ATKINS

Campo Sewer Service Area

Sewer Master Plan

January 2013

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Prepared For:

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Acronyms

ac	acre
CEQA	California Environmental Quality Act
CIP	Capital Improvement Program
County	County of San Diego
d/D	depth to pipe diameter ratio
du	dwelling unit
EDUs	Equivalent Dwelling Units
EIR	Environmental Impact Report
GIS	Graphical Information System
gpcd	gallons per capita per day
gpd	gallons per day
gpd/ac	gallons per day per acre
gpd/du	gallons per day per dwelling unit
Master Plan	Campo SSA Sewer Master Plan Update
mgd	million gallons per day
NASSCO	National Association of Sewer Service Companies
PVC	poly vinyl chloride
RDCWPCF	Rancho Del Campo Water Pollution Control Facility
RDI&I	Rainfall derived inflow and infiltration
SANDAG	San Diego Association of Governments
SSA	Sewer Service Area
SSMP	Sewer System Management Plan
SSO	Sanitary Sewer Overflows
SWRCB	State Water Resources Control Board
WDR	Waste Discharge Requirement

CHAPTER 1
INTRODUCTION

The County of San Diego (County) is updating Sewer Master Plans for its sewer service areas. Due to increased growth, system expansions, and aging infrastructure, the County is addressing its capacity needs and updating its 10-year Capital Improvement Program (CIP). This Sewer Master Plan Update addresses the Campo Sewer Service Area (SSA).

This introductory chapter to the Campo SSA Sewer Master Plan Update (Master Plan) provides a summary of the:

- master plan objectives,
- contents and organization of this report,
- background information on the SSA,
- overview of regulatory requirements, and
- environmental compliance and policy considerations.

1.1 Sewer Master Plan Objectives

The objectives of this Master Plan are to document the available treatment capacity and general facility operational assessment, evaluate the system capacity and provide an assessment of the condition of identified portions of the existing sewer collection system in order to develop a comprehensive 10-year CIP. The 10-year CIP includes pipeline condition and capacity improvement projects, long range maintenance program enhancements and treatment and disposal needs. This recommended CIP forms the basis for capital facility needs, sewer rate evaluations, and long-range financial plans to be completed in separate financial studies.

1.2 Report Organization

This Master Plan provides a comprehensive review and evaluation of the SSA's wastewater collection, conveyance, and capacity requirements under existing and ultimate conditions. Based on findings of the evaluation, the Master Plan will include recommendations for facility improvements and capital cost requirements to ensure that aging infrastructure remains serviceable and to allow for the continued buildout of the County General Plan.

The Master Plan is presented in six (6) chapters:

- Chapter 1 provides an introduction to the project.
- Chapter 2 presents an overview of the study area and existing wastewater collection facilities.

- Chapter 3 presents an overview of the sewer basins and provides estimates of future wastewater generation rates and treatment capacity requirements.
- Chapter 4 presents the methodology and findings of the sewer capacity evaluation, including summaries of hydraulic calculations used to analyze flow conditions.
- Chapter 5 presents a condition assessment of identified SSA facilities and identifies specific condition deficiencies, as well as recommends enhancements to the County's ongoing Video Inspection Program.
- Chapter 6 presents a recommended 10-year CIP for the SSA's wastewater facilities.

1.3 Background

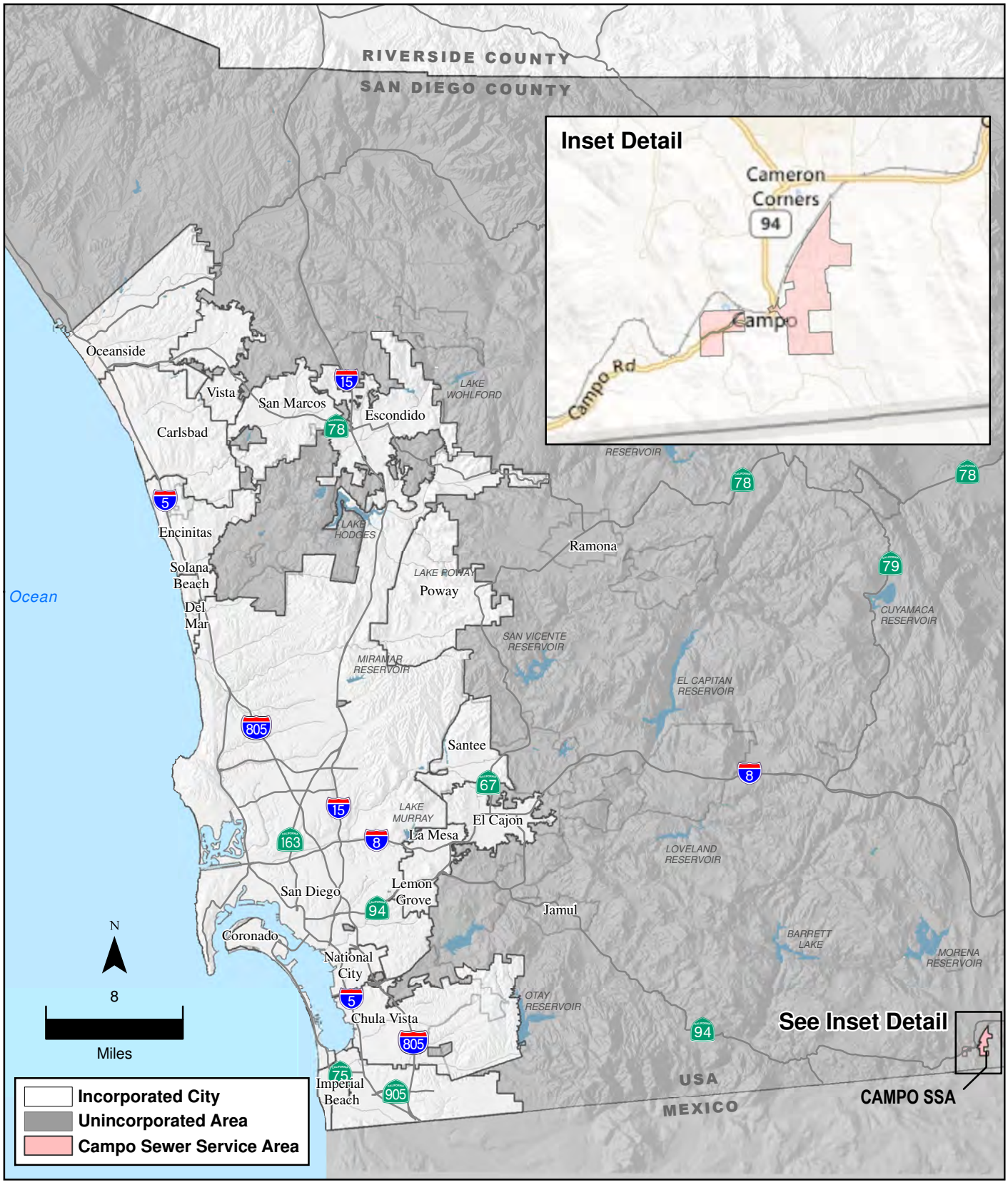
The County Board of Supervisors serves as the Sanitation District Governing Board for the County Sanitation District, which the Campo SSA is a part of. The SSA serves the community of Campo and is maintained by the County of San Diego Wastewater Management Section. Operation and maintenance costs required for the SSA is collected through connection and service fees assessed to each connection to the sewerage system. The location of the Campo SSA is shown on Figure 1-1.

Sewer flows generated within the Campo SSA are conveyed to the Rancho Del Campo Water Pollution Control Facility (RDCWPCF) for treatment and disposal. The RDCWPCF operates under Statewide General Waste Discharge Requirements (WDRs) 87-108 with the permitted discharge capacity of 113,000 gallons per day (gpd). The RDCWPCF has a secondary treatment process which consists of an Imhoff tank, a trickling filter, two secondary clarifiers, anoxic tanks, a solids contact tank with recirculation pumps and a denitrification pump, a sludge drying bed, and four percolation beds, which discharge the plant effluent into the groundwater system.

The Campo Sewer Maintenance District was formed in 1945 by the County Board of Supervisors and serves the community of Campo. Based upon a County Board of Supervisors action, on July 1, 2011 Campo Sewer Maintenance District was officially reorganized and annexed into the Spring Valley Sanitation District and the Spring Valley Sanitation District was renamed the San Diego County Sanitation District.

1.4 Regulatory Requirements

On May 2, 2006, the State Water Resources Control Board (SWRCB) adopted Order 2006-0003, the Statewide General Waste Discharge Requirements (WDRs) for Sanitary Sewer Systems, which requires all federal and state agencies, municipalities, counties, districts, and other public entities that own or operate a sanitary sewer system greater than one mile in length to comply with the elements of the WDRs. The WDRs serve to provide a unified statewide approach for reporting and tracking Sanitary Sewer Overflows (SSO), establishing consistent and uniform requirements for Sewer System Management Plan (SSMP) development and implementation, establishing consistency in reporting, and facilitating consistent enforcement for violations.



PROJECT LOCATION

Figure 1-1

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The County's state mandated SSMP was initially approved July 2009 and encompassed all of the separate sanitation and sewer maintenance districts at the time. The SSMP documents include detailed information demonstrating the County's efforts to comply with each of the mandatory and applicable elements required. Revisions are currently being made to the SSMP documents to reflect the reorganization of previously separated sanitation and sewer maintenance districts into the consolidated San Diego County Sanitation District.

1.5 Environmental Compliance

The Sewer Master Plan is statutorily exempt from the preparation of an Environmental Impact Report (EIR) or a Negative Declaration per Section 15262 of the California Environmental Quality Act (CEQA) guidelines. However, the approval or adoption of this Master Plan represents a discretionary action by the County, which is subject to review under CEQA.

1.6 Policy Considerations

The County of San Diego Board of Supervisors has adopted a number of policies which affect wastewater service in the County. These policies were reviewed for their applicability and impact to the SSAs. Appendix A summarizes the policies reviewed. Policy I-135 "Allocation of Excess Capacity in the Campo Water and Sewer Maintenance District," renewed in 2008, is applicable to the Campo SSA. The policy was adopted to provide guidelines for the allocation of limited capacity in the RDCWPCF. The policy reserves available system capacity for new failing septic systems and expansion of public facilities.

CHAPTER 2
STUDY AREA

This chapter provides a description of the Master Plan study area including:

- existing and planned land uses,
- existing and projected populations,
- physical attributes of the collection system, and
- wastewater facilities serving the SSA.

2.1 Study Area Description

The Campo SSA is located in the south eastern portion of San Diego County off of Highway 94 near the U.S./Mexico Border, approximately 60 miles east of San Diego. The SSA consists of residential homes, commercial businesses, County Operations including the Juvenile Ranch Facility, and the United States Department of Homeland Security's Border Patrol Station. The community of Campo consists of predominately rural residential residences surrounding the commercial and institutional center along Forest Gate Road off of Highway 94. As discussed in the previous Chapter, available sewer system capacity is reserved for the planned expansion of public facilities and to accommodate failing septic systems.

2.2 Land Uses

In August of 2011, the County of San Diego Board of Supervisors adopted an updated General Plan. The General Plan establishes future growth and development thresholds for the unincorporated areas of the County and concentrated population growth in the western areas of the County where infrastructure and services are more readily available. The Campo SSA is not anticipated to see any significant growth according to the adopted General Plan, which suggests the buildout of the residential subdivision, existing public facilities and rural residential development. Figure 2-1 presents the existing land use within the SSA SOI boundary (study area). As shown on the figure, there are limited vacant parcels that are part of the residential subdivision or zoned for industrial or rural residential development. Table 2-1 summarizes the existing and planned land use within the study area. Figure 2-2 presents planned land use for the Campo SSA. Appendix B includes the General Plan Map for the Campo area. Appendix C includes the land use files provided by SANDAG.

Table 2-1 Existing and Planned Land Use

Land Use	Existing Area	Planned Area
Residential	280 ac	368 ac
	228 du	262 du
Commercial	0 ac	7 ac
Industrial	7 ac	0 ac
Institutional	11 ac	44 ac
Parks/Recreation/Open Space	38 ac	0 ac
Agricultural	0 ac	0 ac
Undeveloped Land/Vacant	83 ac	0 ac
Total	**419 ac**	**419 ac**

ac = acre; du = dwelling unit

2.3 Existing and Forecasted Populations

Residential and employment population estimates for the study area were provided by the San Diego Association of Governments (SANDAG) for years 2010, 2015, 2020, 2025, and 2030 at the parcel level and are based on the Series 11 - 2030 San Diego Regional Growth Forecast Update, completed in April 2008. Table 2-2 summarizes the residential and employment population projections through 2030 for the study area. As the table shows, SANDAG does not anticipate any non-residential growth in the study area over the next 20 years. Appendix D includes the population files provided by SANDAG.

Table 2-2 Campo SSA Existing and Forecasted Populations

Year	Residential	Employment
2010	681	67
2015	732	69
2020	784	69
2025	787	69
2030	800	69

SANDAG population forecasts do not include student populations, such as the Rancho del Campo (RDC) Juvenile Court and Community School. RDC is a residential camp for young men ranging from 13 to 19 years of age that have violated the law and has a maximum capacity of 250 students.

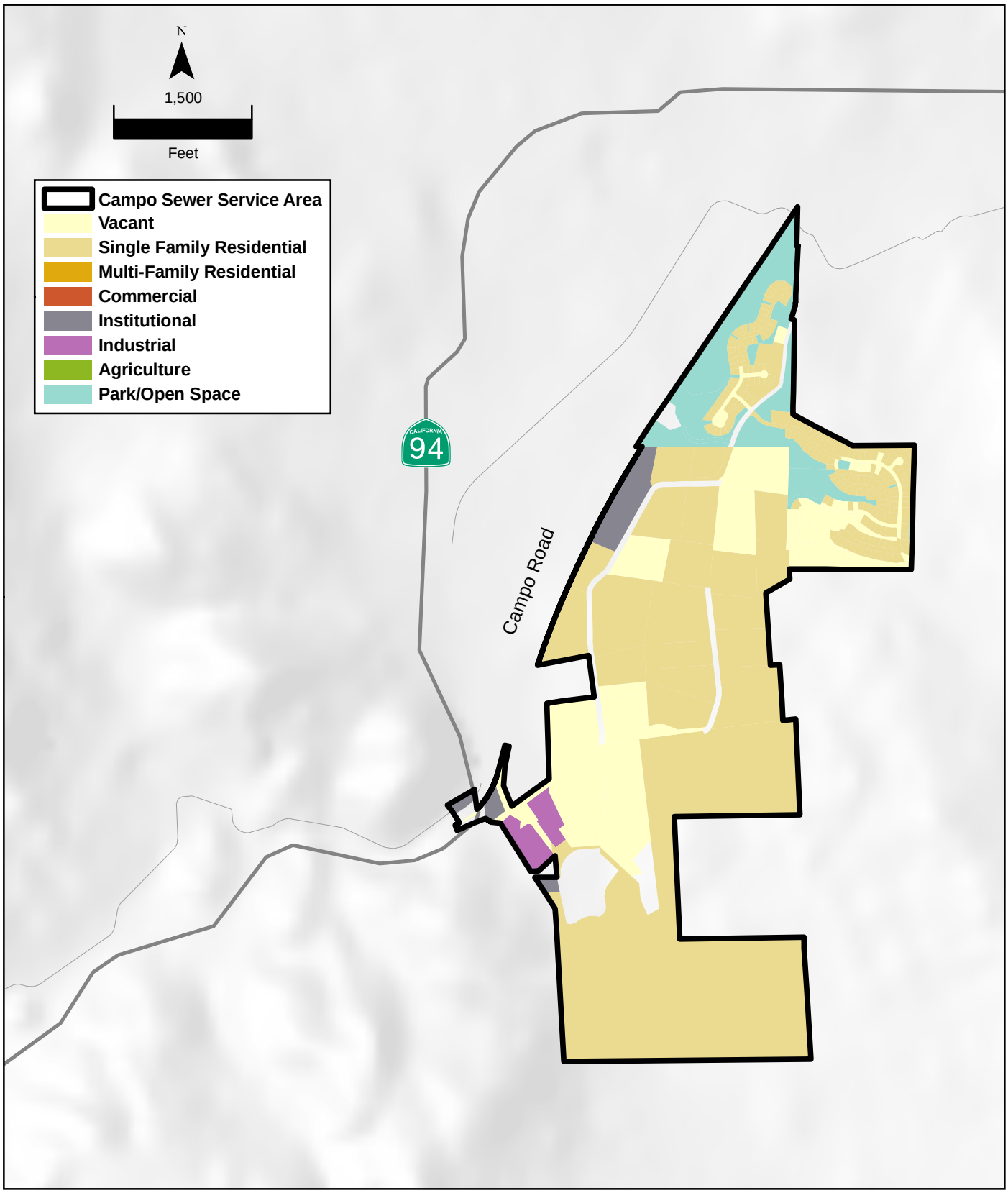
2.4 Existing Wastewater Collection System

Wastewater flows generated in the Campo SSA are conveyed to the County-owned and maintained RDCWPCF, where flows are treated to secondary standards and disposed of via percolation ponds. The existing wastewater collection system is summarized by material and diameter in Table 2-3.

Table 2-3 Existing Wastewater System Summary

Diameter - Decade	Material				
	CI	PVC	VCP	Unknown	Total
6 inch - Unknown	0	1,232	0	0	1,232
8 inch - Unknown	1,764	6,533	3,944	4,513	16,754
10 inch – 2000s	0	11,085	0	0	11,085
10 inch - Unknown	3,194	5	1,326	0	4,525
12 inch - Unknown	257	105	378	0	740
Total	**5,215**	**18,960**	**5,648**	**4,513**	**34,336**

The system inventory is based on information contained within the County's Graphical Information System (GIS) database, review of record drawings, and the recent CCTV data. The GIS database was created for the County Wastewater Department by digitizing the as-built record drawings. Record drawings and CCTV data was not provided for the entire service area, so pipes without accurate records were marked as "Unknown" year and/or material. The County plans to conduct additional research to better assign an estimated installation year, also considering some pipelines may have been re-lined. Figure 2-3 and Figure 2-4 present the size and material of the existing system, respectively.



EXISTING LAND USE

Figure 2-1

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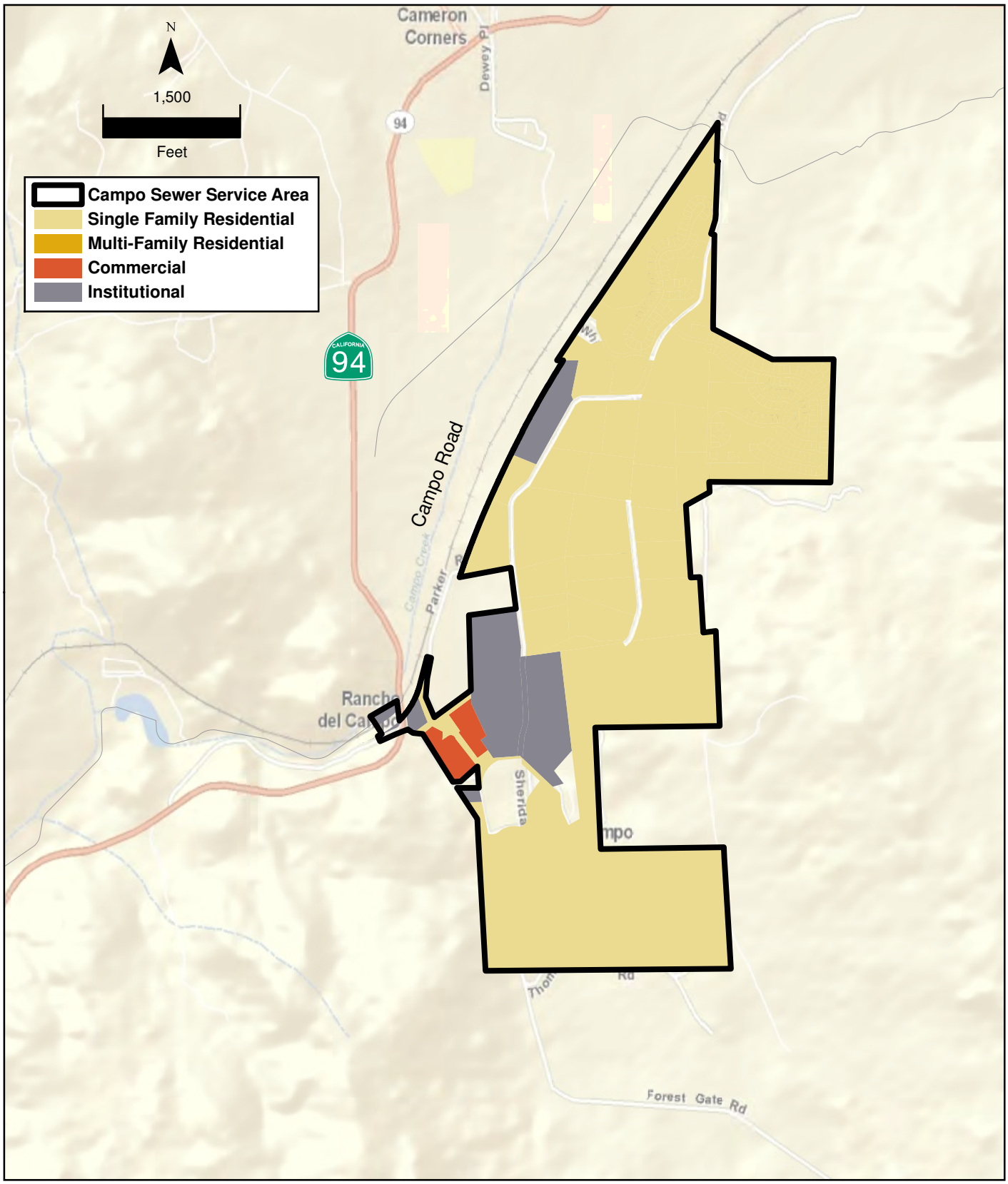

PLANNED LAND USE

Figure 2-2

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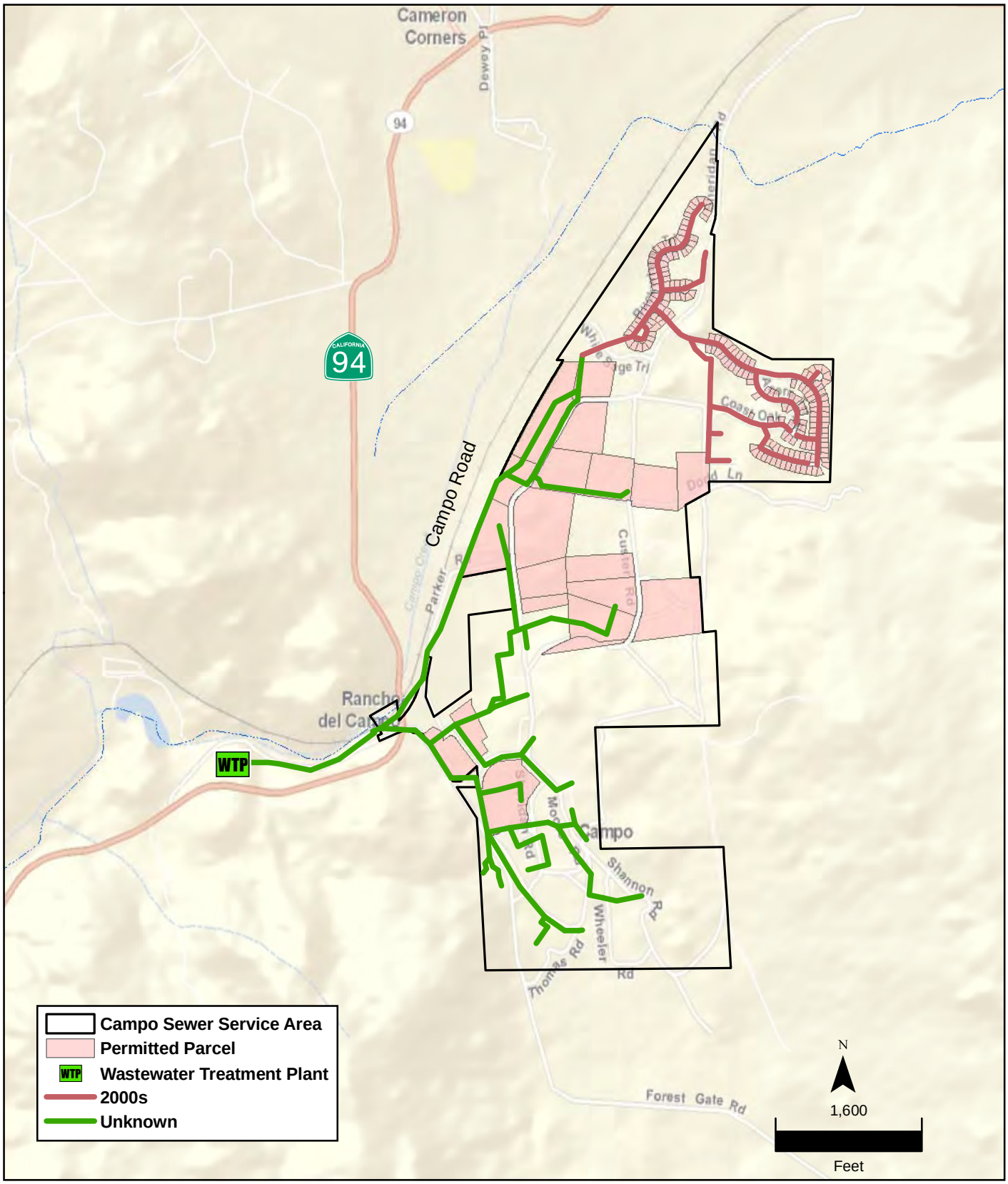

EXISTING GRAVITY MAIN PIPELINE AGE

Figure 2-3

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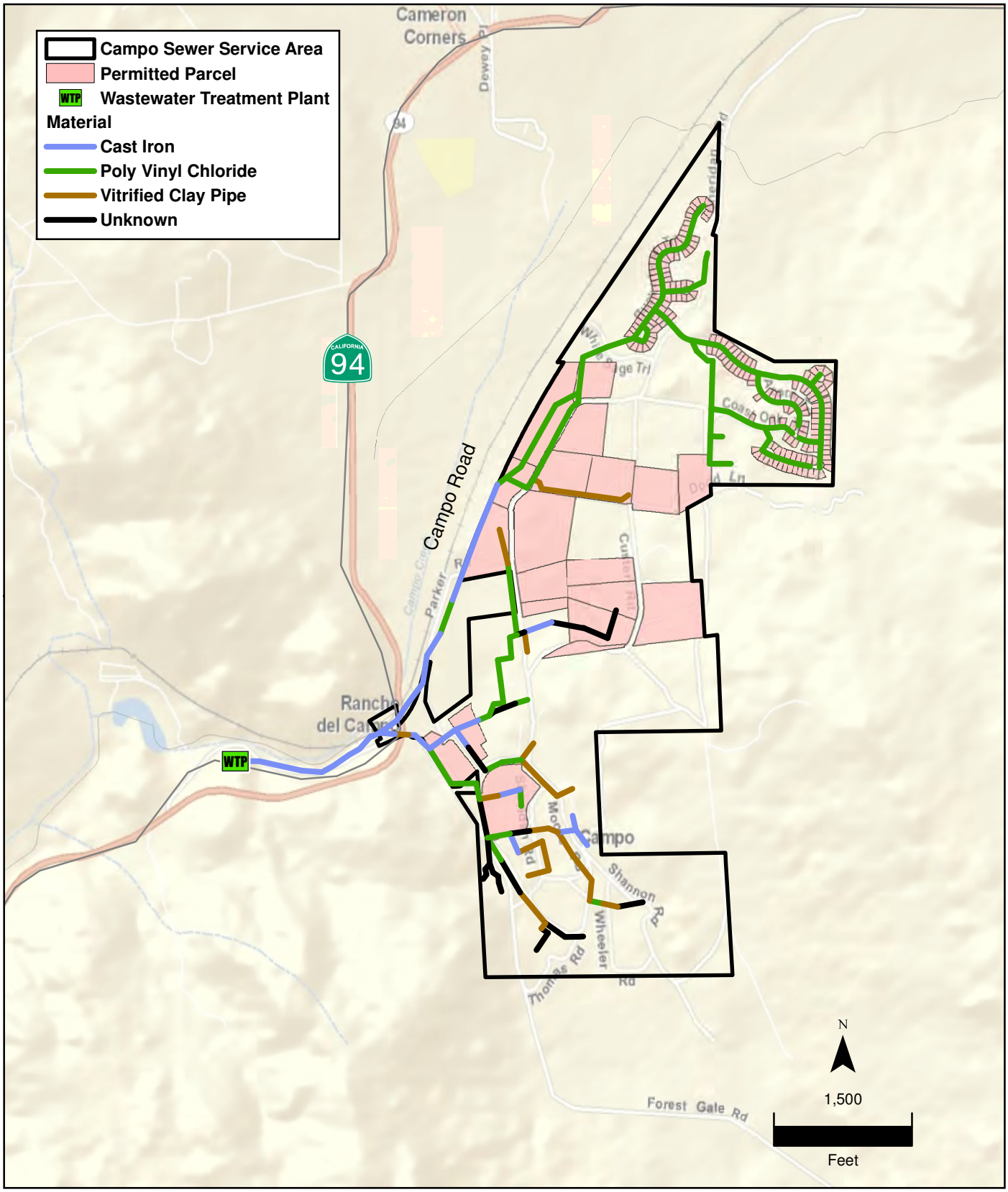

EXISTING GRAVITY MAIN PIPELINE MATERIAL

Figure 2-4

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CHAPTER 3
WASTEWATER GENERATION ANALYSIS

This chapter provides descriptions of the wastewater generation including:

- methodology for developing unit generation rates,
- recommended unit generation rates,
- estimated future wastewater flows, and
- treatment plant capacity needs.

3.1 Treatment Plant Flows

As described in Chapter 2, wastewater generated within the Campo SSA is collected by County-owned facilities and conveyed to the County-owned and maintained RDCWPCF, where flows are treated to secondary standards and disposed of via percolation ponds. The County records daily effluent flow readings for the RDCWPCF and the 2010 readings were used for flow calibration. The RDCWPCF treats an average annual flow of 0.047 million gallons per day (mgd). Flow meter data used for calibration is included in Appendix E.

3.2 Wastewater Generation Rates

The purpose of establishing wastewater generation rates is to characterize the existing unit use by either population or land use, and for use in forecasting wastewater flows. The existing metered flows were compared with land use data and population estimates to develop unit wastewater generation rates. Unit generation rates were estimated using two sources for comparison purposes: 1) population estimates compiled by SANDAG (Series 12 for existing populations and Series 11 for forecast data), and 2) the County's current land use data (Referral Map, May 2008). Based on the findings of the unit generation rate analysis by land use and population, recommended unit rates will be established for forecasting future wastewater flows.

The unit generation rate calibration of the SSA is described in the following sections and summarized in Table 3-1 and Table 3-2.

3.2.1 Generation Rates Using SANDAG Population

The purpose of estimating population based unit generation rates is to establish the amount of wastewater a typical residential person and non-residential employee generate over a given day in order to assist in forecasting the amount of wastewater that the SSA can expect through 2030. Per capita unit generation rates are determined through a comparison of the existing SANDAG population data within the basin against the average wastewater flows observed at the plant flow meter, and industry standard ranges.

SANDAG provided 2008 residential and employment population projections by basin for the SSA based on Series 11 data. Through an iterative process, per capita generation rates for residential and employment populations were estimated. Table 3-1 summarizes the estimated unit generation rates by population through the flow calibration process. Per capita unit generation rates were calibrated to within three percent of existing flows based on industry standards.

SANDAG population forecasts do not include student populations, such as the Rancho del Campo (RDC) Juvenile Court and Community School. RDC is a residential camp for young men ranging from 13 to 19 years of age that have violated the law and has a maximum capacity of 250 students. To estimate wastewater generation from RDC, this Master Plan assumes a student population of 250.

Typically, design and planning standards for agencies in San Diego County assume per capita wastewater generation rates between 60 to 100 gallons per capita per day (gpcd) for residential and 15 to 35 gpcd for employment populations. Table 3-1 summarizes the flows and calibration for the Campo SSA. Campo has an estimated residential per capita unit generation of 60 gpcd and an employment per capita unit generation rate of 25 gpcd. The 2010 census projected an average of 2.4 persons per household for the Campo SSA.

Table 3-1 Wastewater Unit Generation Rate Calibration Based on Population

Land Use	Existing Population	Unit Generation Rate	Estimated Wastewater Generation
Residential	681	60 gpcd	40,860 gpd
Employment	67	25 gpcd	1,680 gpd
Student	250	25 gpcd	**6,250 gpd**
Total			**48,790 gpd**
		Existing Flows =	47,432 gpd
		Calibration =	2.9 %

gpcd = gallons per capita per day; gpd = gallons per day

3.2.2 Generation Rates Using County Land Use Data

The purpose of estimating land use based unit generation rates is to establish the amount of wastewater generated in a day over an acre of land by general land use types in order to assist in estimating the amount of wastewater that the SSA can expect at the buildout of the study area. Land use based unit generation rates are determined through a comparison of the existing area per land use type within the meter basin against the average wastewater flows observed at the plant flow meter, and industry standard ranges.

As shown in Figure 2-3 of the previous chapter, existing land uses include single-family residential, multi-family residential, industrial, commercial, and institutional. When the GIS land use coverage is overlaid with the County's permitted parcel database, it was possible to estimate the number of single-family and multi-family dwelling units and calculate industrial, commercial, and institutional acreage for the Campo SSA.

Table 3-2 summarizes the calibration of sewer flows for the Campo SSA with estimated unit wastewater generation rates summarized by land use. Unit wastewater generation rates were calibrated to within five percent of existing flows measured at the RDCWPCF.

Table 3-2 Wastewater Unit Generation Rate Calibration Based on Land Use

Basin	Units	Unit Generation Rate	Estimated Wastewater Generation
Single-Family Residential	208 du	160 gpd/du	33,280 gpd
Multi-Family Residential	20 du	120 gpd/du	2,400 gpd
Commercial	0 ac	0 gpd/ac	0 gpd
Industrial	7 ac	500 gpd/ac	3,410 gpd
Institutional	11 ac	500 gpd/ac	5,305 gpd
Total			**49,700 gpd**
		Existing Flows =	47,432 gpd
		Calibration =	4.8 %

ac = acre; du = dwelling unit; gpd = gallons per day;

In the Campo SSA the single-family residential land use unit generation rate was assigned a value equal to the higher of the calculated or census population density multiplied by the calibrated population unit generation rate. Non-residential land use unit generation rates were set equal to each other and then were adjusted through an iterative process to reasonably match the estimated employment wastewater generation, as presented previously in Table 3-1.

Typically, design standards for agencies in San Diego County assume wastewater flows between 200 to 400 gallons per day per dwelling unit (gpd/du) for single-family residential and 500 to 1,500 gallons per day per acre (gpd/ac) for non-residential land uses. When compared to typical design standards, the calibrated unit generation rates suggest that the Campo SSA is within the acceptable range of generation rates, although residential generation may be lower than average.

3.2.3 Recommended Unit Generation Rates

For future development, it is typical to develop uniform unit generation rates. The County has relatively uniform wastewater generation rates for land use and population projections based on our unit generation rate analyses. Therefore, for the existing system analysis, the calibrated unit generation rates shown above will be used. For future wastewater generation, more conservative generation rates will be used. The wastewater generation rates used to estimate future flows are summarized in Table 3-3. The County utilizes Equivalent Dwelling Units (EDUs) for non-single family residential land uses and equates an EDU to 240 gpd.

3.3 Wastewater Flow Projections

Wastewater flow projections were developed through 2030 and for buildout. Flow projections through 2030 were estimated by applying the recommended population unit generation rates to the anticipated forecasted population. Buildout wastewater flow projections were determined by applying the land use based unit generation rates to the land use acreages and allowable densities (Referral Map, May 2008). These projections form the basis for sewer input flows to the hydraulic model, and analyses of future capacity needs in the wastewater collection system. Table 3-4 summarizes the estimated future flows based on population through 2030 and Table 3-5 summarizes the estimated buildout flow based on the land use for ultimate conditions in the SSA.

Table 3-3 Recommended Unit Generation Rates

Land Use / Population	Recommended Unit Generation Rate
Land Use	
Single-Family Residential	240 gpd/du
Multi-Family Residential	180 gpd/du
Commercial	500 gpd/ac
Institutional	500 gpd/ac
Population	
Residential	60 gpcd
Employment	25 gpcd
Student	25 gpcd

ac = acre; du = dwelling unit; gpd = gallons per day

Table 3-4 Campo Wastewater Flow Projections through 2030 (by Population)

Basin	Population					Estimated Wastewater Generation (mgd)				
	2010	2015	2020	2025	2030	2010	2015	2020	2025	2030
Residential	681	732	784	787	800	0.041	0.044	0.047	0.047	0.048
Employment	67	69	69	69	69	0.002	0.002	0.002	0.002	0.002
Student	**250**	**250**	**250**	**250**	**250**	0.006	0.006	0.006	0.006	0.006
Total						**0.049**	**0.052**	**0.055**	**0.055**	**0.056**

mgd = million gallons per day

Table 3-5 Campo Buildout Wastewater Flow Projections (by Land Use)

Land Use	Units/Acres	Recommended Unit Generation Rate	Estimated Wastewater Generation (mgd)
Residential	262 du	240 gpd/du	0.063
Commercial	7 ac	500 gpd/ac	0.003
Institutional	44 ac	500 gpd/ac	0.022
Total			**0.088**

ac = acre; du = dwelling unit; gpd = gallons per day; mgd = million gallons per day

3.4 Conclusions

Existing average wastewater flows generated within the Campo SSA are approximately 0.047 mgd. Based on SANDAG population projections, the total Campo SSA average flow rate at 2030 is estimated to be 0.056 mgd. Assuming the buildout of the entire study area, the average flow rate is estimated at approximately 0.088 mgd, which will likely not occur until beyond 2050.

The RDCWPCF has a treatment and discharge capacity of 0.113 mgd. Based on the estimated wastewater flow projections, the discharge capacity at the RDCWPCF will be sufficient to accommodate anticipated growth through 2030 and buildout. The County should continue to monitor flows into RDCWPCF over the next five to ten years to determine whether the recommended phased populations are consistent with future flow projections.

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CHAPTER 4
CAPACITY EVALUATION

This chapter provides a description of the capacity analysis performed as part of the Master Plan, and includes:

- evaluation criteria,
- model selection, development and calibration,
- capacity analysis, and
- potential phased recommended improvements.

4.1 Background

A capacity evaluation of the Campo SSA existing wastewater collection system was completed to identify sewer reaches that may be deficient under recommended design criteria and to identify any upgrades needed to accommodate existing and projected dry and wet weather wastewater flows. Based on the capacity evaluation, no facility improvements are recommended.

4.2 Methodology

The principal tool utilized in the capacity analysis was a steady state hydraulic analysis spreadsheet using the Manning formula to evaluate flow conditions, such as wastewater flow depth, flow rate, and velocity, within pipes and manholes in the SSA wastewater collection system.

The spreadsheet model was developed using the physical collection system data, existing and forecasted populations, and per capita unit generation rates. The model was utilized to evaluate the existing collection system under existing and projected wet weather flow conditions in order to identify potential recommended improvements to the existing collection system.

4.3 Flow Monitoring

The Campo SSA has one flow meter that records daily effluent flows from the RDCWPCF. Flow data from August 2010 at the RDCWPCF was used to develop initial average wastewater generation estimates. The month of January 2010 was identified as having a rainfall event typical of a 2-year return storm and was used to evaluate wet weather events.

4.4 Evaluation Criteria

Recommended criteria were developed to evaluate the capacity of the existing collection system under existing and projected dry and wet weather flow conditions. The recommended evaluation criteria were developed by comparing existing County criteria to criteria for similar Southern California sewer agencies. The recommended evaluation criteria are presented in Table 4-1 and will be utilized to identify deficient facilities and size replacement infrastructure. The evaluation criteria presented in this master plan is not intended to replace the County's existing criteria, which shall continue to be utilized for the design of new infrastructure.

Table 4-1 Recommended Evaluation Criteria

Gravity Main Criteria	Recommended Evaluation Criteria
Minimum Pipe Diameter	8 inches
Minimum Velocity	2 fps at peak flow rate
Manning's Roughness Coefficient	0.013
Maximum Peak d/D Ratio for Existing Sewers	0.50 Peak Dry Weather Flow for dia. $\leq$ 15-inch
	0.75 Peak Dry Weather Flow for dia. > 15-inch
	0.92 Peak Wet Weather Flow for a 2-year storm
Maximum Peak d/D Design Criteria for New Sewers	0.50 Peak Wet Weather Flow for dia. $\leq$ 15-inch
	0.75 Peak Wet Weather Flow for dia. > 15-inch

4.5 Model Development

The spreadsheet model was developed with the physical collection system data, existing and forecasted populations, and per capita unit generation rates. Details regarding the collection system and the application of sewage loading factors and rainfall events are described below.

4.5.1 Collection System Attributes

Data required to create the spreadsheet model includes information describing the physical wastewater collection system, such as physical location, pipe diameters and reach lengths, manhole invert elevations, and estimated pipe roughness coefficients. Model connectivity was reviewed and verified against County as-built records. The physical parameters of the system, including pipe diameter, slope, and roughness coefficients were based principally on the County's GIS records. Where the data appeared to be inaccurate or unclear, data was inferred.

4.5.2 Model Loading

Wastewater flows are entered in the spreadsheet model by applying basin populations to per capita unit generation rates at the basin's identified tributary node. Populations were applied for existing and 2030 conditions at the parcel level. Each parcel was assigned a corresponding tributary model node based on available lateral information and topography. Model basins were then formed by merging parcels with identical tributary nodes. Appendix F includes model basin population projections and diurnal patterns.

The parcel's existing and 2030 residential and employment populations were summed and input into the model at the basin level. Residential and employment population estimates for the existing and 2030 conditions were provided by SANDAG. Figure 4-1 presents the location of the model basins.

4.5.3 Rainfall Events

Rainfall events were evaluated to identify their potential impacts on the collection system. The spreadsheet model assumed a 10 percent increase in flows due to rainfall derived inflow and infiltration (RDI&I) into the system.

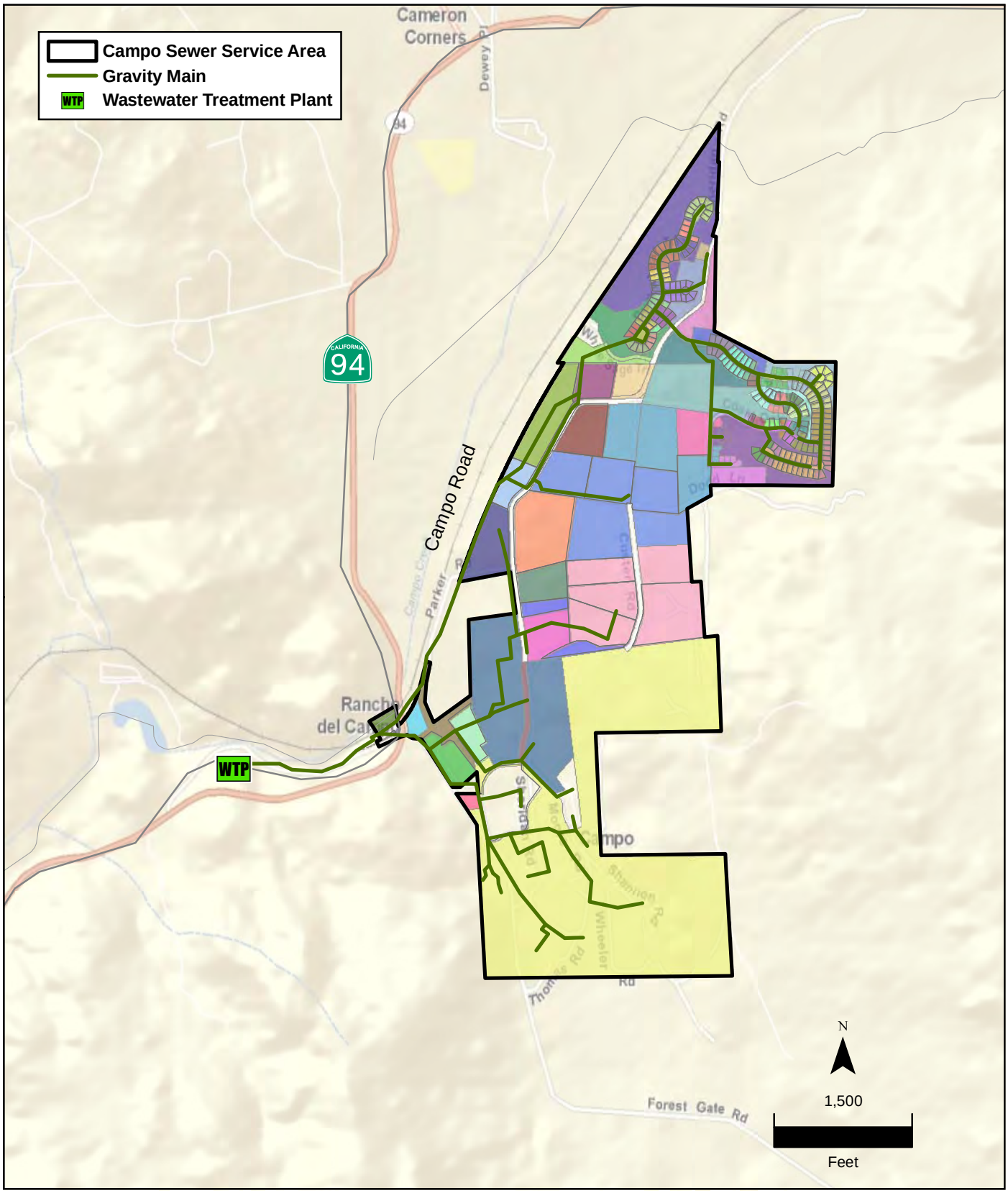
A storm event occurring January 18 to 22, 2010 was selected for assessing peak wet weather flows in the Campo SSA. The precipitation readings for the January storm are slightly lower than the two-year design storms for San Diego County. The Campo rain gauge is closest in proximity to the Campo SSA and was used for this study. Figure 4-2 presents a comparison of the average daily flows recorded at the CWPCF to the average daily rainfall totals at the Campo rain gauge. Rainfall totals for the Campo rain gauge are summarized in Appendix G.

As shown on Figure 4-2, the January storm event produced a peak increase of approximately 0.04 mgd, almost doubling the average flow at the RDCWPCF from a storm event that averaged over an inch of rain during its 5 day period.

4.6 Capacity Analysis

A capacity analysis of the existing collection system was performed under peak future flow conditions. Calculations were performed for the recommended 2030 wastewater generation, discussed in Chapter 3, in order to identify potential improvement projects. Under dry weather flow conditions pipeline capacity projects were identified if the peak flows exceeded a flow depth to pipe diameter (d/D) ratio of 0.50 for pipeline diameters 15 inch and smaller and 0.75 for pipelines greater than 15 inches in diameter. Under wet weather flow conditions pipeline capacity projects were identified if the peak flows exceeded a d/D ratio of 0.92 for all pipeline diameters.

Under peak 2030 flow conditions, no capacity deficiencies were identified for the gravity sewer system. A detailed summary of the gravity pipeline capacity analysis is provided in Appendix H.



CAMPO MODEL BASINS

Figure 4-1

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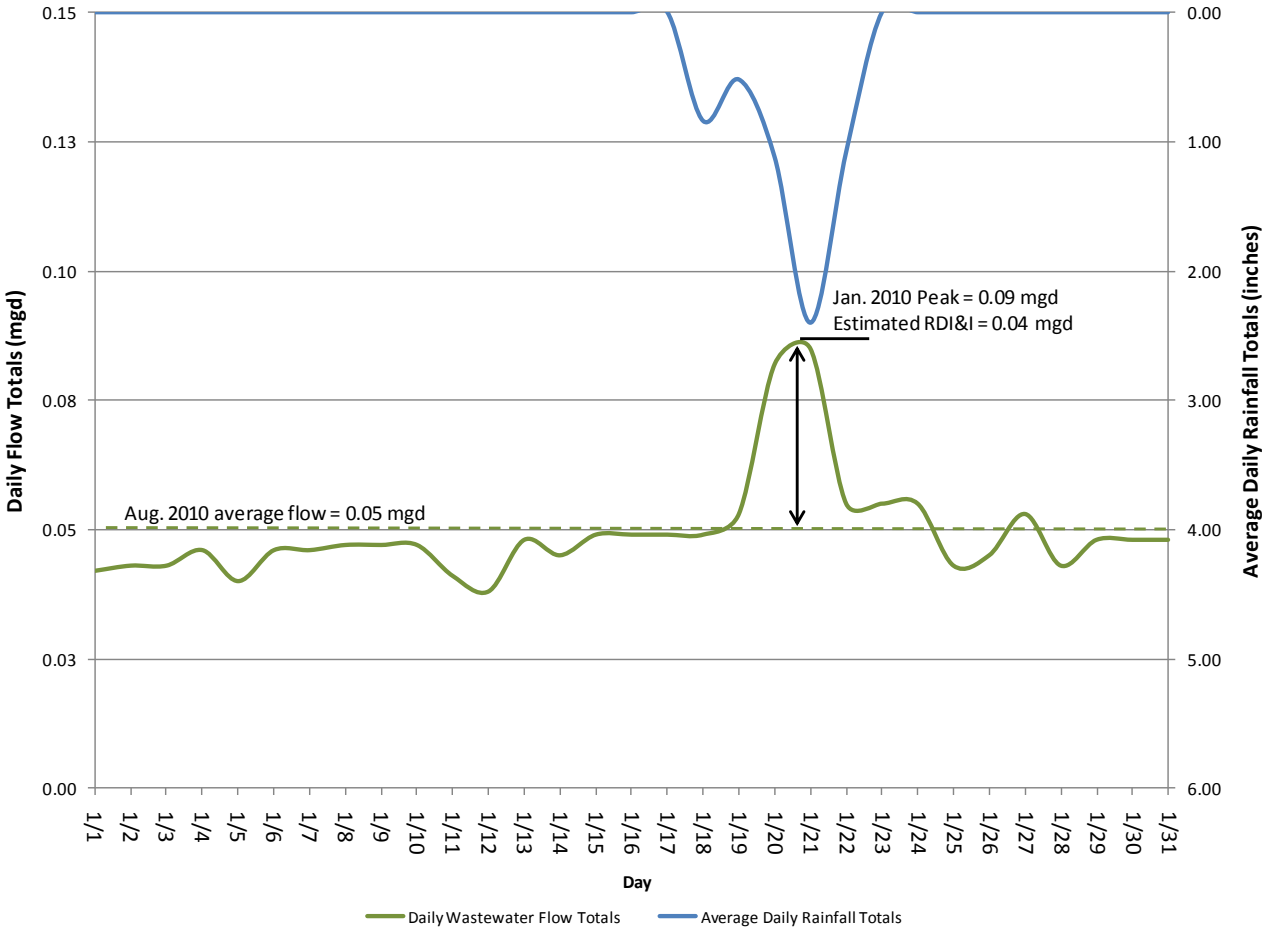
Figure 4-2 Campo SSA Wet Weather Flow Assessment



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CHAPTER 5
CONDITION ASSESSMENT

This chapter provides a description of the condition assessment process implemented as part of developing the Master Plan, and includes a summary of the:

- collection system characteristics,
- current maintenance goals and practices,
- video inspection and assessment process,
- inspection and assessment results, and
- recommended rehabilitation program.

5.1 Background

A wastewater system condition assessment provides agencies and municipalities with valuable information used to determine the funding required to repair and rehabilitate an aging collection system and to prioritize the allocation of funds. An assessment of existing facilities serves to identify the existing system conditions and defects which may contribute to potential overflows and excessive infiltration. Such conditions include root intrusion at misaligned joints or cracks, breaks in the pipe, inflow and infiltration (I/I) entering into the system through cracks in pipes or manholes or via illegal storm drain connections, all of which affect pipe capacity and treatment costs. The condition assessment of the existing Campo SSA collection system was based on the physical inspection of approximately 6,700 linear feet of primarily 8- and 10-inch diameter sewer mains which accounts for approximately 20 percent of the wastewater collection system in the SSA.

5.2 Collection System Characteristics

It is estimated that the Campo SSA collection system was initially constructed in the 1940s and additional construction occurred in the 2000s. Pipe material consists of cast iron (CI), polyvinyl chloride pipe (PVC), and vitrified clay pipe (VCP). A breakdown of the total pipeline length in the Campo SSA by length of material is provided in Table 5-1 and is presented graphically in Figure 5-1. The statistics and lengths included in Table 5-1 are based on the County's database and have not been updated to reflect minor corrections noted for materials determined to be different through the CCTV process. Based upon the CCTV data, the County's GIS and mapbooks should be updated to reflect more accurate information obtained through the inspection and assessment process.

The wastewater collection system data presented in this chapter, including length, material and pipe sizes, are based on information obtained from the County's database. The database has not been updated to reflect any corrections and/or discrepancies noted through the CCTV

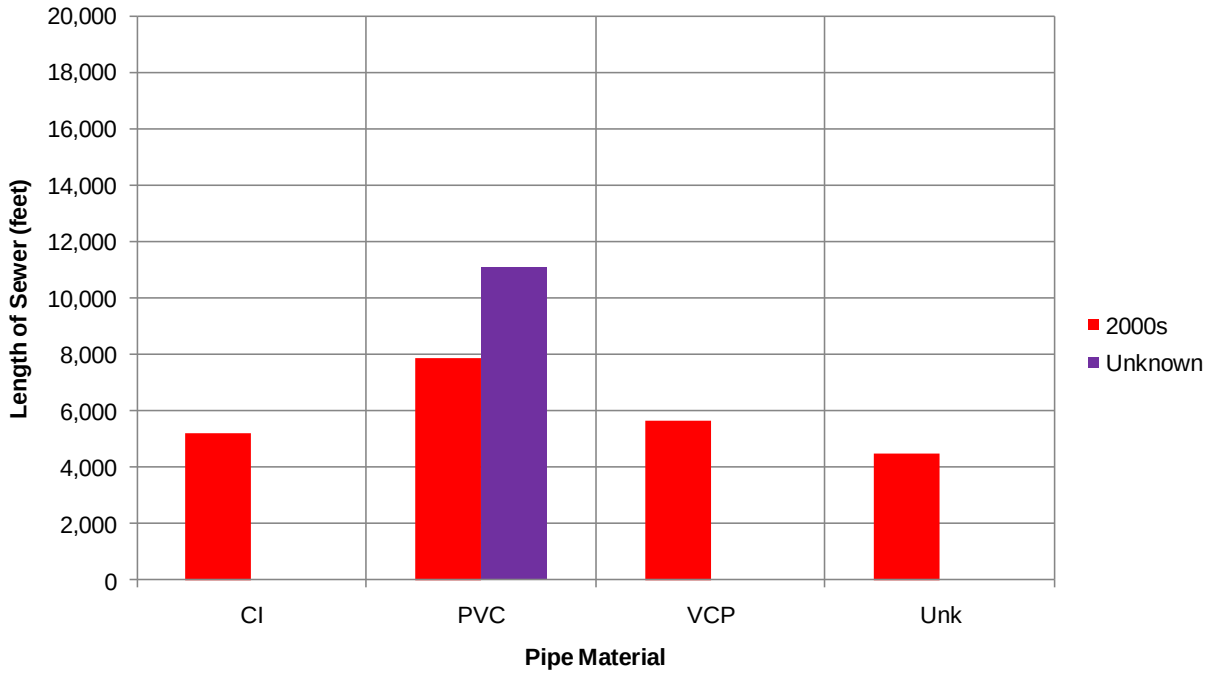
inspection findings. Based upon the CCTV data and as necessary, the County's GIS and mapbooks should be updated to reflect more accurate information obtained through the inspection and assessment process.

Table 5-1 Campo SSA Gravity Pipeline Length of Material by Age

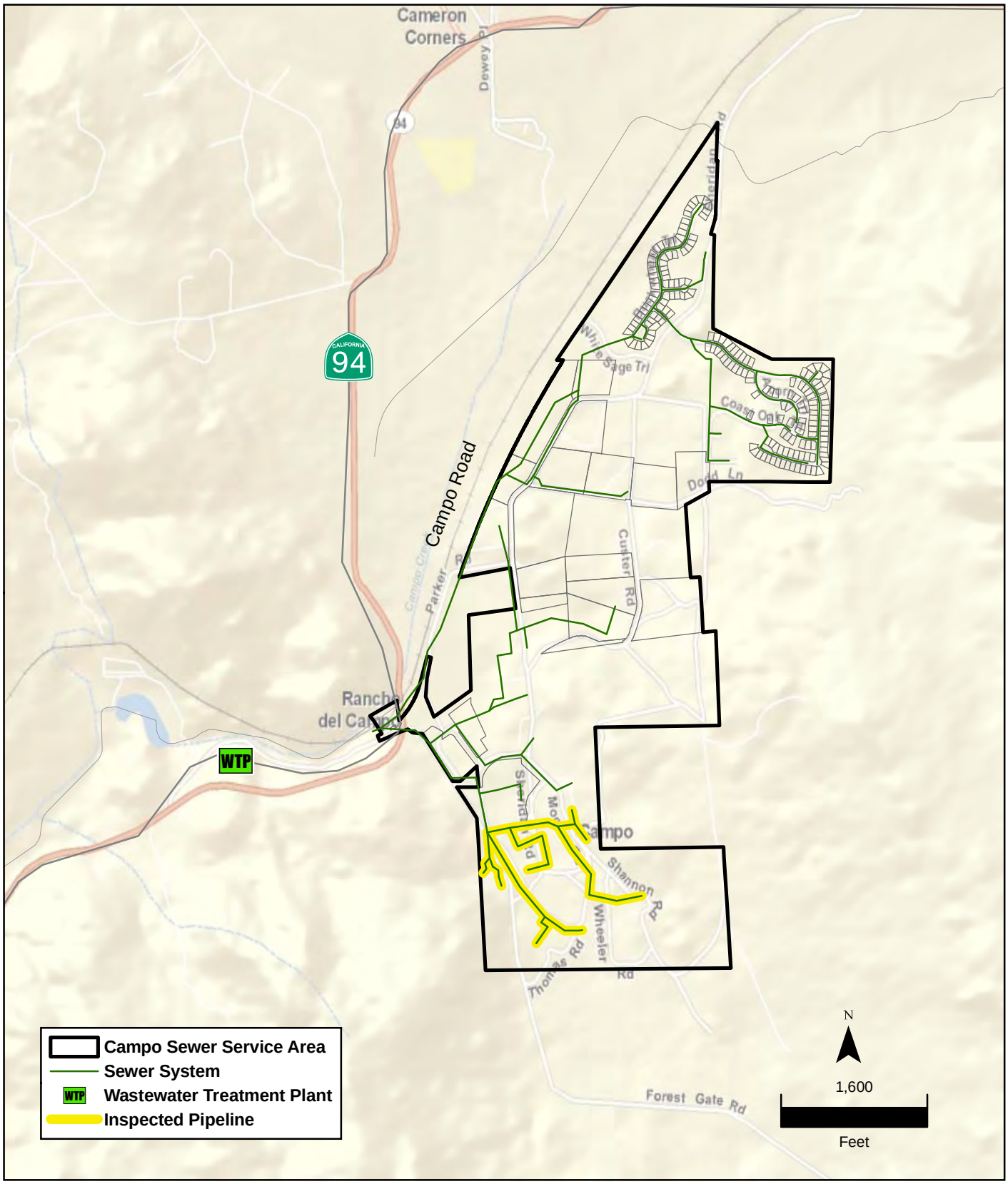
Age	Material				Total
	CI	PVC	VCP	Unknown	
Unknown	5,215	7,875	5,648	4,513	23,251
2000s	0	11,085	0	0	11,085
Total	**5,215**	**18,960**	**5,648**	**4,513**	**34,336**

Note: Pipe with unknown age is assumed to be built after the mid-1940s.

Figure 5-1 Campo SSA Gravity Pipeline Length of Material by Age



As may be determined from Table 5-1 and Figure 5-1, over 45 percent of the Campo SSA system constructed in the 1940s was VCP and CI and approximately 20 percent is of unknown material. It can also be determined that at least 30 percent of the Campo SSA system was constructed in the 2000s. Historically, VCP pipe has a life span ranging from 50-70 years. Based on the assumed installation period for the CI, VCP and pipe of unknown material as presented above, the majority of the Campo SSA system has reached the initial years of the pipe material life cycle. Therefore, as the wastewater collection system continues to age, routine inspection is critical for monitoring and establishing the condition of the pipelines and identifying methods to extend its service life.



INSPECTED
AND ASSESSED PIPELINES

Figure 5-2

11/27/2012 LH SD Z:\Projects\IS\SanDiegoCounty\100001472_AsNd\Task_26_CMP\mxd\19047_Campo-InspectedPipes_Fig 5-2.mxd

5.3 Current Maintenance Practices

The County's Facility Operations staff conducts routine cleaning and inspection of pipelines within Campo SSA, as well as the additional eight (8) SSAs within the County's jurisdiction. The County's goal is to clean the Campo SSA pipelines on a yearly basis. Additionally, crews clean Special Maintenance locations on a quarterly basis. Currently, there are no Special Maintenance locations identified in the Campo SSA. Approximately 5 percent of the pipelines within the Campo SSA are video inspected annually.

5.4 Inspection and Assessment

Closed circuit television cameras offer valuable insight to the structural and maintenance condition of underground infrastructure. Video inspection of sewer pipelines is used to identify and evaluate the existence and severity of defects including cracks, misaligned joints, accumulation of roots or silt, and potential sources of infiltration. Figure 5-2 shows the location of the pipelines in the Campo SSA that were inspected and assessed.

The video inspection for the Campo SSA was performed by Houston and Harris, PCS, Inc. Standard observations and severity ratings were documented on video inspection logs, which included various locations of sewer mains with deficiencies including broken or cracked pipe, misaligned joints, debris, and root intrusion. Inspection log reports are provided in Appendix I. The inspection logs were independently reviewed by Atkins and each observation was assessed for its criticality to assist in determining the final sewer rehabilitation recommendations. The following sections describe the criteria and procedures performed during the inspection and assessment process.

5.4.1 Inspection Criteria and Procedures

For the purposes of this project, National Association of Sewer Service Companies (NASSCO) inspection codes and ratings were used. Implementation of the NASSCO codes provides a consistent method in the manner with which the inspection was conducted and the observations documented. A summary of the observation codes used for the CCTV inspection are included in Appendix J. The numeric severity rating (1-5) assigned to the specific structural and/or maintenance observations are also defined. A NASSCO severity rating of one (1) is minor while a severity rating of five (5) is severe. The severity ratings, as noted, are automatically assigned based on the structural and/or maintenance observation noted by the CCTV operator.

5.4.2 Assessment Criteria and Procedures

For each pipeline inspection conducted, the video record and log was independently reviewed as a quality check of the noted observations and respective ratings included in the database results and as confirmation that the data provided for performing the condition assessment was acceptable. The video inspection log for each pipeline segment was analyzed and ranked to indicate the criticality of the asset condition using a scale of "A" through "E" to indicate the severity of the pipeline's condition, with "E" being the worst condition. Table 5-2 provides a summary of the general criticality ranking associated with the severity of the overall condition of the asset, as well as a general response time. The response time may be to reevaluate the condition of the asset and/or complete the recommended action. It should be noted that the actual response time for implementing a recommended action is dependent upon several

factors. Therefore, assets with rankings of B or C should be re-inspected and reassessed prior to implementing the recommended action as further deterioration may occur or the pipe may remain in stable condition and thus can be reprioritized. The severity assigned to each pipeline is based on the criteria listed in Table 5-3 to ensure consistency and uniformity in the process.

Table 5-2 Condition Severity Ranking

A	B	C	D	E
Good	Adequate	Moderate	Poor	Failing
Maintenance	5+ years	3 to 5 years	1 to 2 years	Immediate

Table 5-3 Condition Assessment Criteria – Severity

Observation	Condition Criticality Ranking				
	A	B	C	D	E
Cracks • Circular • Longitudinal • Multiple	None	Very small hair line crack(s)	Hair line crack(s) <50% of ID in length	Cracks ≤1/8" wide or >50% of ID in length	Cracks >1/8" wide
Broken Pipe	None	Connecting cracks, no displacement	Connecting cracks, displacement ≤1/4"	Connecting cracks, displacement >1/4"	Collapsed pipe, impassable
Joints - Offset	Minimal	Up to 1/2 of the pipe thickness	1/2 to thickness of the pipe	Thickness of the pipe to 1½ times	> 1½ times the thickness of the pipe
Joints – Separation	None	Gasket exposed	Bell exposed	Dirt exposed at top	Dirt exposed at invert
Roots	Minimal	10% to 35% Fine roots	35% to 60% Fine/medium roots	60% to 80% Medium roots	80% to 100% Tap root(s) visible
Debris Accumulation	Minimal	Sporadic deposits (no rocks)	≤10% of ID (no rocks)	10% to 25% of ID and/or rocks	>25% of ID or impassable
Erosion (typical concrete pipe)	None	Rough surface	Exposed aggregate	Exposed rebar	Missing concrete
Mineral Deposits	None	Minimal (possible infiltration)	≤10% ID thickness	>10% ID thickness	Impassable, heavy mineral deposits
Infiltration	None	Dripping	Seeping	Constant stream	Gushing water
Sag	None	Minimal (probably not perceptible)	≤25% of ID	25% to 75% of ID	>75% of ID
Flow Capacity	Minimal	2/5 or less full	2/5 to 1/2 full	1/2 to 3/4 full	3/4 to totally full

Using the applicable observation and severity rating, a preliminary recommendation for each pipeline segment was determined. Table 5-4 summarizes the preliminary recommendations for each observed condition and severity ranking.

Table 5-4 Preliminary Pipeline Recommendation Criteria

Observation	Condition Criticality Ranking				
	A	B	C	D	E
Cracks • Circular • Longitudinal • Multiple	No Action	No Action or Rehabilitate	No Action or Rehabilitate	Rehabilitate	Rehabilitate or Replace
Broken Pipe	No Action	No Action or Rehabilitate	Point Repair or Rehabilitate/ Replace	Point Repair or Replace	Immediate Point Repair
Joints – Offset	No Action	No Action or Rehabilitate	Point Repair and/or Rehabilitate	Point Repair and/or Rehabilitate/ Replace	Point Repair and/or Rehabilitate/ Replace
Joints – Separation	No Action	Rehabilitate	Rehabilitate	Point Repair and/or Rehabilitate/ Replace	Rehabilitate or Replace
Roots	No Action	Clean and Rehabilitate	Clean and Rehabilitate	Clean and Rehabilitate	Clean and Rehabilitate/ Replace
Debris Accumulation	No Action	Clean	Clean	Clean	Clean
Erosion (typical concrete pipe)	No Action	Rehabilitate	Rehabilitate or Replace	Rehabilitate or Replace	Replace
Mineral Deposits	No Action	No Action or Rehabilitate	Point Repair or Rehabilitate	Rehabilitate	Rehabilitate
Infiltration	No Action	No Action or Rehabilitate	Point Repair or Rehabilitate	Rehabilitate	Rehabilitate
Sag	No Action	No Action	Any Option	Replace	Replace
Flow Capacity	No Action	No Action	No Action	Evaluate Capacity	Evaluate Capacity

5.5 Sewer Pipeline Inspection and Assessment Results

The sewer pipelines inspected were initially evaluated using the NASSCO Rating System and were subsequently more thoroughly assessed by conducting a comprehensive review of the videos, still images, and any additional data available. Prior to scheduling maintenance efforts and/or implementing repair and rehabilitation improvements, information included in the appendices should be further reviewed for additional detailed information pertaining to the specific conditions of the pipelines inspected and assessed.

Overall, the pipe segments inspected are generally in fair condition with over 25 percent of the pipelines inspected identified as requiring No Action, approximately 13 percent requiring maintenance, and over 50 percent as requiring some form of repair or rehabilitation. Table 5-5 includes a summary of the recommended actions based on the number of pipe segments and pipe length inspected and assessed. Table 5-6 includes a summary of the criticality rankings based on the number of pipe segments and pipe length inspected and assessed. Figure 5-3 graphically presents the pipeline inspection and assessment findings by percentage of length.

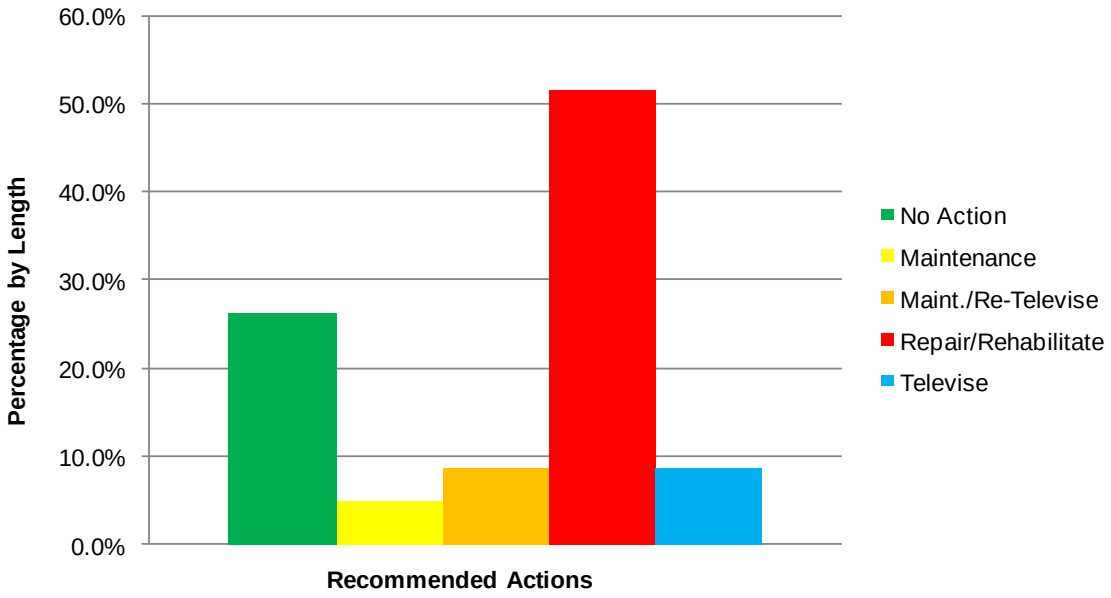
Table 5-5 Pipeline Inspection and Assessment Findings by Segment and Length

Description	No Action	Maintenance	Maintenance/ Re-Televise	Televise	Repair/ Rehabilitate	Total
Number of Segments	10	2	3	3	16	34
Length (feet)	1,749	322	582	577	3,445	6,675
Percentage by Length	26.2%	4.8%	8.7%	8.6%	51.6%	100.0%

Table 5-6 Summary of Criticality Ratings by Length

Description	Criticality						
	A	B	C	D	E	N/A	Total
No of Pipeline Segments	10	9	5	2	5	3	34
Length (feet)	1,749	1,631	1,242	392	1,084	577	6,675
Percentage by Length	26.2%	24.4%	18.6%	5.9%	16.2%	8.6%	100.0%

Figure 5-3 Pipeline Inspection and Assessment Findings by Percentage of Length



Although Table 5-5 illustrates that over 50 percent of the inspected pipelines were identified as requiring repair or rehabilitation, Table 5-6 illustrates that over 20 percent (1,476 linear feet) of the deficiencies documented should be further evaluated for implementation within the next 2 years. Pipelines that were not inspected due to accessibility constraints were not rated for rehabilitation and are noted as N/A.

Figure 5-4 illustrates the recommendations for the pipelines within the SSA that were inspected and assessed based on age and includes the repair and rehabilitation findings for all criticality ratings from A through E.

Figure 5-4 Pipeline Inspection and Assessment Findings by Age

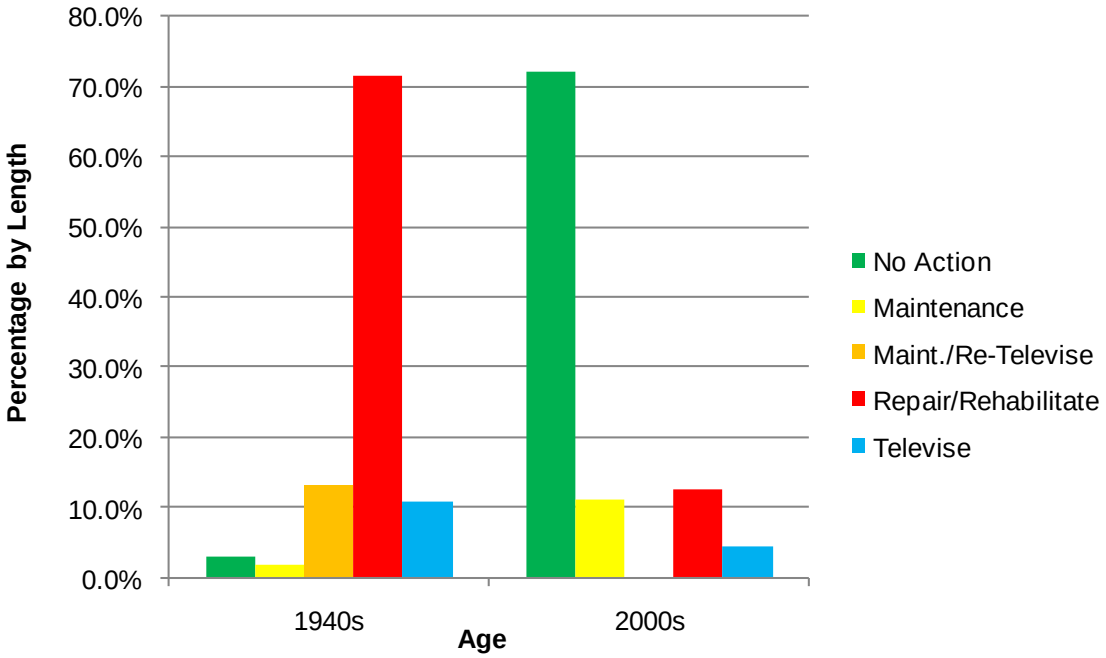


Table 5-7 includes a summary of the number of pipe segments inspected by age and material type while Table 5-8 summarizes the number of pipe segments and the length of pipe inspected and assessed based on material type. It should be noted that data obtained from the County's GIS and mapbooks, classified several of the pipelines inspected as having "unknown" material type. Based on information obtained from the CCTV inspection videos, the material type was updated to reflect the assessment findings.

Table 5-7 Pipeline Segments Inspected by Age and Material

Description	Material					
	CI	PVC/Lined	VCP	AC	Unk	Total
1940s	3	2	13	3	1	22
2000	1	9	1	0	1	12
Total	4	11	14	3	2	34

Table 5-8 Pipeline Inspections by Segment and Material

Description	Material					
	CI	PVC Lined	VCP	AC	Unknown	Total
Number of Segments	4	11	14	3	2	34
Length (feet)	768	1,851	3,126	557	373	6,675
Percentage by Length	11.5%	27.7%	46.8%	8.3%	5.6%	100.0%

Furthermore, Figure 5-5 illustrates the recommendations for the inspected pipelines based on material type.

Figure 5-5 Pipeline Inspection and Assessment Findings by Material

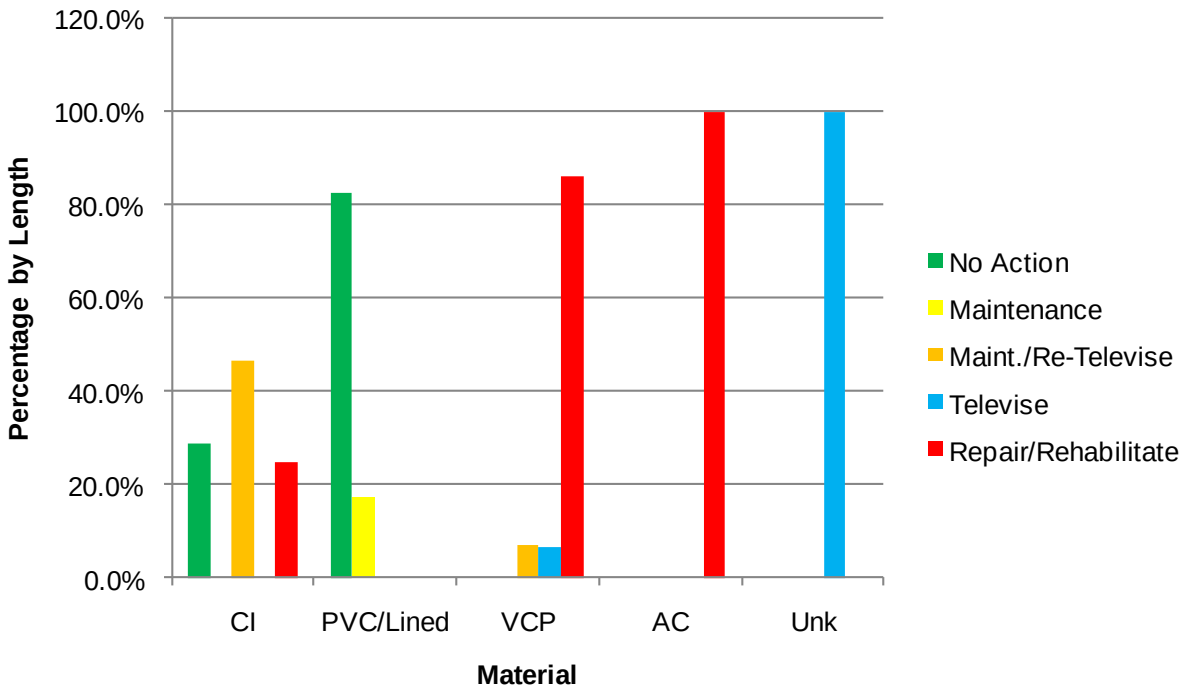


Figure 5-6 illustrates the locations of the recommended actions in the Campo SSA. The recommendations include No Action, Maintenance, Maintenance and Re-Televise, Televise, and Repair/Rehabilitate. Detailed pipeline recommendations are included in Appendix L.

Based on the inspection of approximately 20 percent of the Campo SSA collection system, it appears that 85 percent of the VCP, 25 percent of the CI, and pipe identified as AC pipe material may require a form of rehabilitation or repair. Applying these percentages by material type to the length of pipe in the SSA that was assumed to be constructed in the 1940s (Table 5-1) serves to extrapolate the length of VCP and CI pipe in the system that may require improvements. The extrapolation results presented in Table 5-9 indicates that approximately 6,100 feet (1.2 miles), which equates to approximately 18 percent of the wastewater collection system, may potentially require rehabilitation or repair. The extrapolation was not applied to the PVC as it is assumed that it may include pipe installed in the 1960s and 1970s nor to the pipe of unknown material as it may include pipe previously lined and date of improvement was not documented. Table 5-9 summarizes the projected length of rehabilitation or repair for the two material types in the SSA.

Table 5-9 Extrapolation of Recommended Actions

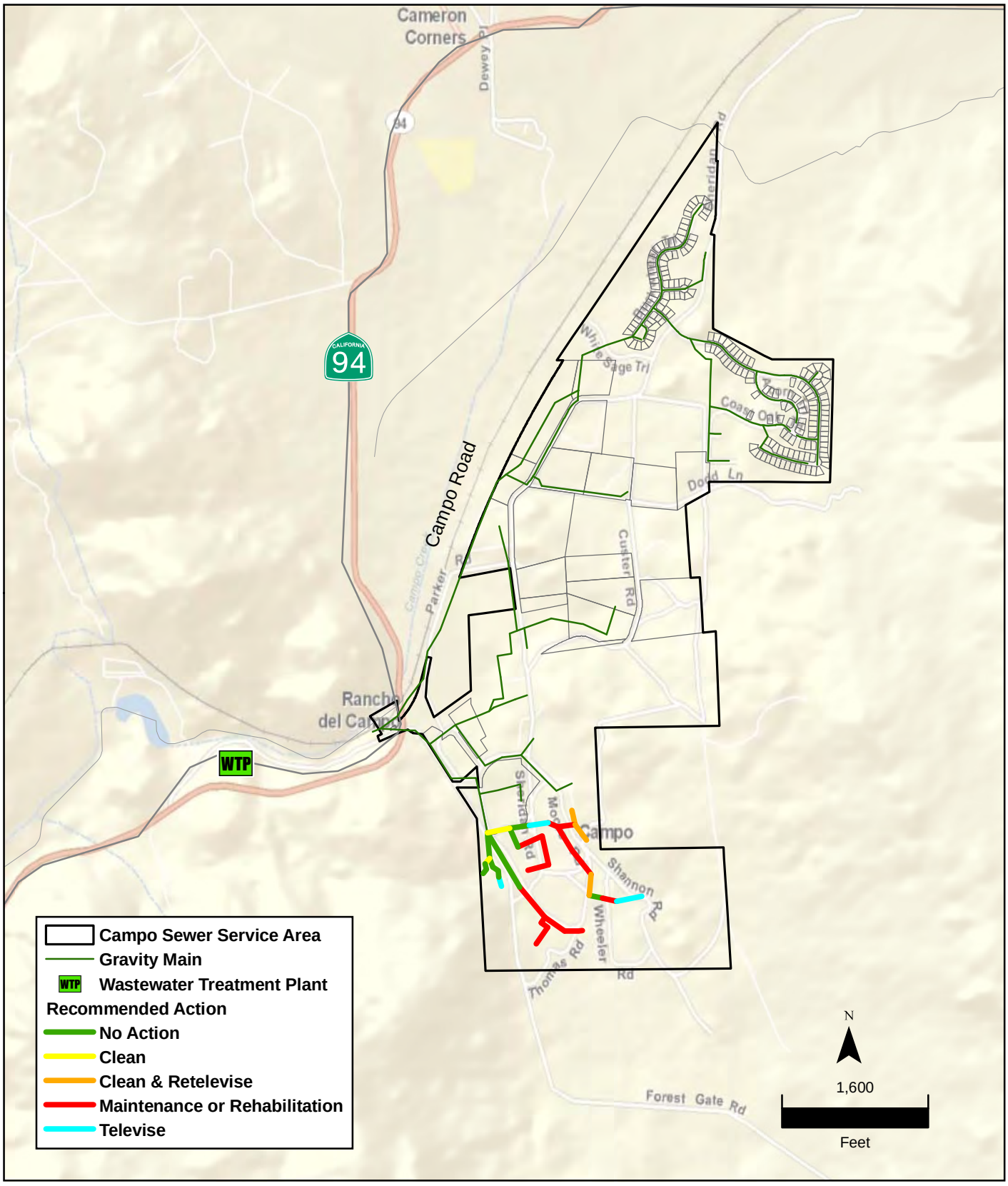
Pipe Material	Length in SSA (ft)	Length of Pipe Assessed (ft)	Percent Extrapolation by Material	Estimated Length for Repair/ Rehabilitation(ft)
VCP	5,648	3,126	85%	4,801
CI	5,215	768	25%	1,304
Estimated Total				**6,105**

5.6 County Condition Assessment Procedures

As part of the County's assessment process, pipelines identified as requiring repair, rehabilitation, or replacement are reviewed and prioritized in compliance with the County's Major Maintenance Project Program. Inspection videos and photos captured during the inspection process of pipelines which were identified to contain noted defects are reviewed and assessed by staff in the County's Major Maintenance Project Program. The defects are scored according to defined criteria and then ranked to indicate the criticality of the asset condition. The scoring procedure is based on the type of defects noted and defined severity criteria. Points assigned range from 0 to 3, with 3 being the most severe for each criterion.

Table 5-10 includes a summary of the scores and severity rankings for the pipelines inspected and assessed in the Campo SSA. Additionally, the score for each of the six (6) criteria used to prioritize projects for the Major Maintenance Project Program are summarized. For the purpose of this study, it was assumed that Sanitary Sewer Overflows (SSOs) have not occurred at these facilities.

The total score for each potential project is then ranked to establish the criticality of the project. Table 5-11 provides a summary of the general criticality ranking associated with the severity of the condition of each asset as well as the recommended response time to complete the recommended action for Major Maintenance Program projects.



RECOMMENDED ACTION

Figure 5-6

11/27/2012 LH SD Z:\Projects\IS\SanDiegoCounty\100001472_AsNd\Task_26_CMP\mxd\19047_RecommAction_Fig 5-6.mxd

Table 5-10 Campo SSA Pipeline Assessment Scores and Rankings

Mainline ID No.	Line Length	Recommended Action	Condition of Facility System	Age of Components, System and/or Facility	Pipe Flow ratio (peak dry weather)	Previous SSOs	Proximity to Watercourse	Blockage or Damage	Scoring Total	Ranking
CM0019	100.00	Televise	-	0	0	0	0	-	0	0
CM0043	146.00	No Action	0	0	0	0	0	0	0	0
CM0034	213.00	No Action	0	0	0	0	0	0	0	0
CM0030	220.00	No Action	0	0	0	0	0	0	0	0
CM0021	403.00	No Action	0	0	0	0	0	0	0	0
CM0020	280.00	No Action	0	0	0	0	0	0	0	0
CM0018	68.00	No Action	0	0	0	0	0	0	0	0
CM0017	71.00	No Action	0	0	0	0	0	0	0	0
CM0016	98.00	No Action	0	0	0	0	0	0	0	0
CM0015	117.00	No Action	0	0	0	0	0	0	0	0
CM0045	273.00	Televise	-	3	0	0	0	-	3	1
CM0035	204.00	Televise	-	3	0	0	0	-	3	1
CM0013	133.00	No Action	0	3	0	0	0	0	3	1
CM0044	159.0	Trim Lateral	0	3	0	0	0	0	3	1
CM0029	246.00	Clean	1	0	0	0	0	0	1	1
CM0013	280.0	Line	1	0	0	0	0	2	3	1
CM0031	285.0	Line & Trim Lateral	1	3	0	0	0	2	6	2
CM0028	41.0	Line	0	3	0	0	0	1	4	2
CM0027	153.0	Line	0	3	0	0	0	1	4	2
CM0026	255.0	Line	0	3	0	0	0	1	4	2
CM0025	218.0	Line	0	3	0	0	0	1	4	2
CM0024	84.0	Line	0	3	0	0	0	1	4	2
CM0041	334.0	Line	1	3	0	0	0	2	6	2
CM0033	229.0	Line & T-Liner	0	3	0	0	0	1	4	2
CM0023	70.0	Line	0	3	0	0	0	1	4	2
CM0036	112.0	Sectional Line	1	3	0	0	0	2	6	2
CM0014	76.00	Clean	0	3	0	0	0	3	6	2
CM0040	290.0	Line	2	3	0	0	0	2	7	3
CM0032	319.0	Line & T-Liner	2	3	0	0	0	2	7	3
CM0042	224.00	Clean & Retelevise	3	3	0	0	0	2	8	3
CM0022	426.0	Line	2	3	0	0	0	3	8	3

Table 5-11 Condition Criticality Ranking-Major Maintenance Projects

Score/ Points	Ranking	Design/ Construction Schedule	Project Assessment	Assessment Description
15-13	5	Within 4 Months	Critical	Recent SSO; Exceeded Capacity; Known Failure/Blockage Points; Maintenance Intensive
12-10	4	4-6 Months	High Priority	Severe Deterioration; SSO History: Potential Blockage/SSO; Maintenance Intensive
9-7	3	6-12 Months	Serious	Severe Deterioration; Near Capacity; Maintenance Intensive
6-4	2	12-24 Months	Major	Visible Deterioration and Near Allowable Capacity
3-1	1	24 Months Plus	Discretionary	Functional; Minor Deterioration; Below Capacity

Based on the summary included in Table 5-10, the scores generally range from 1-8 and rankings consist primarily of 1s, 2s and 3s. Therefore, based on the County Major Maintenance Project Program assessment process, the rankings indicate that there are currently four (4) projects that need to be addressed in 6-12 months. However, it is recommended that appropriate County staff be notified of the pipelines identified as requiring cleaning to ensure the pipelines are included on the appropriate cleaning cycle. Additionally, it is recommended that cleaning and televising be performed on the pipelines for which the recommended action is noted as *Clean and Re-Televise* to establish the condition of the pipelines and subsequently identify and plan for any additional repair and/or rehabilitation projects necessary to ensure the asset is restored to the proper operating condition.

For the pipelines identified as potential improvement projects, Table 5-12 includes a summary of the severity rating results based on the inspection and condition assessment criteria and process presented in Section 5.3 and the total score and ranking based on the County assessment procedures implemented as part of the Major Maintenance Program described above.

The Condition Severity Rankings included in Table 5-3 and the rankings summarized in Table 5-12 are each associated with a recommended response time. Although there is a correlation between the response times in the tables, the response time associated with the County assessment process serves to identify and schedule potential projects within a 24 month period while the response time associated with the severity rankings extends beyond a 5 year period. Therefore, once a project is confirmed for implementation, it is recommended that each project be reviewed in conjunction with the existing CIP and Major Maintenance Project Program as it may have already been identified and planned for construction or its proximity to currently scheduled projects may affect the actual response time. Additionally, the scores for each criterion used to determine the total score for each project should be further reviewed to verify the scores are appropriate (i.e., it was assumed that no previous SSOs occurred at the assets) as it may affect the overall score, project ranking, and thus the recommended response time. Further discussion regarding the timing of necessary improvements is included in Chapter 6.

Table 5-12 Summary of Severity Ratings and Major Maintenance Program Rankings

Mainline ID No.	Line Length	Severity Rating	Recommended Action	Scoring Total	Ranking
CM0044	159.0	B	Trim Lateral	3	1
CM0031	285.0	B	Line & Trim Lateral	6	2
CM0028	41.0	B	Line	4	2
CM0027	153.0	B	Line	4	2
CM0026	255.0	B	Line	4	2
CM0025	218.0	B	Line	4	2
CM0024	84.0	B	Line	4	2
CM0037	190.0	B	Sectional Line	4	2
CM0041	334.0	C	Line	6	2
CM0040	290.0	C	Line	7	3
CM0033	229.0	C	Line & T-Liner	4	2
CM0032	319.0	C	Line & T-Liner	7	3
CM0023	70.0	C	Line	4	2
CM0036	112.0	D	Sectional Line	6	2
CM0013	280.0	D	Line	3	1
CM0022	426.0	E	Line	8	3

5.7 Treatment Plant Assessment

A visual inspection was performed of the RDCWPCF with County operations staff to assess the physical condition of the facility on October 10, 2011. The treatment plant's structure and condition were inspected and assessed. Recommended phased condition improvements were based on the visual inspection and current staff maintenance concerns.

The County would like to add an emergency generator with an automatic transfer switch.

The trickling filter media is in need of replacement, which is a project the County is currently investigating.

CHAPTER 6
PROPOSED CAPITAL IMPROVEMENT PROGRAM

This chapter presents the proposed CIP based on the findings of the Master Plan and includes:

- development of unit costs,
- capital improvement project summary of cost and timing, and
- proposed condition upgrades and estimated costs.

6.1 Development of Unit Costs

The unit cost estimates reflect full capitalization inclusive of planning, engineering design, environmental, legal, construction, construction management and contract administration. The values are presented in mid-2010 dollars based on an anticipated ENR Construction Cost Index of 9969 for the Los Angeles/Orange County area. These estimates are based on representative data available at the time this report was prepared; however, since the cost of materials and labor fluctuate over time, new estimates should be obtained at or near the time of construction of proposed facilities.

6.2 Recommended CIP Program

The CIP projects identify improvements needed to improve the condition and operation of the RDCWPCF. Campo SSA CIP projects are proposed for Phase I at an estimated cost of $405,000. Proposed CIP projects recommended for the Campo SSA are listed in Table 6-1.

Table 6-1 Campo Master Plan Capital Improvement Program

CIP #	Project	Description	Costs
C-1	Campo WWTP Emergency Generator	Install emergency generator with automatic transfer switch.	$105,000
C-2	Campo WWTP Trickling Filter Media	Replace trickling filter media with media suitable for trickling filter depth.	$300,000

6.3 Condition Related Projects

The CCTV inspection and condition assessment of selected pipelines within the Campo SSA served to identify condition related defects in the wastewater collection system. The condition of the selected pipelines was used to determine the most effective method of repair or rehabilitation to restore the asset to its most efficient operating condition. Consequently,

recommendations for improvements based on the noted defects will assist in optimizing the expenditures for the wastewater collection system by targeting available funds to the pipelines that require attention with the most cost effective improvement method.

Specific recommendations were developed based on the results of the condition assessment for the pipelines televised and assessed. Detailed pipeline condition assessment and repair and/or rehabilitation recommendations are included in Appendix L.

6.3.1 Basis of Costs

The wastewater collection system within the Campo SSA consists of 8- and 10-inch diameter pipelines and the recommended rehabilitation methods include a form of lining including full-length lining, sectional lining, and T-Liners at various locations. The base unit costs for pipeline materials and installation including repaving and system appurtenances constitute the principal elements of the wastewater collection system facilities and reflect factors that include eighteen (18) percent to account for design and construction management costs and a twenty (20) percent contingency to account for potential unanticipated design and construction conditions, and traffic control issues. Special circumstances (e.g., jacking, trenchless installations, tunnels, etc.) are considered separately on a case-by-case basis. Unit costs ranging from approximately $215/LF to $225/LF were used for estimating lining costs for 8-inch diameter pipelines and $240/LF to $250/LF was used for estimating pipeline replacement costs.

Table 6-2 summarizes the probable cost to repair/rehabilitate the recommended pipelines within the Campo SSA. The estimated costs are based on the documented length of the pipeline segments and the recommended actions. Recommended actions that included cleaning and/or televising/re-televising were not included in the estimate as the necessary effort is managed as part of the County's overall preventative maintenance program.

The total costs for these condition related projects for the portions inspected are approximately $675,000. Generally, the cost for an individual project identified for the Major Maintenance Project Program is approximately $50,000. Based on the summary included in Table 6-2, approximately 80 percent of the projects listed (totaling $542,000) are large enough that they would warrant inclusion in the CIP program while the other projects can be included in the Major Maintenance Project Program (totaling $133,000) or combined to create a larger rehabilitation project.

Addressing the needs of the County's wastewater collection system is essential to avoiding sewer overflows and for efficiently operating the collection system. Therefore, it is imperative that appropriate budgetary estimates for pipeline rehabilitation and replacement improvements be identified to mitigate projected system deficiencies.

Table 6-2 Estimated Costs for Pipeline Repair/Rehabilitation Projects

Mainline ID No.	Line Length	Recommended Action	Grand Total
CM0044	159.0	Trim Lateral	$1,416
CM0031	285.0	Line & Trim Lateral	$61,008
CM0028	41.0	Line	$8,360
CM0027	153.0	Line	$31,197
CM0026	255.0	Line	$54,912
CM0025	218.0	Line	$48,827
CM0024	84.0	Line	$17,128
CM0037	190.0	Sectional Line	$4,678
CM0041	334.0	Line	$80,223
CM0040	290.0	Line	$69,214
CM0033	229.0	Line & T-Liner	$51,027
CM0032	319.0	Line & T-Liner	$79,593
CM0023	70.0	Line	$17,813
CM0036	112.0	Sectional Line	$3,262
CM0013	280.0	Line	$58,552
CM0022	426.0	Line	$87,592
		Total	**$674,805**

The extrapolation of the condition assessment results revealed that overall over 18 percent of the wastewater collection system, which equates to approximately 6,100 linear feet (1.2 miles), within the Campo SSA that may require a form a repair, rehabilitation or replacement in the next 5-15 years. While VCP sewer pipe has a life of 50-70 years if properly installed, not disturbed and roots are controlled, based on the County GIS information, at least 30 percent of the wastewater collection system within the Campo SSA is assumed to be over 70 years old.

A long term repair and rehabilitation budget was estimated based on the analysis of the data obtained via the CCTV inspection and assessment process. It is assumed that implementation of improvements may potentially be necessary over the next 10-15 years based upon the existing condition of the system. A budget amount was estimated for allocating funds to continue to repair, rehabilitate or replace pipe segments that are in poor condition and that may pose a high risk of sewer overflows. Table 6-3 includes an estimated cost to continue to perform potential rehabilitation and/or replacement improvements in the Campo SSA. For budgetary estimating purposes a base unit cost was assumed.

Table 6-3 Estimated Costs for a Long Term Pipeline Repair/Rehabilitation Program

Description	Estimated Length (feet)	Unit Cost	Subtotal	Design & CM (18%)	Contingency (20%)	Estimated Total
Pipeline Rehabilitation / Replacement	6,100	$150	$915,500	$164,700	$216,000	$1,296,000

For budgetary estimating purposes an average base unit cost of $150/LF was assumed. The average base cost assumes that lining of pipe segments will be the principal rehabilitation method. However, some segments may result that some repairs may include point repairs; others will require full lining while still others may require full replacement due to access constraints.

As the system ages and the condition of the pipelines deteriorate, rehabilitation costs increase and often lining cannot be completed due to the condition of the pipeline. Proactive asset management will minimize costs by completing the necessary rehabilitation prior to pipe failure as response to emergencies generally result in significantly higher costs.

Additionally, as the time period in which improvements are necessary can vary significantly based on the type and frequency of maintenance activities performed on the system, it should be noted that the potential for spills to occur increases as the pipes age and additional deficiencies occur. Therefore, it is recommended that the County continue to conduct routine CCTV inspections and assessments to ascertain a more comprehensive understanding of the existing condition of the wastewater collection system. Performing an initial CCTV inspection of the entire system over a 3-5 year period would serve establish a solid baseline from which accurate cost projections could be developed. Subsequent to completing the initial CCTV inspection of the entire system, the inspection program may be adjusted and conducted over a 5-7 year period.

Although it is likely that additional pipelines requiring a form of repair and/or rehabilitation will be identified, additional CCTV inspections and assessments will also serve to further refine the estimated funds necessary to ensure the assets are ultimately restored to the most efficient operating condition and optimize the funds available in the appropriate programs.

Also, it is recommended that projects identified as requiring improvements be reviewed, prioritized, and subsequently included in the appropriate program. Additionally, as the County proceeds towards implementation of the projects presented in this Master Plan, it is recommended that the engineering cost estimates be further refined to reflect project costs due to inflation and/or increases in construction costs.