D **=** >100**%** Under Pressure

Low Priority

Medium Priority

High Priority

CHAPTER 6.0 – SEWER SYSTEM STRUTURAL DEFCIENCY ANALYSIS

6.1 INTRODUCTION

Currently, most internal inspection of sewer mains is performed by the use of Closed Circuit Television (CCTV) camera systems. Televising of sewer pipes eliminates the necessity of personnel entering manholes and can provide a videotaped record of the conditions in the pipes.

The following objectives and procedures for accurate recording of televised pipe conditions were employed for the City of San Gabriel CCTV investigation:

- Enter data view information such as the date and job number, after the camera is placed in the manholes.
- Record pipe material, pipe joint intervals, and pipe diameter.
- Record structural defects as they are encountered.
- Record extraneous flow sources and assign leakage rates.
- Identify service connections and note whether they are active, capped, or abandoned.
- Identify maintenance problems such as roots, grease, sediments, or dips (sagging).
- Note whether the entire line was inspected, or note the reason for incomplete inspection.

6.2 CITY OF SAN GABRIEL CCTV HISTORY

In addition to inspection of about 10 miles of the system conducted with this study, the City had previously conducted a minimal amount of CCTV inspection. These inspections were either part of the sewer studies conducted by the City's consultant or as required by the City for projects as described under Section 5.2 by the developers. The interior of certain segments of the studied sanitary sewer lines were videoed in October, 1998. The lines and limits of the videoing were as follows:

1. Beginning at Alhambra Wash approximately 400 feet southerly of Valley Boulevard, at manhole No. 865; thence westerly to manhole No. 811C; thence northerly to manhole No. 811B, thence westerly to manhole 811A (in Abbott Avenue southerly of Valley Boulevard); thence northerly in Abbot Avenue (south) to Valley Boulevard; thence westerly in Valley Boulevard to Abbot Avenue (north).
2. Beginning in Arroyo Drive at Santa Anita Avenue; manhole No. 556; thence northerly in Arroyo Drive to Las Tunas in Arroyo Drive to Las Tunas Drive, manhole No. 225R; thence northerly in easement to Stuhr Drive, manhole No. 228R.
3. Valley Blvd., about 460 feet of Valley Blvd. sewer from manhole No. 285 to 846 was videoed on July 12, 2007 by AST

6.3 SELECTION OF MAINS TO BE INSPECTED

As part of this study, about 10 miles out of a total of 72 miles of the system were inspected. The locations inspected included some of the City's major trunk lines, commercial areas in the vicinity of restaurants and known Fat, Oil, Grease (FOG) trouble spots. The locations of these inspections are shown in Exhibit 6-1. A full-size map of the Exhibit is included in the back pocket of this report.

The inspection reports, videos along with defect grade description done under this project are included in Volume 3. The inspections conducted prior to this study are not as comprehensive as the inspections done under this study and lack defect grade description per National Association of Sewer Service Companies (NASSCO). These videos were viewed and reports were evaluated to establish the structural conditions of the sewer lines. However, they are not included as part of this report.

6.4 STRUCTURAL CONDITION DETERMINATION

The Pipeline Assessment and Certification Program (PACP) developed by NASSCO was used to assess the condition of the sewer lines. This program provides a mechanism for creating reliable descriptions of pipe conditions. NASSCO has also developed a system based on the PACP codes to assign a condition rating to pipelines. Requirements of the grading system were as follows:

1. Like the PACP, the grading system should be direct and objective.
2. Provide the ability to quantitively measure the difference in pipe condition between one inspection and subsequent inspections and to prioritize among different pipe segments.

Using the PACP Code Matrix, each PACP defect code is assigned a condition grade from 1 to 5. Grades are assigned based on potential for further deterioration or pipe failure. Pipe failure is defined as when the pipe can no longer convey the pipe design capacity. Grades are assigned for two categories; Structural and O&M defects.

Grades are as follows:

5-Immediate Attention…… Defects requiring immediate attention
4-Poor…….. Severe defects that will become Grade 5 defects within the foreseeable future.
3-Fair……Moderate defects that will continue to deteriorate
2-Good…… Defects that have not begun to deteriorate
1-Excellent……Minor defects

The mechanisms and rates of pipeline deterioration are highly dependent on local conditions. However, the following general guidelines are provided to estimate the amount of time before the defect causes complete line failure. These guidelines should be verified by actual research under prevailing local conditions.

Grade 5 – Pipe has failed or will likely fail within the next five years
Grade 4 – Pipe will probably fail in 5 to 10 years
Grade 3 – Pipe may fail in 10 to 20 years
Grade 2 – Pipe unlikely to fail for at least 20 years
Grade 1 – Failure unlikely in the foreseeable future

The following procedures are used to calculate pipe segment ratings using the PACP Condition Grading System:

1. Determine the number of occurrences for each condition grade within the pipe segment. Calculate separately for Structural Defect Grades and O&M Defect Grades.
2. Calculate the Segment Grade Score by multiplying the number of occurrences by the respective grade 1 through 5. Calculate the Structural Segment Grade Score and the O&M Segment Grade Score separately, then add together for the Overall Segment Grade Score.
3. Calculate the Pipe Rating for the pipe segment by adding the Segment Grade Scores. Add all five Structural Segment Grade Scores for the Structural Pipe Rating, and add all five O&M Segment Grade Scores for the O&M Pipe Rating. Add all five Overall Segment Grade Scores for the Overall Pipe Rating.
4. Determine the PACP Quick Rating by calculating the number of occurrences of the two highest severity grades.
5. Calculate the Pipe Ratings Index by dividing the Pipe Rating by the number of defects. If the pipe has no defects, the Pipe Ratings Index is zero.

The Quick Structural Rate, Quick Maintenance Rate, Structural Pipe Rate, Maintenance Pipe Rate, Overall Pipe Rate, Structural Pipe Rate Index, Maintenance Pipe Rate Index and Overall Pipe Rate Index are included in Volume III (CCTV Data).

Based on CCTV data, a Dot Map of the areas inspected is shown in Exhibit 6-2. A full size map of this exhibit is also included in the back pocket of this report.

The overall Pipe Rate index as described above takes into account the composite condition of an existing pipe segment. Therefore, this index was utilized to determine the needs for repairs and condition upgrades to the sewer system. The priorities for these repairs and condition upgrades are established as:

Table 6-1
STRUCTURAL PIPE RATE INDEX

Overall Pipe Rate Index	Priority
0	**None**
1 To 2	**Low**
Greater than 2 to 3.5	**Medium**
Greater than 3.5 to 5	**High**

6.5 HOT SPOTS; FATS, OILS, GREASE AND DIAPER PROBLEMS

Various "hot spots" exist in the City's sewer system. These are the areas in the system with recurring problems that require additional maintenance and cleaning. The "hot spots" are primarily related to grease and diapers. The hot spot locations located by the City staff are listed below:

- Bencamp Street
- 420 Valley Blvd.
- St. Francis Street and Las Tunas Drive (sewer is very shallow)
- Walnut Grove and Las Tunas Drive
- Lincoln School, 600 East Grand Ave
- Bridge Street and Las Tunas Drive
- Vista Street and Las Tunas Drive

The City does not currently have a formal source control FOG program. FOG is controlled by an aggressive cleaning program of the sections of the system with known FOG problems. The success of this program is evidenced by the lack of sanitary sewer overflows (SSO's). This issue is also addressed in the recently prepared Sanitary Sewer Management Plan (SSMP) required by the State Water Resources Control Board. Reference to that document is made for further discussion on the current City policy regarding FOG and FOG programs

6.6 SANITARY SEWER OVERFLOW (SSO) HISTORY

There was one overflow responded to by the City of San Gabriel crew which occurred on January 12, 2008.

CHAPTER 7.0 METHODS OF REHABILITATION

Multiple methods are available to repair or replace aging or damaged sewers. Many trenchless methodologies are currently available that can minimize disturbances to the community during sewer repair or replacement. When evaluating the most effective repair techniques for the problem sewers in San Gabriel, Norris-Repke considered a variety of technologies that are commonly used for sewers of these sizes (8 to 15 inches). This section provides a brief overview of the available technologies.

7.1 CUT AND COVER REPLACEMENT

The most common method of sewer rehabilitation is cut and cover replacement (i.e.; dig and replace). The ground surface is excavated, the existing sewer is removed, and new pipe replaces the old. Cut and cover replacement has some significant drawbacks: It is very disruptive at the surface, utilities in the vicinity of the trench line need to be carefully protected, and traffic needs to be controlled around the construction. Costs of cut and cover replacement are equal to new sewer construction.

While cut and cover replacement causes significant surface disruption, it is perhaps the only way to correct collapsed pipes or sags and humps in the pipeline caused by differential soil settlement, seismic activity, undersize sewer, or major joint separation or defects. In other cases trenchless options are most desirable.

7.2 BURST AND INSERT

Pipe bursting allows pipe replacement without removing the existing pipe. A cone-shaped bursting tool is inserted into the existing pipe and pulled through the host pipe, breaking the old pipe material as the tool progresses forward. Attached to the bursting tool is a length of replacement pipe, usually high density polyethylene (HDPE) pipe. The entire length of replacement pipe is assembled above ground prior to busting. Laterals, if any, are excavated and reconnected in a separate operation, usually 24 hours after the pipe bursting operation. This 24-hour period allows the HDPE pipe material to relax, or contract to a stable length after being stretched. Because of the relaxation period, a sewer line can be replaced in approximately 24 hours. This requires bypassing of flow during that 24 hour installation period.

Pipe bursting can be used to replace pipe to its original size or to increase its diameter by up to two pipe sizes. It is most applicable on clay, cast iron, and un-reinforced concrete sewers because the bursting tool can easily break these materials.

7.3 PIPE LINING

Pipe lining is a process where a liner is inserted into the existing pipe and does not require removal of the existing pipe. The lining renews the interior surface of the existing pipeline and can even increase the structural capacity of the pipe. There are three basic types of pipe lining systems:

- Slip liners
- Fold and form, or thermoplastic liners.
- Cured-In-Place (CIPP), or thermoset liners.

Slip lining, in which an existing pipe is lined with a new, smaller diameter pipe (usually HDPE, PVC, or fiberglass), is generally reserved for and most effective on large diameter pipes 12” and greater. The disadvantage of lining smaller pipes is that they loose capacity. Therefore, this option was not considered for the pipes in City of San Gabriel.

Fold and form liners are PVC or HDPE that have been deformed to fit easily within a pipe. The fold and form liner is heated with hot water or steam to soften it. The softened liner is inserted into the sewer pipeline through a manhole; excavation is not required. Once inside the pipeline, heat and pressure are applied to expand the fold and form liner to its round shape. The liner is cooled to retain the round shape, fitting snuggly but not adhering to the host pipe wall. Fold and form liners are available under trade names such as AM Liner and U Liner.

Cured-in-place liners are cloth-like fiber shells impregnated with a thermosetting resin. Once the resin cures, it gives the liner rigidity and corrosion resistance. The installation of a cured-in-place liner is a three-step process. Prior to transporting the liner to the site, the resin is applied to the inside of the liner tube. Once onsite, the liner is inserted into the existing pipe through a manhole. The liner is filled with water and the hydrostatic pressure forces the liner to invert into the pipeline. The water in the liner is then heated and circulated to cure the resin. When properly cured, the liner is a rigid pipe-within-a-pipe, mechanically bonded to the host pipe interior. Cured-In-Place (CIPP) liners are available under trade names such as Insituform and Cure Line.

Lateral connections can be restored internally or externally after pipelining for fold and formed and cured-in-place methods. Internal lateral restoration is done by a remote controlled cutting tool. The tool is accurately placed using a closed circuit television inspection camera to view the dimple left by the lateral opening during the curing process. The cutting tool removes the liner material and can restore as much as 95 percent of the lateral

area. External restorations use the traditional cut and cover methods to expose the lateral from the outside of the pipe. Once exposed, a new lateral connection can be strapped on, epoxied, or welded to the liner material. If the lateral connections are restored internally, pipelining eliminates the need for excavation.

Depending on the flow rates in the sewer and the time required to line the pipe, bypass pumping to maintain sewage flow may be required during the lining process.

7.4 POINT REPAIRS

In some cases the problems with existing sewers are limited to one or two locations along the pipeline. In these instances, point repairs may be the most economical rehabilitation choice. Point repairs are also required on a sewer segment to be lined where the lining may be compromised by the condition at a specific location. In these cases the point repair is performed prior to the lining process. Point repairs can include:

- Cut and cover replacement of short segments.
- Internal repair fittings.
- Chemical grouting.
- Lateral connections.

Cut and cover replacement of short segments involves excavation to expose a portion of the existing pipe, which is cut and removed. The new segment replacing the old is connected to the existing pipe with flexible couplings. The replacement pipe is generally the same material as the existing pipe but other materials can be used. The flexible couplings are typically PVC with stainless steel bands.

Newer methods of point repair rehabilitation are trenchless or excavation-less in nature. Internal repair clamps are offered by a number of manufacturers in two basic types: mechanical and cure-in-place. Mechanical internal repair clamps use a sheet metal sleeve that is placed over the repair area and expanded into place. The sleeve has locking tabs to prevent it from collapsing once installed. The portion of the sleeve in contact with the pipe is often coated with a hydrophilic chemical to seal leaks. Cure-in-place internal repair clamps use an ambient temperature cure resin impregnated in a short fiber cloth tube, much like cure-in-place liners. The cure-in-place internal repair clamp is placed over the effected area and expanded into place with an air-filled bladder. The bladder is left in place for a prescribed time to allow the resin to cure.

Chemical grouting offers another trenchless point repair method. Chemical grouts are typically hydrophilic polymers that can be injected into cracks and leaking joints on sewer pipes. Specially designed remote-controlled

devices called packers place the chemical grout inside the pipe. A bladder expands on the packer and chemical grout short distances into lateral connections.

Trenchless technologies also offer repair solutions for re-connecting recessed laterals to the main line. A remote-controlled machine inserts a temporary collar into the lateral opening. A bladder is used to inject grout into the cavity between the collar and the lateral to seal the connection. The temporary collar is then removed by remote-controlled machine and can be used at another location.

CHAPTER 8.0 – INFILTRATION AND INFLOW

8.1 INTRODUCTION

Infiltration and Inflow (I&I) caused by rainfall runoff place an additional burden on the City sewer system as well as the downstream sewage treatment facilities of the Los Angeles County Sanitation District. This additional flow combined with the usual daily peak flows can result in Sanitary Sewer Overflows (SSO's) if the resultant sewage flow exceeds pipe system capacities.

Infiltration is defined as rainfall runoff that percolates through the soil and enters the pipe system through open joints, poor lateral connections, cracked pipe and damaged manholes.

Inflow is rain runoff that enters the sewer system through loose fitting manhole covers or pick holes and also from illegal connection into sewer laterals and mains from roof and yard drainage. These types of connections are generally more prevalent in commercial and industrial areas as owners look for an inexpensive method of disposing of damage causing runoff.

A comprehensive I&I study is beyond the scope of this Master Plan document and generally consists of the following:

- Dividing the sewer collection system into discrete basins
- Simultaneously monitoring the flow from each basin for eight (8) weeks during the rain season to obtain dry and wet weather flows.
- Set rain gauges in each basin to obtain rainfall data and correlate the rainfall to the wet weather flows.
- Perform analysis of rainfall impact on the sewage flow. Basins with 5% or less leakage are considered reasonably tight.
- Perform hydraulic analysis at each flow-monitoring site to determine capacity deficiencies. In general basins with flows greater than 25% of average daily dry flows are considered to have excessive I&I.

Cities with significant inflow or infiltration will often experience capacity deficiencies in the system during periods of high rainfall. Some I&I is to be expected in any system and the system design accounts for it. The condition becomes critical when the capacity deficiencies reach levels that cause overflows at the manholes. According to the City sewer maintenance staff and verified by the lack of SSO's the San Gabriel system does not have a significant problem at this time. However, as pipes age more joint problems and pipe failures can occur and this can result in additional infiltration. In the event this condition should start to be a problem in the future it is recommended a I&I study be prepared

Even if the City of San Gabriel does not have a significant I/I it is recommended that the City establish a goal to reduce inflow and infiltration to assist the regional

significance of this problem. The elements of recommended City I&I reduction plan include the following:

- Identify areas of storm water flooding and the association to local sewer pipes and manholes. Seal manhole covers and plug pick holes in these areas.
- Complete the CCTV of the City sewer system to locate pipes subject to infiltration
- Develop sewer maintenance records system to identify and log potential I/I problem areas.
- Develop a public information program to make the public aware that storm water runoff discharged to the sewer system is illegal.
- Plug sewer manhole Lids

CHPATER 9.0 – FATS, OILS AND GREASE CONTROL

9.1 GENERAL

Excessive fats, oils and grease (FOG) can cause serious problems for a sewer system and is a significant cause of sanitary sewer overflows (SSO's). Accumulated FOG reduces the capacity of sewer mains and the need for frequent removal increases maintenance costs. The majority of FOG production has been associated with food service establishments.

9.2 FOG CONTROL PROGRAM

Because of the FOG problem and the potential impact of SSO's on water quality the State Water Resources Control Board (SWRQB) included consideration of a FOG control program in its order (Order No. 2006-003). This Order requires each sewer collection agency to develop a Sewer System Management Plan (SSMP) to develop measures to prevent, cleanup and report SSO's.

The SWRQB Order requires the City to determine if it has a FOG problem and if so determined to develop a FOG control program to minimize the impacts of FOG on the system and potential SSO"s. The City, as well as most California cities, currently does not have a formal FOG control program. However, based on information obtained from this master plan as well as input from City staff indicates the City may have, to some degree, a FOG problem although SSO's in the City have been small. This could be due to the excellent "hot spot" maintenance program the City has developed to prevent them.

Determination of the need for a FOG control program as well as development of the program is addressed in Volume IV WDR.

CHAPTER 10.0 – STATE SANITARY SEWER OVERFLOW (SSO) & WASTE DISCHARGE REQUIREMENTS (WDR) PROGRAMS

In order to address the requirements of the Federal Clean Water Act regarding the reduction of Sanitary Sewer Overflows (SSO's) impact on natural streams, rainwater channels and ground water, the State Water Resources Control Board (SWRCB) adopted Order No. 2006-003 on May 2, 2006. The order addressed Statewide General Waste Discharge Requirements (WDR) for sewage collection systems and requires each sewer agency to monitor and report all SSO's to the State as well as prepare and adopt a Sewer System Management Plan (SSMP).

The WDR and reporting program addresses SSO reporting and proper collection system management and operation necessary to protect public health, water quality, and the public's investment in the sewer system infrastructure.

The elements of the SSMP and the required completion dates for the City of San Gabriel are:

ELEMENT		DUE DATE
1	**Goal** Section D 13 (i)	Nov. 2, 2007 (completed)
2	**Organization** Section D 13 (ii)	Nov. 2, 2007 (completed)
3	**Legal Authority** Section D 13 (iii)	August 2, 2009
4	**Operation & Maintenance Program** Section D 13 (iv)	August 2, 2009
5	**Overflow Emergency Response Program** Section D 13 (vi)	August 2, 2009
6	**FOG Control Program** Section D 13 (vii)	August 2, 2009
7	**Design & Performance Provisions** Section D 13 (v)	August 2, 2009
8	**System Evaluation & Capacity Assurance Plan** Section D 13 (viii)	August 2, 2009
9	**Monitoring & Program Modifications** Section D 13 (ix)	August 2, 2009
10	**Program Audits** Section D 13 (x)	August 2, 2009
11	**Communication Program** Section D 13 (xi)	August 2, 2009
	Final SSMP Implementation	August 2, 2009

The Sewer System Management Plan (SSMP) is being developed to meet State's Waste Discharge requirements along with submittal schedules are included in Volume IV.

CHAPTER 11.0 – CAPITAL IMPROVEMENT PROGRAM

11.1 INTRODUCTION

The primary goal of the Capital Improvement Plan (CIP) is to provide the City of San Gabriel with a long range planning tool for prioritizing and implementing its sewer infrastructure improvements in an orderly manner as well as providing a basis for developing a financing plan for accomplishing these improvements. To accomplish this goal, the program is phased based upon implementing priorities and considering the implementation cost of the recommended improvements. The goal is to address the priorities and limit the improvements to an amount of work the City of San Gabriel can fund and administer each year.

Out of the existing City's land use excluding streets, flood channels, and railways; two thirds (2/3) is occupied by single, multi, and group housing units. The required improvements in the Mission Specific Plan, Valley Blvd Specific Plan and Redevelopment Agency (RDA) areas are for proposed densities. As discussed in Chapter 5.0, Section 5.5 "Hydraulic Analysis" the sewer flow generations are not significantly different for these two conditions.

All improvements on the existing system can be categorized into three (3) categories: hydraulic deficiencies, pipe condition deficiencies and FOG problems.

11.2 CAPACITY UPGRADES

To mitigate the hydraulically deficient sewer mains shown in Exhibit 6, there are two options. Either replace the deficient sewer with a larger sewer main or parallel the existing main with relief sewer. In this section, the sewer segments where improvements need to be made are evaluated. In addition this section describes the criteria used for developing the CIP and presents the recommended program, its phasing and estimated cost.

The proposed CIP addresses the capacity deficiencies in the existing sewer system that would occur based on the City's General Plan. The pipeline reaches have been grouped together and prioritized into projects. The projects were grouped together based on location, logical construction order, size of upstream pipes, size of downstream pipes and location. For the purpose of establishing this CIP, it is assumed that the projects are for the construction of replacement sewer pipes. Consideration and evaluation of other alternatives such as relief parallel lines or diversions should be made at the project pre-design stage.

The acceptable flow depth to pipe diameter ratio d/D used for sizing of all new sewers is 0.5 for pipe 12 inches and smaller in diameter and 0.75 for pipes larger than 12 inches in diameter. The roughness factor, Manning's "n" of 0.013 is used for new pipes as compared to 0.015 for existing pipes. The slopes for new pipes are assumed to be the same as the average slope of the existing sewers. The minimum and maximum sewer line velocity of 2 and 10 feet per second respectively have been assumed.

The construction costs used are those costs the City of San Gabriel will find to be applicable for construction activities in their area.

Table 11-1 lists the unit construction costs for upsizing the sewer lines. These costs are for the cut and cover replacement (option described in Chapter 7.1) construction and installation work. Engineering Design and Construction Management and Administration costs are also estimated. For the purpose of this report, cut and cover replacement has been used because it is the most common method of sewer size upgrading. It is conservative to use this option because the cost of cut and cover is equal to new construction. It is also the only method to correct collapsed pipe or humps, major joint separation or defects. The Design cost of 10%, Construction Management cost of 15% and Administration costs of 5% has been assumed. The lifetime operation and maintenance costs are **not** included.

Table 11-1
SEWER PIPELINE ESTIMATED UNIT CONSTRUCTION COSTS
FOR
CAPACITY UPSIZING

Diameter (inches)	Cost/L.F.* $	Design, Construction Management & Administration	Total Cost/LF* ($)
10"	200	60	260
12"	250	75	325
15"	300	90	390
18"	350	105	455
21"	410	125	535

*** Theses costs are in 2010 dollars**

Based on hydraulic analysis described in Chapter 5.5, the capacity related projects have been identified. The recommended CIP highlights the recommended projects. The required CIP projects to correct the capacity deficiencies have been prioritized in Table 11-2 below. The order of construction should be based on this prioritization.

Table 11-2
COST ESTIMATE OF SYSTEM CAPACITY DEFICIENCIES

Description	Length (Ft)	Cost $
1. <u>San Gabriel Blvd.</u>		
- Low Priority	830	215,800
- Medium Priority	0	0
- High Priority	8116	3,012,685
2. <u>Del Mar Ave.</u>		
- Low Priority	1269	368,940
- Medium Priority	0	0
- High Priority	0	0
3. <u>Stuhr/Arroyo/Ramona St.</u>		
- Low Priority	2515	880,100
- Medium Priority	2355	806,325
- High Priority	0	2,833,675
4. <u>San Marino Ave.</u>		
- Low Priority	310	80,600
- Medium Priority	265	68,900
- High Priority	0	0
5. <u>Walnut St./Lafayette St.</u>		
- Low Priority		
- Medium Priority	1260	327,600
- High Priority	330	85,800
	0	0
6. <u>West of Del Mar Ave.</u>		
- Low Priority	0	0
- Medium Priority	0	0
- High Priority	7970	3,433,825
7. <u>Santa Anita St. /Broadway</u>		
- Low Priority	2532	802,750
- Medium Priority	505	131,300
- High Priority	0	0

Summary of Capacity Related Projects Costs

Low Priority	**=**	**$2,675,800**
Medium Priority	**=**	**$1,092,300**
High Priority	**=**	**$9,280,200**
Total	=	**$13,048,300**
Contingencies at 25%	**=**	**$3,262,075**
GRAND TOTAL	**=**	**$16,310,400**

11.3 IMPACT OF SAN GABRIEL TRENCH PROJECT

The lowering of the railroad through the City(trench project) is currently in the planning stage. The midblock (between Ramona Ave and Del Mar Ave) sewer flows of the City's system will be diverted to County lines. This change will have impact on the hydraulic capacity of some of the City sewer lines south of the railroad. Once the project is finalized the Sewer Master Plan shall be revised to reflect these changes.

11.4 STRUCTURAL CONDITION REPAIRS

The projects are, in general, rehabilitation of the existing pipe and manhole system. They are considered maintenance and repair of the existing deficiencies such as fractures, cracks, joint dislocation, sag, and root intrusion. It also includes CCTV investigation for the balance of (86%)the City's sewer collection system.

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Most of the manholes are constructed of bricks and their condition is not known. In order to undertake rehabilitation, a condition survey has to be performed. There are a number of products and techniques available to rehabilitate the existing manholes. Some of these techniques are:

1. Sealing of manhole with chemical grout if the manhole is structurally sound.
2. One-piece monolithic unit to be installed inside the existing manhole
3. Poured-in-place concrete manhole liners
4. Cured-in-place liners
5. Cementitious coatings/grouts
6. Polymer coatings/gouts
7. Mechanical seals/inserts

The actual technique to be applied to rehabilitate the sewer system manholes will be determined after the manholes are thoroughly inspected.

The condition repair projects are shown on Exhibit 11-2. A full size map of this exhibit is also included in the back pocket of this report.

The rehabilitation of the deficient sewer mains due to structural condition is assumed to be the installation of cured-in-place liners. The unit cost of the liners is shown in Table 11-3 below.

Table 11-3

Estimated Unit Cost of Cured-in-Place liner

Diameter (inches)	Cost/LF* ($)	Design, Const. Management, and Admin. Cost / L.F. ($)	Total Cost/ L.F. ($)
8	35	10	45
10	45	15	60
12	55	20	75
15	65	20	85
18	80	25	105
21	95	30	125
24	110	35	145
36	160	50	210

***These costs are in 2010 dollars**

Table 11-4 shows condition repair projects and their cost based on CCTV inspection of 10 miles (13.88%) of system and extended costs for the entire City sewer system. The estimated cost for the inspection and subsequent rehabilitation of the manholes is also included in Table 11-4.

Table 11-4

STRUCTURAL CONDITION REPAIR PROJECTS AND COSTS

I Pipe Repairs			
Description	Size (Inches)	Length (Feet)	Cost ($)
DVD #1 Low Priority			
MH #539R To MH #870R	8	472	21,240
MH #115A To MH #117R	8	364	16,380
MH #1185 To MH #1186	8	170	7,650
MH #1189 To MH #1192	8	198	8,910
MH #329 To MH #320	12	344	*
MH #265 To MH #472	12	273	20,475
		Subtotal	$74,655
Medium Priority			
MH #221 To MH #235	8	340	15,300
MH #235 To End	8	197	8,865
MH #696 To MH #697	8	237	10,665
MH #1182 To MH #1183	8	286	12,870
MH #1186 To MH #1187	8	358	16,110
MH #1190 To MH #1191	8	193	8,685

MH #700 To MH #329	12	151	*
MH #425 To MH #265	12	520	*
MH #472 To MH #286	12	396	*
MH #286 To MH #770	12	338	*
MH #819 To MH #818	8	297	*
MH #818 To MH #816	8	297	*
		Subtotal	$72,495
DVD#2			
Low Priority			
MH #772 To MH #773	12	338	*
MH #776 To MH #777	12	401	*
MH #849 To MH #856	12	85	*
MH #855 To MH #856	8	354	15,930
MH #842 To MH #747A	8	150	6,750
		Subtotal	$22,680
Medium Priority			
MH #770 To MH #771	12	338	*
MH #771 To MH #772	12	338	*

*** Included in the Capacity Deficiency CIP**

MH #774 To MH #775	12	255	*
MH #775 To MH #776	12	416	*
MH #777 To MH #778	12	401	*
MH #778 To MH #849	12	329	*
MH #847 To MH #848	8	289	13,005
MH #848 To MH #849	8	301	13,545
MH #854 To MH #855	8	109	4,905
MH #856 To MH #917	12	521	*
MH #917 To MH #862	12	523	*
MH #739A To MH #739	8	303	13,635
MH #739 To MH #817A	8	166	7,470
MH #817A To MH #841	8	295	13,275
MH #841 To MH #842	8	303	13,635
MH #152 To MH #153	8	230	10,350
MH #153 To MH #730	8	228	10,260
MH #807 To MH #806	8	322	14,490
MH #807 To MH #808	8	379	17,055
MH #808 To MH #809	8	215	9,675
MH #809 To MH #810A	8	379	17,055
		Subtotal	$158,355
High Priority			
MH #855 To MH #854	8	243	8,505

		Subtotal	$8,505
DVD#3			
Low Priority			
MH #194 To MH #193	8	406	18,270
MH #194 To MH #621	8	188	8,460
MH #188 To MH #187	8	348	15,660
MH #189 To MH #190	8	364	16,380
MH #71 To MH #72	8	299	13,455
MH #594A To MH #594	8	266	11,970
MH #641 To MH #636	10	213	*
		Subtotal	$84,195
Medium Priority			
MH #555R To MH #621	8	90	4,050
MH #555R To MH #619	8	298	13,410
MH #619 To MH #198	8	337	15,165
MH #198 To MH #618	8	422	18,990
MH #618 To MH #615	8	420	18,900
MH #189 To MH #188	8	364	16,380
MH #190 To MH #191	8	368	16,560
MH #191 To MH #192	8	350	15,750
MH #192 To MH #193	8	328	14,760

*** Included in the Capacity Deficiency CIP**

MH #615 To MH #616	8	368	16,560
MH #84 To MH #69	8	407	18,315
MH #69 To MH #70	8	414	18,630
MH #70 To MH #71	8	414	18,630
MH #594 To MH #690	8	278	12,510
MH #690 To MH #700	8	371	16,695
MH #640 To MH #641	10	419	25,140
MH #592 To MH #593	10	523	*
		Subtotal	$126,480
DVD#4			
Low Priority			
MH #468 To MH #288	10	403	*
MH #222 To MH #559	10	387	*
MH #559 To MH #558	10	373	*
MH #557 To MH #556	10	373	22,380
MH #556 To MH #644	12	270	*
MH #646 To MH #658	12	295	*
MH #500 To MH #499	12	403	*

		Subtotal	$22,380
Medium Priority			
MH #384 To MH #426B	8	183	8,235
MH #426B To MH #426	8	163	7,335
MH #426A To MH #430	8	77	3,465
MH #649 To MH #592	10	238	*
MH #558 To MH #557	10	373	*
MH #644 To MH #562	12	302	*
MH #562 To MH #645	12	163	*
MH #658 To MH #502	12	192	*
MH #499 To MH #498	10	382	*
MH #497 To MH #496	10	238	*
MH #495 To MH #494	10	335	*
MH #494 To MH #493	10	338	*
MH #492 To MH #491	10	467	28,020
MH #913 To MH #914	12	355	*
MH #913 To MH #490	12	369	27,675
		Subtotal	$74,730
DVD#5			
Low Priority			
MH #502 To MH #501	12	404	*
MH #811 To MH #229	12	182	*
MH #226 To MH #227	15	180	15,300
MH #516 To MH #518	12	323	24,225
MH #729 To MH #729B	12	260	19,500
MH #729B To MH #729A	12	119	8,925

*** Included in the Capacity Deficiency CIP**

MH #860 To MH #859B	18	271	28,455
MH #859B To MH #859A	18	147	15,435
MH #636 To MH #635	10	433	25,980
MH #370 To MH #353	8	374	16,830
		Subtotal	$154,650
Medium Priority			
MH #914 To MH #1050	12	518	38,850
MH #1050 To MH #740	12	490	36,750
MH #745 To MH #746	12	438	*
MH #748 To MH #747	12	433	*
MH #501 To MH #500	12	404	30,300
MH #496 To MH #446	12	226	16,950
MH #446 To MH #490	12	269	*
MH #1079 To MH #1080	8	59	2,655

MH #730 To MH #731	12	374	28,050
MH #227 To MH #865	15	201	17,085
MH #108 To MH #858	18	531	55,755
MH #858 To MH #862	18	681	71,505
MH #1081 To MH #1080	8	259	11,655
MH #1080 To MH #1079	8	35	1,575
MH #384 To MH #370	8	174	7,830
		Subtotal	$318,960
High Priority			
MH #514 To MH #516	12	81	6,075
		Subtotal	$6,075
Cost Summary of Structural Condition Repair Projects			
		Low Priority	$358,560
		Medium Priority	$751,020
		High Priority	$14,580
		Cost for 13.88% of the System	$1,124,160
		Extended cost of repairing the entire sewer system.	
		SUB TOTAL	$8,099,135
II. CCTV of remainder of 327,000 feet (62 miles) of collection system. $1.75/LF			575,000
III. Manhole			
		(i) Inspection of 1305 manholes	100,000
		(ii) Repairs of at least 500 manholes, installation of inserts or lining @ $5000 each	2,500,000
Total Structural Condition Repair Projects			**$11,274,135**
		Contingencies at 25%	$2,818,534
		Grand Total	$14,092,669

*** Included in the Capacity Deficiency CIP**

CHAPTER 12.0 FINANCING FOR RECOMMENDED CIP

12.1 INTRODUCTION

The City of San Gabriel is a full service city with a population of approximately 42,762 and covers about 4.13 Square Miles of residential, commercial, and industrial areas. The City's existing sewer collection system is made up of a network gravity system. The gravity system consists of approximately 75 miles of pipes and 1305 manholes.

12.2 FUNDS NEEDED

The Capital Improvement Program recommended by the Sewer Master Plan is described in Chapter 11.0, Table 11-2 & Table 11-4. The following is the summary of the program costs:

Table 12-1
COST SUMMARY

Description	Cost $
Capacity Deficiency Projects	16,310,400
Structural Condition Repair Projects	14,092,700
Implementation of WDR	100,000
SUBTOTAL	30,503,100
Annual System Maintenance & Operation	350,000/year

12.3 REVENUE

The City of San Gabriel currently collects a Sewer Connection Fee for new connections to the system as well as a Sewer Impact Fee. The Impact Fee was adopted in November 16, 2004 and is collected for new developments that are increasing existing density and discharge to deficient downstream systems . It is based on the proposed developments share of upgrading the deficient downstream system that it discharges to. Revenues from both of these fees are modest. Operation and maintenance of the City sewer system is primarily funded from the City General Fund. To fund the recommended capacity and condition deficiencies significant additional revenue will be required. The following provides a brief description of the common methods used to fund sewer system improvements.
Sewer User Charge – Adoption of a User Charge to cover the costs of and maintenance of the entire system, the SSMP provides a brief description of the common methods used to fund sewer system improvements.

1. <u>Sewer User Charge</u>
   Adoption of a User Charge to cover the costs of annual operation and maintenance of the entire system, the SSMP requirements and

also fund sewer system rehabilitation and capacity upgrade costs. Development of a User Charge can be a complicated issue and requires a separate study. Issues to be addressed in the study include:

- Costs to be paid for by the User Charge
- Will the User Charge be applied to each parcel, water user or other?
- Should the charge vary by sewer drainage area or be City wide?
- Will the Charge be a flat annual amount that varies by land use, based on water usage (difficult if City is not water purveyor) or other method?
- Method of collection (City invoicing, with property tax, with water billing or other)
- Number of years improvements to be spread over
- This revenue source has become popular among many southern California Cities over the past few years. Considerable discussion with the City Management staff, City Attorneys Office and City Council is required prior to starting the study to receive needed direction so a focused study can be accomplished.

2. Sewer Impact Fee

A Sewer Impact Fee, similar to the one currently in place, can be used to charge new development for their share of improving downstream capacity deficient systems used by the development. Care must be taking in developing this fee if a User Charge is in place that it does not charge a parcel twice for making the same improvements.

3. Bonds

An interest bearing promise to pay a stipulated sum of money with the principal due on a specific date. Funds raised through sale of bonds can be used for the improvement and maintenance of the City's sewer system.

4. Special Assessments

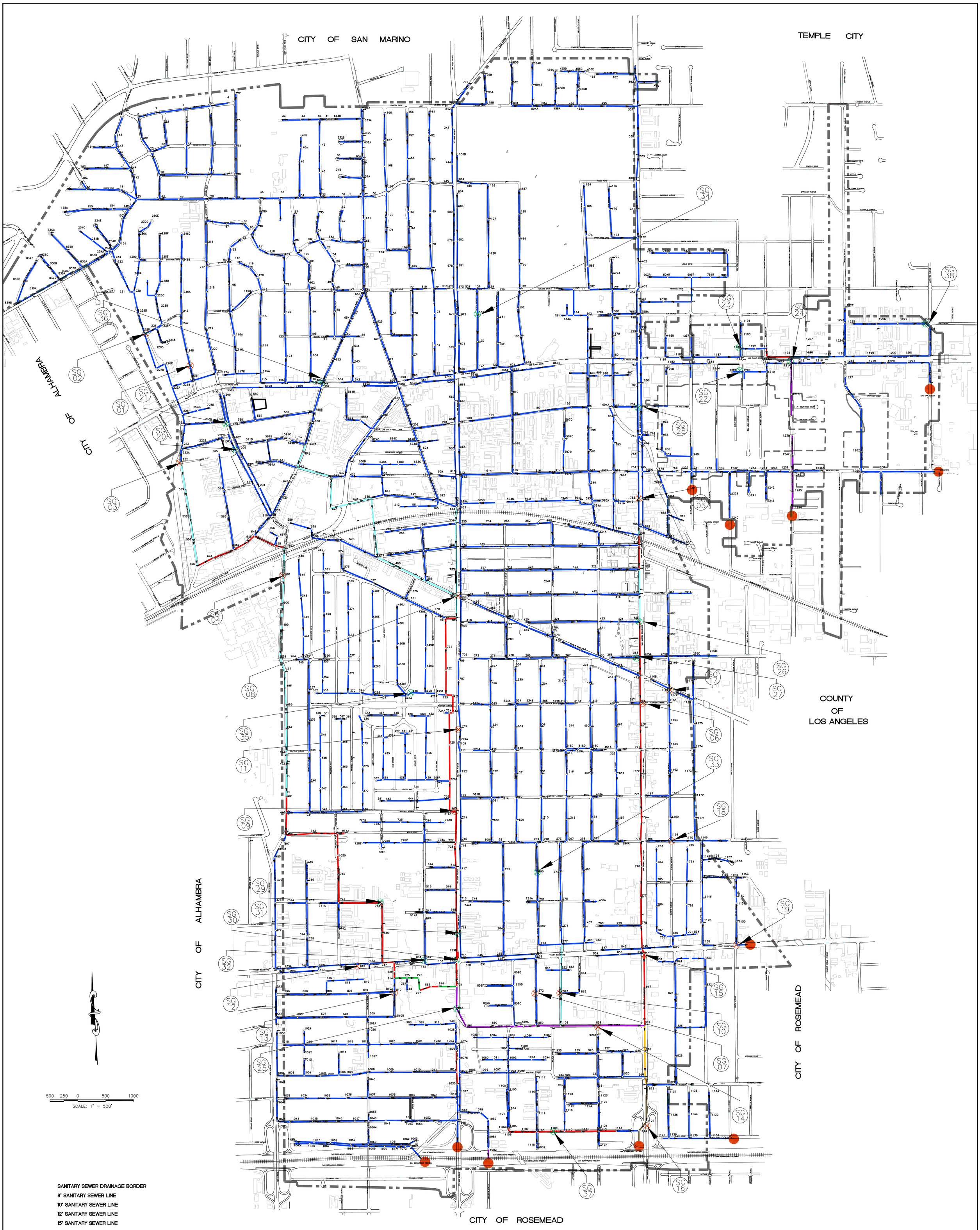
A financing mechanism to fund improvement and maintenance of the infrastructure. All benefiting properties are charged their fair share to fund.

5. General Fund

The revenue currently collected by the City in the form of fees, assessments, sales tax, etc. for services other than sewer provided by the City.

6. Grants
   Federal or State Funds to be received by the City for the improvements and maintenance of the sewer system.

It is recommended that the City consider these methods and determine which ones to study further so a complete financing plan can be developed.



SANITARY SEWER DRAINAGE BORDER
8" SANITARY SEWER LINE
10" SANITARY SEWER LINE
12" SANITARY SEWER LINE
15" SANITARY SEWER LINE
18" SANITARY SEWER LINE
21" SANITARY SEWER LINE
24" SANITARY SEWER LINE
UNKNOWN SIZE SANITARY SEWER LINE
SANITARY SEWER FLOW METER (2000)
SANITARY SEWER FLOW METER (2000-2008)

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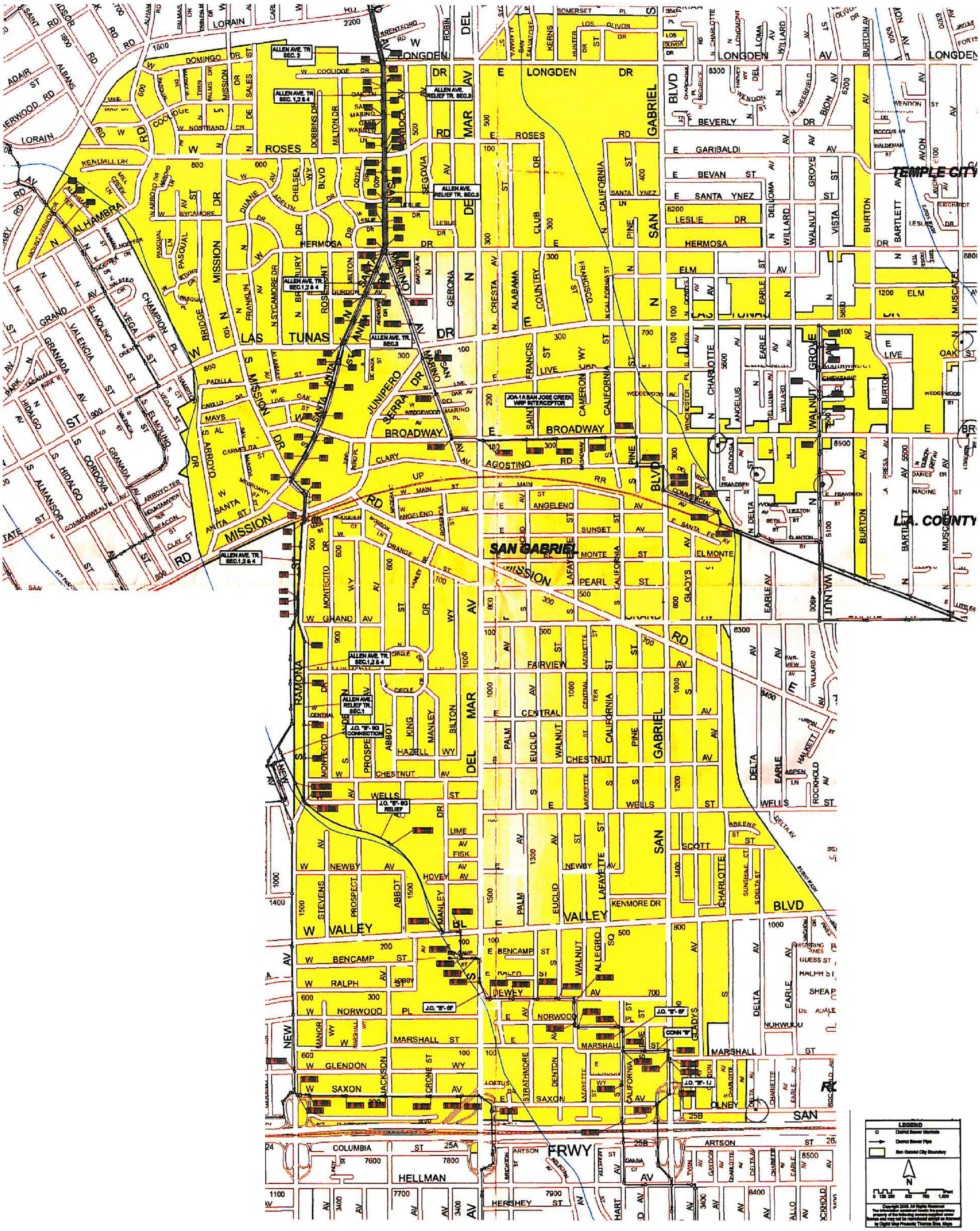
MASTER PLAN OF SEWERS

SANITARY SEWER MAP

CITY OF SAN GABRIEL

EXHIBIT 2-1



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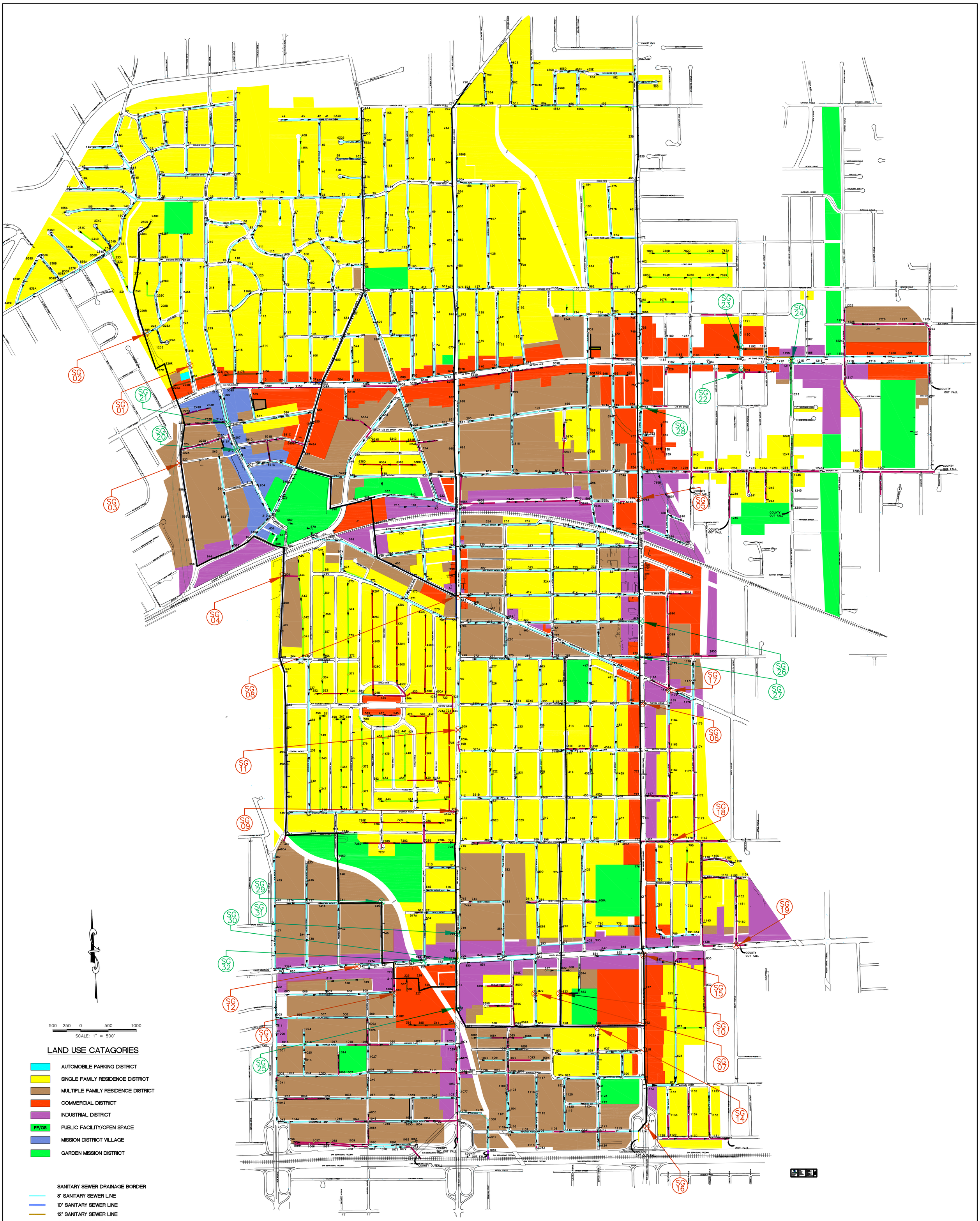
SEWER MASTER PLAN

LACSD SEWER SYSTEM IN CITY OF SAN GABRIEL

CITY OF SAN GABRIEL

City of San Gabriel

EXHIBIT 2-2



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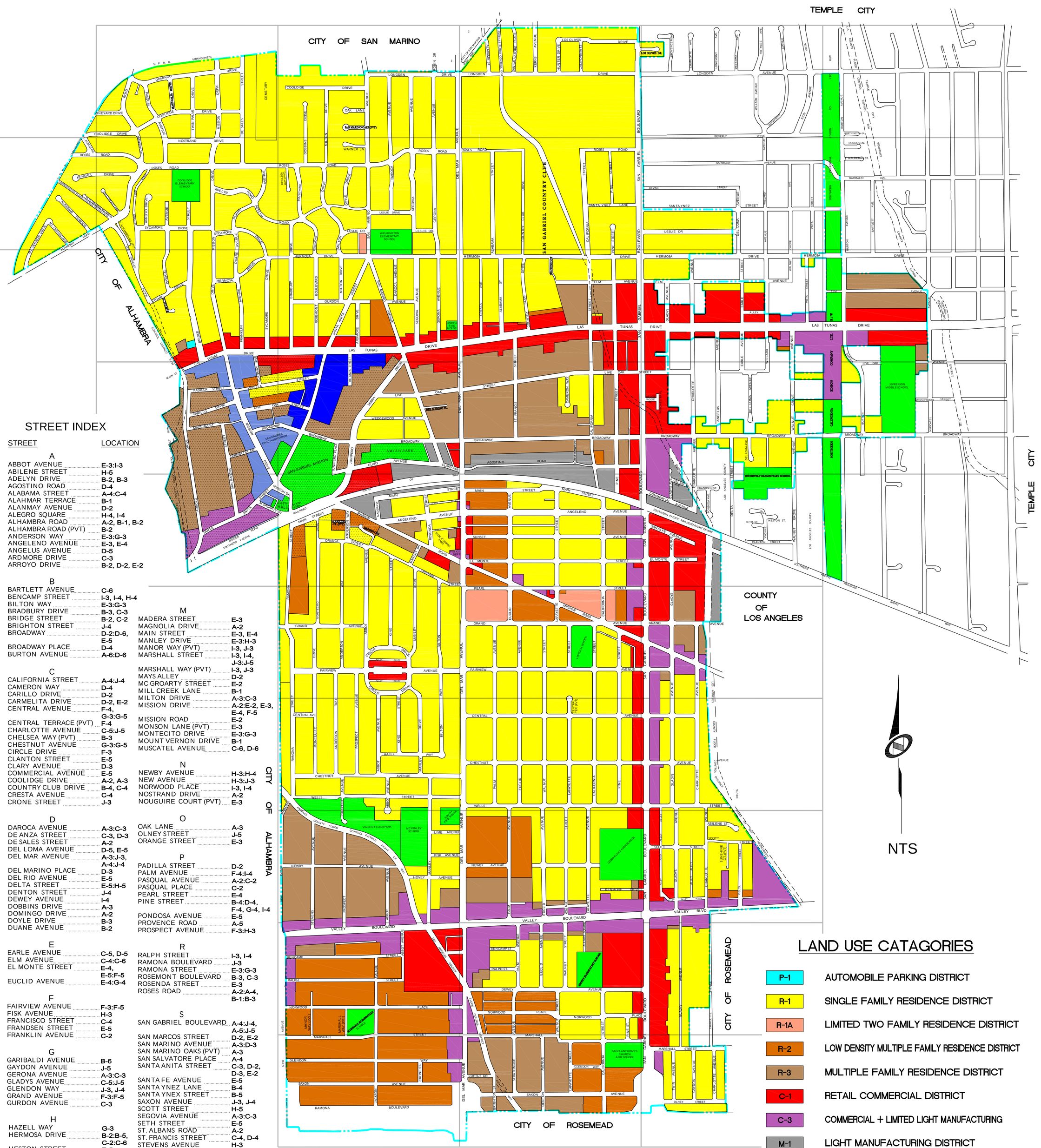
SEWER MASTER PLAN

LAND USE MAP

CITY OF SAN GABRIEL

City of San Gabriel

EXHIBIT 4-1



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LAND USE CATAGORIES

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R-1A	LIMITED TWO FAMILY RESIDENCE DISTRICT
R-2	LOW DENSITY MULTIPLE FAMILY RESIDENCE DISTRICT
R-3	MULTIPLE FAMILY RESIDENCE DISTRICT
C-1	RETAIL COMMERCIAL DISTRICT
C-3	COMMERCIAL + LIMITED LIGHT MANUFACTURING
M-1	LIGHT MANUFACTURING DISTRICT
PF/OS	PUBLIC FACILITY/OPEN SPACE
MD	MISSION DISTRICT VILLAGE
	R-3 ARROYO RESIDENTIAL
	R-2 GRAPEVINE RESIDENTIAL
	R-1 VILLA RESIDENTIAL
	GARDEN MISSION DISTRICT
	C-3 THE MILL
	C-1 THE MARKET PLACE
MF	MEDICAL FACILITY

REVISED: JULY/2006

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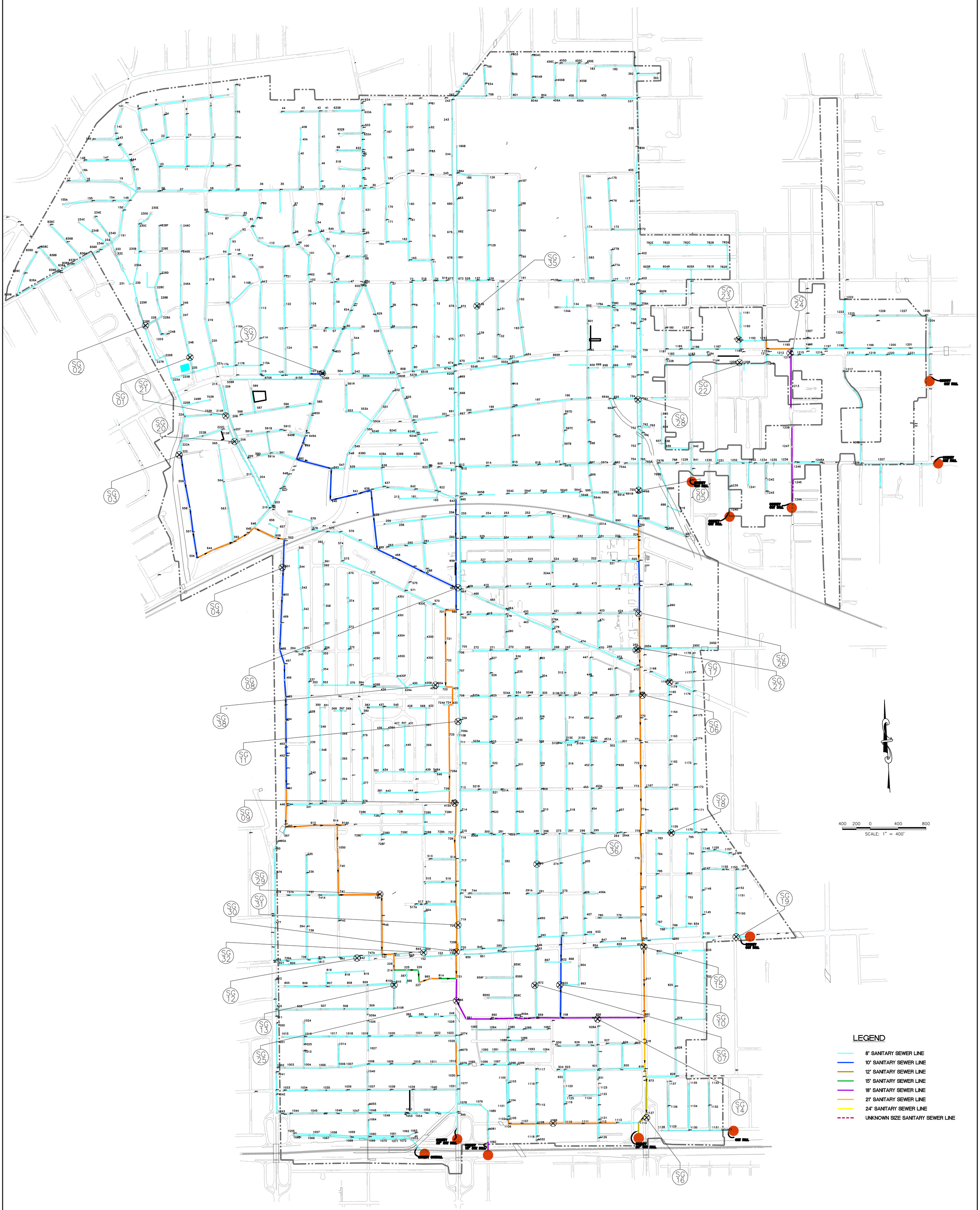
SEWER MASTER PLAN

ZONING MAP

CITY OF SAN GABRIEL

City of San Gabriel

EXHIBIT 4-2



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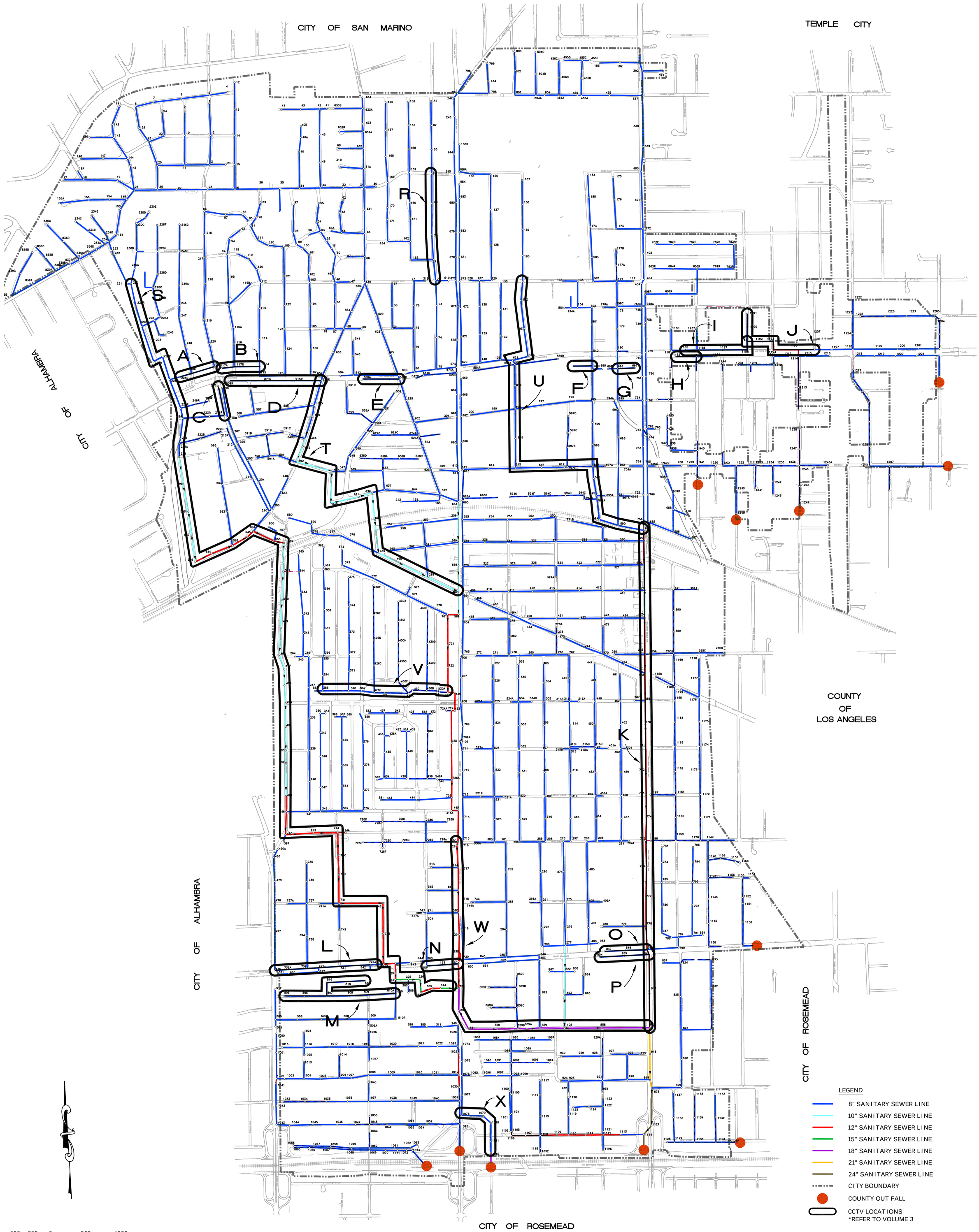
MASTER PLAN OF SEWERS

FLOW MONITOR LOCATIONS

CITY OF SAN GABRIEL

EXHIBIT 5-1



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SEWER MASTER PLAN

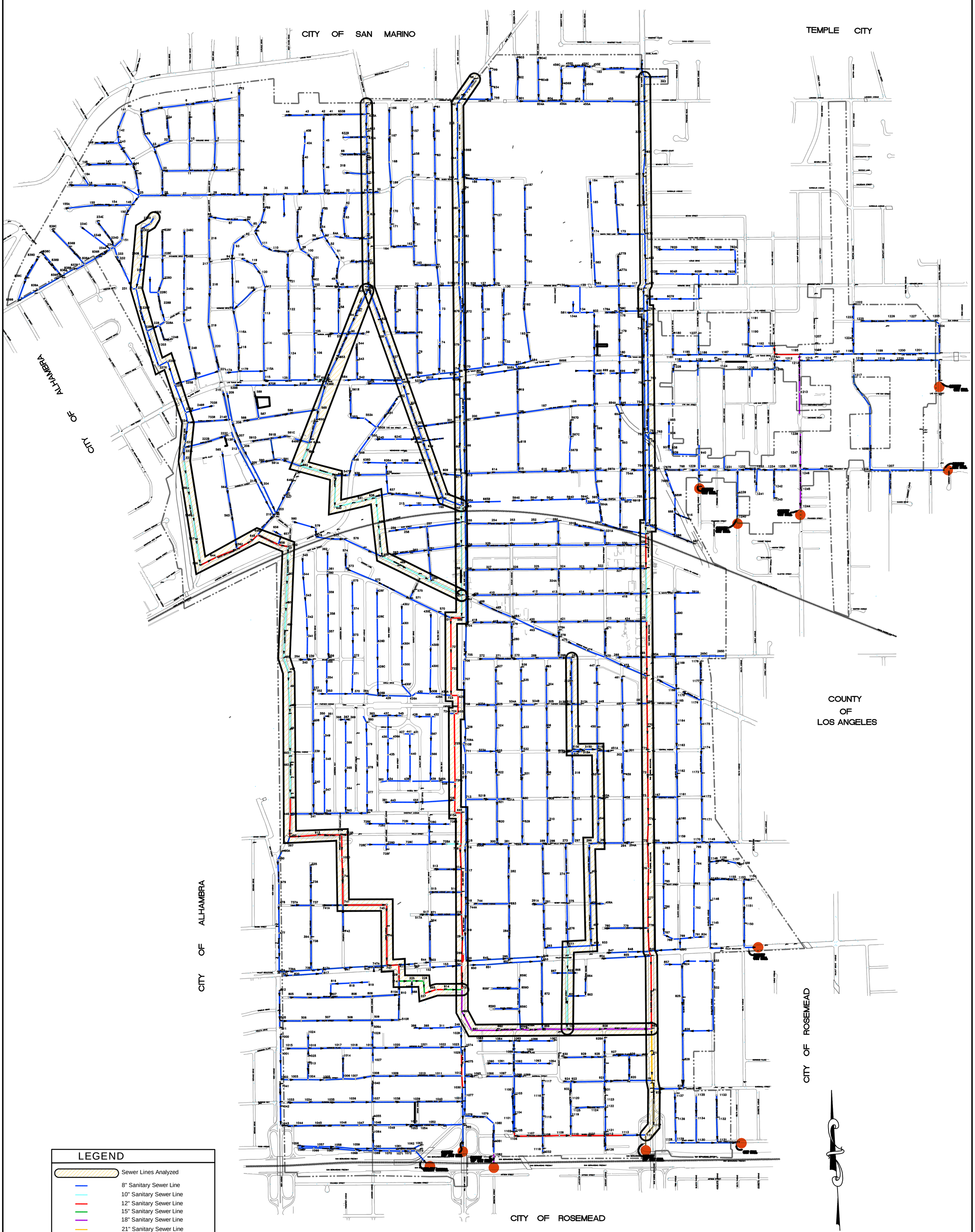
CCTV LOCATIONS

(2009 UPDATE)

CITY OF SAN GABRIEL

City of San Gabriel

EXHIBIT 6-1



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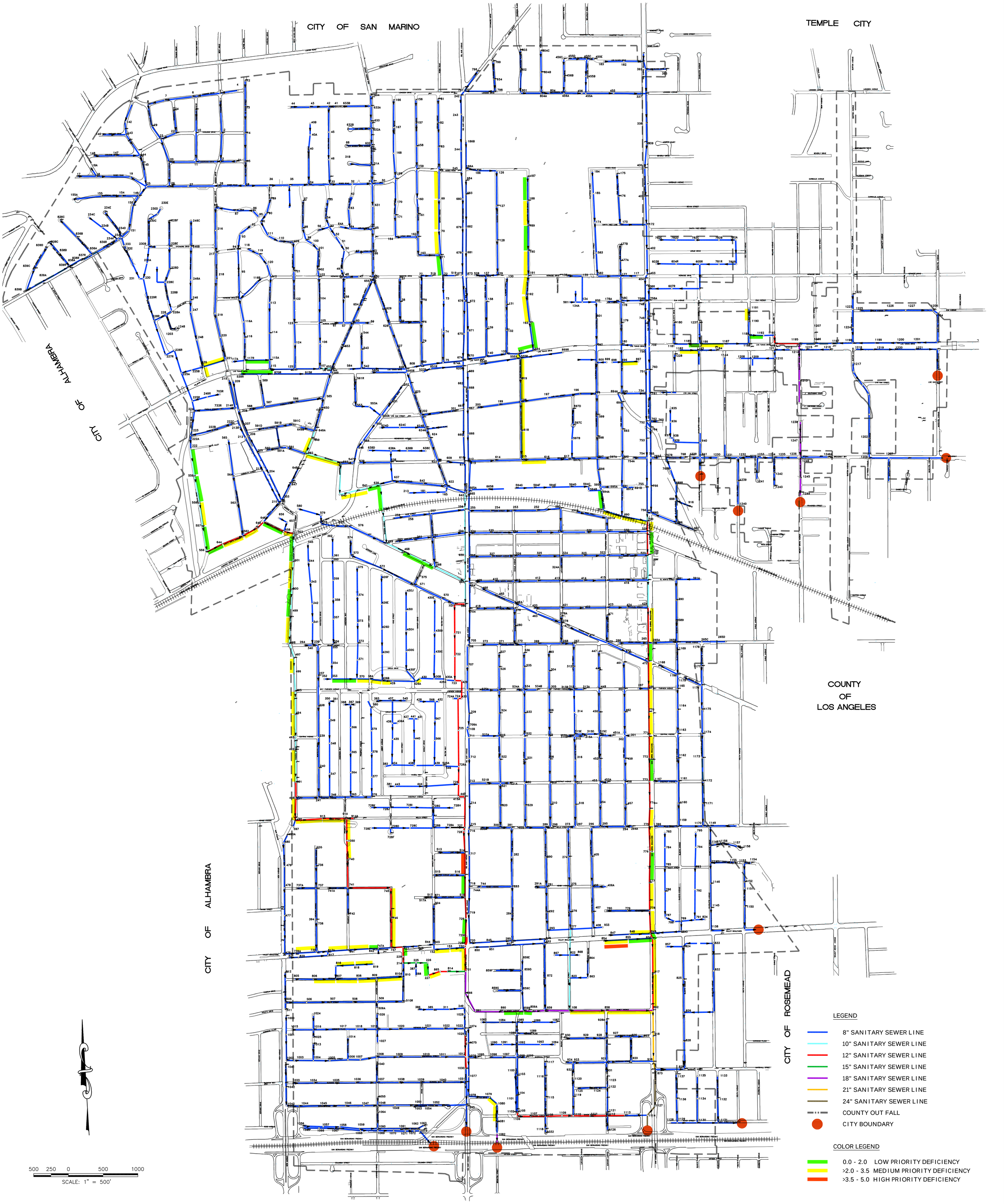
SEWER MASTER PLAN

CAPACITY ANALYSIS LOCATIONS

EXHIBIT 11-1

CITY OF SAN GABRIEL



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SEWER MASTER PLAN

STRUCTURAL DEFICIENCY RATING MAP

CITY OF SAN GABRIEL

City of San Gabriel

EXHIBIT 11-2