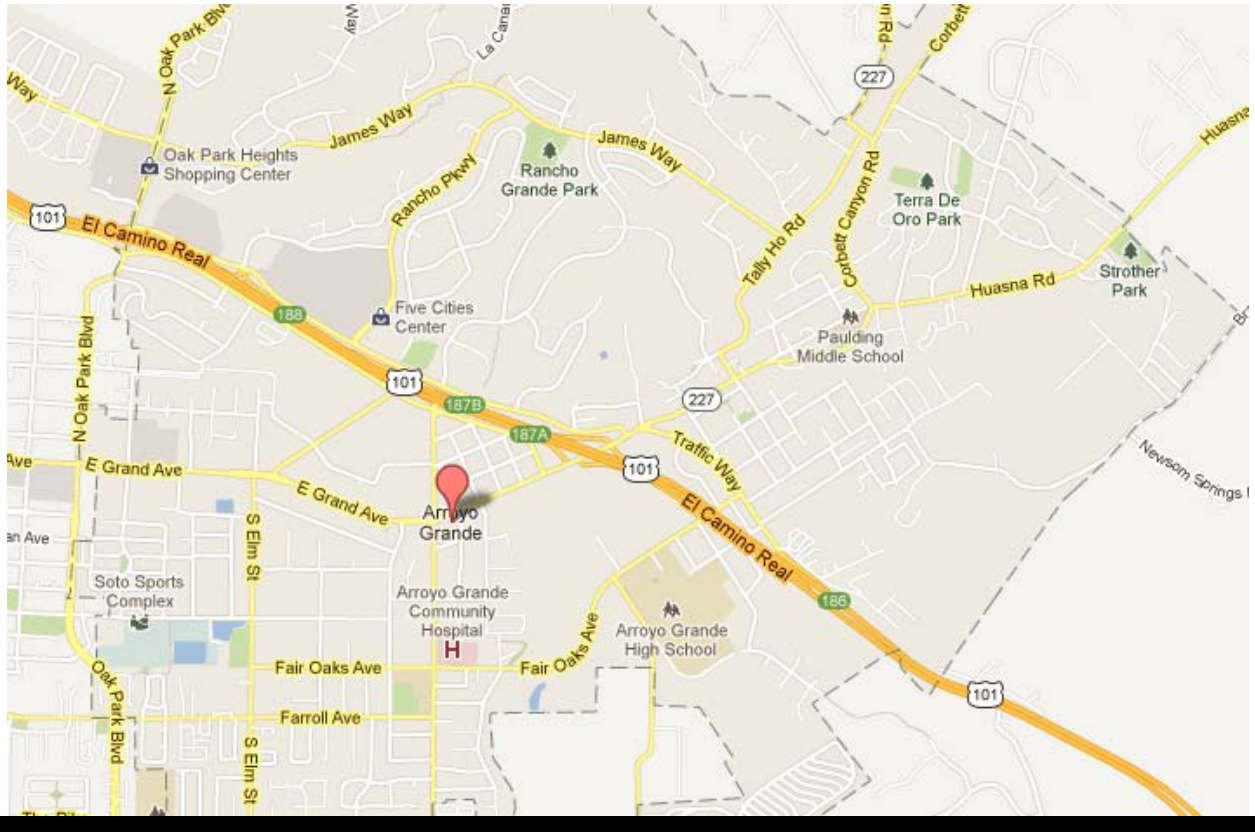
City of Arroyo Grande
Wastewater System Master Plan
December 2012



The Arroyo Grande Wastewater Master Plan was prepared under the direction of the following registered Civil Engineers:

Hydraulic Modeling and Technical Data prepared by:

Prepared by:

Reviewed and Approved by:

RESOLUTION NO. 4506

A RESOLUTION OF THE CITY COUNCIL OF THE CITY OF ARROYO GRANDE ADOPTING THE 2012 WATER MASTER PLAN UPDATE AND THE 2012 WASTEWATER MASTER PLAN UPDATE

WHEREAS, the City of Arroyo Grande has updated the 2012 Water Master Plan and the 2012 Wastewater Master Plan; and

WHEREAS, the City Council has reviewed this project in compliance with the California Environmental Quality Act (CEQA), the State CEQA Guidelines, and the Arroyo Grande Rules and Procedures for Implementation of CEQA and has reviewed the Draft Mitigated Negative Declaration prepared for the project.

NOW, THEREFORE, BE IT RESOLVED, that the City Council of the City of Arroyo Grande hereby adopts the 2012 Water Master Plan Update and the 2012 Wastewater Master Plan Update and the Mitigated Negative Declaration prepared for the project and directs the City Clerk to file a Notice of Determination.

On motion by Council Member Brown, seconded by Council Member Guthrie, and by the following roll call vote, to wit:

AYES: Council Members Brown, Guthrie, Costello, and Mayor Ferrara
NOES: None
ABSENT: Council Member Ray

the foregoing Resolution was passed and adopted this 22nd day of January 2013.

TONY FERRARA, MAYOR

ATTEST:

KELLY WETMORE, CITY CLERK

APPROVED AS TO CONTENT:

STEVEN ADAMS, CITY MANAGER

APPROVED AS TO FORM:

TIMOTHY J. CARMEL, CITY ATTORNEY

OFFICIAL CERTIFICATION

I, KELLY WETMORE, City Clerk of the City of Arroyo Grande, County of San Luis Obispo, State of California, do hereby certify under penalty of perjury, that the attached Resolution No. 4506 is a true, full, and correct copy of said Resolution passed and adopted at a Regular meeting of the City Council of the City of Arroyo Grande on the 22nd day of January 2013.

WITNESS my hand and the Seal of the City of Arroyo Grande affixed this 23rd day of January 2013.

Kelly Wetmore

KELLY WETMORE, CITY CLERK

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EXECUTIVE SUMMARY

The City of Arroyo Grande (City) provides a wastewater collection system for residential, commercial, and institutional buildings within the City. The City's collection system conveys raw wastewater to trunk mains owned and operated by the South San Luis Obispo Sanitation District (SSLOCSD). Wastewater treatment and ocean disposal is also provided by SSLOCSD. According to the State of California, Department of Finance, the 2011 population was approximately 17,291 is expected to increase to 20,000 at build-out of the existing city limit. As the City corrects current capacity and age-related problems with the system infrastructure, it is the City's intent to construct wastewater system improvements consistent with the ultimate needs of the system. In order to provide wastewater collection facilities for build-out and establish a capital improvements projects program, the City contracted with Water Systems Consultants, Inc. to update the hydraulic model of the wastewater collection system.

The Wastewater Master Plan was prepared to be consistent with the City General Plan and General Plan Update. Land use and population data were examined in detail along with historical demand to establish future service requirements. A comprehensive computer model of the wastewater system was developed to establish and project the capabilities of the wastewater collection system. The model was also used to identify projects for the capital improvements projects (CIP) programs, which outlines necessary improvements and upgrades for existing and future expansion wastewater system needs. The recommendations contained in this report will be reviewed periodically to ensure they continue to be consistent with current code requirements and population projections.

Scope of Study

The Wastewater System Master Plan was prepared to evaluate the existing wastewater collection system and recommend a program of improvements in order to provide for a well-planned and comprehensive program. The scope of the study includes the following:

1. In coordination with the City Planning Department and planning consultants, review the Land Use Element of the City General Plan through build-out of the existing City limit.
2. Estimate the current and projected average and peak wastewater flows for the collection system based on flow monitoring and available records, and estimate future flows using a detailed breakdown of land use potential provided by the City Community Development Department.

3. Install and monitor flow recording devices to confirm flow assumptions and peaking factors. In targeted areas, review the date for the occurrence of storm water intrusion into the system.
4. Using available as-built information, prepare a comprehensive computer model of the collection system, including both gravity and pressure systems. Confirm model assumptions through field testing and flow monitoring. Analyze the collection system in terms of existing and future deficiencies.
5. Analyze each sewer lift station and force main in terms of pump hydraulic performance, and recommend improvements to be performed within a 20 year planning horizon.
6. Recommend improvements to the gravity collection system to be performed within a 20 year planning horizon.
7. Describe the City's relationship with the SSLOCSD, and Identify sewers within the City limits owned and operated by the District. Include SSLOCSD trunk mains in the comprehensive computer model.
8. Estimate the budget cost of each recommended improvement to the collection system.
9. Prepare a prioritized capital improvement program for implementation of the recommended system modifications.

Section 1 - Introduction and Overview

Chapter 1 summarizes the study that was performed, and briefly presents recommendations for a program of wastewater system improvements to accommodate the build-out needs of the City.

1.1 Land Use and Population

The land use patterns utilized in this study are based on the 2010 Update of the Land Use Element contained within the Arroyo Grande General Plan and on current or pending changes to this plan associated with the General Plan Amendment process. The 2010 population of the City was 17,252 according to the 2010 U.S. Census Bureau. According to the 2010 Update of the Long Range Planning Report, the population of the City is expected to grow from its current level of approximately 17,252 residents to 20,000 residents at build-out. The infrastructure improvements recommended in this document provide for the ultimate build-out of the City.

1.2 Gravity Collection System

The City's wastewater collection system population includes most residential lots located within the City of Arroyo Grande city limit. In addition, there a number of lots outside the city limit which the city collects wastewater from. A model of the water system was developed and calibrated as part of the update. The model was used to evaluate existing wastewater collection system performance and examine alternatives for future modifications. The model and field testing indicated that the existing wastewater collection system meets demand requirements in 97% of the cases. Improvement projects were identified and modeled to address the identified deficiencies. Recommendations are also provided to meet build-out demands to enhance the reliable of the system in the future.

1.3 Wastewater Lift Stations

The City operates five (5) wastewater lift stations within its collection system. In 2006, Capital improvements were performed at Lift Station No. 1, which consists of a wet well pump configuration and conveys approximately 17% of the total City wastewater flow. In 2012 Lift Station No. 3 underwent a renovation that addressed safety and reliability issues

As part of the 2012 Water and Sewer Master Plan Updates, an evaluation was performed on the City's lift stations to determine if the current capacity of each lift station is adequate for estimated build-out flows. The analysis was performed for Lift Station Nos. 1, 4, 5, and 7. Lift Station No. 3 was excluded from this analysis due that the fact it was undergoing a major upgrade to meet build-out flows at the time of the analysis. The capacity evaluation showed

that Lift Station No. 1, 4, 5, and 7 all have adequate capacity to meet build-out peak hour wet weather flows (PHWWF).

1.4 Wastewater Collection, Treatment, and Disposal by SSLOCSD

The South San Luis Obispo Sanitation District (SSLOCSD) is made up of three member agencies including the City of Arroyo Grande, the City of Grover Beach, and the Oceano Community Services District (OCSD). Wastewater collection (trunk sewers only), treatment, and disposal services are provided to the City of Arroyo Grande. The collection, treatment, and disposal capacity available for each member agency is not established by contract.

Instead, expansion-related upgrades are funded by development impact fees that are paid when development occurs within each of the agencies. As a result, the development impact fees are calculated on a proportional basis which is dependent on the proposed project. The SSLOCSD wastewater treatment plant is currently operating at approximately 58% (2.88 mgd) of its 5.0 million gallon per day capacity.

1.5 Operations and Control

The City system operates automatically. Operations personnel can track lift station operation at a centralized location through the Supervisory Control and Data Acquisition (SCADA) system.

1.6 Recommendations and Capital Improvements

The recommendations resulting from this study are summarized in Chapter 8. A prioritized capital improvement program was assembled, and project costs were estimated. The capital improvements are summarized below:

Priority A - Current Projects	$1,132,100
Priority B - Implement by 2020	$3,077,600
Priority C - Implement by 2030	$3,692,800
TOTAL	$7,902,500

Section 2 - Land Use and Population

2.1 Existing Land Use and Population

The City of Arroyo Grande (City) is located in the Southern portion of San Luis Obispo County along the banks of the Arroyo Grande Creek. The City, a general law entity, currently incorporates 5.45 square miles of land area with primarily residential and agricultural land uses. The City's distinctive character derives from its traditional ties to agriculture, physical diversity, unique village, small town atmosphere, and rural setting. The current (2010) population of the City is 17,252 according to the U.S. Census Bureau; however the City currently serves water to a population of 16,945 residents.

Land Use zones within the City are established by the Land Use Element (LUE) of the General Plan. The City adopted an update to the LUE on October 9, 2001. During the LUE update process, a detailed Land Use Inventory (LUI) was prepared to quantify existing and future development (See Appendix A). The LUI was broken into 65 Traffic Analysis Zones (TAZ) within the current City limits and provided the following information for each zone.

- Number of existing residential units segregated by single family, multi-family, and mobile home parks.
- Existing commercial or institutional uses including additional detail on the intensity of use (building area, number of structures, etc.).
- Estimated potential residential units segregated by single family or multi-family use
- Estimated potential commercial or institutional uses.

The Traffic Analysis Zones were small enough to be integrated and used for the tributary sewer analysis of the collection system. Wastewater flow factors for different types of development were based on metered data and type of use as described in Chapter 4 and Appendices A and B. Existing land use zones within the City are shown in Figure 3-1 and categorized in Table 3-1

Table 2-1 - Land Use Designations

Classification		DU Density	Consistent Zoning/Min Lot Size	Persons/ Household	Approximate Population Density Persons/acre
Single Family Residential (SFR)					
Agriculture	(AG)	1 du/10ac.	Gen or Exclusive Agriculture/ 20 ac. (currently 10 ac. In City)	2.4 p/du	0.24 p/ac
		1 du/20ac.			0.12 p/ac
Conservation Open Space	(C/OS)	1 du/10ac.	OS & PF	2.4 p/du	0.24 p/ac
		1 du/5ac.	5 ac, 10 ac, & 20 ac.		0.5 p/ac
Very Low Density	(VLD)	1du/2 ½ ac.	RE/2½ ac.	2.4 p/du	1.0 p/ac
Low Density	(LD)	1 du/1½ ac.	RH/1½ ac. (cluster)	2.4 p/du	1.6 p/ac
		1 du/1ac.	City RR/1 ac.	2.4 p/du	2.4 p/ac
Low-Medium Density	(LMD)	2.5 du/1ac.	City RS	2.4 p/du	6.0 p/ac
Medium Density	(MD)	4.5 du/ac	City SF	2.4 p/du	10.8 p/ac
Multi-Family Residential (MFR)					
Medium-High Density	(MHD)	9.0 du/ac	City MF	2.0 p/du	18.0 p/ac
High Density	(HD)	14 du/ac	City MFA	2.0 p/du	28.0 p/ac
Very High Density	(VHD)	25 du/ac	Senior Residential	2.0 p/du	50.0 p/ac
Mixed Use (MU)					
Village Core	(VC)	25 du/ac	See Devt. Code	2.0 p/du	50.0 p/ac
Office Professional	(O)		See Devt. Code		
Community Facilities	(CF)		See Devt. Code		
Regional Commercial	(RC)		See Devt. Code		

Table 2-2 - Existing and Projected Land Use Distribution

Land Use Code	Land Use Description	Current Status (Acres)	Build-Out (Acres)
AG	Agriculture	345	347
CF	Community Facilities	364	367
HD	Multi-Family High Density	33	43
LD	Single Family Low Density	308	358
LMD	Single Family Low-Medium Density	535	583
MD	Single Family Medium Density	516	535
MHD	Multi-Family Medium-High Density	146	157
MU	Mixed-Use	160	195
O	Office Professional	27	31
C/OS	Conservation/Open Space	320	320
RC	Regional Commercial	60	60
VC	Village Core	52	52
VHD	Multi-Family Very High Density	4	5
VLD	Single Family Very Low Density	48	48
	TOTAL	2,918	3,100

2.2 Annexation

Staff currently considers the wastewater collection needs of potential annexation projects on a case by case basis. As a result, annexations were not specifically considered in this study, with the exception that upgrades to existing infrastructure will enhance the overall level of service to annexed properties.

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Section 3 - Wastewater Flow Data

3.1 Existing Wastewater Flows

Existing wastewater flows were assessed by utilizing the following sources of data:

- Flow monitoring data from wet and dry weather sources
- Lift station flow data
- SSLOCSD wastewater treatment plant influent flow records

Given that flow monitoring efforts were limited to a short period of time, it was necessary to determine the approximate percentage of the total flow that the City contributes to the SSLOCSD treatment facility. SSLOCSD flow data, which includes continuous flow records and daily totals, was then used to confirm seasonal peaking factor characteristics. The South San Luis Obispo County Sanitation District encompasses a geographic area of 165 square miles. It is located within an area known as the Five Cities area in the southwestern portion of San Luis Obispo County and is located 15 miles south of the City of San Luis Obispo.

The SSLOCSD provides its services for the residents of the City of Arroyo Grande, the City of Grover Beach and the Oceano Community Services District. In addition, there is a small County population of approximately 50 residences that are not incorporated within the communities listed above who also receive those services offered by the District.

Flow estimates were developed of the City's collection system using data from a recently completed infiltration and inflow (I/I) study prepared by the South San Luis Obispo County Sanitation District (SSLOCSD) and effluent flow data from the SSLOCSD WWTP. Effluent flow data from September 2010 through August 2011 was averaged to develop an average annual flow (AAF) for the SSLOCSD WWTP of 2.85 million gallons per day (MGD). The portion of that flow that the attributed to City's system (42%), was then applied to the SSLOCSD WWTP's AAF to obtain the AAF for the City's collection system (1.20 MGD).

Table 4-1 summarizes the estimated wastewater flows of various existing development types within the City. The flow estimates employed in Table 4-1 were derived from a variety of sources including water use information, industry-standard factors, and flow meter studies of selected areas. Residential wastewater flows represent approximately 80% of the total annual average flow, which is consistent with historical water information presented in the Water Master Plan.

Table 3-1 - Sewer Flow Factors

Land Use Description	Land Use Code	Buildout Sewer Flow Factor (gpd/Acre)
Agriculture	AG	5
Community Facilities	CF	151
Multi-Family High Density	HD	1,452
Single Family Low Density	LD	256
Single Family Low-Medium Density	LMD	668
Single Family Medium Density	MD	773
Multi-Family Medium-High Density	MHD	717
Mixed-Use	MU	626
Office Professional	O	457
Conservation/Open Space	C/OS	3
Regional Commercial	RC	405
Village Core	VC	360
Multi-Family Very High Density	VHD	1,806
Single Family Very Low Density	VLD	160

Notes:
1. Sewer flow factors do not include areas where the City does not serve water or sewer, or unclassified land uses within City limits.
2. Per capita flow factors (gpd/capita) are based on existing residential sewage flow divided by the city population. These factors are not used for flow projections.

Table 3-2 - Existing Average Annual (Daily) Flows by Dwelling Unit Type

Dwelling Unit Type	Dwelling Units	Population[1]	Sewer Flow Factors[2] (gpd/capita)	2008-2010 AAF (gpd)[3]
Residential Single Family	5,897 [4]	14,111	57	804,338
Residential Multi-Family	1,156	2,312	57	131,784
Mobile Home Parks	627	1,254	57	71,478
Commercial, Institutional, and Public Facility	n/a	n/a	n/a	238,400
Year 2008-2010 Average Annual (Daily) Flow (AAF)				1,246,000

Notes:
1. This is an estimate based on dwelling units served.
2. Per capita flow factors (gpd/capita) are based on existing residential sewage flow divided by the city population. These factors are not used for flow projections.
3. This number is slightly higher than the flow number predicted using the land use duty factors because a small number of dwelling units are double counted.
4. Single Family number includes 104 secondary units since they fall within the same geographic land use designation; however, secondary unit population is calculated at 2.0

3.2 Peaking Factor Analysis

In order to appropriately design wastewater collection facilities, peak flow conditions must be quantified. The "peak conditions of interest for facility design are summarized below:

Average Annual Flow (AAF) is obtained by dividing the total flow conveyed by the City system in one year by 365 days. Other peak conditions are derived by multiplying the AAF by a peaking factor (PF). The flow factors in Table 4-1 reflect average annual flows.

Peak Day Dry Weather Flow (PDF) is the maximum flow occurring in one day during the dry season. This flow condition is often used for the biological design of treatment processes. PDF was based on data provided by the SSLOCSD.

Peak Hour Wet Weather Flow (PHWWF) is the maximum flow rate that occurs in a single hour during wet weather. Within the City, this condition will govern the design of sewers and represents the maximum flow rate that the system must convey.

Average Day Maximum Month Dry Weather Flow reflects the maximum flow rate during the peak month of summer. This condition reflects the seasonal variation in dry weather flow.

The table below summarizes the historical and projected peaking factors for the City. The historical peaking factors were based on all analysis of SSLOCSD data as described below. Higher peaking factors are often appropriate for the analysis of sub-areas within the system and will be noted in the analysis where appropriate.

Table 3-3 - Existing and Projected Average Annual (Daily) Flows by Land Use

Land Use Description	2008-2010 Existing AAF (gpd)	Development at Build-Out (Acres)	Buildout Sewer Flow Factor (gpd/Acre)	Build-Out AAF (gpd) with Buildout Flow Factor	Build-Out AAF (gpd) with SB7 Target Conservation Flow Factors
Agriculture	1,600	347	5	1,600	1,500
Community Facilities	55,100	367	151	55,500	52,900
Multi-Family High Density	47,500	43	1,452	62,200	59,200
Single Family Low Density	78,800	358	256	91,600	87,300
Single Family Low-Medium Density	357,200	583	668	389,100	370,500
Single Family Medium Density	398,600	535	773	413,300	393,500
Multi-Family Medium-High Density	105,000	157	717	112,400	107,000
Mixed-Use	100,300	195	626	122,200	116,300
Office Professional	12,400	31	457	14,000	13,400
Conservation/Open Space	1,000	320	3	1,000	1,000
Regional Commercial	24,400	60	405	24,400	23,200
Village Core	18,600	52	360	18,600	17,700
Multi-Family Very High Density	7,200	5	1,806	9,800	9,300
Single Family Very Low Density	-	48	160	7,600	7,200
Total ADD	**1,207,700**			**1,323,300**	**1,260,000**

3.3 Storm Water Infiltration and Inflow

The infiltration and inflow of storm water into a sewer system can result in peak flows that far exceed dry weather conditions. For the purposes of this report, these terms are defined as follows:

Infiltration	Infiltration is the water entering a sewer system and service connections from groundwater, through such means as defective pipes, pipe joints, connections, or manhole walls. Infiltration does not include inflow and is relatively constant over period of days, weeks, or even months as high groundwater conditions persist.

Inflow	Inflow is the water discharged into a sewer system and service connections from such sources as roof drains, cellar, yard and area drains, foundation drains, cooling water discharges, drains from springs and swampy areas, manhole covers, cross connections from storm sewers, catch basins, storm water, surface runoff, or drainage. Inflow does not include infiltration. Inflow varies rapidly with rainfall conditions, with flows rising and falling within minutes or hours of a severe storm event.

3.4 Future Wastewater Flows

The table below summarizes the future wastewater flows for the City at build-out using the peaking factors and land use analysis previously described. Appendix A presents a more detailed flow breakdown by Traffic Analysis Zone.

Table 3-4 - Summary of Peaking Factor Analysis

Peak Flow Condition	Historical Peaking Factor	Design Peaking Factor (City-Wide)	Flow Rate (mgd)
Average Annual (Daily) Flow (AAF)	n/a	n/a	1.21
Peak Day Dry Weather Flow (PDF)[1]	1.32	1.30	1.57
Peak Hour Wet Weather Flow (PHWWF)[2]	2.18	2.84	3.43
Average Day Maximum Month Dry Weather Flow[3]	1.01	1.10	1.33

Notes:

1. Historical PDF was calculated using results from the 2011 SSLOCSD I/I Study, where 42% of the peak dry day flow (influent) is attributed to Arroyo Grande. The design PDF is maintained at 1.3, consistent with the past master plan.
2. Historical PHWWF is based on metered manhole data for SSLOCSD manholes C18 and B11a, for the period 3/15/11-4/17/11. Design PHWWF was calculated using the Babbitt equation.
3. Historical Average Day Maximum Month Dry Weather Flow factor was estimated using 2010/2011 SSLOCSD effluent data. Design factor was maintained at 1.1, consistent with the previous master plan.

Table 3-5 - Future Wastewater Flows

Flow Condition	Peaking Factors	Build-out Wastewater Flows (mgd)
Average Annual Flow (AAF)	n/a	1.32
Peak Day Dry Weather Flow (PDF)	1.30	1.72
Peak Hour Wet Weather Flow (PHWWF)	2.84	3.76
Average Day Maximum Month Dry Weather Flow	1.10	1.46

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Section 4 - Wastewater Collection System Analysis

4.1 Existing Collection Facilities

The Arroyo Grande wastewater collection system consists of approximately 73 miles of gravity sewer and five (5) wastewater lift stations. The table below provides an inventory of the current system pipeline infrastructure, and figures display the existing system.

Table 4-1 - Sewer Collection System Inventory

Pipe Diameter (inches)	Approximate Length of Gravity Sewers		Approximate Length of Force Mains	
	(feet)	**(miles)**	**(feet)**	**(miles)**
4	264	0.1	2,033	0.4
6	84,533	16.0	1,381	0.3
8	229,909	43.5	3,068	0.6
10	14,757	2.8	0	0
12	24,683	4.7	0	0
14	2,847	0.5	0	0
15	7,748	1.5	0	0
16	425	0.1	0	0
18	2,620	0.5	0	0
24	883	0.16	0	0
TOTAL	**368,669**	**69.9**	**6,482**	**1.2**
Approx. No. of Sewer Manholes	1,757		n/a	

The table below summarizes the characteristics of the five (5) existing wastewater lift stations.

Table 4-2 - Existing Lift Station Summary

Station Name	Calculated Operating Point	Pump Type and Model	Motor Size (hp)	No. of Pumps	Wet Well Summary	Year of Last Major Upgrade	Standby Power
Lift Station No. 1	810 gpm @ 180' TDH	Fairbanks Morse	60	2	6' dia. X 22' deep	Inst. 1973 Up. 2005	Permanent standby generator
Lift Station No. 3	305 gpm @ 54' TDH	Wemco Submersible	7.9	2	4' dia. X 20' deep	Inst. 1973 Up. 2012	Connection for portable generator
Lift Station No. 4	230 gpm @ 23' TDH	Wemco Submersible	1.5	2	5' dia. X 16' deep	Inst. 1973	None
Lift Station No. 5	125 gpm @ 30' TDH	Wemco Submersible	3	2	4' dia. X 14' deep	Inst. 1978 Up. 2009	None
Lift Station No. 7	175 gpm @ 60' TDH	Wemco Submersible	10	2	7' dia. X 16' deep	Inst. 2001	Connection for portable generator

4.2 Collection System Modeling

In order to evaluate the performance of the existing and future collection systems, a computerized hydraulic model was developed using SewerGEMS Sewer Analysis Software. This powerful program is widely used in the wastewater industry. The modeling process involved the following.

4.2.1 System Map Update

To update the system mapping, the existing GIS shapefiles were modified based on information obtained from as-built drawings for development and CIP projects, the City's Wastewater System Atlas and information provided by City Staff. For system components not currently contained within the GIS system mapping, individual shapefiles were developed for the following features:

- Outfalls
- Wet Wells
- Lift Stations
- Force Mains
- Sewer Nodes

4.2.2 Elevation Data Verification

As elevation data is a critical component of a sewer system modeling. Accurate manhole invert elevation (elevation at the lowest portion of the sewer mains in the manhole) allows the existing slope of the sewer main to be calculated and is critical for determining the capacity of sewer mains. Rim elevations are also important for determining sewer depths and potential for overflows. To develop the updated sewer model, the following sources of elevation data:

- sewer model developed for a 2001 Wastewater Master Plan
- record drawings for recent system improvements
- SSLOCSD trunk lines GIS shapefiles

From these three sources, invert elevation data for 910 of the 1,701 manholes were able to be obtained within the City's collection system.

To establish rim elevation data for the manhole features in the collection system, elevation data was obtained from the United States Geological Survey National Elevation Dataset (USGS NED). The USGS NED provides public domain raster elevation data for the conterminous United States, Alaska, Hawaii and territorial islands. The NED provides elevation data in the following resolutions:

- 1 arc-second (approx. 30 meter grids)
- 1/3 arc-second (approx. 10 meter grids)
- 1/9 arc-second (approx. 3 meter grids)

The best available resolution for the Arroyo Grande City Limits was 1/3 arc-second. Utilizing ArcMap, the NED raster dataset was overlaid and extracted land surface elevation data for each of the manholes in the collection system. For the City's sewer model it was assumed that the rim elevation was equal to the land surface elevation from the USGS NED.

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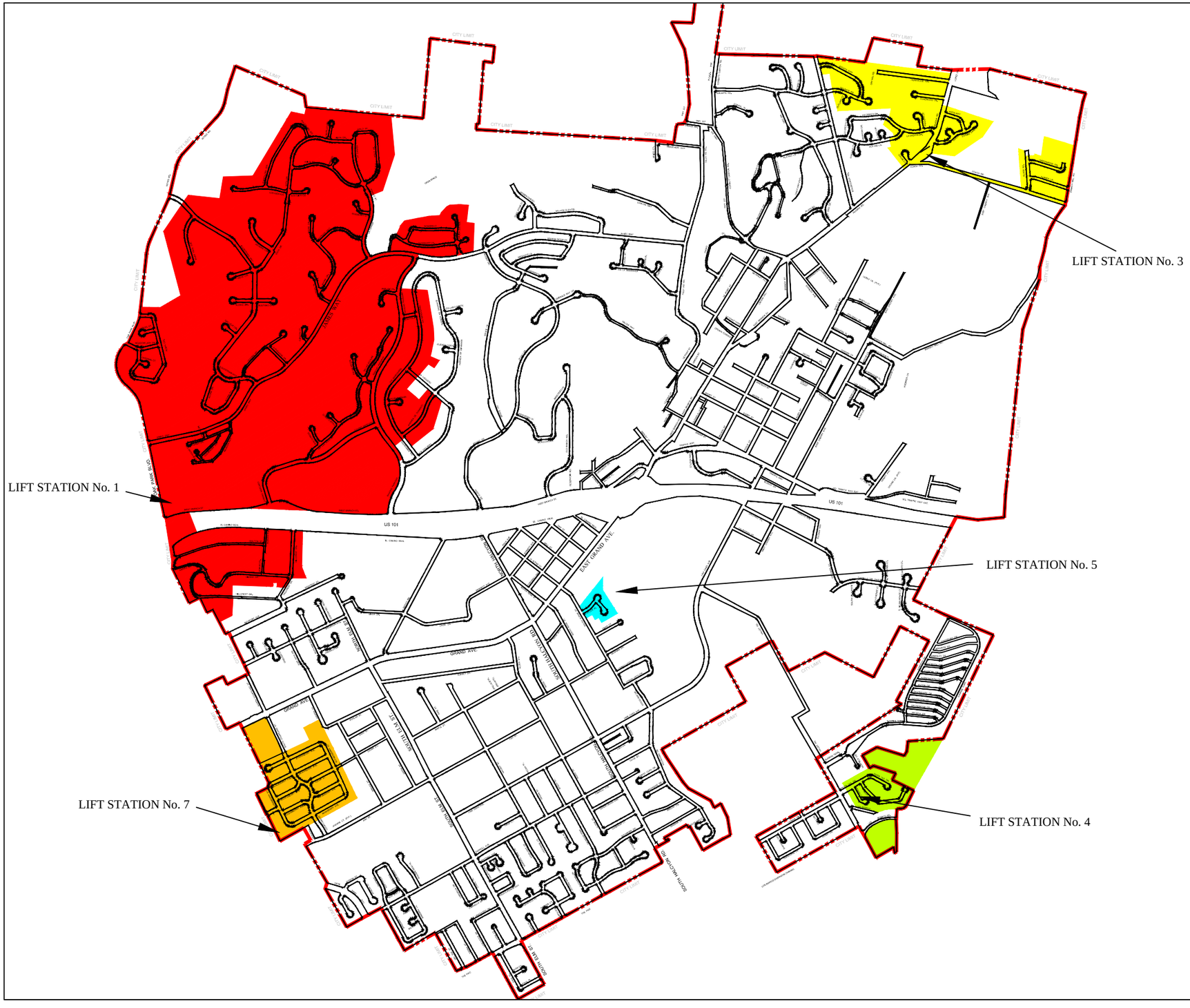
Wastewater System Master Plan

Lift Station Tributary Areas

Figure 4-1



LEGEND

- LIFT STATION No. 1
- LIFT STATION No. 3
- LIFT STATION No. 4
- LIFT STATION No. 5
- LIFT STATION No. 7

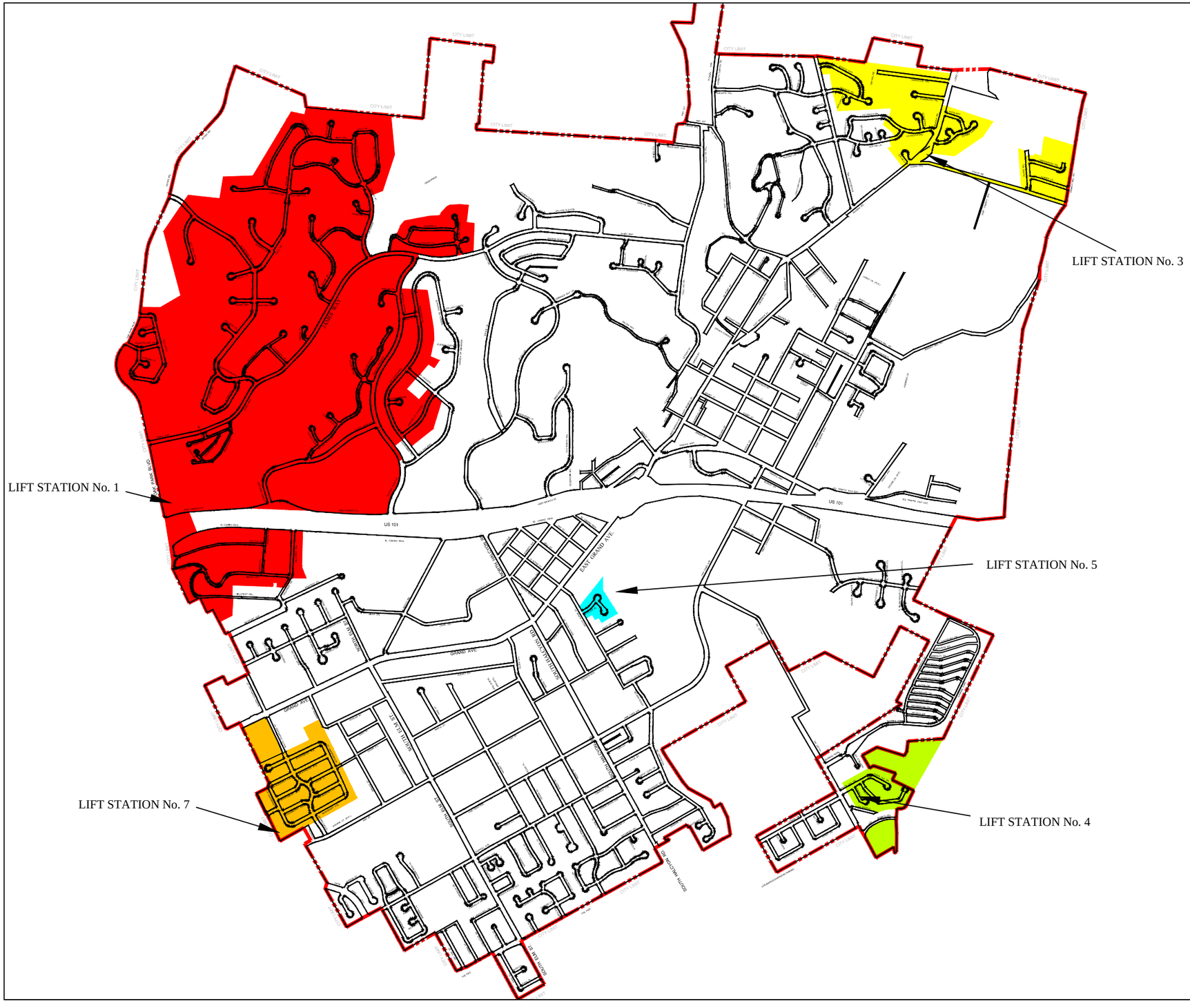
0 850' 1700'

SCALE: 1" = 1700'

Wastewater System Master Plan

Lift Station Tributary Areas

Figure 4-1



LEGEND

- LIFT STATION No. 1
- LIFT STATION No. 3
- LIFT STATION No. 4
- LIFT STATION No. 5
- LIFT STATION No. 7

0 850' 1700'

SCALE: 1" = 1700'

Wastewater Master Plan

Existing Wastewater Collection System

Figure 4-2A

LIFT STATION No. 3
6" FORCE MAIN

Sanitary Sewer Line Size

- 4" Line
- 6" Line
- 8" Line
- 10" Line
- 12" Line
- 14" Line
- 15" Line
- 16" Line
- 18" Line
- 24" Line
- 18" Line SSLOCSD TRUNK LINE
- 24" Line SSLOCSD TRUNK LINE
- 27" Line SSLOCSD TRUNK LINE
- FORCE MAIN

LEGEND

- FORCE MAIN

LIFT STATION No. 1
8" FORCE MAIN

MATCHLINE
FIGURE 4-2B

0 600' 1200'

SCALE: 1" = 1200'

Wastewater Master Plan

Existing Wastewater Collection System

Figure 4-2A

LIFT STATION No. 3
6" FORCE MAIN

Sanitary Sewer Line Size

- 4" Line
- 6" Line
- 8" Line
- 10" Line
- 12" Line
- 14" Line
- 15" Line
- 16" Line
- 18" Line
- 24" Line
- 18" Line SSLOCSD TRUNK LINE
- 24" Line SSLOCSD TRUNK LINE
- 27" Line SSLOCSD TRUNK LINE
- FORCE MAIN

LEGEND

- FORCE MAIN

LIFT STATION No. 1
8" FORCE MAIN

MATCHLINE
FIGURE 4-2B

0 600' 1200'

SCALE: 1" = 1200'

Wastewater Master Plan

Existing Wastewater Collection System

Figure 4-2B

MATCHLINE
FIGURE 4-2A

LIFT STATION No. 5
4" FORCE MAIN

LIFT STATION No. 4
4" FORCE MAIN

LIFT STATION No. 7
4" FORCE MAIN

Sanitary Sewer Line Size

- 4" Line
- 6" Line
- 8" Line
- 10" Line
- 12" Line
- 14" Line
- 15" Line
- 16" Line
- 18" Line
- 24" Line
- 18" Line SSLOCSD TRUNK LINE
- 24" Line SSLOCSD TRUNK LINE
- 27" Line SSLOCSD TRUNK LINE
- FORCE MAIN

LEGEND

- FORCE MAIN

0 600' 1200'

SCALE: 1" = 1200'

Wastewater Master Plan

Existing Wastewater Collection System

Figure 4-2B

MATCHLINE
FIGURE 4-2A

LIFT STATION No. 5
4" FORCE MAIN

LIFT STATION No. 4
4" FORCE MAIN

LIFT STATION No. 7
4" FORCE MAIN

Sanitary Sewer Line Size

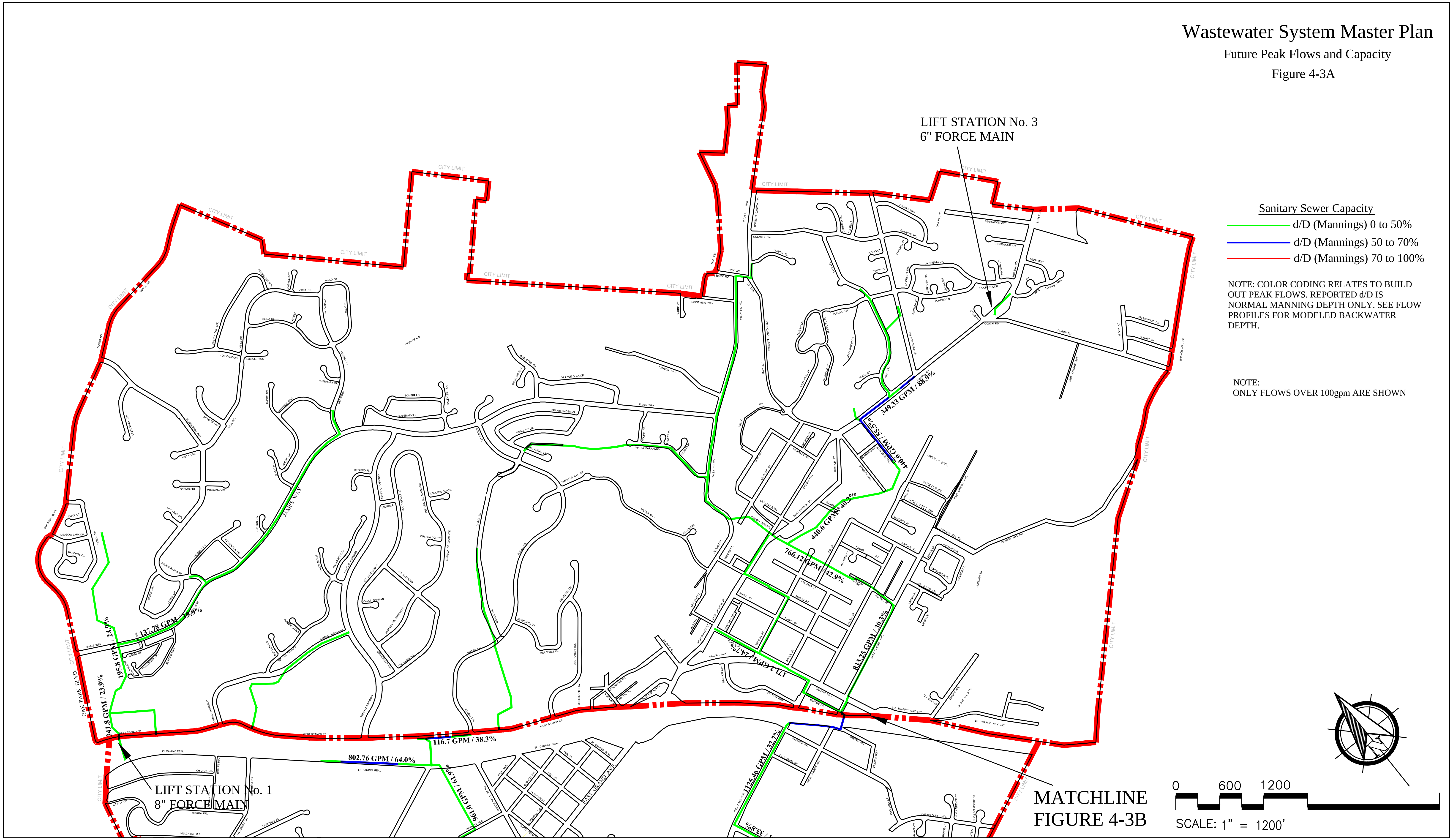
- 4" Line
- 6" Line
- 8" Line
- 10" Line
- 12" Line
- 14" Line
- 15" Line
- 16" Line
- 18" Line
- 24" Line
- 18" Line SSLOCSD TRUNK LINE
- 24" Line SSLOCSD TRUNK LINE
- 27" Line SSLOCSD TRUNK LINE
- FORCE MAIN

LEGEND

- FORCE MAIN

0 600' 1200'

SCALE: 1" = 1200'

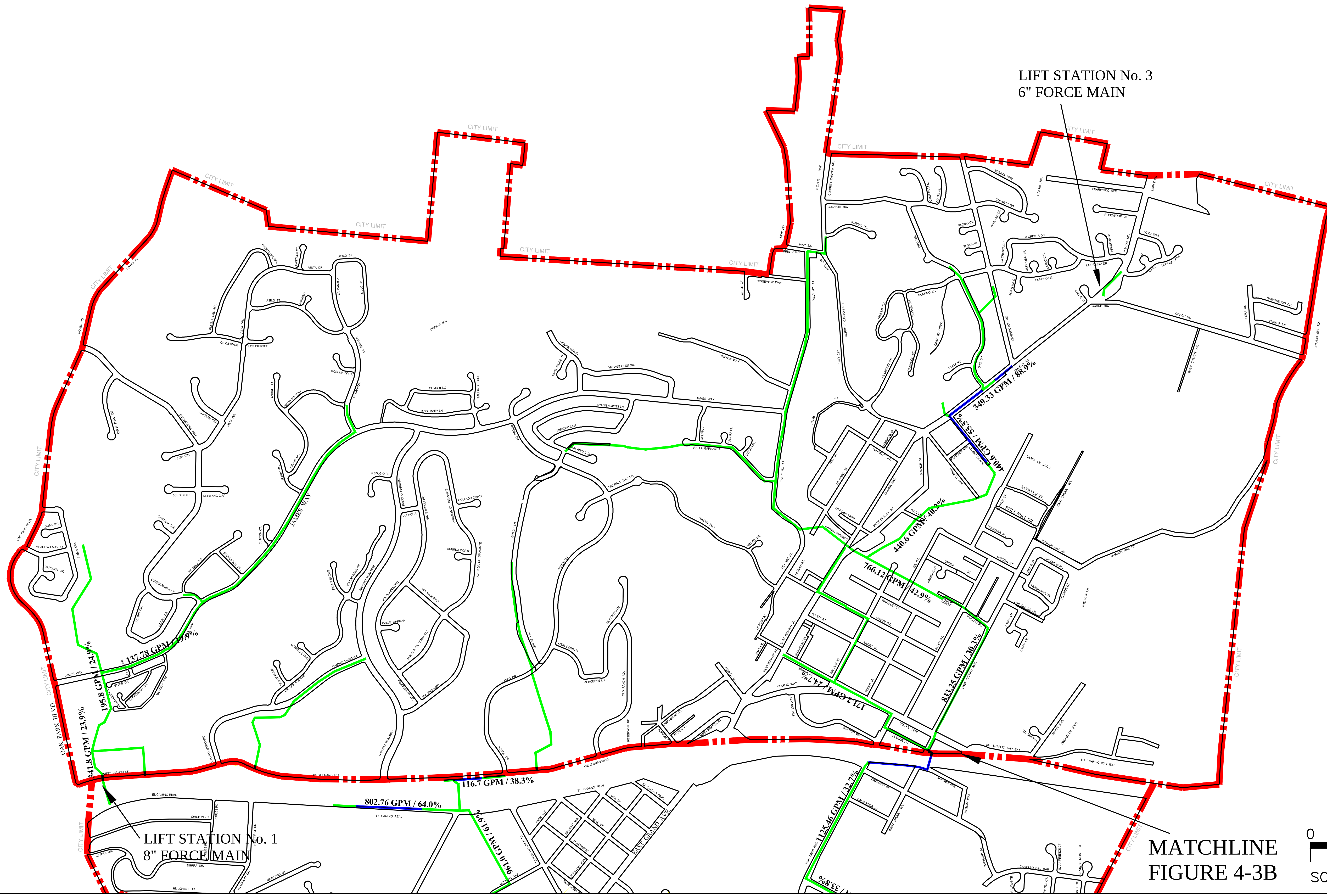


Wastewater System Master Plan
Future Peak Flows and Capacity
Figure 4-3A
Sanitary Sewer Capacity
d/D (Mannings) 0 to 50%
d/D (Mannings) 50 to 70%
d/D (Mannings) 70 to 100%
NOTE: COLOR CODING RELATES TO BUILD OUT PEAK FLOWS. REPORTED d/D IS NORMAL MANNING DEPTH ONLY. SEE FLOW PROFILES FOR MODELED BACKWATER DEPTH.
NOTE:
ONLY FLOWS OVER 100gpm ARE SHOWN
LIFT STATION No. 3
6" FORCE MAIN
LIFT STATION No. 1
8" FORCE MAIN
MATCHLINE
FIGURE 4-3B
0
600
1200
SCALE: 1" = 1200'
CITY LIMIT
OAK PARK BLVD.
JAMES WAY
137.78 GPM / 19.9%
195.8 GPM / 24.9%
341.8 GPM / 23.9%
116.7 GPM / 38.3%
802.76 GPM / 64.0%
349.33 GPM / 88.9%
440.6 GPM / 55.5%
440.6 GPM / 40.2%
766.12 GPM / 42.9%
833.25 GPM / 30.3%
1125.46 GPM / 32.7%
EAST GRAND AVE

Wastewater System Master Plan

Future Peak Flows and Capacity

Figure 4-3A



Sanitary Sewer Capacity

- d/D (Mannings) 0 to 50%
- d/D (Mannings) 50 to 70%
- d/D (Mannings) 70 to 100%

NOTE: COLOR CODING RELATES TO BUILD OUT PEAK FLOWS. REPORTED d/D IS NORMAL MANNING DEPTH ONLY. SEE FLOW PROFILES FOR MODELED BACKWATER DEPTH.

NOTE:
ONLY FLOWS OVER 100gpm ARE SHOWN

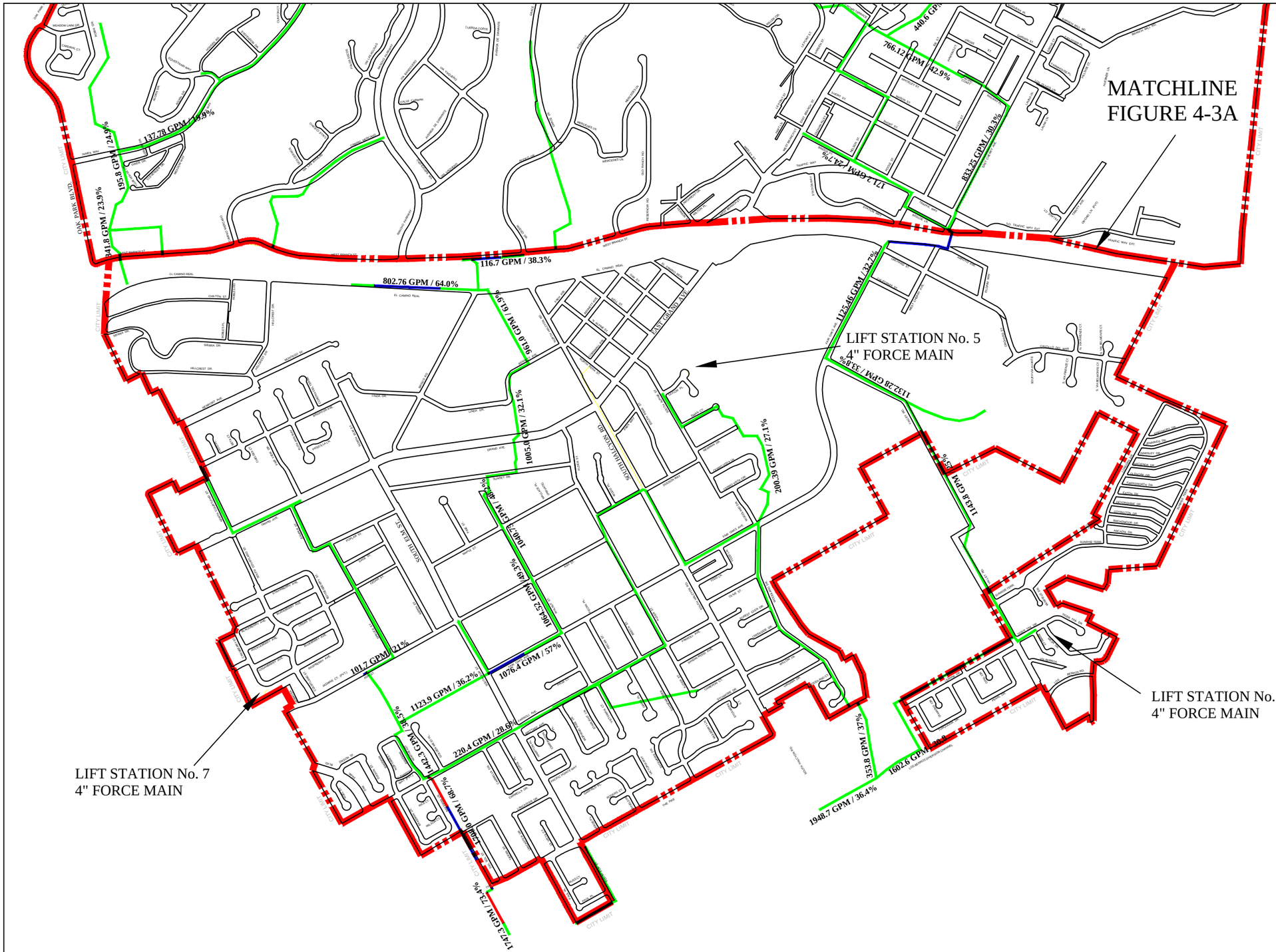
0 600 1200

SCALE: 1" = 1200'

Wastewater System Master Plan

Future Peak Flows and Capacity

Figure 4-3B



Sanitary Sewer Capacity

- d/D (Mannings) 0 to 50%
- d/D (Mannings) 50 to 70%
- d/D (Mannings) 70 to 100%

NOTE: COLOR CODING RELATES TO BUILD OUT PEAK FLOWS. REPORTED d/D IS NORMAL MANNING DEPTH ONLY. SEE FLOW PROFILES FOR MODELED BACKWATER DEPTH.

NOTE:
ONLY FLOWS OVER 100gpm ARE SHOWN

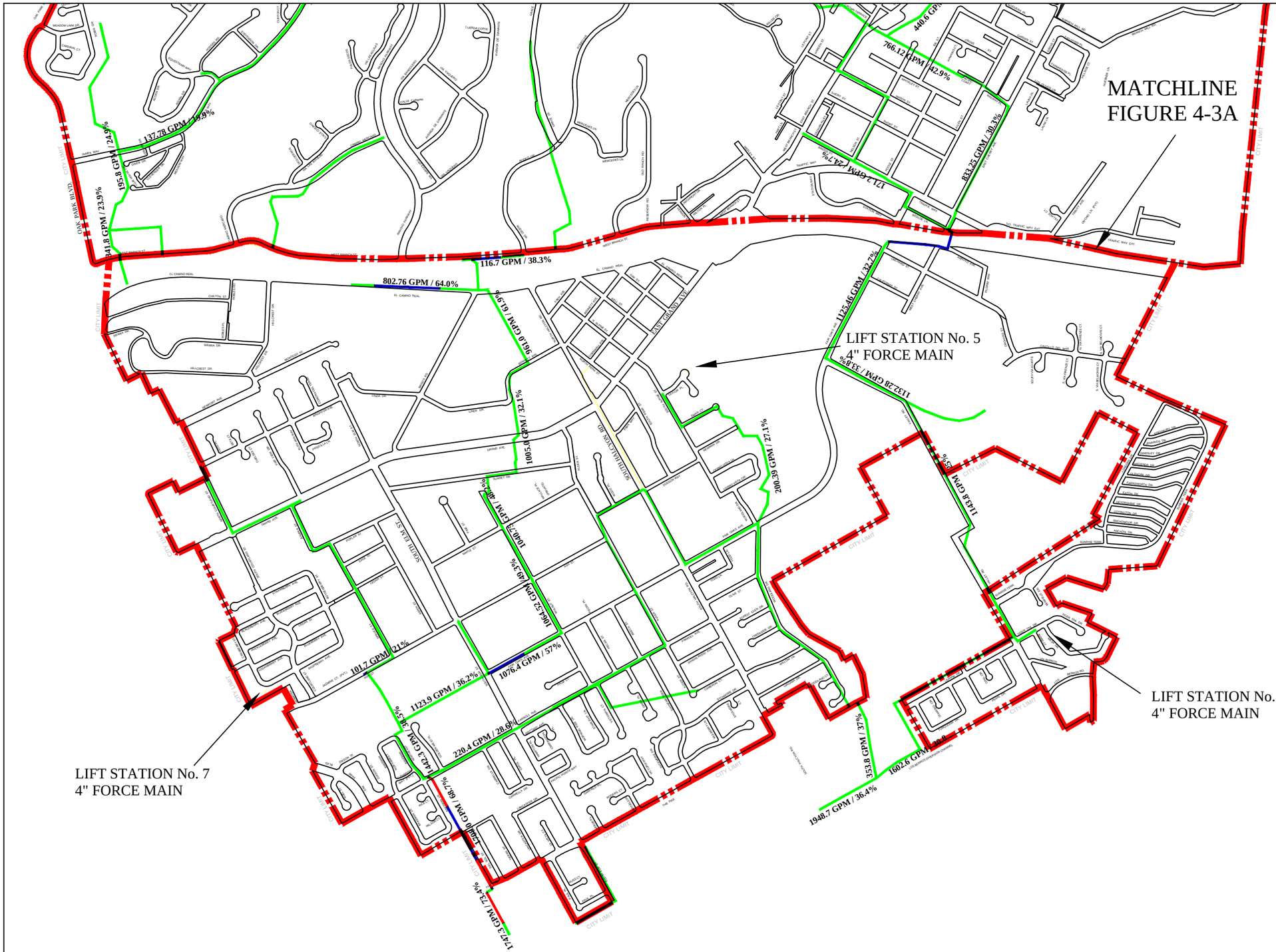
0 600 1200

SCALE: 1" = 1200'

Wastewater System Master Plan

Future Peak Flows and Capacity

Figure 4-3B



Sanitary Sewer Capacity

- d/D (Mannings) 0 to 50%
- d/D (Mannings) 50 to 70%
- d/D (Mannings) 70 to 100%

NOTE: COLOR CODING RELATES TO BUILD OUT PEAK FLOWS. REPORTED d/D IS NORMAL MANNING DEPTH ONLY. SEE FLOW PROFILES FOR MODELED BACKWATER DEPTH.

NOTE:
ONLY FLOWS OVER 100gpm ARE SHOWN

0 600 1200

SCALE: 1" = 1200'

4.2.3 Sewer Flow Rates

Estimates of flow were developed for the City's collection system using data from a recently completed infiltration and inflow (I/I) study prepared by the South San Luis Obispo County Sanitation District (SSLOCSD) and effluent flow data from the SSLOCSD WWTP. Effluent flow data from September 2010 through August 2011 was averaged to develop an average annual flow (AAF) for the SSLOCSD WWTP of 2.85 million gallons per day (MGD). The portion of that flow that the attributed to City's system (42%), was then applied to the SSLOCSDWWTP's AAF to obtain the AAF for the City's collection system (1.20 MGD).

4.2.4 Land Use Sewer Duty Factors

To develop the land use sewer duty factors for the City's collection system, the spatially allocated water demands were utilized, projected build-out water demands and sewer duty factors. WSC initiated the development of the land use sewer duty factors by intersecting the spatially allocated 2010 customer water use records with the land use polygon shapefile to obtain land use water demand factors (gpd/acre).

City staff identified parcels within the City Limits that are not served by the City's collection system. For the purposes of developing the sewer duty factors and land use sewer duty factors, the parcels within the City limits not served by the sewer system and the parcels outside the City Limits were excluded.

Sewer duty factors, which represent the percentage of potable water that is discharged to the collection system, were originally developed based on values obtained from reference textbooks and other local sewer master plans. These percentages were then manipulated until the projected flow to the collection system matched the measured AAF flow from the SSLOCSD I/I study. The sewer duty factors, by land use, used to correlate the current potable water demands and wastewater flow rates and to project build-out wastewater flow rates.

4.2.5 Model Skeletonization

During the development of the sewer model, it was determined that a significant number of the manholes in the City's collection system did not have invert elevation data available. In order to simplify the collection system model and reduce the number of manholes that could potentially require field surveying, noncritical sewer mains and manholes were removed from the sewer model or "skeletonized" the model. Skeletonization of the sewer model was achieved by fully loading the model with build-out AAF flows using the spatial allocation methodology described above. Flow rates through the model were then evaluated and any pipes or manholes with a flow of less than 19,000 gpd were removed from the model. This flow equates to peak hour flow of 6,690 gpd and a peak hour flow depth pipe diameter ratio (d/D) of less than 0.5 at an assumed minimum slope of 0.001 in a 6in pipe and a d/D of 0.5 at a slope of 0.0002 in an 8in

pipe, assuming a roughness coefficient of 0.014. Pipelines removed from the model using this methodology will have capacity to meet build-out flows as long as the installed slope is greater than the assumed minimum slope. For comparison the minimum slope assumed for an 8in pipe was 0.1%, the minimum recommend slope for installation of an 8in pipe is 0.35%, thus this is a conservative removal or skeletonization methodology. Once skeletonized the model did not require any field surveying to determine invert elevations. Any missing invert elevations in the skeletonized model were interpolated from the upstream and downstream manholes.

Once the model was skeletonized, demands to the remaining nodes were redistributed within each sewershed. After the skeletonized model was re-loaded, the flow rates were compared along the remaining trunk lines to determine if the skeletonization altered the distribution of the wastewater flows. Adjustments were made to loading at several locations so that the distribution of wastewater flows in the skeletonized model would closely mimic the un-skeletonized model. The following design criteria are recommended for the analysis of gravity sewers:

Flow Condition	Allowable Flow Depth(d/D)
Avg. Dry Weather Flow	0.5
Peak Dry Weather Flow	0.75
Peak Wet Weather Flow	0.9

- The flow depth was calculated based on the computer generated backwater curve.
- A minimum pipeline velocity of 2.0 feet per second should be maintained.

It should be noted that the computer model analyzes the gravity sewer system as an integrated unit through a backwater analysis. Another generally accepted method for determining sewer capacity and flow depth is the Manning's Equation, which was also checked to confirm sewer capacity. The ratio of flow depth to pipe diameter (d/D) predicted by the Manning's Equation is displayed for existing and future conditions. Sewers with a d/D of greater than 0.5 were selected for additional analysis and review.

4.3 Lift Station Evaluation

An evaluation of the City's lift stations to determine if the current capacity of each lift station is adequate for estimated build-out flows. The analysis was performed for Lift Station Nos. 1, 4, 5, and 7. In 2011 Lift Station No. 3 underwent a major upgrade to meet build-out flows and thus was excluded from this analysis. The capacity evaluation showed that Lift Station Nos. 1, 4, 5, and 7 all have adequate capacity to meet build-out peak hour wet weather flows (PHWWF).

This memorandum provides a brief summary of the lift station capacity evaluation method and results. The capacity evaluation required two primary steps:

(1) determining the current lift station capacity, and
(2) estimating build-out lift station capacity requirements.

4.3.1 Current Lift Station Capacity

System curves were developed for each lift station based on record drawings. Key inputs to creating the system curves included the following:

- Lift station high water level (HWL)
- Lift station low water level (LWL)
- Force main discharge invert elevation
- Force main length and diameter
- Size, number and type of fittings on pump manifold (impeller to pump manifold)
- Size, number and type of fittings on force main (pump manifold to gravity invert)

Using this data, the system curve was calculated for both the best case and the worst case. The best case is defined as the case with the lowest static head (water level at HWL) and the lowest friction losses (highest roughness factor, i.e. smooth pipe). The worst case is defined as the case with the highest static head (water level at LWL) and the highest friction losses (lowest roughness factor, i.e. rough pipe).

Pump curves were obtained for each lift station and plotted these with the calculated system curves to determine the operating point for each lift station. Because both a best and worst case system curve were calculated, this analysis yielded a capacity range (gpm) for each lift station. The pump and system curves for Lift Station 1, 4, 5, and 7 are included below. Note that while Attachment 1 presents curves for both simplex operation (one pump operating) and duplex operation (two pumps operating), only simplex operation is used for the capacity analysis because the City only operates one pump at a time, with the second pump serving as backup.

4.3.2 Capacity Required at Build-out

The lift station must have sufficient capacity to meet the build-out PHWWF. The build-out PHWWF was calculated by applying a peaking factor to the average annual daily flow (AAF) estimated for each sewershed at build-out. An analysis was performed for two different peaking factors: (1) a peaking factor of 2.84, which is the estimated to be the city-wide peaking factor (calculated using the Babbitt equation), and (2) a peaking factor of 3.5, which is more conservative as the individual lift stations may experience a peaking factor greater than the

city-wide average peaking factor (because the lift stations serve a smaller subset of the overall city population). This yielded the capacity requirements of each lift station at build-out.

4.3.3 Results

The build-out capacity requirements and the calculated current capacity for each lift station are shown in the table below. In addition, the table also presents the rated capacity and actual measured flow data for comparison. The rated, calculated and measured capacity of each lift station exceeds the build-out PHWWF for a 3.5 peaking factor. Based on this analysis, the current capacity of each lift station is adequate to meet build-out flows.

Table 4-3 - Lift Station Capacity Evaluation Results

Lift Station	Build-out AAF (gpd)	Build-out PHWWF with 2.84 Peaking Factor (gpm)	Build-out PHWWF Using 3.5 Peaking Factor (gpm)	Pump HP	Current Capacity- One Pump (gpm)			Adequate capacity?
					Rated[1]	Calculated[2]	Measured[3]	
1	205,200	400	500	60	800	770-850	800, 707	Yes
3[4]	33,400	70	80	7.9[5]	305	n/a	n/a	Yes
4	5,900	10	10	1.5	100	125-160	101, 104	Yes
5	2,800	10	10	3	130	115-135	172, 145	Yes
7	23,000	50	60	10	130	160-190	126, 144	Yes

Notes:

1. Obtained from pump curves.
2. Calculated based on record drawings and pump curves. Capacity range shown reflects worst to best case flow, based on estimated worst to best case TDH.
3. Obtained from pump and flow study performed by Fluid Resource Management dated August 22, 2011. Capacities listed in the following order: Pump 1, Pump 2. Flowrate was measured by performing a "draw down" test for each pump. Draw down tests are performed by timing how long it takes the pump to move a known volume of water.
4. Lift Station 3 was being upgraded at the time of this study and thus was excluded from the system curve analysis.
5. Minimum HP from Lift Station 3 specifications.

Draw down and amperage testing were performed on Lift Station 1, 4, 5, and 7, in August 2011. The flowrate measured during the draw down test for each lift station is the measured capacity shown in the table. The amperage testing did not yield conclusive results because data for only this single data point in time is known. This does not allow for performance comparisons of the same winding over time to determine how performance is changing. Draw down and amperage testing is recommended to be performed in the future in order to provide the City three (3) data points for each pump/motor. With three (3) data points, the City can evaluate trends over time and determine if equipment replacement is necessary. The calculated system curve displaying the operating regions for the lift stations follows.

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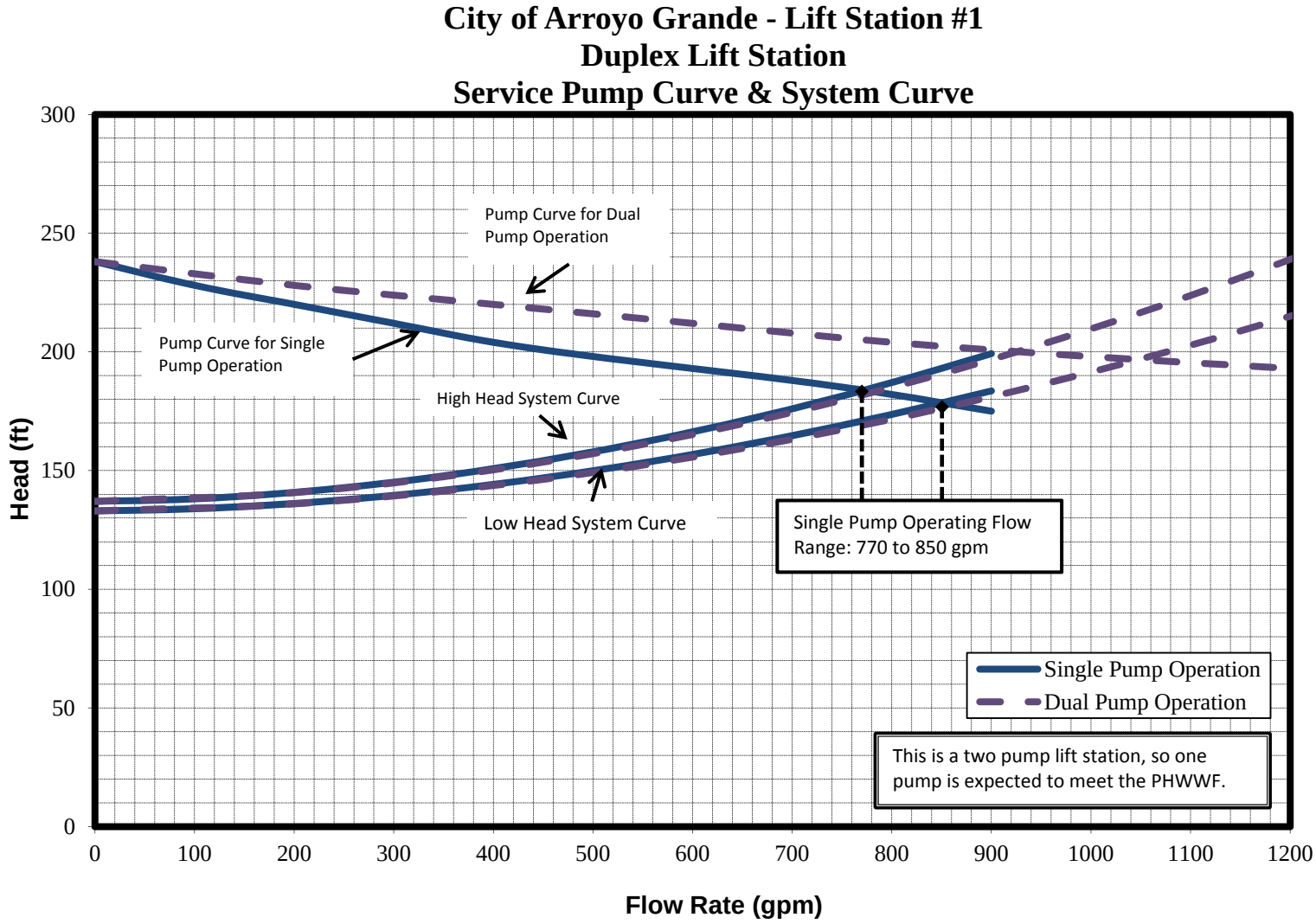

Figure 4-3 - Lift Station No. 1 Service Pump and System Curve

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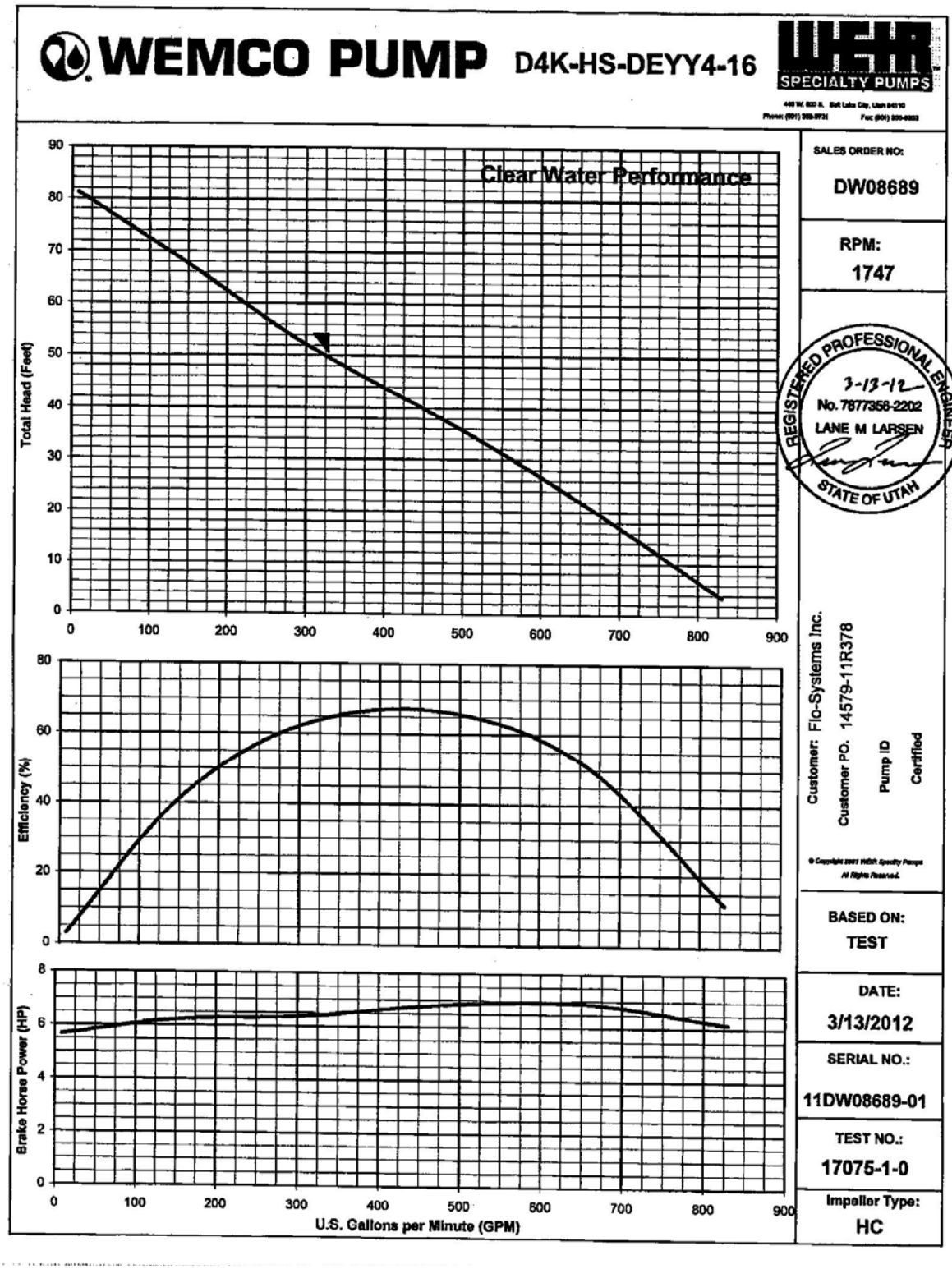

Figure 4-4 - Lift Station No. 3 Service Pump and System Curve (1747 rpm)

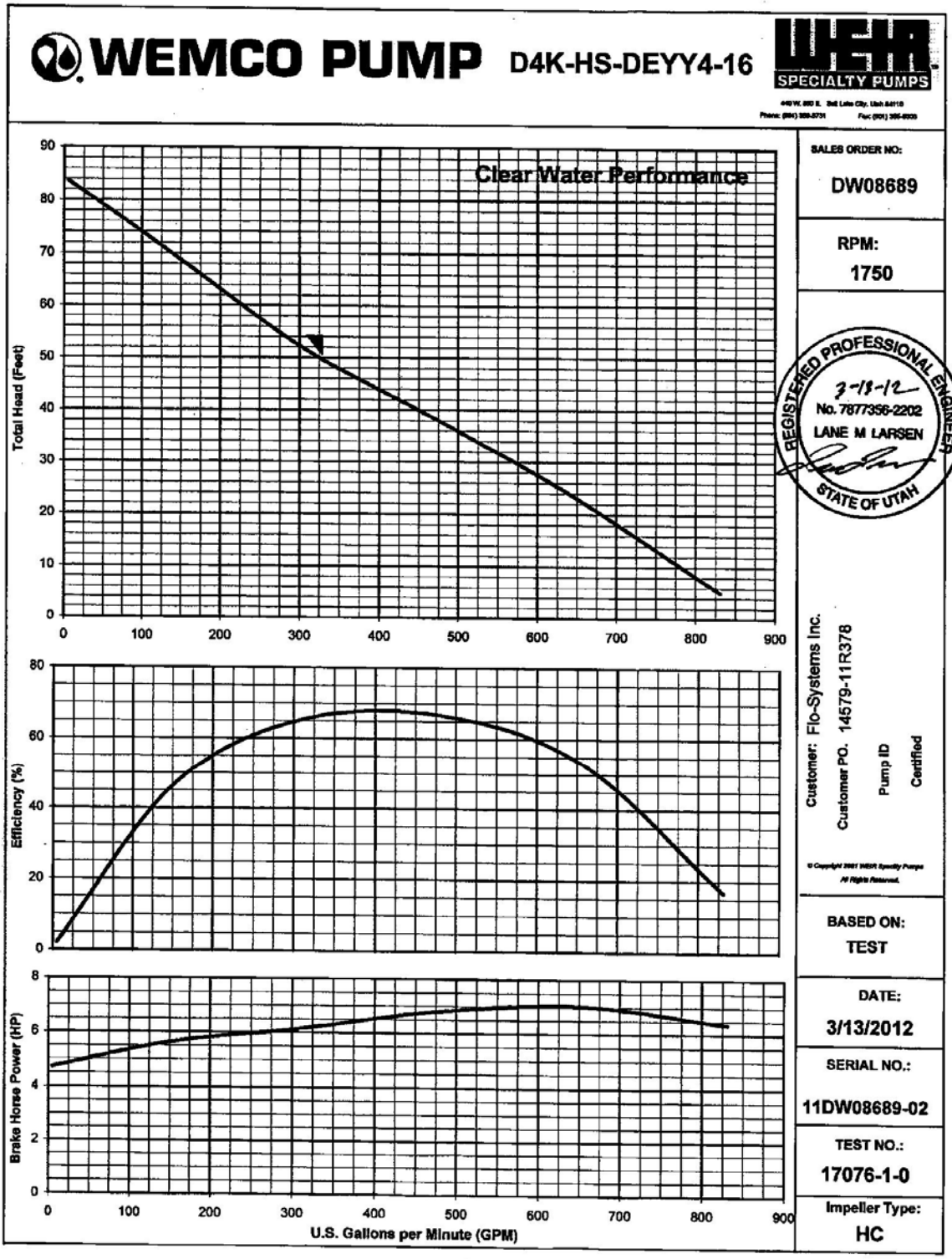

Figure 4-5 - Lift Station No. 3 Service Pump and System Curve (1750 rpm)

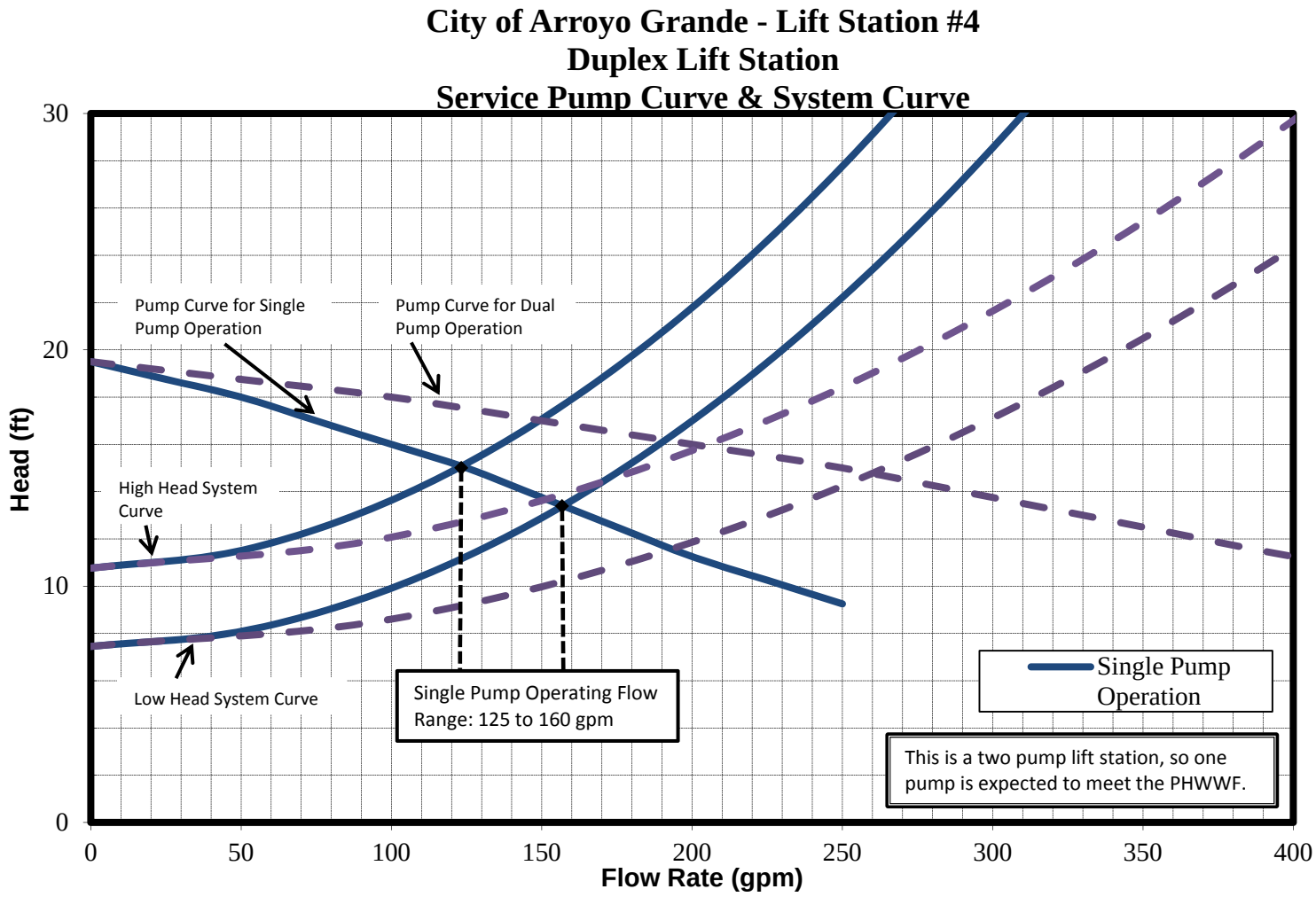

Figure 4-6 - Lift Station No. 4 Service Pump and System Curve

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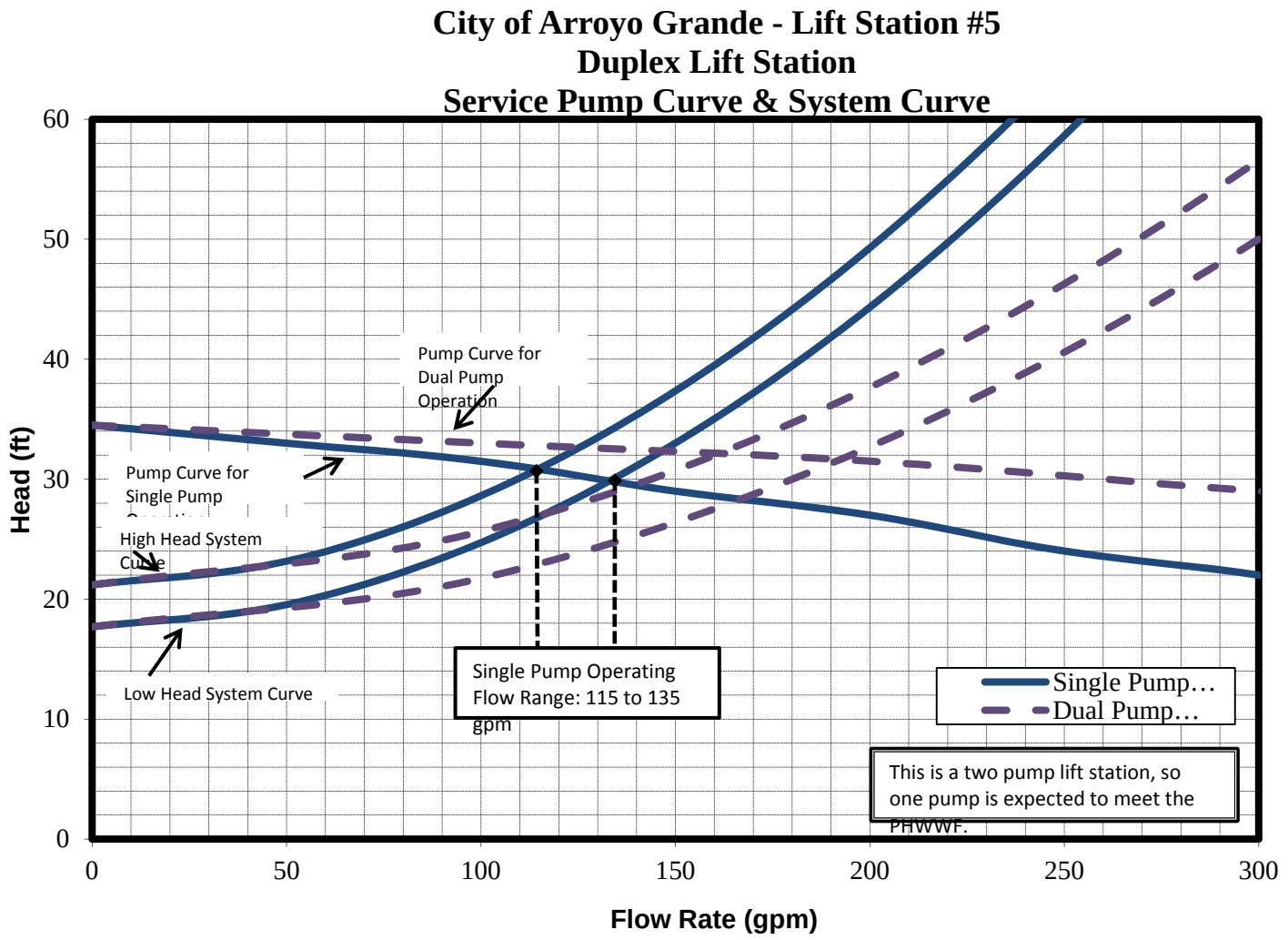

Figure 4-7 - Lift Station No. 5 Service Pump and System Curve

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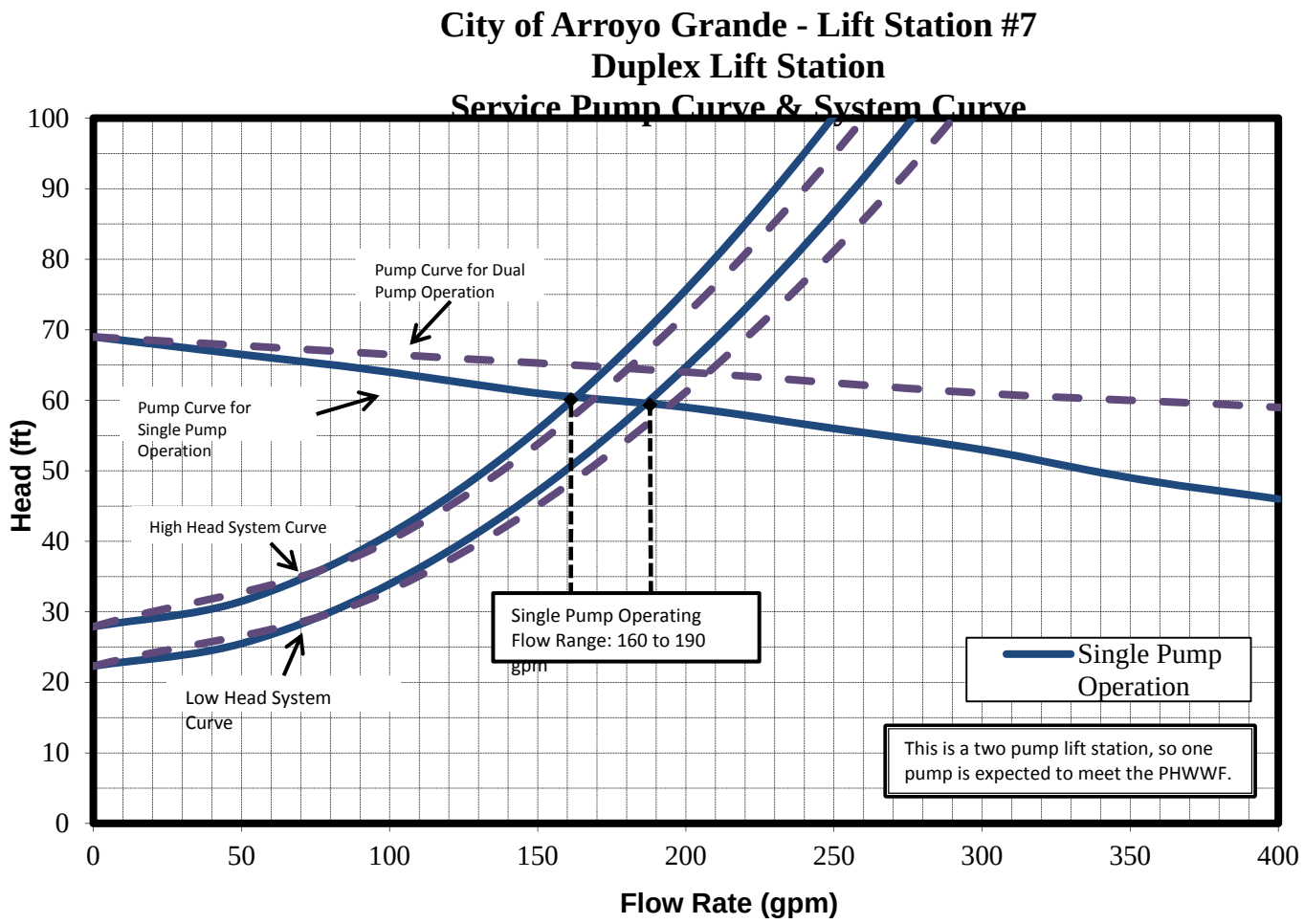

Figure 4-8 - Lift Station No. 7 Service Pump and System Curve

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Section 5 - South County Sanitation District Wastewater Collection, Treatment, and Disposal

The City of Arroyo Grande is a member agency within the South San Luis Obispo Sanitation District (SSLOCSD). The SSLOCSD is governed by a three member board of directors comprised of a representative from each of its member agencies. Member agencies include the City of Arroyo Grande, the City of Grover Beach, and the Oceano Community Services District. Wastewater collection (trunk sewers only), treatment, and disposal services are provided to each agency as described below:

5.1 Wastewater Collection / Trunk Sewers

SSLOCSD owns and maintains a system of trunks within its member agencies, including the City of Arroyo Grande. Figure 4-2a and Figure 4-2b show the SSLOCSD trunks, which vary between18" and 27" in diameter. The majority of the system was constructed in 1966. The trunk capacity available for each member agency is not established by contract and no capacity allotment exists for each agency. However, the SSLOCSD collects impact fees from new development projects within each member agency, and the funds are used for expansion related improvements. As a result, those agencies which sustain the most new development contribute a greater share to SSLOCSD system expansion. Since the hydraulic characteristics of trunk sewers impact the City collection system, the SSLOCSD trunks were included in the computer model. However, the City is only responsible for constructing improvements to the City-owned portion of the system. The existing 30" and36" diameter SSLOCSD trunk mains downstream of the City are adequate to accommodate future City flows and currently anticipated SSLOCSD flows (7.5 mgd treatment plant capacity).

5.2 Wastewater Treatment and Disposal

SSLOCSD owns and operates a wastewater treatment and ocean disposal facility with an average annual flow capacity of 5.0 million gallons per day. The system consists of a secondary treatment facility including the following process elements:

- Headworks - flow meter and raw wastewater pump station
- Primary clarification
- Secondary treatment in a biological trickling filter
- Secondary clarification
- Disinfection and dechlorination
- Gravity ocean outfall (shared with the City of Pismo Beach)

The treatment system is operating at approximately 58% of capacity (2.88 mgd). As with trunk capacity, wastewater treatment and disposal capacity is not established by contract and is therefore not apportioned among the member agencies.

An update recycled water feasibility study was completed by the SSLOCSD in February 2010. The study addressed the feasibility of delivering secondary or tertiary recycled water to member agencies or other users, including the City of Arroyo Grande. One constraint to the efficient production of recycled water identified in the study was the elevated salt levels present in SSLOCSD treated effluent, which could require reverse osmosis treatment prior to reuse. Given that treated effluent is currently discharged to a highly concentrated salt environment (the ocean), the existing SSLOCSD discharge permit does not place a limitation on salts or require the implementation of salt management practices. The City is currently considering a recycled water program and plans to pursue recycled water in the future. The following recycled water studies have been completed with the goal of identifying potential recycled water projects, which would benefit the City:

- *Water Recycling Progress Report, Prepared for South San Luis Obispo County Sanitation District, Prepared by John L. Wallace & Associates, February 2001*
- *Recycled Water Distribution System Conceptual Plan- South San Luis Obispo County Sanitation District WWTP Technical Memorandum, Prepared by the Wallace Group, June 2010*
- *Recycled Water Distribution System Conceptual Plan- City of Pismo Beach WWTP Technical Memorandum, Prepared by the Wallace Group, June 2010*
- *Water Recycling Update report, Prepared for South San Luis Obispo Sanitation District, Prepared by the Wallace Group, January 2009*

Section 6 - Collection System Maintenance and Inspection

Initiated in 1990, the City's cleaning program has helped reduce line blockages, odor complaints, and lift station failures. Maintenance is approached in two ways: preventive and corrective.

Corrective maintenance is considered to be a physical collapse of an existing sewer; stoppage due to roots, FOG, or other foreign materials; inflow or infiltration; or pump failure. These conditions require immediate action to correct the problem and are further discussed in Element 6 of the City of Arroyo Grande Sewer System Management Plan

Preventive maintenance involves inspection of the sewer system and analysis of existing data to identify trouble areas. Inspection and analysis can provide guidance in determining the type, degree, and frequency of preventive maintenance required.

The objectives of both are to improve service, reduce emergency occurrences, and to minimize the cost of the preventive maintenance program. In general, the greater the amount of preventive maintenance performed, the less the amount of corrective maintenance that will be required.

6.1 Pipeline Maintenance

The City of Arroyo Grande has developed a year-round pipeline maintenance program with an emphasis on preventive maintenance, especially in historical trouble areas which are checked at more frequent intervals. The system is videoed in suspected trouble areas and the entire system is cleaned and flushed annually. Based on cleaning, flow analysis and video, the city determines which area of the pipeline system would benefit the most by rehabilitation or replacement. Quarterly cleanings are performed at historical problem areas based on field crew experience. The city also participates in an active FOG Program.

6.2 Manhole Maintenance

The City of Arroyo Grande uses visual manhole inspections, as part of day to day maintenance. Visual inspections are an inexpensive and quick method of detecting inflow / infiltration sources, the general structural condition of the manhole, and the accuracy of previous system drawings. Visual and video manhole inspections are used to determine the following:

- Exact location of the manhole;
- Condition of cover and frame (defects that may allow inflow);
- Is the cover subject to ponding or surface run off;
- Potential area that drains to any defects;

- Condition of benching, risers, grade rings and collar; and
- Condition of sewer pipes.

Manhole repairs are required to correct structural deficiencies, effects of corrosion on the internal surface, and to eliminate the inflow of surface or groundwater. The City of Arroyo Grande continues to install manhole inflow covers to minimize potential infiltration.

6.2.1 Odor and Corrosion Control

In the absence of adequate oxygen, bacteria living in municipal wastewater begin to convert sulfate, a common sewer constituent, into a dissolved compound know as hydrogen sulfide (H,S). This compound subsequently escapes the wastewater, particularly in areas of high turbulence, and enters the air environment as a gas. Once the gas is present in a gravity collection system, it can escape through man-hole covers, roof vents, and lift stations, causing an offensive rotten-egg odor in areas of release. At higher concentrations, the gas can cause eye irritation, respiratory problems, and even death. In addition to its odorous properties, the gas can form sulfuric acid in the presence of air. This acid will corrode concrete and other materials often found in wastewater collection systems.

Typically, oxygen levels in gravity wastewater systems remain adequately high to prevent the formation of excessive hydrogen sulfide. However, the gas forms readily in the following common components of a collection system:

- Lift station wet wells where wastewater can be stored for more than 30 minutes during low flows.
- Long wastewater force mains where the absence of an air-water interface contributes to anaerobic conditions.
- Areas within a gravity collection system where solids have deposited due to inadequate velocities or lack of cleaning.

The primary area of concern in the City is the force main discharge. Hydrogen sulfide-related corrosion is evident in downstream manholes. As gravity sewers are replaced downstream of lift Stations, it is recommended that all new manholes receive a corrosion-resistant coating.

6.3 Lift Station Maintenance

The City of Arroyo Grande maintains five (5) lift stations. Duplication of equipment and functions provides the flexibility necessary for continued operation during individual shutdowns due to scheduled maintenance or emergencies. Weekly inspections are performed on the lift stations that include the seal filters, electrical equipment, instrumentation, wet well, screening devices, venting and housekeeping. Weekly lift station and wet well inspections are performed by field crews and the wet wells are cleaned quarterly.

Section 7 - Recommendations and Capital Improvements

The results of this study are presented in this chapter as the recommended Master Plan and Capital Improvements Project program for water system facilities in the City of Arroyo Grande. The Master Plan consists of staged improvements to correct existing deficiencies and provide for future system expansion. Cost estimates were prepared and used to develop a capital cost program.

The proposed improvements are needed to connect existing wastewater system deficiencies and provide for the ultimate build out of the system within the existing City boundaries. The wastewater system was evaluated using the SewerGEMS water system modeling program which identified flow rates throughout the system for the specified conditions. These flow conditions are those expected to be experienced by the wastewater collection system. The collection system and sewer lift stations were evaluated for their ability to meet the build-out demands of the system under maximum use conditions.

In addition to meeting flow requirements, the recommended collection improvements have been selected to provide system reliability. This chapter outlines the methodologies used to identify the projects recommended in this CIP and to develop project cost opinions.

7.1 Data Collection and Field Investigations

Data collection included City reports, customer water usage and water production data, existing sewer models, and a GIS land use database. In addition, City staff interviewed to gain insight on current operation of the sewer systems and areas known to need improvement. Site visit were performed at all lift stations to review facility condition.

Drawdown testing was performed at all lift stations (excluding Lift Station 3, which is currently being replaced). The drawdown testing included measurements of flow rate and motor amperage, for 3 cases: pump 1 running, pump 2 running, and both pumps running. This provided instantaneous capacity data for each lift station. Neither long term flow data nor run time information was available.

7.2 Mapping, Population, Land Use and Demand Projections

The sewer system maps were updated to reflect the current systems. An iterative process was used to create maps that are as accurate as possible based on the available information.

The population served by the City's wastewater collection system was estimated using the 2010 Census data for the City of Arroyo Grande. Current and buildout acreage by land use category were estimated using City land use data and a 2009Preliminary Housing Opportunity Sites

Inventory (Inventory) provided by the City. The land use data provided the number of acres of each land use category at buildout. The Inventory provided a list of parcels with development potential including the parcel acreage, existing number of dwelling units, and estimates of the number of potential dwelling units that could fit within each parcel. WSC used the data provided in the Inventory to estimate the undeveloped acreage by land use. WSC estimated current developed acreage for each land use category by subtracting the estimated undeveloped acreage identified in the Inventory from the buildout acreage for each land use category.

Metered flow data for two City sewer outfalls to the South San Luis Obispo County Sanitation District (SSLOCSD) trunk line was obtained. Using this data, along with SSLOCSD's Inflow and Infiltration Study (August 3, 2011) and water demand factors, WSC calculated buildout wastewater flow factors (gpd/acre) for each land use category.

7.3 Wastewater Collection System Capacity Evaluation

A SewerGEMS® model was created of the City's wastewater collection system, including gravity sewer mains, force mains, and lift stations. The available sewer pipe invert and slope information is generally limited to large diameter mains modeled in the previous master plan, therefore much of the collection system does not have the required data readily available to analyze the pipeline capacity. In order to simplify the collection system and reduce the number of manholes that require a field survey, noncritical sewer mains were removed from the model. The simplification of a hydraulic model by removing pipelines that do not need analysis is known as skeletonizing. The Arroyo Grande sewer collection system was skeletonized by evaluating projected buildout pipeline flows and eliminating pipes from the model that had future average annual daily flows less than 19,000 gpd. The skeletonized model did not require field surveying to determine invert elevations and pipe slope, the previous model had slope information for the remaining pipelines. Loading was applied using sewer sheds.

7.4 SCADA System Evaluation

An evaluation of the City's SCADA system was performed by conducting field visits to various SCADA sites to understand the City's current SCADA system and identify deficiencies. Based on data collected during the field visits and provided by the City, SCADA software and radio improvements were identified.

7.5 Cost Preparation

The cost opinions (estimates) included in this CIP are based upon the Class 4 Conceptual Report Classification of Opinion of Probable Construction Cost as developed by the Association for the Advancement of Cost Engineering (AACE) Cost Estimate Classification System. The purpose of a Class 4 Estimate is to provide a conceptual level effort that has an expected accuracy range

from -30% to +50% and the inclusion of an appropriate contingency for planning and feasibility studies. The conceptual nature of the design concepts and associated costs presented in this CIP are based upon limited design information available at this stage of the projects. These cost estimates have been developed using a combination of data from RS Means CostWorks®, recent bids, experience with similar projects, current and foreseeable regulatory requirements, specific City requirements, and an understanding of the necessary project components. As the projects progress, the design and associated costs could vary significantly from the project components identified in this CIP.

The recommended projects and these cost opinions are based on the following assumptions:

1. For projects where applicable cost data is available in RS Means CostWorks® (e.g. pipeline replacement), cost data released in Quarter 4 of 2011, adjusted for San Luis Obispo, California, is used. Material prices were adjusted in some cases to provide estimates that align closer with actual local bid results.
2. For projects where RS Means CostWorks® data is not available, cost opinions are generally derived from bid prices from similar projects, vendor quotes, material prices, and labor estimates, with adjustments for inflation, size, complexity, and location.
3. Cost opinions are in 2011 dollars. When budgeting for future years, appropriate escalation factors should be applied (ENR Construction Cost Index of: 9171.73 for December 2011).
4. Cost opinions are “planning-level” and may not fully account for site-specific conditions that will affect the actual costs, such as soils conditions, and utility conflicts.
5. Per the City’s standards, design services, which includes an allowance for alternatives analysis, design phase engineering, surveying, and permitting, are included at a rate of 15 percent of the estimated construction cost.
6. Per the City’s standards, contract administration services during construction are included at a rate of 10 percent of the estimated construction cost.
7. Per the City’s standards, a construction contingency of 10 percent of the estimated construction cost has been included.

The opinions of probable cost prepared by WSC represent our judgment and are supplied for the general guidance of the City. Since WSC has no control over the cost of labor and material, or over competitive bidding or market conditions, WSC does not guarantee the accuracy of such opinions as compared to contractor bids or actual costs.

7.6 Sewer System Program Summary

The sewer system project recommendations address improvements to the sewer collection system. The projects have been divided into three groups, Priority A, B, and C, where Priority A projects have the highest priority. In general, Priority A projects are needed to ensure safe system operation, reduce I/I and prevent spill. Priority B projects address longer-term needs, often related to future growth or improvements that enhance system reliability or other low-level risks. Priority C projects include recommended long term annual or recurring projects.

The table below provides a summary of the sewer system CIP projects. Detailed project descriptions, which include scope, purpose, alternatives, and estimated project duration and cost are provide below.

Table 7-1- Sewer System Project Summary

Project	Project Name	Size	Opinion of Total Project Cost
Priority A (2013-2017)			
A-1	Trenchless Sewer Rehabilitation with Point Repairs	3,190-LF	$364,700
A-2	Trenchless Sewer Rehabilitation	7,120-LF	$719,900
A-3	Lift Station 4 Rehabilitation (performed by City staff)	N/A	$47,500
	Priority A Subtotal		**$1,132,100**
Priority B (2018-2027)			
B-1	Lift Station 1 Forcemain Replacement	3,070-LF	$635,300
B-2	Huasna Road Sewer Upgrade	1,850-LF	$585,000
B-3	Backyard Sewer Replacement	2,820-LF	$945,500
B-4	El Camino Real Sewer Main Upgrade	2,890-LF	$911,800
	Priority B Subtotal		**$3,077,600**
Priority C (2028-2037)			
C-1	Manhole Rehabilitation	500 manholes	$3,670,800
C-2	I/I Study	N/A	$22,000
	Priority C Subtotal		**$3,692,800**
Total			**$7,902,500**

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Wastewater System Master Plan

Capital Improvements Plan

Figure 7-1A

LIFT STATION No. 3
6" FORCE MAIN

Capital Improvement Priorities
Are Listed By Text Color

Priority 1: Red
Priority 2: Blue

LEGEND

- FORCE MAIN

Trenchless Sewer Rehabilitation

Huasna Road Sewer Upgrade

Trenchless Sewer Rehabilitation with Point Repairs

Trenchless Sewer Rehabilitation with Point Repairs

Trenchless Sewer Rehabilitation

Lift Station 1 Forcemain Replacement

Trenchless Sewer Rehabilitation

LIFT STATION No. 1
8" FORCE MAIN

MATCHLINE
FIGURE 7-1B

0 600' 1200'

SCALE: 1" = 1200'

Wastewater System Master Plan

Capital Improvements Plan

Figure 7-1A

LIFT STATION No. 3
6" FORCE MAIN

Capital Improvement Priorities
Are Listed By Text Color

Priority 1: Red
Priority 2: Blue

LEGEND

- FORCE MAIN

Trenchless Sewer Rehabilitation

Huasna Road Sewer Upgrade

Trenchless Sewer Rehabilitation with Point Repairs

Trenchless Sewer Rehabilitation with Point Repairs

Trenchless Sewer Rehabilitation

Lift Station 1 Forcemain Replacement

Trenchless Sewer Rehabilitation

LIFT STATION No. 1
8" FORCE MAIN

MATCHLINE
FIGURE 7-1B

0 600' 1200'

SCALE: 1" = 1200'

Wastewater System Master Plan

Capital Improvements Plan

Figure 7-1B

MATCHLINE
FIGURE 7-1A

Capital Improvement Priorities
Are Listed By Text Color

Priority 1: Red
Priority 2: Blue

LEGEND

- FORCE MAIN

Sewer Relocation

El Camino Real
Sewer Upgrade

El Camino Real
Sewer Upgrade

LIFT STATION No. 5
4" FORCE MAIN

Trenchless Sewer
Rehabilitation

Trenchless Sewer
Rehabilitation

Trenchless Sewer
Rehabilitation

Trenchless Sewer
Rehabilitation

Trenchless Sewer
Rehabilitation

Trenchless Sewer
Rehabilitation

Trenchless Sewer
Rehabilitation

Trenchless Sewer

Trenchless Sewer
Rehabilitation with
Point Repairs

Trenchless Sewer
Rehabilitation

LIFT STATION No. 4
4" FORCE MAIN

LIFT STATION No. 7
4" FORCE MAIN

0 600' 1200'

SCALE: 1" = 1200'

Wastewater System Master Plan

Capital Improvements Plan

Figure 7-1B

MATCHLINE
FIGURE 7-1A

Capital Improvement Priorities
Are Listed By Text Color

Priority 1: Red
Priority 2: Blue

LEGEND

- FORCE MAIN

Sewer Relocation

El Camino Real
Sewer Upgrade

El Camino Real
Sewer Upgrade

LIFT STATION No. 5
4" FORCE MAIN

Trenchless Sewer
Rehabilitation

Trenchless Sewer
Rehabilitation

Trenchless Sewer
Rehabilitation

Trenchless Sewer
Rehabilitation

Trenchless Sewer
Rehabilitation

Trenchless Sewer
Rehabilitation

Trenchless Sewer
Rehabilitation

Trenchless Sewer

Trenchless Sewer
Rehabilitation with
Point Repairs

Trenchless Sewer
Rehabilitation

LIFT STATION No. 4
4" FORCE MAIN

LIFT STATION No. 7
4" FORCE MAIN

0 600' 1200'

SCALE: 1" = 1200'

7.7 Sewer System Project Descriptions

This section contains detailed project descriptions for the recommended sewer system projects. The project descriptions include project scope, purpose, alternatives, and estimated project duration and cost.

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Project A-1 - Trenchless Sewer Rehabilitation with Point Repairs

Design and Permitting:	7 months		
Construction:	4 months	Opinion of Total Project Cost:	$ 364,700

Need for Project:

Video inspection reports and information obtained from City Staff have identified that the following sections of sewer main require rehabilitation with point repairs: (1) Crown Terrace from Le Point St to Crown Hill St, (2) The Pike from Garfield to Gaynfair Terrace, and (3) 12-in sewer main parallel to the creek from Huasna Rd to north of Mason St.

Supporting Information:

Video inspection reports show that the sections of sewer main listed in the table and figures below have identified structural deficiencies.

Table 7-2 - Sewer main sections requiring trenchless rehabilitation and points repairs

Sewer Main Segment	Length (ft)	Diameter (in)	Inspection Date	Inspection Results
(1) Crown Terrace	475	6	1981	8’ dip identified
(2) The Pike	779	6	1981	13’, 23’ & manhole dips identified
(3) 12-in along creek	1,936	12	NA	root intrusion, limited access
Total	**3,190**	-	-	-

Recommended Solution:

It is recommended that the City employ point repairs to remedy the structural deficiencies identified in the sewer inspection reports and perform cured-in-place pipe rehabilitation along the entire length of the listed sections to reduce infiltration, root intrusion and maintenance requirements.

Figure 7-2- Project A-1 (1,3): Trenchless Sewer Rehabilitation with Point Repairs

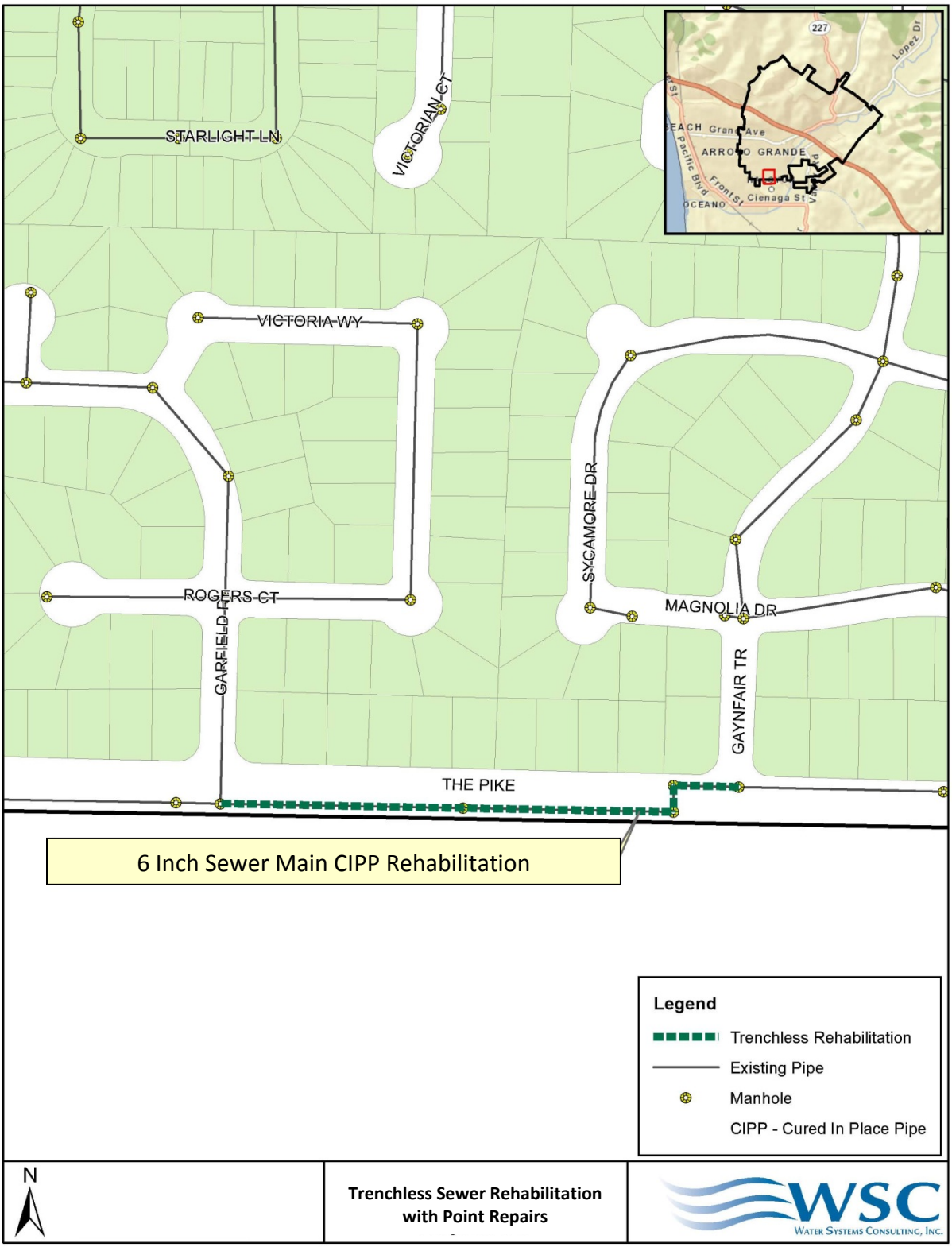

Figure 7-3 - Project A-1(2): Trenchess Sewer Rehabilitation with Point Repairs

Cost Estimate:

Client:	**City of Arroyo Grande**				
Project:	**2011 Wastewater Master Plan Updates**				
Segment:	**A-1(1)**				
Street:	**Trenchless Sewer Rehabilitation with Point Repairs-Crown Tr**			**Prepared by:**	LSW
				Reviewed by:	JHR
Opinion of Probable Construction Cost				**Date:**	4/26/2012

Item No.	Item Description	Quantity	Unit	Unit Cost	Total Item Cost
1	Mobilization	1	LS	-	$ 1,000
2	Insurance and Bonds	1	LS	-	$ 1,000
3	Construction Surveying	0	LS	-	$ -
4	Site Clearing and Restoration	0	LS	-	$ -
5	SWPPP Preparation & Implementation	0	LS	-	$ -
6	Traffic Control	5	Day	$ 500	$ 2,500
7	Gravity Sewer Construction				
7.1	Pavement Removal & Repair for Trench	40	SY	$ 65	$ 2,600
7.2	Trenching/Compaction/Fill/Hauling	40	CY	$ 50	$ 2,000
7.3	Abandon Existing Gravity Sewer In Place	0	LF		$ -
7.4	Gravity Sewer Point Repairs (Furnish and Install)				
7.4.1	6" - PVC SDR35	60	LF	$ 10	$ 600
7.4.2	8" - PVC SDR35	0	LF		$ -
7.4.3	12" - PVC SDR35	0	LF		$ -
7.5	CIPP Trenchless Sewer Rehabilitation				
7.5.1	6" - Cured in Place Pipe	475	LF	$ 50	$ 23,800
7.5.2	8" - Cured in Place Pipe	0	LF		$ -
7.5.3	10" - Cured in Place Pipe	0	LF		$ -
7.5.4	12" - Cured in Place Pipe	0	LF		$ -
7.5.5	14" - Cured in Place Pipe	0	LF		$ -
7.5.6	15" - Cured in Place Pipe	0	LF		$ -
7.6	Temporary Bypass Pumping	1	LS	$ 400	$ 400
8	Service Laterals				
8.1	Reinstate Sewer Service Laterals	17	EA	$ 200	$ 3,400
9	Manholes				
9.1	New Manhole (Furnish and Install, includes pipe connections)	0	EA		$ -
9.2	Abandon Existing Manhole In Place	0	EA		$ -
				Subtotal 1:	$ 37,300
				Construction Contingency (10%):	$ 3,700
				Design (15%):	$ 5,600
				Contract Administration (10%):	$ 3,700
				Total Project Cost:	**$ 50,300**

Client:	**City of Arroyo Grande**				
Project:	**2011 Wastewater Master Plan Updates**				
Segment:	**A-1(2)**				
Street:	**Trenchless Sewer Rehabilitation with Point Repairs-The Pike**			**Prepared by:**	LSW
				Reviewed by:	JHR
Opinion of Probable Construction Cost				**Date:**	4/26/2012

Item No.	Item Description	Quantity	Unit	Unit Cost	Total Item Cost
1	Mobilization	1	LS	-	$ 1,500
2	Insurance and Bonds	1	LS	-	$ 1,500
3	Construction Surveying	0	LS	-	$ -
4	Site Clearing and Restoration	0	LS	-	$ -
5	SWPPP Preparation & Implementation	0	LS	-	$ -
6	Traffic Control	8	Day	$ 500	$ 4,000
7	Gravity Sewer Construction				
7.1	Pavement Removal & Repair for Trench	53	SY	$ 66	$ 3,500
7.2	Trenching/Compaction/Fill/Hauling	53	CY	$ 51	$ 2,700
7.3	Abandon Existing Gravity Sewer In Place	0	LF		$ -
7.4	Gravity Sewer Point Repairs (Furnish and Install)				
7.4.1	6" - PVC SDR35	80	LF	$ 10	$ 800
7.4.2	8" - PVC SDR35	0	LF		$ -
7.4.3	12" - PVC SDR35	0	LF		$ -
7.5	CIPP Trenchless Sewer Rehabilitation				
7.5.1	6" - Cured in Place Pipe	779	LF	$ 50	$ 39,000
7.5.2	8" - Cured in Place Pipe	0	LF		$ -
7.5.3	10" - Cured in Place Pipe	0	LF		$ -
7.5.4	12" - Cured in Place Pipe	0	LF		$ -
7.5.5	14" - Cured in Place Pipe	0	LF		$ -
7.5.6	15" - Cured in Place Pipe	0	LF		$ -
7.6	Temporary Bypass Pumping	1	LS	$ 800	$ 800
8	Service Laterals				
8.1	Reinstate Sewer Service Laterals	11	EA	$ 200	$ 2,200
9	Manholes				
9.1	New Manhole (Furnish and Install, includes pipe connections)	0	EA		$ -
9.2	Abandon Existing Manhole In Place	0	EA		$ -
				Subtotal 1:	$ 56,000
				Construction Contingency (10%):	$ 5,600
				Design (15%):	$ 8,400
				Contract Administration (10%):	$ 5,600
				Total Project Cost:	**$ 75,600**

Client:	**City of Arroyo Grande**				
Project:	**2011 Wastewater Master Plan Updates**				
Segment:	**A-1(3)**				
Street:	**Trenchless Sewer Rehabilitation with Point Repairs-Parallel to Creek**			**Prepared by:**	LSW
				Reviewed by:	JHR
Opinion of Probable Construction Cost				**Date:**	4/26/2012

Item No.	Item Description	Quantity	Unit	Unit Cost	Total Item Cost
1	Mobilization	1	LS	-	$ 4,700
2	Insurance and Bonds	1	LS	-	$ 4,700
3	Construction Surveying	0	LS	-	$ -
4	Site Clearing and Restoration	0	LS	-	$ -
5	SWPPP Preparation & Implementation	0	LS	-	$ -
6	Traffic Control	20	Day	$ 500	$ 10,000
7	Gravity Sewer Construction				
7.1	Pavement Removal & Repair for Trench	267	SY	$ 42	$ 11,100
7.2	Trenching/Compaction/Fill/Hauling	267	CY	$ 39	$ 10,500
7.3	Abandon Existing Gravity Sewer In Place	0	LF		$ -
7.4	Gravity Sewer Point Repairs (Furnish and Install)				
7.4.1	6" - PVC SDR35	0	LF		$ -
7.4.2	8" - PVC SDR35	0	LF		$ -
7.4.3	12" - PVC SDR35	200	LF	$ 24	$ 4,800
7.5	CIPP Trenchless Sewer Rehabilitation				
7.5.1	6" - Cured in Place Pipe	0	LF		$ -
7.5.2	8" - Cured in Place Pipe	0	LF		$ -
7.5.3	10" - Cured in Place Pipe	0	LF		$ -
7.5.4	12" - Cured in Place Pipe	1936	LF	$ 65	$ 125,800
7.5.5	14" - Cured in Place Pipe	0	LF		$ -
7.5.6	15" - Cured in Place Pipe	0	LF		$ -
7.6	Temporary Bypass Pumping	1	LS	$ 2,500	$ 2,500
8	Service Laterals				
8.1	Reinstate Sewer Service Laterals	14	EA	$ 200	$ 2,800
9	Manholes				
9.1	New Manhole (Furnish and Install, includes pipe connections)	0	EA		$ -
9.2	Abandon Existing Manhole In Place	0	EA		$ -
				Subtotal 1:	$ 176,900
				Construction Contingency (10%):	$ 17,700
				Design (15%):	$ 26,500
				Contract Administration (10%):	$ 17,700
				Total Project Cost:	**$ 238,800**

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Project A-2 - Trenchless Sewer Rehabilitation

Design and Permitting:	8 months		
Construction:	5 months	Opinion of Total Project Cost:	$ 719,900

Need for Project:

Video inspection reports have identified that the following sections of sewer main require rehabilitation: (1) Eman Ct to Newman Dr Easement, (2) Woodland Dr from Fair Oaks Ave to Olive St, (3) South Alpine from Eman Ct to Cerro Vista Ln, (4) From South Halcyon Rd to cleanout between Farroll Ave and Sandalwood Ave, (5) Alder St from Fair Oaks Ave to Farroll Ave, (6) Backyard sewer west of Wood Pl, (7) Vernon St from Larchmont Dr to West Branch St, (8) Cameron Ct, (9) The Pike from South Elm St to Garfield Pl, (10) Ash St from Alder St, (11) Le Point St from Crown Terrace to McKinley St, and (12) Tally Ho Creek Crossing.

Supporting Information:

Video inspection reports show that the sections of sewer main listed as segments (1) through (11) in the tables and figures below are impacted by root intrusion, minor cracks, offsets and minor structural defects. In addition, City staff reports that the steel sewer main crossing the Arroyo Grande Creek from Tally Ho Rd is in poor condition and has evidence of corrosion.

Table 7-3 - Sewer main sections requiring trenchless rehabilitation

Sewer Main Segment	Length (ft)	Diameter (in)	Inspection Date
(1) Eman Ct	371	8	1990
(2) Woodland Dr	636	14	2009
(3) South Alpine	605	6	1984
(4) South Halcyon Rd	526	6	1993
(5) Alder St	714	10	1984
(6) Wood Pl	410	6	1984
(7) Vernon St	331	6	1984
(8) Cameron Ct	1,185	14	1985
(9) The Pike	780	6	1981
(10) Ash St	338	6	2009
(11) Le Point St	954	6	1981
(12) Tally Ho Rd Creek Crossing	270	15	n/a
Total	**7,120**	-	-

Recommended Solution:

It is recommended that the City employ cured-in-place pipe rehabilitation along the entire length of the listed sections to reduce infiltration, root intrusion, and maintenance requirements, as well as reduce probability of failure.

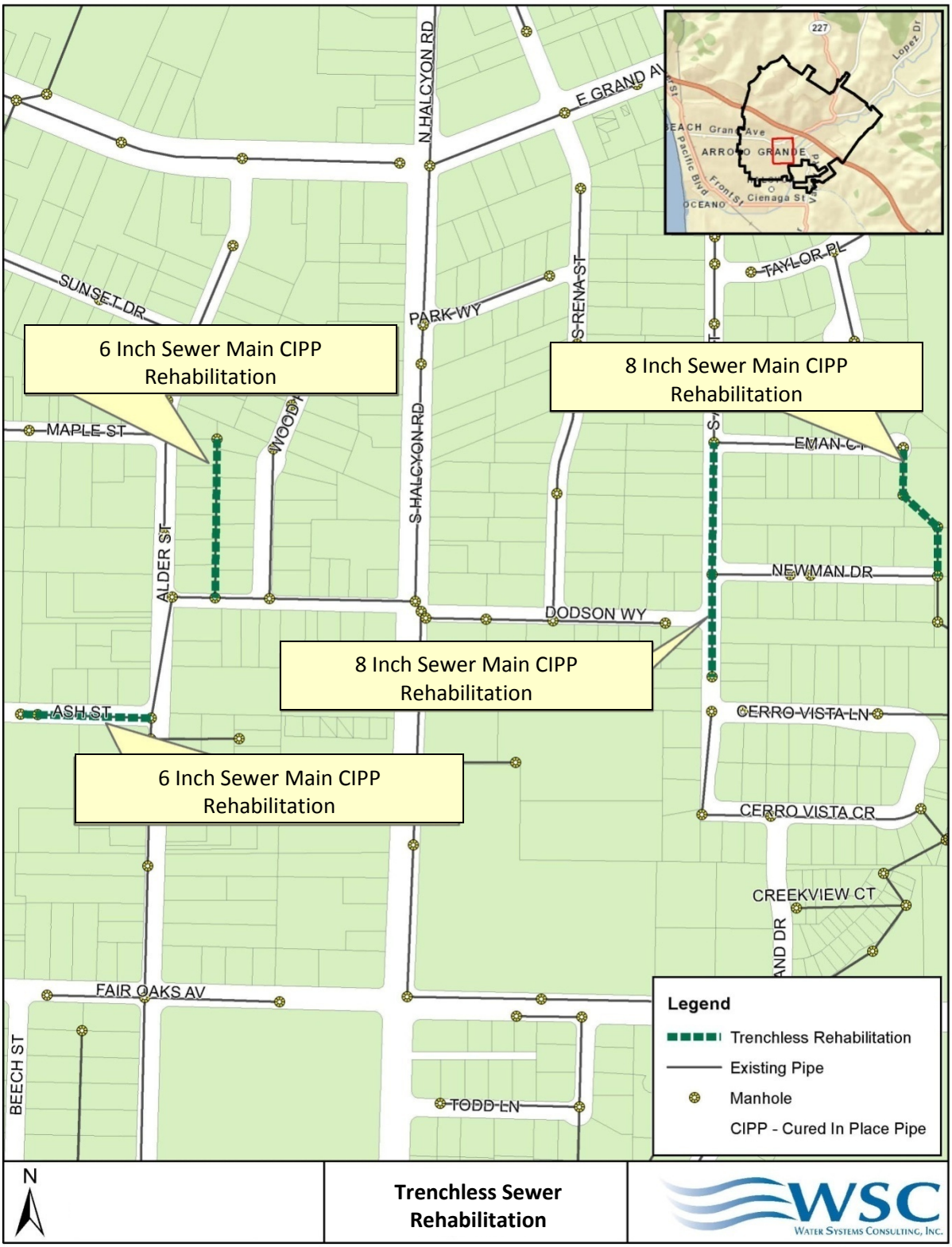

Figure 7-4 - Trenchless Sewer Rehabilitation

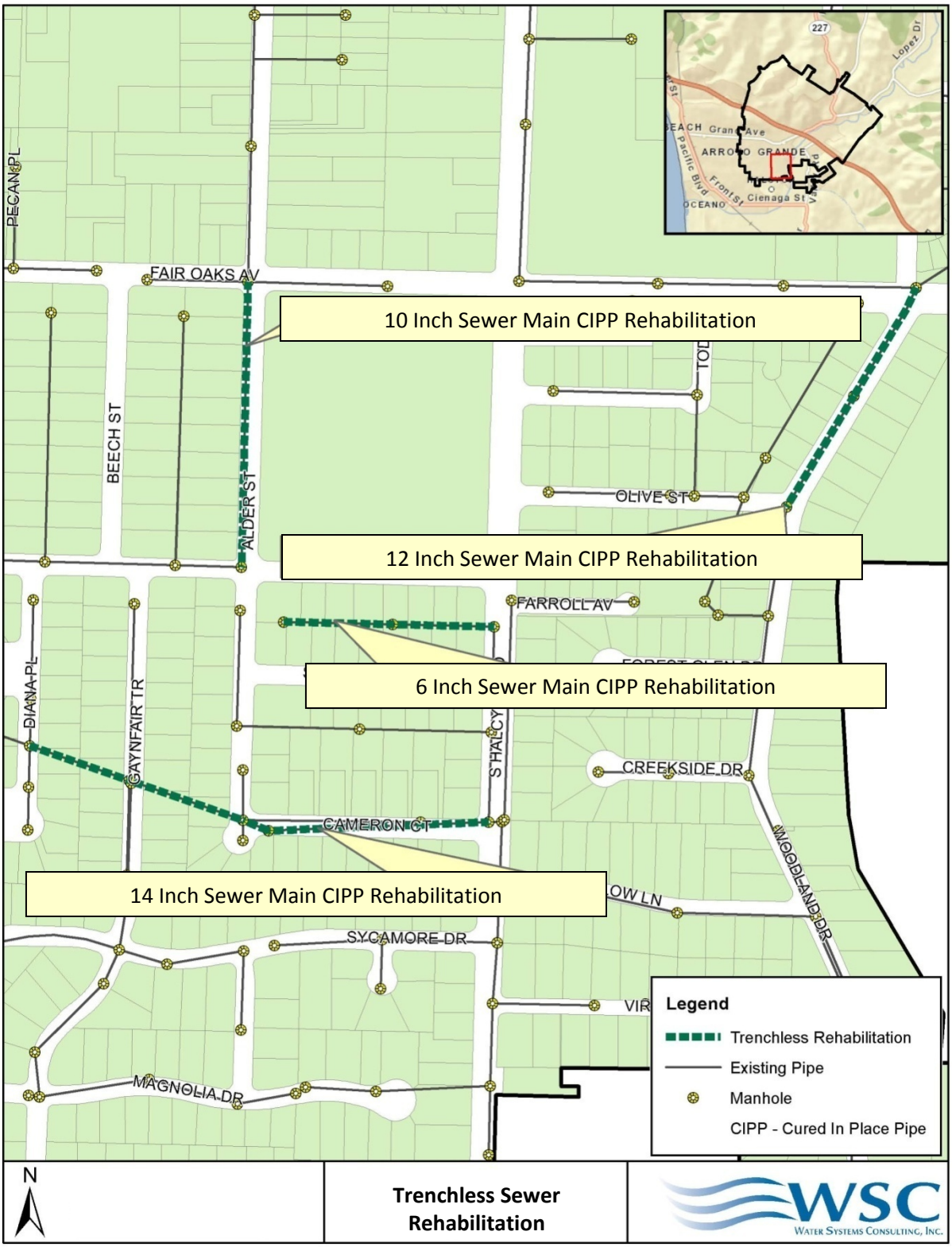

Figure 7-5 - Trenchless Sewer Rehabilitation

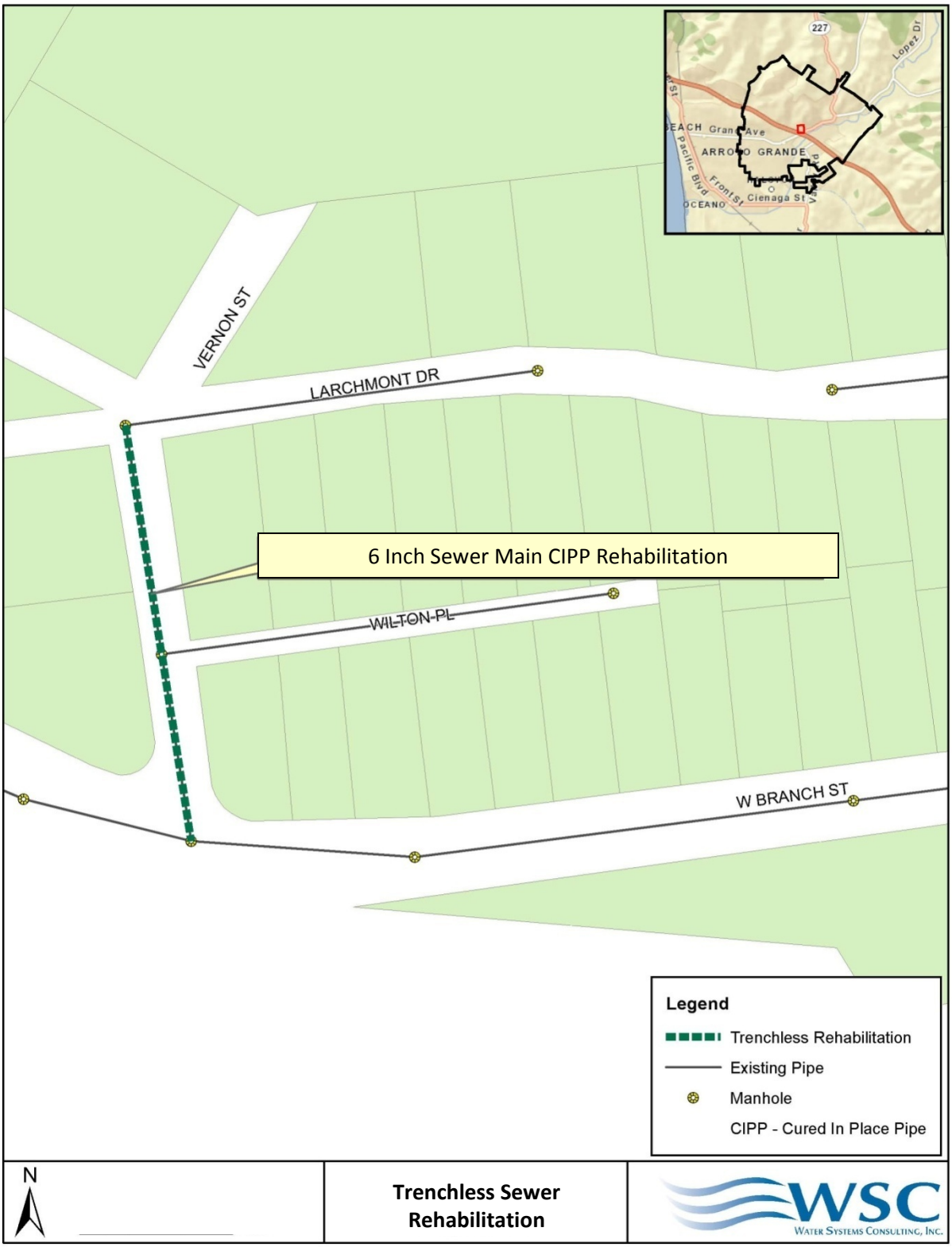

Figure 7-6 - Trenchless Sewer Rehabilitation

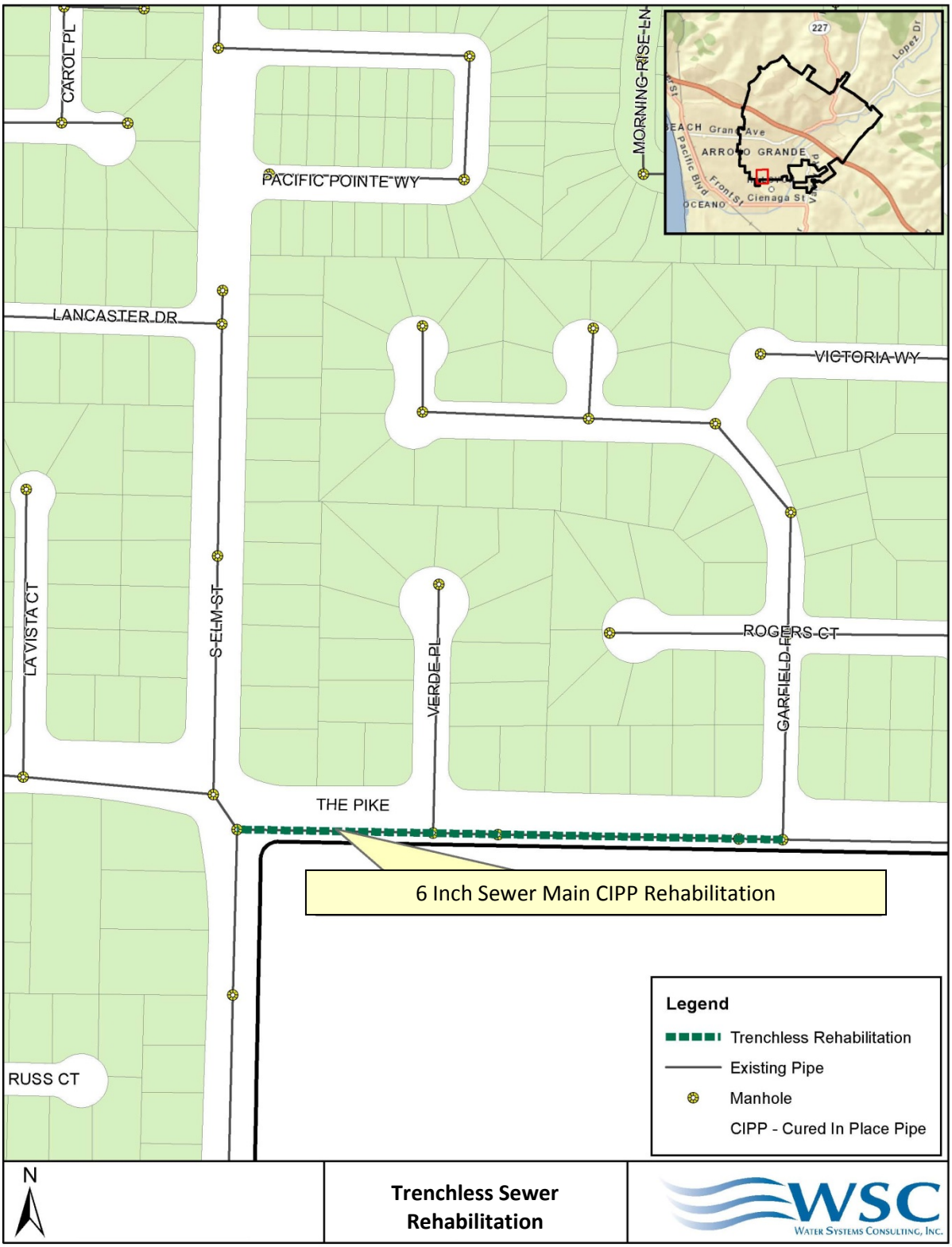

Figure 7-7 - Trenchless Sewer Rehabilitation

Figure 7-8 - Trenchless Sewer Rehabilitation

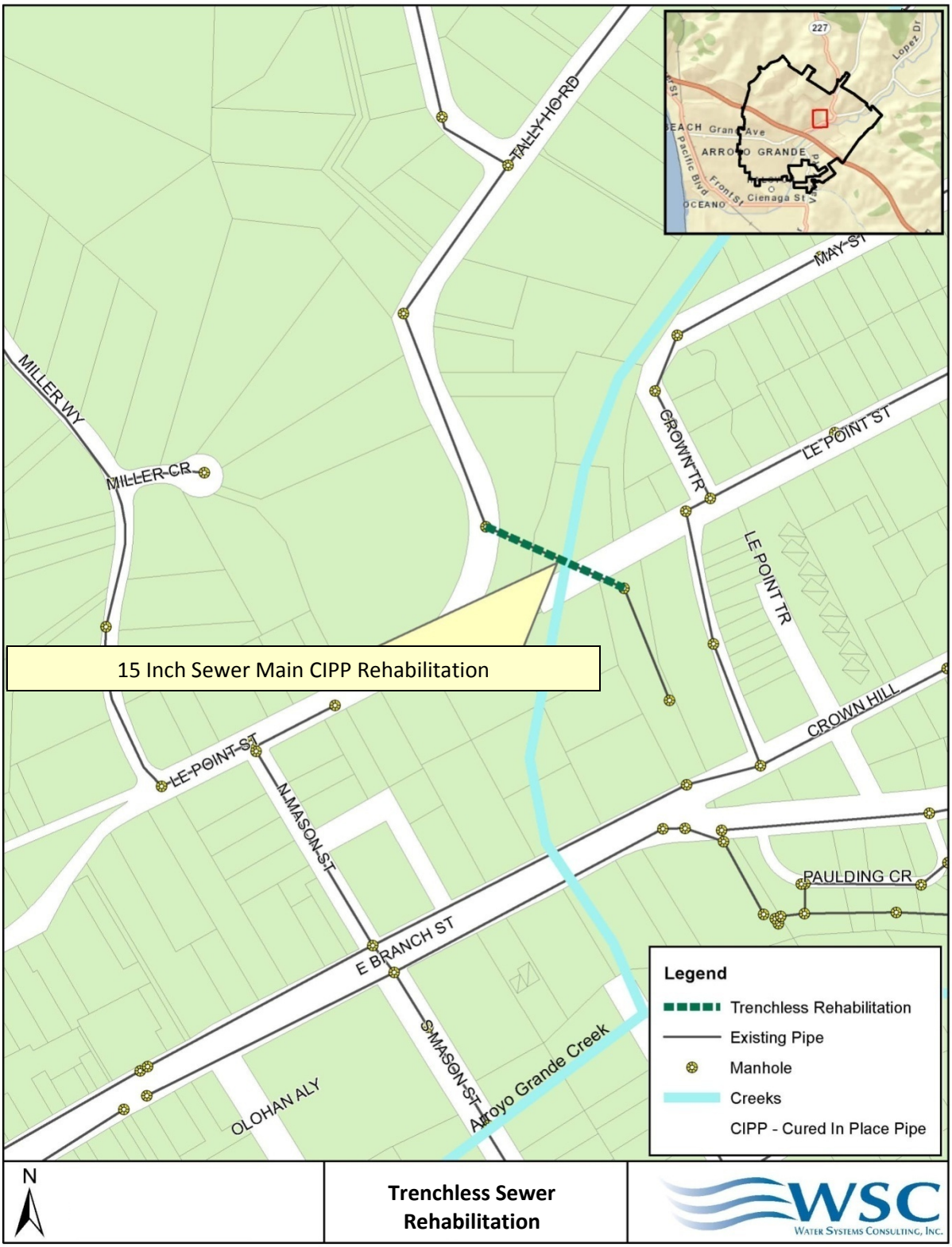

Figure 7-9 - Trenchless Sewer Rehabilitation

Cost Estimate Summary:

Estimated costs for this project are as follows:

Design (15%):	$	80,100
Contract Administration (10%):	$	53,300
Construction Contingency (10%):	$	53,300
Project Construction:	$	533,200
Opinion of Total Project Cost:	$	719,900

A detailed breakdown of the construction costs for this project is shown in below.

Client:	**City of Arroyo Grande**				
Project:	**2011 Wastewater Master Plan Updates**				
Segment:	**A-2(1)**				
Street:	**Trenchless Sewer Rehabilitation-Eman Ct**			**Prepared by:**	LSW
				Reviewed by:	JHR
Opinion of Probable Construction Cost				**Date:**	4/26/2012

Item No.	Item Description	Quantity	Unit	Unit Cost	Total Item Cost
1	Mobilization	1	LS	-	$ 500
2	Insurance and Bonds	1	LS	-	$ 500
3	Construction Surveying	0	LS	-	$ -
4	Site Clearing and Restoration	0	LS	-	$ -
5	SWPPP Preparation & Implementation	0	LS	-	$ -
6	Traffic Control	4	Day	$ 500	$ 2,000
7	Gravity Sewer Construction				
7.1	Pavement Removal & Repair for Trench	0	SY		$ -
7.2	Trenching/Compaction/Fill/Hauling	0	CY		$ -
7.3	Abandon Existing Gravity Sewer In Place	0	LF		$ -
7.4	Gravity Sewer Point Repairs (Furnish and Install)				
7.4.1	6" - PVC SDR35	0	LF		$ -
7.4.2	8" - PVC SDR35	0	LF		$ -
7.4.3	12" - PVC SDR35	0	LF		$ -
7.5	CIPP Trenchless Sewer Rehabilitation				
7.5.1	6" - Cured in Place Pipe	0	LF		$ -
7.5.2	8" - Cured in Place Pipe	371	LF	$ 45	$ 16,700
7.5.3	10" - Cured in Place Pipe	0	LF		$ -
7.5.4	12" - Cured in Place Pipe	0	LF		$ -
7.5.5	14" - Cured in Place Pipe	0	LF		$ -
7.5.6	15" - Cured in Place Pipe	0	LF		$ -
7.6	Temporary Bypass Pumping	1	LS	$ 300	$ 300
8	Service Laterals				
8.1	Reinstate Sewer Service Laterals	5	EA	$ 200	$ 1,000
9	Manholes				
9.1	New Manhole (Furnish and Install, includes pipe connections)	0	EA		$ -
9.2	Abandon Existing Manhole In Place	0	EA		$ -
				Subtotal 1:	$ 21,000
				Construction Contingency (10%):	$ 2,100
				Design (15%):	$ 3,200
				Contract Administration (10%):	$ 2,100
				Total Project Cost:	**$ 28,400**

Client:	**City of Arroyo Grande**				
Project:	**2011 Wastewater Master Plan Updates**				
Segment:	**A-2(2)**				
Street:	**Trenchless Sewer Rehabilitation-Woodland Dr**			**Prepared by:**	LSW
				Reviewed by:	JHR
Opinion of Probable Construction Cost				**Date:**	4/26/2012

Item No.	Item Description	Quantity	Unit	Unit Cost	Total Item Cost
1	Mobilization	1	LS	-	$ 1,400
2	Insurance and Bonds	1	LS	-	$ 1,400
3	Construction Surveying	0	LS	-	$ -
4	Site Clearing and Restoration	0	LS	-	$ -
5	SWPPP Preparation & Implementation	0	LS	-	$ -
6	Traffic Control	7	Day	$ 500	$ 3,500
7	Gravity Sewer Construction				
7.1	Pavement Removal & Repair for Trench	0	SY		$ -
7.2	Trenching/Compaction/Fill/Hauling	0	CY		$ -
7.3	Abandon Existing Gravity Sewer In Place	0	LF		$ -
7.4	Gravity Sewer Point Repairs (Furnish and Install)				
7.4.1	6" - PVC SDR35	0	LF		$ -
7.4.2	8" - PVC SDR35	0	LF		$ -
7.4.3	12" - PVC SDR35	0	LF		$ -
7.5	CIPP Trenchless Sewer Rehabilitation				
7.5.1	6" - Cured in Place Pipe	0	LF		$ -
7.5.2	8" - Cured in Place Pipe	0	LF		$ -
7.5.3	10" - Cured in Place Pipe	0	LF		$ -
7.5.4	12" - Cured in Place Pipe	636	LF	$ 65	$ 41,300
7.5.5	14" - Cured in Place Pipe	0	LF		$ -
7.5.6	15" - Cured in Place Pipe	0	LF		$ -
7.6	Temporary Bypass Pumping	1	LS	$ 600	$ 600
8	Service Laterals				
8.1	Reinstate Sewer Service Laterals	16	EA	$ 200	$ 3,200
9	Manholes				
9.1	New Manhole (Furnish and Install, includes pipe connections)	0	EA		$ -
9.2	Abandon Existing Manhole In Place	0	EA		$ -
				Subtotal 1:	$ 51,400
				Construction Contingency (10%):	$ 5,100
				Design (15%):	$ 7,700
				Contract Administration (10%):	$ 5,100
				Total Project Cost:	**$ 69,300**

Client:	**City of Arroyo Grande**				
Project:	**2011 Wastewater Master Plan Updates**				
Segment:	**A-2(3)**				
Street:	**Trenchless Sewer Rehabilitation-S Alpine St**			**Prepared by:**	LSW
				Reviewed by:	JHR
Opinion of Probable Construction Cost				**Date:**	4/26/2012

Item No.	Item Description	Quantity	Unit	Unit Cost	Total Item Cost
1	Mobilization	1	LS	-	$ 900
2	Insurance and Bonds	1	LS	-	$ 900
3	Construction Surveying	0	LS	-	$ -
4	Site Clearing and Restoration	0	LS	-	$ -
5	SWPPP Preparation & Implementation	0	LS	-	$ -
6	Traffic Control	7	Day	$ 500	$ 3,500
7	Gravity Sewer Construction				
7.1	Pavement Removal & Repair for Trench	0	SY		$ -
7.2	Trenching/Compaction/Fill/Hauling	0	CY		$ -
7.3	Abandon Existing Gravity Sewer In Place	0	LF		$ -
7.4	Gravity Sewer Point Repairs (Furnish and Install)				
7.4.1	6" - PVC SDR35	0	LF		$ -
7.4.2	8" - PVC SDR35	0	LF		$ -
7.4.3	12" - PVC SDR35	0	LF		$ -
7.5	CIPP Trenchless Sewer Rehabilitation				
7.5.1	6" - Cured in Place Pipe	0	LF		$ -
7.5.2	8" - Cured in Place Pipe	605	LF	$ 45	$ 27,200
7.5.3	10" - Cured in Place Pipe	0	LF		$ -
7.5.4	12" - Cured in Place Pipe	0	LF		$ -
7.5.5	14" - Cured in Place Pipe	0	LF		$ -
7.5.6	15" - Cured in Place Pipe	0	LF		$ -
7.6	Temporary Bypass Pumping	1	LS	$ 600	$ 600
8	Service Laterals				
8.1	Reinstate Sewer Service Laterals	17	EA	$ 200	$ 3,400
9	Manholes				
9.1	New Manhole (Furnish and Install, includes pipe connections)	0	EA		$ -
9.2	Abandon Existing Manhole In Place	0	EA		$ -
				Subtotal 1:	$ 36,500
				Construction Contingency (10%):	$ 3,700
				Design (15%):	$ 5,500
				Contract Administration (10%):	$ 3,700
				Total Project Cost:	**$ 49,400**

Client:	**City of Arroyo Grande**				
Project:	**2011 Wastewater Master Plan Updates**				
Segment:	**A-2(4)**				
Street:	**Trenchless Sewer Rehabilitation-S Halcyon Rd**			**Prepared by:**	LSW
				Reviewed by:	JHR
Opinion of Probable Construction Cost				**Date:**	4/26/2012

Item No.	Item Description	Quantity	Unit	Unit Cost	Total Item Cost
1	Mobilization	1	LS	-	$ 1,100
2	Insurance and Bonds	1	LS	-	$ 1,100
3	Construction Surveying	0	LS	-	$ -
4	Site Clearing and Restoration	0	LS	-	$ -
5	SWPPP Preparation & Implementation	0	LS	-	$ -
6	Traffic Control	6	Day	$ 500	$ 3,000
7	Gravity Sewer Construction				
7.1	Pavement Removal & Repair for Trench	40	SY	$ 65	$ 2,600
7.2	Trenching/Compaction/Fill/Hauling	40	CY	$ 50	$ 2,000
7.3	Abandon Existing Gravity Sewer In Place	0	LF		$ -
7.4	Gravity Sewer Point Repairs (Furnish and Install)				
7.4.1	6" - PVC SDR35[1]	60	LF	$ 10	$ 600
7.4.2	8" - PVC SDR35	0	LF		$ -
7.4.3	12" - PVC SDR35	0	LF		$ -
7.5	CIPP Trenchless Sewer Rehabilitation				
7.5.1	6" - Cured in Place Pipe	526	LF	$ 50	$ 26,300
7.5.2	8" - Cured in Place Pipe	0	LF		$ -
7.5.3	10" - Cured in Place Pipe	0	LF		$ -
7.5.4	12" - Cured in Place Pipe	0	LF		$ -
7.5.5	14" - Cured in Place Pipe	0	LF		$ -
7.5.6	15" - Cured in Place Pipe	0	LF		$ -
7.6	Temporary Bypass Pumping	1	LS	$ 500	$ 500
8	Service Laterals				
8.1	Reinstate Sewer Service Laterals	17	EA	$ 200	$ 3,400
9	Manholes				
9.1	New Manhole (Furnish and Install, includes pipe connections)	0	EA		$ -
9.2	Abandon Existing Manhole In Place	0	EA		$ -
				Subtotal 1:	$ 40,600
				Construction Contingency (10%):	$ 4,100
				Design (15%):	$ 6,100
				Contract Administration (10%):	$ 4,100
				Total Project Cost:	**$ 54,900**

Note 1: For 6-inch CIPP sewer projects, budget includes one (1) 20-ft point repair per 200-ft of pipe because any offsets must be corrected so CIPP equipment can fit through 6-inch pipe.

Client:	**City of Arroyo Grande**				
Project:	**2011 Wastewater Master Plan Updates**				
Segment:	**A-2(5)**				
Street:	**Trenchless Sewer Rehabilitation-Alder St**			**Prepared by:**	LSW
				Reviewed by:	JHR
Opinion of Probable Construction Cost				**Date:**	4/26/2012

Item No.	Item Description	Quantity	Unit	Unit Cost	Total Item Cost
1	Mobilization	1	LS	-	$ 1,300
2	Insurance and Bonds	1	LS	-	$ 1,300
3	Construction Surveying	0	LS	-	$ -
4	Site Clearing and Restoration	0	LS	-	$ -
5	SWPPP Preparation & Implementation	0	LS	-	$ -
6	Traffic Control	8	Day	$ 500	$ 4,000
7	Gravity Sewer Construction				
7.1	Pavement Removal & Repair for Trench	0	SY		$ -
7.2	Trenching/Compaction/Fill/Hauling	0	CY		$ -
7.3	Abandon Existing Gravity Sewer In Place	0	LF		$ -
7.4	Gravity Sewer Point Repairs (Furnish and Install)				
7.4.1	6" - PVC SDR35	0	LF		$ -
7.4.2	8" - PVC SDR35	0	LF		$ -
7.4.3	12" - PVC SDR35	0	LF		$ -
7.5	CIPP Trenchless Sewer Rehabilitation				
7.5.1	6" - Cured in Place Pipe	0	LF		$ -
7.5.2	8" - Cured in Place Pipe	0	LF		$ -
7.5.3	10" - Cured in Place Pipe	714	LF	$ 55	$ 39,300
7.5.4	12" - Cured in Place Pipe	0	LF		$ -
7.5.5	14" - Cured in Place Pipe	0	LF		$ -
7.5.6	15" - Cured in Place Pipe	0	LF		$ -
7.6	Temporary Bypass Pumping	1	LS	$ 700	$ 700
8	Service Laterals				
8.1	Reinstate Sewer Service Laterals	11	EA	$ 200	$ 2,200
9	Manholes				
9.1	New Manhole (Furnish and Install, includes pipe connections)	0	EA		$ -
9.2	Abandon Existing Manhole In Place	0	EA		$ -
				Subtotal 1:	$ 48,800
				Construction Contingency (10%):	$ 4,900
				Design (15%):	$ 7,300
				Contract Administration (10%):	$ 4,900
				Total Project Cost:	**$ 65,900**

Client:	**City of Arroyo Grande**				
Project:	**2011 Wastewater Master Plan Updates**				
Segment:	**A-2(6)**				
Street:	**Trenchless Sewer Rehabilitation-Wood Pl**			**Prepared by:**	LSW
				Reviewed by:	JHR
Opinion of Probable Construction Cost				**Date:**	4/26/2012

Item No.	Item Description	Quantity	Unit	Unit Cost	Total Item Cost
1	Mobilization	1	LS	-	$ 900
2	Insurance and Bonds	1	LS	-	$ 900
3	Construction Surveying	0	LS	-	$ -
4	Site Clearing and Restoration	0	LS	-	$ -
5	SWPPP Preparation & Implementation	0	LS	-	$ -
6	Traffic Control	5	Day	$ 500	$ 2,500
7	Gravity Sewer Construction				
7.1	Pavement Removal & Repair for Trench	40	SY	$ 65	$ 2,600
7.2	Trenching/Compaction/Fill/Hauling	40	CY	$ 50	$ 2,000
7.3	Abandon Existing Gravity Sewer In Place	0	LF		$ -
7.4	Gravity Sewer Point Repairs (Furnish and Install)				
7.4.1	6" - PVC SDR35[1]	60	LF	$ 10	$ 600
7.4.2	8" - PVC SDR35	0	LF		$ -
7.4.3	12" - PVC SDR35	0	LF		$ -
7.5	CIPP Trenchless Sewer Rehabilitation				
7.5.1	6" - Cured in Place Pipe	410	LF	$ 50	$ 20,500
7.5.2	8" - Cured in Place Pipe	0	LF		$ -
7.5.3	10" - Cured in Place Pipe	0	LF		$ -
7.5.4	12" - Cured in Place Pipe	0	LF		$ -
7.5.5	14" - Cured in Place Pipe	0	LF		$ -
7.5.6	15" - Cured in Place Pipe	0	LF		$ -
7.6	Temporary Bypass Pumping	1	LS	$ 400	$ 400
8	Service Laterals				
8.1	Reinstate Sewer Service Laterals	23	EA	$ 200	$ 4,600
9	Manholes				
9.1	New Manhole (Furnish and Install, includes pipe connections)	0	EA		$ -
9.2	Abandon Existing Manhole In Place	0	EA		$ -

Subtotal 1:	$ 35,000
Construction Contingency (10%):	$ 3,500
Design (15%):	$ 5,300
Contract Administration (10%):	$ 3,500
Total Project Cost:	**$ 47,300**

Note 1: For 6-inch CIPP sewer projects, budget includes one (1) 20-ft point repair per 200-ft of pipe because any offsets must be corrected so CIPP equipment can fit through 6-inch pipe.

Client:	**City of Arroyo Grande**				
Project:	**2011 Wastewater Master Plan Updates**				
Segment:	**A-2(7)**				
Street:	**Trenchless Sewer Rehabilitation-Vernon St**			**Prepared by:**	LSW
				Reviewed by:	JHR
Opinion of Probable Construction Cost				**Date:**	4/26/2012

Item No.	Item Description	Quantity	Unit	Unit Cost	Total Item Cost
1	Mobilization	1	LS	-	$ 600
2	Insurance and Bonds	1	LS	-	$ 600
3	Construction Surveying	0	LS	-	$ -
4	Site Clearing and Restoration	0	LS	-	$ -
5	SWPPP Preparation & Implementation	0	LS	-	$ -
6	Traffic Control	4	Day	$ 500	$ 2,000
7	Gravity Sewer Construction				
7.1	Pavement Removal & Repair for Trench	27	SY	$ 64	$ 1,700
7.2	Trenching/Compaction/Fill/Hauling	27	CY	$ 49	$ 1,300
7.3	Abandon Existing Gravity Sewer In Place	0	LF		$ -
7.4	Gravity Sewer Point Repairs (Furnish and Install)				
7.4.1	6" - PVC SDR35[1]	40	LF	$ 10	$ 400
7.4.2	8" - PVC SDR35	0	LF		$ -
7.4.3	12" - PVC SDR35	0	LF		$ -
7.5	CIPP Trenchless Sewer Rehabilitation				
7.5.1	6" - Cured in Place Pipe	331	LF	$ 50	$ 16,600
7.5.2	8" - Cured in Place Pipe	0	LF		$ -
7.5.3	10" - Cured in Place Pipe	0	LF		$ -
7.5.4	12" - Cured in Place Pipe	0	LF		$ -
7.5.5	14" - Cured in Place Pipe	0	LF		$ -
7.5.6	15" - Cured in Place Pipe	0	LF		$ -
7.6	Temporary Bypass Pumping	1	LS	$ 300	$ 300
8	Service Laterals				
8.1	Reinstate Sewer Service Laterals	4	EA	$ 200	$ 800
9	Manholes				
9.1	New Manhole (Furnish and Install, includes pipe connections)	0	EA		$ -
9.2	Abandon Existing Manhole In Place	0	EA		$ -

	Subtotal 1:	$ 24,300
Construction Contingency (10%):		$ 2,400
	Design (15%):	$ 3,600
Contract Administration (10%):		$ 2,400
	Total Project Cost:	**$ 32,700**

Note 1: For 6-inch CIPP sewer projects, budget includes one (1) 20-ft point repair per 200-ft of pipe because any offsets must be corrected so CIPP equipment can fit through 6-inch pipe.

Client:	**City of Arroyo Grande**				
Project:	**2011 Wastewater Master Plan Updates**				
Segment:	**A-2(8)**				
Street:	**Trenchless Sewer Rehabilitation-Cameron Ct**			**Prepared by:**	LSW
				Reviewed by:	JHR
Opinion of Probable Construction Cost				**Date:**	4/26/2012

Item No.	Item Description	Quantity	Unit	Unit Cost	Total Item Cost
1	Mobilization	1	LS	-	$ 2,600
2	Insurance and Bonds	1	LS	-	$ 2,600
3	Construction Surveying	0	LS	-	$ -
4	Site Clearing and Restoration	0	LS	-	$ -
5	SWPPP Preparation & Implementation	0	LS	-	$ -
6	Traffic Control	12	Day	$ 500	$ 6,000
7	Gravity Sewer Construction				
7.1	Pavement Removal & Repair for Trench	0	SY		$ -
7.2	Trenching/Compaction/Fill/Hauling	0	CY		$ -
7.3	Abandon Existing Gravity Sewer In Place	0	LF		$ -
7.4	Gravity Sewer Point Repairs (Furnish and Install)				
7.4.1	6" - PVC SDR35	0	LF		$ -
7.4.2	8" - PVC SDR35	0	LF		$ -
7.4.3	12" - PVC SDR35	0	LF		$ -
7.5	CIPP Trenchless Sewer Rehabilitation				
7.5.1	6" - Cured in Place Pipe	0	LF		$ -
7.5.2	8" - Cured in Place Pipe	0	LF		$ -
7.5.3	10" - Cured in Place Pipe	0	LF		$ -
7.5.4	12" - Cured in Place Pipe	0	LF		$ -
7.5.5	14" - Cured in Place Pipe	1185	LF	$ 70	$ 83,000
7.5.6	15" - Cured in Place Pipe	0	LF		$ -
7.6	Temporary Bypass Pumping	1	LS	$ 1,100	$ 1,100
8	Service Laterals				
8.1	Reinstate Sewer Service Laterals	18	EA	$ 200	$ 3,600
9	Manholes				
9.1	New Manhole (Furnish and Install, includes pipe connections)	0	EA		$ -
9.2	Abandon Existing Manhole In Place	0	EA		$ -
				Subtotal 1:	$ 98,900
				Construction Contingency (10%):	$ 9,900
				Design (15%):	$ 14,800
				Contract Administration (10%):	$ 9,900
				Total Project Cost:	**$ 133,500**

Client:	**City of Arroyo Grande**				
Project:	**2011 Wastewater Master Plan Updates**				
Segment:	**A-2(9)**				
Street:	**Trenchless Sewer Rehabilitation-The Pike**			**Prepared by:**	LSW
				Reviewed by:	JHR
Opinion of Probable Construction Cost				**Date:**	4/26/2012

Item No.	Item Description	Quantity	Unit	Unit Cost	Total Item Cost
1	Mobilization	1	LS	-	$ 1,500
2	Insurance and Bonds	1	LS	-	$ 1,500
3	Construction Surveying	0	LS	-	$ -
4	Site Clearing and Restoration	0	LS	-	$ -
5	SWPPP Preparation & Implementation	0	LS	-	$ -
6	Traffic Control	8	Day	$ 500	$ 4,000
7	Gravity Sewer Construction				
7.1	Pavement Removal & Repair for Trench	53	SY	$ 66	$ 3,500
7.2	Trenching/Compaction/Fill/Hauling	53	CY	$ 51	$ 2,700
7.3	Abandon Existing Gravity Sewer In Place	0	LF		$ -
7.4	Gravity Sewer Point Repairs (Furnish and Install)				
7.4.1	6" - PVC SDR35[1]	80	LF	$ 10	$ 800
7.4.2	8" - PVC SDR35	0	LF		$ -
7.4.3	12" - PVC SDR35	0	LF		$ -
7.5	CIPP Trenchless Sewer Rehabilitation				
7.5.1	6" - Cured in Place Pipe	780	LF	$ 50	$ 39,000
7.5.2	8" - Cured in Place Pipe	0	LF		$ -
7.5.3	10" - Cured in Place Pipe	0	LF		$ -
7.5.4	12" - Cured in Place Pipe	0	LF		$ -
7.5.5	14" - Cured in Place Pipe	0	LF		$ -
7.5.6	15" - Cured in Place Pipe	0	LF		$ -
7.6	Temporary Bypass Pumping	1	LS	$ 800	$ 800
8	Service Laterals				
8.1	Reinstate Sewer Service Laterals	10	EA	$ 200	$ 2,000
9	Manholes				
9.1	New Manhole (Furnish and Install, includes pipe connections)	0	EA		$ -
9.2	Abandon Existing Manhole In Place	0	EA		$ -

Subtotal 1:	$ 55,800
Construction Contingency (10%):	$ 5,600
Design (15%):	$ 8,400
Contract Administration (10%):	$ 5,600
Total Project Cost:	**$ 75,400**

Note 1: For 6-inch CIPP sewer projects, budget includes one (1) 20-ft point repair per 200-ft of pipe because any offsets must be corrected so CIPP equipment can fit through 6-inch pipe.

Client:	**City of Arroyo Grande**				
Project:	**2011 Wastewater Master Plan Updates**				
Segment:	**A-2(10)**				
Street:	**Trenchless Sewer Rehabilitation-Ash St**			**Prepared by:**	LSW
				Reviewed by:	JHR
Opinion of Probable Construction Cost				**Date:**	4/26/2012

Item No.	Item Description	Quantity	Unit	Unit Cost	Total Item Cost
1	Mobilization	1	LS	-	$ 700
2	Insurance and Bonds	1	LS	-	$ 700
3	Construction Surveying	0	LS	-	$ -
4	Site Clearing and Restoration	0	LS	-	$ -
5	SWPPP Preparation & Implementation	0	LS	-	$ -
6	Traffic Control	4	Day	$ 500	$ 2,000
7	Gravity Sewer Construction				
7.1	Pavement Removal & Repair for Trench	27	SY	$ 64	$ 1,700
7.2	Trenching/Compaction/Fill/Hauling	27	CY	$ 49	$ 1,300
7.3	Abandon Existing Gravity Sewer In Place	0	LF		$ -
7.4	Gravity Sewer Point Repairs (Furnish and Install)				
7.4.1	6" - PVC SDR35[1]	40	LF	$ 10	$ 400
7.4.2	8" - PVC SDR35	0	LF		$ -
7.4.3	12" - PVC SDR35	0	LF		$ -
7.5	CIPP Trenchless Sewer Rehabilitation				
7.5.1	6" - Cured in Place Pipe	338	LF	$ 50	$ 16,900
7.5.2	8" - Cured in Place Pipe	0	LF		$ -
7.5.3	10" - Cured in Place Pipe	0	LF		$ -
7.5.4	12" - Cured in Place Pipe	0	LF		$ -
7.5.5	14" - Cured in Place Pipe	0	LF		$ -
7.5.6	15" - Cured in Place Pipe	0	LF		$ -
7.6	Temporary Bypass Pumping	1	LS	$ 300	$ 300
8	Service Laterals				
8.1	Reinstate Sewer Service Laterals	6	EA	$ 200	$ 1,200
9	Manholes				
9.1	New Manhole (Furnish and Install, includes pipe connections)	0	EA		$ -
9.2	Abandon Existing Manhole In Place	0	EA		$ -
				Subtotal 1:	$ 25,200
				Construction Contingency (10%):	$ 2,500
				Design (15%):	$ 3,800
				Contract Administration (10%):	$ 2,500
				Total Project Cost:	**$ 34,000**

Note 1: For 6-inch CIPP sewer projects, budget includes one (1) 20-ft point repair per 200-ft of pipe because any offsets must be corrected so CIPP equipment can fit through 6-inch pipe.

Client:	**City of Arroyo Grande**				
Project:	**2011 Wastewater Master Plan Updates**				
Segment:	**A-2(11)**				
Street:	**Trenchless Sewer Rehabilitation-Le Point St**			**Prepared by:**	LSW
				Reviewed by:	JHR
Opinion of Probable Construction Cost				**Date:**	4/26/2012

Item No.	Item Description	Quantity	Unit	Unit Cost	Total Item Cost
1	Mobilization	1	LS	-	$ 1,900
2	Insurance and Bonds	1	LS	-	$ 1,900
3	Construction Surveying	0	LS	-	$ -
4	Site Clearing and Restoration	0	LS	-	$ -
5	SWPPP Preparation & Implementation	0	LS	-	$ -
6	Traffic Control	10	Day	$ 500	$ 5,000
7	Gravity Sewer Construction				
7.1	Pavement Removal & Repair for Trench	67	SY	$ 66	$ 4,400
7.2	Trenching/Compaction/Fill/Hauling	67	CY	$ 50	$ 3,300
7.3	Abandon Existing Gravity Sewer In Place	0	LF		$ -
7.4	Gravity Sewer Point Repairs (Furnish and Install)				
7.4.1	6" - PVC SDR35[1]	100	LF	$ 10	$ 1,000
7.4.2	8" - PVC SDR35	0	LF		$ -
7.4.3	12" - PVC SDR35	0	LF		$ -
7.5	CIPP Trenchless Sewer Rehabilitation				
7.5.1	6" - Cured in Place Pipe	954	LF	$ 50	$ 47,700
7.5.2	8" - Cured in Place Pipe	0	LF		$ -
7.5.3	10" - Cured in Place Pipe	0	LF		$ -
7.5.4	12" - Cured in Place Pipe	0	LF		$ -
7.5.5	14" - Cured in Place Pipe	0	LF		$ -
7.5.6	15" - Cured in Place Pipe	0	LF		$ -
7.6	Temporary Bypass Pumping	1	LS	$ 1,000	$ 1,000
8	Service Laterals				
8.1	Reinstate Sewer Service Laterals	31	EA	$ 200	$ 6,200
9	Manholes				
9.1	New Manhole (Furnish and Install, includes pipe connections)	0	EA		$ -
9.2	Abandon Existing Manhole In Place	0	EA		$ -
				Subtotal 1:	$ 72,400
				Construction Contingency (10%):	$ 7,200
				Design (15%):	$ 10,900
				Contract Administration (10%):	$ 7,200
				Total Project Cost:	**$ 97,700**

Note 1: For 6-inch CIPP sewer projects, budget includes one (1) 20-ft point repair per 200-ft of pipe because any offsets must be corrected so CIPP equipment can fit through 6-inch pipe.

Client:	**City of Arroyo Grande**				
Project:	**2011 Wastewater Master Plan Updates**				
Segment:	**A-2(12)**				
Street:	**Trenchless Sewer Rehabilitation- Tally Ho Rd Creek Crossing**			**Prepared by:**	LSW
				Reviewed by:	JHR
Opinion of Probable Construction Cost				**Date:**	4/26/2012

Item No.	Item Description	Quantity	Unit	Unit Cost	Total Item Cost
1	Mobilization	1	LS	-	$ 600
2	Insurance and Bonds	1	LS	-	$ 600
3	Construction Surveying	0	LS	-	$ -
4	Site Clearing and Restoration	0	LS	-	$ -
5	SWPPP Preparation & Implementation	0	LS	-	$ -
6	Traffic Control	3	Day	$ 500	$ 1,500
7	Gravity Sewer Construction				
7.1	Pavement Removal & Repair for Trench	0	SY		$ -
7.2	Trenching/Compaction/Fill/Hauling	0	CY		$ -
7.3	Abandon Existing Gravity Sewer In Place	0	LF		$ -
7.4	Gravity Sewer Point Repairs (Furnish and Install)				
7.4.1	6" - PVC SDR35	0	LF		$ -
7.4.2	8" - PVC SDR35	0	LF		$ -
7.4.3	12" - PVC SDR35	0	LF		$ -
7.5	CIPP Trenchless Sewer Rehabilitation				
7.5.1	6" - Cured in Place Pipe	0	LF		$ -
7.5.2	8" - Cured in Place Pipe	0	LF		$ -
7.5.3	10" - Cured in Place Pipe	0	LF		$ -
7.5.4	12" - Cured in Place Pipe	0	LF		$ -
7.5.5	14" - Cured in Place Pipe	0	LF		$ -
7.5.6	15" - Cured in Place Pipe	270	LF	$ 75	$ 20,300
7.6	Temporary Bypass Pumping	1	LS	$ 300	$ 300
8	Service Laterals				
8.1	Reinstate Sewer Service Laterals	0	EA		$ -
9	Manholes				
9.1	New Manhole (Furnish and Install, includes pipe connections)	0	EA		$ -
9.2	Abandon Existing Manhole In Place	0	EA		$ -
				Subtotal 1:	$ 23,300
				Construction Contingency (10%):	$ 2,300
				Design (15%):	$ 3,500
				Contract Administration (10%):	$ 2,300
				Total Project Cost:	**$ 31,400**

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Project A-3 - Lift Station 4 Rehabilitation (performed by City staff)

Design and Permitting:	6 months		
Construction:	4 months	Opinion of Total Project Cost:	$ 47,500

Need for Project:

The condition of Lift Station 4 has deteriorated to the point that it requires significant maintenance.

Supporting Information:

During the condition based assessment, Lift Station 4 was identified as requiring maintenance to prolong its operating life. Figure 7-10 - Lift Station #4 wet well

Through Figure 7-12 - Lift Station #4 piping

show the current condition of the existing wet well, vault lids and lift station piping.

Recommended Solution:

It is recommended that the City install a new wet well coating to protect the integrity of the wet well, new lids on the valve vault and wet well to avoid a potential safety hazard, and new piping to prevent failure and improve reliability. The City plans to utilize City staff to perform this rehabilitation.

Figure 7-10 - Lift Station #4 wet well

Figure 7-11 - Lift Station #4 vault lid

Figure 7-12 - Lift Station #4 piping

Cost Estimate:

Client:	**City of Arroyo Grande**				
Project:	**2011 Wastewater Master Plan Updates**				
Number:	**A-3**				
Description:	**Lift Station 4 Rehabilitation**			**Prepared by:**	LSW
				Reviewed by:	JHR
Opinion of Probable Construction Cost				**Date:**	4/26/2012
Item No.	**Item Description**	**Quantity**	**Unit**	**Unit Cost**	**Total Item Cost**
1	Mobilization	1	LS	-	$ 1,000
2	Insurance and Bonds	1	LS	-	$ 1,000
3	Construction Surveying	0	LS	-	$ -
4	Site Clearing and Restoration	1	LS	-	$ 200
5	SWPPP Preparation & Implementation	0	LS	-	$ -
6	Traffic Control	0	Day	$ -	$ -
7	Lift Station Rehabilitation				
7.1	Lids, Coating, Piping Upgrades	1	LS	$ 33,000	$ 33,000
				Subtotal 1:	$ 35,200
				Construction Contingency (10%):	$ 3,500
				Design (15%):	$ 5,300
				Contract Administration (10%):	$ 3,500
				Total Project Cost:	**$ 47,500**

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Project B-1 - Lift Station 1 Forcemain Replacement

Design and Permitting:	12 months		
Construction:	8 months	Opinion of Total Project Cost:	$ 635,300

Need for Project:

The Lift Station 1 forcemain is in poor condition.

Supporting Information:

The 8-inch cast iron forcemain carrying flow leaving Lift Station 1, was installed in about 1973, making the forcemain 41 years old. City staff report that there have been one major and one minor break in the forcemain in recent years, an indicator that the forcemain has exceeded its useful life.

Recommended Solution:

It is recommended that the City replace the existing 8-inch cast iron forcemain with an 8-inch PVC forcemain, as shown in the figure. The length of the forcemain is approximately 3,070-LF.

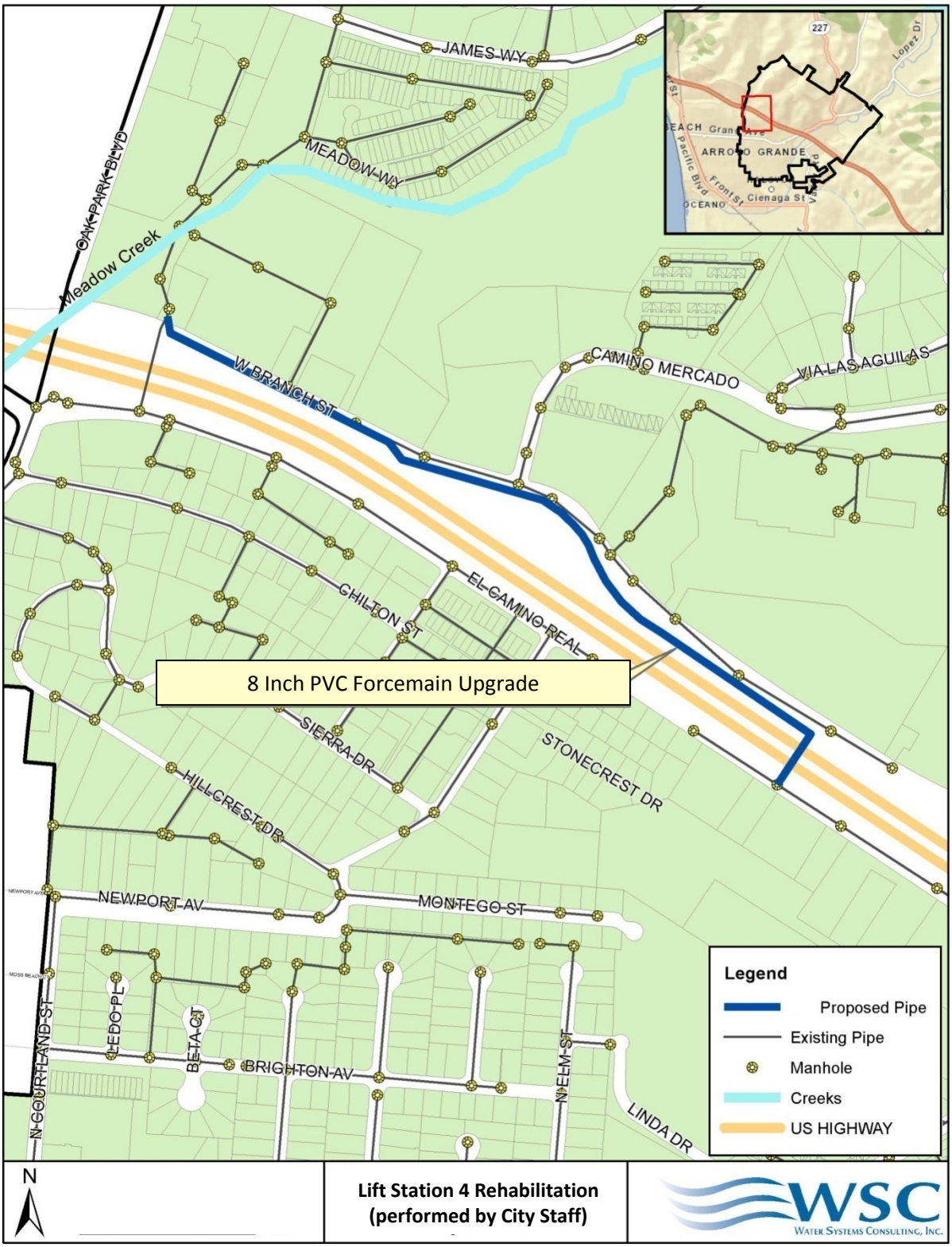

Figure 7-13 - Lift Station 1 Forcemain Replacement

Alternatives:

An alternative to complete replacement is to line the existing pipe with a structural pipe liner. This would reduce the capacity of the main and increase energy costs relative to the construction of a new main. Construction would involve a lengthy bypass of the existing forcemain. Bypass is not only expensive, but carries risk of a sewage spill. WSC recommends the design engineer prepare a detailed analysis of lining versus a new forcemain because utility conflicts in W. Branch Street could mean temporary bypass pumping is required even to construct a new forcemain. This will not be known until detailed utility research is prepared for W. Branch Street during the design phase.

Cost Estimate:

Client:	**City of Arroyo Grande**				
Project:	**2011 Wastewater Master Plan Updates**				
Segment:	**B-1**				
Street:	**Lift Station 1 Forcemain Replacement**			**Prepared by:**	LSW
				Reviewed by:	JHR
Opinion of Probable Construction Cost				**Date:**	4/26/2012

Item No.	Item Description	Quantity	Unit	Unit Cost	Total Item Cost
1	Mobilization	1	LS	-	$ 12,400
2	Insurance and Bonds	1	LS	-	$ 12,400
3	Construction Surveying	1	LS	-	$ 6,200
4	Site Clearing and Restoration	1	LS	-	$ 2,100
5	SWPPP Preparation & Implementation	1	LS	-	$ 8,100
6	Traffic Control	31	Day	$ 500	$ 15,500
7	Gravity Sewer Construction				
7.1	Pavement Removal & Repair for Trench	682	SY	$ 214	$ 146,300
7.2	Trenching/Compaction/Fill/Hauling	682	CY	$ 66	$ 45,100
7.3	Abandon Existing Gravity Sewer In Place	3070	LF	$ 2	$ 6,100
7.4	Gravity Sewer(Furnish and Install)				
7.4.1	6" - PVC Class 200	0	LF		$ -
7.4.2	8" - PVC Class 200	3070	LF	$ 20	$ 61,800
7.5	Fittings (Furnish and Install)	15	EA	$ 347	$ 5,200
7.6	Temporary Bypass Pumping	1	LS	$ 9,100	$ 9,100
7.7	Highway Crossing				
7.7.1	24" Casing and Horizontal Boring	230	LF	$ 500	$ 115,000
7.7.2	Heave and Settlement Monitoring	1	LS	$ 20,000	$ 20,000
				Subtotal 1:	$ 470,500
				Construction Contingency (10%):	$ 47,100
				Design (15%):	$ 70,600
				Contract Administration (10%):	$ 47,100
				Total Project Cost:	**$ 635,300**

Project B-2 - Huasna Road Sewer Upgrade

Design and Permitting:	10 months		
Construction:	8 months	Opinion of Total Project Cost:	$ 585,000

Need for Project:

Hydraulic analysis of the City's sewer collection system has determined that the sewer main along Huasna Road is undersized to meet projected buildout peak hour flows.

Supporting Information:

The hydraulic model indicates that the buildout peak flow along this section of sewer mains will reach 570,000 gpd. This leads to a d/D ratio ranging from 0.56 to 0.89 which exceeds the design criteria for an 8-in sewer main of 0.6 d/D. The 0.56 d/D occurs in a section of 8-in sewer in the middle of the alignment with a slightly steeper slope than the surrounding pipelines; however, it is not prudent to design a large diameter pipe feeding into a smaller pipe then expanding to a larger pipe on the other side. So although technically a small section of the alignment meets the design criteria of 0.6 d/D maximum, upgrading the adjacent pipes means all should be upgraded at the same time. This section of sewer also has a section with two parallel mains, WSC recommend consolidating the two mains into one 12-in main with this project.

Recommended Solution:

It is recommended that the City upgrade the existing 1,850-LF section of 8-in clay sewer main to a 12-in PVC sewer main. Upgrading this section of sewer main will reduce the flow depth in the pipeline to a d/D ranging from 0.31 to 0.41 under buildout peak flow conditions.

Figure 7-14 - Huasna Road Sewer Upgrade

Alternatives:

A do-nothing alternative is not recommended as it could results in sanitary sewer overflows.

Cost Estimate:

Client:	**City of Arroyo Grande**				
Project:	**2011 Wastewater Master Plan Updates**				
Segment:	**B-2**				
Street:	**Huasna Road Sewer Upgrade**			**Prepared by:**	LSW
				Reviewed by:	JHR
Opinion of Probable Construction Cost				**Date:**	4/26/2012

Item No.	Item Description	Quantity	Unit	Unit Cost	Total Item Cost
1	Mobilization	1	LS	-	$ 11,600
2	Insurance and Bonds	1	LS	-	$ 11,600
3	Construction Surveying	1	LS	-	$ 5,800
4	Site Clearing and Restoration	1	LS	-	$ 1,900
5	SWPPP Preparation & Implementation	1	LS	-	$ 6,900
6	Traffic Control	19	Day	$ 500	$ 9,500
7	Gravity Sewer Construction				
7.1	Pavement Removal & Repair for Trench	2467	SY	$ 46	$ 114,000
7.2	Trenching/Compaction/Fill/Hauling	2467	CY	$ 39	$ 96,800
7.3	Abandon Existing Gravity Sewer In Place	1850	LF	$ 2	$ 3,700
7.4	Gravity Sewer(Furnish and Install)				
7.4.1	6" - PVC SDR35	0	LF		$ -
7.4.2	8" - PVC SDR35	0	LF		$ -
7.4.3	12" - PVC SDR35	1850	LF	$ 24	$ 44,700
7.4.4	15" - PVC SDR35	0	LF		$ -
7.5	CIPP Trenchless Sewer Rehabilitation				
7.6	Temporary Bypass Pumping	1	LS	$ 4,700	$ 4,700
8	Service Laterals				
8.1	4" Sewer Service Lateral (Furnish and Install)	8	EA	$ 2,550	$ 20,400
8.2	Abandon Service Laterals	8	EA	$ 100	$ 800
9	Manholes				
9.1	New Manhole (Furnish and Install, includes pipe connections)	8	EA	$ 12,000	$ 96,000
9.2	Abandon Existing Manhole In Place	2	EA	$ 2,500	$ 5,000
				Subtotal 1:	$ 433,400
				Construction Contingency (10%):	$ 43,300
				Design (15%):	$ 65,000
				Contract Administration (10%):	$ 43,300
				Total Project Cost:	**$ 585,000**

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Project B-3 - Backyard Sewer Replacement

Design and Permitting:	12 months		
Construction:	10 months	Opinion of Total Project Cost:	$ 945,500

Need for Project:

Video inspection reports show that three sections of sewer main located in City resident's backyards (not in the public right of way) require rehabilitation. These sewer sections are located at:

(1) 216 Pilgrim Way to West Cherry Ave,

(2) West Cherry Ave to Fair Oaks Ave (east), and

(3) West Cherry Ave to Fair Oaks Ave (west).

Supporting Information:

Video inspection reports from 2000 indicate the sewer mains listed in Table 7-4 are impacted by root intrusion, minor cracks, offsets and minor structural defects. Due to their location in residential backyards, these sewer mains are difficult to access for repair and maintenance. It also appears that some of the mains are located beneath building slabs. The location of the mains in backyards and under buildings could lead to damage of the mains by residents and/or damage to private property by the sewer main. Moving these sewer sections during rehabilitation will improve the City's ability to access and maintain these sewers and reduce the impact on the residents.

Recommended Solution:

It is recommended that the City construct three (3) replacement sewer mains in the right-of-way of the adjacent streets and abandon the existing sewer mains located in the residential backyards. The lengths of the proposed mains are shown in the table below and figure below shows the locations of the existing and proposed sewers.

Alternatives:

An alternative is to maintain the current location of the sewers in the backyards and to employ cured-in-place pipe rehabilitation with point repairs, along the length of the three (3) sewer mains. The City should evaluate this alternative at the time the project is implemented to determine if the City prefers to replace and relocate the sewers or to rehabilitate them in their current location using cured-in-place pipe.

Table 7-4 - Length of Proposed Sewers

Proposed Sewer Mains	Length (ft)	Diameter (in)
(1) Pilgrim Way and Orchard Ave	1,650	8
(2) West Cherry Ave to freeway	290	8
(3) California St and West Cherry Ave	880	8
Total	**2,820**	-

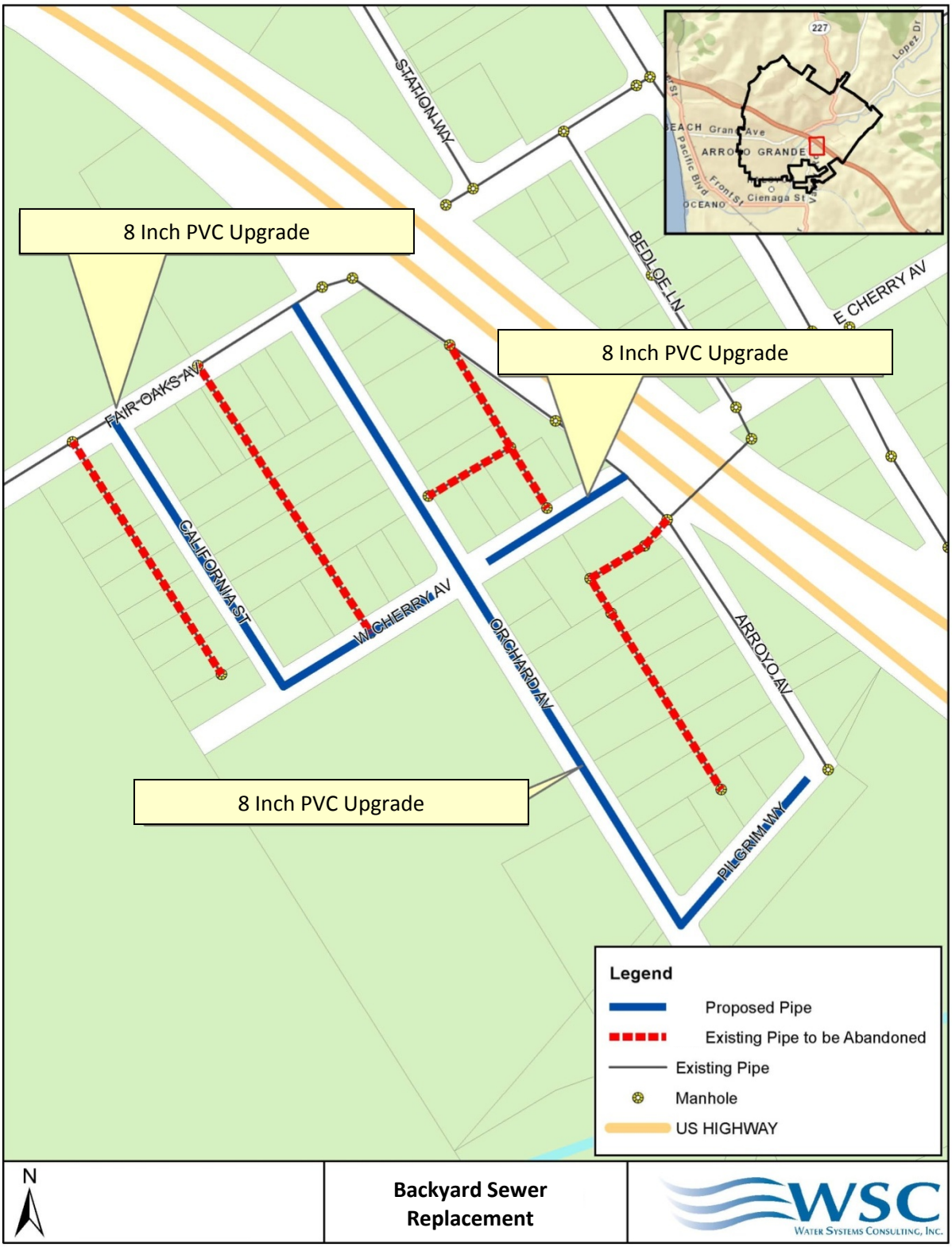

Figure 7-15 - Sewer Relocation

Alternatives:

A do-nothing alternative is not recommended as it will lead to increase maintenance costs and could lead to potential damage to private property.

Cost Estimate Summary:

Estimated costs for this project are as follows:

Design (15%):	$	105,100
Contract Administration (10%):	$	70,000
Construction Contingency (10%):	$	70,000
Project Construction:	$	700,400
Opinion of Total Project Cost:	$	945,500

A detailed breakdown of the construction costs for this project is shown in the Appendix.

Client:	**City of Arroyo Grande**				
Project:	**2011 Wastewater Master Plan Updates**				
Segment:	**B-3**				
Street:	**Backyard Sewer Replacement-Pilgrim Wy and Orchard Ave**			**Prepared by:**	LSW
				Reviewed by:	JHR
Opinion of Probable Construction Cost				**Date:**	4/26/2012

Item No.	Item Description	Quantity	Unit	Unit Cost	Total Item Cost
1	Mobilization	1	LS	-	$ 9,900
2	Insurance and Bonds	1	LS	-	$ 9,900
3	Construction Surveying	1	LS	-	$ 5,000
4	Site Clearing and Restoration	1	LS	-	$ 1,700
5	SWPPP Preparation & Implementation	1	LS	-	$ 6,700
6	Traffic Control	17	Day	$ 500	$ 8,500
7	Gravity Sewer Construction				
7.1	Pavement Removal & Repair for Trench	1468	SY	$ 70	$ 102,500
7.2	Trenching/Compaction/Fill/Hauling	1468	CY	$ 44	$ 65,300
7.3	Abandon Existing Gravity Sewer In Place	1651	LF	$ 2	$ 3,300
7.4	Gravity Sewer(Furnish and Install)				
7.4.1	6" - PVC SDR35	0	LF		$ -
7.4.2	8" - PVC SDR35	1651	LF	$ 15	$ 25,000
7.4.3	12" - PVC SDR35	0	LF		$ -
7.4.4	15" - PVC SDR35	0	LF		$ -
7.5	CIPP Trenchless Sewer Rehabilitation				
7.6	Temporary Bypass Pumping	1	LS	$ 3,900	$ 3,900
8	Service Laterals				
8.1	4" Sewer Service Lateral (Furnish and Install)	20	EA	$ 2,300	$ 46,000
8.2	Abandon Service Laterals	20	EA	$ 100	$ 2,000
9	Manholes				
9.1	New Manhole (Furnish and Install, includes pipe connections)	5	EA	$ 12,000	$ 60,000
9.2	Abandon Existing Manhole In Place	9	EA	$ 2,500	$ 22,500
				Subtotal 1:	$ 372,200
				Construction Contingency (10%):	$ 37,200
				Design (15%):	$ 55,800
				Contract Administration (10%):	$ 37,200
				Total Project Cost:	**$ 502,400**

Client:	**City of Arroyo Grande**				
Project:	**2011 Wastewater Master Plan Updates**				
Segment:	**B-3**				
Street:	**Backyard Sewer Replacement-West Cherry Ave to freeway**			**Prepared by:**	LSW
				Reviewed by:	JHR
Opinion of Probable Construction Cost				**Date:**	4/26/2012

Item No.	Item Description	Quantity	Unit	Unit Cost	Total Item Cost
1	Mobilization	1	LS	-	$ 3,700
2	Insurance and Bonds	1	LS	-	$ 3,700
3	Construction Surveying	1	LS	-	$ 1,900
4	Site Clearing and Restoration	1	LS	-	$ 600
5	SWPPP Preparation & Implementation	1	LS	-	$ 5,300
6	Traffic Control	3	Day	$ 500	$ 1,500
7	Gravity Sewer Construction				
7.1	Pavement Removal & Repair for Trench	259	SY	$ 136	$ 35,300
7.2	Trenching/Compaction/Fill/Hauling	259	CY	$ 44	$ 11,500
7.3	Abandon Existing Gravity Sewer In Place	291	LF	$ 2	$ 600
7.4	Gravity Sewer(Furnish and Install)				
7.4.1	6" - PVC SDR35	0	LF		$ -
7.4.2	8" - PVC SDR35	291	LF	$ 15	$ 4,400
7.4.3	12" - PVC SDR35	0	LF		$ -
7.4.4	15" - PVC SDR35	0	LF		$ -
7.5	CIPP Trenchless Sewer Rehabilitation				
7.6	Temporary Bypass Pumping	1	LS	$ 500	$ 500
8	Service Laterals				
8.1	4" Sewer Service Lateral (Furnish and Install)	18	EA	$ 2,300	$ 41,400
8.2	Abandon Service Laterals	18	EA	$ 100	$ 1,800
9	Manholes				
9.1	New Manhole (Furnish and Install, includes pipe connections)	2	EA	$ 12,000	$ 24,000
9.2	Abandon Existing Manhole In Place	2	EA	$ 2,500	$ 5,000
				Subtotal 1:	$ 141,200
				Construction Contingency (10%):	$ 14,100
				Design (15%):	$ 21,200
				Contract Administration (10%):	$ 14,100
				Total Project Cost:	**$ 190,600**

Client:	**City of Arroyo Grande**				
Project:	**2011 Wastewater Master Plan Updates**				
Segment:	**B-3**				
Street:	**Backyard Sewer Replacement-California St and West Cherry Ave**			**Prepared by:**	LSW
				Reviewed by:	JHR
Opinion of Probable Construction Cost				**Date:**	4/26/2012

Item No.	Item Description	Quantity	Unit	Unit Cost	Total Item Cost
1	Mobilization	1	LS	-	$ 4,900
2	Insurance and Bonds	1	LS	-	$ 4,900
3	Construction Surveying	1	LS	-	$ 2,500
4	Site Clearing and Restoration	1	LS	-	$ 800
5	SWPPP Preparation & Implementation	1	LS	-	$ 5,900
6	Traffic Control	9	Day	$ 500	$ 4,500
7	Gravity Sewer Construction				
7.1	Pavement Removal & Repair for Trench	783	SY	$ 66	$ 51,500
7.2	Trenching/Compaction/Fill/Hauling	783	CY	$ 44	$ 34,800
7.3	Abandon Existing Gravity Sewer In Place	881	LF	$ 2	$ 1,800
7.4	Gravity Sewer(Furnish and Install)				
7.4.1	6" - PVC SDR35	0	LF		$ -
7.4.2	8" - PVC SDR35	881	LF	$ 15	$ 13,400
7.4.3	12" - PVC SDR35	0	LF		$ -
7.4.4	15" - PVC SDR35	0	LF		$ -
7.5	CIPP Trenchless Sewer Rehabilitation				
7.6	Temporary Bypass Pumping	1	LS	$ 1,800	$ 1,800
8	Service Laterals				
8.1	4" Sewer Service Lateral (Furnish and Install)	8	EA	$ 2,300	$ 18,400
8.2	Abandon Service Laterals	8	EA	$ 100	$ 800
9	Manholes				
9.1	New Manhole (Furnish and Install, includes pipe connections)	3	EA	$ 12,000	$ 36,000
9.2	Abandon Existing Manhole In Place	2	EA	$ 2,500	$ 5,000
				Subtotal 1:	$ 187,000
				Construction Contingency (10%):	$ 18,700
				Design (15%):	$ 28,100
				Contract Administration (10%):	$ 18,700
				Total Project Cost:	**$ 252,500**

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Project B-4 - El Camino Real Sewer Upgrade

Design and Permitting:	10 months		
Construction:	8 months	Opinion of Total Project Cost:	$ 911,800

Need for Project:

The existing sewer mains downstream of Lift Station 1, along El Camino Real to Bennett Ave, have insufficient capacity for current and buildout peak flows.

Supporting Information:

Lift Station 1 was upgraded in 2006. With this upgrade, a peak flow of 800-gpm leaves the lift station using the previously constructed 8-in cast iron pipe forcemain. The primary gravity sewer that receives the flow from the Lift Station 1 forcemain is a 10-inch sewer, which runs along El Camino Real. At Brisco Rd, the sewer connects to a 12-inch sewer that runs to Bennett Ave. The length, diameter, estimated buildout flow and calculated segment capacity for each segment. The maximum capacity is based on the pipe material, existing slope, and the design criteria of a maximum d/D of 0.6 for 12-in diameter and less gravity sewer pipelines. Thus, the capacity of the sewer mains need to be increased to accommodate buildout peak flows.

Table 7-5 - El Camino Real Sewer Summary

Sewer Location	Length (ft)	Diameter (in)	Estimated Buildout Flow (mgd)	Calculated Maximum Capacity (mgd)
(1) El Camino Real	1,515	10	1.16	1.05
(2) Brisco Rd through cemetery to Bennett Ave	1,375	12	1.40	1.34
Total	**2,890**	-	-	-

Recommended Solution:

It is recommended that the City upgrade the sewers as follows:

(1) Upgrade the 10-inch sewer along El Camino Real to 12-inch PVC.
(2) Upgrade the 12-inch sewer from Brisco Rd through the cemetery to Bennett Ave to 15-inch PVC.

The project locations are shown in the figure below.

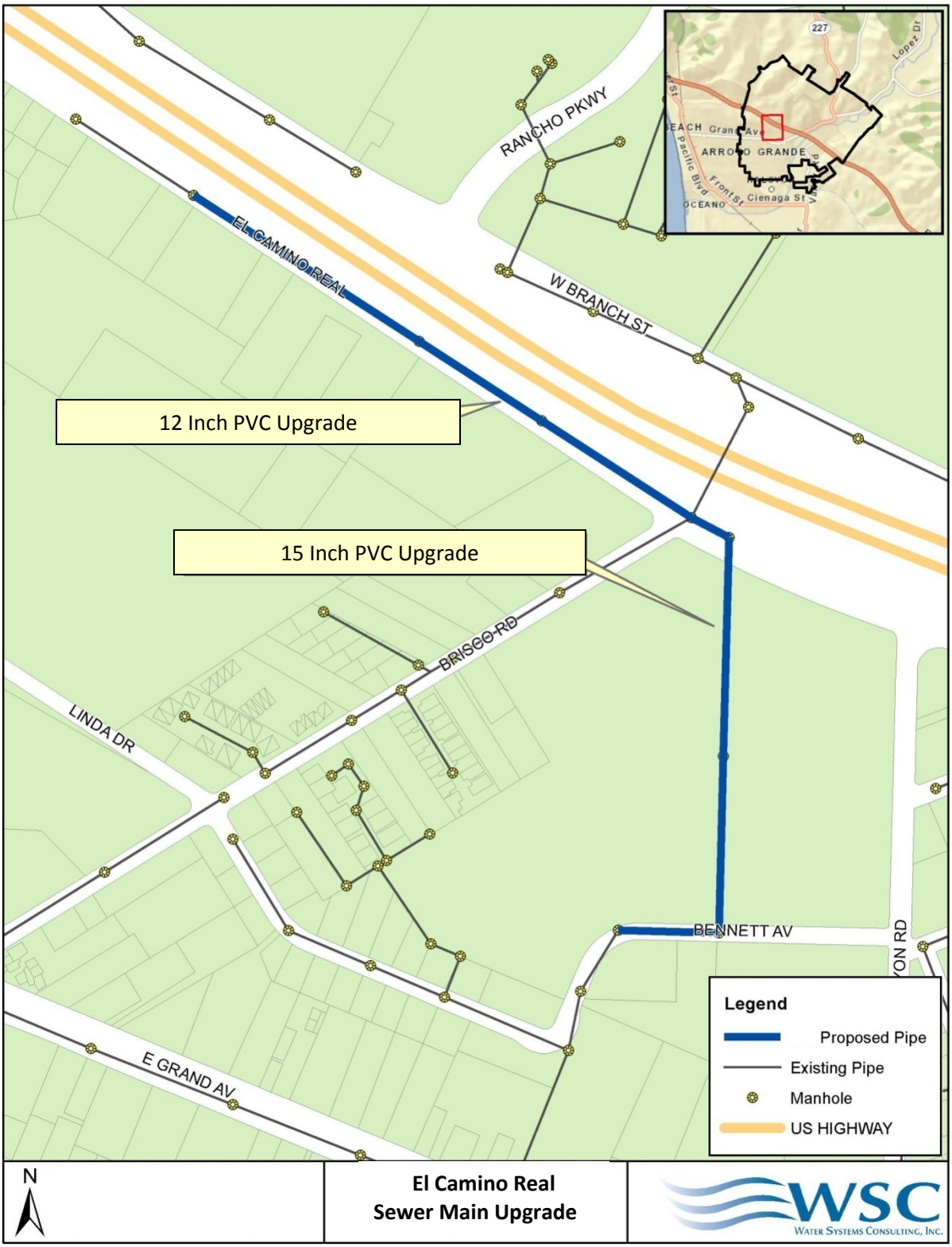

Figure 7-16 - El Camino Real Sewer Upgrade

Alternatives:

A do-nothing alternative is not recommended as it could lead to sewer overflows.

Cost Estimate Summary:

Estimated costs for this project are as follows:

Design (15%):	$	101,300
Contract Administration (10%):	$	67,600
Construction Contingency (10%):	$	67,600
Project Construction:	$	675,300
Opinion of Total Project Cost:	$	911,800

A detailed breakdown of the construction costs for this project is shown below.

Client:	**City of Arroyo Grande**				
Project:	**2011 Wastewater Master Plan Updates**				
Segment:	**B-4**				
Street:	**El Camino Real Sewer Main Upgrade**			**Prepared by:**	LSW
				Reviewed by:	JHR
Opinion of Probable Construction Cost				**Date:**	4/26/2012

Item No.	Item Description	Quantity	Unit	Unit Cost	Total Item Cost
1	Mobilization	1	LS	-	$ 9,200
2	Insurance and Bonds	1	LS	-	$ 9,200
3	Construction Surveying	1	LS	-	$ 4,600
4	Site Clearing and Restoration	1	LS	-	$ 1,500
5	SWPPP Preparation & Implementation	1	LS	-	$ 6,500
6	Traffic Control	16	Day	$ 500	$ 8,000
7	Gravity Sewer Construction				
7.1	Pavement Removal & Repair for Trench	2020	SY	$ 47	$ 94,000
7.2	Trenching/Compaction/Fill/Hauling	2020	CY	$ 39	$ 79,300
7.3	Abandon Existing Gravity Sewer In Place	1515	LF	$ 2	$ 3,000
7.4	Gravity Sewer(Furnish and Install)				
7.4.1	6" - PVC SDR35	0	LF		$ -
7.4.2	8" - PVC SDR35	0	LF		$ -
7.4.3	12" - PVC SDR35	1515	LF	$ 24	$ 36,600
7.4.4	15" - PVC SDR35	0	LF		$ -
7.5	CIPP Trenchless Sewer Rehabilitation				
7.6	Temporary Bypass Pumping	1	LS	$ 3,600	$ 3,600
8	Service Laterals				
8.1	4" Sewer Service Lateral (Furnish and Install)	7	EA	$ 2,543	$ 17,800
8.2	Abandon Service Laterals	7	EA	$ 100	$ 700
9	Manholes				
9.1	New Manhole (Furnish and Install, includes pipe connections)	5	EA	$ 12,000	$ 60,000
9.2	Abandon Existing Manhole In Place	5	EA	$ 2,500	$ 12,500
				Subtotal 1:	$ 346,500
				Construction Contingency (10%):	$ 34,700
				Design (15%):	$ 52,000
				Contract Administration (10%):	$ 34,700
				Total Project Cost:	**$ 467,900**

Client:	**City of Arroyo Grande**				
Project:	**2011 Wastewater Master Plan Updates**				
Segment:	**B-4**				
Street:	**El Camino Real Sewer Main Upgrade**			**Prepared by:**	LSW
				Reviewed by:	JHR
Opinion of Probable Construction Cost				**Date:**	4/26/2012

Item No.	Item Description	Quantity	Unit	Unit Cost	Total Item Cost
1	Mobilization	1	LS	-	$ 8,800
2	Insurance and Bonds	1	LS	-	$ 8,800
3	Construction Surveying	1	LS	-	$ 4,400
4	Site Clearing and Restoration	1	LS	-	$ 1,500
5	SWPPP Preparation & Implementation	1	LS	-	$ 6,400
6	Traffic Control	14	Day	$ 500	$ 7,000
7	Gravity Sewer Construction				
7.1	Pavement Removal & Repair for Trench	2292	SY	$ 40	$ 90,800
7.2	Trenching/Compaction/Fill/Hauling	2292	CY	$ 37	$ 85,700
7.3	Abandon Existing Gravity Sewer In Place	1375	LF	$ 2	$ 2,800
7.4	Gravity Sewer(Furnish and Install)				
7.4.1	6" - PVC SDR35	0	LF		$ -
7.4.2	8" - PVC SDR35	0	LF		$ -
7.4.3	12" - PVC SDR35	0	LF		$ -
7.4.4	15" - PVC SDR35	1375	LF	$ 28	$ 38,700
7.5	CIPP Trenchless Sewer Rehabilitation				
7.6	Temporary Bypass Pumping	1	LS	$ 5,000	$ 5,000
8	Service Laterals				
8.1	4" Sewer Service Lateral (Furnish and Install)	4	EA	$ 2,625	$ 10,500
8.2	Abandon Service Laterals	4	EA	$ 100	$ 400
9	Manholes				
9.1	New Manhole (Furnish and Install, includes pipe connections)	4	EA	$ 12,000	$ 48,000
9.2	Abandon Existing Manhole In Place	4	EA	$ 2,500	$ 10,000
				Subtotal 1:	$ 328,800
				Construction Contingency (10%):	$ 32,900
				Design (15%):	$ 49,300
				Contract Administration (10%):	$ 32,900
				Total Project Cost:	**$ 443,900**

Project C-1 - Manhole Rehabilitation

Design and Permitting:	6 months		
Construction:	Ongoing	Opinion of Total Project Cost:	$ 3,670,800

Need for Project:

A significant portion of the City's manholes have reached the end of their operating life and are in need of replacement or rehabilitation**.**

Supporting Information:

The City's collection system currently contains numerous manholes that have deteriorated and/or experienced structural fatigue. Various physical factors, such as subsidence from traffic loading, shifting and expanding soils, temperature variation and cyclic groundwater levels can lead to the weakening of manholes. Additionally, the environmental conditions within the collection system can cause microbial induced corrosion. Microbial induced corrosion can rapidly destroy concrete-based materials in the collections system. Structurally compromised or deteriorated manholes can lead to increased infiltration and/or leakage of wastewater into the ground.

Recommended Solution:

It is recommended that the City evaluate the condition of its manholes and prioritize the replacement or rehabilitation of the most deteriorated manholes. The project includes rehabilitation of up to 500 manholes using a cured in place epoxy lining system.

Due to the number of manholes requiring rehabilitation, it is recommended that the City perform the manhole rehabilitation projects in phases, beginning with the highest priority areas. To determine the highest priority areas, it is recommended that the City perform a preliminary study to assess which manholes pose the highest risk. Additionally, the City should couple manhole rehabilitation projects with other larger projects in the same area when possible.

Alternatives:

A do-nothing alternative is not recommended as it could result in complete structural failure, increase infiltration and wastewater leakage.

Coat Estimate:

Client:	**City of Arroyo Grande**				
Project:	**2011 Wastewater Master Plan Updates**				
Number:	**C-1**				
Description:	**Manhole Rehabilitation**			**Prepared by:**	LSW
				Reviewed by:	JHR
Opinion of Probable Construction Cost				**Date:**	4/26/2012
Item No.	**Item Description**	**Quantity**	**Unit**	**Unit Cost**	**Total Item Cost**
1	Mobilization	1	LS	-	$ 12,000
2	Insurance and Bonds	1	LS	-	$ 12,000
3	Construction Surveying	1	LS	-	$ 6,000
4	Site Clearing and Restoration	1	LS	-	$ 2,000
5	SWPPP Preparation & Implementation	1	LS	-	$ 8,000
6	Traffic Control	550	Day	$ 500	$ 275,000
7	Manhole Structural Rehabilitation				
7.1	Cured In Place Epoxy Liner up to 10-ft deep	350	EA	$ 3,600	$ 1,260,000
7.2	Cured In Place Epoxy Liner up to 10-ft to 12-ft deep	50	EA	$ 4,400	$ 220,000
8	Manhole Replacement				
8.1	Temporary Bypass Pumping	100	Days	$ 500	$ 50,000
8.2	Remove and Replace Manhole up to 10-ft deep	75	EA	$ 13,000	$ 975,000
8.3	Remove and Replace Manhole 10-ft to 12-ft deep	25	EA	$ 16,000	$ 400,000
				Subtotal 1:	$ 3,220,000
				Construction Contingency (10%):	$ 322,000
				Design (2%)	$ 64,400
				Contract Administration (2%)	$ 64,400
				Total Project Cost:	**$ 3,670,800**

Project C-2- I/I Study

Design and Permitting:	8 months		
Construction:	N/A	Opinion of Total Project Cost:	$ 22,000

Need for Project:

Flow monitoring data indicates that the City's sewer collection system may be vulnerable to Inflow and Infiltration (I/I).

Supporting Information:

SSLOCSD recently completed an I/I Study in August 2011. This study indicated that a large volume of I/I was detected at manholes downstream of the Arroyo Grande sewershed.[1] The increased flows from the Arroyo Grande sewershed were indicative of both inflow and infiltration. The study also indicated that the siphon crossing under the Arroyo Grande Creek may be contributing to the I/I flow. The creek crossing pipeline is owned and maintained by SSLOCSD. The figure below shows the flow monitoring data from the SSLOCSD I/I study by flow monitoring basin. Flow from the Arroyo Grande monitoring basin peaked on March 20th, when rainfall exceeded over two inches.

[1] South San Luis Obispo County Sanitation District (SSLOCSD).*Inflow and Infiltration Study, Final Report*.Prepared by Wallace Group. August 3, 2011.

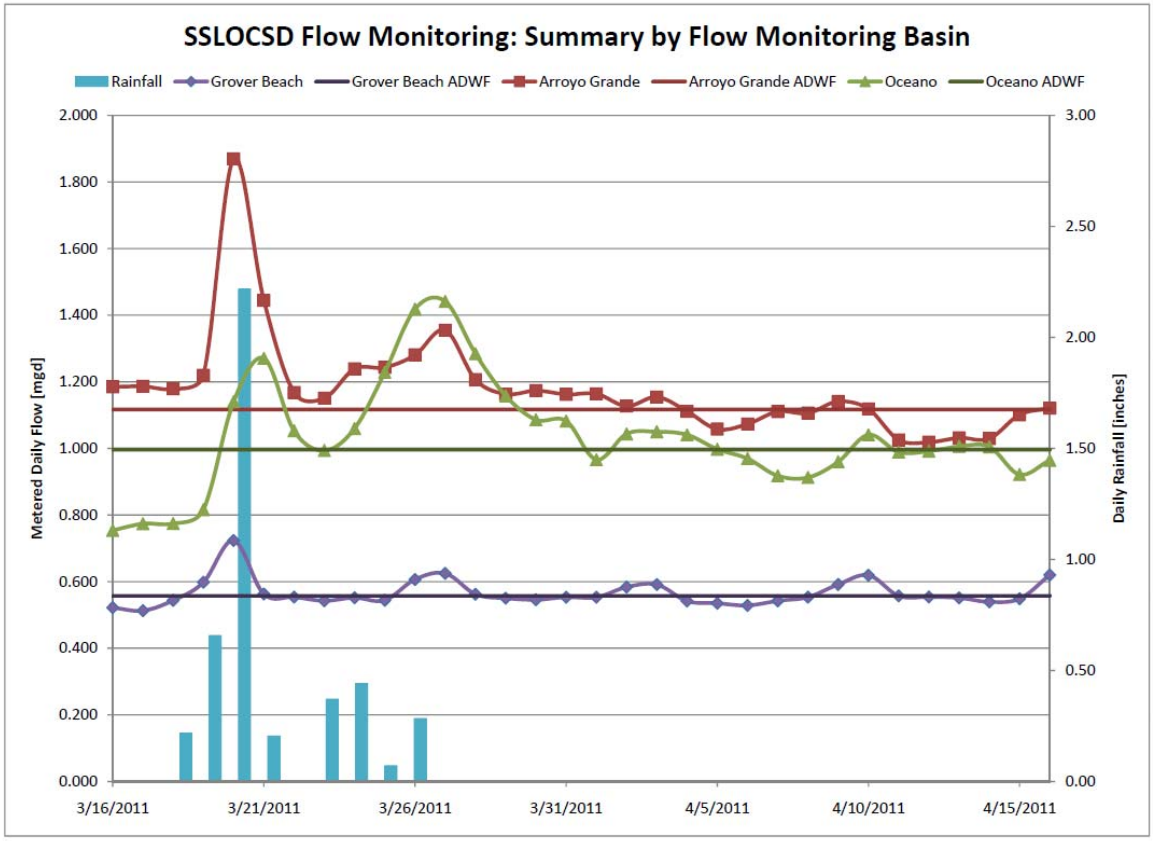

Figure 7-17 - SSLOCSD I/I study flow data by flow monitoring basin

However, due to limited flow monitoring the study could not isolate the direct source of the I/I. Possible sources include the City's collections system, the SSLOCSD's interceptor and portions of the OCSD's collection system.

Recommended Solution:

It is recommended that the City budget for a future I/I study, but wait to perform any detailed I/I analysis on its sewer collection system until the SSLOCSD can eliminate its interceptor and the OCSD's collection system as the source of the I/I.

Cost Estimate:

Client:	**City of Arroyo Grande**				
Project:	**2011 Wastewater Master Plan Updates**				
Number:	**C-2**				
Description:	**I/I Study**			**Prepared by:**	LSW
				Reviewed by:	JHR
Opinion of Probable Construction Cost				**Date:**	4/26/2012
Item No.	**Item Description**	**Quantity**	**Unit**	**Unit Cost**	**Total Item Cost**
1	Mobilization	0	LS	-	$ -
2	Insurance and Bonds	0	LS	-	$ -
3	Construction Surveying	0	LS	-	$ -
4	Site Clearing and Restoration	0	LS	-	$ -
5	SWPPP Preparation & Implementation	0	LS	-	$ -
6	Traffic Control	0	Day	$ -	$ -
7	Inflow/Infiltration Study				
7.1	Conduct I/I Study	1	LS	$ 20,000	$ 20,000
				Subtotal 1:	$ 20,000
				Construction Contingency (10%):	$ 2,000
				Total Project Cost:	**$ 22,000**

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Technical Memorandum

APPENDIX A – Collection System Modeling

Date: 4/24/2012

To: Mike Linn, P.E.
City of Arroyo Grande
208 E. Branch Street
Arroyo Grande, CA 93421

Phone: (805) 473-5444

CC: Shane Taylor; Mike Linn, P.E.; Teresa McClish

Prepared by: Joshua Reynolds, P.E.;Lianne Williams, P.E.

Reviewed by: Jeffery Szytel, P.E.

Project: City of Arroyo Grande 2011 Water and Sewer Master Plan Updates

SUBJECT: **APPENDIX C – LIFT STATION ENERGY CONSIDERATIONS**

The purpose of Collection System Modeling Technical Memorandum (TM) is to describe the development of the collection system model for the purposes of evaluating system capacity. This TM contains the following sections:

(1) System Mapping Update
(2) Elevation Data
(3) Sewer Flow Rates
(4) Land Use Sewer Duty Factors
(5) Spatially Allocated Flows
(6) Model Skeletonization
(7) Collection System Modeling

System Mapping Update

The last major revision to the City's GIS mapping for the sewer system was completed in 2003. Developing an updated sewer model required updated sewer system GIS mapping. To update the system mapping, WSC modified the GIS shapefiles based on information obtained from as-built drawings for development and CIP projects, the City's Wastewater System Atlas and information provided by City Staff. For system components not currently contained within the GIS system mapping, WSC developed individual shapefiles for the following features:

- Outfalls
- Wet Wells
- Lift Stations
- Force Mains
- Sewer Nodes
- Lift Stations

Elevation Data

Elevation data is a critical component of a sewer system model. Accurate manhole invert elevation (elevation at the lowest portion of the sewer mains in the manhole) allows the existing slope of the sewer main to be calculated and is critical for determining the capacity of sewer mains. Rim elevations are important for determining sewer depths and potential for overflows.

Invert Elevations

The City's existing GIS system does not currently contain invert elevation data. To develop the updated sewer model, WSC used the following sources of elevation data:

- sewer model developed for a 2001 Wastewater Master Plan
- record drawings for recent system improvements
- SSLOCSD trunk lines GIS shapefiles

From these three sources, WSC was able to obtain invert elevation data for 910 of the 1,701 manholes within the City's collection system.

Rim Elevations

To establish rim elevation data for the manhole features in the collection system, WSC obtained elevation data from the United States Geological Survey National Elevation Dataset (USGS NED). The USGS NED provides public domain raster elevation data for the conterminous United States, Alaska, Hawaii and territorial islands. The NED provides elevation data in the following resolutions:

- 1 arc-second (approx. 30 meter grids)
- 1/3 arc-second (approx. 10 meter grids)
- 1/9 arc-second (approx. 3 meter grids)

The best available resolution for the Arroyo Grande City Limits was 1/3 arc-second. Utilizing ArcMap, WSC overlaid the NED raster dataset and extracted land surface elevation data for each of the manholes in the collection system. For the City's sewer model it was assumed that the rim elevation was equal to the land surface elevation from the USGS NED.

Sewer Flow Rates

WSC developed estimates of flow through the City's collection system using data from a recently completed infiltration and inflow (I/I) study prepared by the South San Luis Obispo County Sanitation District (SSLOCSD) and effluent flow data from the SSLOCSD WWTP. Effluent flow data from September 2010 through August 2011 was averaged to develop an average annual flow (AAF) for the SSLOCSD WWTP of 2.85 million gallons per day (MGD). The portion of that flow that the attributed to City's system (42%), was then applied to the SSLOCSD WWTP's AAF to obtain the AAF for the City's collection system (1.20 MGD).

Land Use Sewer Duty Factors

To develop the land use sewer duty factors for the City's collection system, WSC utilized the spatially allocated water demands, projected build-out water demands and sewer duty factors. WSC initiated the development of the land use sewer duty factors by intersecting the spatially allocated 2010 customer water use records (see Water Modeling TM) with the land use polygon shapefile to obtain land use water demand factors (gpd/acre). City staff identified parcels within the City Limits that are not served by the City's collection system. For the purposes of developing the sewer duty factors and land use sewer duty factors, the parcels within the City limits not served by the sewer system and the parcels outside the City Limits were excluded (see Water Modeling TM).

Sewer duty factors, which represent the percentage of potable water that is discharged to the collection system, were originally developed based on values obtained from reference textbooks and other local sewer master plans. These percentages were then manipulated until the projected flow to the collection system matched the measured AAF flow from the SSLOCSD I/I study. Table A-1 below shows the sewer duty factors, by land use, used to correlate the current potable water demands and wastewater flow rates and to project build-out wastewater flow rates.

Table A-1 - Current and projected water demands and wastewater flows

Land Use Description	Sewer Duty (%)	2008-2010 Existing ADD/AAF (gpd)		Build-out ADD/AAF (gpd) with Buildout Flow Factors		Build-out ADD/AAF (gpd) with SB7 Target Conservation Flow Factor	
		Water	Wastewater	Water	Wastewater	Water	Wastewater
Agriculture	0.1	15600	1,600	15,700	1,600	14,900	1,500
Community Facilities	0.35	157300	55,100	158,600	55,500	151,000	52,900
Multi-Family High Density	0.44	108000	47,500	141,400	62,200	134,600	59,200
Single Family Low Density	0.44	179100	78,800	208,200	91,600	198,300	87,300
Single Family Low-Medium Density	0.44	811900	357,200	884,400	389,100	842,000	370,500
Single Family Medium Density	0.44	905800	398,600	939,400	413,300	894,400	393,500
Multi-Family Medium-High Density	0.44	238700	105,000	255,400	112,400	243,100	107,000
Mixed-Use	0.35	286700	100,300	349,000	122,200	332,200	116,300
Office Professional	0.35	35400	12,400	40,100	14,000	38,200	13,400
Conservation/Open Space	0.1	10100	1,000	10,100	1,000	9,600	1,000
Regional Commercial	0.35	69800	24,400	69,800	24,400	66,400	23,200
Village Core	0.85	53200	45,200	53,200	45,200	50,600	43,000
Multi-Family Very High Density	0.44	16300	7,200	22,300	9,800	21,200	9,300
Single Family Very Low Density	0.44	0	0	17300	7,600	16,400	7,200
Total ADD		2,890,000	1,234,300	3,170,000	1,349,900	3,020,000	1,285,300

WSC then divided the build-out flow projections, by land use, by the area (acres) of each land use at build-out to develop land use sewer duty factors. Table A-2 shows the build-out AAF and the land use areas used to calculate the land used sewer duty factors.

Table A-2 - Land Use Sewer Duty Factors

Land Use Description	Build-out AAF (gpd) with SB7 Target Conservation Demand Factors	Build-Out (Acres)	Build-Out Land Use Sewer Duty Factors (gpd/Acre)
Agriculture	1,500	347	5
Community Facilities	52,900	367	151
Multi-Family High Density	59,200	43	1452
Single Family Low Density	87,300	358	256
Single Family Low-Medium Density	370,500	583	668
Single Family Medium Density	393,500	535	773
Multi-Family Medium-High Density	107,000	157	717
Mixed-Use	116,300	195	626
Office Professional	13,400	31	457
Conservation/Open Space	1,000	320	3
Regional Commercial	23,200	60	405
Village Core	43,000	52	875
Multi-Family Very High Density	9,300	5	1806
Single Family Very Low Density	7,200	48	160

Spatially Allocated Flows

To develop the spatially allocated flows for the City's sewer collection system, WSC applied the land use sewer duty factors to the build-out land use area for each lift station's and outfall's tributary or sewershed area. The connections to the SSLOCSD were represented in the GIS system and sewer model as outfalls. The total projected flow for each lift station and outfall sewershed was then divided evenly across the nodes within that sewershed. Individually spatially allocated demands for the sewer system were not used because flow data for each customer connection is not known. Minor

adjustments to flows through the collection system were made to calibrate or allow the model to mimic the flow rates observed during the SSLOCSD's I/I study.

Model Skeletonization

During the development of the sewer model, WSC determined that a significant number of the manholes in the City's collection system did not have invert elevation data available. In order to simplify the collection system model and reduce the number of manholes that could potentially require field surveying, WSC removed non-critical sewer mains and manholes from the sewer model or "skeletonized" the model. Skeletonization of the sewer model was achieved by fully loading the model with build-out AAF flows using the spatial allocation methodology described above. Flow rates through the model were then evaluated and any pipes or manholes with a flow of less than 19,000 gpd were removed from the model. This flow equates to peak hour flow of 6,690 gpd and a peak hour flow depth pipe diameter ratio (d/D) of less than 0.5 at an assumed minimum slope of 0.001 in a 6in pipe and a d/D of 0.5 at a slope of 0.0002 in an 8in pipe, assuming a roughness coefficient of 0.014. Pipelines removed from the model using this methodology will have capacity to meet build-out flows as long as the installed slope is greater than the assumed minimum slope. For comparison the minimum slope assumed for an 8in pipe was 0.0010, the minimum recommend slope for installation of an 8in pipe is 0.0035, thus this is a conservative removal or skeletonization methodology. Once skeletonized the model did not require any field surveying to determine invert elevations. Any missing invert elevations in the skeletonized model were interpolated from the upstream and downstream manholes.

Once the model was skeletonized, WSC redistributed the demands to the remaining nodes within each sewershed. After the skeletonized model was re-loaded, WSC compared the flow rates along the remaining trunk lines to determine if the skeletonization altered the distribution of the wastewater flows. Adjustments were made to loading at several locations so that the distribution of wastewater flows in the skeletonized model would closely mimic the un-skeletonized model.

Collection System Modeling

To evaluate the need for improvements to the City's sewer system, WSC used the calibrated model to analyze the collection system's ability to meet the minimum pipe velocity and d/D criteria. The specific evaluation criteria utilized for the collection system evaluation is contained in the Evaluation Criteria TM and where appropriate the Capital Improvement Program (CIP) projects were supported with sewer model runs.

Technical Memorandum

APPENDIX B – Lift Station Capacity Evaluation

Date: 4/24/2012

To: Mike Linn, P.E.
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208 E. Branch Street
Arroyo Grande, CA 93421

Phone: (805) 473-5433

CC: Shane Taylor, Mike Linn, P.E., Teresa McClish

Prepared by: Joshua Reynolds, P.E.;Lianne Williams, P.E.

Reviewed by: Jeffery Szytel, P.E.

Project: City of Arroyo Grande 2011 Water and Sewer Master Plan Updates

SUBJECT: **APPENDIX B – LIFT STATION CAPACITY EVALUATION**

As part of the 2011 Water and Sewer Master Plan Updates, WSC performed an evaluation of the City's lift stations to determine if the current capacity of each lift station is adequate for estimated build-out flows. The analysis was performed for Lift Station 1, 4, 5, and 7. Lift Station 3 is currently undergoing a major upgrade to meet build-out flows and thus was excluded from this analysis.

The capacity evaluation showed that Lift Station 1, 4, 5, and 7 all have adequate capacity to meet build-out peak hour wet weather flows (PHWWF). This memorandum provides a brief summary of the lift station capacity evaluation method and results. The calculated system curves, which show operating regions for the lift stations, are included as Attachment 1.

Method

The capacity evaluation required two primary steps: (1) determining the current lift station capacity, and (2) estimating build-out lift station capacity requirements. These two steps of the analysis are described briefly here.

Current Lift Station Capacity

WSC developed system curves for each lift station based on record drawings. Key inputs to creating the system curves included the following:

- Lift station high water level (HWL)
- Lift station low water level (LWL)
- Force main discharge invert elevation

- Force main length and diameter
- Size, number and type of fittings on pump manifold (impeller to pump manifold)
- Size, number and type of fittings on force main (pump manifold to gravity invert)

Using this data, WSC calculated the system curve for both the best case and the worst case. The best case is defined as the case with the lowest static head (water level at HWL) and the lowest friction losses (highest roughness factor, i.e. smooth pipe). The worst case is defined as the case with the highest static head (water level at LWL) and the highest friction losses (lowest roughness factor, i.e. rough pipe).

WSC obtained pump curves for each lift station and plotted these with the calculated system curves to determine the operating point for each lift station. Because both a best and worst case system curve were calculated, this analysis yielded a capacity range (gpm) for each lift station. The pump and system curves for Lift Station 1, 4, 5, and 7 are included as Attachment 1. Note that while Attachment 1 presents curves for both simplex operation (one pump operating) and duplex operation (two pumps operating), only simplex operation is used for the capacity analysis because the City only operates one pump at a time, with the second pump serving as backup.

Capacity Required at Build-out

The lift station must have sufficient capacity to meet the build-out PHWWF. WSC calculated the build-out PHWWF by applying a peaking factor to the average annual daily flow (AAF) estimated for each sewershed at build-out. WSC performed the analysis for two different peaking factors: (1) a peaking factor of 2.84, which is the estimated to be the city-wide peaking factor (calculated using the Babbitt equation), and (2) a peaking factor of 3.5, which is more conservative as the individual lift stations may experience a peaking factor greater than the city-wide average peaking factor (because the lift stations serve a smaller subset of the overall city population). This yielded the capacity requirements of each lift station at build-out.

Results

The build-out capacity requirements and the calculated current capacity for each lift station are shown in Table B-1 -. In addition, Table B-1 - also presents the rated capacity and actual measured flow data for comparison. The rated, calculated and measured capacity of each lift station exceeds the build-out PHWWF for a 3.5 peaking factor. Based on this analysis, the current capacity of each lift station is adequate to meet build-out flows.

Table B-1 -Lift Station Capacity Evaluation Results

Lift Station	Build-out AAF (gpd)	Build-out PHWWF with 2.84 Peaking Factor (gpm)	Build-out PHWWF Using 3.5 Peaking Factor (gpm)	Pump HP	Current Capacity- One Pump (gpm)			Adequate capacity?
					Rated[1]	Calculated[2]	Measured[3]	
1	205,200	400	500	60	800	770-850	800, 707	Yes
3[4]	33,400	70	80	7.9[5]	305	n/a	n/a	Yes
4	5,900	10	10	1.5	100	125-160	101, 104	Yes
5	2,800	10	10	3	130	115-135	172, 145	Yes
7	23,000	50	60	10	130	160-190	126, 144	Yes

[1] Obtained from pump curves.

[2] Calculated based on record drawings and pump curves. Capacity range shown reflects worst to best case flow, based on estimated worst to best case TDH.

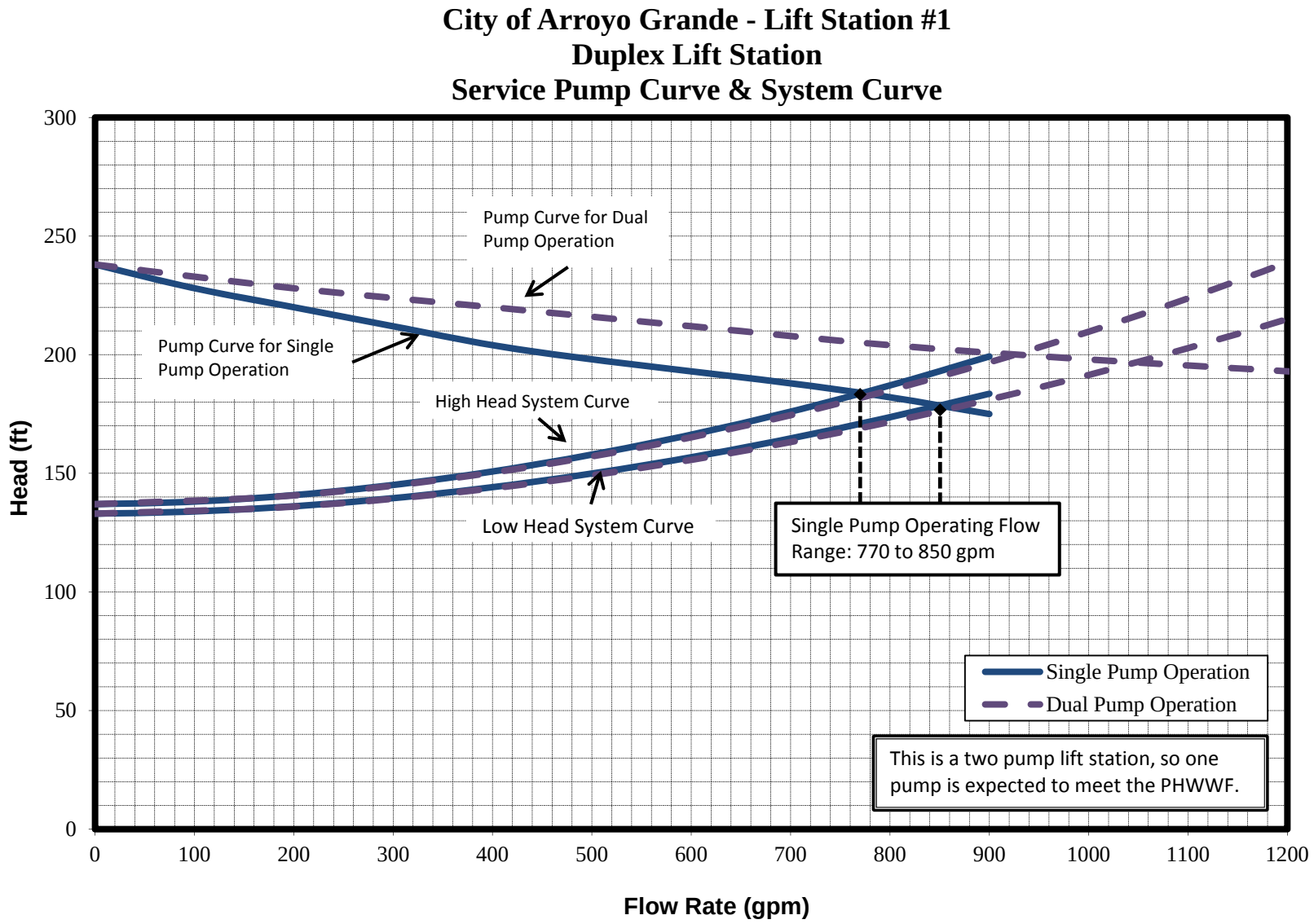
[3] Obtained from pump and flow study performed by Fluid Resource Management dated August 22, 2011. Capacities listed in the following order: Pump 1, Pump 2. Flowrate was measured by performing a "draw down" test for each pump. Draw down tests are performed by timing how long it takes the pump to move a known volume of water.

[4] Lift Station 3 was being upgraded at the time of this study and thus was excluded from the system curve analysis.

[5] Minimum HP from Lift Station 3 specifications.

Fluid Resource Management performed draw down and amperage testing on Lift Station 1, 4, 5, and 7, in August 2011. The flowrate measured during the draw down test for each lift station is the measured capacity shown in Table B-1 -. The amperage testing did not yield conclusive results because data for only this single data point in time is known. This does not allow for performance comparisons of the same winding over time to determine how performance is changing. WSC recommends performing the draw down and amperage testing in 2012 and 2013, which will give the City three (3) data points for each pump/motor. With three (3) data points, the City can evaluate trends over time and determine if equipment replacement is necessary.

Lift Station Pump and System Curves


City of Arroyo Grande - Lift Station #1
Duplex Lift Station
Service Pump Curve & System Curve
Head (ft)
Flow Rate (gpm)
300
250
200
150
100
50
0
0
100
200
300
400
500
600
700
800
900
1000
1100
1200
Pump Curve for Dual Pump Operation
Pump Curve for Single Pump Operation
High Head System Curve
Low Head System Curve
Single Pump Operating Flow Range: 770 to 850 gpm
Single Pump Operation
Dual Pump Operation
This is a two pump lift station, so one pump is expected to meet the PHWWF.

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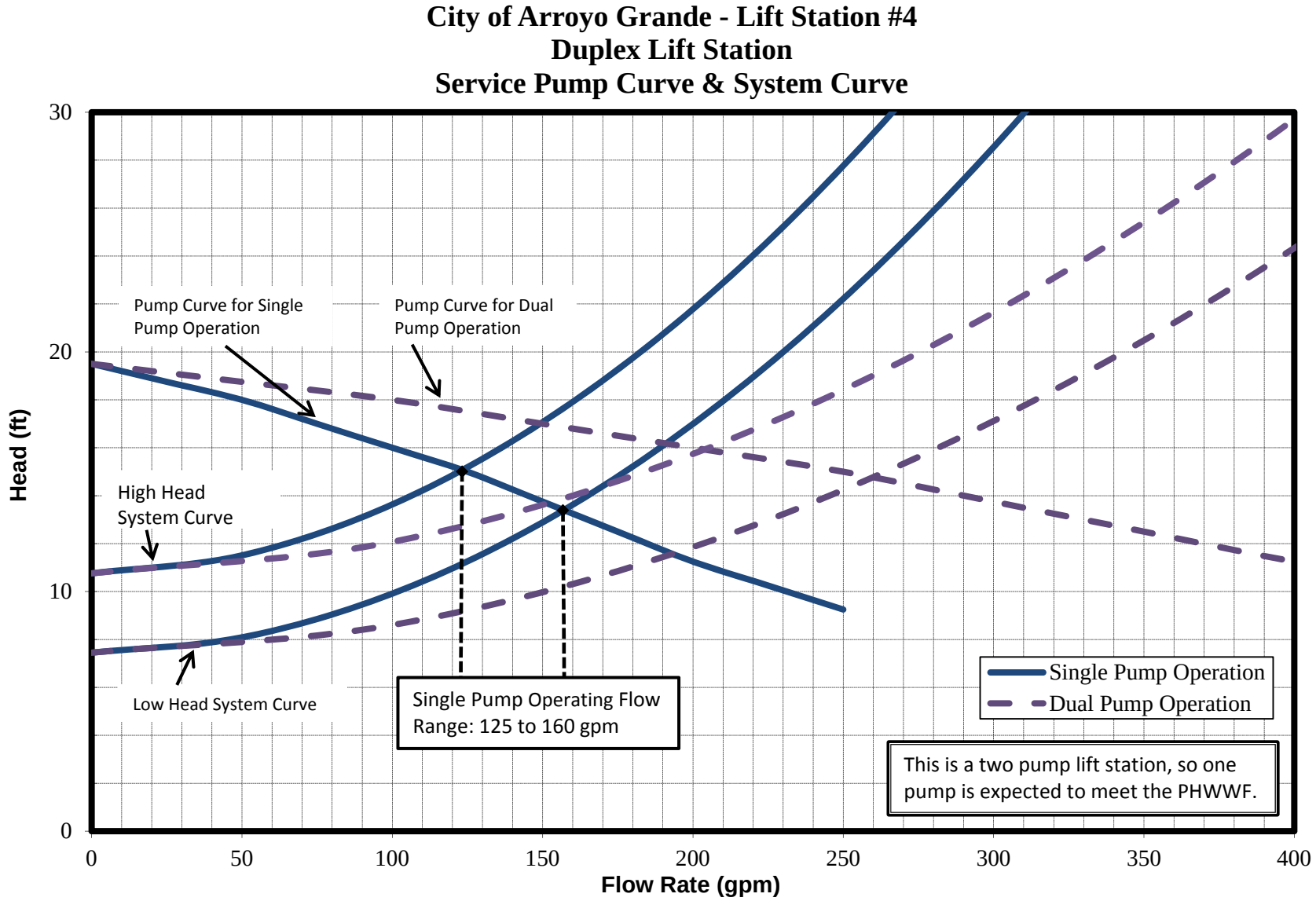
City of Arroyo Grande - Lift Station #4
Duplex Lift Station
Service Pump Curve & System Curve
Head (ft)
Flow Rate (gpm)
0
10
20
30
0
50
100
150
200
250
300
350
400
Pump Curve for Single Pump Operation
Pump Curve for Dual Pump Operation
High Head System Curve
Low Head System Curve
Single Pump Operating Flow Range: 125 to 160 gpm
Single Pump Operation
Dual Pump Operation
This is a two pump lift station, so one pump is expected to meet the PHWWF.

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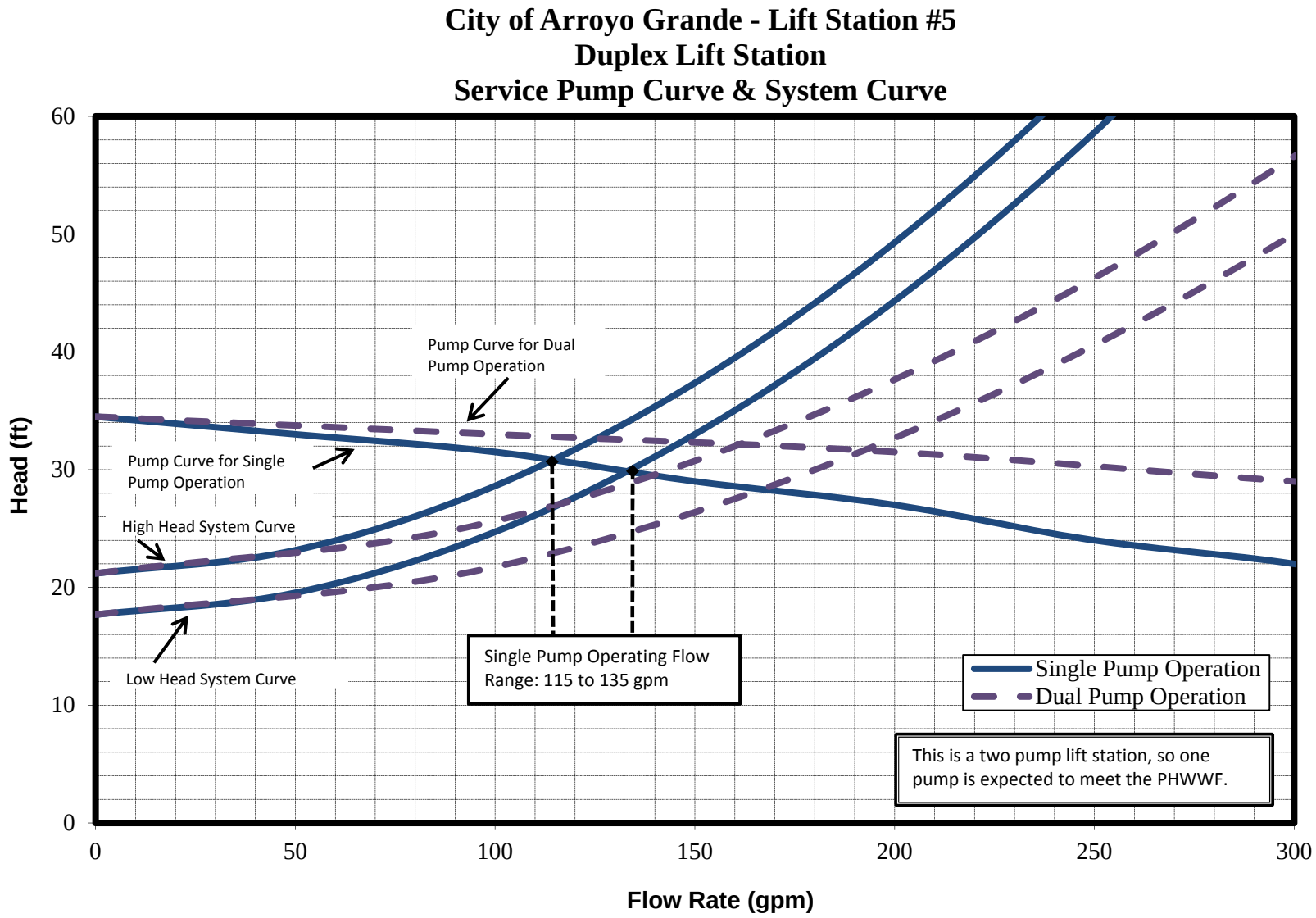
City of Arroyo Grande - Lift Station #5
Duplex Lift Station
Service Pump Curve & System Curve
Head (ft)
Flow Rate (gpm)
0
10
20
30
40
50
60
0
50
100
150
200
250
300
Pump Curve for Dual Pump Operation
Pump Curve for Single Pump Operation
High Head System Curve
Low Head System Curve
Single Pump Operating Flow Range: 115 to 135 gpm
Single Pump Operation
Dual Pump Operation
This is a two pump lift station, so one pump is expected to meet the PHWWF.

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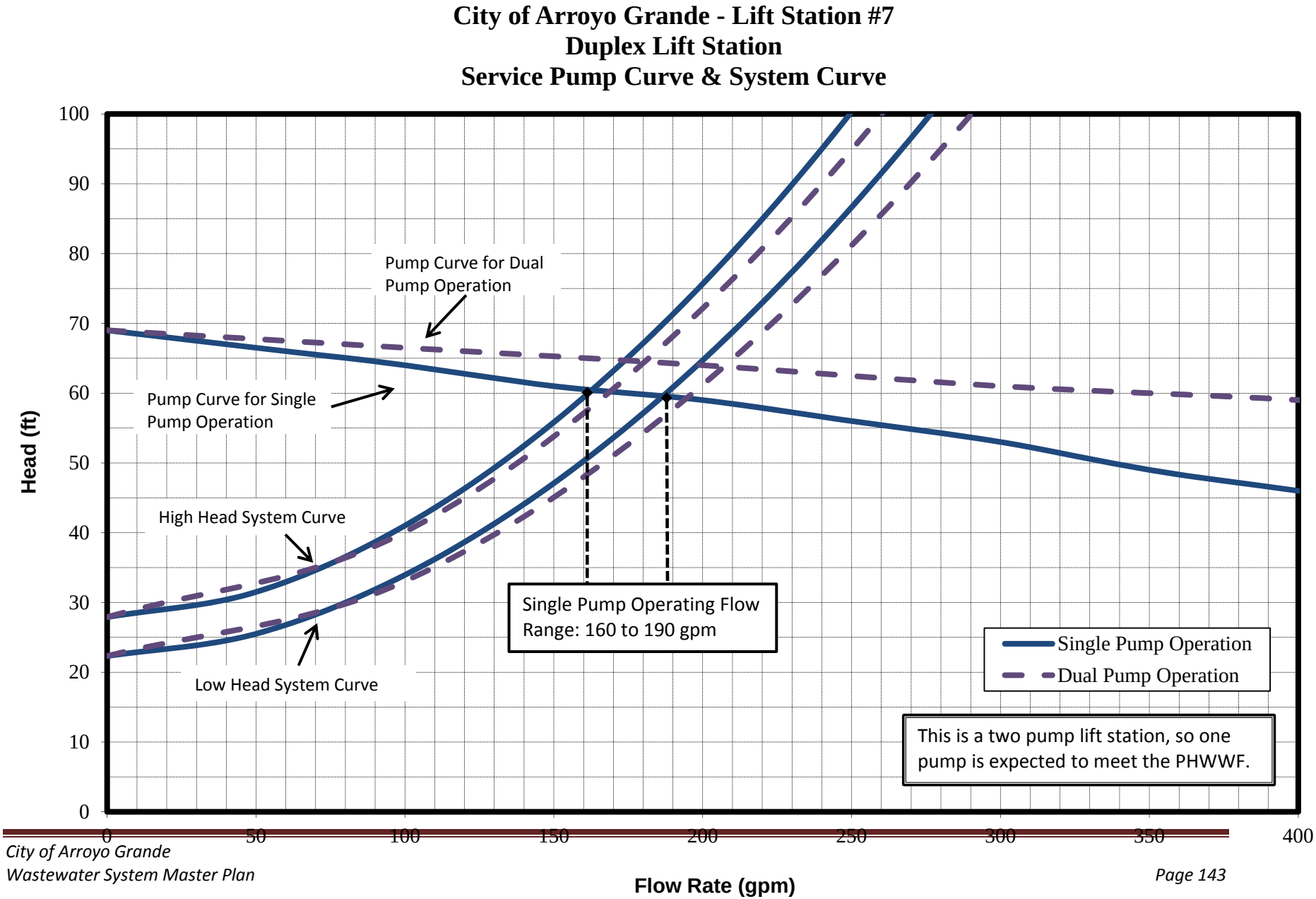
City of Arroyo Grande - Lift Station #7
Duplex Lift Station
Service Pump Curve & System Curve
Head (ft)
Flow Rate (gpm)
100
90
80
70
60
50
40
30
20
10
0
0
50
100
150
200
250
300
350
400
Pump Curve for Dual Pump Operation
Pump Curve for Single Pump Operation
High Head System Curve
Low Head System Curve
Single Pump Operating Flow Range: 160 to 190 gpm
Single Pump Operation
Dual Pump Operation
This is a two pump lift station, so one pump is expected to meet the PHWWF.

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Technical Memorandum

APPENDIX C – Lift Station Energy Considerations

Date: 4/24/2012

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Project: City of Arroyo Grande 2011 Water and Sewer Master Plan Updates

SUBJECT: **APPENDIX C – LIFT STATION ENERGY CONSIDERATIONS**

The purpose of this analysis was to investigate the energy use of the City of Arroyo Grande's lift stations. These energy considerations will support the development of the Sewer System Master Plan Update.

From the results of this analysis, WSC recommends the following two actions:

(1) Perform a detailed energy investigation of Lift Station 1, including a pump efficiency test.
(2) Consult with the City's PG&E account representative about changing the PG&E rate schedule for the electric meter serving Lift Station 5.

Data

WSC obtained energy billing data from Pacific Gas and Electric Company (PG&E) for Lift Stations 1, 3, 4, and 5, for approximately 2008 through 2010. WSC was not able to access energy usage for Lift Station 7 because the PG&E electricity bill for Lift Station 7 is paid by a private development, not the City.

The compiled energy usage for the lift stations for 2008 – 2010 is shown in Figure C-1. The tabulated energy usage and energy costs are shown in Table C-1 -. Note that the PG&E billing cycles do not align exactly with the calendar month and calendar year; thus, the data shown for

each year represents an approximate value for that year, estimated using data for one year beginning with the first full billing cycle in each year (i.e. the 2008 total is tabulated from PG&E billing data from mid-January 2008, through mid-January 2009).

The energy analysis was limited to a high-level investigation due to limited availability of data. Flow records for the lift stations were not available. In addition, pump efficiency test reports were not available.

Results and Recommendations

As illustrated by the energy billing data in Figure C-1 and Table C-1 -, Lift Station 1 is the dominant energy user in the City's wastewater system. From 2008 – 2010, Lift Station 1 consumed between 87% and 89% of the total energy used by all the lift stations on an annual basis (excluding Lift Station 7). For the same time period, the energy costs to operate Lift Station 1 accounted for 85% to 87% of the annual energy costs for all the lift stations (excluding Lift Station 7; by agreement, the electricity bill at Lift Station 7 is paid by the homeowners association).

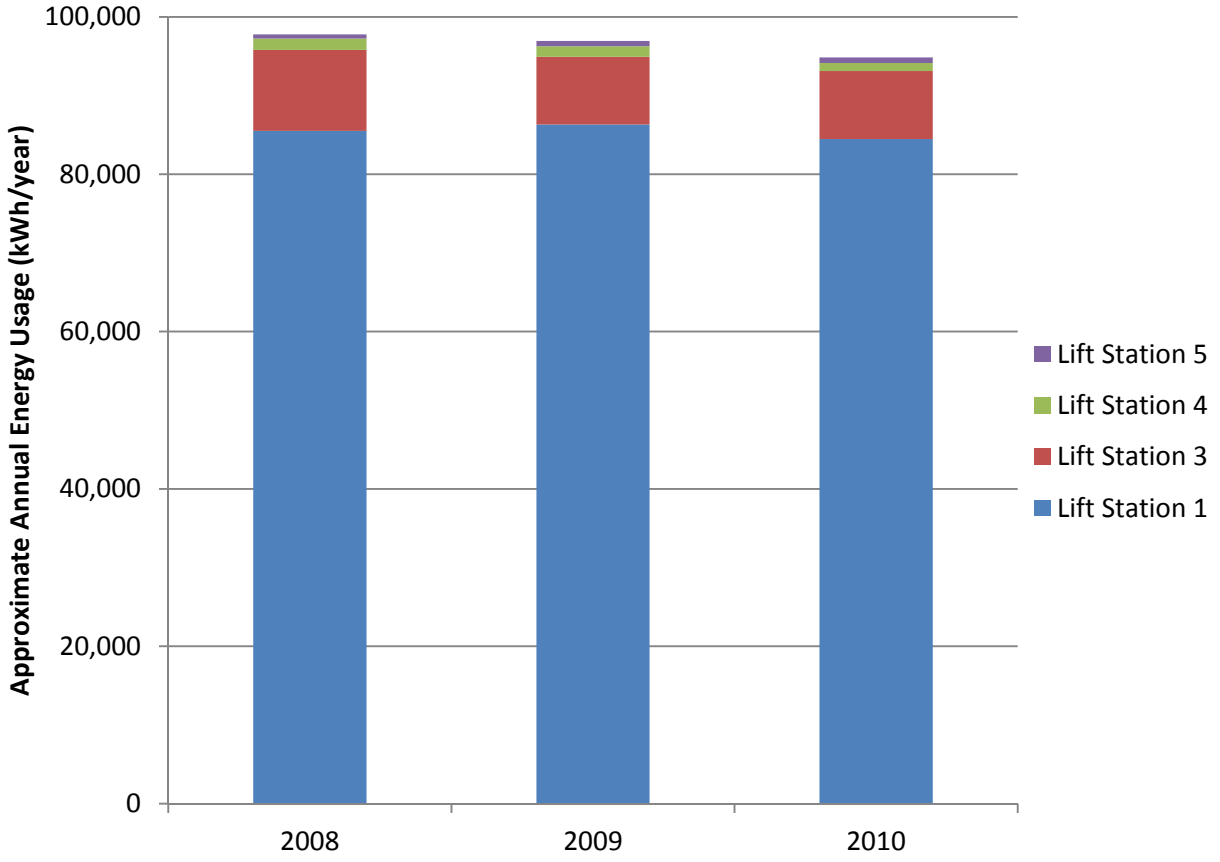

Figure C-1 - Energy Consumption of the City's Lift Stations for 2008 – 2010

Table C-1 -Energy Use (kWh), Energy Cost ($), and Average Cost per Unit Energy ($/kWh) for Lift Stations

Lift Station	Current Rate Schedule	2008			2009			2010		
		Energy (kWh)	Cost ($)	$/kWh	Energy (kWh)	Cost ($)	$/kWh	Energy (kWh)	Cost ($)	$/kWh
1	A6X	85,520	12,926	0.15	86,320	14,035	0.16	84,480	14,803	0.18
3	A1P	10,283	1,777	0.17	8,614	1,611	0.19	8,632	1,685	0.20
4	A1	1,436	334	0.23	1,325	333	0.25	1,025	286	0.28
5	A1P	540	246	0.46	677	277	0.41	714	286	0.40
7	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a

Specific equipment recommendations cannot be made due to the limited availability of data. However, from the above energy data, WSC recommends the following:

(1) Perform a detailed energy investigation of Lift Station 1, including performing a pump efficiency test. Because Lift Station 1 is the highest energy user, a more thorough investigation of the lift station's performance and overall plant efficiency is warranted. Implementing energy efficiency improvements at Lift Station 1 has the potential to yield the greatest energy bill savings because Lift Station 1 has the largest energy use, which results from it having the largest pump capacity and the greatest run time. WSC recommends seeking available energy efficiency incentives from PG&E to support the improvements.

Figure C-2 - Lift Station 1

(2) Consult with the City's PG&E account representative about changing the PG&E rate schedule for the electric meter serving Lift Station 5. Lift Station 5 is currently on an A1P rate schedule, with an average rate of $0.40/kWh is 2010, a significantly higher rate than Lift Station 4, which is of a comparable size and operating schedule. Although the cost savings of switching to a different rate schedule may be small (e.g. A1 rate schedule), it is worth investigating as it could lead to essentially "free" cost savings.

Figure C-2 - Lift Station 5